Report
S00-ARW-ENV-REP-00059

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Surat Gas Project Updated CSG WMMP Annual Report

Reporting Period: 22 October 2021 to 21 October 2022

Version	1.0
Released	20 January 2023
Document Owner	Groundwater Manager
Document Author	Principal Hydrogeologist
Document Status	Issued for Use

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1. Purpose

Arrow Energy's (Arrow) Surat Gas Project (SGP) was approved by the Australian Government under the *Environment and Protection and Biodiversity Conservation Act 1999* (EPBC Act) decision 2010/5344 on 19 December 2013. The conditions attached to approval EPBC 2010/5344 require a Stage 1 Coal Seam Gas (CSG) Water Monitoring and Management Plan (WMMP) (as required under condition 13, and approved by the Australian Government on 18 December 2018) and an Updated CSG WMMP (as required under condition 17, and approved by the Australian Government on 22 November 2019) be prepared.

Section 8.2.4 of the SGP Updated WMMP requires Arrow to publish an annual report presenting a summary of progress towards Arrow's commitments and document Arrow's compliance against the approval conditions. This annual report is required to be prepared within three months of the anniversary date of the SGP commencement, which was 22 October 2020. This Report has been prepared to fulfil these obligations for the reporting period of 22 October 2021 to 21 October 2022 and provides:

- a summary of relevant monitoring results and analysis and interpretation of data, including:
    - groundwater levels (Section 3.1)
    - groundwater chemistry results (Section 3.2)
    - subsidence monitoring results (Section 3.3)
- documentation of corrective actions implemented to address exceedances of trigger thresholds, limits, or non-compliance with approval conditions (Sections 3 and 6)
- details of any updates to the Field Development Plan (FDP) and implications for water monitoring and management (Section 4)
- reporting of any relevant ongoing studies and research projects, and includes any supporting technical studies as appendices to the annual report (Section 5)
- documentation of Arrow's compliance against the approval conditions over the preceding 12 months, including monitoring obligations and implementation of the early warning monitoring system (EWMS) (Section 6)
- reporting against the performance measure criteria detailed in Section 8.3 of the SGP Updated WMMP (Sections 3, 5 and 6).

2. Surat Gas Project Status

The SGP commenced on 22 October 2020 and, in the first 12 months, production had not started from any SGP production wells during that reporting period and, as such, no water was produced from these wells during that reporting period. During this reporting period of 22 October 2021 to 21 October 2022, 37 SGP production wells started production.

2.1 Well Installations

A total of 150 production wells have been installed since commencement of the SGP.

2.2 Well Production

During this reporting period, 37 production wells started production, their production start dates are shown in Table 2-1. Figure 2-1 shows the location of these wells. The water production volumes are summarised in Table 2-2.

Table 2-1: SGP Production well details and start dates

Bore	Easting	Northing	PL	Production start date
Stratheden 131	305,795	6,988,720	PL 252	May 23 2022
Stratheden 132	305,807	6,988,730	PL 252	May 23 2022
Stratheden 133	305,819	6,988,740	PL 252	May 23 2022
Stratheden 134	305,831	6,988,750	PL 252	May 23 2022
Stratheden 135	305,843	6,988,760	PL 252	May 23 2022
Stratheden 137	305,613	6,987,470	PL 252	Apr 28 2022
Stratheden 138	305,626	6,987,470	PL 252	Apr 28 2022
Stratheden 139	304,517	6,987,460	PL 252	Apr 26 2022
Stratheden 151	308,346	6,988,440	PL 252	Aug 31 2022
Stratheden 152	308,331	6,988,440	PL 252	Aug 31 2022
Stratheden 153	308,316	6,988,450	PL 252	Aug 31 2022
Stratheden 154	308,302	6,988,450	PL 252	Aug 31 2022
Stratheden 155	308,287	6,988,450	PL 252	Aug 31 2022
Stratheden 171	307,827	6,987,210	PL 252	Aug 30 2022
Stratheden 172	307,812	6,987,220	PL 252	Aug 30 2022
Stratheden 181	303,212	6,986,340	PL 252	May 29 2022
Stratheden 182	303,220	6,986,320	PL 252	May 29 2022
Stratheden 183	303,228	6,986,310	PL 252	May 29 2022
Stratheden 184	303,236	6,986,300	PL 252	May 29 2022
Stratheden 186	303,252	6,986,270	PL 252	May 29 2022
Stratheden 188	303,268	6,986,250	PL 252	May 26 2022
Stratheden 191	305,580	6,986,050	PL 252	Jun 6 2022
Stratheden 192	305,588	6,986,040	PL 252	Jun 6 2022
Stratheden 193	305,596	6,986,030	PL 252	Jun 6 2022
Stratheden 194	305,603	6,986,020	PL 252	Jun 17 2022
Stratheden 196	305,619	6,985,990	PL 252	Jun 17 2022
Stratheden 197	305,626	6,985,980	PL 252	Jun 17 2022
Stratheden 198	305,634	6,985,960	PL 252	Jun 17 2022
Stratheden 71	304,843	6,993,180	PL 252	May 3 2022
Stratheden 72	304,851	6,993,170	PL 252	May 3 2022

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Bore	Easting	Northing	PL	Production start date
Stratheden 73	304,859	6,993,160	PL 252	May 3 2022
Stratheden 74	304,867	6,993,150	PL 252	May 3 2022
Stratheden 89	307,015	6,989,700	PL 252	Apr 26 2022
Stratheden 91	304,989	6,990,770	PL 252	May 23 2022
Stratheden 93	305,014	6,990,790	PL 252	May 23 2022
Stratheden 94	305,027	6,990,800	PL 252	May 23 2022
Stratheden 97	306,547	6,990,460	PL 252	Apr 26 2022

Table 2-2: 2021 – 2022 water production volumes by month and annual total

Month	Volume extracted (ML)
November 2021	0.0
December 2021	0.0
January 2022	0.0
February 2022	0.0
March 2022	0.0
April 2022	2.4
May 2022	48.7
June 2022	87.6
July 2022	86.9
August 2022	89.8
September 2022	138.6
October 2022	158.2
Total annual	**671.5**

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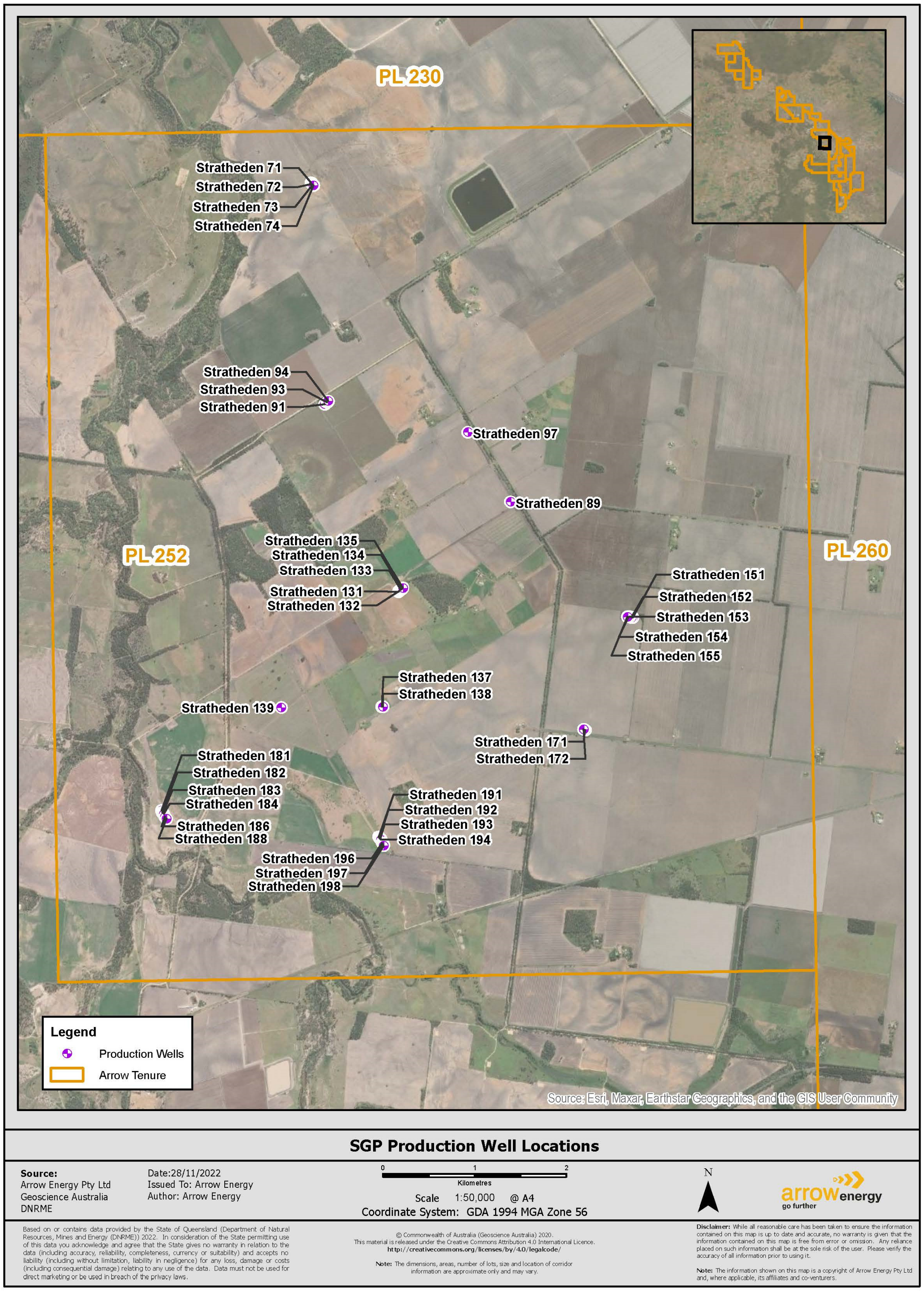

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Figure 2-1: SGP production well locations that have commenced production

3. Monitoring and Management Programs

3.1 Groundwater pressure/level

3.1.1 Data collection

Groundwater pressure and level data were collected from all operational WMMP monitoring points throughout the reporting period where land access was in place except for Daandine-161 which was unable to be accessed due to wet weather. In accordance with Section 7.3 of the SGP Updated WMMP, the locations monitored and the frequency of monitoring were carried out throughout the reporting period in alignment with the most current Underground Water Impact Report (UWIR), which was the 2019 UWIR for the period to 30 April 2022, and 2021 UWIR from its commencement on 1 May 2022. A summary of changes to the groundwater pressure / level monitoring program due to the new 2021 UWIR is provided in Section 3.4.

Throughout the reporting period there were instances where hourly data were unable to be collected due to monitoring equipment failure or access to the monitoring point was not in place. Daily data collection from Kogan North-79 and Carn Brea-18/19/20 (single skid) was interrupted due to a global supply shortage of suitable modems, Hopeland-17 skid was shut down between April and June 2022 for the bore's workover to replace the Upper Taroom monitoring point's pressure gauge and subsequent issues encountered by contractors reconnecting the pressure gauges, and Longswamp-7 skid required replacement parts during the month of March. Nonetheless, of the 133 pressure / level monitoring points listed in the 2021 UWIR required by the end of the reporting period of October 2022, 6 were unable to be accessed due to land access arrangements, 14 experienced large gaps in their monitoring record for the reporting period as discussed above, and the remaining 113 had hourly data collected and no known issues. It should be noted that although not all hourly data were collected from the monitoring points noted here, the majority of hourly data for the reporting period was collected from almost all of these monitoring points.

Individual hydrographs for each monitoring point are provided in Appendix A.

In accordance with Section 9.12 of the 2021 UWIR, Arrow provided to the Office of Groundwater Impact Assessment (OGIA) a WMS network implementation report and WMS water monitoring report by the required dates of 1 April and 1 October 2022.

3.1.2 Data analysis

An analysis of data collected to date is provided in the following sections, noting that water production from SGP production wells commenced during the reporting period and, as a result, changes in observed groundwater levels / pressure have been analysed with respect to groundwater extraction.

EWMS comparison

Biannual comparison of the collected groundwater level/pressure data against the EWMS values was undertaken within 90 days of the end of each six-monthly monitoring period. No EWMS exceedances were identified during the reporting period and illustrations of these comparisons are provided in Appendix A.

Condamine Alluvium trend analysis

A hydrograph of the groundwater level data collected from the Condamine Alluvium monitoring bores is shown in Figure 3-1. The data show general groundwater flow in the Condamine Alluvium, within the vicinity of Arrow's monitoring network, is from south to north.

Groundwater level trends are variable within the Condamine Alluvium. The majority of the bores located in the central Condamine Alluvium area (groundwater elevation between 305 and 325 m AHD) displaying strong seasonal responses to non-CSG groundwater take (Figure 3-2) and thus the greatest observed drawdown (and generally subsequent recovery).

A long-term slightly declining groundwater level trend is evident across most monitoring bores. Bores 42230209, Tipton 203 and Macalister 5 have a stable trend with no observable seasonal variation. Carn Brea 17, Stratheden-62 and Macalister 7 also have a relatively stable trend but show seasonal responses. Bores 42231370 and Mt Haystack 5 have previously shown declining trends but in the last two years have started to show an increasing trend. Tipton 221 has historically (and this period) shown a slightly increasing trend.

Observed drawdown is greatest in Daandine-161 with 3.01 m since 2013. The SGP Production Arrow wells located near Stratheden-62 commenced extraction from the reservoir in April 2022 and the water level in this bore has remained stable throughout the reporting period.

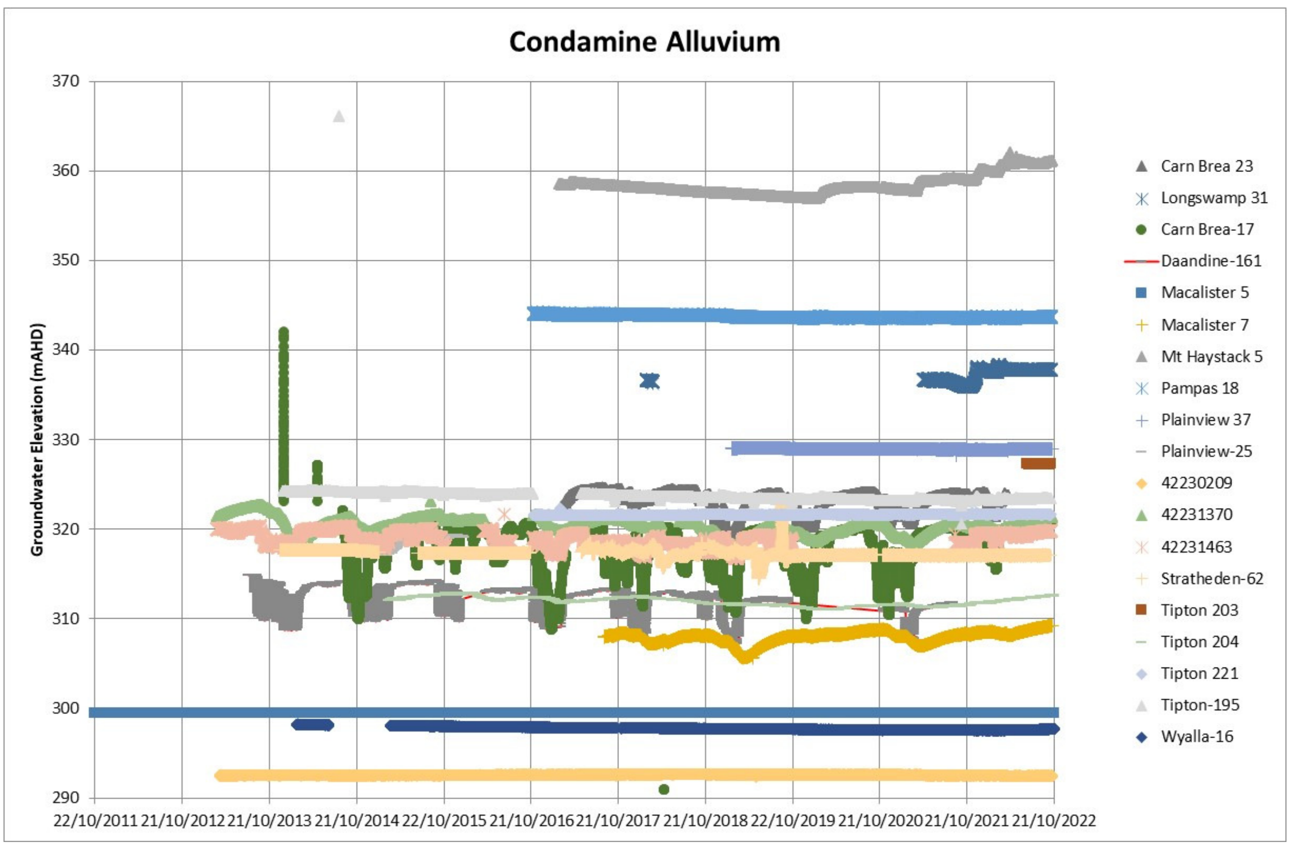

Figure 3-1: Condamine Alluvium monitoring bores hydrograph

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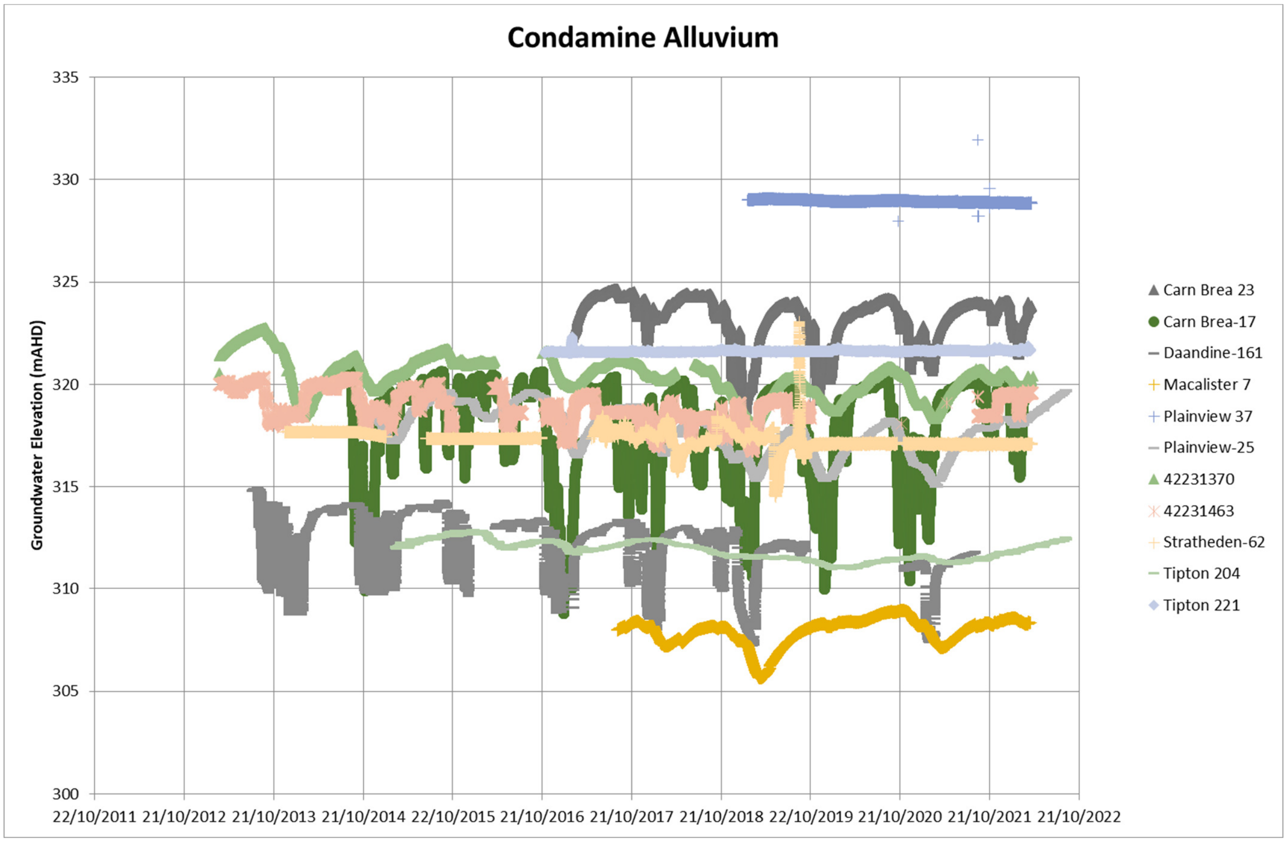

Figure 3-2: Central Condamine Alluvium area monitoring bores hydrograph

Springbok Sandstone trend analysis

Groundwater levels/pressure in the Springbok Sandstone monitoring bores displayed varying trends; however, all monitoring points except for Glenburnie 20 (given its monitoring interval is a perched seepage zone and is not representative of the regional water table) and part of the monitoring record for Hopeland-17 (still recovering from groundwater sampling) displayed a groundwater elevation between 290 and 340 m AHD during this reporting period (Figure 3-3).

Bores Stratheden-63, Meenawarra-21, Glenburnie-18 (following a period of pressure equalisation succeeding bore installation), Glenburnie 20, Plainview 36, Longswamp 29, Longswamp 33 and Tipton 202 displayed generally stable groundwater pressure trends. Hopeland-17 displayed variability in its groundwater pressure, most likely a result of nearby CSG production on neighbouring non-Arrow tenements (as noted in Section 5.6.2.2 of the 2021 UWIR (OGIA, 2021)), a workover in May 2020 to install a new pressure gauge (the gauge failed in November 2018) and swabbing of the bore in December 2020 to collect a groundwater sample (which the bore was still recovering from at the end of the reporting period as a result of low permeability of the formation). The SGP Production Wells located near Stratheden-63 commenced extraction from April 2022, a response to this production is not evident in the water level data during this time. These trends in the Springbok Sandstone monitoring bores continued throughout the reporting year.

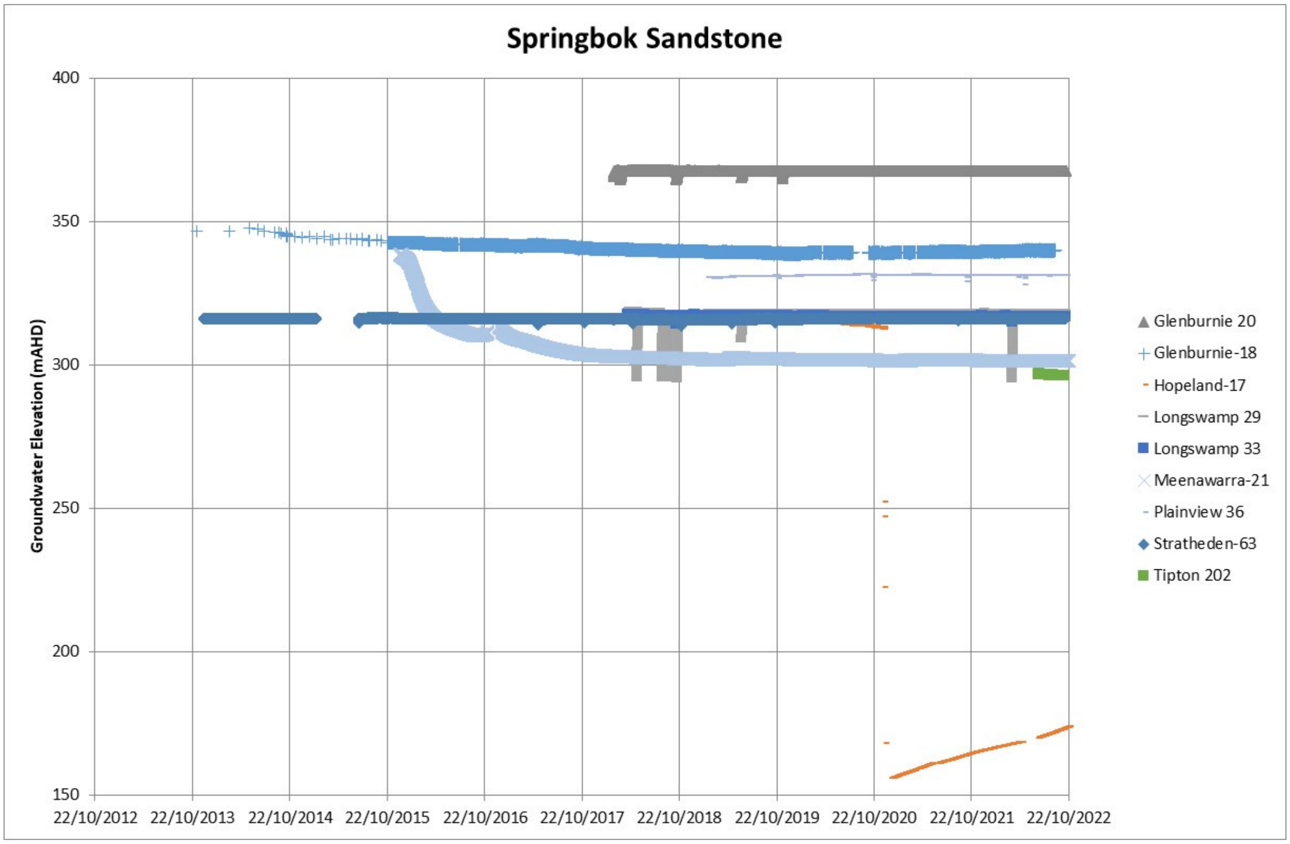

Figure 3-3: Springbok Sandstone monitoring bores hydrograph

Hutton Sandstone trend analysis

All Hutton Sandstone monitoring bores showed a long-term declining trend (Figure 3-4) at rates that are consistent with Section 5.6.2.1 of the 2021 UWIR (OGIA, 2021), which is up to 2 m per year. The largest observed drawdown has been in bore Wyalla-17 which has recorded a drawdown of 20.3 m since 2019, the majority of which occurred within the first six months of installation, with a drawdown rate of less than 2 m/year since then. Newly installed monitoring point Daandine-123 (July 2020) recorded a drawdown of 12.9 m since August 2020 (rate of 6.3 m/year). The least drawdown has been observed in Tipton-153 of 0.45 m since 2019 (rate of 0.13 m/year). The smaller observed drawdown rate in Kedron-570 (0.21 m/year) is also consistent with the 2021 UWIR (OGIA, 2021) which states that there is generally no groundwater level trends in the Hutton Sandstone north of the Great Dividing Range. The initial steeper drawdown curves observed in Wyalla-17 and when a new pressure gauge was installed in Daandine-123 (July 2020), are likely a result of pressure equalisation between the bore and the formation following workover of the bores to install the gauges. Both Plainview 16 and Tipton 200 were installed relatively recently and have correspondingly short periods of monitoring, however, the Hutton Sandstone groundwater level is stable at these bores.

These long-term trends have continued throughout the reporting period, noting that data have not been collected from Burunga Lane-176 since 2018 due to ongoing land access negotiations (Table 3-4).

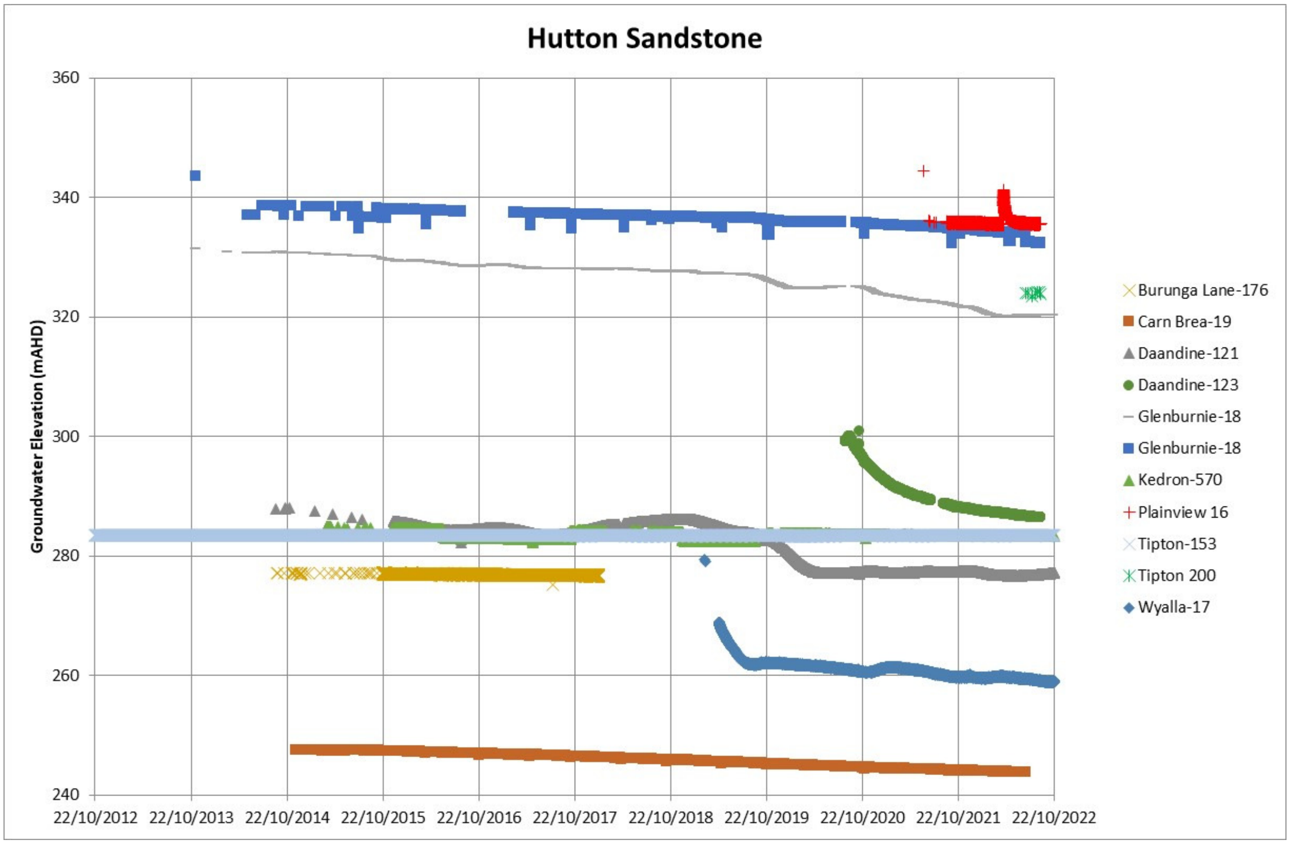

Figure 3-4: Hutton Sandstone monitoring bores hydrograph

Precipice Sandstone trend analysis

Observed groundwater pressure trends in the Precipice Sandstone monitoring bores shows a declining trend in the monitoring bores located further south within Arrow's tenure (Figure 3-5). These trends are consistent with that described in Section 5.6.2.4 of the 2021 UWIR (OGIA, 2021) where there is extensive non-CSG development (in parallel with the Moonie oil field) which has resulted in regionally observed declines in groundwater pressure in the south. The 2021 UWIR indicates in areas where reinjection is occurring correlates to increasing groundwater level trends, however, no groundwater level data was collected from Arrows northern bore (Burunga Lane-174 – land access is not in place) during this annual period to confirm whether this trend was occurring in this area. The rate of drawdown is most notable in Carn Brea-20 during this annual reporting period.

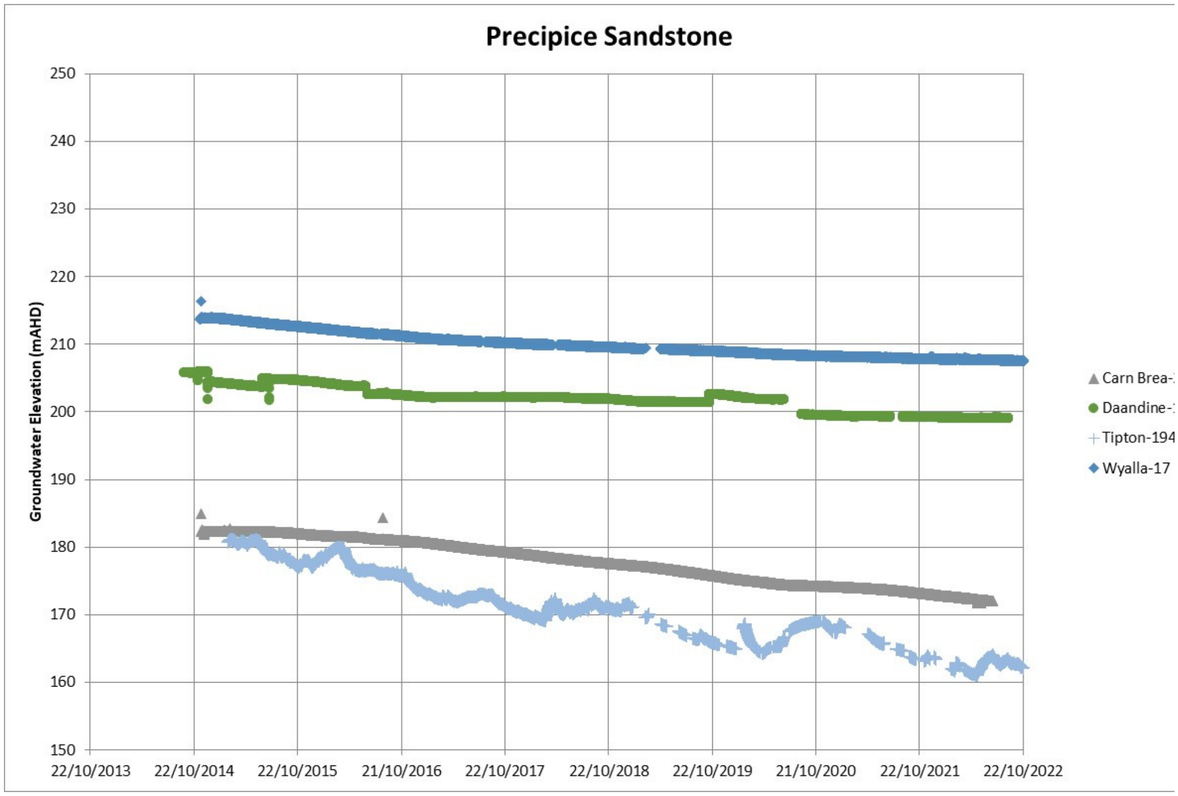

Figure 3-5: Precipice Sandstone monitoring bores hydrograph

Walloon Coal Measures trend analysis

Hydrographs for the Walloon Coal Measures (WCM) observed groundwater pressures are provided in Figure 3-6 to Figure 3-9. The WCM are the reservoir target for production of CSG. The pressure data have been split into four hydrographs based on the large number of monitoring points and variation in observed pressure values. The hydrographs demonstrate, as predicted, the pressure responses at those locations close to CSG operations such as those monitoring points located at Daandine production field, Tipton production field and Hopeland area, while those monitoring bores further away from CSG operations display a more subdued (or no) pressure response. This relationship between observed drawdown in the WCM and distance from nearest production is consistent with that reported for the WCM across the Surat CMA in the 2019 and 2021 UWIR (OGIA 2019, 2021).

Production from SGP production wells started in April 2022. Further declines in groundwater levels at Longswamp-7 sites were observed after this date, however these sites were already showing a decline in groundwater levels. A change in groundwater levels at Longswamp 34 and Daandine-254 sites were not observed around this time. Further monitoring is needed to observe if any trends develop as a result of production.

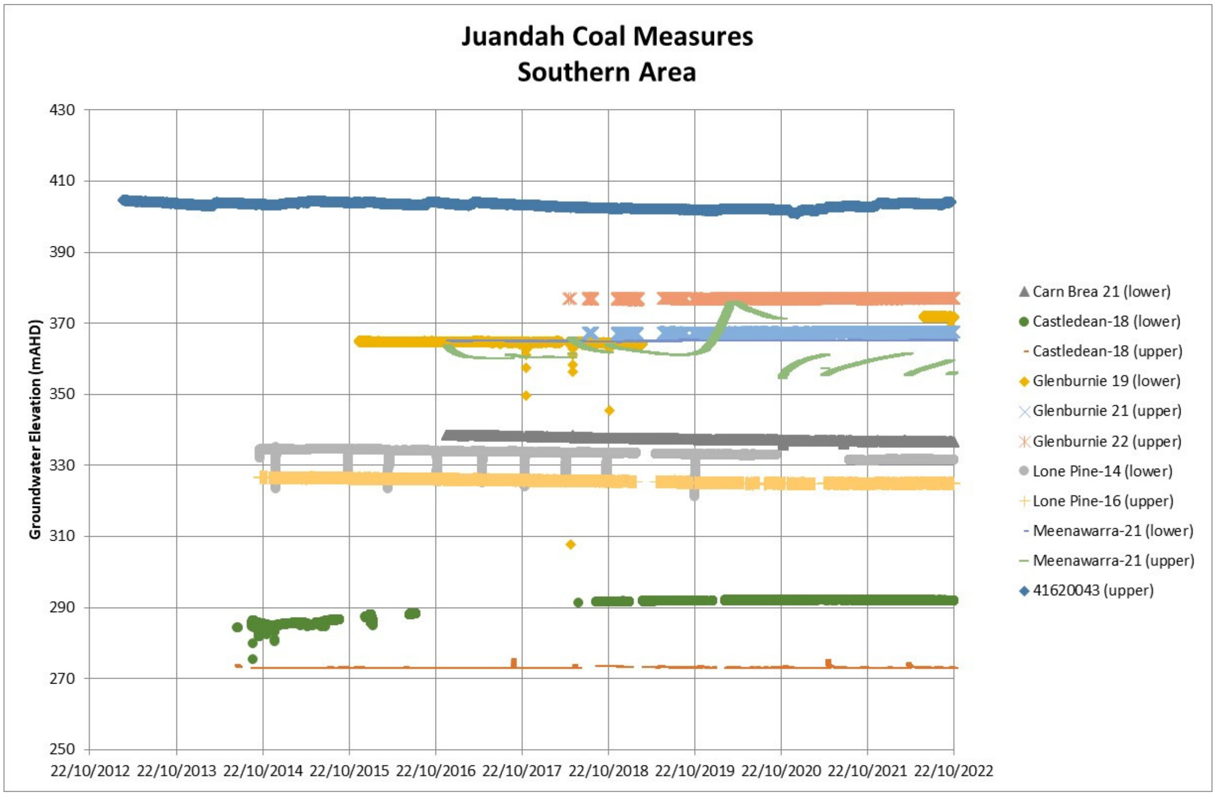

Figure 3-6: Juandah Coal Measures monitoring bores hydrograph – southern area

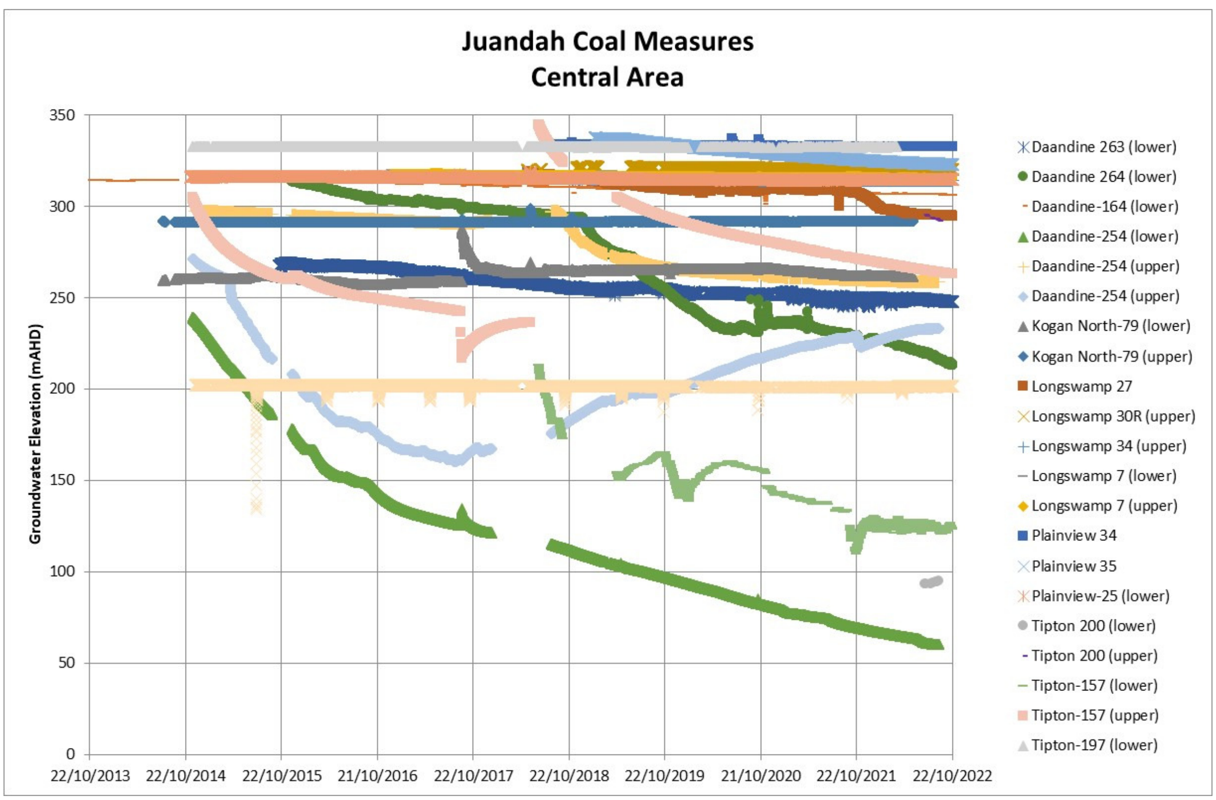

Figure 3-7: Juandah Coal Measures monitoring bores hydrograph – central area

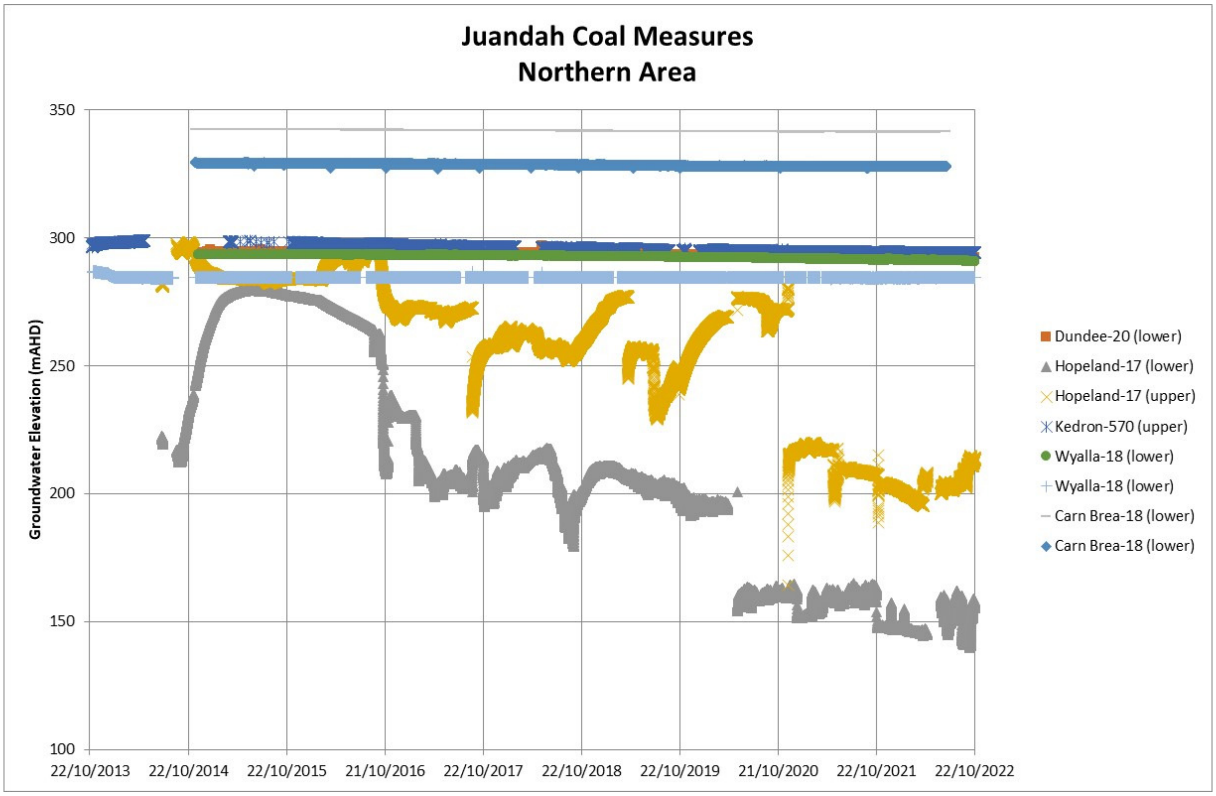

Figure 3-8: Juandah Coal Measures monitoring bores hydrograph – northern area

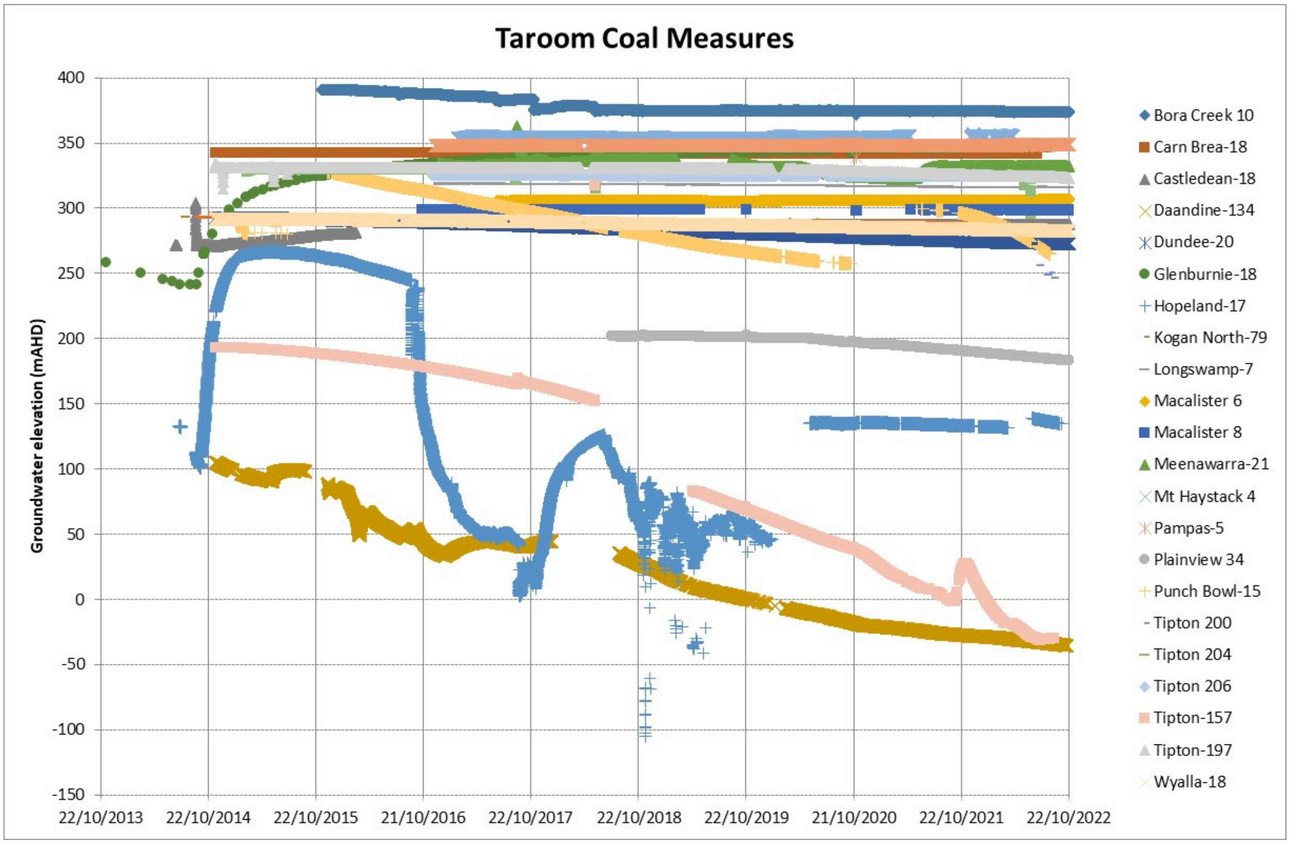

Figure 3-9: Taroom Coal Measures monitoring bores hydrograph

3.2 Groundwater quality

3.2.1 Data collection

Groundwater samples were collected from all operational WMMP monitoring points throughout the reporting period where land access arrangements were in place. In accordance with Section 7.3 of the SGP Updated WMMP, the locations monitored and frequency of monitoring throughout the reporting period were in alignment with the current UWIR, which was the 2021 version. A summary of changes to the groundwater quality monitoring program is provided in Section 3.4 and a list of monitoring bores sampled during the reporting period is provided in Table 3-1. It should be noted that the 2021 UWIR specifies (Table 9-4) that sampling is no longer required from monitoring points where five samples have been collected (including one sample of dissolved strontium and strontium isotopes ($^{87}Sr/^{86}Sr$) in Springbok Sandstone, Hutton Sandstone and Precipice Sandstone monitoring points).

A summary of groundwater sampling conducted during the reporting period is provided in Table 3-1. These groundwater samples were analysed for the 2021 UWIR suite which is provided in Table 3-6 and the results are provided in Appendix B.

Table 3-1: 2021 UWIR groundwater chemistry monitoring points

Bore Name	OGIA MP ID	Formation	Sampling completed during reporting period[1]
Burunga Lane-176	477	Hutton Sandstone	No sampling completed due to no land access
Carn Brea-17	39	Condamine Alluvium	Not required
Carn Brea-18	41	WCM	Not required
Carn Brea-19	45	Hutton Sandstone	Not required
Daandine-121	183	Hutton Sandstone	Not required
RN 42230209	282	Condamine Alluvium	Not required
Glenburnie-18	739	Hutton Sandstone	Not required
Plainview 36	790	Springbok Sandstone	Sampled April 2022. Sampled again after reporting period (November 2022)
Stratheden-63	623	Springbok Sandstone	Not required
Tipton-195	85	Condamine Alluvium	Sampled October 2022
Tipton-197	89	WCM	Not required
Tipton 202	830	Springbok Sandstone	New monitoring bore, first sampling event conducted after reporting period (November 2022)
Wyalla-16	248	Condamine Alluvium	Not required
RN 42231370	52	Condamine Alluvium	Not required

Notes:
1. Refer to Table 3-4 and Table 3-5 for sampling requirements

3.2.2 Data analysis

The 2021 UWIR discusses the water quality parameters for each groundwater monitoring zone in terms of the 20th 50th, and 80th percentiles. The section below discusses in detail the water quality results for the two formations where water quality data was obtained during this annual reporting period as well as a brief comparison of the hydrogeochemistry of the other formations.

Field parameters

Condamine Alluvium

A statistical summary of the historical field water quality parameters is provided in Table 3-2 for Condamine Alluvium in relation to the 20th, 50th and 80th percentiles. These statistics were compared to those in the EPP, specifically the Condamine River Basin, Central Condamine values. Field EC is generally within the 20th and 80th percentile at bores monitoring the Condamine Alluvium, however, bore 42230209 has significantly higher EC concentrations than the other bores monitoring this unit and the EPP water quality objectives. It is noted that the 80th percentiles for bores 42231370 and Wyalla-16 are both slightly higher than the EPP 80th percentile criteria.

Table 3-2: Summary field water quality percentiles for Condamine Alluvium

Parameter		42231370	42230209	Carn Brea-17	Tipton-195	Wyalla-16	All bores	EPP WQ objective
FIELD EC (µS/cm)	Count	10	10	10	11	10	52	
	20 per	2,053	9,260	897	1,559	1,154	1,136	606
	50 per	2,134	9,614	1008	1,568	1,226	1,568	1,150
	80 per	2,241	10,219	1108	1,787	1,368	2,472	2,050
FIELD pH	Count	10	10	10	11	10	52	
	20 per	7.35	6.74	6.83	7.12	7.23	6.94	7.4
	50 per	7.41	6.91	6.94	7.22	7.38	7.20	7.9
	80 per	7.47	6.97	7.18	7.34	7.51	7.39	8.3
FIELD REDOX (mV)	Count	10	10	10	11	10	52	
	20 per	-124	-31	-89	-135	-37	-116	NA
	50 per	-97	6	-15	-118	2	-45	NA
	80 per	-76	27	33	-63	51	23	NA
FIELD TEMP (℃)	Count	10	10	10	11	10	52	
	20 per	21.34	22.98	22.60	23.30	24.14	22.70	NA
	50 per	22.70	23.60	23.60	23.90	25.85	23.90	NA
	80 per	25.88	24.08	28.30	27.40	26.54	26.56	NA

Note per = percentile

EC data (this laboratory and field where no laboratory data is available) collected to date is shown in Figure 3-10. The data show EC levels in the monitoring bores are generally stable with a slight declining trend in RN42230209. The collected pH data are graphically shown in Figure 3-11. The data show pH levels in the monitoring bores within the Condamine Alluvium are generally stable.

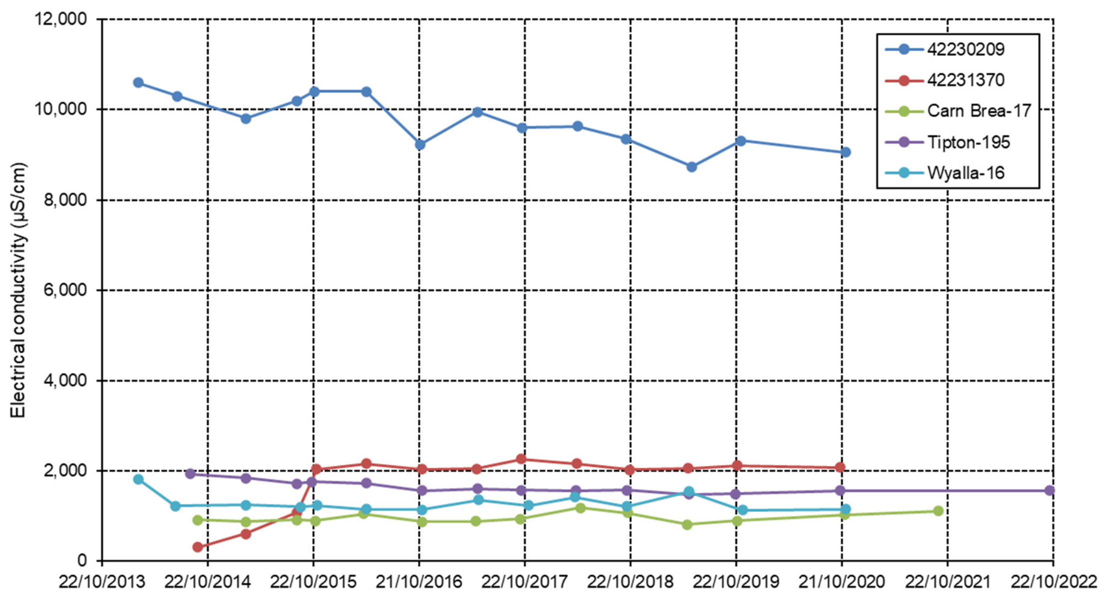

Figure 3-10: Condamine Alluvium electrical conductivity

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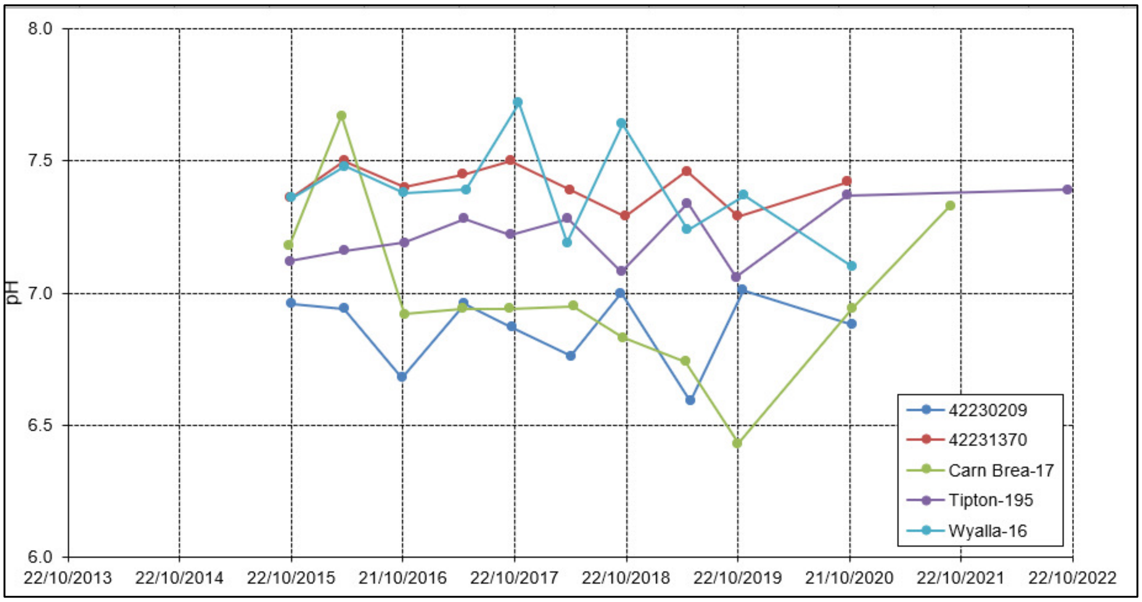

Figure 3-11: Condamine Alluvium pH

Springbok Sandstone

A statistical summary of the historical field water quality parameters is provided in Table 3-3 for Springbok Sandstone in relation to the 20th, 50th and 80th percentiles. These statistics were compared to those in the EPP, specifically the Lower GAB, Eastern Springbok Outcrop values. Both bores monitoring this unit have 80th percentiles for EC below the 80th percentile EPP WQ objective. However, Stratheden-63 has higher 20th and 50th percentiles than the EPP objectives. The pH measured at both bores is higher than the EPP objectives for the 20th, 50th and 80th percentile.

Table 3-3: Summary field water quality percentiles for Springbok Sandstone

Parameter		Plainview 36	Stratheden-63	All bores	EPP WQ objective
FIELD EC (µS/cm)	Count	8	8	16	
	20 per	300	3847	1265	1420
	50 per	1282	4135	2407	3175
	80 per	1314	4581	4199	9480
FIELD pH	Count	8	8	16	
	20 per	8.16	9.17	8.16	7.5
	50 per	8.24	9.39	8.58	8
	80 per	8.33	9.81	9.49	8.4
FIELD REDOX (mV)	Count	8	8	16	
	20 per	-81	-220	-212	NA
	50 per	-44	-208	-90	NA
	80 per	73	-177	43	NA
FIELD TEMP (℃)	Count	8	8	16	
	20 per	21.62	22.12	22.00	NA
	50 per	26.90	26.10	26.10	NA
	80 per	31.84	28.42	29.70	NA

Note per = percentile

EC data (this laboratory and field where no laboratory data is available) collected to date is shown in Figure 3-12. The data show EC levels in the monitoring bores are generally stable with an increasing trend in Stratheden-63.

The collected pH data are graphically shown in Figure 3-13. The data show pH levels in the monitoring bores are generally stable with a slight declining trend in Stratheden-63.

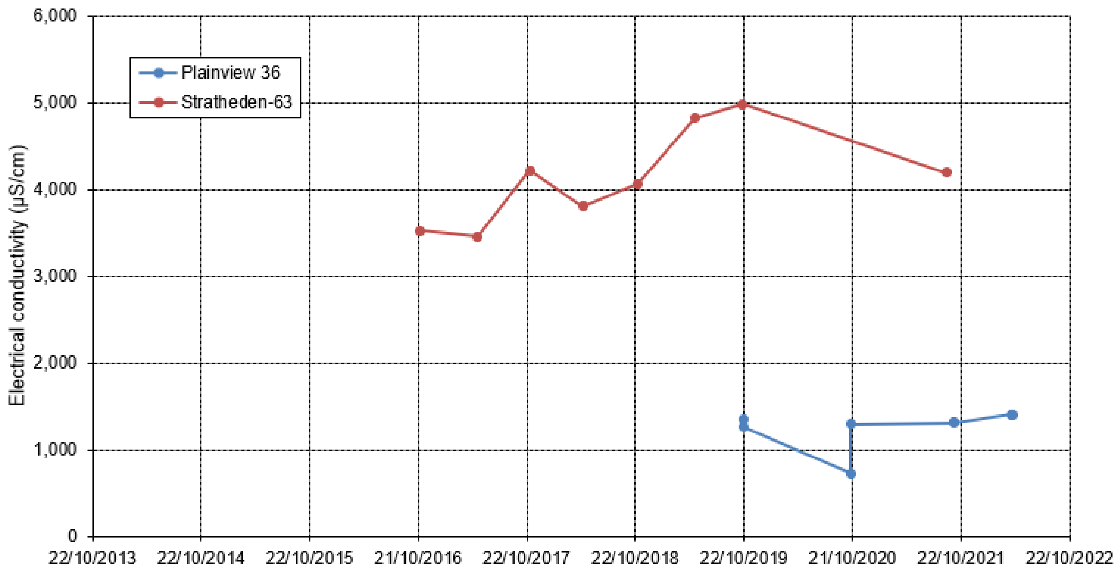

Figure 3-12: Springbok Sandstone electrical conductivity

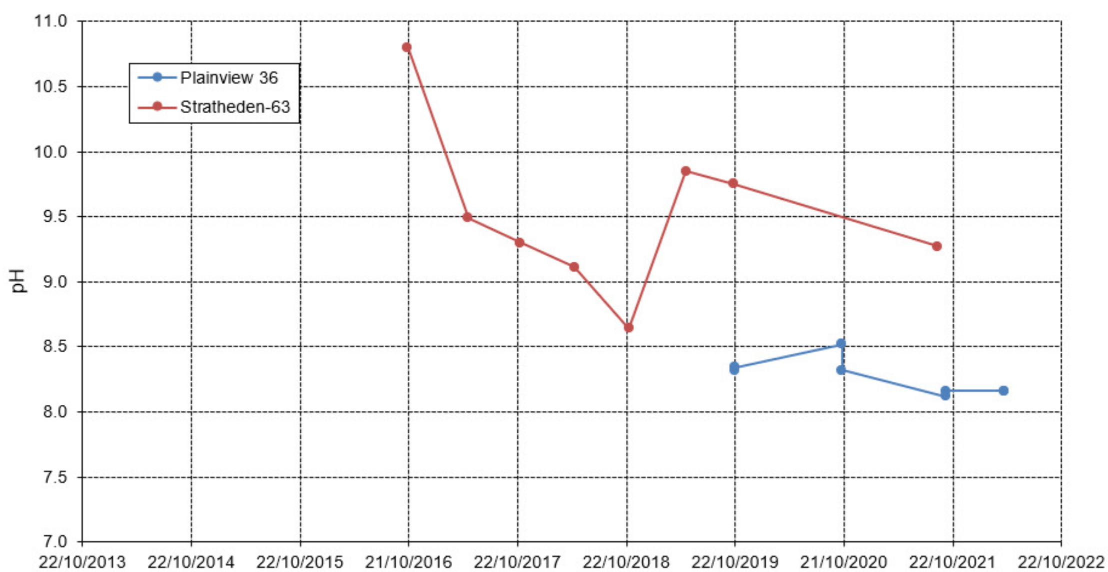

Figure 3-13: Springbok Sandstone pH

Metals, major ions and other key analytes

In the analysis of the water quality results, the DES (DES, 2021) recommends a minimum of eight samples at each site be used in the comparison of water quality. In this instance, historical samples from bores have also been combined to statistically analyse the results into 20th, 50th and 80th percentiles. A comparison of the water quality results for Condamine Alluvium and Springbok Sandstone (the two formations sampled this reporting period) for analytes listed in the 2021 UWIR along with the relevant water quality guideline values are shown in Appendix B.

Condamine Alluvium

For Condamine Alluvium, the water quality results show that bicarbonate alkalinity, chloride and total alkalinity are higher for all percentiles than the aquatic criteria. Sodium is higher than the 20th and 50th percentiles and magnesium for the 20th percentile and sulfate for the 80th percentile. A few of the dissolved metals (Copper and Iron) and total dissolved solids exceeded the Australian Drinking Water Guidelines (NHMRC, NRMMC 2011). Bores 42231370 and 42230209 (refer Appendix B) have the highest number of exceedances in comparison to the other Condamine Alluvium monitoring bores.

Some key time series plots were developed based on some analytes exceeding guidelines criteria. Figure 3-14 shows that chloride concentrations at 42230209 are significantly higher than that at the other Condamine alluvium monitoring bores and have a decreasing trend. Figure 3-15 indicates that bicarbonate alkalinity concentrations tend to be stable across these monitoring bores in the last few years, previously concentrations were decreasing at Tipton-195 and increasing at 42231370. The calcium, magnesium and sodium trends shown in Figure 3-16, Figure 3-17 and Figure 3-18 respectively are very similar to those for bicarbonate. Sulphate concentrations in Figure 3-19 show a high degree of variability between the monitoring bores, with most bores having concentrations < 25 mg/L except for 42230209 and Wyalla-16. Generally, TDS concentrations in the Condamine alluvium are < 1,200 mg/L, however, bore 42230209 consistently records a TDS >5,000 mg/L as shown in Figure 3-20.

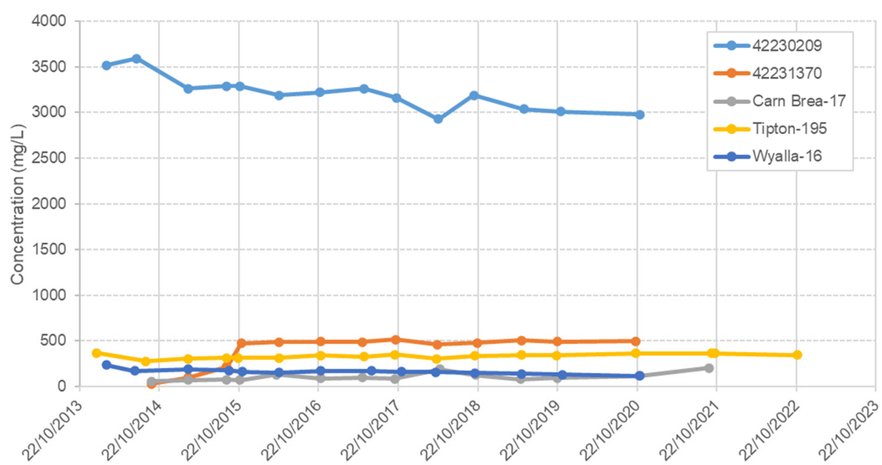

Figure 3-14: Condamine Alluvium: Chloride

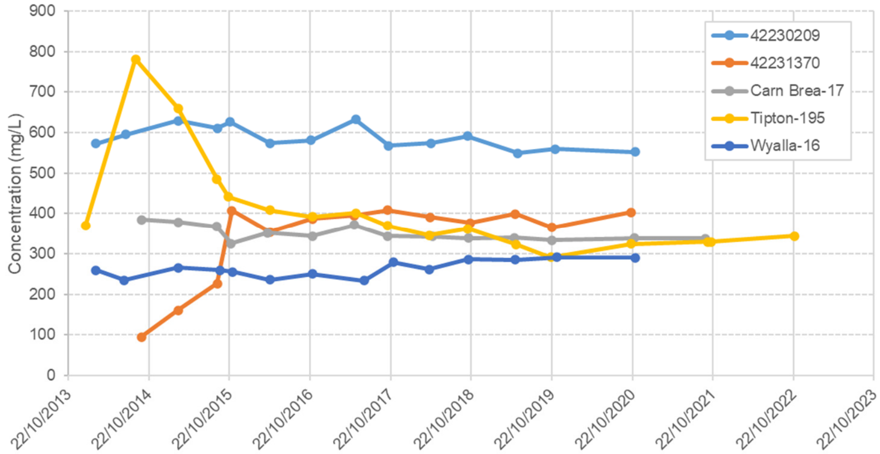

Figure 3-15: Condamine Alluvium: Bicarbonate Alkalinity

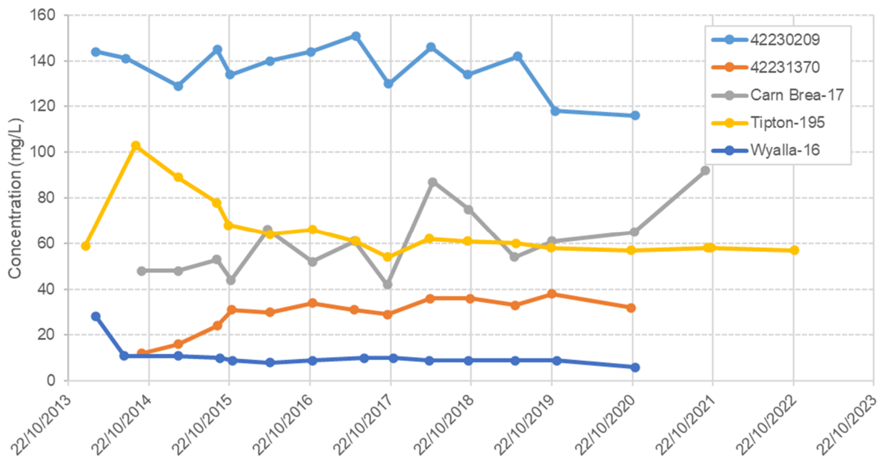

Figure 3-16: Condamine Alluvium: Calcium

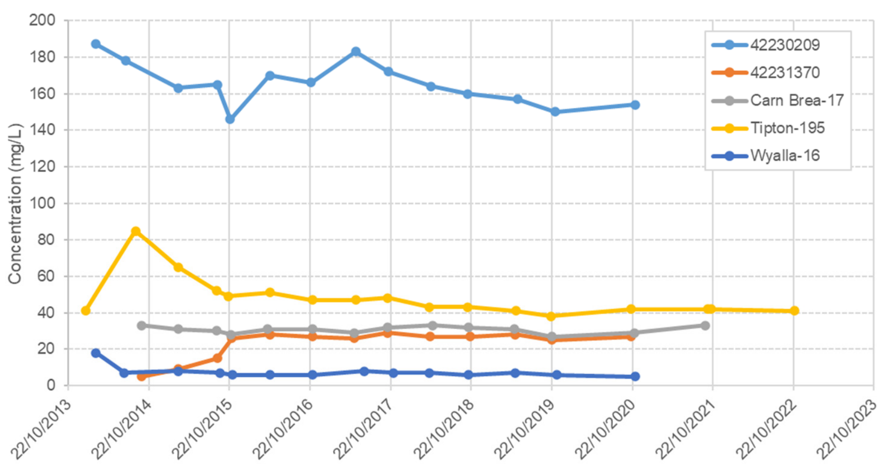

Figure 3-17: Condamine Alluvium: Magnesium

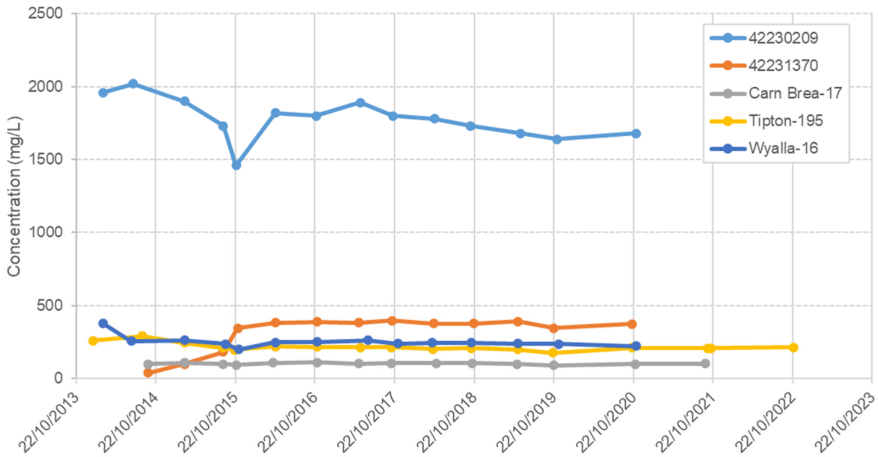

Figure 3-18: Condamine Alluvium: Sodium

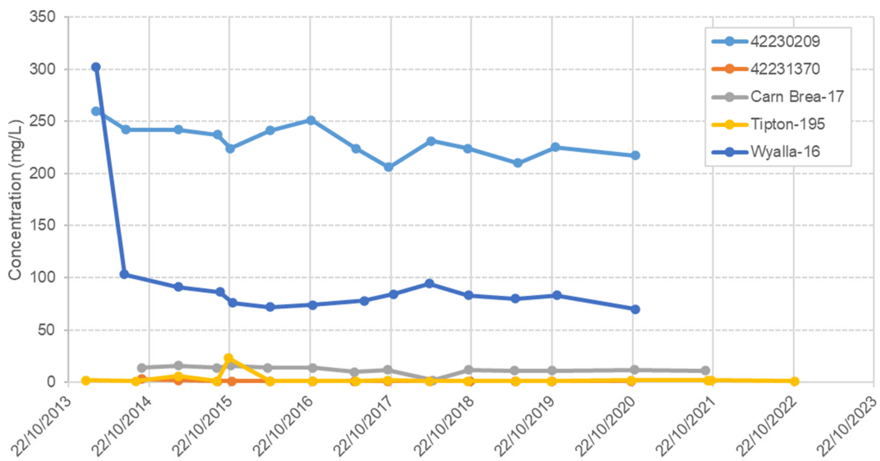

Figure 3-19: Condamine Alluvium: Sulphate

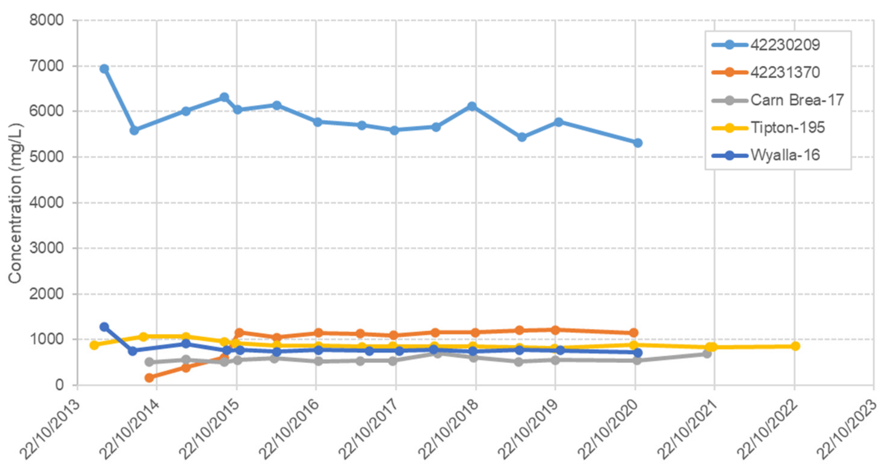

Figure 3-20: Condamine Alluvium: TDS

Springbok Sandstone

Water quality data is obtained from two bores within the Springbok Sandstone, however one of these bores only has limited data and thus is insufficient to comment on the statistical results for these bore separately. The water quality results and statistical summary for Springbok Sandstone is shown in Appendix B. The water quality results for chloride 20th and 50th percentiles, magnesium for the 20th percentile, sodium for the 20th and 50th percentiles and sulfate for 20th and 80th percentiles are higher than the aquatic ecosystem value (Appendix B). Concentrations for chloride, sodium and TDS were also exceeded for drinking water guidelines and TDS for stock watering**.**

Some key time series plots were developed based on some analytes exceeding guidelines criteria. Figure 3-21 shows fluctuations in calcium concentrations at Stratheden-63 and similar concentrations in the two samples taken at Plainview-36. Chloride concentrations at Stratheden-63 (>1,000 mg/L) are significantly higher than that at Plainview-36 (around 200 mg/L) as shown in Figure 3-22. Figure 3-23 shows that concentrations of magnesium are more similar between the two bores with the last readings at the bores only being different by 2 mg/L. Similar to chloride, sodium concentrations are much higher in Stratheden-63 (>600 mg/L) than that at Plainview-36 (around 300 mg/L) as shown in Figure 3-24. Sulfate concentrations are quite variable in Stratheden-63 (Figure 3-25). Total dissolved solids also show a large degree of difference between the two bores, with a difference of around 1,000 mg/L (Figure 3-26). It is noted that in the water quality time series plots created that peak concentrations at Stratheden-63 all occur in 2019.

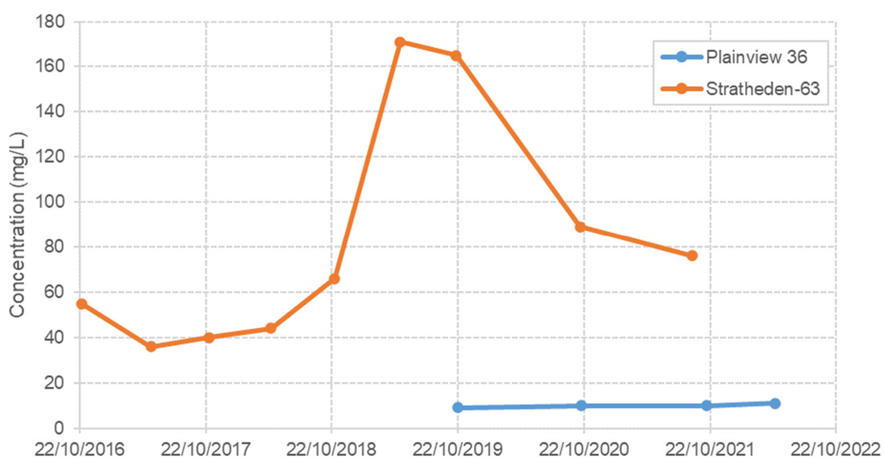

Figure 3-21: Springbok Sandstone: Calcium

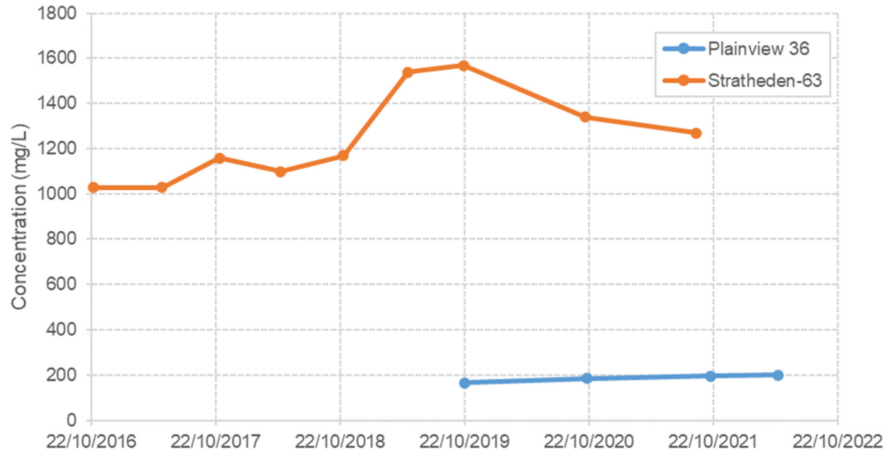

Figure 3-22: Springbok Sandstone: Chloride

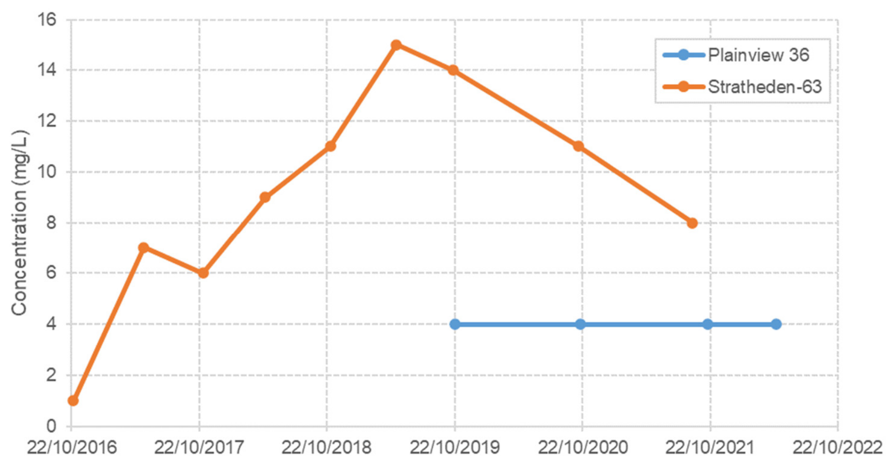

Figure 3-23: Springbok Sandstone: Magnesium

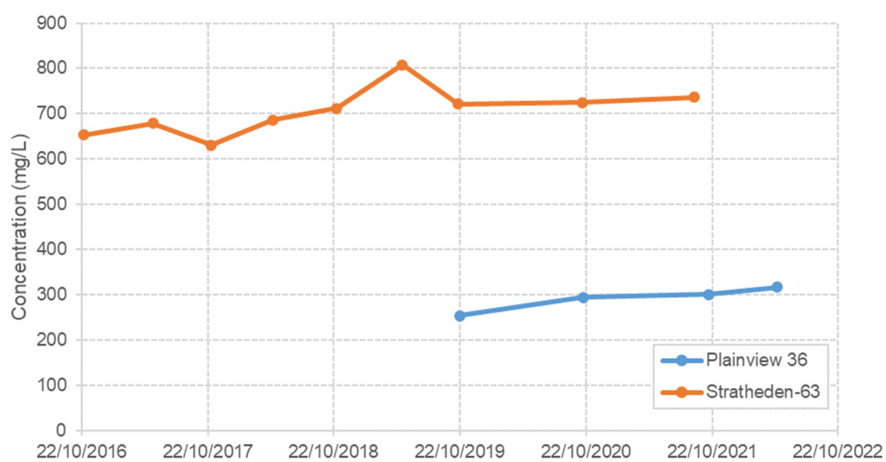

Figure 3-24: Springbok Sandstone: Sodium

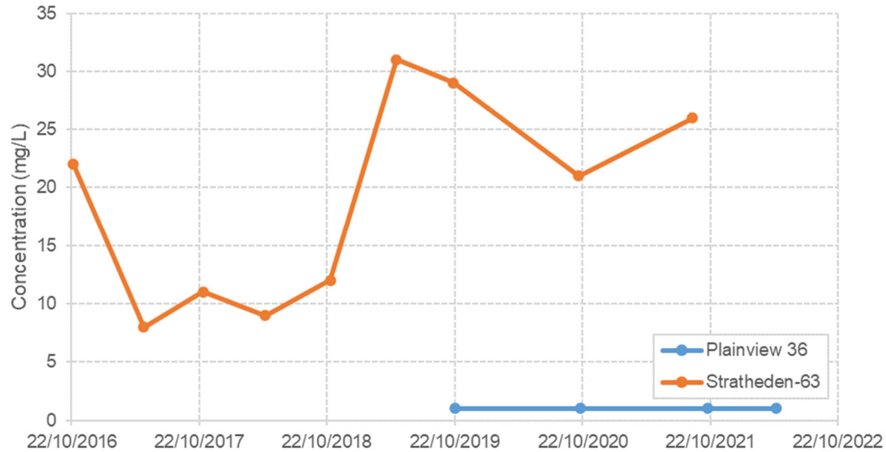

Figure 3-25: Springbok Sandstone: Sulphate

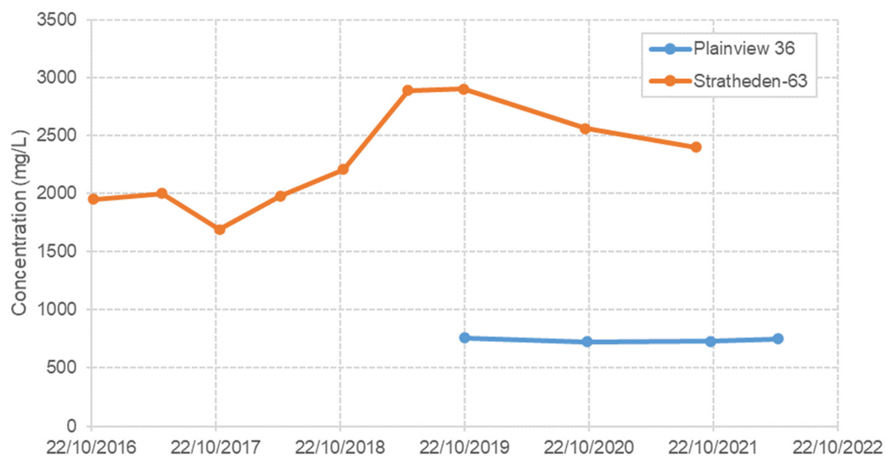

Figure 3-26: Springbok Sandstone: TDS

Chemical composition

The chemical composition of samples collected since 2017 from each of the geological formations is shown graphically in Figure 3-27 to Figure 3-32.

