

PF Formation Pty Ltd

# Groundwater Report Hitchcock Road Site, Maroota, NSW Annual Groundwater Management Plan 2022 - 2023

Report E2W-0224 R004 (v1)

11 September 2023

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# Project: Annual Groundwater Report 2022-2023 Hitchcock Road Site, Maroota

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[1] *Logger cable submerged under water and unable to retrieve to download data for Por167dam.*

# 1 INTRODUCTION

Earth2Water Pty Ltd (E2W) was engaged by PF Formation Pty Ltd (PFF) to provide the Annual Groundwater Report (2022-2023) for Hitchcock Road Site, Maroota (Figure 1). The groundwater and surface water sampling[2] and downloading of data loggers (6) was conducted in consultation and Joshua Graham (PFF) on 15 & 16 August 2023. The ongoing quarterly monitoring of creeks and monthly gauging of groundwater levels was undertaken by Melissa Mass of South East Environmental Pty Ltd (SEE). URS Australia Pty Ltd (URS) was previously (up to 2013) retained by PFF to prepare the groundwater component of the report.

PF Formation Pty Ltd (PFF) is required under the "Project Approval 06_0104 MOD1" conditions set for the Maroota Hitchcock Road property area (Figure 2) to prepare an Annual Review report to Department of Planning and Environment (DPE). This annual groundwater report is prepared to complete the Groundwater and Surface water aspects for the Annual Review in accordance with Condition 5 of Schedule 5 of the Project Approval, and to present the annual monitoring and analytical data to show compliance with the approved Water management Plan (WMP).

E2W provided an updated WMP (8 January 2018, 23 November 2020, & 11 April 2022) which included a detailed assessment of the hydrogeology, site survey, pit depths and installation of additional wells and data loggers.

This annual groundwater report by E2W includes the monitoring data collected from 1996 to August 2023 for the Hitchcock Road and Portion 198 sites. Additional monitoring data was obtained from the 2018 to 2023 period which included water testing, and data logger information from new deep onsite wells (PF167MW-3D, PF167MW-4D). Due to the high rainfall and dam level, the data logger at Por 167 Dam was unable to be retrieved (i.e. logger download planned for 2024).

The monthly water monitoring by Meliss Mass (SEE) continued from the adjacent new site (i.e. 4378 Old Northern Rd @ PF-1, PF-2, PF-3)[3], and the new wells installed in 2020 at Pit-8 (PFPit8MW-6D) and Pit-13 (PFPit13MW-7D, refer to Figure 1B). The seven (7) monitoring wells including; PFPit8MW-8A, PFPit8MW-8B, PFPit8MW-8C, PFPit8MW-8D, PFPit8MW-8E, PFPit8MW-8F, and PFPit8MW-8G which were installed in the Pit-8 floor were decommissioned in late 2022 to early 2023 due to the completion of sand extraction and backfilling operations.

The monthly water levels[4] continued to be undertaken at available monitoring wells at the Hitchcock Road site and pumping bore (PB-1, PB-3 [5]) at Lot 198 (Figures 1 & 5, appendix D).

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[2] *Sampling locations (16) include: PF214MW-1, PFL2HitchMW-1, PF167MW-1, PF166MW-1, Lot198PB-1 & PB-3, and new locations: PF166MW-2D, PF166MW-2s, PF167MW-3D, PF167MW-4D, PF167MW-4s, and PFPit8MW-6D, PFPit13MW-7D and PF-3. The two water storage dams include: CWD & Por167spring. The two creeks (Lot 198, Hitchcock Rd) were sampled by Melissa Mass on 29 September 2022, 19 December 2022, 14 March 2023 and 16 June 2023.*

[3] *Water sampling was completed at PF-3 on 16 August 2023, as no access was possible to PF-2 and PF-3 due to earthworks and boggy ground.*

[4] *Measurements conducted by Melissa Mass of South East Environmental Pty Ltd using an acoustic water level probe.*

## 2 GROUNDWATER AND SURFACE WATER MONITORING NETWORK

During May 2017, six (6) additional monitoring wells were installed to improve the site characterisation of the Hawkesbury Sandstone (i.e. PF166MW-2D, PF167MW-3D, PF167MW-4D, PF167MW-5D) and Maroota Sand aquifers (PF166MW-2s, PF167MW-4s). Refer to Figure 1B. The 6 monitoring wells were drilled by TerraTest Pty Ltd under E2W (Dino Parisotto) supervision to further assess groundwater levels and to guide the pit extraction depths (Tables 3A & 3B).

The existing wells (PF214MW-1, PFL2HitchMW-1, PF167MW-1, PF166MW-1) and new wells (PF166MW-2D/2s, PF167MW-3D, PF167MW-4D/4s, PF167MW-5D) were subsequently surveyed to enable reduction of groundwater levels to the Australian Height Datum (mAHD). The aerial survey provided an updated aerial photographic plan showing pit excavation works and site topographic contours in 2017 (Figure 2). The monitoring wells were surveyed by a registered surveyor (Mathew Freeburn Pty Ltd, May 2017). Refer to Table 2A.

During 2018, PFF acquired a new site (4378 Old Northern Rd, Maroota) which is adjacent to the Hitchcock Road sand extraction area (Figure 1B). Three existing monitoring wells identified as PF-1, PF-2, & PF-3 are situated on the new site. Melissa Mass from SEE has monitored the water levels on monthly basis since December 2018 (Graph HG-11).

During August/September 2020, an additional 8 monitoring wells (PFPit8MW-8A, PFPit8MW-8B, PFPit8MW-8C, PFPit8MW-8D, PFPit8MW-8E, PFPit8MW-6s, PFPit8MW-6D, & PFPit13MW-7D) were installed by Ultradrilling Pty Ltd and E2W at Pits 8 & 13 to assess groundwater levels and the flow regime (appendix D, Figure 1B, Graph HG-11B). The groundwater levels are monitored monthly by SEE to further assess the pit extraction depths.

At the Hitchcock Road site, groundwater was monitored at existing and new locations on 15 & 16 August 2023 by E2W (download of loggers, annual groundwater sampling, water level gauging and measuring field chemistry). Monthly gauging of groundwater levels and quarterly creek sampling was undertaken by Melissa Mass (SEE) during 2022-2023. The details of monitoring at the existing and new wells are presented in Tables; 2B, 3A, 3B, 3C, appendix D.

### *Groundwater Sampling of Existing Wells (August 2023)*

1. Monitoring bore PF167MW-1 is located at Portion 167 and sampled on 16 August 2023 by E2W (note: data logger was removed in 2018).
2. Monitoring bore PF166MW-1 is located at Portion 166 and sampled on 16 August 2023 by E2W.
3. Monitoring bore PFL2HitchMW-1 is located at Lot 2 and has data logger results available from September 2021 to August 2023. The well was sampled on 15 August 2023 by E2W.
4. Monitoring bore PFP214MW-1 is located at Portion 214 and has data logger results available for the past year. Sampled on 15 August 2023 by E2W. A new logger was reinstated in well (PFP214MW-1) during July 2021 to enable the ongoing monitoring of water levels after construction of the nearby bund walls and tailings (note: logger was shifted from CWD).

[5] *The pumping bores (PB-2 & PB-3) are no longer in use due to high iron. PB-1 & PB-3 were sampled in 2023.*

5. Production Bores PF198PB-1/PF198PB-2[6] and PF198PB-3 are located at Portion 198. Two production bores (PB-1, PB-3) were sampled on 17 August 2023 by PFF under E2W guidance (Figure 5).

The pumping records for 2022 to 2023 are available from the two water supply dams (clean water dams) located at Portion 167-CWD and Lot 198-CWD. No pumping occurred during 2022-2023 for the Lot 198 By-wash dam or the Portion167 dam[7] due to the high rainfall.

Significant changes to the landform occurred during 2018 to 2019 in the vicinity of PF167MW-5D and PFP214MW-1 which is now covered by a bund wall, raised ground and tailings ponds. A large clay bund wall and holding/tailing pond are located on the southern boundary and alongside the boundary monitoring well (PFP214MW-1).

The altered landforms (bund walls, dams) on the southern boundary are used for water storages and stormwater control. Water circulating in the new tailing dam are interpreted to artificially raise the local groundwater levels at PFP214MW-1. Seepages were not observed in the downslope area of well (PFP214MW-1) during E2W site inspection with PFF (Josh Graham) on 24 July 2021, 15 September 2022 or 15 August 2023.

### *Groundwater Sampling of New Wells (August 2023)*

6. Monitoring bore PF166MW-2D is located at Portion 166 and sampled on 15 August 2023 by E2W.
7. Monitoring bore PF166MW-2s is the nested shallow well adjacent to the deep well (PF166MW-2D) in Portion 166. The well was sampled on 15 August 2023 by E2W.
8. Monitoring bore PF167MW-3D is located at Portion 167 and has data logger results available. Sampled on 16 August 2023 by E2W.
9. Monitoring bore PF167MW-4D is located at Portion 167 and has data logger results available. Sampled on 16 August 2023 by E2W.
10. Monitoring bore PF167MW-4s is the nested shallow well adjacent to the deep well (PF167MW-4D[8]) and at Portion 167. Sampled on 16 August 2023 by E2W.
11. Monitoring bore PF167MW-5D was formerly located in Portion 167 and subsequently decommissioned in 2017 due to the construction of bund walls**.**
12. One of three wells (PF-3, not PF-1 or PF-2 as not accessible) located at the new site were sampled by E2W on 16 August 2023. Well construction logs are not available for the 3 wells.

- The two (2) new monitoring bores installed at Pits 8 & 13 were sampled on 15 & 16 August 2023 by E2W (i.e. PFPit13MW-7D, PFPit8MW-6D[9]). The shallow well outside of Pit-8 was dry and not sampled (PFPit8MW-6s). The Pit-8 floor area was flooded in 2021 and 2022 and subsequently backfilled due to completion of sand extraction works in late 2022 to early 2023. The wells (PFPit8MW-8A to -8G) have been

[6] *PF198PB-2 was not operational during 2019-2020 (clogging issues). A new bore (PB-3) was installed in October 2019 at Lot 198 wash plant to replace the blocked bore (PF198PB-2), however is currently capped off due to clogging issues (Note: no water samples from PB-2). The pump from PB-3 has been removed in early 2023 due to clogging and high iron in the water.*

[7] *The Por167dam is also refered to as the Por167Spring*

[8] *The data logger had fallen to bottom of well MW-4D as the holding cable snapped. The data logger measurements were corrected for the logger depth change.*

[9] *The two deep wells are elevated areas and located outside of the extraction area.*

decommissioned in late 2022 to early 2023 due to the backfilling of the Pit-8 quarry floor.

Collection of water levels and samples during 2022 to 2023 monitoring period and in previous months has been difficult at the site due to the heavy rains and muddy site conditions. The high rainfall in March 2022 (581 mm) and subsequent rainfall in late 2022/2023 has caused high dam levels and inaccessible access roads. Some data gaps exist in the past year of monitoring due to flooding and difficult site access.

The additional new wells (14) installed in 2017 (6) and 2021 (8) aimed to better characterise the groundwater flow regime in the central and northern portion of the site (i.e. PF166MW-2D & PF167MW-3D). The new wells at Pits-8 & 13 and PF-1,2,3 improved mapping of the groundwater flow pattern east of the Hitchcock Rd site (Figure 2). The groundwater flow regime at Pit-8 area is complex due to frequent flooding and geological divides causing variable recharge patterns.

The groundwater data and site topography indicate the presence of a groundwater divide near the highest part of the site which separates the flows to the north and south (RL ~240 m AHD at trig station, Figures 2 & 4).

Groundwater pumping and chemical analyses were also collected from the water supply bores in Portion 198 (i.e. PF198PB-1 & PB-3). The bores PB-2/PB-3 are both clogged due to high iron levels and no longer used (pumps removed). The replacement bore (PB-3) was installed in October 2019. The chemical treatment ceased at PB-2 in December 2016, however the bore is constantly clogged due to high iron levels in the water. The same issues occurred with the new bore (PB-3) which is capped off in 2022.

Groundwater monitoring has been carried out at the sites since 1996. Initially, water levels in bores PF166MW-1 and PF167MW-1 were measured manually at weekly intervals together with chemical field parameters such as pH and Electrical Conductivity (EC). The manual measurements continued until December 1998. In January 1999, the two bores were equipped with Dataflow Systems automatic data loggers (i.e. PF166MW-1; data logger was removed in 2017).

Data loggers have been downloaded quarterly between January 1999 and June 2000. Since June 2000, the dataloggers have been downloaded biannually. In January 2006, the old-style Dataflow dataloggers were replaced with Solinst Levelogger 3001 units, capable of storing 40,000 readings in the memory, with a battery life span of around 10 years. The Solinst dataloggers allow the data for annual downloading, a monitoring interval (once daily) started on July 2006. E2W downloaded the aged data loggers on 17 July 2017, however the data was only recorded from one (PF167MW-1) out of the four loggers (*note*. No data was not able to be downloaded from loggers at PFL2HitchMW-1, PFP214MW-1, PF166MW-1 in the 2016 to 2017 period).

Data logger information was retrieved from PF167MW-1 for the 2017 to 2018 period, including the two loggers (PFL2HitchMW-1, PFP214MW-1). The loggers from the two wells (PF166MW-1 in 2018, and PF167MW-1 in 2019) were not able to be programmed and subsequently decommissioned. In August 2021, the loggers from the two wells (PF214MW-1 and PFL2HitchMW-1) were not able to be downloaded and subsequently decommissioned.

Solinst level data loggers were reinstated in the two wells (PF214MW-1 @ July 2021, and PFL2HitchMW-1 @ September 2021) to continue the daily monitoring data.

Groundwater level measurements at all available wells is undertaken using an acoustic water level probe on a monthly basis (August 2017 to 2023) by Melissa Mass of South East Environmental Pty Ltd (SEE). The monthly water level measurements (& creek sampling) are conducted at new and existing wells by SEE, whilst training, assessment and the annual gauging and download of data loggers is conducted by E2W (Dino Parisotto).

Solinst data loggers (4) were installed at four locations (Por 167 dam, clean water dam, PF167MW-3D, PF167MW-4D) on 9 August 2017 to assist with the groundwater management and guiding of pit extraction depths. Three loggers (PF167MW-3D, PF167MW-4D, CWD) were downloaded on 15 & 16 August 2023 as part of this annual groundwater report. The data logger in the Por167spring was not able to be collected due to high water levels. The logger data from Por167dam would be retrieved once dam levels are lower.

PFF installed a Solinst Barologger at the site in 2021 to assist with the barometric correction of the logger data. The Barologger records 4 barometric readings per day to link with loggers in the dams (recording 4 readings per day) and bore logger data (1 reading per day).

Field chemistry (EC, PH, T, DO, Redox) was measured using a calibrated field meter hired from AES Pty Ltd (Geologic YSI professional series) at the groundwater monitoring wells (PF167MW-1, PF166MW-1, PFPFL2HitchMW-1, PFP214MW-1, PF167MW-4D/4s, PF167MW-2D/2s), and well (PF-3) at 4378 Old Northern Rd, and at Pits-8& 13 (PFPit13MW-7D, PFPit8MW-6D) on 15 & 16 August 2023 by E2W. The field chemistry (PH,EC) of the Lot 198 pumping bores (Lot198PB-1 & PB-3) were measured by the laboratory (ALS) on 17 August 2023.

Surface water sampling[10] was conducted at the 2 dams (CWD, Por167 Dam) on 16 August 2023 by E2W. All water samples were submitted for chemical analyses under Chain of Custody procedures to Australian Laboratory Services Pty Ltd (ALS, NATA accredited).

Samples were collected from a total of 14 bores and 2 dams;

- Existing/original Wells: PFL2HitchMW-1, PFP214MW-1, PF167MW-1, PF166MW-1, Lot198PB-1 & PB-3.
- New Wells (2017): PF167MW-3D, PF167MW-4D, PF167MW-4s, PF167MW-2D, PF167MW-2s.
- 4378 Old Northern Rd existing well; PF-3 (no access to PF-1, PF-2).
- New Wells (2020). PFPit13MW-7D, and PFPit8MW-6D (dry well: PFPit8MW-6s). The former seven (7) wells on the floor of Pit-8 have been decommissioned in late 2022/early 2023 due to completion of sand extraction and backfilling of the quarry (i.e. decommissioned wells: PFPit8MW-8A, PFPit8MW-8B, PFPit8MW-8C, PFPit8MW-8D, PFPit8MW-8E, PFPit8MW-8F, PFPit8MW-8G).
- Water storage dams (CWD & Por167 Spring).

[10] *Sampling of creeks at Hitchcock Road and Lot 198 is undertaken on quarterly basis by SEE (Sept 2022, December 2022, March 2023, and June 2023).*

*Water sample collected from the bore PF198PB-1 & PB-3 are from water supply bores (i.e. large diameter deep bores. PB-3 is longer used for water supply/pumping due to high iron levels/clogging).*

The laboratory reports are presented in Appendix B-1. The analytical results have been plotted on individual graphs that are updated annually to assess trends over time (Graphs 1 to 6, and Appendix C).
The analytical list for all bores, which was discussed and agreed upon with the DLWC (now DPIE Water) has included:

- pH, Electrical Conductivity and Total Dissolved Solids;
- Calcium, Magnesium, Sodium and Potassium;
- Chloride, Sulphate, Bicarbonate; and
- Oil & Grease.

## 2.1 Surface Water Monitoring

The updated Water Management Plan for the site outlines the surface water monitoring requirements. The surface water monitoring program was undertaken in compliance with Condition 19 of Schedule 3 of the Project Approval. Surface water quality monitoring was monitored on a quarterly basis when the creek sample locations were flowing (& accessible).

Surface water samples were taken from a creek below the Hitchcock Rd site (Figure 1) and from a creek below Lot 198 DP752025 (Figure 5). Refer to Appendix B-2 (field/laboratory reports), and Table 3-13 (tabulated laboratory results).

*Condition 19.*

The Surface Water Monitoring Program shall include:

(a) detailed baseline data on surface water flows and quality in downstream water courses that could be affected by the project;
(b) surface water quality and stream health assessment criteria, including trigger levels for investigating any potentially adverse surface water impacts; and
(c) a program to monitor:
• surface water flows, quality, and impacts on water users;
• stream health; and
• channel stability.

Monitoring of channel stability will be based on visual inspections undertaken at the same time. The assessment will include analysis applying to the following trigger levels:

| | |
|---|---|
| • pH; | +/-1 unit from background |
| • Electrical conductivity (EC); | <1,500 uS/cm |
| • Total suspended solids (TSS); | <50 mg/L |
| • Oil and grease. | <10 mg/L |

*Note: Exceedance of trigger levels would trigger an investigation into the cause will be undertaken immediately so action can be taken to return levels to within average range. No additional investigations or follow up on storm and/or erosion issues were conducted after the monitoring undertaken on 4 dates (September 2022, December*

*2022, March 2023, June 2023) due to the satisfactory water testing results and site observations. Refer to Tables 3-9A, 3-9B, and Appendix B-2.*

Samples were taken and analysed following heavy rain events and any incidents on Lot 198 DP752025 which could have an impact on water quality. Sample location is presented in Figure 5, with the field and laboratory reports presented in Appendix B-2.

Surface water monitoring was undertaken by Melissa Mass (SEE) at two locations on the Hitchcock Road site (i.e. Lot 198 creek, and Little Catai Creek on Hitchcock Rd site). Creek water samples were obtained and analysed on a quarterly basis; 29 September 2022, 19 December 2022, 14 March 2023 and 16 June 2023 (Appendix B-2).

## 2.2 Monitoring Bore PF167MW1

Groundwater monitoring at bore PF167MW-1 commenced in March 1996. The data between March 1996 and December 1998 (manual collection) have been plotted in the graph of Figure 2, together with EC and rainfall records collected by PFF (Appendix C). An automated weather station has been installed by PFF in 2010 and in early 2017 (including barometric pressure).

The Figure HG-2 (2013-2018, and after 2019 is not available due to a faulty-aged logger) presents the combined Solinst datalogger records for bore PF167MW-1 (previous records are in Appendix C). The recent and monthly water level gauging data and graphs is presented in Table 2A, Figure HG-8, and Appendix D.

Previous minor data gaps exist and a slight difference between the manual data and the start of the automatic recording is evident in the previous data, which are due to the time intervening between the end of the manual and start of the automatic recording methods (Appendix C, URS, 2013).

## 2.3 Monitoring Bore PF166MW1

Groundwater monitoring at bore PF166MW-1 (Figure HG-3 shows 2013 to 2016 monitoring data) commenced in March 1998 in the same manner as for bore PF167MW-1. The data between March 1998 and December 1998 (manual collection) have been plotted in the graph of Figure 4 in Appendix C, together with EC and rainfall records collected by PFF.

Refer to Table 2A for water level gauging results. Logger data is not available for 2016-2017 (logger now decommissioned due to age >10 yrs). The monthly water level gauging graph is presented in Figure HG-8A/8B (2017 to 2021), and Appendix D (Table F-1). The well was previously dry (2019) due to drought but sampled during high rainfall years (2020 to 2023).

## 2.4 Monitoring Bore PFP214MW1

Bore PFP214MW-1 was installed in March 2009 as part of an extended groundwater monitoring network following the Development Approval for Portion 214, located at the southern boundary of the Hitchcock Road site.

A datalogger was installed in the bore in early April 2009 (Solinst Levelogger Gold 3001, serial no. 51040540). Refer to Table 2A for the recent water level gauging results.

Bore PFP214MW-1 hydrograph is presented in Figure HG-4 (showing data collection from 2013 to 2020, and 2021 to 2023). Logger data is not available for 2016-2017, and for 2020-2021 due to technical issues with the aged logger. The replacement Solinst Level logger (SN. 2071864) was installed in the bore during July 2021. The monthly water level gauging graph is presented in Figure HG-4 and Appendix D (Table F-1).

The monthly water level gauging graph is presented in Figure HG-8A & HG-8B (2017 to 2023) and in Appendix D.

## 2.5 Monitoring Bore PFL2HitchMW1

Bore PFL2HitchMW-1 was also installed in March 2009. This bore is located midway along the eastern boundary of the Hitchcock Site and monitors the full sequence of the Maroota Sand. A datalogger was installed in the bore in early April 2009 (Solinst Levelogger Gold 3001, SN. 510405840). Refer to Table 2A for water level gauging results. A new level logger (Solinst serial no. 2139431) was installed in the well on 23 September 2021 and downloaded in September 2022.

The bore PFL2HitchMW-1 hydrograph is presented in Figures HG-5, HG-8A/8B (2017 to 2021, and 2021 to 2023) and in Appendix D (Table F-1).

## 2.6 New Monitoring Bores (2017-2021)

A summary of the existing and new bores is presented in Tables 3A, 3B and 3C.

Seven new monitoring wells (PF167MW-3D, PF167MW-4D, PF167MW-4s, PF167MW-2D, PF167MW-2s, PF167MW-5D[11]) were installed at the site in 2017 to assist with the hydrogeological assessment of the Hawkesbury Sandstone and Maroota Sands aquifers.

Data loggers were installed in August 2017 at two deep wells (PF167MW-4D, PF167MW-3D, refer to Figures HG-6 and HG-7) to assist with the pit extraction depths. Results for the new wells are in presented in Table 3-9A, Figure HG-8A/8B, and Appendix D (Table F-1).

The four existing wells (PFL2HitchMW-1, PFP214MW-1, PF167MW-1, PF166MW-1) were sampled on 16 August 2023 to assist with the groundwater study at the site. The new wells (2 out 5) at Pits-8 & 13 (PFPit13MW-7D, PFPit8MW-6D), and one bore (PF-3) on the adjacent property were included with the monitoring program (i.e. monthly monitoring and annual sampling in August 2023).

Access was not possible to PF-2 and PF-1 on the neighbouring property in August 2023, and all monitoring wells at Pit-8 (quarry floor) were flooded during mid to late 2022 due to heavy rain (wells are underwater; PFPit8MW-8A to 8G) and subsequently decommissioned in late 2022 and early 2023 due to backfilling operations.

## 2.7 Portion 167 Spring

At the early stages of the site development, an excavation (PF167 Spring[12]) was carried out to the top of the Hawkesbury Sandstone to an approximate level of 178m AHD. The excavation

[11] *PF167MW-5D was decommissioned in early 2018 during the construction of the tailings dam.*
[12] *The Portion 167 Spring is also referred to as the Portion 167 Dam.*

collects groundwater and surface water run-off and was eventually licensed by the DLWC (No.10BL157308) as part of the water supply of the operation. Water levels measured against surveyed pegs have been collected at the dam since September 1996 and pumpage records kept since January 1997.

Water quality in the dam is generally not monitored because the dam collects incident rainfall, run-off and groundwater and, as a result, water quality would vary according to the proportion of each component at the time of measurement.

Due to high rainfall in 2014-2015 (1321.5 mm) no monitoring or pumping was required from the Portion 167 Dam. Pumping was undertaken by PFF from Portion 167 Spring during the 2019 to 2020 monitoring period (Total of 28.448 ML) due to the prevailing drought.

Pumping was undertaken by PFF from Portion 167 Spring during 2020 to 2021 (42.865 ML) and for the 2021 to 2022 (2.256 ML) monitoring period and summarised in Table 3-7 (2021-2022). Pumpage occurred during the rainfall periods (1633.5 mm during 2021-2022, and 1264.4 mm for 2020-2021) but also to meet the requirements for sand extraction and processing.

No pumping was undertaken by PFF from Portion 167 Spring during 2022 to 2023. The water level of Por167Spring on 10 August 2023 was approximately 186 mAHD.

Water level monitoring is not required in the license conditions, however a data logger was installed in August 2017 to assist with the site water balance and assessment. (*Note: the logger could not be downloaded due to high dam levels in July-September 2021, July-September 2022, and August 2023. The two dams CWD and P167 spring had merged during the heavy rainfall in 2022)*. The approximate level of the Por167Spring on 10 August 2023 was 186 mAHD (i.e. based on comparison to a nearby survey marker).

The previous data logger readings are provided as raw data in Figure HG-10 (*note: logger data requires adjustment with barometric pressure, evaporation and pumping influences. To be provided in separate documentation*).

Water samples and field chemistry were collected on 16 August 2023 for the annual water sampling and assessment (Figure HG-10, Table 3-9B).

## 2.8 Clean Water Dam (Portion 167)

Water quality in the dam is not previously monitored because the dam collects incident rainfall, run-off and recycled water from the wash plant and tailings.

Water level monitoring is not required in the license condition, however a data logger was installed in August 2017 to assist with the site water balance. Water samples and field chemistry were collected on 16 August 2023 as part of the annual water sampling by E2W (Figure HG-9 and Table 3-9B). The data logger was downloaded on 16 August 2023 (*note: logger was not downloaded in 2022 due to high rainfall and dam levels*). The logger data is presented in Figure HG-9 (*note: the raw logger data at CWD requires adjustment with barometric pressure- provided in separate documentation*).

## 2.9 Portion 198 Water Supply Bores

The two water supply bores in Portion 198 (PF198PB-1 and PF198PB-2) have been monitored manually since their installation in March 1998. Groundwater samples have been collected quarterly for the last four quarters to March 2000, biannually up to July 2006 and annually since then. Pumpage records are collected and totalised weekly.

The pump in bore PF198PB1 was out of service for most of 2012-2013, and PF198PB-2 was replaced in 2019 by PF198PB-3.

Water quality data have been plotted for selected parameters and the graphs (5 & 6) and the laboratory reports in Appendix B-1. Monthly water levels were measured during the 2017 to 2023 period by South East Environmental (Melissa Mass, Figure HG-1).

The water supply bore (PF198PB-1) was operational during 2022 to 2023 (Table 3-8[13]). Groundwater sampling was conducted in August 2023 from the PF198PB-1 discharge outlet, together with manual (bailer) sampling at PF198PB-3 (note: pumps are removed from PF198PB-2/PB-3 due to clogging issues). A water sample was collected from PF198PB-1 and PF198PB-3 for the chemical assessment by ALS (Tables 3-5 & 3-6).

*Note: Chemical treatment for clogging (Fe-floc) at PF198PB-2 ceased in December 2016, however the bore has been clogged/not sampled for the past few years and replaced by PB-3 in 2019. The clogging issues has occurred at new bore (PB-3), and therefore decommissioned.*

# 3 GROUNDWATER DATA ASSESSMENT

The groundwater assessment for the site has been conducted by E2W in collaboration with PFF (Josh Graham) and Melissa Mass (South East Environmental Pty Ltd, SEE). The analytical reports by ALS Environmental Pty Ltd (NATA laboratory) are presented in Appendix B-1, whilst the monthly water level measurements by SEE are included in Appendix D.

Additional monitoring locations are included in the 2020 to 2023 (where access was possible) operating period due to the installation of eight new wells (Pits 8 & 13 in Aug/Sept 2020), six new wells (May 2017), inclusion of 3 wells (PF-1,2,3) on the adjacent property (Figure HG-11), assessment of the clean water dam (CWD) and Por 167 dam (Figures; 1, 1A, 1B). The additional testing locations relate to the revised water management plans (January 2018, November 2020, April 2022).

The quarterly surface water testing (September 2022, December 2022, March 2023, June 2023) has been included at two locations (Lot 198, and Little Catai Creek) in the annual water monitoring program (Figures 1 & 5, Table 3-13, and Appendix B-2). No exceedances of the guidelines are reported for the 2022 to 2023 monitoring period.

This annual groundwater report contains the available monitoring data and updates the analytical data from water monitoring (incl field chemistry) collected annually. The Water Management Plan (WMP) for the site outlines the sample locations, parameters and guidelines in which test results are assessed, together with the associated trigger limits.

[13] *PFL198PB-1 pumpage for 1 July 2022 to 30 June 2023= 17.688 ML/yr, whilst a total of 26.684 ML for the 2022 calendar year (January to December).*

## 3.1 New Monitoring Wells

During May 2017, six additional monitoring wells were installed to improve site coverage and better assess water levels in the Hawkesbury Sandstone (PF166MW-2D, PF167MW-3D, PF167MW-4D, PF167MW-5D) and Maroota Sand Aquifers (PF166MW-2s, PF167MW-4s Figures 1 & 2, Tables; 2, 3A & 3B). The 6 monitoring wells were drilled by TerraTest Pty Ltd under E2W (Dino Parisotto) supervision and testing (Table 3B).

The eight (7) additional wells (PFPit8MW-8A to 8G) installed in the floor of Pit 8 in 2020/2021 to guide the pit extraction depths were decommissioned in late 2022 to early 2023 due to the quarry backfill operations. The inferred hydrogeological cross sections for the site are presented in Figures 3 & 4. The new monitoring wells and recent survey (aerial and well RL details) were used to better assess the pit extraction depths and the 2 m buffer zone.

E2W note that the previous URS water contour maps (2013) were based on a limited well network comprising three monitoring wells over the 100 ha site. The additional new wells (14) installed at the site in 2017 and 2020 provide a better depiction of the groundwater flow regime, particularly in the north (e.g. PF166MW-2D). The additional three wells (PF-1,2,3) available on the adjacent new property (4378 Old Northern Rd) also improve the characterisation of the flow regime on the eastern site boundary (Appendix D & Table F-3, Figure 1B).

The groundwater data and site topography indicate the presence of a groundwater divide at the highest point of the site (RL ~240 mAHD at former trig station located near PF166MW-3D and PFL2HitchMW-1). Refer to Figures 1 to 4.

A decline in groundwater levels was evident across the site in 2019-2020 due to the drought (i.e. rainfall =559 mm during 2019-2020), however water levels did rise during 2021/2022 due to the above average annual rainfall (2021-2022= 1,633.5 mm, 2020-2021= 1,264.4 mm). Water levels have declined slightly since late 2022 to 2023 due to less rainfall (2022-2023= 1246.2 mm). Refer to graphs HG-8A & 8B.

## 3.2 Groundwater Levels

Groundwater levels in the Hawkesbury Sandstone and Maroota Sand aquifers indicate the presence of perched and regional water tables (Tables; 2A, 3A & 3B).

The plots of bore PF167MW-1, which taps the full saturated thickness of the Maroota Sand, and bore PF166MW-1, which taps an unconfined aquifer (Maroota Sand) perched at a higher elevation, indicate a general rapid response to periods of sustained rainfall (Appendix C). Records for the two monitoring bores (PF214MW-1 and PFL2HitchMW-1) indicate a subdued and moderate response to rainfall. The water levels at bore (PF214MW-1) are influenced and mounded by the artificial recharge linked to recent dam and tailings constructions (2019).

The yearly rainfall for the year 2010 (1015.1mm), for the year 2011 (1115.4 mm) and for the year 2012 (984 mm) are above the long term average of 910.3 mm (to June 2013). Rainfall for the year July 2013-June 2014 has been just 595.5 mm, indicating that the rainfall for year is below the yearly long term average (*Note: These rainfall data are reported from the BOM weather station No. 67014 located on Old Telegraph Road*).

Rainfall for July 2014 to June 2015 was 1321.5 mm and above the annual average. The above average rainfall for 2014-2015 and high monthly rainfall during April 2015 (422 mm) has stabilised water levels associated with the previous year of low rainfall and subsequently caused a rising of the water table in all bores. Rainfall for July 2015 to June 2016 was 1176 mm and above the annual average.

The average rainfall for July 2016 to June 2017 was 957.4 mm, with a substantial 276.8 mm occurring in the month of March 2017. The groundwater table rose approximately 1m in the sandstone aquifer (PF167MW-1) following March 2017.

The rainfall for July 2017 to June 2018 was 473 mm, July 2018 to June 2019 was 557.4 mm, and 559 mm for the July 2019 to June 2020 reporting period. The rainfall in 2018/2019 were below the annual average and indicate drought conditions. All deep wells and shallow wells show a general decline and/or stabilisation of groundwater levels reflecting the prevailing low rainfall.

The rainfall for July 2020 to June 2021 was 1264.4 mm, and 1633.5 mm from July 2021 to June 2022. The rainfall during 2020 to 2022 indicate a return to above average rainfall conditions (& site flooding) after several years of drought. Groundwater levels in shallow wells responded well to heavy rainfall during February 2020 (243 mm) and March 2021 (229.8mm), whilst only subtle changes in the deep wells. Intense rainfall occurred during February 2022 (250.6 mm) and March 2022 (581.2mm) causing obvious water level rises in both shallow and deep aquifers at the site.

The rainfall during 2022 to 2023 of 1246.2 mm, although was lower than the previous year is still substantially above the annual average. Groundwater levels have declined with the lower rainfall during 2023, especially from March to August 2023.

### 3.3 Bore PF167MW1

After a significant rain event in June 2007, the water level rose by 4.5 m and similar to highest recorded value in mid-2000 (Figure HG-2, Appendix C).

Since June 2011 to 2014, after a period of variable and a slow decline, the water level in this bore has been rising steadily following the above average rainfall up to 2013 (2014 is below annual average). The level from rainfall in 2014 to 2015 is similar in the year 2000. Water levels were stable in 2014 and then rose sharply (approximately 1.5 m, 183.8 m AHD) after the high recharge event of April 2015 (rainfall 422 mm, Figure HG-2).

Following the April 2015 rainfall event other recharges occurred in early and middle of 2016 causing groundwater levels to rise between 183 and 184 m AHD (June 2016 ~ 183.4 m AHD).

Water levels were approximately 183.5 AHD during July 2017 and ranged from ~182.5 to 184 m AHD during 2016 to 2017. Spikes in water levels relate to storm events, such as the high rainfall in March 2017 (Figure HG-2). The groundwater table rose approximately 1 m in the sandstone aquifer (PF167MW-1) following the March 2017 rainfall.
The water levels manually measured from August 2016 to August 2018 ranged from 183.12 m AHD to 181.1 m AHD (August 2018), and with a gradual lowering (approximately 1m) to August 2019 (180.24 m AHD). The water levels during 2020 to 2021 rose due to the higher

rainfall and ranged from 181.95 mAHD (August 2020) to approximately 183.96 m AHD (May 2021).

Water levels responded substantially to the high rainfall in February and March 2022 (250.6 mm, 581.2 mm) causing levels to rise substantially (~2.3m) to July 2022 (185.85 mAHD). The October 2022 groundwater levels of 185.55 mAHD are the highest since 2013. The groundwater levels decline by 1.7m from late 2022 to August 2023 (183.85 mAHD) due to the decreased rainfall recharge.

Refer to Table 2A, Appendix D (Table F-1) and Figures HG-8A/8B and Figure HG-2.

### 3.4 Bore PF166MW1

Since March 2011, the water level in this bore has been rising steadily, although it shows a slight fall during a low rainfall period in the second half of 2012, followed by a rise due to the high rainfall at the beginning of 2013. Bore PF166MW-1 taps a perched aquifer with variable responses to major and sustained rainfall events and periods (Figure 3 in Appendix C).

The water level declines during 2014 and then rises steadily in 2015 due to the above average rainfall and high April 2015 rainfall (422 mm, Figure 3). Following the April 2015 rainfall event other recharge events occurred in early 2016 causing groundwater levels to rise and peak at approximately 200.8 m AHD in April 2016 (Figure HG-3).

The water levels manually measured from August 2016 to August 2018 ranged from 199.55 m AHD to below 199 m AHD in May 2018 (Figure HG-8A/8B). The well has been dry from 2018 to August 2020 (BOH=11.8 m bgl). The groundwater rose quickly (1m) following heavy rains in May 2020 and was measured at 199.20 mAHD on 24 July 2020 (Figure HG-8A).

During 2020 to 2021, water levels rose gradually due to the higher rainfall, and ranged from 199.33 mAHD (August 2020) to approximately 199.85 m AHD (August 2021). The water levels continued to rise (1.69 m) during late 2021 through to September 2022 (201.54 mAHD). Water levels decrease by approximately 1.15m from late 2022 through to August 2023 (200.41 mAHD) due to less rainfall, especially from March to August.

The water levels in the Maroota Sand are generally perched above the sandstone aquifer and have recently risen due to the high annual rainfall in 2020-2021 (1264.4 mm) and particularly from 2021 to 2022 (1,633.5 mm).

### 3.5 Bore PFP214MW1

Bore PFP214MW-1 taps the full thickness of the Maroota Sand at the southern edge of the quarry area. Since its installation in March 2009, the water level has shown a slow declining trend up to end of February 2011. Since that time, the water level has risen in response to the above average rainfall (Figure 4 in Appendix C).

Water levels fluctuated slightly (<1m) during 2014 (181.6 m to 180.3 AHD) and then rises slightly and stabilises (180.3 to 181.2 m AHD) with minor fluctuations during 2015 and 2016. Water levels also showed minor fluctuation during 2017 to 2018 with an overall decline. Water levels ranged from approximately 180.2 to 179.5 m AHD (August 2018, Figure HG-4).

The water levels manually measured from August 2016 to August 2018, ranged from 179.41 m AHD to 179.54 mA HD (August 2018). The water levels continued to fluctuate during 2018 to 2019 (178.06 to 179.69 m AHD), reflecting nearby water storages, and bund wall constructions. The groundwater has risen by almost 2 m since early 2019 to July 2020 due to the nearby new water storages/tailing dam (Figure HG-8A/8B). The groundwater level was manually measured at 180.41m AHD on 24 July 2020 which corresponds to the logger levels (Figure HG-4).

During 2020 to 2021, water levels continued to rise gradually to approximately April 2021 and then stabilised with slight decline. The groundwater levels ranged from 179.72 mAHD (August 2020) to approximately 181.19 m AHD (May 2021).

The groundwater levels have remained relatedly stable during late 2021 to middle of 2022 (22-3-2022 @ 181.26 mAHD, and 181.25 @ 15-9-22). The groundwater levels decline by approximately 0.7 m from late 2022 to August 2023 (180.53 mAHD) due to the lower rainfall. Access to the well (PFP214MW-1) was not possible from April 2022 to November 2022 due to muddy conditions.

Refer to Table 2A and Figure HG-8A/8B which presents the water levels trends over time (2013 to 2023).

*Note: PFF conducted a survey of new and existing wells (Freeburn Surveying Pty Ltd) in May 2017 as part of updating the well network. An adjustment (1.16m elevation) of the well casing RL at PF214MW-1.*

### 3.6 Bore PFL2HitchMW1

Bore PFL2HitchMW-1 is the deepest bore in the Hitchcock Road site, as it in the vicinity of the former trigonometric station, which is the highest elevation on the site and taps the full thickness of the Maroota Sand aquifer.

The hydrograph shows that after an initial settlement period after drilling, the water level stabilised at an RL level of 189.6 m AHD without any significant response to the rainfall events until September 2012, after which time it shows a steady rise in response to the above average rainfall (Figure HG-5, Appendix C).

Since 2013, the water level shows a slight consistent decline to approximately December 2014, followed by a stable to gently rising water table after April 2015 to middle of 2016 where it stabilises at approximately 189.95 m AHD (Figure HG-5). The water levels decline gently from August 2017 to August 2018, ranging from approximately 189.7 to 189.4 m AHD, respectively. The water levels from August 2018 to July 2019 show a relatively stable and decreasing water level (189.85 to 189.5 m AHD) reflecting the below average rainfall.

The water levels manually measured from August 2016 to August 2018 ranged from 189.6 m AHD to 189.85 m AHD (Figure HG-8A/8B). The water levels from September 2018 to July 2020 show a relatively stable depth between 189 to 190 m AHD[14].

[14] *The steel monument and PVC pipe at well (PFL2HitchMW-1) was damaged during September 2018. The water levels and reference point were subsequently adjusted for the gatic cover (ground level).*

The groundwater level was manually measured on 24 July 2020 (189.28 m AHD) and 22 July 2021 (189.63 mAHD) showing a stable and gentle rise from the higher rainfall of 2020-2021. The groundwater level continues to rise from late 2021 to July 2022 and September 2022 (192.05 mAHD) due to high rainfall. The groundwater level after September 2022 declines steadily through to August 2023 (190.79m AHD). The heavy rainfall events during 2022 (July 407.8mm) followed by dry weather in middle of 2023 caused the rapid recharge and the rise of water levels and subsequent decline. Refer to Figures HG-5, and HG-8B.

## 3.7 Portion 167 Spring

Records of pump operation have been kept from Portion 167 Spring since January 1997. The Figure 7 (in Appendix C) shows the monthly summary of the pumpage from the dam. Due to the above average rainfall over previous years (2011-2013 and 2014-2015) no pumping has been necessary from this source, however below average rainfall has occurred in early 2014, and 2017-2018, with some pumping necessary. No pumping occurred from July 2014 to June 2015.

Pumpage occurred (46.829 ML) from Portion 167 Spring during 2015 to 2016. Pumpage occurred (38.407 ML) from Portion 167 Spring during 2016 to 2017, and 48.953 ML for 2017 to 2018. Pumpage (26.009 ML) occurred from Portion 167 Spring during 2018 to 2019, and from 2019 to 2020 (28.448 ML).

The new licensed limit for the Portion 167 spring is 44 ML/year which was not exceeded for any year. The annual pumpages are as follows; 2019 to 2020 period (28.448 ML), 2020 to 2021 (42.865 ML) and the current year 2021-2022 (2.256 ML).

The pumping records from 1997 to 2022 are provided in Table 3-7. No pumping occurred for the Por167 Spring from July 2022 to June 2022, and from July 2022 to June 2023. Pumping has not occurred at Por167 Spring since November 2021 due to the high rainfall.

The rainfall recorded at the BOM station since 2010 has been above the long-term annual average of 910.3 mm. No water levels have been recorded at this site during the 2011 - 2013, 2014 - 2015 years, as the dam and the pump have been under water for most of the recording period due to the above average rainfall and resulting run-off experienced in the Maroota area during the 2011-2013 and, in particular, during the period May-June 2013 when the water level peaked briefly at 189 m AHD, returning to 180 m AHD at the end of June 2013.

The water level in the dam reduced by approximately 2 m (184.5 m to 182.5 mAHD) during the years (2017-2018) due to the low rainfall and high pumpage (48.953 ML/yr). During 2018 to 2019 levels were at low levels (30 July 2019 @ 183.63 mAHD) due to the drought conditions.

Dam water levels have been rising from 2020 to late 2022 due to the above average rainfall. The water level was measured at 184.54 mAHD on 22 July 2021. The water levels in the dam during 2021-2022 are potentially the highest and estimated between 186 and 187 mAHD (September 2022), which caused a merge with the CWD. Refer to Figure HG-10. PFF (Josh Graham) estimated the spring water level on 10 August 2023 at 186 mAHD.

The water levels in the dam are also affected by significant evaporation losses during summer and combined contributions from rainfall and groundwater recharge (Figure HG-10). The dam

is hydraulically connected to the Maroota Sands aquifer and aquifer recharge patterns being closely linked to climate.

The quarry area is internally draining and, therefore, the dam collects all incident rainfall on the site. Although the dam levels are variable and affected by pumpage (i.e. dust suppression and irrigation of rehabilitated areas and, more recently, for sand slurry), records show that water levels return rapidly to the average values, especially after rainfall and ceased pumping.

The data logger was installed in the dam during a period of high levels in August 2017 (Figure HG-10). Due to the low rainfall and declining water levels, the logger was shifted to a deeper part of the dam by 2.295m on 12 April 2018. The logger data indicates a lowered water table due to the drought conditions up to 2020. The higher rainfall period (2020-2022) and heavy rainfall in February 2021 (243 mm), March 2022 (581 mm) and July 2022 (407mm) caused dam levels to rise (> 2 m) and cover the data logger/peg (i.e. not downloaded as submerged). The water level in Por167 Spring was measured at 184. 42 mAHD on 22 July 2021 by PFF using nearby surveyed benchmarks. Accurate survey (2022 and 2023) of the water levels in Por167spring has not been conducted due to heavy rains and muddy site conditions.

Previous records suggest that the Maroota Sand aquifer at the site can sustain the required pumpage even under the lower rainfall recharge conditions.

### 3.8 Clean Water Dam (CWD in Portion 167)

Water quality in the dam (1 Ha ~1.5m maximum depth) was not previously monitored because the dam collects incident rainfall, run-off and recycled water from the wash plant and tailings. The data logger was installed in the dam during a period of high levels in August 2017 (187.635 mAHD). The water levels have decreased by approximately 1m from 2017 to 2018 (186.5 mAHD) due to a lack of rainfall, summer evaporation losses and through operational activities. The water levels fluctuated by approximately 1 m from 2018 to 2019.

The water level on 22 July 2020 of 186.90 m AHD was slightly higher than the 30 July 2019 level (186.77 m AHD). Pumping records are provided in Table 3-12 whilst the logger results are presented in Figure HG-9. The water level was 0.315 m higher on 14 July 2021 (187.215 mAHD) relative to CWD level on 22 July 2020.

The collection of the data logger and survey was not possible from the CWD in September 2022 due to high dam levels and flooding at the site. The logger at CWD was downloaded on 16 August 2023 and presented in Figure HG-9 (raw logger data). The CWD has fluctuating water levels due to the frequent inputs (tailings, return water) and outputs (pumping for processing plant) from the dam.

Water level monitoring is not required in the new licence conditions, however a data logger was installed in August 2017 to assist with the site water balance. Water samples and field chemistry were collected on 16 August 2023 by E2W to assist with assessing and managing the surface water quality (Table 3-9B).

## 3.9 Water Supply Bores (PB1, PB2/PB3 at Lot 198)

Pumping records for the water supply bores (PB-1/PB-2 and PB-3[15]) in Lot 198 for the year July 2021 to June 2022 had combined usage of 20.201 ML. The Pumping records for the water supply bore (PB-1) is tabulated in Table 3-8 (i.e. usage of 17.688 ML from July 2022 to June 2023, or 26.684 ML for calendar year; January to December 2022). Groundwater usage is still significantly below the combined new annual allocation of 56 ML.

In previous years, during 2014-2015 pumpage was 21.8 ML, whilst during 2013-2014 the total pumpage was 33.6 ML. During 2015 to 2016 and given the above average rainfall the available pumping records (PB-1 & PB-2) indicate a usage of 16.841 ML. Pumpage from 2016 to 2017 from PB-1/PB-2 indicate a combined usage of 16.507 ML. The pumpage during 2017 to 2018 (13.622 ML), and from 2018 to 2019 at PB-1 (9.947 ML) are well below the 60 ML allocation.

The replacement bore (PB-3) was installed and commissioned in October 2019 due to the ongoing clogging/high iron levels of PB-2 (i.e. PB-2 is no longer used and replaced by PB-3, which was also decommissioned in 2022 due to clogging). Refer to Table 3-8 & Figure HG-1.

## 3.10 Water Quality

The water quality obtained from all available monitoring wells and dams are presented in the hydrochemical diagrams (i.e. Piper trilinear & expanded Durov in Appendix E) and time series graphs (Graphs 1 to 6).

Water quality in bores PF167MW-1 and PF166MW-1 has been monitored for pH and EC since monitoring started. Since June 1999, groundwater quality has been analysed for a range of analytical parameters and for Oil & Grease to obtain background data.

Since July 2009, groundwater quality data have also become available from the newly installed monitoring bores, PFP214MW-1 and PFL2HitchMW-1. Historical and recent analytical results for the other samples from the monitoring sites are summarised in Tables 3-1 to 3-6 and have been plotted in the graphs (1 to 6). The laboratory reports are presented in Appendix B-1.

The graphs (1 & 2) show EC time series trends with water levels and rainfall for the initial monitoring period (March 1996 to January 1999 for bore PF167MW-1 and March 1998 to January 1999 for bore PF166MW-1), before the installation of the dataloggers. Refer to Appendix C for previous graphs presented in URS 2013. The EC graphs show a sympathetic variation with rainfall, indicating the effects of dilution generated by recharge (decrease in EC) and by a lower water table. In the latter case, the improved EC is interpreted as the effect of aquifer recharge by fresher water.

The graphs (1 to 6) confirm the dependence of the aquifer upon rainfall to maintain storage and supply. Analysis was not previously carried out of the water from the Portion 167 Dam because of extraneous influences, such as direct rainfall and run-off, make the water in the dam not representative of the groundwater at that site.

Groundwater quality has also been monitored at bores PF198PB-1 (Graph-5) and PF198PB-2/PB-3 (Graph-6; previous data), the processing plant water supply bores[16]. The water in these

[15] *PB-2 and PB-3 have been decomissioned due to high iron in the groundwater*

[16] *PB-2 was replaced by PB-3 (since October 2019, refer to Table 3A).The two bores (PB-2/PB-3) are no longer in use due to Fe/clogging issues.*

bores is derived from the Hawkesbury Sandstone aquifer. Water quality records are summarised in Tables 3-5 and 3-6 and have been graphed (Refer to Graphs 1 to 6, and previously by URS (2013) in Appendix C). The groundwater levels in the production bores (PF198PB-1 & PB-2/PB-3) are presented in Table 3-8.

