

# Santos QNT Pty Ltd

## EP161 – HFS EMP Annual Groundwater Monitoring Data Review

14 December 2023 - Final

### 1. Introduction

Santos is the operator of Exploration Permit 161 (EP161) in the Northern Territory, Australia. EP161 is the subject of shale gas exploration targeting formations of the Beetaloo Sub-basin and is located approximately 120 km east of Daly Waters on the Carpentaria Highway and 600 km south-east of Darwin.

The Santos *Environment Management Plan: McArthur Basin Hydraulic Fracturing Program NT Exploration Permit (EP) 161 (revision) STO3-8* (Santos, 2021) (the HFS EMP) was approved on 6 October 2021. The scope of the HFS EMP was for hydraulic fracture stimulation and production testing of wells at the Tanumbirini and Inacumba sites (the regulated activities) (**Error! Reference source not found.**).

This report satisfies Condition 5 of the approval which requires:

*An interpretative report of groundwater quality based on the groundwater monitoring required to be conducted at the well site(s) in accordance with Table 6 of the Code. The interpretative report must be provided annually within three months of the anniversary of the approval date of the EMP and include:*

- *Identification of any change to groundwater quality or level attributable to conduct of the regulated activity at the well site(s) and discussion of the significance and cause of any such observed change;*
- *Interpretation of any statistical outliers observed from baseline measured values for each of the analytes;*
- *Discussion of any trends observed;*
- *A summary of the results inclusive of descriptive statistics; and*
- *A description of the layout of groundwater monitoring bores and wells, indicative groundwater flow directions and levels in accordance with the Preliminary Guideline Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin.*

The Code is in reference to the *Code of Practice: Onshore petroleum activities in the Northern Territory* (DENR, 2019). It is referred to as the “Code” throughout this report. The *Preliminary Guideline Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin* (DENR, 2018) is referred to as the “Guideline” throughout this report.

In summary, the interpretation and discussion of the observed outliers and trends identifies:

- This report includes all monitoring data acquired up to and including October 2023.
- Water levels in the control monitoring bore (CMB) and impact monitoring bore (IMB) remain within the range of background variability following execution of the regulated activities at the Tanumbirini site.
- There has been no impact to the beneficial use of the Gum Ridge Formation aquifer with respect to Livestock drinking water following execution of the regulated activities.
- There was a statistically significant increase in the dissolved methane concentration in the IMB during execution of the authorised activities, but the concentration has subsequently decreased. The dissolved methane concentration increased in the CMB from a starting concentration of less than the laboratory limit of reporting. It decreased to less than the limit of reporting but has again been detected in the three most recent results. The maximum reported dissolved methane concentration (48 µg/L in the IMB) at the Tanumbirini well site is an order of magnitude less than maximum concentration observed in pastoral

bores elsewhere on Tanumbirini Station. The absence of propane and ethane is indicative that the methane is most likely not thermogenic in origin and therefore unlikely to come from the reservoir via the exploration wells. CSIRO has previously identified that dissolved methane in the Gum Ridge Formation – the same aquifer as the CMB and IMB – is biogenic methane.

- Changes in major ion and trace element chemistry and the temperature response in the IMB are indicative of a subtle influence of the drilling process on the groundwater quality. Similar changes were observed following the drilling of the CMB and IMB. No influence of the hydraulic fracture stimulation was observed.
- No drilling activities or fracture stimulation activities have been performed at the Inacumba site.
- Rising trends have been observed in pH and other analyte concentrations at the Inacumba site however no regulated activities have been commenced by Santos at this site.
- There is a small but consistent correlation between analysed batches of samples and trace parameter concentrations across all results. This is expected where all analyte concentrations are extremely low. The correlation represents the variability in measurement accuracy which is consistent between batches of samples analysed by the laboratory.

## 2. Exploration activities

The locations of Santos activities on EP161 are shown on Figure 1.

Santos drilled the Tanumbirini 2H and Tanumbirini 3H exploration wells between May and November 2021. 'Tanumbirini 2' and 'Tanumbirini 3' are used throughout this report to refer to the vertical wells and their associated horizontals. Key dates associated with the drilling activities are summarised in Table 1, and are shown on Figure 2 and on the graphs in Attachment C.

The wells were drilled using mud rotary methods. The wells were initially drilled using water-based drilling fluids (mud) until lost circulation was encountered in the Cambrian Limestone Aquifer. At this point the drilling fluid was swapped to bore water with no drilling additives until the aquifer had been sealed off from the well. Water for drilling was sourced from RN040930, the CMB at the Tanumbirini site.

The wells underwent hydraulic fracture stimulation (HFS) in December 2021, flowback commenced immediately thereafter and continued to December 2022, when the wells were shut-in and remote monitoring commenced. Hydraulic fracture stimulation of the wells was approved under *McArthur Basin Hydraulic Fracturing Program NT Exploration Permit (EP) 161 STO3-8 (HFS EMP)*.

No drilling or hydraulic fracturing activities have been performed at the Inacumba site to date. Monitoring bores were installed at the Inacumba site in 2018 and 2019.

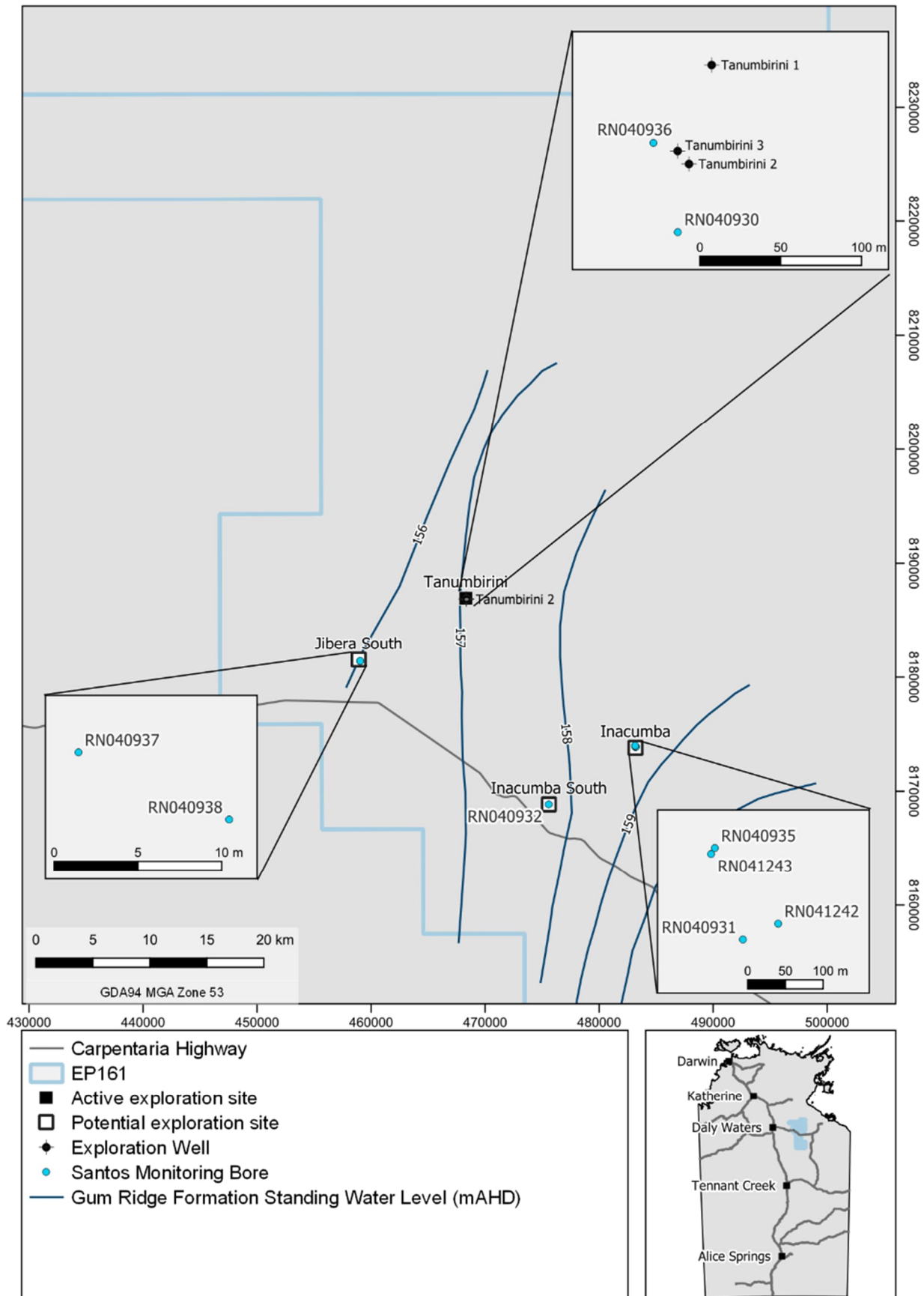
Santos has installed groundwater monitoring bores at the Jibera South and Inacumba South locations. No exploration activities have been approved or performed at these locations.

**Table 1 Key dates of the EP161 exploration activities at Tanumbirini**

Date	Event
11-May-21	Tanumbirini 2H start drilling (spud)
17-Aug-21	Tanumbirini 2H complete drilling (rig release)*
23-Aug-21	Tanumbirini 3H start drilling (spud)
19-Nov-21	Tanumbirini 3H complete drilling (rig release)*
1-Dec-2021	Hydraulic fracture stimulation (frac) start
19-Dec-2021	Hydraulic fracture stimulation end
19-Dec-2021	Flowback start
3-Dec-2022	Flowback end. Remote monitoring starts.

\* drilling and well construction would have been completed several days prior to rig release

Figure 1 Activity and monitoring bore locations



### 3. Tanumbirini

This review focusses on the groundwater monitoring data acquired during the regulated activities performed on the Tanumbirini 2 and Tanumbirini 3 exploration wells. Data from prior to May 2021, when drilling commenced, was used to establish baseline groundwater conditions.

#### Monitoring Activities

In December 2018 and in accordance with the Guideline a control monitoring bore (RN040930 – 43 m from Tanumbirini 2) was installed at the Tanumbirini site, and the impact monitoring bore (RN040936 – 16 m from Tanumbirini 3) was installed in July 2019. Water level contours for the GRF were prepared using data collected by Santos (RDM Hydro, 2021) and indicate groundwater flow directions in the vicinity of Tanumbirini are from east-southeast to west-northwest (Figure 1). Both bores are installed to enable monitoring of the full thickness of the Gum Ridge Formation (GRF). The Anthony Lagoon Formation aquifer is not present at the Tanumbirini well pad.

Water level, temperature and conductivity (LTC) sensors were installed in the monitoring bores in September 2020 (prior to the approval of the Drilling EMP), replacing the previously installed sensors. A barometric pressure sensor was also installed at the site at this time. During background monitoring the sensors record every four hours. Condition 6 of the HFS EMP approval required *groundwater level/pressure monitoring at each impact monitoring bore established, using a logger to record water level for 2 weeks prior to, during, and 4 weeks after completion of hydraulic fracturing operations at each well pad. Data logging should record at a minimum of every 4 minutes for the duration of the recording period.* Accordingly, the datalogger, the recording interval in RN040930 and RN040936 was increased to four minutes from 29 September 2021 (62 days prior to the start of the HFS) to 2 February 2022 (45 days after the end of the HFS activity). It was then returned to a four-hourly recording interval. The original LTC logger failed in October 2022 and was replaced in January 2023. No logger data is available for the intervening period.

RN040930 was equipped with a dedicated electric submersible pump which is used for purging and sampling, at a pumping rate of 17 L/s. This bore was used for water supply throughout the regulated activities. The pump was replaced with a lower capacity sampling pump in December 2022.

RN040936 was constructed with sealed sub-surface headworks in a “gatic” in accordance with the Bore Work Permit. Prior to the commencement of the 2021 drilling program, an electric submersible pump was installed in the bore to allow baseline water quality monitoring. Because of its close proximity to the exploration wells (16 m from Tanumbirini 3, in accordance with the Guideline) and to allow the drill rig to operate, the pump was removed from the bore and the headworks sealed, therefore water quality monitoring could not be undertaken during drilling activities. The LTC sensor remained in the bore for the duration of the drilling campaign. The sampling pump was reinstalled during rig-down (at the end of drilling) and prior to the commencement of HFS activities and has remained available for sampling since.

Routine water quality monitoring of the bores commenced in July 2019. The suite of analysis is compliant with Table 6 of the Code and exceeds the requirements of the Guideline. RN040930 had been monitored 27 times and RN040936 had been monitored 10 times prior to the commencement of drilling in 2021. RN040930 has continued to be monitored for water quality at a quarterly interval. RN040936 was monitored on 16 March 2021, approximately 1 month before the drilling rig mobilised to site, and quarterly monitoring recommenced on 17 November 2021, after the completion of drilling of Tanumbirini 3, but prior to the HFS. Quarterly monitoring has continued through 2022 and 2023. A sample could not be collected from RN040930 in January 2023 due to a pumping equipment failure, however a sample was collected in February 2023 during a return visit. Twelve samples have been collected from RN040930 and ten samples have been collected from RN040936 (two on the same day) since the start of the regulated activities.

## Water level, temperature and electrical conductivity monitoring

The timing of sampling relative to exploration activities can be seen on Figure 2. The downhole sensor responses are described and interpreted as follows.

### RN040930 (CMB)

- Groundwater extraction for water supply from RN040930 started on 6 April 2021. Extraction was initially during daytime hours only until the commencement of Tanumbirini 2 drilling. The frequency then reduced and become more intermittent. Extraction increased to fill storages prior to the HFS. During the HFS, extraction was effectively continuous. There has been infrequent, short-duration extraction only since the completion of the HFS in late December 2021.
- There are diurnal water level fluctuations of 2 mm to 12 mm in RN040930 due to barometric pressures changes.
- A water level drawdown of approximately 0.05 m (5 cm) was recorded within the bore during pumping of RN040930.
- There was a long-term *rising* trend of 0.2 m over the period of extraction, which appeared to cease approximately a month after extraction ceased and then stabilised. Water levels have more recently started to decline. This is roughly consistent with regional water level trends as observed in NTG monitoring bores (accessed via the Water Monitoring Portal) screened in the Cambrian Limestone Aquifer around the Beetaloo Basin. These trends are shown on Figure 3. The most recently available data from the Water Monitoring Portal for these bores was from May 2023.
- The logger failed in October 2022 and was replaced in January 2023. There is no logger data available from the intervening period. The Guideline does not mandate the use of water level and conductivity sensors.
- There was a rise in temperature of 0.2 °C during extraction, followed by a longer-term rise in the overall water temperature. Following extraction the temperature stabilised and then declined very gradually. The increased temperature indicates that the extracted groundwater is potentially coming from deeper in the bore than the sensor and pump intake (roughly 130m below ground). The increase in temperature in October 2022 is likely an artefact due to the replacement sensor being installed marginally deeper than the original sensor.
- The EC showed a correlation to the amount of pumping, with EC increasing in proportion to the amount of extraction. This may relate to differential depressurisation of discrete fractures within the limestone, and a change in the relative proportion of water provided by each fracture to the bore. The drop in the logger EC between October 2022 to January 2023 is related to a different calibration of the replacement sensor.

### RN040936 (IMB)

- The overall water level response was similar to RN040930, but the overall rising trend was smaller, with a maximum increase of less than 0.05 m (5 cm). The water level returned to the pre-activity water level in about June 2023 and has been relatively stable since.
- The influence of ongoing extraction over approximately 2 months can be seen as a small (~1 cm) decline in water level.
- Shortly after the start of drilling of Tanumbirini 2, there was a drop in water level, much like if the bore were being pumped (which lasted about a day), and then a flat signal.
- A small decrease in temperature (<0.05 °C) after the start of drilling of Tanumbirini 2 and a declining temperature after the start of drilling of Tanumbirini 3. These changes in temperature may be related to the influence of drilling fluids which were cooler than the aquifer water due to the former being stored on the surface.
- Step changes in the temperature response are due to changes in the logger depth. These changes are only 0.4 °C in total.
- The temperature and electrical conductivity in RN040936 are subtly affected by pumping in RN040930.



- There is a small (~1 cm) seasonal influence of barometric pressure on the water level trend.

## Water quality monitoring

For each of RN040930 and RN040936, Attachment A includes a summary table that contains:

- A statistical summary of all groundwater quality results,
- The results of samples collected immediately prior to and after the start of drilling, and
- The P-value of the T-Test comparing the analyte results from pre the start of drilling and post the start of drilling.

A Before After/Control Impact (BACI) approach has been used to assess the potential effects of drilling activities on groundwater quality.

Gross alpha is the only parameter that exceeded its ANZECC (2000) livestock drinking water guideline value. It was exceeded in both the RN040930 and RN040936 including baseline water quality. Therefore, this exceedance is not related to drilling activities. Gross beta activity also exceeded the ANZECC (2000) livestock drinking water guideline value in one baseline water quality result from RN040930.

The groundwater quality results have been graphically presented as box-and-whisker plots (Attachment B). The statistics were calculated on all data up to and including 16 March 2021 (baseline data – prior to the start of drilling), with those results from samples collected post 16 March 2021 shown as individual symbols. The box-and-whisker plots were used to identify those parameters which exceeded the range of background variability in at least one sample. Where a parameter was identified to exceed the range of background variability, a timeseries chart was prepared (Attachment C), with results from other sites where Santos has installed monitoring bores provided for comparison (control sites). The timeseries charts for a parameter are scaled based on the maximum concentration across all of the sites. The trends identified in these charts are described in Table 2.

The timeseries charts mostly show no consistent trend in parameter concentrations. In some cases the baseline maximum is exceeded in the first sample collected after the drilling commenced, others the middle or the last. Sometimes the concentrations have decreased to less than the baseline maximum by the end of drilling. There appears to be correlations in the many of the parameter concentrations across all of the monitoring sites. This is most likely related to laboratory measurement uncertainties rather than changes in the aquifer as the monitoring bores are separated by distances of 10-20 km and show the same variations in concentrations. Laboratory measurement uncertainties are greatest when the concentrations are less than ten times the limit of reporting (i.e. the values are very low concentrations).

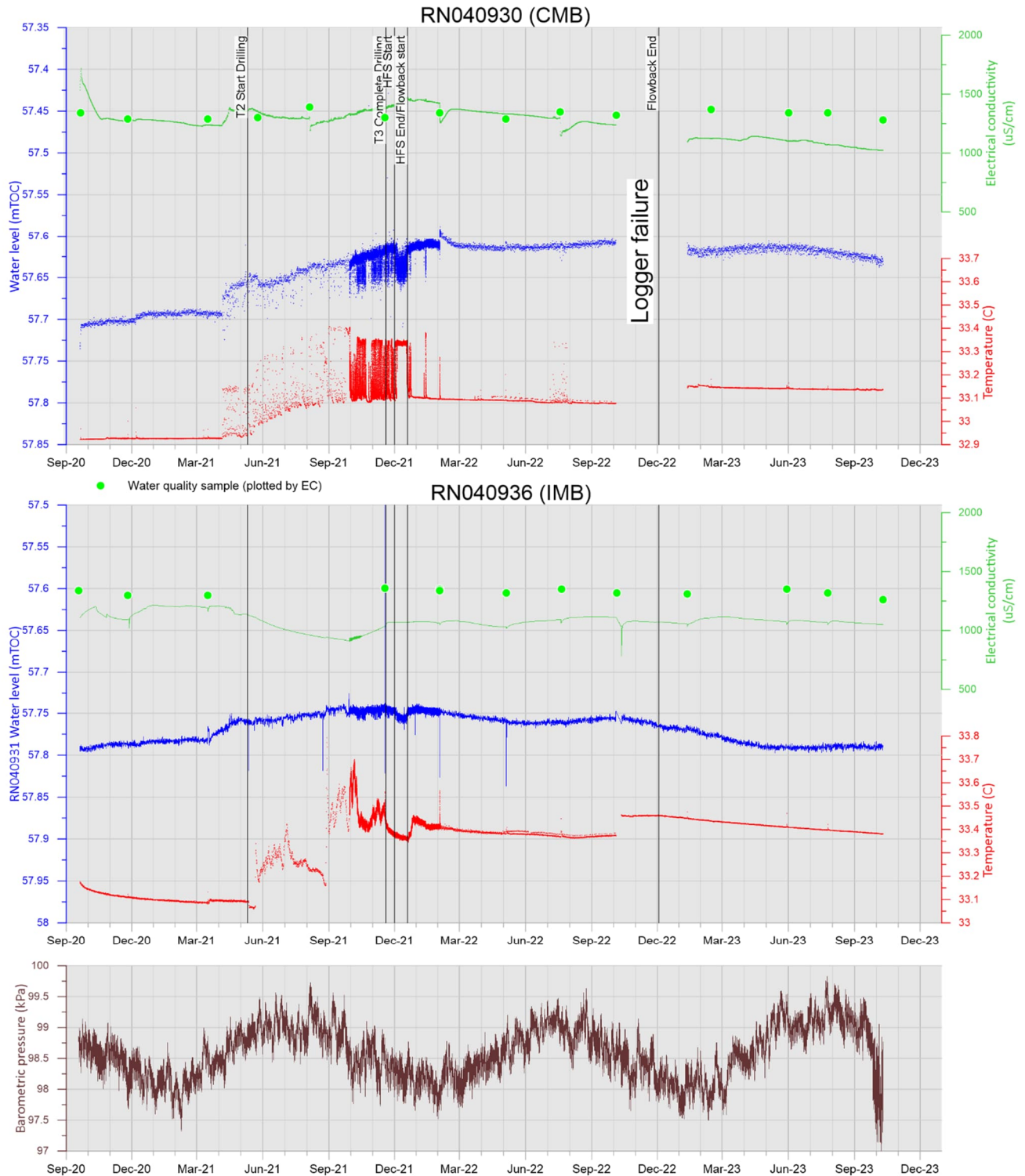
Since there is bias in the selection of the pre-activity maximum concentration, a statistical assessment was made using a Student T-Test to test whether there was a significant difference in the results before and after the start of exploration activities on Tanumbirini 2 and Tanumbirini 3. An F-Test was used to determine whether the homoscedastic (statistically similar variance) or heteroscedastic (statistically different variance) formula for the T-Test was used. Where a concentration was reported as less than the limit of reporting, the limit of reporting was assumed to be the sample concentration. The statistical significance was assessed to a 95% confidence. The results of the analysis are included in the statistical summaries in Attachment A. The bores and parameters where the P-value was less 0.05 (95% confidence that there is a significant difference between the pre- and post-drilling data) are identified in Table 3. The parameters identified are generally consistent with those in which the maximum baseline concentration was exceeded. For some of the trace elements (metals/metalloids), there was a statistically significant *decrease* in the reported concentration, i.e. water quality improved following exploration activities, as identified in Table 3.

The observed variability in major ion and trace element concentrations suggest a possible, but subtle, influence of the exploration activities on the groundwater quality in the vicinity of the wells. This influence is likely to be related to the drilling of the wells through the following mechanisms:

- **Drilling mud:** there were increases in potential indicators of the presence of drilling mud such as potassium, chloride, pH, alkalinity and barium.
- **Drill cuttings:** Mobilisation of ions and elements associated with the increased surface area of the cuttings relative to in-tact formation, and through the oxidation of the minerals from the oxygen rich drilling mud that had been stored in open tanks on surface. Wallis and Pichler (2018) and Poulsen et al. (2020) refer to these mechanisms in the literature. A similar influence on water chemistry could be seen in the evolution of the baseline water chemistry observed in most of the monitoring bores where declining trends in parameters were observed following drilling of the water bore itself, until a relatively stable baseline had been reached (RDM Hydro, 2022).

There were no significant changes to the groundwater chemistry that can be attributed to the regulated activities.

Figure 2 Tanumbirini - LTC timeseries monitoring data





**Figure 3 Regional groundwater level monitoring of the Cambrian Limestone Aquifer**

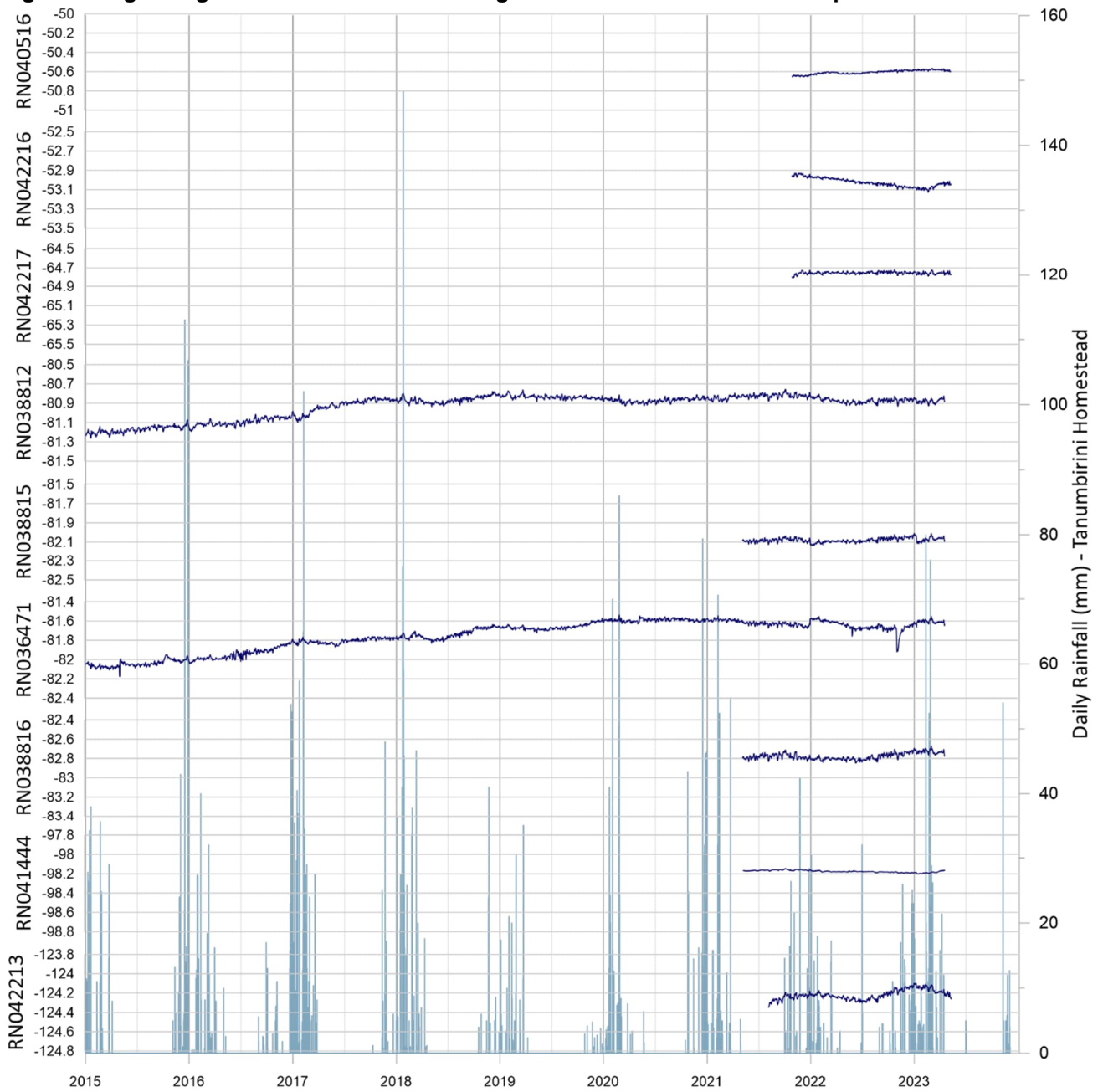


Table 2 Tanumbirini - Description of trends in parameters exceeding the baseline maximum concentration