The Condamine Alluvium piper diagram (Figure 3-27) shows all bores except for Carn Brea-17 are predominantly sodium-chloride type water with carbonate-bicarbonate contributions and a magnesium and calcium contribution in Tipton-195. The chemical composition of samples collected from Carn Brea-17 indicate it is a magnesium-bicarbonate type water. The one sample collected during this reporting period for Tipton-195 shows a similar chemical composition to previous samples collected at this location.

There is either no trend or a clustered recurring trend in chemical composition evident in all bores except for Wyalla-16 which shows a steady increasing carbonate-bicarbonate contribution.

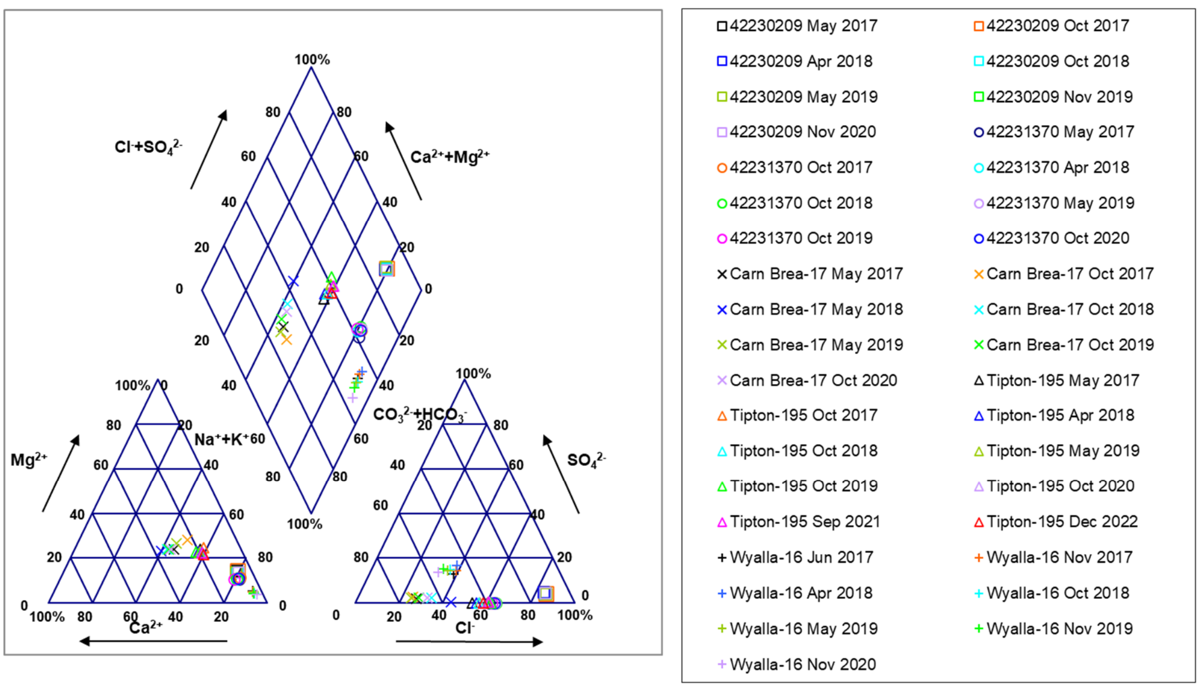

Figure 3-27: Condamine Alluvium Piper Diagram

No major ion data was collected for the Westbourne Formation monitoring point (Daandine-124) (Figure 3-28) during this annual reporting period. Data previously collected shows it is sodium-chloride type water and there is no trend in chemical composition evident over time.

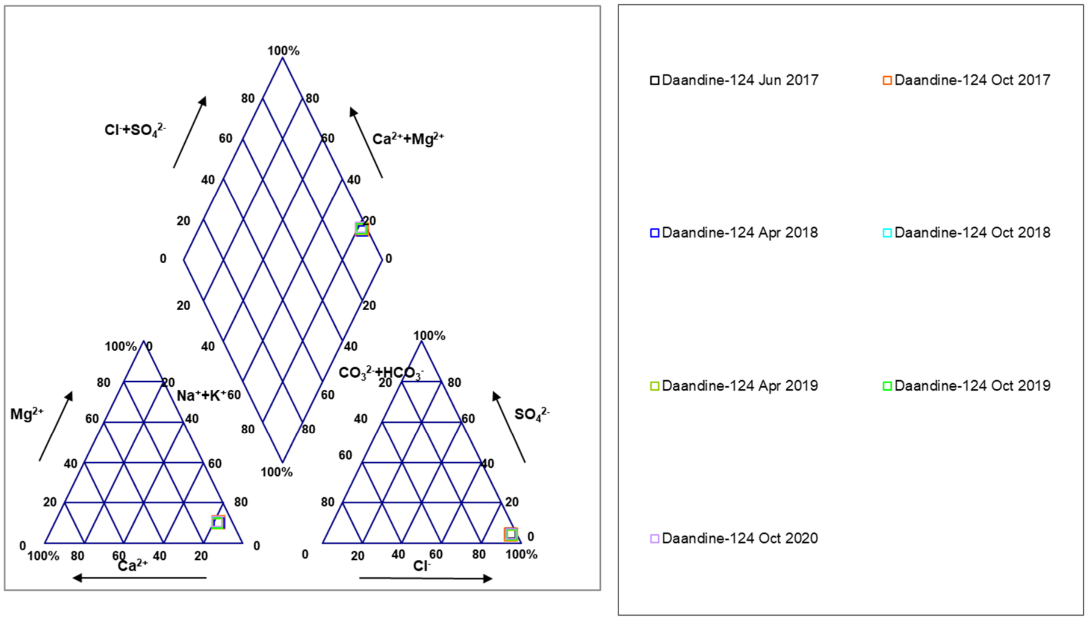

Figure 3-28: Westbourne Formation Piper Diagram

The major ion data for the Springbok Sandstone monitoring point Stratheden-63 (Figure 3-29) show it is sodium-chloride type water and there is a recurring trend in the calcium to sodium ratio evident over time. The chemical composition of Plainview 36 shows it is sodium-bicarbonate type water and there is no trend in the data. Only one sample from this monitored formation at Plainview 36 was collected during this reporting period, having similar chemical composition to previous samples collected at this location.

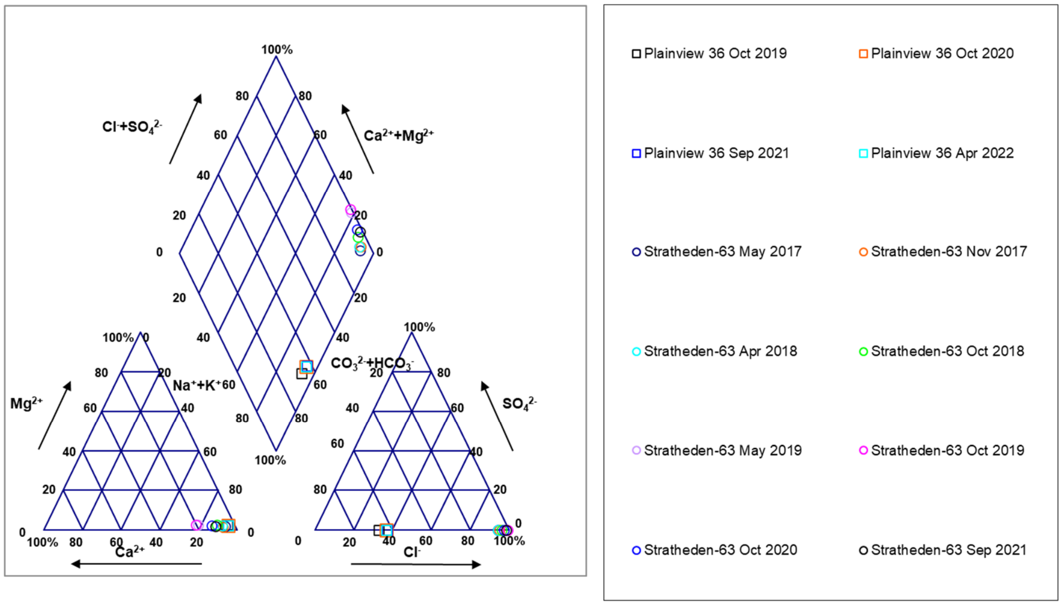

Figure 3-29: Springbok Sandstone Piper Diagram

No major ion data was collected for the WCM monitoring points (Figure 3-30) during this annual reporting period. Data previously collected shows Tipton-197 is sodium-chloride type water with a carbonate-bicarbonate contribution, and Carn Brea-18 is a sodium-bicarbonate type water. There is no trend evident in chemical composition in Tipton-197 while Carn Brea-18 is displaying a steady increasing carbonate-bicarbonate and decreasing chloride contributions over time.

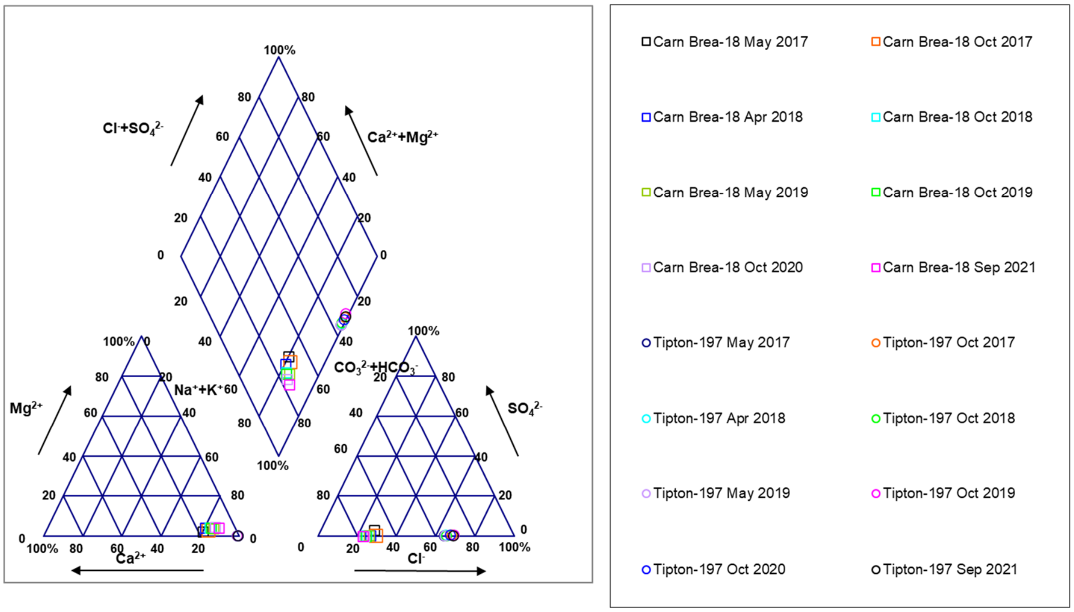

Figure 3-30: WCM Piper Diagram

No major ion data was collected for the Hutton Sandstone monitoring points (Figure 3-31) during this annual reporting period. Data previously collected show the Hutton comprises sodium-bicarbonate type water. There is a recurring trend in the calcium to sodium ratio evident over time in Carn Brea-19, and a recurring trend in the bicarbonate to chloride ratio evident over time in Daandine-121.

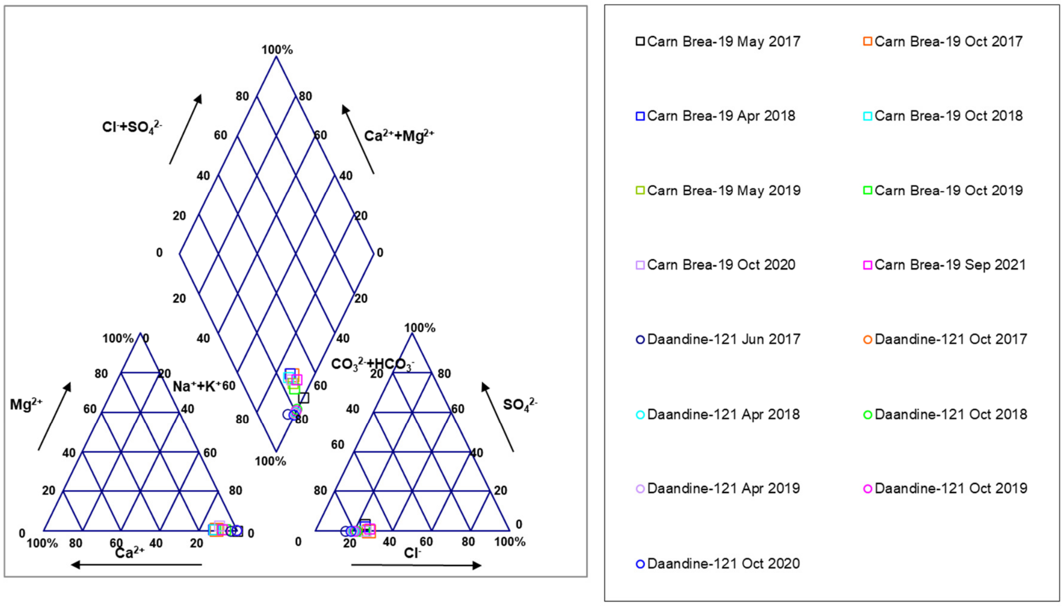

Figure 3-31: Hutton Sandstone Piper Diagram

No major ion data was collected for the Precipice Sandstone monitoring points (Figure 3-32) during this annual reporting period. Data previously collected show Wyalla-17 is sodium-chloride type water with a carbonate-bicarbonate contribution, and Carn Brea-20 is a sodium-bicarbonate type water. There is no trend evident in chemical composition in Wyalla-17 while Carn Brea-20 is displaying a slight but steady increasing chloride contribution over time.

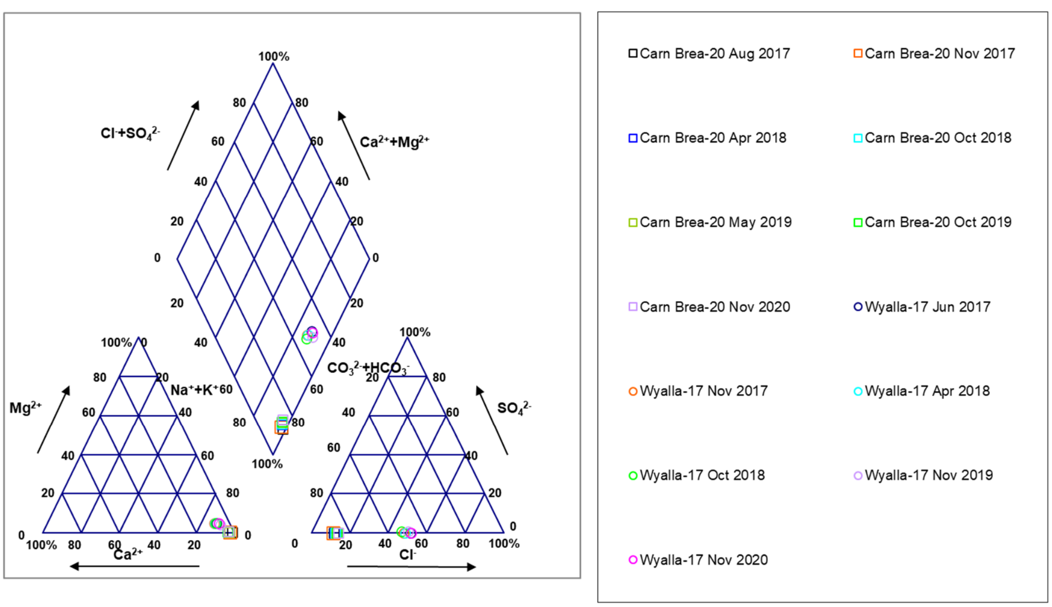

Figure 3-32: Precipice Sandstone Piper Diagram

Trend analysis

Mann-Kendall trend analysis has been undertaken to evaluate increasing and decreasing trends in concentrations for monitored water quality parameters (with more than four data points). Water quality samples were only collected within the Condamine Alluvium (Tipton-195) and Springbok Sandstone (Plainview 36) during the annual reporting period and thus only summaries from these formations are provided in Figure 3-33 and Figure 3-34 respectively (trend analysis for the other formations can be found in the previous annual report). The axis on the charts indicates the number of bores, within that formation, with an observed increasing (positive number) or decreasing (negative number) trend in the analyte concentration. A zero number represents no trend in the data.

For the Condamine Alluvium, a larger number of water quality parameters have been analysed at this formation. The analysis is based on 6 to 17 water quality results for each parameter. The data shows that there is predominately a decreasing trend across the parameters tested except for chloride, dissolved oxygen (field), pH (field) and redox (field).

For the Springbok Sandstone, the analysis is generally based off 9 samples at Strathden-63 and 4 to 8 samples at Plainview 36. The data shows there is predominately either an increasing trend or no trend. Decreasing trends were recorded for carbonate alkalinity, EC (field), pH (field) and total alkalinity.

The magnitude of trends for individual monitoring points are presented in Appendix C for monitoring points sampled during this annual reporting period.

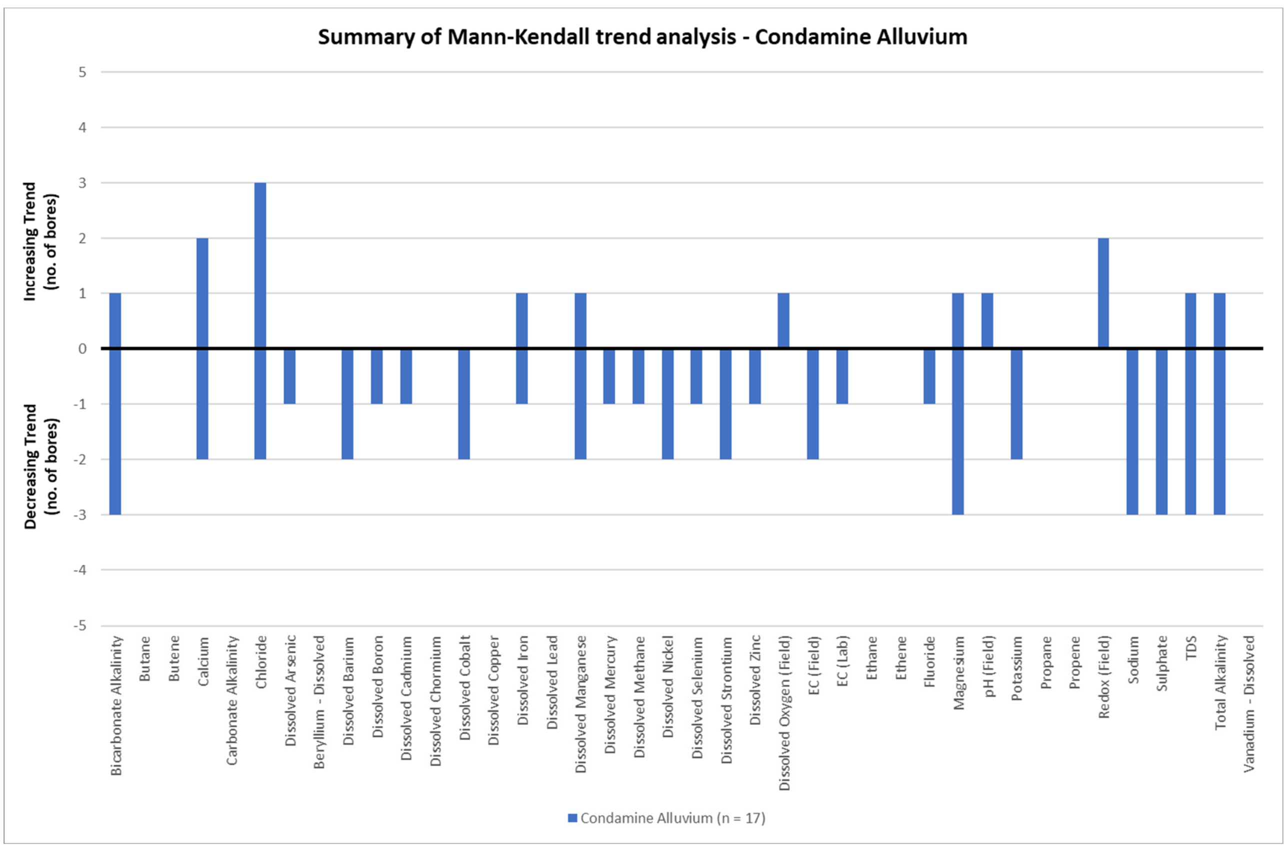

Figure 3-33: Summary of Mann-Kendall trend analysis for Condamine Alluvium monitoring bores

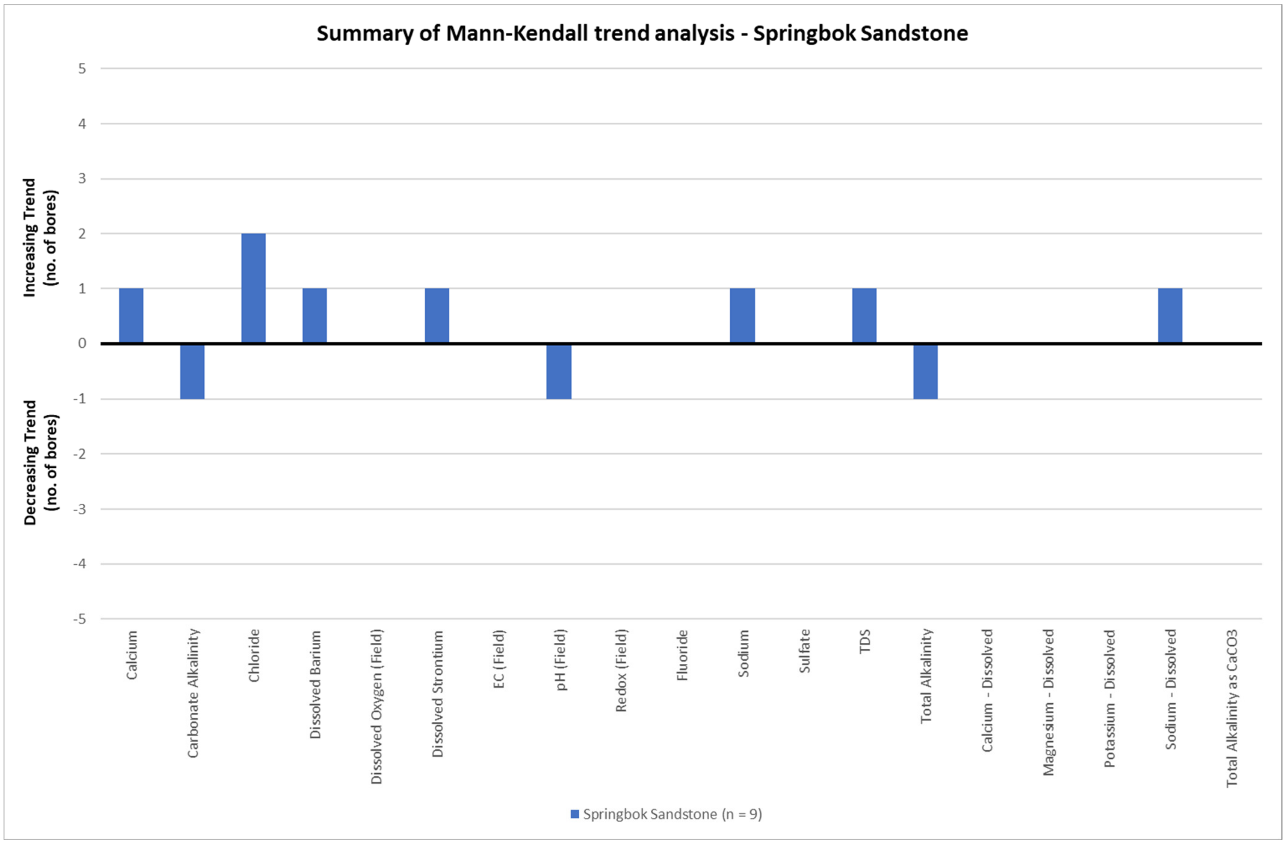

Figure 3-34: Summary of Mann-Kendall trend analysis for Springbok Sandstone monitoring bores

3.3 Ground movement monitoring

Coal seam gas occurs within coal formations through adsorption to the surface of the coal under hydrostatic pressure. Depressurisation of the coal seams below a threshold by groundwater extraction reduces hydrostatic pressure and liberates the gas from the formation. As the pressure falls, the gas migrates to the extraction wells. This process requires substantial lowering of groundwater pressure.

At any point below the ground surface, the weight of overlying strata is supported partly by water pressure and partly by the fabric of the rock mass. Any reduction in water pressure therefore results in an increased proportion of the load being carried by the rock mass, leading to compression of the rock. This is known as an increase in effective stress. The combined compression over the thickness of rock strata affected by reduced water pressure will result in some compaction of the coal seams, and may cause overlying formations to subside resulting in some subsidence at the ground surface.

The development of a CSG field, where the effect of depressurisation of individual wells interact with each other over time, results in relatively uniform depressurisation within a field and a depressurisation surface which gradually decreases away from the CSG field. Any CSG induced ground surface movement is normally expected to be regionally consistent, and with the magnitudes predicted unobtrusive in terms of environmental and land use impacts. However, monitoring systems have been established to distinguish any significant ground surface movement as a result of CSG operations from natural ground surface changes such as attrition and climatic induced soil swelling and depletion.

During the current reporting period the Queensland Office of Groundwater Impact Assessment (OGIA) developed a 3D numerical model coupling geomechanics to groundwater depressurisation, predicting magnitude of subsidence and change in slope as a result of CSG operations in the area of the Condamine Alluvium, and developed an analytical model predicting magnitude of subsidence in the greater Surat Basin, as reported in the 2021 Underground Water Impact Report [2021 UWIR] (OGIA, 2021).

The 3D numerical geomechanical model was built incorporating all available data on local geomechanical properties and lithological distribution, with predicted depressurisation from the OGIA groundwater model used as an input to make predictions of subsidence. A model grid ranging from 250 by 250m to 750 by 750m with 88 vertical layers was used to account for variations in lithology, and OGIA generated a set of 1,000 models from stochastic realisations of geomechanical properties to explore the range of uncertainty in predictions. History matching these models to the available InSAR data in the vicinity of the Condamine Alluvium allowed the 50 best fitting models to be selected to generate predictions of subsidence. Predicted subsidence and change in slope are therefore reported statistically in the 2021 UWIR as a median (P50) prediction derived from those 50 model runs. Predicted subsidence from the 2021 UWIR, including predicted temporal development of subsidence at specific locations, is presented in Figure 3-35, with predicted maximum changes in slope within the cropping areas of the Condamine River floodplain at any time during CSG field development presented in Figure 3-36.

OGIA processed outputs from the uncertainty analysis to derive probability of magnitudes of subsidence and slope occurring at each model cell. This is presented as maps of the probability of 0.001% (0.01m in 1km) and 0.005% (0.05m in 1km) slope change, together with probability of 100mm and 150mm magnitude subsidence occurring within the cropping areas of the Condamine River floodplain, in Figure 3-37. The Horrane Fault is a large north-south trending fault zone east of Cecil Plains, with displacement of up to approximately 100m. Displacement of the fault and the low permeability of the fault core can result in differential depressurisation patterns either side of the fault, resulting in the greatest predicted change in slope across the Horrane Fault.

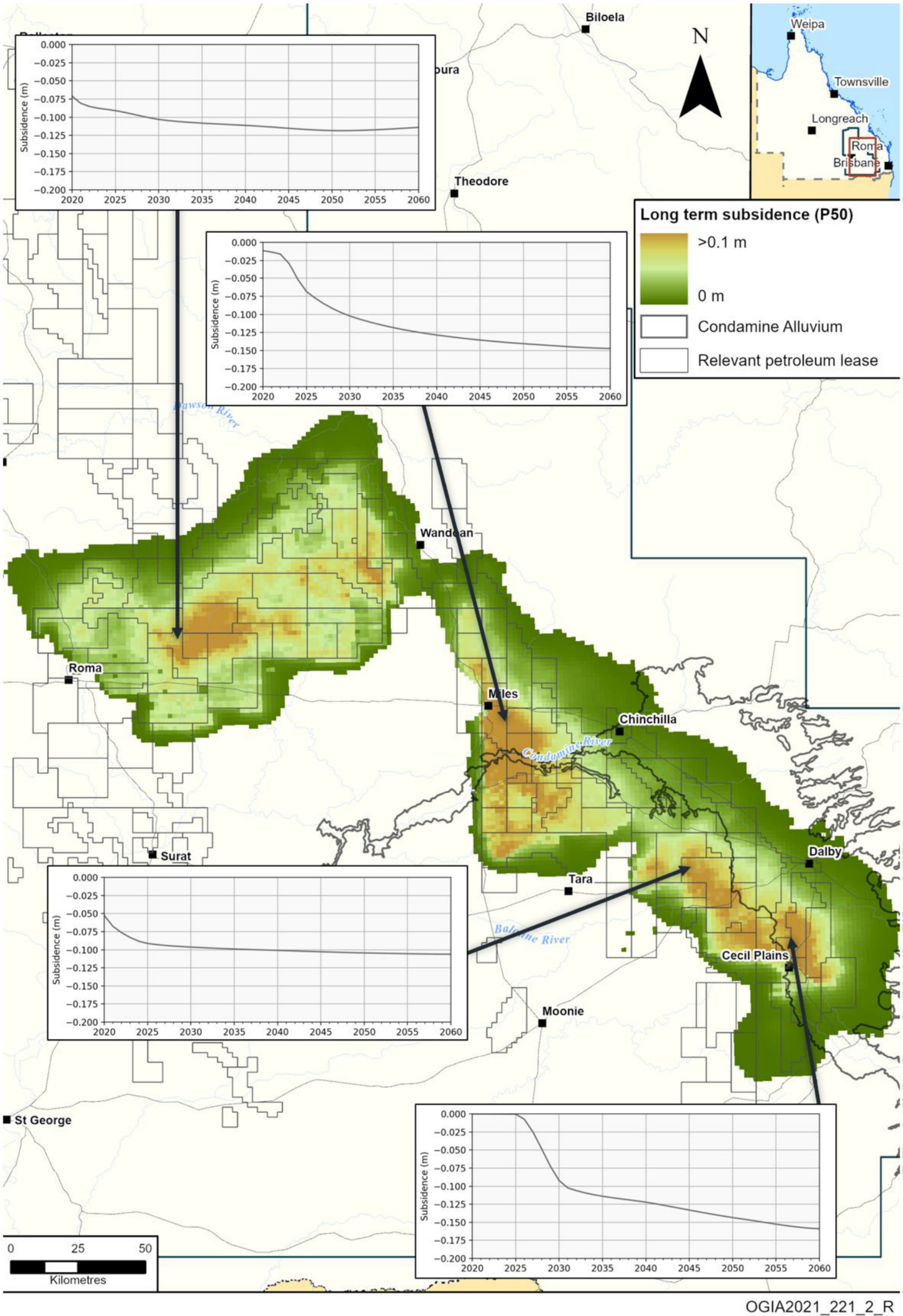

Figure 3-35: 2021 UWIR predicted long-term CSG-induced subsidence across the Surat Basin (after OGIA, 2021)

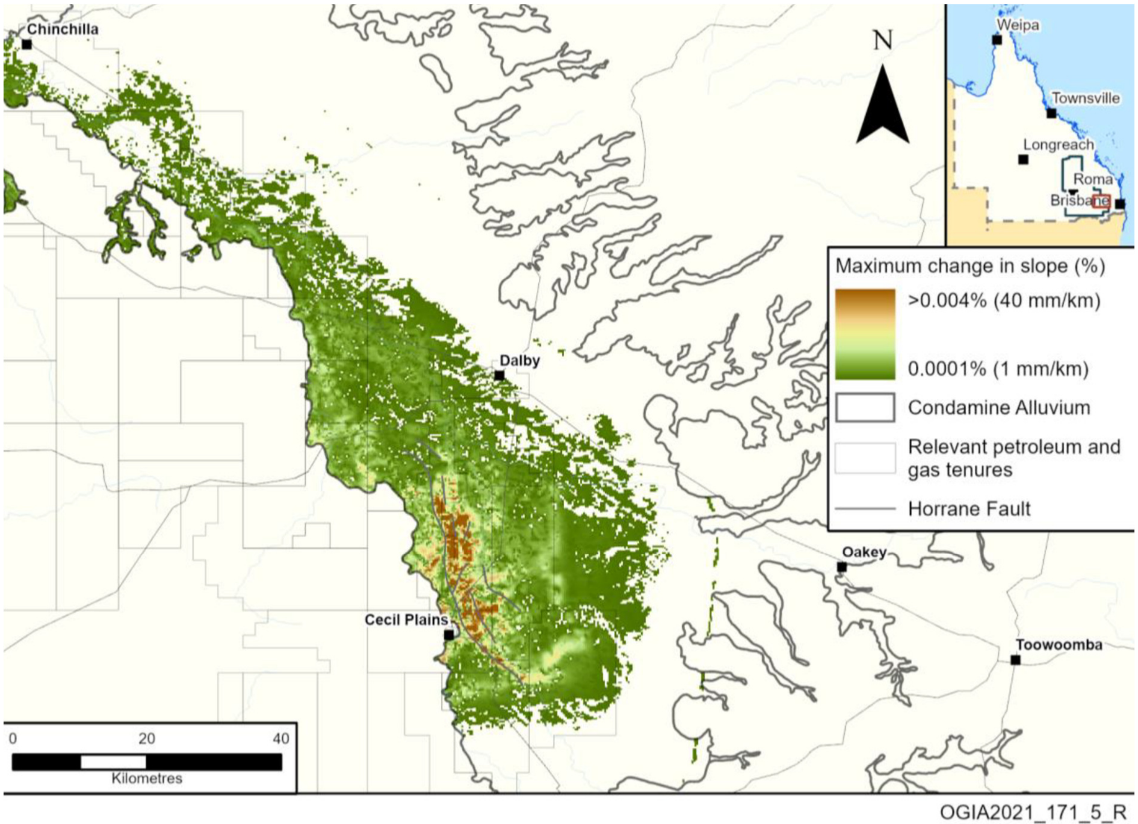

Figure 3-36: Predicted maximum change in ground slope from CSG-induced subsidence within the Condamine Alluvium area (after OGIA, 2021)

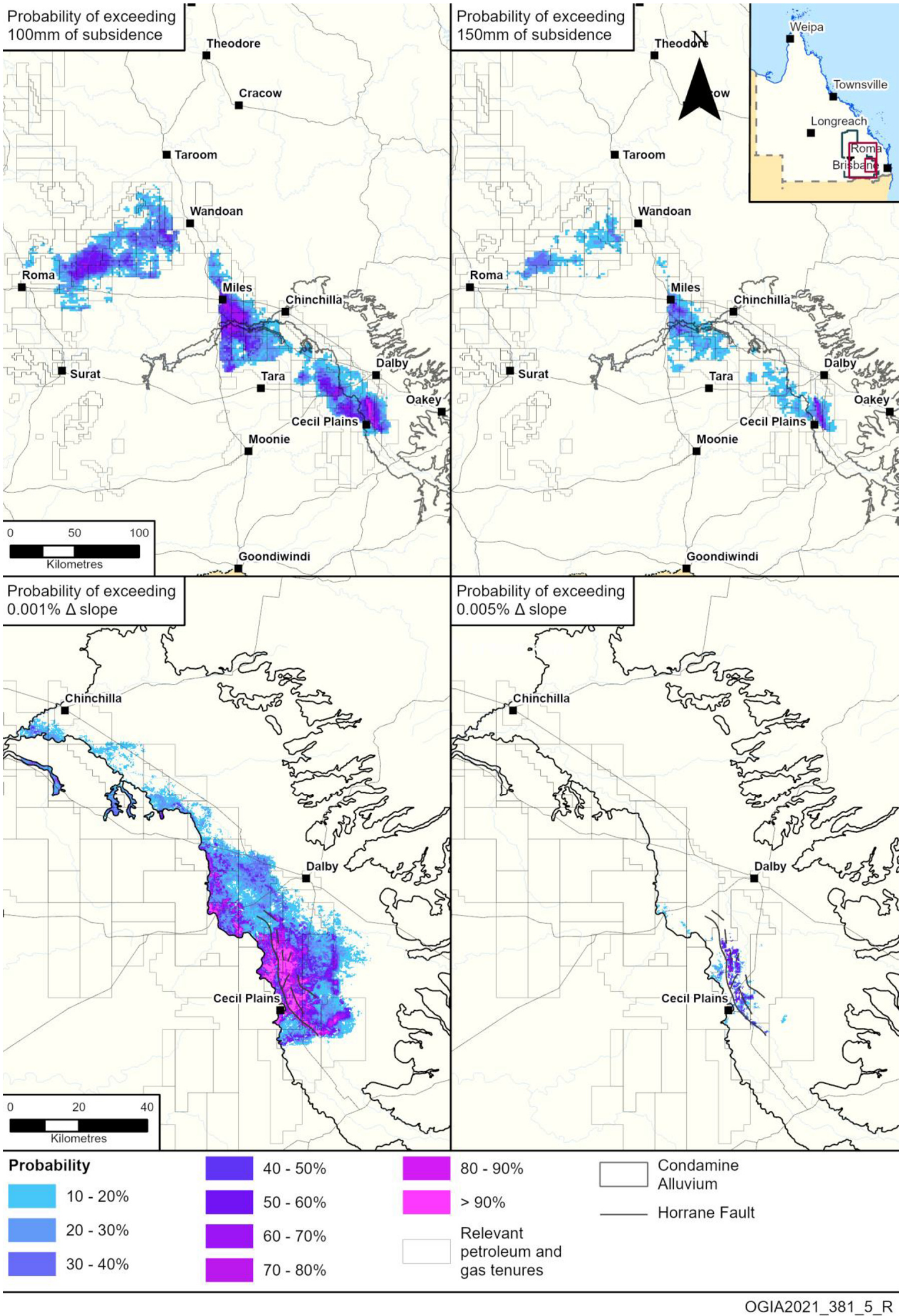

Figure 3-37: Probabilities of predicted subsidence and resulting change in slope within the Condamine Alluvium area (after OGIA, 2021)

3.3.1 Data collection

Monitoring of subsidence was carried out by Altamira using satellite borne Interferometric Synthetic Aperture Radar technology (InSAR), a radar technique used in geodesy and remote sensing (Altamira, 2016), which provides change in ground elevation over time.

Arrow has acquired InSAR data since 2006, with the most recent satellite system (Sentinel) providing data since 2015. The Sentinel satellite system passes every 12 days (every 6 days since 2017) providing high frequency ground motion monitoring, with a vertical resolution to approximately 8mm/year.

The InSAR data provides a baseline from which future data can be assessed to determine changes in vertical ground elevation, and also provides a snapshot of current vertical ground movement.

Geotechnical ground movement monitoring points have also been installed to provide a ground-truthing check of the InSAR data. These points are instrumented with Global Navigation Satellite System (GNSS) Continually Operating Reference Stations (CORS), and provide millimetric accuracy of changes in vertical elevation.

Periodic surveys using Light Detection And Ranging (LiDAR), a remote-sensing technique using airborne laser scanning systems, have been undertaken to provide snapshots of relative elevation of the land and derived slopes at moment of capture. These surveys, which provide for accurate assessment of slopes at property and regional scale, have been acquired for Arrow in 2012, 2014, 2020, 2021 and 2022. The LiDAR data provides a temporal baseline from which future data can be assessed to determine changes in slope.

These monitoring methods detect changes in the ground surface from all potential causes, not just CSG induced subsidence.

3.3.2 Data analysis

Following the baseline interferometric synthetic aperture radar (InSAR) survey for the period 2006 to 2015, and reported in the Stage 1 WMMP, Tre-Altamira was commissioned for ongoing surface deformation monitoring across the Arrow tenements, with the latest data available up to the end of June 2022.

Figure 3-38 shows a down-sampled data set, where the point cloud InSAR data was reduced to the median vertical velocity within a 1,000 m x 1,000 m grid. Stable has been classified as ground motion of less than 8 mm per year (subsidence or uplift) as related to the screening level identified in the Stage 1 WMMP.

These data show stability across most of Arrow's tenure, together with large areas of upward ground movement. Areas of upward ground movement are particularly observed over the vertosol soils of the Condamine Alluvium, and are likely related to increased rainfall related to the La Nina event observed over the monitoring period causing swelling of the clay soils. Areas of poor satellite data coherence, shown as no data on the map, also occur within the area of the Condamine Alluvium. Coherence is a measure of the local spatial correlation between radar images, where changes to the reflection of the radar signal (such as due to rapid vegetation growth or changes in soil moisture) result in irregular variation in phase and higher noise in the data.

Limited areas of downward ground movement exceeding the screening level of 8 mm per year are observed, with only two grid cells located within 5km of Arrow producing wells (the reasonable distance within which CSG induced subsidence might be detectable). As these areas exceeded the screening level, further assessment of changes to the ground surface and slopes within and around the grid cell areas was undertaken, using the InSAR point clouds and LiDAR surveys, to assess if there was any CSG induced subsidence impacts and exceedance of investigation levels.

One grid cell is located over the area of the Wilkie Creek Mine west of Dalby, with the further analysis of the InSAR and LiDAR data indicating that the ground movement is related to compaction/settlement of overburden dumps and erosion associated with the mine. The other grid cell was located northwest of Lake Broadwater in an area of 'gilgai' on the western edge of Arrow's tenure. Analysis of InSAR and LiDAR data indicates that the area is located on the edge of a broad but shallow subsidence feature propagating across from adjacent tenures to the west, with slope change of less than 20mm/km. No exceedance of investigation levels were observed during these assessments.

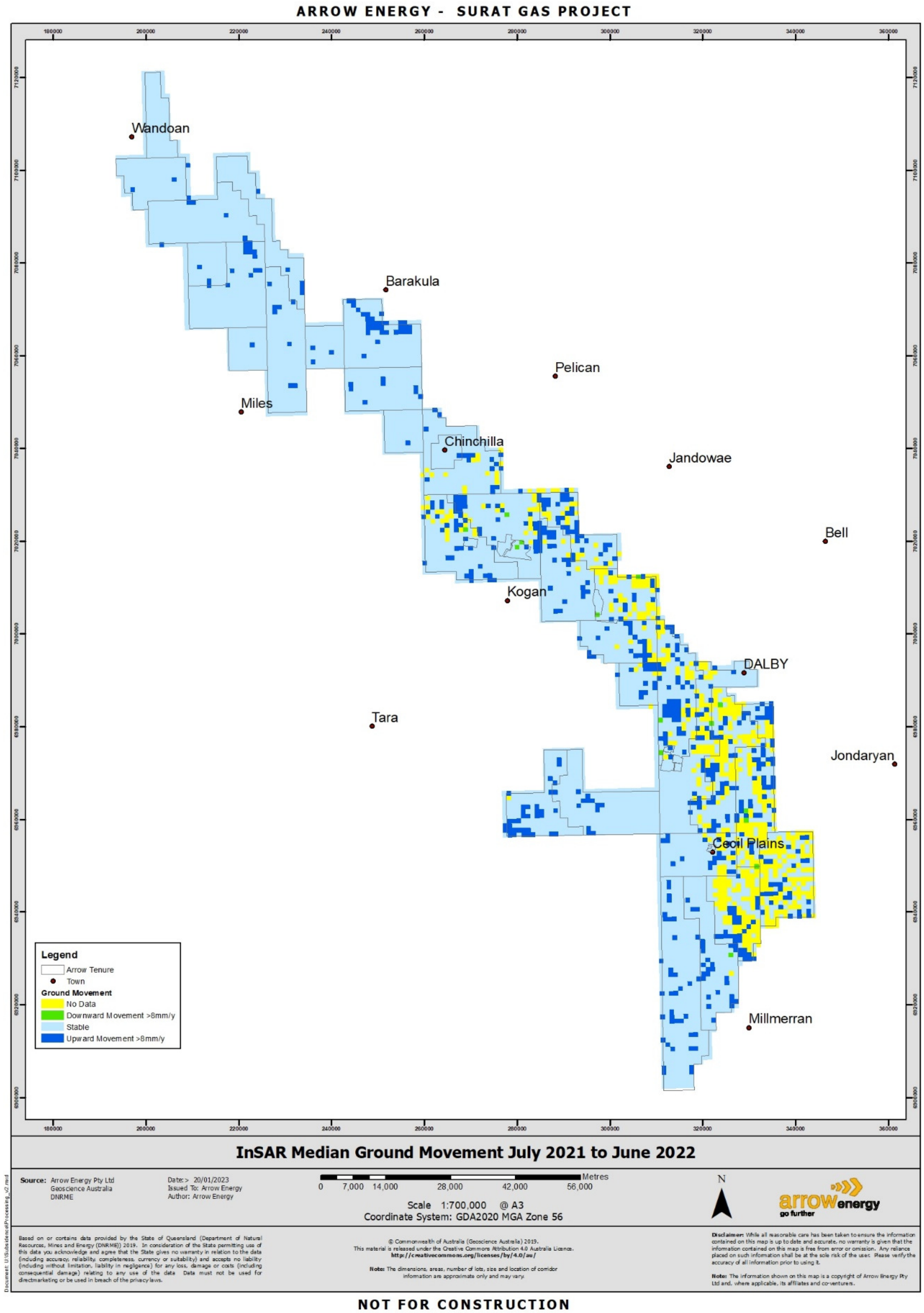

Figure 3-38: InSAR Median Ground Movement (July 2021 to June 2022 inclusive)

3.4 Update to monitoring networks

Groundwater monitoring locations and frequency of monitoring were revised upon the release of the 2021 UWIR in line with Section 7.3 of the SGP Updated WMMP. The monitoring network presented in Table 7-1 of the SGP Updated WMMP has been aligned with the 2021 UWIR water monitoring strategy (WMS) to ensure monitoring is undertaken proportionally to the predicted impacts presented in the 2021 UWIR. A summary of the changes to the monitoring network is provided in Table 3-4 and the updated list of monitoring points (and their purpose) is provided in Table 3-5 and illustrated in Figure 3-39 and Figure 3-40. In addition to the changes noted in Table 3-4, the groundwater chemistry suite and sampling frequency has been revised to align with that presented in the 2021 UWIR and is presented in Table 3-6.

Key changes to the monitoring programs are:

- the number of monitoring points has increased from 120 in the SGP Updated WMMP to 150 to align with the 2021 UWIR
- the groundwater analysis suite has been expanded to include strontium isotopes (87Sr/86Sr) (this was changed under the 2019 UWIR)
- Table 4-2 of the 2021 UWIR supporting document "*Details of the Water Monitoring Strategy for the Underground Water Impact Report 2021*" (OGIA 2021b) (and also Table H-4 of the 2019 UWIR) stipulates a groundwater sampling frequency of every six months until five samples have been obtained, with one of these samples analysed for dissolved strontium and strontium isotopes ($^{87}Sr/^{86}Sr$) in Springbok Sandstone, Hutton Sandstone and Precipice Sandstone monitoring points.

Table 3-4: Summary of changes to the Updated CSG WMMP monitoring points to align with the 2021 UWIR monitoring requirements

Location ID	Target Aquifer	Original monitoring requirement as per Updated CSG WMMP			2021 UWIR Monitoring Requirement	Monitoring point status and current monitoring requirement based on 2021 UWIR
		Level / pressure	Water Quality	CA-WCM flux		
Bora Creek-10	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Burunga Lane-174	Evergreen	✓			No change. Still required to be monitored for the 2021 UWIR.	Access to the site was not possible during the reporting period due to ongoing negotiations with the landholder. The monitoring points are currently offline. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring in Burunga Lane-174 (removed from UWIR).
Burunga Lane-174	Precipice	✓	✓		No change to the pressure monitoring requirement. Water quality monitoring requirement has been removed from the 2021 UWIR.	
Burunga Lane-176	Hutton	✓	✓		No change. Still required to be monitored for the 2021 UWIR.	
Burunga Lane-176	WCM	✓				
Carn Brea-17	Condamine Alluvium	✓	✓	✓	No change to the level monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Carn Brea-18	WCM	✓	✓ (at UWIR MP 41 only)	✓	No change to the pressure monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Carn Brea-19	Evergreen	✓			No change to the pressure monitoring requirement.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Carn Brea-19	Hutton	✓	✓		No change to the pressure monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Carn Brea-20	Precipice	✓	✓		No change to the level monitoring requirement. Water quality monitoring requirement has been removed from the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (removed from UWIR).
Carn Brea-21	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Carn Brea-23	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Carn Brea-24	CA / WCM transition layer	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Castledean-18	Springbok	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point is operational but dry. Monitoring point operational. Monitoring as per Updated CSG WMMP.
Castledean-18	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Daandine-121	Hutton	✓	✓		No change to the pressure monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Daandine-123	WCM	✓			Not listed to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring is no longer required under the 2021 UWIR.
Daandine-124	Westbourne	✓	✓		No change to the level monitoring requirement. Water quality monitoring requirement has been removed from the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (removed from UWIR).
Daandine-134	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Daandine-134	Eurombah	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.

Location ID	Target Aquifer	Original monitoring requirement as per Updated CSG WMMP			2021 UWIR Monitoring Requirement	Monitoring point status and current monitoring requirement based on 2021 UWIR
		Level / pressure	Water Quality	CA-WCM flux		
Daandine-161	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	No monitoring data available for Daandine-161 as bore was isolated by standing water during monitoring events.
Daandine-163	CA / WCM transition layer	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Daandine-164	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Daandine-254	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Daandine-263	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Daandine-264	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Dundee-20	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Glenburnie-19	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Pressure gauge had failed. Pressure gauge became operational again in June 2022. Monitoring as per Updated CSG WMMP.
Hopeland-17	Springbok	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Hopeland-17	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Periods of no data (between April and June 2022) within the annual period within bores monitoring the WCM and jumps in recorded levels. Data validation ongoing to confirm observed pressure trends. Monitoring as per Updated CSG WMMP.
Kedron-570	Eurombah	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Kedron-570	Hutton	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Kedron-570	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Kedron-570	Springbok	✓			Monitoring point removed from the previous UWIR (2019).	Monitoring point no longer monitored as per the 2019 and 2021 UWIRs.
Kogan North-56	WCM	✓		✓	Monitoring point removed from the 2021 UWIR (previously removed in 2019 UWIR).	Monitoring point no longer monitored as per the 2021 UWIR (previously removed in 2019 UWIR) Monitoring point plugged and abandoned.
Kogan North-79	CA / WCM transition layer	✓		✓	Monitoring point removed from the 2021 UWIR (previously removed in 2019 UWIR).	Monitoring point no longer monitored as per the 2021 UWIR.
Kogan North-79	Condamine Alluvium	✓		✓	Monitoring point removed from the 2021 UWIR (previously removed in 2019 UWIR).	Monitoring point no longer monitored as per the 2021 UWIR.
Tipton-153	Hutton	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Long Swamp-1 (replaced by Longswamp 27)	WCM	✓			Monitoring point replaced by Longswamp 27 installed adjacent to Long Swamp-1.	Monitoring point (Longswamp 27) operational. Monitoring as per Updated CSG WMMP.
Longswamp-7	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Period of no monitoring data (between February and March 2022) in annual period. Monitoring point operational. Monitoring as per Updated CSG WMMP.
Macalister-5	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Macalister-8	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.

Location ID	Target Aquifer	Original monitoring requirement as per Updated CSG WMMP			2021 UWIR Monitoring Requirement	Monitoring point status and current monitoring requirement based on 2021 UWIR
		Level / pressure	Water Quality	CA-WCM flux		
Meenawarra-21	Springbok	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Meenawarra-21	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Meenawarra-5	WCM	✓			Monitoring point removed from the 2021 UWIR.	Monitoring point no longer monitored as per the 2021 UWIR.
Pampas-18	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Pampas-5	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Plainview-35	WCM	✓			No change. Monitoring point replaced previous UWIR monitoring point Plainview-1.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Plainview-25	CA / WCM transition layer	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring points operational. Monitoring as per Updated CSG WMMP.
Plainview-25	Condamine Alluvium	✓		✓		
Plainview-25	WCM	✓		✓		
RN 41620043	WCM (previously assessed by OGIA as Springbok Sandstone)	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
RN 42230088	Condamine Alluvium	✓		✓	Monitoring point removed from the 2021 UWIR.	Monitoring point no longer monitored as per the 2021 UWIR.
RN 42230209	Condamine Alluvium	✓	✓	✓	No change to the level monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
RN 42231294	Condamine Alluvium	✓		✓	Monitoring point removed from the 2021 UWIR.	Monitoring point no longer required to be monitored as per the 2021 UWIR.
RN 42231295	WCM	✓		✓	Monitoring point removed from the 2021 UWIR.	Monitoring point no longer required to be monitored as per the 2021 UWIR.
RN 42231339	Condamine Alluvium	✓			Monitoring point removed from the 2021 UWIR.	Monitoring point no longer required to be monitored as per the 2021 UWIR.
RN 42231370	Condamine Alluvium	✓	✓		No change to the level monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
RN 42231463	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Stratheden-63	Springbok	✓	✓		No change to the level monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020, and collection of samples for analysis of strontium isotopes completed in Q4 2021).
Tipton-157	WCM	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Tipton-195	Condamine Alluvium	✓	✓	✓	No change to the level monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Tipton-196A	CA / WCM transition layer	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.

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Location ID	Target Aquifer	Original monitoring requirement as per Updated CSG WMMP			2021 UWIR Monitoring Requirement	Monitoring point status and current monitoring requirement based on 2021 UWIR
		Level / pressure	Water Quality	CA-WCM flux		
Tipton-197	WCM	✓	✓ (at UWIR MP 89 only)	✓	No change to the level monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Tipton-204	CA / WCM transition layer	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Tipton-204	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Tipton-204	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Tipton-206	Eurombah	✓			No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Tipton-206	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Tipton-221	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Tipton-222	CA / WCM transition layer	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Macalister 7	Condamine Alluvium	✓		✓	No change. Still required to be monitored for the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Macalister 6	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Macalister 6	Eurombah	✓			No change. Still required to be monitored for the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP.
Wyalla-17	Hutton	✓			No change. Still required to be monitored for the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP.
UWIR Site 94	Hutton	✓			Monitoring point not yet installed as 2016 UWIR timing requirement for installation (two years prior to production within 10km) was not triggered. This monitoring point is no longer required under the 2021 UWIR (previously not required in 2019 UWIR).	Monitoring point no longer required.
UWIR Site 94 (Burunga Lane 186)	WCM	✓			Monitoring point not yet installed as 2016 UWIR timing requirement for installation (two years prior to production within 10km) was not triggered. The 2019 UWIR requires this monitoring point to be installed in 2022.	Monitoring point is scheduled to be installed in 2022 as per the 2021 UWIR.
Wyalla-16	Condamine Alluvium	✓	✓	✓	No change to the level monitoring requirement. Water quality monitoring is no longer required as sufficient number of samples have been collected as per Table 9-4 of the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Wyalla-17	Precipice	✓	✓		No change to the level monitoring requirement. Water quality monitoring requirement has been removed from the 2021 UWIR	Monitoring point operational. Monitoring as per Updated CSG WMMP except for the cessation of water quality monitoring (completion of collection of five samples in Q4 2020).
Wyalla-18	WCM	✓		✓	No change. Still required to be monitored for the 2021 UWIR.	Monitoring point operational. Monitoring as per Updated CSG WMMP.

Table 3-5: Revised Updated CSG WMMP Monitoring Network as per the 2021 UWIR WMS

Location ID	OGIA MP ID	Latitude	Longitude	Target Aquifer	UWIR Required Online Date	Monitoring point purpose			
						Level / pressure	Quality	CA-WCM flux	Early warning
41620043	578	-27.922222	151.121389	WCM	Complete	✓			✓
42230209	281	-26.7422	150.6799	Condamine Alluvium	Complete	✓	✓	✓	✓
42231370	51	-27.491498	151.393194	Condamine Alluvium	Complete	✓	✓		✓
42231463	37	-27.548794	151.313017	Condamine Alluvium	Complete	✓		✓	✓
42231597	597	-27.73082	151.76343	Main Range Volcanics	Complete	✓			
Baking Board 4	877	-26.567	150.653	WCM	2022	✓			
Baking Board 5	891	-26.48009491	150.5512695	Alluvium	2022	✓			
Barakula 2	878 and 869	-26.480094	150.551269	WCM, Hutton Sandstone	2022	✓			
Bora Creek 10	579	-27.924504	151.12492	WCM	Complete	✓			
Burunga Lane 186	494, 495, 496	-26.2301	149.9534	WCM	2022	✓			
Burunga Lane-174	478, 625	-26.242667	150.050176	Precipice, Evergreen	Monitoring points installed. Awaiting land access to recommence monitoring	✓			✓ (478)
Burunga Lane-176	473, 474, 475, 476, 477	-26.242897	150.049993	WCM, Hutton	Monitoring points installed. Awaiting land access to recommence monitoring	✓	✓ (477)		✓ (476)
Carn Brea 21	94	-27.437622	151.357504	WCM	Complete	✓		✓	
Carn Brea 22	882	-27.43779	151.357466	Hutton	2022	✓			
Carn Brea 23	92	-27.43762778	151.3576733	Condamine Alluvium	Complete	✓		✓	✓
Carn Brea 24	93	-27.437628	151.357707	Condamine Alluvium - Walloon Transition Layer	Complete	✓		✓	
Carn Brea-17	38	-27.533016	151.36648	Condamine Alluvium	Complete	✓	✓		✓
Carn Brea-18	40, 41, 42, 43	-27.532995	151.36633	WCM	Complete	✓	✓ (41)	✓	
Carn Brea-19	44, 45, 46	-27.532975	151.36618	Hutton, Evergreen	Complete	✓	✓ (45)	✓	✓ (44)
Carn Brea-20	47	-27.532954	151.36603	Precipice	Complete	✓	✓		✓
Castledean-18	375, 376, 377, 378	-26.552914	150.221984	WCM, Springbok	Complete	✓			✓ (375)
Daandine 263	181	-27.102426	150.961255	WCM	Complete	✓			
Daandine 264	148	-27.15307149	151.0442114	WCM	Complete	✓			
Daandine-121	182	-27.100415	150.955656	Hutton	Complete	✓	✓		✓
Daandine-123	719, 720	-27.144075	150.948059	WCM, Precipice	Complete	✓			
Daandine-124	157	-27.144119	150.948001	Westbourne Formation	Complete	✓			
Daandine-134	162, 163, 164	-27.14401378	150.9485653	Tangalooma Sandstone, Eurombah, WCM	Complete	✓			
Daandine-161	166	-27.118534	151.075606	Condamine Alluvium	Complete	✓		✓	✓
Daandine-163	167	-27.119974	151.075875	Condamine Alluvium - Walloon Transition Layer	Complete	✓		✓	
Daandine-164	168	-27.120008	151.075969	WCM	Complete	✓		✓	
Daandine-254	160, 161, 159	-27.144104	150.948239	WCM	Complete	✓			
Dundee-20	283, 284, 285	-26.743476	150.678351	WCM	Complete	✓		✓	
Glenburnie 19	23	-27.639218	151.167664	WCM	Complete	✓			
Glenburnie 20	732	-27.83304667	151.0972642	Springbok	Complete	✓			
Glenburnie 21	733	-27.83242474	151.0980474	WCM	Complete	✓			
Glenburnie 22	734	-27.83252476	151.0981482	WCM	Complete	✓			
Glenburnie-18	735, 736, 737, 738, 739	-27.72017464	151.1565154	Hutton, WCM, Springbok	Complete	✓	✓ (739)		
Hopeland-17	615, 616, 617, 618	-26.973208	150.611817	Springbok, WCM	Complete	✓			✓ (615)
Kedron-570	626, 627, 628, 629	-26.413424	150.153717	WCM, Tangalooma Sandstone, Hutton	Complete	✓			✓ (629)

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Location ID	OGIA MP ID	Latitude	Longitude	Target Aquifer	UWIR Required Online Date	Monitoring point purpose			
						Level / pressure	Quality	CA-WCM flux	Early warning
Kogan North-79	747, 748, 749	-26.99886636	150.9018044	WCM	Complete	✓			
Lone Pine-14	750	-27.55472483	151.3591434	WCM	Complete	✓			
Lone Pine-16	751	-27.55468423	151.3587845	WCM	Complete	✓			
Long Swamp 27	83	-27.343091	151.124186	WCM	Complete	✓			
Longswamp 28	752	-27.3415143	151.0917476	Westbourne Formation	Complete	✓			
Longswamp 29	753	-27.34150399	151.0915948	Springbok	Complete	✓			
Longswamp 30R	754	-27.34148851	151.0914061	WCM	Complete	✓			
Longswamp 31	755	-27.34347302	151.0957158	Condamine Alluvium	Complete	✓			
Longswamp 33	756	-27.26852415	151.0953309	Springbok	Complete	✓			
Longswamp 34	757	-27.26851019	151.0952109	WCM	Complete	✓			
Longswamp-7	145, 146, 147	-27.184333	151.127397	WCM	Complete	✓			
Macalister 5	244	-26.895087	150.954269	Condamine Alluvium	Complete	✓		✓	✓
Macalister 6	205, 206	-27.025681	151.133187	Eurombah Formation, WCM	Complete	✓		✓	
Macalister 7	203	-27.025639	151.133279	Condamine Alluvium	Complete	✓		✓	✓
Macalister 8	245	-26.895103	150.954439	WCM	Complete	✓		✓	
Meenawarra-21	34, 35, 36, 619	-27.57994613	151.1333987	WCM, Springbok	Complete	✓			✓ (619)
Mt Haystack 2	598	-27.727166	151.763337	WCM	Complete	✓			
Mt Haystack 4	600	-27.724061	151.276431	WCM	Complete	✓			
Mt Haystack 5	599	-27.723972	151.276483	Condamine Alluvium	Complete	✓			
Pampas 18	24	-27.61473529	151.2266555	Condamine Alluvium	Complete	✓		✓	✓
Pampas-5	25	-27.614646	151.226669	WCM	Complete	✓		✓	
Plainview 34	1053,1054	-27.3828	151.1869	WCM	Complete	✓			
Plainview 35	77	-27.3842	151.2044	WCM	Complete	✓			
Plainview 36	789, 790	-27.3868	151.216	Springbok	Complete	✓	✓ (790)		
Plainview 37	791	-27.3868	151.216	Condamine Alluvium	Complete	✓			
Plainview-25	119, 120, 121	-27.25210762	151.2922186	Condamine Alluvium, Condamine Alluvium - Walloon Transition Layer, WCM	Complete	✓		✓	✓ (119)
Punch Bowl-15	796, 797	-26.55156345	150.3782458	WCM	Complete	✓			
Stratheden-62	822	-27.19895544	151.0267434	Condamine Alluvium	Complete	✓			
Stratheden-63	622, 623	-27.198933	151.026801	Springbok	Complete	✓	✓ (623)		✓ (622)
Tipton 153	620	-27.358607	151.153091	Hutton	Complete	✓			✓
Tipton 200	832, 834, 835, 836	-27.383	151.173	Hutton, WCM	Complete	✓			
Tipton 202	830, 833	-27.383	151.173	Springbok	Complete	✓	✓ (830)		
Tipton 203	831	-27.383	151.173	Condamine Alluvium	Complete	✓			
Tipton 204	149, 150, 151	-27.149552	151.20938	Condamine Alluvium, Condamine Alluvium - Walloon Transition Layer, WCM	Complete	✓		✓	✓ (149)
Tipton 206	141, 142	-27.215683	151.348949	Eurombah, WCM	Complete	✓		✓	
Tipton 221	138	-27.215626	151.348869	Condamine Alluvium	Complete	✓		✓	✓
Tipton 222	139	-27.215589	151.348817	Condamine Alluvium - Walloon Transition Layer	Complete	✓		✓	
Tipton-157	72, 73, 74	-27.398089	151.088923	WCM	Complete	✓			
Tipton-194	861	-27.38748328	151.1181328	Precipice	Complete	✓			
Tipton-195	84, 85	-27.32054	151.20535	Condamine Alluvium	Complete	✓	✓ (85)	✓	✓ (84)

Location ID	OGIA MP ID	Latitude	Longitude	Target Aquifer	UWIR Required Online Date	Monitoring point purpose			
						Level / pressure	Quality	CA-WCM flux	Early warning
Tipton-196A	86	-27.320232	151.205042	Condamine Alluvium - Walloon Transition Layer	Complete	✓		✓	
Tipton-197	88, 89, 90, 91	-27.320228	151.205316	WCM	Complete	✓	✓ (89)	✓	
Plainview 16	792	-27.3858	151.2165	Hutton	Complete	✓			
Punch Bowl 53	868	-26.312681	150.377656	Hutton	2023	✓			
UWIR MP ID 1047	1047	-27.4429	151.2887	Springbok	Timing to be determined by OGIA	✓			
UWIR MP ID 1048	1048	-27.4429	151.2887	WCM	Timing to be determined by OGIA	✓			
UWIR MP ID 1049	1049	-27.4429	151.2887	Condamine Alluvium	Timing to be determined by OGIA	✓			
UWIR MP ID 1050	1050	-27.4822	151.1834	Springbok	Timing to be determined by OGIA	✓			
UWIR MP ID 1051	1051	-27.4822	151.1834	WCM	Timing to be determined by OGIA	✓			
UWIR MP ID 1052	1052	-27.4822	151.1834	Springbok	Timing to be determined by OGIA	✓			
UWIR MP ID 1060	1060	-27.4340	151.2272	Condamine Alluvium	Timing to be determined by OGIA	✓			
UWIR MP ID 1061	1061	-27.4340	151.2272	Springbok	Timing to be determined by OGIA	✓			
UWIR MP ID 1062	1062	-27.4340	151.2272	WCM	Timing to be determined by OGIA	✓			
Wyalla-16	246, 248	-26.86619798	150.7550201	Condamine Alluvium	Complete	✓	✓ (248)	✓	✓
Wyalla-17	252, 624	-26.86632619	150.7549919	Precipice, Hutton	Complete	✓			✓ (252)
Wyalla-18	249, 250, 251	-26.8660577	150.7550667	WCM	Complete	✓		✓	

Notes:

(1) As noted in Revision 0 of the SGP Updated WMMP, the baseline monitoring assessment indicated Condamine Alluvium bores 42231370, Daandine-161 and Carn Brea-17 exhibited regular drawdown and recovery cycles of several metres because of nearby groundwater extraction for agricultural or other non-CSG uses. The magnitude of these groundwater fluctuations is such that these bores have limited use for early warning monitoring, and as such, have been excluded as early warning monitoring bores in the SGP Updated WMMP.

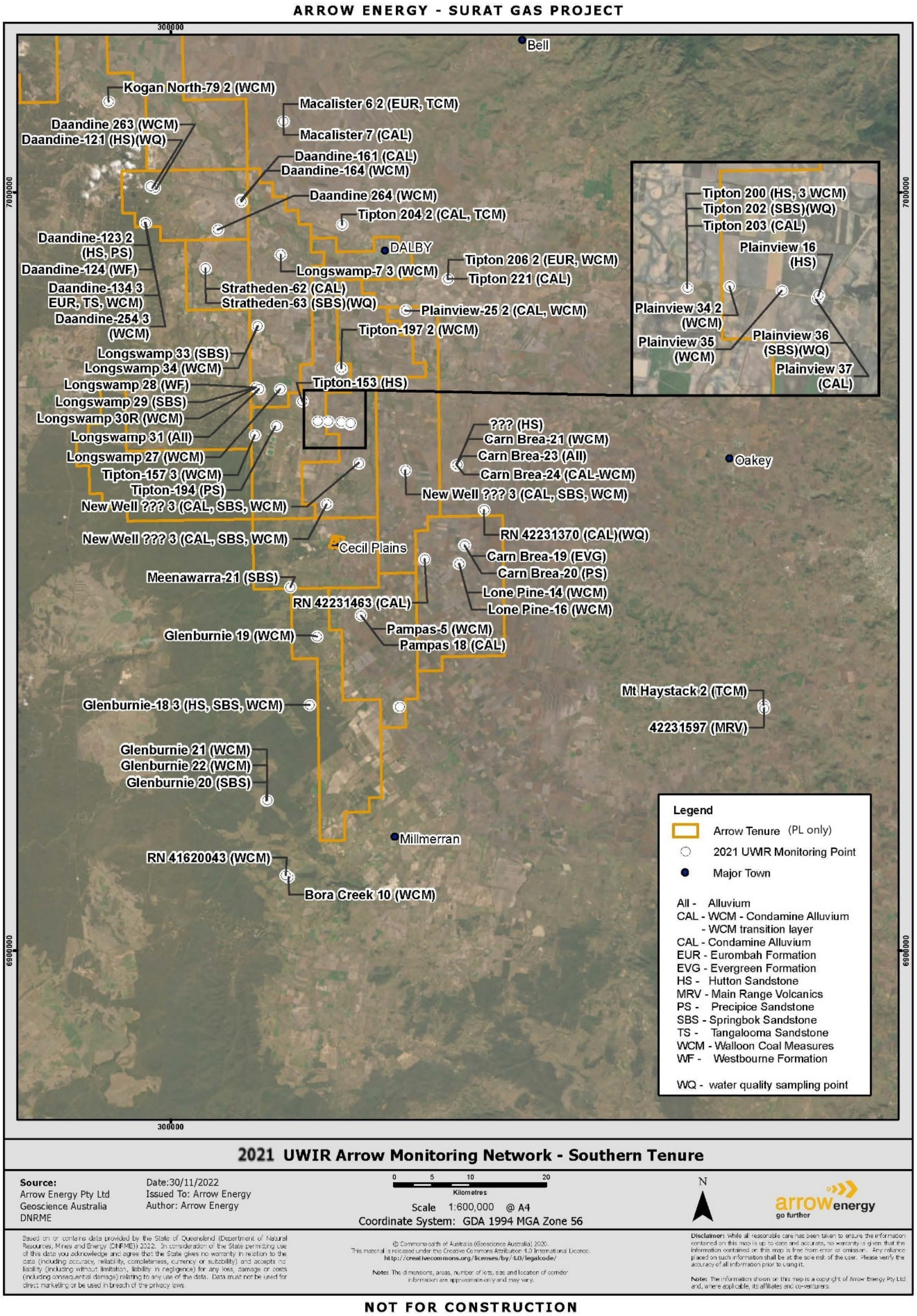

Figure 3-39: 2021 UWIR Arrow Monitoring Network – southern tenure

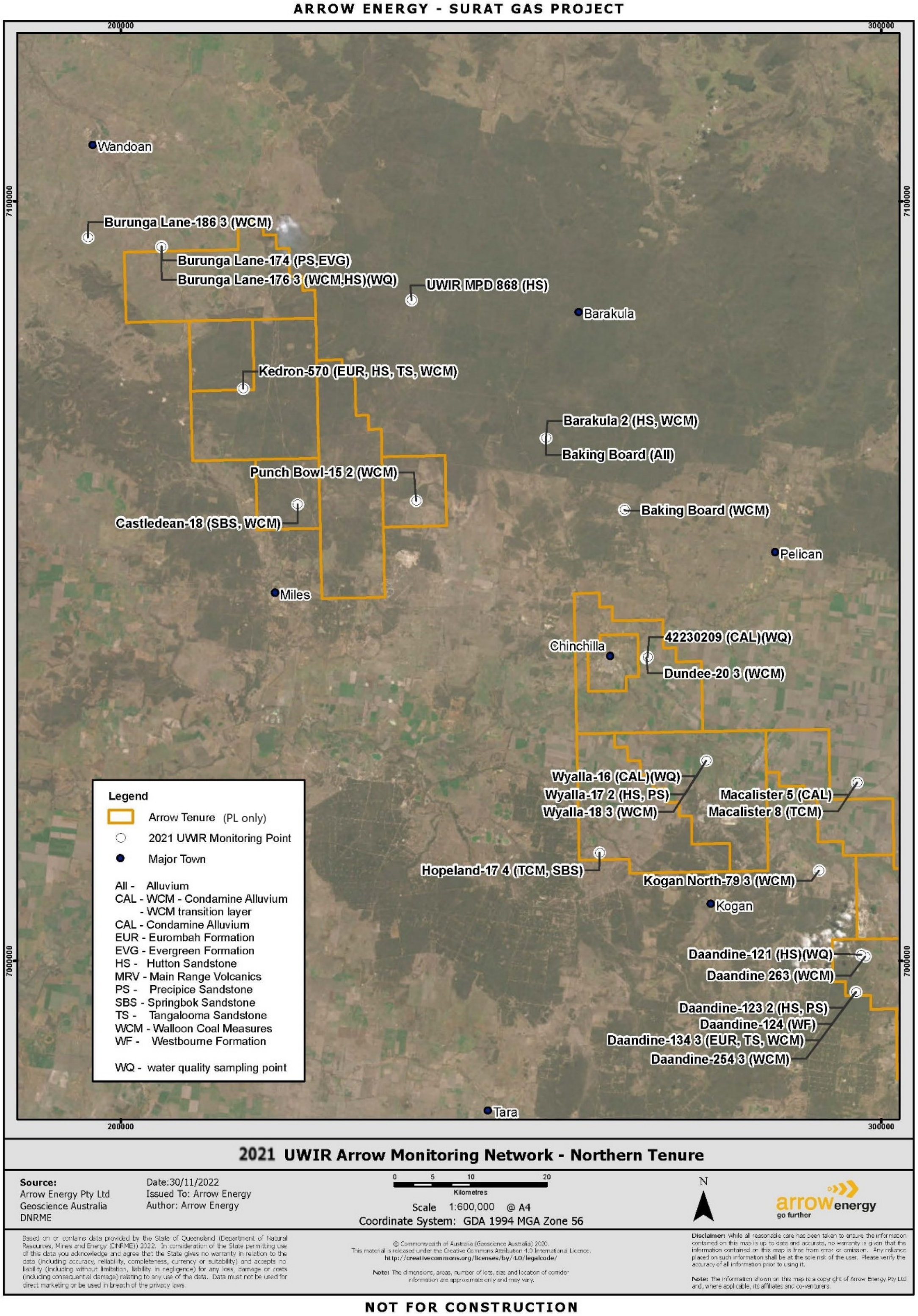

Figure 3-40: 2021 UWIR Arrow Monitoring Network – northern tenure

Table 3-6: 2021 UWIR groundwater sampling parameters and frequency for groundwater monitoring points

Suite	Type	Parameters to be measured as part of the suite	Frequency
Suite A	Field Parameters	Electrical Conductivity (µS/cm @ 25℃), pH, Redox Potential (Eh), Temperature (℃), Free gas at wellhead (CH_4)	Every six months until five samples obtained
	Laboratory analytes	Major cations and anions: Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Potassium (K^+), Sodium (Na^+), Bicarbonate (HCO_3^-), Carbonate (CO_3^-), Chloride (Cl^-), Sulphate (SO_4 2^-), Total Alkalinity	
		Metals (dissolved): Arsenic (As), Barium (Ba), Boron (B), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Selenium (Se), Strontium (Sr^{2+}), Zinc (Zn)	
		Fluoride (F^-), Total Dissolved Solids	
		Gas (dissolved): Methane (CH_4)	
Suite B	Laboratory analytes	Isotopes: Strontium (87Sr/86Sr)	Once only in: SBK, HUT, PCP
		Metals (dissolved): Strontium (Sr^{2+})	

4. Updated Impact Predictions

4.1 Groundwater drawdown extent

Following the approval of the Updated CSG WMMP on 22 November 2019, the 2019 UWIR for the Surat CMA was approved by the Queensland Department of Environment and Science (DES) on 16 December 2019. On 17 March 2022, the 2021 UWIR for the Surat CMA was approved for release by the DES (this UWIR came into effect on 1 May 2022) and was the current UWIR at the time of writing this Report. The 2021 UWIR simulated an updated Arrow field development plan (FDP) compared to the 2019 UWIR.

Changes have occurred in the predicted groundwater drawdown extent across the different iterations of the UWIR regional groundwater model, resulting from the simulation of cumulative production from all operators FDP which have been revised over time.

At the time of reporting the 2021 UWIR model files had not yet been provided to Arrow in order to estimate the Arrow only predicted impacts. As such, a comparison of the 2019 UWIR long term cumulative predictive impacts to the UWIR 2021 long term cumulative predictive impacts has been undertaken in relation to Arrow's lease area.

The Springbok Sandstone 5 m predicted drawdown extent is relatively the same as the 2019 UWIR (Figure 4-1), however there are some minor changes such as there being only one drawdown contour instead of the two in the 2019 UWIR. Similarly, the 2021 UWIR WCM 5 m predicted drawdown extent is relatively the same as the 2019 UWIR contours (Figure 4-2).