The waters in the Maroota Sand aquifer monitoring bores are similar and have a characteristic rain composition, with low pH (acidic), low TDS and a Sodium-Chloride water type. The samples were also analysed for Oil&Grease to monitor the possible effect of the sand extraction operations. Concentrations of Oil & Grease were not detected in all bores for the August 2023, 2022, 2021, 2019, 2018, and previous four monitoring events (2017, 2016, 2015, 2014). Some anomalous Oil&Grease results were reported from water samples from two locations (CWD and P166MW-1) on 5 August 2020, however were "not detected" with re-sampling on 19 August 2020 by E2W. The initial anomalous Oil & Grease results are interpreted to result from potential cross contamination, such as skin contact.

The deep Hawkesbury Sandstone pumping bores groundwater display a slightly different character from that in the shallow Maroota Sand aquifer in the Hitchcock Road area and from the shallow Hawkesbury Sandstone aquifer in other areas of Maroota. The deeper groundwater has a slightly higher TDS, pH and Bicarbonate content than the shallower Maroota Sand groundwater; however, its overall low salinity content and sodium-chloride rain composition indicate a dynamic groundwater regime with regular and rapid rainfall recharge.

An increasing EC/TDS trend was evident in two bores (PFL2HitchMW-1, PF214MW-1) from 2013 to 2017, and inferred to relate to variable aquifer characteristics and rainfall recharge patterns. The EC/TDS trends at the two bores (PFL2HitchMW-1, PF214MW-1) stabilised over several years (2017-2022), however show a slight increase in August 2023. The TDS/EC trend at both bores (PFL2HitchMW-1, PF214MW-1) is variable to increasing, and likely to relate to the seasonal variations ranging from drought to floods. Ongoing monitoring is required to further assess the EC/TDS (including Na-Cl) trends at the two bore locations.

The boundary bore (PF214MW-1) had a rising water table up to middle of 2021 due to the nearby water storages/tailings dams. The monitoring at PF214MW-1 indicated some mounding of the water table from nearby water storages. Seepages were not observed by E2W at the base of the bund walls next to PF214MW-1 on 15 September 2022 or 16 August 2023.

The water quality of the deep new bores (PF166MW-2D, PF167MW-3D, PF167MW-4D) within the Hawkesbury Sandstone are like the existing bores. The water quality in the dams (CWD and Por167 spring) are similar to shallow bores (MW-4s) situated within the Maroota Sands aquifer. The deeper bores (MW-4D) are similar in major ion composition (Na-Cl rich) to shallower bores and dams, however have slightly higher TDS (Appendix E, Piper trilinear & Durov diagrams).

The new wells at Pits 8 & 13 also target the sandstone and Maroota sands aquifer (i.e. sandstone bores: PFPit13MW-7D, PFPit8MW-6D and Maroota Sand bores; PFPit8MW-8A PFPit8MW-8B, PFPit8MW-8C, PFPit8MW-8D, PFPit8MW-8E and PFPit8MW-6s).
The groundwater samples and pond 8 from Pit-8 is not available due to flooding during 2021-2022 and decommissioning of seven wells (PFPit8MW-8A to 8G) due to backfilling of Pit-8. The available well sampling, water analyses and the hydrochemistry are presented in Table 3-14 and in appendix E.

The water monitoring results at Pits 8 & 13 and at wells (PF-3, Table 3-10) indicate similar water quality characteristics (Na-Cl, low TDS, acidic pH) to the Hitchcock Road bores. The deep bore (PFPit13MW-7D) has a higher TDS as it encountered siltstone/shale bedrock at depth (lower permeability formation), whilst the Pond8 pond (2021) is relatively fresh indicating a stormwater runoff source (not groundwater).

The groundwater bores at Pits 8 & 13, and PF-3 indicate minor variations in the water quality due to variations in climate and the geology of the Maroota Sand and sandstone (e.g. ironstone layers, shell grit, pebbles, shale/siltstone layers).

Overall, all the site monitoring bores in both the Hawkesbury Sandstone and in the Maroota Sand show minor variation in Total Dissolved Solids (TDS) over time, with the deeper bores showing a more constant character. The general groundwater flow regime with the sandstone aquifer is shown in Figures 2 to 4.

### 3.11 Laboratory Quality Control

The laboratory quality control samples (ALS laboratory duplicates, procedure blanks and control spikes) returned results within the required limits and acceptance criteria. The quality control data generated by the laboratory are presented with the laboratory certificates in Appendix B-1 & B-2.

ALS Environmental is NATA accredited for the analyses performed. Based on the evaluation of the data, it is assessed that the accuracy and precision of the analytical data generated in the sampling round, as reported by the analytical laboratory, are acceptable as a basis for interpretation. The short holding time for laboratory PH measurements is supplemented with field readings using a calibrated field chemistry meter (YSI professional series).

## 4 CONCLUSIONS

The assessment of the data collected on the groundwater levels and quality in the Maroota Hitchcock Road site, some of which represent the oldest data available to the groundwater study carried out by the DLWC (now Office of Water) indicate the following:

- Water levels in the Maroota Sand aquifer generally respond to the rainfall pattern. The rainfall in the past three years (2020-2021 @ 1264.4 mm, 2021-2022 @ 1633.5 mm. and 2022-2023 @ 1246.2mm) were substantially above the annual average.
- Water quality in the Maroota Sand aquifer varies with rainfall recharge due to variations in aquifer characteristics and rainfall from 2013 to 2023. The recent 2022-2023 sampling indicates variability of the EC/TDS trend in PFL2HitchMW-1 and PF214MW-1 due to the variable climate. The previous water level rises at PF214MW-1 and stabilisation in 2022 and 2023 relate to the construction of nearby water storages.
- Water was not pumped from the Portion 167 Spring for the 2022 to 2023 period (i.e. last pumpage in November 2021). PFF allocation (44 ML) was not utilised due to high water levels and rainfall at the site.
- Previous pumpage records for the two production bores (PF198PB1=12.027 ML, and PF198PB2=1.595 ML) in 2017-2018 was 13.622 ML, whilst during the 2018-2019 period was 9.947 ML (PB-1 only). During 2019-2020, the existing production bore (PB-1) and a new bore (PB-3, replacing PB-2) recorded 26.745 ML. The combined pumpage from PB-1/PB-3 during 2020 to 2021 was 14.248 ML. The pumpage during

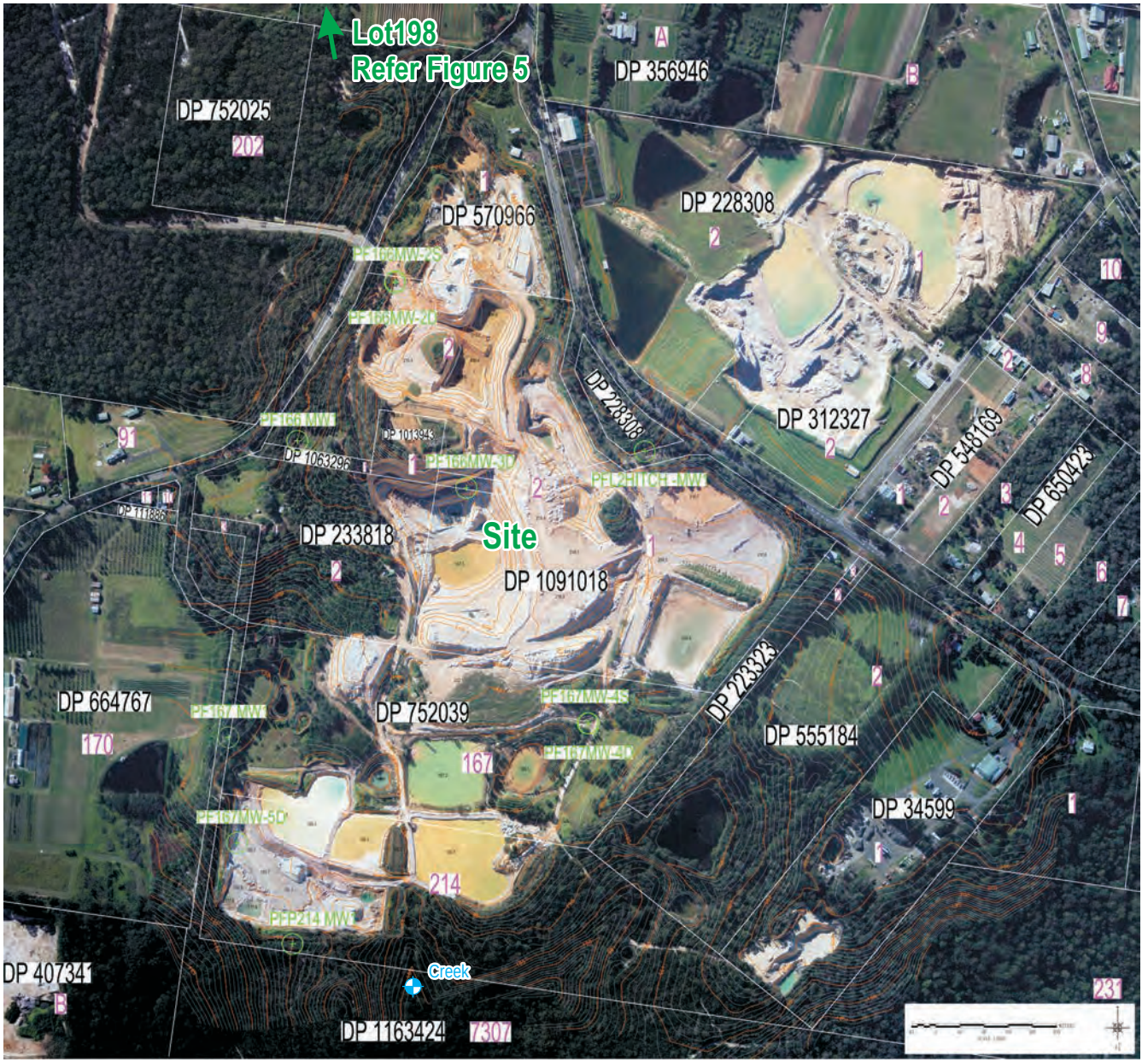
2021-2022 was 20.201 ML (PB-1), and 17.685 ML (PB-1 only) for 2022-2023 period. Groundwater pumpage has remained substantially below the allocation of 56 ML/year (i.e. PB-1 only). The two bores (PB-2/PB-3) have been decommissioned due to high iron in the groundwater and pump clogging issues.

- The chemical composition of the groundwater in the deep aquifer of the Hawkesbury Sandstone (water supply bores in Lot 198) has an overall character that indicates that rainfall recharge occurs readily.
- The new monitoring wells (6) installed in 2017, three additional wells at the new site (PF-1, PF-2, PF-3), and 8 new wells (2020) at Pits 8 & 13 were used to better assess groundwater levels, the flow regime and pit extraction depths. The 7 wells (PFPit8MW-8A to 8G) located in the quarry floor of Pit-8 were decommissioned in late 2022/early 2023 due to backfilling operations. The two previous pit extraction areas (locations near PF167MW-3D and PF167MW-5D) were backfilled in 2017-2019 to meet the required groundwater buffer zone ( >2m above the high water table).
- The current sand extraction operations in the Hitchcock Road area operate in a manner that does not appear to have an adverse impact upon the groundwater sustainability and meets the DA Approval Conditions.

The data collected during the year are available to Water NSW for their continued study in the area.

# FIGURES

earth2water Pty Ltd
Environmental & Groundwater Consulting




LEGEND

PFP214MW1
Groundwater Monitoring Location
Creek Sample Location

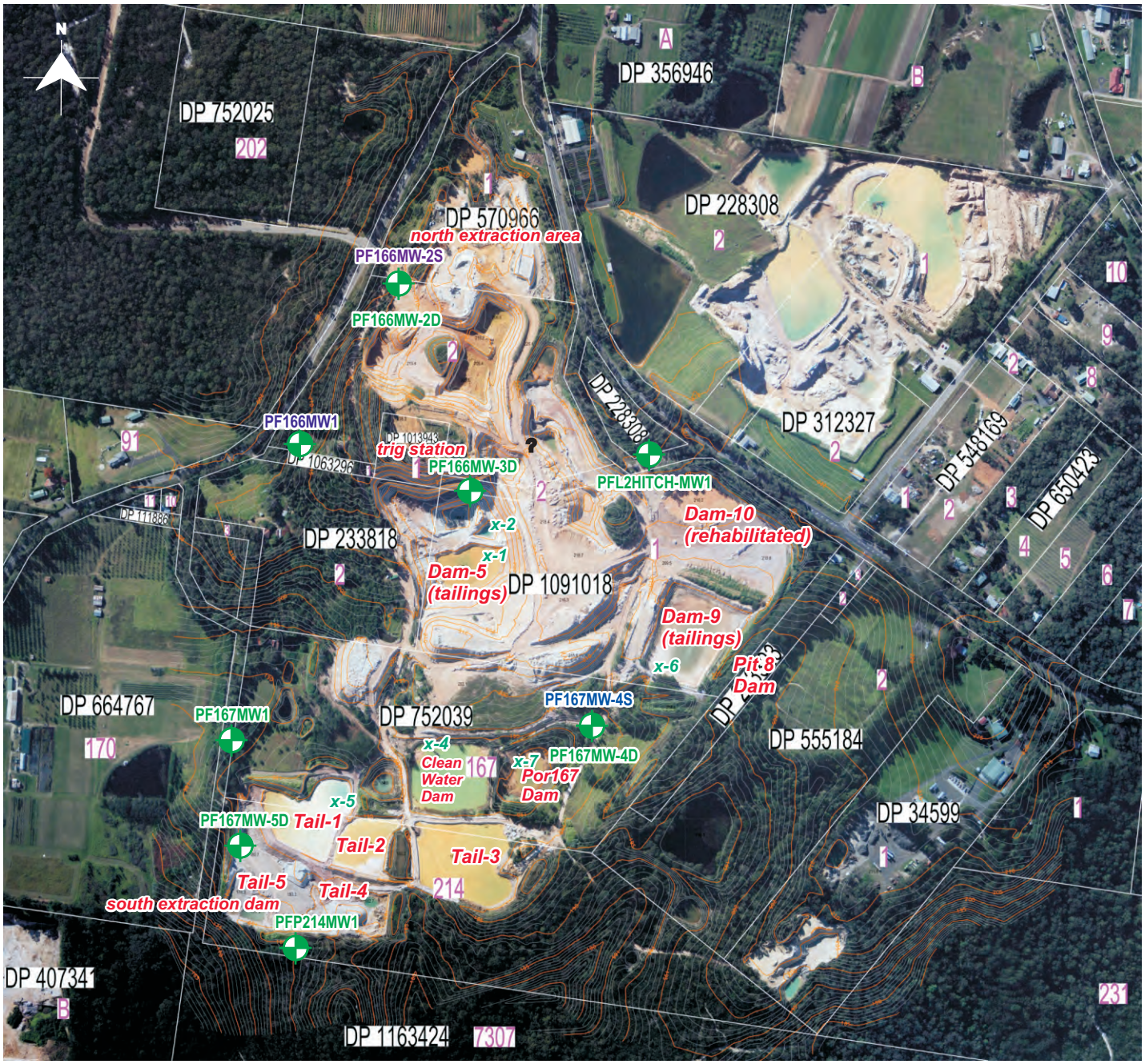
**SITE LOCATION- Hitchcock Rd (2023)**

**Maroota - Hitchcock Road**

***Date:*** *22 August 2023*

***Reference:*** *E2W_224_01.cdr*

**Figure 1**




Base source: Landair Surveys

0 100 200 300 m
Scale

*Landair Pty Ltd; May 2017 Topography Shown*

*Landscape constantly changing due to extractions*

LEGEND

| | |
|---|---|
| PF167MW-4S | Well location (Maroota Sands) |
| PF167MW-4D | Well location (Sandstone aquifer) |
| x-5 | Water sample location (E2W; 20 April 2017) |
| Tail-2 | Tailing dam (active settlement) |
| Dam-9 | Dam (former extraction pit, undergoing rehabilitation) |

Pit 8 Dam; from 2019 to early 2023 (now backfilled)
Tail: 4 & 5 from 2019 (former backfilled extraction areas)

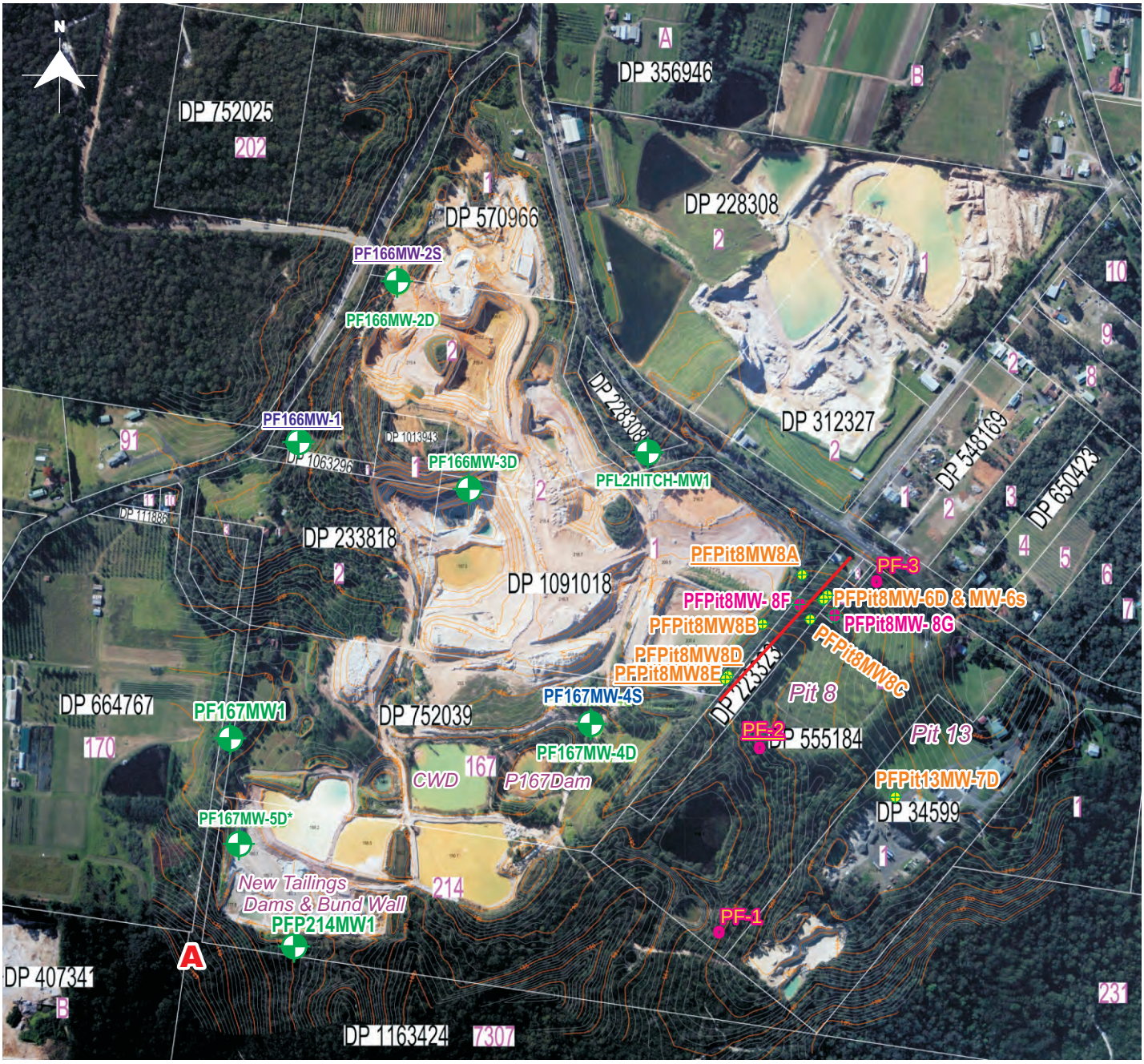
## Site Layout & Water Storages (2023)

***Date:*** *22 August 2023*

***Reference:*** *E2W_224_15.cdr*

**MAROOTA - HITCHCOCK ROAD SITE**

**Figure 1 A**




0 100 200 300 m
Scale

*Base source: Landair Surveys 2017*

LEGEND

| | |
|---|---|
| PF167MW-4S | Well location (Maroota Sands) |
| PF167MW-4D | Well location (Sandstone aquifer) |
| PF-1 | Well Location (2019) |
| PFPit13MW-7D | New Wells; Pits 8 & 13 (Aug/Sept 2020) |
| PFPit8MW- 8F | New Wells; Pit 8 (22 Sept 2021) |
| | Pit-8 wells decommissioned in early 2023 (PFPit8MW-8A to 8F) |

*Note:*

*Perched Water Table (Maroota Tertiary Sand):*

*PF166MW-2s, PF167MW-4s, PF166MW-1, PF-2*

*PFPit8MW-8A, PFPit8MW-8D, PFPit8MW-8E*

***Date:*** *22 August 2023*

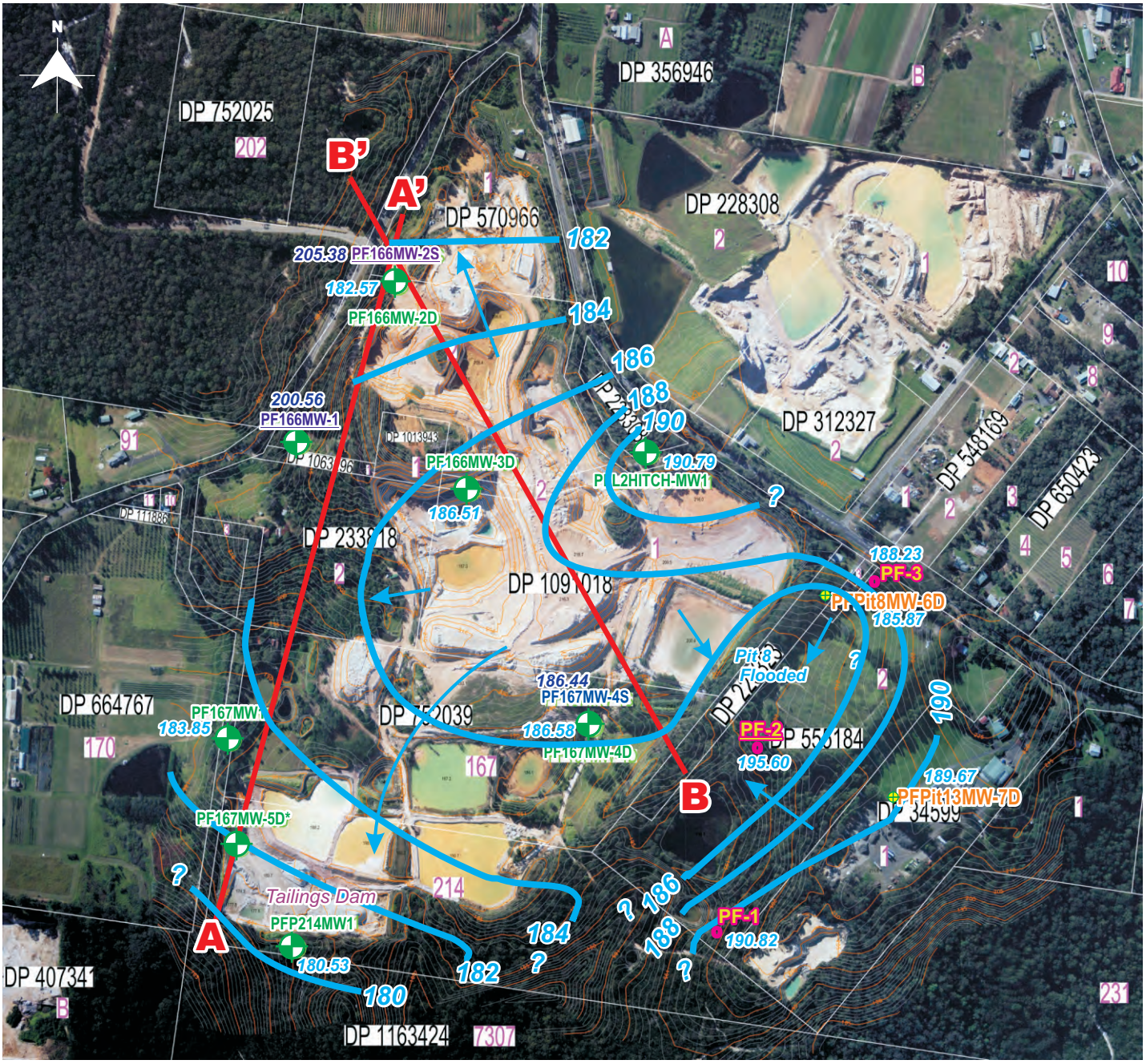
***Reference:*** *E2W_224_15.cdr*

**Site Layout & Groundwater Monitoring Well Network (2023)**

**MAROOTA- HITCHCOCK ROAD SITE**

**Figure 1B**

earth2water Pty Ltd
Environmental & Groundwater Consulting




0 100 200 300 m
Scale

LEGEND

PFPit13MW-7D
New Wells (Aug/Sept 2020) at Pits 8 & 13
(Wells at Pit8;MW-8A to 8G; not shown, decommissioned in early 2023)

Note:
Perched Water Table ( Maroota Sand):
PF166MW-2s, PF167MW-4s, PF166MW-1, PF-2

PF167MW-4S — Well location (Maroota Sands)
PF167MW-4D — Well location (Sandstone aquifer)
179.41 — SWL (mAHD)- Sandstone (Aug 2023)
Inferred groundwater flow (sandstone)
Inferred groundwater flow contour (sandstone @ 15-16 Aug 2023)
A-A' — Line of cross section
PF-1 — Well Location (new site, acquired 2019)

## Site Plan & Inferred Groundwater Flow Regime (August 2023)

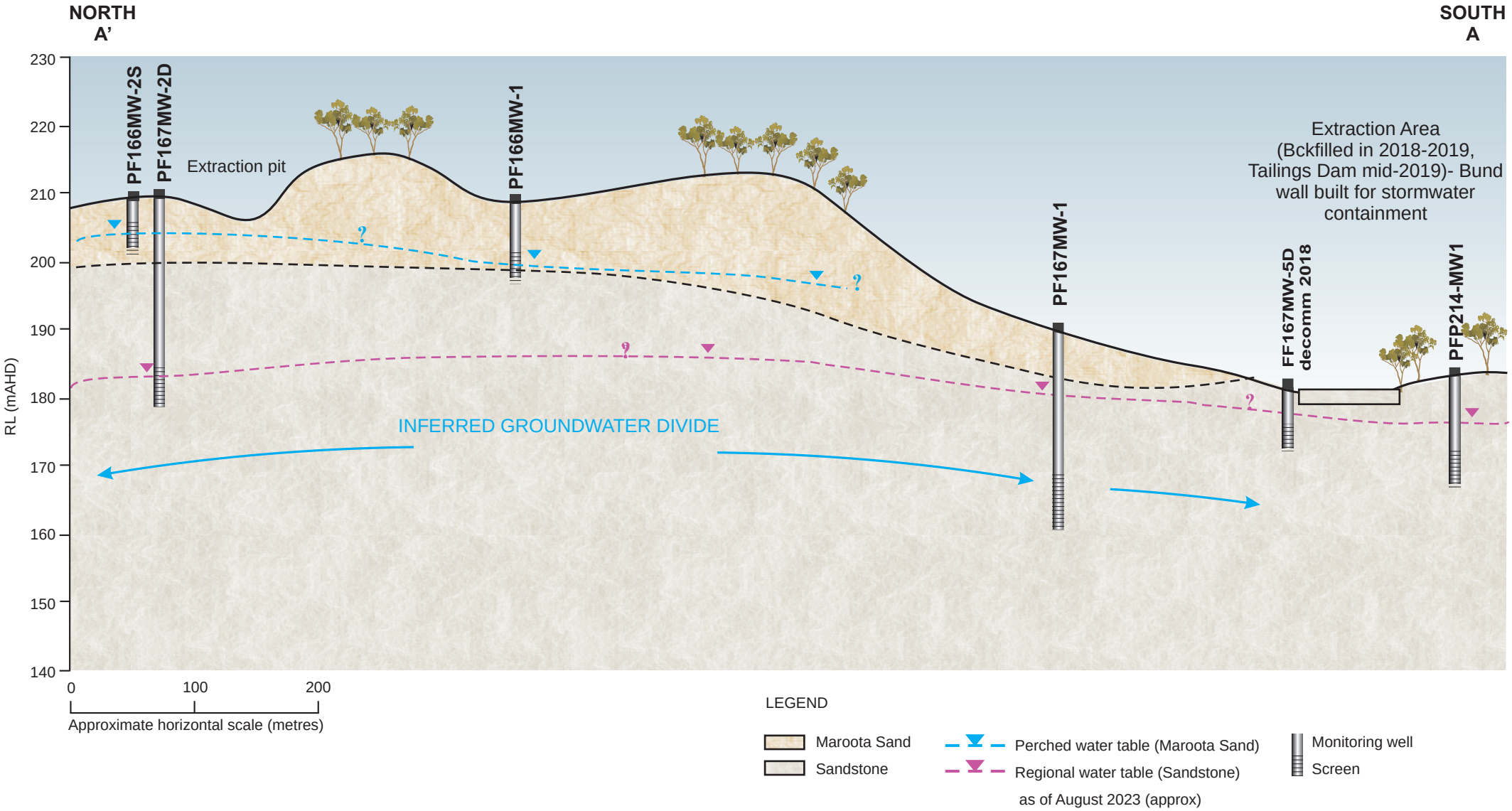
**Date:** 23 August 2023

MAROOTA - HITCHCOCK ROAD SITE

**Reference:** E2W_224_15.cdr

**Figure 2**

earth2water Pty Ltd
Environmental & Groundwater Consulting




# INFERRED HYDROGEOLOGICAL SECTION (N-S)

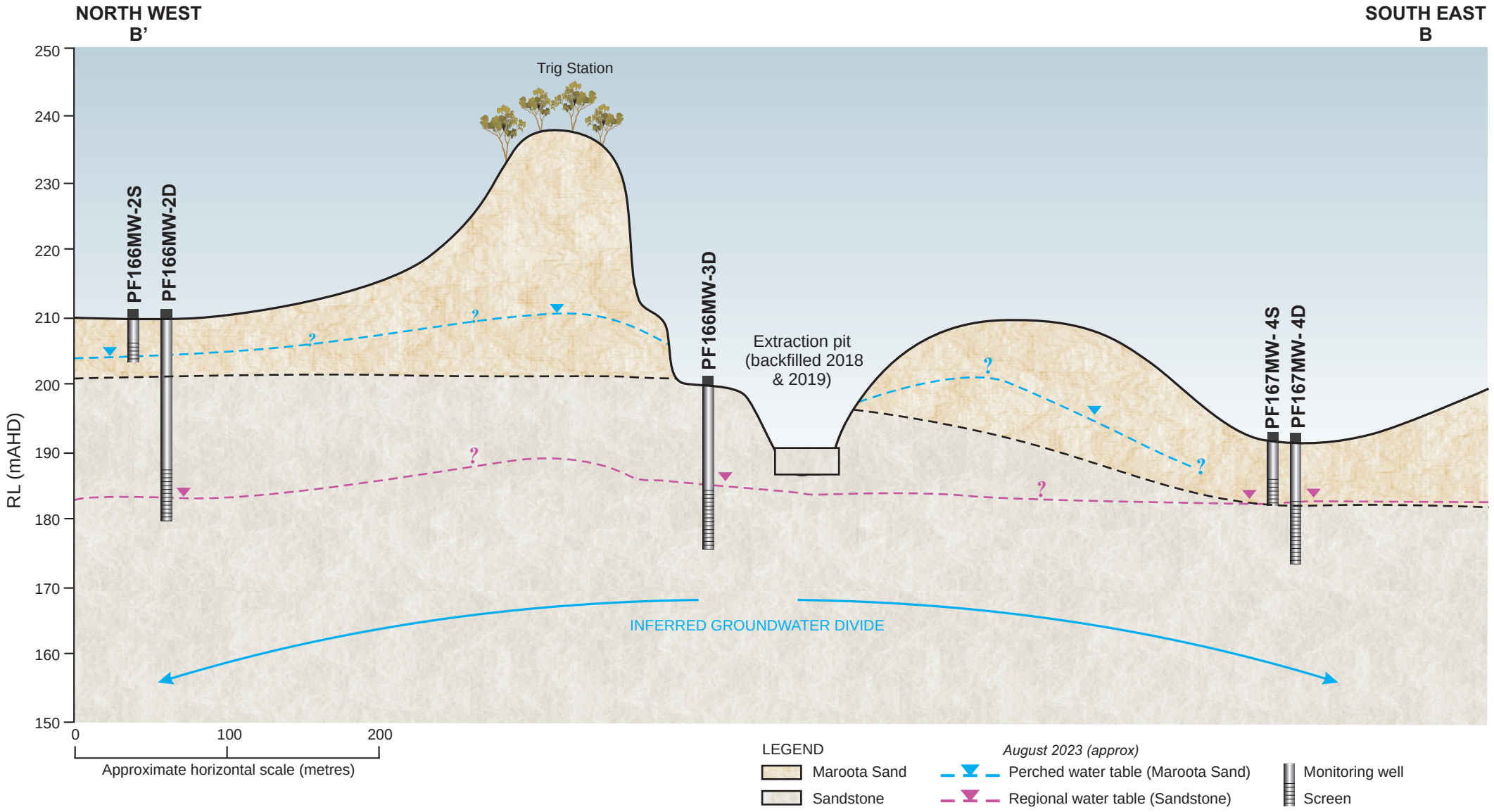
**Date:** 22-8-2023

**Reference:** E2W_224_17.cdr

MAROOTA - HITCHCOCK ROAD SITE

**Figure 3**

earth2water Pty Ltd
Environmental & Groundwater Consulting




# INFERRED HYDROGEOLOGICAL SECTION (NW-SE)

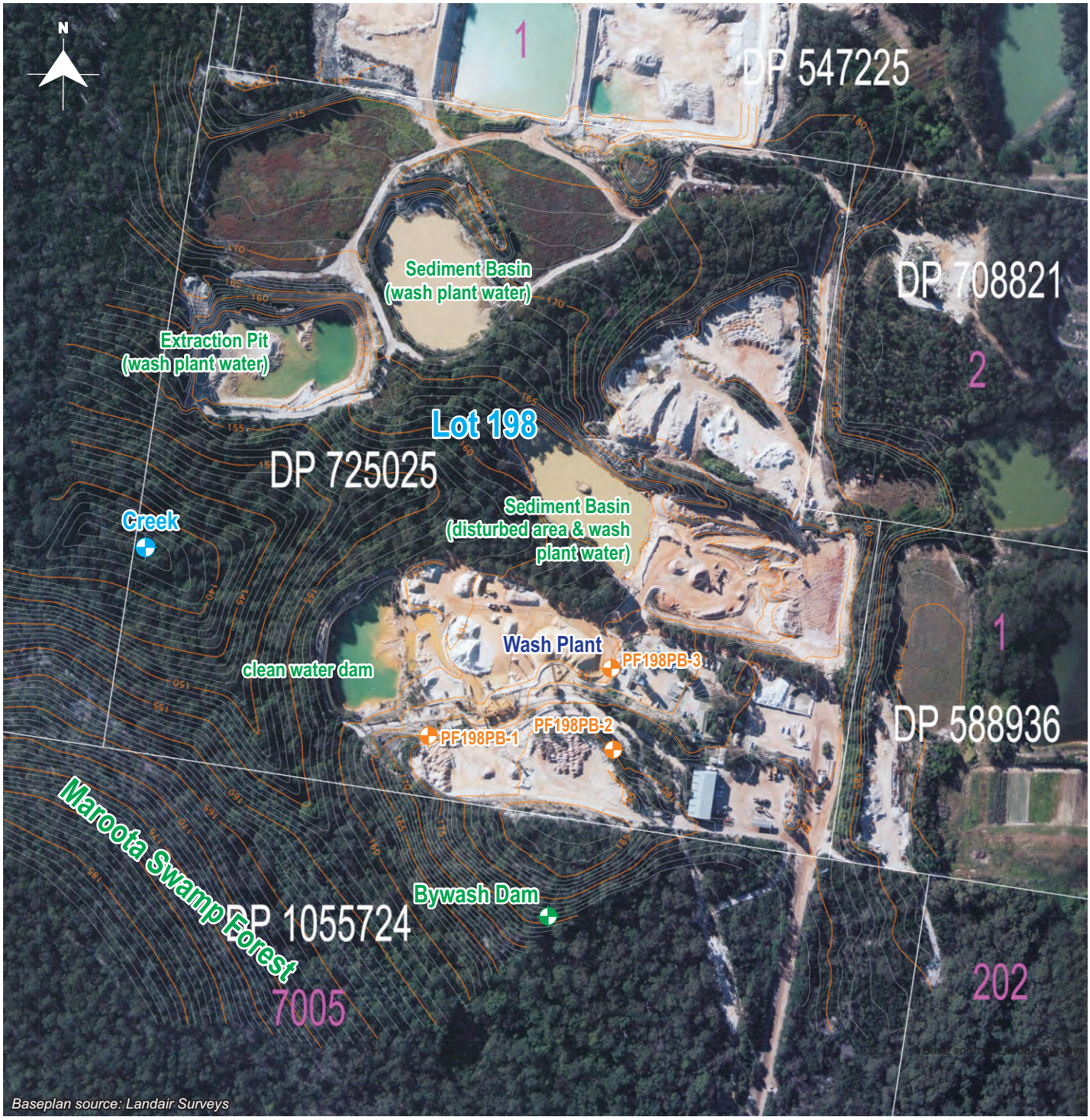
**Date:** August 2023

**Reference:** E2W_224_16.cdr

MAROOTA - HITCHCOCK ROAD SITE

**Figure 4**

earth2water Pty Ltd
Environmental & Groundwater Consulting




0 30 60 90 120 150
Scale (metres)

LEGEND

PF198PB-1 Production Bore (sandstone aquifer)
PF198PB-3 installed in 2019 to replace PF198PB-2

Creek Creek Sample Location

## Site Layout for Lot 198 (2023)

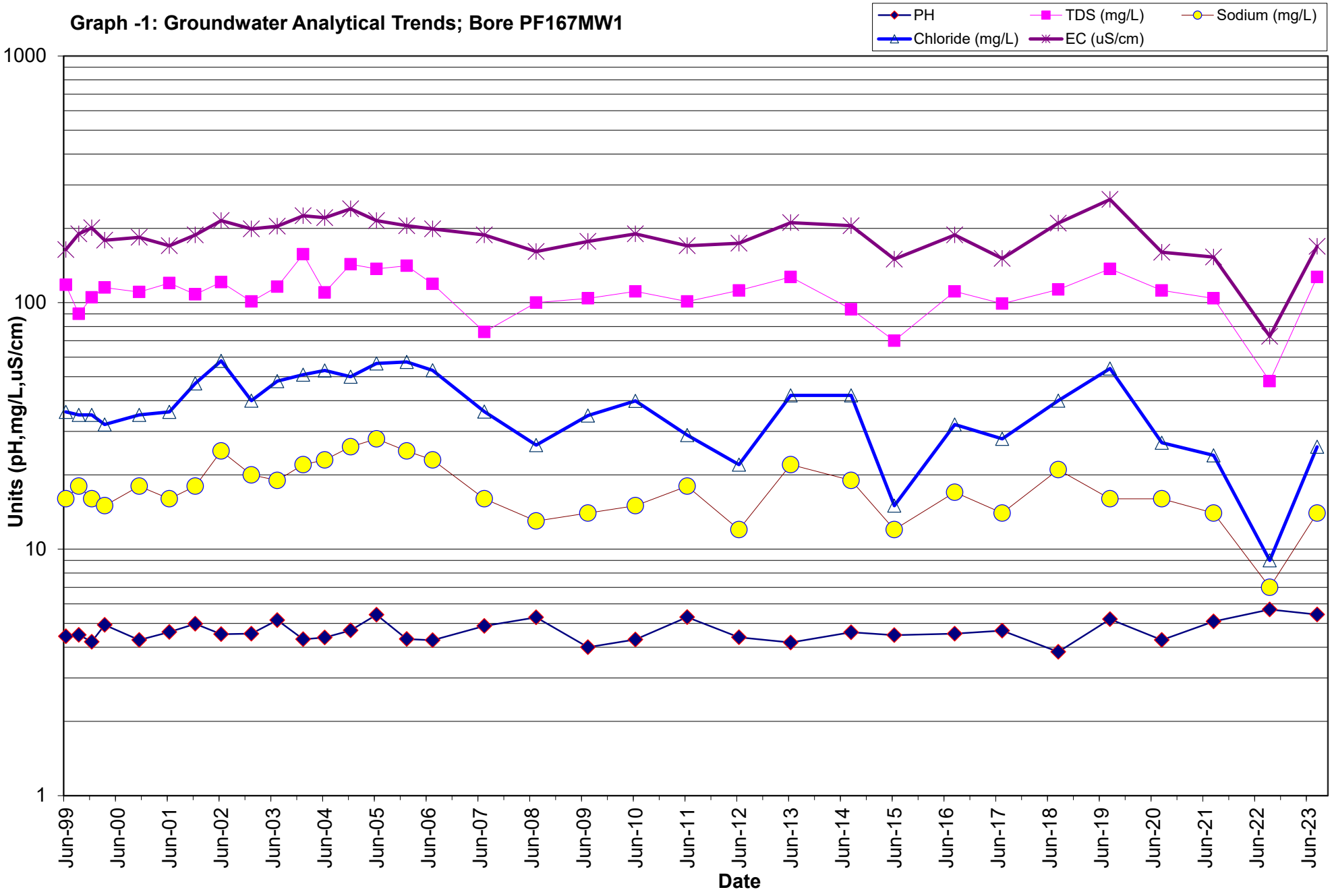
***Date:*** *August 2023*

***Reference:*** *E2W_224_22.cdr*

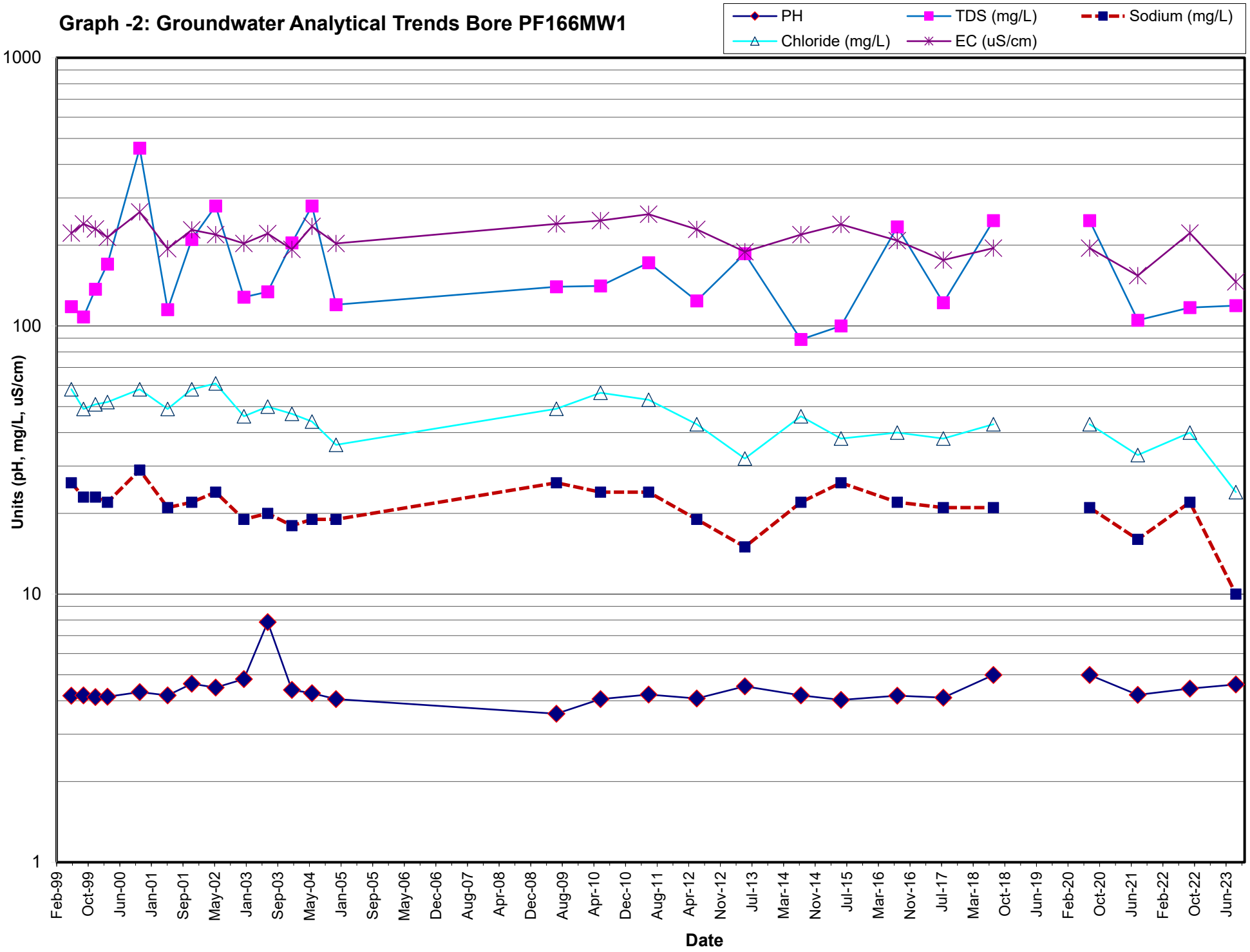
**PF Formation: Maroota Lot 198 Site**

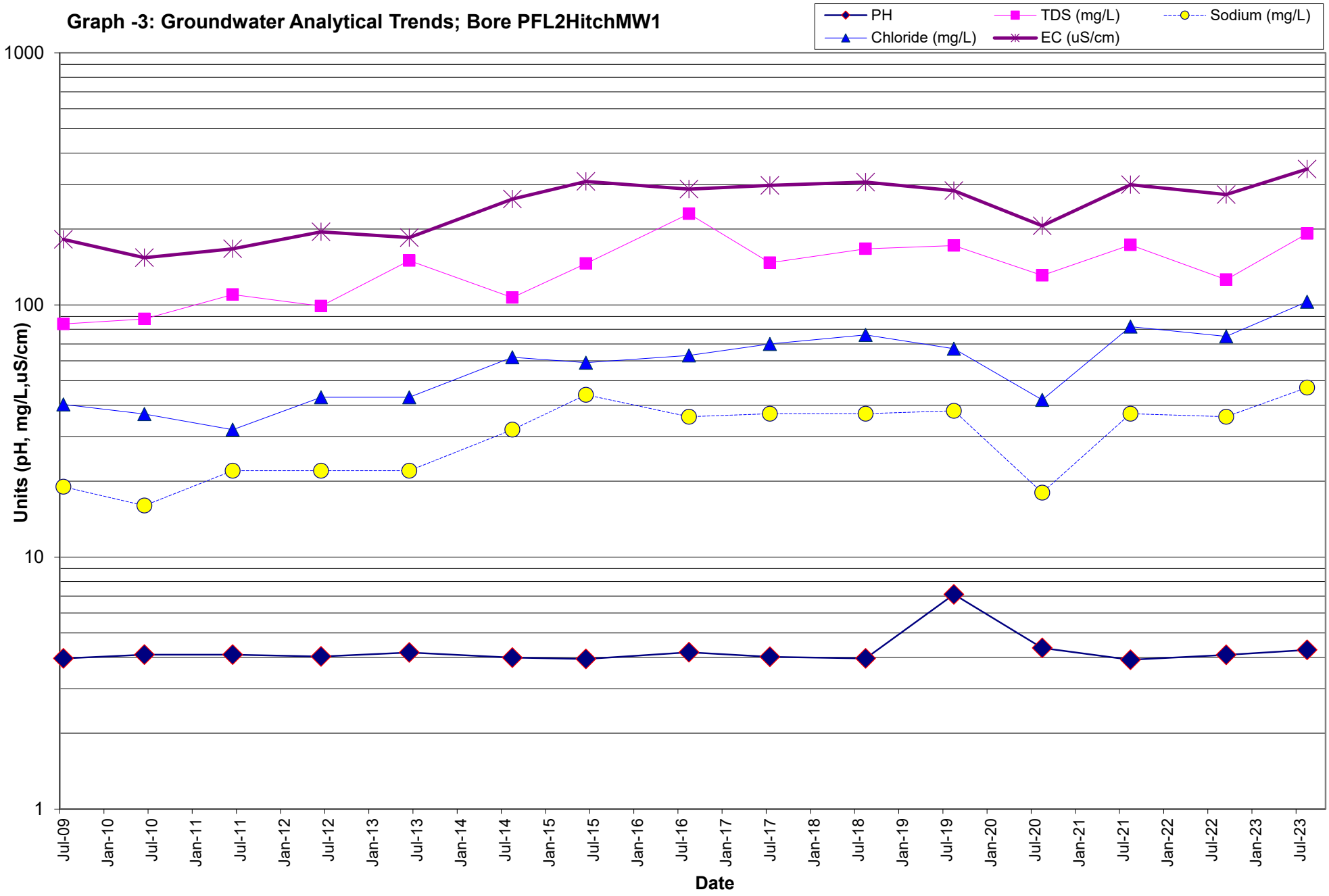
**Figure 5**

# HYDRO-CHEMICAL GRAPHS

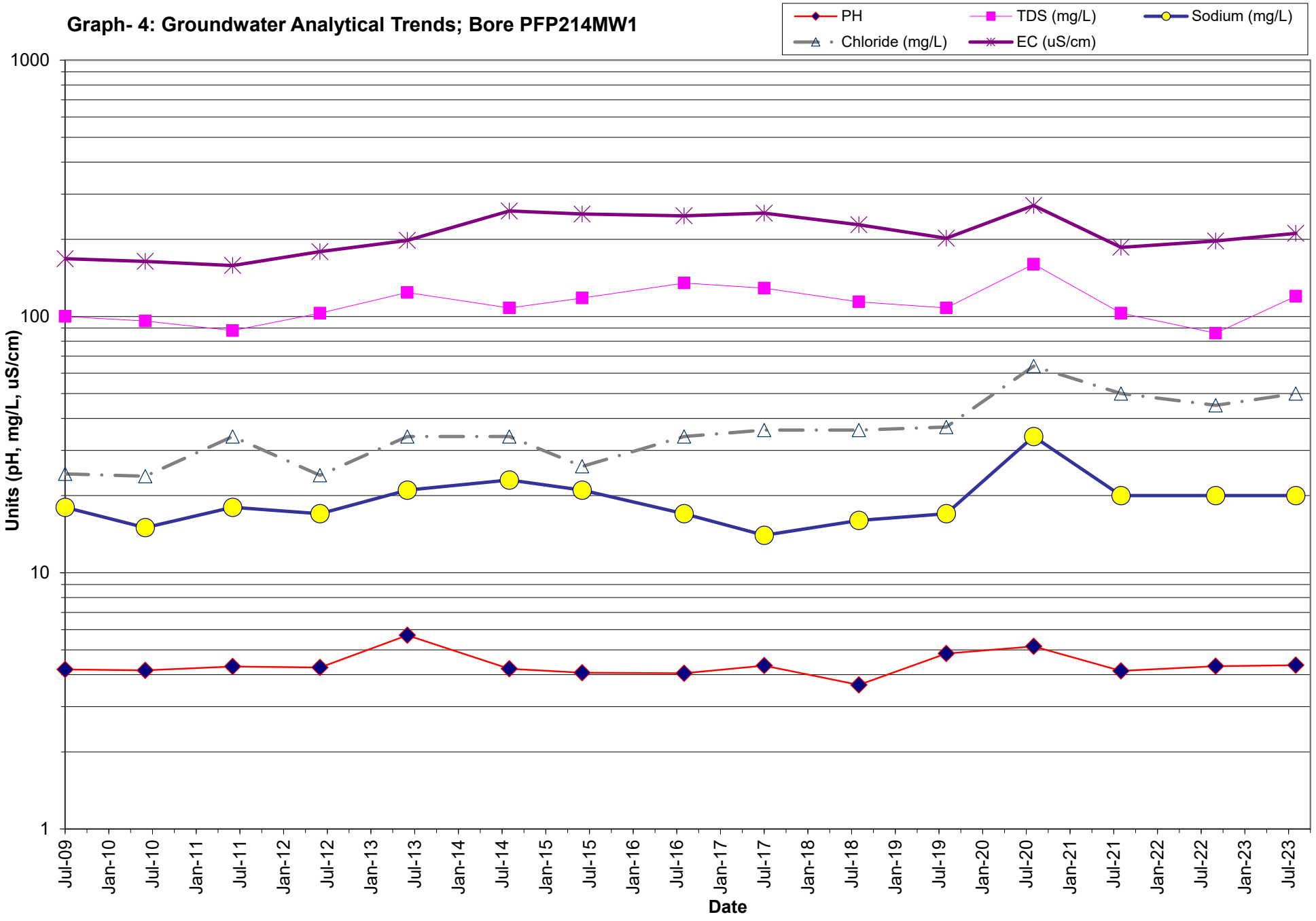

Graph -1: Groundwater Analytical Trends; Bore PF167MW1
PH
TDS (mg/L)
Sodium (mg/L)
Chloride (mg/L)
EC (uS/cm)
1000
100
10
1
Units (pH,mg/L,uS/cm)
Jun-99
Jun-00
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23
Date