Parameter (and fraction) exceeding baseline range in natural variability	Bore(s) in which exceedances were reported	Description
pH - Lab	RN040930 (CMB) RN040936 (IMB)	The laboratory pH measured in all three bores at Tanumbirini (CMB, IMB and RN038580) was reported to increase during both drilling and HFS activities, but then declined in February 2021 to within the range of background variability before increasing to ~pH 7.9 in May 2022, dropping again in July 2022, and then rising again. Since December 2022, the pH in all bores with pumps still installed has decreased to their reported minima. Similar trends in pH were observed across the other Santos monitoring sites.
Chloride		Both the CMB and IMB chloride concentrations increased marginally during activities and exceeded their pre-activity maxima, and then varied around the pre-activity average, with the most recent samples reporting concentrations amongst the lowest reported for these bores (106 mg/L and 107 mg/L). The chloride concentration in RN038580 rose very slightly after the start of drilling but declined to less than the pre-activity concentrations after the start of the flowback but has increased again and followed the same trend as the CMB and IMB. Chloride results from Jibera South, Inacumba and Inacumba show similar trends across all aquifers for the earlier data, but pumps have been removed from most of these bores. The recent data for RN041242 at Inacumba shows similar trends to those observed from Tanumbirini.
Sodium		The sodium concentration remained consistent in the CMB and IMB throughout the drilling and first six months of flowback. In July 2022 there was a slight rise in the sodium concentration in both the CMB and IMB, with the sodium concentration remaining slightly higher through the second half of 2022 but declined through 2023 for final concentrations of ~75 mg/L, marginally less than the pre-activity values. Similar rising trends in sodium concentrations are observed in the results from Jibera South, Inacumba and Inacumba South prior to pump removal. The chloride content in RN041242 declined during 2023, similar to Tanumbirini.
Potassium		Potassium concentrations in the CMB increased to its maximum reported value in the first sample after the start of drilling, but then decreased to within the background range, although on a slight rising trend to the end of the HFS. The IMB showed a similar rising trend through the drilling and HFS activities. The potassium concentration in both bores decreased in the first two samples following the HFS but show an upward trend in the two subsequent samples, followed by more recent declining trends through 2023. Samples from the other sites and all aquifers show similar rising trends through 2022, with the most recent data from RN041242 showing similar declining trends to the bores at Tanumbirini through 2023.
Calcium		Calcium concentrations effectively remain consistent in both the CMB and IMB from once the bore chemistry stabilised after drilling and through the drilling activities. Consistent with calcium concentrations from the other sites (Jibera South, Inacumba and Inacumba South), calcium concentrations were reported to decrease from after the start of the flowback, prior to increasing from May 2022 to greater than the pre-activity maxima. Since October 2022 calcium concentrations have declined to ~125 mg/L, less than the concentrations reported pre-activity. A similarly declining trend is observed in the data from RN041242, although its most recent calcium concentration is similar, rather than less than, its initial concentration.
Magnesium		The magnesium concentrations in the IMB, CMB and RN038580 reported effectively flat trends following the establishment of baseline conditions in Q1 2019 and very slightly declining trends from the start of drilling through to the July 2022 samples. The October 2022 samples reported relatively higher concentrations in all Santos monitoring bores, with the IMB exceeding its pre-activity maximum (60 mg/L compared with 59 mg/L). Concentrations have since declined in both the IMB and CMB to less than the pre-activity maxima. Relatively greater concentrations were reported from the other Santos sites in October 2022. While most bores have not been sampled since October 2022, the concentration in RN0421242 has also declined (similar to Tanumbirini).
Methane (dissolved)		Dissolved methane concentrations in the IMB reported steadily declining trends from the peak in February 2022 of 48 µg/L to January 2023 (15 µg/L), however in May 2023 the reported concentration increased to 25 µg/L, but has subsequently declined to 10 µg/L, which is comparable to a pre-activity maximum concentration of 9 µg/L. The CMB dissolved methane concentrations have always been less than the IMB but have shown similar trends. The most recent CMB concentration was reported as 4 µg/L. The IMB and RN038580 reported dissolved low methane concentrations prior to the commencement activities. Prior to the activities, the CMB had previously only reported concentrations <LOR. RN038580 concentrations showed a declining trend from November 2019 through to August 2021 (during drilling activities) to a local minimum concentration of 2 mg/L. Thereafter the concentration slowly increased to 6 mg/L in May 2022, prior to declining again in July 2022 to 4 mg/L and rising to 6 µg/L in January 2023 (the most recent sample). Results from other Santos monitoring sites, where there have been no exploration activities, show variable methane concentrations. RN040938 showed an increase trend from <LOR to a peak of 37 µg/L, followed by a decrease over 6 months to 10 µg/L. All results from the most recent samples (October 2022 or 2023) were <LOR.
Boron (dissolved)		The CMB reported a maximum concentration (0.21 mg/L) in the first sample following the start of drilling, as compared with its pre-activity maximum of 0.19 mg/L. The concentration decreased to 0.19 mg/L (May 2021) and 0.18 mg/L (November 2021) before increasing again to 0.2 mg/L in February 2022. Through 2022, the concentration gradually decreased, but started to increase again in 2023, reaching 0.22 mg/L in May 2023, but reporting decreasing concentrations from July 2023 (0.18 mg/L) and October 2023 (0.11 mg/L). In the IMB, the pre-activity maximum reported boron concentration was 0.19 mg/L. The dissolved boron trend in the IMB was similar to the CMB, with the IMB reporting a maximum concentration of 0.2 mg/L in May 2023, before declining to 0.13 mg/L in October 2023 (most recent sample) In RN038580, the dissolved boron concentration decreased from a pre-activity maximum of 0.19 mg/L to 0.13 mg/L in February 2022, but increased to follow the same trends as the CMB and IMB from May 2022. All of the Santos monitoring bores show similar trends in concentrations to the bores at the Tanumbirini site. RN040931, at Inacumba, reported concentrations of dissolved boron greater than 0.2 mg/L from September 2020 onward, until the pump was removed from the bore,
Copper (dissolved)		Following stabilisation of background concentrations (after December 2019) the dissolved copper concentrations were <LOR in the CMB and IMB. The first sample after the end of drilling (December 2021) reported the presence of dissolved copper in both the CMB (0.004 mg/L) and IMB (0.001 mg/L). Since those samples, dissolved copper concentrations in the CMB and IMB were <LOR, except for the IMB reporting a maximum concentration in May 2022 of 0.014 mg/L. RN038580 had previously reported a dissolved copper concentration <= LOR. Dissolved copper concentrations from the other Santos monitoring bores are generally <LOR, however concentrations >LOR have been reported.
Lithium (dissolved)		The CMB (0.084 mg/L) and IMB (0.078 mg/L) reported dissolved lithium concentrations greater than their historical maxima in May and February 2023 respectively. Concentrations have since declined to 0.069 mg/L and 0.071 mg/L from the CMB and IMB respectively in October 2023, which are similar to their initial concentrations. RN041242 concentrations show similar trends to the Tanumbirini bores. The Dissolved lithium concentration from RN040931 was generally greater than 0.4 mg/L
Strontium (dissolved)		The dissolved strontium concentrations in the CMB and IMB have generally moved in concert, decline from roughly 0.8 mg/L pre-drilling, and gradually rising to a local maximum of 0.82 mg/L in January 2021. There was some variability in the trends between the CMB and IMB through 2022, but bore bores reported maximum concentrations in May 2023 (CMB = 0.905 mg/L, IMB = 0.861 mg/L), but declining to less than 0.8 mg/L in July and October 2023. Similar trends are observed from the other Santos monitoring bores where there have been no exploration activities. The dissolved strontium concentration in RN040931 was consistently less than 0.2 mg/L from January 2020 to the last sample collected in October 2021.
Boron (total)		The CMB reported a total boron concentration (0.27 mg/L) during the drilling of Tanumbirini 2 exceeding its pre-activity maximum (0.22 mg/L) in August 2021. The concentration decreased to 0.16 mg/L in November 2021 (prior to HFS) but increased again to 0.2 mg/L in February 2022 and then declining to 0.14 mg/L in October 2022, but rising to 0.18 mg/L in January 2023. The IMB total boron concentration showed a declining trend through the activities to January 2021, but then increased to its maximum reported concentration (0.28 mg/L) in July 2022. The concentration decreased to 0.17 mg/L in October 2022 but rose to 0.21 mg/L in January 2023. Through 2023, the total boron concentrations in the CMB and IMB have moved in concert, with the final samples (October 2023) reporting 0.17 mg/L and 0.15 mg/L for the CMB and IMB respectively. RN038580 reported total boron concentration in February 2022 (0.21 mg/L) that exceeded its pre-activity maximum (0.19 mg/L). The concentration then declined but increased again to 0.21 mg/L in January 2023. No samples have been collected since. Total boron concentrations in the other Santos monitoring bores show similar variability in trends across the bores and site.
Copper (total)	RN040930 (CMB)	The total copper concentration in the CMB peaked at 0.031 mg/L in the last sample prior to drilling and exhibited a declining trend during the drilling and HFS program. The concentration was <LOR in May 2022, but then spiked up to 0.16 mg/L in July 2022, and reduced to 0.043mg/L in October 2022 and was reported <~LOR since. Total copper concentrations in other monitoring bores have generally been <LOR, except in October 2022 when very low concentrations (LOR) were reported.
Electrical conductivity at 25°C	RN040936 (IMB)	The electrical conductivity (EC) of the groundwater in the Gum Ridge Formation at the Tanumbirini site is approximately 1,300 µS/cm, with the three bores showing slight variations over time, generally in concert with each other. The maximum reported EC in the IMB was 1,360 µS/cm, as compared with its maximum prior to the start of activities of 1,340 µS/cm and minimum of 1,280 µS/cm. The most recent concentration has decreased to 1,260 µS/cm. The maximum reported EC in the CMB was 1,410 µS/cm prior to activities starting, and 1,390 µS/cm during activities. The most recent EC was 1,280 µS/cm. Bores at other sites also reported slight variations in EC over time and in concert with each other suggesting potential variations in the laboratory sensor calibrations
Total Dissolved Solids @180°C		The TDS concentrations reported from the IMB have mostly varied in concert with the CMB. The maximum reported pre-activity TDS from the IMB was 878 mg/L, with a maximum concentration of 920 mg/L reported from the first sample collected following drilling in November 2021. The reported TDS from the IMB decreased to 826 mg/L after the completion of the HFS (July 2022), but increased in the two samples since (October 2022 and January 2023) with the last sample reporting a TDS of 916 mg/L. IT declined during 2023, but increased slightly in the final sample to 869 mg/L. The October 2023 concentration in the CMB was 840 mg/L TDS and generally shows a similar trend to the IMB. The most recent concentration (February 2023) in RN038580 was 877 mg/L TDS and shows a similar trend to the CMB and IMB.

Parameter (and fraction) exceeding baseline range in natural variability	Bore(s) in which exceedances were reported	Description
		The concentration in RN041242 shows a similar trend to the IMB and CMB.
Bicarbonate Alkalinity as CaCO3		The dominant major anion in the groundwater in the Gum Ridge Formation is bicarbonate. The maximum bicarbonate concentration in the IMB (435 mg/L) was reported from the November 2021 sample, compared with a pre-activity maximum of 420 mg/L. The bicarbonate concentration decreased to a minimum post-activity concentration of 377 mg/L in May 2022, but then increased to 419 mg/L in July 2023, with an October 2023 reported concentration of 401 mg/L. Concentrations in the other Santos monitoring bores show similar temporal trends. The most recent (October 2023) concentration in the CMB was 400 mg/L.
Nitrate		The nitrate concentration in the IMB and CMB was <=LOR prior to and through the activities at Tanumbirini. The IMB sample from May 2023 reported 0.09 mg/L and has since declined to <LOR. Nitrate concentrations in other Santos monitoring bores are generally <LOR, except for RN040937 at Jibera South and RN040932 at Inacumba South, where low concentrations of nitrate were consistently reported.
Nitrite		The nitrate concentration in the IMB and CMB was <LOR prior to and through the activities at Tanumbirini. The IMB sample from May 2023 reported 0.13 mg/L and has since declined to <LOR. Nitrite concentrations in other Santos monitoring bores were <LOR for all results.
Reactive Silica		The reactive silica concentration in the IMB exhibited a very slight rising trend from 22.9 mg/L in March 2021 to 25.1 mg/L October 2022. It reported decreasing concentrations through 2023, with a final reported concentration of 23.5 mg/L in October 2023. The maximum pre-activity concentration was 24.9 mg/L. The CMB reported similar concentrations and trends from the end of the HFS. Reactive silica concentrations show more variability between the Santos monitoring bores than most other parameters.
Gross alpha		The pre-activity maximum reported Gross alpha concentration in the IMB was 0.82 Bq/L with a local maximum concentration (0.93 Bq/L) reported in July 2022. The concentration in the IMB then reduced to 0.66 Bq/L in January 2023, but has increased through 2023 to 1 Bq/L in October 2023. The CMB reported an increased concentration during drilling to a maximum of 0.91 Bq/L in August 2021, but the decreased and changing in concert with the IMB and RN041242 since. The most recent concentration in the CMB was 0.99 Bq/L. Gross alpha shows some variability in reported concentration magnitude in all monitored bores, with the direction of change mimicking those reported from the IMB.
Gross beta		The gross beta concentration in the IMB reported a declining trend from a 0.39 Bq/L peak in July 2020 (prior to the start of drilling) to 0.24 Bq/L in November 2021, after the completion of the drilling activities. In the first sample following the HFS (February 2022) the concentration increased to 0.36 Bq/L, decreased to 0.31 Bq/L in May 2022 and then increased to its reported maximum of 0.44 Bq/L in July 2022 prior to declining to 0.34 mg/L in October 2022. Concentrations have since declined further, with the most recent sample (October 2023) reporting a concentration of 0.29 Bq/L. Gross beta concentrations show some consistencies in concentration trends between the monitoring bores but are less correlated than many of the other parameters where this occurs.
Aluminium (dissolved)		The dissolved aluminium concentration in the IMB has historically been <LOR. The result from May 2023 was reported as 0.02 mg/L. The CMB and RN041242 also reported concentrations >LOR from May 2023. With the exception of an early sample from each of the CMB and RN038580, all reported dissolved aluminium concentrations were <LOR.
Barium (dissolved)		The pre-activity maximum reported concentration of dissolved barium (0.05 mg/L) was only exceeded in the IMB (0.051 mg/L) in November 2021 declining to 0.040 mg/L in May 2022, increasing to 0.049 mg/L in July 2022 and then decreasing. The most recent sample reported a concentration of 0.043 mg/L. A similar trend was reported from the CMB, reaching a maximum of 0.048 mg/L during activities compared with a pre-activity maximum of 0.05 mg/L. The most recent concentration was 0.042 mg/L in October 2023. Barium is ubiquitously present in the groundwater samples collected across the Santos monitoring bores. The maximum reported dissolved barium concentration (0.137 mg/L) reported from RN040938 at Jibera South is approximately 4 times greater than the concentrations reported from the Tanumbirini site. Similar temporal trends are observed in the dissolved barium concentrations reported from RN041242 compared with the IMB and CMB.
Aluminium (total)		Total aluminium was reported <LOR in the IMB in all samples prior to activities starting. One of the samples collected in February 2022 reported 0.02 mg/L whereas the other reported <LOR (0.01 mg/L). The CMB reported total aluminium in the August 2021 sample (0.02 mg/L), but had previously had a reported concentration of 0.03 mg/L. Both the IMB and CMB have reported <=LOR since February 2022. Significantly higher dissolved aluminium concentrations have been reported from the other Santos monitoring bores, generally from the first sample collected, where the concentration may be influenced by the presence of solids resulting from the drilling of the bore. Concentrations are generally <=LOR.
Barium (total)		In the IMB, the total barium concentration exceeded the pre-activity maximum (0.049 mg/L) in the November 2021 (0.05 mg/L) and the two samples collected in February 2022 (0.086 mg/L and 0.055 mg/L). The total barium concentration remained greater than the pre-activity maximum but had a declining trend from February 2022 until July 2023 when it had a reported concentration of 0.044 mg/L, less than the pre-activity maximum. The most recent (October 2023) total barium concentration reported for the IMB was 0.046 mg/L. The CMB reported some variability in total barium concentration through the activities (0.044-0.04 mg/L), but the concentration did not exceed the pre-activity maximum (0.049 mg/L) and showed a marginally increasing trend since the end of activities, rising from 0.047 mg/L to 0.049 mg/L between February and October 2022. The concentration in the CMB has since declined to 0.044 mg/L (July and October 2023). Total barium concentrations are regularly greater at Jibera South and Inacumba South as compared with Tanumbirini.
Chromium (total)		Prior to activities commencing, the IMB reported total chromium <LOR. The November 2021 sample reported 0.002 mg/L total chromium. The concentration reduced to <LOR in February 2022 and has remained <LOR throughout 2022 and 2023, including the most recent sample from October 2023. The CMB total chromium concentration was also <LOR throughout 2022 and 2023. Most other Santos monitoring bores report total chromium that fluctuate between <LOR and =LOR.
Lithium (total)		The pre-activity maximum total lithium concentration reported from the IMB was 0.076 mg/L from May 2020. The concentration then decreased to a minimum of 0.058 mg/L in November 2020, before rising to 0.074 mg/L in the last sample collected prior to the start of activities. Through the activities and 2022, the concentration fluctuated between 0.066 mg/L and 0.075 mg/L, mostly reported around 0.07 mg/L. The concentration rose in 2023 to a maximum of 0.081 mg/L in May, before declining again. The most recent concentration was 0.075 mg/L. A similar rising trend in the total lithium concentration from late 2022 through to May 2023 was observed in the CMB.
Molybdenum (total)		Prior to activities commencing, the IMB reported total molybdenum <LOR. The November 2021 sample reported 0.003 mg/L total molybdenum. The concentration reduced to <LOR in February 2022 and has remained <LOR throughout 2022 and 2023, including the most recent sample from October 2023. The CMB total molybdenum concentration has remained <LOR since March 2020 when it stabilised post the drilling of the bore. Most other Santos monitoring bores report total molybdenum <LOR. RN040931 at Inacumba consistently reports total molybdenum in the range 0.002-0.004 mg/L. RN040938 at Jibera South reported a maximum dissolved molybdenum concentration of 0.02 mg/L prior to declining to <=LOR.
Strontium (total)		The total strontium concentration in the IMB has moved in concert with the concentration in the CMB. Pre-activity maximum concentrations were reported in September 2020 (IMB 0.876 mg/L and CMB 0.859 mg/L). Minimum concentrations were then reported in the next sample, collected in November 2020. The concentrations increased in both bores prior to the start of drilling but remained less than the pre-activity maxima. Concentrations remained relatively stable during drilling and then increased to 0.87 mg/L / 0.861 mg/L in the IMB/CMB respectively in February 2022. Concentrations then declined in May 2022 prior to showing an increasing trend from then to October 2022, where the IMB concentration remained relatively stable around its maximum of 0.88 mg/L until May 2023. In the July and October 2023 samples, the IMB concentration decreases to ~0.77 mg/L. The CMB concentration show a little more variability through 2023, but also declined to similar concentrations as the IMB in July and October 2023. Similar concentrations and trends in total strontium are observed across all monitoring bores.

LOR - limit of reporting; <LOR – less than the LOR; =LOR – equal to the LOR; >LOR – greater than the LOR; <~LOR – less than or roughly equal to the LOR  
CMB = RN040930; IMB=RN040936

**Table 3 Parameters with a significant difference between pre- and post-activity concentrations**

Bore	Parameter	Comment
RN040930 (CMB)	Electrical Conductivity - Field	Post-activity mean concentration less than pre-activity mean
	Total Dissolved Solids @180°C	
	Chloride	
	Potassium	
	Calcium	
	Reactive Silica (dissolved)	
	Gross beta	Post-activity mean concentration less than pre-activity mean
	Methane	
	Arsenic (dissolved)	Post-activity mean concentration less than pre-activity mean
	Iron (dissolved)	
	Nickel (dissolved)	Post-activity mean concentration less than pre-activity mean
	Uranium (dissolved)	Post-activity mean concentration less than pre-activity mean
	Zinc (dissolved)	Post-activity mean concentration less than pre-activity mean
	Aluminium (total)	Post-activity mean concentration less than pre-activity mean
	Barium (total)	
	Cobalt (total)	Post-activity mean concentration less than pre-activity mean
	Lead (total)	Post-activity mean concentration less than pre-activity mean
	Uranium (total)	Post-activity mean concentration less than pre-activity mean
	Zinc (total)	Post-activity mean concentration less than pre-activity mean
RN040936 (IMB)	Electrical Conductivity @ 25°C	Post-activity mean concentration less than pre-activity mean
	Total Dissolved Solids @180°C	
	Chloride	
	Potassium	
	Calcium	Post-activity mean concentration less than pre-activity mean
	Magnesium	Post-activity mean concentration less than pre-activity mean
	Reactive Silica (dissolved)	
	Gross alpha	
	Methane	
	Arsenic (dissolved)	Post-activity mean concentration less than pre-activity mean
	Barium (dissolved)	
	Iron (dissolved)	Post-activity mean concentration less than pre-activity mean
	Lithium (dissolved)	
	Nickel (dissolved)	Post-activity mean concentration less than pre-activity mean
	Uranium (dissolved)	Post-activity mean concentration less than pre-activity mean
	Arsenic (total)	Post-activity mean concentration less than pre-activity mean
	Barium (total)	
	Boron (total)	
	Iron (total)	Post-activity mean concentration less than pre-activity mean
	Lead (total)	Post-activity mean concentration less than pre-activity mean
	Nickel (total)	Post-activity mean concentration less than pre-activity mean
	Uranium (total)	Post-activity mean concentration less than pre-activity mean

#### 4. Inacumba

There have been no drilling or HFS activities at Inacumba. The Inacumba site is approximately 20 km to the east of Tanumbirini.

#### Monitoring Activities

Monitoring activities target two formations at the Inacumba site.

##### Gum Ridge Formation (GRF)

A control monitoring bore (RN040931 – up hydraulic gradient of the proposed well locations) was installed in the Gum Ridge Formation (GRF) at the Inacumba site in December 2018 and a future impact monitoring bore (RN040935 – down hydraulic gradient of the proposed well locations) was installed in July 2019. Both bores are installed across the full thickness of the Gum Ridge Formation (GRF) in accordance with the Guideline.



Water level, temperature and conductivity (LTC) sensors were installed in the monitoring bores in September 2020, replacing previously installed sensors that were found to provide unreliable data. The sensors record at four hourly intervals. The LTC sensor in RN040931 was removed from the bore in December 2022. Data acquisition from the LTC sensor in RN040935 failed at the end of May 2023 and was reinstated at the end of July 2023.

RN040931 was equipped with a dedicated electric submersible pump which is used for purging and sampling, at a pumping rate of ~0.5 L/s, however the bore cannot sustain this pumping rate. Routine water quality monitoring of RN040931 commenced in late July 2019. The suite of analysis exceeds the requirements of the Guideline and is compliant with Table 6 of the Code. RN040931 has been sampled 27 times. A sample could not be collected in February 2022 as the site was not accessible due to wet weather. The pump was removed from the bore in December 2022 and the last sample available for RN040931 was collected in October 2022.

RN040935 was constructed as a future IMB with sealed sub-surface headworks in a “gatic” in accordance with the Bore Work Permit. There is no pump installed in this bore and no water quality samples have been collected.

### **Inacumba Aquifer (IA)**

Santos, working with the NTG (Tickell, 2020), identified a previously unrecognised stratigraphic interval, informally called the Inacumba Unit. The Inacumba Unit comprises a red-brown siltstone overlying a clean limestone. The Inacumba Unit has been encountered at the Tanumbirini and Inacumba exploration sites, where it is up to ~200 m thick, but is not known further west. A control monitoring bore (RN041242) and a future impact monitoring bore (RN041243) were installed in the Inacumba Unit aquifer in September 2019.

Water level, temperature and conductivity (LTC) sensors were installed in the monitoring bores in September 2020. The sensors record at four hourly intervals. The LTC sensor in RN041243 failed in August 2022 and was replaced in January 2023. It failed again at the end of May 2023. There is no data available for the periods of failure, however manual water levels were collected.

RN041242 was equipped with a dedicated electric submersible pump which was used for purging and sampling, at a pumping rate of 17 L/s. Routine of water quality monitoring of RN041242 commenced in October 2019. The suite of analysis exceeds the requirements of the Guideline and is compliant with Table 6 of the Code. RN041242 had been sampled 11 times. A sample could not be collected in January 2022 as the site was not accessible due to wet weather. The pump was removed from the bore in December 2023 and was replaced with a smaller pump in April 2022, thus a sample was not collected in January 2023.

RN041243 was constructed as a future IMB with sealed sub-surface headworks in a “gatic” in accordance with the Bore Work Permit. There is no pump installed in this bore and no water quality samples have been collected.

### **Water level, temperature and electrical conductivity monitoring**

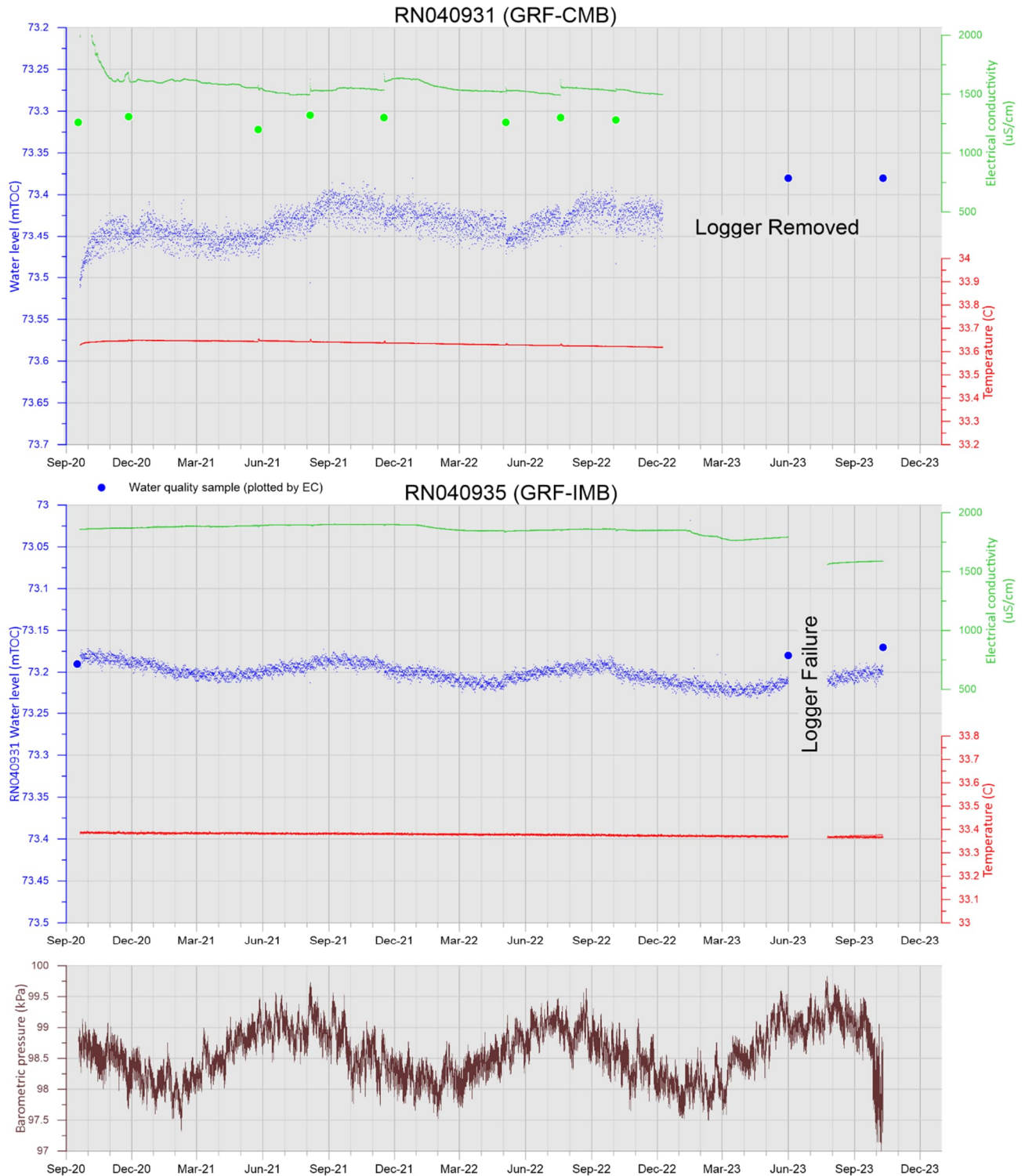
The timing of sampling relative to exploration activities can be seen on Figure 2. The downhole sensor responses are described and interpreted as follows.

- There is a slight seasonal fluctuation in water level that lags behind but follows barometric pressure
- The following diurnal variations in water level (approximate) can be observed:
  - RN040931 (GRF) – 0.05 m (5 cm)
  - RN040935 (GRF) – 0.025 m (2.5 cm)
  - RN042142 (IA) – 0.07 m (7 cm)
  - RN042143 (IA) – 0.07 m (7 cm)
- There is an approximately 0.05 m decline in overall water levels in the GRF and 0.1 m decline in the IA

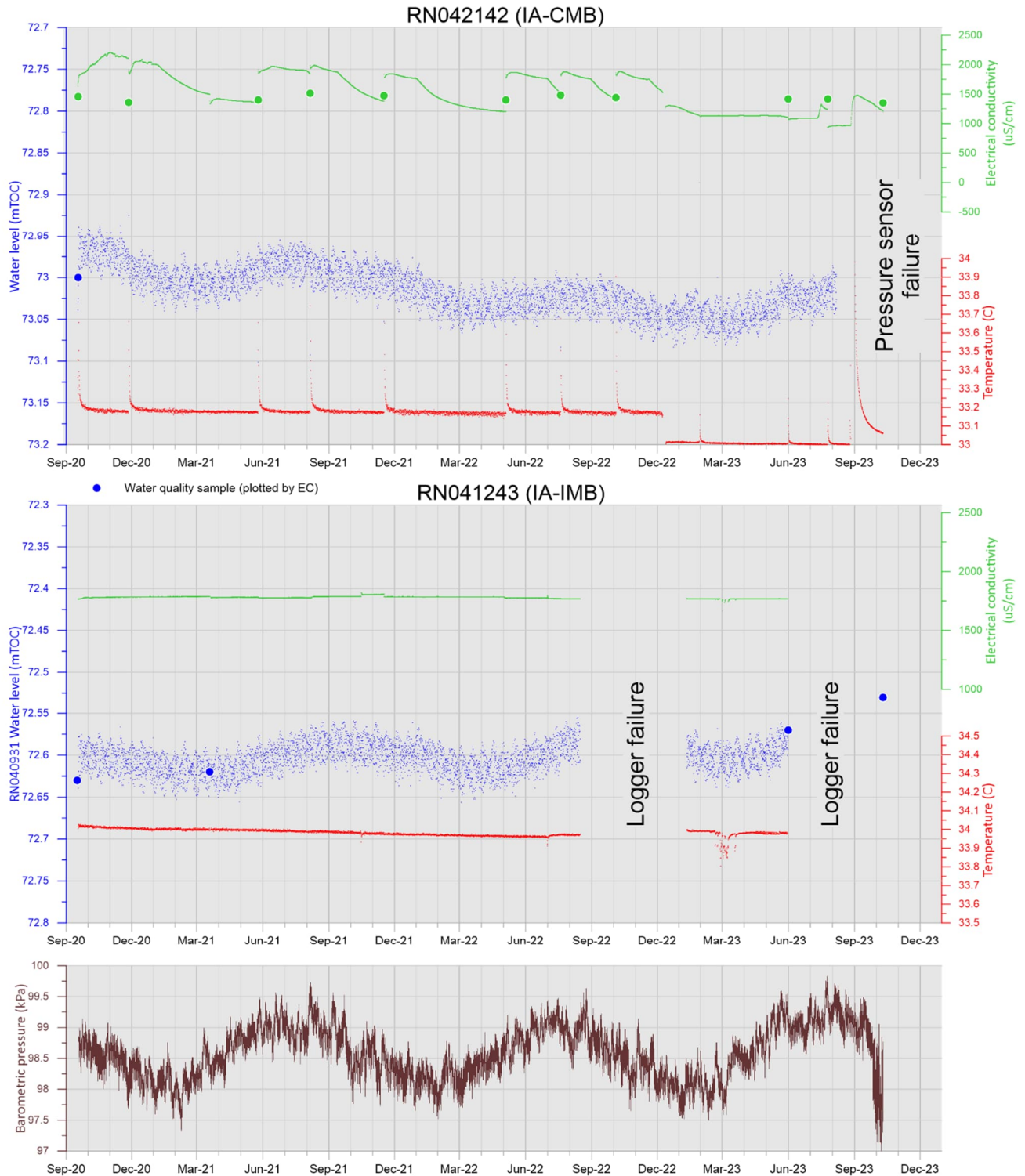


- The temperature and conductivity response in RN042142 indicate that pumped water is coming up the bore from deeper in the formation, and that the deeper water may be more saline than shallower water within the same geological formation. This is indicative of fracture dominated flow.
- The electrical conductivity measured by the sensor in RN040931 was roughly 250  $\mu\text{S}/\text{cm}$  greater than the field measured electrical conductivity. Both sets of data show similar effectively flat trends. The offset is likely to relate to a different calibration on the downhole sensor. The field measured electrical conductivity is considered the more reliable measurement as the portable meter is routinely calibrated each field visit.
- The LTC sensor in RN040931 was removed in December 2022. Manual water levels were measured with an electronic dipmeter during the quarterly monitoring showed a stable water level. The discrepancy between the logger water levels and the manually measured water levels is likely to be due to different reference points, and is approximately 2 cm.
- The LTC sensor in RN041243 failed in August 2022 and was replaced in January 2023. It failed again in late May 2023. There is no data available for the periods of failure.
- The Guideline does not mandate the use of water level and conductivity sensors.