The Hutton Sandstone drawdown contour has decreased in the 2021 UWIR compared to the 2019 UWIR (Figure 4-3). The location of both predicted 5 m drawdown contours are associated with the Horrane Fault however it should be noted that Arrow's investigation of the fault indicates that clay smearing in the fault zone limited hydraulic connectivity between the WCM and the Hutton Sandstone (as per Section 4.4.5 of the 2021 UWIR). Nonetheless, the distribution of the 2021 UWIR Hutton Sandstone monitoring points is sufficiently spread across the predicted drawdown extent to detect any hydraulic connection.

The Precipice Sandstone drawdown contour has decreased in the 2021 UWIR compared to the 2019 UWIR (Figure 4-4). However, it is noted that the 2019 UWIR did not predict any Arrow-only drawdown greater than 5 m in the Precipice Sandstone.

The adequacy of the monitoring network to monitor Arrows predicted impacts is normally assessed based on the Arrow only predicted impact drawdown contours. However, based on the changes between the 2019 UWIR and 2021 UWIR cumulative predicted contours and that the monitoring network has not significantly changed since the last annual reporting, the monitoring network is considered adequate.

In regards to the Condamine Alluvium, section 6.5.2.5 of the 2021 UWIR notes the magnitude of impact is less than 0.3 m for most of the area and the footprint of predicted impact is similar to that in the previous UWIR. The average net loss of water from the Condamine Alluvium to the WCM is predicted to be about 1,270 ML/year over the next 100 years. This is higher than predictions in the 2019 UWIR but comparable to predictions in the 2012 UWIR and 2016 UWIR.

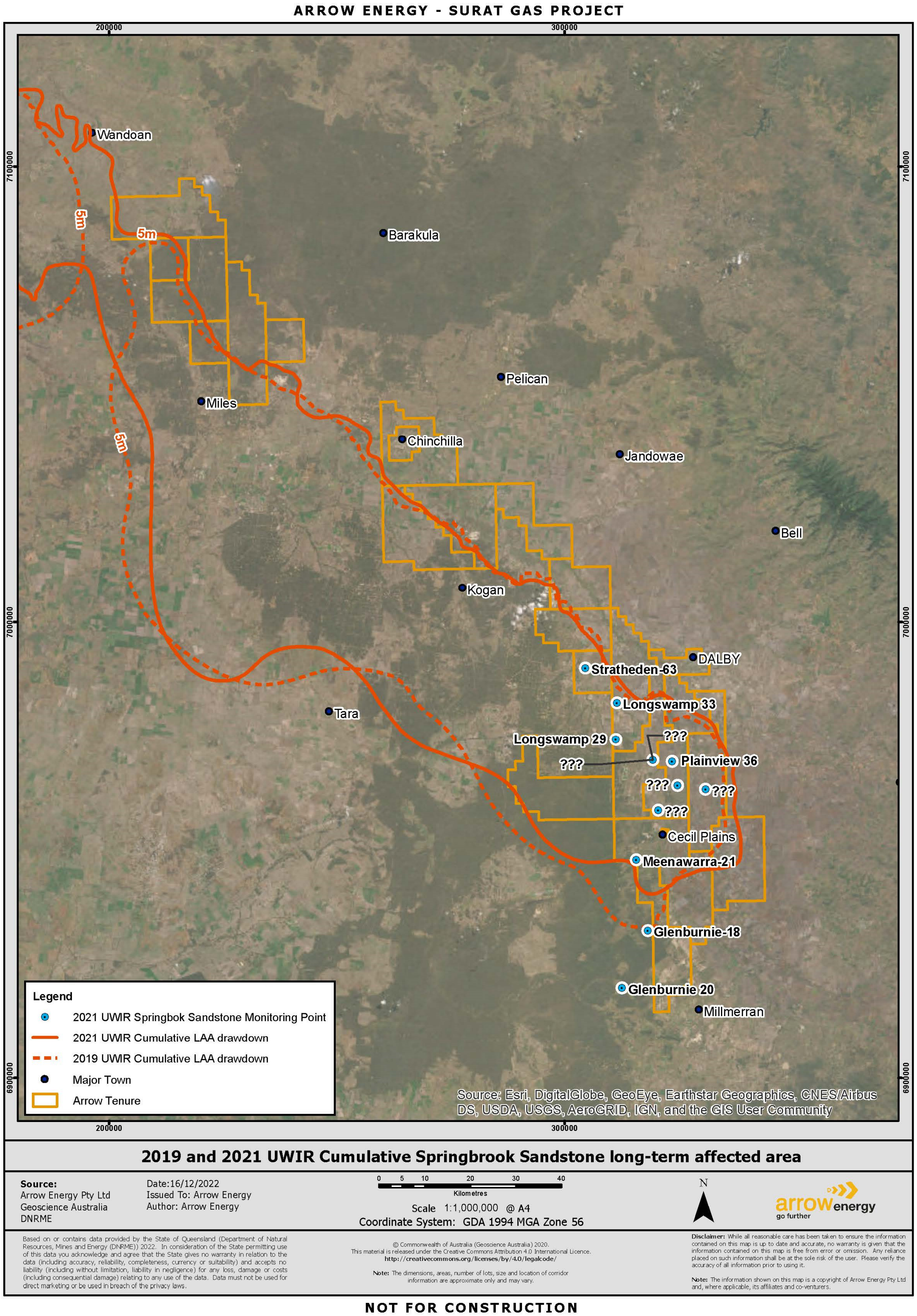

Figure 4-1: Updated CSG WMMP and 2019 UWIR Combined Springbok Sandstone long-term affected area

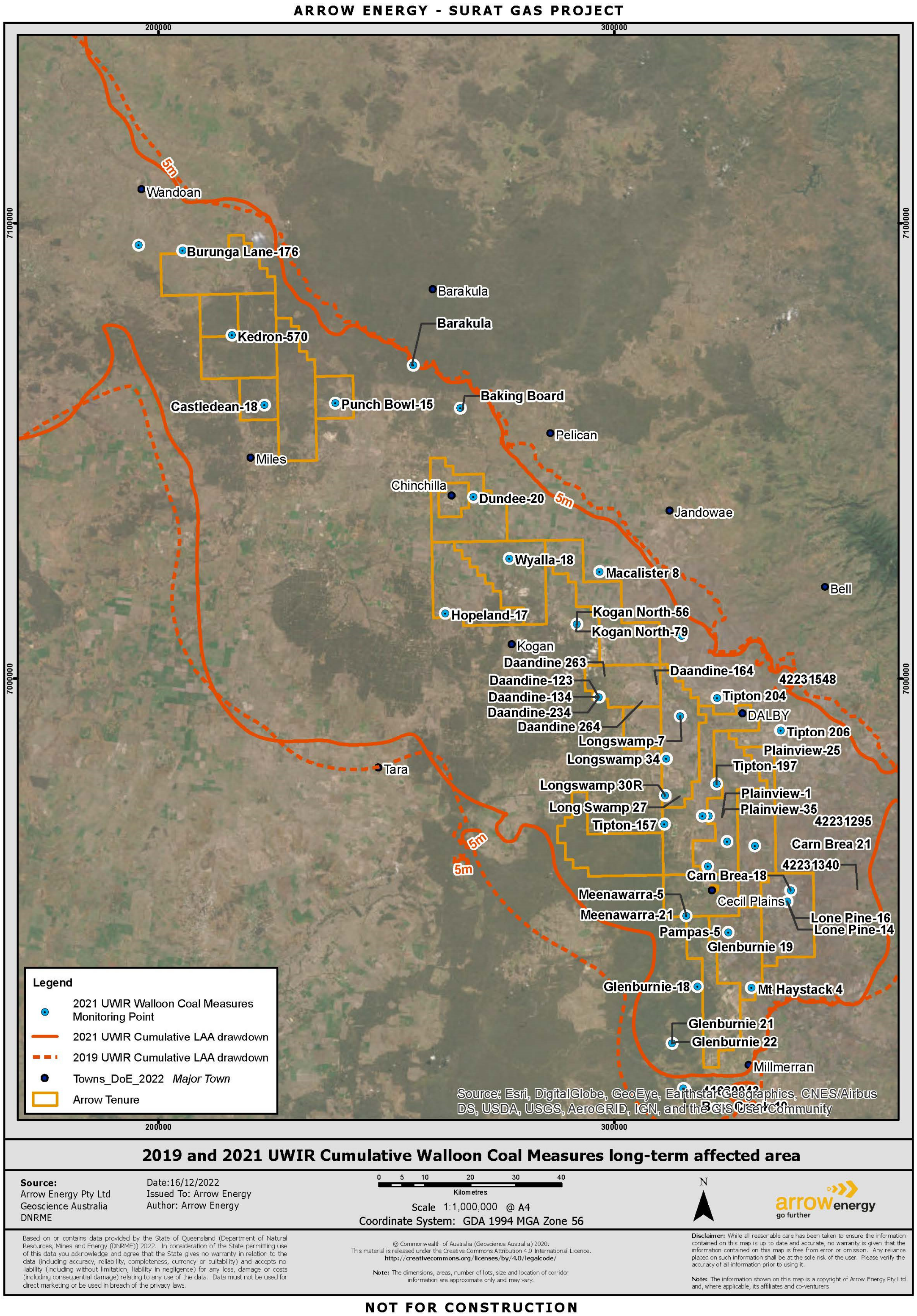

Figure 4-2: Updated CSG WMMP and 2019 UWIR Combined WCM long-term affected area

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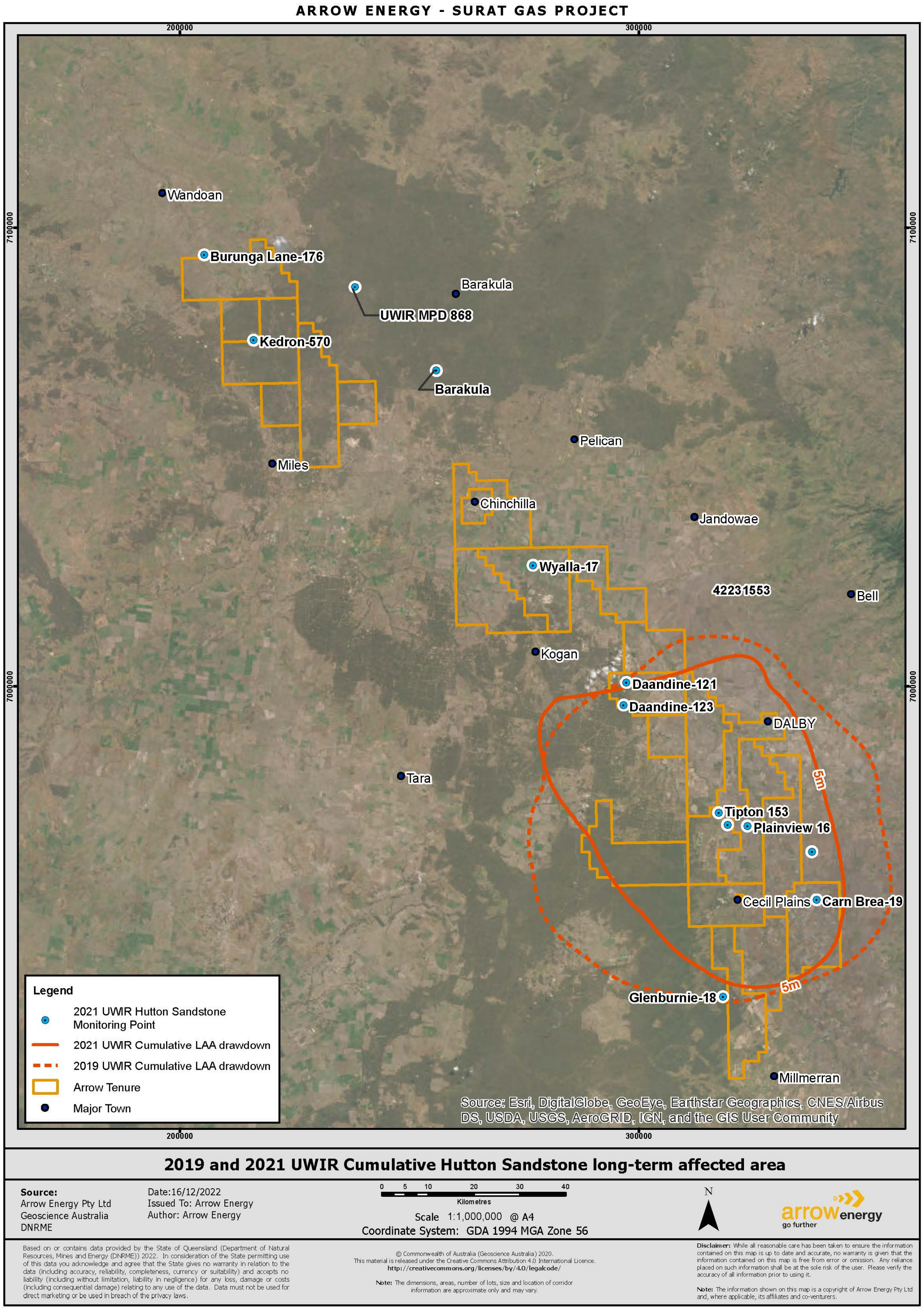

Figure 4-3: Updated CSG WMMP and 2019 UWIR Combined Hutton Sandstone long-term affected area

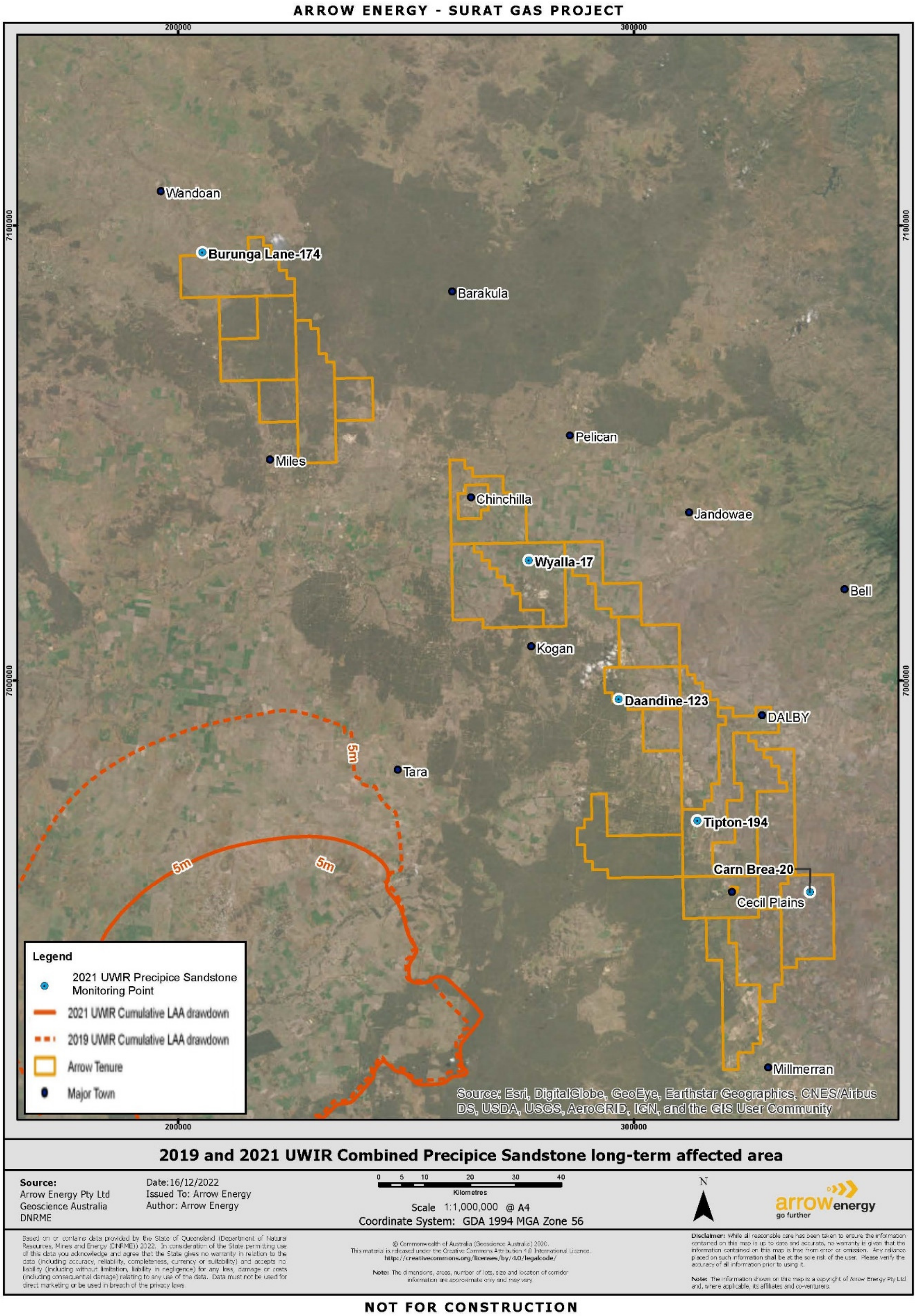

Figure 4-4: Updated CSG WMMP and 2019 UWIR Combined Precipice Sandstone long-term affected area

5. WMMP Revision

In accordance with Section 8.6 of the SGP Updated WMMP, assessments are required to be undertaken upon the release of a new UWIR and after receiving technical files for that UWIR. These assessments are:

- revision of the Early Warning Monitoring System (EWMS);
- risk assessment of potential terrestrial groundwater dependent ecosystems (TGDE); and
- potential changes to stream connectivity.

The 2021 UWIR took effect during the reporting period on 1 May 2022. Technical files for the UWIR were partly received on 6 October 2022. The technical files received were related to TGDE and the other two assessments noted above (EWMS and stream connectivity) are currently unable to be undertaken given their technical files have not yet been received. The desktop risk assessment of potential TGDEs has been completed on 21 December 2022 (within 90 days of receiving the technical files as per the Updated WMMP).

An update on the field assessment of potential TGDEs is provided in the following sections.

5.1 Field assessment of potential TGDEs

Section 5.2 of the WMMP Annual Report for the previous period (2020-21) outlined the results of the TGDE desktop assessment completed based on the 2019 UWIR. The assessment identified two sites (Juandah Creek and Wilkie Creek) which required field assessments to confirm they are TGDEs to be completed by 30 June 2022 and a summary report/s prepared within 90 days thereafter. This summary report is provided in Appendix D with key information provided here.

Ecological and hydrogeological field surveys of Juandah Creek and Wilkie Creek were completed on 13 October 2021 and 15 October 2021 respectively.

5.1.1 Juandah Creek

The assessment of the Juandah Creek site identified that Quaternary alluvial deposits of primarily sand with some clay extend along the Juandah Creek potential TGDE area. Juandah creek traverses and shallowly incises the regionally south-westerly dipping Great Artesian Basin (GAB) sequence, including the WCM at the far northern end of the area, Springbok Sandstone in the central to northern section of the area and Westbourne Formation at the southernmost end of the area.

Most lines of evidence supported that the deeper-rooted trees assessed were utilising relatively fresh and isotopically enriched groundwater from the basal alluvium, likely recharged primarily from rainfall directly infiltrating the alluvium in addition to surface water run off / stream flow. One of the three conceptual models developed as part of the assessment identified the potential for vertical upward leakage, namely:

- Dry season with vertical upward leakage: where upward leakage of bedrock aquifers is occurring into the base of the alluvium in the dry season, which is acting to support floodplain vegetation where other sources of moisture have been depleted. The capacity of this leakage to stimulate vegetation growth and vigour is dependent to a degree on the groundwater salinity of the leaking aquifers. It is not possible to predict the extent to which this is occurring without more detailed assessment during a drier climatic period. It is however conceptualised to be restricted to discrete areas and pockets where the function is supported by underlying geology, rather than occurring more extensively across the landscape.

This conceptual model needs further testing through additional assessment during a prolonged dry period to address critical research gaps and subsequent refinement of the eco-hydrogeological conceptual model.

While the collected data indicate that the site is not a TGDE reliant on the regional aquifer hosted within the GAB, an EWMS will be established for the site while further information is collected to confirm the conceptual model. This EWMS will be developed as per the required timelines in the Updated WMMP which equates to 29 December 2022.

5.1.2 Wilkie Creek

Prior to commencement of significant identified hydrological and hydrogeological alteration which commenced in 1990, it is considered likely that vegetation within portions of the identified reach of Wilkie Creek and an extension downstream to the north was dependant, at least seasonally, on groundwater. This is consistent with the classification of river red gum as a facultative phreatophyte.

However severe degradation of the ecosystem including widespread mature tree dieback, likely due to exposure to shallow saline groundwater, has resulted in ecosystem collapse. In the current hydrogeological regime, no trees within the affected reach were identified as being groundwater reliant. Elevated groundwater salinity is considered the major factor contributing to the poor ecological health of the reach of Wilkie Creek that is subject to this assessment. The riparian vegetation is still relatively intact immediately north of Dalby-Kogan Road where the preferential source of water appeared to be shallow soil moisture at the time of assessment.

The conceptual model identifies numerous potential stressors to the riparian ecosystem on Wilkie Creek which appear to have commenced from 1990 and are likely a result of activities other than Arrow's operations. Such hypotheses require further testing through additional work to address critical research gaps and subsequent refinement of the eco-hydrogeological conceptual model.

5.2 Potential terrestrial groundwater dependent ecosystems

The 2019 UWIR included an assessment of terrestrial groundwater dependent ecosystems (GDE) which was further revised in OGIA's 2019 UWIR Approval Condition 3 Response (OGIA, 2020) released on 16 December 2020. This document was submitted to the DES by OGIA as part of the conditions of approval of the 2019 UWIR[1]. The document is available from OGIA upon request. The 2021 UWIR also included an assessment of terrestrial GDEs which required a follow up desktop assessment to be conducted by Arrow. The associated technical data were provided to Arrow on 6 October 2022 in response to Arrow's request in June 2022 following the SGP commencement on 22 October 2020 and the 2021 UWIR taking effect on 1 May 2022.

Arrow was obliged to revise the terrestrial GDE risk assessment in accordance with Section 8.6 of the SGP Updated WMMP. Arrow completed the revised desktop risk assessment on 21 December 2022 (within 90 days from 6 October 2022) i.e. within 90 days of a new approved UWIR being issued (and upon receiving technical files from OGIA). Arrow's revised risk assessment is provided in Appendix D.

The risk assessment identified eight potential terrestrial GDEs predicted to be at risk of being impacted from the Action or the cumulative CSG operation. A summary of the desktop risk assessment is provided in Section 5.2.1, with further detail provided in Appendix D. As a result, further work is required to be undertaken to gather supporting data to confirm the ecosystems' reliance on groundwater and validate the findings of the desktop assessment. In the instance a high-risk site was identified in the risk assessment, section 8.6 of the SGP Updated WMMP also requires a revised Updated WMMP be submitted to DAWE within 90 days of completing the risk assessment.

5.2.1 Risk assessment

OGIA's terrestrial GDE desktop assessment method (OGIA, 2020), detailed in the document Attachment 1 Condition 3 Response, integrates:

- GIS mapping of potential terrestrial GDEs
- areas of predicted drawdown in the 2019 UWIR groundwater model within outcropping aquifers
- regional ecosystem (RE) mapping
- biodiversity status.

Twelve potential terrestrial GDE areas were identified by OGIA on Arrow tenure as potentially at risk of impact. Arrow assessed these twelve sites against available data such as depth to groundwater, landscape setting, field survey vegetation mapping, and previous assessments conducted in the Stage 1 CSG WMMP and Revision 0 of the Updated CSG WMMP (Appendix D – Stream Connectivity and GDE Impact Assessment memo). Arrow's review identified that eight of the twelve areas are considered to be at risk of impact or likely to represent a terrestrial GDE.

[1] The Chief Executive of the Department of Environment and Science approved the 2019 Surat CMA UWIR on 16 December 2019 with conditions including Condition 3 which required submission of an environmental values assessment with the first annual review that updates the assessment of impacts presented in the approved UWIR on the following environment values: a. terrestrial groundwater dependent ecosystems; b. changes in water quality of each aquifer; and c. irrigation land.

OGIA (2020) note that the priority knowledge gaps for further investigation of medium or high-risk sites are:

- validation and confirmation of the GDE mapping and associated REs
- conceptualisation of the identified terrestrial GDEs in terms of:
  - quantification of their ecological water requirements – the temporal nature, quantity and quality of groundwater use
  - their likely ecological response to changes in groundwater regime.

6. Compliance with the WMMP

The approved SGP Updated WMMP was developed based on an adaptive management framework which meets the water-related approval conditions. Compliance, therefore, with the SGP Updated WMMP demonstrates compliance with the approval conditions.

Throughout the reporting period, Arrow maintained compliance with the WMMP with the exception of six bores which had periods with no groundwater level/pressure monitoring (Section 3.1.1). Compliance with the WMMP is demonstrated through:

- publication of the approved Updated CSG WMMP on Arrow's website
- publication of this annual report on Arrow's website within three months of the anniversary of the start of the SGP
- providing raw data to OGIA as required in Section 9.13 of the 2021 UWIR for potential inclusion (at the discretion of Department of Regional Development, Manufacturing and Water [DRDMW]) on the Queensland Globe database
- met performance measure criteria for assessment of the protection of matters of national environmental significance (MNES), namely:
  - adequacy of the groundwater monitoring network was reviewed according to the predicted drawdown from a new OGIA model (2021 UWIR) (Section 3.1)
  - the desktop terrestrial GDE risk assessment was reviewed following the release of a new UWIR (2021 UWIR) (Section 5.25.2)
  - monitoring obligations (groundwater and subsidence) were carried out in accordance with the 2021 UWIR with the exception of Carn Brea-18, Carn Brea-19, Carb Brea-20, Kogan North-79, Mt Haystack 4 and Punch Bowl-15 which had periods with no groundwater level/pressure monitoring (Section 3)
- the EWMS was implemented noting that there were no exceedances of early warning indicators, trigger thresholds or limits during the reporting period.

In addition to the above, Arrow's compliance with all EPBC Approval 2010/5344 conditions is documented in the report Surat – EPBC Approval 2010/5344 Annual Compliance Report 2021/2022 (S00-ARW-ENV-REP-00055) available on Arrow's website.

7. Document Administration

This document has been created using ORG-ARW-IMT-TEM-00005 v4.0

Revision history

Revision	Revision Date	Revision Summary	Author
1	20/01/2023	Issued for Use	

Related documents

Document Number	Document title

Acceptance and release

Author

Position	Incumbent	Release Date
Principal Hydrogeologist	St.John Herbert	20/12/2022

Stakeholders and reviewers

Position	Incumbent	Review Date
Team Lead Hydrogeology	Chris Jones	20/12/2022
Senior Hydrogeologist	Andrew Wilson	19/01/2023
Groundwater Manager	Stephen Denner	19/01/2023

Approver(s)

Position	Incumbent	Approval Date
Groundwater Manager	Stephen Denner	20/01/2023

8. References

Department of Natural Resources, Mines and Energy, 2017. *Identification of Gaining Streams in the Surat Cumulative Management Area, Hydrogeology Investigation Report*, March 2017, Office of Groundwater Impact Assessment

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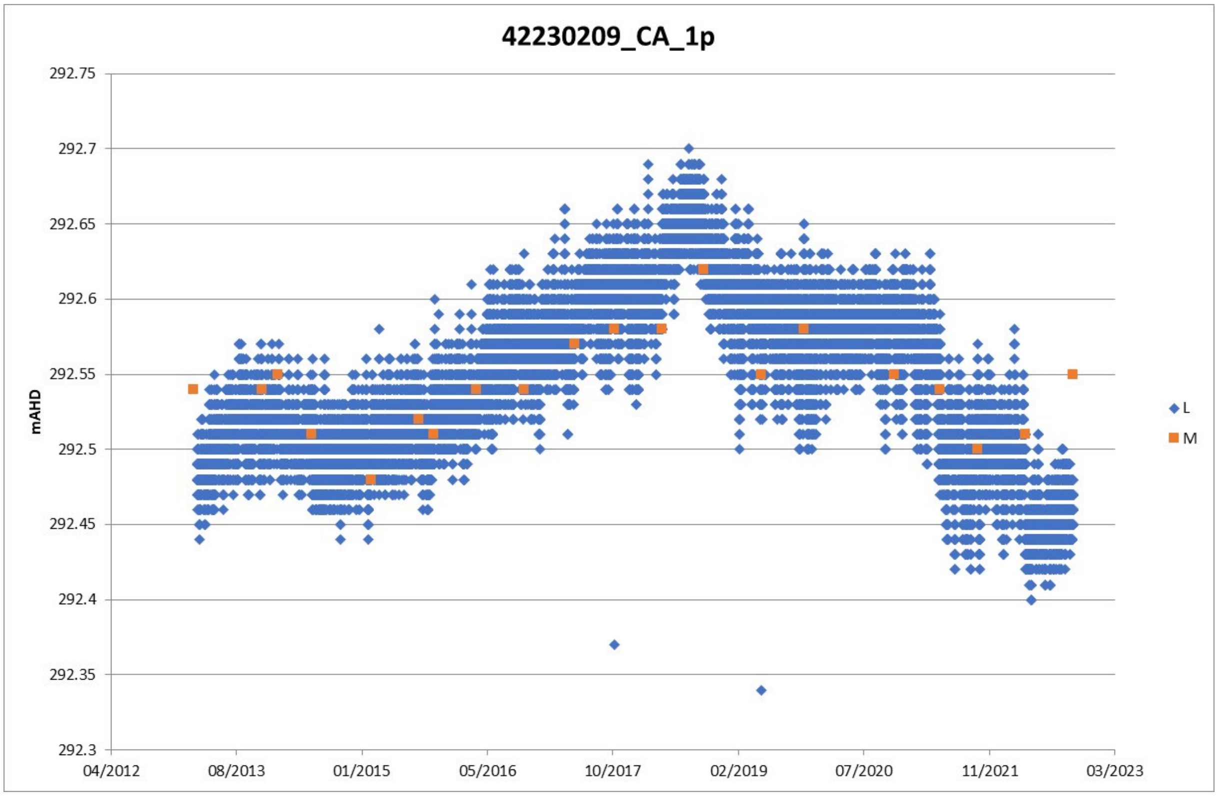
DES, 2021, Using monitoring data to assess groundwater quality and potential environmental impacts, Version 2. Department of Environment and Science (DES), Queensland Government, Brisbane.

Appendix A – Hydrographs

Groundwater level monitoring bores Appendix A – Hydrographs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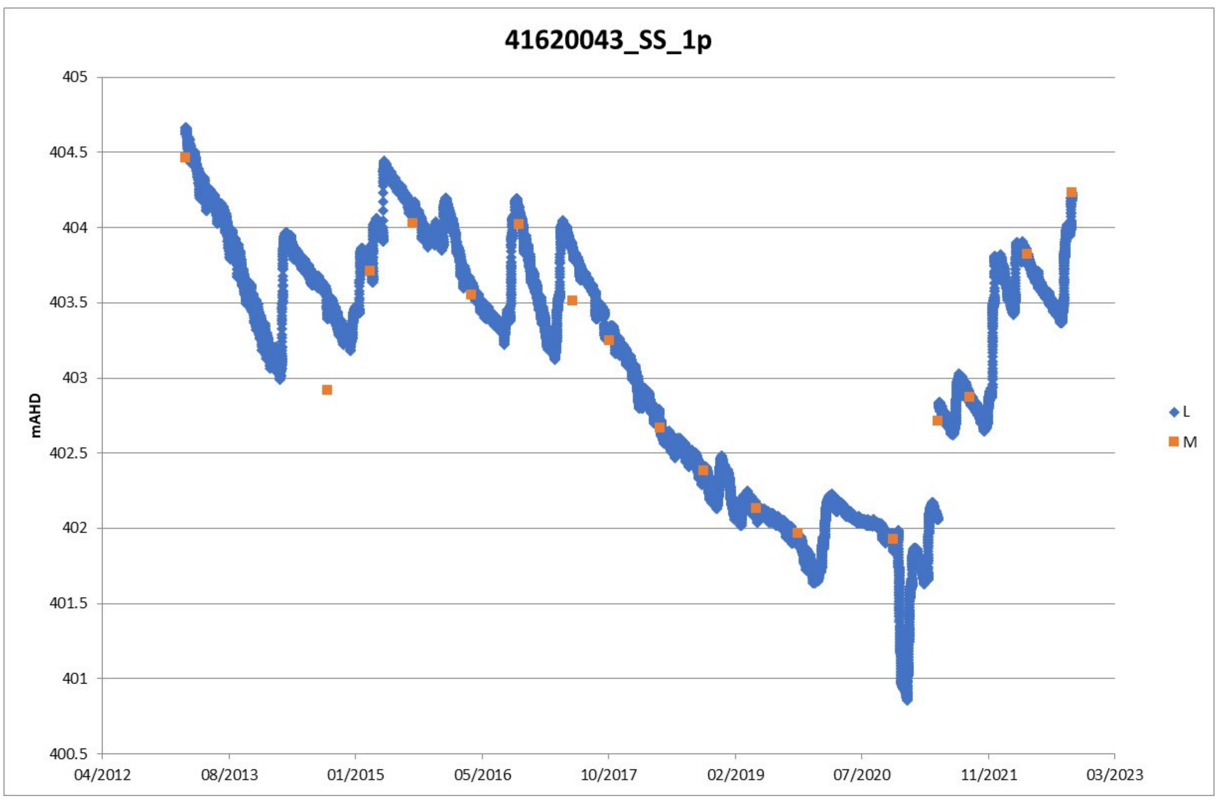
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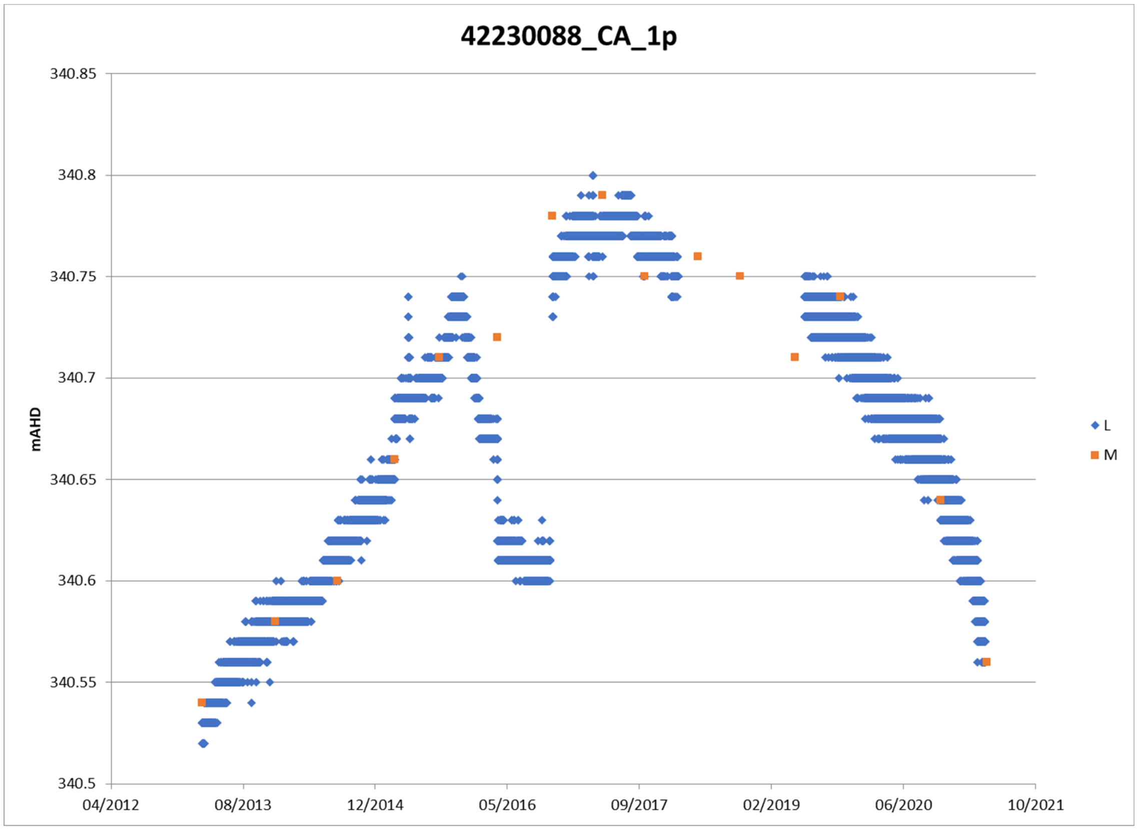
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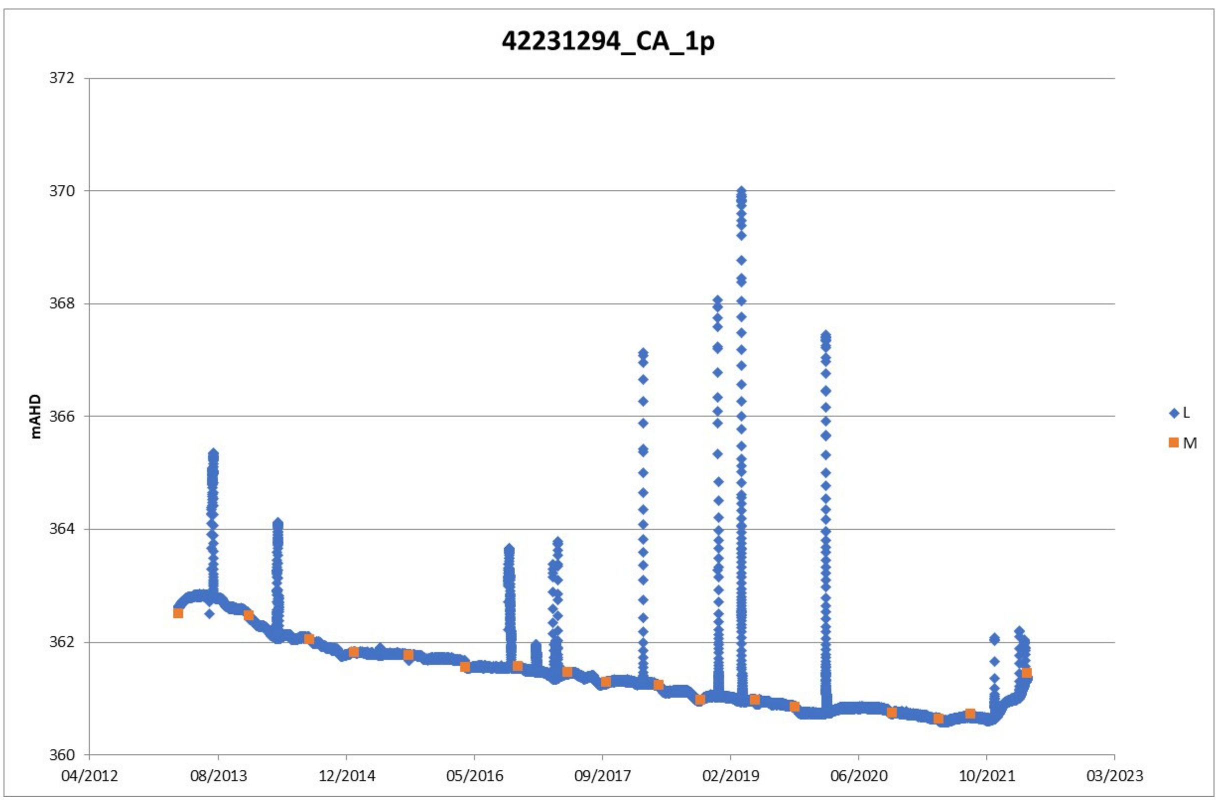
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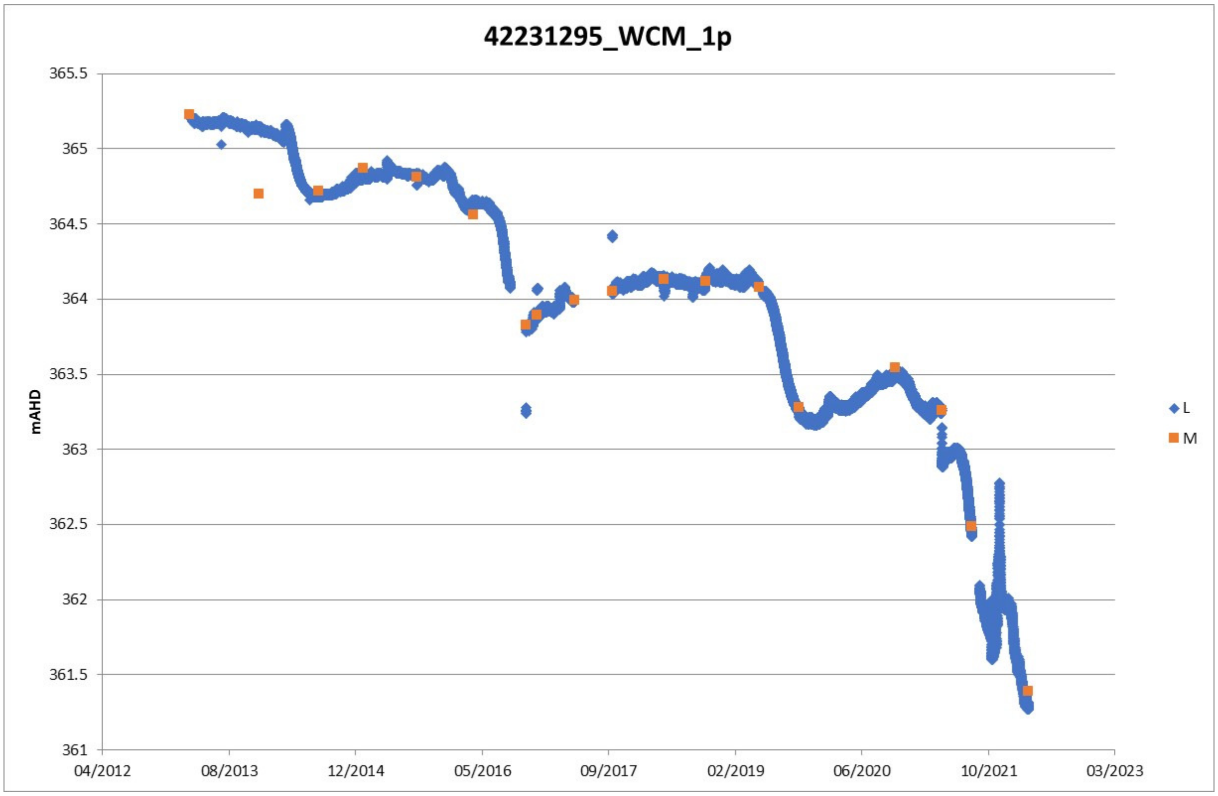