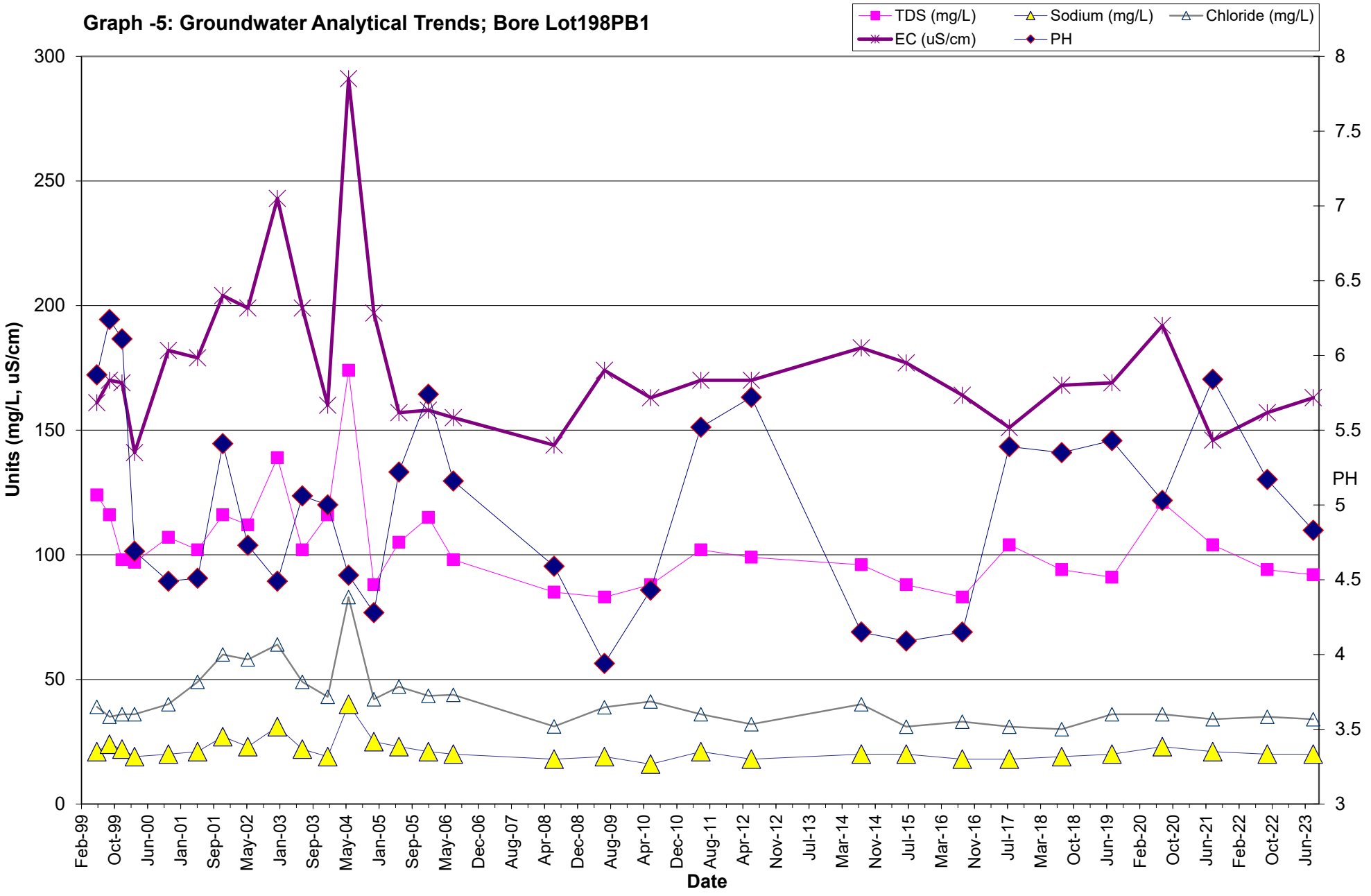
## Graph -2: Groundwater Analytical Trends Bore PF166MW1

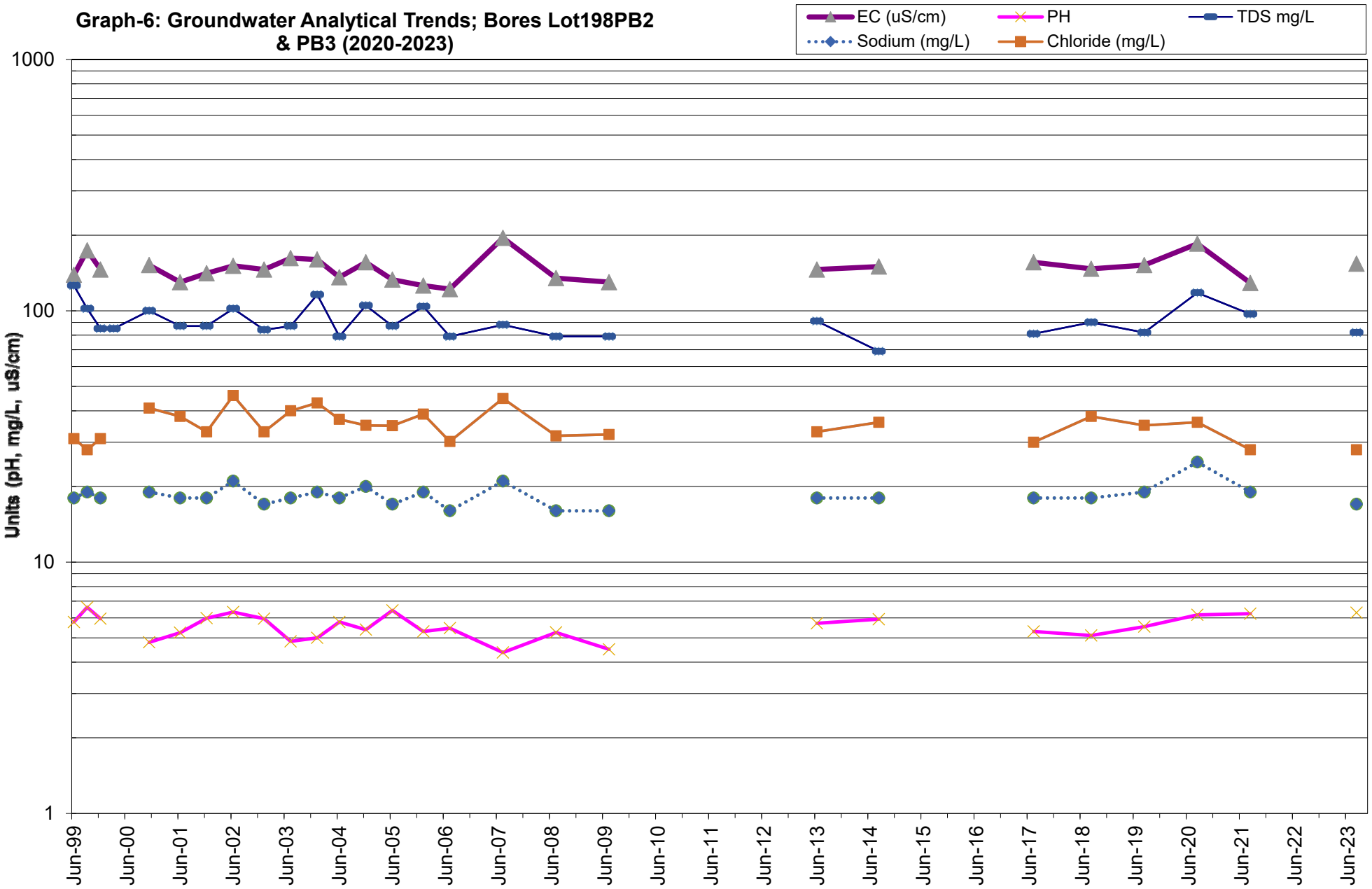



Graph -3: Groundwater Analytical Trends; Bore PFL2HitchMW1
PH
TDS (mg/L)
Sodium (mg/L)
Chloride (mg/L)
EC (uS/cm)
1000
100
10
1
Units (pH, mg/L,uS/cm)
Jul-09
Jan-10
Jul-10
Jan-11
Jul-11
Jan-12
Jul-12
Jan-13
Jul-13
Jan-14
Jul-14
Jan-15
Jul-15
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Jul-18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Date

**Graph- 4: Groundwater Analytical Trends; Bore PFP214MW1**




Graph -5: Groundwater Analytical Trends; Bore Lot198PB1
TDS (mg/L)
Sodium (mg/L)
Chloride (mg/L)
EC (uS/cm)
PH
Units (mg/L, uS/cm)
PH
Date
300
250
200
150
100
50
0
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
Feb-99
Oct-99
Jun-00
Jan-01
Sep-01
May-02
Jan-03
Sep-03
May-04
Jan-05
Sep-05
May-06
Dec-06
Aug-07
Apr-08
Dec-08
Aug-09
Apr-10
Dec-10
Aug-11
Apr-12
Nov-12
Jul-13
Mar-14
Nov-14
Jul-15
Mar-16
Nov-16
Jul-17
Mar-18
Oct-18
Jun-19
Feb-20
Oct-20
Jun-21
Feb-22
Oct-22
Jun-23


Graph-6: Groundwater Analytical Trends; Bores Lot198PB2 & PB3 (2020-2023)
EC (uS/cm)
PH
TDS mg/L
Sodium (mg/L)
Chloride (mg/L)
Units (pH, mg/L, uS/cm)
1000
100
10
1
Jun-99
Jun-00
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10
Jun-11
Jun-12
Jun-13
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
Jun-23

# HYDRO-GRAPHS

Figure HG-1: Manual Water Level Gauging at Lot 198 Wells (PB1, PB2, PB3), 2017 to 2023

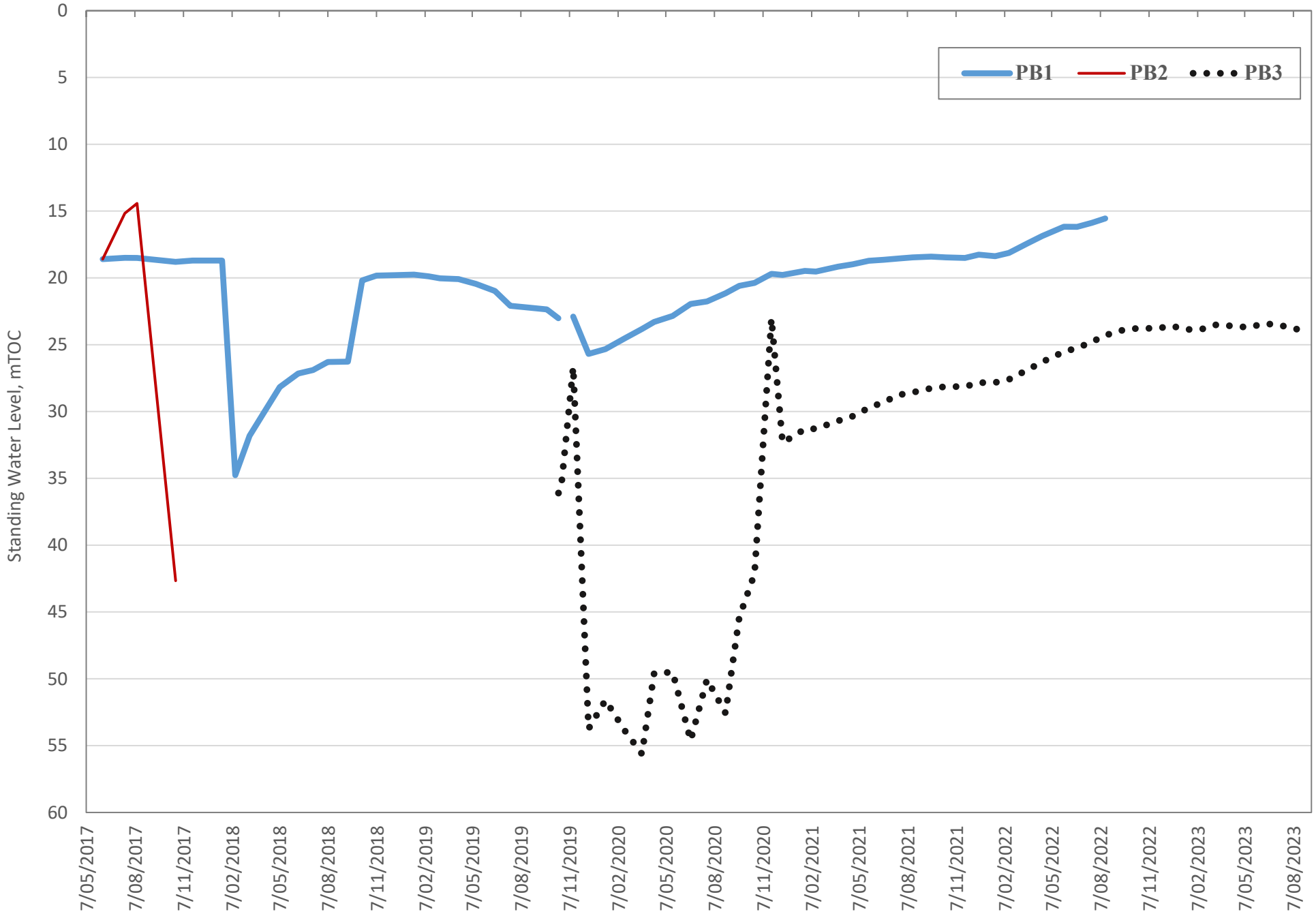


**Figure HG-2: Monitoring Data at Bore PF167MW1 (2013-2018)**

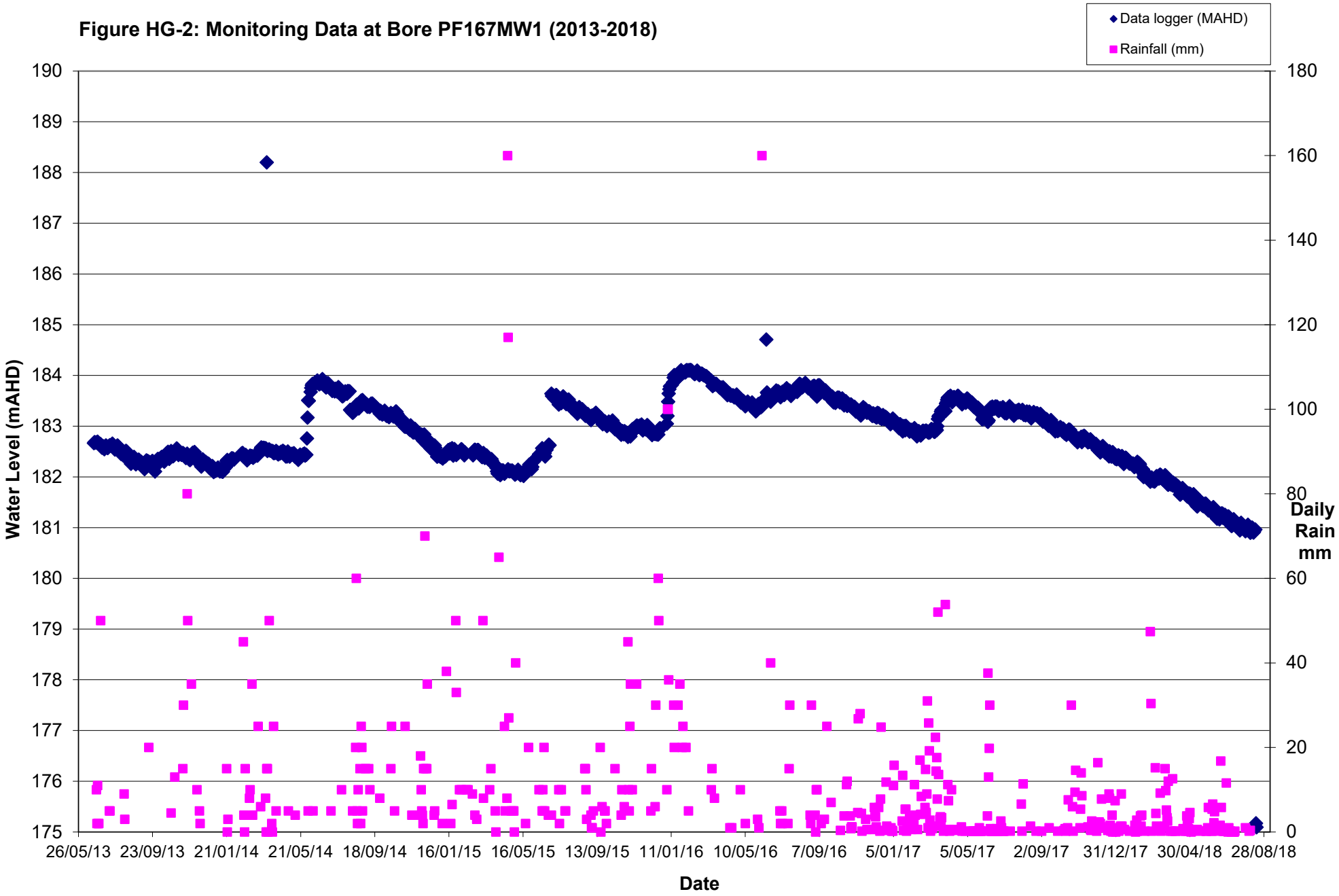


**Figure HG-3: Monitoring Data at Bore PF166MW1 (2013-2016)**

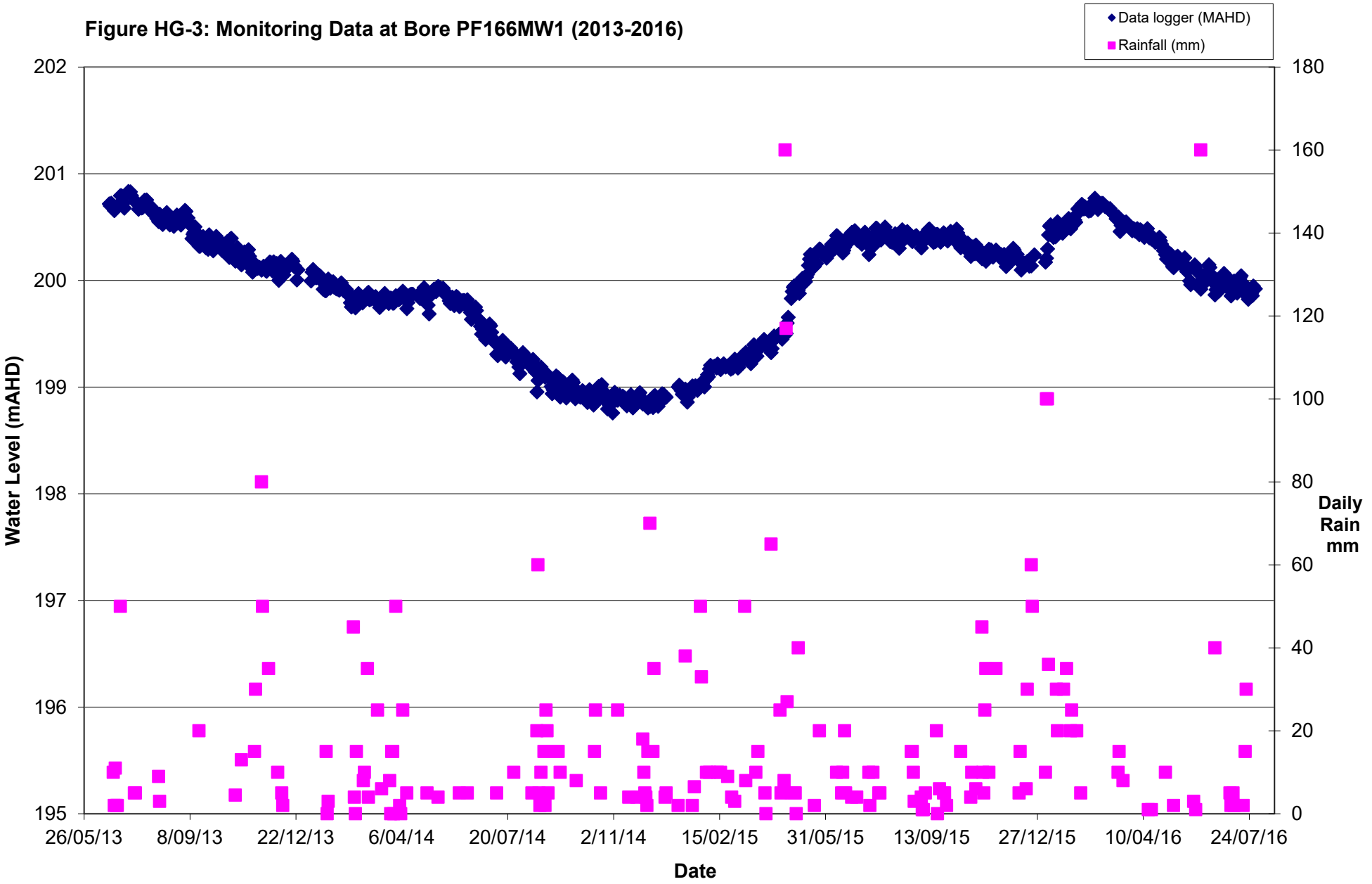


Figure HG-4: Monitoring Data at Bore PF214MW1 (2013-2023)

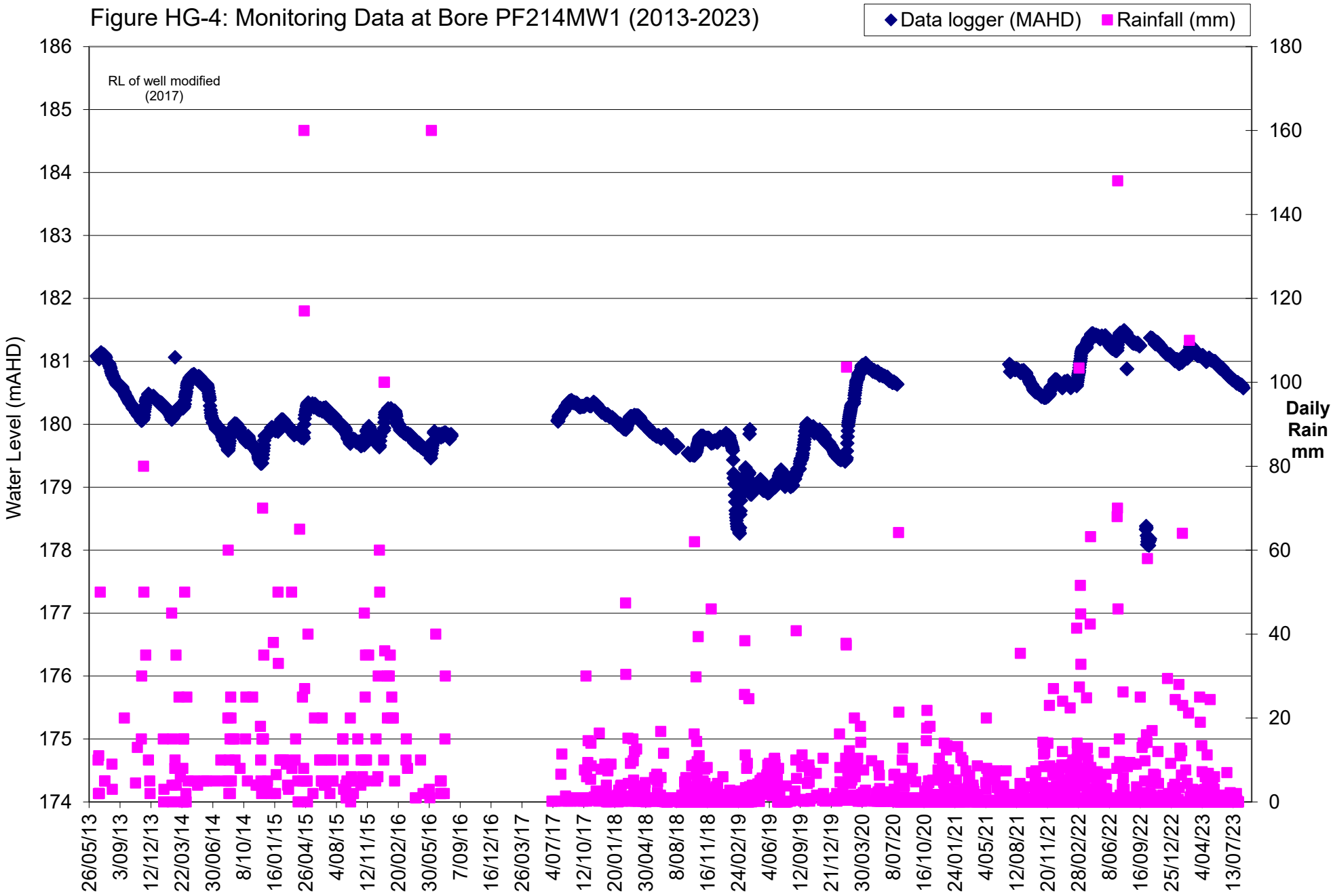


Figure HG-5: Monitoring Data Bore PFL2HitchMW1 (2013-2023)

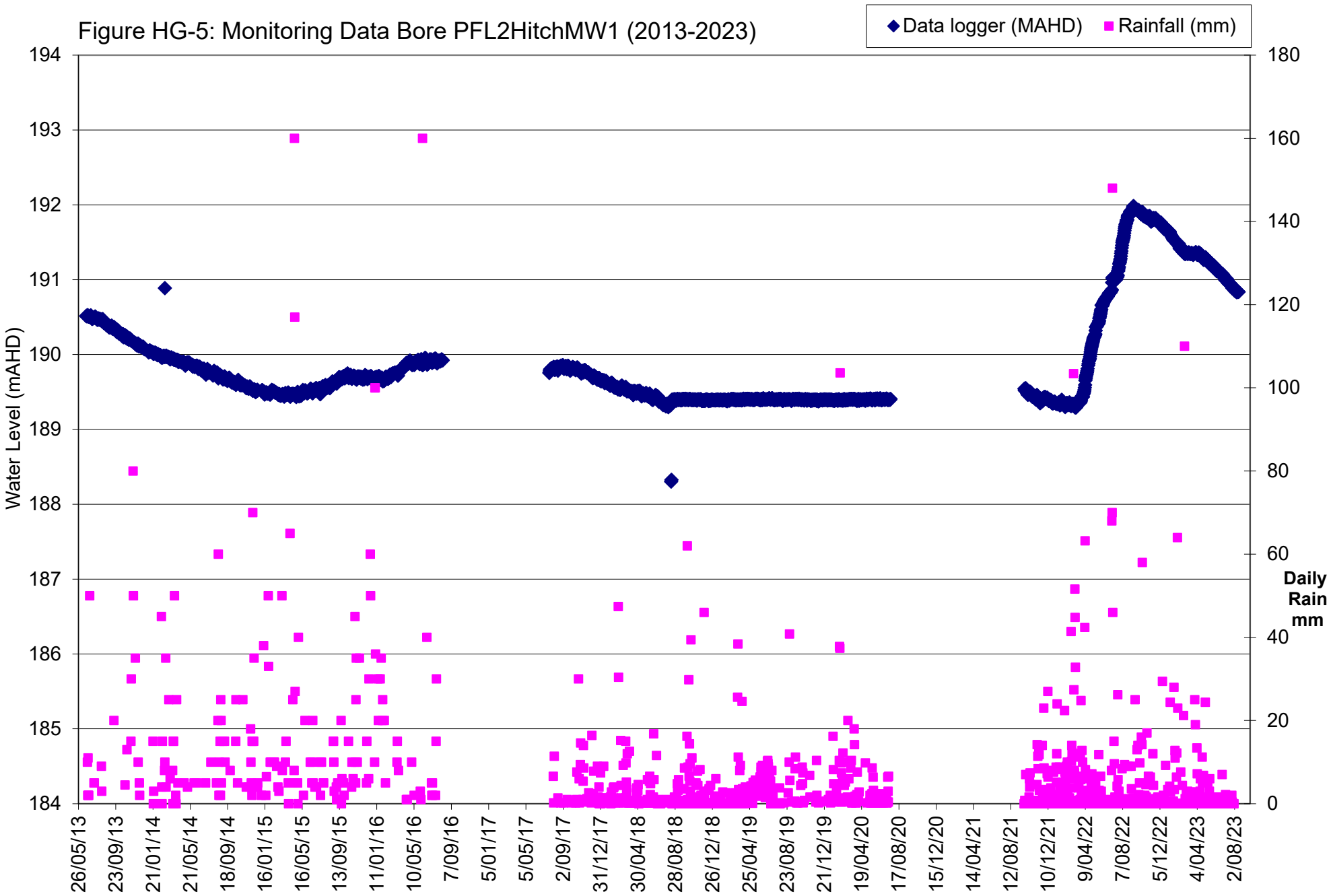


**Figure HG-6: Monitoring Data Bore PF167MW3D (2017-2023, New bore)**

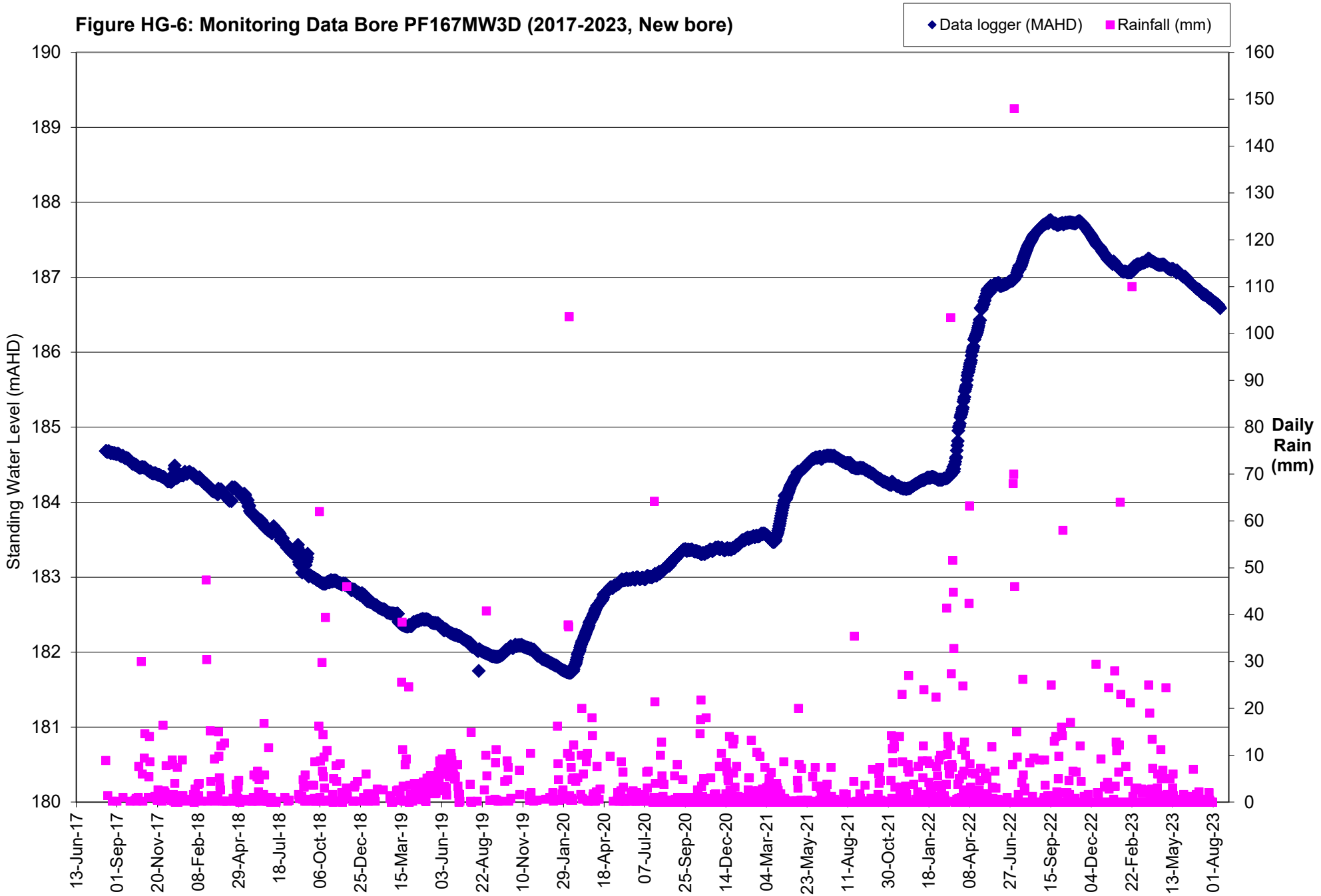
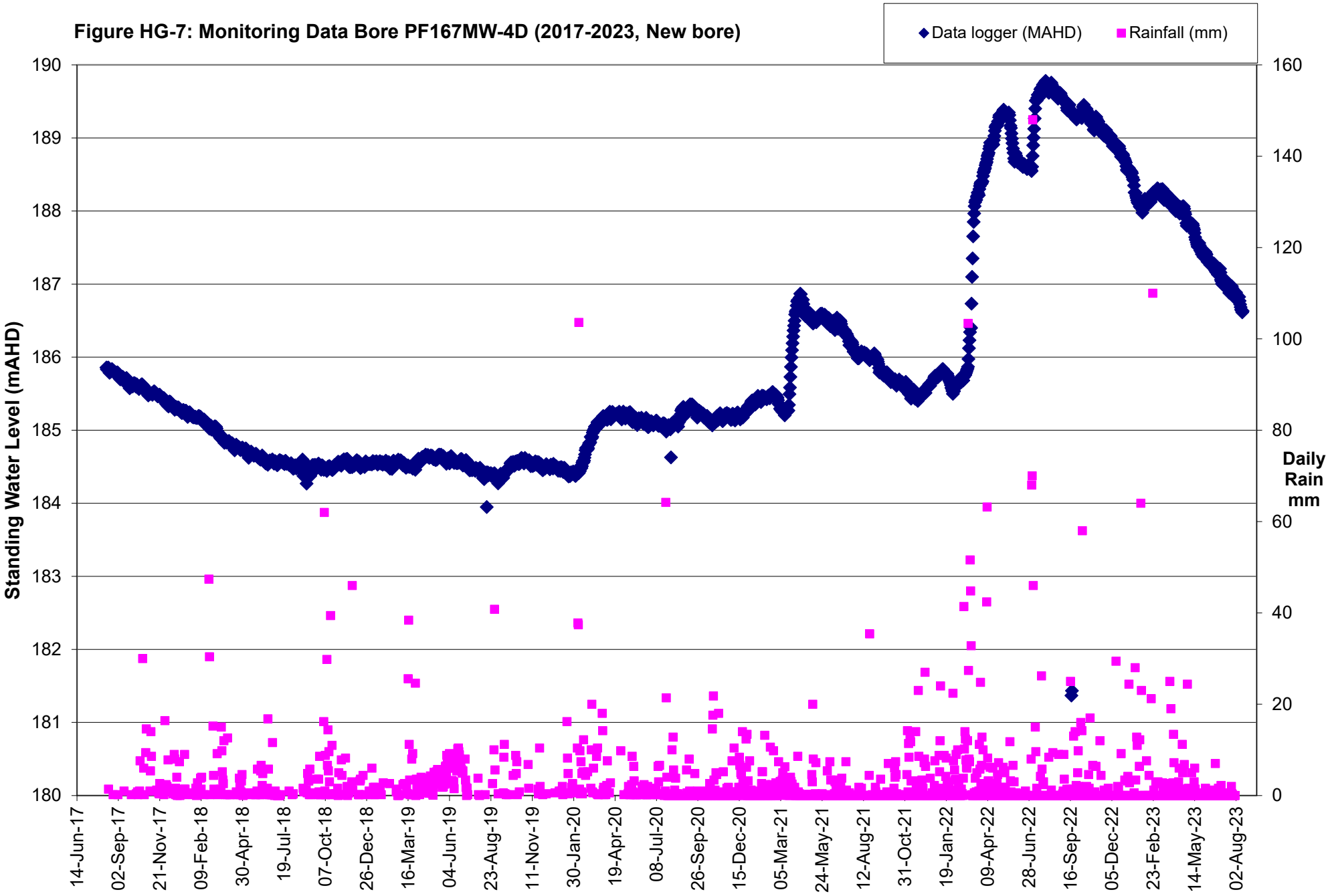


**Figure HG-7: Monitoring Data Bore PF167MW-4D (2017-2023, New bore)**



## Figure 8A: Maroota; Monthly Groundwater Levels (2017 to 2023)- All Wells

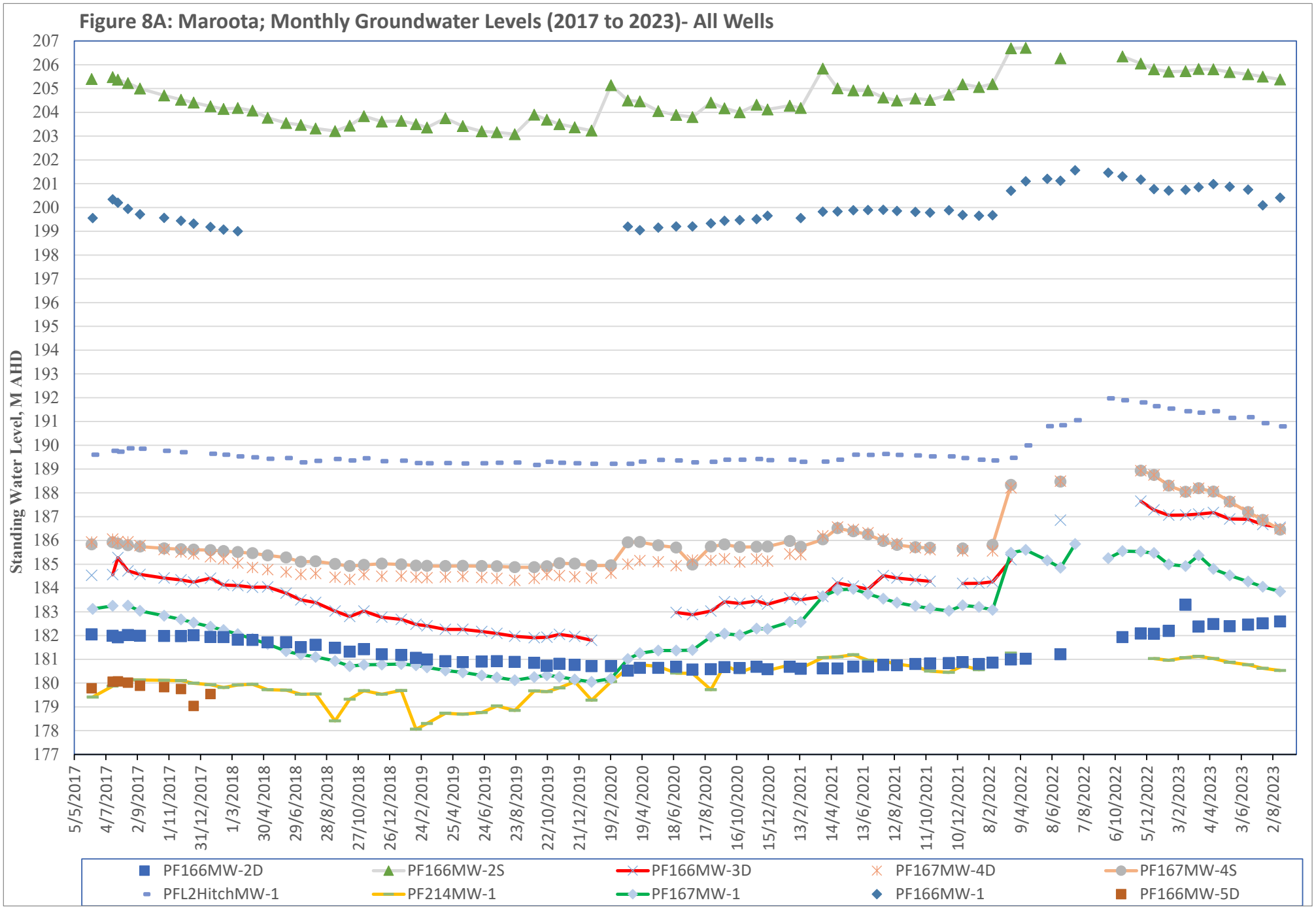


**Figure 8B: Maroota; Monthly Groundwater Levels (2017 to 2023)- Selected Wells**

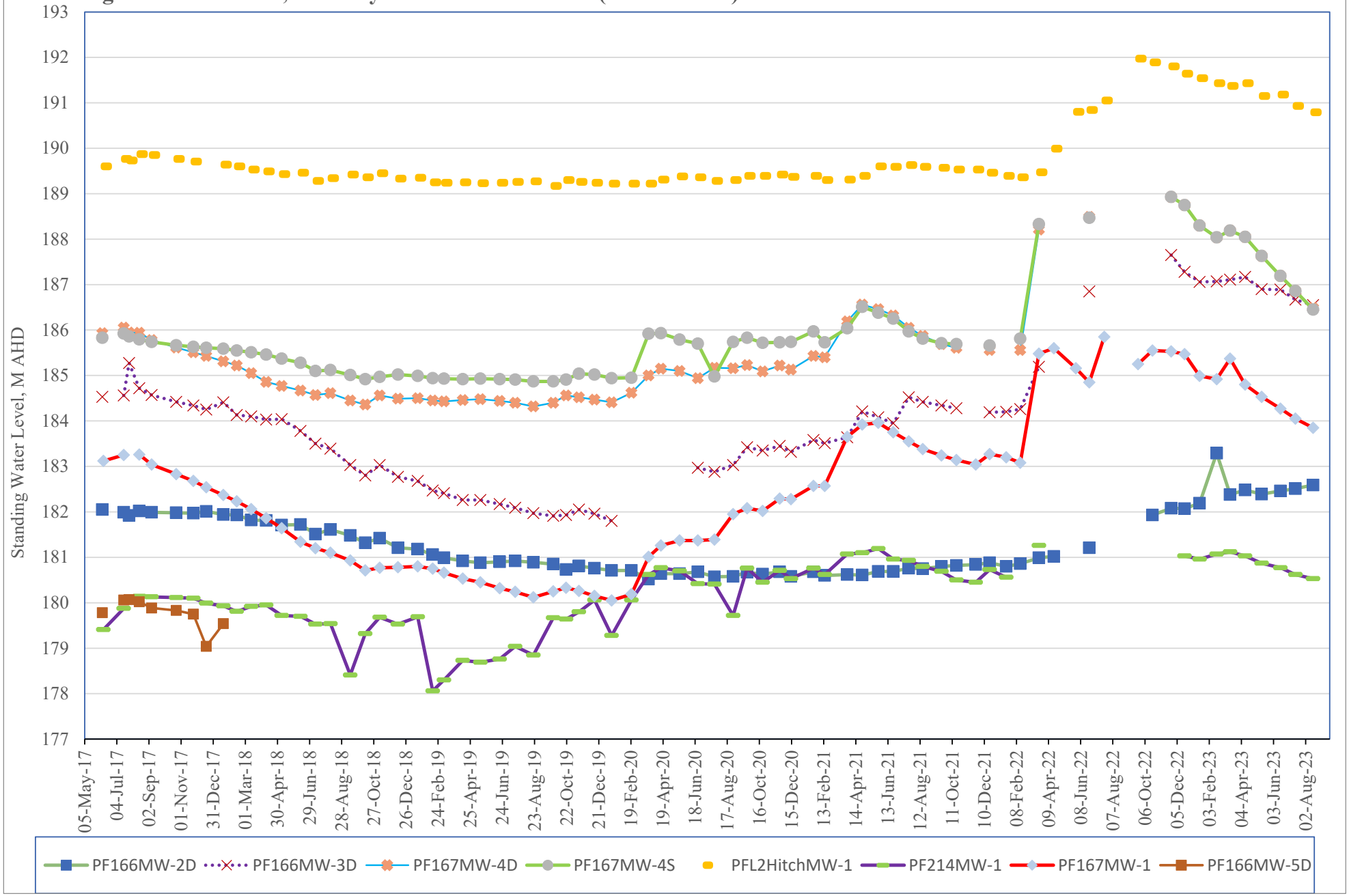


**Figure HG-9: Preliminary Logger Data; Hitchcock Rd Clean Water Dam (2017-2023)**

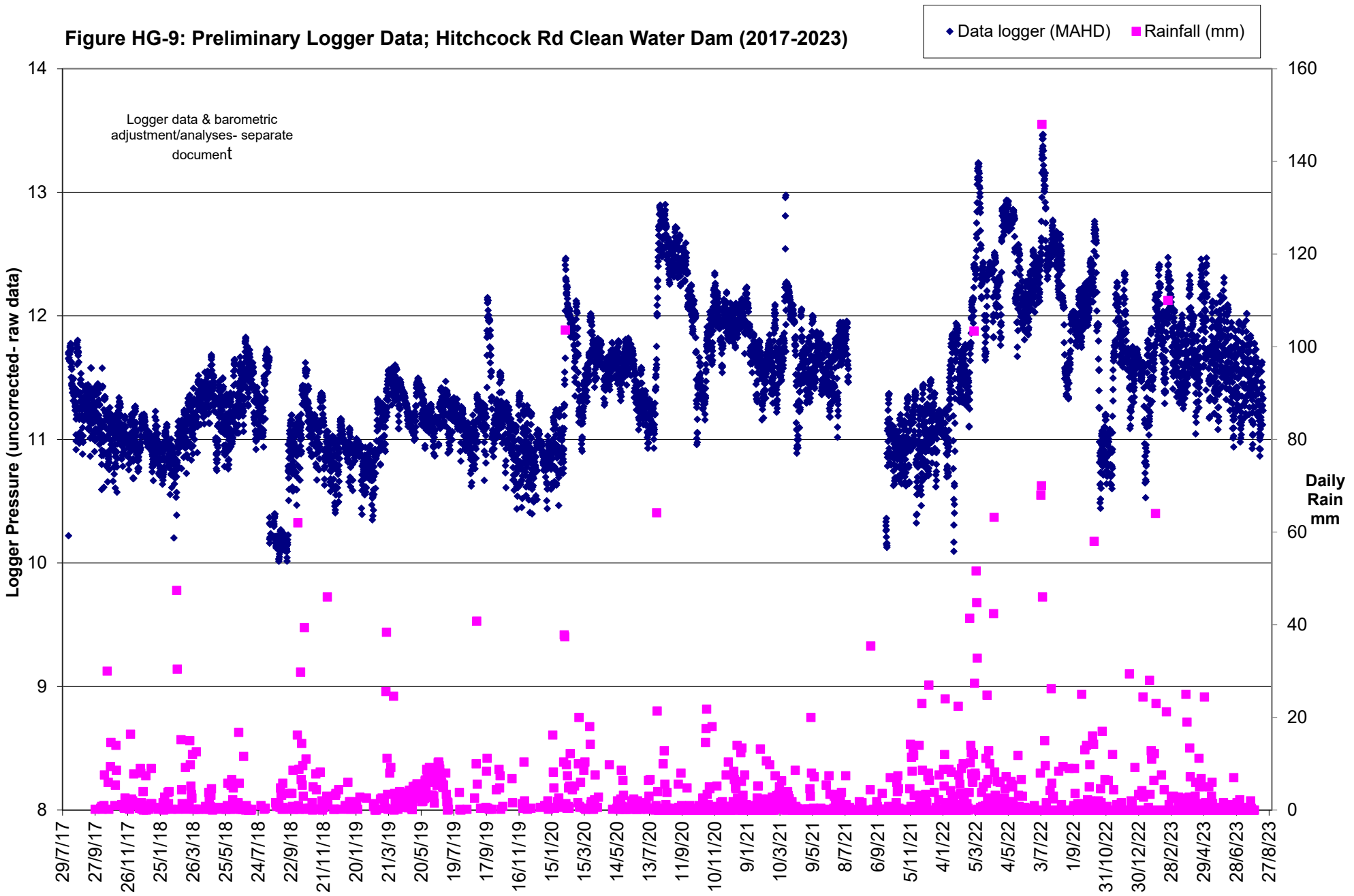


**Figure HG-10: Preliminary Logger Data; Por167 Dam (2017-2020)**

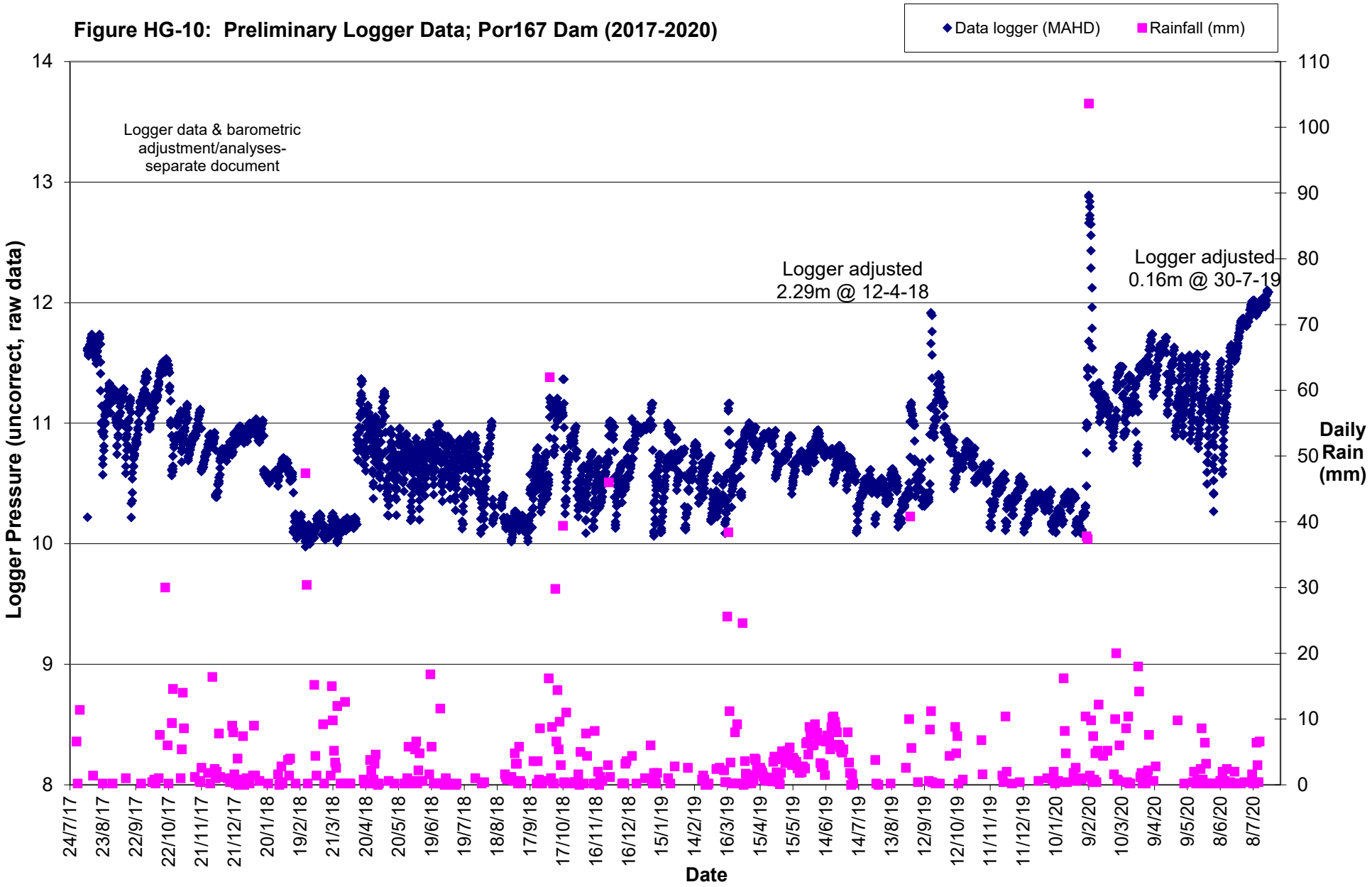


Figure HG-11: Maroota; Monthly Groundwater Levels at PF-1,2,3 (2017 to 2023)
4378 ONorthern Rd