**Figure 4 Inacumba Gum Ridge Formation (GRF) - LTC timeseries monitoring data**



**Figure 5 Inacumba Aquifer (IA) - LTC timeseries monitoring data**



## Water quality monitoring

There have been no drilling or HFS activities at Inacumba.

The most recent samples available from the bores at Inacumba are from October 2022 as the pumps were removed from the bores in December 2022.

Statistical summaries of the water quality results are provided in Attachment A. In lieu of assessing potential changes to water quality associated with exploration activities, the Mann-Kendall test for trend has been performed for all analytes for each of RN040931 and RN041242. Where the Mann-Kendall test has identified a rising trend (i.e. there appears to be a deterioration in the reported water quality), a time-series chart has been prepared and the data qualitatively described in Table 4

**Table 4 Inacumba - Description of timeseries data for those analytes with a rising trend**

Bore in which exceedances were reported	Parameter with rising trend	Description of trend
RN040931 (Gum Ridge Formation) <sup>1</sup>	pH – field	The field pH was quite variable when routine sampling commenced in Jul 2019, showing an overall steeply declining trend to a minimum of 6.4. The field pH then rose to ~pH 8, where it was relatively stable, except for an anomalously low reading in September 2020. The field pH has shown a slight declining trend through 2022.
	pH - laboratory	The laboratory measured pH exhibits similar trends to the field pH. The value of the laboratory measured pH is generally approximately 0.5 pH units greater than the field measured pH. This is likely due to volatilisation of dissolved carbon dioxide, a weak acid, that is commonly observed effervescing in the groundwaters collected from the Gum Ridge Formation
	Carbonate alkalinity	Carbonate alkalinity has mostly been reported at <LOR except for one sample in January 2022 and for 3 samples from August 2021, October and 2021 and February 2022 where concentrations peaked at 20 mg/L. The two most recent samples (July and October 2022) were both <LOR.
	Potassium	The potassium sample collected immediately after drilling contained 22 mg/L potassium. The concentration rose from 25 mg/L to 33 mg/L as the bore continued to be sampled, and then gradually declined to 26 mg/L between January 2020 and July 2022. Most recent sample report a concentration of 28 mg/L.
	Methane (dissolved)	Dissolved methane was report <LOR in all samples prior to October 2021. The concentration rose to a maximum of 5 mg/L in May 2022, declining to 20 mg/L in July 2022 and <LOR in October 2022.
	Lithium (dissolved)	The dissolved lithium concentration has fluctuated between 0.4 mg/L and 0.5 mg/L except for a few lower concentration outliers. The most recent sample (0.48 mg/L) contained lower than the maximum reported concentration (0.51 mg/L).
	Molybdenum (total)	The maximum total molybdenum concentration (0.05 mg/L) was reported from the sample immediately after drilling. When routine sampling commenced, concentrations were generally 0.002 mg/L, but reduced to <LOR in January 2020. Concentrations rose to a maximum of 0.004 mg/L in May 2021 and remained less than this concentration but >LOR since.
RN041242 (Inacumba Aquifer)	Gross alpha	The gross alpha concentration has fluctuated between roughly 0.8 Bq/L and 1.2 Bq/L. The two most recent samples reported 1.17 Bq/L and 1.21 Bq/L in July and October 2023 respectively.
	Iron (dissolved)	The dissolved iron concentration exhibited a gradually increasing concentration from 0.14 mg/L in October 2019 to 0.38 mg/L November 2021. The May 2023 sample reported 21.9 mg/L. This sample was the first collected for six months due to the pump being removed. The most recent sample (October 2023) reported <LOR. The large fluctuation in concentration most likely relates to the presence of corrosion product and the amount the bore is used/purged prior to sample collection.
	Manganese (dissolved)	The dissolved manganese concentration has risen from 0.004 mg/L in the first sample collected to a maximum of 0.574 mg/L in May 2023. The concentration has since declined to 0.288 mg/L. The rising trend is likely related to corrosion of the bore casing, with fluctuation in concentrations related to the amount the bore is used/purged prior to sample collection.
	Iron (total)	The total iron exhibits a similar trend to the dissolved iron trend, but at higher concentrations.
	Manganese (total)	The total manganese concentrations and trends are very similar to the dissolved manganese concentrations and trends.

<sup>1</sup> Most recent sample was from October 2022

## 5. Dissolved methane

Santos has analysed 313 individual samples for dissolved methane across its monitoring bores and from pastoral bores baselined and routinely monitored on Tanumbirini Station and the adjacent O.T. Downs (Beetaloo) station. This includes bore baseline and routine monitoring of pastoral water bores and Santos monitoring bores. Methane was detected in 105 of those samples (34 %). Dissolved methane has been detected in all monitored formations (Anthony Lagoon Formation, Gum Ridge Formation, Inacumba Aquifer and Proterozoic Bedrock) before and after drilling, and before and after HFS activities. The maximum reported dissolved methane concentration was 777 µg/L, from RN037666 (a station bore) that is more than 50 km to the northeast of the Tanumbirini site, compared with a maximum reported concentration of less than 50 µg/L at the Tanumbirini site. Methane saturation in water at atmospheric pressure is 20,700 µg/L at 30 °C (Walker and Mallants, 2014), which is the concentration required for free gas to be present.

Timeseries data shows a rising trend in the reported dissolved methane concentrations in the Tanumbirini IMB (RN040936) and CMB (RN040930) over the period of the exploration activities. Low concentrations of dissolved methane were detected in the IMB and RN038580 prior to the commencement of drilling, however dissolved methane had not previously been detected in the CMB. The IMB reported a maximum concentration of 48 µg/L and the CMB a maximum of 16 µg/L. The peak concentrations were followed by a decline to local minima in July 2022 and January 2023 in the CMB and IMB respectively. The CMB concentrations returned to <LOR in samples from July and October 2022, however concentrations in that bore have since increased to 4 µg/L. The IMB concentration increased from 15 µg/L in January 2023 to 25 mg/L in May 2023, but has since declined to 10 µg/L, which is similar to the pre-activity maximum of 9 µg/L reported in December 2020. RN038580 is also at the Tanumbirini site and reported the presence of dissolved methane in 2018 (11 µg/L). Concentrations declined through 2019 and 2020, reaching a minimum of 2 µg/L in August 2021 (near the end of drilling). The concentration exhibited a rising trend and local maximum concentration of 6 µg/L was reported in May 2022. The concentration remained at 5-6 µg/L until the last sample was collected from the bore in January 2023. A maximum concentration of 20 µg/L (CSIRO, 2019) was reported from RN038580 prior to the commencement of drilling.

While the dissolved methane concentrations temporarily increased at the Tanumbirini exploration site, the detected dissolved methane concentrations remain less than concentrations observed elsewhere across EP161. A timeseries comparison of the methane concentrations from Santos's regular monitoring of pastoral bores and those at the Tanumbirini exploration site is shown on Figure 6 and the spatial distribution of methane concentrations from all Santos monitoring activities (including bore baselines) are shown on Figure 7. From these figures, it can be seen:

- Dissolved methane has been detected in all monitored formations (Anthony Lagoon Formation, Gum Ridge Formation, Inacumba Aquifer and Proterozoic Bedrock) before and after drilling, and before and after HFS activities.
- There is no apparent spatial pattern to the distribution of dissolved methane concentrations.
- The maximum reported dissolved methane concentration was 777 µg/L, from RN037666 (a station bore) that is more than 50 km to the northeast of the Tanumbirini exploration site.
- RN038179 (11 km southwest of the Tanumbirini site) routinely reports dissolved methane concentrations greater than 200 µg/L, with a maximum concentration of 620 µg/L reported in March 2021. CSIRO (2019) reported a concentration of 379 µg/L from RN038179 (sampled in October 2018). The methane concentration in this bore was rising when the last sample was collected in January 2023,
- RN030325 (3.6 km from Tanumbirini), RN040937 (10.8 km from Tanumbirini) and RN037654 (24.3 km from Tanumbirini) also report rising dissolved methane concentrations over the equivalent period to the drilling and HFS activities (May 2021 to February 2022), albeit at lower concentrations compared with the Tanumbirini site. The dissolved methane concentration in RN040937 has been <LOR in since July 2022 from a peak of 6 µg/L. RN030325 reported 25 µg/L in July 2023 (its most recent sample), having increased from <LOR in May 2022.

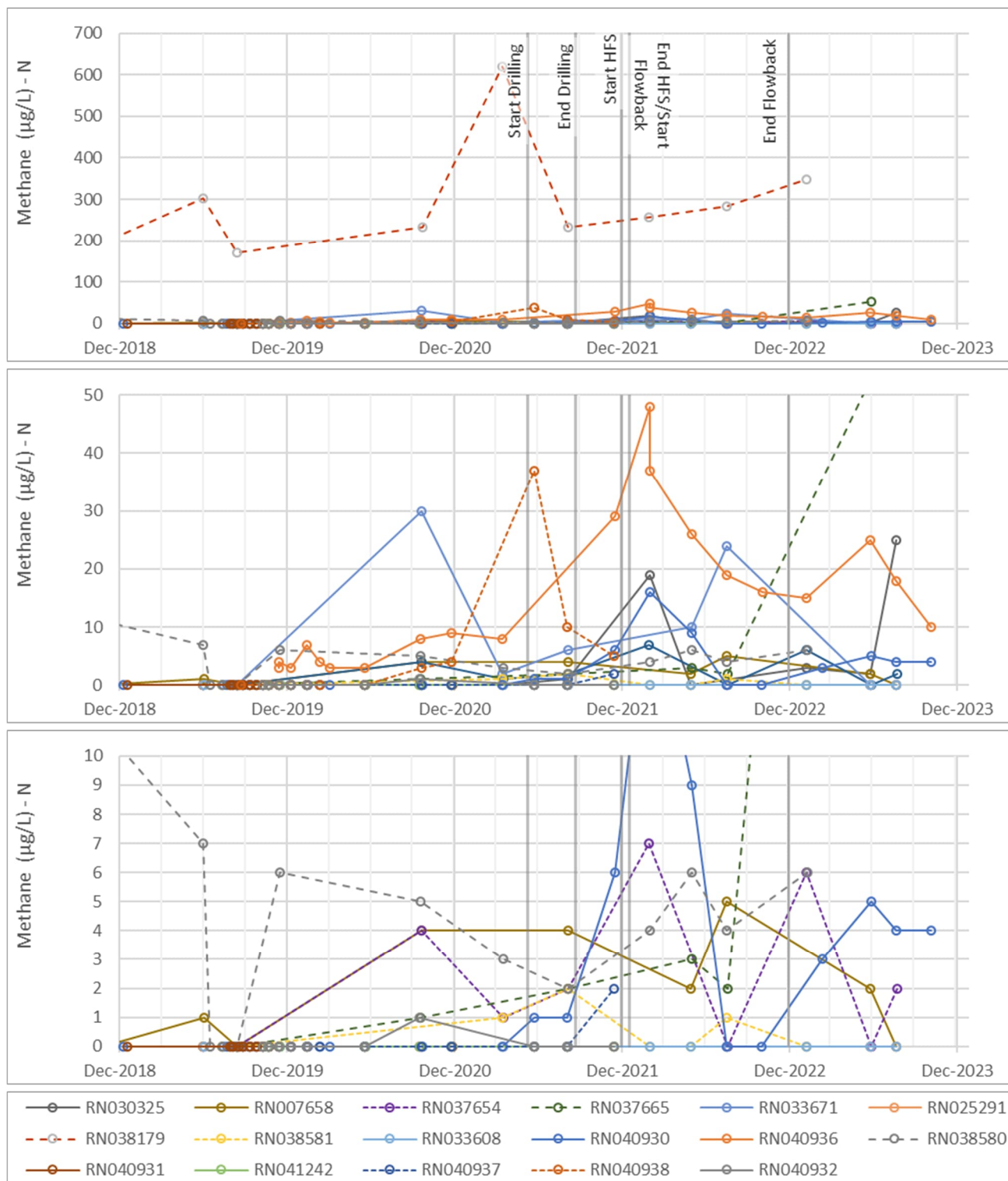


- RN037665 reported a dissolved methane concentration of 53 µg/L in May 2023. Its previously reported maximum concentration was 13 µg/L, reported in May 2018, with intervening concentrations less than or equal to 3 µg/L. RN037665 is approximately 30 km from the Tanumbirini site.
- RN040938 reported an increasing trend from <LOR to a peak of 37 µg/L in May 2021, followed by a gradual decrease to 1 µg/L in October 2022 (most recent sample)
- RN033761 reported an increasing trend from <LOR to a peak of 30 µg/L, followed by a decrease to less than 10 µg/L in the following two samples. From March 2021 the reported concentration increased to 10 µg/L in May 2022, and was reported to be 24 µg/L in July 2022, but was <LOR in May and July 2023.
- RN040931 (the GRF monitoring bore at Inacumba) reported 5 µg/L in May 2022 and 2 µg/L in July 2022. All other samples prior to and post these dates, the reported dissolved methane concentrations were <LOR.
- RN035502 reported 1 µg/L in July 2023 with all previous results reporting <LOR.
- Of the bores that are routinely sampled by Santos, only six bores have never reported dissolved methane greater than the limit of reporting (RN040939, RN041242, RN025291, RN033608).
- Dissolved methane concentrations may reduce to less than the limit of reporting, and then increase again. These changes may occur between consecutive samples (every three or six months depending on the bore) or over a longer period.

CSIRO (2019) collected 25 samples for dissolved methane in October to November 2018. The CSIRO (2019) limit of reporting was 0.2 µg/L as compared with the 1 µg/L at which Santos's results are usually reported. CSIRO reported the presence of methane in all the samples it collected. It found that concentrations were generally less than 10 µg/L, but concentrations up to 1129.5 µg/L were present. Stable isotope composition of the methane in the two samples analysed (RN031397 and RN038179) indicated that the presence of methane was due to microbial activity. RN038179 is on Tanumbirini Station and is included in the Santos regional monitoring program. CSIRO (2020) identified that methanogenic organisms (i.e. methane producing organisms) are naturally occurring within the groundwater of the Cambrian Limestone Aquifer. Dissolved methane concentrations are generally too low to enable isotopic characterisation. CSIRO has advised Santos that analysis to determine the stable isotope composition of the methane, which would confirm whether the methane is sourced from microbial activity, cannot be performed with confidence in the results if the dissolved methane concentration is less than 500 µg/L (pers. Comm. Santos, 2022).

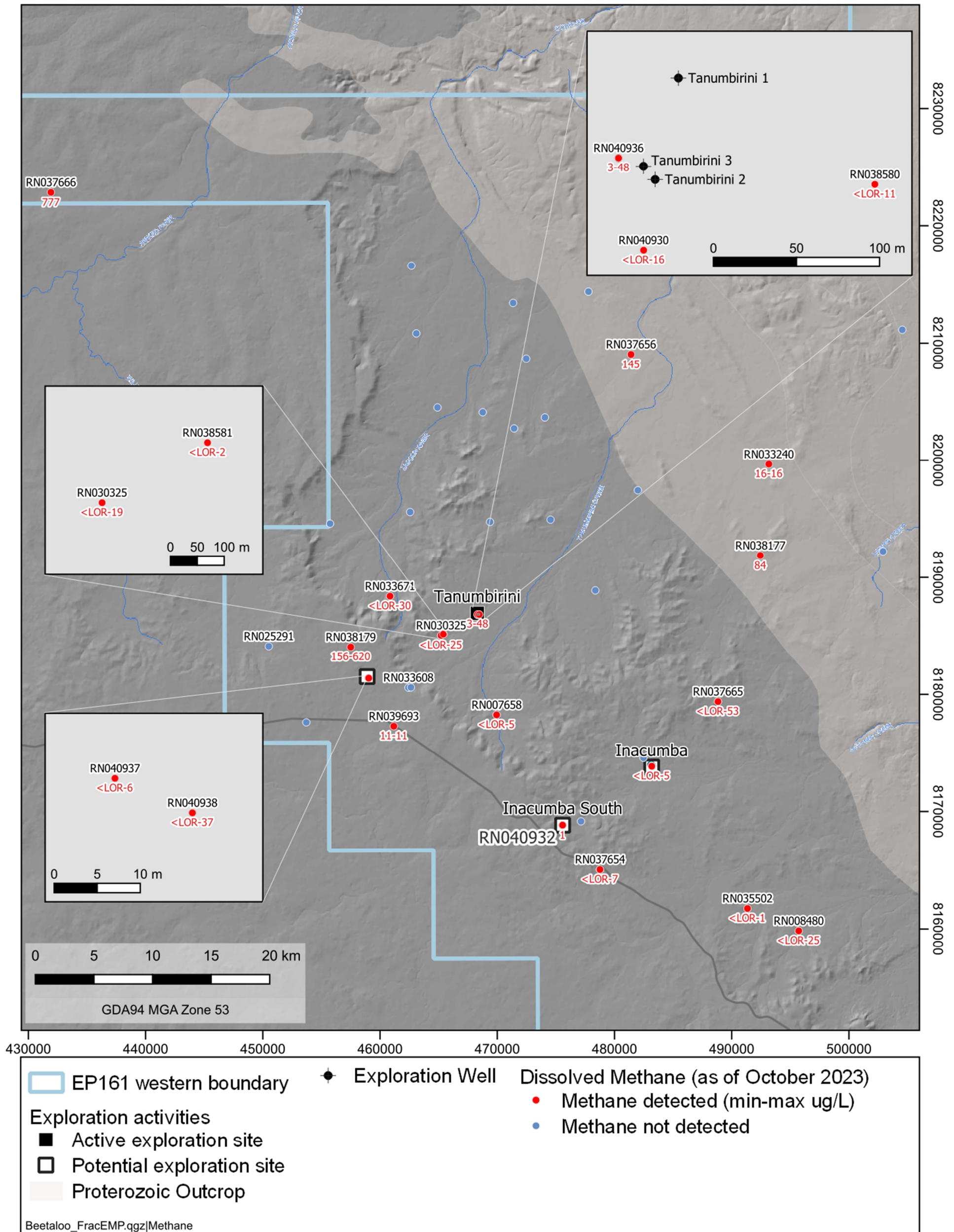
No propane or ethane has been detected in any of the groundwater samples collected by Santos. While the absence of propane and ethane does not preclude a thermogenic origin for the methane, it does indicate that a biogenic source to the methane detected is more likely.

Figure 6 Dissolved methane time series comparison\*



\* the graphs report the same data at different scales, except for the lowermost graph where some bores have been removed for clarity

Figure 7 Spatial distribution of methane concentrations





## 6. References

ANZECC (2000) Water Quality Guidelines. Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000

CSIRO (2019) Baseline assessment of groundwater characteristics in the Beetaloo Sub-basin, NT.

CSIRO (2020) Characterisation of the stygofauna and microbial assemblages of the Beetaloo Sub-basin, Northern Territory. CSIRO, Australia.

DENR, (2018) Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin. Department of Environment and Natural Resources, November 2018.

DENR (2019) Code of Practice: Onshore petroleum activities in the Northern Territory. Department of Environment and Natural Resources, May 2019.

Poulsen, D.L., Cook, P.G. and Dogramaci, S. (2020) Excess Air Correction of SF6 and Other Dissolved Gases in Groundwater Impacted by Compressed Air from Drilling or Well Development. Water Resources Research Vol 56, Issue 8.

RDM Hydro (2022) EP161 – Beetaloo Sub-Basin Groundwater Monitoring Interpretative Report. Prepared for Santos QNT Pty Ltd. 28 January 2022.

Tickell, S. J. (2020). Identification of the new Inacumba aquifer at Tanumbirini Station, Water Resources Division Technical Report 20/2020.

Wallis, I. and Pichler (2018) Generating false negatives and false positives for As and Mo concentrations in groundwater due to well installation. Science of The Total Environment, Volume 631-632.

Walker, G.R. and Mallants, D. (2014) Methodologies for Investigating Gas in Water Bores and Links to Coal Seam Gas Development. CSIRO Land and Water prepared for Queensland Natural Resources and Mines. September 2014.

## 7. Disclaimer

RDM Hydro Pty Ltd (RDM Hydro) has prepared this report with all reasonable skill, care and diligence, and taking account of the timescale and resources allowed to it by agreement with Santos (the Client). Information reported herein is based on the interpretation of data collected and collated, which has been accepted in good faith as being accurate and valid.

This report is for exclusive use by the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied on up by other parties without written consent from RDM Hydro.

RDM Hydro disclaims any responsibility to the Clients and other parties in respect of any matters outside of the agreed scope of the work.

## Attachment A – Groundwater chemistry statistical summaries



RN040930				Statistical Summary: All Data							Statistical Summary: Pre-Activity Data							Statistical Summary: Post Activity Data							Statistics		
Group	Parameter	Units	Fraction	Count	Min	Max	Average	P10	P50	P90	Count	Min	Max	Average	P10	P50	P90	Count	Min	Max	Average	P10	P50	P90	F-Test Statistic	T-Test - P-value	
Field Measurements	pH - Field	pH Unit	N	33	6.28	8.16	6.97	6.58	6.9	7.29	23	6.28	7.61	6.9	6.55	7	7.29	11	6.7	8.16	6.98	6.71	6.89	7.02	0.35	0.42	
	Electrical Conductivity - Field	µS/cm	N	33	1183	1643	1384	1303.2	1382	1444.2	23	1356	1643	1407.9	1371	1388	1458.4	11	1183	1445	1325.4545	1259	1304	1441	0.19	0.001	
	CH4 - Field	% LEL	N	30	<LOR	0.2	0.01	<LOR	<LOR	<LOR	<LOR	20	0	0.2	0.0	0	0	10	0	0.1	0.01	0	0	0.01	0.29	0.50	
Physicochemical	Electrical Conductivity @ 25°C	µS/cm	N	38	878	1410	1311.8	1287	1310	1376	27	878	1410	1304.7	1286	1310	1376	11	1280	1390	1329.0909	1290	1340	1370	0.00	0.12	
	Total Dissolved Solids @180°C	mg/L	T	38	616	929	842.6	800.2	846.5	897.8	27	616	929	832.2	787.8	843	880.2	11	825	910	868.18182	834	859	902	0.03	0.01	
	pH - Lab	pH Unit	N	38	6.92	8.04	7.738	7.407	7.77	8.01	27	7.27	8.02	7.7	7.406	7.72	7.986	11	6.92	8.04	7.7254545	7.42	7.84	8.03	0.04	0.44	
Major Ions	Suspended Solids	mg/L	N	38	5	46	5.8	5	5	5	27	5	46	6.7	5	5	5	11	5	5	5	5	5	5	-	-	
	Bicarbonate Alkalinity as CaCO3	mg/L	N	38	269	467	403.8	379.1	408	424	27	269	467	404.7	382.4	410	424	11	373	444	401.6	377	400	422	0.15	0.39	
	Carbonate Alkalinity as CaCO3	mg/L	N	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	1	1.0	1	1	1	11	1	1	1	1	1	1	-	-	
	Chloride	mg/L	N	38	60	121	109.9	105.7	111	116	27	60	116	108.1	104.8	110	113	11	105	121	114.2	106	116	121	0.04	0.01	
	Sulfate as SO4 2-	mg/L	D	38	125	208	171.4	160.4	172.5	183.3	27	125	208	170.6	160.2	172	183.8	11	143	184	173.3	171	174	182	0.25	0.30	
	Sodium	mg/L	D	38	45	83	75.8	74	76	79	27	45	81	75.1	73.6	76	79	11	74	83	77.4	75	77	79	0.00	0.07	
	Potassium	mg/L	D	38	7	17	11.9	11	12	13	27	7	13	11.4	11	12	12	11	11	17	13.1	12	13	14	0.09	0.00	
	Calcium	mg/L	D	38	86	156	135.8	125.4	137	149.3	27	99	152	137.2	126.6	138	149.4	11	86	156	132.3	124	134	145	0.04	0.20	
	Magnesium	mg/L	D	38	35	63	55.9	53	56	60.3	27	35	63	56.0	53.6	57	60.8	11	53	61	55.6	53	56	57	0.01	0.37	
Nutrients & Radiological	Fluoride	mg/L	N	38	0.5	1	0.64	0.6	0.6	0.7	27	0.5	1	0.7	0.6	0.6	0.7	11	0.6	0.7	0.6	0.6	0.6	0.7	0.01	0.07	
	Nitrite as N	mg/L	N	37	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Nitrate as N	mg/L	N	38	0.04	0.04	0.012	0.01	0.01	0.01	27	0.01	0.04	0.0	0.01	0.01	0.01	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
Dissolved Gases	Reactive Silica	mg/L	N	37	14.8	25.7	23.44	22.66	23.6	24.82	26	14.8	25.7	23.1	22.55	23.2	24.85	11	23.2	25.5	24.1	23.4	24.1	24.6	0.00	0.01	
	Gross alpha	Bq/L	N	38	0.43	1.46	0.762	0.597	0.75	0.903	27	0.43	1.46	0.8	0.608	0.75	0.864	11	0.44	0.99	0.8	0.6	0.79	0.91	0.62	0.46	
	Gross beta activity - 40K	Bq/L	N	38	0.12	0.82	0.363	0.234	0.335	0.469	27	0.21	1.1	0.4	0.262	0.35	0.494	11	0.12	0.46	0.3	0.22	0.27	0.43	0.04	0.03	
Dissolved Metals/ Metalloids	Methane	µg/L	N	38	1	16	2.3	1	1	5.3	27	1	10	1.3	1	1	1	11	1	16	4.6	1	4	9	0.00	0.02	
	Ethane	µg/L	N	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Propane	µg/L	N	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
Dissolved Metals/ Metalloids	Aluminium	mg/L	D	38	0.01	0.02	0.01	0.01	0.01	0.01	27	0.01	0.02	0.010	0.01	0.01	0.01	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Arsenic	mg/L	D	38	0.001	0.008	0.004	0.001	0.004	0.007	27	0.002	0.008	0.005	0.0026	0.005	0.007	11	0.001	0.005	0.001	0.001	0.001	0.002	0.20	0.00	
	Barium	mg/L	D	38	0.032	0.05	0.0438	0.0417	0.044	0.0463	27	0.039	0.05	0.044	0.0416	0.044	0.046	11	0.032	0.049	0.044	0.042	0.044	0.048	0.00	0.48	
	Beryllium	mg/L	D	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Boron	mg/L	D	38	0.1	0.22	0.172	0.14	0.18	0.193	27	0.1	0.2	0.169	0.14	0.17	0.19	11	0.11	0.22	0.18	0.16	0.18	0.21	0.26	0.10	
	Cadmium	mg/L	D	38	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	27	0.0001	0.0002	0.000	0.0001	0.0001	0.0001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Chromium	mg/L	D	38	0.009	0.009	0.0012	0.001	0.001	0.001	27	0.001	0.009	0.001	0.001	0.001	0.001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Cobalt	mg/L	D	38	0.001	0.057	0.005	0.001	0.0035	0.0073	27	0.001	0.057	0.007	0.002	0.004	0.0084	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Copper	mg/L	D	38	0.001	0.014	0.0015	0.001	0.001	0.001	27	0.001	0.002	0.001	0.001	0.001	0.001	11	0.001	0.014	0.003	0.001	0.001	0.005	0.00	0.12	
	Iron	mg/L	D	38	0.06	1.16	0.423	0.05	0.395	0.772	27	0.05	1.1	0.368	0.056	0.34	0.712	11	0.05	1.16	0.566	0.05	0.54	1.11	0.20	0.04	
	Lead	mg/L	D	38	0.001	0.003	0.0011	0.001	0.001	0.001	27	0.001	0.003	0.001	0.001	0.001	0.0014	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Lithium	mg/L	D	38	0.057	0.084	0.0673	0.0627	0.067	0.073	27	0.057	0.076	0.067	0.0626	0.065	0.073	11	0.059	0.084	0.069	0.064	0.068	0.071	0.17	0.11	
	Manganese	mg/L	D	38	0.001	0.046	0.0191	0.015	0.018	0.0263	27	0.008	0.046	0.019	0.015	0.018	0.0268	11	0.001	0.027	0.019	0.017	0.019	0.026	0.96	0.43	
	Mercury	mg/L	D	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Molybdenum	mg/L	D	38	0.001	0.009	0.0013	0.001	0.001	0.001	27	0.001	0.009	0.001	0.001	0.001	0.0014	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Nickel	mg/L	D	38	0.001	0.22	0.0179	0.0017	0.0115	0.0246	27	0.004	0.22	0.024	0.007	0.014	0.0284	11	0.001	0.005	0.002	0.001	0.002	0.004	0.00	0.00	
	Selenium	mg/L	D	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	0.01	0.01	0.010	0.01	0.01	0.01	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Silver	mg/L	D	37	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	26	0.001	0.001	0.001	0.001	0.001	0.001	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
	Strontium	mg/L	D	37	0.692	0.905	0.7893	0.7488	0.784	0.8468	26	0.719	0.864	0.792	0.753	0.787	0.84	11	0.692	0.905	0.784	0.747	0.77	0.858	0.06	0.30	
	Uranium	mg/L	D	38	0.001	0.037	0.0051	0.001	0.004	0.008	27	0.002	0.037	0.007	0.003	0.005	0.0084	11	0.001	0.002	0.001	0.001	0.001	0.002	0.00	0.00	
	Vanadium	mg/L	D	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Zinc	mg/L	D	38	0.005	0.099	0.0238	0.0067	0.0195	0.0414	27	0.005	0.099	0.027	0.0088	0.02	0.0554	11	0.005	0.035	0.017	0.006	0.016	0.033	0.01	0.04	
	Total Metals/ Metalloids	Aluminium	mg/L	T	38	0.01	0.03	0.011	0.01	0.01	0.01	27	0.01	0.03	0.0111	0.01	0.01	0.01	11	0.01	0.02	0.0109	0.01	0.01	0.01	0.26	0.44
		Arsenic	mg/L	T	38	0.001	0.014	0.0044	0.001	0.004	0.0073	27	0.001	0.014	0.006	0.0026	0.006	0.008	11	0.001	0.005	0.002	0.001	0.001	0.004	0.05	0.00
Barium		mg/L	T	38	0.038	0.053	0.0465	0.0437	0.047	0.05	27	0.038	0.053	0.046	0.0426	0.047	0.05	11	0.044	0.051	0.047	0.044	0.046	0.049	0.17	0.45	
Beryllium		mg/L	T	38	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
Boron		mg/L	T	38	0.08	0.27	0.178	0.14	0.18	0.21	27	0.08	0.22	0.173	0.136	0.17	0.204	11	0.14	0.27	0.19	0.16	0.18	0.24	0.34	0.07	
Cadmium		mg/L	T	38	0.0001	0.0002	0.00011	0.0001	0.0001	0.0001	27	0.0001	0.0002	0.000	0.0001	0.0001	0.00014	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
Chromium		mg/L	T	38	0.001	0.003	0.0012	0.001	0.001	0.0013	27	0.001	0.003	0.001	0.001	0.001	0.002	11	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
Cobalt		mg/L	T	38	0.002	0.06	0.0054	0.001	0.004	0.0083	27	0.002	0.06	0													