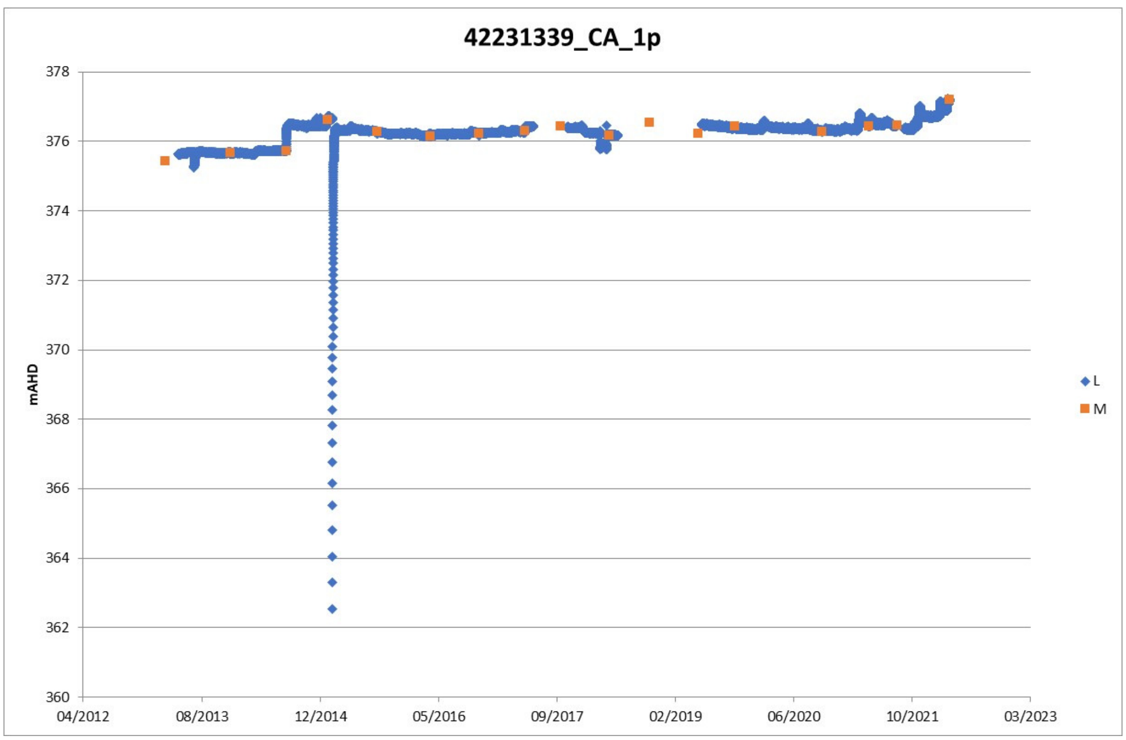

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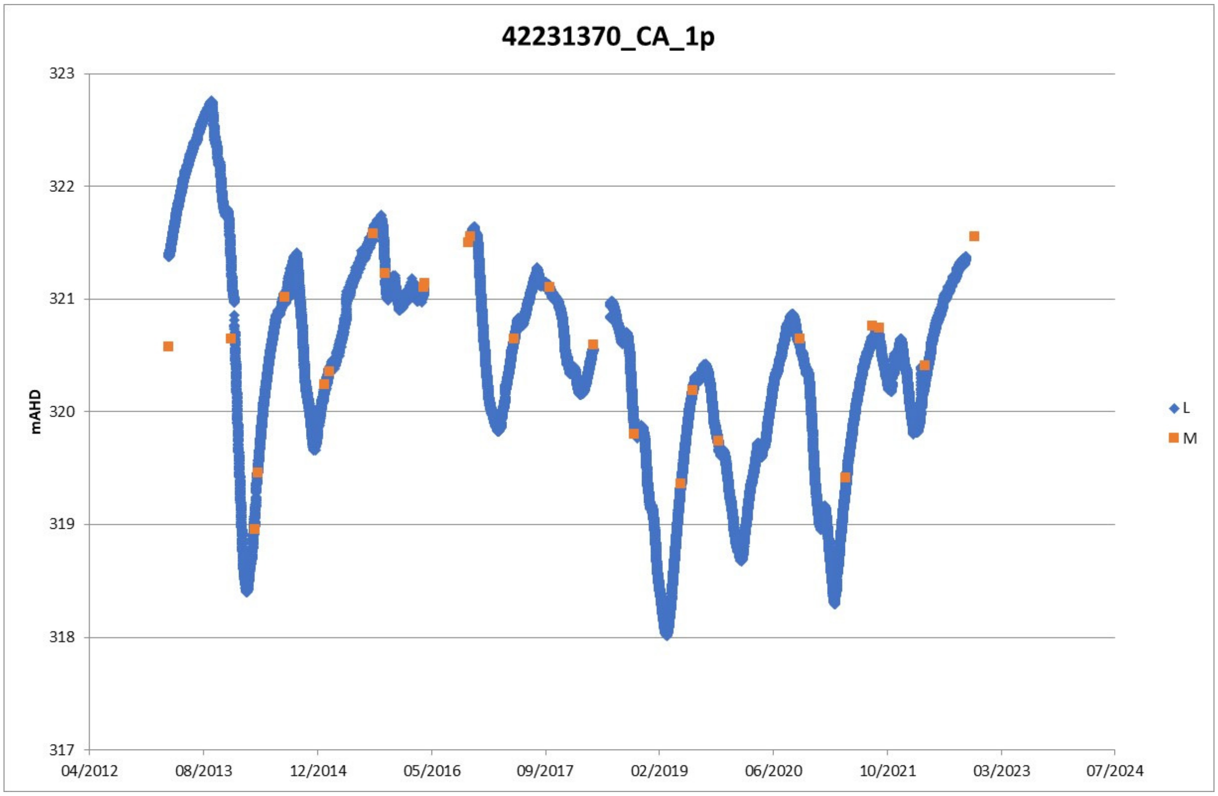
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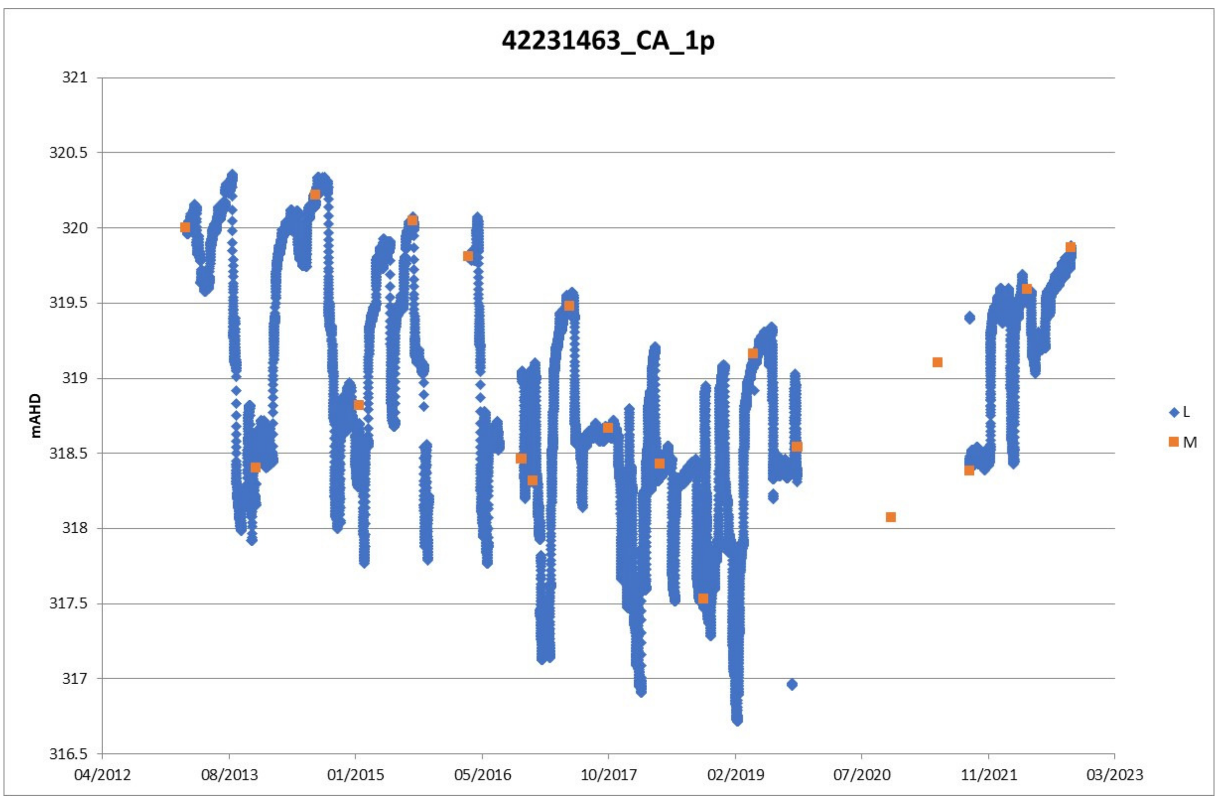
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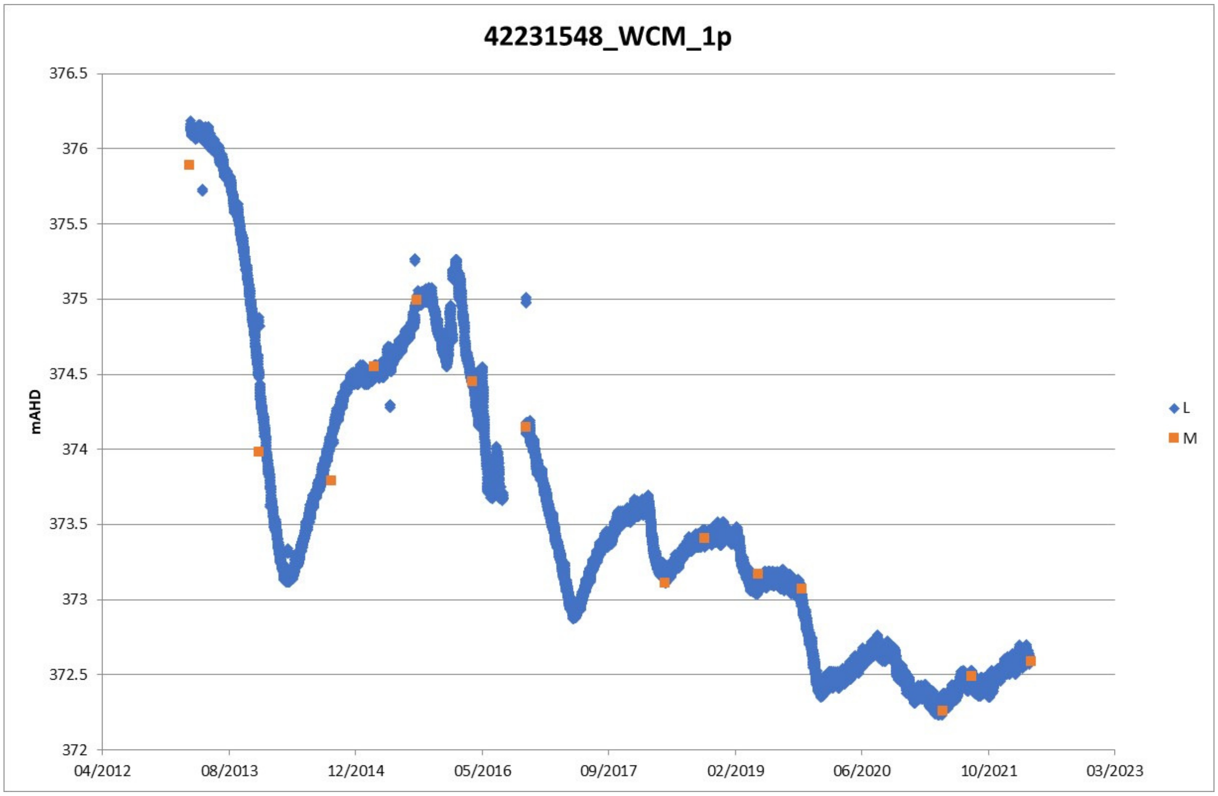
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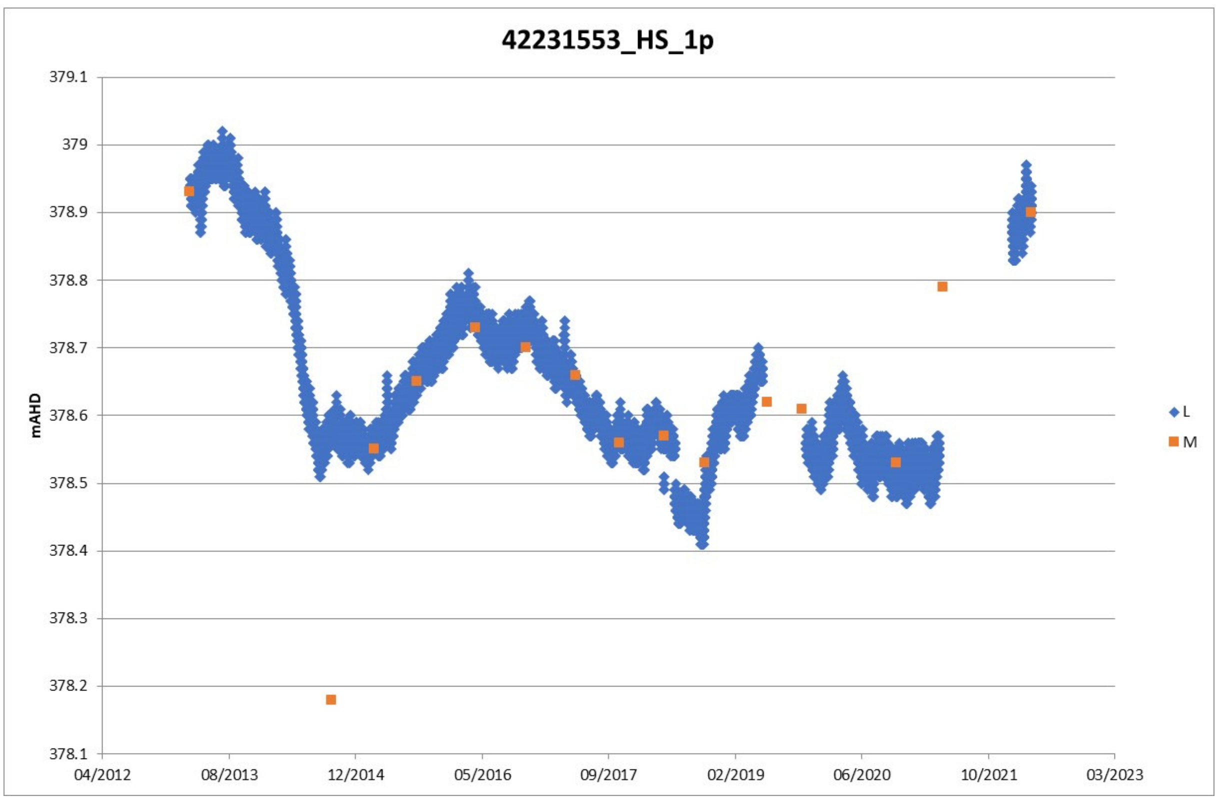
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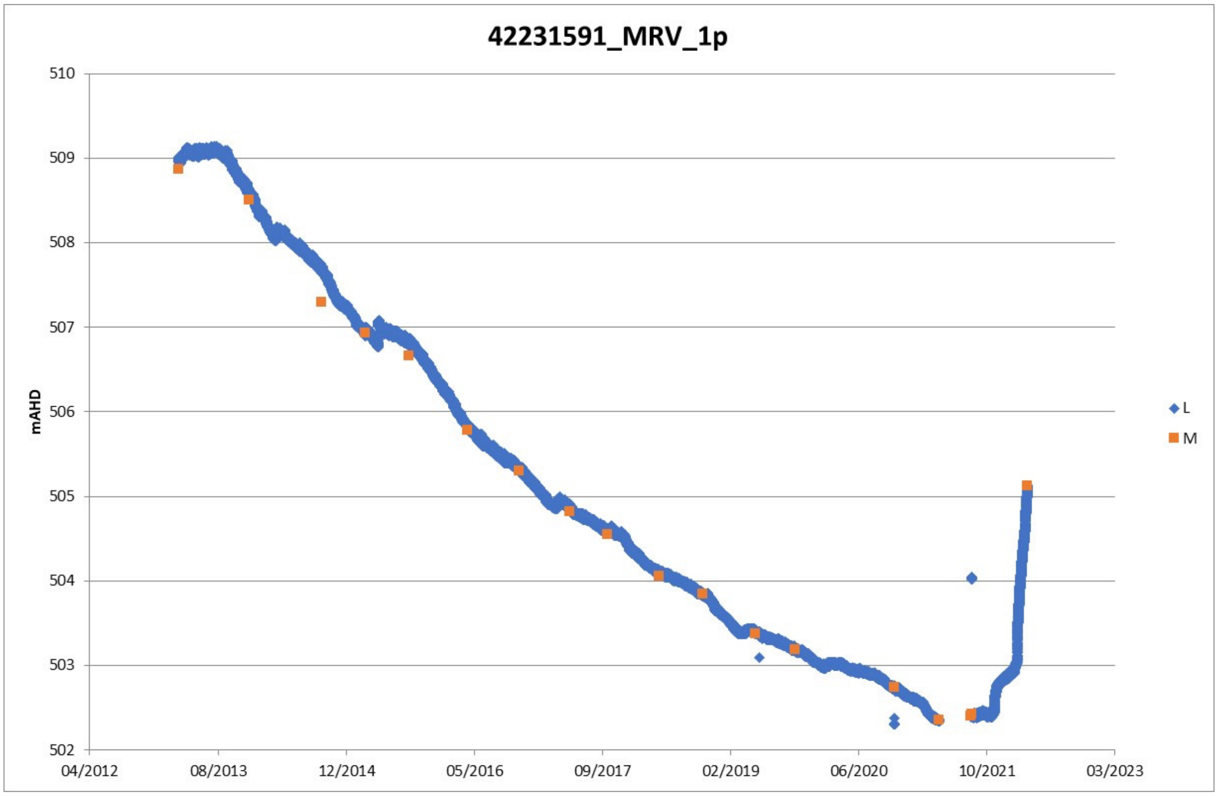
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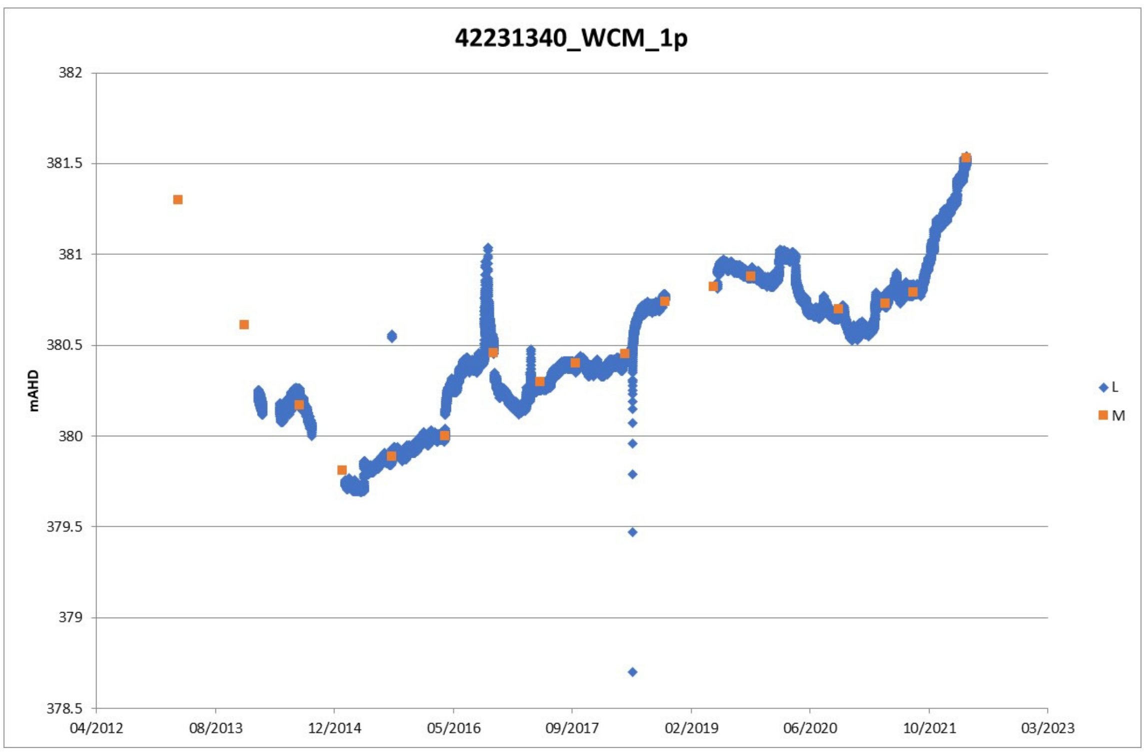
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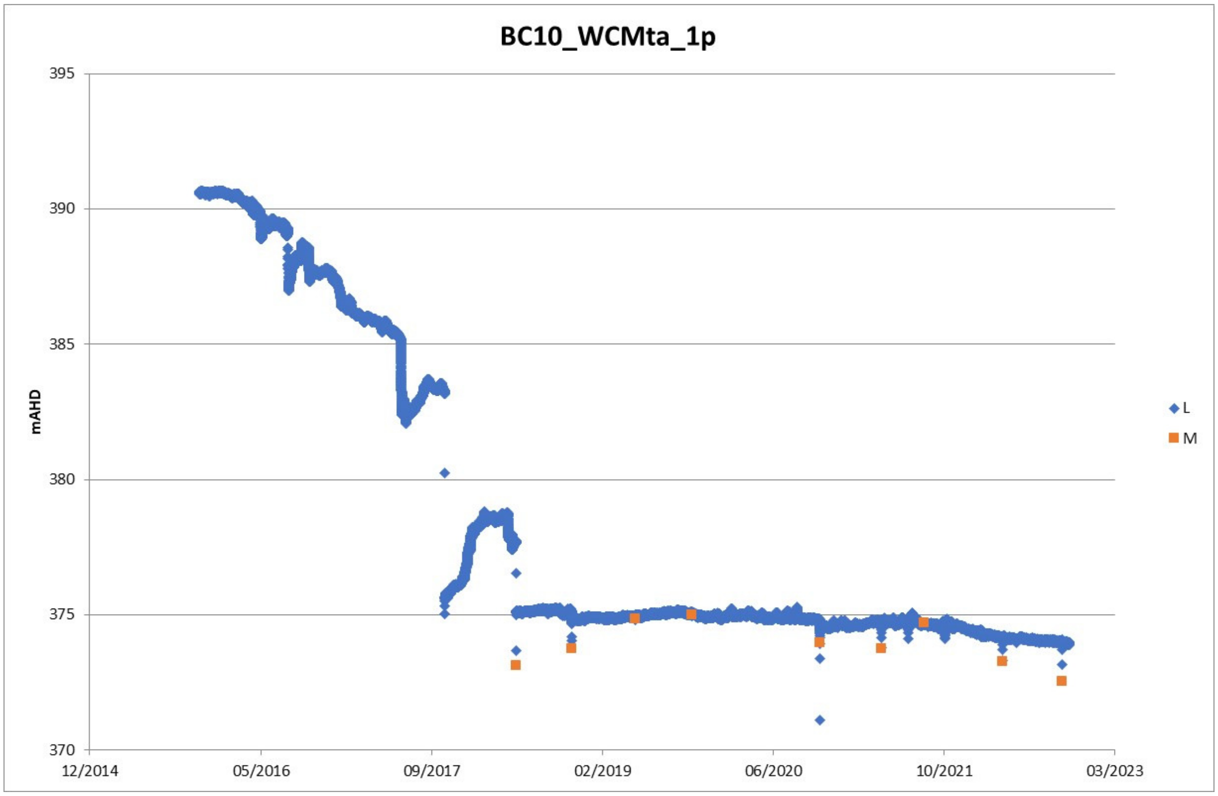
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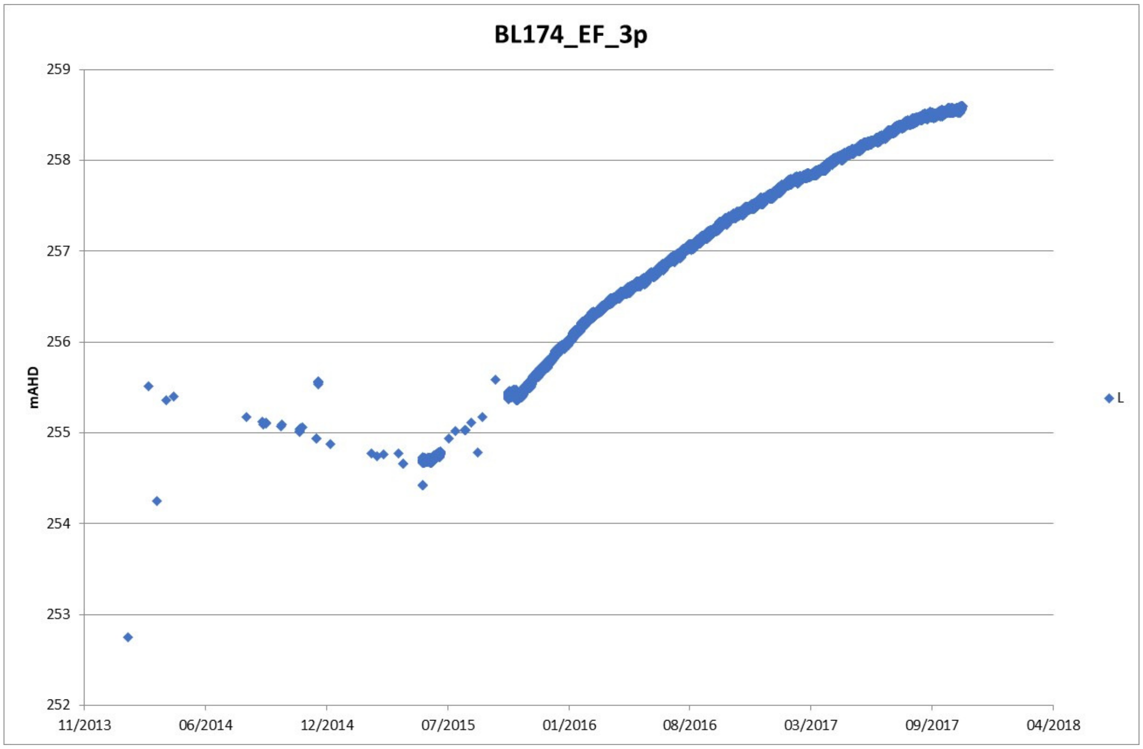
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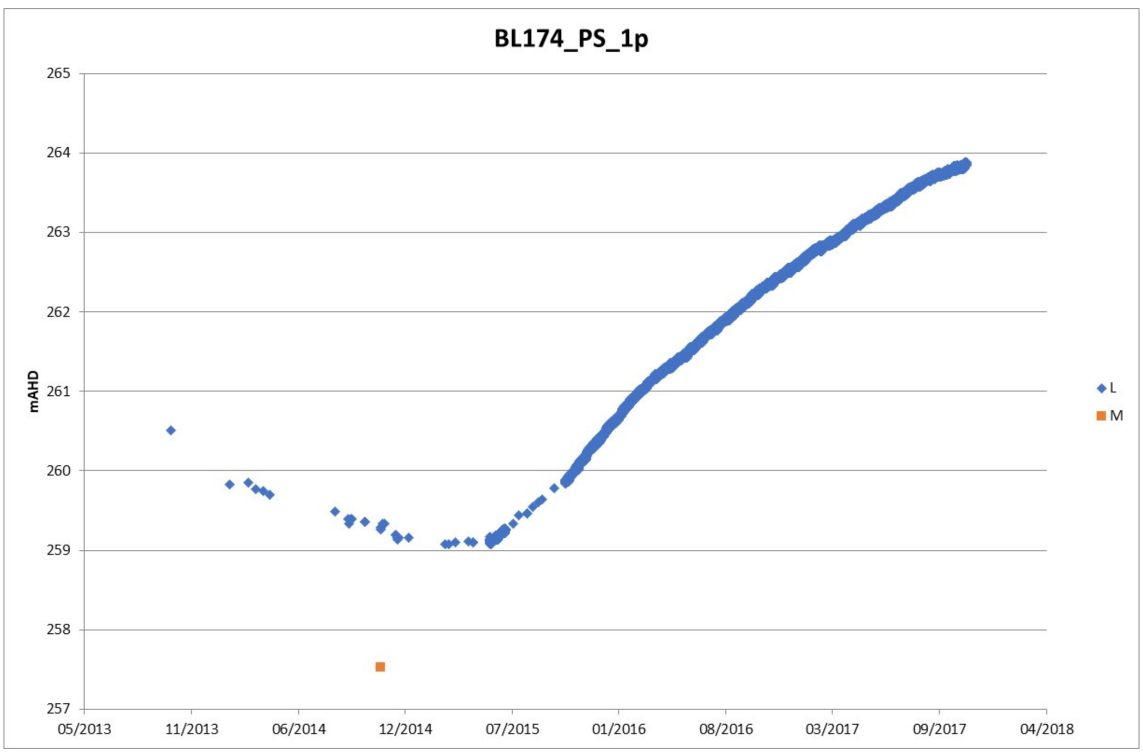
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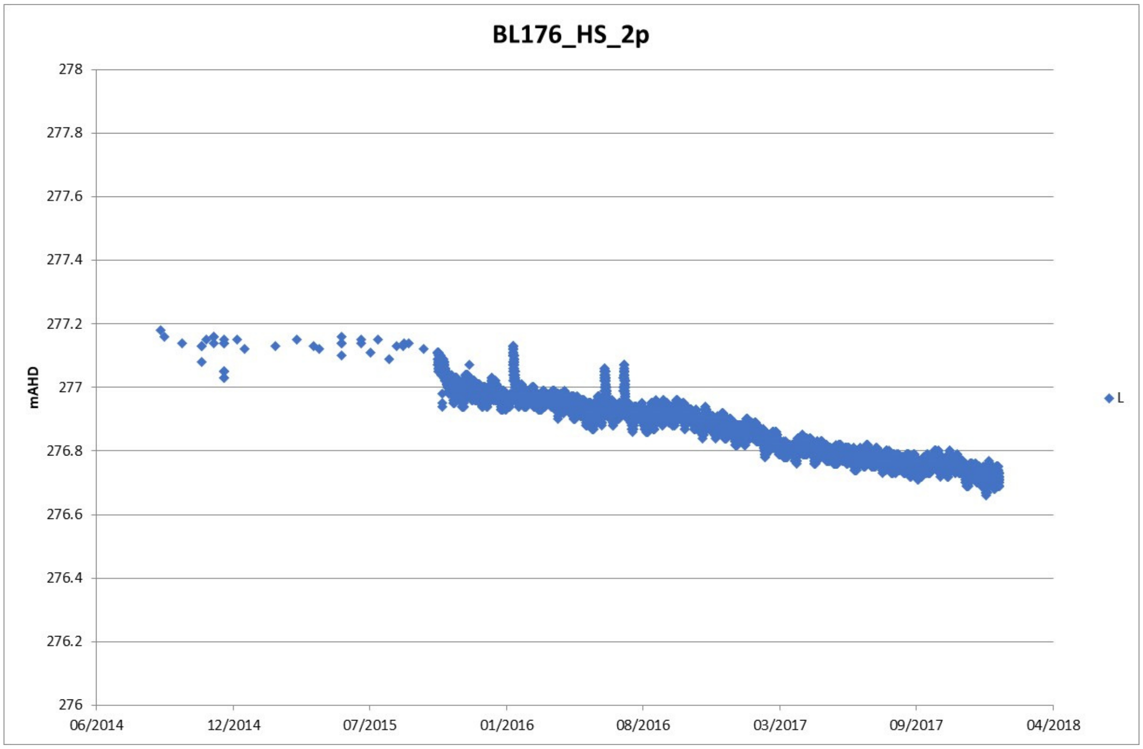
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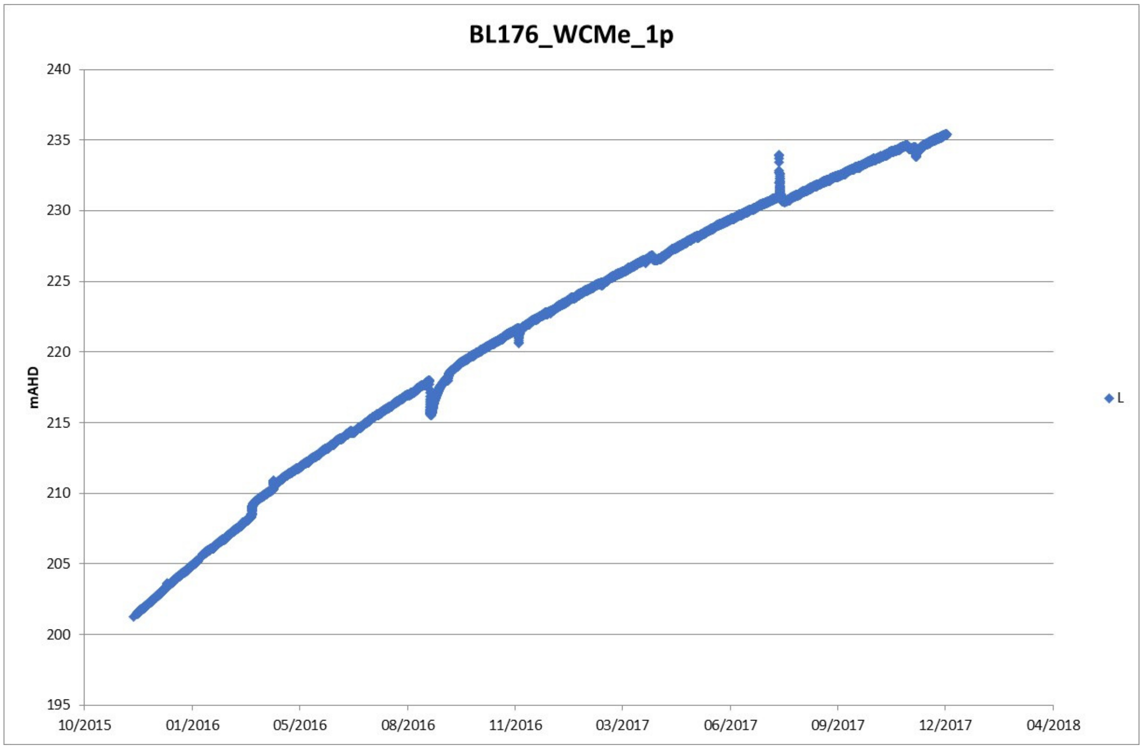
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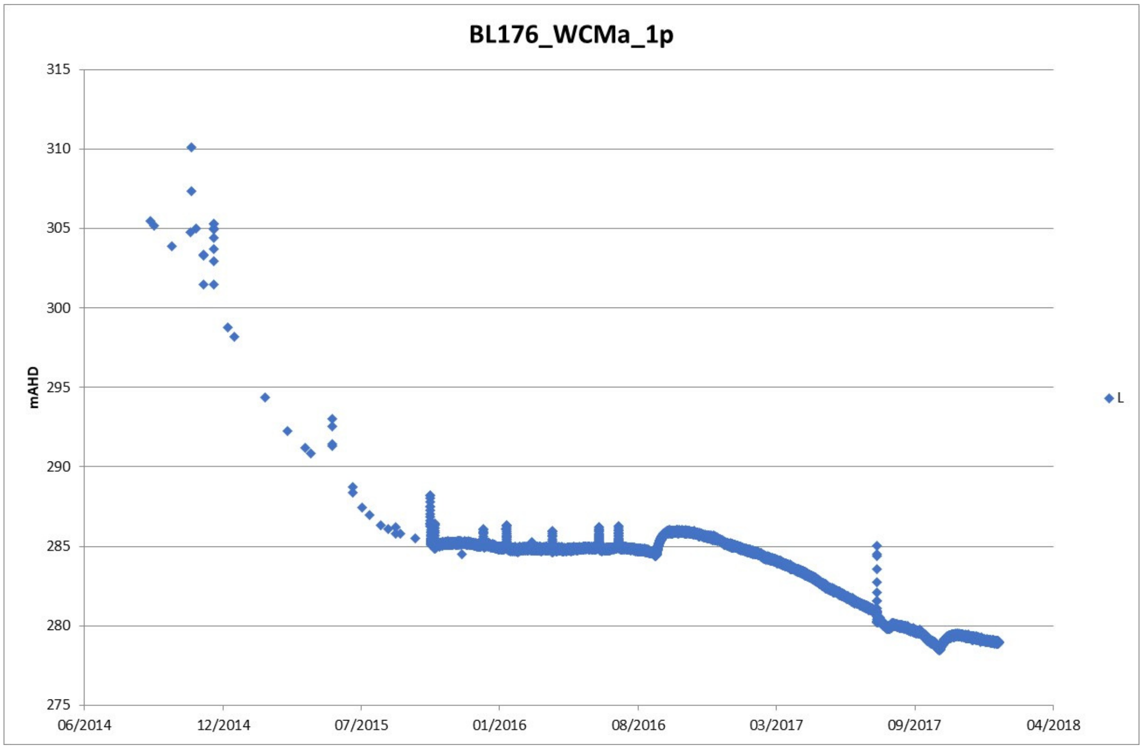
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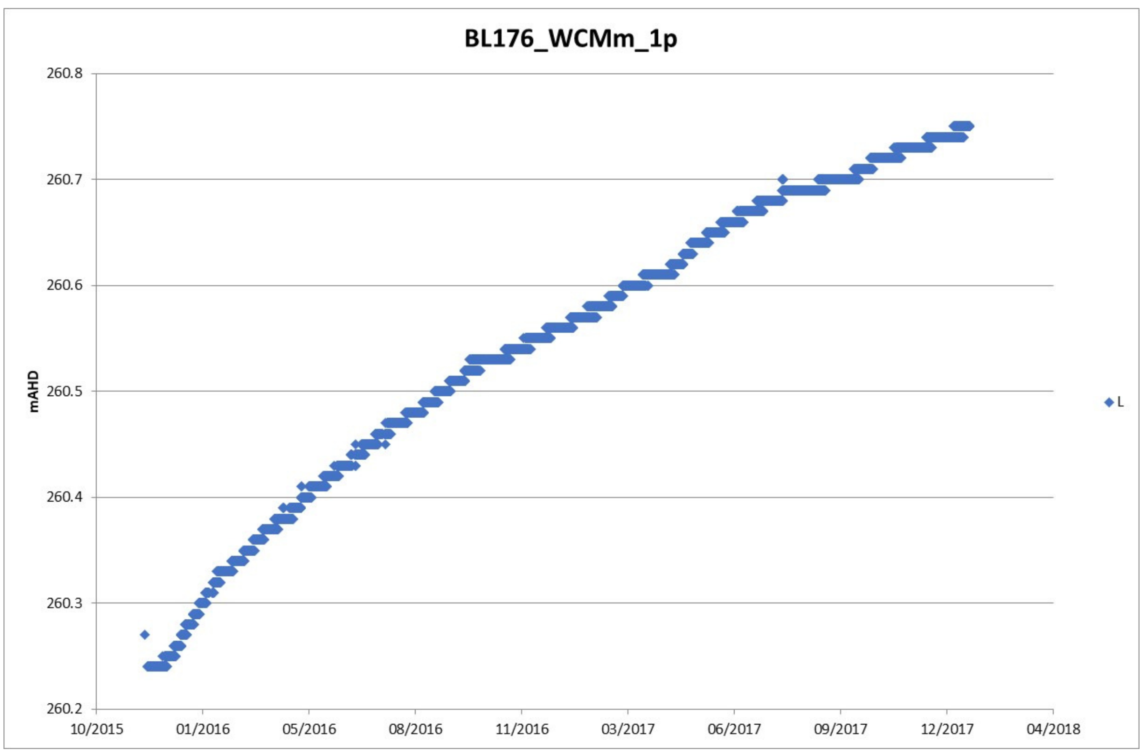
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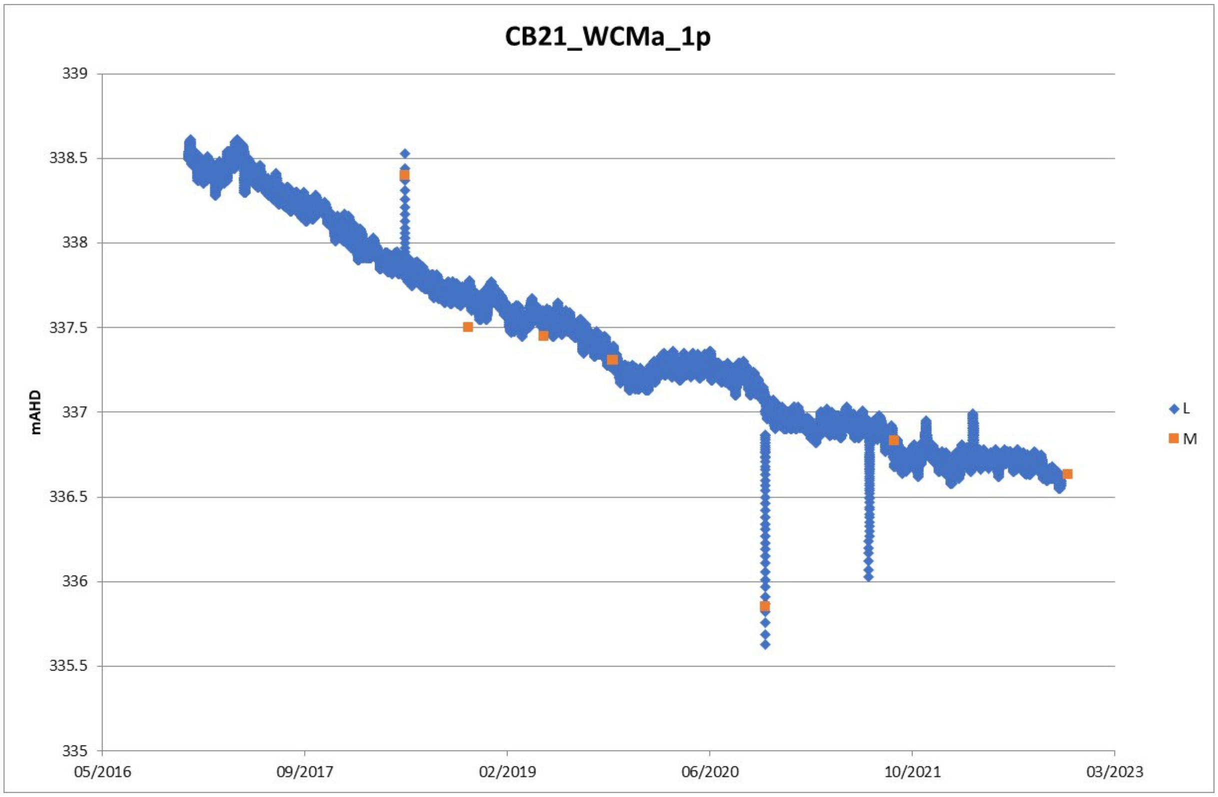
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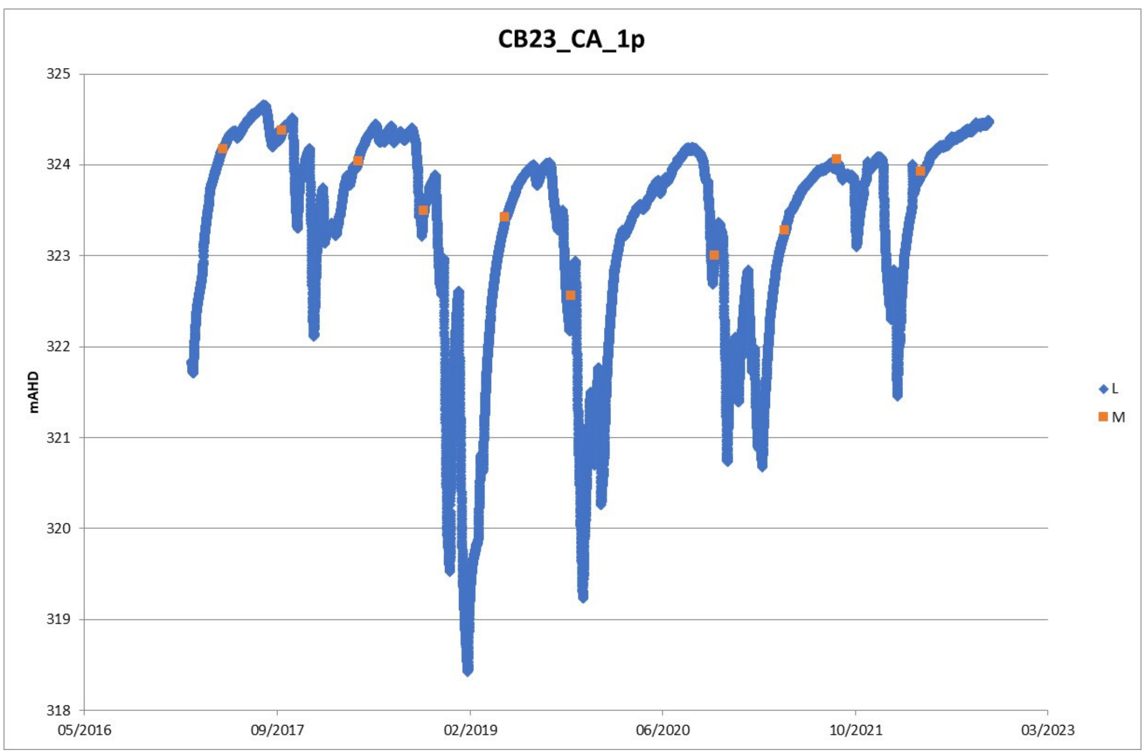
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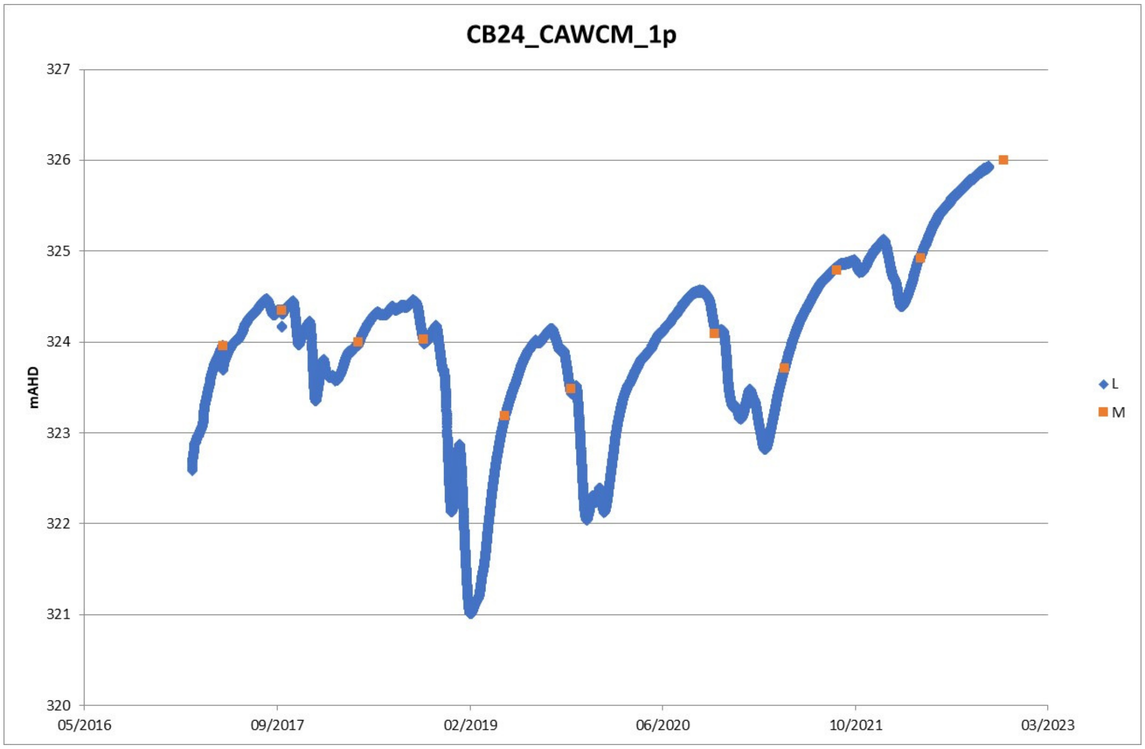
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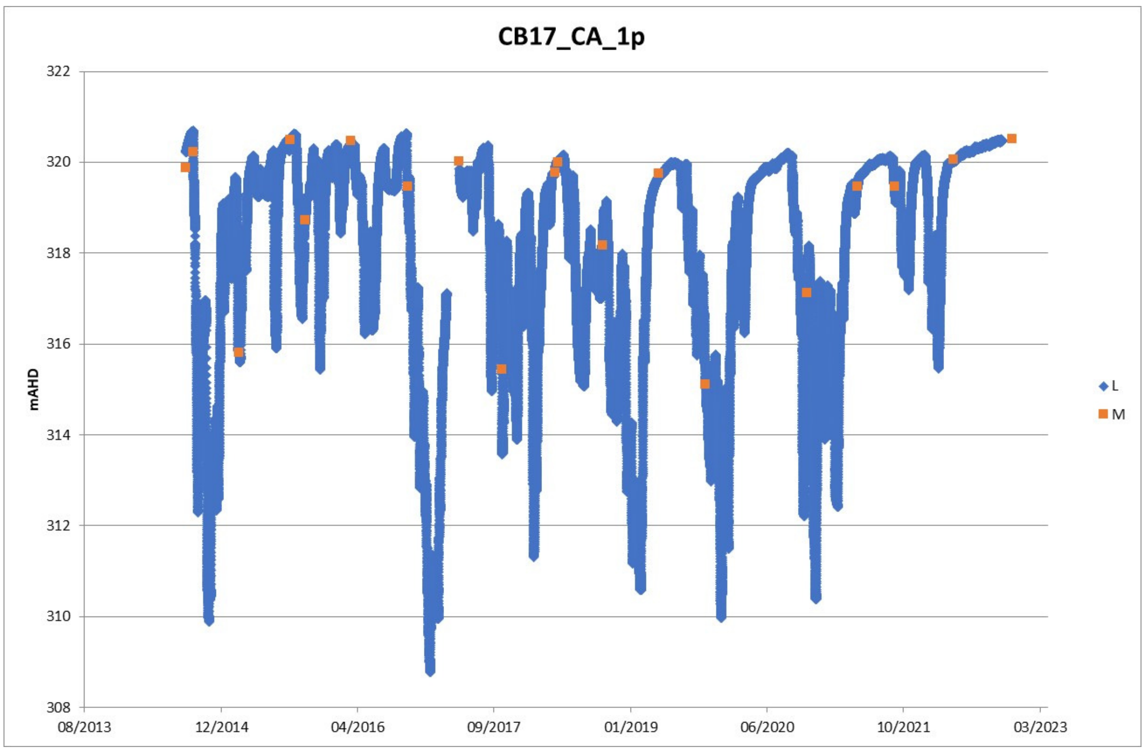
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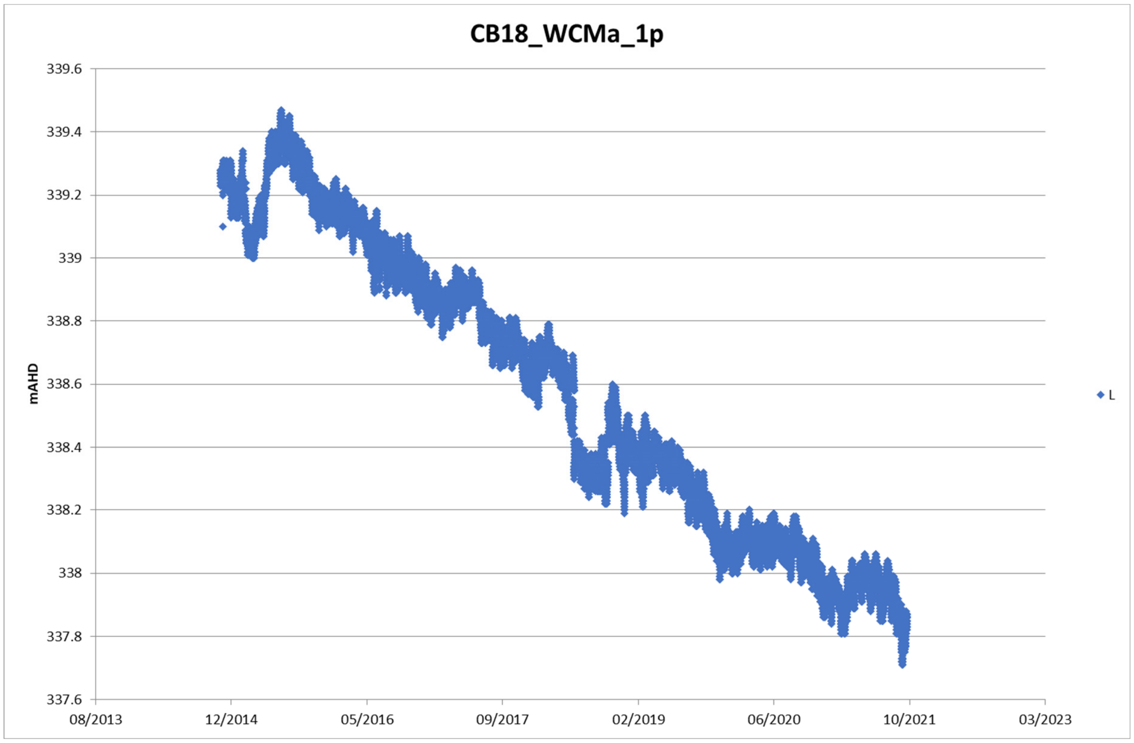
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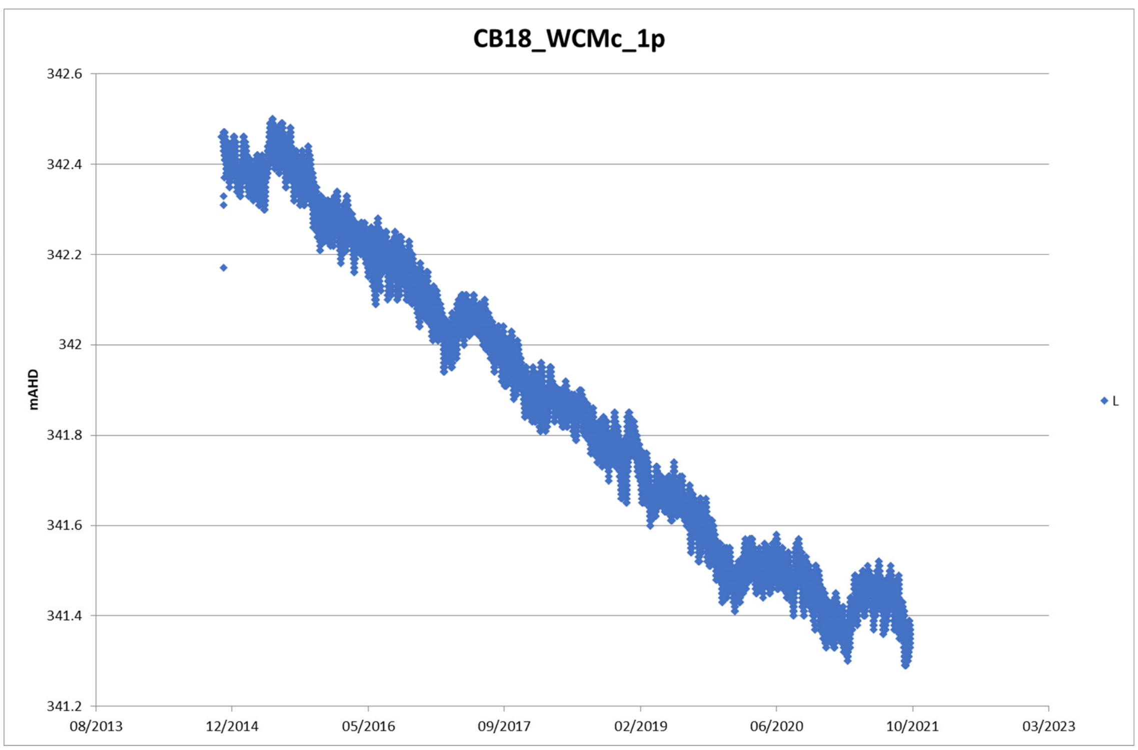
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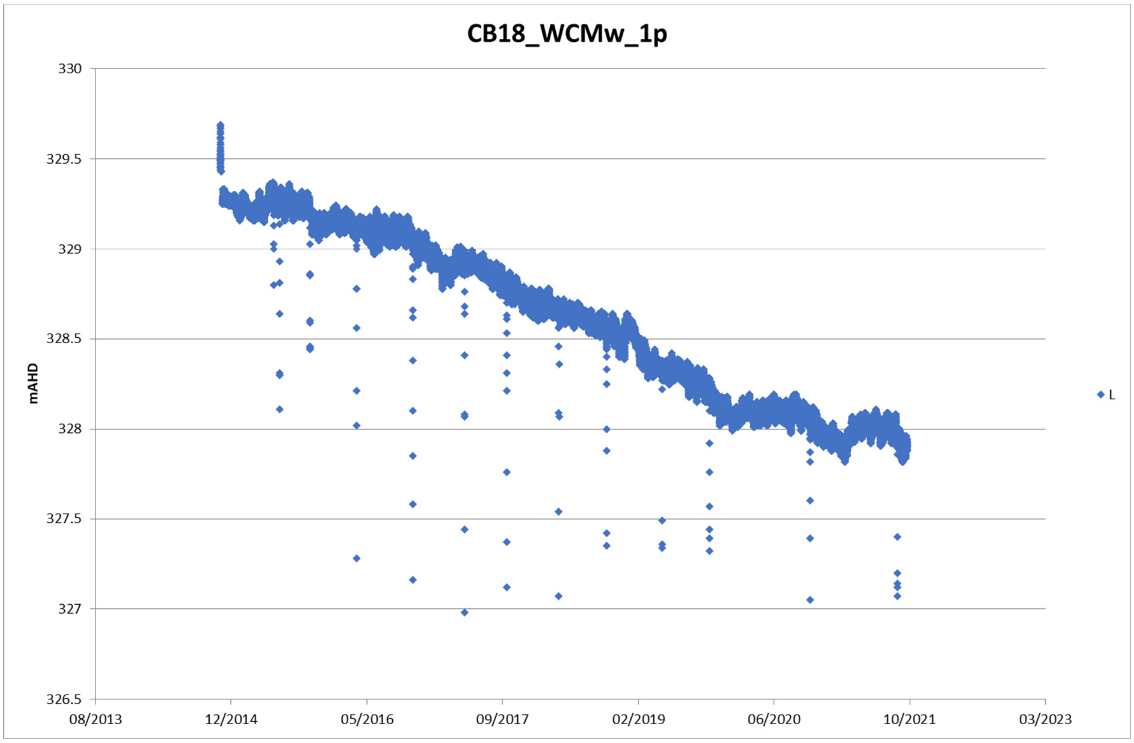
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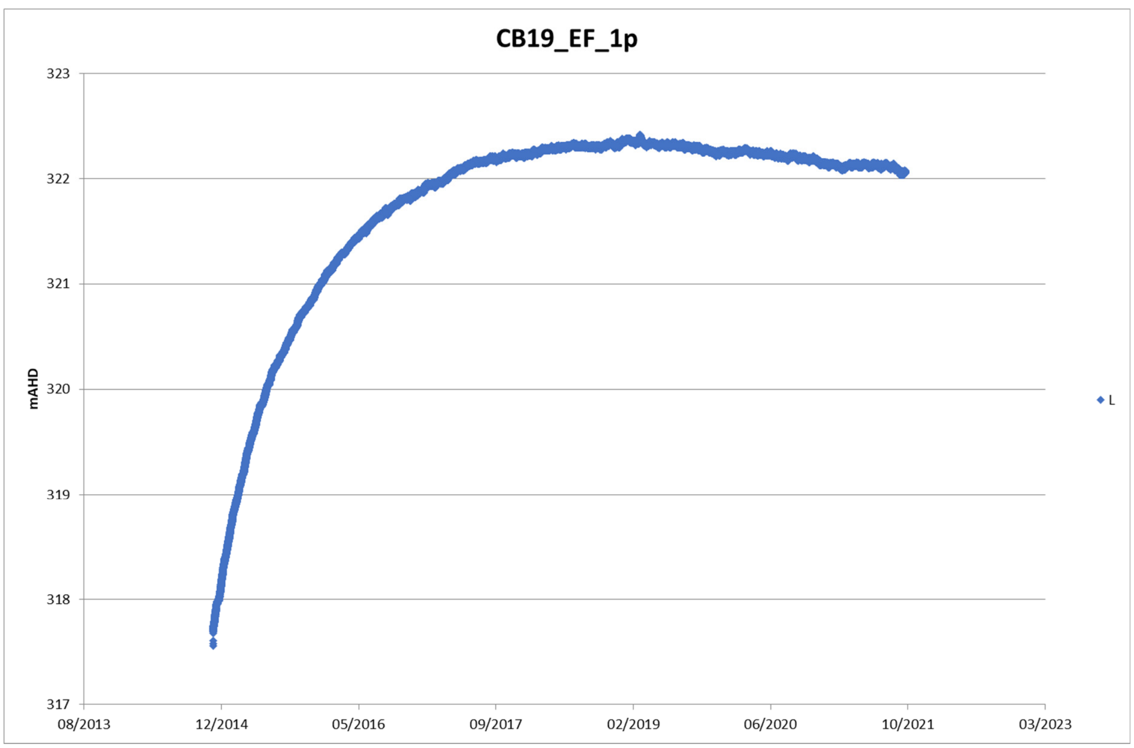
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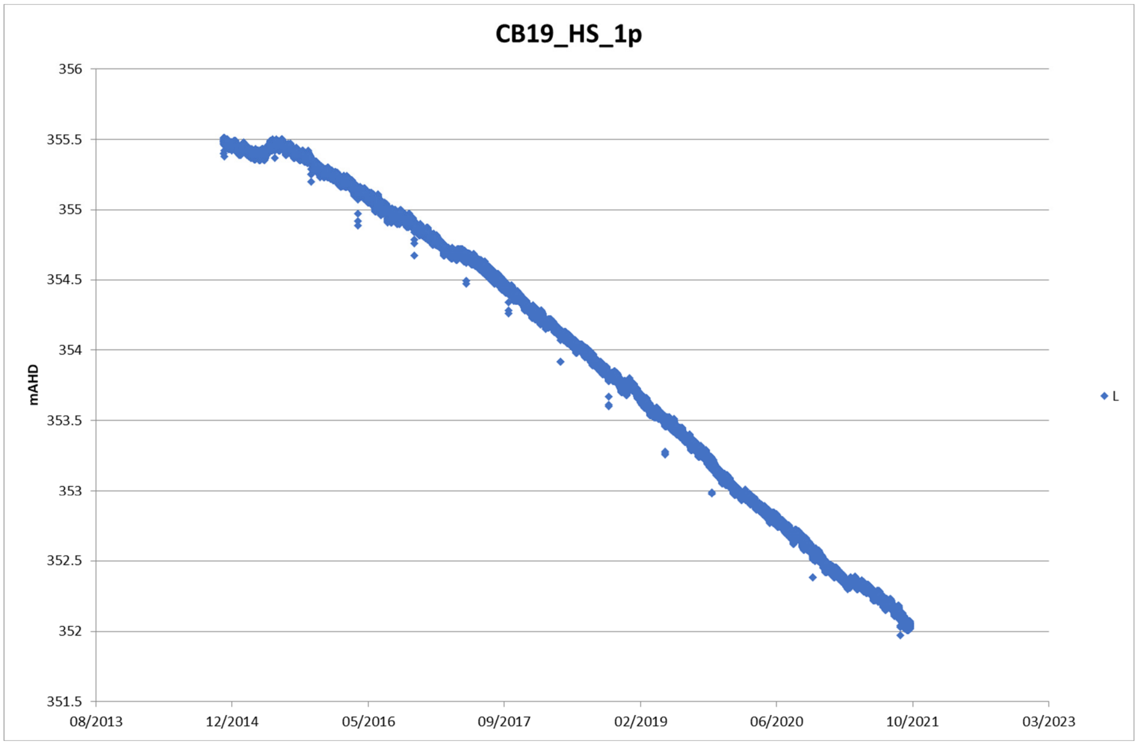
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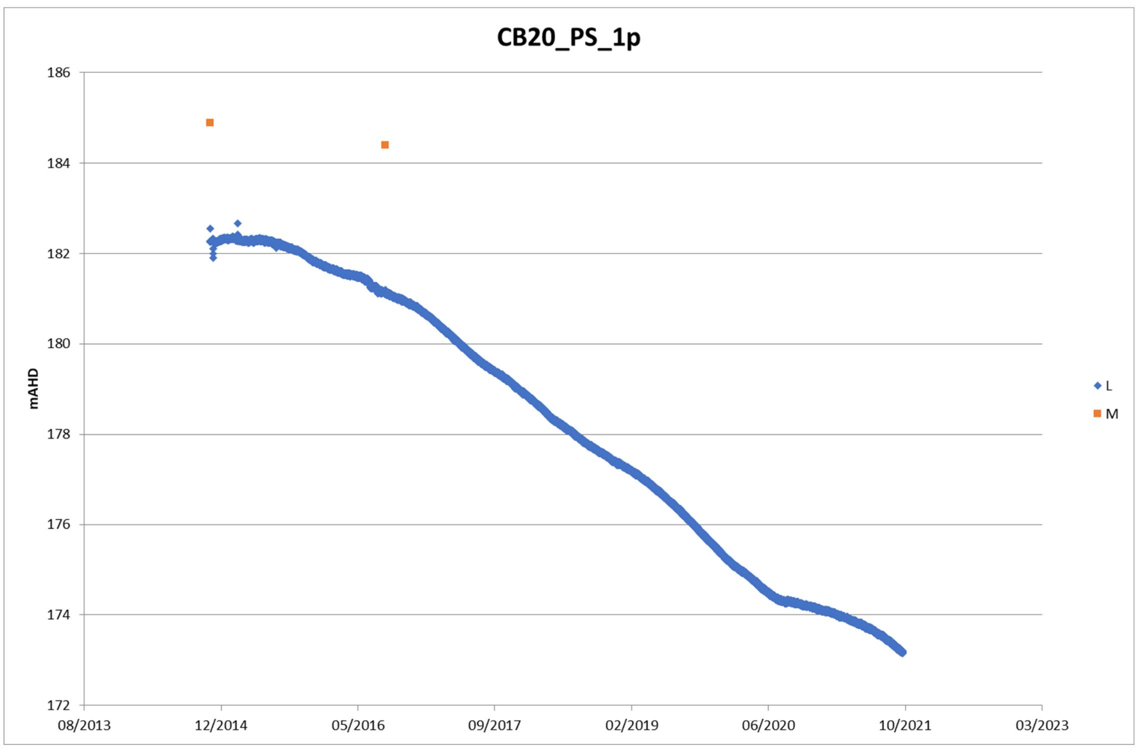
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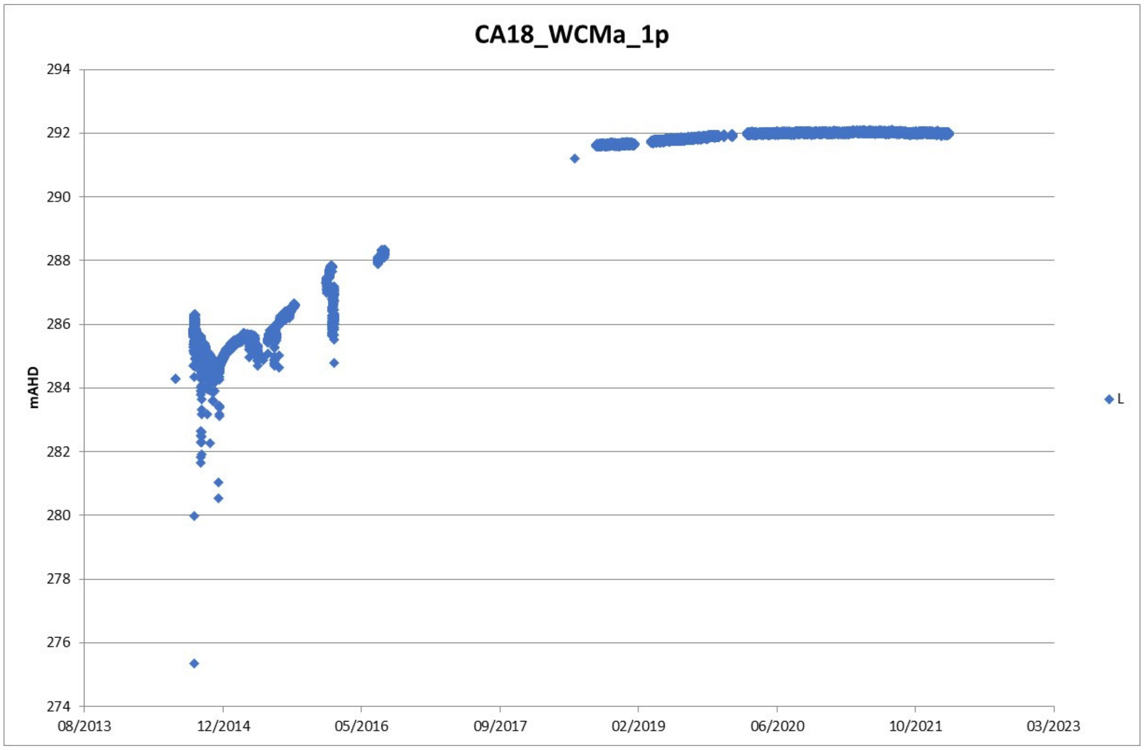
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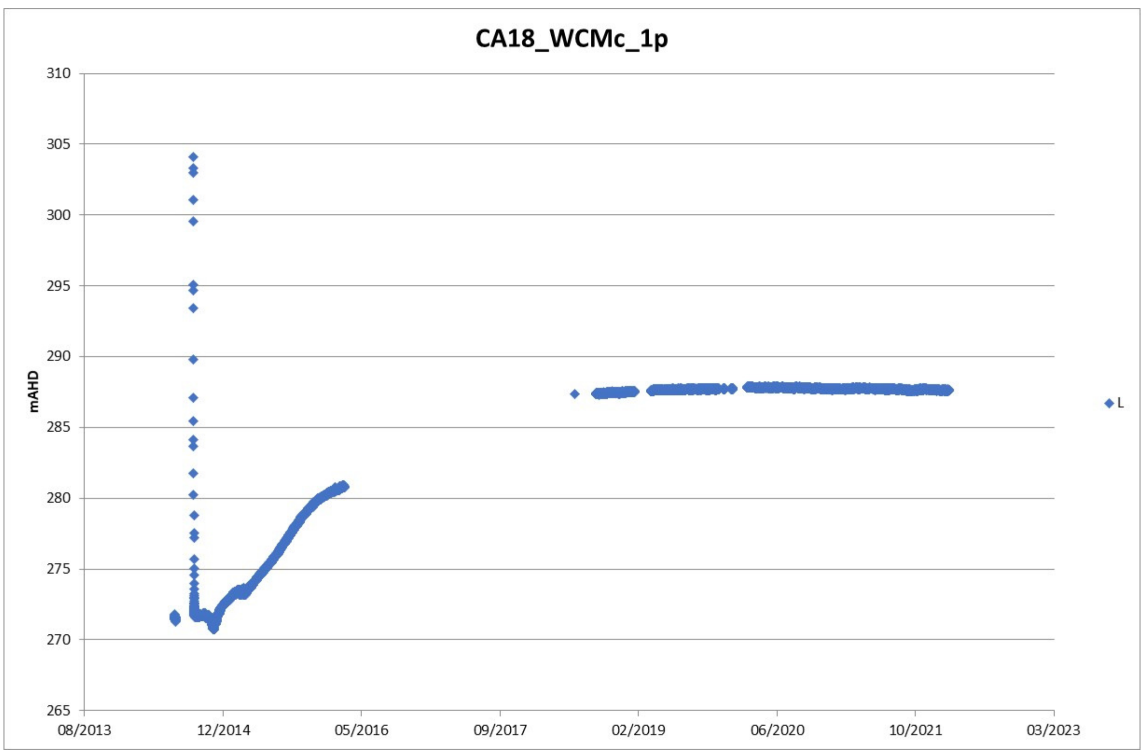
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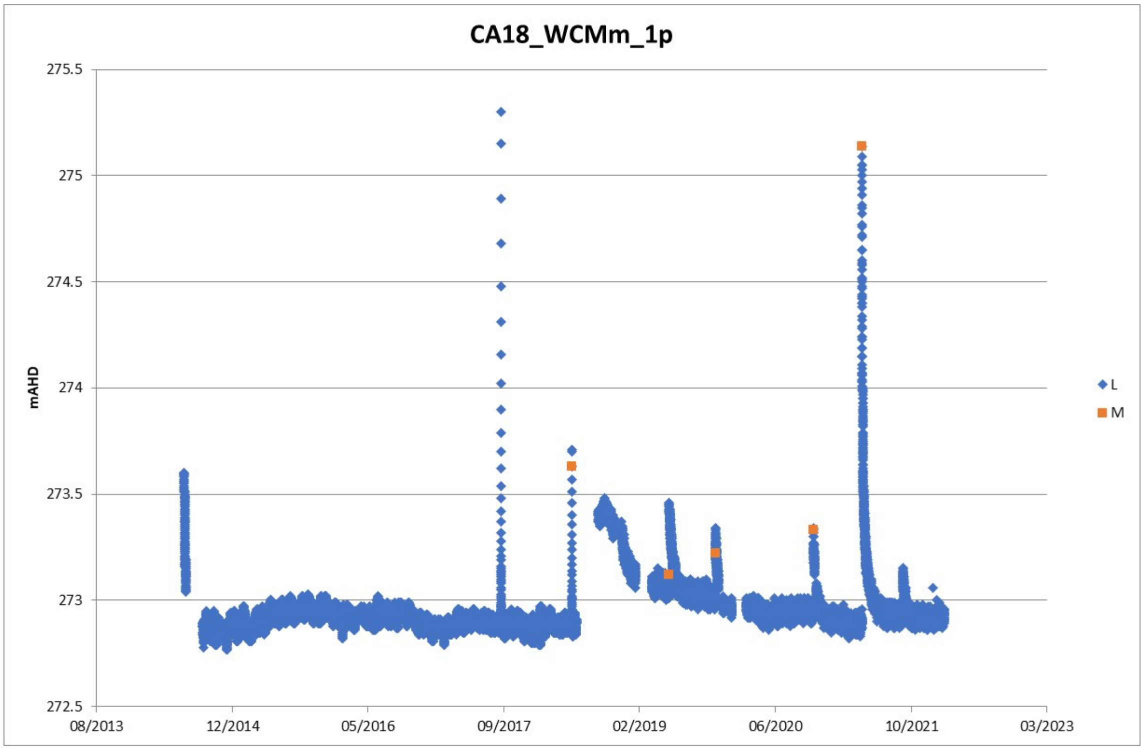

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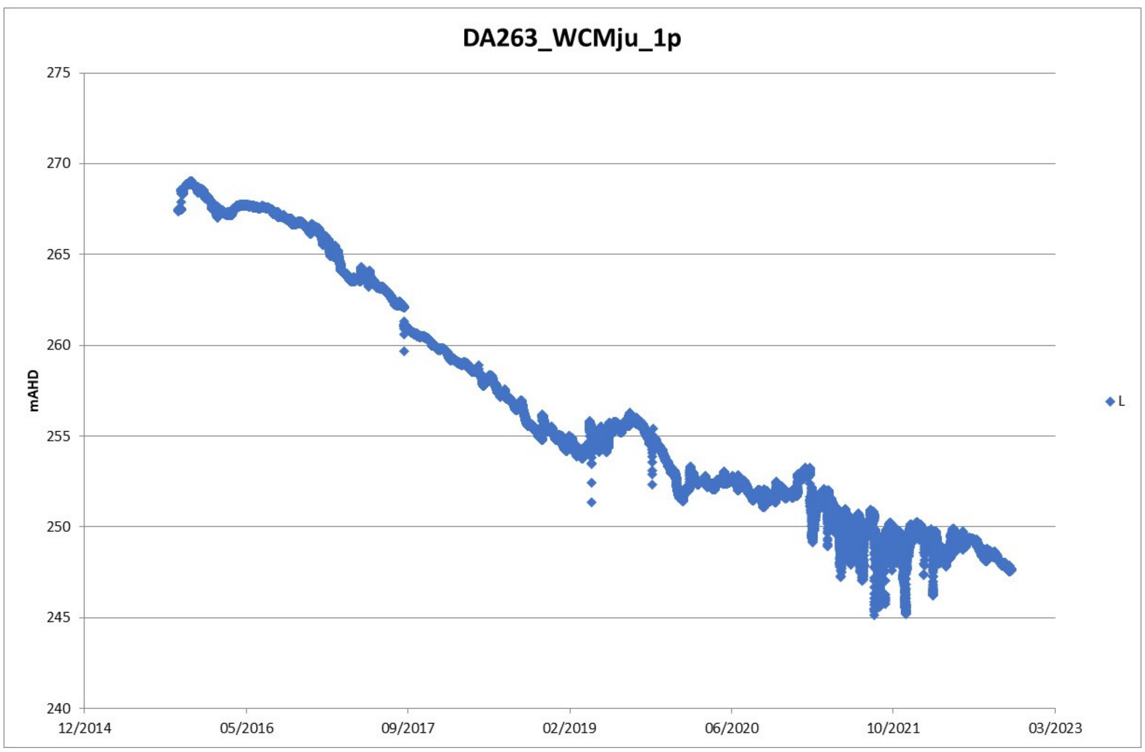