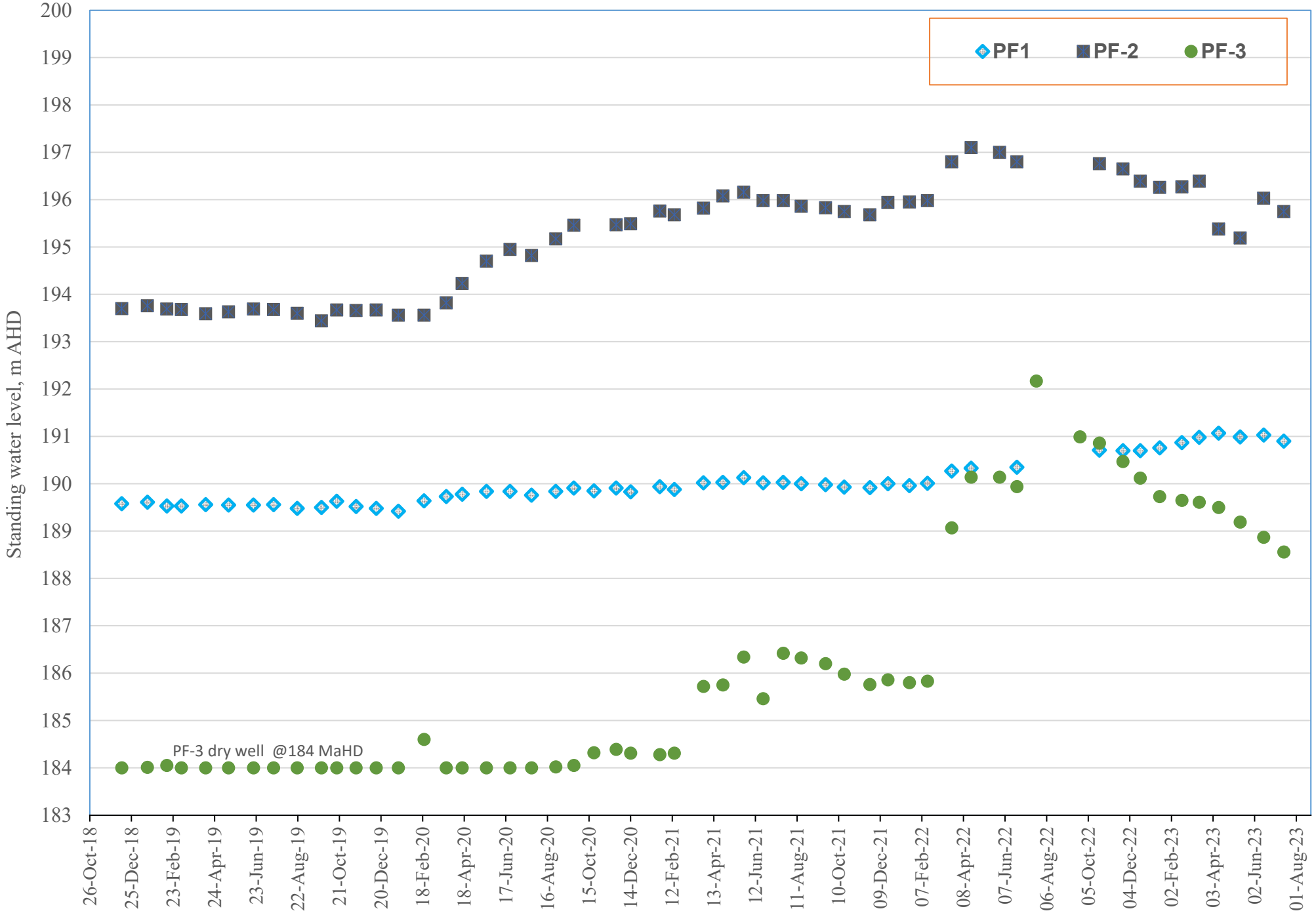


Figure HG-11A: Maroota; Monthly Groundwater Levels- Pits 8 & 13, & 4378 ONRd (2017 to 2023)

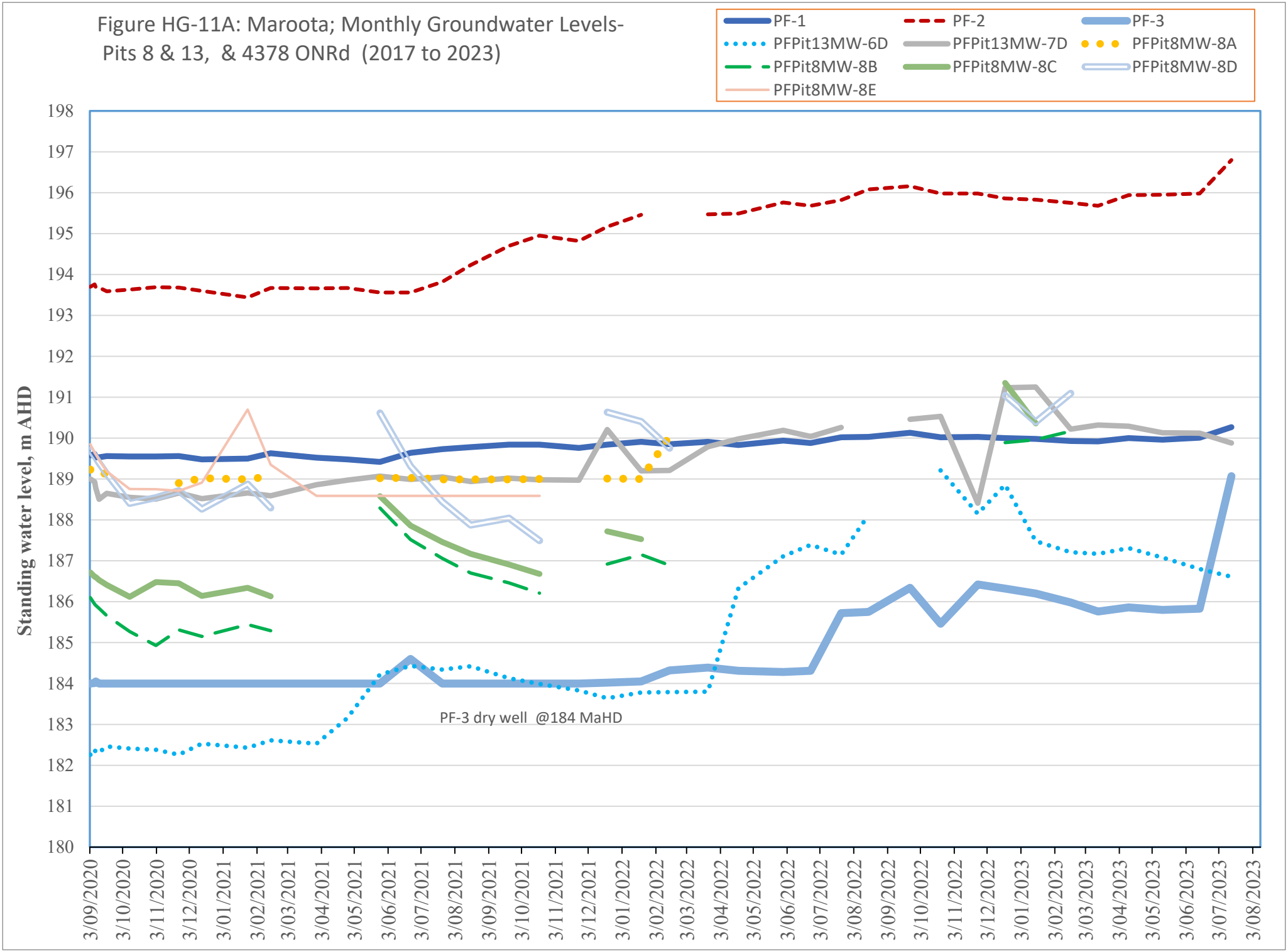
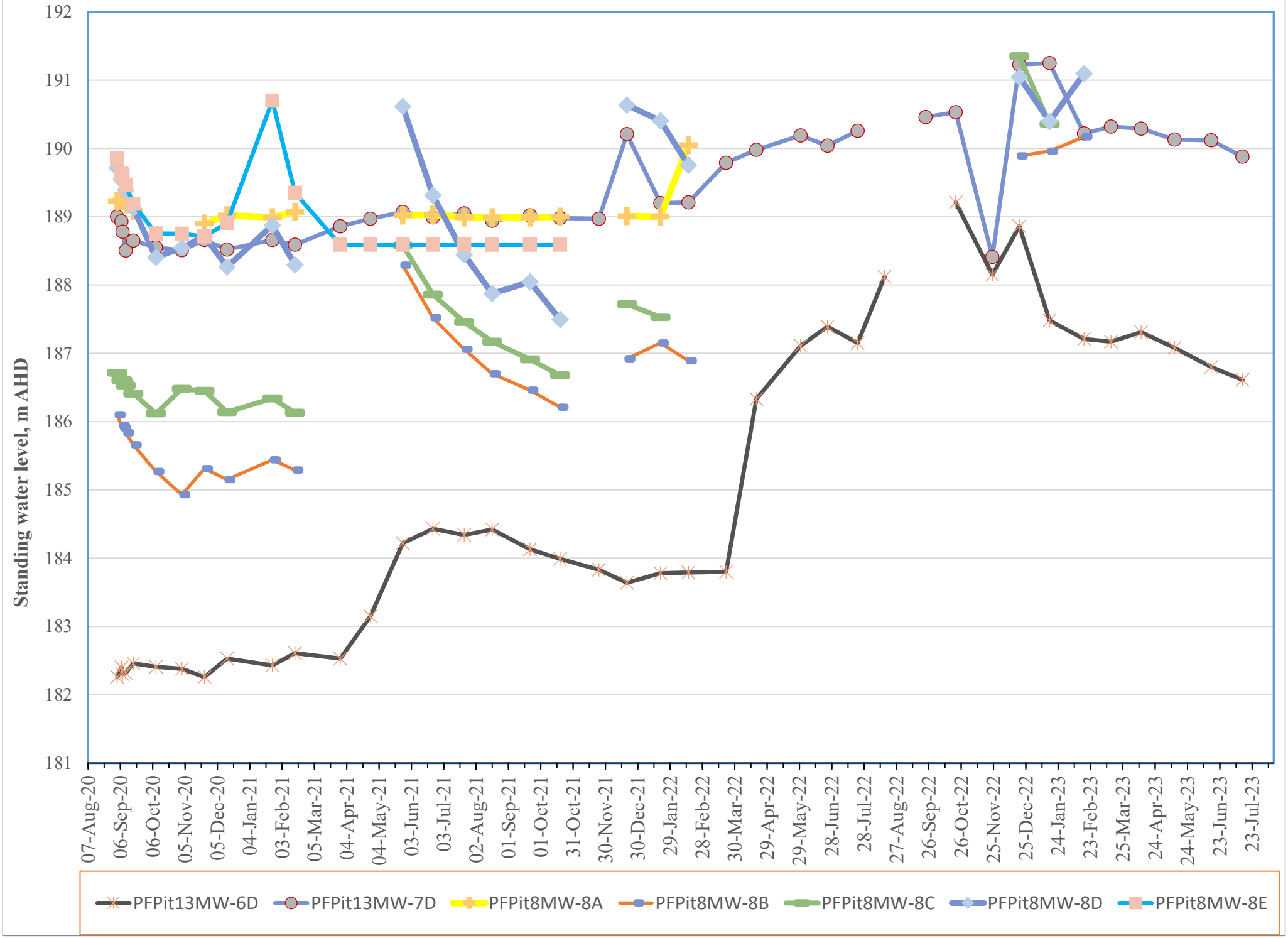


Figure HG-11B: Maroota; Monthly Groundwater Levels- Pits 8 & 13 (2017 to 2023)



# TABLES

## Table 1: Maroota Climate (2021-2023)

| Month | PFF Rainfall (mm, monthly) | BOM Maroota Rainfall (mm, monthly) | Comments |
|---|---|---|---|
| July '2021 | 14 | 30.4 | |
| August | 43.4 | 66.4 | |
| September | 15.4 | 23 | |
| October | 24.6 | 47.4 | |
| November | 123.4 | 183.6 | |
| December | 69.6 | 129.3 | |
| January | 83.4 | 112 | |
| February | 171.8 | 250.6 | |
| March | 373.2 | 581.2 | |
| April | 151.4 | 115.8 | |
| May | 52.5 | 87.6 | |
| June '2022 | 2.6 | 6.2 | |
| Total (yr) | 1125.3 | 1633.5 | Above Average annual rainfall |
| July '2022 | NA | 407.8 | BOM station is |
| August | | 28 | close to PFF site |
| September | | 87.2 | |
| October | | 133.2 | |
| November | | 26.4 | |
| December | | 45.4 | |
| January | | 196 | |
| February | | 147 | |
| March | | 57.4 | |
| April | | 85.2 | |
| May | | 18 | |
| June '2023 | | 14.6 | |
| Total (yr) | | 1246.2 | Above Average annual rainfall |

**Note:**
**Data source: PFF Weather station**
**BOM (Station ID: 067014 Old Telegraph Road, Maroota)**

**Table 2A: Monitoring Wells, Water Level Gauging & Chemistry (15 & 16 August 2023)**
**Maroota - Hitchcock Road**

| Sample ID | SWL (m btoc) 15 & 16 August 2023 | PVC Stickup * | BOH (mbgl) | Ground RL | RL (TOC) * | Reduced SWL (mAHD) 15 & 16 August 2023 | Co-ordinates | pH | EC (uS/cm) | DO (%) | DO (mg/L) | Redox (mV) | Temp (°C) | Aquifer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Existing Wells (new site)** | | | | | | | | | | | | | | |
| PF-1* | **12.08** | 0.93 | 19 | 201.97 | 202.9 | 190.82 | 313919.48 & 6294505.13 | NA | NA | NA | NA | NA | NA | deep sandstone |
| PF-2* | **5.4** | 0.9 | 13.28 | 200.1 | 201 | 195.60 | 313950.78 & 6294789.93 | NA | NA | NA | NA | NA | NA | maroota sand |
| PF-3 | **30.97** | 0.75 | 32.2 | 218.45 | 219.2 | 188.23 | 314159.95 & 6295046.84 | 3.99 | 242 | 15 | 1.51 | 230 | 17.5 | deep sandstone |
| **Existing Monitoring Wells** | | | | | | | | | | | | | | |
| PF214MW-1 | **4.73** | 0.8 | 18 | 184.45 | 185.26 | 180.53 | 313286.41 & 6294508.34 | 3.86 | 180 | 34 | 3.2 | 212 | 16.6 | deep sandstone |
| PF167MW-1 | **4.1** | 0.3 | 23.8 | 187.85 | 187.95 | 183.85 | 313190.79 & 6294816.05 | 4.33 | 154 | 12 | 1.16 | 136 | 17.3 | deep sandstone |
| PF166MW-1 | **9.79** | 0.55 | 11.8 | 209.78 | 210.35 | 200.56 | 313293.61 & 6295256.65 | 3.94 | 128 | 42 | 4.01 | 188 | 18 | maroota sand |
| PFL2HitchMW-1 (note 1) | **34.43** | -0.02 | 43.5 | 225.13 | 225.3 | 190.87 | 313810.71 & 6295241.46 | 3.68 | 320 | 74 | 6.9 | 191 | 18.2 | deep sandstone |
| **New Monitoring Wells (May 2017)** | | | | | | | | | | | | | | |
| PF167 MW-2D | **27.33** | 0.6 | 29.4 | 209.28 | 209.9 | 182.57 | 313438.92 & 6295492.65 | 4.43 | 144 | 63 | 6.2 | 199 | 16.7 | deep sandstone |
| PF167 MW-2s | **4.62** | 0.7 | 5.1 | 209.3 | 210.00 | 205.38 | 313439.64 & 6295494.49 | 3.77 | 231 | 68 | 6.7 | 205 | 15.8 | maroota sand |
| PF167 MW-3D | **12.16** | 0.75 | 23 | 197.93 | 198.67 | 186.51 | 313545.67 & 6295186.86 | 3.92 | 138 | 78 | 7.8 | 107 | 15.9 | deep sandstone |
| PF166 MW-4D | **6.81** | 0.5 | 15.5 | 192.93 | 193.39 | 186.58 | 313727.56 & 6294836.89 | 5.34 | 162 | 43 | 4.2 | 158 | 16.3 | deep sandstone |
| PF166 MW-4s | **7.00** | 0.5 | 8 | 192.93 | 193.44 | 186.44 | 313725.86 & 6294836.93 | 4.41 | 147 | 20 | 2.04 | 178 | 15.6 | maroota sand |

Notes:

SWl= standing water level — Water level gauging undertaken by D.Parisotto (E2W) using an acoustic water level probe

BOH= bottom of well — *TOC= top of 50mm PVC casing (reference point for water level gauging)

E2W Field parameters measured by D.Parisotto on 15 & 16 August 2023 during water sampling (pH, EC, DO, Eh and temperature using YSI professional series hired from AES)

Redox (Eh mV, based on Ag/AgCl electrode) and conversion from Orp (mv) to Redox by adding 200 MV

## Table 2B: Monitoring Well Details & Water Table Gauging at Pits 8 & 13 (15 & 16 August 2023)

**Maroota - Hitchcock Road & Pits 8 & 13 Area**

| Sample ID | SWL (btoc) 15 & 16 August 2023 | PVC Stickup * | BOH (mbgl) | RL (mTOC) m AHD | Reduced SWL (mAHD) 15 & 16 August 2023 | pH | EC (mS/cm) | DO (%) | DO (mg/L) | Redox (mV) | Temp (°C) | Aquifer | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **New Wells installed at Pit 8 Floor during September 2020** | | | | | | | | | | | | | |
| PFPIT8MW-8A | NA | 1.15 | 7.7 | 196.64 | | | | | | | | Maroota Sand | Pit8 backfilled & well decommissioned |
| PFPIT8MW-8B | NA | 1.15 | 10.3 | 193.77 | | | | | | | | Maroota Sand | Pit8 backfilled & well decommissioned |
| PFPIT8MW-8C | NA | 1.28 | 8.8 | 194.5 | | | | | | | | Maroota Sand | Pit8 backfilled & well decommissioned |
| PFPIT8MW-8D | NA | 1 | 7.3 | 184.45 | | | | | | | | Maroota Sand | Pit8 backfilled & well decommissioned |
| PFPIT8MW-8E | NA | 0.95 | 4.5 | 187.85 | | | | | | | | Maroota Sand | Pit8 backfilled & well decommissioned |
| **New Wells installed outside of Pits 8 & 13 during August 2020** | | | | | | | | | | | | | |
| **Sample ID** | **SWL (btoc) 15 & 16 August 2023** | **PVC Stickup m** | **BOH (mbgl)** | **RL (TOC)** | **Reduced SWL (mAHD) 15 & 16 August 2023** | **pH** | **EC (mS/cm)** | **DO (%)** | **DO (mg/L)** | **Redox (mV)** | **Temp (°C)** | **Aquifer** | **Comments** |
| PFPIT8MW-6D | 23.91 | 0.52 | 38.8 | 209.78 | 185.87 | 4.51 | 173 | 30 | 2.9 | 113 | 17.1 | deep sandstone | clear water |
| PFPIT8MW-6s | dry | 0.42 | 10.8 | 225.13 | NA | | | | | | | Maroota Sand | dry well |
| PFPIT13MW-7D | 24.16 | 0.5 | 42.5 | 225.13 | 200.97 | 3.61 | 381 | 48 | 4.6 | 227 | 18.5 | deep sandstone | cloudy brown water |

Notes:
NA= not available
SWl= standing water level
BOH= bottom of well
E2W Field parameters measured by D.Parisotto on 15 & 16 August 2023 during water sampling (pH, EC, DO, Eh and temperature using YSI professional series hired from AES)
Redox (Eh mV, based on Ag/AgCl electrode) and conversion from Orp (mv) to Redox by adding 200 MV

## Table 3A: Summary of Existing Monitoring Wells (Hitchcock Road, 2023)

PF Formation at Maroota

| | PF167MW1 | PF166MW1 | PFL2HitchMW1 | PFP214MW1 | Lot 198PB1 | Lot 198PB3 | Lot 198PB2 | Por 167 Spring |
|---|---|---|---|---|---|---|---|---|
| **Ground Elevation (mAHD)** | **187.64** | **209.94** | **226** | **186.5** | | | | **184** |
| **Lot & DP** | Lot 167 DP 752039 | Lot 2 DP570933 | Lot 1 DP109 1018 | Lot 167 DP 752039 | Lot 198 DP 752025 | Lot 198 DP 752025 | Lot 198 DP 752025 | Lot 167 DP 752039 |
| **License No** | GW100649 | GW104410 | GW110746 | GW110747 | GW101528 | GW101527 | 10WAL1093550 | GW104614 |
| **Alocation (ML/yr)** | | | | | Combined 56 ML /yr | | | 44 ML/year |
| **Approval Number** | | | | | 10AL109354 | 10WA109355 | GW101527 | 10WA114809 |
| Groundwater Resource | Sydney Central Sandstone | Maroota Tertiary Sand | Sydney Central Sandstone | Sydney Central Sandstone | Sydney Central Sandstone | Sydney Central Sandstone | Sydney Central Sandstone | Maroota Tertiary Sand |
| Date Installed | 1996 | **1998** | **2009** | **2009** | **1998** | **October 2019** | **1998** | **1995** |
| Drilled Depth (m bgl) | 23.8 | 11.8 | 43.5 | 18 | 150 | 150 | 138 | 4 |
| Well Screen Interval (mbgl) | 20-23 ? | 4.9-10.9 | 31- 43 | 11.5- 17.5 | 23.4 - 140 | 50 to 150 (open hole) | 35.5-140 | |
| Aquifer Permeability (K m/day) | 0.1 L/sec | NA | 0.1 L/sec | 0.1 L/sec | 0.5 L/sec | 1.6 L/sec | 2.6 L/sec | 10 L/sec |
| Water Levels (mbgl) | 4 | 10.57 | 36 | 5.6 | 20.58 | 48 | 35.36 | (~4 m) 180 MAHD |
| Water Type | Na-Cl | Na-SO4 | Na-Cl | Na-Cl | Na-Cl | Na-Cl | Na-Cl | |
| PH | 4.5 | 4 | 4 | 4.1 | 4.1 | | 5 | |
| Total Dissolved Solids, TDS | 100 | 100 | 140 | 120 | 100 | | 150 | |
| Data Logger | Yes | Yes | Yes | Yes | No | No | No | No |
| Water Bearing Zones (mbgl) | 6 to 8m | Na | Na-Cl | 11.5-12 | 15.5-18.5m , 26-27m, 108 -114.5m, 188.5-121m | 101 to 102m, 145 to 146m | 56.5-57.2m, 74-75.55m | |
| Geology | 0-2m Sand 2-10m Wet gravel 10-23.8 m Weathered Sandstone | 0- 0.7m Sand 0.7-6.5m Sandy Clay 6.5- 11.5m Sand 11.5 -11.8m weathered sandstone | 0- 18.5m Clay Sandy 18.5- 24.5m qtz gravel 24- 34m Clay & gravel 34 -43.5m weathered sandstone & clay | 0- 0.5m Sandy 0.5- 18m sandstone - soft with clay | 0-150 m Sandstone. Some interbedded Shale; 44-45m, 51-53.5m, 114.5-188.5m, 134.4-135m | Sandstone: 0-31 m, & 62-150m Shale; 31-62m | 0-138 m Sandstone. Some interbedded Ironstone; 48.5-49m, Shale; 49-50.5m, 58.5-60m | Inferred sand/gravels (Maroota) |
| Comments | located on south west boundary | located on west boundary | located on east boundary | located on south boundary | Allocation is Under utilised. Pumping bore and supply to sand wash plant | Cased to 50m, open hole below 50 to 150m | Pumping bore and supply to sand wash plant. Treated for Fe floc- not sampled for 2 yrs. Bore replaced bhy PB-3 at concrete wash plant | Allocation is Under utilised. Former agricultural use- spring & unlined dam. Previous data logging (URS, 1996-2012) of pond levels |



Prepared By: Earth2Water Pty Ltd
Checked By: DP

## Table 3B: Summary of New Monitoring Wells (Hitchcock Road; 2023)

PF Formation at Maroota

| | PF166MW-2S | PF166MW-2D | PF166MW-3D | PF167MW-4D | PF167MW-4S | PF167MW-5D # |
|---|---|---|---|---|---|---|
| **Ground Elevation (mAHD)** | **210** | **210.09** | **198.67** | **193.39** | **193.44** | 181.54 |
| **Lot & DP** | Lot 1 DP 570966 | Lot 1 DP 570966 | Lot 1 DP1013943 | Lot 167 DP 752039 | Lot 167 DP 752039 | Lot 214 DP 752039 |
| **Groundwater Resource** | Maroota Tertiary Sand | Sydney Central Sandstone | Sydney Central Sandstone | Sydney Central Sandstone | Maroota Tertiary Sand | Sydney Central Sandstone |
| **Date Installed** | **May-17** | **May-17** | **May-17** | **May-17** | **May-17** | 1/05/2017 (#Feb 2018) |
| Drilled Depth (m bgl) | 8.5 m | 29.4 m | 23 m | 15.5 m | 8 m | 9.5 m |
| Well Screen Interval (mbgl) | 4.9 -7.9 m | 26.4 -29.4 m | 20 -23 m | 11.5 -15.5 m | 5 -8 m | 6.4 -9.4 m |
| Aquifer Permeability (K m/day) | 6.9 * E-01 m/sec | Na | 4.57 * E-02 m/sec | 1.6 * E-01 m/sec | 7.18 * E-02 m/sec | 4.95 * E-02 m/sec |
| Water Levels (mbgl) | 4 | 25 | 14 | 8.5 | 7 | 2 |
| **Water Type** | Na-Cl | Na-Cl | Na-Cl | Na-Cl | Ca-SO4 | K-Cl |
| PH | 5.39 | 6.99 | 5.63 | 5.85 | 5.85 | 5.82 |
| Total Dissolved Solids, TDS | 384 | 549 | 346 | 2170 | 736 | 1140 |
| Water Bearing Zones (mbgl) | 4 to 5.5m | 4 to 5.5m | Na | 7 to 8 m | 7 to 8 m | Na |
| Geology | 0-4m: Sandy Clay<br>4- 5.5m: Sand<br>5.5 -8.5m: Sandy Clay | 0-4m: Sandy Clay<br>4-5.5m: Sand<br>5.5 -8.5m: Sandy Clay<br>8.5 -29.4m: Sandstone | 0-23m: Sandstone | 0- 7.1m: Sandy Silt & Clay<br>7.1 -15.5m: Sandstone | 0- 7.1m: Sandy Silt & Clay<br>7.1 -8m: Sandstone | 0 -9.5m: Sandstone |
| Comments | located on site entrance | located on site entrance | located next to extraction pit | located near Por 167 Dam | located near Por 167 Dam | located on southern extraction area |



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Checked By: DP

## Table 3C: Summary of New Monitoring Wells at Hitchcock Road- Pits 8 & 13 (2023)

PF Formation- Pit 8 Assessment of Extraction Depths

| | PFPit8 MW-6D | PFPit8 MW-6s | PFPit13 MW-7D | PFPit8 MW-8A | PFPit8 MW-8B | PFPit8 MW-8C | PFPit8 MW-8D | PFPit8 MW-8E | PFPit8 MW-8F | PFPit8 MW-8G |
|---|---|---|---|---|---|---|---|---|---|---|
| **Date Well Installed** | **Aug-20** | **Aug-20** | **Aug-20** | **Sep-20** | **Sep-20** | **Sep-20** | **Sep-20** | **Sep-20** | **Sep-21** | **Sep-21** |
| **Ground Elevation (mAHD)** | **209.53** | **209.63** | **213.48** | **196.64** | **193.75** | **194.53** | **192.82** | **192.84** | **195.61** | **196.12** |
| **Base of Bore (m AHD)** | **169.53** | **197.13** | **170.98** | **188.94** | **182.75** | **185.03** | **184.62** | **187.84** | **185.41** | **188.02** |
| **Borehole Status** | Groundwater Intersected | Dry Well (Above SWL) | Groundwater Intersected | Dry or Perched | Groundwater Intersected | Groundwater Intersected | Dry or Perched | Dry or Perched | Groundwater Intersected | Dry or Perched |
| **Pit 8 Extraction Guide** | **Yes** | NA | **Yes** | NA | **Yes** | **Yes** | NA | NA | **Yes** | NA |
| **Lot & DP** | Lot 2 DP223323 | Lot 2 DP223323 | Lot 1 DP34599 | Lot 1 DP223323 | Lot 1 DP223323 | Lot 1 DP223323 | Lot 1 DP223323 | Lot 1 DP223323 | Lot 1 DP223323 | Lot 1 DP223323 |
| **Groundwater Resource** | Sydney Central Sandstone | Maroota Tertiary Sand | Sydney Central Sandstone | Maroota Tertiary Sand | Maroota Tertiary Sand | Maroota Tertiary Sand | Maroota Tertiary Sand | Maroota Tertiary Sand | Maroota Tertiary Sand | Maroota Tertiary Sand |
| **Aquifer Characteristics** | Regional | Regional | Regional | Perched- spillway | Regional | Regional | Perched- near Dam | Perched- near Dam | Regional | Regional |
| **Drilled Depth (m bgl)** | 40 | 12.5 | 42.5 | 7.7 | 11 | 9.5 | 8.2 | 5 | 10.2 | 8.1 |
| **Well Screen Interval (mbgl)** | 32.8 -38.8m | 4.8 - 10.8m | 36.5 - 42.5 m | 4.7 - 7.7 m | 7.3 - 10.3 m | 5.8 - 8.8 m | 5.8 - 7.3 m | 3.1 - 4.6 m | 7.2 - 10.2 m | 5.1 - 8.1 m |
| **Permeability or Yield** | Low (<0.2 L/sec) | NA | Low (<0.2 L/sec) | Low-moderate | Low-moderate | Low-moderate | Low-moderate | Low-moderate | Low-moderate | Low-moderate |
| **Initial Water Levels (mbgl)** | 27 | dry | 25 | 7.7 | 8 | 8 | 4 | 3 | 9 | dry |
| **Water Bearing Zones (mbgl)** | 32 m & 38 m | NA, dry | 40 m | 7 - 7.7 m | 8- 11 m | 8- 9 m | 4- 6.5 m | 3 -5 m | 2.5 - 10.2 m | 2.5 - 8.1 m |
| **Local Geology** | 0- 28m: Interbedded Sand, silt, gravel, & clay-brown. 28-40m: Sandstone, brown. weathered some pebbles & ironstone | 0- 12.3 m: Interbedded Sand, silt, gravel, brown 12.3m hard layer (sandstone, Fe) | 0-1m: Clayey Silt, brown. 1- 42.5m: Interbedded Sandstone, Siltstone & Shale- brown to grey | 0-0.5m: Sandy Clay, brown 0.5- 7.1m: Interbedded Sands, Silt & Clay, brown | 0- 0.7m: Sandy Clay, brown 0.7 -11m: Interbedded Sand,Silt & Gravel, minor clay & ironstone, brown | 0- 9.2m: Interbedded Sand, Silt & Gravel, minor clay 9.2m: Sandstone, hard | 0- 6.5m: Interbedded Sand, Silt & Gravel, minor clay 6.5 -8.2m: Sandstone, brown & weathered | 0- 5m: Interbedded Sand, Silt & Gravel, minor clay, brown | 0- 10.2m: Interbedded Sand, Silt & Gravel, minor clay, brown | 0- 8.1m: Interbedded Sand, Silt & Gravel, minor clay, red/brown with multiple hard ironstone layers |
| **Comments** | Located rear of firestation & residence | Located rear of firestation & residence | Located rear of commercial property/aggregate supplier | Located on floor of Pit 8-north end | Located on floor of Pit 8-north | Located on floor of Pit 8-north east corner | Located on floor of Pit 8-south end near pond | Located on floor of Pit 8-south end near pond | Located on floor of Pit 8-north end near MW-8a | Located on floor of Pit 8-north end near MW-6s. Difficult drilling to ironstone layers |
| **Well Status** | Active monitoring | Active (dry well) | Active monitoring | All wells decommissioned in late 2022 and early 2023 due to backfilling of Pit 8 quarry | | | | | | |

Legend:

**New groundwater monitoring wells installed in August & September 2020 to guide the Pit Shell Plan.**

**Additional groundwater monitoring wells (2) installed on 22 Sept 2021 to assess gw flow patterns & verify regional WLs**

NA **Shallow well used to verify high water levels/buffer zone and to identify perched water system**

Refer to borelog/well cvonstruction records for details of geology and well construction



Prepared By: Earth2Water Pty Ltd
Checked By: DP

# Tables 3-1 to 3-2: Maroota Hitchcock Road- Water Analyses (1999 to 2023)

**Table 3-1** **Bore PF167MW1 Chemical Analyses Summary**

| Date | | 2.6.99 | 8.9.99 | 21.12.99 | 9.3.00 | 28.11.00 | 21.6.01 | 19.12.01 | 26.6.02 | 23.1.03 | 9.7.03 | 30.1.04 | 29.6.04 | 15.12.04 | 22.6.05 | 19.1.06 | 6.7.06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 4.43 | 4.49 | 4.21 | 4.93 | 4.28 | 4.61 | 4.98 | 4.52 | 4.54 | 5.15 | 4.31 | 4.38 | 4.68 | 5.42 | 4.32 | 4.27 |
| Electrical Conductivity, EC | uS/cm | 164 | 190 | 201 | 179 | 184 | 170 | 188 | 215 | 199 | 204 | 225 | 221 | 240 | 215 | 205 | 199 |
| Total Dissolved Solids, TDS | mg/L | 118 | 90 | 105 | 115 | 207 | 120 | 108 | 121 | 101 | 116 | 157 | 110 | 143 | 137 | 141 | 119 |
| Calcium, Ca | mg/L | 3 | 3 | 5 | 6 | 3 | 6 | 6 | 5 | 3 | 4 | 4 | 5 | 5 | 5 | 4 | 4 |
| Magnesium, Mg | mg/i. | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| Sodium, Na | mg/L | 16 | 18 | 16 | 15 | 18 | 16 | 18 | 25 | 20 | 19 | 22 | 23 | 26 | 28 | 25 | 23 |
| Potassium, K | mg/L | 2 | 2 | 3 | 3 | 3 | 5 | 4 | 5 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| Bicarbonate, HCO3 | mg/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | <1 | <1 | <1 | 2 | 1 | <1 |
| Sulphate, SO4 | mgIL | 9 | 11 | 35 | 32 | 16 | 15 | 15 | 14 | 9 | 13 | 12 | 10 | 13 | 13 | 10 | 6 |
| Chloride, Cl | mg/L | 36 | 11 | 35 | 32 | 35 | 36 | 47 | 58 | 4 | 48 | 51 | 53 | 50 | 56.6 | 57.4 | 53.1 |
| Oil and Grease | mg/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | | <5 | <5 | <5 | <5 | <5 |

**Table 3-1 (Con't)** **Bore PF167MW1 Chemical Analyses Summary**

| Date | | 5.7.07 | 3.7.08 | 3.7.09 | 16.6.10 | 22.6.11 | 20.6.12 | 19.6.13 | 8.8.14 | 30.6.15 | 10.8.16 | 17.7.17 | 14.8.18 | 2.9.19 | 5.8.20 | 17.8.21 | 15.9.22 | 16/08/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 4.88 | 5.29 | 4 | 4.3 | 5.3 | 4.39 | 4.18 | 4.6 | 4.48 | 4.54 | 4.67 | 3.83 | 5.2 | 4.28 | 5.09 | 5.69 | 5.43 |
| Electrical Conductivity, EC | uS/cm | 188 | 161 | 177 | 190 | 170 | 174 | 211 | 205 | 150 | 188 | 151 | 210 | 262 | 160 | 153 | 73 | 169 |
| Total Dissolved Solids, TDS | mg/L | 76 | 100 | 104 | 111 | 101 | 112 | | 94 | 70 | 111 | 99 | 113 | 137 | 112 | 104 | 48 | 127 |
| Calcium, Ca | mg/L | 2 | 6 | 5 | 3 | 4 | 7 | <1 | 5 | 5 | 5 | 4 | 4 | 2 | 3 | 5 | 1 | 4 |
| Magnesium, Mg | mg/i. | 3 | 5 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 5 | 2 | 4 |
| Sodium, Na | mg/L | 16 | 13 | 14 | 15 | 18 | 12 | 22 | 19 | 12 | 17 | 14 | 21 | 16 | 16 | 14 | 7 | 14 |
| Potassium, K | mg/L | 2 | 4 | 4 | 2 | 4 | 4 | 2 | 3 | 2 | 3 | 3 | 4 | 22 | 3 | 4 | 3 | 4 |
| Bicarbonate, HCO3 | mg/L | <1 | <1 | <1 | 2 | 2.4 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 4 | <1 | <1 | 4 | 4 |
| Sulphate, SO4 | mgIL | 10 | 30 | 22.6 | 17.1 | 18 | 28 | 1 | 19 | 30 | 22 | 24 | 17 | 10 | 21 | 27 | 16 | 26 |
| Chloride, Cl | mg/L | 36.1 | 26.4 | 34.8 | 39.9 | 29 | 22 | 42 | 42 | 15 | 32 | 28 | 40 | 54 | 27 | 24 | 9 | 26 |
| Oil and Grease | mg/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <8 | <5 | <5 |

**Table 3-2** **Bore PF166MW1 Chemical Analyses Summary**

| Date | | 1.6.99 | 8.9.99 | 21.12.99 | 9.3.00 | 29.11.00 | 21.6.01 | 19.12.01 | 26.6.02 | 23.1.03 | 9.7.03 | 30.1.04 | 29.6.04 | 15.12.04 | 22.6.05 | 19.1 .06 | 6.7.06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 4.18 | 4.19 | 4.13 | 4.14 | 4.31 | 4.19 | 4.63 | 4.48 | 4.82 | 7.86 | 4.39 | 4.27 | 4.06 | | | |
| Electrical Conductivity, EC | uS/cm | 222 | 240 | 230 | 214 | 266 | 194 | 228 | 219 | 203 | 221 | 193 | 235 | 203 | DRY | DRY | DRY |
| Total Dissolved Solids, TDS | mg/L | 118 | 108 | 137 | 170 | 460 | 115 | 210 | 280 | 128 | 134 | 204 | 280 | 120 | | | |
| Calcium, Ca | mg/L | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | <1 | 1 | 1 | | | |
| Magnesium, Mg | mg/L | 6 | 6 | 6 | 5 | 6 | 5 | 6 | 6 | 5 | 4 | 5 | 5 | 4 | | | |
| Sodium, Na | mg/L | 26 | 23 | 23 | 22 | 29 | 21 | 22 | 24 | 19 | 20 | 18 | 19 | 19 | | | |
| Potassium, K | mg/L | <1 | <1 | 1 | 1 | 1 | 1 | 2 | 1 | <1 | <1 | <1 | 1 | 1 | | | |
| Bicarbonate, HCO3 | mg/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | <1 | <1 | <1 | | | |
| Sulphate, SO4 | mgIL | 1 | 7 | 1 | 1 | 16 | 2 | 1 | 2 | <1 | <1 | 2 | <1 | 2 | | | |
| Chloride, Cl | mg/L | 58 | 49 | 51 | 52 | 58 | 49 | 58 | 61 | 46 | 50 | 47 | 44 | 36 | | | |
| Oil and Grease | mg/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 6 | <5 | <5 | 5 | <5 | | | |

**Table 3-2 (con't)** **Bore PF166MW1 Chemical Analyses Summary**

| Date | | 5.7.07 | 3.7.08 | 3.7.09 | 16.6.10 | 22.6.11 | 20.6.12 | 19.6.13 | 8.8.14 | 30.6.15 | 10.8.16 | 17.7.17 | 14.8.18 | 15.8.19 | 5.8.20 | 17.8.21 | 15.9.22 | 16/08/23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 4.76 | | 3.58 | 4.06 | 4.22 | 4.08 | 4.53 | 4.19 | 4.03 | 4.18 | 4.11 | dry | dry | 4.99 | 4.21 | 4.44 | 4.6 |
| Electrical Conductivity, EC | uS/cm | 163 | NA | 240 | 247 | 261 | 229 | 189 | 219 | 239 | 208 | 176 | | | 195 | 154 | 222 | 146 |
| Total Dissolved Solids, TDS | mg/L | 98 | | 140 | 141 | 172 | 124 | 186 | 89 | 100 | 234 | 122 | | | 247 | 105 | 117 | 119 |
| Calcium, Ca | mg/L | | | <1 | <1 | 1 | 1 | 6 | 1 | <1 | 1 | <1 | | | <1 | 1 | 1 | 2 |
| Magnesium, Mg | mg/L | | | 4 | 4 | 6 | 5 | 4 | 5 | 6 | 5 | 5 | | | 5 | 5 | 7 | 5 |
| Sodium, Na | mg/L | | | 26 | 24 | 24 | 19 | 15 | 22 | 26 | 22 | 21 | | | 21 | 16 | 22 | 10 |
| Potassium, K | mg/L | | | 2 | 2 | 3 | 3 | 4 | 1 | 1 | 2 | 2 | | | 2 | 2 | 3 | 2 |
| Bicarbonate, HCO3 | mg/L | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | | | 2 | <1 | <1 | 2 |
| Sulphate, SO4 | mgIL | | | 2.21 | 1.77 | 1 | 1 | 21 | 2 | 1 | 2 | 2 | | | 2 | 1 | 2 | 14 |
| Chloride, Cl | mg/L | | | 49.1 | 56.3 | 53 | 43 | 32 | 46 | 38 | 40 | 38 | | | 43 | 33 | 40 | 24 |
| Oil and Grease | mg/L | | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | | | (13#) <5 | <5 | <5 | <5 |

Note:
Groundwater and surface water samples collected by Earth2Water Pty Ltd (15 & 16 Aug 23)
(13#) & <5 = Initial (anomalous) and resampling results of Oil/Grease on 5 & 28 August 2020, respectively



Prepared By: Earth2Water Pty Ltd
Checked By: DP

## Tables 3-3 to 3-4: Maroota Hitchcock Road- Water Analyses (2009 to 2023)

**Table 3-3** **Bore PFL2HitchMW1 Chemical Analyses Summary**

| Date | | 3.7.2009 | 16.6.2010 | 22.6.2011 | 20.6.2012 | 20.6.2012 | 19.6.2013 | 8.08.2014 | 30.06.2015 | 10.8.2016 | 17.7.2017 | 14.8.2018 | 15.8.2019 | 5.8.2020 | 17.8.2021 | 15.9.2022 | 16.8.2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 3.96 | 4.1 | 4.1 | 4.03 | 4.03 | 4.18 | 3.99 | 3.94 | 4.19 | 4.02 | 3.96 | 7.11 | 5.16 | 3.91 | 4.09 | 4.28 |
| Electrical Conductivity, EC | uS/cm | 182 | 154 | 167 | 195 | 195 | 185 | 263 | 309 | 288 | 298 | 307 | 284 | 271 | 300 | 274 | 346 |
| Total Dissolved Solids, TDS | mg/L | 84 | 88 | 110 | 99 | 99 | 150 | 107 | 146 | 230 | 147 | 167 | 172 | 160 | 173 | 126 | 192 |
| Calcium, Ca | mg/L | 1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 2 | <1 | <1 | <1 |
| Magnesium, Mg | mg/L | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 4 |
| Sodium, Na | mg/L | 19 | 16 | 22 | 22 | 22 | 22 | 32 | 44 | 36 | 37 | 37 | 38 | 34 | 37 | 36 | 47 |
| Potassium, K | mg/L | 2 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate, HCO3 | mgIL | <1 | < | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 9 | 2 | <1 | <1 | <1 |
| Sulphate, SO4 | mg/L | 7.88 | 4.06 | 5 | 1 | 1 | 4 | 6 | 6 | 6 | 5 | 6 | 6 | 5 | 5 | 5 | 4 |
| Chloride, Cl | mg/L | 40.3 | 36.9 | 32 | 43 | 43 | 43 | 62 | 59 | 63 | 70 | 76 | 67 | 64 | 82 | 75 | 103 |
| Oil and Grease | mgJL | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |

**Table 3-4** **Bore PFP214MW1 Chemical Analyses Summary**

| Date | | 3.7.2009 | 16.6.2010 | 22.6.2011 | 20.6.2012 | 19.6.2013 | 8.08.2014 | 30.06.2015 | 10.8.2016 | 17.7.2017 | 14.8.2018 | 15.8.2019 | 5.8.2020 | 17.8.2021 | 15.9.2022 | 16.8.2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 4.19 | 4.16 | 4.31 | 4.27 | 5.7 | 4.22 | 4.07 | 4.05 | 4.34 | 3.65 | 4.84 | 4.36 | 4.14 | 4.32 | 4.36 |
| Electrical Conductivity, EC | uS/cm | 168 | 164 | 158 | 179 | 198 | 258 | 251 | 247 | 253 | 228 | 202 | 206 | 186 | 197 | 211 |
| Total Dissolved Solids, TDS | mg/L | 100 | 96 | 88 | 103 | 124 | 108 | 118 | 135 | 129 | 114 | 108 | 131 | 103 | 86 | 120 |
| Calcium, Ca | mg/L | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Magnesium, Mg | mg/L | 6 | 5 | 4 | 6 | 7 | 10 | 11 | 10 | 8 | 9 | 6 | 7 | 6 | 6 | 6 |
| Sodium, Na | mg/L | 18 | 15 | 18 | 17 | 21 | 23 | 21 | 17 | 14 | 16 | 17 | 18 | 20 | 20 | 20 |
| Potassium. K | mg/L | 1 | <1 | 1 | <1 | 2 | <1 | <1 | 1 | 1 | 2 | <1 | 1 | 1 | 1 | 1 |
| Bicarbonate, HCO3 | mg/L | <1 | <1 | <1 | <1 | 2 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Sulphate, SO4 | mg/L | 1.9 | <0.5 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | 3 |
| Chloride, Cl | mg/L | 24.3 | 23.8 | 34 | 24 | 34 | 34 | 26 | 34 | 36 | 36 | 37 | 42 | 50 | 45 | 50 |
| Oil and Grease | mg/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |

Groundwater and surface water samples collected by Earth2Water Pty Ltd (15 & 16 Aug 23)