RN040936				Statistical Summary: All Data							Statistical Summary: Pre-Activity Data							Statistical Summary: Post Activity Data							Statistics	
Group	Parameter	Units	Fraction	Count	Min	Max	Average	P10	P50	P90	Count	Min	Max	Average	P10	P50	P90	Count	Min	Max	Average	P10	P50	P90	F-Test Statistic	T-Test P-value
Field Measurements	pH - Field	pH Unit	N	18	6.44	7.13	6.75	6.53	6.76	6.94	10	6.44	7.13	6.8	6.54	6.76	7.02	8	6.49	6.91	6.74	6.58	6.77	6.87	0.31	0.42
	Electrical Conductivity - Field	µS/cm	N	18	1117	1691	1355	1188.7	1377.5	1444	10	1342	1691	1422.0	1358.2	1396	1475	8	1117	1441	1271.25	1147.1	1273	1407.4	0.73	0.004
	% CH4 - Field	% LEL	N	18	<LOR	0.2	0.02	<LOR	<LOR	0.1	10	0	0.2	0	0	0	0.11	8	0	0.1	0.0125	0	0	0.03	0.10	0.26
	Electrical Conductivity @ 25°C	µS/cm	N	20	1260	1360	1321.5	1298	1320	1350	10	1280	1340	1315.0	1298	1315	1340	10	1260	1360	1328	1305	1330	1351	0.21	0.13
Physicochemical	Total Dissolved Solids @180°C	mg/L	T	20	783	920	864	828.7	869	894.4	10	783	878	852.2	824.4	857.5	876.2	10	826	920	875.8	844	879	916.4	0.92	0.05
	pH - Lab	pH Unit	N	20	6.96	8.05	7.513	7.28	7.465	7.9	10	7.28	7.99	7.5	7.316	7.445	7.63	10	6.96	8.05	7.547	7.248	7.54	7.906	0.15	0.29
	Suspended Solids	mg/L	N	20	6	18	6.9	4.5	7	9.1	10	5	18	8.3	5.9	7.5	9.9	10	5	10	6.4	5	5.5	8.2	0.04	0.08
Major Ions	Bicarbonate Alkalinity as CaCO3	mg/L	N	20	377	435	401.8	380.8	402	421.2	10	379	420	400.0	383.5	402.5	416.4	10	377	435	403.5	380.6	402	424.2	0.37	0.33
	Carbonate Alkalinity as CaCO3	mg/L	N	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Chloride	mg/L	N	20	103	125	112	106.7	111	118.3	10	103	114	108.5	103.9	110.5	113.1	10	107	125	114.4	107	115.5	121.4	0.12	0.03
	Sulfate as SO4 2-	mg/L	D	20	145	187	173.6	161.4	174.5	185.1	10	156	187	175.0	161.4	177	186.1	10	145	183	172.1	166.7	174	180.3	0.98	0.28
	Sodium	mg/L	D	20	75	83	78.4	75.9	78.5	81	10	76	81	78.9	76.9	79.5	80.1	10	75	83	77.8	75	77	81.2	0.17	0.14
	Potassium	mg/L	D	20	11	15	13	12	13	15	10	11	13	12.1	11.9	12	13	10	12	15	13.8	12.9	14	15	0.09	0.00
	Calcium	mg/L	D	20	124	155	137.5	127.7	136.5	152.2	10	128	155	141.1	129.8	139	152.3	10	124	154	133.8	124.9	133	139.6	0.81	0.04
	Magnesium	mg/L	D	20	54	60	56	54	56	58.1	10	54	59	57.0	55.8	57	58.1	10	54	60	55.0	54	54	56.4	0.32	0.01
	Fluoride	mg/L	N	20	0.6	0.7	0.61	0.6	0.6	0.61	10	0.6	0.7	0.6	0.6	0.6	0.7	10	0.6	0.6	0.6	0.6	0.6	0.6	0.00	0.08
	Nutrients & Radiological	Nitrite as N	mg/L	N	19	0.13	0.13	0.016	0.01	0.01	0.01	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	9	0.01	0.13	0.0	0.01	0.01	0.034	0.00
Nitrate as N		mg/L	N	20	0.09	0.09	0.014	0.01	0.01	0.01	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	0.01	0.09	0.0	0.01	0.01	0.018	0.00	0.17
Reactive Silica		mg/L	N	20	21.8	25.1	23.73	22.19	24.05	24.72	10	21.8	24.9	23.1	22.07	23	24.63	10	23.5	25.1	24.4	23.86	24.35	24.74	0.02	0.00
Gross alpha		Bq/L	N	20	0.54	1	0.742	0.576	0.74	0.894	10	0.54	0.82	0.7	0.54	0.725	0.82	10	0.63	1	0.8	0.657	0.78	0.937	0.65	0.04
Dissolved Gases	Gross beta activity - 40K	Bq/L	N	20	0.2	0.44	0.32	0.24	0.315	0.381	10	0.2	0.39	0.3	0.254	0.315	0.372	10	0.24	0.44	0.3	0.24	0.325	0.386	0.80	0.35
	Methane	µg/L	N	20	3	48	14.8	3	9.5	29.8	10	3	9	5.2	3	4	8.1	10	10	48	24.3	14.5	22	38.1	0.00	0.00
	Ethane	µg/L	N	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Propane	µg/L	N	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
Dissolved Metals/ Metalloids	Aluminium	mg/L	D	20	0.02	0.02	0.011	0.01	0.01	0.01	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	0.01	0.02	0.011	0.01	0.01	0.011	0.00	0.17
	Arsenic	mg/L	D	20	0.001	0.004	0.0019	0.001	0.0015	0.0031	10	0.002	0.004	0.003	0.002	0.0025	0.004	10	0.001	0.001	0.001	0.001	0.001	0.001	0.00	0.00
	Barium	mg/L	D	20	0.039	0.051	0.0454	0.0427	0.0455	0.0491	10	0.039	0.05	0.044	0.0426	0.044	0.0464	10	0.04	0.051	0.047	0.0427	0.047	0.0492	0.75	0.05
	Beryllium	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Boron	mg/L	D	20	0.12	0.2	0.169	0.13	0.18	0.191	10	0.12	0.19	0.160	0.129	0.165	0.19	10	0.13	0.2	0.178	0.157	0.18	0.2	0.60	0.05
	Cadmium	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Chromium	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Cobalt	mg/L	D	20	0.001	0.002	0.0013	0.001	0.001	0.002	10	0.001	0.002	0.002	0.001	0.0015	0.002	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Copper	mg/L	D	20	0.001	0.001	0.001	0.001	0.001	0.001	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	0.001	0.001	0.001	0.001	0.001	0.001	1.00	0.50
	Iron	mg/L	D	20	1.82	4.73	2.299	0.05	2.27	3.714	10	0.05	4.73	2.923	1.949	3.01	4.091	10	0.05	2.51	1.674	0.05	1.94	2.438	0.31	0.01
	Lead	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Lithium	mg/L	D	20	0.055	0.078	0.0687	0.0638	0.07	0.0731	10	0.055	0.074	0.067	0.0613	0.0675	0.0713	10	0.066	0.078	0.071	0.0669	0.07	0.0735	0.15	0.04
	Manganese	mg/L	D	20	0.023	0.062	0.0365	0.0289	0.0345	0.0446	10	0.023	0.062	0.040	0.0275	0.0395	0.0512	10	0.029	0.039	0.033	0.0299	0.033	0.0381	0.00	0.06
	Mercury	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Molybdenum	mg/L	D	20	0.001	0.001	0.001	0.001	0.001	0.001	10	0.001	0.001	0.001	0.001	0.001	0.001	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Nickel	mg/L	D	20	0.001	0.009	0.0032	0.001	0.002	0.0071	10	0.002	0.009	0.005	0.0029	0.005	0.0081	10	0.001	0.002	0.001	0.001	0.001	0.0011	0.00	0.00
	Selenium	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Silver	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Strontium	mg/L	D	20	0.722	0.861	0.7991	0.7556	0.7965	0.8546	10	0.722	0.86	0.794	0.749	0.7945	0.8546	10	0.756	0.861	0.805	0.785	0.8105	0.8421	0.65	0.27
	Uranium	mg/L	D	20	0.001	0.005	0.0026	0.001	0.0025	0.0041	10	0.003	0.005	0.004	0.003	0.004	0.005	10	0.001	0.002	0.001	0.001	0.001	0.002	0.22	0.00
Vanadium	mg/L	D	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-	
Zinc	mg/L	D	20	0.006	0.024	0.0126	0.0059	0.012	0.0192	10	0.006	0.024	0.013	0.0087	0.0115	0.0213	10	0.005	0.019	0.012	0.005	0.012	0.0181	0.98	0.32	
Total Metals/ Metalloids	Aluminium	mg/L	T	20	0.01	0.02	0.011	0.01	0.01	0.01	10	0.01	0.01	0.010	0.01	0.01	0.01	10	0.01	0.02	0.011	0.01	0.01	0.011	0.00	0.17
	Arsenic	mg/L	T	20	0.001	0.004	0.002	0.001	0.0015	0.0031	10	0.002	0.004	0.003	0.002	0.003	0.004	10	0.001	0.001	0.001	0.001	0.001	0.001	0.00	0.00
	Barium	mg/L	T	20	0.039	0.086	0.0499	0.0429	0.048	0.0563	10	0.039	0.049	0.045	0.0417	0.044	0.049	10	0.044	0.086	0.055	0.0458	0.053	0.0617	0.00	0.01
	Beryllium	mg/L	T	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Boron	mg/L	T	20	0.08	0.28	0.168	0.129	0.165	0.211	10	0.08	0.2	0.150	0.116	0.15	0.2	10	0.14	0.28	0.185	0.149	0.17	0.226	0.74	0.03
	Cadmium	mg/L	T	20	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	-	-
	Chromium	mg/L	T	20	0.002	0.002	0.0011	0.001	0.001	0.001	10	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	10	0.001	0.002	0.0011	0.001	0.001	0.0011	0.00	0.17
	Cobalt	mg/L	T	20	0.002	0.002																				

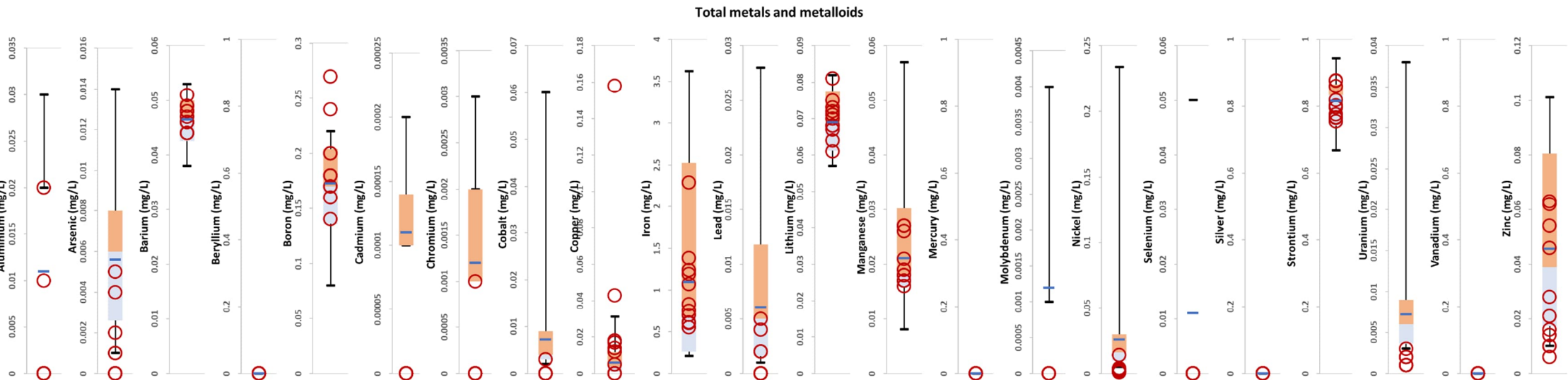
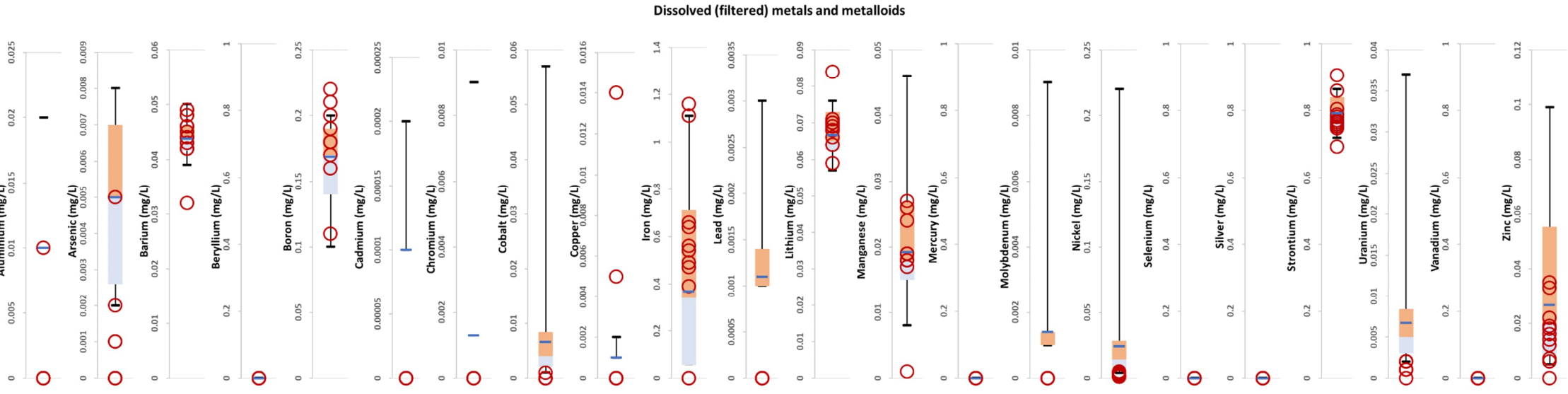
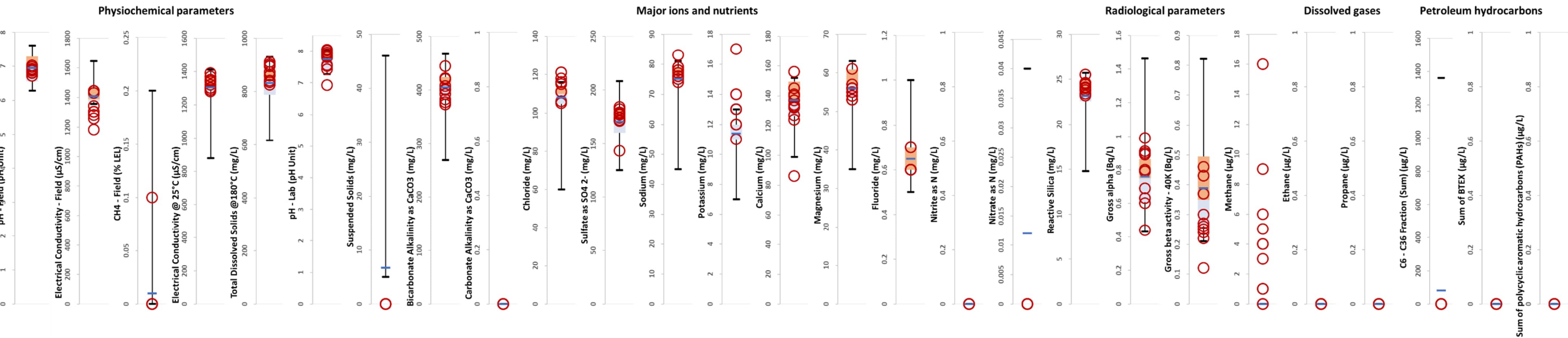
RN040931													
Group	Parameter	Units	Fraction	Count	Min	Max	Average	P10	P50	P90	First	Last	MK-trend
Field Measurements	pH - Field	pH Unit	N	25	6.39	8.11	7.356	6.77	7.3	8.008	7.8	7.78	Rising
	Electrical Conductivity - Field	µS/cm	N	25	1241	2018	1662.5	1319	1794	1925.4	1845	1290	Falling
	CH4 - Field	% LEL	N	24	<LOR	0.2	0.01	<LOR	<LOR	<LOR	0	0	No Trend
	Electrical Conductivity @ 25°C	µS/cm	N	27	1200	1940	1583.3	1260	1590	1894	1560	1280	Falling
	Total Dissolved Solids @ 180°C	mg/L	T	27	697	1330	1016.4	732.2	1130	1258	976	783	Falling
Physiochemical parameters	pH - Lab	pH Unit	N	27	7.36	8.49	7.947	7.454	8	8.354	8.06	8.29	Rising
	Suspended Solids	mg/L	N	27	8	36	14.6	5	13	30.4	35	<LOR	Falling
Major ions, nutrients and radiological parameters	Bicarbonate Alkalinity as CaCO3	mg/L	N	27	225	470	362.2	244.4	366	461.8	363	271	Falling
	Carbonate Alkalinity as CaCO3	mg/L	N	27	7	22	3.3	1	1	10.6	<LOR	<LOR	Rising
	Chloride	mg/L	N	27	142	161	153.1	147.2	154	159	148	142	No Trend
	Sulfate as SO4 2-	mg/L	D	27	192	451	313.1	195	343	423	328	203	Falling
	Sodium	mg/L	D	27	100	127	110.1	105.4	109	117.4	103	117	No Trend
	Potassium	mg/L	D	27	22	33	27.6	26	28	30	22	28	No Trend
	Calcium	mg/L	D	27	20	163	92	21.6	114	156.6	134	28	Falling
	Magnesium	mg/L	D	27	80	122	98.6	83.6	102	114.4	88	95	Falling
	Fluoride	mg/L	N	27	1.3	3	2.15	1.5	2.3	2.8	1.8	1.5	Falling
	Nitrite as N	mg/L	N	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Nitrate as N	mg/L	N	27	0.02	2.12	0.091	0.01	0.01	0.014	0.02	<LOR	No Trend
	Reactive Silica	mg/L	N	26	7.42	24.8	16.492	7.88	17.75	24.55	23.9	9.37	Falling
	Gross alpha	Bq/L	N	27	0.05	1.7	0.28	0.114	0.24	0.354	1.7	0.09	Falling
	Gross beta activity - 40K	Bq/L	N	27	0.1	0.84	0.223	0.106	0.21	0.28	0.84	<LOR	Falling
Dissolved Gases	Methane	µg/L	N	27	2	5	1.5	1	1	1.4	<LOR	<LOR	Rising
	Ethane	µg/L	N	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Propane	µg/L	N	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
Dissolved Metals/Metalloids	Aluminium	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Arsenic	mg/L	D	27	0.001	0.003	0.0012	0.001	0.001	0.002	0.003	<LOR	Falling
	Barium	mg/L	D	27	0.019	0.047	0.0293	0.0206	0.029	0.036	0.028	0.021	Falling
	Beryllium	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Boron	mg/L	D	27	0.1	0.31	0.244	0.208	0.25	0.28	0.31	0.25	No Trend
	Cadmium	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Chromium	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Cobalt	mg/L	D	27	0.033	0.033	0.0022	0.001	0.001	0.001	0.033	<LOR	No Trend
	Copper	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Iron	mg/L	D	27	0.07	9.58	1.878	0.05	0.29	5.77	<LOR	<LOR	Falling
	Lead	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Lithium	mg/L	D	27	0.19	0.51	0.4224	0.3796	0.434	0.482	0.416	0.48	Rising
	Manganese	mg/L	D	27	0.068	0.249	0.1407	0.0696	0.125	0.2284	0.142	<LOR	Falling
	Mercury	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Molybdenum	mg/L	D	27	0.001	0.046	0.0037	0.001	0.002	0.0034	0.046	0.002	No Trend
	Nickel	mg/L	D	27	0.001	0.032	0.0021	0.001	0.001	0.001	0.032	<LOR	No Trend
	Selenium	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Silver	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Strontium	mg/L	D	27	0.096	1.02	0.5809	0.117	0.671	0.9864	0.868	0.145	Falling
	Uranium	mg/L	D	27	0.01	0.01	0.0013	0.001	0.001	0.001	0.01	<LOR	No Trend
Total Metals/Metalloids	Vanadium	mg/L	D	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Zinc	mg/L	D	27	0.012	0.098	0.0212	0.005	0.012	0.0482	0.014	0.023	Falling
	Aluminium	mg/L	T	27	0.01	0.3	0.023	0.01	0.01	0.02	0.3	<LOR	Falling
	Arsenic	mg/L	T	27	0.001	0.01	0.0019	0.001	0.002	0.002	0.01	<LOR	Falling
	Barium	mg/L	T	27	0.025	0.048	0.034	0.026	0.034	0.0416	0.036	0.026	Falling
	Beryllium	mg/L	T	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Boron	mg/L	T	27	0.06	0.36	0.261	0.224	0.26	0.316	0.27	0.26	No Trend
	Cadmium	mg/L	T	27	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	<LOR	0.0001	No Trend
	Chromium	mg/L	T	27	0.003	0.003	0.0011	0.001	0.001	0.001	<LOR	<LOR	No Trend
	Cobalt	mg/L	T	27	0.036	0.036	0.0023	0.001	0.001	0.001	0.036	<LOR	No Trend
	Copper	mg/L	T	27	0.001	0.002	0.001	0.001	0.001	0.001	0.002	<LOR	No Trend
	Iron	mg/L	T	27	0.05	19.1	6.776	0.872	5.03	14.96	7.33	0.12	Falling
	Lead	mg/L	T	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Lithium	mg/L	T	27	0.199	0.606	0.4475	0.4016	0.45	0.5038	0.365	0.49	No Trend
	Manganese	mg/L	T	27	0.002	0.269	0.159	0.0778	0.163	0.2418	0.163	0.002	Falling
	Mercury	mg/L	T	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Molybdenum	mg/L	T	27	0.002	0.05	0.0041	0.002	0.002	0.003	0.05	0.003	Rising
	Nickel	mg/L	T	27	0.001	0.034	0.0024	0.001	0.001	0.0014	0.034	<LOR	No Trend
	Selenium	mg/L	T	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
Complex Hydrocarbons	Silver	mg/L	T	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Strontium	mg/L	T	27	0.082	1.16	0.6234	0.1222	0.835	1.03	0.835	0.164	Falling
	Uranium	mg/L	T	27	0.011	0.011	0.0014	0.001	0.001	0.001	0.011	<LOR	No Trend
	Vanadium	mg/L	T	27	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Zinc	mg/L	T	27	0.021	0.473	0.078	0.0298	0.048	0.1042	0.041	0.045	No Trend
	C6 - C36 Fraction (Sum)	µg/L	N	23	50	120	30	20	20	44	<LOR	120	No Trend
	Sum of BTEX	µg/L	N	27	2	2	1	1	1	1	<LOR	<LOR	No Trend
	Sum of polycyclic aromatic hydrocarbons (PAHs)	µg/L	N	26	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA