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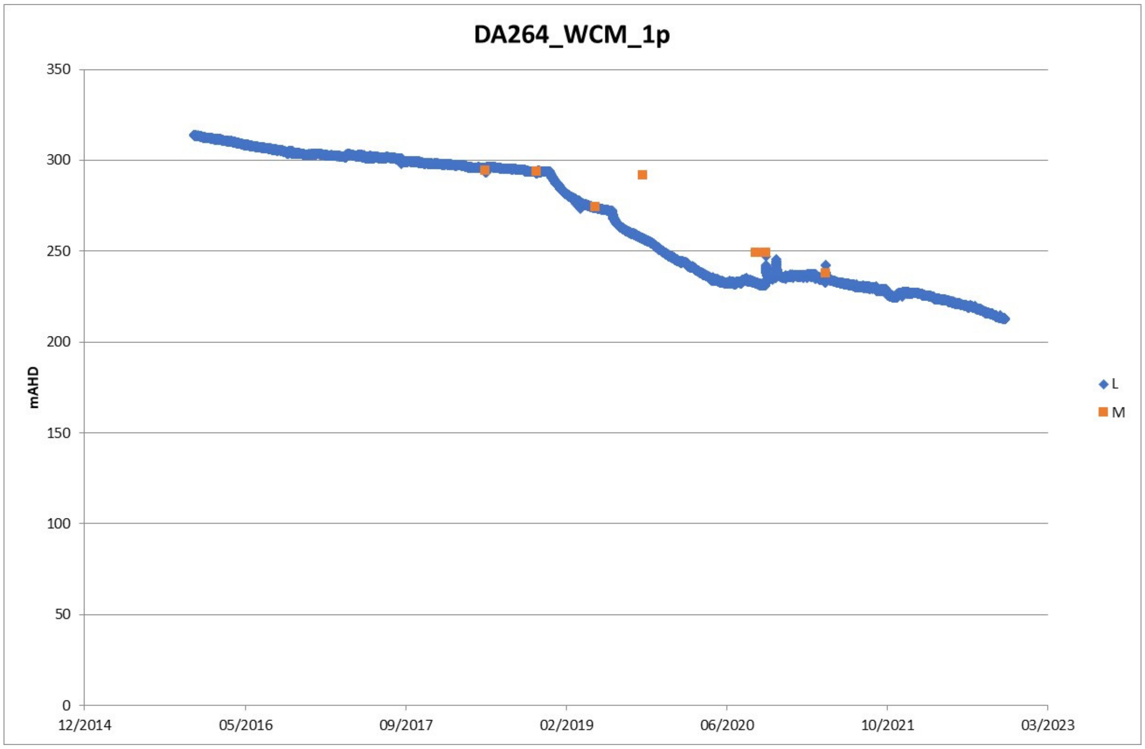
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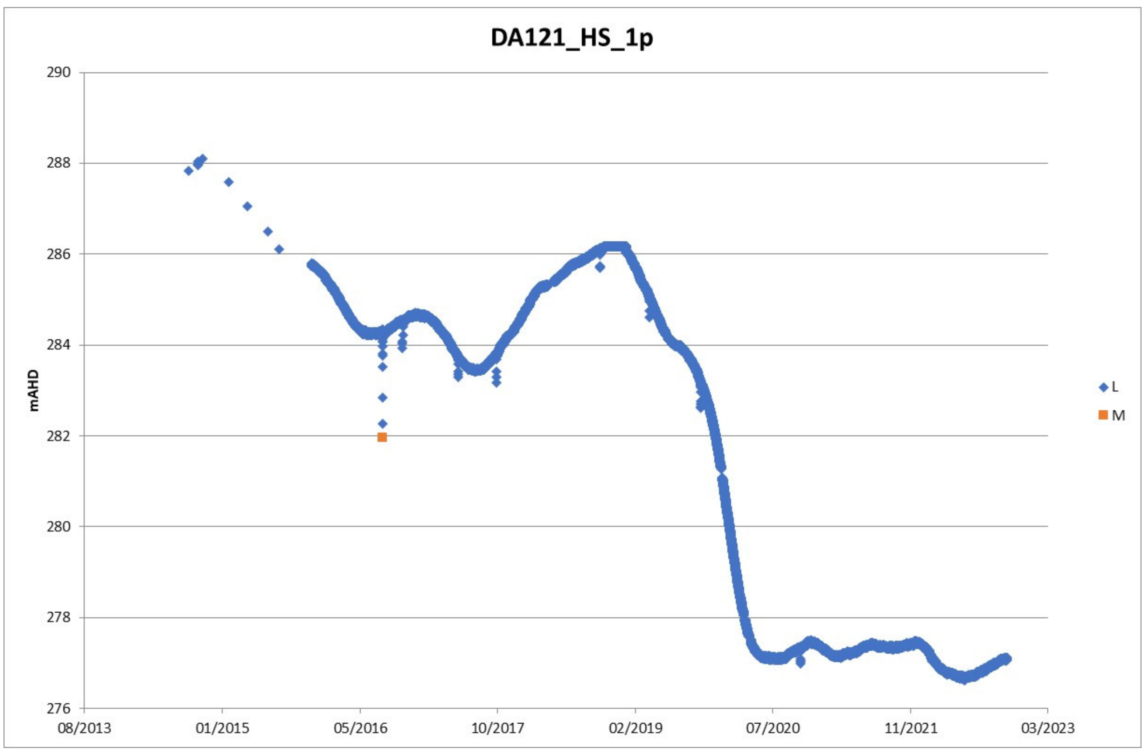
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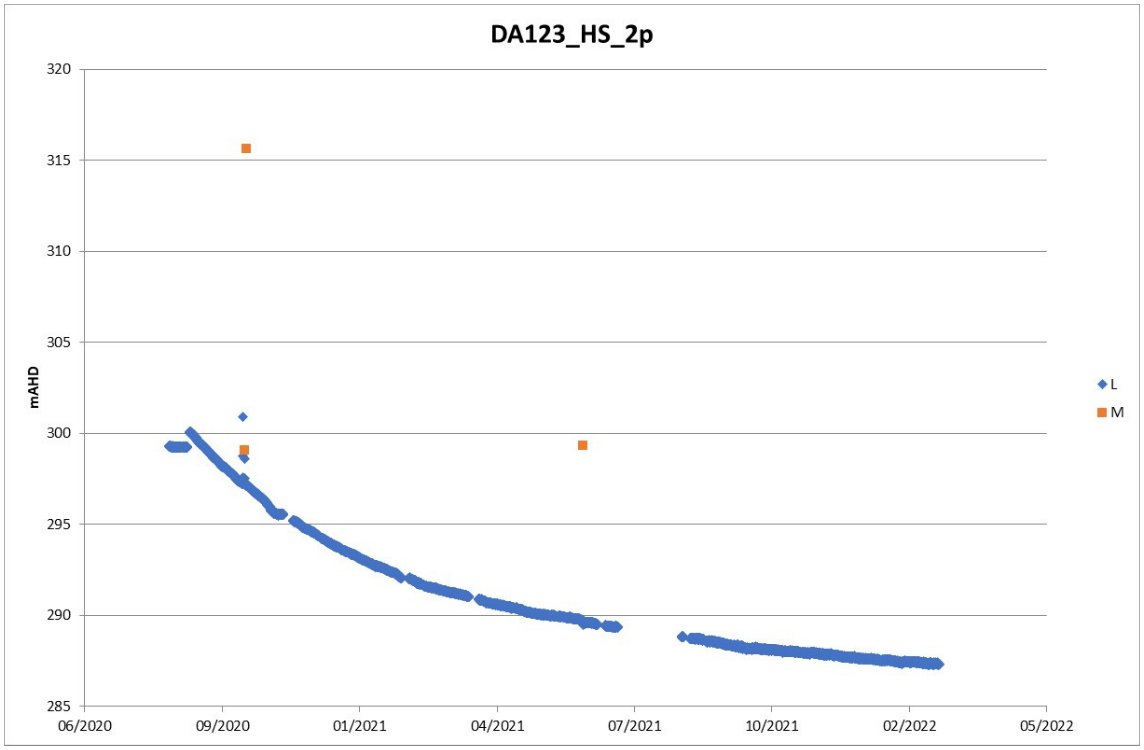
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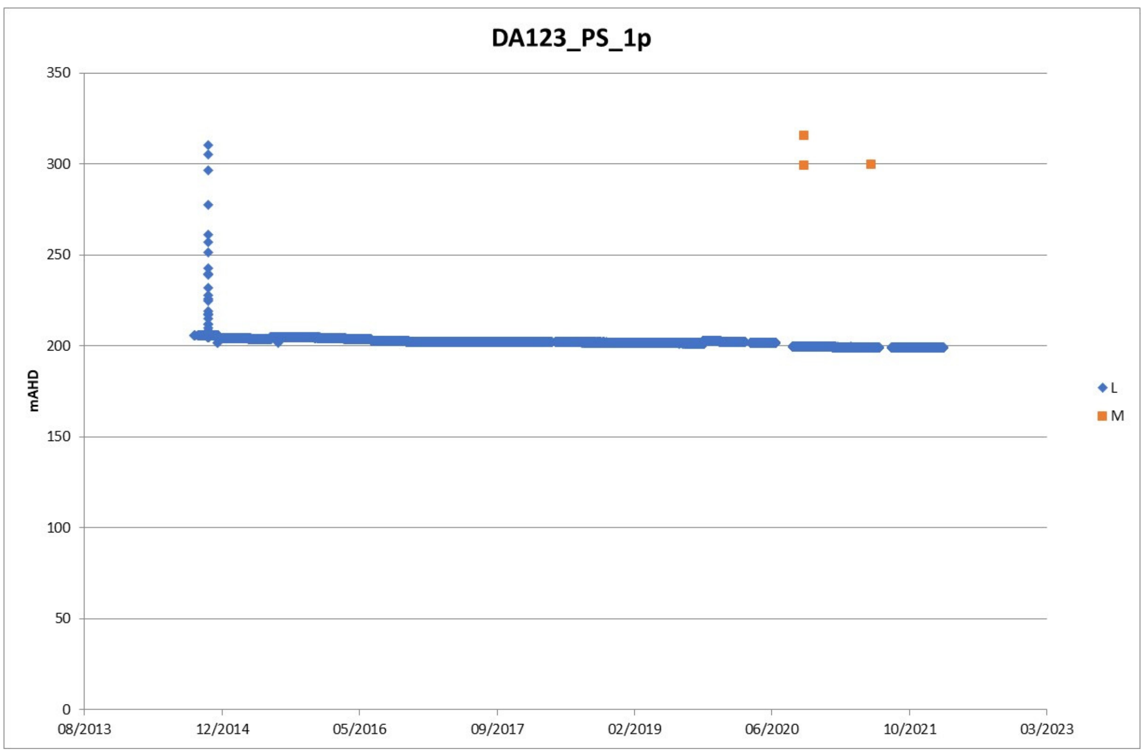
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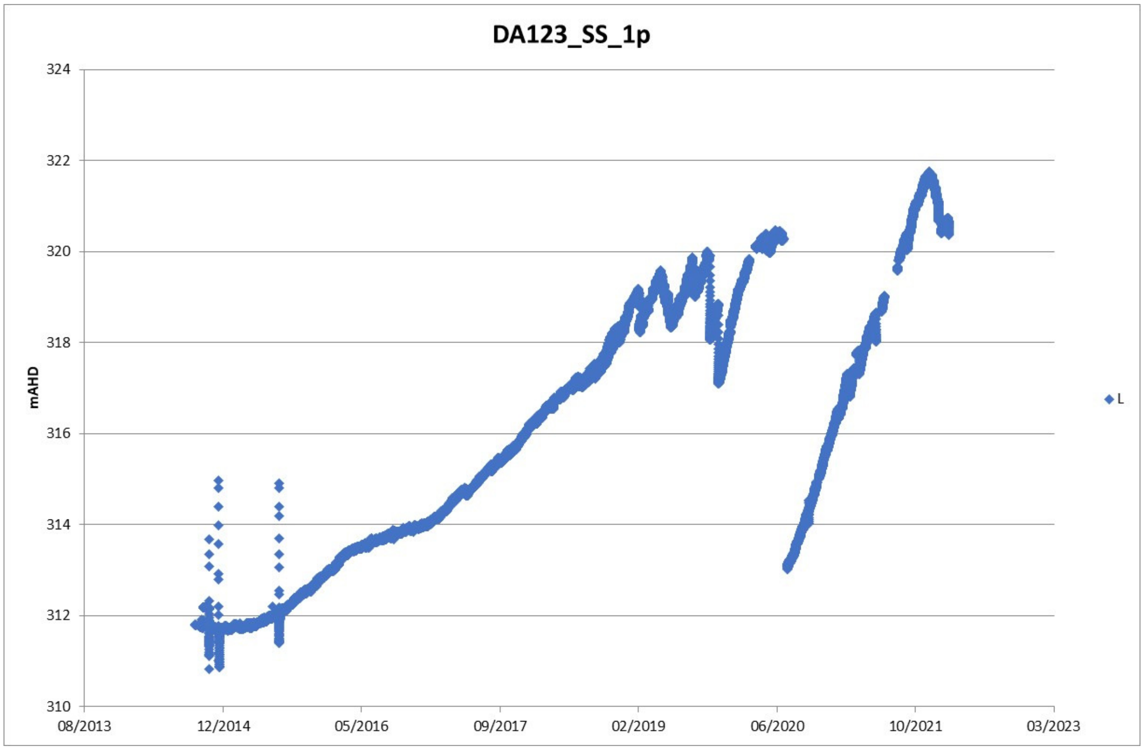
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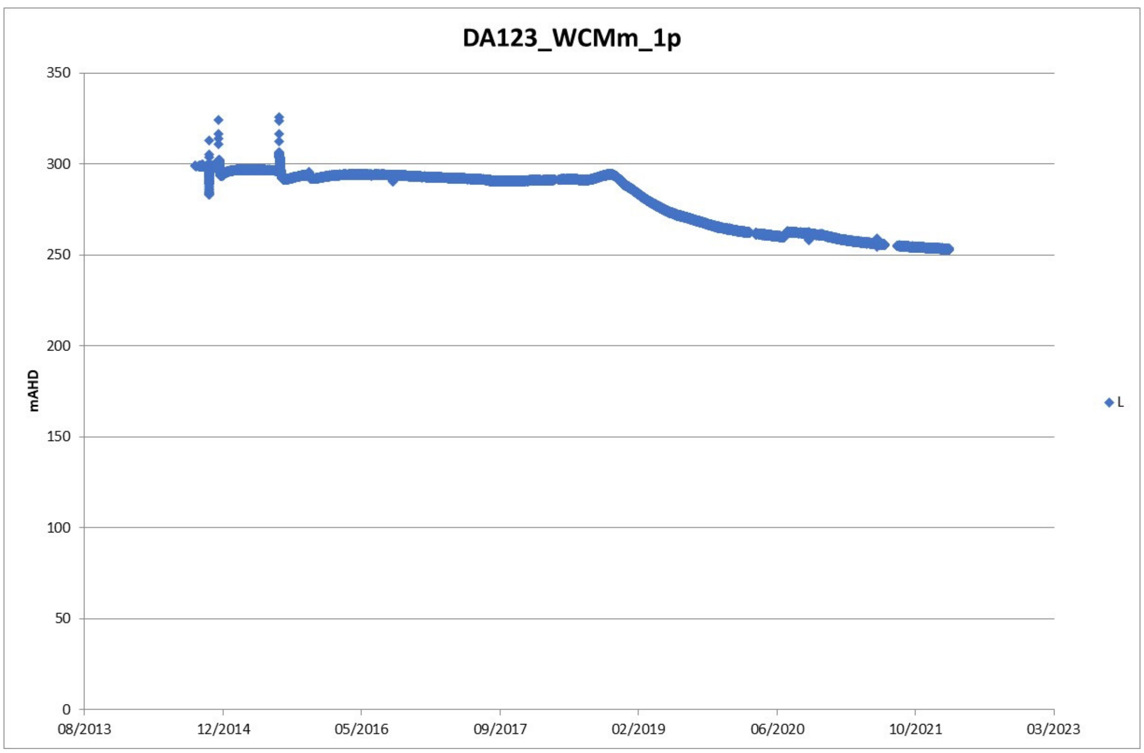
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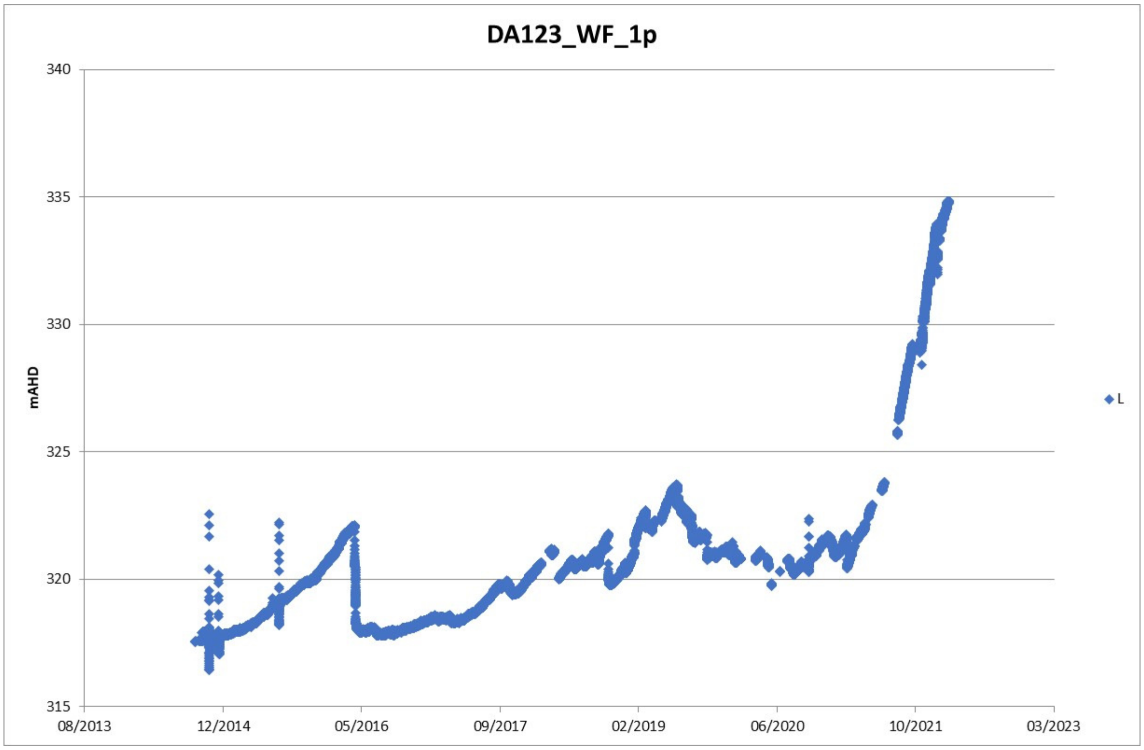
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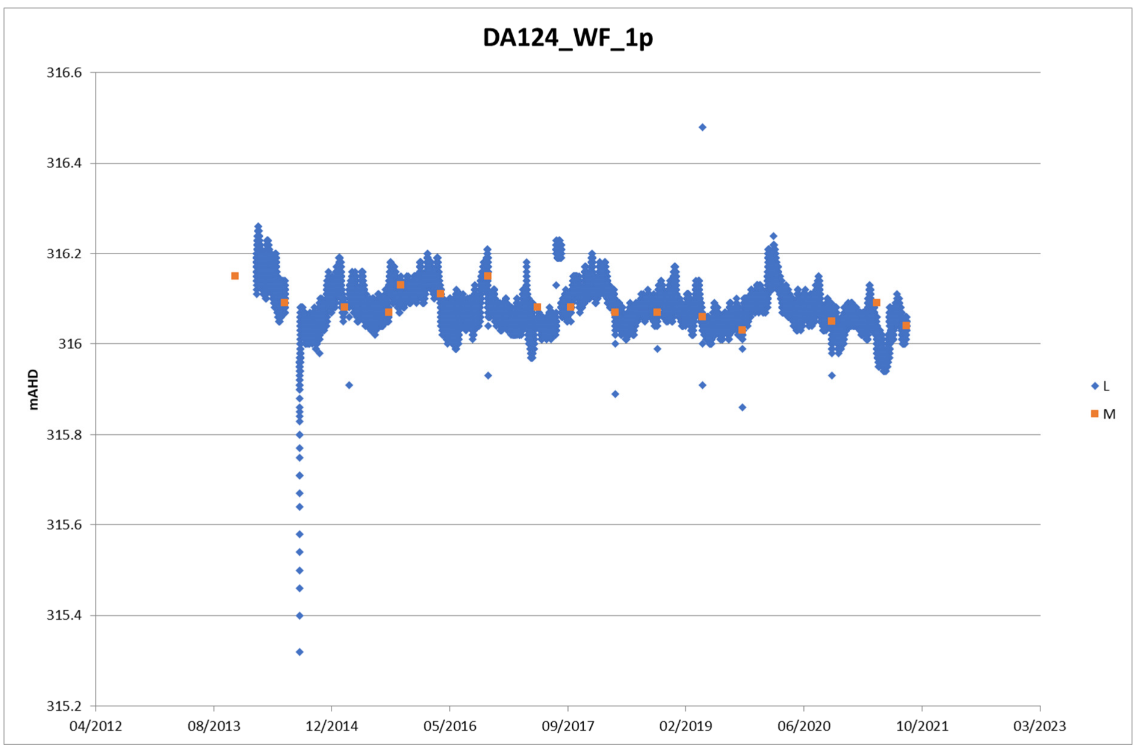
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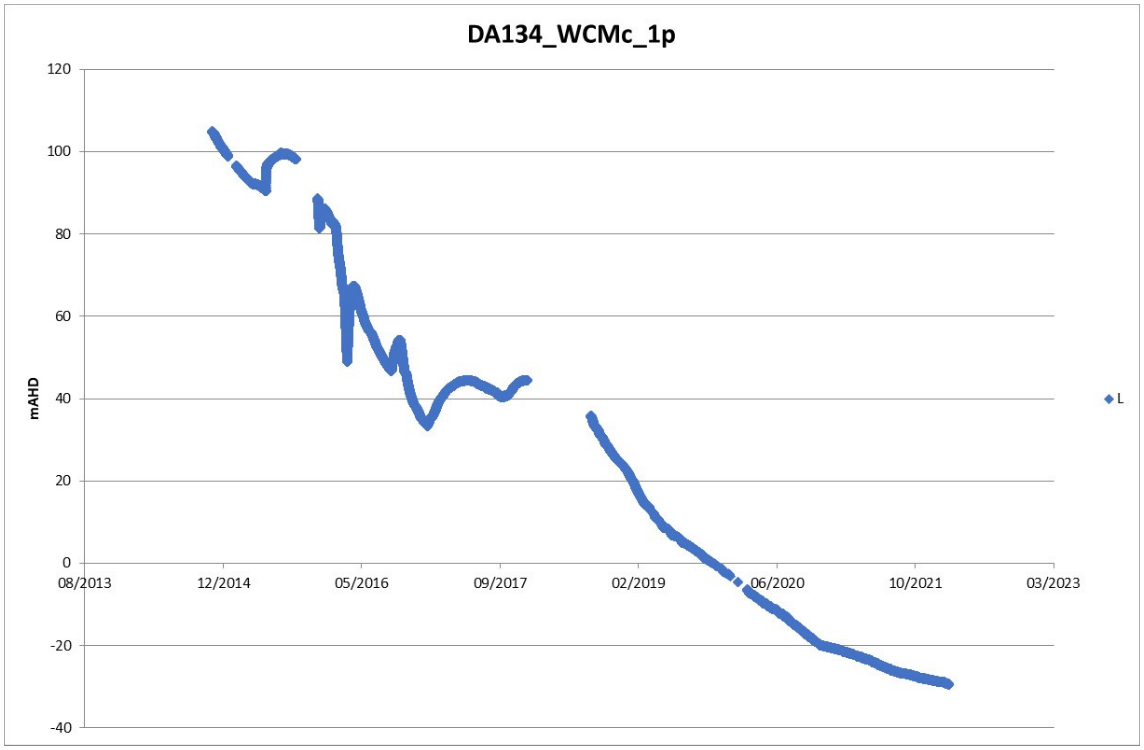
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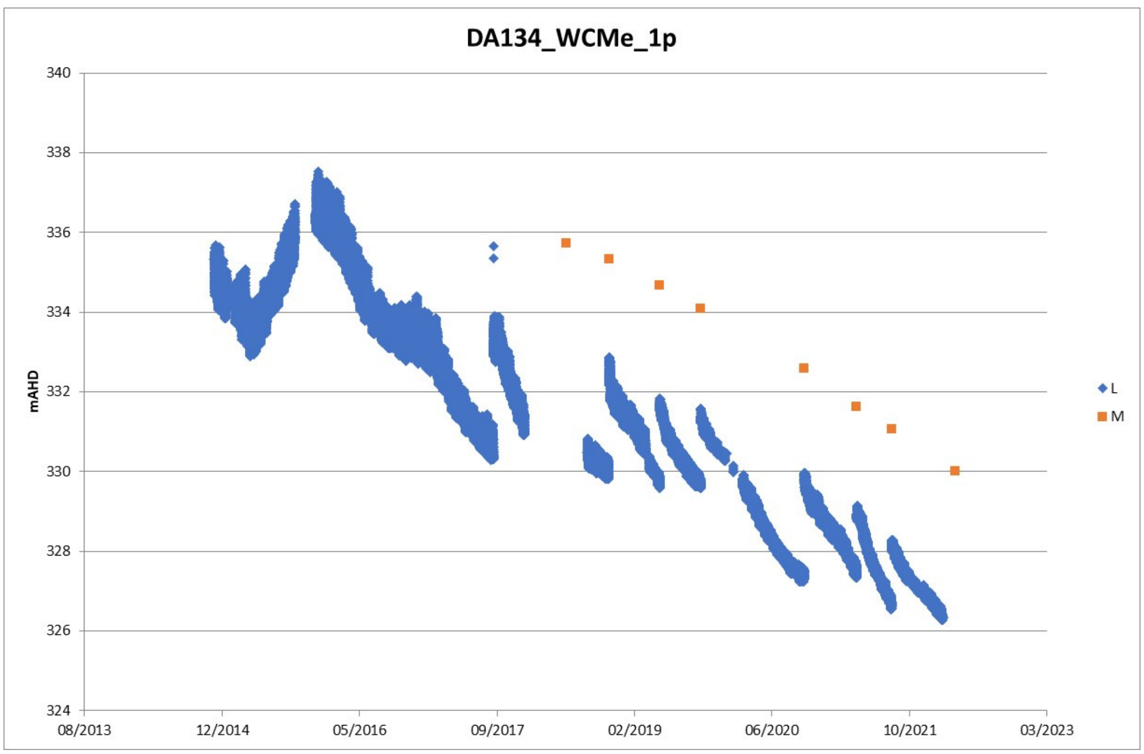
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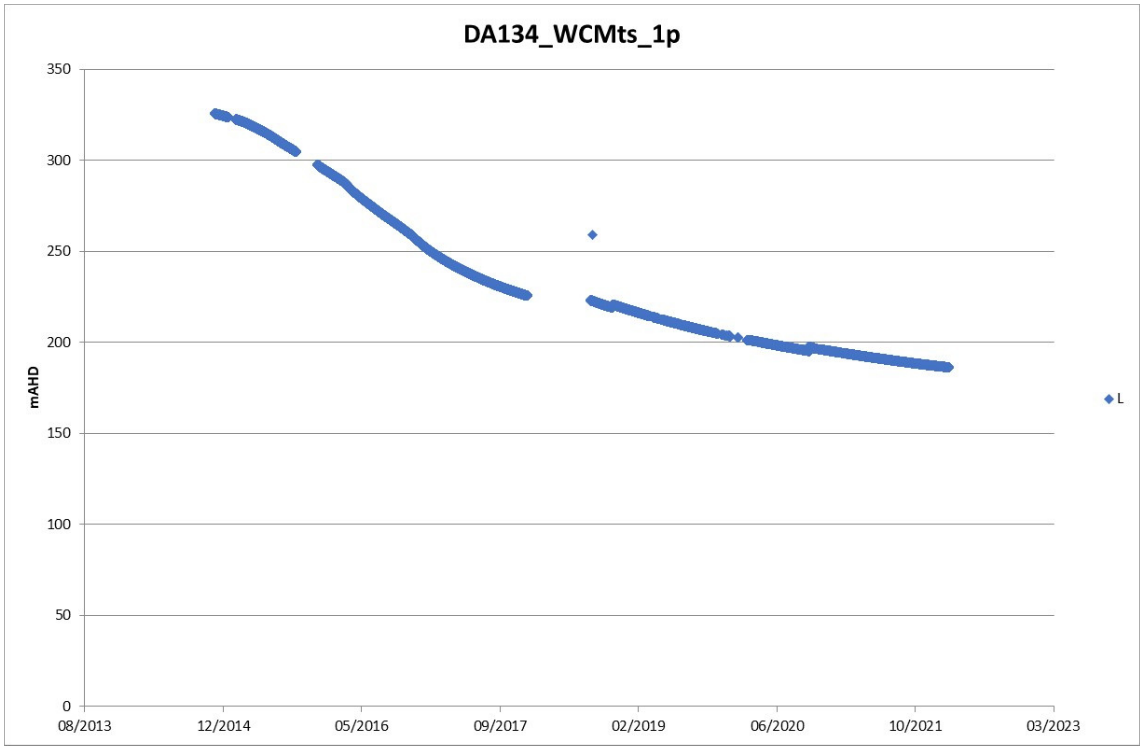
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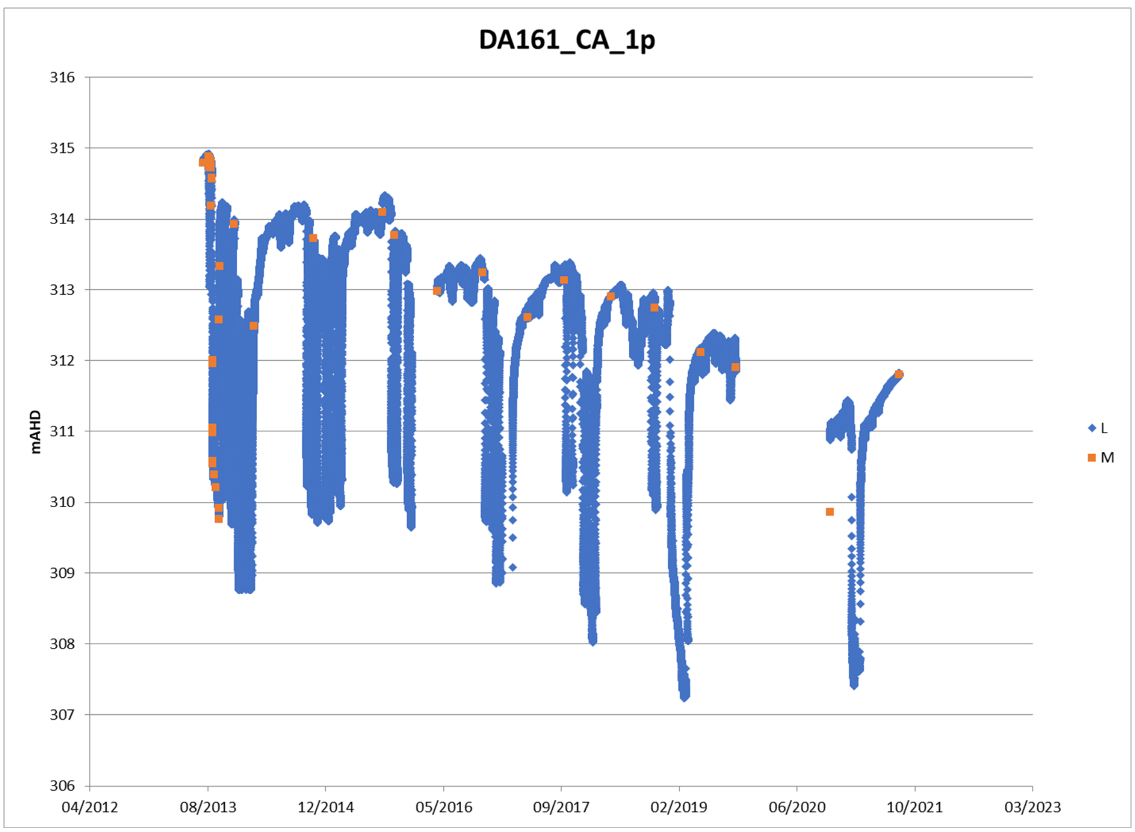
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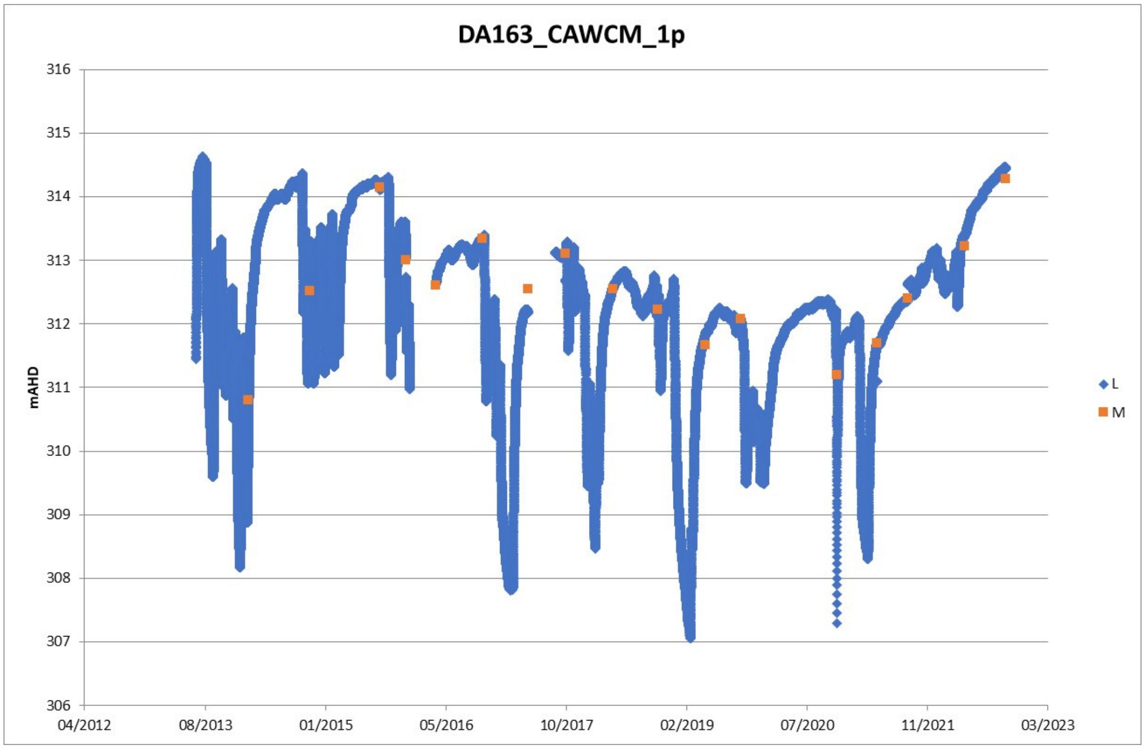
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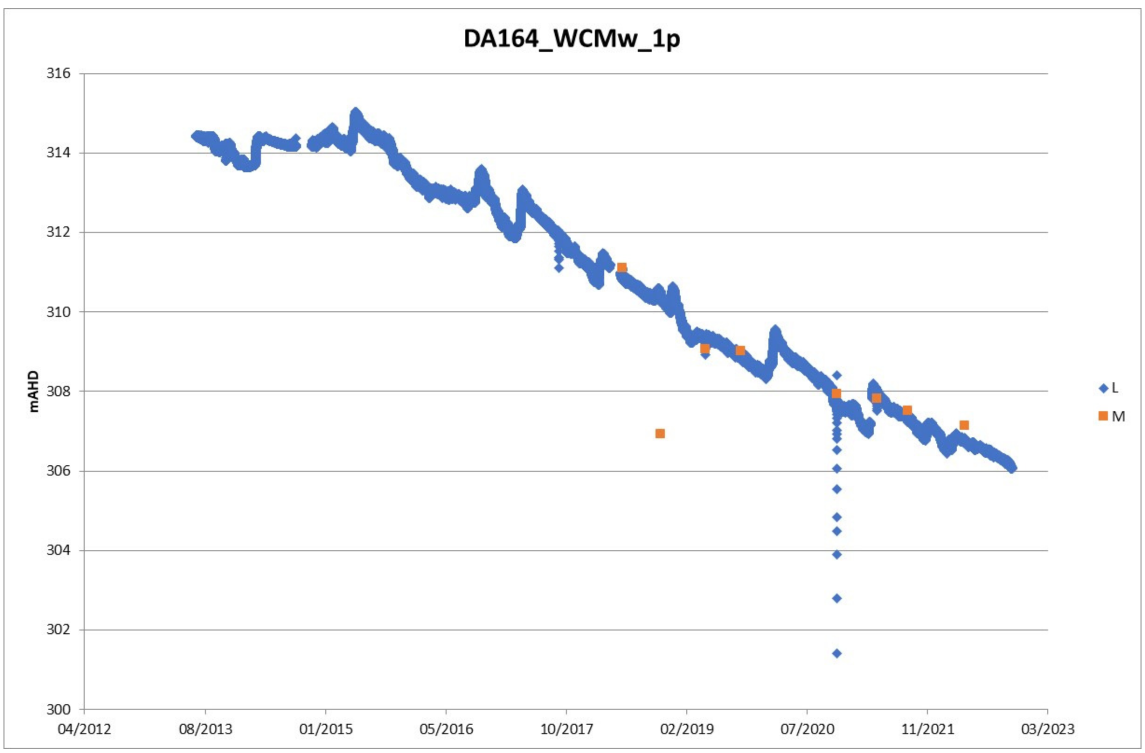
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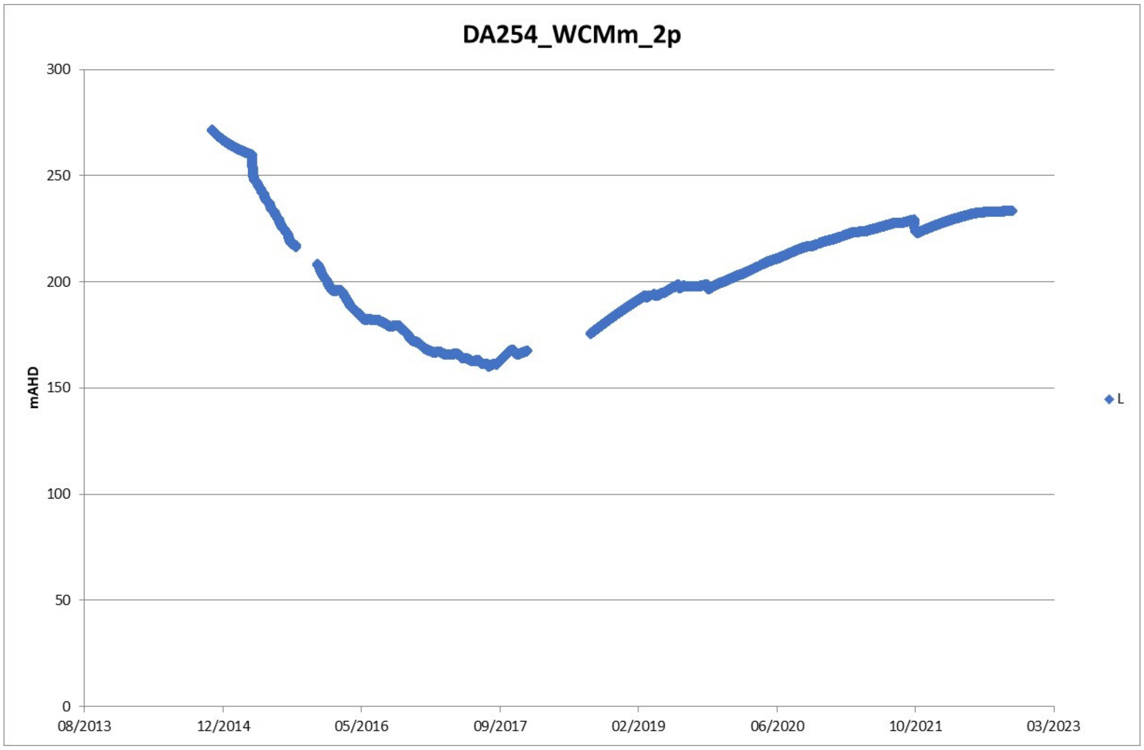
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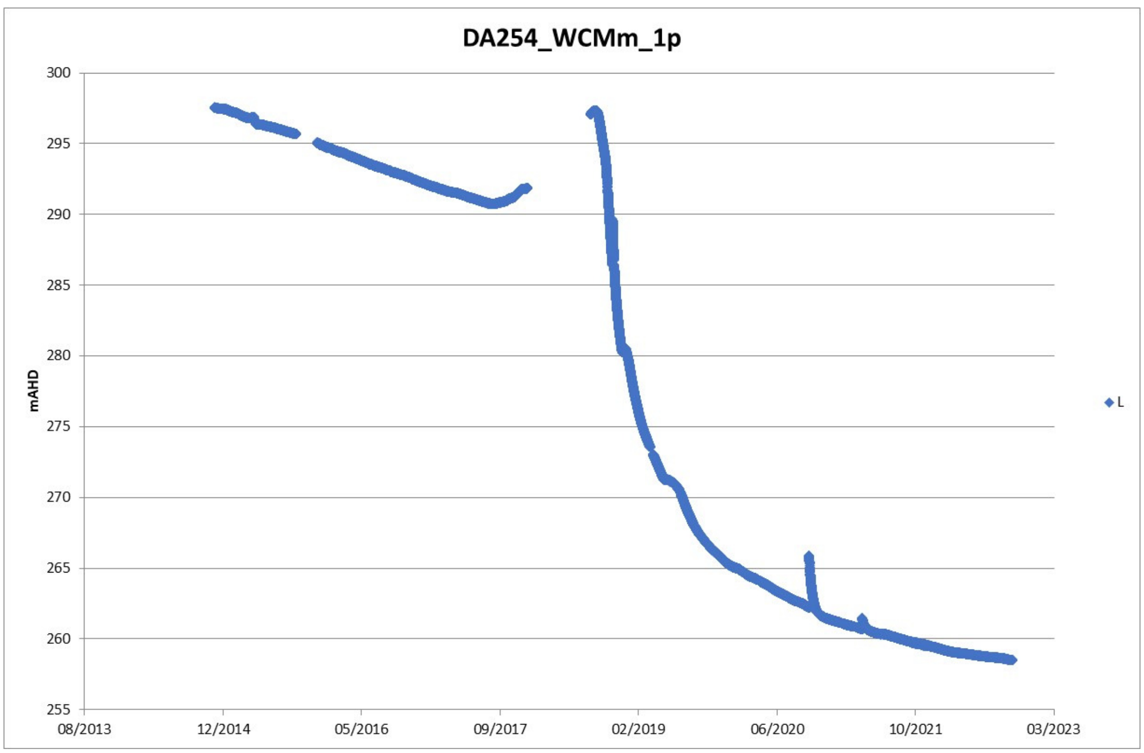
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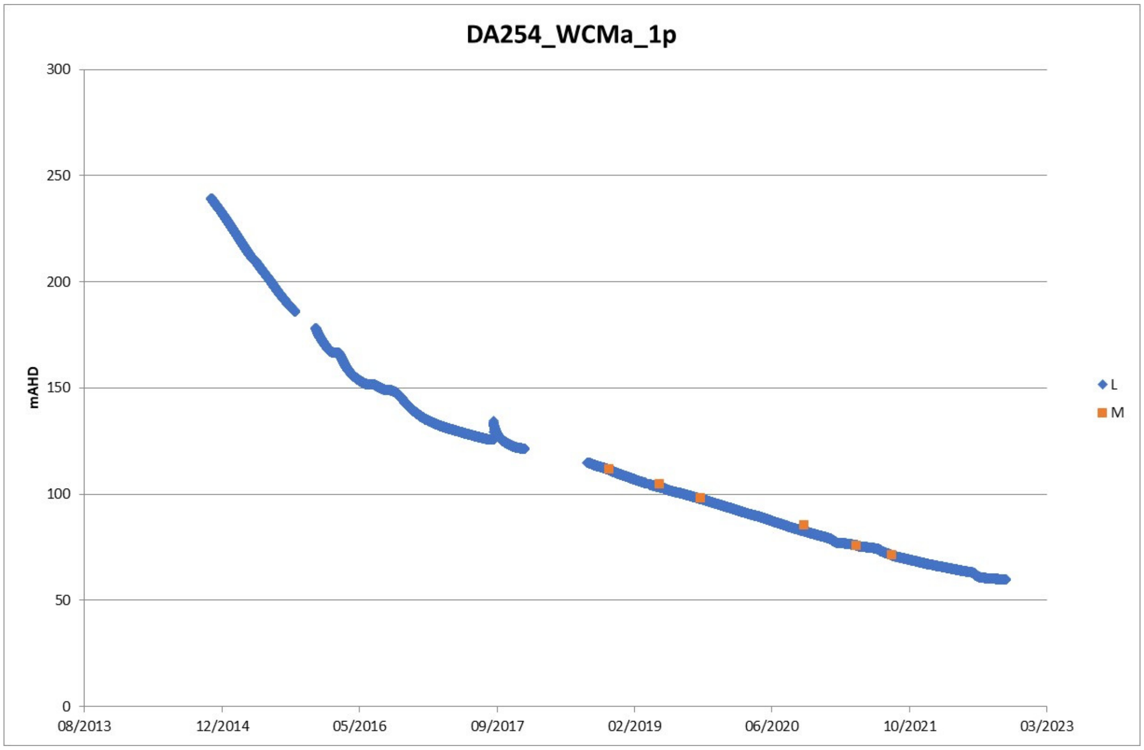
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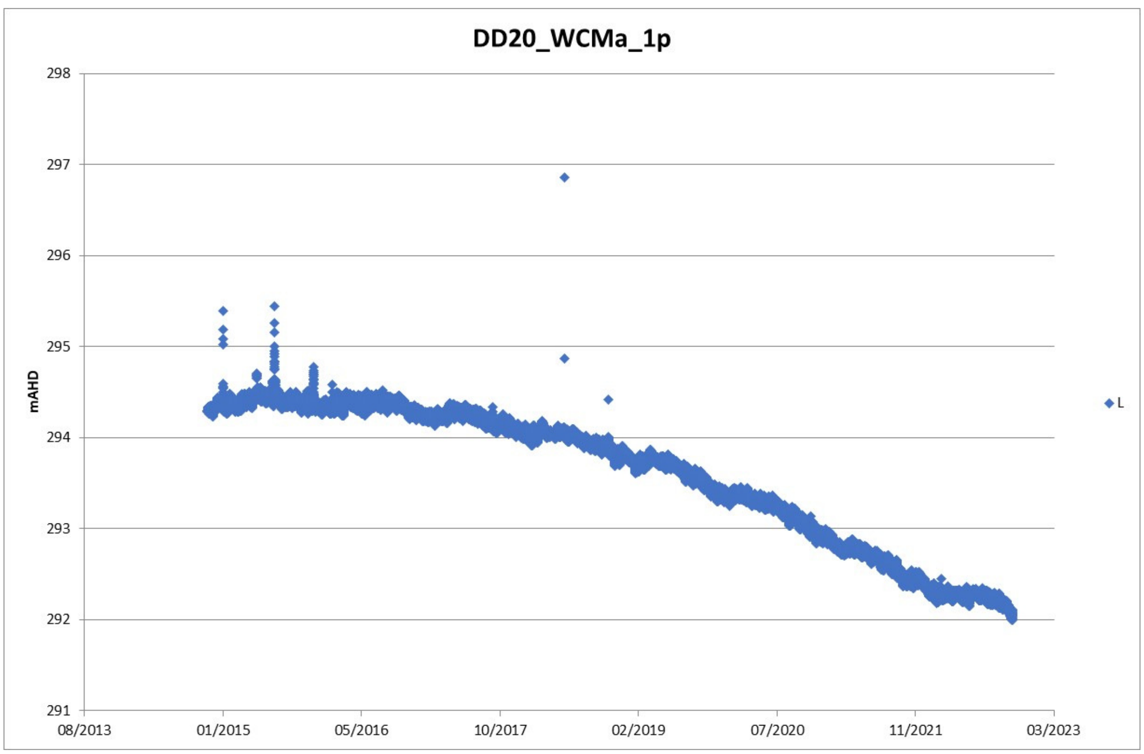
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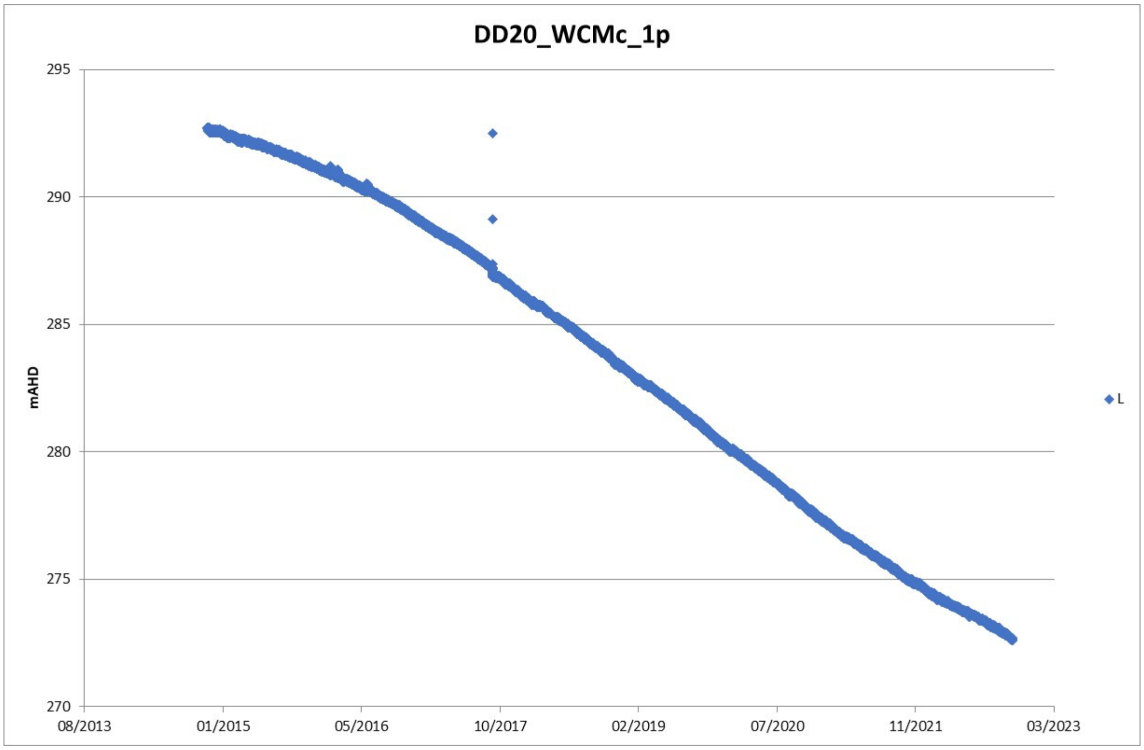
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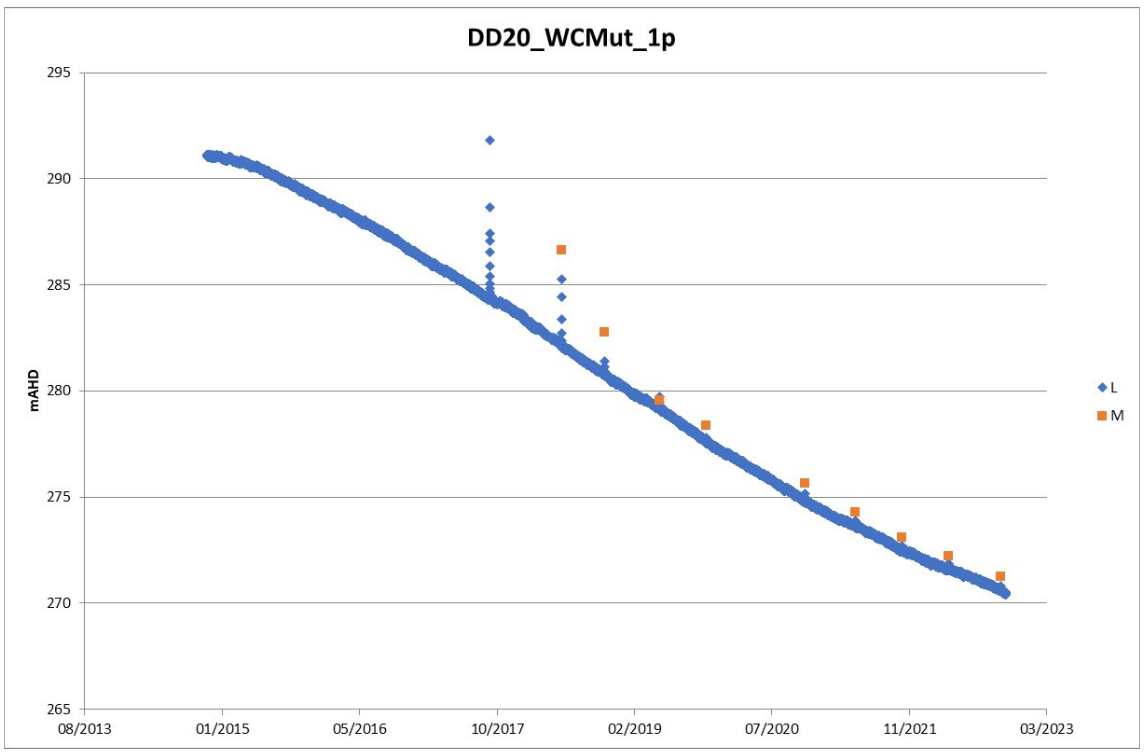
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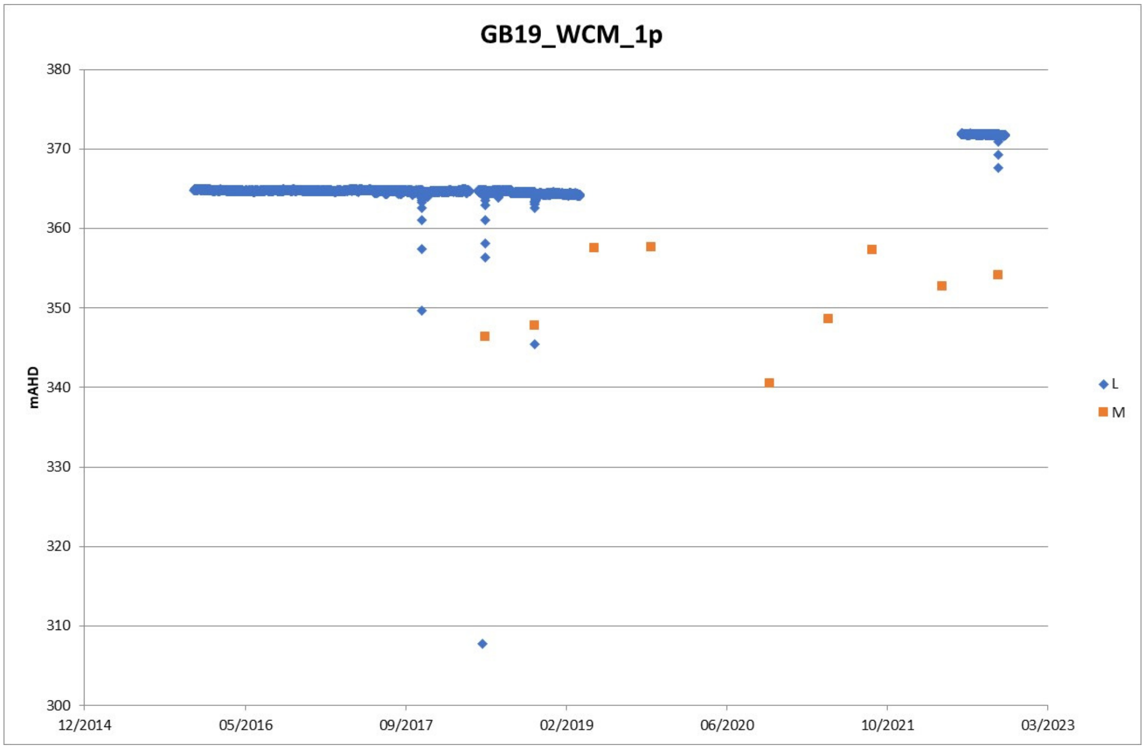
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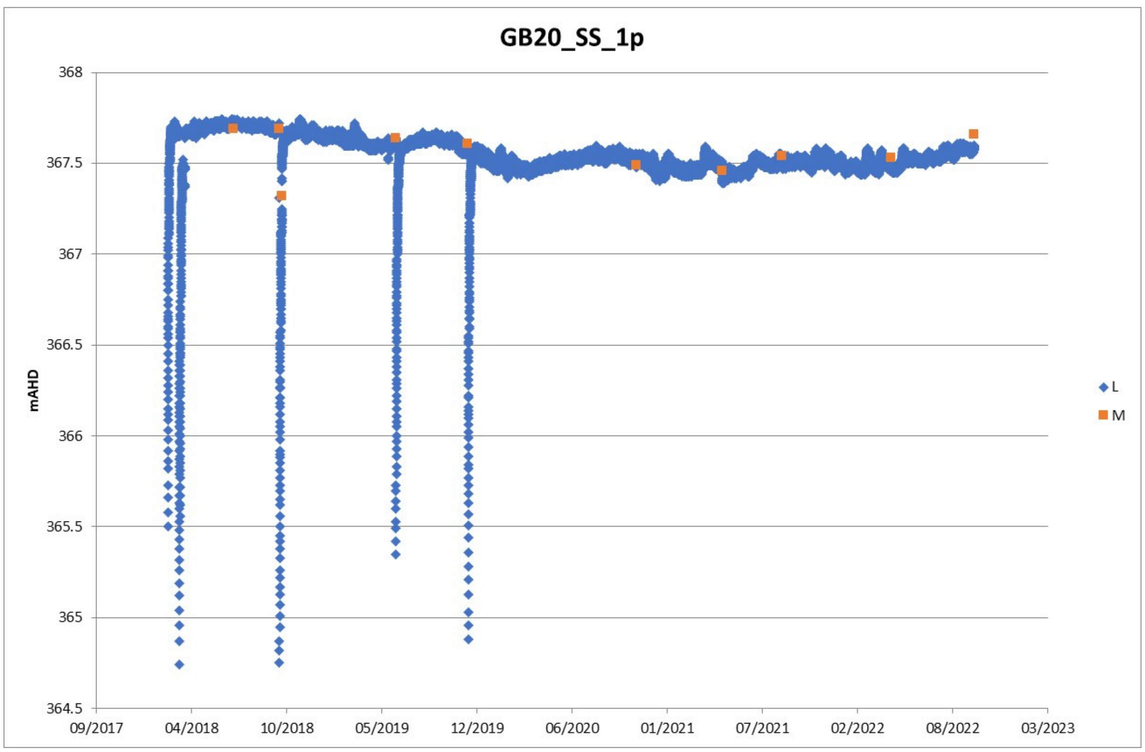
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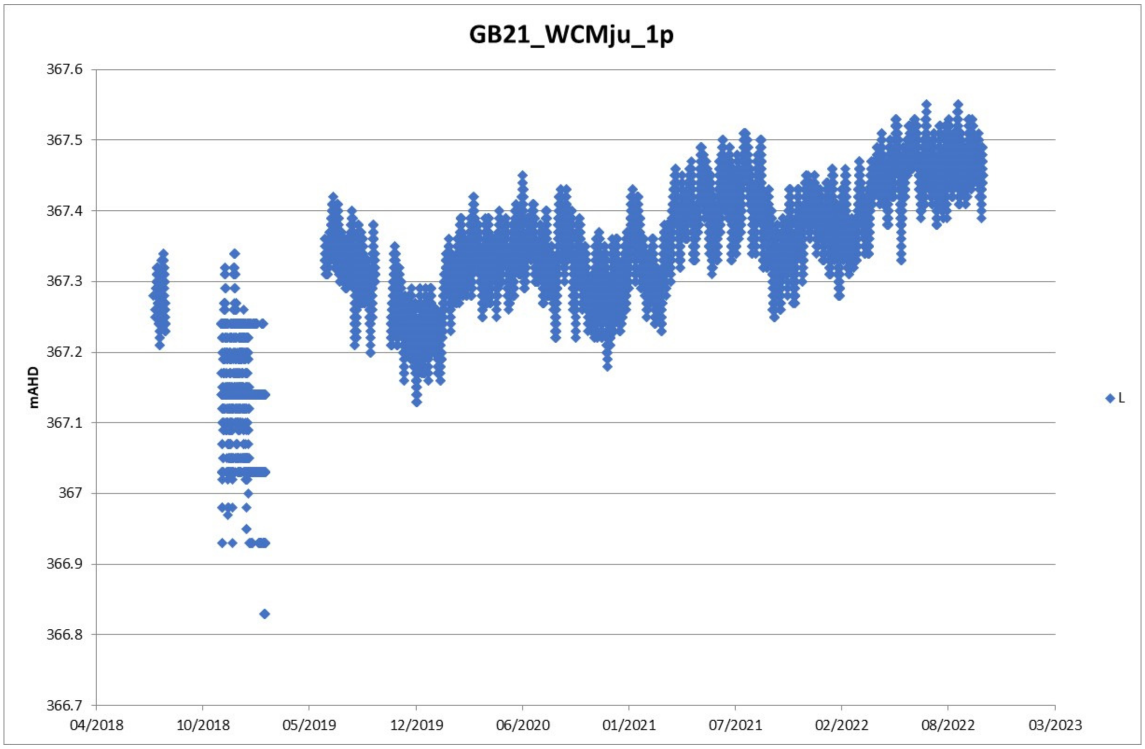
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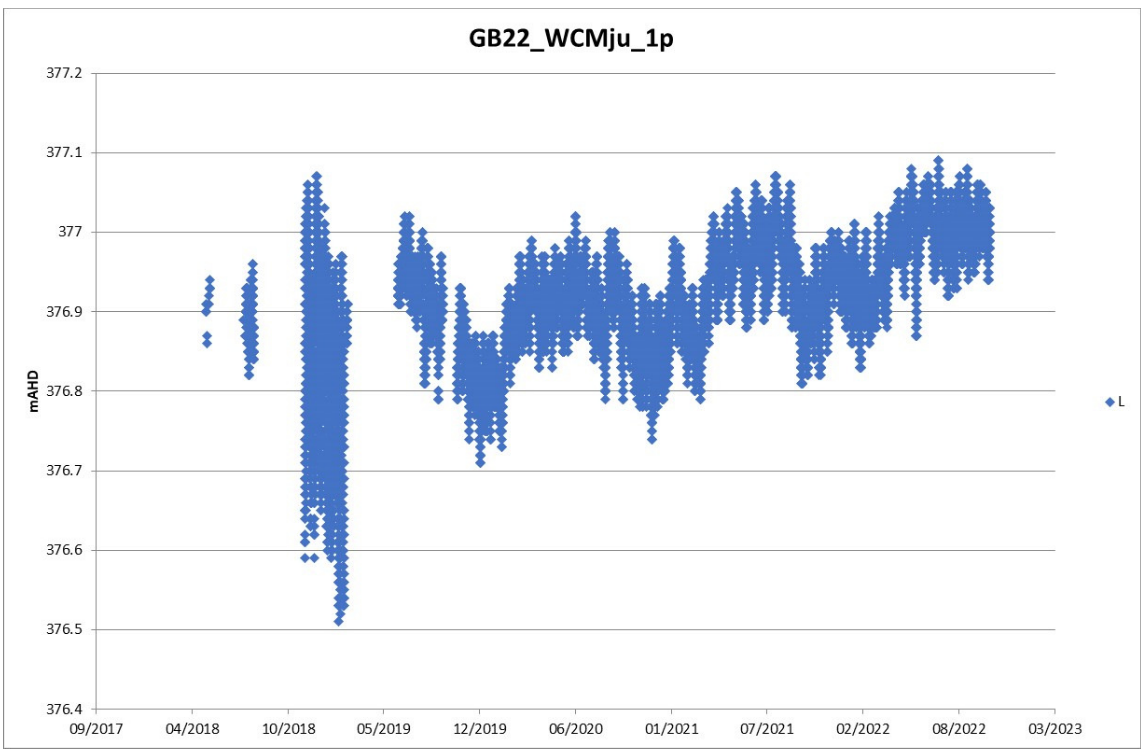
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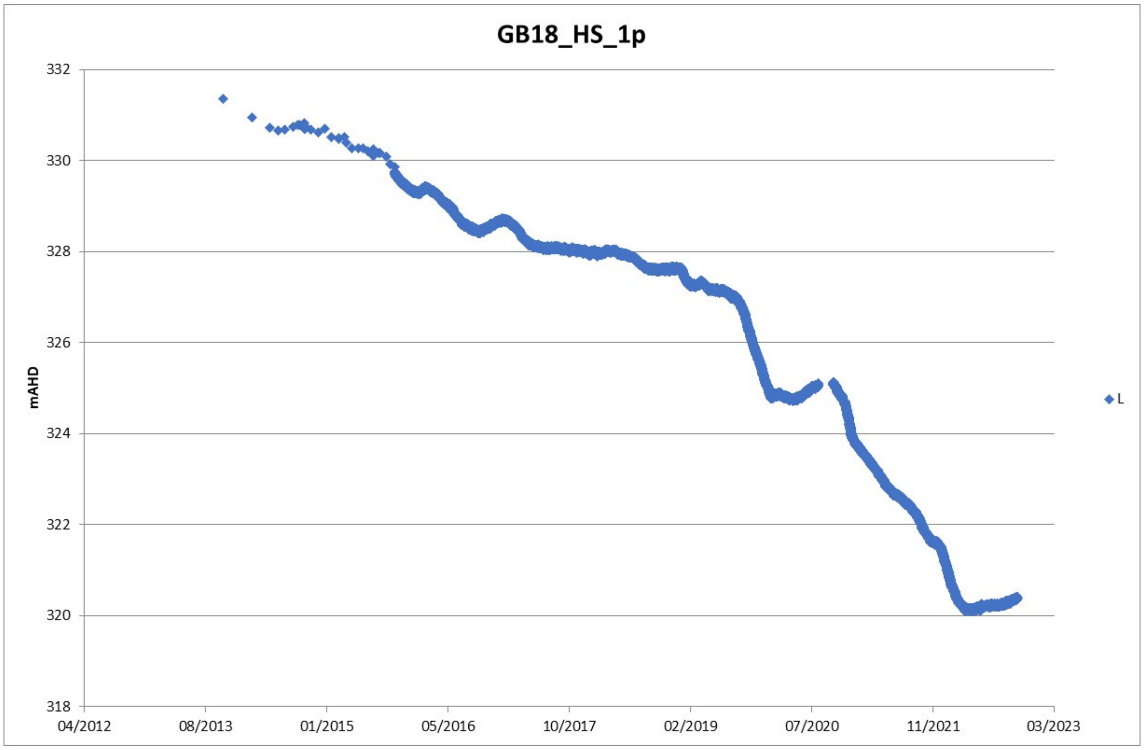
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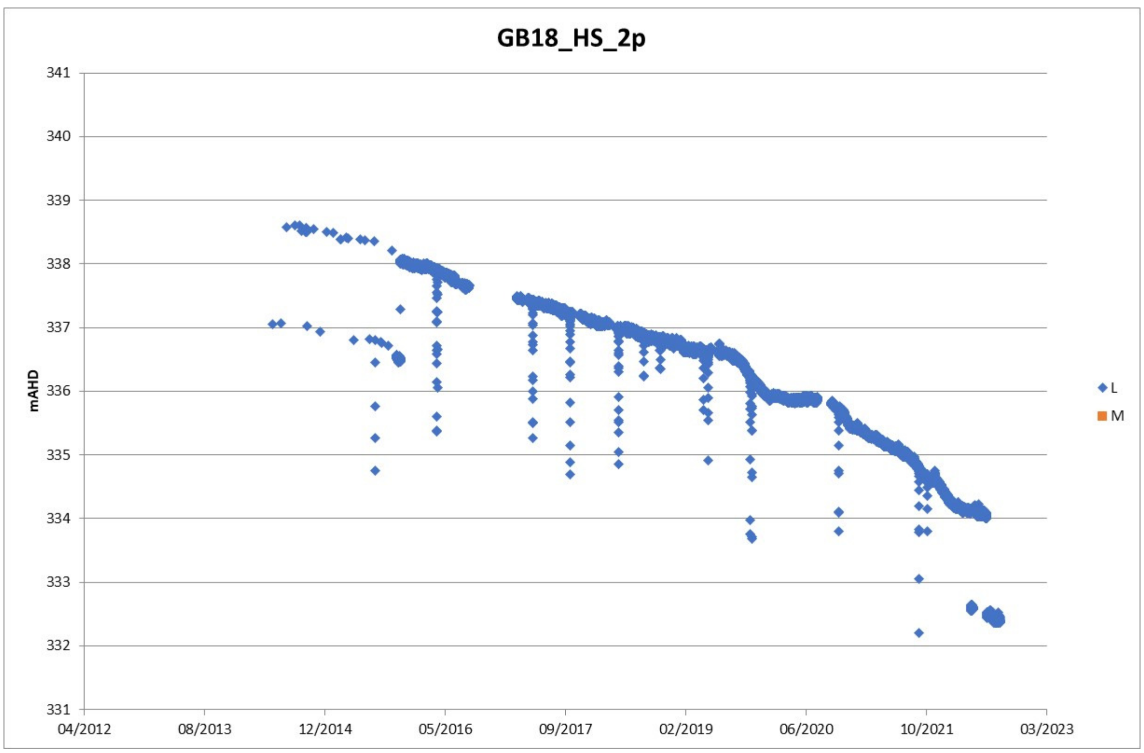
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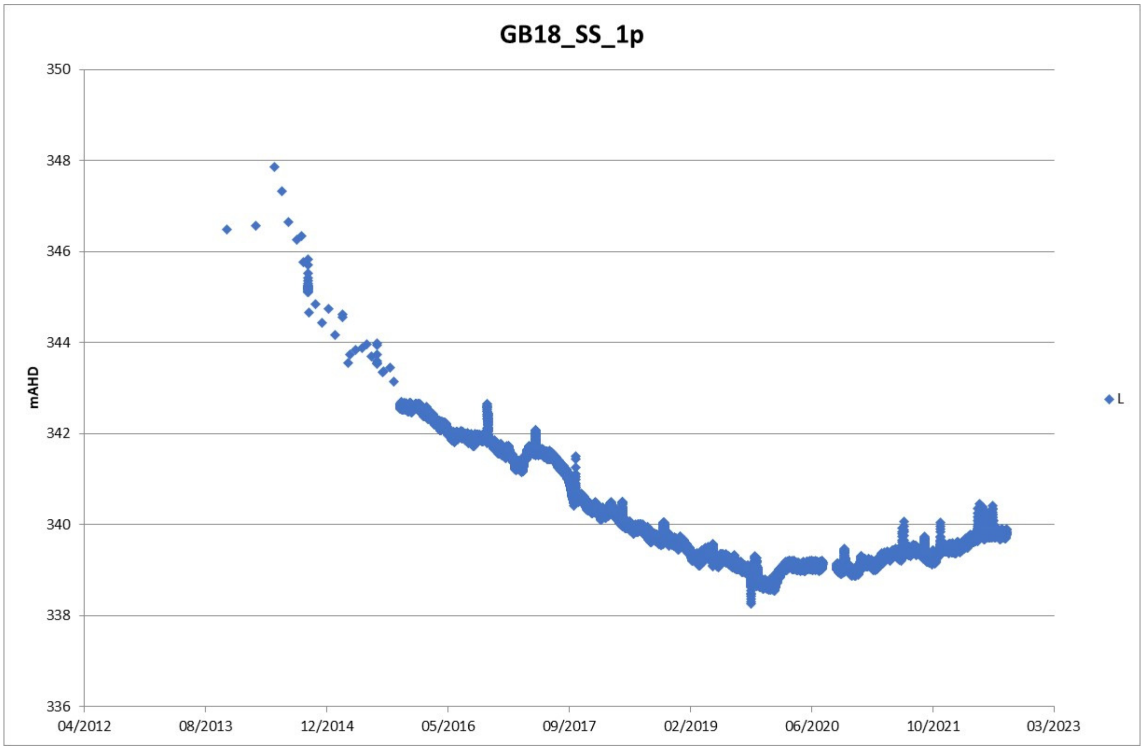
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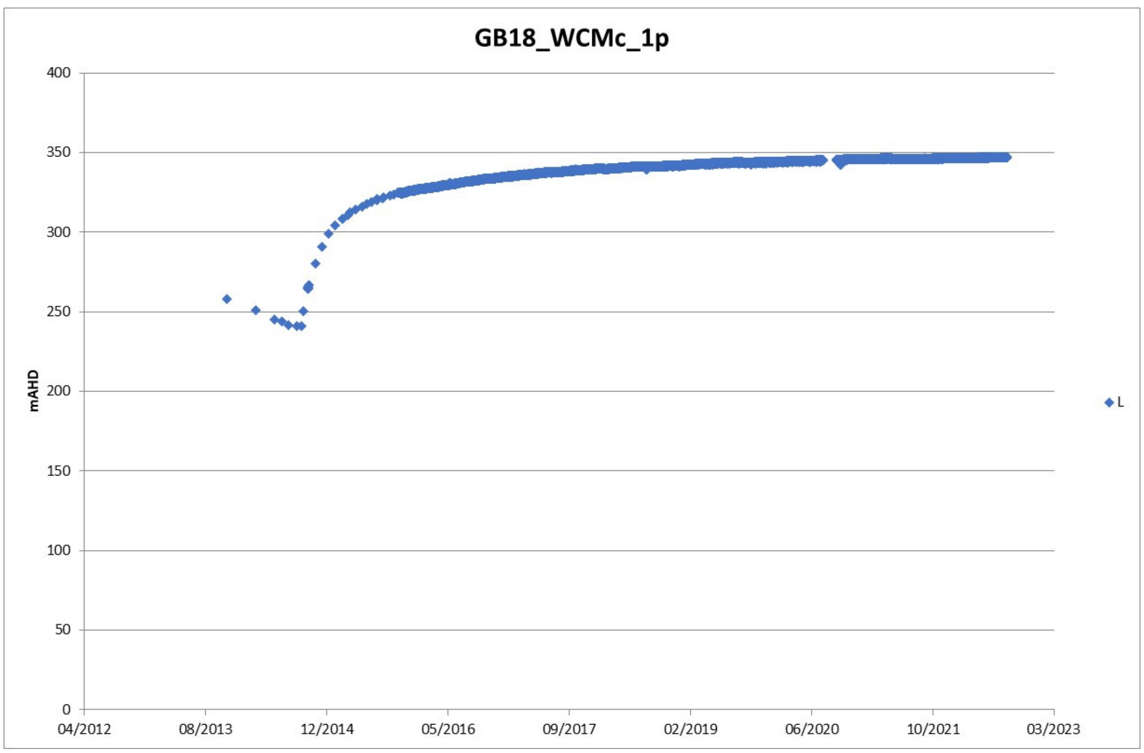
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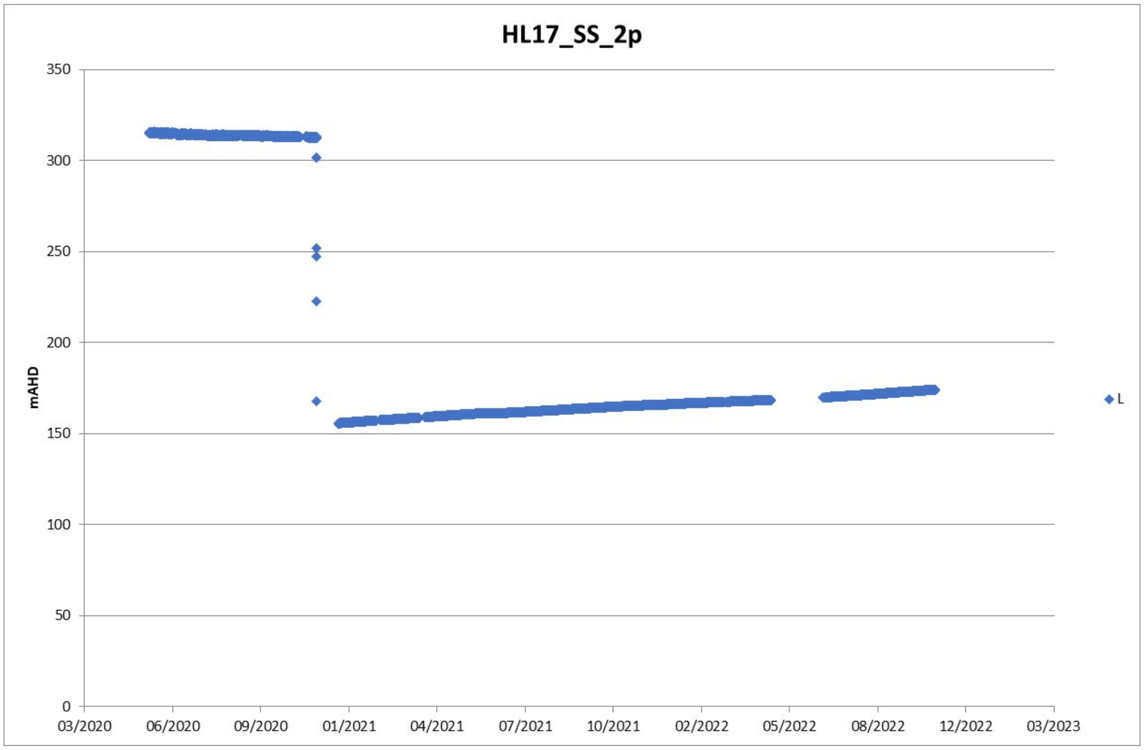
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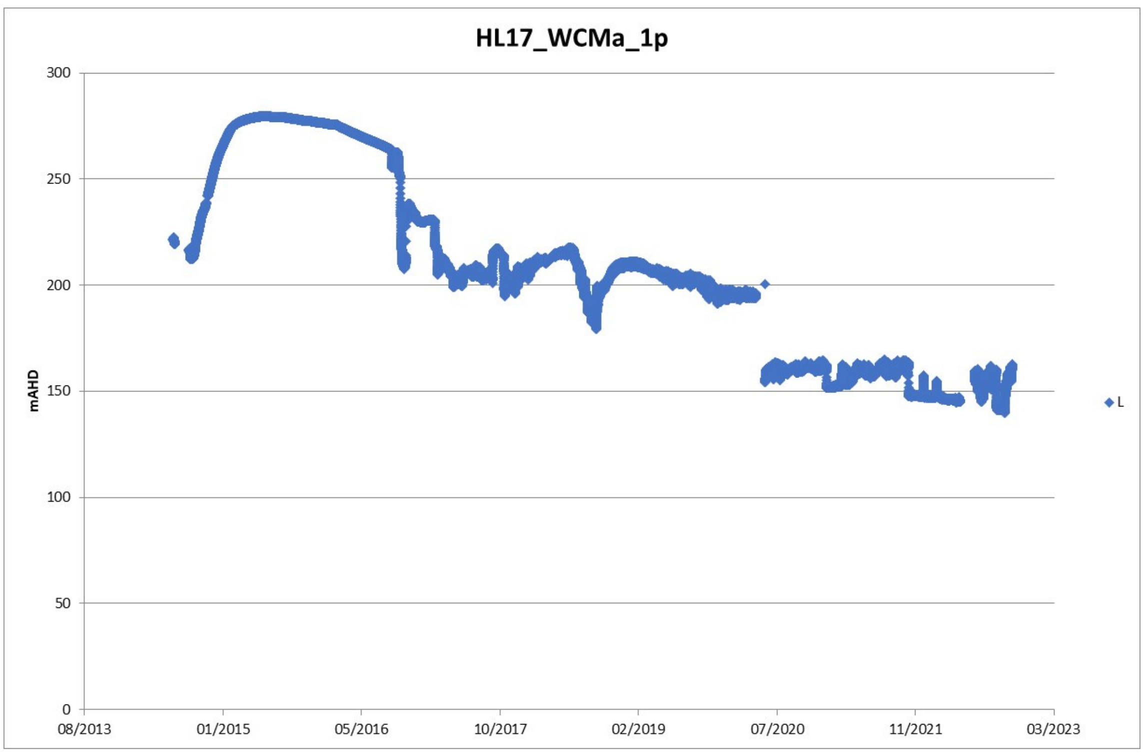
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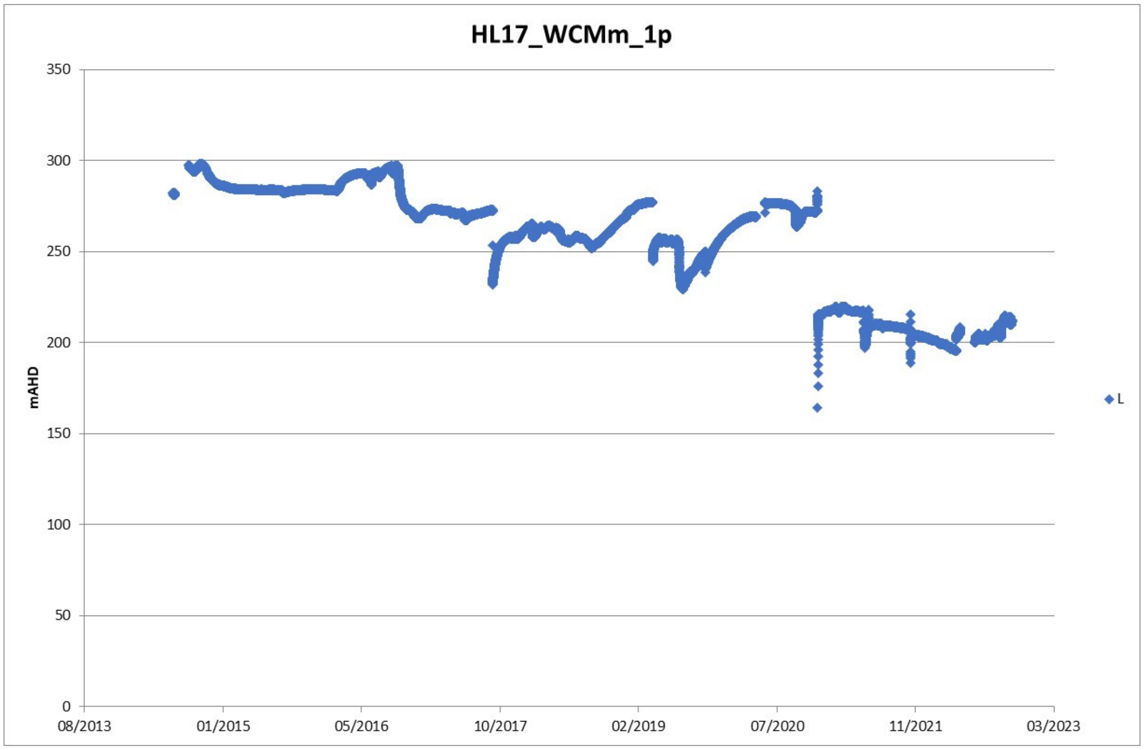
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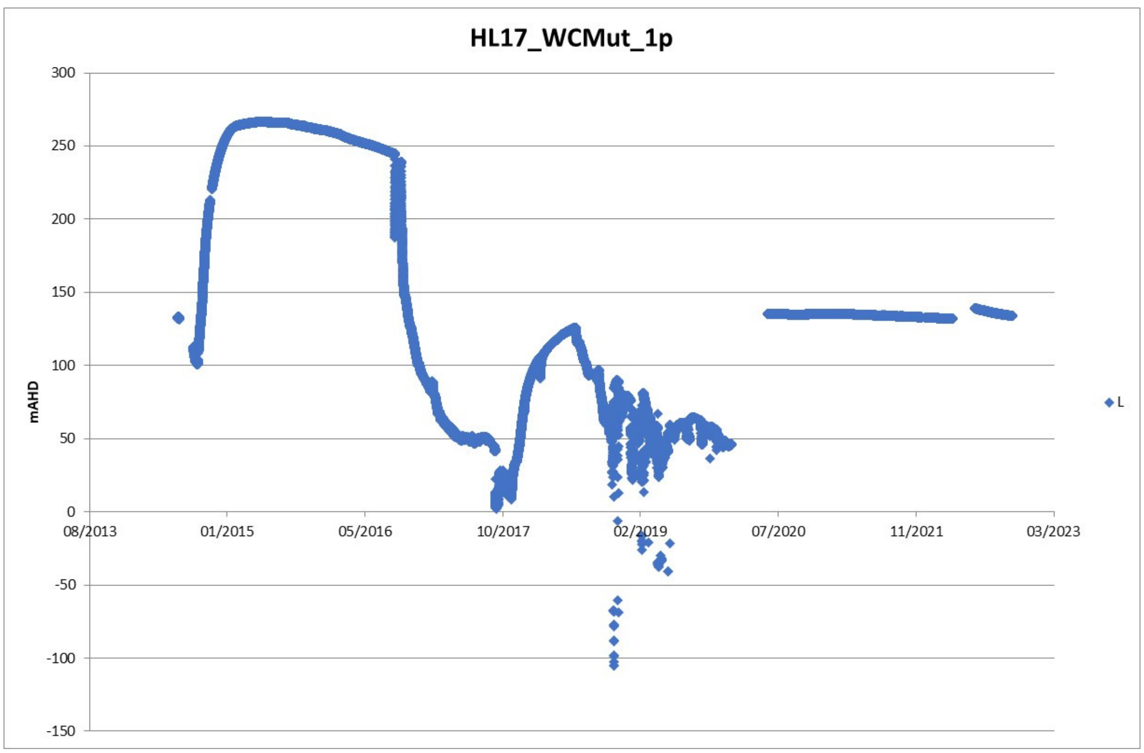
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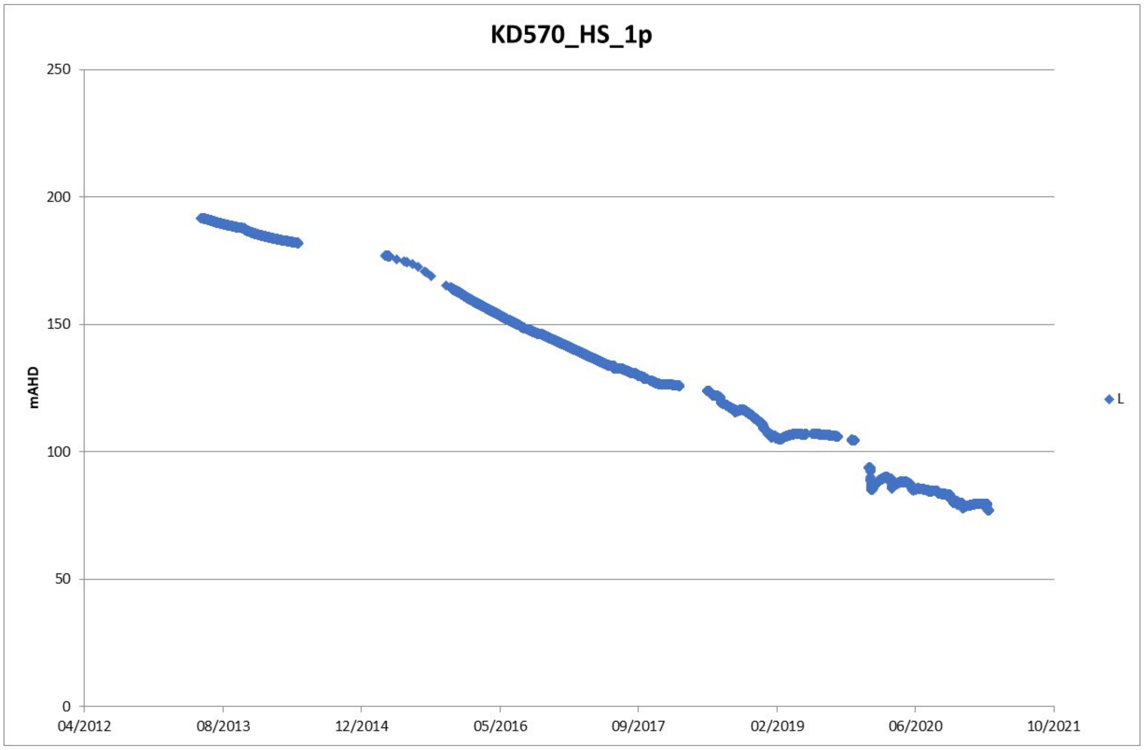
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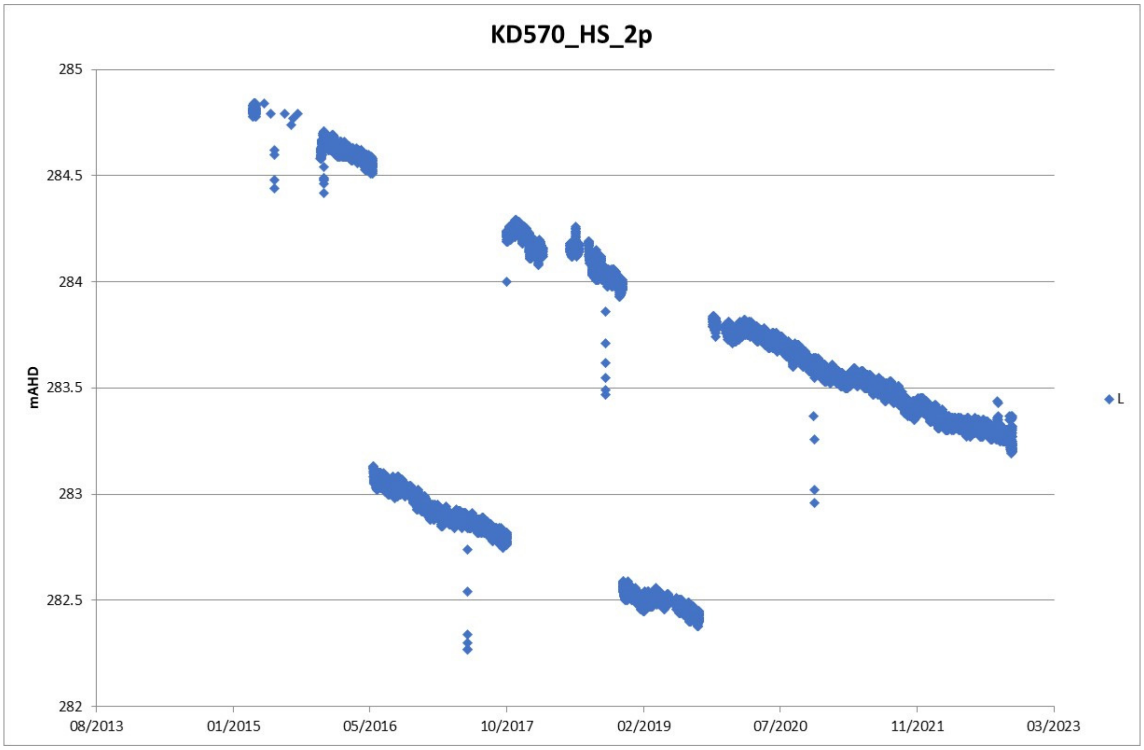
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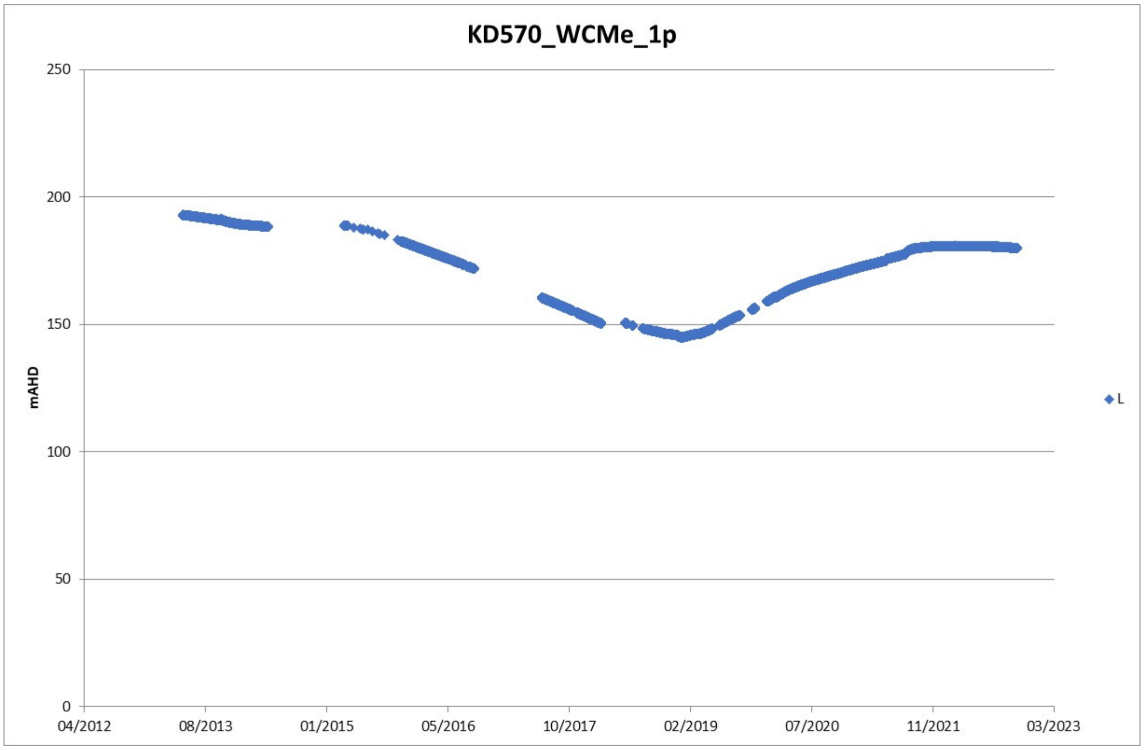
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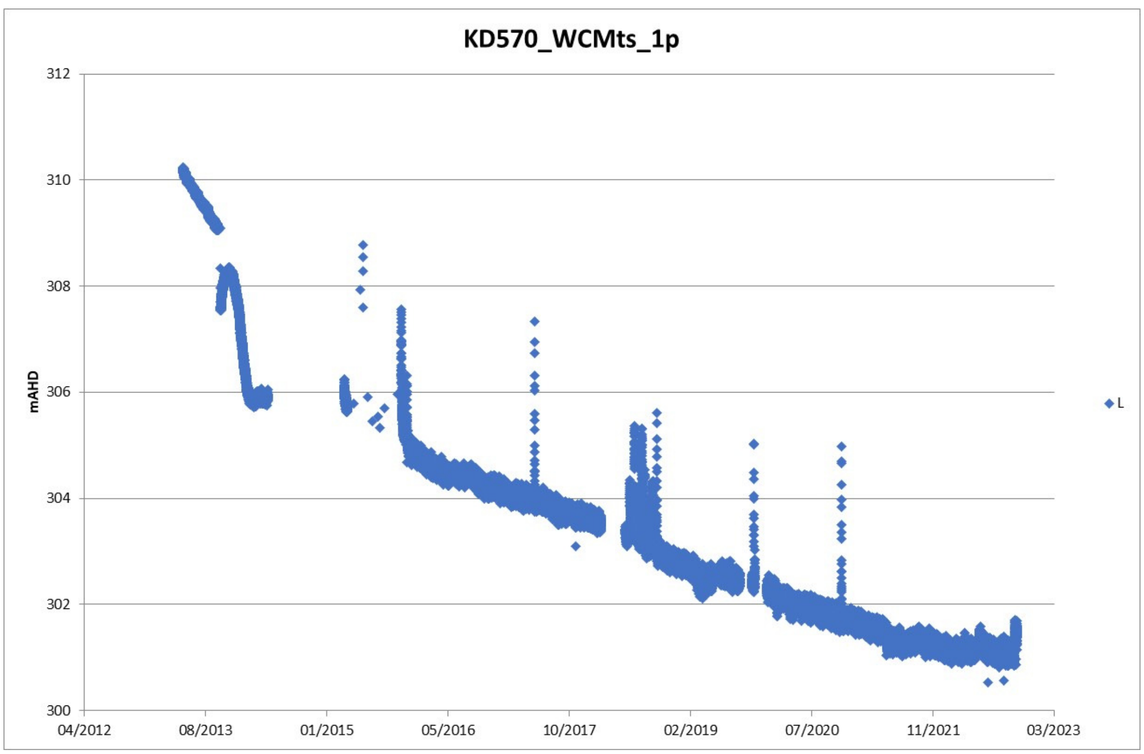
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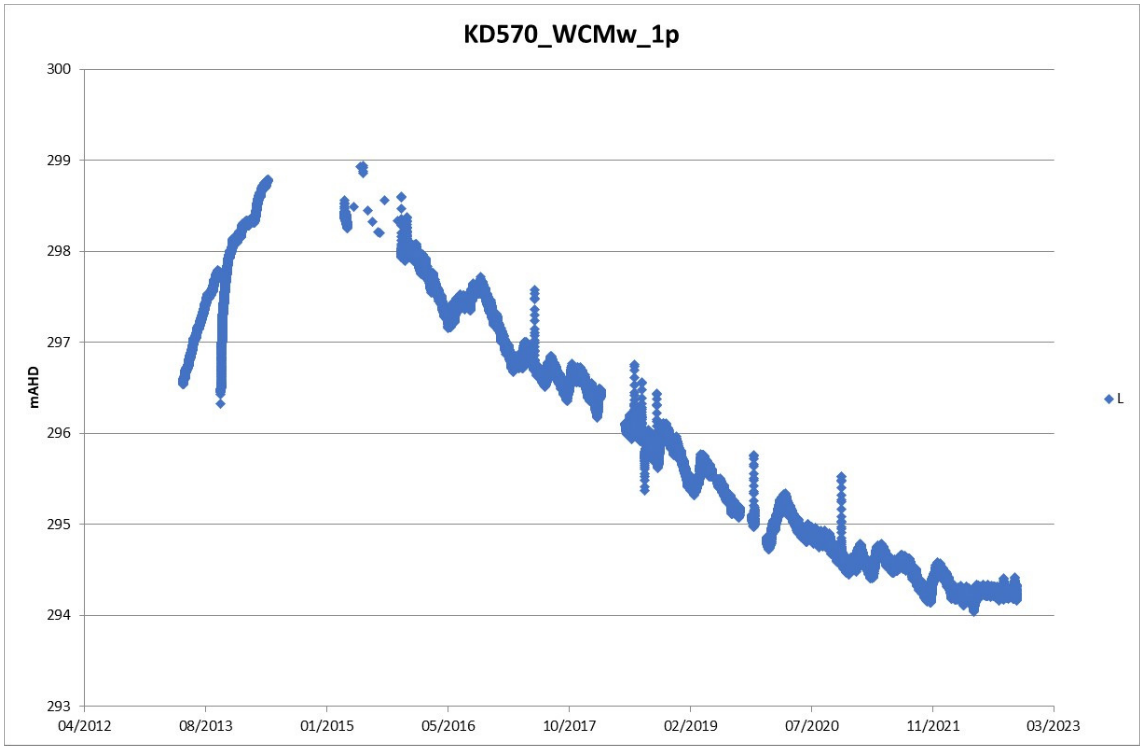
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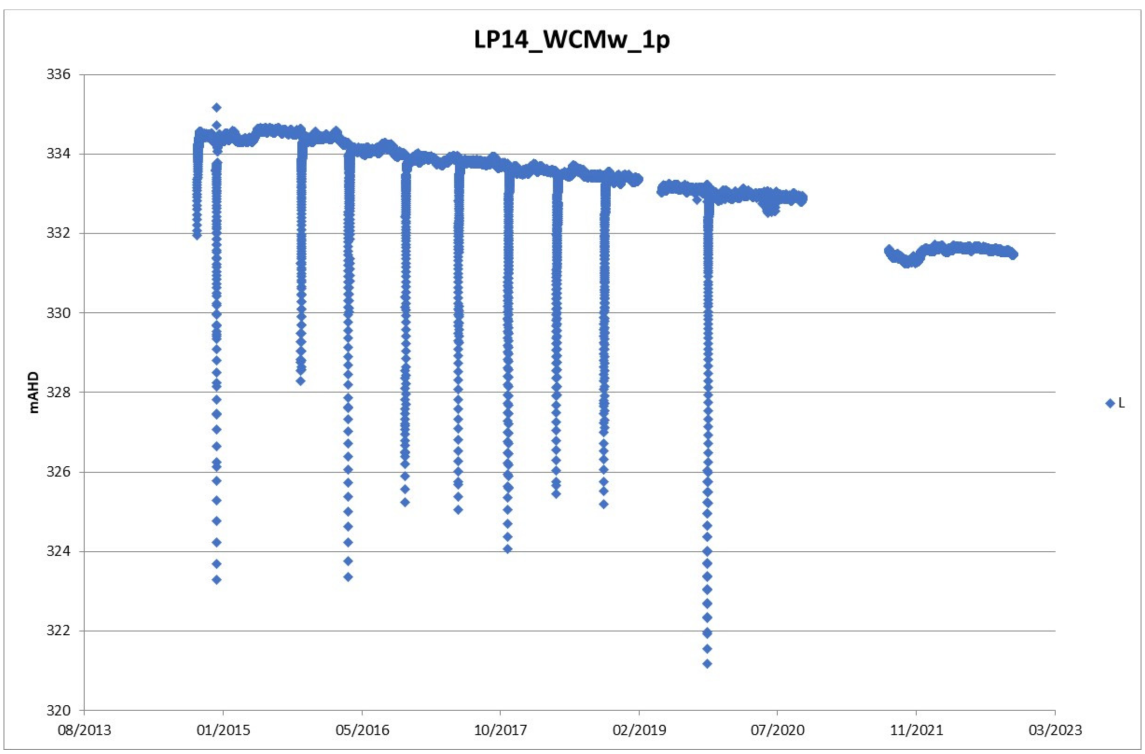
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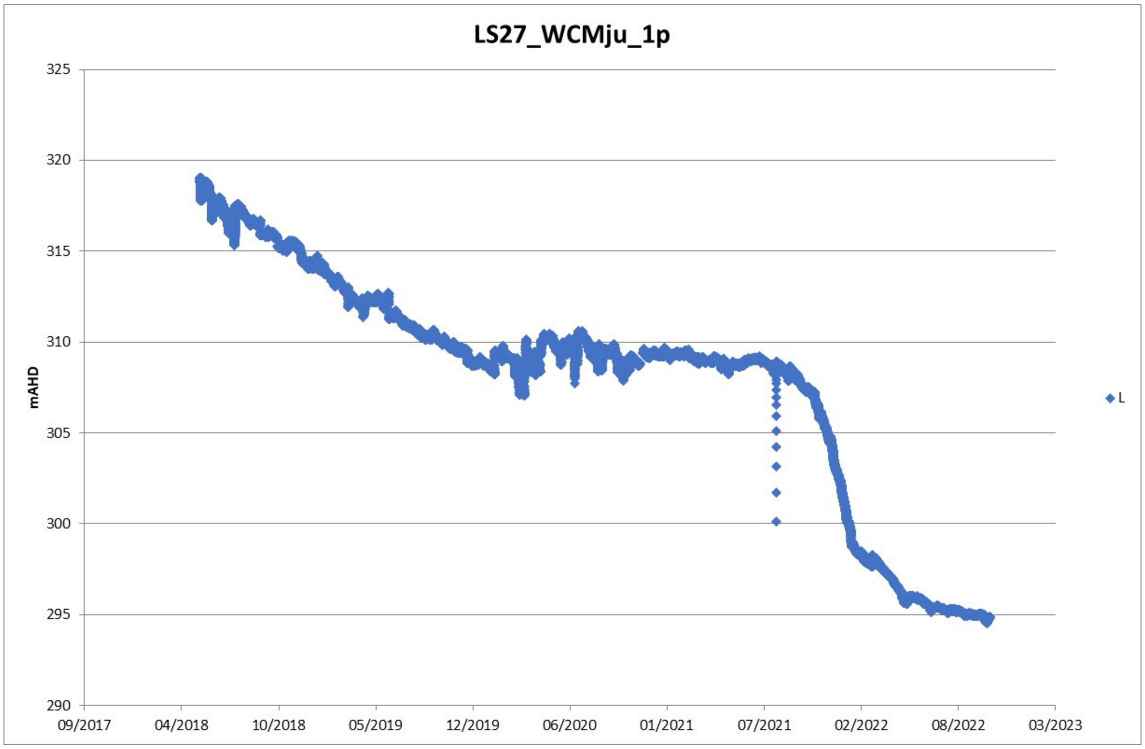
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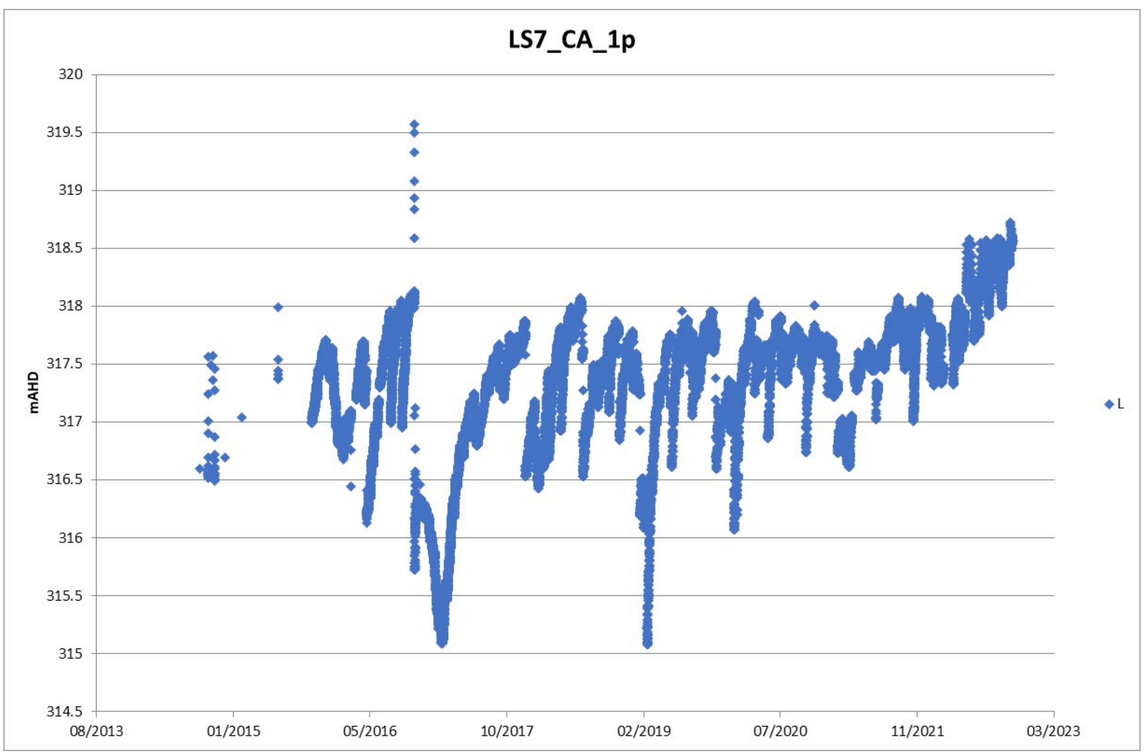
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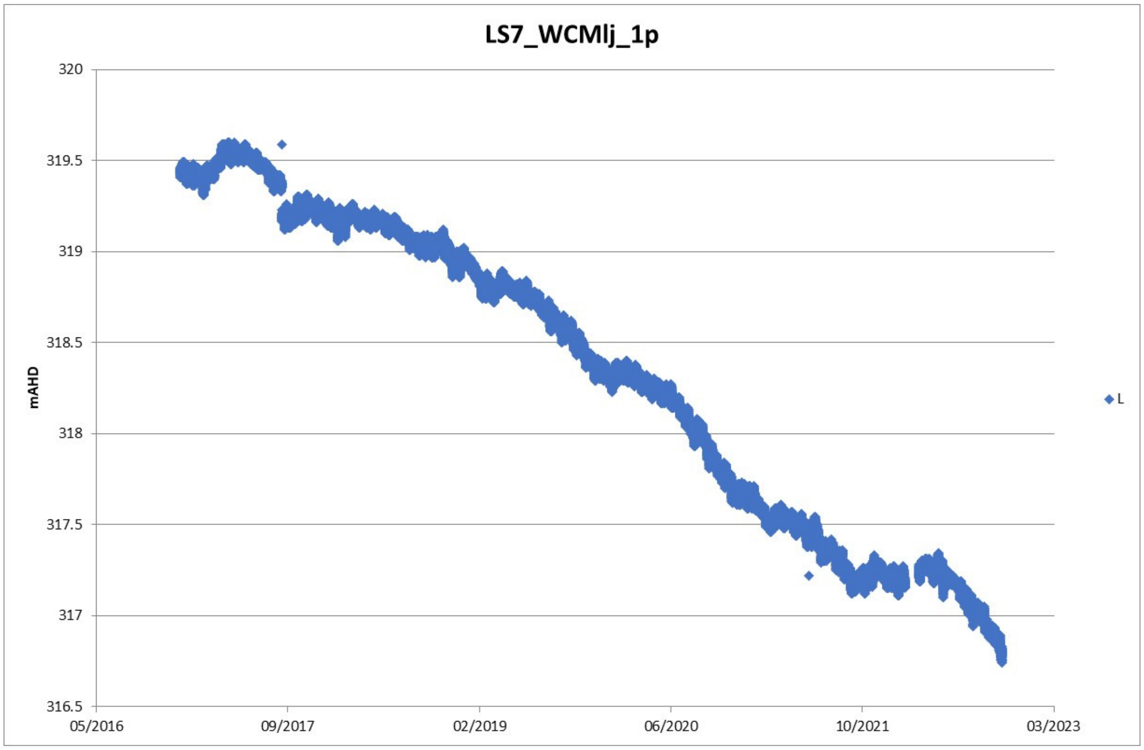
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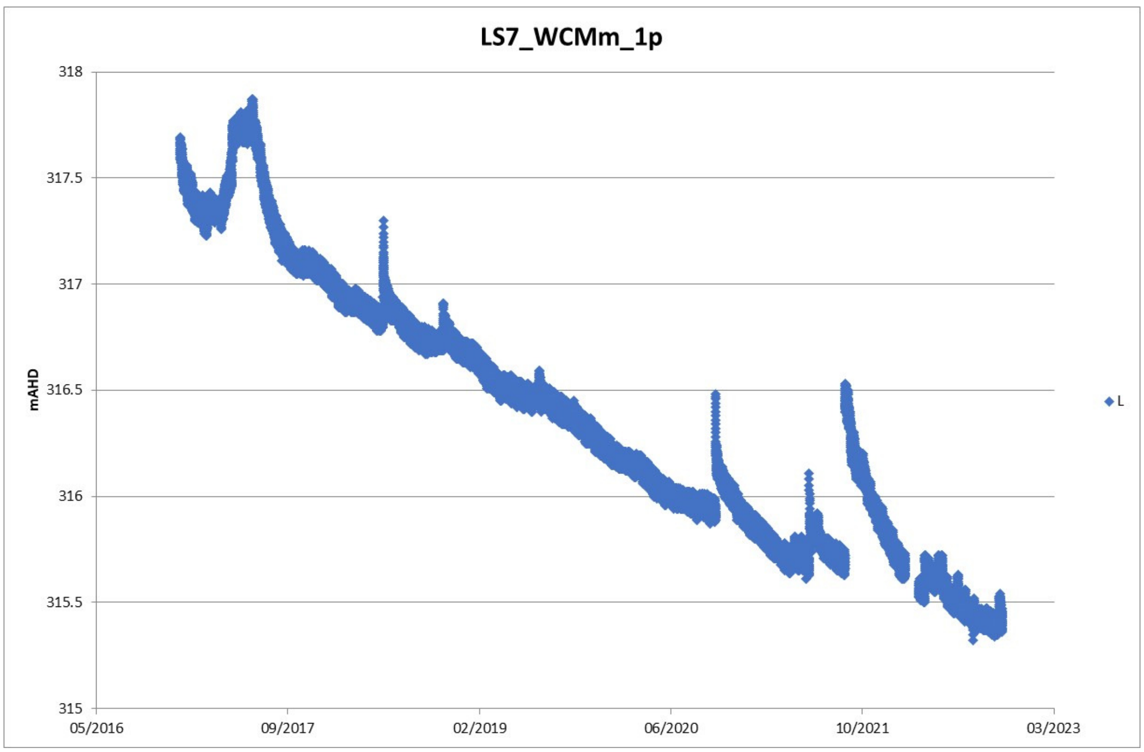
LS7_WCMm_1p
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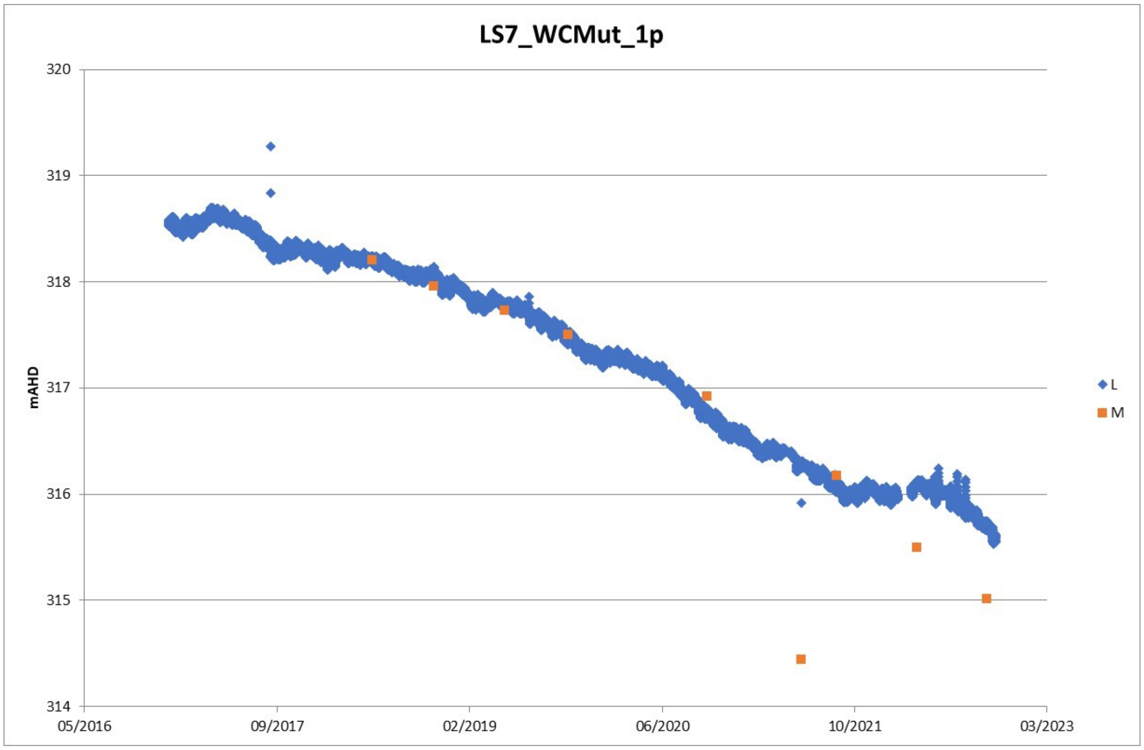
LS7_WCMut_1p
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mAHD
05/2016
09/2017
02/2019
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03/2023
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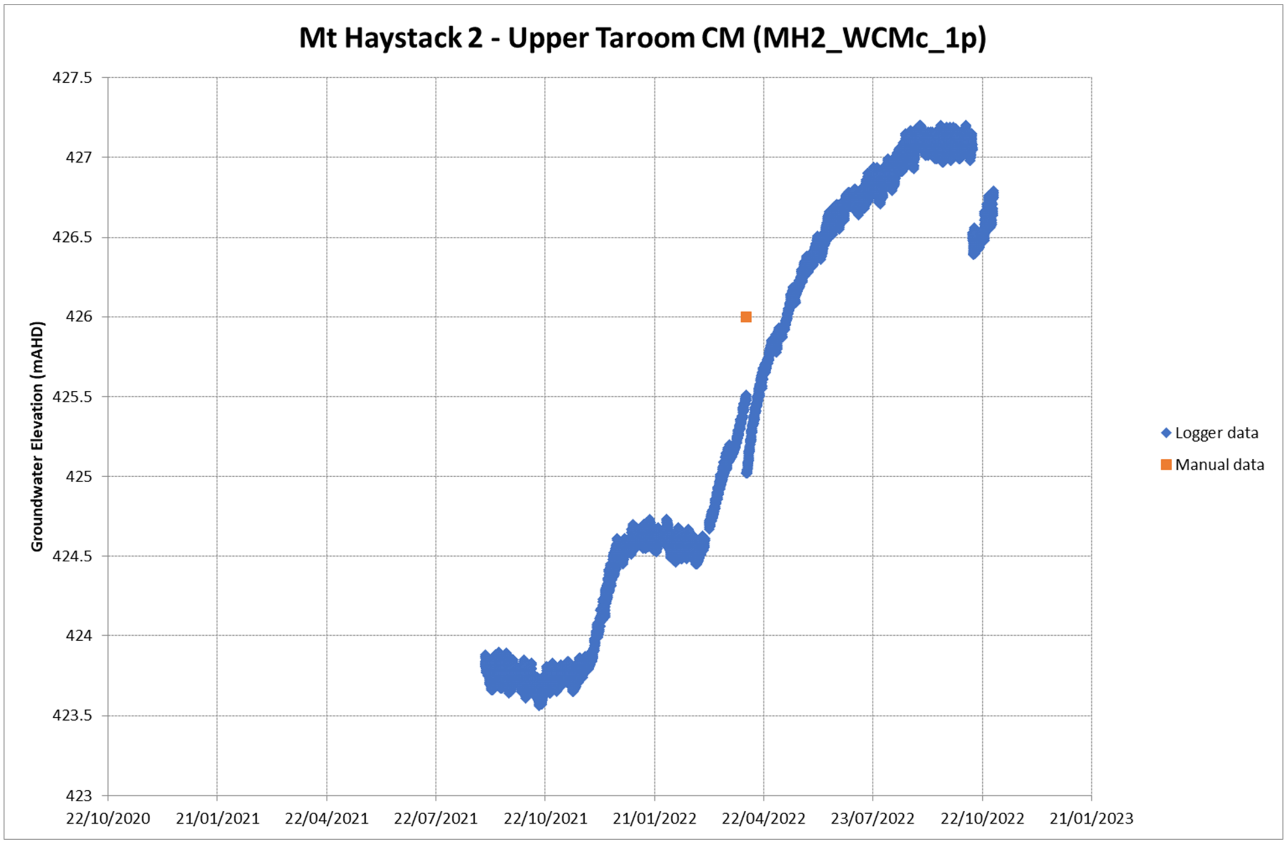
Mt Haystack 2 - Upper Taroom CM (MH2_WCMc_1p)
Groundwater Elevation (mAHD)
427.5
427
426.5
426
425.5
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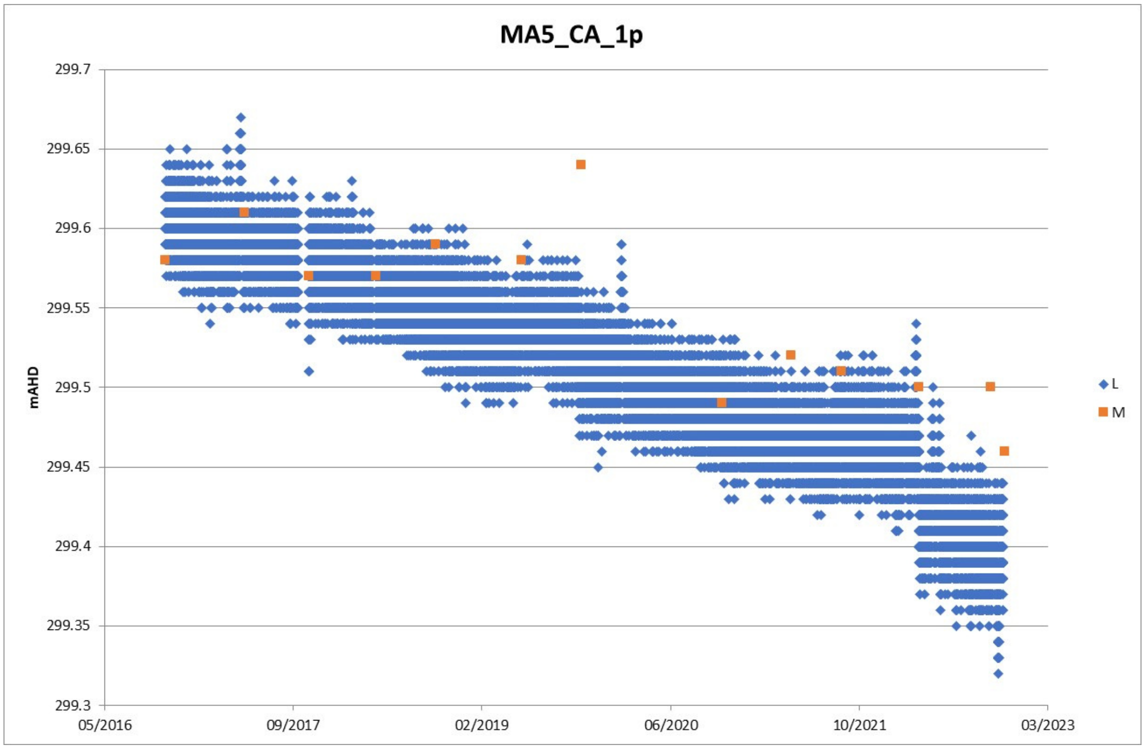
424.5
424
423.5
423
22/10/2020
21/01/2021
22/04/2021
22/07/2021
22/10/2021
21/01/2022
22/04/2022
23/07/2022
22/10/2022
21/01/2023
Logger data
Manual data