## Tables 3-5 to 3-6: Maroota Hitchcock Road- Water Analyses (1999 to 2023)

**Table 3-5** **Bore L198PB1 Chemical Analyses Summary (1999-2023)**

| Date | | 1.6.99 | 8.9.99 | 21.12.99 | 9.3.00 | 28.11.00 | 21.6.01 | 19.12.01 | 26.6.02 | 23.1.03 | 9.7.03 | 30.1.04 | 29.6.04 | 15.12.04 | 22.6.05 | 19.1.06 | 6.7.06 | 5.7.07 | 3.7.08 | 3.7.09 | 16.6.10 | 22.6.11 | 20.6.12 | 19.6.13 | 8.08.14 | 30.06.15 | 10.08.16 | 17.7.17 | 14.8.18 | 15.8.19 | 5.8.20 | 17.8.21 | 16.9.22 | 17.8.2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 5.87 | 6.24 | 6.11 | 4.69 | 4.49 | 4.51 | 5.41 | 4.73 | 4.49 | 5.06 | 5 | 4.53 | 4.28 | 5.22 | 5.74 | 5.16 | NA | 4.59 | 3.94 | 4.43 | 5.52 | 5.72 | NA | 4.15 | 4.09 | 4.15 | 5.39 | 5.35 | 5.43 | 5.03 | 5.84 | 5.17 | 4.83 |
| E Conductivity, EC | uS/cm | 161 | 170 | 169 | 141 | 182 | 179 | 204 | 199 | 243 | 199 | 160 | 291 | 197 | 157 | 158 | 155 | | 144 | 174 | 163 | 170 | 170 | | 183 | 177 | 164 | 151 | 168 | 169 | 192 | 146 | 157 | 163 |
| Total Dissolved Solids, TDS | mg/l | 124 | 116 | 98 | 97 | 107 | 102 | 116 | 112 | 139 | 102 | 116 | 174 | 88 | 105 | 115 | 98 | | 85 | 83 | 88 | 102 | 99 | | 96 | 88 | 83 | 104 | 94 | 91 | 121 | 104 | 94 | 92 |
| Calcium, Ca | mg/L | 1 | <1 | 1 | 1 | 3 | 2 | 2 | 4 | 3 | 2 | 2 | 4 | 1 | 1 | 2 | 1 | | <1 | 1 | <1 | 2 | 2 | | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 1 |
| Magnesium, Mg | mg/L | 4 | 6 | 5 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 2 | 5 | 2 | 2 | 4 | 3 | | 2 | 2 | 2 | 4 | 3 | | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| Sodium, Na | mg/L | 21 | 24 | 22 | 19 | 20 | 21 | 27 | 23 | 31 | 22 | 19 | 40 | 25 | 23 | 21 | 20 | | 18 | 19 | 16 | 21 | 18 | | 20 | 20 | 18 | 18 | 19 | 20 | 23 | 21 | 20 | 20 |
| Potassium, K | mg/L | 1 | <1 | 1 | 1 | 2 | 5 | 5 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | | 1 | 2 | 1 | 2 | 2 | | 2 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 |
| Bicarbonate, HCO3 | mg/l | 13 | 29 | 22 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 | 12 | 5 | | <1 | <1 | <1 | 3.7 | 9.8 | | <1 | <1 | <1 | 3 | 7 | 5 | <1 | 3 | 1 | <1 |
| Sulphate, SO4 | mg/L | 4 | 4 | 4 | 2 | 8 | 8 | 3 | 7 | 4 | 8 | 6 | 9 | 8 | 8 | 6 | 2 | | 10 | 9.31 | 6.89 | 6 | 6 | | 9 | 7 | 8 | 6 | 9 | 8 | 8 | 7 | 9 | 8 |
| Chloride, Cl | mg/l | 39 | 35 | 36 | 36 | 40 | 49 | 60 | 58 | 64 | 49 | 43 | 83 | 42 | 47.1 | 43.4 | 43.8 | | 31.1 | 38.8 | 41.1 | 36 | 32 | | 40 | 31 | 33 | 31 | 30 | 36 | 36 | 34 | 35 | 34 |
| Oil and Grease | mg/l | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | 6 | <5 | <5 | <5 | <5 | <5 | 5 | <5 | | <5 | <5 | <5 | <5 | <5 | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <8 | <5 | <5 |

**Table 3-6A** **Bore L198PB2 Chemical Analyses Summary (1999-2023)**

| Date | | 1.6.99 | 8.9.99 | 21.12.99 | 9.3.00 | 29.11.00 | 21.6.01 | 19.12.01 | 26.6.02 | 23.1.03 | 9.7.03 | 30.1.04 | 29.6.04 | 15.12.04 | 22.6.05 | 19.1.06 | 6.7.06 | 5.7.07 | 3.7.08 | 3.7.09 | 16.6.10 | 22.6.11 | 20.6.12 | 19.6.13 | 8.08.14 | 30.6.15 | 10.8.16 | 17.7.17 | 14.8.18 | 15.8.19 | 5.8.20 | 17.8.21 | 16.9.22 | 17.8.2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 5.78 | 6.61 | 5.96 | NA | 4.8 | 5.24 | 5.99 | 6.33 | 5.96 | 4.84 | 5 | 5.78 | 5.39 | 6.43 | 5.3 | 5.46 | 4.37 | 5.25 | 4.5 | no sample | | | 5.71 | 5.93 | **no sample** | | 5.3 | 5.11 | 5.54 | No sample | | No sample | |
| E Conductivity, EC | uS/cm | 139 | 174 | 146 | NA | 152 | 130 | 141 | 151 | 146 | 162 | 160 | 136 | 156 | 133 | 126 | 122 | 195 | 135 | 130 | | | | 146 | 150 | (note 1) | (note 1) | 156 | 147 | 152 | | | | |
| Total Dissolved Solids, TDS | mg/L | 126 | 102 | 85 | NA | 100 | 87 | 87 | 102 | 84 | 87 | 116 | 79 | 105 | 87 | 104 | 79 | 88 | 79 | 79 | | | | 91 | 69 | | | 81 | 90 | 82 | | | | |
| Calcium, Ca | mgIL | 1 | 2 | 2 | NA | <1 | <1 | <1 | 1 | <1 | <1 | 2 | 1 | 1 | <1 | <1 | 1 | <1 | 1 | <1 | | | | <1 | <1 | | | <1 | <1 | <1 | | | | |
| Magnesium, Mg | mg/L | 5 | 5 | 5 | NA | 4 | 3 | 4 | 4 | 4 | 2 | 2 | 4 | 2 | 4 | 3 | 4 | 3 | 5 | 3 | | | | 3 | 4 | | | 3 | 3 | 3 | | | | |
| Sodium, Na | mg/L | 18 | 19 | 18 | NA | 19 | 18 | 18 | 21 | 17 | 18 | 19 | 18 | 20 | 17 | 19 | 16 | 21 | 16 | 16 | | | | 18 | 18 | | | 18 | 18 | 19 | | | | |
| Potassium, K | mg/L | 2 | 2 | 2 | NA | 1 | 1 | 2 | 2 | 1 | <1 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | | | | 2 | 2 | | | 1 | 1 | <1 | | | | |
| Bicarbonate, HCO3 | mg/L | 23 | 33 | 19 | NA | 4 | 3 | 13 | 8 | 16 | <1 | <1 | 9 | 2 | 14 | 7 | 24 | <1 | 24.4 | 9.2 | | | | 9 | 10 | | | 6 | 6 | 5 | | | | |
| Sulphate, 804 | mg/L | 3 | 3 | 2 | NA | 1 | 1 | 3 | 2 | <1 | <1 | 6 | 1 | 4 | 4 | 1 | 1 | 4 | 2 | 2.78 | | | | 2 | 4 | | | 6 | 3 | 3 | | | | |
| Chloride, Cl | mg/l | 31 | 28 | 31 | NA | 41 | 38 | 33 | 46 | 33 | 40 | 43 | 37 | 35 | 34.9 | 38.8 | 30.2 | 44.8 | 31.8 | 32.2 | | | | 33 | 36 | | | 30 | 38 | 35 | | | | |
| Oil and Grease | mg/L | <5 | <5 | <5 | - | NA | <5 | <5 | 11 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | | | | <5 | <5 | | | <5 | <5 | <5 | | | | |

***Note 1= Bore clogging (Iron floc) and chemicals added to unclogg (unrepresentative water)***

**Table 3-6B** **Bore L198PB3 Chemical Analyses Summary (2020-2023)**

| Date | | 5.8.20 | 17.8.21 | 16.9.22 | 17.8.23 |
|---|---|---|---|---|---|
| pH | | 6.17 | 6.24 | No sample | 6.29 |
| E Conductivity, EC | uS/cm | 185 | 129 | | 154 |
| Total Dissolved Solids, TDS | mg/L | 118 | 97 | | 82 |
| Calcium, Ca | mgIL | 2 | 2 | | 2 |
| Magnesium, Mg | mg/L | 5 | 5 | | 5 |
| Sodium, Na | mg/L | 25 | 19 | | 17 |
| Potassium, K | mg/L | 2 | 2 | | 2 |
| Bicarbonate, HCO3 | mg/L | 17 | 17 | | 22 |
| Sulphate, 804 | mg/L | 4 | 5 | | 4 |
| Chloride, Cl | mg/l | 36 | 28 | | 28 |
| Oil and Grease | mg/L | <5 | <5 | | <5 |

Note: New bore L198PB3 was installed in October 2019 to replace L198PB-2 (Fe clogging). PB3 Well capped off in 2022 due to high Fe in water
PB1 & PB3: Groundwater samples collected by PF Formation (J.Graham) on 17 August 2023 under E2W supervision



Prepared by: Earth2Water Pty Ltd
Checked By: DParisotto

## Table 3-7: Pumping Logbook POR 167 - Spring (2021-2022)

| DATE START | TIME START | METER READING START | DATE FINISH | TIME FINISH | METER READING FINISH | M3 PUMPED | Approval No: 10WA114809 WAL number: 24156 |
|---|---|---|---|---|---|---|---|
| 2/09/21 | 14 | 0 | 44442 | 15 | 199 | 199 | |
| 5/10/21 | 14.45 | 199 | 44475 | 16.3 | 435 | 236 | |
| 20/10/21 | 16.2 | 435 | 44490 | 16.2 | 657 | 222 | |
| 27/10/21 | 16.3 | 657 | 44498 | 11.3 | 918 | 261 | |
| 3/11/21 | 16.3 | 918 | 44505 | 16.45 | 1417 | 499 | |
| 16/11/21 | 8.1 | 1417 | 44522 | 8 | 2256 | 839 | Lost prime |

| | |
|---|---|
| **TOTAL (m3)** | **2256** |
| **TOTAL (ML)** | **2.256** |

Note: information provided by PFF in August 2022

## Con't Table 3-7: Pumping Logbook POR 167 - Spring (2022-2023)

| DATE START | TIME START | METER READING START | DATE FINISH | TIME FINISH | METER READING FINISH | M3 PUMPED | Approval No: 10WA114809 WAL number: 24156 |
|---|---|---|---|---|---|---|---|
| 16/11/21 | 8.1 | 1417 | 44522 | 8 | 2256 | 839 | Last Pumpage in 2021 |
| Jan 2022 to Dec 2022 | 0 | | | | 2256 | 0 | No Pumpage- wet weather |
| Jan 2023 to June 2023 | 0 | | | | 2256 | 0 | No Pumpage- wet weather |

| | |
|---|---|
| **TOTAL (m3)** | **0** |
| **TOTAL (ML)** | **0** |

Note: information provided by PFF in August 2023



Prepared by: Earth2Water Pty Ltd
Checked By: DP

**Table 3-8: Pumping Records - Lot 198 PB01**
**(Jan 2022 to Dec 2022)**

| DATE | TIME START | METER READING START | METER READING FINISH | M3 PUMPED | Approval No. 10WA109355 WAL number: 42252 |
|---|---|---|---|---|---|
| 1/07/21 | | 45529 | 52542 | 7013 | |
| 18/11/21 | | 52542 | 52592 | 50 | |
| 19/11/21 | | 52592 | 52797 | 205 | |
| 23/11/21 | | 52797 | 52849 | 52 | |
| 24/11/21 | | 52849 | 52901 | 52 | |
| 25/11/21 | | 52901 | 52954 | 53 | |
| 26/11/21 | | 52954 | 53117 | 163 | |
| 29/11/21 | | 53117 | 53168 | 51 | |
| 30/11/21 | | 53168 | 53224 | 56 | |
| 1/12/21 | | 53224 | 53280 | 56 | |
| 2/12/21 | | 53280 | 53340 | 60 | |
| 3/12/21 | | 53340 | 53497 | 157 | |
| 6/12/21 | | 53497 | 53551 | 54 | |
| 7/12/21 | | 53551 | 53604 | 53 | |
| 8/12/21 | | 53604 | 53659 | 55 | |
| 9/12/21 | | 53659 | 53875 | 216 | |
| 13/12/21 | | 53875 | 53933 | 58 | |
| 14/12/21 | | 53933 | 53987 | 54 | |
| 15/12/21 | | 53987 | 54046 | 59 | |
| 16/12/21 | | 54046 | 54096 | 50 | |
| 17/12/21 | | 54096 | 54202 | 106 | |
| 20/12/21 | | 54202 | 54318 | 116 | |
| 22/12/21 | | 54318 | 54370 | 52 | |
| 23/12/21 | | 54370 | 55341 | 971 | |
| 10/01/22 | | 55341 | 55455 | 114 | |
| 12/01/22 | | 55455 | 55505 | 50 | |
| 13/01/22 | | 55505 | 55650 | 145 | |
| 14/01/22 | | 55650 | 55854 | 204 | |
| 19/01/22 | | 55854 | 56537 | 683 | |
| 1/02/22 | | 56537 | 56588 | 51 | |
| 2/02/22 | | 56588 | 56656 | 68 | |
| 3/02/22 | 13.1 | 56656 | 56796 | 140 | |
| 4/02/22 | 6.55 | 56796 | 56856 | 60 | |
| 7/02/22 | 6 | 56856 | 56910 | 54 | |
| 8/02/22 | 6.5 | 56910 | 57019 | 109 | |
| 10/02/22 | 8.22 | 57019 | 57058 | 39 | |
| 11/02/22 | 6.5 | 57058 | 57228 | 170 | |
| 14/02/22 | 6.4 | 57228 | 57283 | 55 | |
| 15/02/22 | 7 | 57283 | 57346 | 63 | |
| 16/02/22 | 7 | 57346 | 57401 | 55 | |
| 18/02/22 | 7.3 | 57401 | 57744 | 343 | |
| 24/02/22 | 6.5 | 57744 | 58050 | 306 | |
| 1/03/22 | 10.1 | 58050 | 58099 | 49 | |
| 2/03/22 | 7.05 | 58099 | 58701 | 602 | |
| 14/03/22 | 9 | 58701 | 58765 | 64 | |
| 15/03/22 | 7 | 58765 | 58831 | 66 | |
| 16/03/22 | 7.15 | 58831 | 58902 | 71 | |
| 17/03/22 | 10.2 | 58902 | 59134 | 232 | |
| 21/03/22 | 7.45 | 59134 | 59218 | 84 | |
| 22/03/22 | 7.3 | 59218 | 59283 | 65 | |
| 23/03/22 | 6.55 | 59283 | 59347 | 64 | |
| 24/03/22 | 6.4 | 59347 | 60192 | 845 | |
| 6/04/22 | 7.2 | 60192 | 60255 | 63 | |
| 7/04/22 | 6.31 | 60255 | 60318 | 63 | |
| 8/04/22 | 9 | 60318 | 60517 | 199 | |
| 11/01/22 | 6.3 | 60517 | 60584 | 67 | |
| 12/04/22 | 6.55 | 60584 | 60650 | 66 | |
| 13/04/22 | 7 | 60650 | 60745 | 95 | |
| 14/04/22 | 6.4 | 60745 | 60944 | 199 | |
| 19/04/22 | 6.27 | 60944 | 61112 | 168 | |
| 20/04/22 | 6.4 | 61112 | 61133 | 21 | |
| 21/04/22 | 6.4 | 61133 | 61242 | 109 | |
| 22/04/22 | 6.26 | 61242 | 61507 | 265 | |
| 26/04/22 | 6.25 | 61507 | 61575 | 68 | |
| 27/04/22 | 6.35 | 61575 | 61643 | 68 | |
| 28/04/22 | 6 | 61643 | 61708 | 65 | |
| 29/04/22 | 7.05 | 61708 | 61926 | 218 | |
| 3/05/22 | 7.2 | 61926 | 62041 | 115 | |
| 4/05/22 | 11.3 | 62041 | 62095 | 54 | |
| 5/06/22 | 6.5 | 62095 | 62158 | 63 | |
| 6/06/22 | 6.3 | 62158 | 62415 | 257 | |
| 10/05/22 | 6.4 | 62415 | 62480 | 65 | |
| 11/05/22 | 6.53 | 62480 | 62545 | 65 | |
| 12/05/22 | 9.45 | 62545 | 62806 | 261 | |
| 16/05/22 | 7.37 | 62806 | 62870 | 64 | |
| 17/05/22 | 6.57 | 62870 | 63073 | 203 | |
| 20/05/22 | 11.3 | 63073 | 63123 | 50 | |
| 21/05/22 | 7 | 63123 | 63166 | 43 | |
| 24/05/22 | 6.55 | 63166 | 63402 | 236 | |
| 25/05/22 | 2.14 | 63402 | 63445 | 43 | |
| 26/05/22 | 6.45 | 63445 | 63515 | 70 | |
| 27/05/22 | 8.3 | 63515 | 63575 | 60 | |
| 28/05/22 | 7 | 63575 | 63705 | 130 | |
| 30/05/22 | 6.55 | 63705 | 63760 | 55 | |
| 31/05/22 | 2 | 63760 | 63803 | 43 | |
| 1/06/22 | 6.35 | 63803 | 63868 | 65 | |
| 2/06/22 | 6.5 | 63868 | 63930 | 62 | |
| 3/06/22 | 6.3 | 63930 | 64123 | 193 | |
| 6/06/22 | 6.55 | 64123 | 64193 | 70 | |
| 7/06/22 | 6.45 | 64193 | 64257 | 64 | |
| 8/06/22 | 6.35 | 64257 | 64385 | 128 | |
| 10/06/22 | 6.45 | 64385 | 64645 | 260 | |
| 14/06/22 | 6.55 | 64645 | 64708 | 63 | |
| 15/06/22 | 6.45 | 64708 | 64774 | 66 | |
| 16/06/22 | 7 | 64774 | 64837 | 63 | |
| 17/06/22 | 6.46 | 64837 | 65025 | 188 | |
| 20/06/22 | 6.55 | 65025 | 65086 | 61 | |
| 21/06/22 | 6.35 | 65086 | 65123 | 37 | |
| 22/06/22 | 6.43 | 65123 | 65422 | 299 | |
| 27/06/22 | 7.4 | 65422 | 65442 | 20 | |
| 28/06/22 | 6.55 | 65442 | 65443 | 1 | |
| 29/06/22 | 6.3 | 65443 | 65506 | 63 | |
| 30/06/22 | 6.3 | 65506 | 65730 | 224 | |
| 4/07/22 | 7.3 | 60730 | 65868 | 5138 | |
| 5/07/22 | 7.3 | 65868 | 66067 | 199 | |
| 11/07/22 | 7 | 66067 | 66131 | 64 | |
| 12/07/22 | 6.41 | 66131 | 66204 | 73 | |
| 13/07/22 | 8.22 | 66204 | 66262 | 58 | |
| 14/07/22 | 6.52 | 66262 | 66326 | 64 | |
| 15/07/22 | 6.51 | 66326 | 66526 | 200 | |
| 18/07/22 | 7.12 | 66526 | 66551 | 25 | |
| 19/07/22 | 6.45 | 66551 | 66657 | 106 | |
| 20/07/22 | 6.4 | 66657 | 66726 | 69 | |
| 21/07/22 | 6.5 | 66726 | 66794 | 68 | |
| 22/07/22 | 6.46 | 66794 | 67009 | 215 | |
| 25/07/22 | 7 | 67009 | 67077 | 68 | |
| 26/07/22 | 6.42 | 67077 | 67145 | 68 | |
| 27/07/22 | 6.35 | 67145 | 67213 | 68 | |

*Note: information provided by PFF in August 2022-23*

| | |
|---|---|
| **TOTAL (m3)** | **26684** |
| **TOTAL (ML)** | **26.684** |

**Table 3-8: Pumping Records - Lot 198 PB01**
**(July 2022- June 2023)**

| DATE | TIME START | METER READING START | METER READING FINISH | M3 PUMPED | Approval No. 10WA109355 WAL number: 42252 |
|---|---|---|---|---|---|
| 4/07/22 | 7.3 | 60730 | 65868 | 5138 | |
| 5/07/22 | 7.3 | 65868 | 66067 | 199 | |
| 11/07/22 | 7 | 66067 | 66131 | 64 | |
| 12/07/22 | 6.41 | 66131 | 66204 | 73 | |
| 13/07/22 | 8.22 | 66204 | 66262 | 58 | |
| 14/07/22 | 6.52 | 66262 | 66326 | 64 | |
| 15/07/22 | 6.51 | 66326 | 66526 | 200 | |
| 18/07/22 | 7.12 | 66526 | 66551 | 25 | |
| 19/07/22 | 6.45 | 66551 | 66657 | 106 | |
| 20/07/22 | 6.4 | 66657 | 66726 | 69 | |
| 21/07/22 | 6.5 | 66726 | 66794 | 68 | |
| 22/07/22 | 6.46 | 66794 | 67009 | 215 | |
| 25/07/22 | 7 | 67009 | 67077 | 68 | |
| 26/07/22 | 6.42 | 67077 | 67145 | 68 | |
| 27/07/22 | 6.35 | 67145 | 67213 | 68 | period of no pumping |
| 10/01/23 | 7.05 | 0 | 5592 | 5592 | New meter - other broke |
| 11/01/23 | 6.5 | 5592 | 5621 | 29 | |
| 12/01/23 | 6.3 | 5621 | 5651 | 30 | |
| 13/01/23 | 6.35 | 5651 | 5741 | 90 | |
| 16/01/23 | 6.35 | 5741 | 5769 | 28 | |
| 17/01/23 | 7.14 | 5769 | 5797 | 28 | |
| 18/01/23 | 6.42 | 5797 | 5825 | 28 | |
| 19/01/23 | 6.3 | 5825 | 5851 | 26 | |
| 20/01/23 | 6.45 | 5851 | 5935 | 84 | |
| 23/01/23 | 6.56 | 5935 | 5999 | 64 | |
| 25/01/23 | 10 | 5999 | 6249 | 250 | |
| 1/02/23 | 6.5 | 6249 | 6297 | 48 | |
| 2/02/23 | 6.3 | 6297 | 6337 | 40 | |
| 3/02/23 | 8.11 | 6337 | 6440 | 103 | |
| 6/02/23 | 6.45 | 6440 | 6504 | 64 | |
| 8/02/23 | 7.55 | 6504 | 6534 | 30 | |
| 9/02/23 | 6.42 | 6534 | 6566 | 32 | |
| 10/02/23 | 8 | 6566 | 6664 | 98 | |
| 13/02/23 | 6.45 | 6664 | 6697 | 33 | |
| 14/02/23 | 6.45 | 6697 | 6728 | 31 | |
| 15/02/23 | 10.5 | 6728 | 6752 | 24 | |
| 16/02/23 | 6.33 | 6752 | 6799 | 47 | |
| 17/02/23 | 6.24 | 6799 | 6897 | 98 | |
| 21/02/23 | 10.1 | 6897 | 6930 | 33 | |
| 22/02/23 | 7.17 | 6930 | 7090 | 160 | |
| 24/02/23 | 7.15 | 7090 | 7101 | 11 | |
| 27/02/23 | 7.05 | 7101 | 7135 | 34 | |
| 28/02/23 | 7.15 | 7135 | 7170 | 35 | |
| 1/03/23 | 7 | 7170 | 7206 | 36 | |
| 2/03/23 | 6.5 | 7206 | 7242 | 36 | |
| 3/03/23 | 6.55 | 7242 | 7349 | 107 | |
| 6/03/23 | 6.4 | 7349 | 7385 | 36 | |
| 7/03/23 | 6.45 | 7385 | 7422 | 37 | |
| 8/03/23 | 8.3 | 7422 | 7453 | 31 | |
| 9/03/23 | 6.55 | 7453 | 7485 | 32 | |
| 10/03/23 | 7.01 | 7485 | 7585 | 100 | |
| 13/03/23 | 8.5 | 7585 | 7612 | 27 | |
| 14/03/23 | 6.4 | 7612 | 7649 | 37 | |
| 15/03/23 | 9.45 | 7649 | 7676 | 27 | |
| 16/03/23 | 6.45 | 7676 | 7710 | 34 | |
| 17/03/23 | 6.45 | 7710 | 7803 | 93 | |
| 20/03/23 | 7 | 7803 | 7858 | 55 | |
| 22/03/23 | 6.5 | 7858 | 7890 | 32 | |
| 23/03/23 | 7.2 | 7890 | 7925 | 35 | |
| 24/03/23 | 8.3 | 7925 | 7955 | 30 | |
| 25/03/23 | 6.5 | 7955 | 8049 | 94 | |
| 28/03/23 | 2.2 | 8049 | 8081 | 32 | |
| 29/03/23 | 7.25 | 8081 | 8112 | 31 | |
| 30/03/23 | 7.3 | 8112 | 8142 | 30 | |
| 31/03/23 | 7 | 8142 | 8242 | 100 | |
| 3/04/23 | 6.35 | 8242 | 8276 | 34 | |
| 4/04/23 | 9.4 | 8276 | 8490 | 214 | |
| 11/04/23 | 7 | 8490 | 8528 | 38 | |
| 12/04/23 | 6.35 | 8528 | 8562 | 34 | |
| 13/04/23 | 6.3 | 8562 | 8596 | 34 | |
| 14/04/23 | 6.4 | 8596 | 8708 | 112 | |
| 17/04/23 | 6.4 | 8708 | 8745 | 37 | |
| 18/04/23 | 7.3 | 8745 | 8774 | 29 | |
| 19/04/23 | 6.5 | 8774 | 8806 | 32 | |
| 20/04/23 | 6.5 | 8806 | 8841 | 35 | |
| 21/04/23 | 10.55 | 8841 | 8871 | 30 | |
| 22/04/23 | 6.5 | 8871 | 8932 | 61 | |
| 24/04/23 | 7.4 | 8932 | 9037 | 105 | |
| 27/04/23 | 6.5 | 9037 | 9071 | 34 | |
| 28/04/23 | 6.5 | 9071 | 9173 | 102 | |
| 1/05/23 | 9.05 | 9173 | 9204 | 31 | |
| 2/05/23 | 6.45 | 9204 | 9237 | 33 | |
| 3/05/23 | 6.45 | 9237 | 9304 | 67 | |
| 5/05/23 | 6.3 | 9304 | 9406 | 102 | |
| 8/05/23 | 6.45 | 9406 | 9436 | 30 | |
| 9/05/23 | 6.45 | 9436 | 9471 | 35 | |
| 10/05/23 | 6.5 | 9471 | 9508 | 37 | |
| 11/05/23 | 9 | 9508 | 9536 | 28 | |
| 12/05/23 | 6.5 | 9536 | 9635 | 99 | |
| 15/05/23 | 6.45 | 9635 | 9668 | 33 | |
| 16/05/23 | 6.45 | 9668 | 9701 | 33 | |
| 17/05/23 | 6.4 | 9701 | 9734 | 33 | |
| 18/05/23 | 6.35 | 9734 | 9773 | 39 | |
| 19/05/23 | 9.05 | 9773 | 9868 | 95 | |
| 22/05/23 | 6.55 | 9868 | 9902 | 34 | |
| 23/05/23 | 8.45 | 9902 | 9965 | 63 | |
| 25/05/23 | 6.45 | 9965 | 9998 | 33 | |
| 26/05/23 | 6.5 | 9998 | 10024 | 26 | |
| 29/05/23 | 6.41 | 10024 | 10127 | 103 | |
| 30/05/23 | 6.43 | 10127 | 10158 | 31 | |
| 31/05/23 | 6.4 | 10158 | 10189 | 31 | |
| 1/06/23 | 8.45 | 10189 | 10220 | 31 | |
| 2/06/23 | 7 | 10220 | 10313 | 93 | |
| 5/06/23 | 6.55 | 10313 | 10345 | 32 | |
| 6/06/23 | 8.55 | 10345 | 10372 | 27 | |
| 7/06/23 | 6.5 | 10372 | 10404 | 32 | |
| 8/06/23 | 7 | 10404 | 10434 | 30 | |
| 9/06/23 | 6.5 | 10434 | 10563 | 129 | |
| 13/06/23 | 6.5 | 10563 | 10592 | 29 | |
| 14/06/23 | 6.5 | 10592 | 10625 | 33 | |
| 15/06/23 | 6.5 | 10625 | 10688 | 63 | |
| 16/06/23 | 6.5 | 10688 | 10754 | 66 | |
| 19/06/23 | 6.45 | 10754 | 10786 | 32 | |
| 20/06/23 | 6.3 | 10786 | 10815 | 29 | |
| 21/06/23 | 6.35 | 10815 | 10849 | 34 | |
| 22/06/23 | 9 | 10849 | 10876 | 27 | |
| 23/06/23 | 6.5 | 10876 | 10967 | 91 | |
| 26/06/23 | 6.4 | 10967 | 10997 | 30 | |
| 27/06/23 | 8.35 | 10997 | 11026 | 29 | |
| 28/06/23 | 6.4 | 11026 | 11056 | 30 | |
| 29/06/23 | 6.4 | 11056 | 11088 | 32 | |
| 30/06/23 | 9 | 11088 | 11173 | 117 | |
| *Note: information provided by PFF in August 2023* | | | | | |
| *PB-3 decommissioned (high Fe in water)* | | | **TOTAL (m3)** | **17688** | |
| | 1 July 2022 - 30 June 2023 | | **TOTAL (ML)** | **17.688** | |



Prepared By: Earth2Water
Checked By: DP

**Table 3-9A: Maroota Hitchcock Road- Water Analyses for New Wells (2017 to 2023)**

| New Wells & Dams | | MW-2S | MW-2S | MW-2S | MW-2S | MW-2S | MW-2S | MW-2S | MW-2S | MW-2D | MW-2D | MW-2D | MW-2D | MW-2D | MW-2D | MW-2D | MW-2D | MW-3D | MW-3D | MW-3D | MW-3D | MW-3D | MW-3D | MW-3D | MW-4S | MW-4S | MW-4S | MW-4S | MW-4S | MW-4S | MW-4S | MW-4D | MW-4D | MW-4D | MW-4D | MW-4D | MW-4D | MW-4D | MW-5D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | 17/07/17 | 18/05/17 | 14/08/18 | 15/08/19 | 5/08/20 | 17/08/21 | 15/09/22 | 15/08/23 | 18/05/17 | 14/08/18 | 2/09/19 | 5/08/20 | 17/08/21 | 15/09/22 | 15/08/23 | 18/05/17 | 1/08/18 | 15/08/19 | 5/08/20 | 17/08/21 | 15/09/22 | 15/08/23 | 18/05/17 | 14/08/18 | 15/08/19 | 5/08/20 | 17/08/21 | 15/09/22 | 15/08/23 | 18/05/17 | 14/08/18 | 15/08/19 | 5/08/20 | 17/08/21 | 15/09/22 | 15/08/23 | 18/05/17 |
| pH | units | 4.58 | 5.39 | 5.5 | 6.15 | 4.77 | 5.03 | 4.57 | 4.45 | 6.99 | 5.5 | 5.44 | 5.18 | 5.73 | 5.22 | 5.21 | 5.63 | 4.02 | 4.98 | 4.75 | 4.27 | 4.46 | 4.33 | 6.03 | 4.48 | insufficient | 5.65 | 5.56 | 5.3 | 5.25 | 5.85 | 5.47 | 5.65 | 5.73 | 6.11 | 5.41 | 6.32 | 5.82 |
| Electrical Conductivity | uS/cm | 166 | 211 | 128 | 168 | 67 | 129 | 221 | 242 | 307 | 128 | 152 | 137 | 120 | 172 | 140 | 278 | 306 | 250 | 164 | 143 | 87 | 118 | 129 | 76 | water | 76 | 74 | 126 | 157 | 274 | 158 | 149 | 152 | 136 | 125 | 162 | 190 |
| Total Dissolved Solids | mg/L | 114 | 384 | 84 | ---- | 66 | 102 | 124 | 137 | 549 | 84 | 77 | 96 | 78 | 79 | 93 | 346 | 159 | 130 | 103 | 90 | 61 | 72 | 169 | ---- | | 60 | 48 | 64 | 120 | 736 | 95 | 92 | 110 | 112 | 73 | 120 | 1140 |
| Calcium, Ca | mg/L | 3 | 5 | 2 | 3 | 1 | 2 | 4 | 4 | 9 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 1 | <1 | <1 | <1 | <1 | 7 | 1 | | <1 | 2 | 3 | 4 | 3 | 2 | 2 | 3 | 4 | 3 | 5 | <1 |
| Magnesium, Mg | mg/L | 4 | 3 | 2 | 3 | 1 | 3 | 5 | 6 | 3 | 2 | 2 | 2 | 2 | 4 | 3 | 1 | 7 | 4 | 2 | 2 | 1 | 2 | 3 | 1 | | 2 | 3 | 4 | 5 | 1 | 2 | 2 | 3 | 2 | 5 | 2 | <1 |
| Sodium, Na | mg/L | 18 | 20 | 15 | 18 | 8 | 17 | 26 | 20 | 40 | 15 | 18 | 18 | 19 | 20 | 19 | 32 | 36 | 31 | 21 | 21 | 10 | 12 | 8 | 11 | | 8 | 8 | 13 | 15 | 37 | 22 | 21 | 21 | 21 | 11 | 22 | 13 |
| Potassium, K | mg/L | 2 | 2 | 1 | 2 | <1 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 11 | <1 | <1 | <1 | <1 | <1 | <1 | 3 | 1 | | 1 | <1 | <1 | 1 | 8 | <1 | <1 | <1 | 1 | <1 | <1 | 26 |
| Bicarbonate, HCO3 | mgIL | <1 | 2 | 8 | 4 | <1 | <1 | <1 | <1 | 35 | 8 | 8 | 3 | 5 | 3 | 4 | 2 | <1 | <1 | <1 | <1 | <1 | <1 | 12 | <1 | | 8 | <1 | 6 | 5 | 8 | 13 | 7 | 11 | 7 | 3 | 15 | 3 |
| Sulphate, SO4 | mg/L | 6 | 8 | 3 | 3 | 2 | 5 | 6 | 5 | 12 | 3 | 1 | 1 | 2 | 4 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 20 | 4 | | 7 | 12 | 16 | 20 | 32 | 7 | 3 | 2 | 7 | 19 | 4 | <1 |
| Chloride, Cl | mg/L | 38 | 37 | 30 | 36 | 15 | 31 | 58 | 63 | 40 | 30 | 32 | 31 | 28 | 41 | 32 | 56 | 68 | 57 | 36 | 33 | 18 | 24 | 12 | 17 | | 12 | 11 | 22 | 25 | 34 | 18 | 9 | 19 | 18 | 16 | 19 | 36 |
| Oil& Grease | mg/L | <5 | | | <5 | <5 | <5 | <5 | <5 | | | <5 | <5 | <5 | <5 | <5 | | <5 | <5 | <5 | <8 | <5 | <5 | | <5 | | <5 | <5 | <5 | <5 | | <5 | <5 | <5 | <5 | <5 | <5 | |

Note: Analyses by ALS
Re-analyses conducted on TDS- filtering of samples conducted due to TDS values exceeding EC (turbidity & silica issues)
**bold-** TDS results are considered anomalous (re-analyses conducted after filtering samples, i.e. TDS higher than EC, possibly silica in water)
**--- (no TDS available- matrix interference)**
MW-2D sample on 15 Aug 2019 was turbid and not representative. MW-2D resampled on 2 Sept 2019 by Melissa Mass

## Table 3-9B: Maroota Hitchcock Road- Water Analyses for Dams ( 2018 to 2023)

| Existing Site Dams | | CWD | CWD | CWD | CWD | CWD | CWD | Por167 Dam | Por167 Dam | Por167 Dam | Por167 Dam | Por167 Dam | Por167 Dam |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | 14/08/18 | 2/09/19 | 5/08/20 | 17/08/21 | 16/09/22 | 16/08/23 | 14/08/18 | 2/09/19 | 5/08/20 | 17/08/21 | 16/09/22 | 16/08/23 |
| pH | units | 4.62 | 5.26 | 5.43 | 4.72 | 5.09 | 4.97 | 4.15 | 5.52 | 5.38 | 5.02 | 6.31 | 5.97 |
| Electrical Conductivity | uS/cm | 222 | 86 | 113 | 161 | 159 | 122 | 201 | 222 | 176 | 94 | 103 | 129 |
| Total Dissolved Solids | mg/L | 125 | ---- | 76 | 113 | 90 | 85 | 108 | ---- | 119 | 74 | 68 | 94 |
| Calcium, Ca | mg/L | 5 | 1 | 3 | 8 | 7 | 1 | 2 | 6 | 2 | 4 | 8 | 6 |
| Magnesium, Mg | mg/L | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 2 | 1 | 2 |
| Sodium, Na | mg/L | 25 | 9 | 13 | 18 | 16 | 13 | 22 | 24 | 22 | 11 | 9 | 12 |
| Potassium, K | mg/L | 3 | 2 | 3 | 3 | 4 | 4 | 2 | 5 | 3 | 2 | 2 | 3 |
| Bicarbonate, HCO3 | mgIL | <1 | <1 | <1 | <1 | <1 | 1 | <1 | 4 | <1 | <1 | 8 | 4 |
| Sulphate, SO4 | mg/L | 5 | 4 | 8 | 20 | 30 | 7 | 7 | 20 | 8 | 13 | 16 | 15 |
| Chloride, Cl | mg/L | 45 | 20 | 21 | 31 | 24 | 25 | 38 | 44 | 36 | 21 | 14 | 22 |
| Oil & Grease | mg/L | <5 | <5 | (10 #) <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |

Note:
Groundwater and surface water samples collected by Earth2Water Pty Ltd (15 & 16 Aug 23)
CWD= Clean Water Dam on Por 167 site
(10#) & <5 = Initial (anomalous) and resampling results of Oil/Grease on 5 & 19 August 2020, respectively
Por167Dam= Por167Spring



Prepared By:Earth2Water Pty Ltd
CHecked By: DParisotto

**Table 3-10: Maroota - Water Analyses for Existing Wells at 4378 ON Rd (2019 -2023)**

Site; 4378 Old Northern Rd, Maroota

| Maroota New Wells | units | 4378ONR PF1 | 4378ONR PF1 | 4378ONR PF1 | 4378ONR PF1 | 4378ONR PF2 | 4378ONR PF2 | 4378ONR PF2 | 4378ONR PF2 | 4378ONR PF3 | 4378ONR PF3 | 4378ONR PF3 | 4378ONR PF3 | 4378ONR PF3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | | 15/8/2019 | 5/08/2020 | 17/08/2021 | 16/09/2022 | 15/8/2019 | 5/08/2020 | 17/08/2021 | 16/09/2022 | 15/8/2019 | 5/08/2020 | 17/08/2021 | 16/09/2022 | 16/08/2023 |
| pH | | 5.76 | 4.79 | 4.8 | 3.87 | 5.84 | 4.9 | 7.36 | 7.47 | dry | 4.29 | 4.08 | 4.47 | 4.07 |
| Electrical Conductivity, EC | uS/cm | 156 | 64 | 149 | 130 | 72 | 55 | 206 | 198 | | 221 | 632 | 226 | 286 |
| Total Dissolved Solids (ALS) | mg/L | 79 | 28 | 96 | 99 | 38 | 57 | 116 | 50 | | 191 | 347 | 107 | 168 |
| Calcium, Ca | mg/L | <1 | 1 | 1 | 2 | 1 | <1 | <1 | <1 | | 2 | 4 | 1 | 2 |
| Magnesium, Mg | mg/L | 2 | <1 | 2 | 2 | <1 | <1 | <1 | <1 | | 4 | 11 | 3 | 4 |
| Sodium, Na | mg/L | 16 | 5 | 23 | 9 | 8 | 8 | 9 | 8 | | 26 | 83 | 29 | 31 |
| Potassium, K | mg/L | 2 | 1 | 2 | <1 | <1 | <1 | 3 | 3 | | <1 | <1 | 1 | <1 |
| Bicarbonate, HCO3 | mgIL | 12 | <1 | <1 | <1 | 11 | <1 | 79 | 68 | | <1 | <1 | <1 | <1 |
| Sulphate, SO4 | mg/L | 2 | <1 | 3 | 14 | 3 | 3 | 7 | 5 | | 9 | 8 | 4 | 9 |
| Chloride, Cl | mg/L | 32 | 11 | 39 | 21 | 9 | 9 | 11 | 14 | | 51 | 178 | 64 | 58 |
| Oil& Grease | mg/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | | <5 | <5 | <5 | <5 |

Note:
Groundwater samples collected by Earth2Water Pty Ltd on 16 August 2023
Samples analysed by ALS Environmental (NATA accredited)
Wells PF-1 & PF-2; not accessible (earthworks) on 16 Aug 2023

## Table 3-11: Pumping Log book Lot 198 - Bywash Dam (2021-2022)

| DATE | TIME START | METER READING START | TIME FINISH | METER READING FINISH | M3 PUMPED | Approval No: 10WA105415 WAL number : 26168 |
|---|---|---|---|---|---|---|
| 1/07/21 | | 12732 | 13/07/21 8.40 | 12875 | 143 | |
| 13/07/21 | 8.4 | 12875 | 17 | 12930 | 55 | |
| 20/07/21 | 8 | 12930 | 21/07/21 8.30 | 13090 | 160 | |
| 27/07/21 | 7.3 | 13090 | 18.15 | 13160 | 70 | |
| 5/08/21 | 8 | 13160 | 16.45 | 13189 | 29 | |
| 23/08/21 | 7.3 | 13189 | 24/08/21 08.15 | 13351 | 162 | |
| 27/09/21 | 12.55 | 13351 | 28/09/21 6.30 | 13468 | 117 | |
| 12/10/21 | 6.3 | 13468 | 12/10/21 16.30 | 13534 | 66 | |
| 22/10/21 | 7.15 | 13534 | 4.25 | 13544 | 10 | |
| 28/10/21 | 7 | 13544 | 16.3 | 13805 | 261 | |
| 17/11/21 | 7 | 13805 | 18/11/21 16.30 | 13865 | 60 | |
| 20/11/21 | 7 | 13865 | 16.15 | 13897 | 32 | |
| 25/11/21 | 16.3 | 13897 | 26/11/21 07.30 | 13993 | 96 | |
| 5/01/22 | 11 | 13993 | | 14006 | 13 | |
| 6/01/22 | 10 | 14006 | | 14078 | 72 | |

| | |
|---|---|
| **TOTAL (m3)** | **1346** |
| **TOTAL (ML)** | 1.346 |

Note: information provided by PFF in August 2022

## Table 3-11: Pumping Log book Lot 198 - Bywash Dam (2022-2023)

| DATE | TIME START | METER READING START | TIME FINISH | METER READING FINISH | M3 PUMPED | Approval No: 10WA105415 WAL number : 26168 |
|---|---|---|---|---|---|---|
| 6/01/22 | 10 | 14006 | | 14078 | 72 | |
| Jan 2022 to Dec 2022 | 0 | | | | 2256 | No Pumpage- wet weather |
| Jan 2023 to June 2023 | 0 | | | | 2256 | No Pumpage- wet weather |

| | |
|---|---|
| **TOTAL (m3)** | **0** |
| **TOTAL (ML)** | 0 |

## Table 3-12A: Pumping Records for POR 167 Clean Water Dam (July 2022 to June 2023)

| DATE | METER READING START | METER READING FINISH | HOURS PUMPED (METER) | M3 PUMPED | Approval No: 10WA114809 WAL: 24156 |
|---|---|---|---|---|---|
| 4/11/22 | 12840 | 12852 | 12 | 11484 | |
| 7/11/22 | 12852 | 12864 | 12 | 11484 | July-Nov22 |
| 8/11/22 | 12864 | 12874 | 10 | 9570 | Pump under |
| 9/11/22 | 12874 | 12884 | 10 | 9570 | water & stopped |
| 10/11/22 | 12884 | 12894 | 10 | 9570 | |
| 11/11/22 | 12894 | 12904 | 10 | 9570 | |
| 14/11/22 | 12904 | 12920 | 16 | 15312 | |
| 15/11/22 | 12920 | 12938 | 18 | 17226 | |
| 16/11/22 | 12938 | 12955 | 17 | 16269 | |
| 17/11/22 | 12955 | 12966 | 11 | 10527 | |
| 18/11/22 | 12966 | 12981 | 15 | 14355 | |
| 19/11/22 | 12981 | 12985 | 4 | 3828 | |
| 21/11/22 | 12985 | 12998 | 13 | 12441 | |
| 22/11/22 | 12998 | 13013 | 15 | 14355 | |
| 23/11/22 | 13013 | 13018 | 5 | 4785 | |
| 24/11/22 | 13018 | 13030 | 12 | 11484 | |
| 25/11/22 | 13030 | 13043 | 13 | 12441 | |
| 28/11/22 | 13043 | 13057 | 14 | 13398 | |
| 29/11/22 | 13057 | 13069 | 12 | 11484 | |
| 30/11/22 | 13069 | 13084 | 15 | 14355 | |
| 1/12/22 | 13084 | 13097 | 13 | 12441 | |
| 5/12/23 | 13097 | 13113 | 16 | 15312 | |
| 6/12/23 | 13113 | 13129 | 16 | 15312 | |
| 7/12/23 | 13129 | 13147 | 18 | 17226 | |
| 8/12/23 | 13147 | 13164 | 17 | 16269 | |
| 9/12/23 | 13164 | 13180 | 16 | 15312 | |
| 12/12/22 | 13180 | 13190 | 10 | 9570 | |
| 13/12/22 | 13190 | 13207 | 17 | 16269 | |
| 14/12/22 | 13207 | 13220 | 13 | 12441 | |
| 15/12/22 | 13220 | 13232 | 12 | 11484 | |
| 16/12/22 | 13232 | 13243 | 11 | 10527 | |
| 19/12/22 | 13243 | 13256 | 13 | 12441 | |
| 20/12/22 | 13256 | 13259 | 3 | 2871 | |
| 21/12/22 | 13259 | 13274 | 15 | 14355 | |
| 22/12/22 | 13274 | 13291 | 17 | 16269 | |
| 10/01/23 | 13291 | 13305 | 14 | 13398 | |
| 11/01/23 | 13305 | 13317 | 12 | 11484 | |
| 12/01/23 | 13317 | 13329 | 12 | 11484 | |
| 13/01/23 | 13329 | 13341 | 12 | 11484 | |
| 16/01/23 | 13341 | 13356 | 15 | 14355 | |
| 17/01/23 | 13356 | 13375 | 19 | 18183 | |
| 18/01/23 | 13375 | 13391 | 16 | 15312 | |
| 19/01/23 | 13391 | 13406 | 15 | 14355 | |
| 20/01/23 | 13406 | 13419 | 13 | 12441 | |
| 23/01/23 | 13419 | 13433 | 14 | 13398 | |
| 24/01/23 | 13433 | 13445 | 12 | 11484 | |
| 25/01/23 | 13445 | 13465 | 20 | 19140 | |
| 27/01/23 | 13465 | 13476 | 11 | 10527 | |
| 30/01/23 | 13476 | 13480 | 4 | 3828 | |
| 31/01/23 | 13480 | 13488 | 8 | 7656 | |
| 1/02/23 | 13488 | 13501 | 13 | 12441 | |
| 2/02/23 | 13501 | 13513 | 12 | 11484 | |
| 3/02/23 | 13513 | 13525 | 12 | 11484 | |
| 6/02/23 | 13525 | 13535 | 10 | 9570 | |
| 7/02/23 | 13535 | 13550 | 15 | 14355 | |
| 8/02/23 | 13550 | 13564 | 14 | 13398 | |
| 10/02/23 | 13564 | 13577 | 13 | 12441 | |
| 13/02/23 | 13577 | 13715 | 138 | 132066 | |
| 2/03/23 | 13715 | 13729 | 14 | 13398 | |
| 3/03/23 | 13729 | 13741 | 12 | 11484 | |
| 6/03/23 | 13741 | 13755 | 14 | 13398 | |
| 7/03/23 | 13755 | 13764 | 9 | 8613 | |
| 8/03/23 | 13764 | 13777 | 13 | 12441 | |
| 9/03/23 | 13777 | 13790 | 13 | 12441 | |
| 10/03/23 | 13790 | 13804 | 14 | 13398 | |
| 13/03/23 | 13804 | 13816 | 12 | 11484 | |
| 14/03/23 | 13816 | 13831 | 15 | 14355 | |
| 15/03/23 | 13831 | 13842 | 11 | 10527 | |
| 16/03/23 | 13842 | 13842 | 0 | 0 | |
| 17/03/23 | 13842 | 13842 | 0 | 0 | |
| 20/03/23 | 13842 | 13854 | 12 | 11484 | |
| 21/03/23 | 13854 | 13868 | 14 | 13398 | |
| 22/03/23 | 13868 | 13868 | 0 | 0 | |
| 23/03/23 | 13868 | 13879 | 11 | 10527 | |
| 24/03/23 | 13879 | 13889 | 10 | 9570 | |
| 25/03/23 | 13889 | 13900 | 11 | 10527 | |