RN041242													
Group	Parameter	Units	Fraction	Count	Min	Max	Average	P10	P50	P90	First	Last	MK-trend
Field Measurements	pH - Field	pH Unit	N	13	6.69	7.3	6.934	6.72	6.89	7.226	7.13	6.86	No Trend
	Electrical Conductivity - Field	µS/cm	N	13	733	1841	1437.2	1248.8	1480	1583.8	1579	1585	Falling
	CH4 - Field	% LEL	N	12	<LOR	0.2	0.03	<LOR	<LOR	0.09	0.2	0	No Trend
	Electrical Conductivity @ 25°C	µS/cm	N	14	1350	1510	1424.3	1369	1420	1477	1410	1350	No Trend
Physiochemical parameters	Total Dissolved Solids @180°C	mg/L	T	14	854	1040	986.7	967.2	991.5	1030	991	992	No Trend
	pH - Lab	pH Unit	N	14	6.86	8	7.591	7.221	7.59	7.891	7.57	6.86	No Trend
	Suspended Solids	mg/L	N	14	6	48	11.1	5	5	29.9	<LOR	25	No Trend
	Bicarbonate Alkalinity as CaCO3	mg/L	N	14	355	438	395.6	372.6	397	423.4	355	408	No Trend
Major ions, nutrients and radiological parameters	Carbonate Alkalinity as CaCO3	mg/L	N	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Chloride	mg/L	N	14	99	114	105.4	103	105.5	107.7	103	99	No Trend
	Sulfate as SO4 2-	mg/L	D	14	242	287	267.1	254.5	264.5	282.2	258	253	No Trend
	Sodium	mg/L	D	14	67	74	71	68.3	72	72	67	68	No Trend
	Potassium	mg/L	D	14	12	14	12.6	12	12.5	13	13	12	No Trend
	Calcium	mg/L	D	14	143	179	158	144.2	157.5	171.6	147	143	No Trend
	Magnesium	mg/L	D	14	60	69	64.3	62.3	64	66	60	63	No Trend
	Fluoride	mg/L	N	13	0.5	0.8	0.65	0.6	0.6	0.78	0.8	0.5	Falling
	Nitrite as N	mg/L	N	12	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Nitrate as N	mg/L	N	13	0.04	0.04	0.012	0.01	0.01	0.01	<LOR	<LOR	No Trend
	Reactive Silica	mg/L	N	13	19.5	23.6	22.08	20.1	22.4	22.78	22.3	19.5	No Trend
	Gross alpha	Bq/L	N	14	0.71	1.26	0.988	0.792	0.905	1.21	0.71	1.21	Rising
	Gross beta activity - 40K	Bq/L	N	14	0.26	1	0.441	0.273	0.4	0.589	0.37	0.48	No Trend
Dissolved Gases	Methane	µg/L	N	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Ethane	µg/L	N	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Propane	µg/L	N	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
Dissolved Metals/Metalloids	Aluminium	mg/L	D	14	0.02	0.02	0.011	0.01	0.01	0.01	<LOR	<LOR	No Trend
	Arsenic	mg/L	D	14	0.001	0.002	0.0011	0.001	0.001	0.001	0.001	<LOR	No Trend
	Barium	mg/L	D	14	0.026	0.04	0.0351	0.0312	0.036	0.0377	0.035	0.026	No Trend
	Beryllium	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Boron	mg/L	D	14	0.12	0.2	0.161	0.13	0.17	0.18	0.17	0.13	No Trend
	Cadmium	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Chromium	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Cobalt	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Copper	mg/L	D	14	0.013	0.013	0.0019	0.001	0.001	0.001	<LOR	<LOR	No Trend
	Iron	mg/L	D	14	0.14	21.9	1.893	0.077	0.32	1.088	0.14	<LOR	Rising
	Lead	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Lithium	mg/L	D	14	0.08	0.116	0.0911	0.0823	0.089	0.102	0.116	0.087	No Trend
	Manganese	mg/L	D	14	0.004	0.574	0.0696	0.0046	0.009	0.2073	0.004	0.288	Rising
	Mercury	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Molybdenum	mg/L	D	13	0.001	0.006	0.0015	0.001	0.001	0.0018	0.006	<LOR	No Trend
	Nickel	mg/L	D	14	0.001	0.006	0.0015	0.001	0.001	0.0024	0.001	<LOR	No Trend
	Selenium	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Silver	mg/L	D	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Strontium	mg/L	D	13	0.727	0.87	0.7863	0.7338	0.782	0.8488	0.87	0.731	No Trend
	Uranium	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Vanadium	mg/L	D	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Zinc	mg/L	D	14	0.01	0.099	0.0308	0.0115	0.028	0.0485	0.028	0.015	No Trend
Total Metals/Metalloids	Aluminium	mg/L	T	14	0.01	0.01	0.01	0.01	0.01	0.01	<LOR	<LOR	No Trend
	Arsenic	mg/L	T	14	0.001	0.002	0.0011	0.001	0.001	0.001	0.001	<LOR	No Trend
	Barium	mg/L	T	14	0.02	0.044	0.0363	0.0329	0.038	0.039	0.038	0.037	No Trend
	Beryllium	mg/L	T	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Boron	mg/L	T	14	0.08	0.3	0.177	0.136	0.17	0.224	0.17	0.16	No Trend
	Cadmium	mg/L	T	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Chromium	mg/L	T	14	0.001	0.002	0.0011	0.001	0.001	0.0017	<LOR	<LOR	No Trend
	Cobalt	mg/L	T	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Copper	mg/L	T	14	0.001	0.01	0.0029	0.001	0.001	0.007	0.004	<LOR	No Trend
	Iron	mg/L	T	14	0.17	26.1	3.377	0.265	0.405	11.264	0.17	15.5	Rising
	Lead	mg/L	T	14	0.001	0.002	0.0011	0.001	0.001	0.001	0.002	<LOR	No Trend
	Lithium	mg/L	T	14	0.034	0.121	0.0883	0.0783	0.0895	0.1008	0.121	0.084	Falling
	Manganese	mg/L	T	14	0.003	0.56	0.0694	0.0043	0.0095	0.2139	0.004	0.297	Rising
	Mercury	mg/L	T	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Molybdenum	mg/L	T	14	0.005	0.005	0.0016	0.001	0.001	0.0038	0.005	<LOR	Falling
	Nickel	mg/L	T	14	0.001	0.01	0.0016	0.001	0.001	0.001	<LOR	<LOR	No Trend
	Selenium	mg/L	T	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Silver	mg/L	T	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Strontium	mg/L	T	13	0.394	0.896	0.7744	0.6854	0.818	0.8584	0.843	0.783	No Trend
	Uranium	mg/L	T	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Vanadium	mg/L	T	14	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Zinc	mg/L	T	14	0.009	0.084	0.0361	0.0183	0.0245	0.0729	0.021	0.084	No Trend
Complex Hydrocarbons	C6 - C36 Fraction (Sum)	µg/L	N	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Sum of BTEX	µg/L	N	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA
	Sum of polycyclic aromatic hydrocarbons (PAHs)	µg/L	N	13	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	<LOR	NA

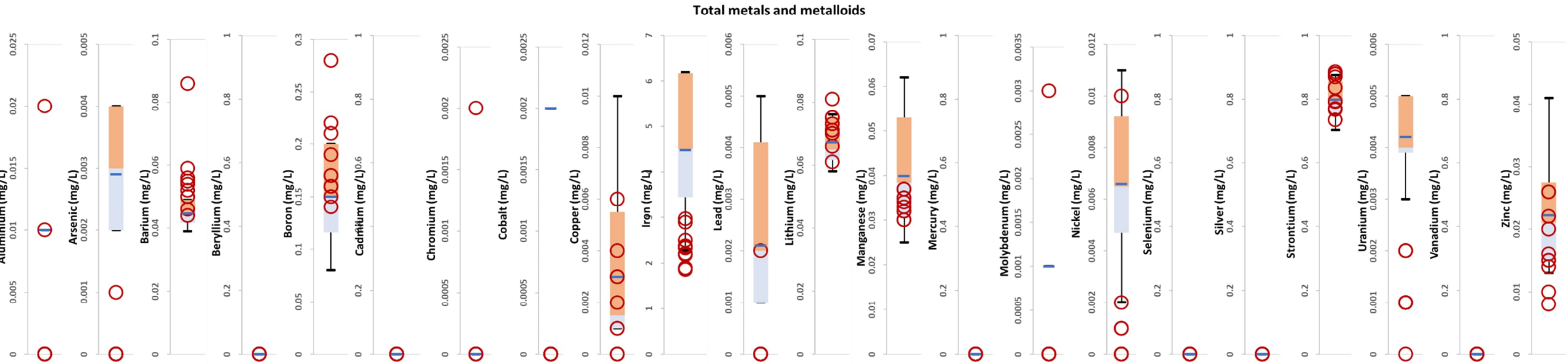
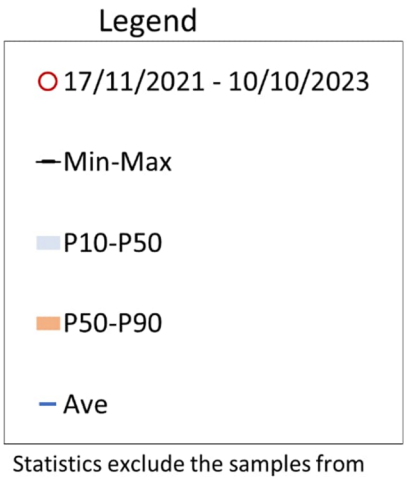
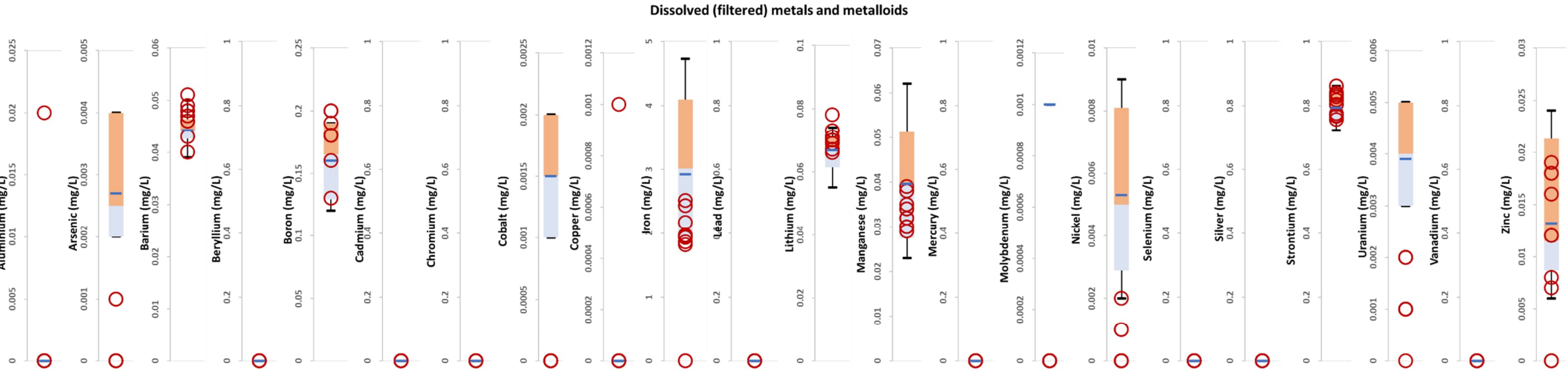
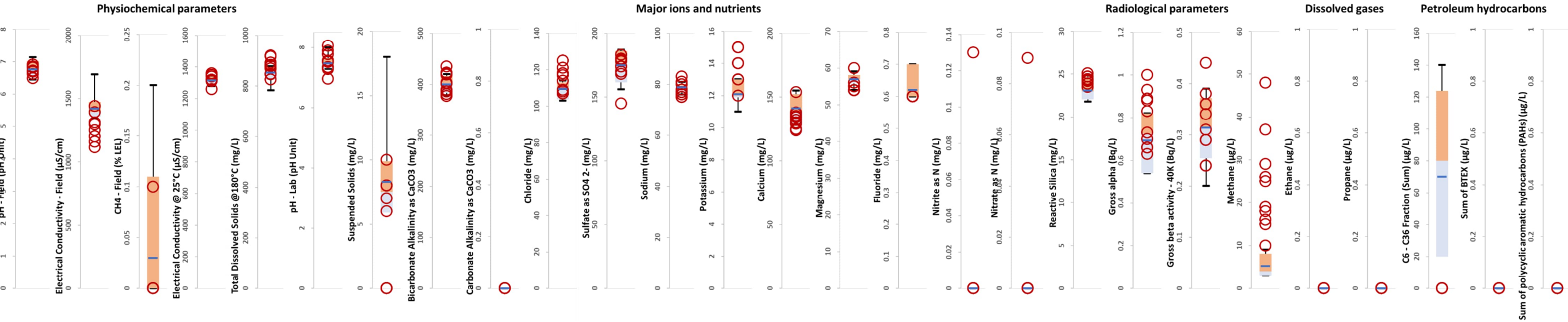
## Attachment B – Box-and-whisker plots



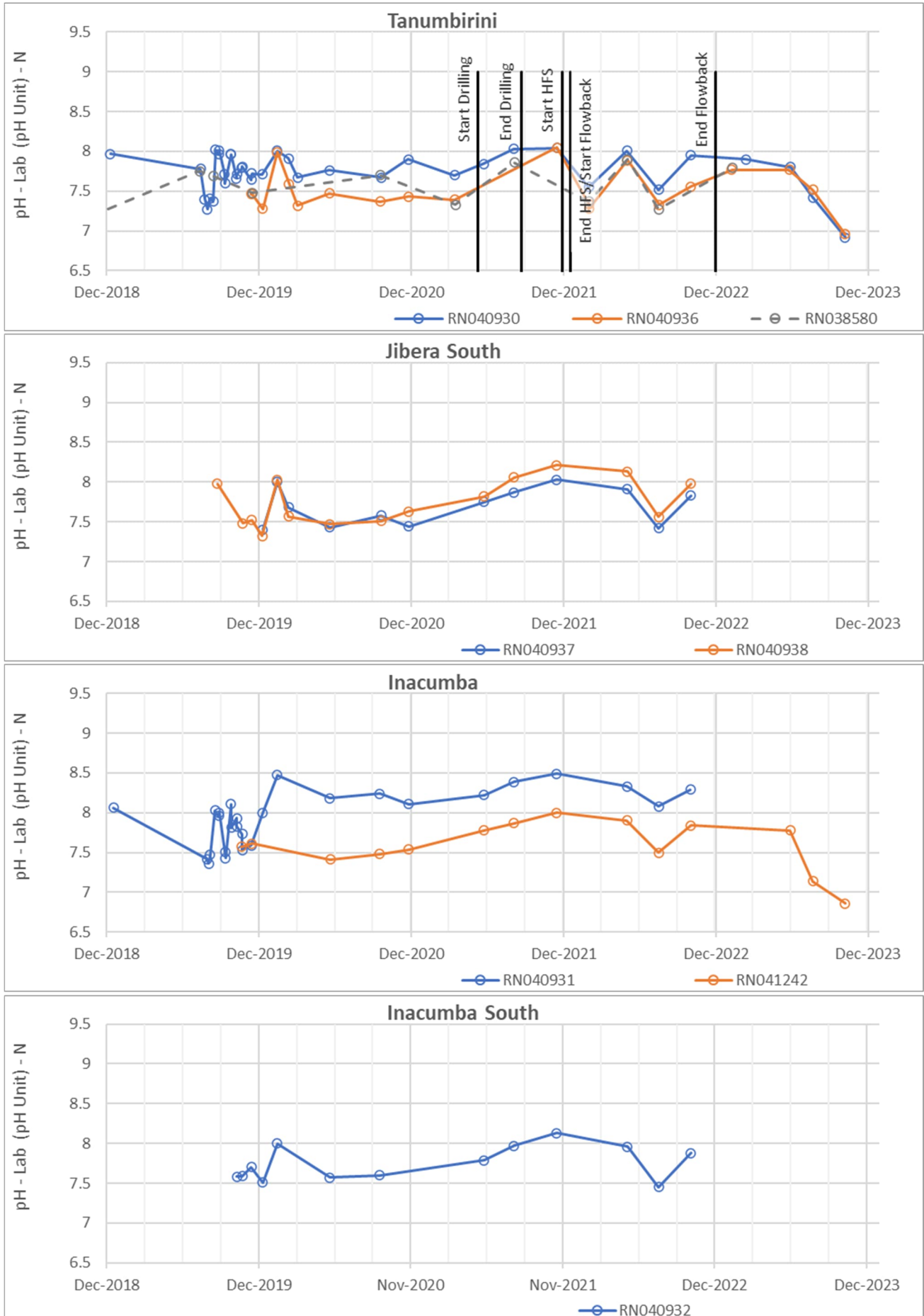
RN040930

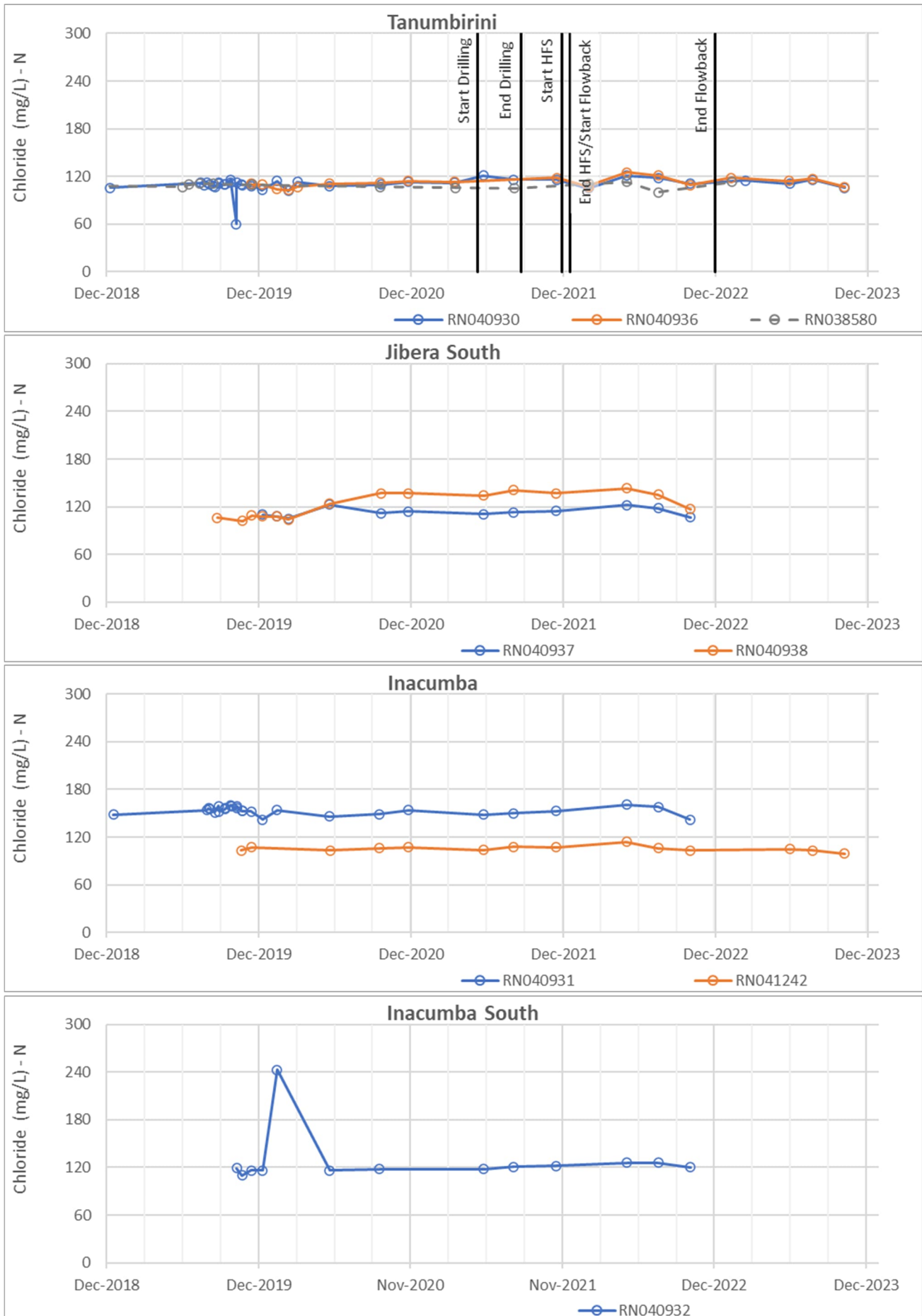


RN040936

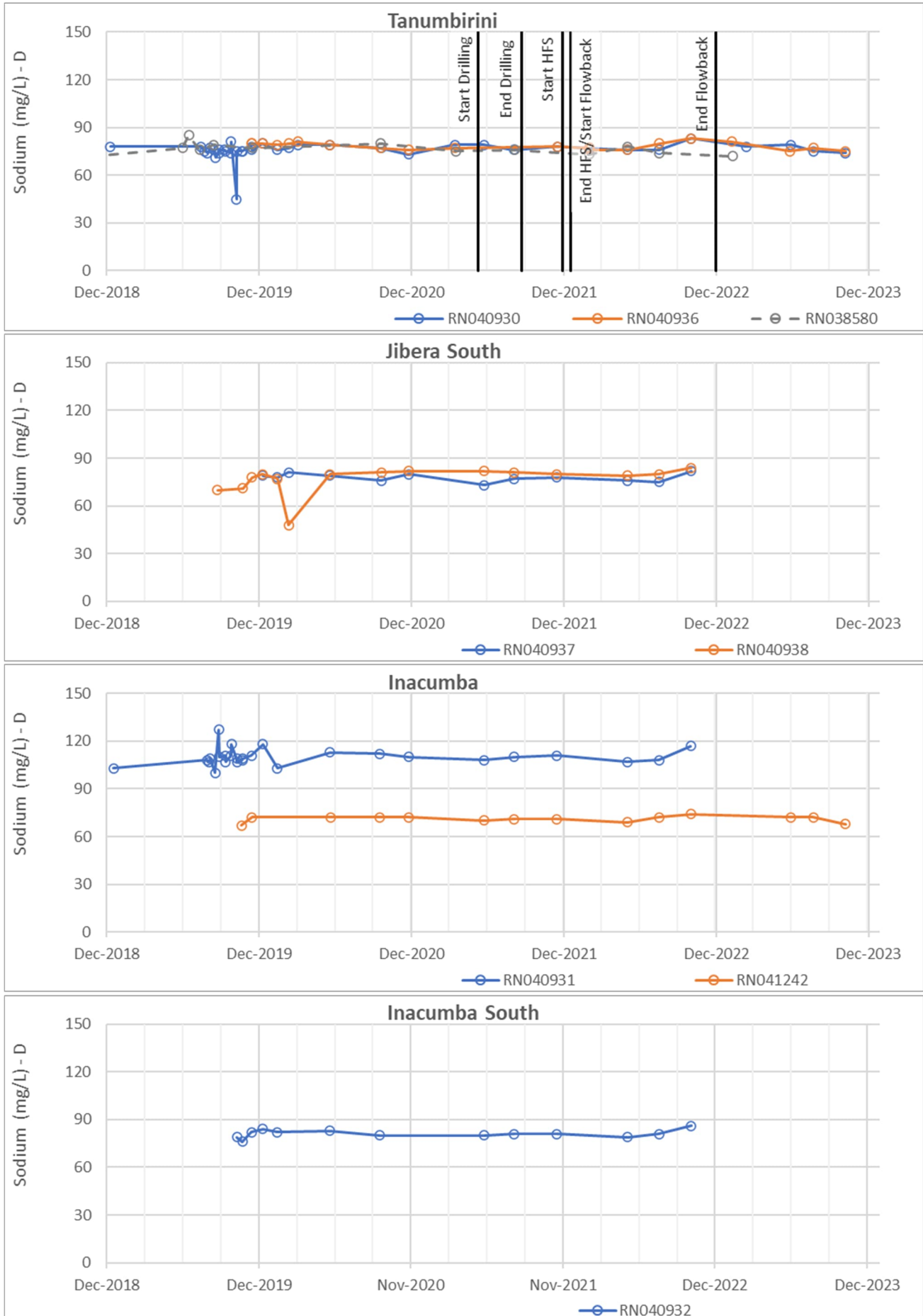


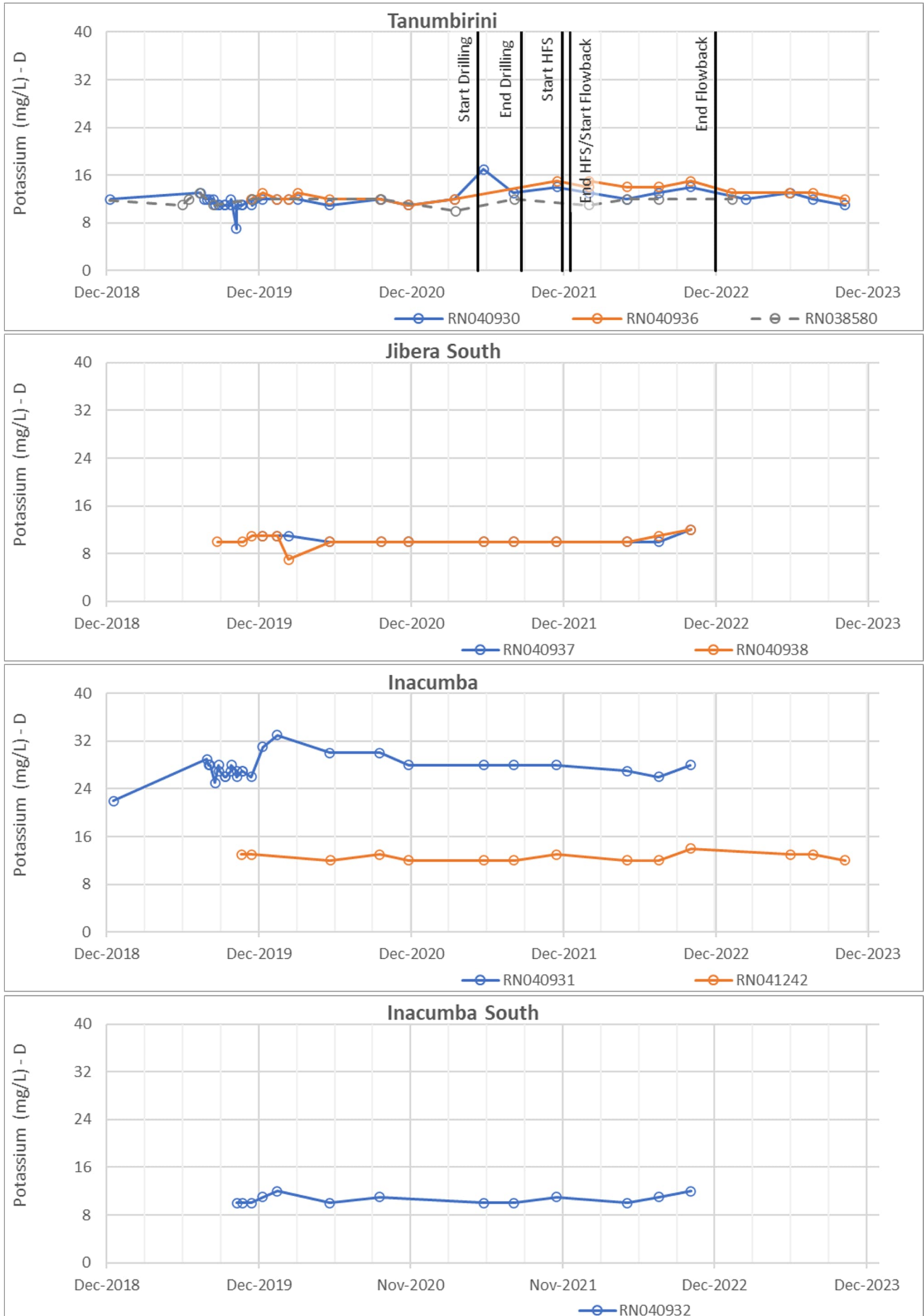
## Attachment C – Tanumbirini - Timeseries chemistry charts (including other Santos monitoring bores)