MA5_CA_1p
mAHD
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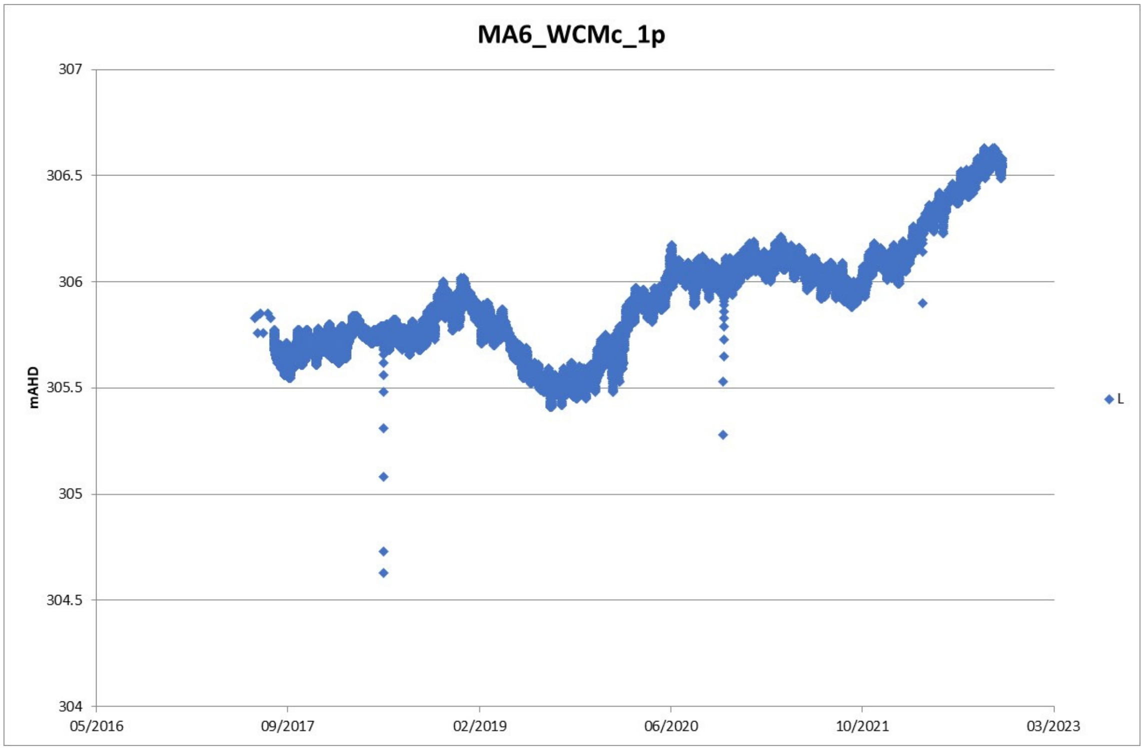
MA6_WCMc_1p
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mAHD
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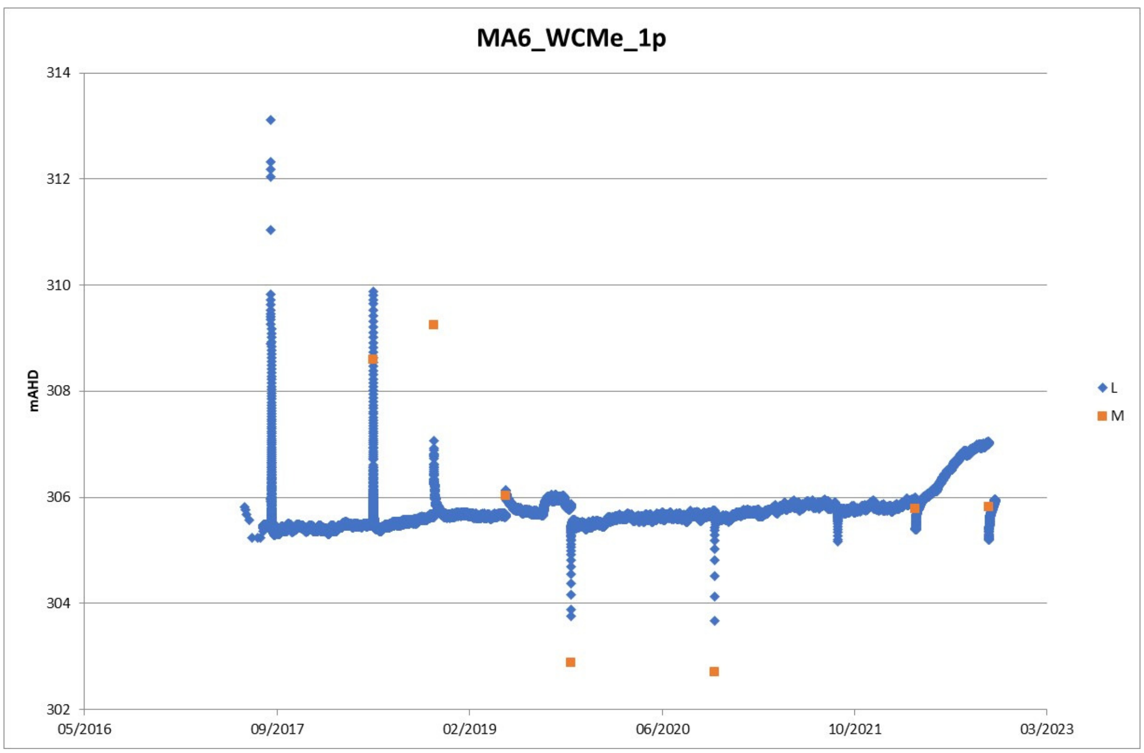
MA6_WCMe_1p
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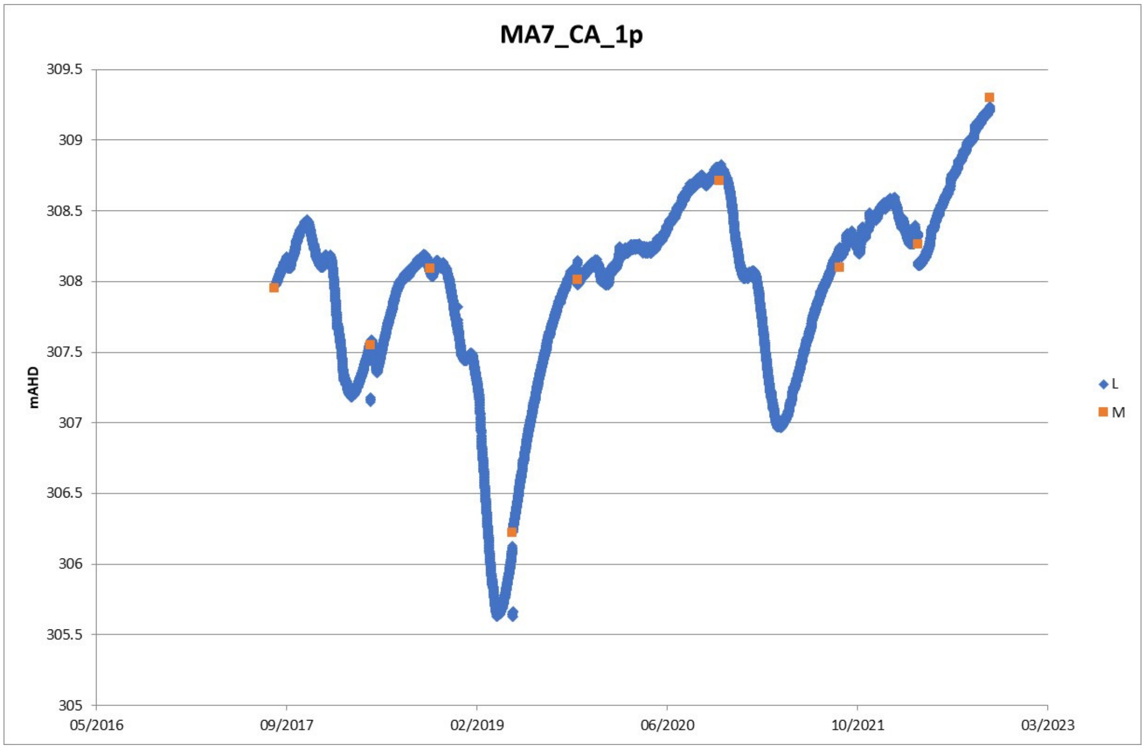
MA7_CA_1p
mAHD
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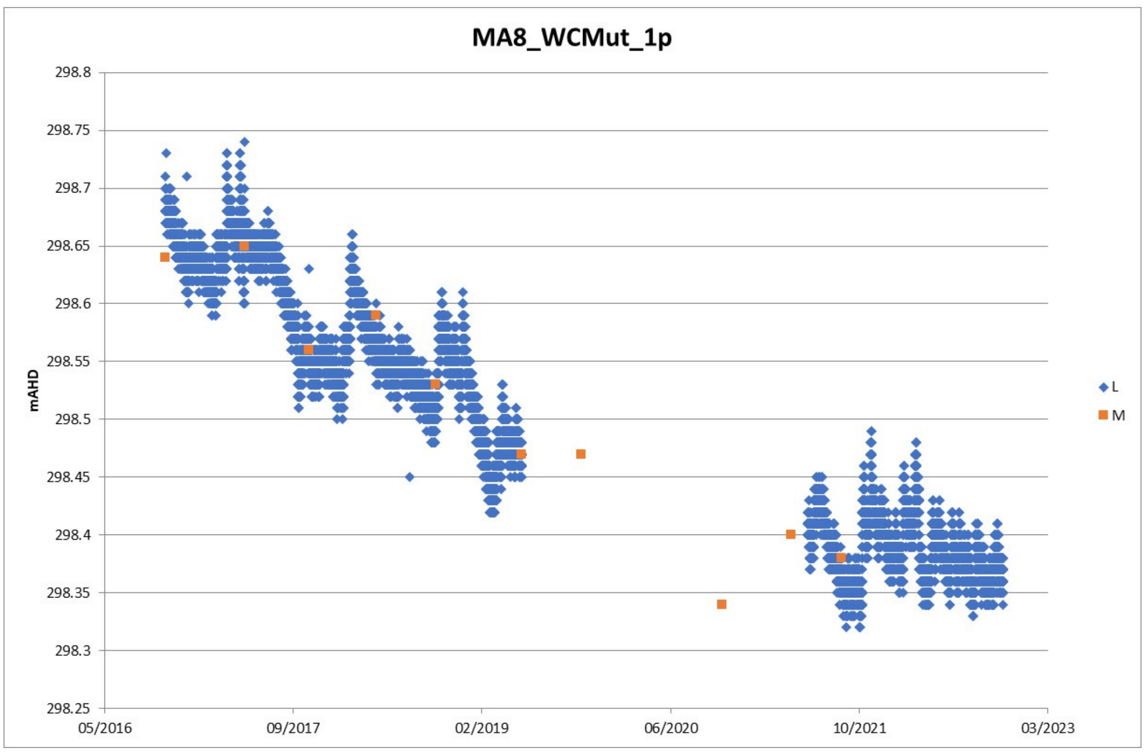
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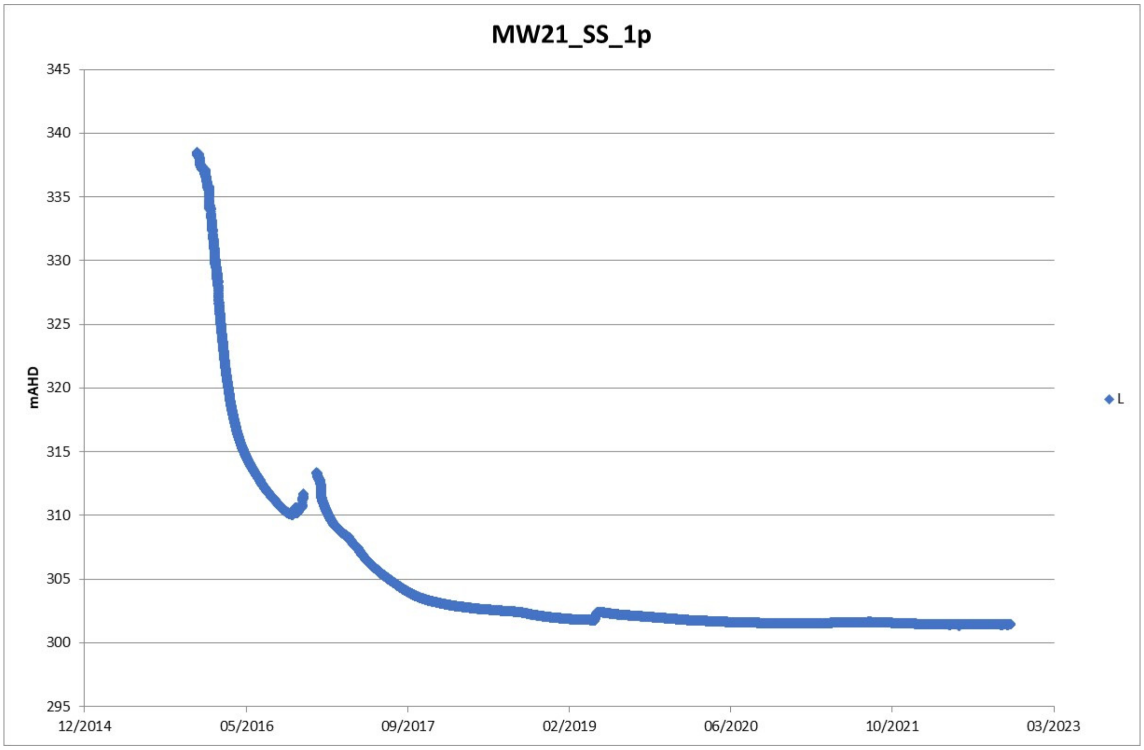
MW21_SS_1p
mAHD
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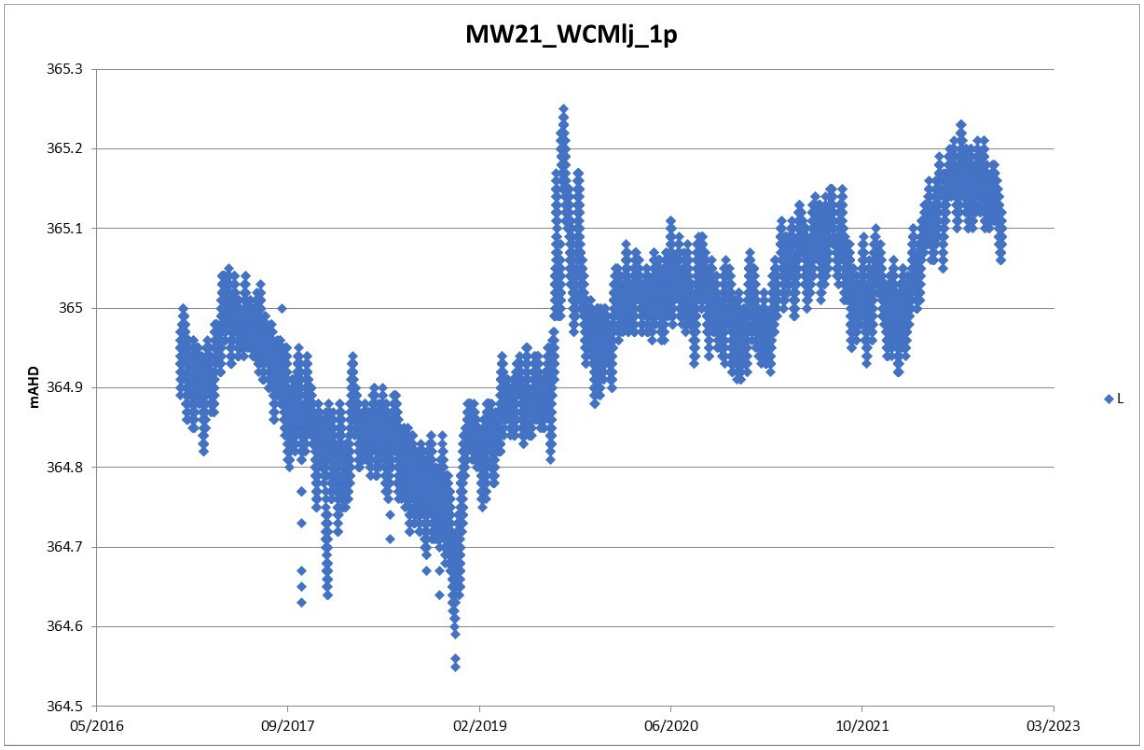
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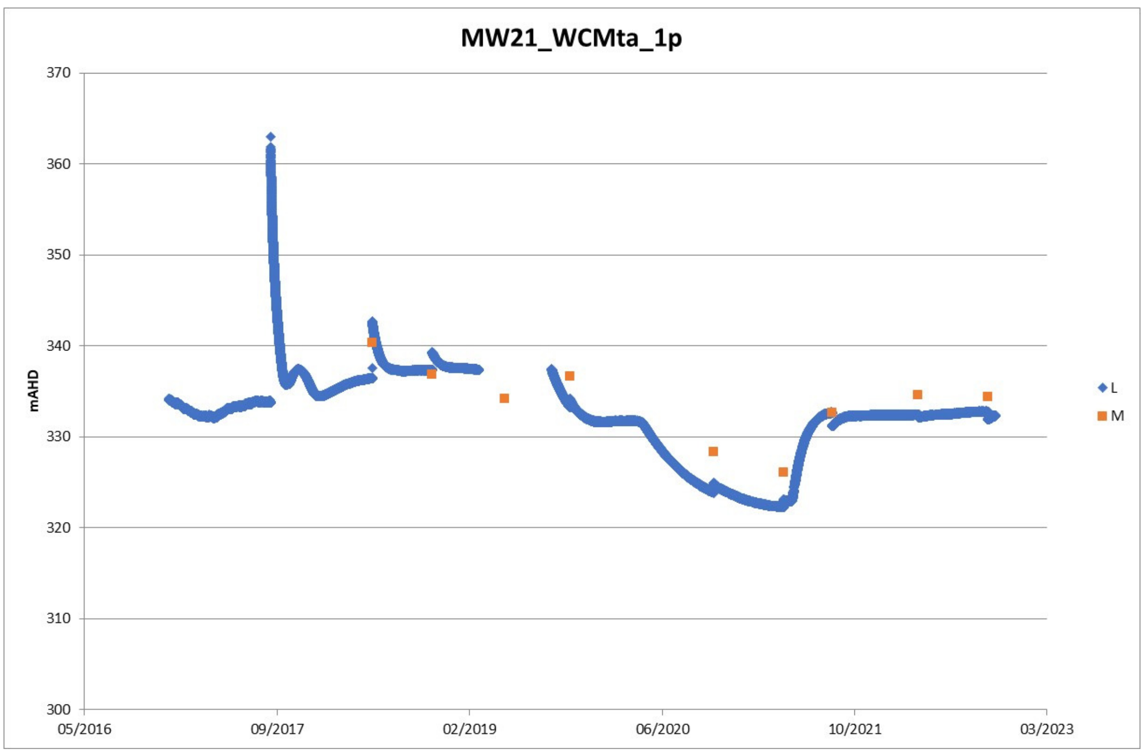
MW21_WCMta_1p
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mAHD
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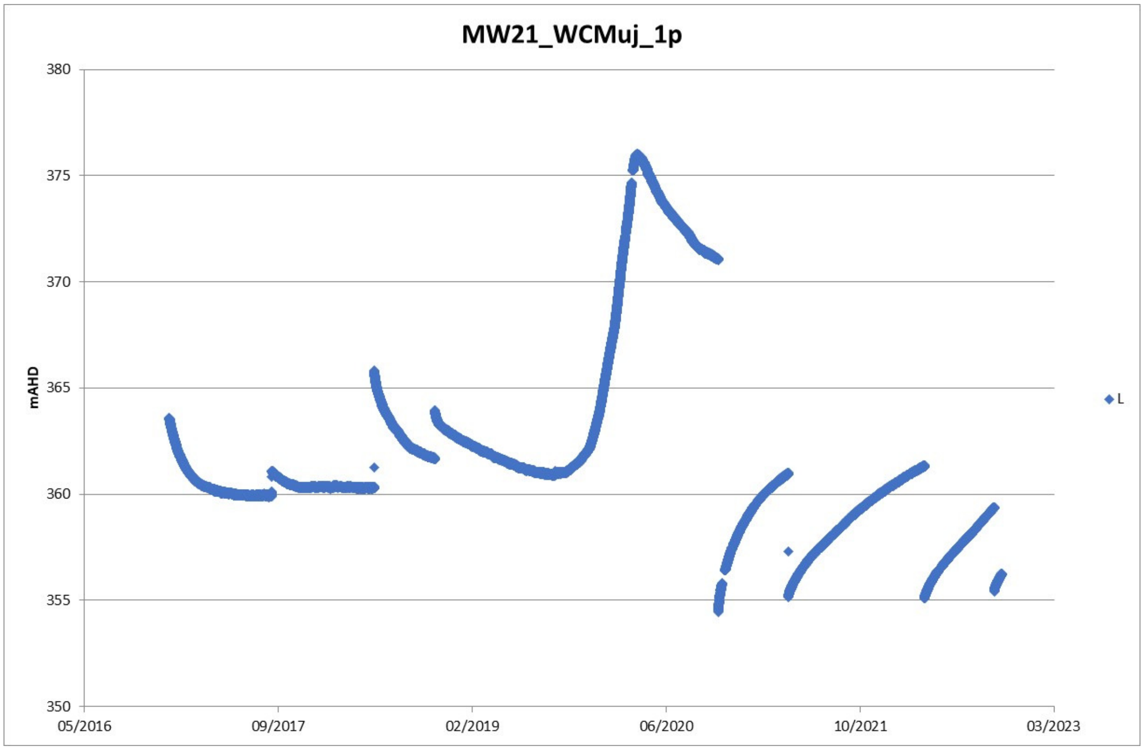
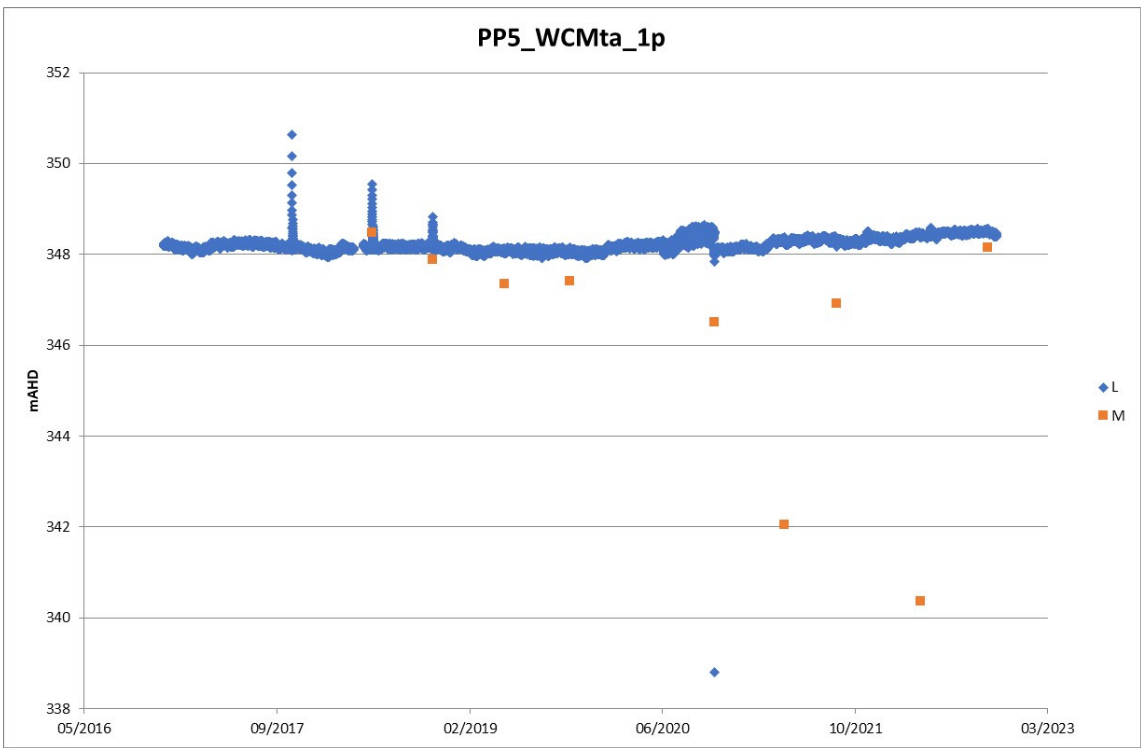
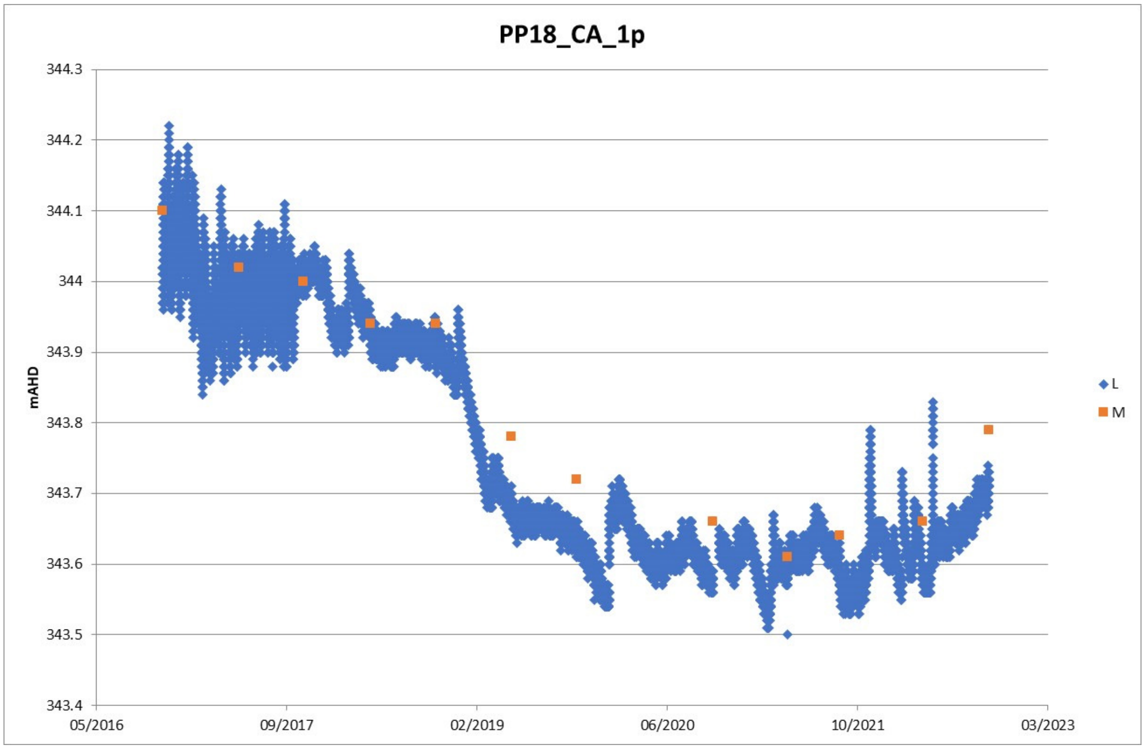
03/2023
L
M





arrow energy go further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L
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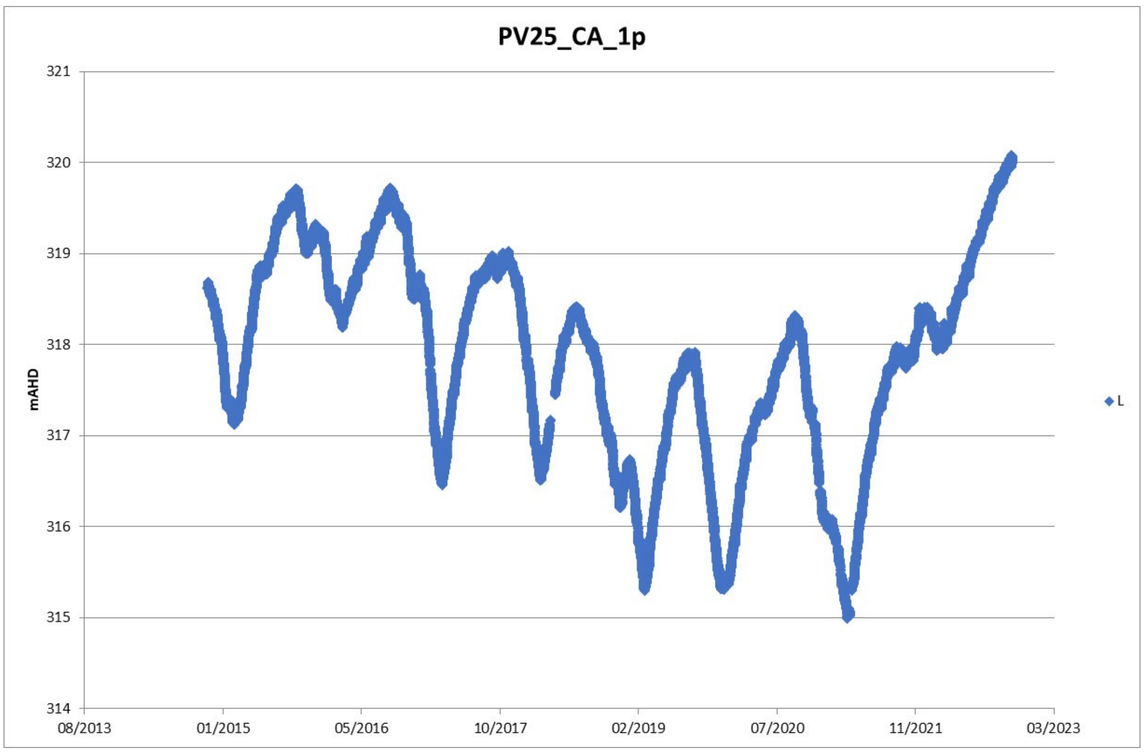
PV25_CA_1p
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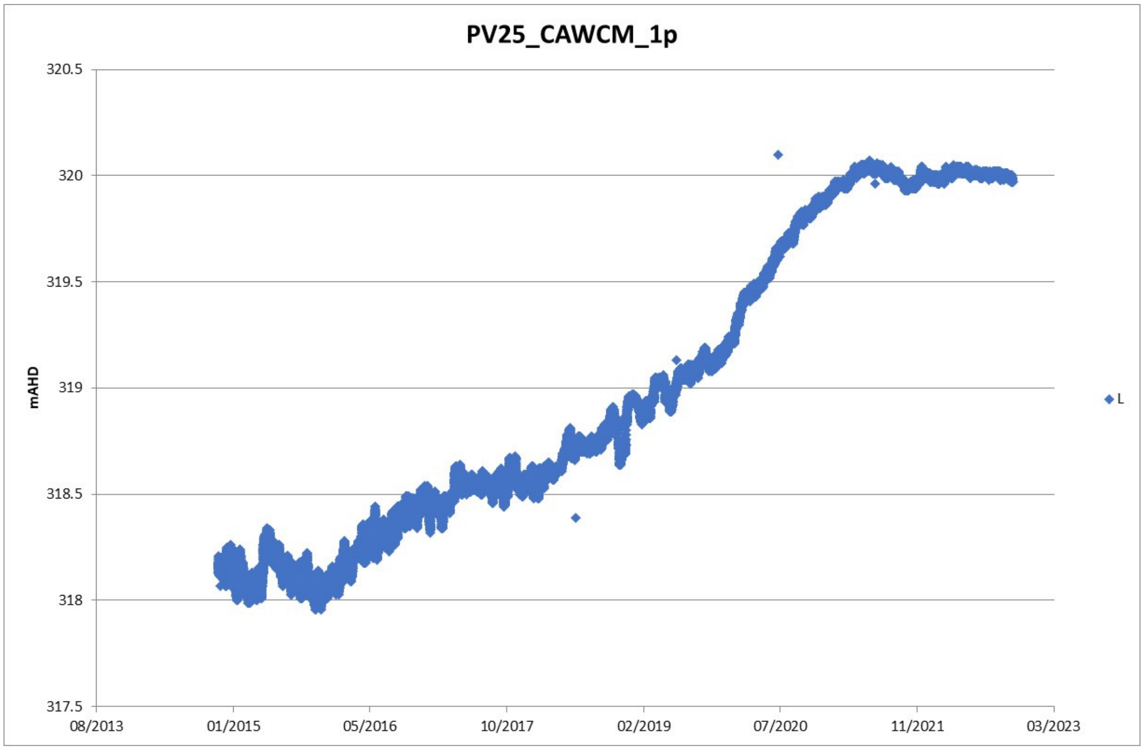
PV25_CAWCM_1p
mAHD
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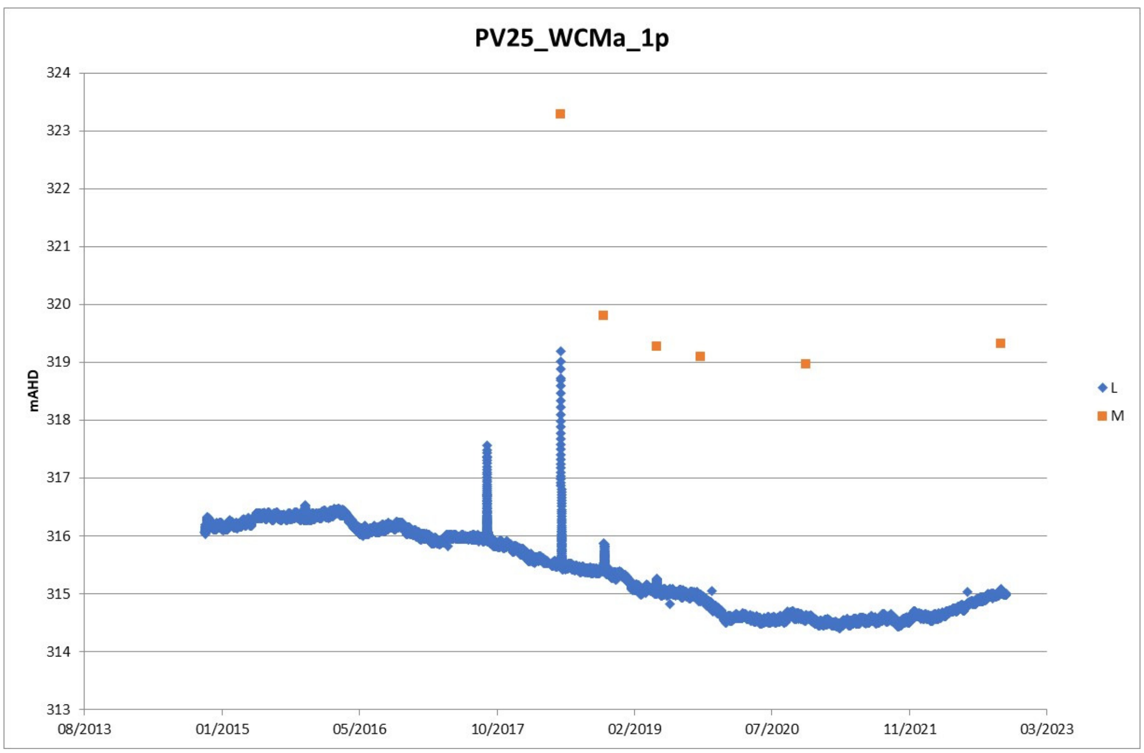
PV25_WCMa_1p
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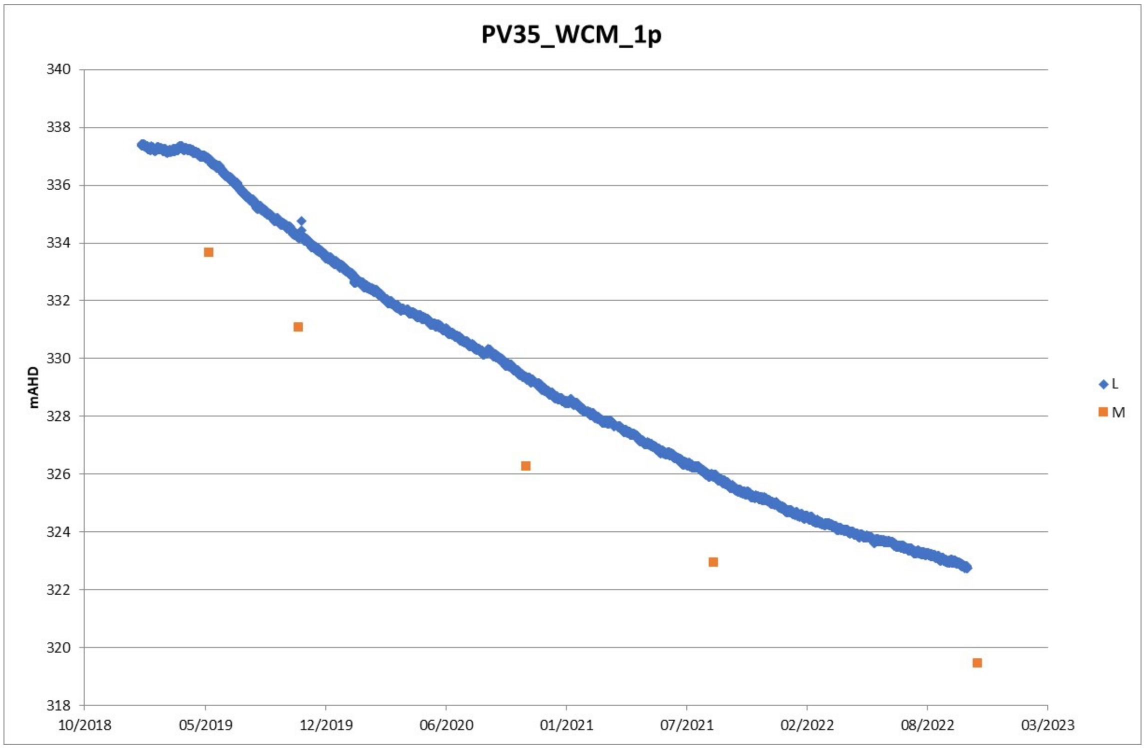
PV35_WCM_1p
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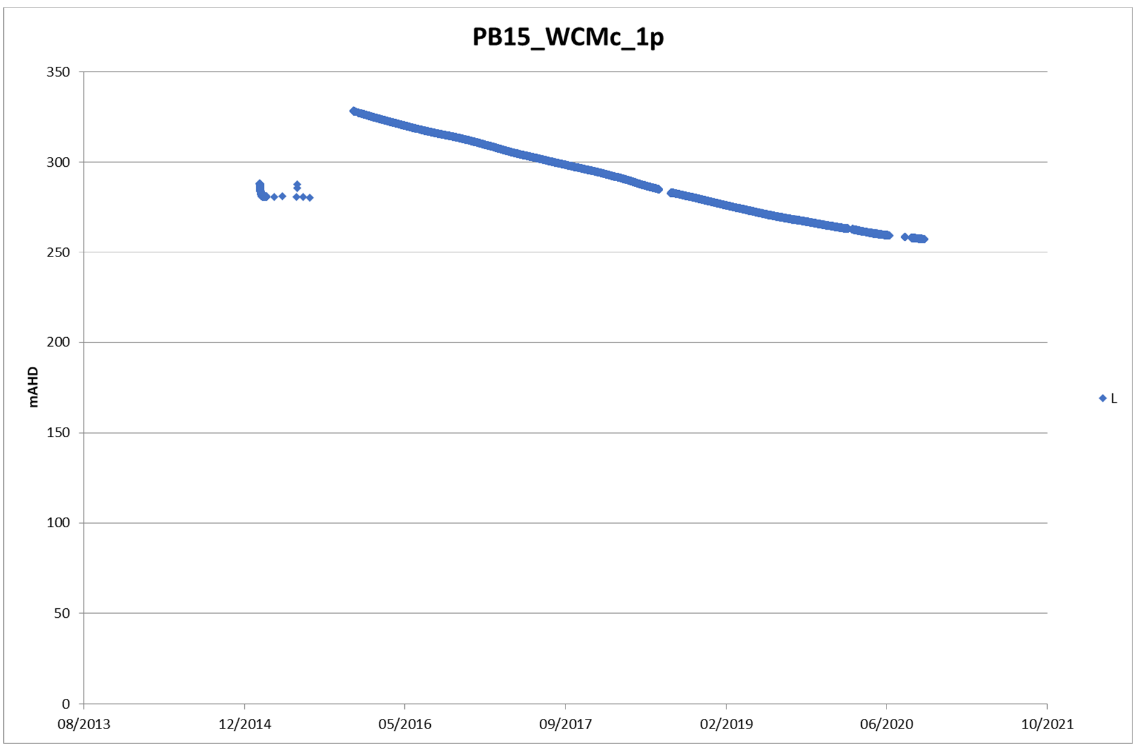
PB15_WCMc_1p
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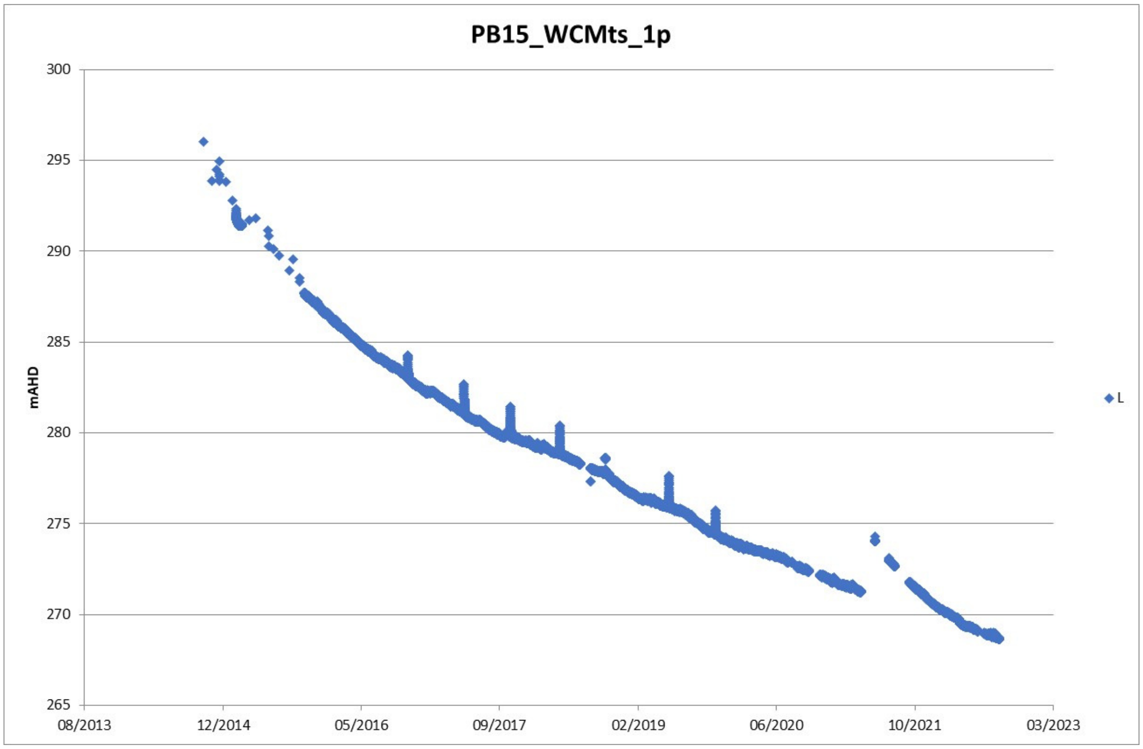
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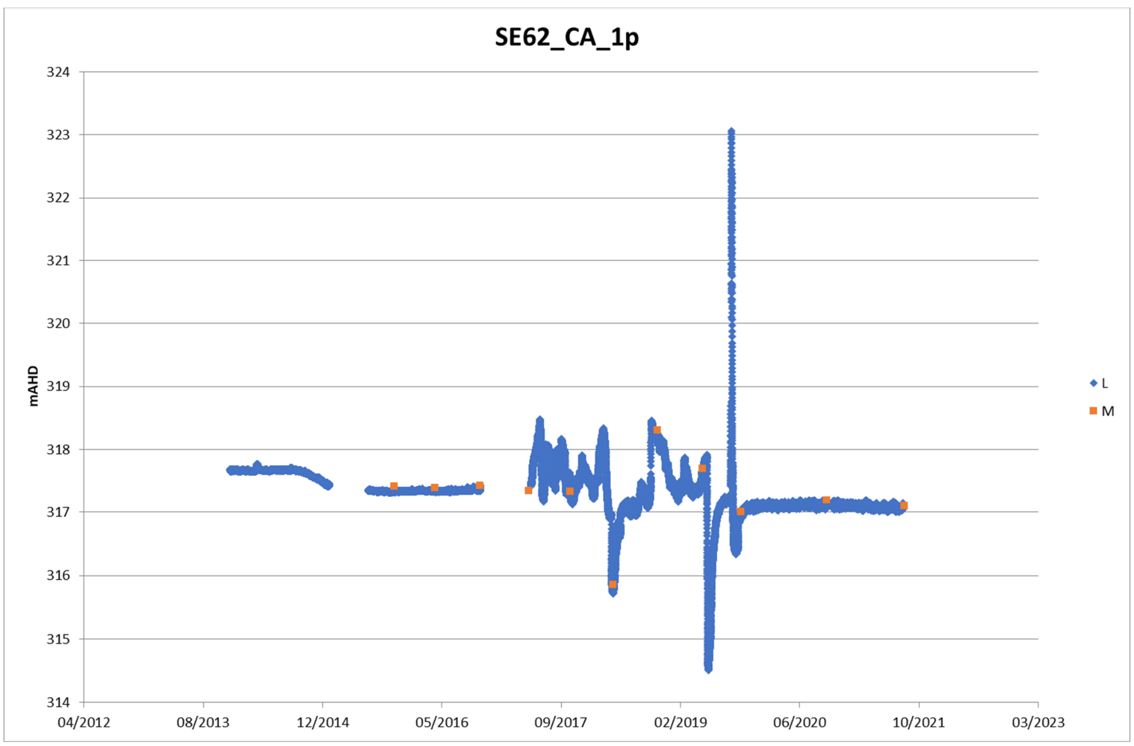
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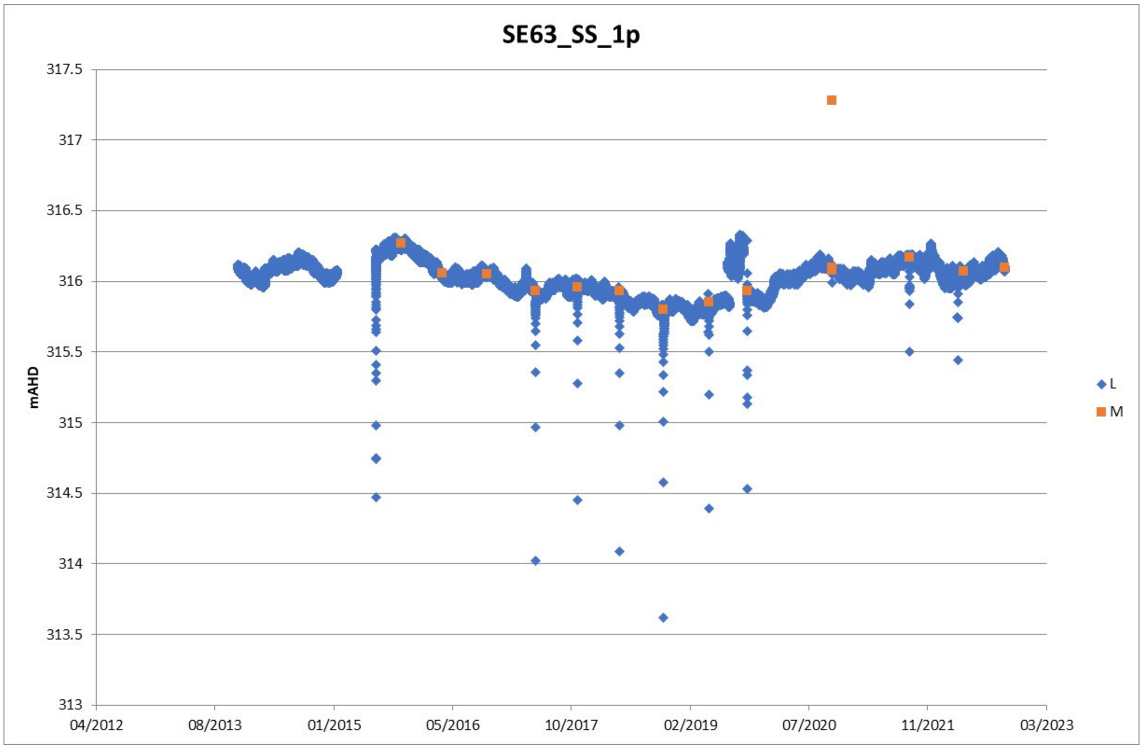
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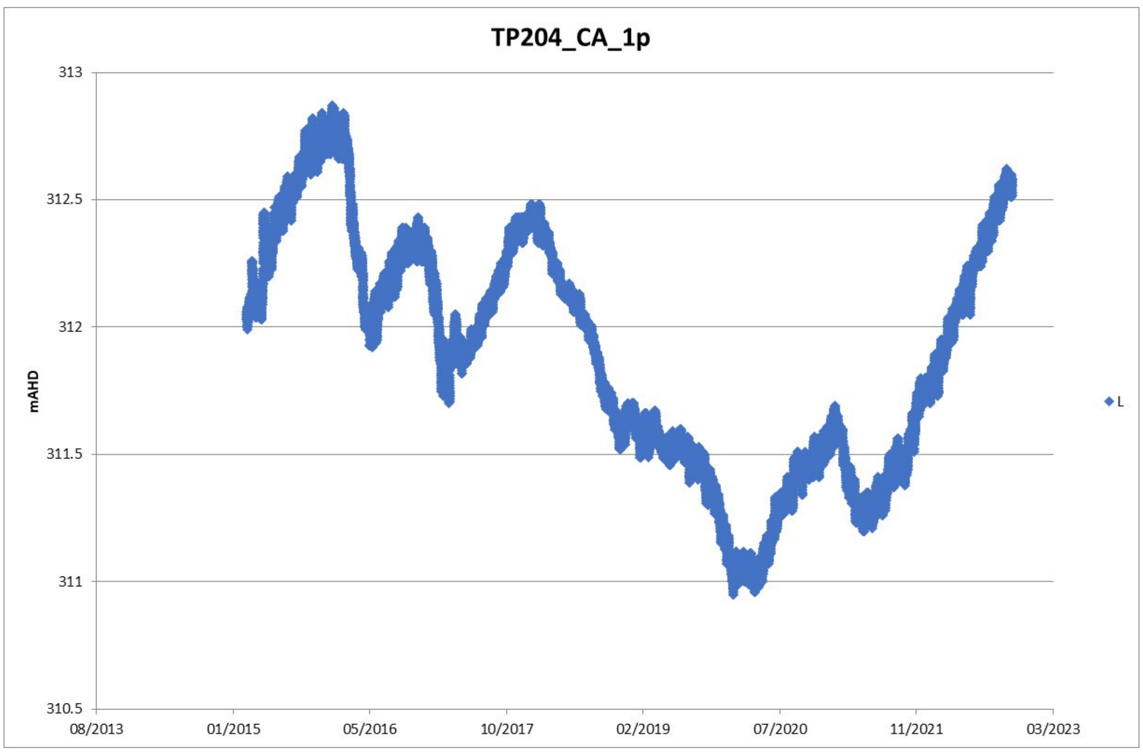
TP204_CA_1p
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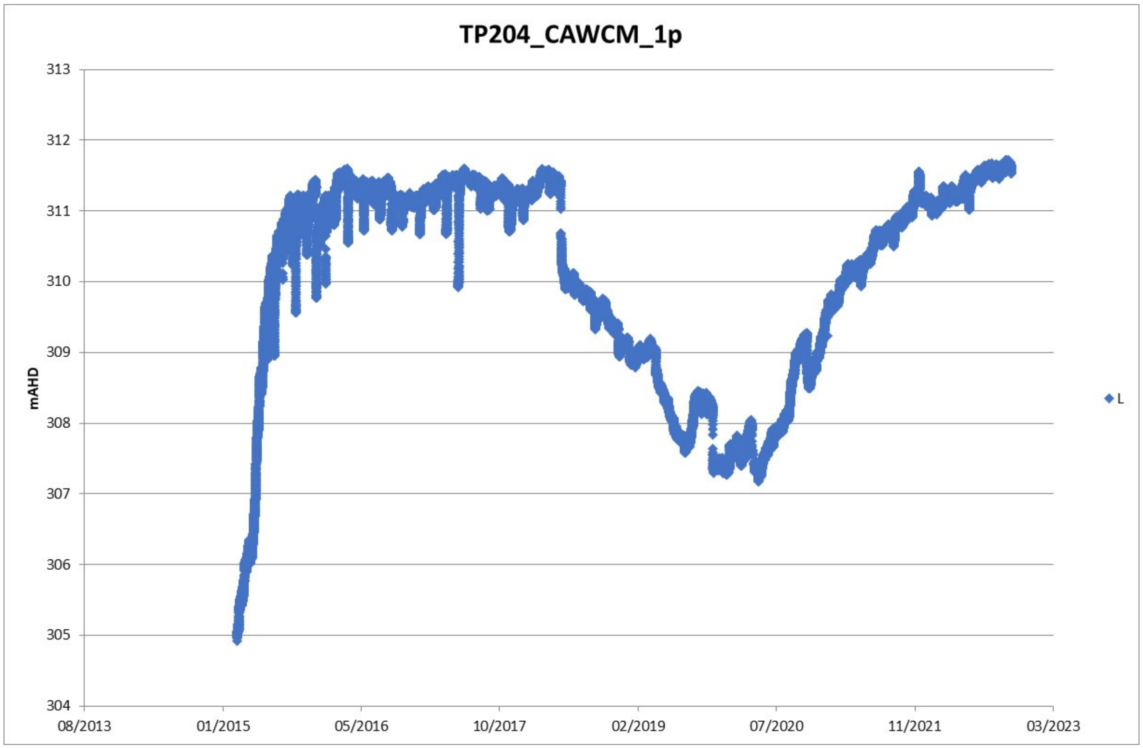
TP204_CAWCM_1p
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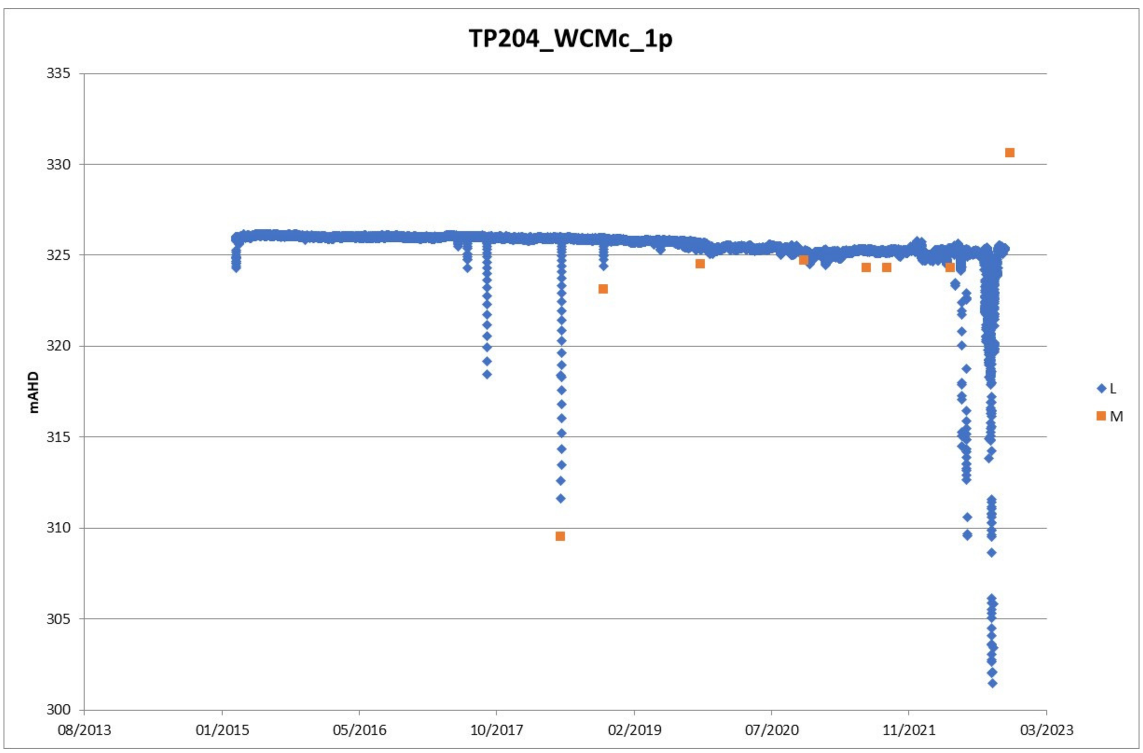
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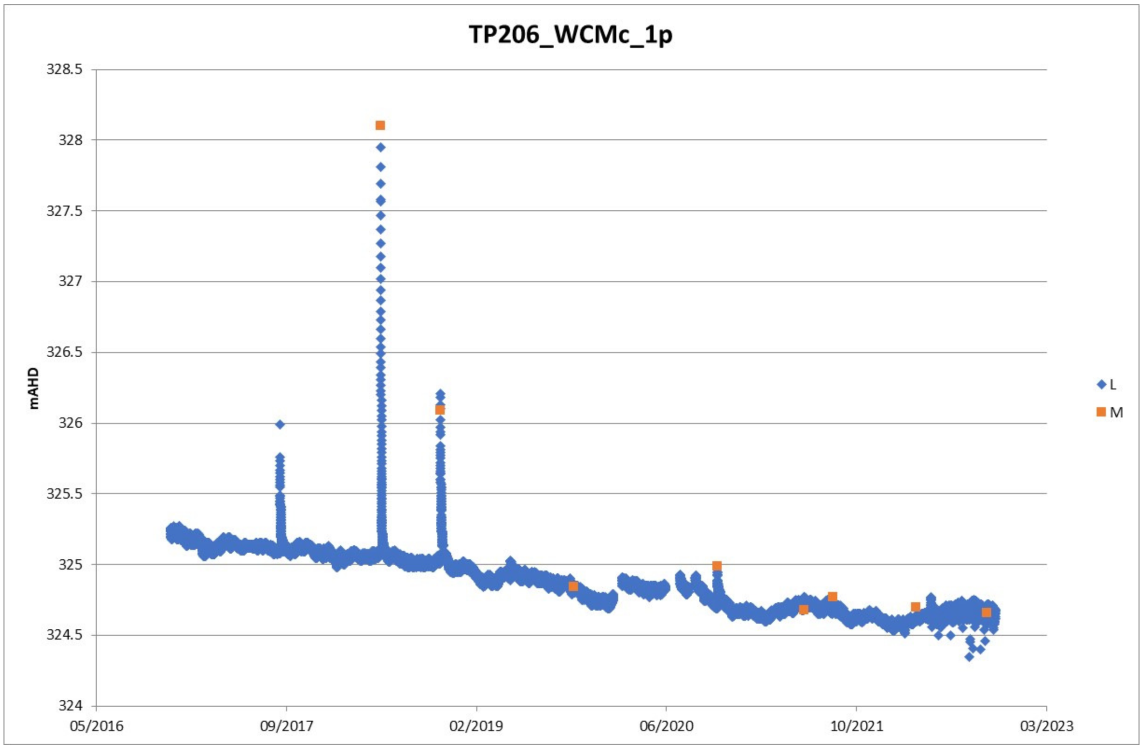
TP206_WCMc_1p
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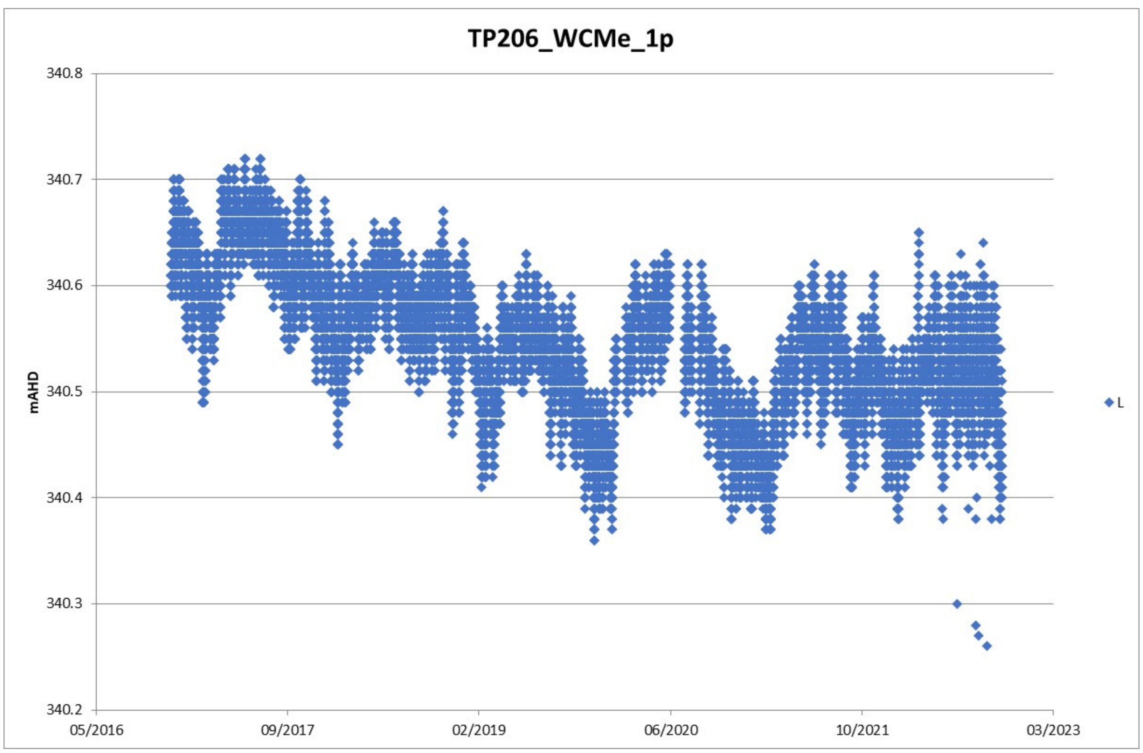
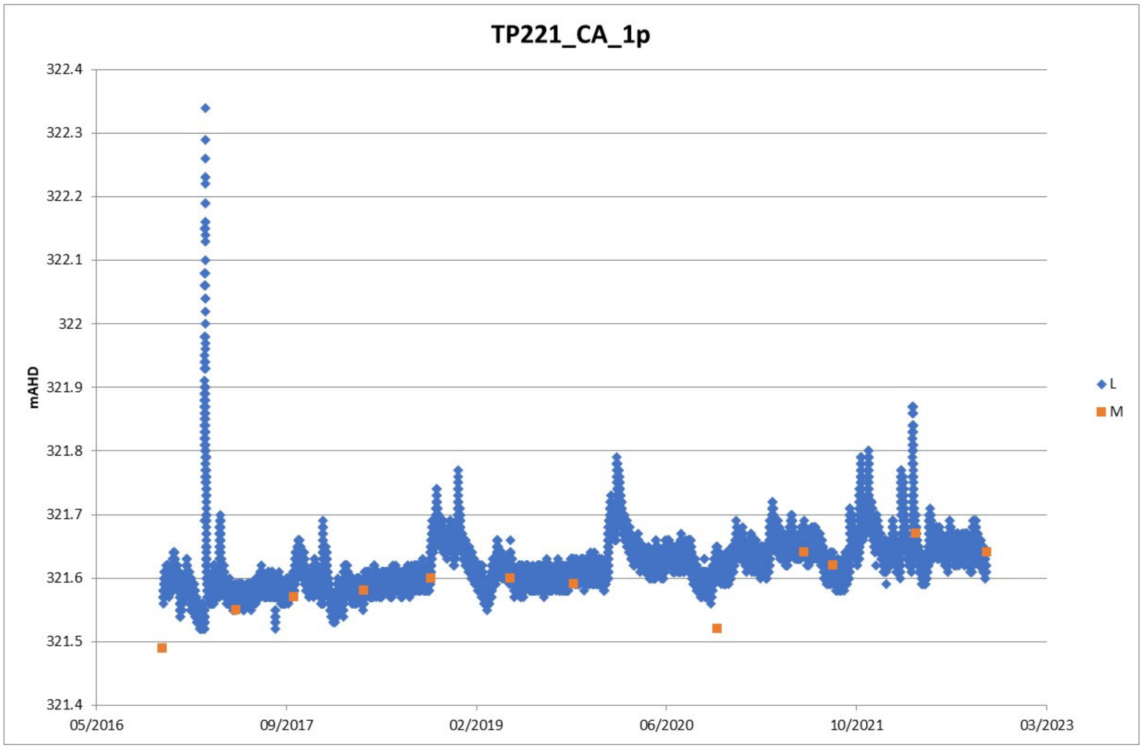
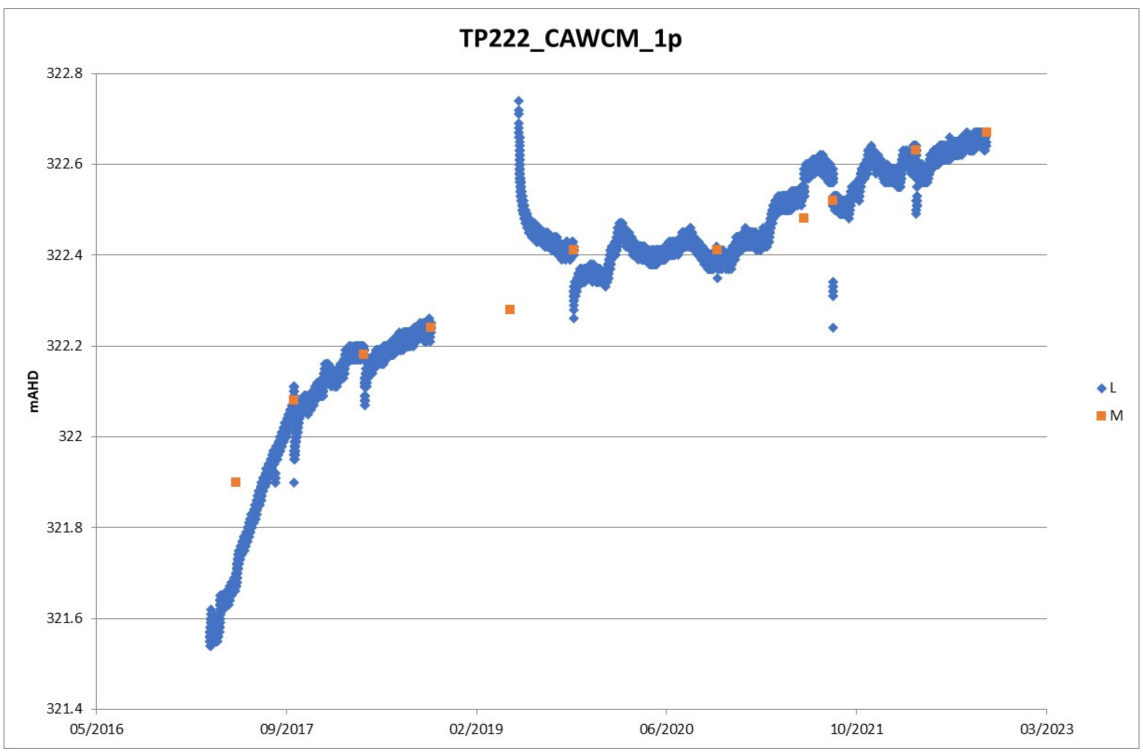
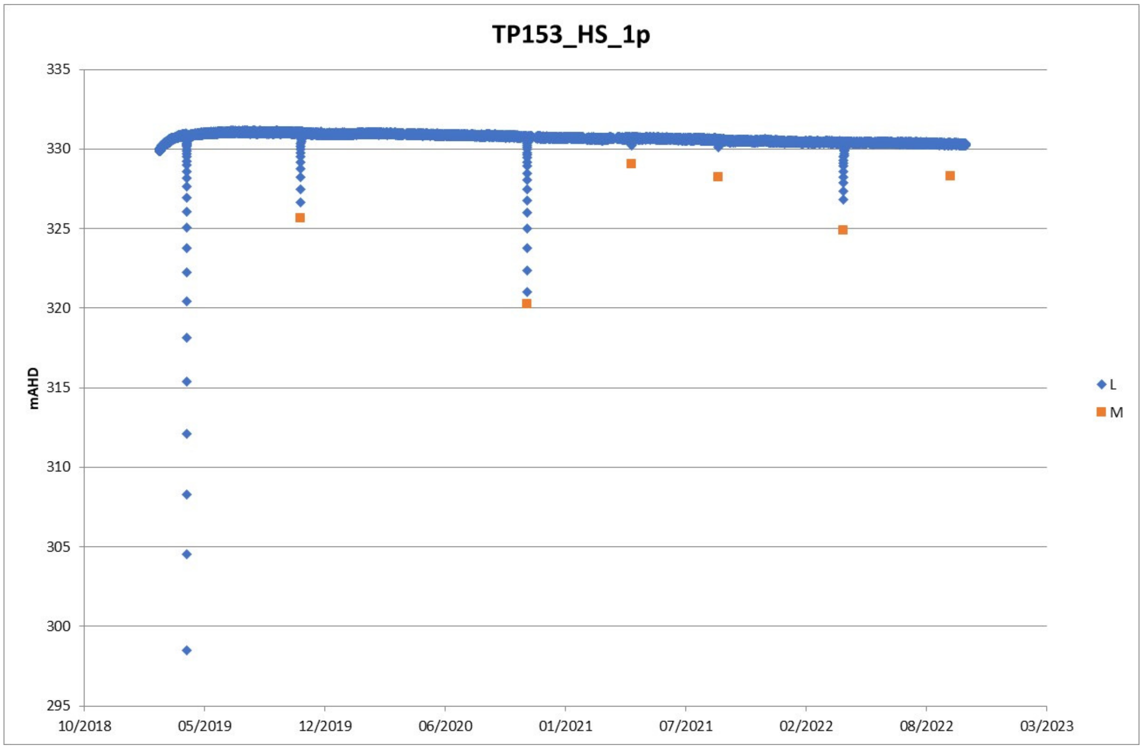
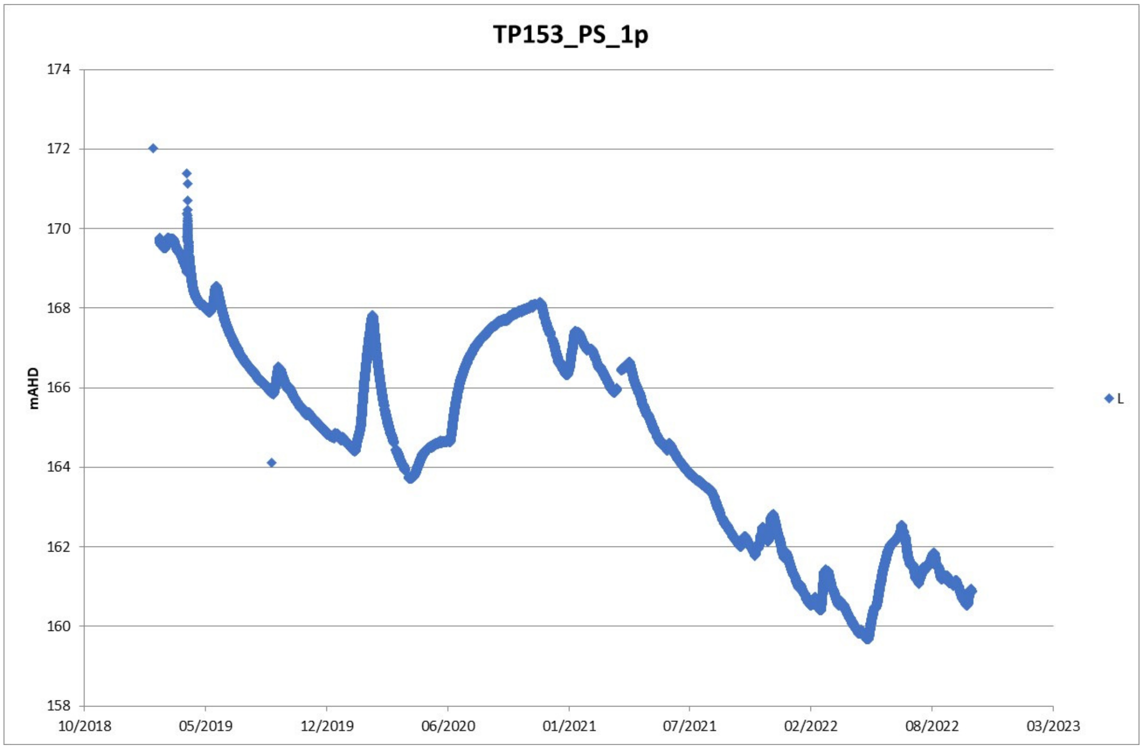
L
M

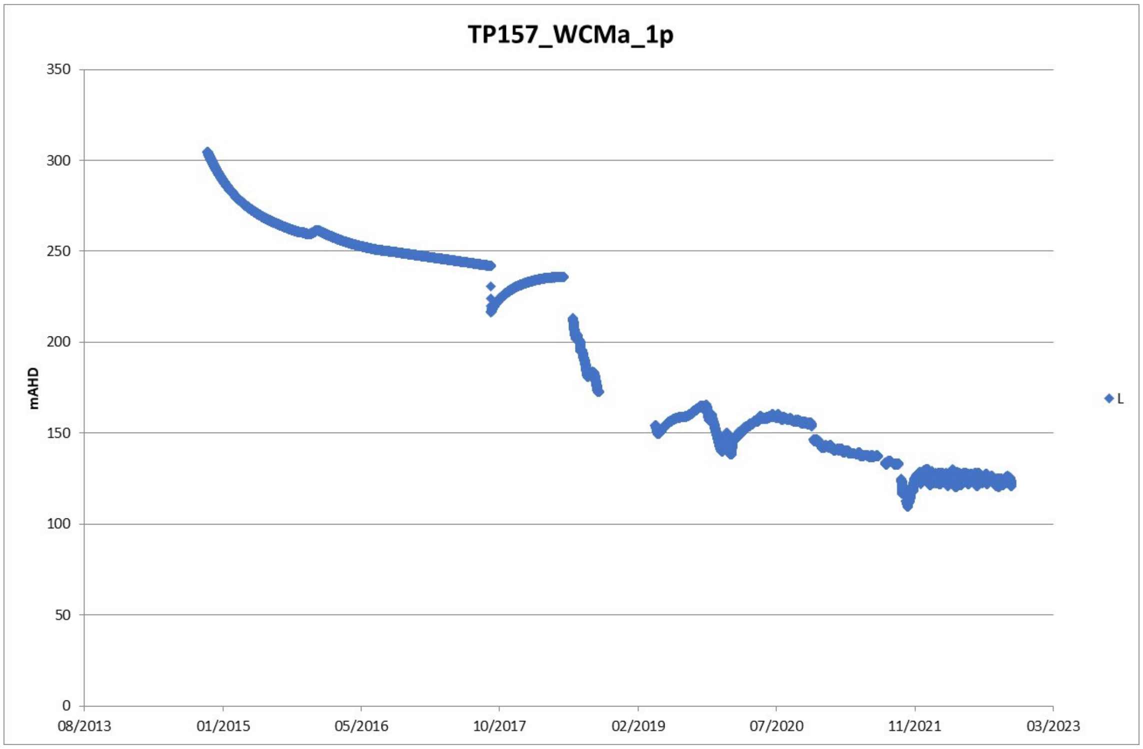

TP206_WCMe_1p
340.8
340.7
340.6
340.5
340.4
340.3
340.2
mAHD
05/2016
09/2017
02/2019
06/2020
10/2021
03/2023
L

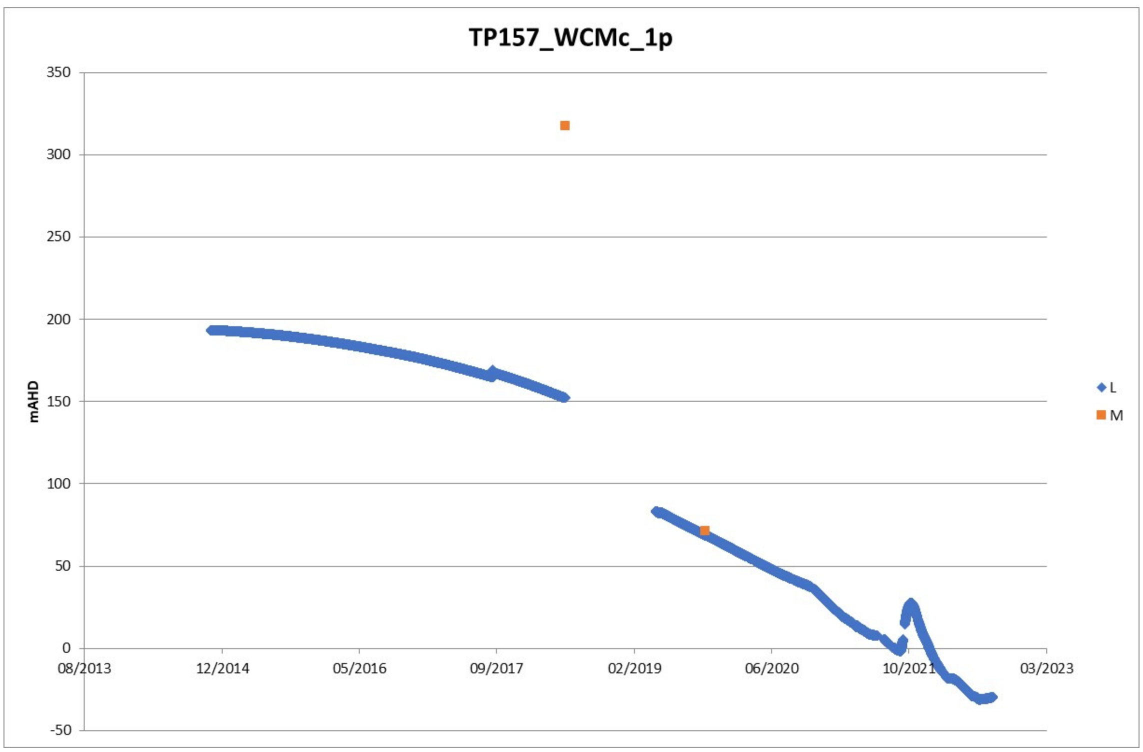

TP221_CA_1p
mAHD
322.4
322.3
322.2
322.1
322
321.9
321.8
321.7
321.6
321.5
321.4
05/2016
09/2017
02/2019
06/2020
10/2021
03/2023
L
M