Prepared By: Earth2Water
Checked By: DP

## Table 3-12A: Pumping Records for POR 167 Clean Water Dam (July 2022 to June 2023)

| DATE | METER READING START | METER READING FINISH | HOURS PUMPED (METER) | M3 PUMPED | Approval No: 10WA114809 WAL: 24156 |
|---|---|---|---|---|---|
| 27/03/23 | 13900 | 13913 | 13 | 12441 | |
| 28/03/23 | 13913 | 13942 | 29 | 27753 | |
| 30/03/23 | 13942 | 13942 | 0 | 0 | |
| 31/03/23 | 13942 | 13956 | 14 | 13398 | |
| 3/04/23 | 13956 | 13956 | 0 | 0 | |
| 4/04/23 | 13956 | 13968 | 12 | 11484 | |
| 5/04/23 | 13968 | 13994 | 26 | 24882 | |
| 11/04/23 | 13994 | 14008 | 14 | 13398 | |
| 12/04/23 | 14008 | 14023 | 15 | 14355 | |
| 13/04/23 | 14023 | 14047 | 24 | 22968 | |
| 14/04/23 | 14047 | 14057 | 10 | 9570 | |
| 17/04/23 | 14057 | 14068 | 11 | 10527 | |
| 18/04/23 | 14068 | 14078 | 10 | 9570 | |
| 19/04/23 | 14078 | 14090 | 12 | 11484 | |
| 20/04/23 | 14090 | 14100 | 10 | 9570 | |
| 21/04/23 | 14100 | 14107 | 7 | 6699 | |
| 22/04/23 | 14107 | 14114 | 7 | 6699 | |
| 24/04/23 | 14114 | 14129 | 15 | 14355 | |
| 27/04/23 | 14129 | 14144 | 15 | 14355 | |
| 28/04/23 | 14144 | 14157 | 13 | 12441 | |
| 1/05/23 | 14157 | 14171 | 14 | 13398 | |
| 2/05/23 | 14171 | 14225 | 54 | 51678 | |
| 5/05/23 | 14225 | 14237 | 12 | 11484 | |
| 8/05/23 | 14237 | 14247 | 10 | 9570 | |
| 9/05/23 | 14247 | 14258 | 11 | 10527 | |
| 10/05/23 | 14258 | 14268 | 10 | 9570 | |
| 11/05/23 | 14268 | 14277 | 9 | 8613 | |
| 12/05/23 | 14277 | 14290 | 13 | 12441 | |
| 15/05/23 | 14290 | 14303 | 13 | 12441 | |
| 16/05/23 | 14303 | 14314 | 11 | 10527 | |
| 17/05/23 | 14314 | 14327 | 13 | 12441 | |
| 18/05/23 | 14327 | 14338 | 11 | 10527 | |
| 19/05/23 | 14338 | 14347 | 9 | 8613 | |
| 22/05/23 | 14347 | 14359 | 12 | 11484 | |
| 23/05/23 | 14359 | 14385 | 26 | 24882 | |
| 25/05/23 | 14385 | 14396 | 11 | 10527 | |
| 26/05/23 | 14396 | 14408 | 12 | 11484 | |
| 29/06/23 | 14408 | 14422 | 14 | 13398 | |
| 30/05/23 | 14422 | 14434 | 12 | 11484 | |
| 31/05/23 | 14434 | 14445 | 11 | 10527 | |
| 1/06/23 | 14445 | 14455 | 10 | 9570 | |
| 2/06/23 | 14455 | 14467 | 12 | 11484 | |
| 5/06/23 | 14467 | 14481 | 14 | 13398 | |
| 6/06/23 | 14481 | 14493 | 12 | 11484 | |
| 7/06/23 | 14493 | 14505 | 12 | 11484 | |
| 8/06/23 | 14505 | 14512 | 7 | 6699 | |
| 9/06/23 | 14512 | 14530 | 18 | 17226 | |
| 13/06/23 | 14530 | 14543 | 13 | 12441 | |
| 14/06/23 | 14543 | 14556 | 13 | 12441 | |
| 15/06/23 | 14556 | 14556 | 0 | 0 | |
| 16/06/23 | 14556 | 14569 | 13 | 12441 | |
| 19/06/23 | 14569 | 14584 | 15 | 14355 | |
| 20/06/23 | 14584 | 14597 | 13 | 12441 | |
| 21/06/23 | 14597 | 14610 | 13 | 12441 | |
| 22/06/23 | 14610 | 14619 | 9 | 8613 | |
| 23/06/23 | 14619 | 14631 | 12 | 11484 | |
| 24/06/23 | 14631 | 14637 | 6 | 5742 | |
| 26/06/23 | 14637 | 14653 | 16 | 15312 | |
| 27/06/23 | 14653 | 14669 | 16 | 15312 | |
| 28/06/23 | 14669 | 14682 | 13 | 12441 | |
| 29/06/23 | 14682 | 14695 | 13 | 12441 | |
| 30/06/23 | 14695 | 14707 | 12 | 11484 | |
| Note: information provided by PFF in August 2023 | | | | | |
| | | 1 July 2022- 30 June 2023 | **TOTAL (m3)** | **1786719** | |
| | | | **TOTAL (ML)** | **1786.719** | |



Prepared By: Earth2Water
Checked By: DP

## Table 3-12A: Pumping Records for POR 167 Clean Water Dam (Jan 2022 to Dec 2022)

| DATE | METER READING START | METER READING FINISH | HOURS PUMPED (METER) | M3 PUMPED | Approval No: 10WA114809 WAL: 24156 |
|---|---|---|---|---|---|
| 10/01/22 | 10913 | 10923 | 10 | 9570 | |
| 11/01/22 | 10923 | 10933 | 10 | 9570 | |
| 12/01/22 | 10933 | 10941 | 8 | 7656 | |
| 13/01/22 | 10941 | 10951 | 10 | 9570 | |
| 14/01/22 | 10951 | 10960 | 9 | 8613 | |
| 17/01/22 | 10960 | 10969 | 9 | 8613 | |
| 18/01/22 | 10969 | 10978 | 9 | 8613 | |
| 19/01/22 | 10978 | 10987 | 9 | 8613 | |
| 20/01/22 | 10987 | 11046 | 59 | 56463 | |
| 25/01/22 | 11046 | 11053 | 7 | 6699 | |
| 28/01/22 | 11053 | 11062 | 9 | 8613 | |
| 1/02/22 | 11062 | 11079 | 17 | 16269 | |
| 2/02/22 | 11079 | 11082 | 3 | 2871 | |
| 3/02/22 | 11082 | 11089 | 7 | 6699 | |
| 4/02/22 | 11089 | 11098 | 9 | 8613 | |
| 7/02/22 | 11098 | 11108 | 10 | 9570 | |
| 8/02/22 | 11108 | 11117 | 9 | 8613 | |
| 10/02/22 | 11117 | 11126 | 9 | 8613 | |
| 11/02/22 | 11126 | 11134 | 8 | 7656 | |
| 14/02/22 | 11134 | 11144 | 10 | 9570 | |
| 15/02/22 | 11144 | 11153 | 9 | 8613 | |
| 16/02/22 | 11153 | 11163 | 10 | 9570 | |
| 18/02/22 | 11163 | 11171 | 8 | 7656 | |
| 21/02/22 | 11171 | 11180 | 9 | 8613 | |
| 22/02/22 | 11180 | 11184 | 4 | 3828 | |
| 1/03/22 | 11184 | 11200 | 16 | 15312 | |
| 14/03/22 | 11200 | 11217 | 17 | 16269 | |
| 16/03/22 | 11217 | 11248 | 31 | 29667 | |
| 23/03/22 | 11248 | 11257 | 9 | 8613 | |
| 24/03/22 | 11257 | 11320 | 63 | 60291 | |
| 19/04/22 | 11320 | 11328 | 8 | 7656 | |
| 20/04/22 | 11328 | 11337 | 9 | 8613 | |
| 21/04/22 | 11337 | 11347 | 10 | 9570 | |
| 22/04/22 | 11347 | 11357 | 10 | 9570 | |
| 26/04/22 | 11357 | 11366 | 9 | 8613 | |
| 27/04/22 | 11366 | 11375 | 9 | 8613 | |
| 28/04/22 | 11375 | 11384 | 9 | 8613 | |
| 29/04/22 | 11384 | 11425 | 41 | 39237 | |
| 6/05/22 | 11425 | 11491 | 66 | 63162 | |
| 20/05/22 | 11491 | 11499 | 8 | 7656 | |
| 21/05/22 | 11499 | 11510 | 11 | 10527 | |
| 23/05/22 | 11510 | 11524 | 14 | 13398 | |
| 24/05/22 | 11524 | 11534 | 10 | 9570 | |
| 25/05/22 | 11534 | 11542 | 8 | 7656 | |
| 26/05/22 | 11542 | 11559 | 17 | 16269 | |
| 27/05/22 | 11559 | 11574 | 15 | 14355 | |
| 28/05/22 | 11574 | 11579 | 5 | 4785 | |
| 30/05/22 | 11579 | 11599 | 20 | 19140 | |
| 31/05/22 | 11599 | 11604 | 5 | 4785 | |
| 1/06/22 | 11604 | 11616 | 12 | 11484 | |
| 2/06/22 | 11616 | 11628 | 12 | 11484 | |
| 3/06/22 | 11628 | 11640 | 12 | 11484 | |
| 6/06/22 | 11640 | 11652 | 12 | 11484 | |
| 7/06/22 | 11652 | 11665 | 13 | 12441 | |
| 8/06/22 | 11665 | 11688 | 23 | 22011 | |
| 10/06/22 | 11688 | 11701 | 13 | 12441 | |
| 14/06/22 | 11701 | 11714 | 13 | 12441 | |
| 15/06/22 | 11714 | 11725 | 11 | 10527 | |
| 16/06/22 | 11725 | 11736 | 11 | 10527 | |
| 17/06/22 | 11736 | 11748 | 12 | 11484 | |
| 20/06/22 | 11748 | 11761 | 13 | 12441 | |
| 21/06/22 | 11761 | 11774 | 13 | 12441 | |
| 22/06/22 | 11774 | 11798 | 24 | 22968 | |
| 27/06/22 | 11786 | 11811 | 25 | 23925 | |
| 28/06/22 | 11798 | 11824 | 26 | 24882 | |
| 29/06/22 | 11811 | 11824 | 13 | 12441 | |
| 30/06/22 | 11824 | 11840 | 16 | 15312 | Pump under |
| 4/11/22 | 12840 | 12852 | 12 | 11484 | water & stopped |
| 7/11/22 | 12852 | 12864 | 12 | 11484 | |
| 8/11/22 | 12864 | 12874 | 10 | 9570 | |
| 9/11/22 | 12874 | 12884 | 10 | 9570 | |
| 10/11/22 | 12884 | 12894 | 10 | 9570 | |
| 11/11/22 | 12894 | 12904 | 10 | 9570 | |
| 14/11/22 | 12904 | 12920 | 16 | 15312 | |
| 15/11/22 | 12920 | 12938 | 18 | 17226 | |
| 16/11/22 | 12938 | 12955 | 17 | 16269 | |
| 17/11/22 | 12955 | 12966 | 11 | 10527 | |
| 18/11/22 | 12966 | 12981 | 15 | 14355 | |
| 19/11/22 | 12981 | 12985 | 4 | 3828 | |
| 21/11/22 | 12985 | 12998 | 13 | 12441 | |
| 22/11/22 | 12998 | 13013 | 15 | 14355 | |
| 23/11/22 | 13013 | 13018 | 5 | 4785 | |
| 24/11/22 | 13018 | 13030 | 12 | 11484 | |
| 25/11/22 | 13030 | 13043 | 13 | 12441 | |
| 28/11/22 | 13043 | 13057 | 14 | 13398 | |
| 29/11/22 | 13057 | 13069 | 12 | 11484 | |
| 30/11/22 | 13069 | 13084 | 15 | 14355 | |
| 1/12/22 | 13084 | 13097 | 13 | 12441 | |
| 5/12/23 | 13097 | 13113 | 16 | 15312 | |
| 6/12/23 | 13113 | 13129 | 16 | 15312 | |
| 7/12/23 | 13129 | 13147 | 18 | 17226 | |
| 8/12/23 | 13147 | 13164 | 17 | 16269 | |
| 9/12/23 | 13164 | 13180 | 16 | 15312 | |
| 12/12/22 | 13180 | 13190 | 10 | 9570 | |
| 13/12/22 | 13190 | 13207 | 17 | 16269 | |
| 14/12/22 | 13207 | 13220 | 13 | 12441 | |
| 15/12/22 | 13220 | 13232 | 12 | 11484 | |
| 16/12/22 | 13232 | 13243 | 11 | 10527 | |
| 19/12/22 | 13243 | 13256 | 13 | 12441 | |
| 20/12/22 | 13256 | 13259 | 3 | 2871 | |
| 21/12/22 | 13259 | 13274 | 15 | 14355 | |
| 22/12/22 | 13274 | 13291 | 17 | 16269 | |
| 10/01/23 | 13291 | 13305 | 14 | 13398 | |
| 11/01/23 | 13305 | 13317 | 12 | 11484 | |
| 12/01/23 | 13317 | 13329 | 12 | 11484 | |
| 13/01/23 | 13329 | 13341 | 12 | 11484 | |
| 16/01/23 | 13341 | 13356 | 15 | 14355 | |
| 17/01/23 | 13356 | 13375 | 19 | 18183 | |
| 18/01/23 | 13375 | 13391 | 16 | 15312 | |
| 19/01/23 | 13391 | 13406 | 15 | 14355 | |



Prepared By: Earth2Water
Checked By: DP

## Table 3-12A: Pumping Records for POR 167 Clean Water Dam (Jan 2022 to Dec 2022)

| DATE | METER READING START | METER READING FINISH | HOURS PUMPED (METER) | M3 PUMPED | Approval No: 10WA114809 WAL: 24156 |
|---|---|---|---|---|---|
| 20/01/23 | 13406 | 13419 | 13 | 12441 | |
| 23/01/23 | 13419 | 13433 | 14 | 13398 | |
| 24/01/23 | 13433 | 13445 | 12 | 11484 | |
| 25/01/23 | 13445 | 13465 | 20 | 19140 | |
| 27/01/23 | 13465 | 13476 | 11 | 10527 | |
| 30/01/23 | 13476 | 13480 | 4 | 3828 | |
| 31/01/23 | 13480 | 13488 | 8 | 7656 | |
| 1/02/23 | 13488 | 13501 | 13 | 12441 | |
| 2/02/23 | 13501 | 13513 | 12 | 11484 | |
| 3/02/23 | 13513 | 13525 | 12 | 11484 | |
| 6/02/23 | 13525 | 13535 | 10 | 9570 | |
| 7/02/23 | 13535 | 13550 | 15 | 14355 | |
| 8/02/23 | 13550 | 13564 | 14 | 13398 | |
| 10/02/23 | 13564 | 13577 | 13 | 12441 | |
| 13/02/23 | 13577 | 13715 | 138 | 132066 | |
| 2/03/23 | 13715 | 13729 | 14 | 13398 | |
| 3/03/23 | 13729 | 13741 | 12 | 11484 | |
| 6/03/23 | 13741 | 13755 | 14 | 13398 | |
| 7/03/23 | 13755 | 13764 | 9 | 8613 | |
| 8/03/23 | 13764 | 13777 | 13 | 12441 | |
| 9/03/23 | 13777 | 13790 | 13 | 12441 | |
| 10/03/23 | 13790 | 13804 | 14 | 13398 | |
| 13/03/23 | 13804 | 13816 | 12 | 11484 | |
| 14/03/23 | 13816 | 13831 | 15 | 14355 | |
| 15/03/23 | 13831 | 13842 | 11 | 10527 | |
| 16/03/23 | 13842 | 13842 | 0 | 0 | |
| 17/03/23 | 13842 | 13842 | 0 | 0 | |
| 20/03/23 | 13842 | 13854 | 12 | 11484 | |
| 21/03/23 | 13854 | 13868 | 14 | 13398 | |
| 22/03/23 | 13868 | 13868 | 0 | 0 | |
| 23/03/23 | 13868 | 13879 | 11 | 10527 | |
| 24/03/23 | 13879 | 13889 | 10 | 9570 | |
| 25/03/23 | 13889 | 13900 | 11 | 10527 | |
| 27/03/23 | 13900 | 13913 | 13 | 12441 | |
| 28/03/23 | 13913 | 13942 | 29 | 27753 | |
| 30/03/23 | 13942 | 13942 | 0 | 0 | |
| 31/03/23 | 13942 | 13956 | 14 | 13398 | |
| 3/04/23 | 13956 | 13956 | 0 | 0 | |
| 4/04/23 | 13956 | 13968 | 12 | 11484 | |
| 5/04/23 | 13968 | 13994 | 26 | 24882 | |
| 11/04/23 | 13994 | 14008 | 14 | 13398 | |
| 12/04/23 | 14008 | 14023 | 15 | 14355 | |
| 13/04/23 | 14023 | 14047 | 24 | 22968 | |
| 14/04/23 | 14047 | 14057 | 10 | 9570 | |
| 17/04/23 | 14057 | 14068 | 11 | 10527 | |
| 18/04/23 | 14068 | 14078 | 10 | 9570 | |
| 19/04/23 | 14078 | 14090 | 12 | 11484 | |
| 20/04/23 | 14090 | 14100 | 10 | 9570 | |
| 21/04/23 | 14100 | 14107 | 7 | 6699 | |
| 22/04/23 | 14107 | 14114 | 7 | 6699 | |
| 24/04/23 | 14114 | 14129 | 15 | 14355 | |
| 27/04/23 | 14129 | 14144 | 15 | 14355 | |
| 28/04/23 | 14144 | 14157 | 13 | 12441 | |
| 1/05/23 | 14157 | 14171 | 14 | 13398 | |
| 2/05/23 | 14171 | 14225 | 54 | 51678 | |
| 5/05/23 | 14225 | 14237 | 12 | 11484 | |
| 8/05/23 | 14237 | 14247 | 10 | 9570 | |
| 9/05/23 | 14247 | 14258 | 11 | 10527 | |
| 10/05/23 | 14258 | 14268 | 10 | 9570 | |
| 11/05/23 | 14268 | 14277 | 9 | 8613 | |
| 12/05/23 | 14277 | 14290 | 13 | 12441 | |
| 15/05/23 | 14290 | 14303 | 13 | 12441 | |
| 16/05/23 | 14303 | 14314 | 11 | 10527 | |
| 17/05/23 | 14314 | 14327 | 13 | 12441 | |
| 18/05/23 | 14327 | 14338 | 11 | 10527 | |
| 19/05/23 | 14338 | 14347 | 9 | 8613 | |
| 22/05/23 | 14347 | 14359 | 12 | 11484 | |
| 23/05/23 | 14359 | 14385 | 26 | 24882 | |
| 25/05/23 | 14385 | 14396 | 11 | 10527 | |
| 26/05/23 | 14396 | 14408 | 12 | 11484 | |
| 29/06/23 | 14408 | 14422 | 14 | 13398 | |
| 30/05/23 | 14422 | 14434 | 12 | 11484 | |
| 31/05/23 | 14434 | 14445 | 11 | 10527 | |
| 1/06/23 | 14445 | 14455 | 10 | 9570 | |
| 2/06/23 | 14455 | 14467 | 12 | 11484 | |
| 5/06/23 | 14467 | 14481 | 14 | 13398 | |
| 6/06/23 | 14481 | 14493 | 12 | 11484 | |
| 7/06/23 | 14493 | 14505 | 12 | 11484 | |
| 8/06/23 | 14505 | 14512 | 7 | 6699 | |
| 9/06/23 | 14512 | 14530 | 18 | 17226 | |
| 13/06/23 | 14530 | 14543 | 13 | 12441 | |
| 14/06/23 | 14543 | 14556 | 13 | 12441 | |
| 15/06/23 | 14556 | 14556 | 0 | 0 | |
| 16/06/23 | 14556 | 14569 | 13 | 12441 | |
| 19/06/23 | 14569 | 14584 | 15 | 14355 | |
| 20/06/23 | 14584 | 14597 | 13 | 12441 | |
| 21/06/23 | 14597 | 14610 | 13 | 12441 | |
| 22/06/23 | 14610 | 14619 | 9 | 8613 | |
| 23/06/23 | 14619 | 14631 | 12 | 11484 | |
| 24/06/23 | 14631 | 14637 | 6 | 5742 | |
| 26/06/23 | 14637 | 14653 | 16 | 15312 | |
| 27/06/23 | 14653 | 14669 | 16 | 15312 | |
| 28/06/23 | 14669 | 14682 | 13 | 12441 | |
| 29/06/23 | 14682 | 14695 | 13 | 12441 | |
| 30/06/23 | 14695 | 14707 | 12 | 11484 | |
| Note: information provided by PFF in August 2022-23 | | | | | |
| | | 1 Jan 2022- 31 Dec 2022 | **TOTAL (m3)** | **2710224** | |
| | | | **TOTAL (ML)** | **2710.224** | |



Prepared By: Earth2Water
Checked By: DP

## Table 3-12B: Pumping Records; Lot 198 Clean Water Dam (Jan 2022 to Dec 2022)

| DATE START | METER READING START | METER READING FINISH | HOURS PUMPED (METER) | M3 PUMPED |
|---|---|---|---|---|
| 8/02/22 | 7908 | 7916 | 8 | 7656 |
| 10/02/22 | 7916 | 7925 | 9 | 8613 |
| 11/02/22 | 7925 | 7932 | 7 | 6699 |
| 14/02/22 | 7932 | 7941 | 9 | 8613 |
| 15/02/22 | 7941 | 7950 | 9 | 8613 |
| 16/02/22 | 7950 | 7955 | 5 | 4785 |
| 18/02/22 | 7955 | 7960 | 5 | 4785 |
| 21/02/22 | 7960 | 7971 | 11 | 10527 |
| 22/02/22 | 7971 | 7977 | 6 | 5742 |
| 24/02/22 | 7977 | 7978 | 1 | 957 |
| 1/03/22 | 7978 | 7984 | 6 | 5742 |
| 2/03/22 | 7984 | 7993 | 9 | 8613 |
| 14/03/22 | 7993 | 7997 | 4 | 3828 |
| 15/03/22 | 7997 | 8002 | 5 | 4785 |
| 16/03/22 | 8002 | 8009 | 7 | 6699 |
| 17/03/22 | 8009 | 8012 | 3 | 2871 |
| 21/03/22 | 8012 | 8021 | 9 | 8613 |
| 22/03/22 | 8021 | 8029 | 8 | 7656 |
| 23/03/22 | 8029 | 8039 | 10 | 9570 |
| 24/03/22 | 8039 | 8043 | 4 | 3828 |
| 6/04/22 | 8043 | 8046 | 3 | 2871 |
| 7/04/22 | 8046 | 8050 | 4 | 3828 |
| 8/04/22 | 8050 | 8056 | 6 | 5742 |
| 11/04/22 | 8056 | 8066 | 10 | 9570 |
| 12/04/22 | 8066 | 8075 | 9 | 8613 |
| 13/04/22 | 8075 | 8084 | 9 | 8613 |
| 14/04/22 | 8084 | 8092 | 8 | 7656 |
| 19/04/22 | 8092 | 8095 | 3 | 2871 |
| 20/04/22 | 8095 | 8105 | 10 | 9570 |
| 21/04/22 | 8105 | 8114 | 9 | 8613 |
| 22/04/22 | 8114 | 8117 | 3 | 2871 |
| 26/04/22 | 8117 | 8127 | 10 | 9570 |
| 27/04/22 | 8127 | 8136 | 9 | 8613 |
| 28/04/22 | 8136 | 8146 | 10 | 9570 |
| 29/04/22 | 8146 | 8160 | 14 | 13398 |
| 3/05/22 | 8160 | 8170 | 10 | 9570 |
| 5/05/22 | 8170 | 8174 | 4 | 3828 |
| 5/05/22 | 8174 | 8184 | 10 | 9570 |
| 6/05/22 | 8184 | 8197 | 13 | 12441 |
| 10/05/22 | 8197 | 8207 | 10 | 9570 |
| 11/05/22 | 8207 | 8216 | 9 | 8613 |
| 12/05/22 | 8216 | 8225 | 9 | 8613 |
| 16/05/22 | 8225 | 8233 | 8 | 7656 |
| 17/05/22 | 8233 | 8242 | 9 | 8613 |
| 20/05/22 | 8242 | 8249 | 7 | 6699 |
| 21/05/22 | 8249 | 8269 | 20 | 19140 |
| 24/05/22 | 8269 | 8277 | 8 | 7656 |
| 25/05/22 | 8277 | 8283 | 6 | 5742 |
| 26/05/22 | 8283 | 8292 | 9 | 8613 |
| 27/05/22 | 8292 | 8300 | 8 | 7656 |
| 28/05/22 | 8300 | 8304 | 4 | 3828 |
| 30/05/22 | 8304 | 8314 | 10 | 9570 |
| 31/05/22 | 8314 | 8316 | 2 | 1914 |
| 1/06/22 | 8316 | 8326 | 10 | 9570 |
| 2/06/22 | 8326 | 8335 | 9 | 8613 |
| 3/06/22 | 8335 | 8344 | 9 | 8613 |
| 6/06/22 | 8344 | 8353 | 9 | 8613 |
| 7/06/22 | 8353 | 8362 | 9 | 8613 |
| 8/06/22 | 8362 | 8375 | 13 | 12441 |
| 10/06/22 | 8375 | 8385 | 10 | 9570 |
| 14/06/22 | 8385 | 8394 | 9 | 8613 |
| 15/06/22 | 8394 | 8403 | 9 | 8613 |
| 16/06/22 | 8403 | 8412 | 9 | 8613 |
| 17/06/22 | 8412 | 8423 | 11 | 10527 |
| 20/06/22 | 8423 | 8432 | 9 | 8613 |
| 21/06/22 | 8432 | 8442 | 10 | 9570 |
| 22/06/22 | 8442 | 8451 | 9 | 8613 |
| 27/06/22 | 8451 | 8459 | 8 | 7656 |
| 28/06/22 | 8459 | 8469 | 10 | 9570 |
| 29/06/22 | 8469 | 8478 | 9 | 8613 |
| 30/06/22 | 8478 | 8488 | 10 | 9570 |
| 1/07/22 | 8478 | 8488 | 10 | 9570 |
| 4/07/22 | 8488 | 8489 | 1 | 957 |
| 8/07/22 | 8489 | 8497 | 8 | 7656 |
| 9/07/22 | 8497 | 8500 | 3 | 2871 |
| 11/07/22 | 8500 | 8515 | 15 | 14355 |
| 12/07/22 | 8515 | 8525 | 10 | 9570 |
| 13/07/22 | 8525 | 8533 | 8 | 7656 |
| 14/07/22 | 8533 | 8543 | 10 | 9570 |
| 15/07/22 | 8543 | 8552 | 9 | 8613 |
| 18/07/22 | 8552 | 8561 | 9 | 8613 |
| 19/07/22 | 8561 | 8571 | 10 | 9570 |
| 20/07/22 | 8571 | 8580 | 9 | 8613 |
| 21/07/22 | 8580 | 8590 | 10 | 9570 |
| 22/07/22 | 8590 | 8599 | 9 | 8613 |



Prepared By: Earth2Water
Checked By: DP

| | | | | |
|---|---|---|---|---|
| 25/07/22 | 8599 | 8608 | 9 | 8613 |
| 26/07/22 | 8608 | 8618 | 10 | 9570 |
| 27/07/22 | 8618 | 8628 | 10 | 9570 |
| 28/07/22 | 8628 | 8637 | 9 | 8613 |
| 29/07/22 | 8637 | 8647 | 10 | 9570 |
| 1/08/22 | 8647 | 8656 | 9 | 8613 |
| 2/08/22 | 8656 | 8666 | 10 | 9570 |
| 3/08/22 | 8666 | 8676 | 10 | 9570 |
| 4/08/22 | 8676 | 8684 | 8 | 7656 |
| 5/08/22 | 8684 | 8691 | 7 | 6699 |
| 8/08/22 | 8691 | 8700 | 9 | 8613 |
| 9/08/22 | 8700 | 8710 | 10 | 9570 |
| 10/08/22 | 8710 | 8718 | 8 | 7656 |
| 11/08/22 | 8718 | 8727 | 9 | 8613 |
| 15/08/22 | 8727 | 8737 | 10 | 9570 |
| 16/08/22 | 8737 | 8742 | 5 | 4785 |
| 19/08/22 | 8742 | 8751 | 9 | 8613 |
| 22/08/22 | 8751 | 8758 | 7 | 6699 |
| 23/08/22 | 8758 | 8772 | 14 | 13398 |
| 25/08/22 | 8772 | 8782 | 10 | 9570 |
| 26/08/22 | 8782 | 8790 | 8 | 7656 |
| 3/09/22 | 8790 | 8795 | 5 | 4785 |
| 5/09/22 | 8795 | 8805 | 10 | 9570 |
| 6/09/22 | 8805 | 8814 | 9 | 8613 |
| 7/09/22 | 8814 | 8819 | 5 | 4785 |
| 8/09/22 | 8819 | 8829 | 10 | 9570 |
| 9/09/22 | 8829 | 8835 | 6 | 5742 |
| 12/09/22 | 8835 | 8848 | 13 | 12441 |
| 13/09/22 | 8848 | 8858 | 10 | 9570 |
| 14/09/22 | 8858 | 8867 | 9 | 8613 |
| 15/09/22 | 8867 | 8876 | 9 | 8613 |
| 16/09/22 | 8876 | 8881 | 5 | 4785 |
| 19/09/22 | 8881 | 8891 | 10 | 9570 |
| 20/09/22 | 8891 | 8900 | 9 | 8613 |
| 21/09/22 | 8900 | 8910 | 10 | 9570 |
| 23/09/22 | 8910 | 8919 | 9 | 8613 |
| 26/09/22 | 8919 | 8929 | 10 | 9570 |
| 27/09/22 | 8929 | 8938 | 9 | 8613 |
| 28/09/22 | 8938 | 8948 | 10 | 9570 |
| 29/09/22 | 8948 | 8957 | 9 | 8613 |
| 30/09/22 | 8957 | 8967 | 10 | 9570 |
| 4/10/22 | 8967 | 8977 | 10 | 9570 |
| 6/10/22 | 8977 | 8986 | 9 | 8613 |
| 7/10/22 | 8986 | 9004 | 18 | 17226 |
| 12/10/22 | 9004 | 9032 | 28 | 26796 |
| 17/10/22 | 9032 | 9041 | 9 | 8613 |
| 18/10/22 | 9041 | 9051 | 10 | 9570 |
| 19/10/22 | 9051 | 9060 | 9 | 8613 |
| 20/10/22 | 9060 | 9069 | 9 | 8613 |
| 21/10/22 | 9069 | 9079 | 10 | 9570 |
| 24/10/22 | 9079 | 9088 | 9 | 8613 |
| 25/10/22 | 9088 | 9098 | 10 | 9570 |
| 26/10/22 | 9098 | 9108 | 10 | 9570 |
| 28/10/22 | 9108 | 9117 | 9 | 8613 |
| 31/10/22 | 9117 | 9127 | 10 | 9570 |
| 1/11/22 | 9127 | 9136 | 9 | 8613 |
| 3/11/22 | 9136 | 9143 | 7 | 6699 |
| 4/11/22 | 9143 | 9152 | 9 | 8613 |
| 7/11/22 | 9152 | 9161 | 9 | 8613 |
| 8/11/22 | 9161 | 9170 | 9 | 8613 |
| 9/11/22 | 9170 | 9179 | 9 | 8613 |
| 10/11/22 | 9179 | 9188 | 9 | 8613 |
| 11/11/22 | 9188 | 9198 | 10 | 9570 |
| 14/11/22 | 9198 | 9206 | 8 | 7656 |
| 15/11/22 | 9206 | 9215 | 9 | 8613 |
| 16/11/22 | 9215 | 9225 | 10 | 9570 |
| 17/11/22 | 9225 | 9235 | 10 | 9570 |
| 21/11/22 | 9235 | 9244 | 9 | 8613 |
| 22/11/22 | 9244 | 9252 | 8 | 7656 |
| 23/11/22 | 9252 | 9259 | 7 | 6699 |
| 24/11/22 | 9259 | 9265 | 6 | 5742 |
| 25/11/22 | 9265 | 9275 | 10 | 9570 |
| 26/11/22 | 9275 | 9284 | 9 | 8613 |
| 27/11/22 | 9284 | 9293 | 9 | 8613 |
| 30/11/22 | 9293 | 9302 | 9 | 8613 |
| 1/12/22 | 9302 | 9313 | 11 | 10527 |
| 5/12/22 | 9313 | 9322 | 9 | 8613 |
| 6/12/22 | 9322 | 9331 | 9 | 8613 |
| 7/12/22 | 9331 | 9341 | 10 | 9570 |
| 8/12/22 | 9341 | 9358 | 17 | 16269 |
| 12/12/22 | 9358 | 9362 | 4 | 3828 |
| 13/12/22 | 9362 | 9372 | 10 | 9570 |
| 14/12/22 | 9372 | 9382 | 10 | 9570 |
| 15/12/22 | 9382 | 9391 | 9 | 8613 |
| 16/12/22 | 9391 | 9400 | 9 | 8613 |
| 19/12/22 | 9400 | 9410 | 10 | 9570 |
| 20/12/22 | 9410 | 9419 | 9 | 8613 |
| 21/12/22 | 9419 | 9429 | 10 | 9570 |

Note: information provided by PFF in August 2022 &23

1 Jan 2022 to 31 Dec 2022

| | |
|---|---|
| **TOTAL (m3)** | **1465167** |
| **TOTAL (ML)** | 1465.167 |



Prepared By: Earth2Water
Checked By: DP

**Table 3-12B: Pumping Records; Lot 198 Clean Water Dam (July 2022- June 2023)**

| DATE START | METER READING START | METER READING FINISH | HOURS PUMPED (METER) | M3 PUMPED |
|---|---|---|---|---|
| 1/07/22 | 8478 | 8488 | 10 | 9570 |
| 4/07/22 | 8488 | 8489 | 1 | 957 |
| 8/07/22 | 8489 | 8497 | 8 | 7656 |
| 9/07/22 | 8497 | 8500 | 3 | 2871 |
| 11/07/22 | 8500 | 8515 | 15 | 14355 |
| 12/07/22 | 8515 | 8525 | 10 | 9570 |
| 13/07/22 | 8525 | 8533 | 8 | 7656 |
| 14/07/22 | 8533 | 8543 | 10 | 9570 |
| 15/07/22 | 8543 | 8552 | 9 | 8613 |
| 18/07/22 | 8552 | 8561 | 9 | 8613 |
| 19/07/22 | 8561 | 8571 | 10 | 9570 |
| 20/07/22 | 8571 | 8580 | 9 | 8613 |
| 21/07/22 | 8580 | 8590 | 10 | 9570 |
| 22/07/22 | 8590 | 8599 | 9 | 8613 |
| 25/07/22 | 8599 | 8608 | 9 | 8613 |
| 26/07/22 | 8608 | 8618 | 10 | 9570 |
| 27/07/22 | 8618 | 8628 | 10 | 9570 |
| 28/07/22 | 8628 | 8637 | 9 | 8613 |
| 29/07/22 | 8637 | 8647 | 10 | 9570 |
| 1/08/22 | 8647 | 8656 | 9 | 8613 |
| 2/08/22 | 8656 | 8666 | 10 | 9570 |
| 3/08/22 | 8666 | 8676 | 10 | 9570 |
| 4/08/22 | 8676 | 8684 | 8 | 7656 |
| 5/08/22 | 8684 | 8691 | 7 | 6699 |
| 8/08/22 | 8691 | 8700 | 9 | 8613 |
| 9/08/22 | 8700 | 8710 | 10 | 9570 |
| 10/08/22 | 8710 | 8718 | 8 | 7656 |
| 11/08/22 | 8718 | 8727 | 9 | 8613 |
| 15/08/22 | 8727 | 8737 | 10 | 9570 |
| 16/08/22 | 8737 | 8742 | 5 | 4785 |
| 19/08/22 | 8742 | 8751 | 9 | 8613 |
| 22/08/22 | 8751 | 8758 | 7 | 6699 |
| 23/08/22 | 8758 | 8772 | 14 | 13398 |
| 25/08/22 | 8772 | 8782 | 10 | 9570 |
| 26/08/22 | 8782 | 8790 | 8 | 7656 |
| 3/09/22 | 8790 | 8795 | 5 | 4785 |
| 5/09/22 | 8795 | 8805 | 10 | 9570 |
| 6/09/22 | 8805 | 8814 | 9 | 8613 |
| 7/09/22 | 8814 | 8819 | 5 | 4785 |
| 8/09/22 | 8819 | 8829 | 10 | 9570 |
| 9/09/22 | 8829 | 8835 | 6 | 5742 |
| 12/09/22 | 8835 | 8848 | 13 | 12441 |
| 13/09/22 | 8848 | 8858 | 10 | 9570 |
| 14/09/22 | 8858 | 8867 | 9 | 8613 |
| 15/09/22 | 8867 | 8876 | 9 | 8613 |
| 16/09/22 | 8876 | 8881 | 5 | 4785 |
| 19/09/22 | 8881 | 8891 | 10 | 9570 |
| 20/09/22 | 8891 | 8900 | 9 | 8613 |
| 21/09/22 | 8900 | 8910 | 10 | 9570 |
| 23/09/22 | 8910 | 8919 | 9 | 8613 |
| 26/09/22 | 8919 | 8929 | 10 | 9570 |
| 27/09/22 | 8929 | 8938 | 9 | 8613 |
| 28/09/22 | 8938 | 8948 | 10 | 9570 |
| 29/09/22 | 8948 | 8957 | 9 | 8613 |
| 30/09/22 | 8957 | 8967 | 10 | 9570 |
| 4/10/22 | 8967 | 8977 | 10 | 9570 |
| 6/10/22 | 8977 | 8986 | 9 | 8613 |
| 7/10/22 | 8986 | 9004 | 18 | 17226 |
| 12/10/22 | 9004 | 9032 | 28 | 26796 |
| 17/10/22 | 9032 | 9041 | 9 | 8613 |
| 18/10/22 | 9041 | 9051 | 10 | 9570 |
| 19/10/22 | 9051 | 9060 | 9 | 8613 |
| 20/10/22 | 9060 | 9069 | 9 | 8613 |
| 21/10/22 | 9069 | 9079 | 10 | 9570 |
| 24/10/22 | 9079 | 9088 | 9 | 8613 |
| 25/10/22 | 9088 | 9098 | 10 | 9570 |
| 26/10/22 | 9098 | 9108 | 10 | 9570 |
| 28/10/22 | 9108 | 9117 | 9 | 8613 |
| 31/10/22 | 9117 | 9127 | 10 | 9570 |
| 1/11/22 | 9127 | 9136 | 9 | 8613 |
| 3/11/22 | 9136 | 9143 | 7 | 6699 |
| 4/11/22 | 9143 | 9152 | 9 | 8613 |
| 7/11/22 | 9152 | 9161 | 9 | 8613 |
| 8/11/22 | 9161 | 9170 | 9 | 8613 |
| 9/11/22 | 9170 | 9179 | 9 | 8613 |
| 10/11/22 | 9179 | 9188 | 9 | 8613 |
| 11/11/22 | 9188 | 9198 | 10 | 9570 |
| 14/11/22 | 9198 | 9206 | 8 | 7656 |
| 15/11/22 | 9206 | 9215 | 9 | 8613 |
| 16/11/22 | 9215 | 9225 | 10 | 9570 |
| 17/11/22 | 9225 | 9235 | 10 | 9570 |
| 21/11/22 | 9235 | 9244 | 9 | 8613 |
| 22/11/22 | 9244 | 9252 | 8 | 7656 |
| 23/11/22 | 9252 | 9259 | 7 | 6699 |
| 24/11/22 | 9259 | 9265 | 6 | 5742 |
| 25/11/22 | 9265 | 9275 | 10 | 9570 |
| 26/11/22 | 9275 | 9284 | 9 | 8613 |
| 27/11/22 | 9284 | 9293 | 9 | 8613 |
| 30/11/22 | 9293 | 9302 | 9 | 8613 |
| 1/12/22 | 9302 | 9313 | 11 | 10527 |
| 5/12/22 | 9313 | 9322 | 9 | 8613 |
| 6/12/22 | 9322 | 9331 | 9 | 8613 |
| 7/12/22 | 9331 | 9341 | 10 | 9570 |
| 8/12/22 | 9341 | 9358 | 17 | 16269 |
| 12/12/22 | 9358 | 9362 | 4 | 3828 |
| 13/12/22 | 9362 | 9372 | 10 | 9570 |
| 14/12/22 | 9372 | 9382 | 10 | 9570 |
| 15/12/22 | 9382 | 9391 | 9 | 8613 |
| 16/12/22 | 9391 | 9400 | 9 | 8613 |
| 19/12/22 | 9400 | 9410 | 10 | 9570 |
| 20/12/22 | 9410 | 9419 | 9 | 8613 |
| 21/12/22 | 9419 | 9429 | 10 | 9570 |
| 9/01/23 | 9429 | 9439 | 10 | 9570 |
| 10/01/23 | 9439 | 9450 | 11 | 10527 |



Prepared By: Earth2Water
Checked By: DP

| | | | | |
|---|---|---|---|---|
| 11/01/23 | 9450 | 9461 | 11 | 10527 |
| 12/01/23 | 9461 | 9472 | 11 | 10527 |
| 13/01/23 | 9472 | 9483 | 11 | 10527 |
| 16/01/23 | 9483 | 9511 | 28 | 26796 |
| 19/01/23 | 9511 | 9521 | 10 | 9570 |
| 20/01/23 | 9521 | 9540 | 19 | 18183 |
| 24/01/23 | 9540 | 9548 | 8 | 7656 |
| 25/01/23 | 9548 | 9571 | 23 | 22011 |
| 31/01/23 | 9571 | 9575 | 4 | 3828 |
| 1/02/23 | 9575 | 9585 | 10 | 9570 |
| 2/02/23 | 9585 | 9593 | 8 | 7656 |
| 3/02/23 | 9593 | 9601 | 8 | 7656 |
| 6/02/23 | 9601 | 9607 | 6 | 5742 |
| 8/02/23 | 9607 | 9614 | 7 | 6699 |
| 9/02/23 | 9614 | 9624 | 10 | 9570 |
| 10/02/23 | 9624 | 9630 | 6 | 5742 |
| 13/02/23 | 9630 | 9640 | 10 | 9570 |
| 14/02/23 | 9640 | 9650 | 10 | 9570 |
| 15/02/23 | 9650 | 9658 | 8 | 7656 |
| 16/02/23 | 9658 | 9668 | 10 | 9570 |
| 17/02/23 | 9668 | 9673 | 5 | 4785 |
| 21/02/23 | 9673 | 9680 | 7 | 6699 |
| 22/02/23 | 9680 | 9706 | 26 | 24882 |
| 27/02/23 | 9706 | 9715 | 9 | 8613 |
| 28/02/23 | 9715 | 9720 | 5 | 4785 |
| 1/03/23 | 9720 | 9729 | 9 | 8613 |
| 2/03/23 | 9729 | 9739 | 10 | 9570 |
| 3/03/23 | 9739 | 9748 | 9 | 8613 |
| 6/03/23 | 9748 | 9758 | 10 | 9570 |
| 7/03/23 | 9758 | 9764 | 6 | 5742 |
| 8/03/23 | 9764 | 9772 | 8 | 7656 |
| 9/03/23 | 9772 | 9781 | 9 | 8613 |
| 10/03/23 | 9781 | 9791 | 10 | 9570 |
| 13/03/23 | 9791 | 9798 | 7 | 6699 |
| 14/03/23 | 9798 | 9808 | 10 | 9570 |
| 15/03/23 | 9808 | 9814 | 6 | 5742 |
| 16/03/23 | 9814 | 9824 | 10 | 9570 |
| 17/03/23 | 9824 | 9833 | 9 | 8613 |
| 20/03/23 | 9833 | 9848 | 15 | 14355 |
| 21/03/23 | 9848 | 9852 | 4 | 3828 |
| 22/03/23 | 9852 | 9861 | 9 | 8613 |
| 23/03/23 | 9861 | 9870 | 9 | 8613 |
| 24/03/23 | 9870 | 9878 | 8 | 7656 |
| 25/03/23 | 9878 | 9887 | 9 | 8613 |
| 27/03/23 | 9887 | 9897 | 10 | 9570 |
| 28/03/23 | 9897 | 9906 | 9 | 8613 |
| 29/03/23 | 9906 | 9915 | 9 | 8613 |
| 30/03/23 | 9915 | 9924 | 9 | 8613 |
| 31/03/23 | 9924 | 9933 | 9 | 8613 |
| 3/04/23 | 9933 | 9935 | 2 | 1914 |
| 4/04/23 | 9935 | 9967 | 32 | 30624 |
| 12/04/23 | 9967 | 9976 | 9 | 8613 |
| 13/04/23 | 9976 | 9986 | 10 | 9570 |
| 14/04/23 | 9986 | 9996 | 10 | 9570 |
| 17/04/23 | 9996 | 10005 | 9 | 8613 |
| 18/04/23 | 10005 | 10014 | 9 | 8613 |
| 19/04/23 | 10014 | 10024 | 10 | 9570 |
| 20/04/23 | 10024 | 10033 | 9 | 8613 |
| 21/04/23 | 10033 | 10038 | 5 | 4785 |
| 22/04/23 | 10038 | 10043 | 5 | 4785 |
| 24/04/23 | 10043 | 10052 | 9 | 8613 |
| 27/04/23 | 10052 | 10061 | 9 | 8613 |
| 28/04/23 | 10061 | 10071 | 10 | 9570 |
| 1/05/23 | 10071 | 10078 | 7 | 6699 |
| 2/05/23 | 10078 | 10087 | 9 | 8613 |
| 3/05/23 | 10087 | 10101 | 14 | 13398 |
| 5/05/23 | 10101 | 10110 | 9 | 8613 |
| 8/05/23 | 10110 | 10120 | 10 | 9570 |
| 9/05/23 | 10120 | 10129 | 9 | 8613 |
| 10/05/23 | 10129 | 10139 | 10 | 9570 |
| 11/05/23 | 10139 | 10145 | 6 | 5742 |
| 12/05/23 | 10145 | 10155 | 10 | 9570 |
| 15/05/23 | 10155 | 10164 | 9 | 8613 |
| 16/05/23 | 10164 | 10174 | 10 | 9570 |
| 17/05/23 | 10174 | 10184 | 10 | 9570 |
| 18/05/23 | 10184 | 10193 | 9 | 8613 |
| 19/05/23 | 10193 | 10200 | 7 | 6699 |
| 22/05/23 | 10200 | 10210 | 10 | 9570 |
| 23/05/23 | 10210 | 10227 | 17 | 16269 |
| 25/05/23 | 10227 | 10236 | 9 | 8613 |
| 28/05/23 | 10236 | 10246 | 10 | 9570 |
| 29/05/23 | 10246 | 10255 | 9 | 8613 |
| 30/05/23 | 10255 | 10265 | 10 | 9570 |
| 31/05/23 | 10265 | 10275 | 10 | 9570 |
| 1/06/23 | 10275 | 10282 | 7 | 6699 |
| 2/06/23 | 10282 | 10291 | 9 | 8613 |
| 5/06/23 | 10291 | 10301 | 10 | 9570 |
| 6/06/23 | 10301 | 10308 | 7 | 6699 |
| 7/06/23 | 10308 | 10318 | 10 | 9570 |
| 8/06/23 | 10318 | 10327 | 9 | 8613 |
| 9/06/23 | 10327 | 10336 | 9 | 8613 |
| 13/06/23 | 10336 | 10344 | 8 | 7656 |
| 14/06/23 | 10344 | 10354 | 10 | 9570 |
| 15/06/23 | 10354 | 10363 | 9 | 8613 |
| 16/06/23 | 10363 | 10373 | 10 | 9570 |
| 19/06/23 | 10373 | 10382 | 9 | 8613 |
| 20/06/23 | 10382 | 10392 | 10 | 9570 |
| 21/06/23 | 10392 | 10402 | 10 | 9570 |
| 22/06/23 | 10402 | 10409 | 7 | 6699 |
| 23/06/23 | 10409 | 10418 | 9 | 8613 |
| 26/06/23 | 10418 | 10428 | 10 | 9570 |
| 27/06/23 | 10428 | 10437 | 9 | 8613 |
| 28/06/23 | 10437 | 10447 | 10 | 9570 |
| 29/06/23 | 10447 | 10457 | 10 | 9570 |
| 30/06/23 | 10457 | 10467 | 10 | 9570 |

Note: information provided by PFF in August 2023

1 July 2022 to 30 June 2023

| | |
|---|---|
| **TOTAL (m3)** | **1903473** |
| **TOTAL (ML)** | 1903.473 |



Prepared By: Earth2Water
Checked By: DP

**Table 3-13: Maroota Hitchcock Road & Lot 198- Surface Water Analyses for Creeks (2018 - 2023)**
Sites: Lot 198 & Hitchcock Rd

| Water Sample ID | | Guideline Limits | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Lot 198 | Downstream Lot 198 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Date* | Units | | 16/6/23 | 14/3/23 | 19/12/22 | 29/9/22 | 22/3/22 | 20/12/21 | 21/9/21 | 23/6/21 | 14/12/20 | 23/9/20 | 30/6/20 | 23/3/20 | 13/12/19 | 2/9/19 | 5/12/18 | 11/4/19 | 3/9/18 |
| pH | | =+/- 1 (BG) | 6.23 | 6.56 | 6.38 | 7.27 | 6.37 | 5.76 | 6.75 | 5.75 | 6.04 | 5.85 | 5.91 | 6.24 | 5.6 | 5.86 | 5.35 | 6.72 | 5.7 |
| Electrical Conductivity, EC | uS/cm | <1500 | 206 | 173 | 208 | 220 | 107 | 212 | 200 | 205 | 194 | 193 | 182 | 221 | 210 | 224 | 291 | 225 | 201 |
| Suspended Solids (SS) | mg/L | <50 | <5 | <5 | 6 | 8 | 24 | 7 | <5 | <5 | <5 | <5 | NA | NA | NA | 18 | <5 | 8 | 4.5 |
| Turbidity | NTU | <50 | | | | | | | | | | | NA | 6 | <5 | NA | 1.5 | 10.5 | 1.5 |
| Oil& Grease | mg/L | <10 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <0.1 |
| Total Dissolved Solids | mg/L | | | 127 | 107 | | | | 130 | | | 136 | 124 | | | | | | 108 |
| *Major Ions* | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | | NA | 4 | 4 | 7 | 4 | | | 3 | 2 | 3 | 4 | | 3 | 6 | | | |
| Magnesium | mg/L | | | 5 | 5 | 7 | 2 | | | 6 | 4 | 4 | 4 | | 4 | 4 | | | |
| Sodium | mg/L | | | 21 | 23 | 21 | 13 | | | 29 | 25 | 29 | 30 | | 30 | 25 | | | |
| Potassium | mg/L | | | 2 | 3 | 4 | 3 | | | 2 | 1 | 2 | 2 | | 2 | 2 | | | |
| Bicarbonate | mg/L | | 9 | 6 | 10 | 10 | 13 | | | 2 | 6 | 4 | 8 | | 4 | 8 | | | |
| Total Alkalinity | mg/L | | 9 | 6 | 10 | 10 | 13 | | | 2 | 6 | 4 | 8 | | 4 | 8 | | | |
| Sulphate | mg/L | | 18 | 16 | 21 | 34 | 16 | | | 24 | 6 | 14 | 6 | | 9 | 16 | | | |
| Chloride | mg/L | | 48 | 36 | 42 | 38 | 20 | | | 43 | 46 | 45 | 48 | | 53 | 46 | | | |

Notes:
Water samples collected by Melissa Mass of SE Environmental Pty Ltd
Note 1: Analyses by Boral Laboratory in Sept 2019
Note 2: Analyses by ALS Laboratory in Dec 2018, April /May 2019 to 2023
BG= background. Sample locations shown on Figures 1 & 5

Laboratory reports by ALS are provided in separate documentation. Summary results table provided for future reference

No Site Access- June & September 2022 (too wet)

| Water Sample ID | | Guideline Limits | Hitchcock Tailings | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd Crk | Hitchcock Rd | Hitchcock Rd Crk | Hitchcock Rd | Hitchcock Rd- Little Catai Crk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Date* | Units | | 23/9/20 | 16/6/23 | 14/3/23 | 19/12/22 | 29/9/22 | 22/3/22 | 20/12/21 | 21/9/21 | 23/6/21 | 14/12/20 | 23/9/20 | 30/6/20 | 23/3/20 | 13/12/19 | 2/9/19 | 5/12/18 | 11/4/19 | 1/9/18 |
| pH | | =+/- 1 (BG) | 5.52 | 6.05 | 6.41 | 6.02 | NA | 6.53 | 6.85 | 5.84 | 5.73 | 5.6 | 5.36 | 5.24 | 5.54 | 5.02 | 5.04 | 4.4 | 5.22 | 4.4 |
| Electrical Conductivity, EC | uS/cm | <1500 | 129 | 108 | 108 | 116 | | 170 | 139 | 151 | 148 | 187 | 173 | 179 | 225 | 193 | 282 | 236 | 241 | 187 |
| Suspended Solids (SS) | mg/L | <50 | 9 | <5 | <5 | <5 | | <5 | 11 | <5 | <5 | <5 | <5 | NA | NA | NA | 9 | <5 | 5 | 6.5 |
| Turbidity | NTU | <50 | | | | | | | | | | | | NA | <5 | <5 | 9 | 0.3 | 0.3 | 1.1 |
| Oil& Grease | mg/L | <10 | <5 | <5 | <5 | <5 | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <0.1 |
| Total Dissolved Solids | mg/L | | 96 | | 64 | 70 | | | | 114 | | | 130 | 110 | | | | | | 95 |
| *Major Ions* | | | | | | | | | | | | | | | | | | | | |
| Calcium | mg/L | | 3 | NA | 1 | 1 | | 3 | | | 1 | <1 | <1 | <1 | | <1 | 2 | | | |
| Magnesium | mg/L | | 3 | | 3 | 3 | | 5 | | | 4 | 4 | 4 | 5 | | 4 | 7 | | | |
| Sodium | mg/L | | 16 | | 13 | 13 | | 21 | | | 21 | 23 | 26 | 28 | | 22 | 33 | | | |
| Potassium | mg/L | | 3 | | 3 | 3 | | 4 | | | 3 | 2 | 2 | 2 | | <1 | 2 | | | |
| Bicarbonate | mg/L | | 2 | 5 | 5 | 6 | | 8 | | | 4 | 2 | 2 | 4 | | 2 | <1 | | | |
| Total Alkalinity | mg/L | | 2 | 5 | 5 | 6 | | 8 | | | 4 | 2 | 2 | 4 | | 2 | <1 | | | |
| Sulphate | mg/L | | 9 | 5 | 4 | 3 | | 7 | | | 4 | 2 | 6 | 4 | | 2 | 6 | | | |
| Chloride | mg/L | | 30 | 28 | 27 | 31 | | 40 | | | 40 | 46 | 45 | 48 | | 46 | 68 | | | |


Prepared By: Earth2Water Pty Ltd
Checked By: DP

**Table 3-14: Water Analyses for New Wells at Pits 8 & 13 (Nov 2020, Aug 2021, Sept 2022, & Aug 2023)**

Site; 4378 Old Northern Rd, Maroota

| **Maroota New Wells** | units | PFPit8MW 6D | PFPit8MW6D | PFPit8MW6D | PFPit8MW6D | PFPit13MW 7D | PFPit13MW 7D | PFPit13MW 7D | PFPitMW 8B | PFPitMW 8B | PFPit8MW 8C | PFPit8MW 8C | PFPit8MW 8D | PFPit8MW 8D | Pit 8 Pond | Pit 8 Pond |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sandstone | Sandstone | Sandstone | Sandstone | Sandstone | Sandstone | Sandstone | Tertiary Sands | Tertiary Sands | Tertiary Sands | Tertiary Sands | Tertiary Sands | Tertiary Sands | Stormwater Pond | Stormwater Pond |
| Date | | 15/8/2023 | 15/9/2022 | 17/8/2021 | 02/11/2020 | 16/8/2023 | 15/9/2022 | 17/8/2021 | 02/11/2020 | 17/8/2021 | 02/11/2020 | 17/8/2021 | 02/11/2020 | 17/8/2021 | 02/11/2020 | 17/8/2021 |
| pH | | 5.68 | 5.63 | 5.39 | 5.63 | 4.05 | 4.06 | 4.09 | 6.37 | 4.76 | 6.13 | 4.44 | 6.22 | 4.82 | 5.61 | 5.34 |
| Electrical Conductivity, EC | uS/cm | 64 | 69 | 97 | 118 | 445 | 435 | 438 | 78 | 49 | 143 | 100 | 87 | 57 | 47 | 54 |
| Total Dissolved Solids (ALS) | mg/L | 51 | 38 | 61 | 62 | 258 | 226 | 254 | 79 | 32 | 216 | 65 | 56 | 49 | 31 | 35 |
| Calcium, Ca | mg/L | 1 | 1 | <1 | 2 | <1 | <1 | 1 | 6 | <1 | 6 | <1 | 3 | 1 | <1 | <1 |
| Magnesium, Mg | mg/L | 2 | 2 | 4 | 3 | 8 | 8 | 8 | 1 | 1 | 3 | 4 | 1 | 1 | <1 | 1 |
| Sodium, Na | mg/L | 6 | 8 | 10 | 12 | 60 | 57 | 58 | 7 | 5 | 13 | 12 | 9 | 7 | 6 | 8 |
| Potassium, K | mg/L | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | <1 | 1 | 1 | 4 | 2 | 1 | 2 |
| Bicarbonate, HCO3 | mgIL | 3 | 4 | <1 | 3 | <1 | <1 | <1 | 10 | <1 | 6 | <1 | 4 | <1 | 2 | <1 |
| Sulphate, SO4 | mg/L | 2 | 2 | <1 | 4 | 4 | 4 | 3 | 6 | 1 | 8 | <1 | 12 | 4 | 4 | 6 |
| Chloride, Cl | mg/L | 11 | 13 | 19 | 19 | 130 | 127 | 126 | 12 | 10 | 23 | 21 | 13 | 11 | 8 | 14 |
| Oil& Grease | mg/L | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |

Note:
Groundwater samples collected by D.Parisotto from Earth2Water Pty Ltd
Samples analysed by ALS Environmental (NATA acredited laboratory)
No access to Pit 8 wells (PFPit8MW-8A to MW-8G) or Pond 8 during 2021- 2022 due to flood/muddy site. Pit 8 quarry backfilled in late 2022 to early 2023 and wells decommissioned



Prepared By: Earth2Water Pty Ltd
CHecked By: DParisotto

# APPENDIX A

## LIMITATIONS

Earth2Water Pty Ltd has prepared this report for the use of PF Formation Pty Ltd (PFF) in accordance with the standard terms and conditions of the consulting profession. This report is prepared in accordance with a generalised scope of work. The methodology adopted and sources of information used by E2W are outlined in this report. Information for the groundwater and surface water study were also provided by Melissa Mass of SE Environmental Pty Ltd.