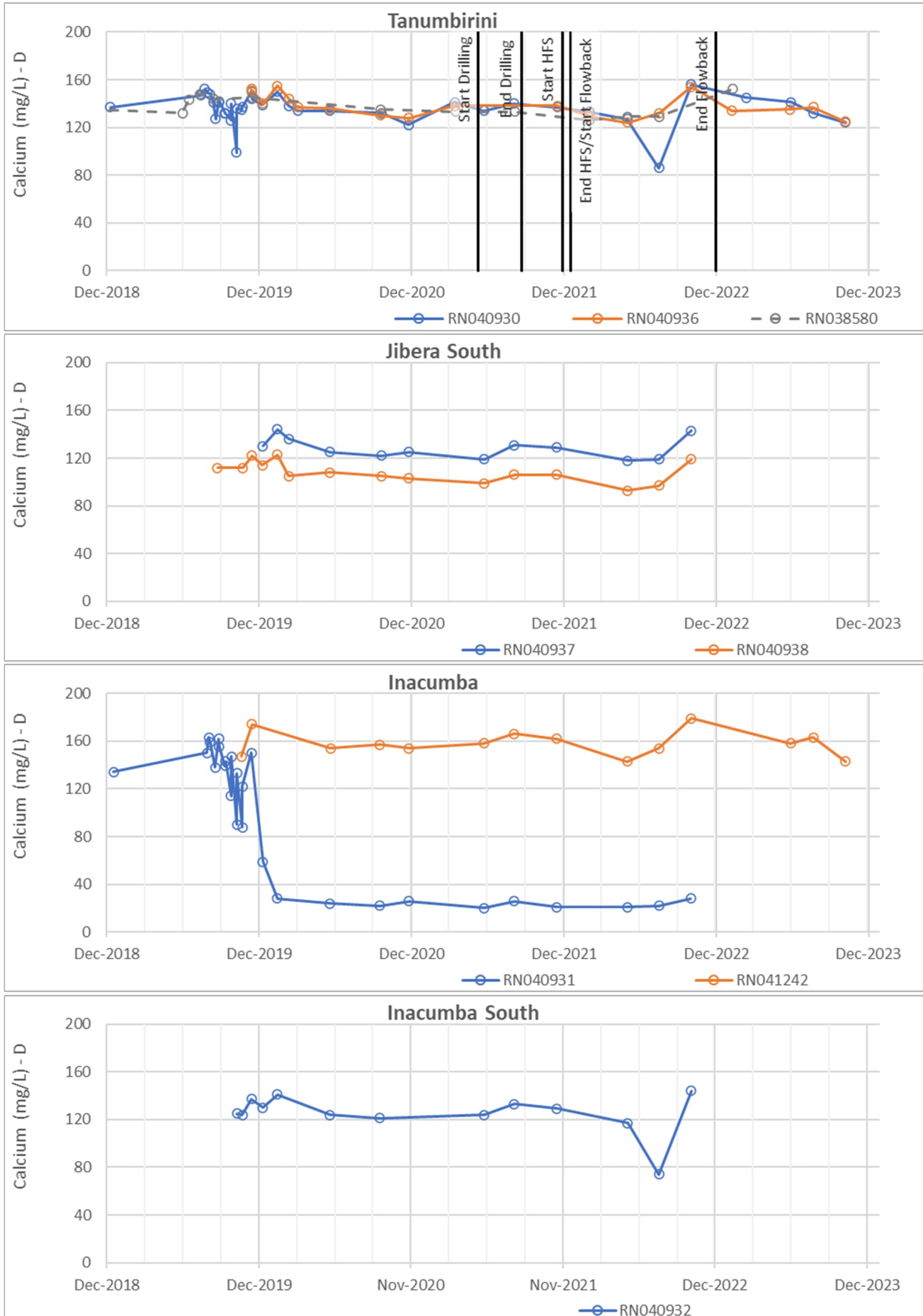


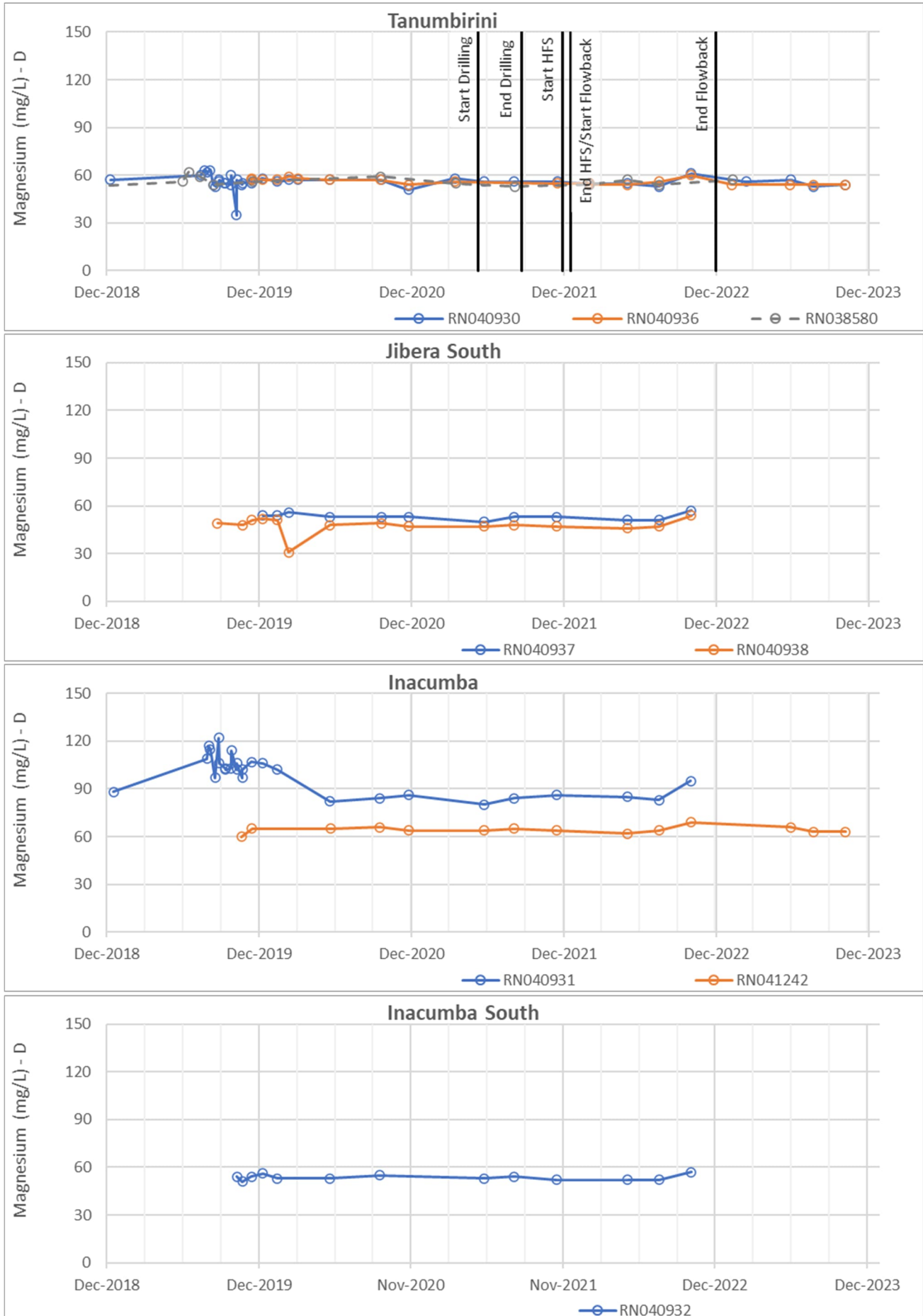


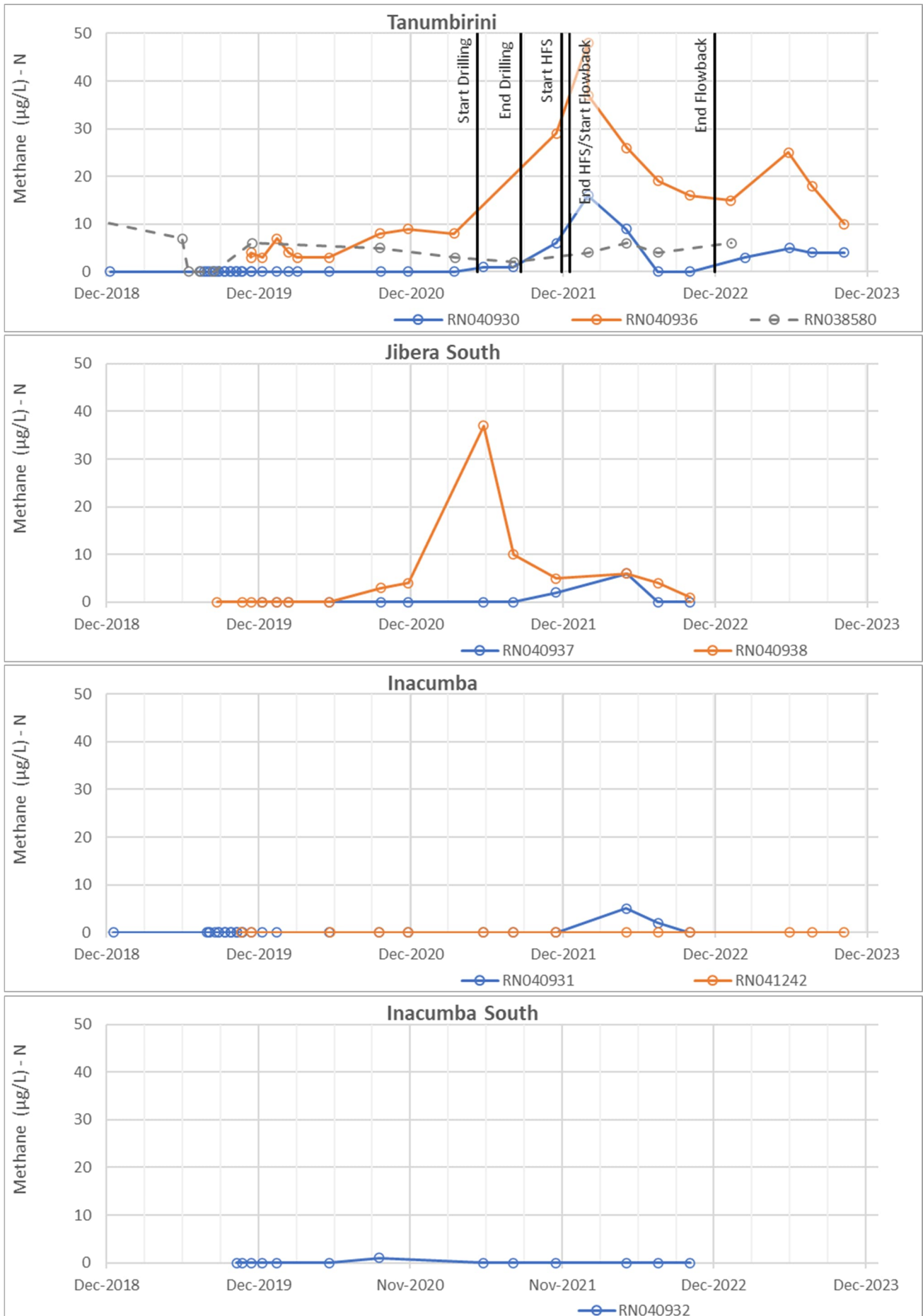




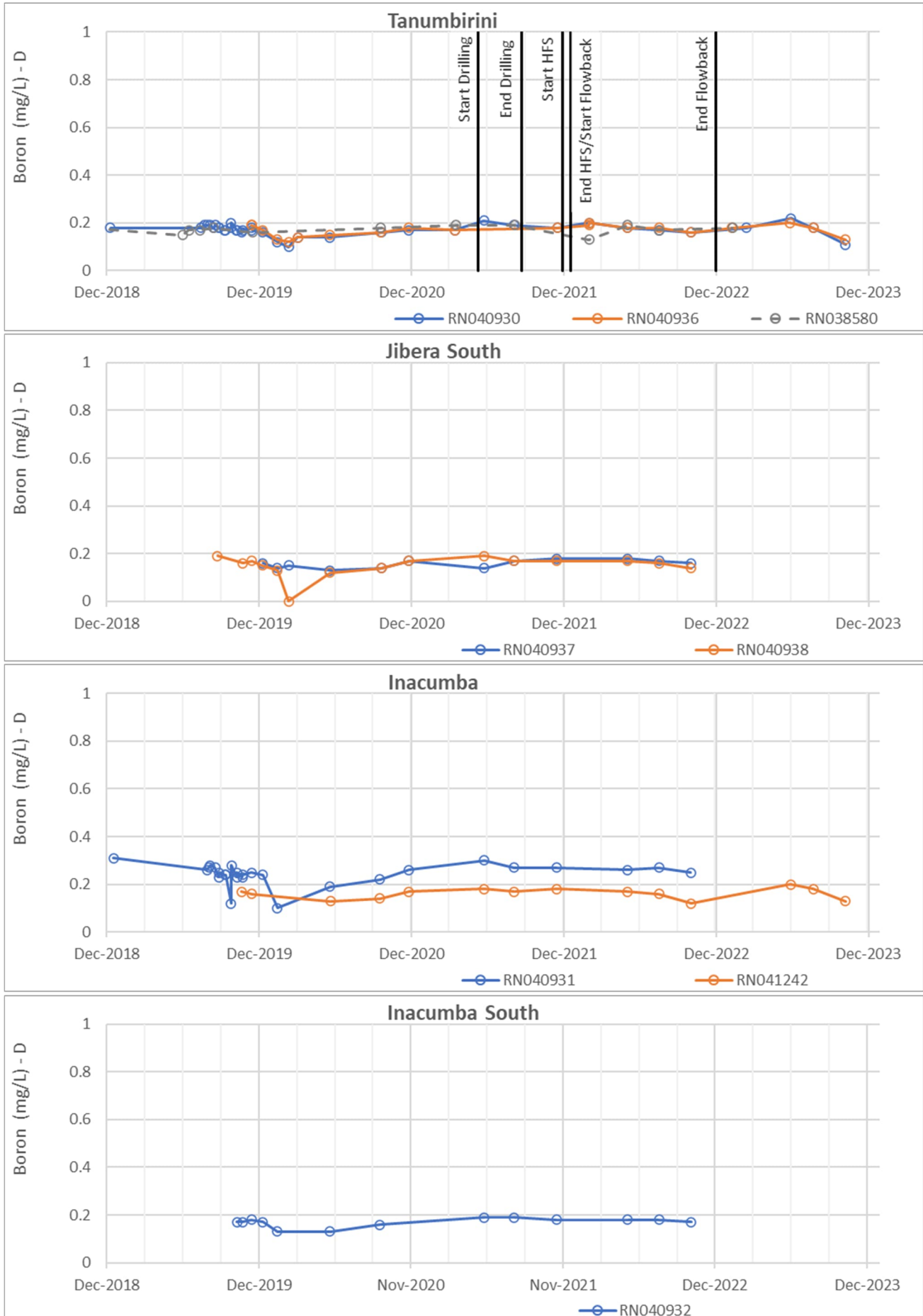


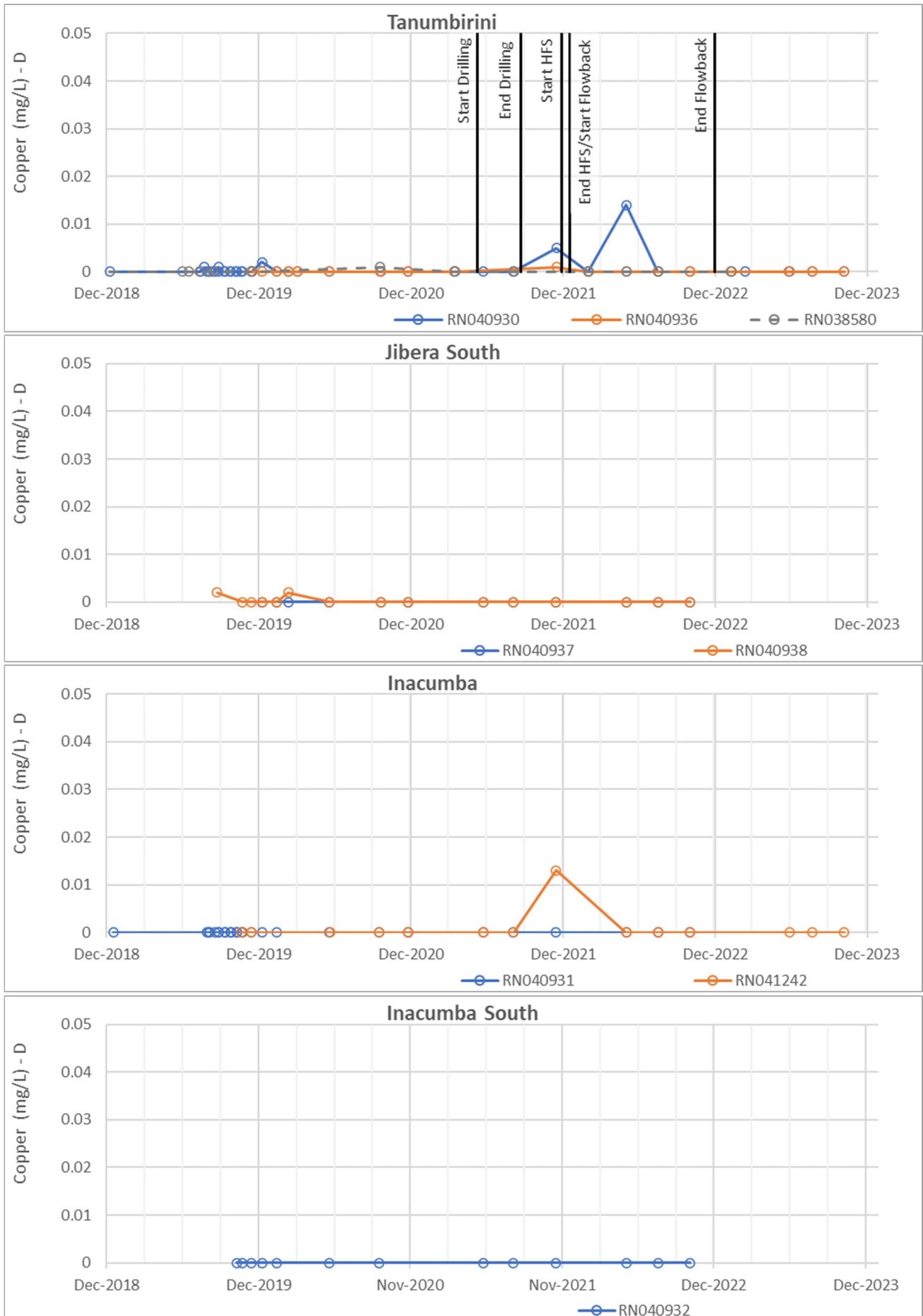


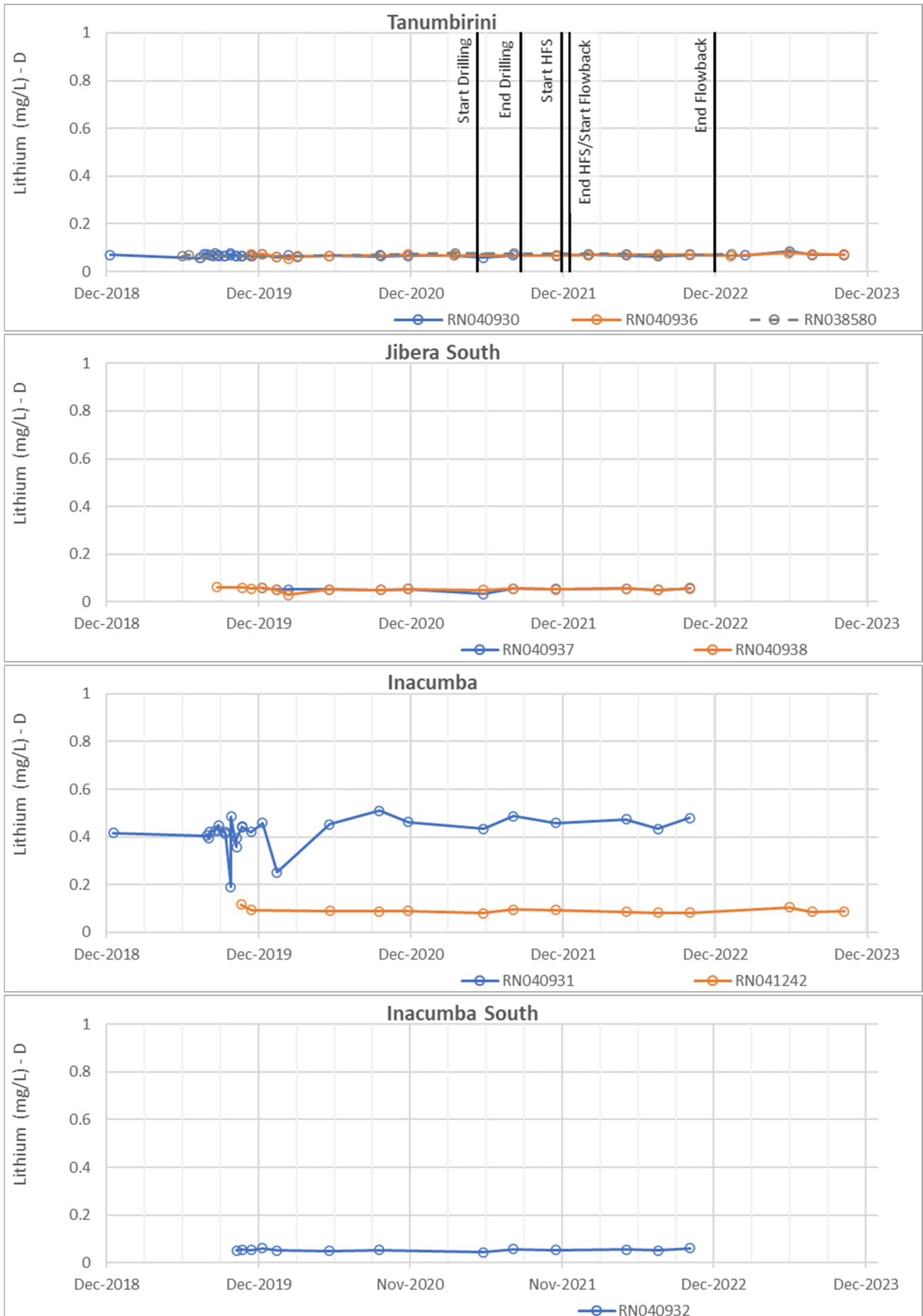


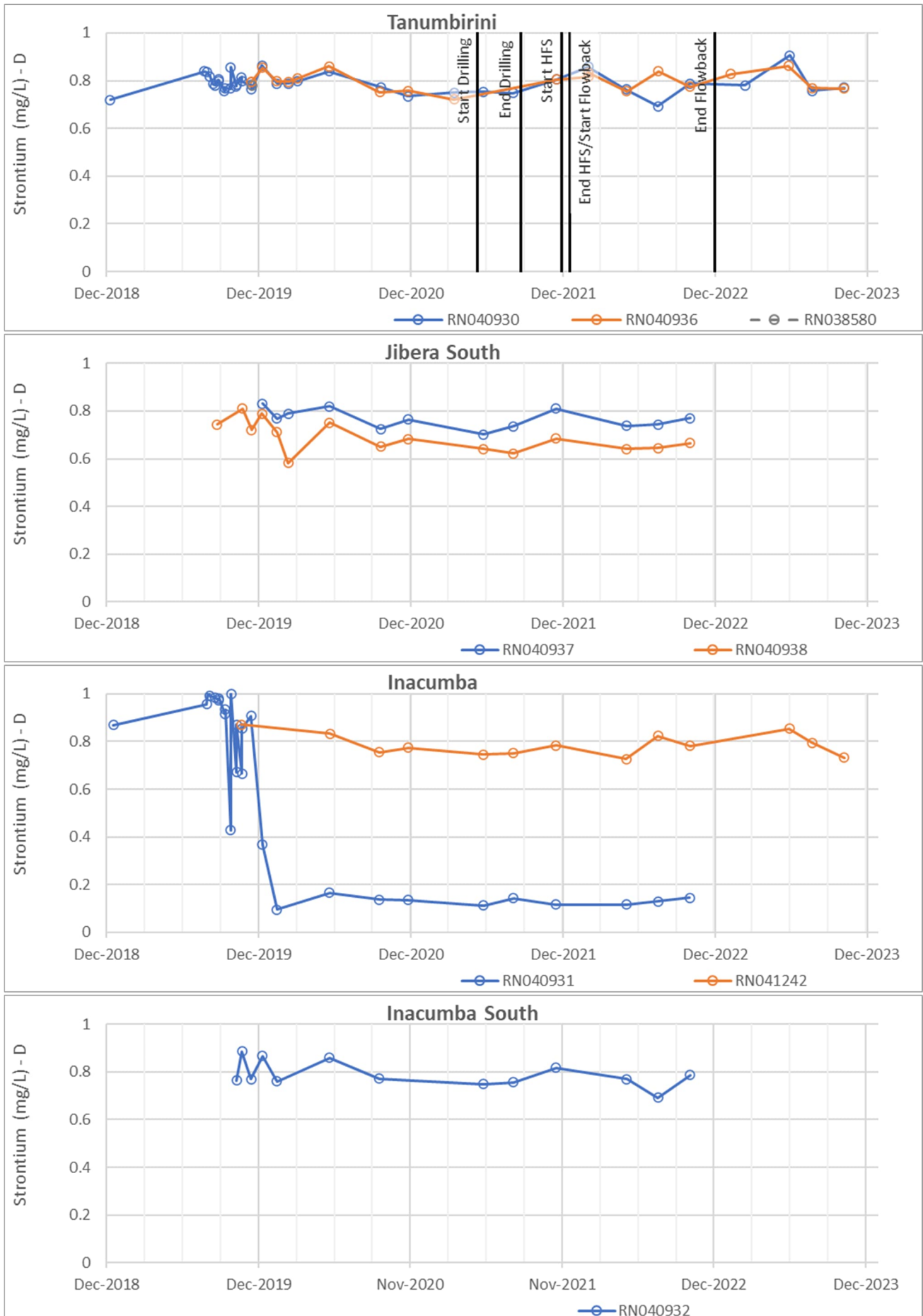


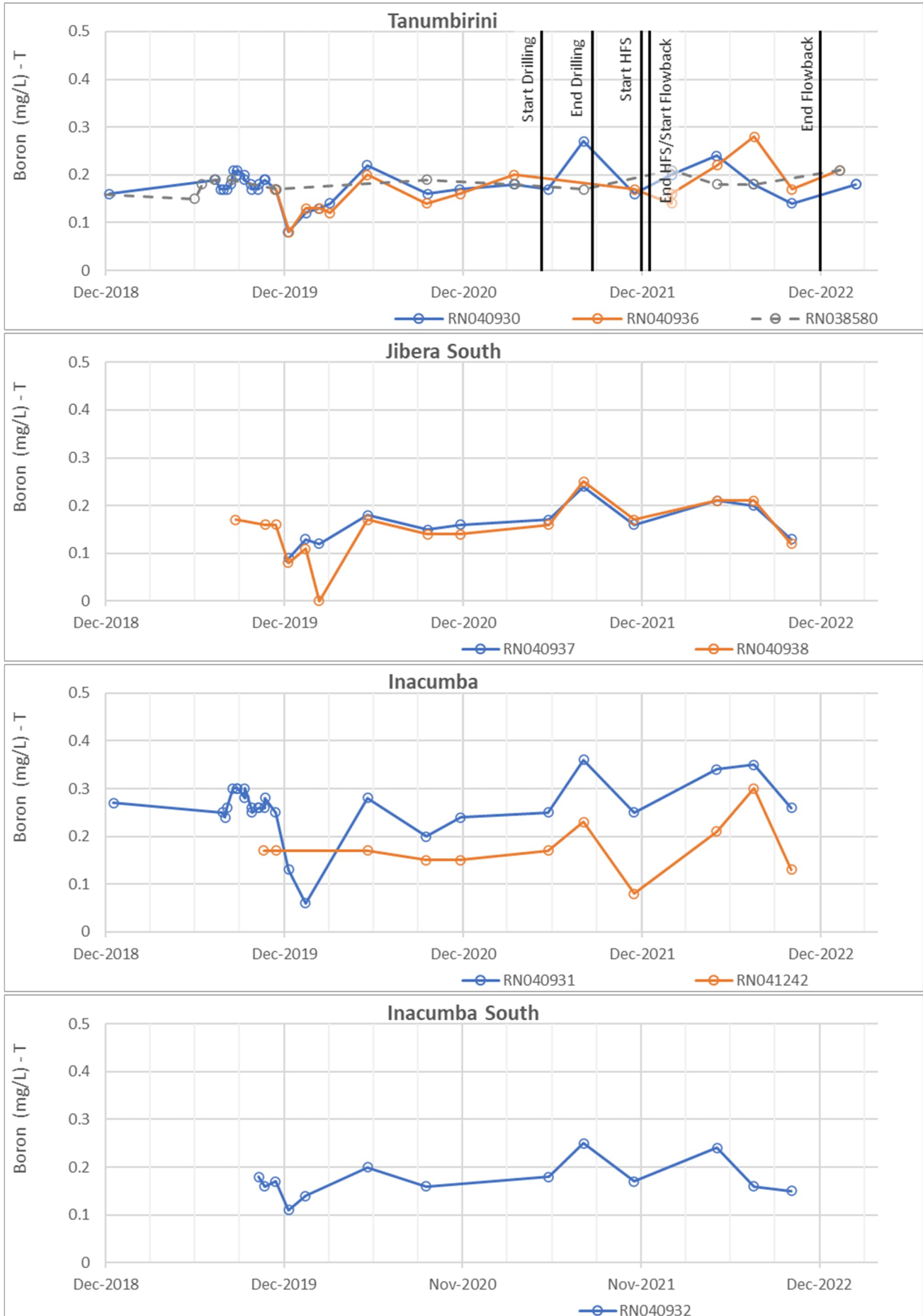




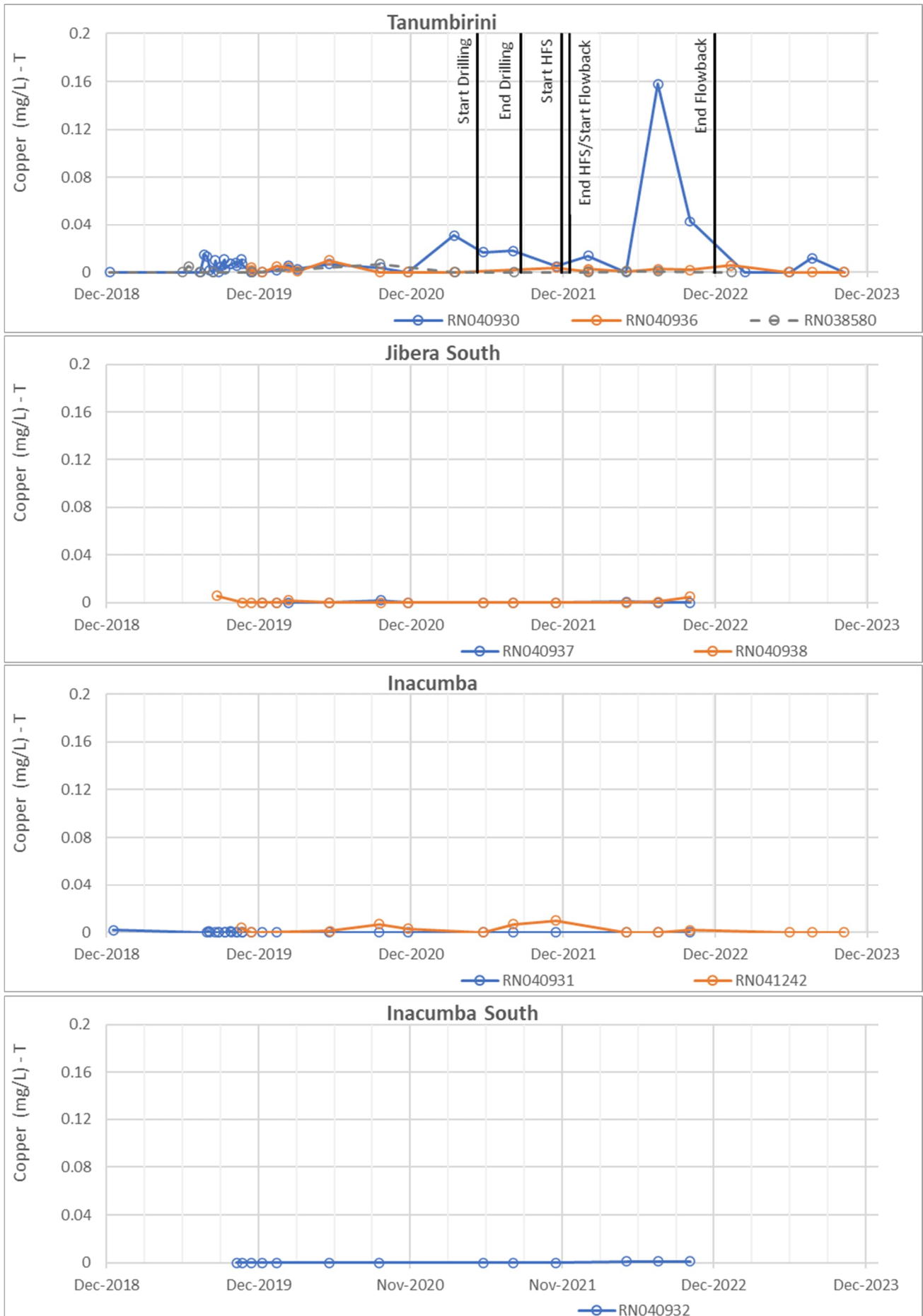