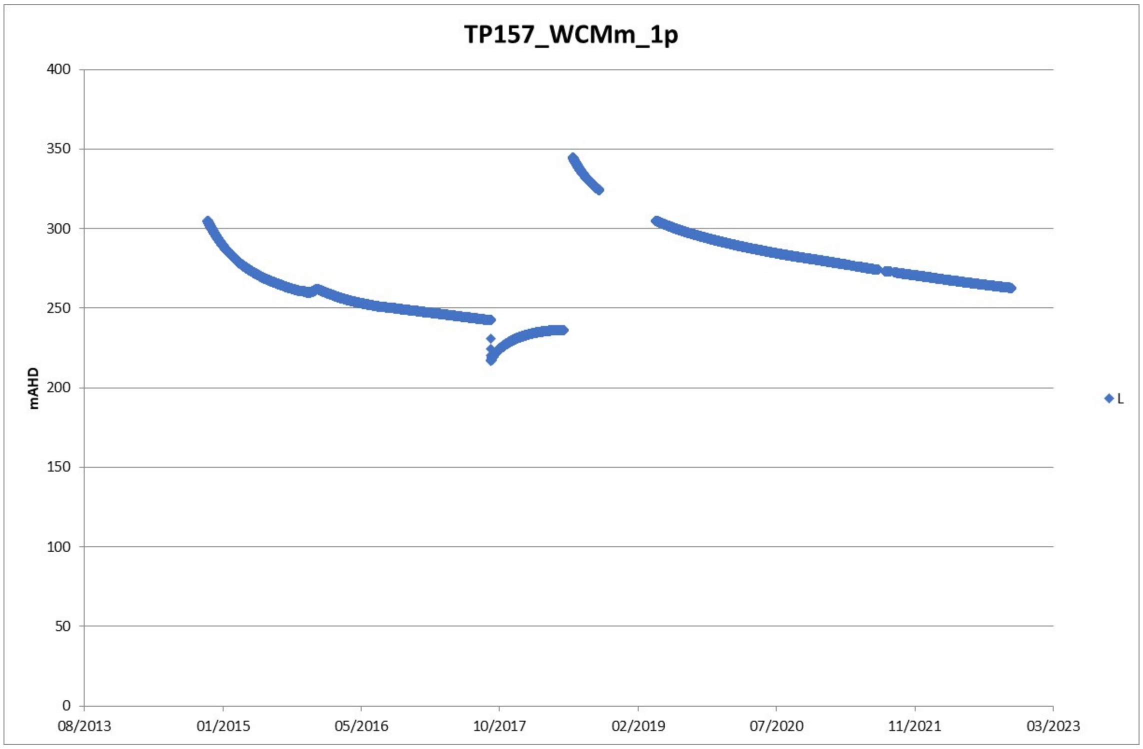

TP222_CAWCM_1p
mAHD
322.8
322.6
322.4
322.2
322
321.8
321.6
321.4
05/2016
09/2017
02/2019
06/2020
10/2021
03/2023
L
M

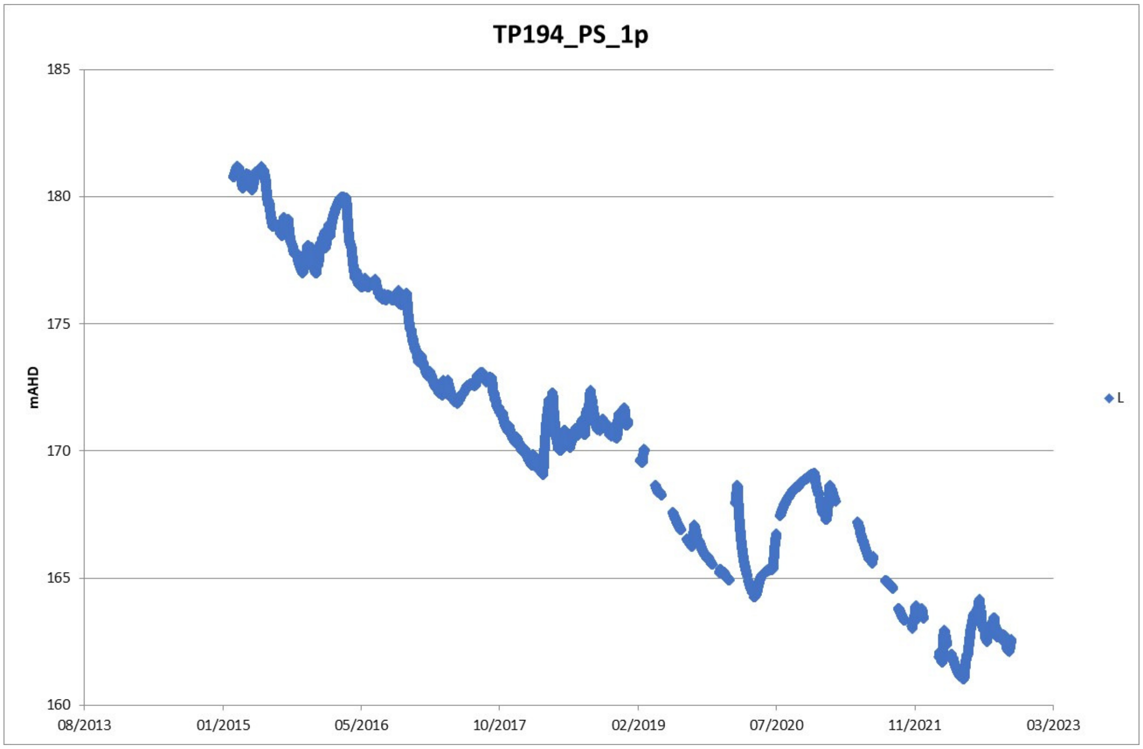

TP153_HS_1p
mAHD
335
330
325
320
315
310
305
300
295
10/2018
05/2019
12/2019
06/2020
01/2021
07/2021
02/2022
08/2022
03/2023
L
M

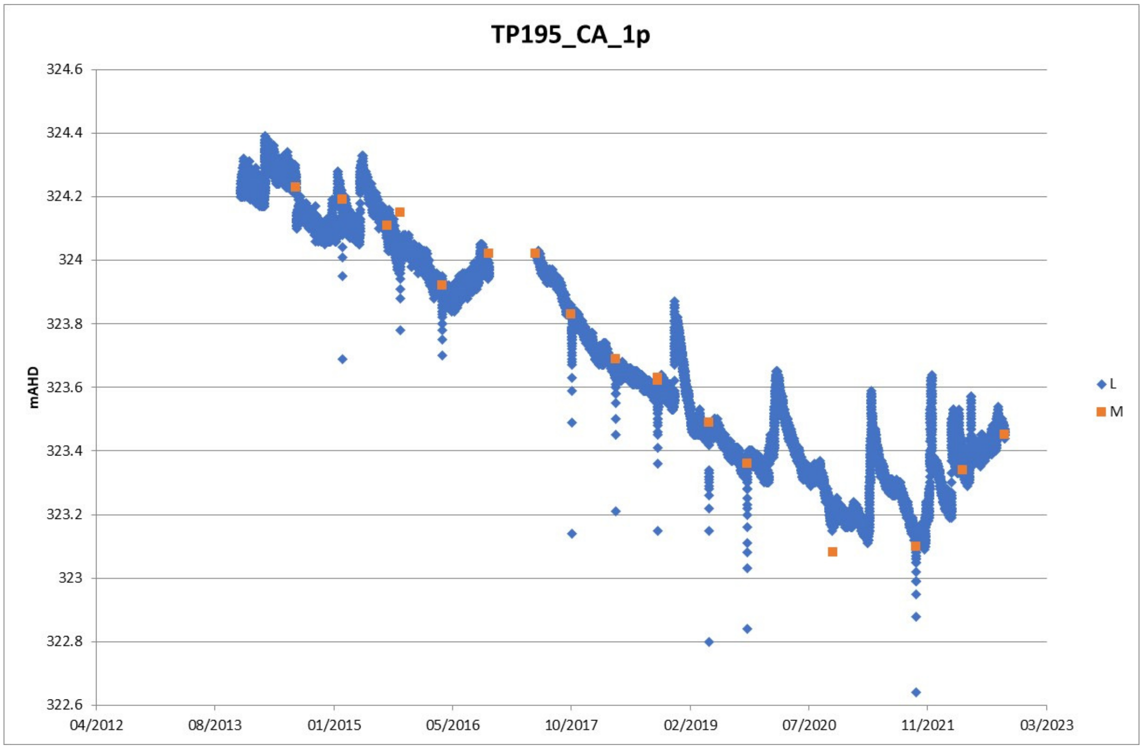

TP153_PS_1p
mAHD
174
172
170
168
166
164
162
160
158
10/2018
05/2019
12/2019
06/2020
01/2021
07/2021
02/2022
08/2022
03/2023
L

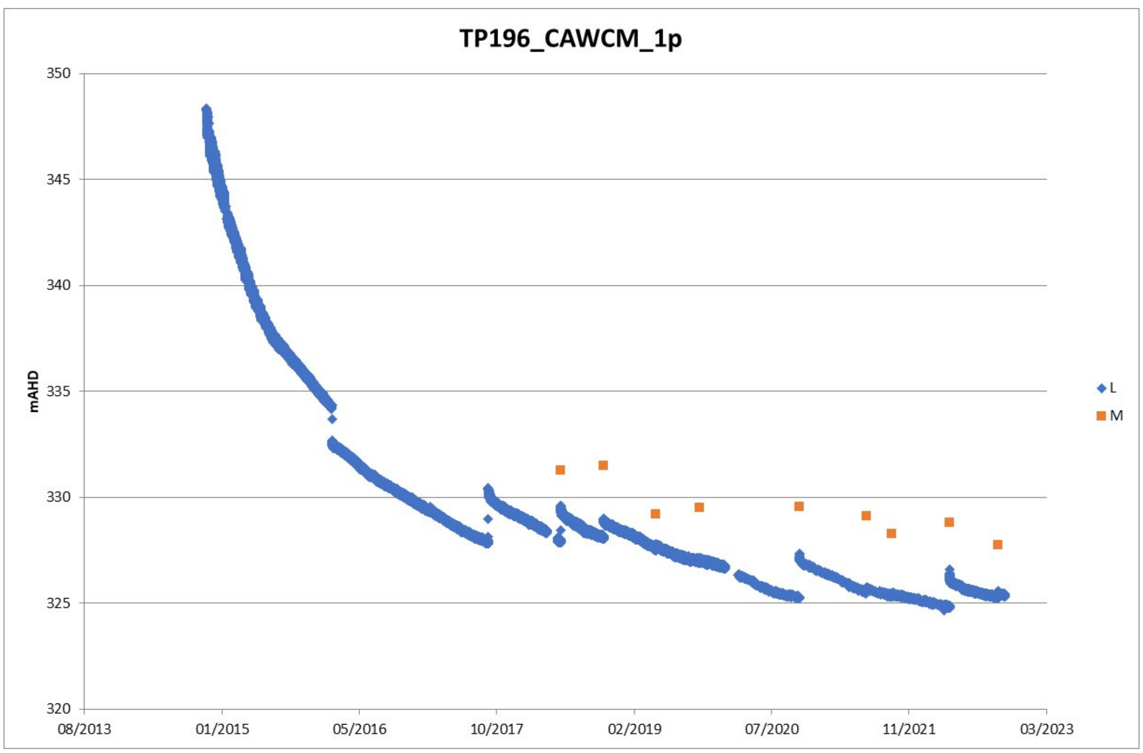

TP157_WCMa_1p
mAHD
350
300
250
200
150
100
50
0
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L


TP157_WCMc_1p
mAHD
350
300
250
200
150
100
50
0
-50
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
03/2023
L
M

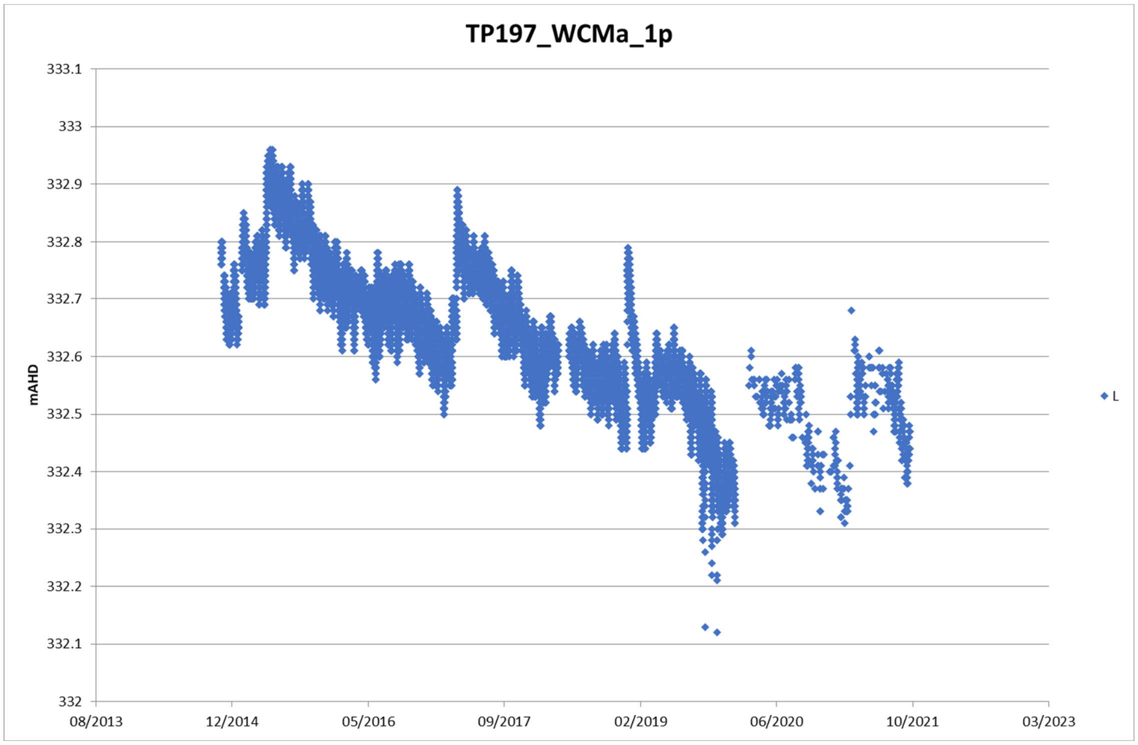

TP157_WCMm_1p
400
350
300
250
200
150
100
50
0
mAHD
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L

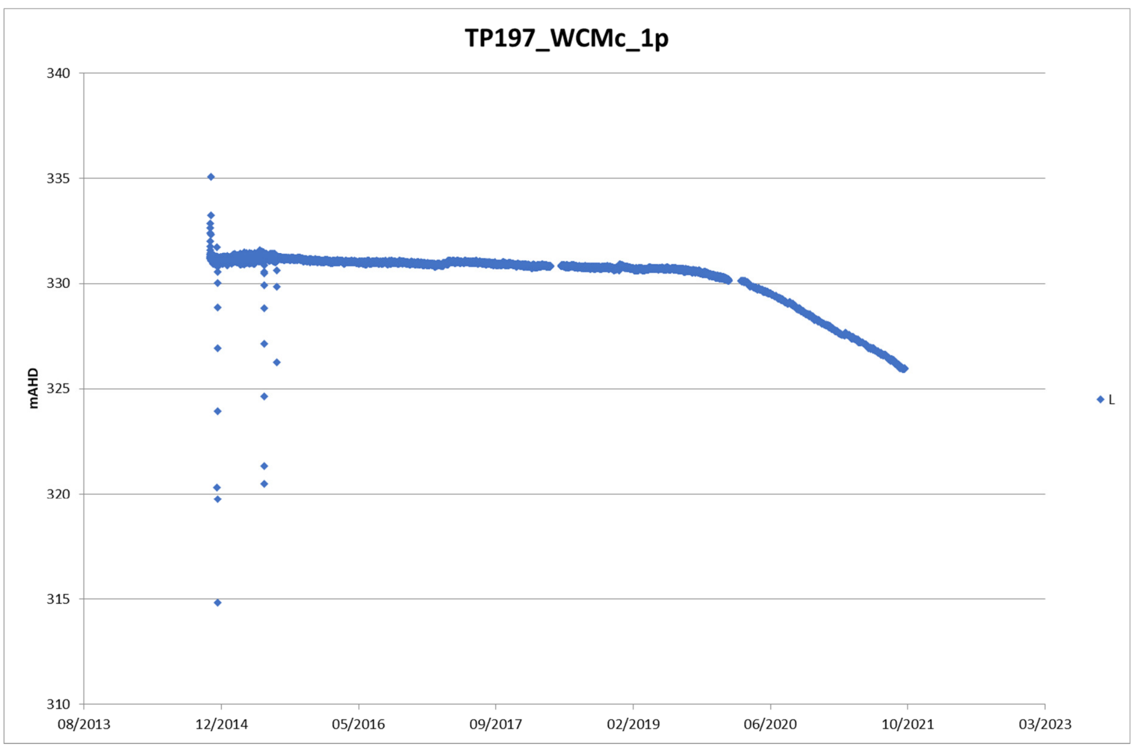

TP194_PS_1p
185
180
175
170
165
160
mAHD
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L

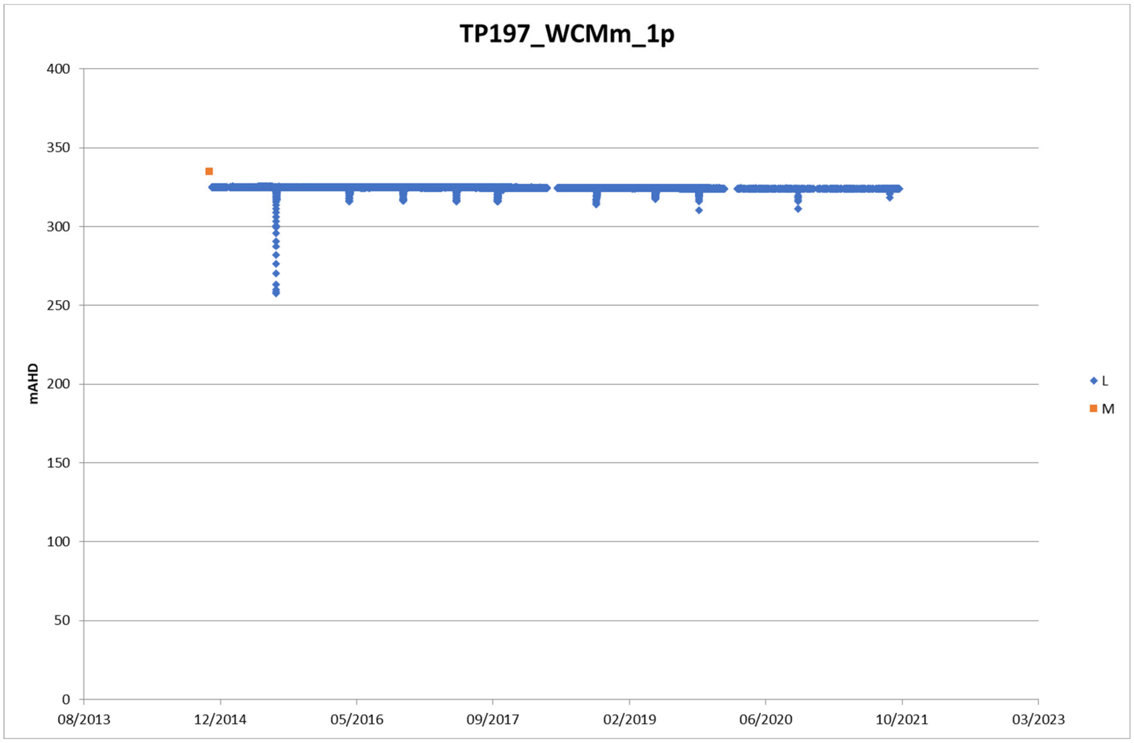


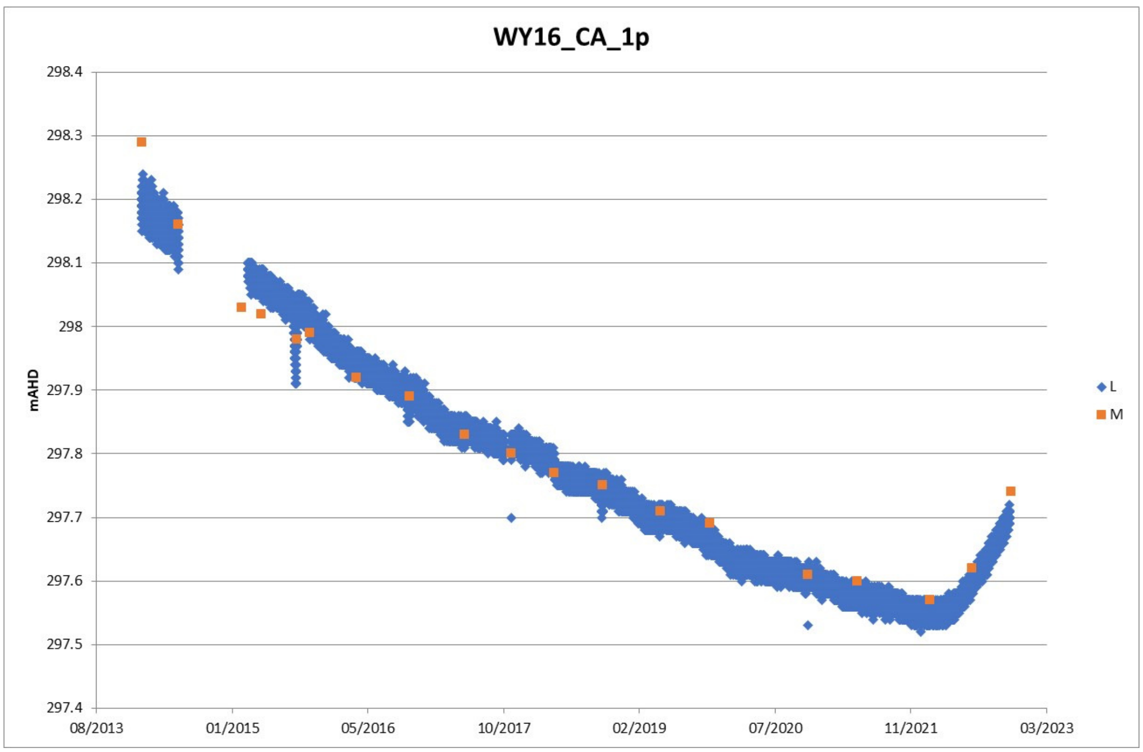


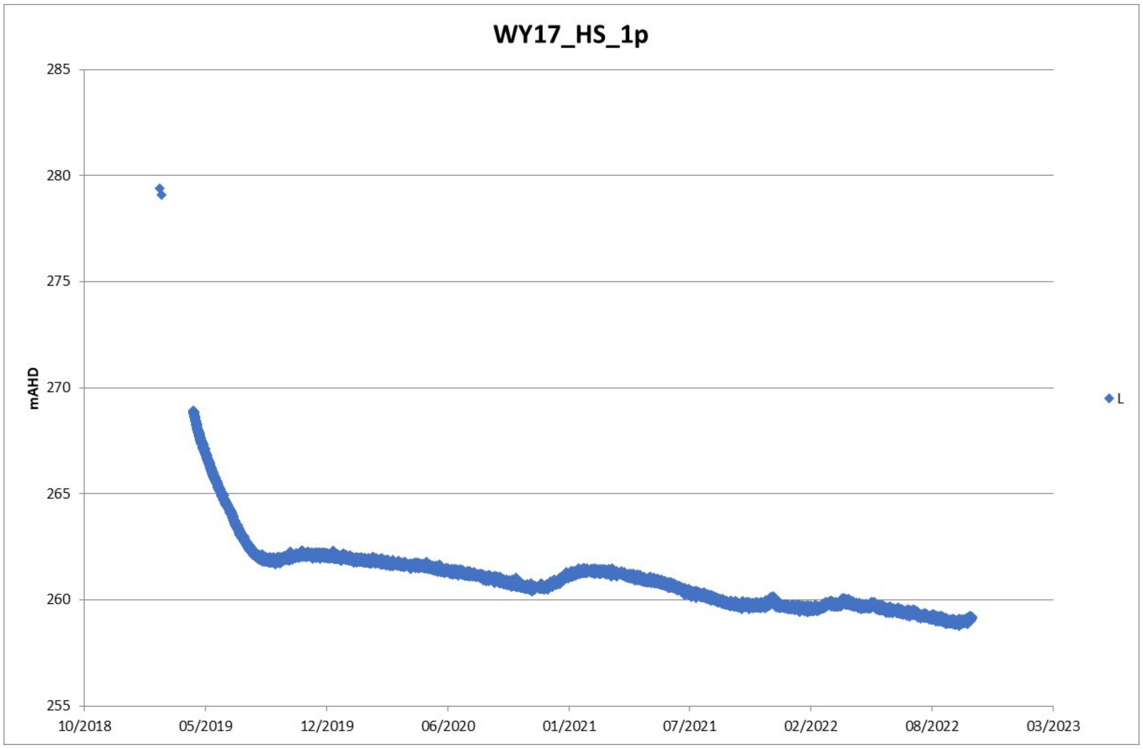
arrow energy
go further

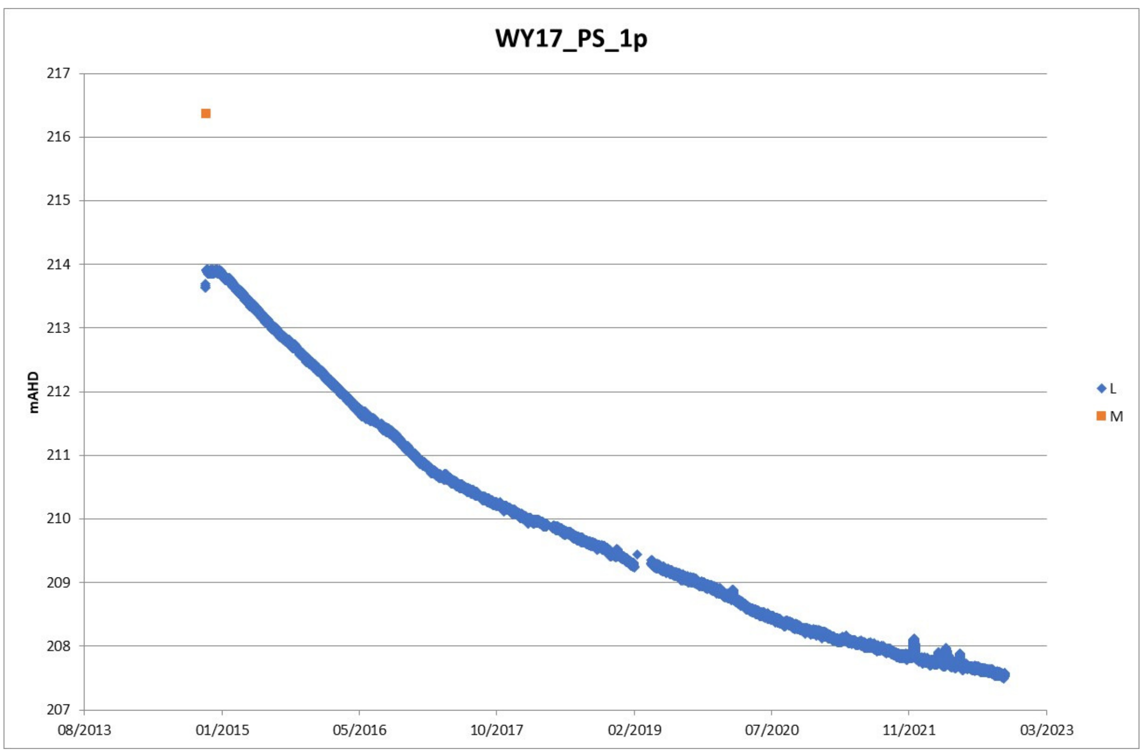

TP197_WCMa_1p
mAHD
333.1
333
332.9
332.8
332.7
332.6
332.5
332.4
332.3
332.2
332.1
332
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
03/2023
L

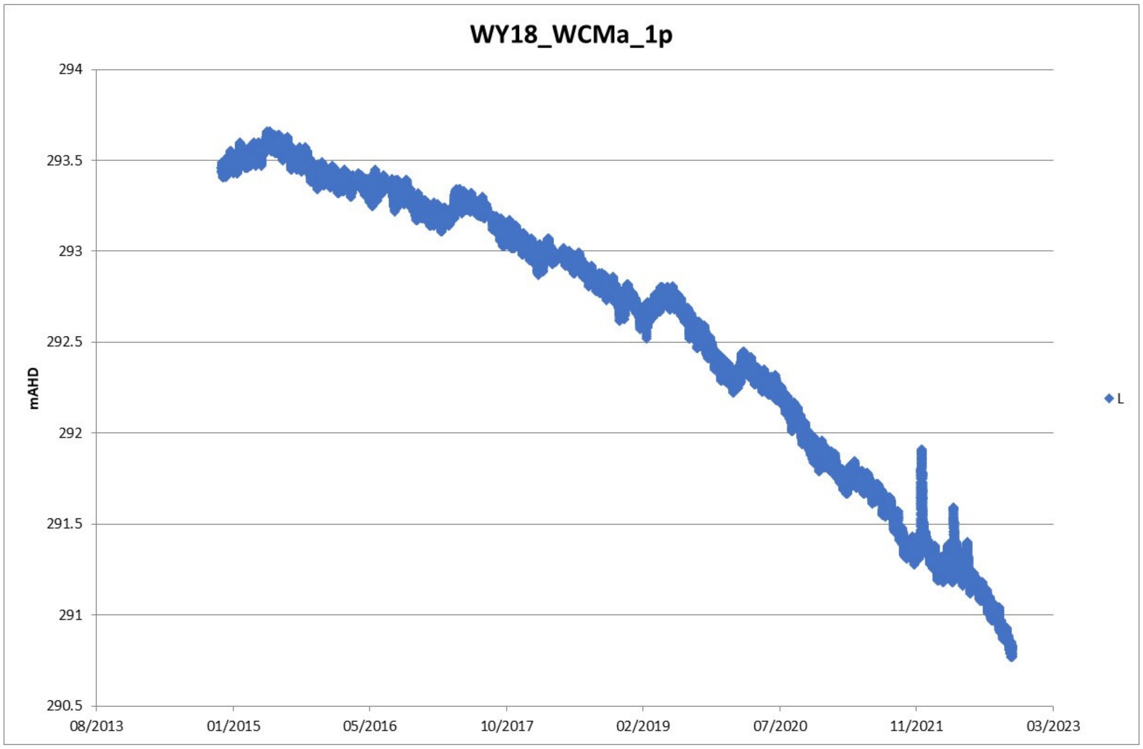

TP197_WCMc_1p
mAHD
340
335
330
325
320
315
310
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
03/2023
L

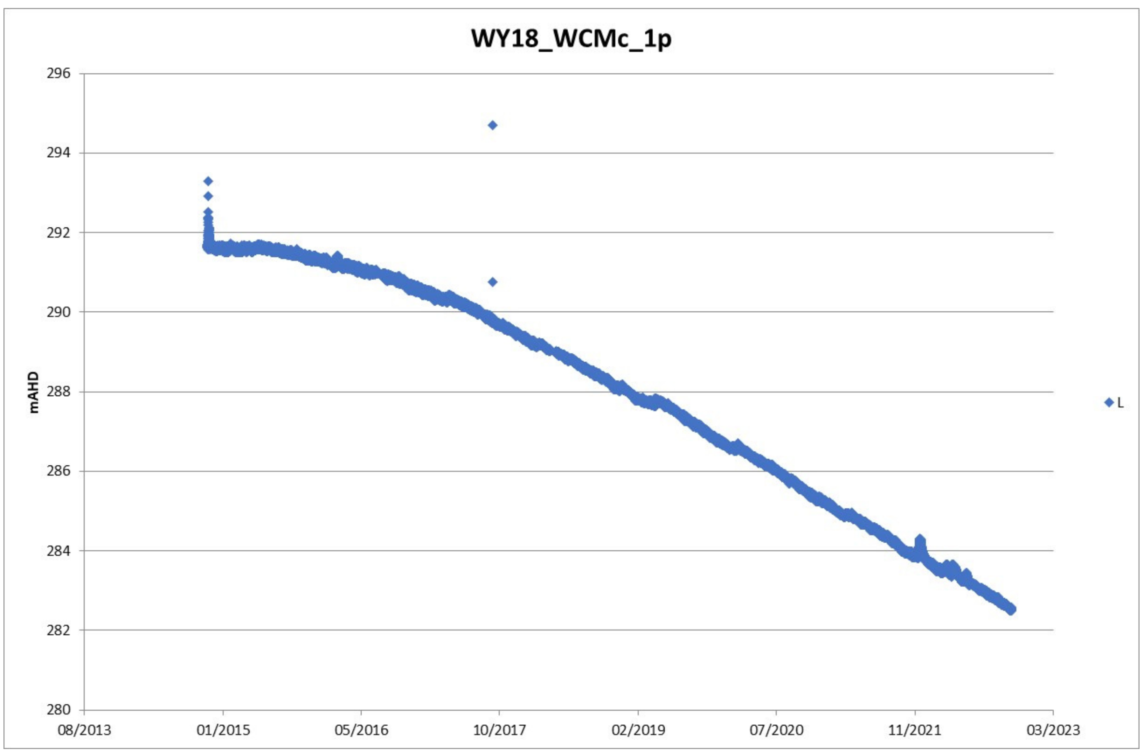

TP197_WCMm_1p
400
350
300
250
200
150
100
50
0
mAHD
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
03/2023
L
M

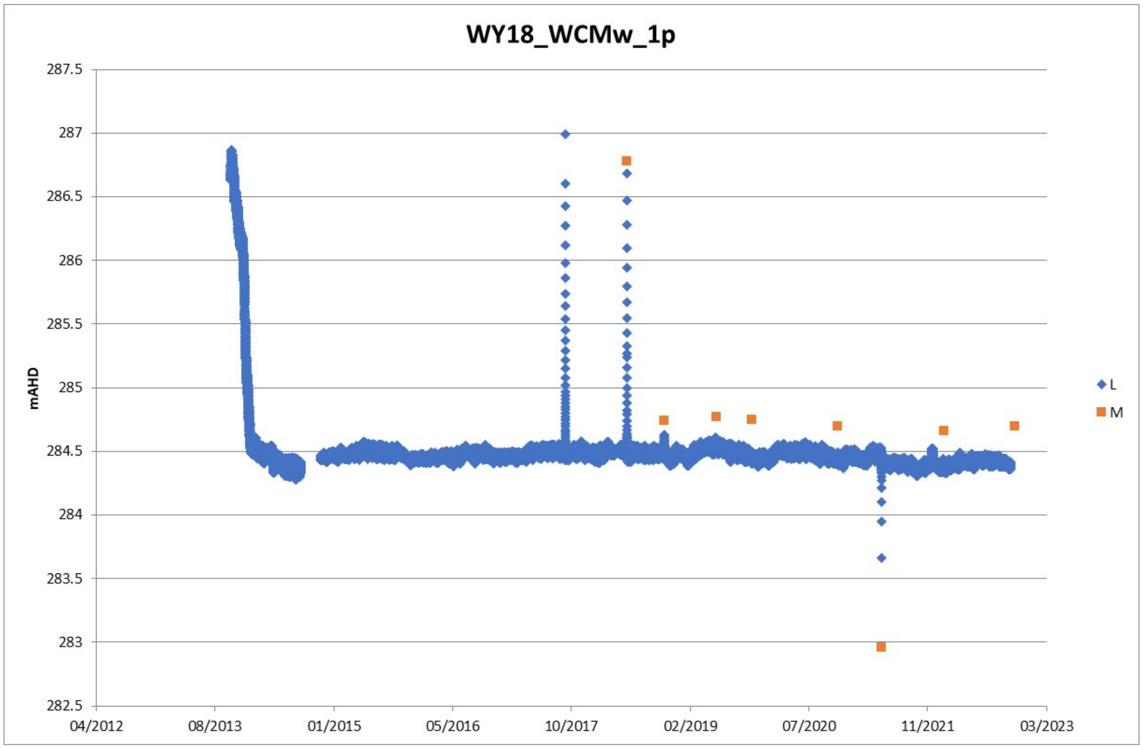

WY16_CA_1p
298.4
298.3
298.2
298.1
298
297.9
297.8
297.7
297.6
297.5
297.4
mAHD
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L
M

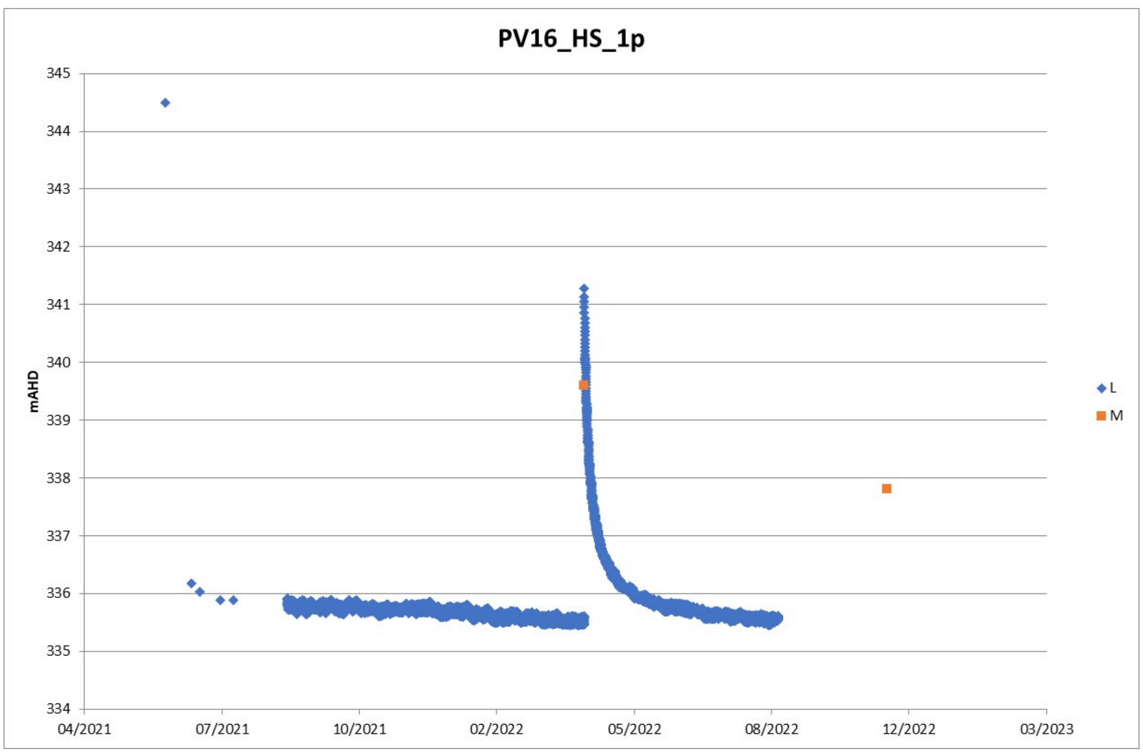

WY17_HS_1p
mAHD
285
280
275
270
265
260
255
10/2018
05/2019
12/2019
06/2020
01/2021
07/2021
02/2022
08/2022
03/2023
L

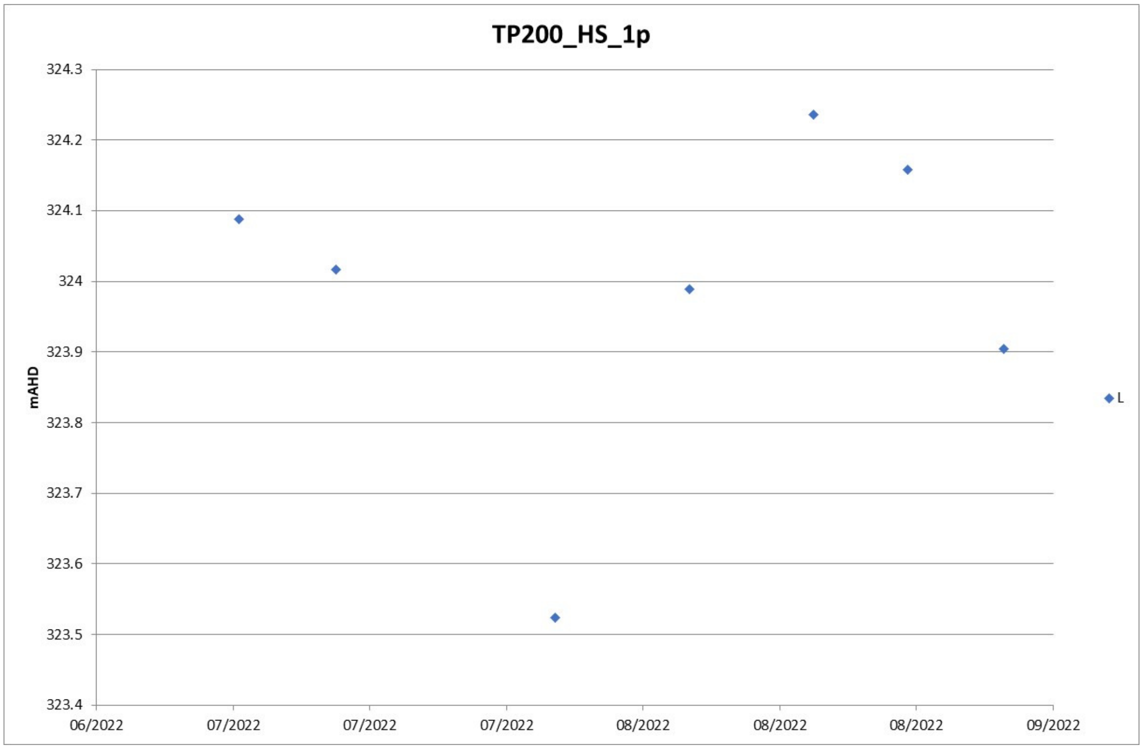

WY17_PS_1p
mAHD
217
216
215
214
213
212
211
210
209
208
207
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L
M

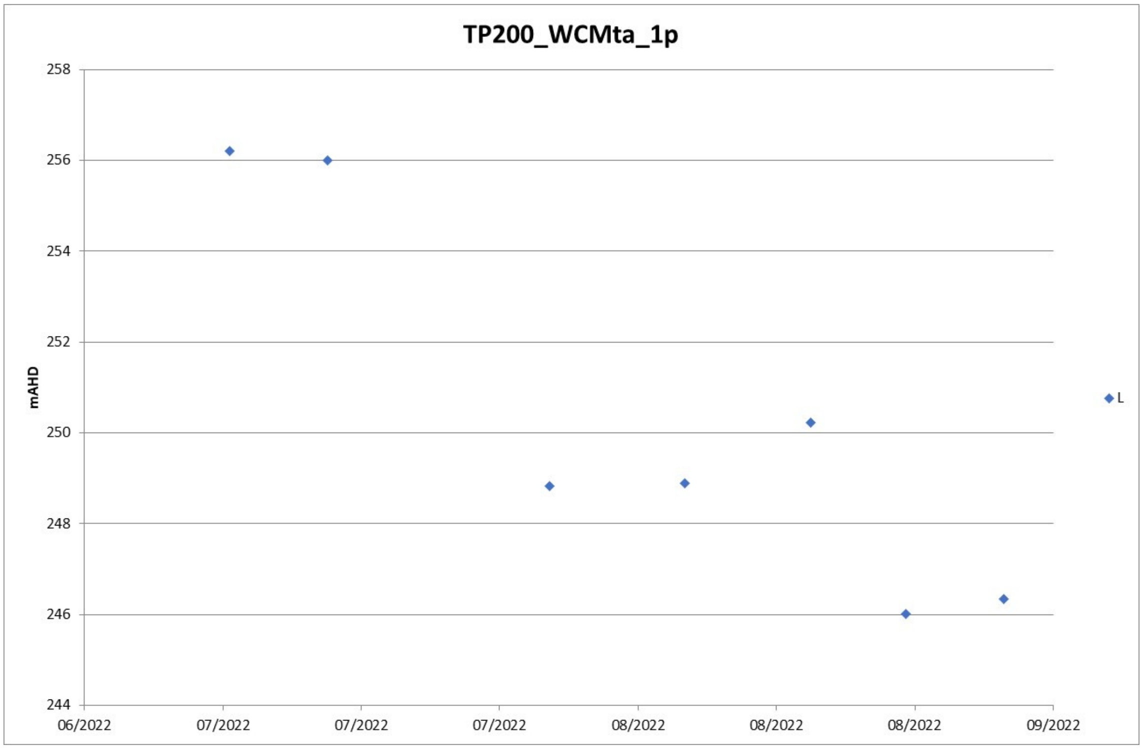

WY18_WCMa_1p
294
293.5
293
292.5
292
291.5
291
290.5
mAHD
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L


WY18_WCMc_1p
296
294
292
290
288
286
284
282
280
mAHD
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L


WY18_WCMw_1p
mAHD
287.5
287
286.5
286
285.5
285
284.5
284
283.5
283
282.5
04/2012
08/2013
01/2015
05/2016
10/2017
02/2019
07/2020
11/2021
03/2023
L
M


PV16_HS_1p
mAHD
345
344
343
342
341
340
339
338
337
336
335
334
04/2021
07/2021
10/2021
02/2022
05/2022
08/2022
12/2022
03/2023
L
M


TP200_HS_1p
mAHD
324.3
324.2
324.1
324
323.9
323.8
323.7
323.6
323.5
323.4
06/2022
07/2022
07/2022
07/2022
08/2022
08/2022
08/2022
09/2022
L


TP200_WCMta_1p
mAHD
258
256
254
252
250
248
246
244
06/2022
07/2022
07/2022
07/2022
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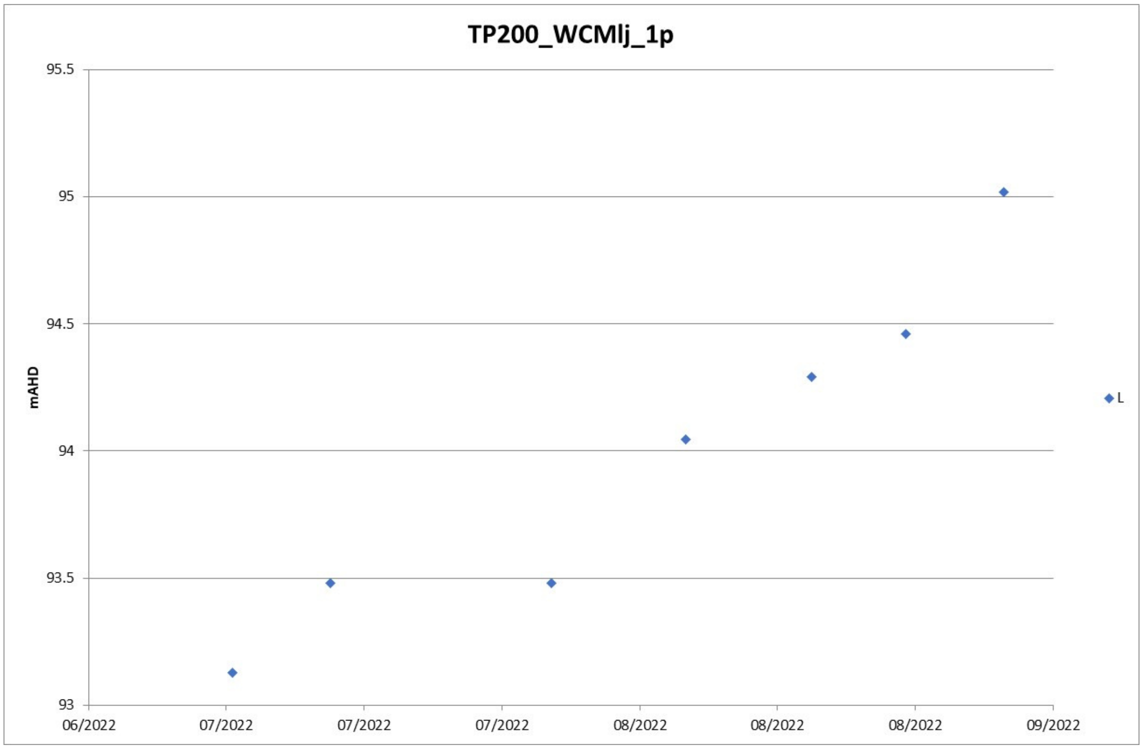
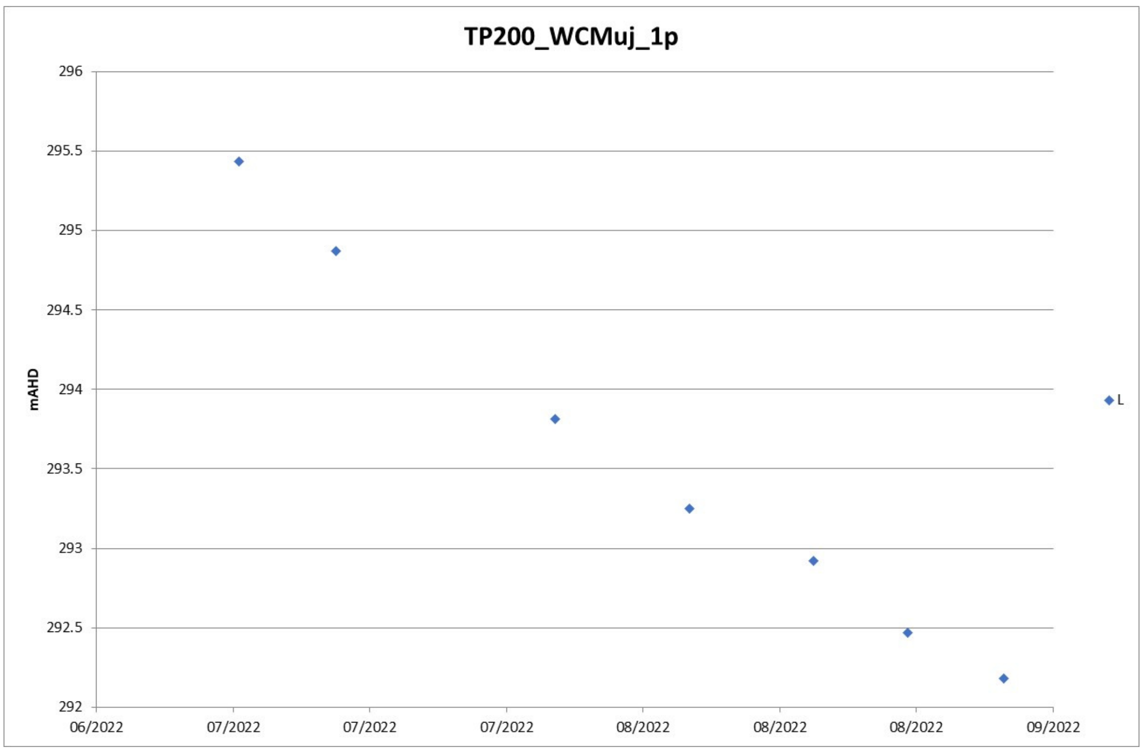
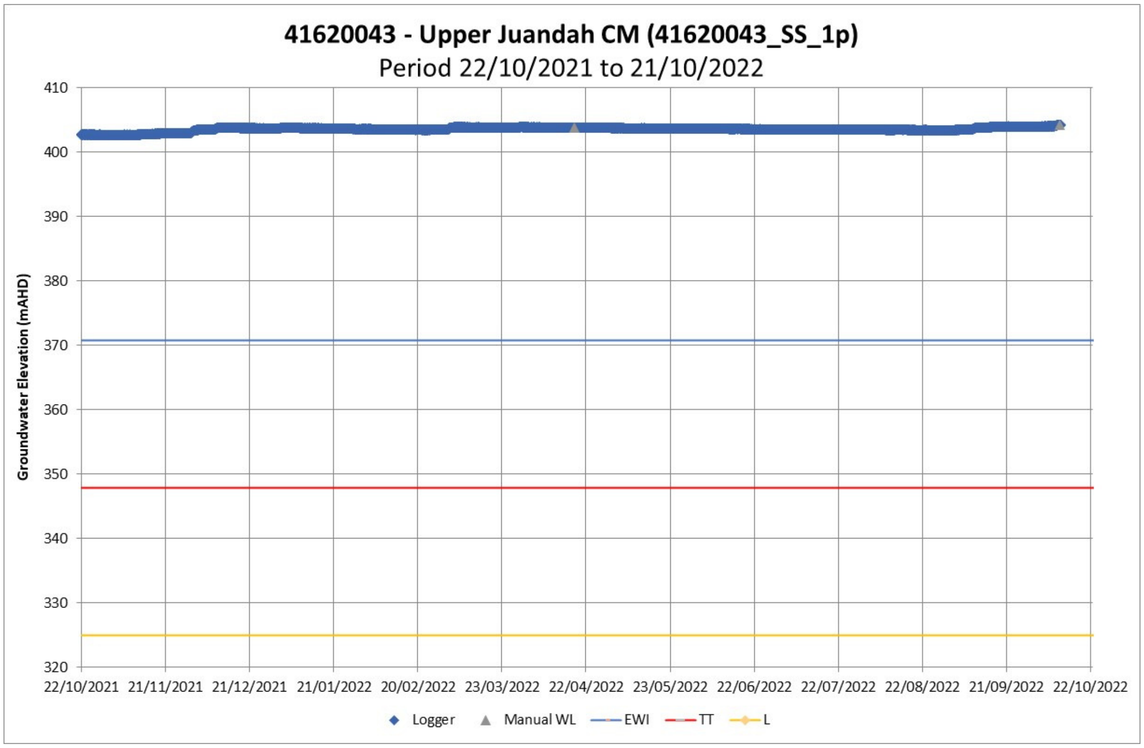
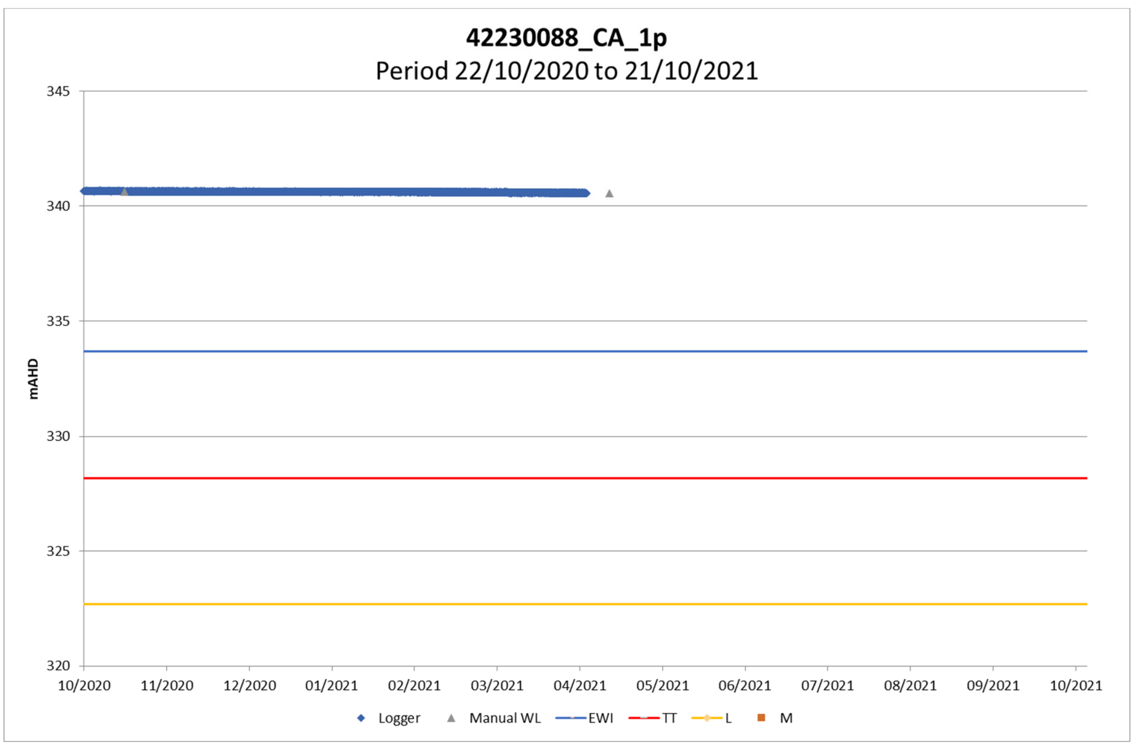
08/2022
08/2022
09/2022
L

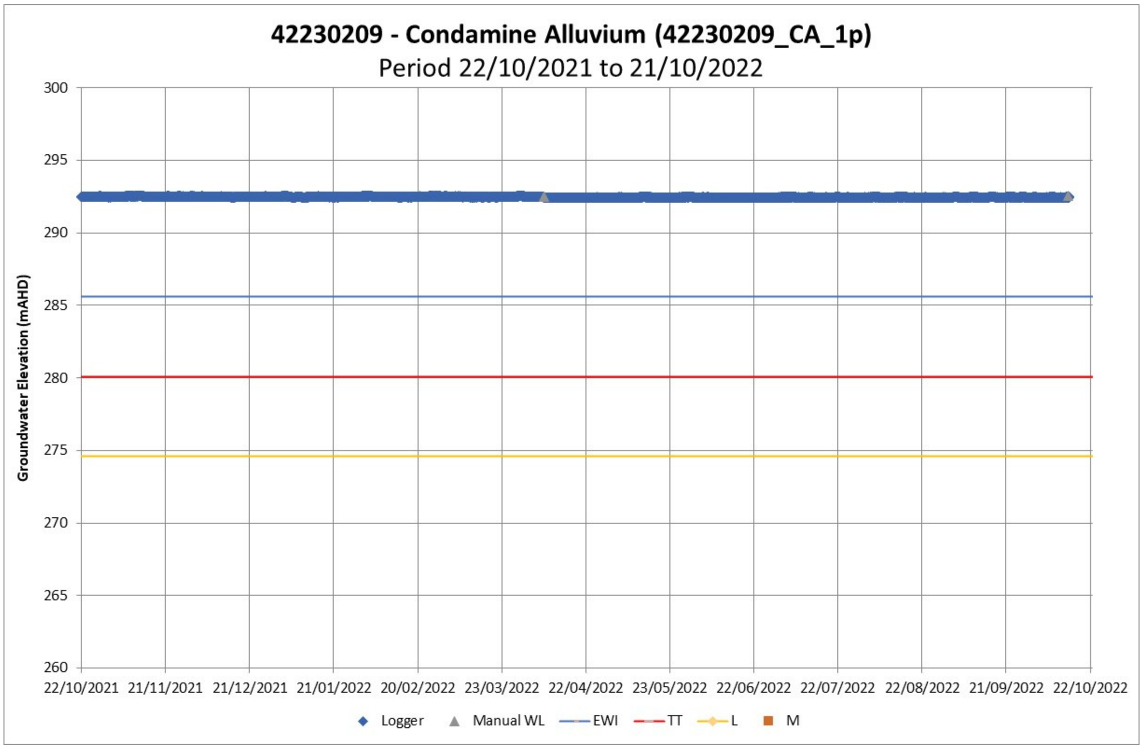

TP200_WCMlj_1p
95.5
95
94.5
94
93.5
93
mAHD
L
06/2022
07/2022
07/2022
07/2022
08/2022
08/2022
08/2022
09/2022

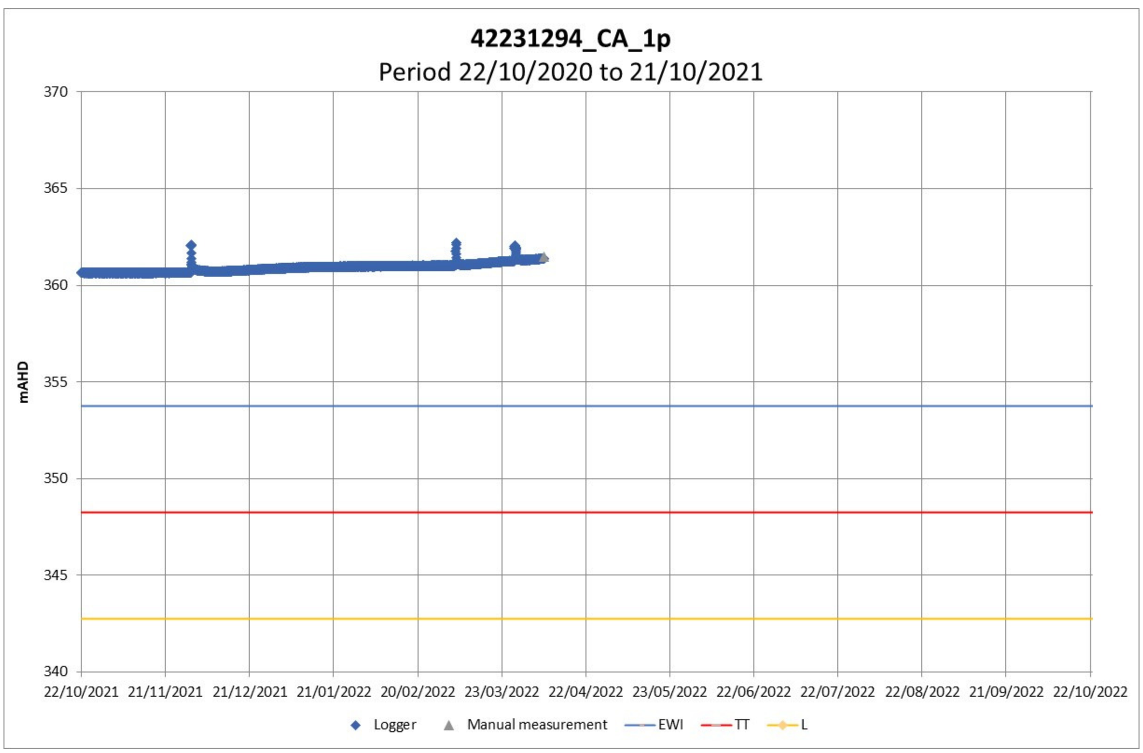

TP200_WCMuj_1p
296
295.5
295
294.5
294
293.5
293
292.5
292
mAHD
L
06/2022
07/2022
07/2022
07/2022
08/2022
08/2022
08/2022
09/2022

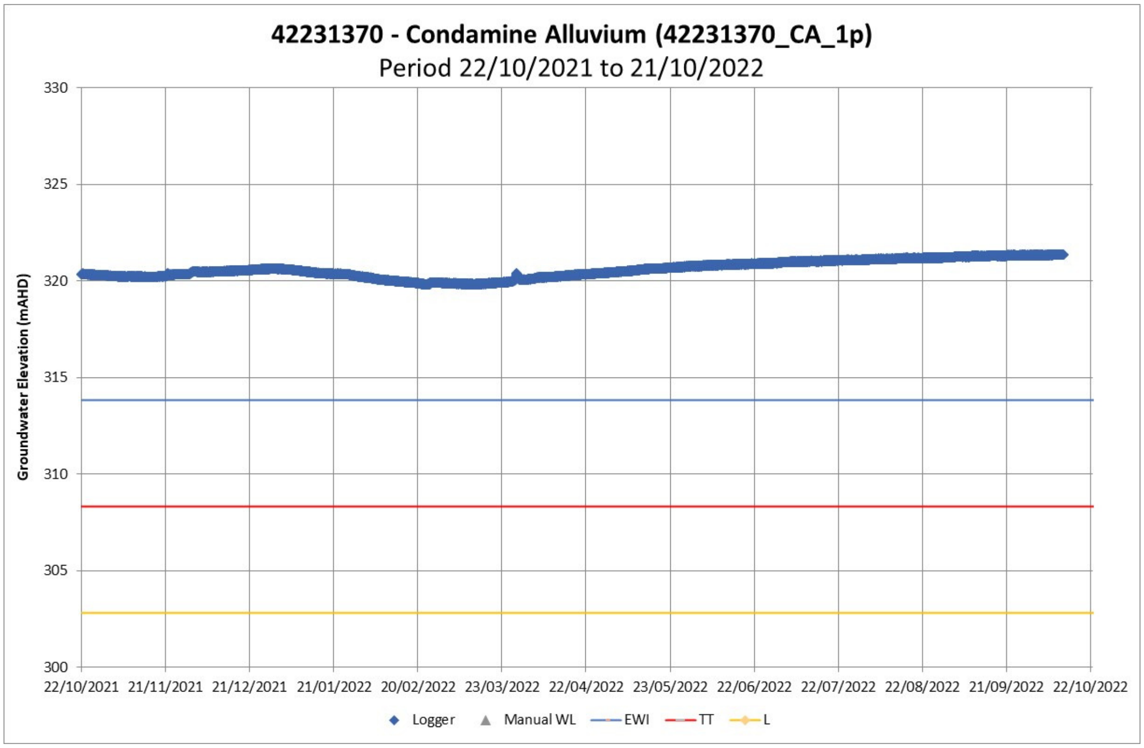
Early Warning Management System Hydrographs

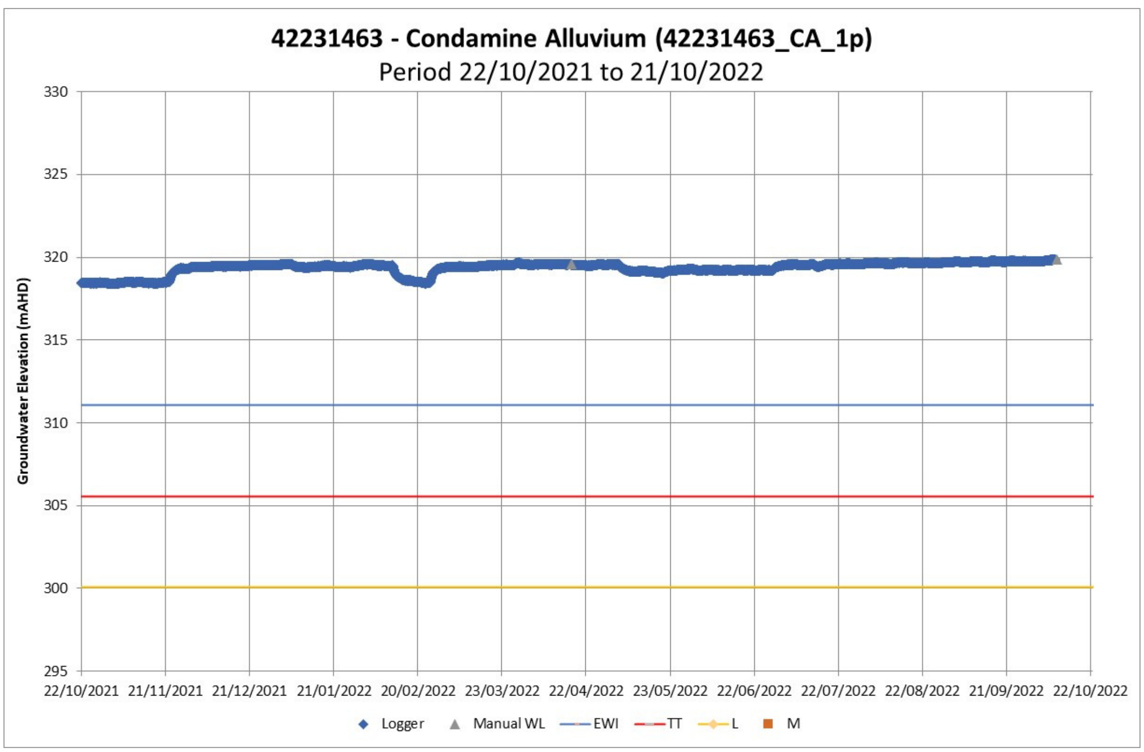


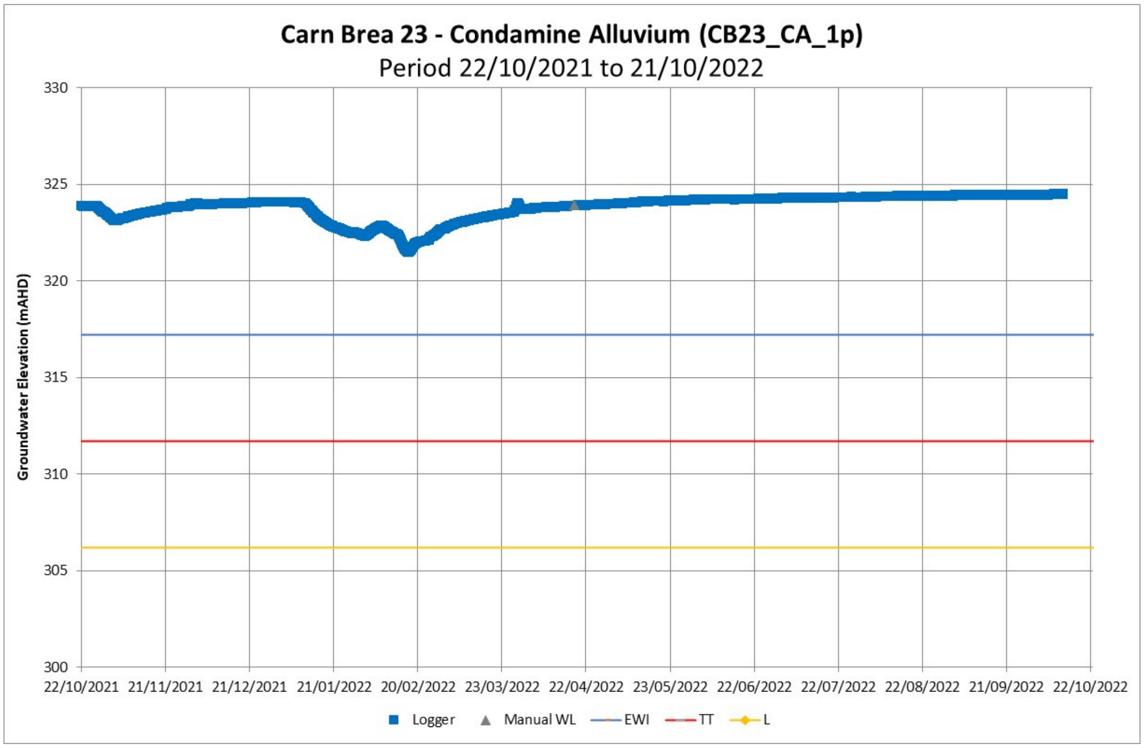


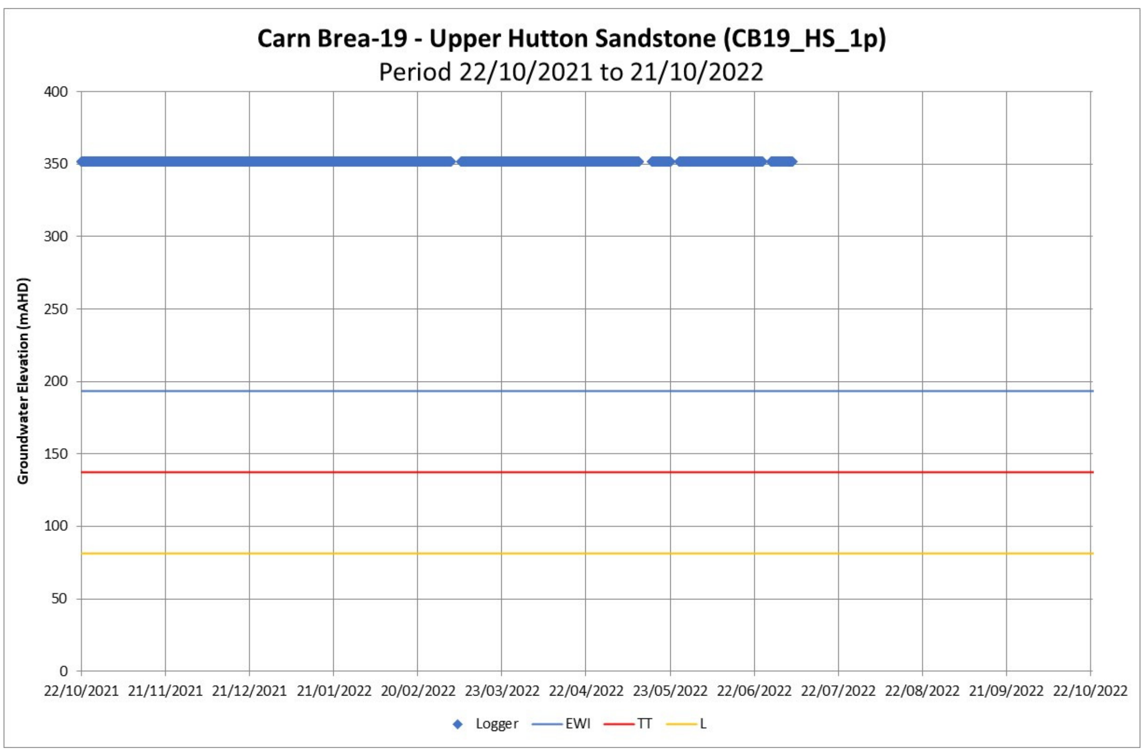

42230209 - Condamine Alluvium (42230209_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
300
295
290
285
280
275
270
265
260
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
Manual WL
EWI
TT
L
M

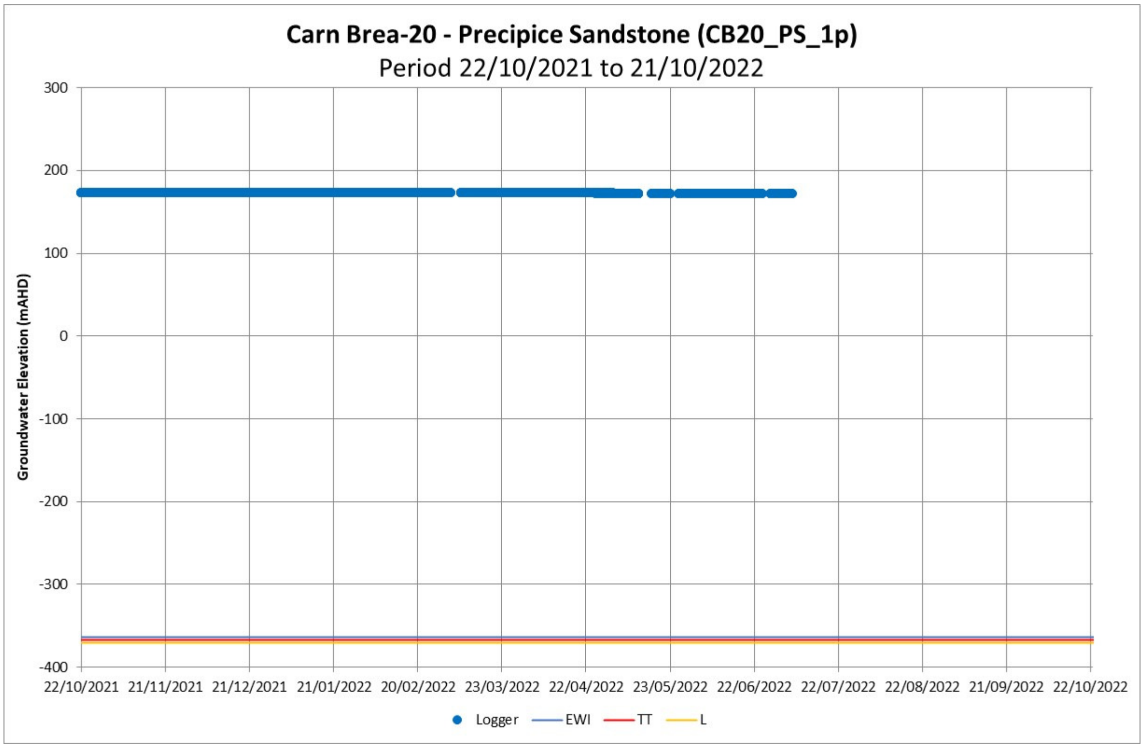

42231294_CA_1p
Period 22/10/2020 to 21/10/2021
mAHD
370
365
360
355
350
345
340
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
Manual measurement
EWI
TT
L

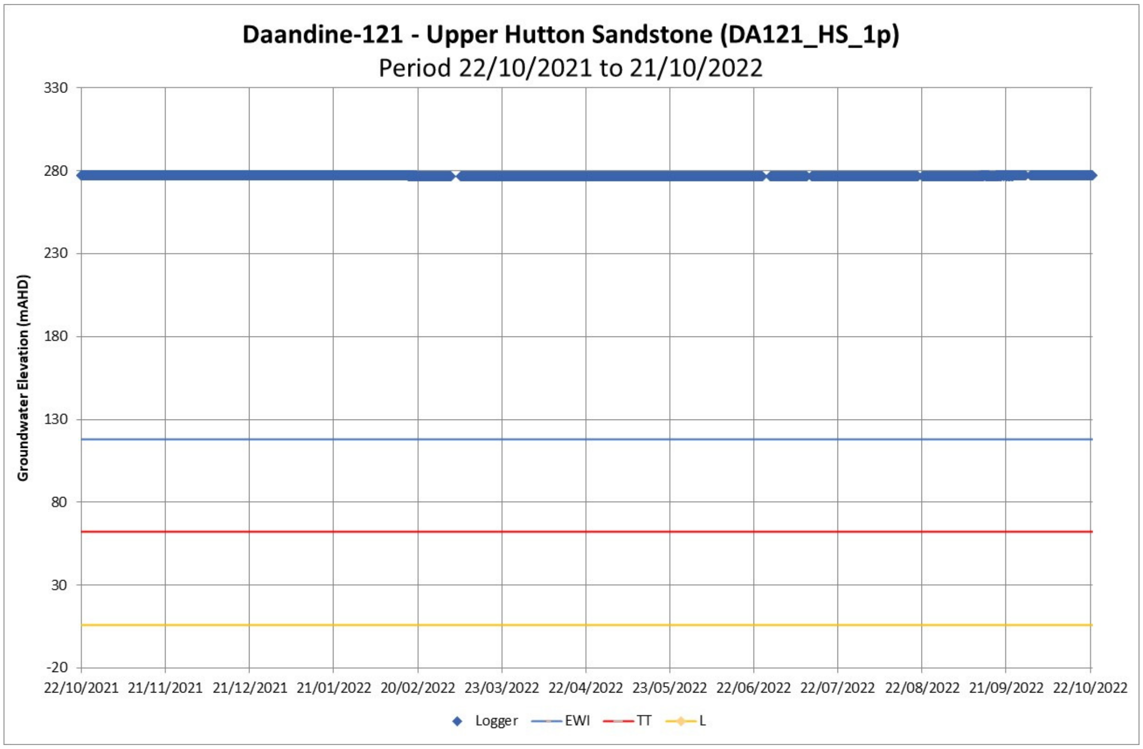

42231370 - Condamine Alluvium (42231370_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
330
325
320
315
310
305
300
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
Manual WL
EWI
TT
L

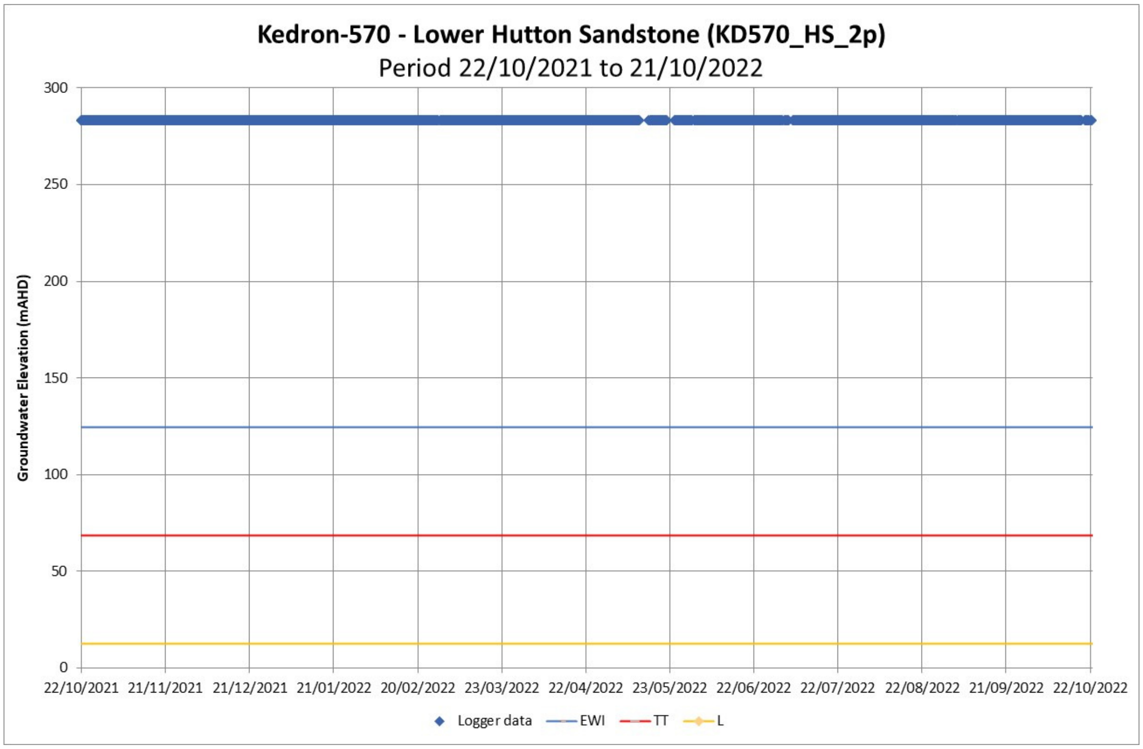

42231463 - Condamine Alluvium (42231463_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
330
325
320
315
310
305
300
295
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
Manual WL
EWI
TT
L
M