This report was prepared during August/September 2023 and is based on the information reviewed at the time of preparation. This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

The precision with which conditions are indicated depends largely on the frequency and method of sampling, and the uniformity of conditions as constrained by the project budget limitations. The behaviour of groundwater and some aspects of contaminants in soil and groundwater are complex. Our conclusions are based upon the analytical data presented in this report, and our experience.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, E2W should be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

# APPENDIX B-1

Analytical Laboratory Certificates (ALS, August 2023)
Groundwater Wells

Batch 2 of 2.

# CHAIN OF CUSTODY DOCUMENTATION- EARTH2WATER PTY LTD

CLIENT: **Earth2Water Pty Ltd**
POSTAL ADDRESS: 175 Fern St, Gerringong NSW
SEND REPORT TO: D.Parisotto — SEND INVOICE TO: JOSh Graham
DATA NEEDED BY: 5 day turnaround — REPORT NEEDED BY: 5 day turnaround (important)
Site: Maroota — QUOTE NO.:
P.O. NO.: E2W-224A — COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:

INVOICE to:
PF Formation
Josh Graham
josh@pfformation.com.au

Ratain samples for 3 weeks prior to disposal

LABORATORY BATCH NO.:
SAMPLERS: Melissa Mass
PHONE: 0422 334102 E-MAIL: dino@earth2water.com.au
REPORT FORMAT: HARD: Yes FAX:Yes DISK: ☐ BULLETIN BOARD: ☐ E-MAIL: yes
QC LEVEL: QCS1:☐ QCS2:☐ QCS3 Yes QCS4:☐

ALS Environmental
**Smithfield**

ANALYSIS REQUIRED

| | SAMPLE ID | MATRIX | DATE | TIME | ALS Containers TYPE & PRESERVATIVE | NO. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ✓ PF 167 MW-1 | gwater | 16.8.23 | | OG + 1Lpl | | YES | | | |
| 2 | ✓ PF 166 MW1 | gwater | 16.8.23 | | " | | YES | | | |
| | PF L2 Hicth MW1 | gwater | | | | | ~~YES~~ | | | |
| 3 | ✓ PF P214 MW1 | gwater | 16.8.23 | | OG + 1L pl | | YES | | | |
| | PF 198 PB3 | gwater | | | client to | | YES | | | |
| | PF 198 PB1 | gwater | | | provide 17.8.22 | | YES | | | |
| | PF167MW-2D | gwater | | | | | ~~YES~~ | | | |
| | PF167MW-2S | gwater | | | | | ~~YES~~ | | | |
| 4 | ✓ PF167MW-3D | gwater | 16.8.23 | | OG + 1Lpl | | YES | | | |
| 5 | ✓ PF167MW-4D | gwater | 16.8.23 | | ↓ | | YES | | | |
| 6 | ✓ PF167MW-4S | gwater | 16.8.23 | | ↓ | | YES | | | |
| | PF-1 | gwater | | | | | ~~YES~~ | | | |
| | PF-2 | gwater | | | | | ~~YES~~ | | | |
| 7 | ✓ PF-3 | gwater | 16.8.23 | | OG + 1L pl | | YES | | | |
| 8 | ✓ CWD | swater | 16.8.23 | | OG + 1L pla | | YES | | | |
| 9 | ✓ Por167 Dam | swater | 16.8.23 | | " | | YES | | | |

HT

Environmental Division
Sydney
Work Order Reference
ES2327795

Telephone : +61-2-8784 8555

**Laboratory Analyses**

1 **Oil & Grease**
1 **Ph, EC, TDS,**
1 **Ca, Mg, Na, K, Cl, HCO3, SO4**

Email lab reports & COC to 3 recipients
dino@earth2water.com.au
josh@pfformation.com.au
mmass@southeastenvironmental.com.au

Notes
**water samples not filtered**

RELINQUISHED BY:
NAME: Dino Parisotto DATE:
OF: Earth2Water TIME:
NAME: DATE:
OF: TIME:
17/8/23

RECEIVED BY
NAME: Jack DATE: 17/8/23
OF: AU TIME: 17:45pm
NAME: DATE:
OF: TIME:

OG = oil & grease container

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES2327640** | Page | : 1 of 3 |
| Client | : **EARTH2WATER PTY LTD** | Laboratory | : Environmental Division Sydney |
| Contact | : MR DINO PARISOTTO | Contact | : Customer Services ES |
| Address | : 175 FERN ST<br>GERRINGONG NSW 2534 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| Telephone | : ---- | Telephone | : +61-2-8784 8555 |
| Project | : ---- | Date Samples Received | : 16-Aug-2023 14:49 |
| Order number | : E2W-224A | Date Analysis Commenced | : 18-Aug-2023 |
| C-O-C number | : ---- | Issue Date | : 24-Aug-2023 08:38 |
| Sampler | : Melissa Mass | | |
| Site | : Maroota | | |
| Quote number | : SYBQ/408/21 | | |
| No. of samples received | : 4 | | |
| No. of samples analysed | : 4 | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Ankit Joshi | Senior Chemist - Inorganics | Sydney Inorganics, Smithfield, NSW |
| Dian Dao | Senior Chemist - Inorganics | Sydney Inorganics, Smithfield, NSW |

## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- TDS by method EA-015 may bias high for sample 4 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EN055: Ionic Balance out of acceptable limits for sample ES2327640-#001 due to analytes not quantified in this report.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | PF L2 Hitch MW1 | PF167MW-2D | PF167MW-2S | MW-6D | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 15-Aug-2023 00:00 | 15-Aug-2023 00:00 | 15-Aug-2023 00:00 | 15-Aug-2023 00:00 | ---- |
| Compound | CAS Number | LOR | Unit | ES2327640-001 | ES2327640-002 | ES2327640-003 | ES2327640-004 | -------- |
| | | | | Result | Result | Result | Result | ---- |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 4.28 | 5.21 | 4.45 | 5.68 | ---- |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 346 | 140 | 242 | 64 | ---- |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 192 | 93 | 137 | 51 | ---- |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | <1 | 4 | <1 | 3 | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | <1 | 4 | <1 | 3 | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 4 | 2 | 5 | 2 | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 103 | 32 | 63 | 11 | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | <1 | 2 | 4 | 1 | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | 4 | 3 | 6 | 2 | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | 47 | 19 | 20 | 6 | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | <1 | 2 | 2 | 2 | ---- |
| **EN055: Ionic Balance** | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | 2.99 | 1.02 | 1.88 | 0.41 | ---- |
| ø Total Cations | ---- | 0.01 | meq/L | 2.37 | 1.22 | 1.61 | 0.53 | ---- |
| **EP020: Oil and Grease (O&G)** | | | | | | | | |
| Oil & Grease | ---- | 5 | mg/L | <5 | <5 | <5 | <5 | ---- |

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES2327795** | Page | : 1 of 5 |
| **Amendment** | : **1** | | |
| Client | : **PF FORMATION** | Laboratory | : Environmental Division Sydney |
| Contact | : Josh Graham | Contact | : Customer Services ES |
| Address | : 1 Patrica Fay Drive<br>MAROOTA 2756 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| Telephone | : ---- | Telephone | : +61-2-8784 8555 |
| Project | : Maroota | Date Samples Received | : 17-Aug-2023 12:45 |
| Order number | : ---- | Date Analysis Commenced | : 18-Aug-2023 |
| C-O-C number | : ---- | Issue Date | : 30-Aug-2023 13:40 |
| Sampler | : Melissa Mass | | |
| Site | : ---- | | |
| Quote number | : EN/333 | | |
| No. of samples received | : 12 | | |
| No. of samples analysed | : 12 | | |

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- Analytical Results

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This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Ankit Joshi | Senior Chemist - Inorganics | Sydney Inorganics, Smithfield, NSW |

## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EN055: Ionic Balance out of acceptable limits for sample ES2327795-#010 due to analytes not quantified in this report.
- Amendment (24/085/2023): This report has been amended and re-released to allow the reporting of additional analytical data, for sample MW-7D which was previously on hold.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | PF 167 MW-1 | PF 166 MW1 | PF 214 MW1 | PF167MW-3D | PF167MW-4D |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 |
| Compound | CAS Number | LOR | Unit | ES2327795-001 | ES2327795-002 | ES2327795-003 | ES2327795-004 | ES2327795-005 |
| | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 5.43 | 4.60 | 4.36 | 4.33 | 6.32 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 169 | 146 | 211 | 118 | 162 |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 127 | 119 | 120 | 72 | 120 |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 4 | 2 | <1 | <1 | 15 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 4 | 2 | <1 | <1 | 15 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 26 | 14 | 3 | 2 | 4 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 26 | 24 | 50 | 24 | 19 |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 4 | 2 | <1 | <1 | 5 |
| Magnesium | 7439-95-4 | 1 | mg/L | 4 | 5 | 6 | 2 | 2 |
| Sodium | 7440-23-5 | 1 | mg/L | 14 | 10 | 20 | 12 | 22 |
| Potassium | 7440-09-7 | 1 | mg/L | 4 | 2 | 1 | <1 | <1 |
| **EN055: Ionic Balance** | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | 1.35 | 1.01 | 1.47 | 0.72 | 0.92 |
| ø Total Cations | ---- | 0.01 | meq/L | 1.24 | 1.00 | 1.39 | 0.69 | 1.37 |
| **EP020: Oil and Grease (O&G)** | | | | | | | | |
| Oil & Grease | ---- | 5 | mg/L | <5 | <5 | <5 | <5 | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | PF167MW-4S | PF-3 | CWD | POR167 DAM | MW-7D |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 |
| Compound | CAS Number | LOR | Unit | ES2327795-006 | ES2327795-007 | ES2327795-008 | ES2327795-009 | ES2327795-010 |
| | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 5.25 | 4.07 | 4.97 | 5.97 | 4.05 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 157 | 286 | 122 | 129 | 445 |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 120 | 168 | 85 | 94 | 258 |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 5 | <1 | 1 | 4 | <1 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 5 | <1 | 1 | 4 | <1 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 20 | 9 | 7 | 15 | 4 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 25 | 58 | 25 | 22 | 130 |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 4 | 2 | 1 | 6 | <1 |
| Magnesium | 7439-95-4 | 1 | mg/L | 5 | 4 | 2 | 2 | 8 |
| Sodium | 7440-23-5 | 1 | mg/L | 15 | 31 | 13 | 12 | 60 |
| Potassium | 7440-09-7 | 1 | mg/L | 1 | <1 | 4 | 3 | 1 |
| **EN055: Ionic Balance** | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | 1.22 | 1.82 | 0.87 | 1.01 | 3.75 |
| ø Total Cations | ---- | 0.01 | meq/L | 1.29 | 1.78 | 0.88 | 1.06 | 3.29 |
| ø Ionic Balance | ---- | 0.01 | % | ---- | ---- | ---- | ---- | 6.48 |
| **EP020: Oil and Grease (O&G)** | | | | | | | | |
| Oil & Grease | ---- | 5 | mg/L | <5 | <5 | <5 | <5 | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | PF 198 PB3 | PF 198 PB1 | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 16-Aug-2023 00:00 | 16-Aug-2023 00:00 | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | ES2327795-011 | ES2327795-012 | -------- | -------- | -------- |
| | | | | Result | Result | ---- | ---- | ---- |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | **6.29** | **4.83** | ---- | ---- | ---- |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | **154** | **163** | ---- | ---- | ---- |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | **82** | **92** | ---- | ---- | ---- |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | ---- | ---- | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | ---- | ---- | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | **22** | <1 | ---- | ---- | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | **22** | <1 | ---- | ---- | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | **4** | **8** | ---- | ---- | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | **28** | **34** | ---- | ---- | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | **2** | **1** | ---- | ---- | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | **5** | **2** | ---- | ---- | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | **17** | **20** | ---- | ---- | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | **2** | **2** | ---- | ---- | ---- |
| **EN055: Ionic Balance** | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | **1.31** | **1.12** | ---- | ---- | ---- |
| ø Total Cations | ---- | 0.01 | meq/L | **1.30** | **1.14** | ---- | ---- | ---- |
| **EP020: Oil and Grease (O&G)** | | | | | | | | |
| Oil & Grease | ---- | 5 | mg/L | <5 | <5 | ---- | ---- | ---- |

# APPENDIX B-2

Creek Monitoring Results
SEE field testing & ALS Laboratory Reports
(September 2022,
December 2022, March 2023, June 2023)

# Surface Water Monitoring

**PF Formation - Maroota Quarries**

1 Patricia Fay Drive Ph 45668314
Maroota NSW 2756

Location - Lot 198

| | | | |
|---|---|---|---|
| **Time of collection** (date/time) | 29/09/2022 815am | **Weather conditions** (hot/cold/dry/windy/raining) | Cool, calm, clear |
| **Stream bank** (rocky/sandy/muddy) | Rocky/sandy | **Climate 3mths preceeding** (rainfall/drought/extremes) | Extreme rainfall |
| **Water flow rate** (fast/slow/none) | Moderate | **Stream depth** (mm, cm or m) | 1cm |
| **Water clarity** (turbidity, sheen) | Clear | **Stream width** (mm, cm or m) | 1.2m |
| **Stream condition** (erosion, polutants) | Vegetated on banks | **Other observations** | |

| **Field tests** | **pH** | **EC** | **TDS** | **Temp C°** |
|---|---|---|---|---|
| | 6.41 | 0.2 | 100 | 14.1 |

**Site photo**

Sample collected by - Melissa Mass/South East Environmental
Signed *Melissa Mass*

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES2234911** | Page | : 1 of 4 |
| Client | : **PF FORMATION** | Laboratory | : Environmental Division Sydney |
| Contact | : Josh Graham | Contact | : Customer Services ES |
| Address | : 1 Patrica Fay Drive<br>MAROOTA 2756 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| Telephone | : ---- | Telephone | : +61-2-8784 8555 |
| Project | : ---- | Date Samples Received | : 29-Sep-2022 14:50 |
| Order number | : ---- | Date Analysis Commenced | : 01-Oct-2022 |
| C-O-C number | : ---- | Issue Date | : 07-Oct-2022 17:33 |
| Sampler | : Melissa Mass | | |
| Site | : ---- | | |
| Quote number | : EN/333 | | |
| No. of samples received | : 5 | | |
| No. of samples analysed | : 5 | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Ankit Joshi | Senior Chemist - Inorganics | Sydney Inorganics, Smithfield, NSW |
| Wisam Marassa | Inorganics Coordinator | Sydney Inorganics, Smithfield, NSW |

## General Comments

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Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EA010-P LCS recovery for Conductivity falls outside ALS Dynamic Control Limit . However, it is within the acceptance criteria based on ALS DQO. No further action is required.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | LOT 198 | PIT 5 | PIT 4 | MAROOTA LODGE DAM 1 | MAROOTA LODGE DAM 2 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 29-Sep-2022 08:15 | 29-Sep-2022 10:00 | 29-Sep-2022 10:35 | 29-Sep-2022 11:00 | 29-Sep-2022 11:05 |
| Compound | CAS Number | LOR | Unit | | ES2234911-001 | ES2234911-002 | ES2234911-003 | ES2234911-004 | ES2234911-005 |
| | | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | | 7.27 | 6.55 | 7.34 | 6.95 | 7.18 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | | 220 | 64 | 251 | 106 | 247 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | | 8 | 28 | 18 | 15 | 18 |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | | 10 | 5 | 29 | 14 | 39 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | | 10 | 5 | 29 | 14 | 39 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | | 34 | 6 | 27 | 15 | 42 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | | 38 | 13 | 34 | 16 | 19 |
| **ED093F: Dissolved Major Cations** | | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | | 7 | 1 | 14 | 6 | 19 |
| Magnesium | 7439-95-4 | 1 | mg/L | | 7 | 1 | 7 | 2 | 6 |
| Sodium | 7440-23-5 | 1 | mg/L | | 21 | 10 | 18 | 12 | 17 |
| Potassium | 7440-09-7 | 1 | mg/L | | 4 | 2 | 8 | 2 | 9 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | | ---- | ---- | ---- | <0.01 | 2.30 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | | ---- | ---- | ---- | 0.2 | 3.9 |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | | ---- | ---- | ---- | 0.2 | 6.2 |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | | ---- | ---- | ---- | 0.01 | 1.12 |
| **EN055: Ionic Balance** | | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | | 1.98 | 0.59 | 2.10 | 1.04 | 2.19 |
| ø Total Cations | ---- | 0.01 | meq/L | | 1.94 | 0.62 | 2.26 | 1.04 | 2.41 |
| **EP020: Oil and Grease (O&G)** | | | | | | | | | |
| Oil & Grease | ---- | 5 | mg/L | | <5 | <5 | <5 | <5 | <5 |

# Surface Water Monitoring

**PF Formation - Maroota Quarries**

1 Patricia Fay Drive Ph 45668314
Maroota NSW 2756

Location - Hitchcock Road

| | | | |
|---|---|---|---|
| **Time of collection** (date/time) | 19/12/2022 10.50am | **Weather conditions** (hot/cold/dry/windy/raining) | Warm, partly cloudy, still |
| **Stream bank** (rocky/sandy/muddy) | Sand/rock | **Climate 3mths preceeding** (rainfall/drought/extremes) | Average rain |
| **Water flow rate** (fast/slow/none) | Moderate | **Stream depth** (mm, cm or m) | 10cm - 50cm |
| **Water clarity** (turbidity, sheen) | Clear | **Stream width** (mm, cm or m) | 0.5 - 1.2m |
| **Stream condition** (erosion, polutants) | Vegetated, moss | **Other observations** | |

| **Field tests** | **pH** | **EC** | **TDS** | **Temp C°** |
|---|---|---|---|---|
| | 6.46 | 0.10mS | 50ppm | 18.5 |

**Site photo**


Sample collected by -
Melissa Mass/South East Environmental
Signed *Melissa Mass*

# Surface Water Monitoring

**PF Formation - Maroota Quarries**

1 Patricia Fay Drive Ph 45668314
Maroota NSW 2756

Location - Lot 198

| | | | |
|---|---|---|---|
| **Time of collection** (date/time) | 19/12/2022 8am | **Weather conditions** (hot/cold/dry/windy/raining) | Warm, partly cloudy, still |
| **Stream bank** (rocky/sandy/muddy) | Sand/rock | **Climate 3mths preceeding** (rainfall/drought/extremes) | Average rain |
| **Water flow rate** (fast/slow/none) | moderate | **Stream depth** (mm, cm or m) | 1cm - 30cm |
| **Water clarity** (turbidity, sheen) | Clear | **Stream width** (mm, cm or m) | 0.8-1.2m |
| **Stream condition** (erosion, polutants) | Vegetated | **Other observations** | vegetation recovering from erosio |

| **Field tests** | **pH** | **EC** | **TDS** | **Temp C°** |
|---|---|---|---|---|
| | 6.32 | 0.17mS | 90ppm | 15.6 |

**Site photo**

Sample collected by -
Melissa Mass/South East Environmental
Signed *Melissa Mass*

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES2245900** | Page | : 1 of 4 |
| Client | : **PF FORMATION** | Laboratory | : Environmental Division Sydney |
| Contact | : Josh Graham | Contact | : Customer Services ES |
| Address | : 1 Patrica Fay Drive<br>MAROOTA 2756 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| Telephone | : ---- | Telephone | : +61-2-8784 8555 |
| Project | : ---- | Date Samples Received | : 19-Dec-2022 13:10 |
| Order number | : ---- | Date Analysis Commenced | : 19-Dec-2022 |
| C-O-C number | : ---- | Issue Date | : 29-Dec-2022 21:29 |
| Sampler | : MMass-SouthEastEnvironmental | | |
| Site | : ---- | | |
| Quote number | : EN/333 | | |
| No. of samples received | : 5 | | |
| No. of samples analysed | : 5 | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Wisam Marassa | Inorganics Coordinator | Sydney Inorganics, Smithfield, NSW |

## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- TDS by method EA-015 may bias high for sample 4 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | Lot 198 | Pit 4 | Hitchcock Rd | Maroota Lodge 1 | Maroota Lodge 2 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 19-Dec-2022 07:50 | 19-Dec-2022 09:30 | 19-Dec-2022 10:45 | 19-Dec-2022 10:00 | 19-Dec-2022 10:05 |
| Compound | CAS Number | LOR | Unit | ES2245900-001 | ES2245900-002 | ES2245900-003 | ES2245900-004 | ES2245900-005 |
| | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 6.38 | 7.10 | 6.02 | 6.42 | 7.08 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 208 | 378 | 116 | 92 | 222 |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 107 | 254 | 70 | 78 | 138 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | 6 | 12 | <5 | 28 | 44 |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 10 | 66 | 6 | 18 | 56 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 10 | 66 | 6 | 18 | 56 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 21 | 43 | 3 | 9 | 28 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 42 | 38 | 31 | 15 | 18 |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 4 | 26 | 1 | 4 | 18 |
| Magnesium | 7439-95-4 | 1 | mg/L | 5 | 9 | 3 | 2 | 5 |
| Sodium | 7440-23-5 | 1 | mg/L | 23 | 20 | 13 | 9 | 11 |
| Potassium | 7440-09-7 | 1 | mg/L | 3 | 14 | 3 | 2 | 7 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | ---- | ---- | ---- | <0.01 | <0.01 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | 0.6 | 2.9 |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | 0.6 | 2.9 |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | ---- | ---- | ---- | 0.09 | 1.66 |
| **EN055: Ionic Balance** | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | 1.82 | 3.28 | 1.06 | 0.97 | 2.21 |
| ø Total Cations | ---- | 0.01 | meq/L | 1.69 | 3.27 | 0.94 | 0.81 | 1.97 |
| ø Ionic Balance | ---- | 0.01 | % | ---- | 0.30 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: **WATER** (Matrix: **WATER**) | | | | Sample ID | **Lot 198** | **Pit 4** | **Hitchcock Rd** | **Maroota Lodge 1** | **Maroota Lodge 2** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 19-Dec-2022 07:50 | 19-Dec-2022 09:30 | 19-Dec-2022 10:45 | 19-Dec-2022 10:00 | 19-Dec-2022 10:05 |
| *Compound* | *CAS Number* | *LOR* | *Unit* | | **ES2245900-001** | **ES2245900-002** | **ES2245900-003** | **ES2245900-004** | **ES2245900-005** |
| | | | | | Result | Result | Result | Result | Result |
| **EP020: Oil and Grease (O&G)** | | | | | | | | | |
| **Oil & Grease** | ---- | 5 | mg/L | | <5 | <5 | <5 | <5 | **8** |

# Surface Water Monitoring

**PF Formation - Maroota Quarries**

1 Patricia Fay Drive Ph 45668314
Maroota NSW 2756

Hitchcock Road

| | | | |
|---|---|---|---|
| **Time of collection** (date/time) | 14/03/2023 850am | **Weather conditions** (hot/cold/dry/windy/raining) | Cloudy/cool/calm |
| **Stream bank** (rocky/sandy/muddy) | Sand/Peat | **Climate 3mths preceeding** (rainfall/drought/extremes) | Average |
| **Water flow rate** (fast/slow/none) | Fast-moderate | **Stream depth** (mm, cm or m) | 3cm - 30cm |
| **Water clarity** (turbidity, sheen) | Clear | **Stream width** (mm, cm or m) | 0.4m-2m |
| **Stream condition** (erosion, polutants) | Vegetated/mossy | **Other observations** | |

| **Field tests** | **pH** | **EC** | **TDS** | **Temp C°** |
|---|---|---|---|---|
| | 6.46 | 0.11mS | 60ppm | 19.5 |

**Site photo**


Sample collected by - Melissa Mass/South East Environmental

Signed *Melissa Mass*

# Surface Water Monitoring

**PF Formation - Maroota Quarries**

1 Patricia Fay Drive Ph 45668314
Maroota NSW 2756

Lot 198

| | | | |
|---|---|---|---|
| **Time of collection** (date/time) | 14/03/2023 8.00am | **Weather conditions** (hot/cold/dry/windy/raining) | Cloudy/cool/calm |
| **Stream bank** (rocky/sandy/muddy) | Rock/sand | **Climate 3mths preceeding** (rainfall/drought/extremes) | Average |
| **Water flow rate** (fast/slow/none) | Fast-moderate | **Stream depth** (mm, cm or m) | 3cm-30cm |
| **Water clarity** (turbidity, sheen) | Clear | **Stream width** (mm, cm or m) | 3m |
| **Stream condition** (erosion, polutants) | Vegetated on banks | **Other observations** | |

| **Field tests** | **pH** | **EC** | **TDS** | **Temp C°** |
|---|---|---|---|---|
| | 6.48 | 0.18mS | 70ppm | 18.8 |

**Site photo**

Sample collected by - Melissa Mass/South East Environmental

Signed *Melissa Mass*

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES2308246** | Page | : 1 of 6 |
| Client | : **PF FORMATION** | Laboratory | : Environmental Division Sydney |
| Contact | : Josh Graham | Contact | : Customer Services ES |
| Address | : 1 Patrica Fay Drive<br>MAROOTA 2756 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| Telephone | : ---- | Telephone | : +61-2-8784 8555 |
| Project | : ---- | Date Samples Received | : 14-Mar-2023 13:35 |
| Order number | : ---- | Date Analysis Commenced | : 14-Mar-2023 |
| C-O-C number | : ---- | Issue Date | : 21-Mar-2023 16:13 |
| Sampler | : M.Mass - South East Environmental | | |
| Site | : ---- | | |
| Quote number | : EN/333 | | |
| No. of samples received | : 6 | | |
| No. of samples analysed | : 6 | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Ankit Joshi | Senior Chemist - Inorganics | Sydney Inorganics, Smithfield, NSW |
| Wisam Marassa | Inorganics Coordinator | Sydney Inorganics, Smithfield, NSW |

## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | Pit 5 | Pit 4 | Lot 198 | Hitchcock Rd | Maroota Lodge Dam 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 14-Mar-2023 09:35 | 14-Mar-2023 10:05 | 14-Mar-2023 07:50 | 14-Mar-2023 00:00 | 14-Mar-2023 10:40 |
| Compound | CAS Number | LOR | Unit | ES2308246-001 | ES2308246-002 | ES2308246-003 | ES2308246-004 | ES2308246-005 |
| | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 6.98 | 7.35 | 6.56 | 6.41 | 6.54 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 98 | 354 | 173 | 108 | 69 |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | 65 | 212 | 127 | 64 | 62 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | 10 | <5 | <5 | <5 | 7 |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 13 | 91 | 6 | 5 | 12 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 13 | 91 | 6 | 5 | 12 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 4 | 31 | 16 | 4 | 6 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 20 | 38 | 36 | 27 | 9 |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 2 | 28 | 4 | 1 | 4 |
| Magnesium | 7439-95-4 | 1 | mg/L | 2 | 11 | 5 | 3 | 1 |
| Sodium | 7440-23-5 | 1 | mg/L | 13 | 23 | 21 | 13 | 7 |
| Potassium | 7440-09-7 | 1 | mg/L | 3 | 10 | 2 | 3 | 2 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | ---- | ---- | ---- | ---- | <0.01 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | ---- | 0.3 |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | ---- | 0.3 |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | ---- | ---- | ---- | ---- | 0.03 |
| **EN055: Ionic Balance** | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | 0.91 | 3.54 | 1.47 | 0.94 | 0.62 |
| ø Total Cations | ---- | 0.01 | meq/L | 0.91 | 3.56 | 1.58 | 0.94 | 0.64 |
| ø Ionic Balance | ---- | 0.01 | % | ---- | 0.33 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: **WATER** (Matrix: **WATER**) | | | Sample ID | **Pit 5** | **Pit 4** | **Lot 198** | **Hitchcock Rd** | **Maroota Lodge Dam 1** |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 14-Mar-2023 09:35 | 14-Mar-2023 10:05 | 14-Mar-2023 07:50 | 14-Mar-2023 00:00 | 14-Mar-2023 10:40 |
| *Compound* | *CAS Number* | *LOR* | *Unit* | **ES2308246-001** | **ES2308246-002** | **ES2308246-003** | **ES2308246-004** | **ES2308246-005** |
| | | | | Result | Result | Result | Result | Result |
| **EP020: Oil and Grease (O&G)** | | | | | | | | |
| **Oil & Grease** | ---- | 5 | mg/L | <5 | <5 | <5 | <5 | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | Maroota Lodge Dam 2 | ---- | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 14-Mar-2023 10:45 | ---- | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | ES2308246-006 | -------- | -------- | -------- | -------- |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **EA005P: pH by PC Titrator** | | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | | 6.98 | ---- | ---- | ---- | ---- |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | | 234 | ---- | ---- | ---- | ---- |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | | 154 | ---- | ---- | ---- | ---- |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | | 30 | ---- | ---- | ---- | ---- |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | | <1 | ---- | ---- | ---- | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | | <1 | ---- | ---- | ---- | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | | 46 | ---- | ---- | ---- | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | | 46 | ---- | ---- | ---- | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | | 37 | ---- | ---- | ---- | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | | 17 | ---- | ---- | ---- | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | | 18 | ---- | ---- | ---- | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | | 5 | ---- | ---- | ---- | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | | 15 | ---- | ---- | ---- | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | | 11 | ---- | ---- | ---- | ---- |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | | <0.01 | ---- | ---- | ---- | ---- |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | | 1.7 | ---- | ---- | ---- | ---- |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | | 1.7 | ---- | ---- | ---- | ---- |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | | 0.86 | ---- | ---- | ---- | ---- |
| **EN055: Ionic Balance** | | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | | 2.17 | ---- | ---- | ---- | ---- |
| ø Total Cations | ---- | 0.01 | meq/L | | 2.24 | ---- | ---- | ---- | ---- |
| **EP020: Oil and Grease (O&G)** | | | | | | | | | |

## Analytical Results

| Sub-Matrix: **WATER** (Matrix: **WATER**) | | | | Sample ID | **Maroota Lodge Dam 2** | **----** | **----** | **----** | **----** |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 14-Mar-2023 10:45 | ---- | ---- | ---- | ---- |
| *Compound* | *CAS Number* | *LOR* | *Unit* | | **ES2308246-006** | **--------** | **--------** | **--------** | **--------** |
| | | | | | Result | ---- | ---- | ---- | ---- |
| **EP020: Oil and Grease (O&G) - Continued** | | | | | | | | | |
| **Oil & Grease** | ---- | 5 | mg/L | | <5 | **----** | **----** | **----** | **----** |

# Surface Water Monitoring

**PF Formation - Maroota Quarries**

1 Patricia Fay Drive Ph 45668314
Maroota NSW 2756

Location - Hitchcocks Road

| | | | | | |
|---|---|---|---|---|---|
| **Time of collection** (date/time) | 16/06/2023 1055am | | | **Weather conditions** (hot/cold/dry/windy/raining) | Cool, still, clear |
| **Stream bank** (rocky/sandy/muddy) | Peat/Sand | | | **Climate 3mths preceeding** (rainfall/drought/extremes) | Near normal |
| **Water flow rate** (fast/slow/none) | Moderate | | | **Stream depth** (mm, cm or m) | 3cm - 40cm |
| **Water clarity** (turbidity, sheen) | Clear | | | **Stream width** (mm, cm or m) | 1m - 1.5m |
| **Stream condition** (erosion, polutants) | Vegetated/mossy | | | **Other observations** | |
| **Field tests** | **pH** | **EC** | **TDS** | **Temp C°** | |
| | 7.37 | 0.11mS | 50ppm | 12 | |

**Site photo**


Sample collected by - Melissa Mass/South East Environmental
Signed *Melissa Mass*

# Surface Water Monitoring

**PF Formation - Maroota Quarries**

1 Patricia Fay Drive Ph 45668314
Maroota NSW 2756

Location - Lot 198

| | | | |
|---|---|---|---|
| **Time of collection** (date/time) | 16/06/2023 8.15am | **Weather conditions** (hot/cold/dry/windy/raining) | Cool, still, clear |
| **Stream bank** (rocky/sandy/muddy) | Rock | **Climate 3mths preceeding** (rainfall/drought/extremes) | Near normal |
| **Water flow rate** (fast/slow/none) | Moderate | **Stream depth** (mm, cm or m) | 2cm - 40cm |
| **Water clarity** (turbidity, sheen) | Clear | **Stream width** (mm, cm or m) | 20cm - 2m |
| **Stream condition** (erosion, polutants) | Vegetated on banks | **Other observations** | |

| **Field tests** | **pH** | **EC** | **TDS** | **Temp C°** |
|---|---|---|---|---|
| | 7.11 | 0.21mS | 100ppm | 10 |

**Site photo**

Sample collected by - Melissa Mass/South East Environmental
Signed *Melissa Mass*

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ES2320075** | Page | : 1 of 3 |
| Client | : **PF FORMATION** | Laboratory | : Environmental Division Sydney |
| Contact | : Josh Graham | Contact | : Customer Services ES |
| Address | : 1 Patrica Fay Drive<br>MAROOTA 2756 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 |
| Telephone | : ---- | Telephone | : +61-2-8784 8555 |
| Project | : ---- | Date Samples Received | : 16-Jun-2023 13:35 |
| Order number | : ---- | Date Analysis Commenced | : 16-Jun-2023 |
| C-O-C number | : ---- | Issue Date | : 22-Jun-2023 14:56 |
| Sampler | : Melissa Mass, South East Environmental | | |
| Site | : ---- | | |
| Quote number | : EN/333 | | |
| No. of samples received | : 5 | | |
| No. of samples analysed | : 5 | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Ankit Joshi | Senior Chemist - Inorganics | Sydney Inorganics, Smithfield, NSW |

## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Poor spike recovery for TKN due to matrix interferences(confirmed by re-analysis).

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | Lot 198 | Pit 4 | Maroota Lodge Dam 1 | Maroota Lodge Dam 2 | Hitchcock Rd |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 16-Jun-2023 08:15 | 16-Jun-2023 09:50 | 16-Jun-2023 10:20 | 16-Jun-2023 10:35 | 16-Jun-2023 10:55 |
| Compound | CAS Number | LOR | Unit | | ES2320075-001 | ES2320075-002 | ES2320075-003 | ES2320075-004 | ES2320075-005 |
| | | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | | 6.23 | 6.95 | 6.31 | 6.83 | 6.05 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | | 206 | 573 | 75 | 246 | 108 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | | <5 | <5 | 13 | 8 | <5 |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | | 9 | 84 | 11 | 66 | 5 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | | 9 | 84 | 11 | 66 | 5 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | | 18 | 105 | 5 | 24 | 5 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | | 48 | 49 | 14 | 21 | 28 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | | ---- | ---- | <0.01 | 0.48 | ---- |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | | ---- | ---- | 0.5 | 1.2 | ---- |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | | ---- | ---- | 0.5 | 1.7 | ---- |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | | ---- | ---- | 0.01 | 1.05 | ---- |
| **EP020: Oil and Grease (O&G)** | | | | | | | | | |
| Oil & Grease | ---- | 5 | mg/L | | <5 | <5 | <5 | <5 | <5 |

# APPENDIX C

Previous Bore Hydrographs (URS, 2013)