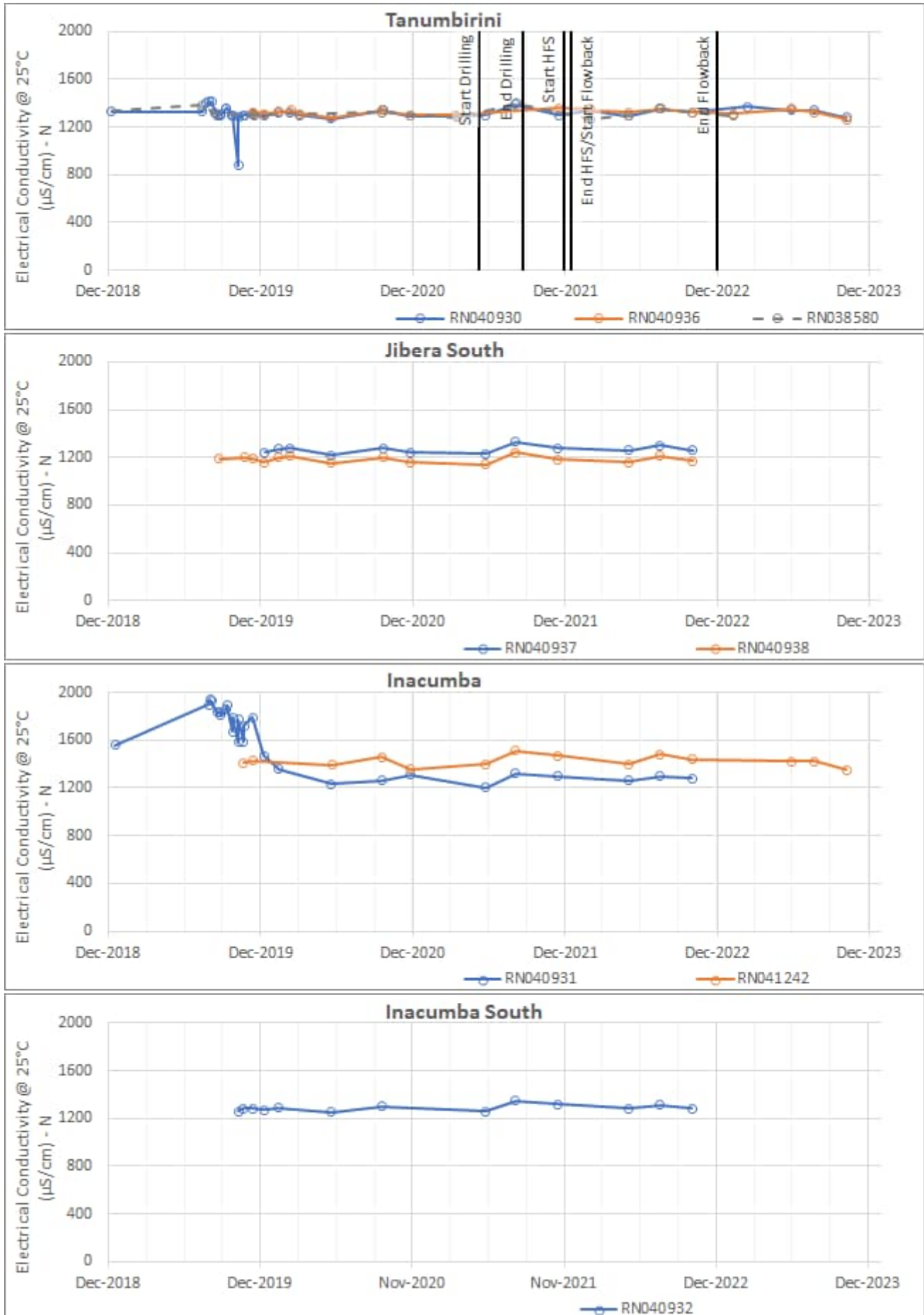


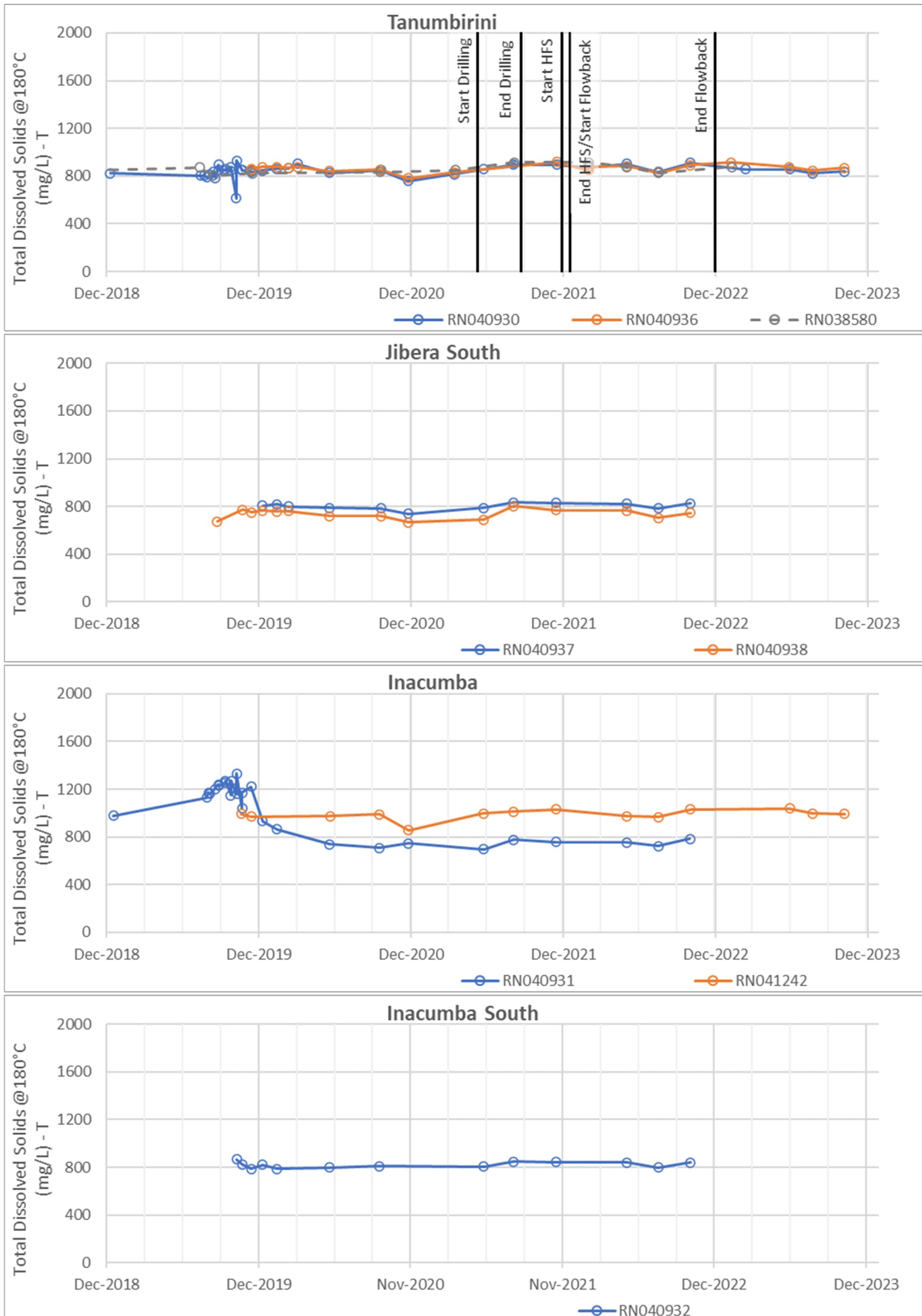


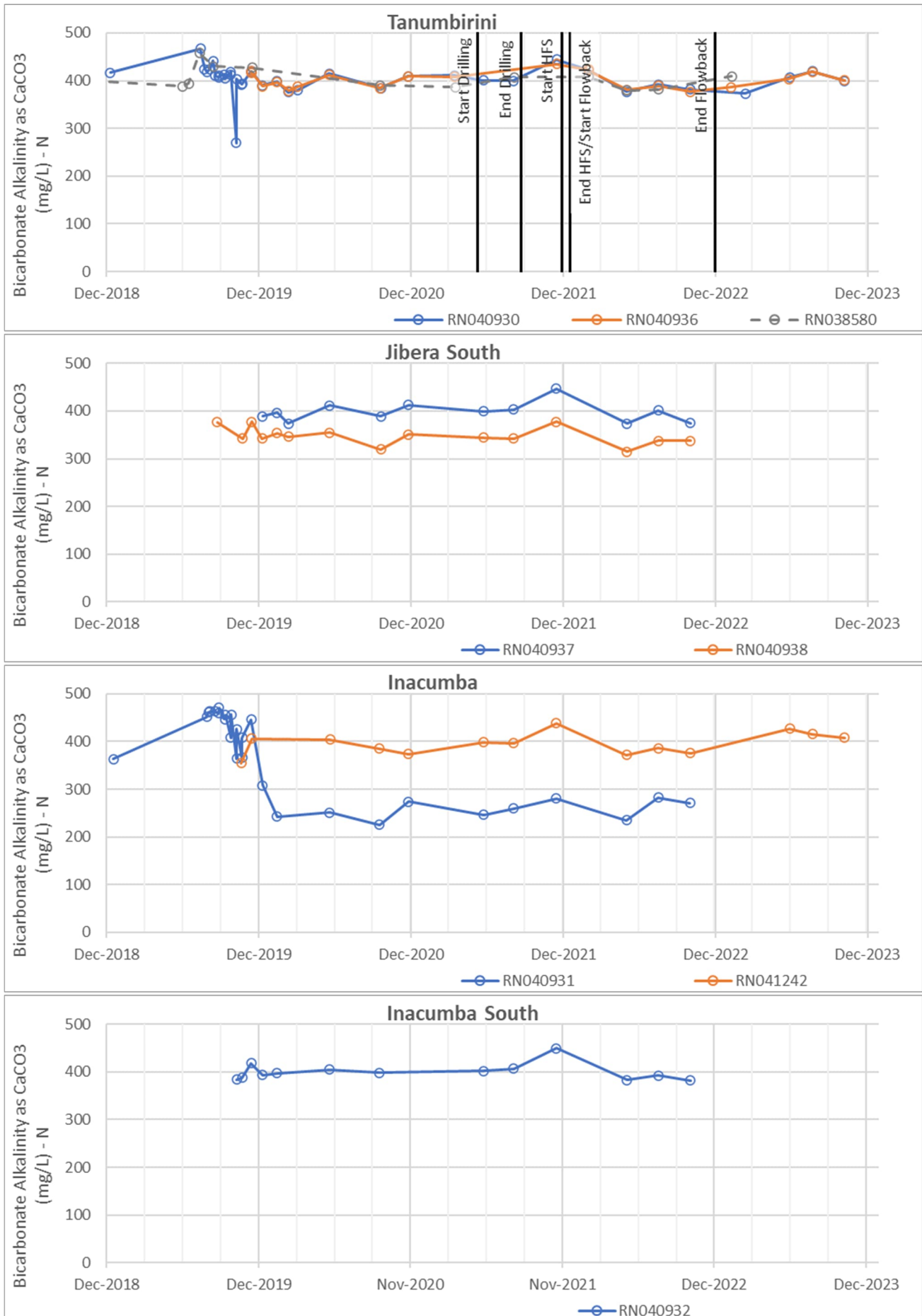


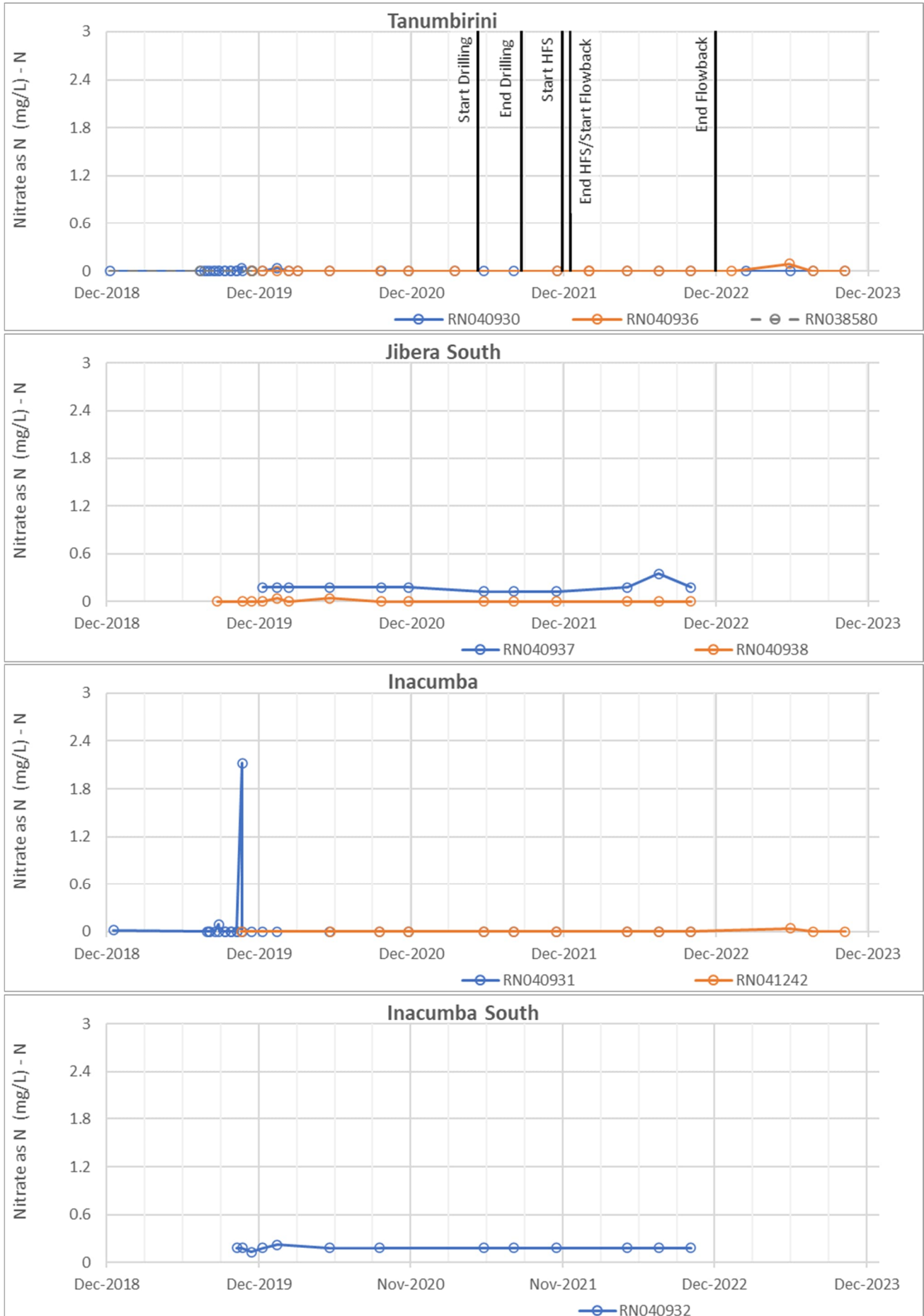




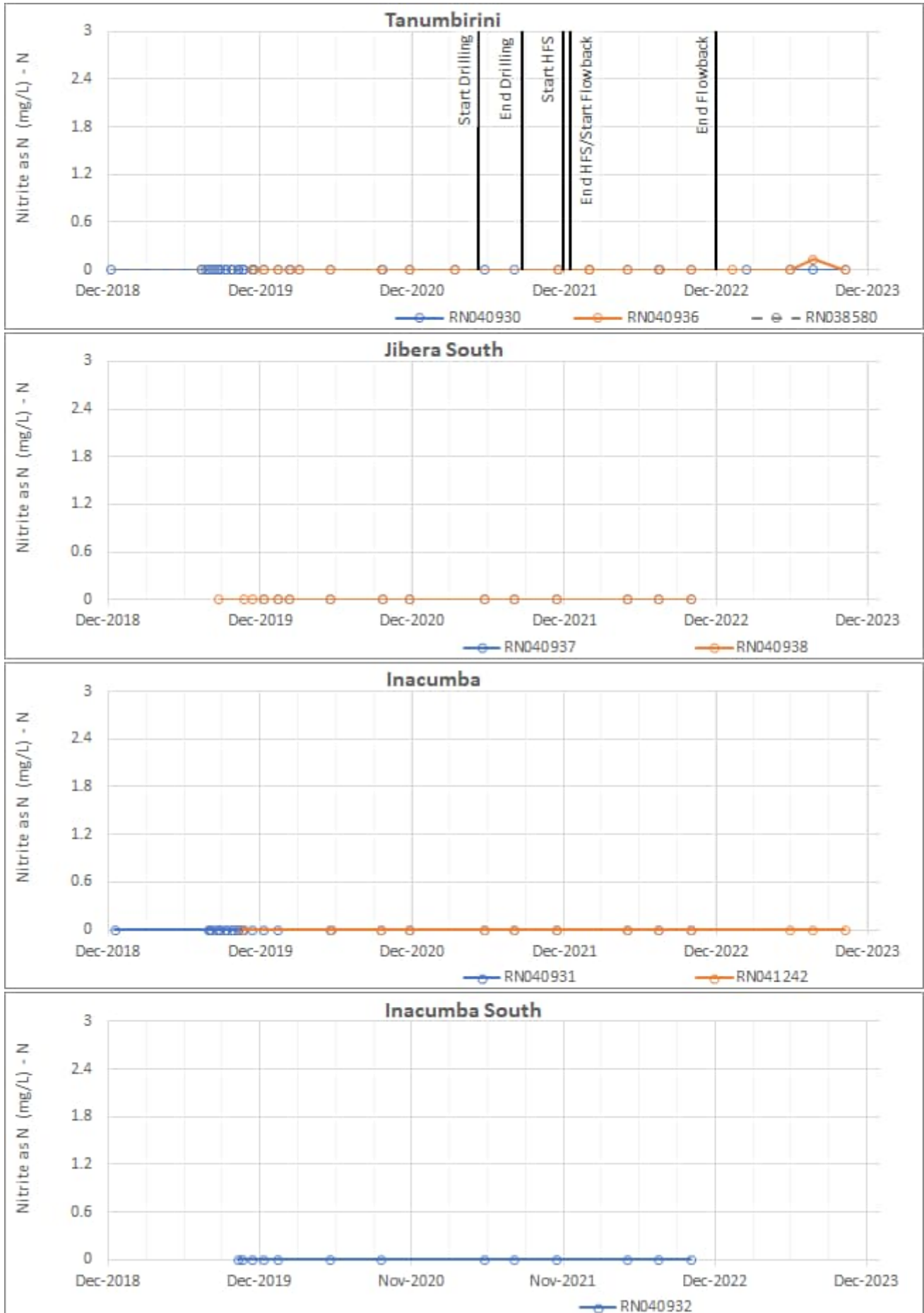


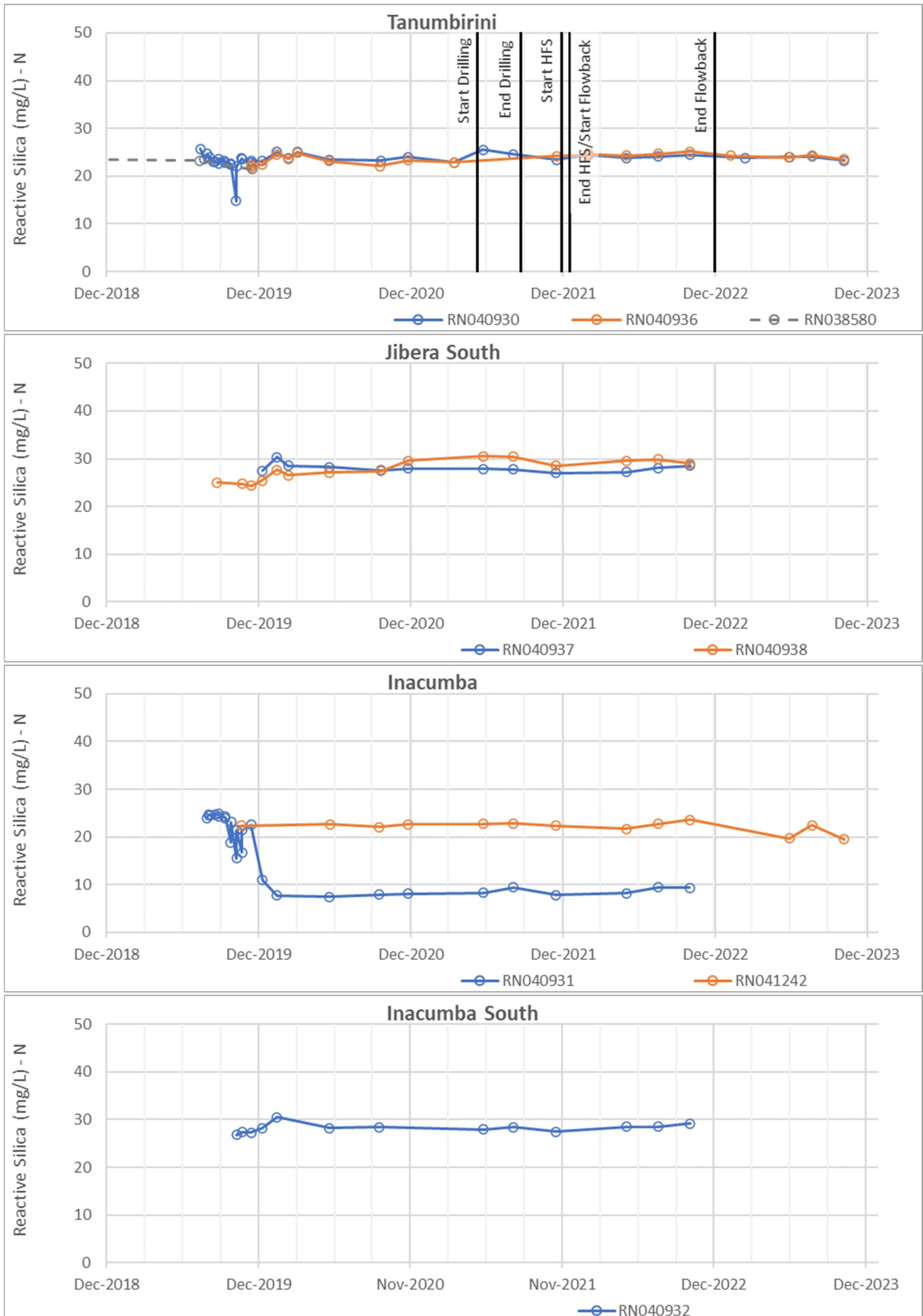


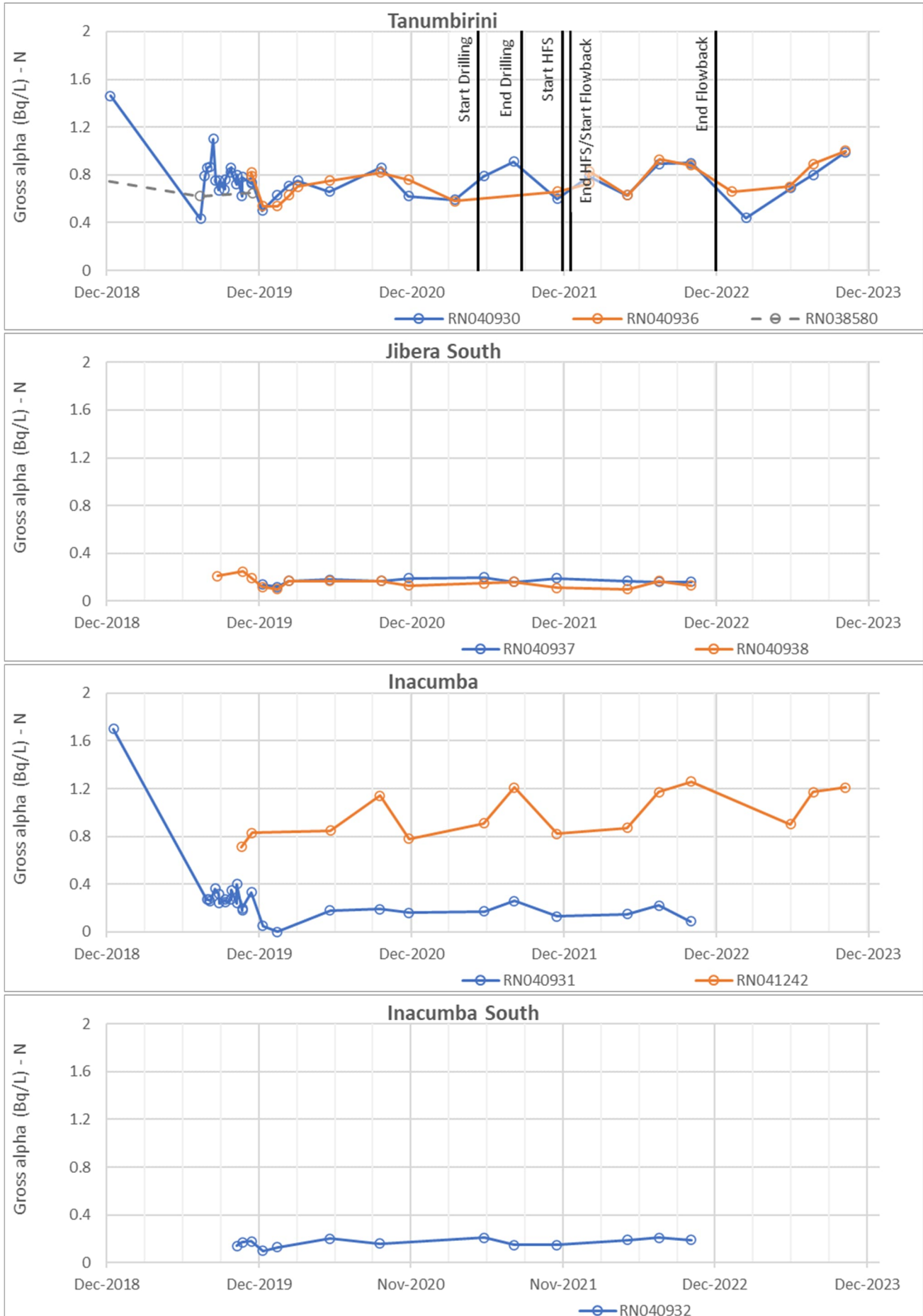


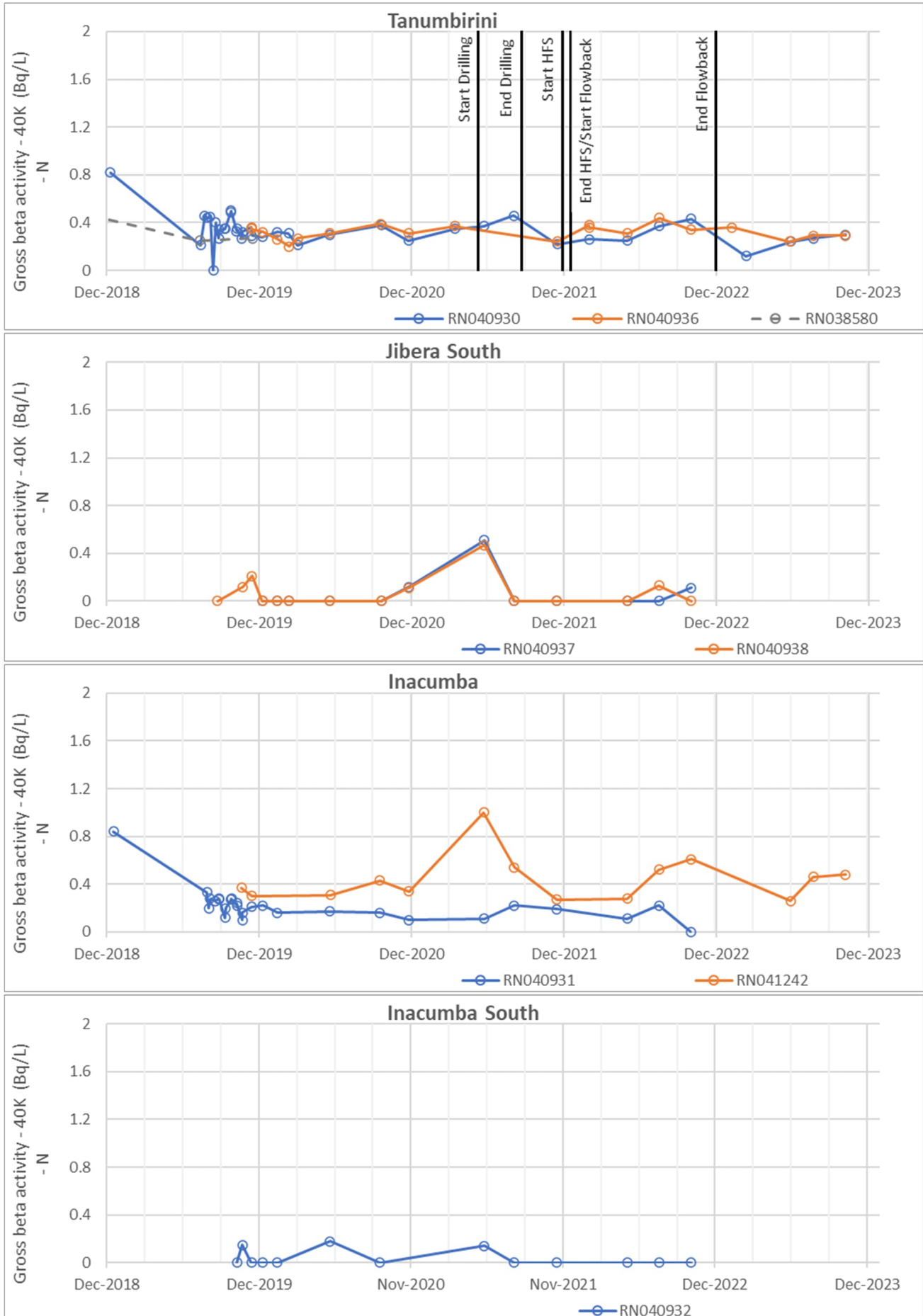


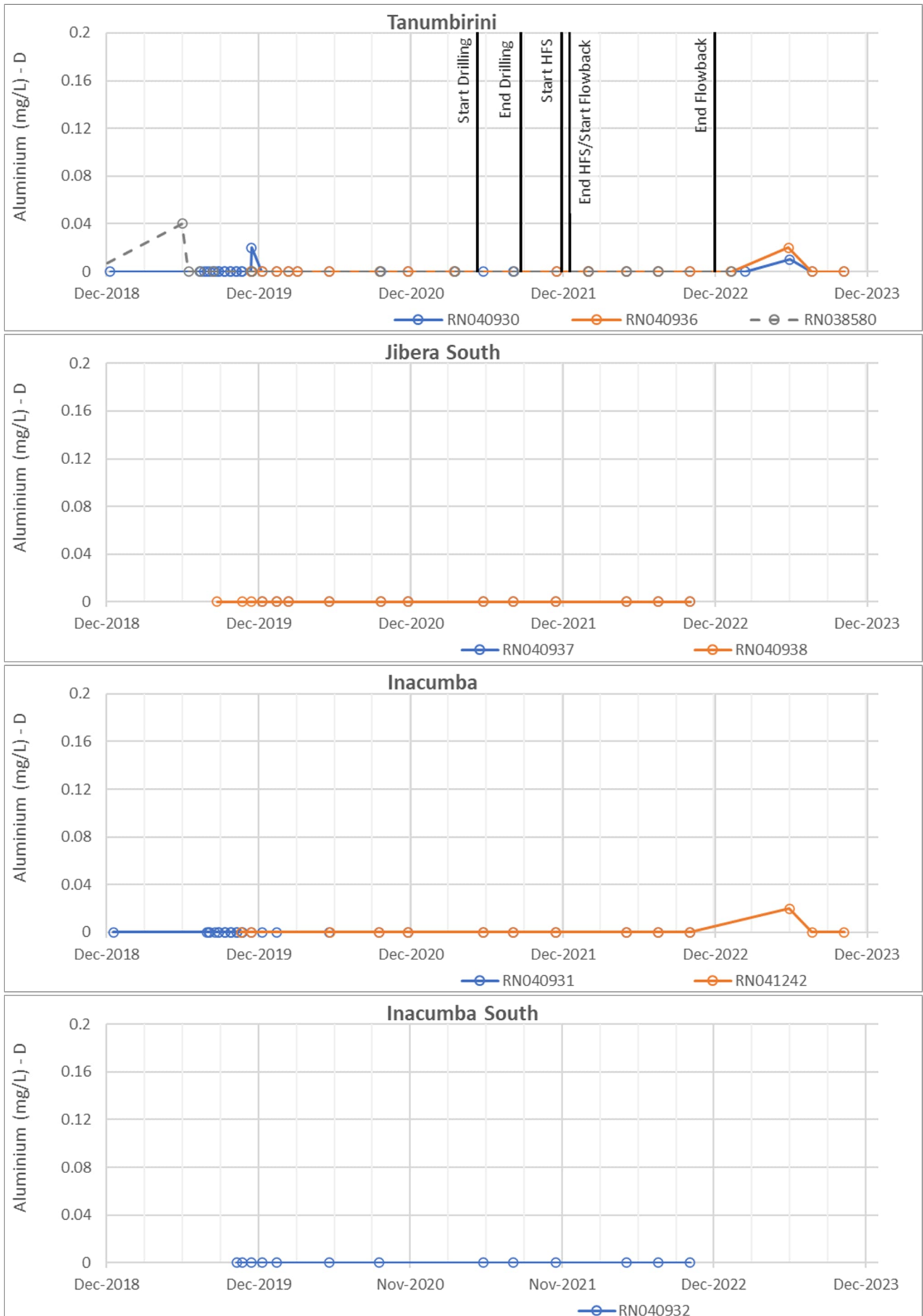