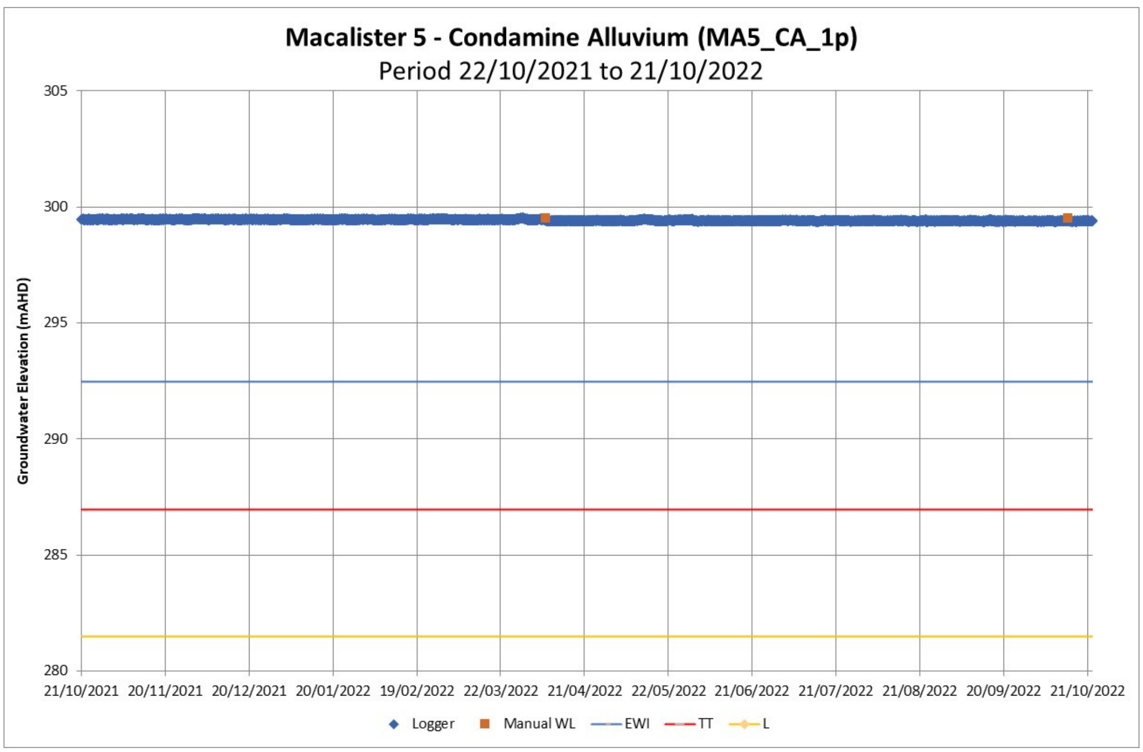

Carn Brea 23 - Condamine Alluvium (CB23_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
330
325
320
315
310
305
300
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
Manual WL
EWI
TT
L

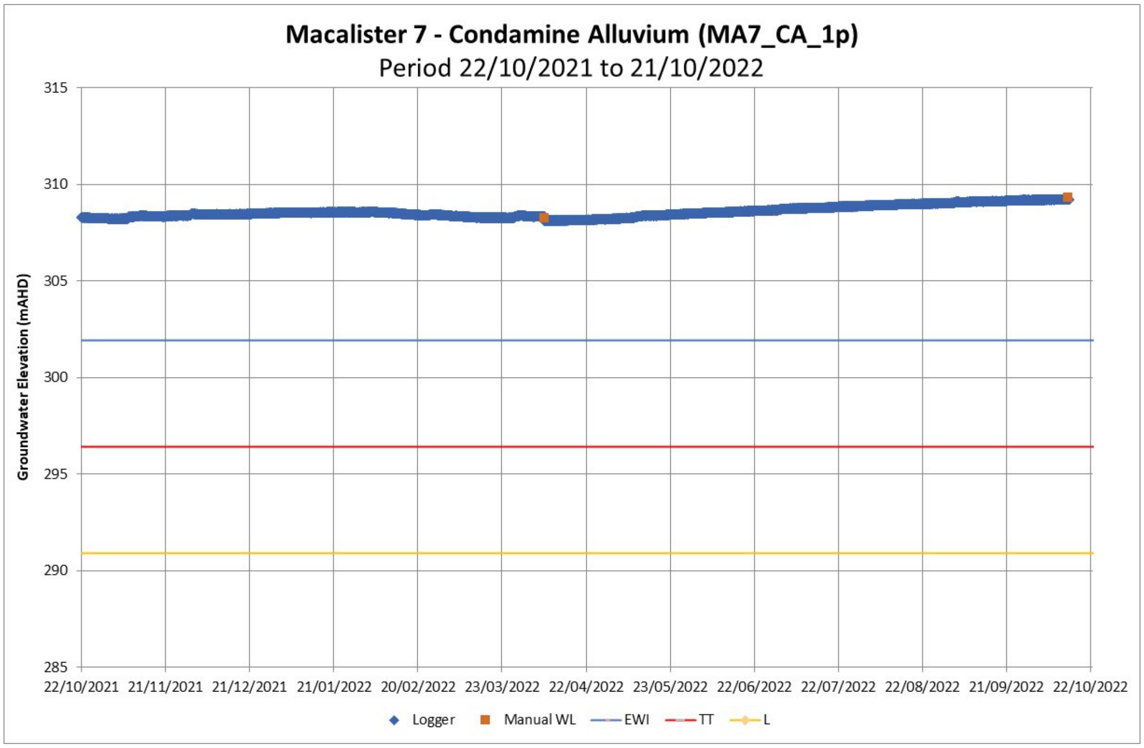

Carn Brea-19 - Upper Hutton Sandstone (CB19_HS_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
400
350
300
250
200
150
100
50
0
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
EWI
TT
L

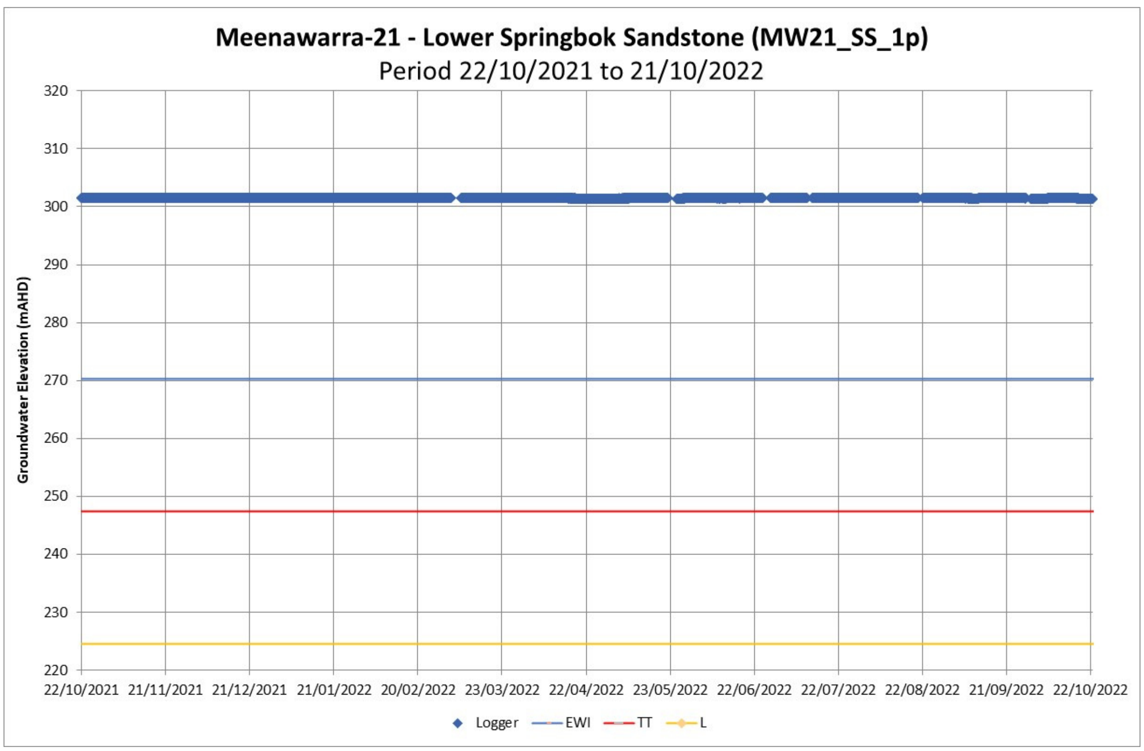

Carn Brea-20 - Precipice Sandstone (CB20_PS_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
300
200
100
0
-100
-200
-300
-400
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger EWI TT L

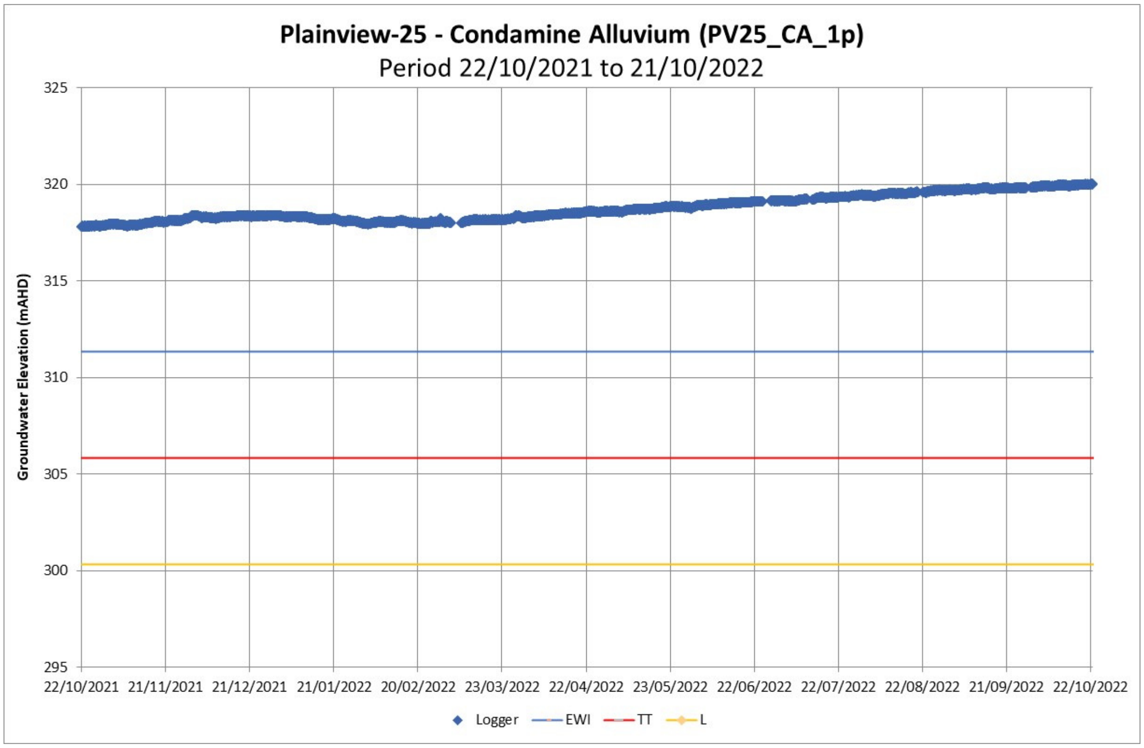

Daandine-121 - Upper Hutton Sandstone (DA121_HS_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
330
280
230
180
130
80
30
-20
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger EWI TT L

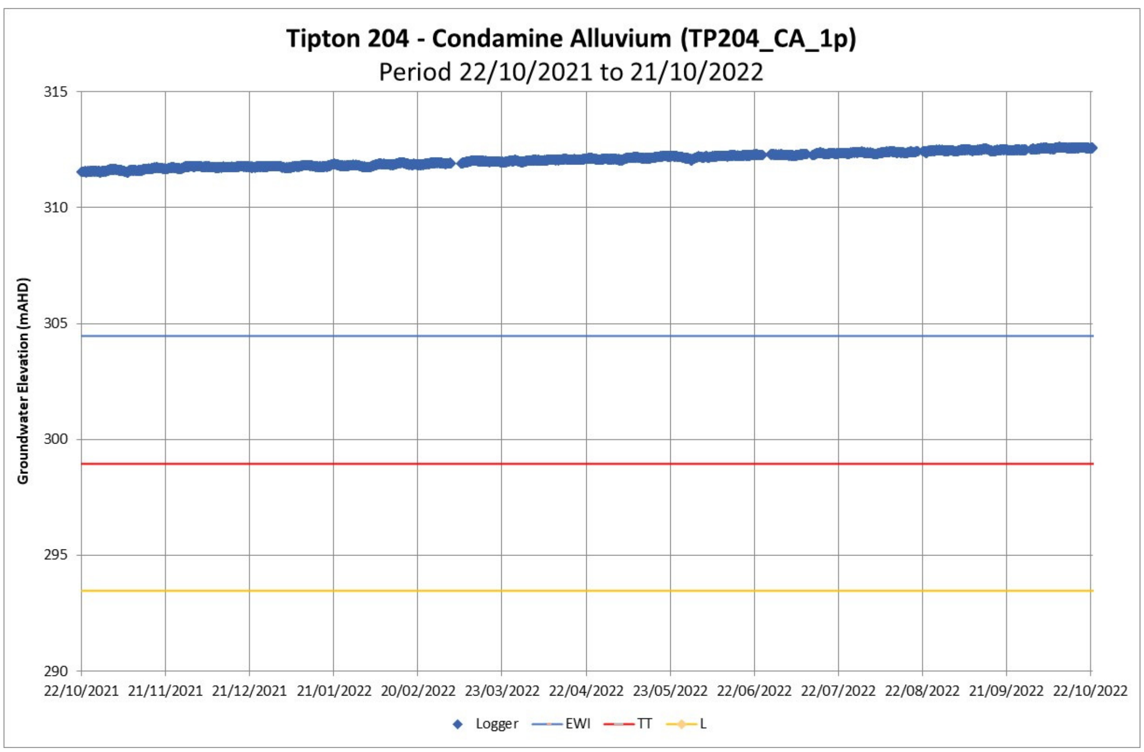

Kedron-570 - Lower Hutton Sandstone (KD570_HS_2p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
300
250
200
150
100
50
0
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger data
EWI
TT
L

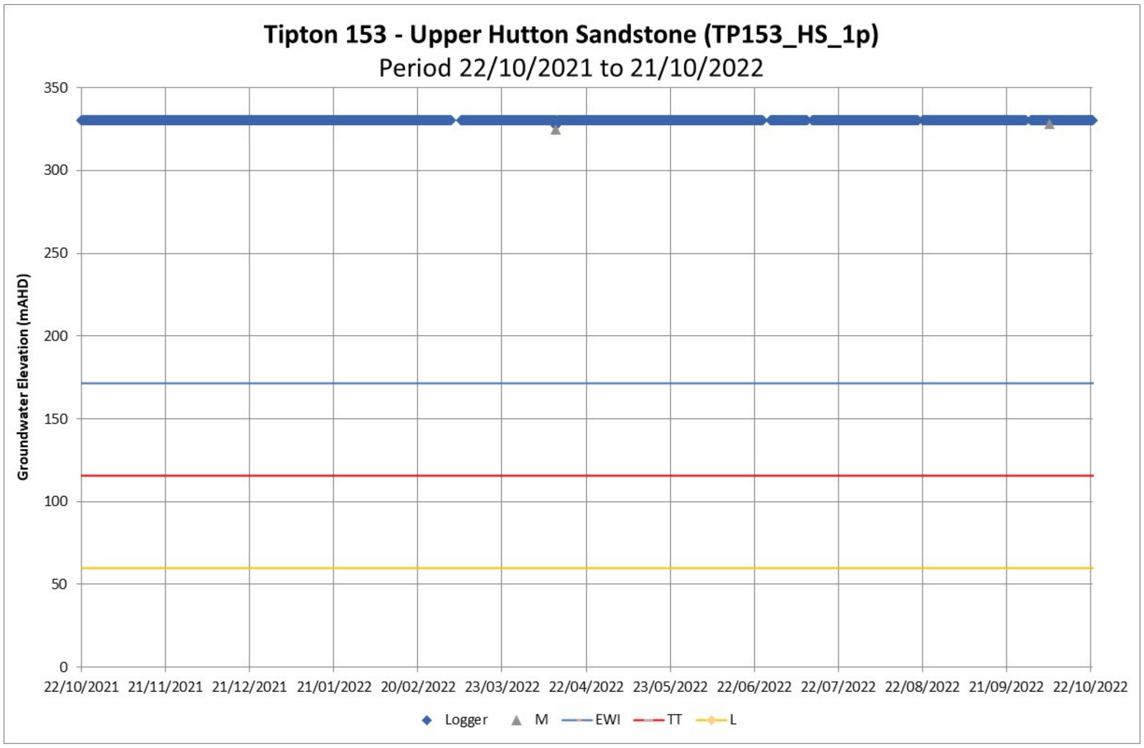

Macalister 5 - Condamine Alluvium (MA5_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
305
300
295
290
285
280
21/10/2021 20/11/2021 20/12/2021 20/01/2022 19/02/2022 22/03/2022 21/04/2022 22/05/2022 21/06/2022 21/07/2022 21/08/2022 20/09/2022 21/10/2022
Logger
Manual WL
EWI
TT
L

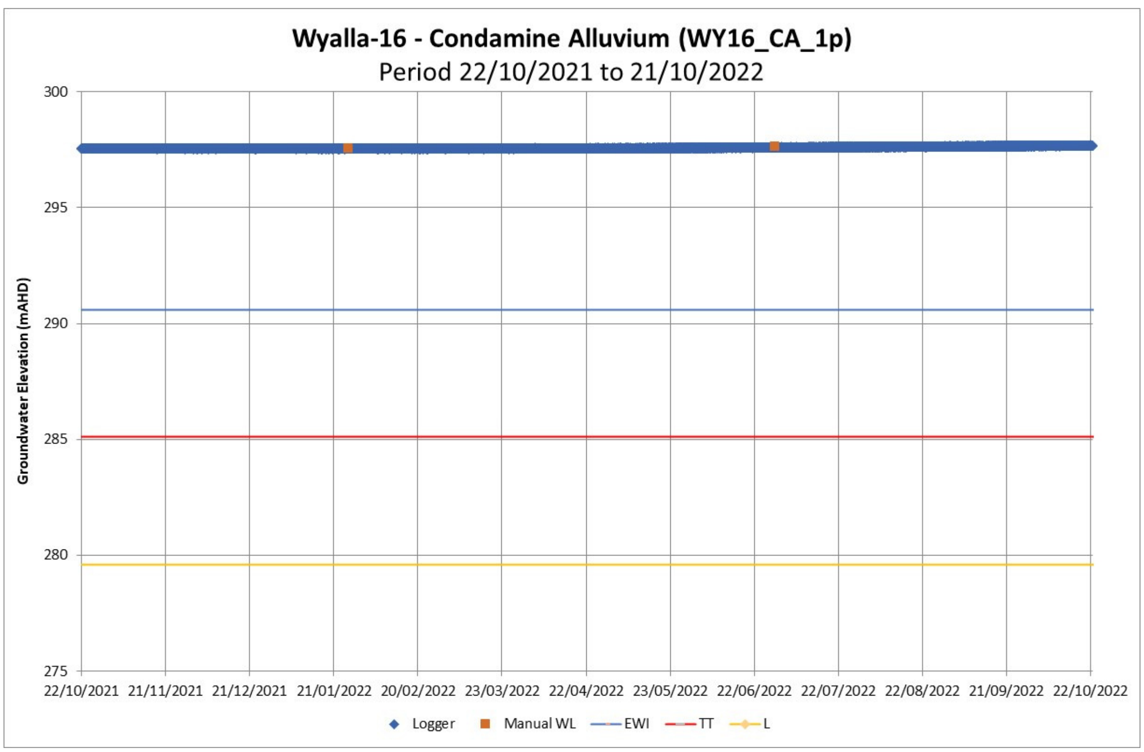

Macalister 7 - Condamine Alluvium (MA7_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
315
310
305
300
295
290
285
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
Manual WL
EWI
TT
L

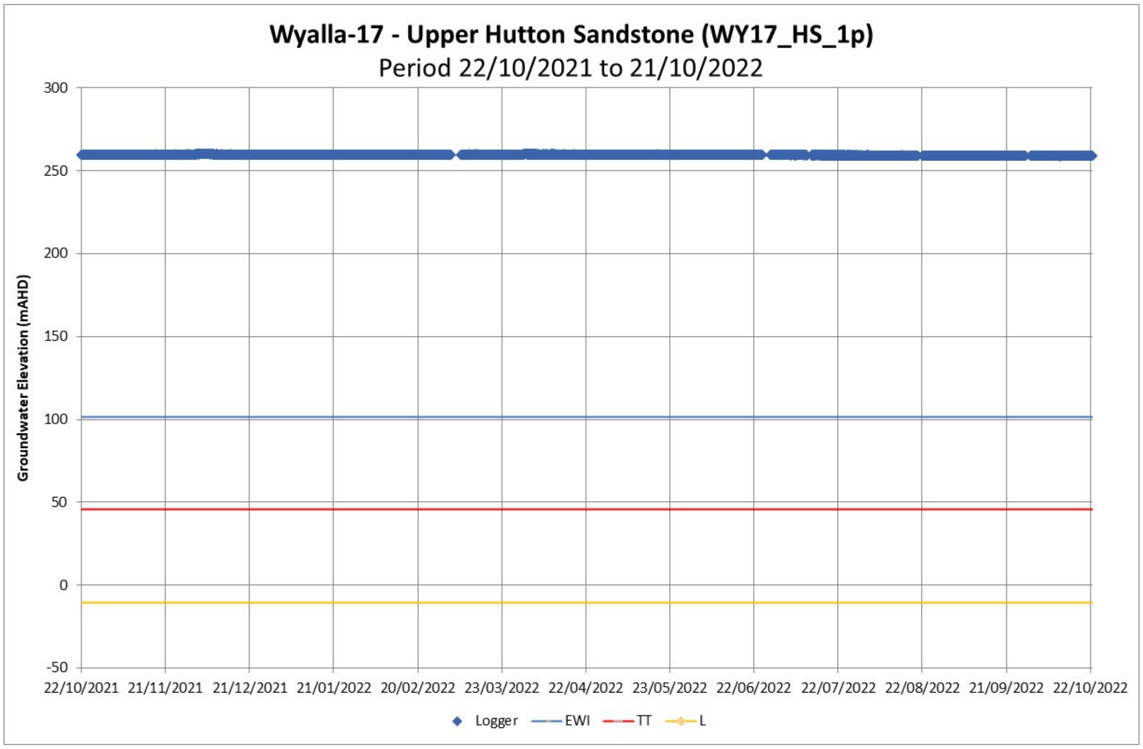

Meenawarra-21 - Lower Springbok Sandstone (MW21_SS_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
320
310
300
290
280
270
260
250
240
230
220
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
EWI
TT
L

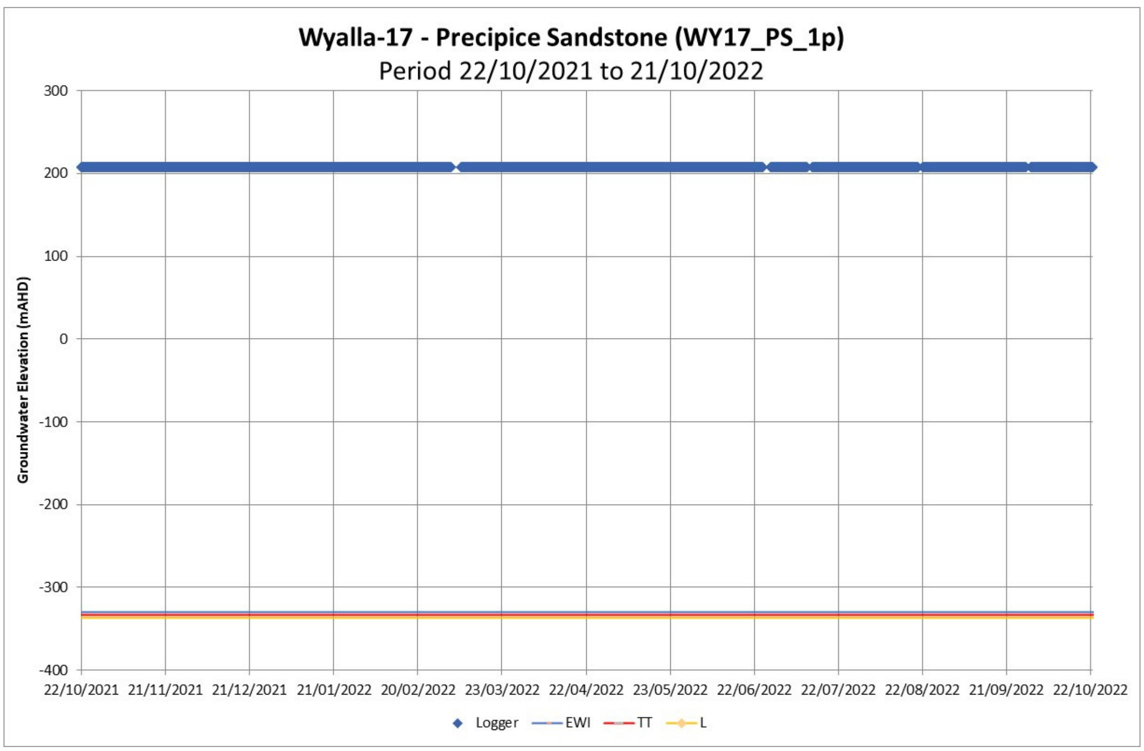

Plainview-25 - Condamine Alluvium (PV25_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
325
320
315
310
305
300
295
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
EWI
TT
L


Tipton 204 - Condamine Alluvium (TP204_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
315
310
305
300
295
290
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
EWI
TT
L


Tipton 153 - Upper Hutton Sandstone (TP153_HS_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
350
300
250
200
150
100
50
0
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
M
EWI
TT
L


Wyalla-16 - Condamine Alluvium (WY16_CA_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
300
295
290
285
280
275
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
Manual WL
EWI
TT
L


Wyalla-17 - Upper Hutton Sandstone (WY17_HS_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
300
250
200
150
100
50
0
-50
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
EWI
TT
L


Wyalla-17 - Precipice Sandstone (WY17_PS_1p)
Period 22/10/2021 to 21/10/2022
Groundwater Elevation (mAHD)
300
200
100
0
-100
-200
-300
-400
22/10/2021 21/11/2021 21/12/2021 21/01/2022 20/02/2022 23/03/2022 22/04/2022 23/05/2022 22/06/2022 22/07/2022 22/08/2022 21/09/2022 22/10/2022
Logger
EWI
TT
L

Appendix B – Groundwater quality results

	Water quality guidelines				42231370					42230209				
Parameter	**Irrigation**	**Stock water**	**Drinking water (ADWG)**	**Aquatic (ANZG 95%)**	**Count**	**Count below LOR**	**20th**	**50th**	**80th**	**Count**	**Count below LOR**	**20th**	**50th**	**80th**
87Sr/86Sr					1	0	0.70414	0.70414	0.7041	1	0	0.70572	0.70572	0.706
Arsenic - Dissolved	0.1 -2	0.5	0.01	0.013	13	10	0.001	0.001	0.0010	14	10	0.001	0.001	0.001
Barium - Dissolved			2		13	0	0.2842	0.495	0.5366	14	0	0.038	0.04	0.0488
Bicarbonate Alkalinity as CaCO3				195-311-380	13	0	278	387	401	14	0	564.4	577.5	617
Boron - Dissolved	0.5	5	4	0.94	12	0	0.112	0.14	0.1500	14	0	0.53	0.54	0.574
Cadmium - Dissolved	0.01 - 0.05	0.01	0.002	0.0002	13	13	1E-04	1E-04	0.0001	14	13	1E-04	1E-04	1E-04
Calcium - Dissolved				19-32-56	13	0	26	31	35	14	0	130	141	144
Carbonate Alkalinity as CaCO3					13	8	1	1	20	14	12	1	1	1
Chloride			5	68-161-447	13	0	314	486	495	14	0	3028	3205	3290
Chromium - Dissolved	0.1 - 1	1	0.05	0.001	13	12	0.001	0.001	0.001	14	14	0.001	0.001	0.001
Cobalt - Dissolved	0.05 - 1	1			13	5	0.001	0.001	0.002	14	0	0.002	0.002	0.0042
Copper - Dissolved	0.2 - 5	0.4 to 5	1	0.0014	13	10	0.001	0.001	0.001	14	7	0.001	0.001	0.0038
Fluoride	1 - 2	2	1.5		13	0	0.3	0.3	0.300	14	0	0.4	0.4	0.5
Iron - Dissolved	0.2 - 10		0.3		13	2	0.062	0.18	0.246	14	5	0.05	0.1	0.134
Lead - Dissolved	2 - 5	0.1	0.01	0.0034	13	12	0.001	0.001	0.001	14	13	0.001	0.001	0.001
Magnesium - Dissolved				13-22-45	13	0	19	27	28	14	0	156	165	174
Manganese - Dissolved	0.2 - 10		0.1	1.9	13	0	0.103	0.133	0.149	14	0	0.0616	0.0675	0.086
Mercury - Dissolved	0.002	0.002	0.001	0.0006	13	13	1E-04	1E-04	1E-04	14	14	1E-04	1E-04	1E-04
Methane					12	1	82.6	238.5	261	13	13	10	10	10
Nickel - Dissolved	0.2 - 2	1	0.02	0.011	13	2	0.001	0.002	0.013	14	0	0.002	0.0065	0.018
Potassium - Dissolved					13	0	4	4	5.000	14	0	2	2	2
Selenium - Dissolved	0.02 - 0.05	0.02	0.01	0.011	13	13	0.01	0.01	0.010	14	14	0.01	0.01	0.01
Sodium - Dissolved			180	82-207-407	13	0	247.6	375	386	14	0	1680	1790	1894
Strontium - Dissolved					13	0	0.65	1.27	1.356	14	0	4.368	4.48	4.824
Sulfate as SO4 - Turbidimetric - Dissolved			250	5-19-70	13	8	1	1	1	14	0	221	228	242
Total Alkalinity as CaCO3				196-320-388	13	0	287	399	412	14	0	564	593	626
Total Dissolved Solids @180°C		2000 to 5000	600		13	0	783.6	1150	1160	14	0	5590	5780	6128
Zinc - Dissolved	2 - 5	20	3	0.008	13	6	0.005	0.02	0.37	14	1	0.0082	0.0275	0.066

Note the ADWG adopted is generally for health, in instances where aesthetic or recreational values are lower, these are shown. Irrigation values show a range in some instances representing the long-term and short-term criteria. Where there are multiple values in the aquatic ecosystem column, this represents the 20th percentile – 50th percentile-80th percentile values.

	Water quality guidelines				Carn Brea-17					Tipton-195				
Parameter	**Irrigation**	**Stock water**	**Drinking water (ADWG)**	**Aquatic (ANZG 95%)**	**Count**	**Count below LOR**	**20th**	**50th**	**80th**	**Count**	**Count below LOR**	**20th**	**50th**	**80th**
87Sr/86Sr					2	0	0.705386	0.70541	0.705	3	0	0.02	0.02	0.431
Arsenic - Dissolved	0.1 -2	0.5	0.01	0.013	14	13	0.001	0.001	0.001	17	2	0.001	0.002	0.0028
Barium - Dissolved			2		14	0	0.3266	0.371	0.425	17	0	0.2538	0.27	0.493
Bicarbonate Alkalinity as CaCO3				195-311-380	14	0	339	344	369	17	0	329	370	434.6
Boron - Dissolved	0.5	5	4	0.94	13	4	0.05	0.06	0.060	16	2	0.06	0.065	0.100
Cadmium - Dissolved	0.01 - 0.05	0.01	0.002	0.0002	14	14	1E-04	1E-04	1E-04	17	16	1E-04	1E-04	1E-04
Calcium - Dissolved				19-32-56	14	0	48	57.5	69.6	17	0	58	61	67.6
Carbonate Alkalinity as CaCO3					14	12	1	1	1	17	15	1	1	1
Chloride			5	68-161-447	14	0	75	93	128.8	17	0	312.2	340	360.4
Chromium - Dissolved	0.1 - 1	1	0.05	0.001	14	12	0.001	0.001	0.001	17	17	0.001	0.001	0.001
Cobalt - Dissolved	0.05 - 1	1			14	9	0.001	0.001	0.0028	17	9	0.001	0.001	0.002
Copper - Dissolved	0.2 - 5	0.4 to 5	1	0.0014	14	11	0.001	0.001	0.001	17	14	0.001	0.001	0.001
Fluoride	1 - 2	2	1.5		14	1	0.1	0.1	0.140	17	0	0.3	0.3	0.300
Iron - Dissolved	0.2 - 10		0.3		14	8	0.05	0.05	0.290	17	0	0.71	1.83	4.822
Lead - Dissolved	2 - 5	0.1	0.01	0.0034	14	14	0.001	0.001	0.001	17	16	0.001	0.001	0.001
Magnesium - Dissolved				13-22-45	14	0	29	31	32.4	17	0	41.2	43	50.6
Manganese - Dissolved	0.2 - 10		0.1	1.9	14	0	0.0426	0.178	0.535	17	0	0.0744	0.092	0.189
Mercury - Dissolved	0.002	0.002	0.001	0.0006	14	14	1E-04	1E-04	1E-04	17	17	1E-04	1E-04	1E-04
Methane					13	11	10	10	10	16	1	2780	6190	16800
Nickel - Dissolved	0.2 - 2	1	0.02	0.011	14	1	0.002	0.004	0.008	17	0	0.006	0.008	0.026
Potassium - Dissolved					14	0	2	3	4	17	0	2	2	3
Selenium - Dissolved	0.02 - 0.05	0.02	0.01	0.011	14	14	0.01	0.01	0.01	17	17	0.01	0.01	0.01
Sodium - Dissolved			180	82-207-407	14	0	98.6	102.5	106.4	17	0	202.4	212	219
Strontium - Dissolved					14	0	1.022	1.165	1.310	17	0	1.202	1.28	1.514
Sulfate as SO4 - Turbidimetric - Dissolved			250	5-19-70	14	0	11	12	14	17	9	1	1	2
Total Alkalinity as CaCO3				196-320-388	14	0	338.6	343.5	370.2	17	0	329	370	448.2
Total Dissolved Solids @180°C		2000 to 5000	600		14	0	525.6	547	595.6	17	0	838.4	859	914.2
Zinc - Dissolved	2 - 5	20	3	0.008	14	8	0.005	0.005	0.033	17	9	0.005	0.005	0.031

Note the ADWG adopted is generally for health, in instances where aesthetic or recreational values are lower, these are shown. Irrigation values show a range in some instances representing the long-term and short-term criteria. Where there are multiple values in the aquatic ecosystem column, this represents the 20th percentile – 50th percentile-80th percentile values.

	Water quality guidelines				Wyalla-16					All				
Parameter	**Irrigation**	**Stock water**	**Drinking water (ADWG)**	**Aquatic (ANZG 95%)**	**Count**	**Count below LOR**	**20th**	**50th**	**80th**	**Count**	**Count below LOR**	**20th**	**50th**	**80th**
87Sr/86Sr					1	0	0.70478	0.70478	0.705	8		0.29	0.7	0.71
Arsenic - Dissolved	0.1 -2	0.5	0.01	0.013	14	0	0.004	0.004	0.005	72		0.001	0.001	0.004
Barium - Dissolved			2		14	0	0.022	0.0275	0.0314	72		0.0372	0.2635	0.4852
Bicarbonate Alkalinity as CaCO3				195-311-380	14	0	244.4	261	285.4	72		287	364	551
Boron - Dissolved	0.5	5	4	0.94	14	0	0.08	0.09	0.104	69		0.06	0.09	0.498
Cadmium - Dissolved	0.01 - 0.05	0.01	0.002	0.0002	14	14	1E-04	1E-04	1E-04	72		0.0001	0.0001	0.0001
Calcium - Dissolved				19-32-56	14	0	9	9	10	72		18	57	101
Carbonate Alkalinity as CaCO3					14	9	1	1	11	72		1	1	3.8
Chloride			5	68-161-447	14	0	146	163	174	72		130	315	513
Chromium - Dissolved	0.1 - 1	1	0.05	0.001	14	11	0.001	0.001	0.001	72		0.001	0.001	0.001
Cobalt - Dissolved	0.05 - 1	1			14	12	0.001	0.001	0.001	72		0.001	0.001	0.002
Copper - Dissolved	0.2 - 5	0.4 to 5	1	0.0014	14	7	0.001	0.001	0.0028	72		0.001	0.001	0.002
Fluoride	1 - 2	2	1.5		14	0	0.6	0.6	0.74	72		0.26	0.3	0.5
Iron - Dissolved	0.2 - 10		0.3		14	13	0.05	0.05	0.05	72		0.05	0.125	0.668
Lead - Dissolved	2 - 5	0.1	0.01	0.0034	14	14	0.001	0.001	0.001	72		0.001	0.001	0.001
Magnesium - Dissolved				13-22-45	14	0	6	7	7	72		10	32	81
Manganese - Dissolved	0.2 - 10		0.1	1.9	14	2	0.0016	0.002	0.0076	72		0.0422	0.0775	0.1628
Mercury - Dissolved	0.002	0.002	0.001	0.0006	14	14	1E-04	1E-04	1E-04	72		0.0001	0.0001	0.0001
Methane					13	13	10	10	10	67		10	10	2500
Nickel - Dissolved	0.2 - 2	1	0.02	0.011	14	9	0.001	0.001	0.002	72		0.001	0.004	0.015
Potassium - Dissolved					14	13	1	1	1	72		2	2	4
Selenium - Dissolved	0.02 - 0.05	0.02	0.01	0.011	14	13	0.01	0.01	0.01	72		0.01	0.01	0.01
Sodium - Dissolved			180	82-207-407	14	0	236	245	258	72		109	239	394
Strontium - Dissolved					14	0	0.2142	0.221	0.232	72		0.3012	1.245	3.742
Sulfate as SO4 - Turbidimetric - Dissolved			250	5-19-70	14	0	75	83	92	72		1	12	185
Total Alkalinity as CaCO3				196-320-388	14	0	257	268	285	72		287	369	551
Total Dissolved Solids @180°C		2000 to 5000	600		14	0	755	764	781	72		623	857	1266
Zinc - Dissolved	2 - 5	20	3	0.008	14	8	0.005	0.005	0.0182	72		0.005	0.007	0.05

Note the ADWG adopted is generally for health, in instances where aesthetic or recreational values are lower, these are shown. Irrigation values show a range in some instances representing the long-term and short-term criteria. Where there are multiple values in the aquatic ecosystem column, this represents the 20th percentile – 50^{th} percentile-80^{th} percentile values.

Springbok Sandstone

Parameter	Water quality guidelines			Plainview 36 (insuffcent samples to statistically analyse/assess)					Stratheden-63					All bores				
Parameter	Stock water	Drinking water (ADWG)	Aquatic (ANZG 95%)	Count	Count below LOR	20th	50th	80th	Count	Count below LOR	20th	50th	80th	Count	Count below LOR	20th	50th	80th
87Sr/86Sr				2	0	0.704048	0.704075	0.704102	1	0	0.70481	0.70481	0.70481	3	0	0.704066	0.70412	0.704534
Arsenic - Dissolved	0.5	0.01	0.013	2	2	0.001	0.001	0.001	9	9	0.001	0.001	0.001	11	11	0.001	0.001	0.001
Barium - Dissolved		2		2	0	0.125	0.1265	0.128	9	0	0.4618	0.54	0.6234	11	0	0.33	0.5	0.623
Bicarbonate Alkalinity as CaCO3			165-283-677	4	0	406	424	434.8	9	1	15	46	64	13	1	26.8	62	406
Boron - Dissolved	5	4	0.94	2	0	0.152	0.155	0.158	9	0	0.1	0.13	0.184	11	0	0.1	0.15	0.18
Cadmium - Dissolved	0.01	0.002	0.0002	2	2	1.00E-04	1.00E-04	1.00E-04	9	9	1.00E-04	1.00E-04	1.00E-04	11	11	1.00E-04	1.00E-04	1.00E-04
Calcium - Dissolved			2-20-86	4	0	9.6	10	10.4	9	0	42	66	119	13	0	10.4	44	83.8
Carbonate Alkalinity as CaCO3				4	1	13.6	25	35.6	9	4	1	5	13.2	13	4	1	10	25.6
Chloride		5	186-737-2939	4	0	177	190	197	9	0	1,072	1,170	1,420	13	0	197	1,100	1,312
Chromium - Dissolved	1	0.05	0.001	2	2	0.001	0.001	0.001	9	9	0.001	0.001	0.001	11	11	0.001	0.001	0.001
Cobalt - Dissolved	1			2	2	0.001	0.001	0.001	9	9	0.001	0.001	0.001	11	11	0.001	0.001	0.001
Copper - Dissolved	0.4 to 5	1	0.0014	2	2	0.001	0.001	0.001	9	9	0.001	0.001	0.001	11	11	0.001	0.001	0.001
Fluoride	2	1.5		4	0	0.26	0.3	0.3	9	0	0.2	0.2	0.24	13	0	0.2	0.2	0.3
Iron - Dissolved		0.3		2	1	0.072	0.105	0.138	9	9	0.05	0.05	0.05	11	10	0.05	0.05	0.05
Lead - Dissolved	0.1	0.01	0.0034	2	2	0.001	0.001	0.001	9	9	0.001	0.001	0.001	11	11	0.001	0.001	0.001
Magnesium - Dissolved			2-8-82	4	0	4	4	4	9	1	7	9	12	13	1	4	7	11
Manganese - Dissolved		0.1	1.9	2	0	0.0596	0.062	0.0644	9	1	0.002	0.005	0.0094	11	1	0.002	0.006	0.018
Mercury - Dissolved	0.002	0.001	0.0006	2	2	1.00E-04	1.00E-04	1.00E-04	9	9	1.00E-04	1.00E-04	1.00E-04	11	11	1.00E-04	1.00E-04	1.00E-04
Methane				2	0	526.4	1169	1811.6	8	0	8538	11600	16800	10	0	7056	9905	14600
Nickel - Dissolved	1	0.02	0.011	2	0	0.0066	0.009	0.0114	9	6	0.001	0.001	0.0014	11	6	0.001	0.001	0.003
Potassium - Dissolved				4	0	3.6	4	4.4	9	0	5	6	7	13	0	4.4	5	7
Selenium - Dissolved	0.02	0.01	0.011	2	2	0.01	0.01	0.01	9	9	0.01	0.01	0.01	11	11	0.01	0.01	0.01
Sodium - Dissolved		180	246-677-1821	4	0	277.6	297	306.4	9	0	669	712	729	13	0	306.4	679	723.8
Strontium - Dissolved				2	0	0.3702	0.3705	0.3708	9	0	1.37	1.79	2.83	11	0	1.25	1.38	2.53
Sulfate as SO4 - Turbidimetric - Dissolved		250	1-8-47	4	3	1	1	1	9	0	10	21	27	13	2	1	11	24.4
Total Alkalinity as CaCO3			195-309-790	4	0	438	446	450.4	9	0	18	62	77	13	0	31.6	76	438
Total Dissolved Solids @180°C	2000 to 5000	600		2	0	731.4	738	744.6	9	0	1968	2210	2692	11	0	1690	2000	2560
Zinc - Dissolved	20	3	0.008	2	0	0.07	0.1075	0.145	9	9	0.005	0.005	0.005	11	9	0.005	0.005	0.005

Note the ADWG adopted is generally for health, in instances where aesthetic or recreational values are lower, these are shown. Irrigation values show a range in some instances representing the long-term and short-term criteria. Where there are multiple values in the aquatic ecosystem column, this represents the 20th percentile – 50^{th} percentile-80^{th} percentile values.

Tenure_Holder_Bore_ID	Tenure_Holder_Sample_ID	Results_Date_Time	Result	Qualifier	Parameter	HGA_Chemical_Name	Result_Unit	laboratory_name	laboratory_sample_reference	Technical_reference	PQL_Min	Limit_of_Reporting	Results_Comment
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	0.004		Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	0.620000005		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED037-P: Alkalinity by PC Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	0.050000001	<	Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	11200		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	18/01/2022 3:44	55.5		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2125077008	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.703501999		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2125077008	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.004		Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.620000005		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1200		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED037-P: Alkalinity by PC Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.340000004		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	2		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED093F: Major Cations - Dissolved	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	74		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED037-P: Alkalinity by PC Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1060		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED045G: Chloride by Discrete Analyser	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.001		Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	2.299999952		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EK040P: Fluoride by PC Titrator	0.1	0.1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED037-P: Alkalinity by PC Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	3.170000076		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2125077008	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.050000001	<	Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	2		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED093F: Major Cations - Dissolved	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.006		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	11200		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.002		Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	5		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED093F: Major Cations - Dissolved	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1350		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED093F: Major Cations - Dissolved	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1.299999952		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	1280		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	ED037-P: Alkalinity by PC Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	55.5		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2125077008	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	59.09999847		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2125077008	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	3230		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EA015H: Total Dissolved Solids (High Level)	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	16/02/2022 4:22	0.006		Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2125077008	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:29	1.360000014		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:29	4323		FIELD EC	Electrical_Conductivity_Field	us/cm						
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:29	8.470000267		FIELD pH	pH_Field							
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:29	92.30000305		FIELD REDOX	REDOX_Field	mv						
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:29	31.89999962		FIELD TEMP	Temperature_Field	degree						
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.745999992		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1090		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED037-P: Alkalinity by Auto Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.409999996		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED093F: Major Cations - Dissolved	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	74		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED037-P: Alkalinity by Auto Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1120		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED045G: Chloride by Discrete Analyser	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2.900000095		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED037-P: Alkalinity by Auto Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.379999995		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547003	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.050000001	<	Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED093F: Major Cations - Dissolved	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.006		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10200		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	5		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED093F: Major Cations - Dissolved	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EP033: C1 - C4 Gases	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1290		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED093F: Major Cations - Dissolved	1	1	

Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.24000001		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1170		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	ED037-P: Alkalinity by Auto Titrator	1	1	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	55		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547003	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	56.5		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547003	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3230		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EA015H: Total Dissolved Solids (High Level)	10	10	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Daandine-99	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.703508973		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547003	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 2:41	1.159999967		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 2:41	1315		FIELD EC	Electrical_Conductivity_Field	us/cm						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 2:41	8.119999886		FIELD pH	pH_Field							
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 2:41	92.5		FIELD REDOX	REDOX_Field	mv						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 2:41	20.29999924		FIELD TEMP	Temperature_Field	degree						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 12:41	1.220000029		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 12:41	1312		FIELD EC	Electrical_Conductivity_Field	us/cm						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 12:41	8.159999847		FIELD pH	pH_Field							
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 12:41	94.30000305		FIELD REDOX	REDOX_Field	mv						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/09/2021 12:41	20.10000038		FIELD TEMP	Temperature_Field	DEGC						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.123999998		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	422		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.150000006		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	10		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	22		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	195		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED045G: Chloride by Discrete Analyser	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.300000012		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EK040P: Fluoride by PC Titrator	0.1	0.1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	1.470000029		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2127765002	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.050000001	<	Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	4		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.066		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	2240		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.013		Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	3		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	300		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.370000005		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	444		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	14.39999962		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2127765002	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	14		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2127765002	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	727		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EA015H: Total Dissolved Solids (High Level)	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	13/10/2021 6:19	0.170000002		Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2127765002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	18/10/2021 6:21	0.704029977		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2127765002	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 5:23	4.349999905		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 5:23	14.06000042		FIELD EC	Electrical_Conductivity_Field	us/cm						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 5:23	8.159999847		FIELD pH	pH_Field							
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 5:23	-43.90000153		FIELD REDOX	REDOX_Field	mv						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 5:23	28		FIELD TEMP	Temperature_Field	degree						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 15:23	4.349999905		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 15:23	14.06000042		FIELD EC	Electrical_Conductivity_Field	us/cm						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 15:23	8.159999847		FIELD pH	pH_Field							
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 15:23	-43.90000153		FIELD REDOX	REDOX_Field	mv						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	11/04/2022 15:23	28		FIELD TEMP	Temperature_Field	DEGC						
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.128999993		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	426		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.159999996		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	11		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	28		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	199		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED045G: Chloride by Discrete Analyser	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.200000003		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EK040P: Fluoride by PC Titrator	0.1	0.1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.140000001		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2210700005	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.159999996		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	

Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	4		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.057999998		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	98		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.005		Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	4		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EP033: C1 - C4 Gases	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	316		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED093F: Major Cations - Dissolved	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.370999992		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	454		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	ED037-P: Alkalinity by PC Titrator	1	1	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	14.69999981		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2210700005	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	14.69999981		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2210700005	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	749		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EA015H: Total Dissolved Solids (High Level)	10	10	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	29/04/2022 9:34	0.045000002		Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2210700005	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Plainview 36	f20530c8-d228-4dcf-a367-d4704f7042af	9/05/2022 3:12	0.70411998		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2210700005	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:00	0		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:00	8188		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:00	8.010000229		FIELD pH	pH_Field							
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:00	-229.3999939		FIELD REDOX	REDOX_Field	mv						
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:00	30.20000076		FIELD TEMP	Temperature_Field	degree						
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.639999986		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.370000005		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EP033: C1 - C4 Gases	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EP033: C1 - C4 Gases	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	7		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED093F: Major Cations - Dissolved	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2500		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EP033: C1 - C4 Gases	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EP033: C1 - C4 Gases	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.700000048		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	6.860000134		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547009	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.050000001		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	4		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED093F: Major Cations - Dissolved	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.024		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	16700		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EP033: C1 - C4 Gases	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	8		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED093F: Major Cations - Dissolved	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EP033: C1 - C4 Gases	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EP033: C1 - C4 Gases	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1840		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED093F: Major Cations - Dissolved	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2.75999999		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	70.5		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547009	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	80.90000153		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547009	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	4590		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547009	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-116	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.703402996		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547009	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:19	0		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:19	5692		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:19	8.460000038		FIELD pH	pH_Field							
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:19	-199.5		FIELD REDOX	REDOX_Field	mv						
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:19	35.79999924		FIELD TEMP	Temperature_Field	degree						
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.690999985		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1120		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.779999971		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EP033: C1 - C4 Gases	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EP033: C1 - C4 Gases	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED093F: Major Cations - Dissolved	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	83		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1230		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EP033: C1 - C4 Gases	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EP033: C1 - C4 Gases	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3.200000048		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.570000052		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547010	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.050000001	<	Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	

Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED093F: Major Cations - Dissolved	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.017999999		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	12900		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EP033: C1 - C4 Gases	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	5		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED093F: Major Cations - Dissolved	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EP033: C1 - C4 Gases	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EP033: C1 - C4 Gases	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1300		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED093F: Major Cations - Dissolved	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.129999995		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1200		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	58.70000076		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547010	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	56.79999924		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547010	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3270		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547010	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-120	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.703554988		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547010	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 2:41	5182		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 2:41	8.489999771		FIELD pH	pH_Field							
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 2:41	-114		FIELD REDOX	REDOX_Field	mv						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 2:41	29		FIELD TEMP	Temperature_Field	degree						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 12:41	5182		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 12:41	8.489999771		FIELD pH	pH_Field							
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 12:41	-114		FIELD REDOX	REDOX_Field	mv						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	20/10/2021 12:41	29		FIELD TEMP	Temperature_Field	DEGC						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.5		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1340		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED037-P: Alkalinity by PC Titrator	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.779999971		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	2		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	76		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED037-P: Alkalinity by PC Titrator	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	916		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	3.200000048		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EK040P: Fluoride by PC Titrator	0.1	0.1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED037-P: Alkalinity by PC Titrator	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.209999993		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2130185007	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.050000001	<	Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.009		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	12200		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	4		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1230		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.84799999		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	1410		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	ED037-P: Alkalinity by PC Titrator	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	54		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2130185007	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	53.79999924		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2130185007	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	2900		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	2/11/2021 4:55	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2130185007	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	11/11/2021 5:59	0.703660011		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2130185007	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:56	0		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:56	5028		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:56	8.489999771		FIELD pH	pH_Field							
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:56	-203.3999939		FIELD REDOX	REDOX_Field	mv						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 5:56	31		FIELD TEMP	Temperature_Field	degree						
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.513999999		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1240		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.920000017		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	100		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	976		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3.5		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED037-P: Alkalinity by Auto Titrator	1	1	

Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.710000038		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547011	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.050000001		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.013		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	11100		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	4		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EP033: C1 - C4 Gases	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1200		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED093F: Major Cations - Dissolved	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.85799998		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1340		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	54.29999924		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547011	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	52.5		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547011	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2900		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547011	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-121	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.703646004		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547011	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 4:24	0		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 4:24	7761		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 4:24	7.989999771		FIELD pH	pH_Field							
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 4:24	-237.1000061		FIELD REDOX	REDOX_Field	mv						
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 4:24	35.59999847		FIELD TEMP	Temperature_Field	degree						
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.480000019		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.639999986		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EP033: C1 - C4 Gases	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EP033: C1 - C4 Gases	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	7		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED093F: Major Cations - Dissolved	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2420		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EP033: C1 - C4 Gases	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EP033: C1 - C4 Gases	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2.299999952		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	7.380000114		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547012	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.050000001	<	Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	4		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED093F: Major Cations - Dissolved	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	5250		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EP033: C1 - C4 Gases	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	7		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED093F: Major Cations - Dissolved	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EP033: C1 - C4 Gases	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EP033: C1 - C4 Gases	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1800		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED093F: Major Cations - Dissolved	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2.319999933		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	68.30000305		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547012	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	79.19999695		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547012	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	4530		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547012	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-138	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.703477979		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547012	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	7/10/2022 2:50	0.870000005		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	7/10/2022 2:50	1567		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	7/10/2022 2:50	7.389999866		FIELD pH	pH_Field							
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	7/10/2022 2:50	56.20000076		FIELD REDOX	REDOX_Field	mv						
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	7/10/2022 2:50	23.29999924		FIELD TEMP	Temperature_Field	degree						
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.002		Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.25		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	343		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.07		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	57		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1	<	Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	341		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.300000012		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED037-P: Alkalinity by Auto Titrator	1	1	

Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	2.569999933		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230150002	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1.320000052		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	41		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.061999999		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	2280		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.006		Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	2		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	216		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1.25		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1		Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	343		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	16.5		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230150002	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	15.69999981		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230150002	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	842		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150002	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.002		Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.248999998		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	344		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.059999999		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	57		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1	<	Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	347		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.300000012		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	3.559999943		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230150003	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1.309999943		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	41		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.061999999		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	2780		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.006		Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	2		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EP033: C1 - C4 Gases	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	213		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED093F: Major Cations - Dissolved	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1.25		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	1		Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	344		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	16.70000076		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230150003	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	15.5		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230150003	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	859		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-195	9991040F-8D63-42D8-BE43-ACEE707E42F5	25/10/2022 23:46	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230150003	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 1:15	0.01		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 1:15	5721		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 1:15	8.359999657		FIELD pH	pH_Field							
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 1:15	-198.3999939		FIELD REDOX	REDOX_Field	mv						
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 1:15	30.5		FIELD TEMP	Temperature_Field	degree						
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.708000004		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1130		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.620000005		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EP033: C1 - C4 Gases	10	10	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EP033: C1 - C4 Gases	10	10	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED093F: Major Cations - Dissolved	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	72		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1320		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EP033: C1 - C4 Gases	10	10	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EP033: C1 - C4 Gases	10	10	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2.599999905		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2.720000029		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547013	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.289999992		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED093F: Major Cations - Dissolved	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.006		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	13600		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EP033: C1 - C4 Gases	10	10	

Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	5		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED093F: Major Cations - Dissolved	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EP033: C1 - C4 Gases	10	10	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EP033: C1 - C4 Gases	10	10	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1330		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED093F: Major Cations - Dissolved	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.039999962		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1210		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	61.40000153		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547013	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	58.20000076		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547013	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3250		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547013	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-38T	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.703702986		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547013	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 0:35	0.790000021		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 0:35	7398		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 0:35	8.220000267		FIELD pH	pH_Field							
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 0:35	-179.3999939		FIELD REDOX	REDOX_Field	mv						
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 0:35	28.60000038		FIELD TEMP	Temperature_Field	degree						
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.24000001		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	785		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.360000014		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EP033: C1 - C4 Gases	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EP033: C1 - C4 Gases	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	5		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED093F: Major Cations - Dissolved	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	32		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1960		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EP033: C1 - C4 Gases	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EP033: C1 - C4 Gases	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.600000024		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.50999999		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547014	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.050000001		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	4		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED093F: Major Cations - Dissolved	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.028000001		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	15300		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EP033: C1 - C4 Gases	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	6		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED093F: Major Cations - Dissolved	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EP033: C1 - C4 Gases	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EP033: C1 - C4 Gases	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1580		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED093F: Major Cations - Dissolved	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	2.029999971		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	816		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	71.59999847		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547014	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	69.40000153		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547014	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3990		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547014	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-39	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.703426003		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547014	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:55	0		FIELD DISS OX	Dissolved_Oxygen_Field	%						
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:55	5974		FIELD EC	Electrical_Conductivity_Field	us/cm						
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:55	8.130000114		FIELD pH	pH_Field							
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:55	-214		FIELD REDOX	REDOX_Field	mv						
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	13/10/2022 2:55	26.89999962		FIELD TEMP	Temperature_Field	degree						
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Arsenic - Dissolved	Arsenic_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.782000005		Barium - Dissolved	Barium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	946		Bicarbonate Alkalinity as CaCO3	Bicarbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.419999987		Boron - Dissolved	Boron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butane		µg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EP033: C1 - C4 Gases	10	10	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Butene		µg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EP033: C1 - C4 Gases	10	10	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Cadmium - Dissolved	Cadmium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.0001	0.0001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	4		Calcium - Dissolved	Calcium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED093F: Major Cations - Dissolved	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	36		Carbonate Alkalinity as CaCO3	Carbonate_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1470		Chloride	Chloride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED045G: Chloride by Discrete Analyser	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Chromium - Dissolved	Chromium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Cobalt - Dissolved	Cobalt_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Copper - Dissolved	Copper_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethane	Ethane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EP033: C1 - C4 Gases	10	10	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Ethene	Ethene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EP033: C1 - C4 Gases	10	10	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.899999976		Fluoride	Fluoride	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EK040P: Fluoride by Auto Titrator	0.1	0.1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Hydroxide Alkalinity as CaCO3	Hydroxide_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.860000014		Ionic Balance	Ionic_Balance	%	Australian Laboratory Services Pty Ltd	EB2230547015	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.140000001		Iron - Dissolved	Iron_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.05	0.05	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Lead - Dissolved	Lead_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3		Magnesium - Dissolved	Magnesium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED093F: Major Cations - Dissolved	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.011		Manganese - Dissolved	Manganese_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1E-04	<	Mercury - Dissolved	Mercury_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG035F: Dissolved Mercury by FIMS	0.0001	0.0001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	11600		Methane	Methane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EP033: C1 - C4 Gases	10	10	

Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.001	<	Nickel - Dissolved	Nickel_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	5		Potassium - Dissolved	Potassium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED093F: Major Cations - Dissolved	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propane	Propane	µg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EP033: C1 - C4 Gases	10	10	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	10	<	Propene	Propene	µg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EP033: C1 - C4 Gases	10	10	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.01	<	Selenium - Dissolved	Selenium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.01	0.01	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1340		Sodium - Dissolved	Sodium	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED093F: Major Cations - Dissolved	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1.480000019		Strontium - Dissolved	Strontium_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020B-F: Dissolved Metals by ICP-MS - Suite B	0.001	0.001	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	1	<	Sulfate as SO4 - Turbidimetric - Dissolved	Sulphate	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED041G: Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	982		Total Alkalinity as CaCO3	Total_Alkalinity_CaCO3	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	ED037-P: Alkalinity by Auto Titrator	1	1	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	61.09999847		Total Anions	Total_Anions	meq/L	Australian Laboratory Services Pty Ltd	EB2230547015	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	58.90000153		Total Cations	Total_Cations	meq/L	Australian Laboratory Services Pty Ltd	EB2230547015	EN055 - PG: Ionic Balance by PCT DA and Turbi SO4 DA	0.01	0.01	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	3350		Total Dissolved Solids @180°C	Total_Dissolved_Solids_180C	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EA015H: Total Dissolved Solids (High Level)	10	10	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	26/10/2022 22:51	0.005	<	Zinc - Dissolved	Zinc_Dissolved	mg/L	Australian Laboratory Services Pty Ltd	EB2230547015	EG020A-F: Dissolved Metals by ICP-MS - Suite A	0.005	0.005	
Tipton-47	267D3622-15E8-4CE9-A3C2-C1C1EC980A5C	9/11/2022 7:00	0.70341301		87Sr/86Sr	Strontium_Isotopes_86_87		Australian Laboratory Services Pty Ltd	EB2230547015	Sr_ISOTOPE: Ratio of 87Sr and 86Sr analysis	0.01	0.01	

Appendix C – Mann-Kendall Summary

Monitoring Unit	Field	Bore Name	Mann-Kendall Trend	Analyte	No. of data points	Mann-Kendall Statistic (S)
Condamine Alluvium	Tipton	Tipton-195	no trend	Arsenic - Dissolved	17	-41
Condamine Alluvium	Tipton	Tipton-195	decreasing	Barium - Dissolved	17	-105
Condamine Alluvium	Tipton	Tipton-195	no trend	Beryllium - Dissolved	6	0
Condamine Alluvium	Tipton	Tipton-195	decreasing	Bicarbonate Alkalinity as CaCO3	17	-90
Condamine Alluvium	Tipton	Tipton-195	decreasing	Boron - Dissolved	16	-53
Condamine Alluvium	Tipton	Tipton-195	no trend	Butane	9	0
Condamine Alluvium	Tipton	Tipton-195	no trend	Butene	9	0
Condamine Alluvium	Tipton	Tipton-195	no trend	Cadmium - Dissolved	17	-16
Condamine Alluvium	Tipton	Tipton-195	decreasing	Calcium - Dissolved	17	-87
Condamine Alluvium	Tipton	Tipton-195	no trend	Carbonate Alkalinity as CaCO3	17	-21
Condamine Alluvium	Tipton	Tipton-195	increasing	Chloride	17	67
Condamine Alluvium	Tipton	Tipton-195	no trend	Chromium - Dissolved	17	-16
Condamine Alluvium	Tipton	Tipton-195	decreasing	Cobalt - Dissolved	17	-67
Condamine Alluvium	Tipton	Tipton-195	no trend	Copper - Dissolved	17	-15
Condamine Alluvium	Tipton	Tipton-195	Decreasing	Electrical Conductivity @ 25°C	6	-11
Condamine Alluvium	Tipton	Tipton-195	decreasing	Ethane	9	0
Condamine Alluvium	Tipton	Tipton-195	no trend	Ethene	9	0
Condamine Alluvium	Tipton	Tipton-195	no trend	FIELD DISS OX	11	3
Condamine Alluvium	Tipton	Tipton-195	decreasing	FIELD EC	11	-37
Condamine Alluvium	Tipton	Tipton-195	increasing	FIELD REDOX	11	25
Condamine Alluvium	Tipton	Tipton-195	decreasing	FIELD TEMP	11	-23
Condamine Alluvium	Tipton	Tipton-195	increasing	FIELD pH	11	24
Condamine Alluvium	Tipton	Tipton-195	no trend	Fluoride	17	25
Condamine Alluvium	Tipton	Tipton-195	no trend	Hydroxide Alkalinity as CaCO3	17	-16
Condamine Alluvium	Tipton	Tipton-195	increasing	Ionic Balance	16	54
Condamine Alluvium	Tipton	Tipton-195	decreasing	Iron - Dissolved	17	-56
Condamine Alluvium	Tipton	Tipton-195	no trend	Lead - Dissolved	17	-16
Condamine Alluvium	Tipton	Tipton-195	decreasing	Magnesium - Dissolved	17	-82
Condamine Alluvium	Tipton	Tipton-195	decreasing	Manganese - Dissolved	17	-121
Condamine Alluvium	Tipton	Tipton-195	no trend	Mercury - Dissolved	17	-16
Condamine Alluvium	Tipton	Tipton-195	decreasing	Methane	16	-71
Condamine Alluvium	Tipton	Tipton-195	no trend	Nickel - Dissolved	17	-36
Condamine Alluvium	Tipton	Tipton-195	decreasing	Potassium - Dissolved	17	-56
Condamine Alluvium	Tipton	Tipton-195	no trend	Propane	9	0
Condamine Alluvium	Tipton	Tipton-195	no trend	Propene	9	0
Condamine Alluvium	Tipton	Tipton-195	no trend	Selenium - Dissolved	17	-16
Condamine Alluvium	Tipton	Tipton-195	decreasing	Sodium - Dissolved	17	-64
Condamine Alluvium	Tipton	Tipton-195	decreasing	Strontium - Dissolved	17	-109
Condamine Alluvium	Tipton	Tipton-195	no trend	Sulfate as SO4 - Turbidimetric - Dissolved	17	-5
Condamine Alluvium	Tipton	Tipton-195	decreasing	Total Alkalinity as CaCO3	17	-88
Condamine Alluvium	Tipton	Tipton-195	no trend	Total Anions	8	12
Condamine Alluvium	Tipton	Tipton-195	no trend	Total Cations	8	2
Condamine Alluvium	Tipton	Tipton-195	decreasing	Total Dissolved Solids	17	-75
Condamine Alluvium	Tipton	Tipton-195	no trend	Vanadium - Dissolved	6	0
Condamine Alluvium	Tipton	Tipton-195	no trend	Zinc - Dissolved	17	-7
Springbok Sandstone	Plainview	Plainview 36	no trend	FIELD DISS OX	8	15
Springbok Sandstone	Plainview	Plainview 36	no trend	FIELD EC	10	-8
Springbok Sandstone	Plainview	Plainview 36	no trend	FIELD REDOX	8	9
Springbok Sandstone	Plainview	Plainview 36	no trend	FIELD TEMP	8	-11
Springbok Sandstone	Plainview	Plainview 36	decreasing	FIELD pH	10	-24
Springbok Sandstone	Plainview	Plainview 36	no trend	Calcium - Dissolved	4	5
Springbok Sandstone	Plainview	Plainview 36	no trend	Carbonate Alkalinity as CaCO3	4	0
Springbok Sandstone	Plainview	Plainview 36	increasing	Chloride	4	6
Springbok Sandstone	Plainview	Plainview 36	no trend	Fluoride	4	-1
Springbok Sandstone	Plainview	Plainview 36	no trend	Magnesium - Dissolved	4	0
Springbok Sandstone	Plainview	Plainview 36	no trend	Potassium - Dissolved	4	-3
Springbok Sandstone	Plainview	Plainview 36	increasing	Sodium - Dissolved	4	6
Springbok Sandstone	Plainview	Plainview 36	no trend	Sulfate as SO4 - Turbidimetric - Dissolved	4	0
Springbok Sandstone	Plainview	Plainview 36	no trend	Total Alkalinity as CaCO3	4	4

Appendix D – Field assessment of potential TGDEs related to the SGP WMMP using the 2019 UWIR

FILE NOTE

FROM:	**Arrow Energy**	**REF:**	
SUBJECT:	**Summary of field verification of Wilkie Creek and Juandah Creek potential terrestrial groundwater dependent ecosystems sites as identified in Updated WMMP desktop assessment**		

The purpose of this File Note is to provide a summary of the field assessment undertaken at the two sites identified as potential terrestrial groundwater dependent ecosystems (TGDE) potentially at impact from the Action.

1. Juandah Creek, is located 10 km southeast of Wandoan on PL494 and the potential TGDE is predominantly associated with riparian vegetation flanking a defined reach of Juandah Creek.

2. Wilkie Creek is located 28 km northwest of Dalby on PL194 and PL230 and the potential TGDE is predominantly associated with riparian vegetation flanking

These two sites were identified through the desktop assessment undertaken by Arrow Energy based on the 2019 Underground Water Impact Report (UWIR) and documented in the File Note presented in the 2022 Updated Water Monitoring and Management Plan (WMMP) Annual Report (available at arrowenergy.com.au).

Juandah Creek

An ecological and hydrogeological field survey of the Wilkie Creek mapped TGDE was undertaken over a 2-day period (11 – 13th October 2021). The assessment coincided with a rainfall event in the region with 35.2mm falling at Miles (60km to the south) on the 12th and 13th October, although no rainfall was received at the study site. In total, four targeted sites were assessed during the field assessment.

Field assessment methods

Assessment of the Juandah Creek site comprised a desktop assessment followed by a field assessment which included:

- Descriptions of creek hydrology, geomorphology and ecology;
- Measurements of Leaf Area Index (LAI) using an automated canopy imaging camera (C110 Plant Canopy Imager);
- Pre-dawn leaf water potential (LWP) measurements from mature Forest Red Gum (Eucalyptus tereticornis) using a Scholander LWP Meter;
- Surface water sample collection for measurement of field water quality parameters and laboratory analysis of a standard water quality suite and ^{222}radon;
- Advancement of hand auger holes within alluvium within and on the levees of Juandah Creek using an AMS hand auger, aiming to intersect the groundwater table, or until indurated sedimentary basement rock was intersected;
- Description of the geological profile encountered;
- Collection of groundwater samples from hand auger bores for measurement of field water quality parameters; and

- Collection and analysis of soil, leaf water, surface water and groundwater from hand augers for analysis of stable isotopes of oxygen and deuterium.

Eco-hydrogeological conceptual site model

The reach of Juandah Creek mapped as a potential TGDE has been categorised as a mid-catchment alluvial system. Quaternary alluvial deposits of primarily sand with some clay extend along the Juandah Creek study area, with maximum cross-sectional width of 500 metres and anticipated maximum depths of less than 15 metres, but generally <5m.

Juandah creek traverses and shallowly incises the regionally south-westerly dipping Great Artesian Basin (GAB) sequence, including the Walloon Coal Measures (WCM) at the far northern end of the mapped TDGE, Springbok Sandstone in the central to northern section of the TGDE and Westbourne Formation at the southernmost end of the TDGE.

Available data indicates the basal alluvial system forms a predominantly continuously saturated system (below ground level), likely recharged primarily from rainfall directly infiltrating the alluvium in addition to surface water run off / stream flow.

Regional groundwater pressure monitoring in the upper WCM members (Macalister) across the northern half of the mapped TGDE show that the groundwater pressures are near-surface, respond positively to rainfall recharge events and are therefore likely to locally comprise recharge intake beds during periods of prolonged and above-average rainfall. It is possible that during low rainfall, drying periods, relatively high pressures within the upper WCM may provide an ongoing source of moisture to the alluvium and deeper-rooted vegetation that may extend to the basal alluvium and into the upper WCM. Further assessment during a prolonged dry period would be required to fully test this hypothesis. It however cannot be discounted given heavy rainfall in the months prior to the assessment, which could have resulted in dilution of the geochemical signature of bedrock aquifers at the base of the alluvium.

Shallow groundwater levels of <10 mbGL in the WCM across the northern half of the mapped TDGE (if present) would, in theory, provide a direct water source for vegetation where the WCM sequence outcrops or the shallow alluvium is unsaturated. The salinity of any groundwater leakage into the rooting zone of riparian vegetation may however limit its capacity to stimulate vegetative growth or productivity.

Three eco-hydrogeological conceptualisations of the Juandah Creek site were developed based on the available data and are summarised here:

1. Dry season: this conceptualisation indicates a dry season scenario whereby groundwater perched in the channel sands is being utilised by riparian vegetation along the margins of the drainage. In this scenario, while the potentiometric surface of the bedrock aquifers intrudes into (or above) the base level of the alluvium, there is no leakage due to the tightness of the sandstone bedrock and lack of fracturing. Perched groundwater in the alluvium and GAB aquifers are vertically isolated by a low permeability GAB regolith interburden, and do not mix. Vegetation moisture sources are being supplied by the perched aquifer and soil moisture alone.

2. Dry season with vertical upward leakage: Provides a variation on the dry season conceptualisation, where upward leakage of bedrock aquifers is occurring into the base of the alluvium in the dry season, which is acting to support floodplain vegetation where other sources of moisture have been depleted. The capacity of this leakage to stimulate vegetation growth and vigour is dependent to a degree on the groundwater salinity of the leaking aquifers. It is not possible to predict the

extent to which this is occurring without more detailed assessment during a drier climatic period. It is however conceptualised to be restricted to discrete areas and pockets where the function is supported by underlying geology, rather than occurring more extensively across the landscape.

3. Post-flooding / Wet season: a post-flooding / wet season conceptualisation where the perched aquifer at the base of the Juandah Creek floodplain alluvium has been replenished by seasonal rainfall and / or overbank flow. Any leakage of GAB aquifers into the base of the alluvium would be diluted by the perched groundwater table, making it difficult to differentiate based on groundwater geochemistry.

Any response of riparian vegetation to CSG extraction would be variable and difficult to predict, depending on a number of factors including:

- The extent of bedrock aquifer leakage into the alluvium, including leakage volumes and wetted area;
- Salinity of GAB aquifer leakage; and
- Climatic factors including periods of extended drought and rainfall recharge.

River red gum, and its closely allied species forest red gum (Eucalyptus tereticornis which is the dominant species is the assessment area) is an adaptable species that is adapted to arid and semi-arid environments and will go through alternate phases of shedding and regaining its crown, depending on the availability of water. It is adapted to do so over time and across the flood frequency classes. River red gum have the capacity to self-regulate and adjust their transpiration rates to match the average flood return interval (Colloff 2014). The species is considered opportunistic in its water use, sourcing water according to osmotic and matric water potential and source reliability (Thorburn et al., 1993; Mensforth et al., 1994; Holland et al., 2006; Doody et al., 2009) with the water requirements obtained from three main sources being groundwater, rainfall, and river flooding. Doody et al. (2015) demonstrated that soil moisture alone can sustain the health of Eucalyptus camaldulensis through periods of drought for up to six years before significant decline in tree health is noted. With these ecological considerations, and based on the conceptualisations above, impacts on riparian vegetation are likely to be discrete and difficult to detect above current base levels of tree senescence caused by long-term drought alone.

Conclusions

It is considered highly likely that vegetation within the identified reach of Juandah Creek is dependent on groundwater within the shallow alluvium. The field assessment was undertaken during a relatively wet period and there was no information gathered during the survey that supported the hypothesis that trees were sourcing groundwater from deeper GAB aquifers at the time of the assessment. Most lines of evidence supported that the deeper-rooted trees assessed were utilising relatively fresh and isotopically enriched groundwater from the basal alluvium.

Hypotheses are provided for GDE water requirements as well as likely responses to changes in the groundwater regime through an assessment of water sources and pathways within an eco-hydrogeological conceptual site model. Such hypotheses need further testing through additional assessment during a prolonged dry period to address critical research gaps and subsequent refinement of the eco-hydrogeological conceptual model.

Wilkie Creek

An ecological and hydrogeological field survey of the Wilkie Creek mapped TGDE was undertaken over a 2.5-day period (13th, 14th and 15th October 2021). The assessment coincided with a rainfall event with 44 mm falling in Dalby on the 14th of October (prior to surface water quality sampling) which introduced some ambiguity into the results of water quality and geochemical sampling. Attempts were made throughout 2022 to return to the area for a follow up survey however the above average rainfall experienced throughout the year inhibited the ability to conduct a survey that would not be influenced by recent rainfall.

Field assessment methods

Assessment of the Wilkie Creek site comprised a desktop assessment followed by a field assessment which included:

- Descriptions of creek hydrology, geomorphology and ecology;
- Measurements of Leaf Area Index (LAI) using an automated canopy imaging camera (C110 Plant Canopy Imager);
- Pre-dawn leaf water potential measurements from mature River Red Gums using a Scholander Leaf Water Potential Meter;
- Surface water sample collection for measurement of field water quality parameters and laboratory analysis of a standard water quality suite and ^{222}radon;
- Advancement of hand auger bores within alluvium on each side of the creek using an AMS hand auger to a depth below the groundwater table (if present), or until the indurated sedimentary basement rock was intersected;
- Description of the geological profile encountered;
- Collection of groundwater samples from hand auger bores for measurement of field water quality parameters and laboratory analysis of a standard water quality suite, ^{222}radon; and
- Collection and analysis of soil, leaf water, surface water and groundwater from hand augers for analysis of stable isotopes of oxygen and deuterium.

Eco-hydrogeological conceptual site model

Lines of evidence drawn from data and observations from both the desktop and field assessments has culminated in the preparation of a preliminary eco-hydrogeological conceptual site model for the potential Wilkie Creek TGDE.

The reach of Wilkie Creek mapped as a potential TGDE forms the western margin of the Condamine River Alluvium (CRA) Quaternary alluvial deposits which thicken eastwards and northwards towards the Condamine River.

There is a strong association with the position and orientation of Wilkie Creek and the underlying geology. Notably, the potential TGDE reach of Wilkie Creek follows the contact between elevated regolith of Jurassic bedrock (and associated colluvial cover sediments) to the west which emerges from lower elevation alluvium of the Wilkie Creek and broader Condamine River Alluvium to the east. The current position of Wilkie Creek is relatively hard-up against the toe of the eastward slope off the bedrock regolith, and therefore follows the bedrock/alluvium geological contact in a south-to-north orientation.

A shallow anticline underlies the north-western elevated portion of the mapped TGDE, with the roughly 25m rise in the topography a subdued expression of the underlying subsurface structure. Here, Wilkie Creek runs parallel on the eastern side of the anticline with is intersected by a series of fault-bounded graben block structures and sub-vertical thrust faults, some of which extend through the full Surat Basin sequence to surface. Vertical throws across a number of the faults is interpreted to be up to 40 metres.

North of the Dalby-Kogan Road, WCM groundwater pressures are likely to be >10 mbGL across most of the study area. However, anomalous elevated groundwater levels (above Wilkie Creek) appear to be present across the elevated plateau west of Wilkie Creek, upon which the Wilkie Creek Coal Mine is located. The presence of numerous sub-vertical faults and "keystone structures" are likely to result in complexities and disruptions to the regional groundwater hydraulic regime. Faults may both enhance vertical flow, resulting in cross-formational mixing of groundwater, and also provide barriers to lateral flow resulting in compartmentalisation of the groundwater flow system. Barriers to groundwater lateral flow and enhanced vertical flow in some hydrogeological settings may result in anomalous pressure gradients and vertical discharges of mixed groundwater to surface (springs or stream baseflow).

Supporting the hypothesis for the presence of a mixing zone is groundwater quality and hydrogeochemistry analyses which show distinctive similarities between surface water and WCM and CRA groundwaters north of Dalby-Kogan Road. Supporting the hypothesis of a groundwater discharge zone into Wilkie Creek and/or the Wilkie Creek alluvium is the presence of ^{222}radon in Wilkie Creek surface water.

Also of possible relevance is that the CRA sequence within the study area is relatively thin (shallow depth to bedrock) and is dominated by finer-grained (silt/clay-rich) sediments. This may result in lower recharge infiltration volumes and therefore limited dilution of laterally-discharging saline groundwater from the WCM. This is evident through review of lithological descriptions within bore logs and the lack of high flow rate irrigation bores present within the study area. Relatively low CRA permeabilities and limited extraction may also result in higher CRA and laterally-adjacent WCM pressures.

Given that there is evidence within the DRDMW groundwater database of the presence of both saline groundwater and elevated groundwater pressures in the area prior to the mine operation, it is considered most likely that these anomalies are due primarily to natural structural complexities in the geological setting.

However the onset of vegetation dieback around 1990 coinciding with other activities in the area and drought suggests the possibility of non-CSG stressors causing critical changes in hydrogeological conditions, likely related to shallow groundwater salinity levels.

Conclusions

Prior to commencement of significant identified hydrological and hydrogeological alteration which commenced in 1990, it is considered likely that vegetation within portions of the identified reach of Wilkie Creek and an extension downstream to the north was dependant, at least seasonally, on groundwater. This is consistent with the classification of river red gum as a facultative phreatophyte.

However severe degradation of the ecosystem including widespread mature tree dieback, likely due to exposure to shallow saline groundwater, has resulted in ecosystem collapse. In the current hydrologeological regime, no trees within the affected reach were identified as being groundwater reliant. Elevated groundwater salinity is considered the major factor contributing to the poor ecological health of the reach of Wilkie Creek that is subject to this assessment. The riparian vegetation is still relatively intact immediately north of Dalby-Kogan Road where the preferential source of water appeared to be shallow soil moisture at the time of assessment.

The conceptual model identifies numerous potential stressors to the riparian ecosystem on Wilkie Creek which appear to have commenced from 1990 and are likely a result of activities otherthan Arrow's operations. Such hypotheses require further testing through additional work to address critical research gaps and subsequent refinement of the eco-hydrogeological conceptual model.

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