URS

## P.F.FORMATION
## Bore PF167MW1 Groundwater Monitoring Data

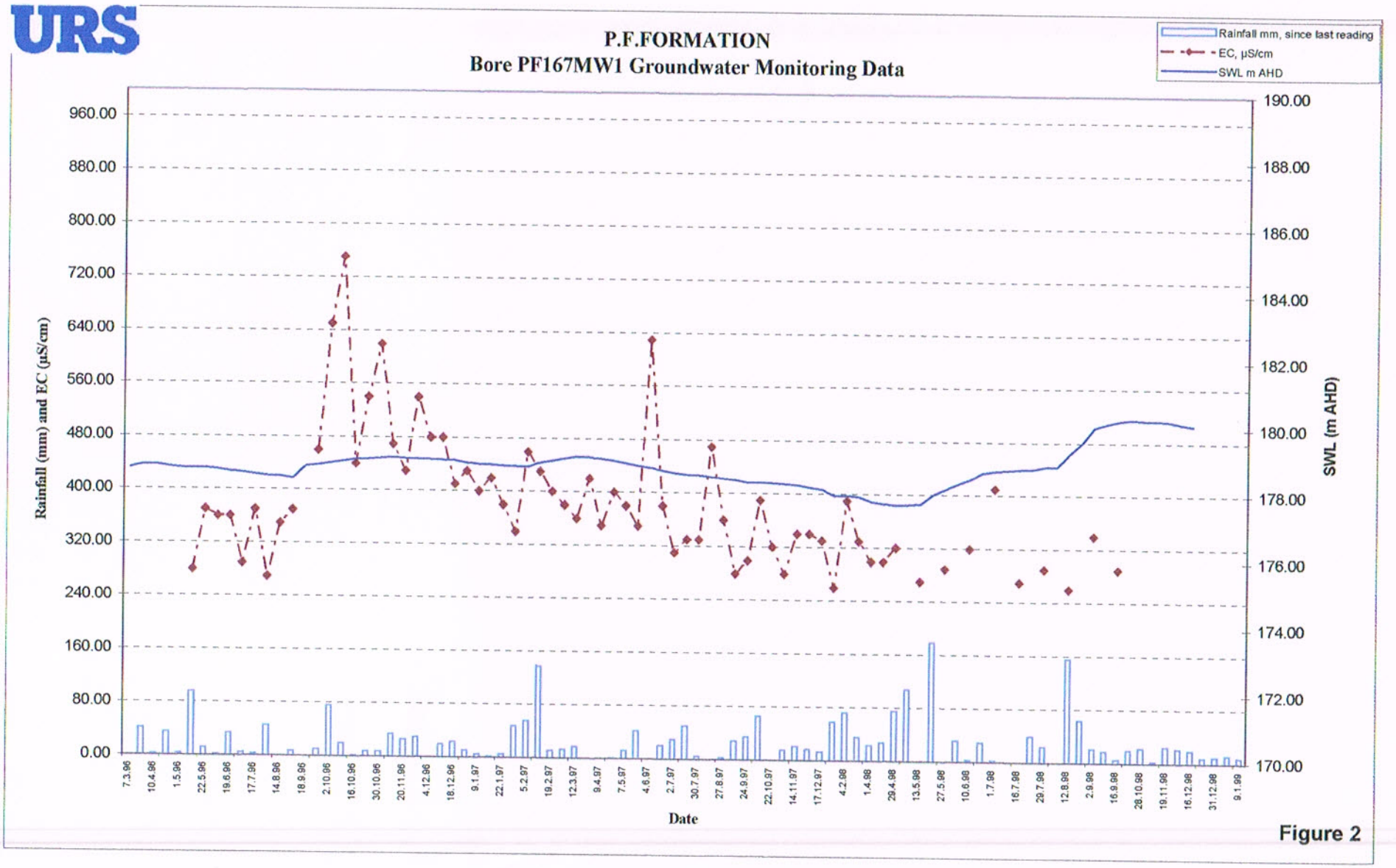



Figure 2

URS

**PF FORMATION**
**Bore PF167MW1 Groundwater Monitoring Data**

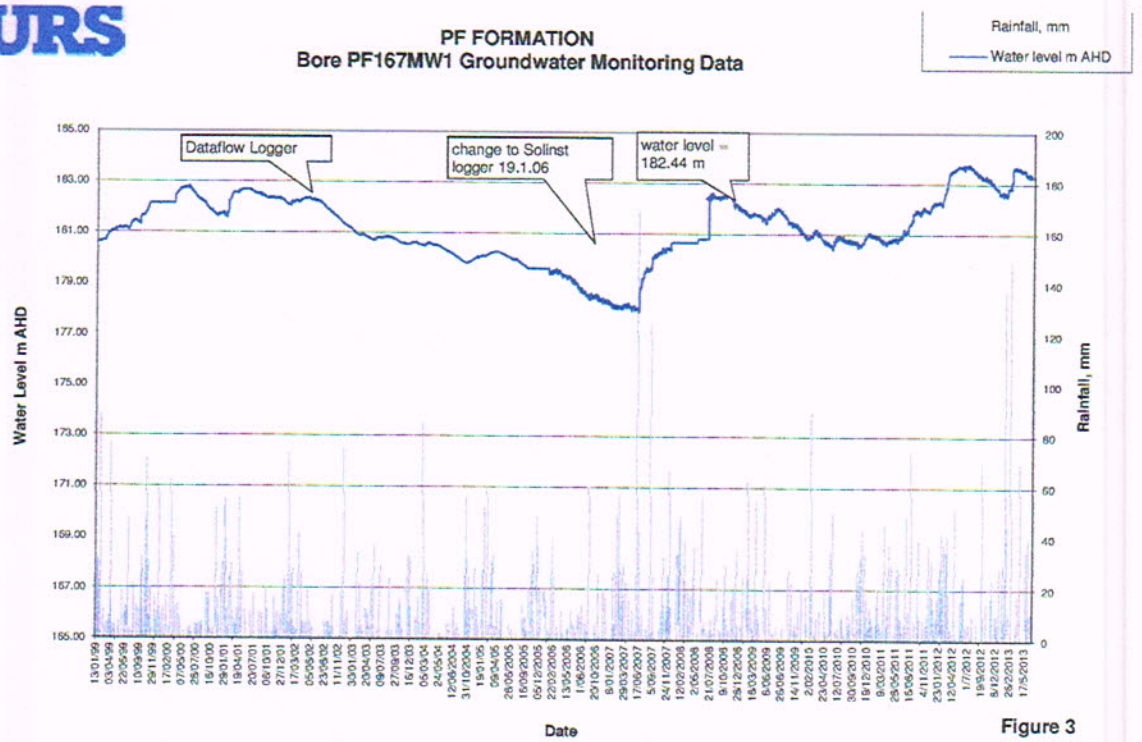



Figure 3

URS

**PF FORMATION**
**PF166MW1 Groundwater Monitoring Data**

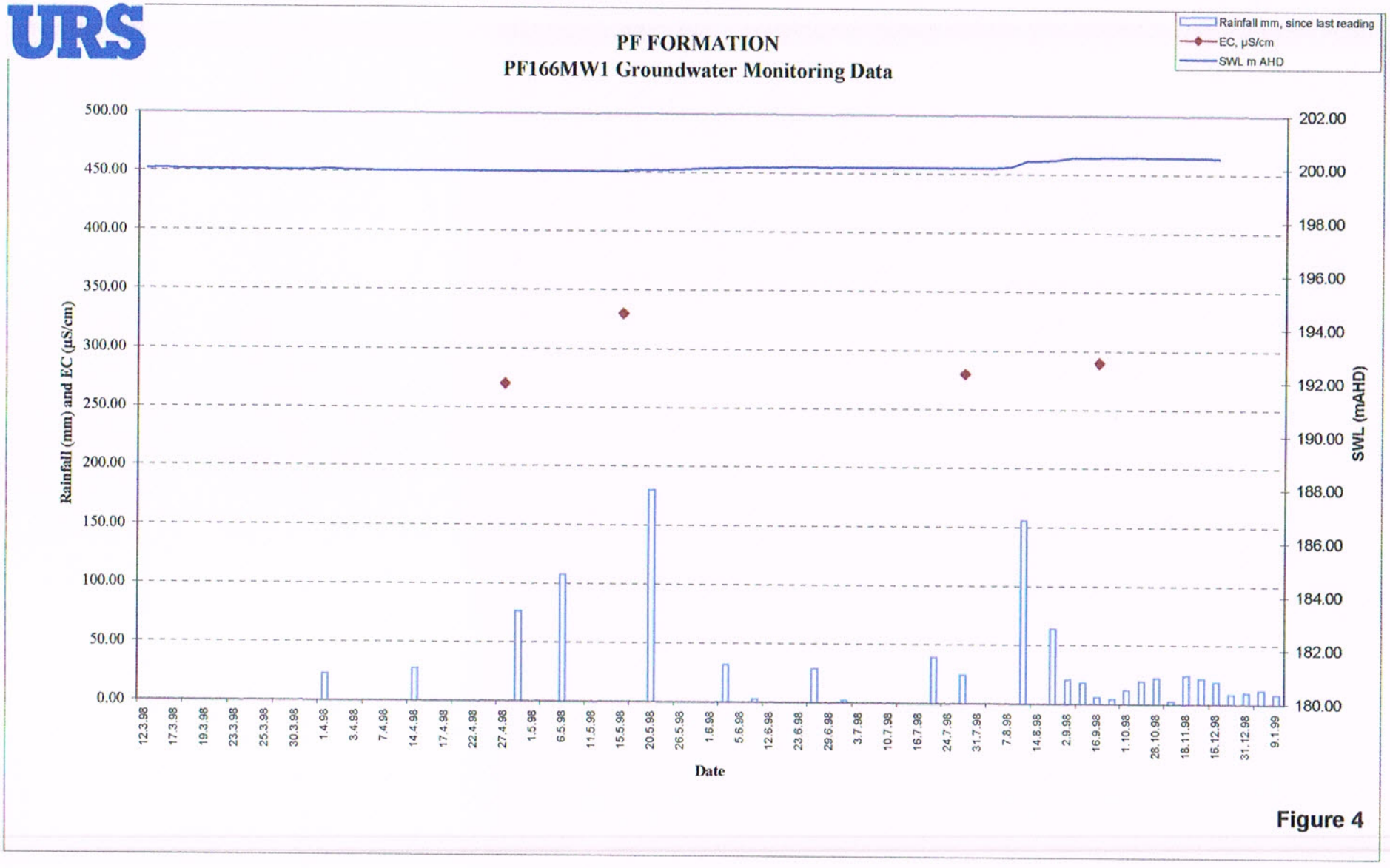



**Figure 4**

URS

## PF FORMATION
## Bore PF166MW1 Groundwater Monitoring Data

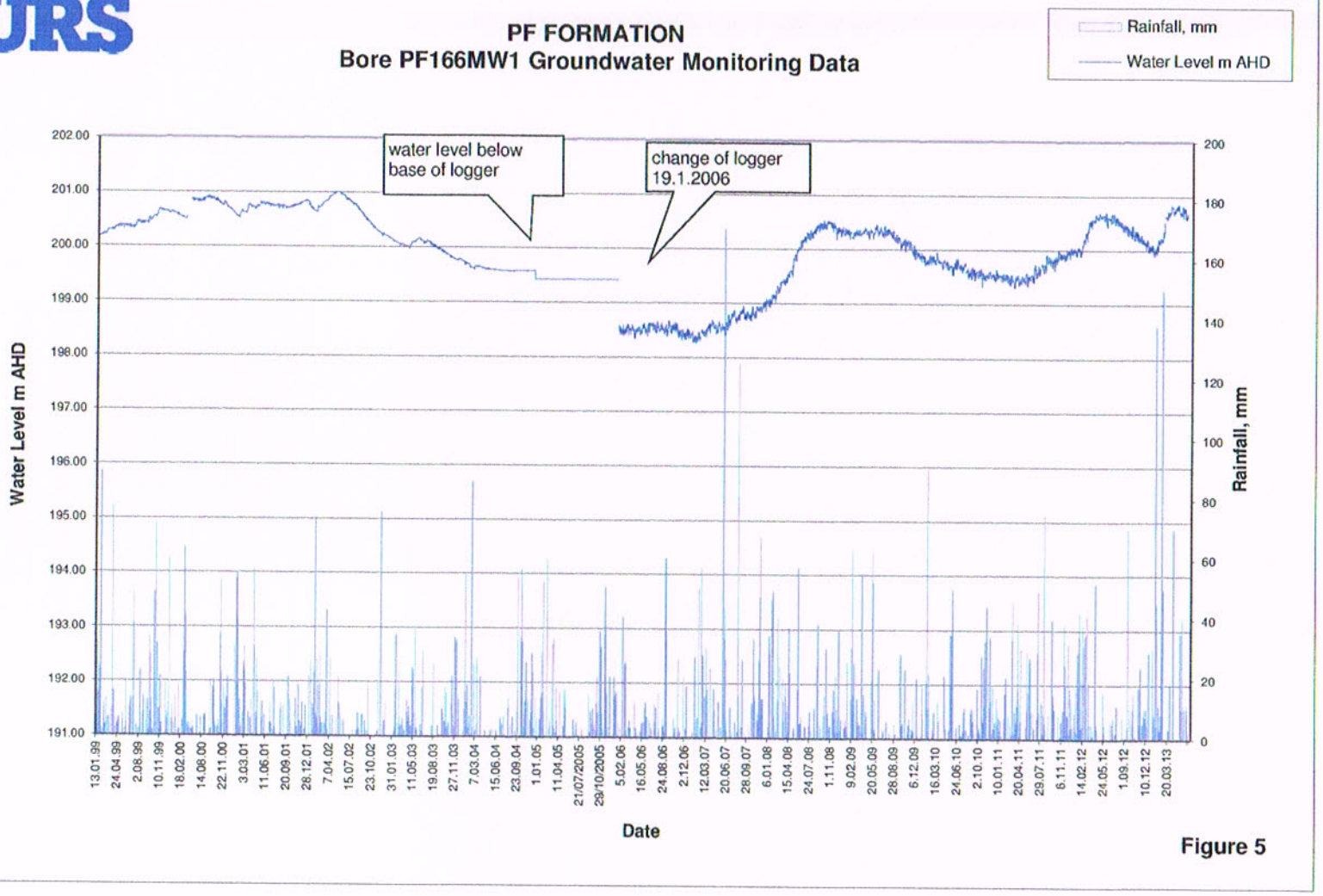



Figure 5

URS

**PF FORMATION**
**Bore PFP214MW1 Groundwater Monitoring Data**

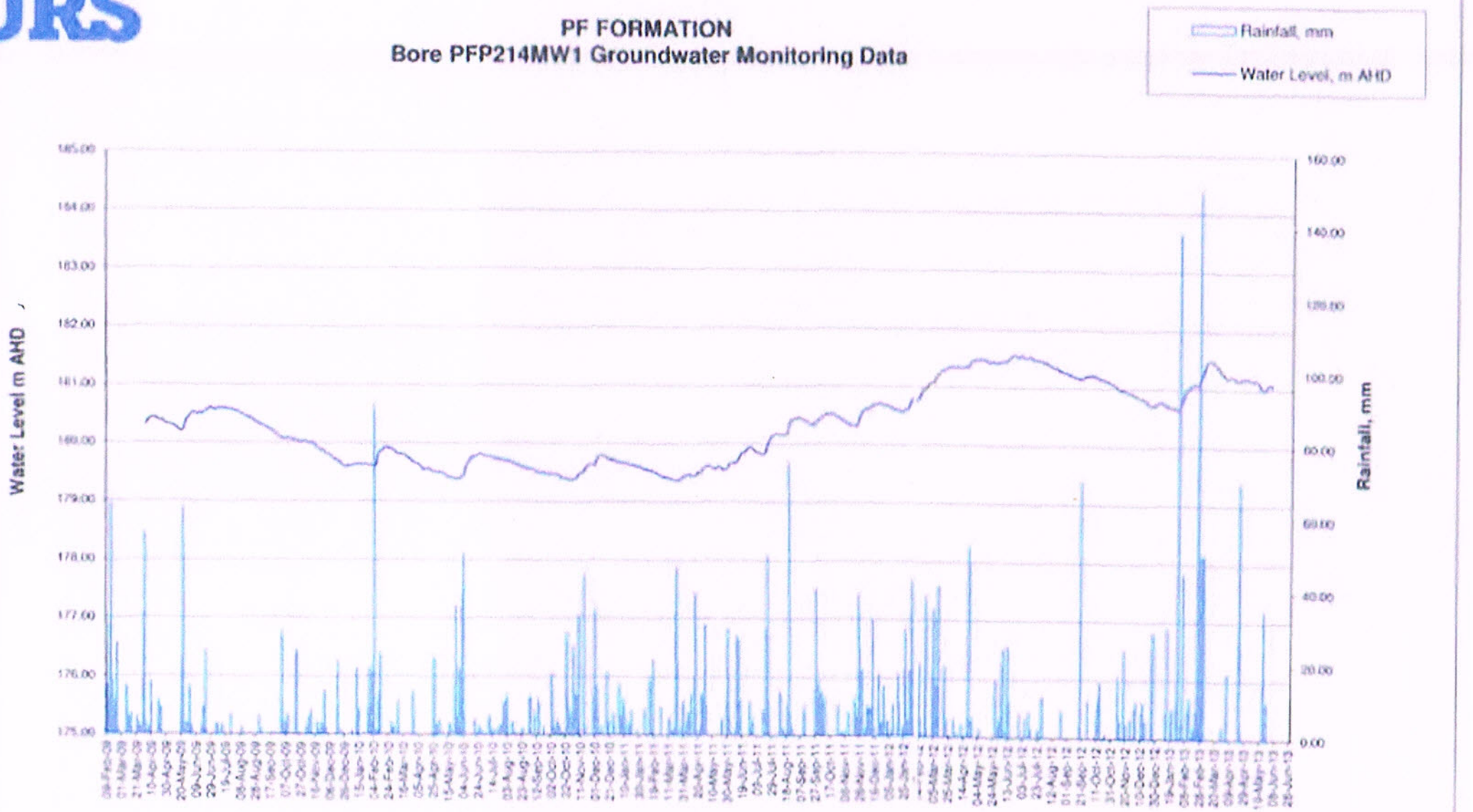



Figure 6

URS

**PF FORMATION**
**Bore PFL2HitchMW1 Groundwater Monitoring Data**

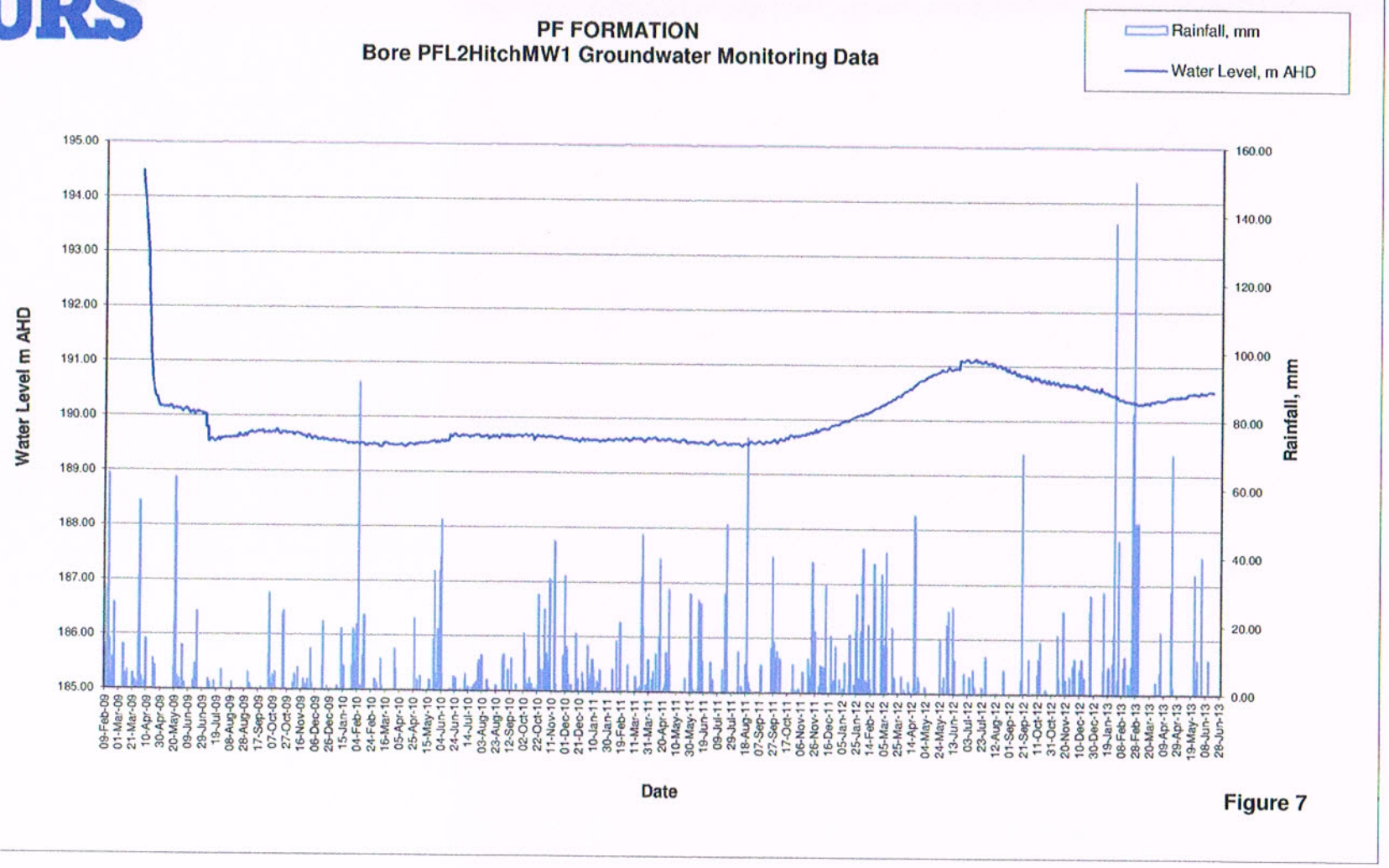



**Figure 7**

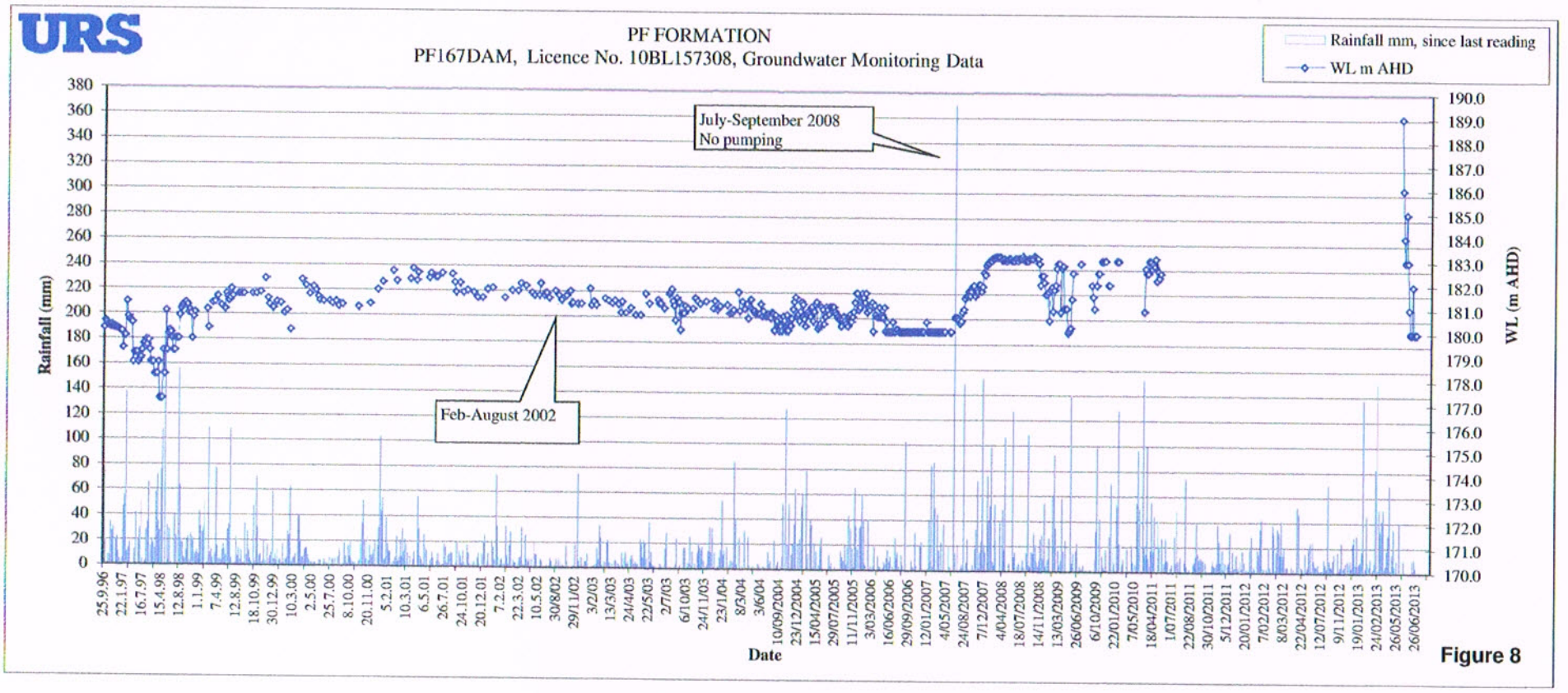

URS
PF FORMATION
PF167DAM, Licence No. 10BL157308, Groundwater Monitoring Data
Rainfall mm, since last reading
WL m AHD
July-September 2008
No pumping
Feb-August 2002
Rainfall (mm)
WL (m AHD)
Date

Figure 8

URS

## PF FORMATION
## PF167DAM Monthly Pumpage Records

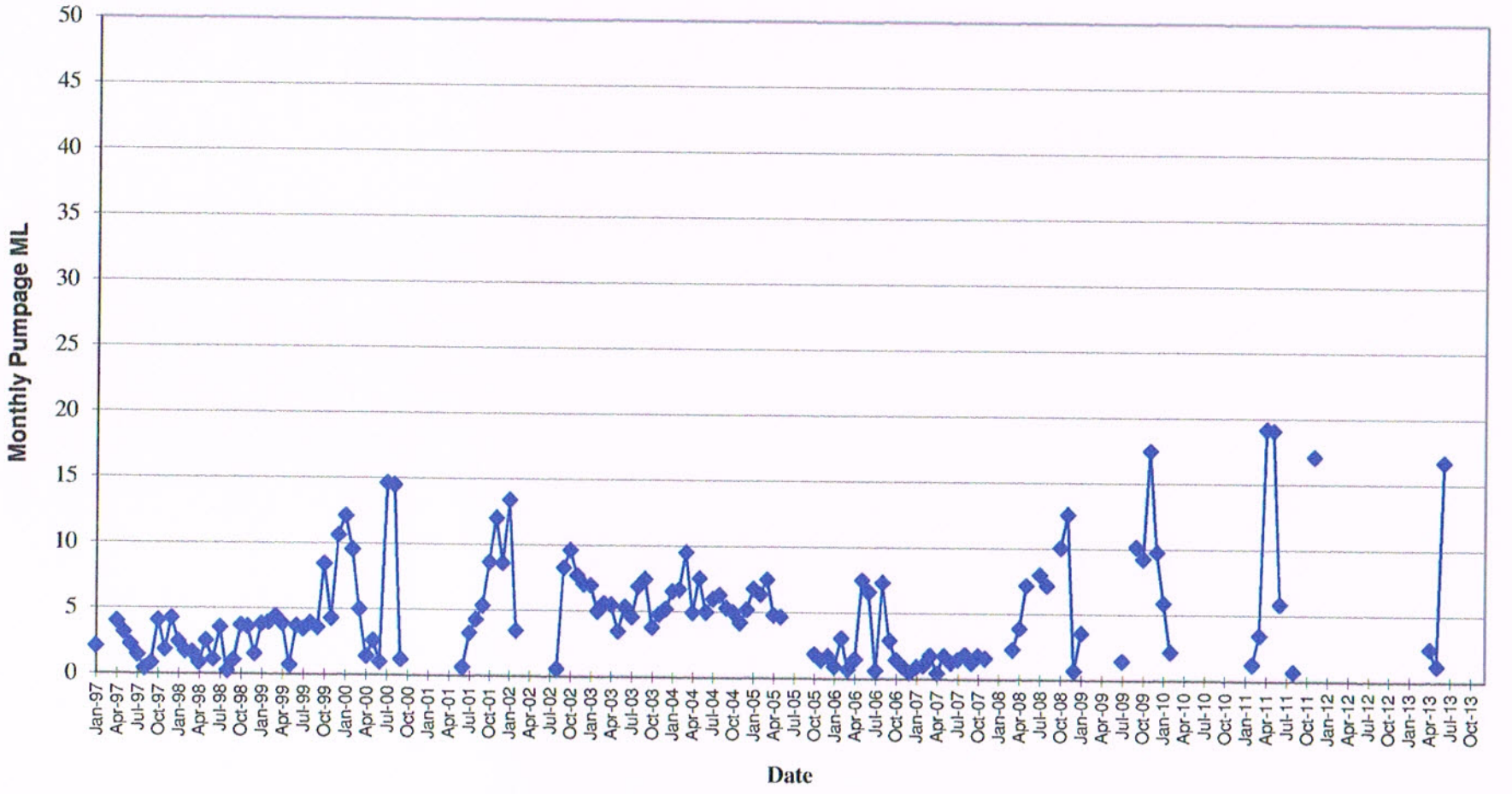



Figure 9

# APPENDIX D

Monthly Water Level Monitoring (2017 to 2023 @ SEE Pty Ltd)
Hitchcock Road Wells (Table F1), New Wells at Pits 8 & 13 (Table F-2),
and Existing wells PF-1,2,3 (Table F-3).

**Table F1: Summary of Monthly Bore Water Monitoring (2017 - 2023)**
**Hitchcock Road & Lot 198**

| Date | PF166MW 2D | PF166MW -2S | PF166MW 3D | PF166MW 4D | PF166MW 4s | PF166MW1 | PF167MW1 | PF214MW1 | PFL2Hitch MW-1 | PF167MW -5D |
|---|---|---|---|---|---|---|---|---|---|---|
| 7/06/2017 | 182.05 | 205.4 | 184.53 | 185.93 | 185.83 | | | | | 179.78 |
| 9/06/2017 | | | | | | 199.55 | 183.12 | 179.41 | 189.6 | |
| 17/07/2017 | 181.99 | 205.48 | 184.56 | 186.055 | 185.925 | 200.34 | 183.25 | 179.875 | 189.765 | 180.06 |
| 27/07/2017 | 181.92 | 205.375 | 185.275 | 185.945 | 185.86 | 200.2 | | | 189.73 | 180.07 |
| 15/08/2017 | 182.02 | 205.23 | 184.72 | 185.94 | 185.795 | 199.94 | 183.26 | 180.14 | 189.87 | 180.02 |
| 7/09/2017 | 181.99 | 205 | 184.57 | 185.78 | 185.74 | 199.71 | 183.04 | 180.13 | 189.85 | 179.885 |
| 23/10/2017 | 181.98 | 204.71 | 184.42 | 185.615 | 185.665 | 199.56 | 182.83 | 180.114 | 189.765 | 179.83 |
| 24/11/2017 | 181.97 | 204.53 | 184.34 | 185.51 | 185.63 | 199.44 | 182.68 | 180.1 | 189.705 | 179.75 |
| 18/12/2017 | 182.01 | 204.41 | 184.25 | 185.43 | 185.61 | 199.32 | 182.54 | 179.99 | | 179.04 |
| 19/01/2018 | 181.94 | 204.25 | 184.41 | 185.31 | 185.59 | 199.18 | 182.37 | 179.93 | 189.64 | 179.54 |
| 13/02/2018 | 181.93 | 204.14 | 184.13 | 185.22 | 185.55 | 199.07 | 182.23 | 179.81 | 189.6 | |
| 12/03/2018 | 181.82 | 204.18 | 184.1 | 185.05 | 185.51 | 199 | 182.06 | 179.92 | 189.53 | |
| 9/04/2018 | 181.81 | 204.07 | 184.03 | 184.86 | 185.46 | dry | 181.86 | 179.95 | 189.49 | |
| 8/05/2018 | 181.71 | 203.77 | 184.04 | 184.77 | 185.37 | | 181.64 | 179.72 | 189.43 | |
| 12/06/2018 | 181.72 | 203.55 | 183.78 | 184.67 | 185.28 | | 181.34 | 179.7 | 189.46 | |
| 10/07/2018 | 181.51 | 203.47 | 183.5 | 184.57 | 185.1 | | 181.2 | 179.53 | 189.28 | |
| 7/08/2018 | 181.61 | 203.32 | 183.39 | 184.61 | 185.12 | | 181.1 | 179.54 | 189.34 | |
| 13/09/2018 | 181.48 | 203.21 | 183.03 | 184.45 | 185.01 | | 180.93 | 178.41 | 189.42 | |
| 11/10/2018 | 181.32 | 203.44 | 182.8 | 184.36 | 184.92 | | 180.71 | 179.32 | 189.36 | |
| 7/11/2018 | 181.42 | 203.84 | 183.03 | 184.56 | 184.97 | | 180.77 | 179.68 | 189.45 | |
| 11/12/2018 | 181.21 | 203.61 | 182.77 | 184.49 | 185.02 | | 180.78 | 179.53 | 189.33 | |
| 17/01/2019 | 181.18 | 203.64 | 182.68 | 184.5 | 184.99 | | 180.8 | 179.69 | 189.35 | |
| 14/02/2019 | 181.06 | 203.5 | 182.47 | 184.45 | 184.94 | | 180.75 | 178.06 | 189.25 | |
| 7/03/2019 | 180.99 | 203.36 | 182.41 | 184.43 | 184.93 | | 180.66 | 178.3 | 189.24 | |
| 11/04/2019 | 180.92 | 203.75 | 182.26 | 184.46 | 184.92 | | 180.53 | 178.73 | 189.25 | |
| 14/05/2019 | 180.88 | 203.42 | 182.26 | 184.48 | 184.93 | | 180.45 | 178.69 | 189.23 | |
| 19/06/2019 | 180.9 | 203.2 | 182.17 | 184.44 | 184.92 | | 180.32 | 178.76 | 189.24 | |
| 18/07/2019 | 180.92 | 203.16 | 182.09 | 184.4 | 184.91 | | 180.24 | 179.04 | 189.26 | |
| 21/08/2019 | 180.89 | 203.08 | 181.97 | 184.32 | 184.87 | | 180.12 | 178.85 | 189.27 | |
| 27/09/2019 | 180.85 | 203.9 | 181.91 | 184.4 | 184.87 | | 180.25 | 179.67 | 189.17 | |
| 21/10/2019 | 180.73 | 203.69 | 181.93 | 184.56 | 184.91 | | 180.33 | 179.64 | 189.3 | |
| 14/11/2019 | 180.81 | 203.5 | 182.05 | 184.52 | 185.04 | | 180.26 | 179.8 | 189.26 | |
| 13/12/2019 | 180.76 | 203.37 | 181.96 | 184.47 | 185.02 | | 180.15 | 180.06 | 189.24 | |
| 14/01/2020 | 180.71 | 203.23 | 181.8 | 184.41 | 184.94 | | 180.05 | 179.28 | 189.22 | |
| 20/02/2020 | 180.71 | 205.14 | | 184.62 | 184.95 | | 180.19 | 180.06 | 189.22 | |
| 23/03/2020 | 180.52 | 204.5 | | 185 | 185.92 | 199.19 | 181.01 | 180.62 | 189.22 | |
| 15/04/2020 | 180.64 | 204.46 | | 185.15 | 185.93 | 199.04 | 181.26 | 180.77 | 189.31 | |
| 20/05/2020 | 180.64 | 204.05 | | 185.1 | 185.79 | 199.15 | 181.37 | 180.7 | 189.38 | |
| 23/06/2020 | 180.68 | 203.89 | 182.97 | 184.94 | 185.7 | 199.2 | 181.37 | 180.42 | 189.36 | |
| 24/07/2020 | 180.57 | 203.8 | 182.88 | 185.17 | 184.98 | 199.2 | 181.39 | 180.41 | 189.28 | |
| 28/08/2020 | 180.58 | 204.41 | 183.03 | 185.16 | 185.74 | 199.33 | 181.95 | 179.72 | 189.3 | |
| 23/09/2020 | 180.67 | 204.17 | 183.42 | 185.23 | 185.83 | 199.44 | 182.08 | 180.76 | 189.39 | |
| 22/10/2020 | 180.63 | 204 | 183.35 | 185.09 | 185.72 | 199.47 | 182.02 | 180.45 | 189.39 | |
| 23/11/2020 | 180.68 | 204.32 | 183.45 | 185.22 | 185.73 | 199.51 | 182.29 | 180.71 | 189.42 | |
| 14/12/2020 | 180.58 | 204.12 | 183.32 | 185.13 | 185.74 | 199.65 | 182.28 | 180.53 | 189.37 | |
| 25/01/2021 | 180.68 | 204.28 | 183.58 | 185.43 | 185.97 | | 182.57 | 180.76 | 189.39 | |
| 15/02/2021 | 180.6 | 204.18 | 183.51 | 185.4 | 185.73 | 199.55 | 182.57 | 180.62 | 189.3 | |
| 29/03/2021 | 180.62 | 205.84 | 183.64 | 186.19 | 186.04 | 199.82 | 183.65 | 181.07 | 189.31 | |
| 26/04/2021 | 180.61 | 205.01 | 184.21 | 186.56 | 186.51 | 199.83 | 183.92 | 181.1 | 189.39 | |
| 26/05/2021 | 180.69 | 204.92 | | 186.46 | 186.38 | 199.88 | 183.96 | 181.19 | 189.6 | |
| 23/062021 | 180.69 | 204.92 | 183.95 | 186.32 | 186.25 | 199.89 | 183.75 | 180.96 | 189.59 | |
| 22/07/2021 | 180.76 | 204.62 | 184.52 | 186.05 | 185.97 | 199.9 | 183.55 | 180.93 | 189.63 | |
| 17/08/2021 | 180.75 | 204.5 | 184.42 | 185.87 | 185.81 | 199.85 | 183.38 | 180.8 | 189.59 | |
| 21/09/2021 | 180.8 | 204.58 | 184.34 | 185.69 | 185.71 | 199.81 | 183.24 | 180.69 | 189.57 | |
| 19/10/2021 | 180.82 | 204.52 | 184.28 | 185.61 | 185.69 | 199.78 | 183.14 | 180.5 | 189.53 | |
| 24/11/2021 | 180.84 | 204.74 | | | | 199.88 | 183.04 | 180.45 | 189.53 | |
| 20/12/2021 | 180.88 | 205.18 | 184.19 | 185.56 | 185.66 | 199.68 | 183.27 | 180.73 | 189.46 | |
| 20/01/2022 | 180.8 | 205.06 | 184.2 | | | 199.65 | 183.2 | 180.56 | 189.39 | |
| 15/02/2022 | 180.86 | 205.19 | 184.26 | 185.56 | 185.81 | 199.67 | 183.08 | | 189.36 | |
| 22/03/2022 | 180.99 | 206.69 | 185.19 | 188.21 | 188.33 | 200.7 | 185.48 | 181.26 | 189.47 | |
| 19/04/2022 | 181.02 | 206.71 | | | | 201.1 | 185.6 | | 189.99 | |
| 30/05/2022 | | | | | | 201.2 | 185.16 | | 190.8 | |
| 24/06/2022 | 181.21 | 206.27 | 186.85 | 188.49 | 188.47 | 201.12 | 184.85 | | 190.84 | |
| 22/07/2022 | | | | | | 201.56 | 185.85 | | 191.05 | |
| 16/08/2022 | | | | | | | | | | |
| 23/09/2022 | | | | | | 201.46 | 185.25 | | 191.97 | |
| 20/10/2022 | 181.93 | 206.35 | | | | 201.3 | 185.55 | | 191.89 | |
| 24/11/2022 | 182.08 | 206.05 | 187.65 | 188.97 | 188.93 | 201.17 | 185.53 | | 191.8 | |
| 19/12/2022 | 182.07 | 205.81 | 187.28 | 188.75 | 188.75 | 200.77 | 185.47 | 181.03 | 191.64 | |
| 16/01/2023 | 182.19 | 205.71 | 187.06 | 188.31 | 188.3 | 200.71 | 184.99 | 180.96 | 191.54 | |
| 17/02/2023 | 183.29 | 205.73 | 187.07 | 188.07 | 188.04 | 200.74 | 184.92 | 181.07 | 191.43 | |
| 14/03/2023 | 182.38 | 205.82 | 187.11 | 188.19 | 188.19 | 200.85 | 185.37 | 181.12 | 191.37 | |
| 11/04/2023 | 182.48 | 205.81 | 187.17 | 188.1 | 188.05 | 200.98 | 184.8 | 181.03 | 191.43 | |
| 12/05/2023 | 182.39 | 205.69 | 186.9 | 187.65 | 187.63 | 200.87 | 184.53 | 180.87 | 191.15 | |
| 16/06/2023 | 182.46 | 205.6 | 186.89 | 187.26 | 187.19 | 200.75 | 184.27 | 180.77 | 191.18 | |
| 14/07/2023 | 182.51 | 205.5 | 186.67 | 186.93 | 186.86 | 200.09 | 184.05 | 180.62 | 190.93 | |
| 16/08/2023 | 182.59 | 205.38 | 186.55 | 186.49 | 186.45 | 200.41 | 183.85 | 180.53 | 190.79 | |

***Note: no data= area not accessible due to flooding & high rainfall***

***SWLs measured by M.Mass of SE Environmental***



Prepated By: Earth2Water Pty Ltd
Checked By: DP

**Table F1: Summary of Monthly Borewater Monitoring (2017-2023)**

Lot 198 Water Supply Bores

| Date | PB-3 SWL (m,toc) | PB-2 SWL (mtoc) | PB-1 SWL (mtoc) |
|---|---|---|---|
| 7/06/2017 | | 18.6 | 18.6 |
| 19/07/2017 | | 15.17 | 18.5 |
| 11/08/2017 | | 14.42 | 18.51 |
| 23/10/2017 | | 42.66 | 18.805 |
| 24/11/2017 | | | 18.705 |
| 19/01/2018 | | | 18.7 |
| 13/02/2018 | | | 34.76 |
| 12/03/2018 | | | 31.82 |
| 9/04/2018 | | | 30.02 |
| 8/05/2018 | | | 28.17 |
| 12/06/2018 | | | 27.16 |
| 10/07/2018 | | | 26.9 |
| 7/08/2018 | | | 26.29 |
| 14/09/2018 | | | 26.27 |
| 11/10/2018 | | | 20.19 |
| 7/11/2018 | | | 19.83 |
| 11/12/2018 | | | 19.8 |
| 17/01/2019 | | | 19.76 |
| 14/02/2019 | | | 19.89 |
| 7/03/2019 | | | 20.03 |
| 11/04/2019 | | | 20.09 |
| 14/05/2019 | | | 20.45 |
| 19/06/2019 | | | 20.98 |
| 18/07/2019 | | | 22.09 |
| 21/08/2019 | | | 22.22 |
| 25/09/2019 | | | 22.36 |
| 17/10/2019 | 36.1 | | 23.02 |
| 23/10/2019 | 35.39 | | |
| 14/11/2019 | 26.67 | | 22.9 |
| 13/12/2019 | 53.74 | | 25.69 |
| 14/01/2020 | 51.6 | | 25.33 |
| 20/02/2020 | 53.9 | | 24.51 |
| 23/03/2020 | 55.62 | | 23.83 |
| 15/04/2020 | 49.6 | | 23.3 |
| 20/05/2020 | 49.5 | | 22.85 |
| 23/06/2020 | 54.62 | | 21.95 |
| 24/07/2020 | 50.04 | | 21.76 |
| 28/08/2020 | 52.57 | | 21.15 |
| 23/09/2020 | 45.4 | | 20.6 |
| 22/10/2020 | 42.13 | | 20.38 |
| 23/11/2020 | 23.03 | | 19.7 |
| 14/12/2020 | 32.34 | | 19.78 |
| 25/01/2021 | 31.32 | | 19.48 |
| 15/02/2021 | 31.29 | | 19.53 |
| 29/03/2021 | 30.7 | | 19.16 |
| 26/04/2021 | 30.35 | | 18.98 |
| 26/05/2021 | 29.73 | | 18.72 |
| 23/06/2021 | 29.3 | | 18.65 |
| 22/07/2021 | 28.76 | | 18.55 |
| 17/08/2021 | 28.57 | | 18.47 |
| 21/09/2021 | 28.26 | | 18.41 |
| 19/10/2021 | 28.14 | | 18.47 |
| 24/11/2021 | 28.14 | | 18.51 |
| 20/12/2021 | 27.84 | | 18.26 |
| 20/01/2022 | 27.83 | | 18.38 |
| 15/02/2022 | 27.6 | | 18.13 |
| 22/03/2022 | 26.89 | | 17.42 |
| 19/04/2022 | 26.29 | | 16.87 |
| 30/05/2022 | 25.53 | | 16.17 |
| 24/06/2022 | 25.25 | | 16.18 |
| 22/07/2022 | 24.79 | | 15.88 |
| 16/08/2022 | 24.3 | | 15.55 |
| 23/09/2022 | 23.85 | | NM |
| 20/10/2022 | 23.77 | | |
| 24/11/2022 | 23.78 | | |
| 19/12/2022 | 23.58 | | |
| 16/01/2023 | 23.87 | | |
| 17/02/2023 | 23.81 | | |
| 14/03/2023 | 23.51 | | |
| 11/04/2023 | 23.59 | | |
| 12/05/2023 | 23.7 | | |
| 16/06/2023 | 23.42 | | |
| 14/07/2023 | 23.56 | | |
| 16/08/2023 | 23.86 | | |

Notes:

Monitoring conducted by Melissa Mass (SEE Pty Ltd) for PF Formation using an acoustic water level probe

PB-1 & 2 = decommissioned

## Table F2: Summary of Monthly Borewater Monitoring (2017-2023)
## Pits 8 & 13: 4378 Old Northern Road Maroota

| Date | Pit8MW8A (SWL mAHD) | Pit8MW-8B (SWL mAHD) | Pit8MW-8C (SWL mAHD) | Pit8MW-8D (SWL mAHD) | Pit8MW-8E (SWL mAHD) | Pit8MW-8F (SWL mAHD) | Pit13 MW-7D (SWL mAHD) | Pit13 MW-6D (SWL mAHD) |
|---|---|---|---|---|---|---|---|---|
| 3/08/2020 | 189.23 | 186.1 | 186.715 | 189.715 | 189.85 | | | |
| 7/09/2020 | 189.24 | 185.94 | 186.61 | 189.555 | 189.64 | | | |
| 8/09/2020 | 189.23 | 185.91 | 186.6 | 189.52 | 189.6 | | 188.78 | |
| 11/09/2020 | 189.24 | 185.835 | 186.53 | 189.39 | 189.46 | | | 182.3 |
| 18/09/2020 | 189.09 | 185.66 | 186.41 | 189.125 | 189.19 | | | 182.32 |
| 9/10/2020 | | 185.27 | 186.12 | 188.405 | 188.755 | | 188.55 | 182.41 |
| 2/11/2020 | | 184.93 | 186.48 | 188.545 | | | | 182.26 |
| 23/11/2020 | 188.9 | 185.31 | 186.45 | 188.715 | 188.75 | | 188.66 | 182.53 |
| 14/12/2020 | 189.02 | 185.15 | 186.14 | 188.265 | 188.71 | | 188.52 | 182.43 |
| 25/01/2021 | 188.99 | 185.44 | 186.34 | 188.875 | 188.91 | | 188.66 | 182.61 |
| 15/02/2021 | 189.07 | 185.29 | 186.13 | 188.295 | | | 188.59 | 182.53 |
| 29/03/2021 | | | | | | | 188.86 | 183.15 |
| 26/04/2021 | | | | | | | 188.97 | 184.22 |
| 26/05/2021 | 189.02 | 188.29 | 188.58 | 190.615 | 190.7 | | 189.07 | 184.43 |
| 23/06/2021 | 189.03 | 187.52 | 187.86 | 189.315 | 189.35 | | 188.99 | 184.34 |
| 22/07/2021 | 188.99 | 187.06 | 187.46 | 188.445 | 188.59 | | 189.05 | 184.42 |
| 17/08/2021 | 188.99 | 186.7 | 187.17 | 187.875 | 188.59 | | 188.94 | 184.13 |
| 21/09/2021 | 188.99 | 186.46 | 186.91 | 188.045 | | | 189.02 | 183.99 |
| 19/10/2021 | 189 | 186.21 | 186.68 | 187.495 | | 186.39 | 188.98 | 183.83 |
| 24/11/2021 | | | | | | | 188.97 | 183.64 |
| 20/12/2021 | 189.01 | 186.92 | 187.72 | 190.635 | 188.59 | 186.6 | 190.21 | 183.78 |
| 20/01/2022 | 189 | 187.15 | 187.53 | 190.405 | 188.59 | 186.81 | 189.2 | 183.79 |
| 15/02/2022 | 190.05 | 186.89 | | 189.755 | 188.59 | 186.72 | 189.21 | 183.8 |
| 22/03/2022 | | | | | | | 189.79 | 186.33 |
| 19/04/2022 | | | | | | | 189.98 | 187.11 |
| 30/05/2022 | | | | | | | 190.19 | 187.39 |
| 24/06/2022 | | | | | | | 190.04 | 187.15 |
| 22/07/2022 | | | | | | | 190.26 | 188.12 |
| 16/08/2022 | | | | | | | | |
| 23/09/2022 | | | | | | | 190.46 | 189.21 |
| 21/10/2022 | | | | | | | 190.53 | 188.15 |
| 24/11/2022 | | | | | | | 188.41 | 188.86 |
| 19/12/2022 | | 189.89 | 191.35 | 191.045 | | | 191.23 | 187.48 |
| 16/01/2023 | | 189.96 | 190.36 | 190.395 | | | 191.25 | 187.21 |
| 17/02/2023 | | 190.17 | | 191.095 | | | 190.22 | 187.17 |
| 14/03/2023 | | | | | | | 190.32 | 187.31 |
| 11/04/2023 | | | | | | | 190.29 | 187.08 |
| 12/05/2023 | | | | | | | 190.13 | 186.8 |
| 15/06/2023 | | | | | | | 190.12 | 186.61 |
| 14/07/2023 | | | | | | | 189.88 | 186.31 |
| 16/08/2023 | | | | | | | 189.67 | 186.02 |

***Note: no data= area not accessible due to flooding & rain***
***SWLs measured by M.Mass of SE Environmental***
***Pit8 wells decommissioned by early 2023 due to backfilling***


Prepared By: Earth2Water Pty Ltd
Checked By: DP

## Table F3: Summary of Monthly Borewater Monitoring (2017-2023)

4378 Old Northern Road Maroota

| Date | PF-1 SWL (mAHD) | PF-2 SWL (mAHD) | PF-3 SWL (mAHD) |
|---|---|---|---|
| 11/12/2018 | 189.58 | 193.7 | 184 |
| 17/01/2019 | 189.61 | 193.76 | 184.01 |
| 14/02/2019 | 189.53 | 193.69 | 184.05 |
| 7/03/2019 | 189.53 | 193.68 | 184 |
| 11/04/2019 | 189.56 | 193.59 | 184 |
| 14/05/2019 | 189.55 | 193.63 | 184 |
| 19/06/2019 | 189.55 | 193.69 | 184 |
| 18/07/2019 | 189.56 | 193.68 | 184 |
| 21/08/2019 | 189.48 | 193.6 | 184 |
| 25/09/2019 | 189.5 | 193.44 | 184 |
| 17/10/2019 | 189.63 | 193.67 | 184 |
| 14/11/2019 | 189.52 | 193.66 | 184 |
| 13/12/2019 | 189.48 | 193.67 | 184 |
| 14/01/2020 | 189.42 | 193.56 | 184 |
| 20/02/2020 | 189.64 | 193.56 | 184.6 |
| 23/03/2020 | 189.73 | 193.82 | 184 |
| 15/04/2020 | 189.78 | 194.23 | 184 |
| 20/05/2020 | 189.84 | 194.7 | 184 |
| 23/06/2020 | 189.84 | 194.95 | 184 |
| 24/07/2020 | 189.76 | 194.82 | 184 |
| 28/08/2020 | 189.84 | 195.17 | 184.02 |
| 23/09/2020 | 189.91 | 195.46 | 184.05 |
| 22/10/2020 | 189.85 | | 184.32 |
| 23/11/2020 | 189.91 | 195.47 | 184.39 |
| 14/12/2020 | 189.83 | 195.49 | 184.31 |
| 25/01/2021 | 189.94 | 195.76 | 184.28 |
| 15/02/2021 | 189.88 | 195.68 | 184.31 |
| 29/03/2021 | 190.02 | 195.82 | 185.72 |
| 26/04/2021 | 190.03 | 196.08 | 185.75 |
| 26/05/2021 | 190.13 | 196.16 | 186.34 |
| 23/06/2021 | 190.02 | 195.98 | 185.46 |
| 22/07/2021 | 190.03 | 195.98 | 186.42 |
| 17/08/2021 | 190 | 195.86 | 186.32 |
| 21/09/2021 | 189.98 | 195.83 | 186.2 |
| 18/10/2021 | 189.93 | 195.75 | 185.98 |
| 24/11/2021 | 189.92 | 195.68 | 185.76 |
| 20/12/2021 | 190 | 195.94 | 185.86 |
| 20/01/2022 | 189.96 | 195.95 | 185.8 |
| 15/02/2022 | 190.01 | 195.98 | 185.83 |
| 22/03/2022 | 190.27 | 196.8 | 189.07 |
| 19/04/2022 | 190.33 | 197.1 | 190.14 |
| 30/05/2022 | | 197 | 190.14 |
| 24/06/2022 | 190.35 | 196.8 | 189.94 |
| 22/07/2022 | | | 192.17 |
| 16/08/2022 | | | Probe broken |
| 23/09/2022 | | | 190.99 |
| 21/10/2022 | 190.71 | 196.76 | 190.86 |
| 24/11/2022 | 190.7 | 196.65 | 190.47 |
| 19/12/2022 | 190.7 | 196.39 | 190.12 |
| 16/01/2023 | 190.76 | 196.26 | 189.73 |
| 17/02/2023 | 190.87 | 196.27 | 189.65 |
| 14/03/2023 | 190.98 | 196.39 | 189.61 |
| 11/04/2023 | 191.07 | 195.38 | 189.5 |
| 12/05/2023 | 190.99 | 195.19 | 189.19 |
| 15/06/2023 | 191.03 | 196.03 | 188.87 |
| 14/07/2023 | 190.9 | 195.75 | 188.56 |
| 16/08/2023 | 190.82 | 195.6 | 188.23 |

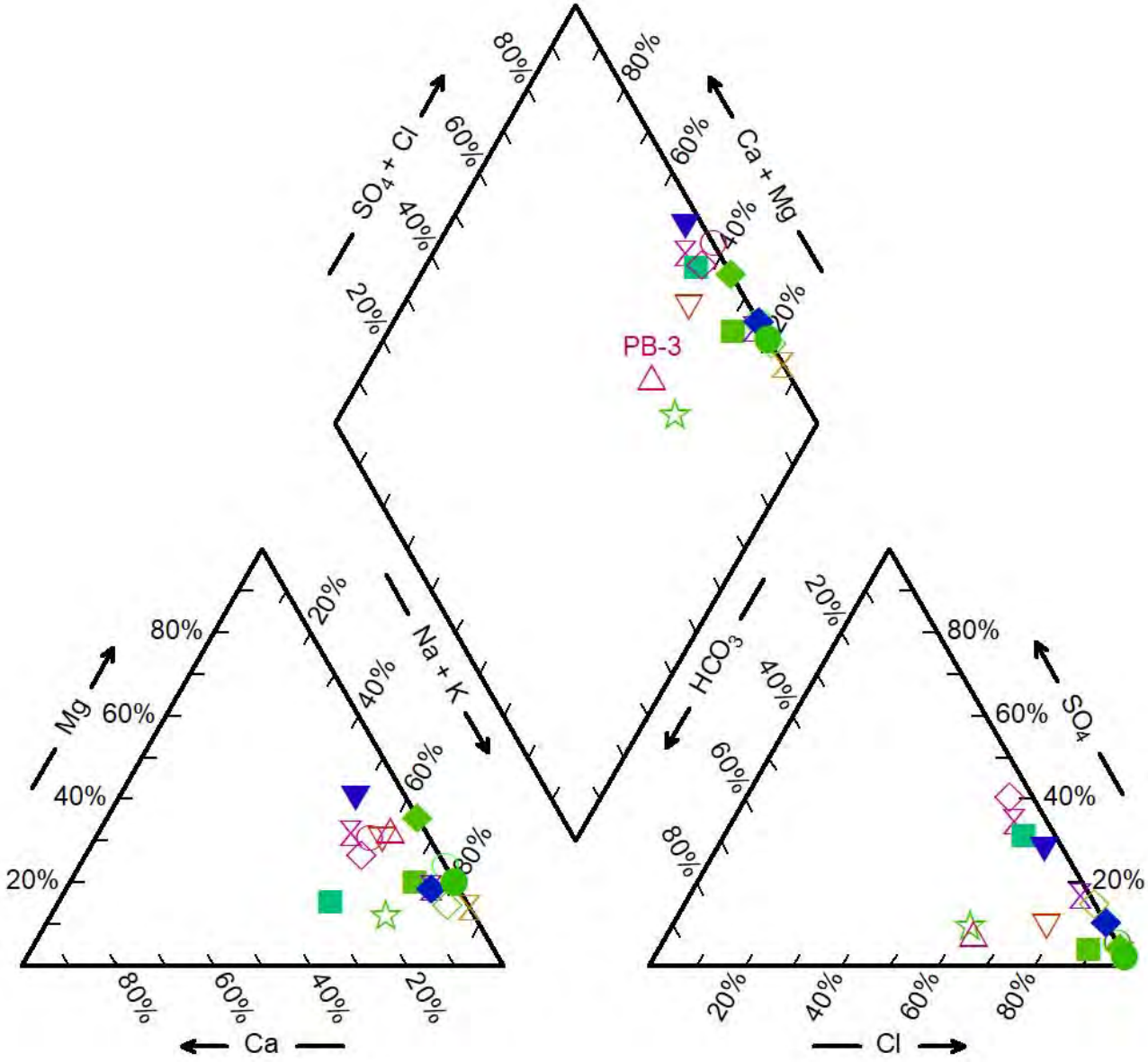
***Note: no data= area not accessible due to flooding***

***SWLs measured by M.Mass of SE Environmental***

# APPENDIX E

Piper Trilinear & expanded Durov Hydro-chemical Diagrams
(August 2023)

# Piper 1: Groundwater & Dams, Aug 2023




Legend

- MW-2S
- MW-2D
- MW-3D
- MW-4S
- MW-4D
- CWD
- Por167 Dam
- Pit8MW6D
- PF-3
- PF167MW1
- PF166MW1
- L2HitchMW1
- P214MW1
- PB-1
- PB-3
- MW7D

# Durov-2: Groundwater & Dams, Aug 2023