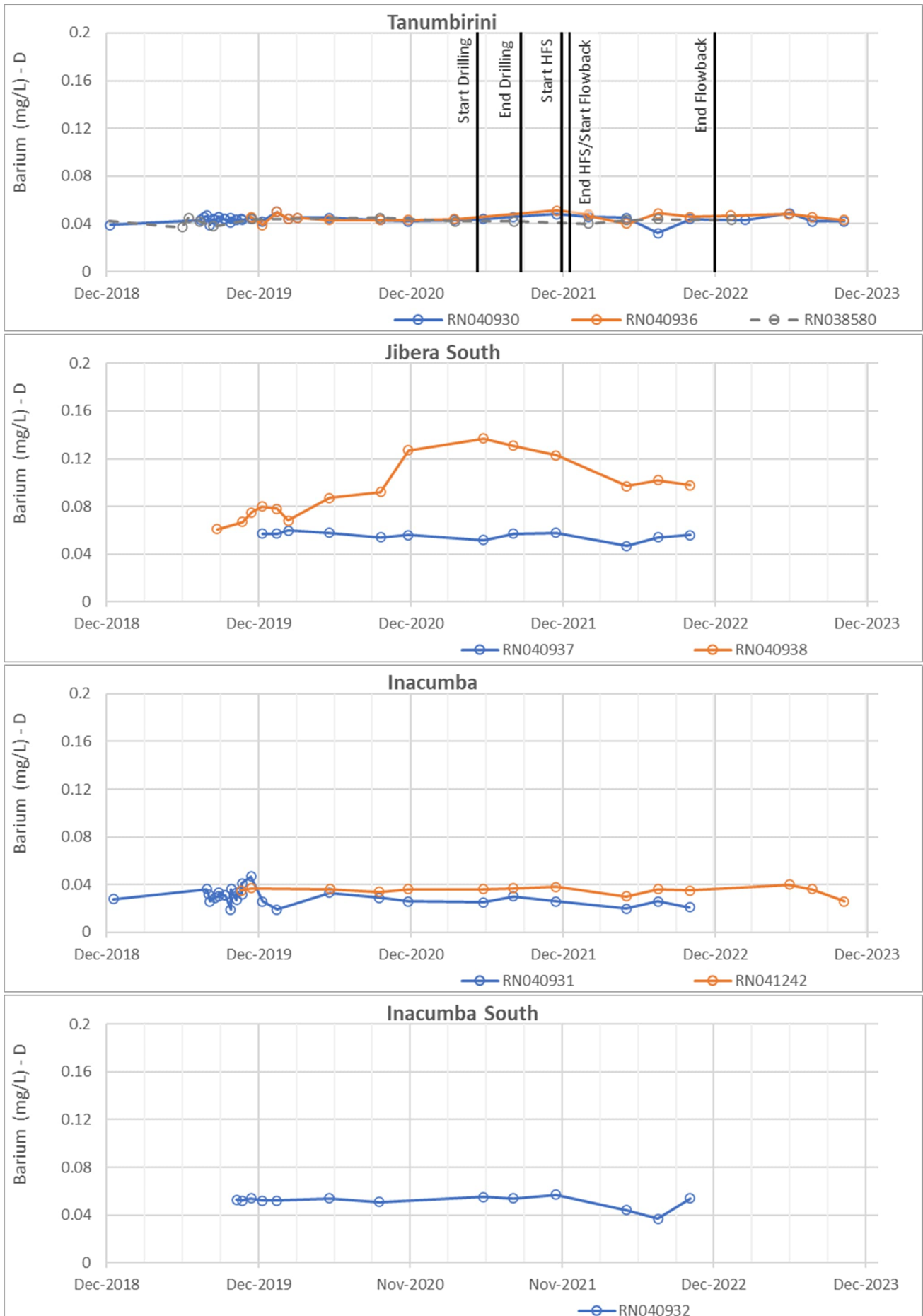


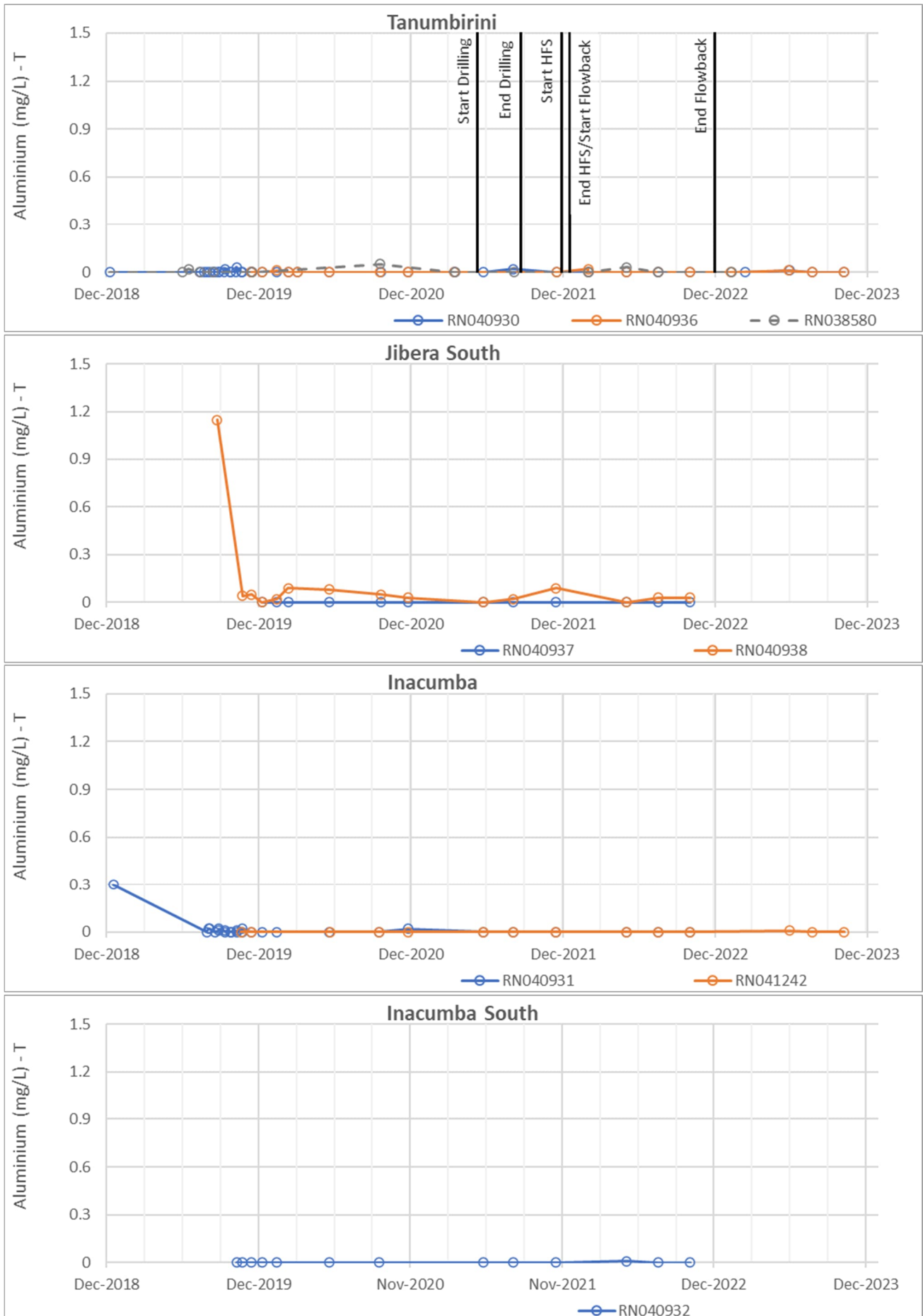


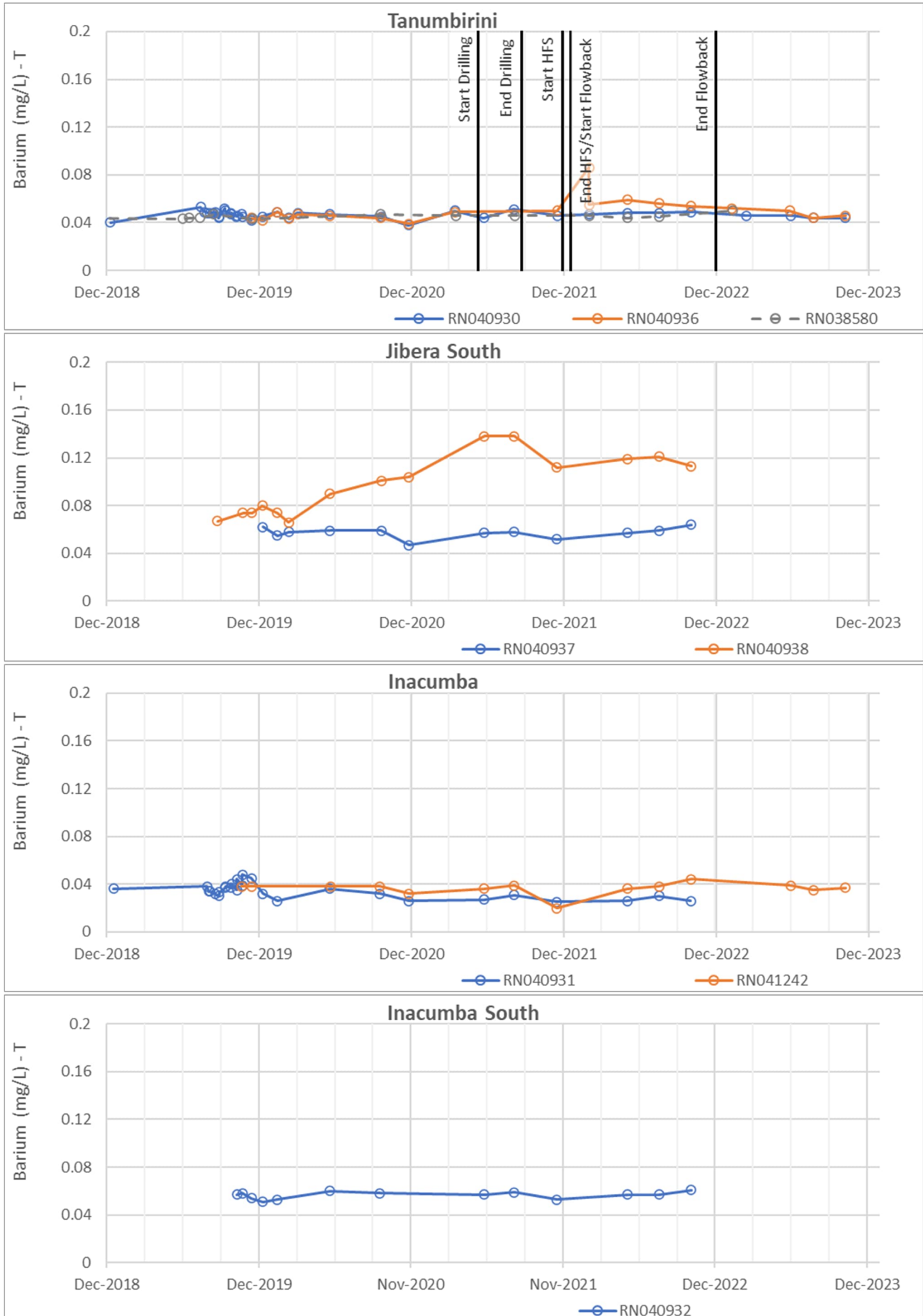


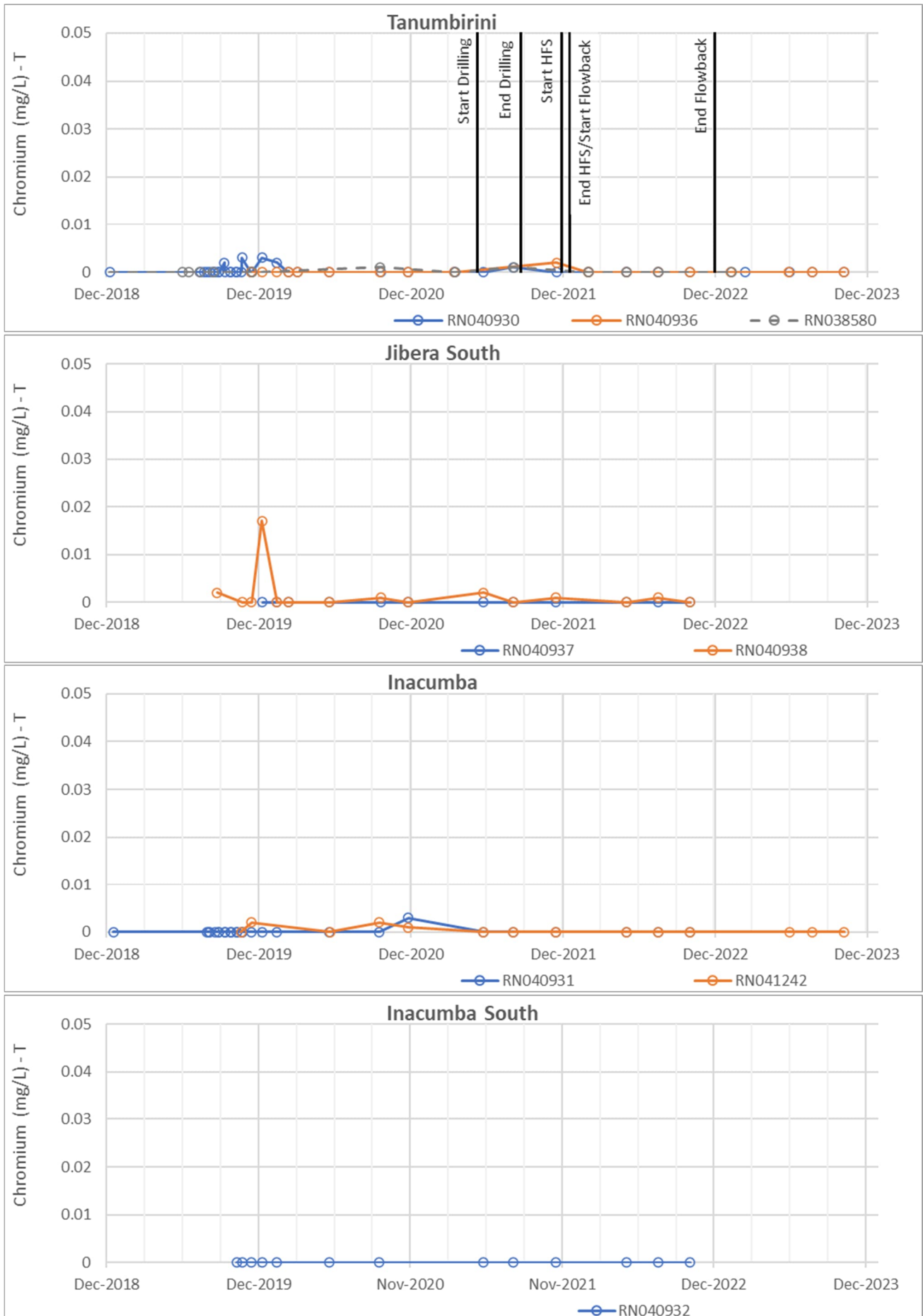


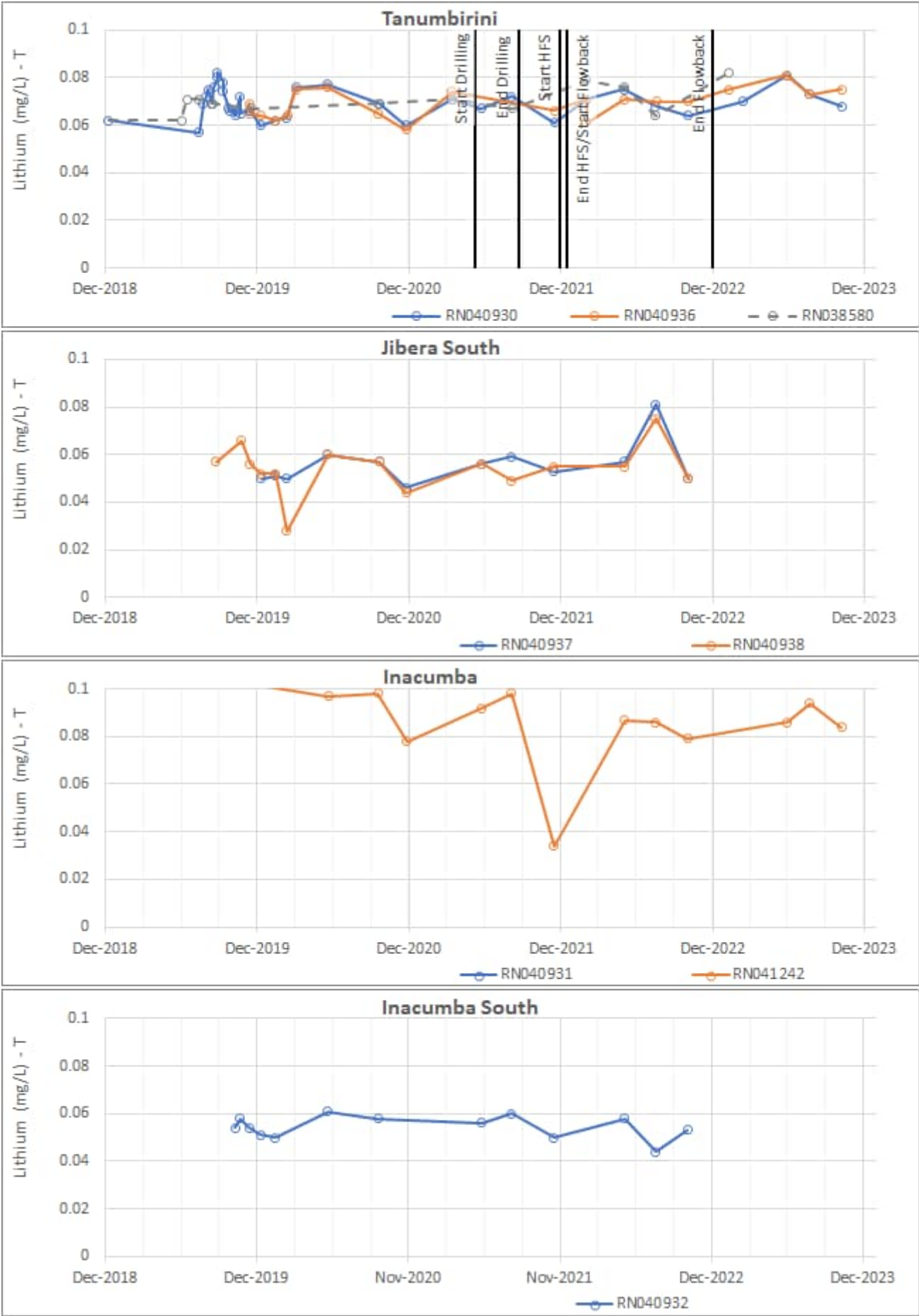




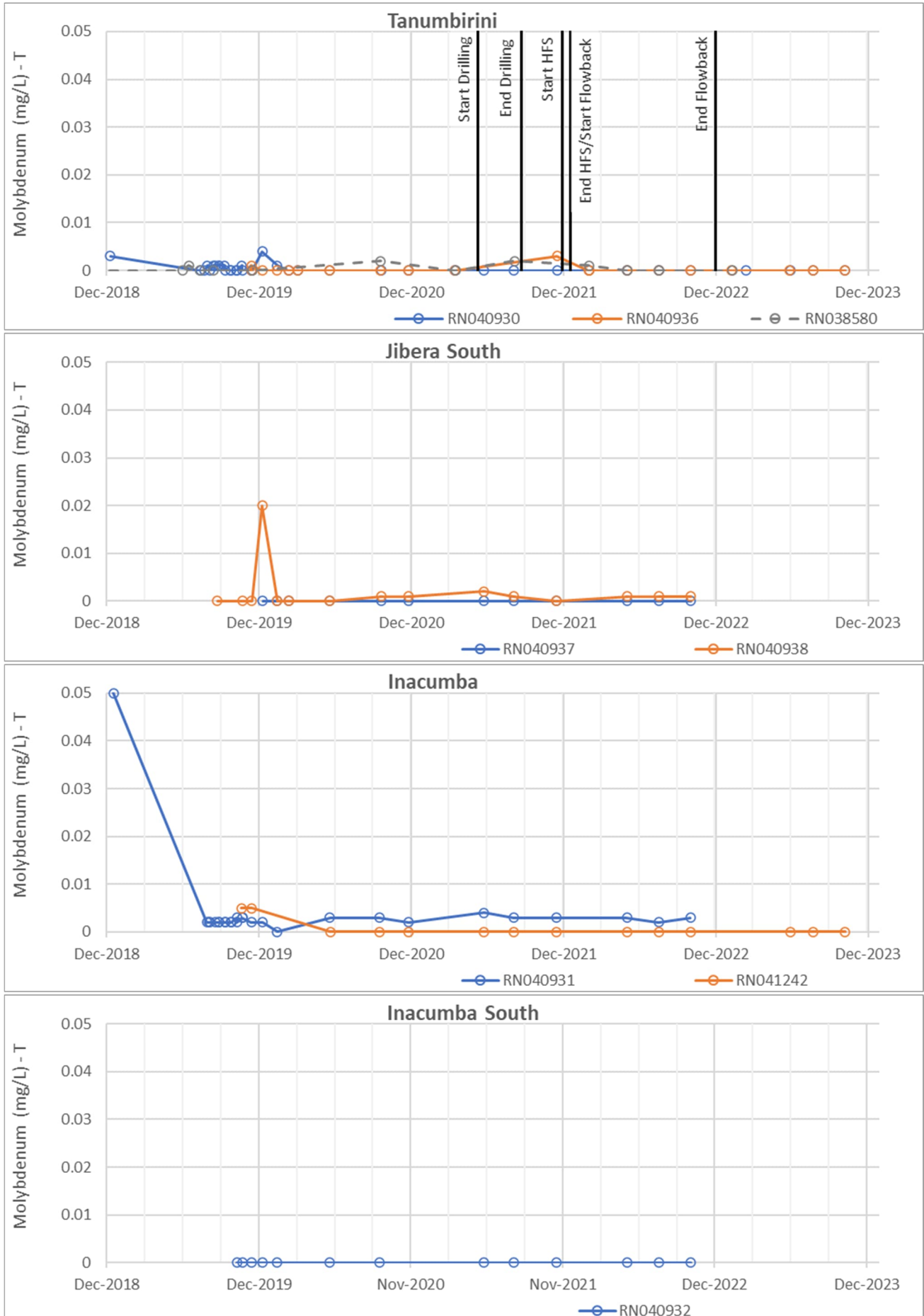


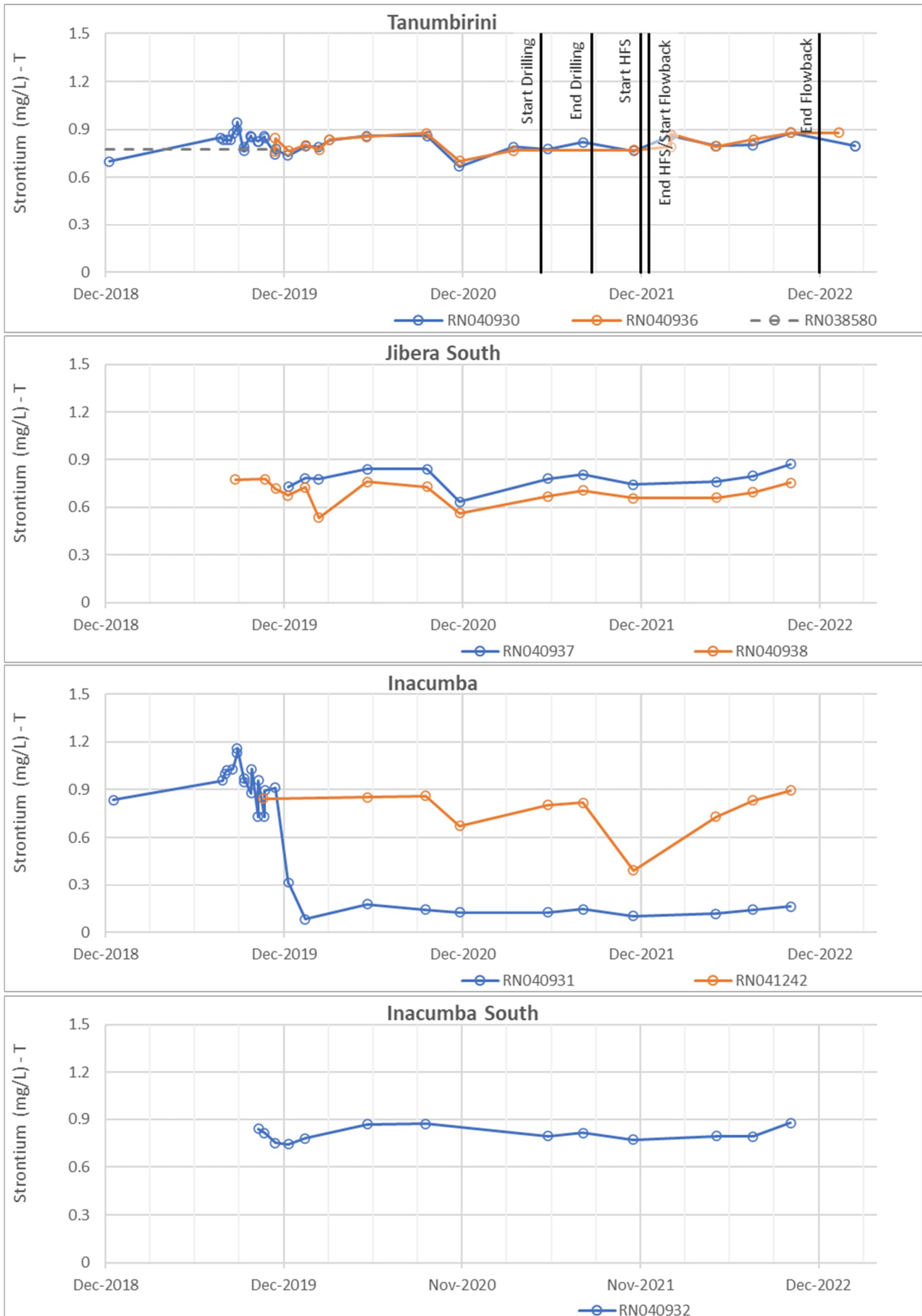












## Attachment C – Inacumba Timeseries Charts

