KEMERTON SILICA SAND MINE

BIENNIAL ENVIRONMENTAL REPORT 2025

October 2025

Prepared for:

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BIENNIAL ENVIRONMENTAL REPORT 2025

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Final Report	Elodie Payet Ian Mullins	Kristy Sell	31/10/2025

CONTENTS

TABLES

FIGURES

CHARTS

APPENDICES

1. Introduction

Kemerton Silica Sand Pty Ltd (KSS) owns and operates the Kemerton Silica Sand Mine located 35 km north of Bunbury in southwest Western Australia (Figure 1). The operation commenced in April 1996 following formal assessment by the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (EP Act) with the approval of Ministerial Statement 366 (Bulletin 741).

In 2005, KSS requested permission to mine two new areas and transfer ownership of a parcel of land containing a Threatened Ecological Community (TEC) to the State. The project was approved by Ministerial Statement (MS) 703 (Bulletin 1183) on 29 November 2009. The land transfer was approved on 4 February 2015, which substantially commenced this portion of the project and extended the potential mining footprint by 13.2 ha. An additional extension to the mining area was approved by MS 916 which substantially commenced on in December 2017 following formal notification from the Department of Water and Environmental Regulation (DWER) on 30 January 2018.

KSS is required to comply with the conditions of MS 366, MS 703 and MS 916 as well as those activities prescribed under an Environmental Licence issued under Part V of the *EP Act* (L6593/1995/8) and Groundwater Abstraction Licence (GWL60 367(5)).

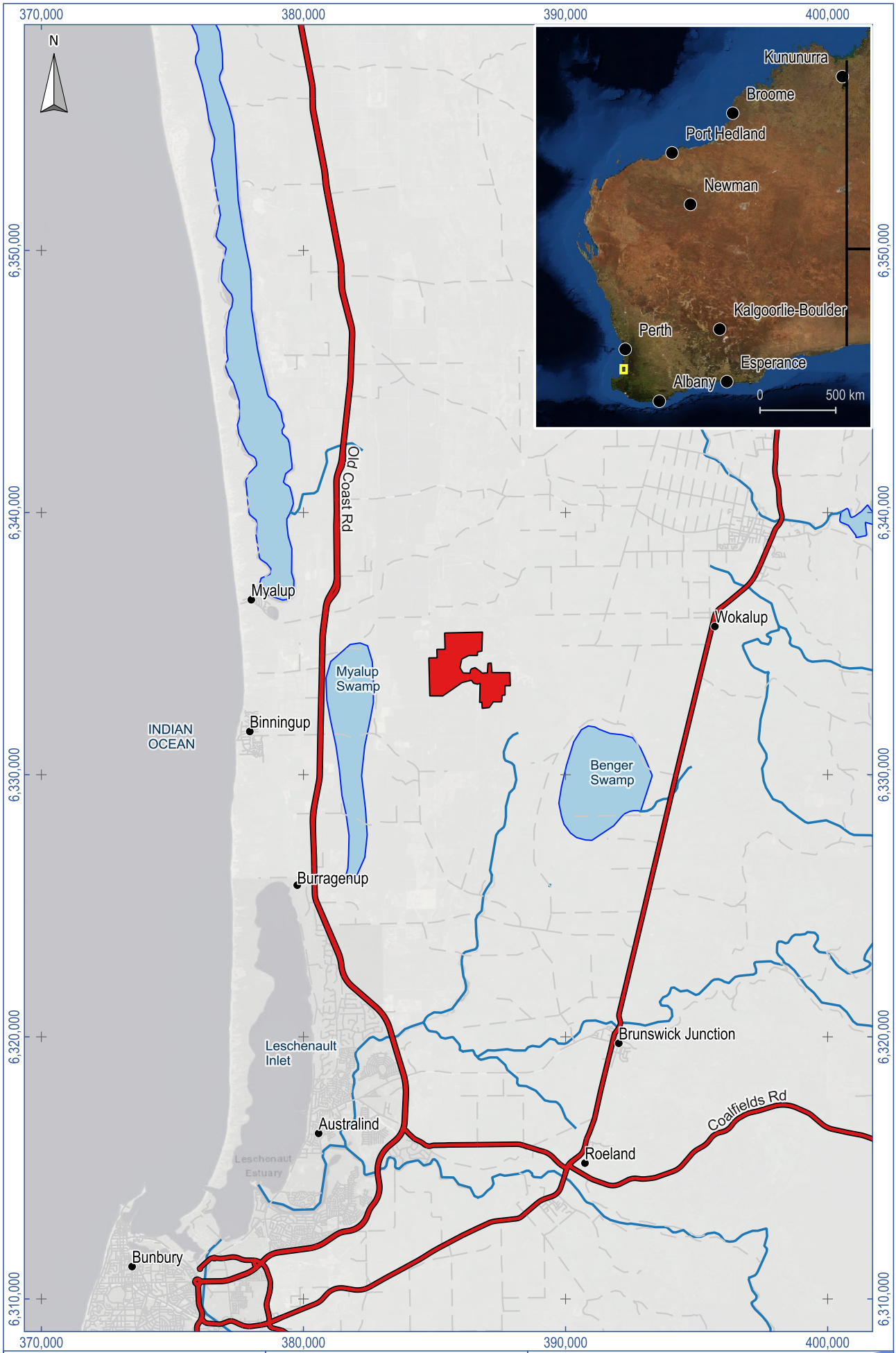
The Environmental Licence was amended on 17 March 2025 and extended until 20 March 2030 after DWER conducted a licence review. KSS received a renewed Licence to Take Water (GWL60367 (5)) in 2025, valid from 13 March 2025 until 12 March 2035 which provides an annual water entitlement of 660,000 kL.

On 16 May 2022, DWER reduced the annual environmental reporting requirements for the Environmental Licence to biennial submission as provided for by their "*Notice of amendment and schedule of licences with amended reporting conditions*" (DWER 2022). Condition 16 of the amended licence issued in March 2025 still retains annual submission of the Annual Environmental Report (AER) however this is considered to be overridden by the 2022 notice which lists L6593/1995/8 and is enacted under Section 59(2), Section 59(1)(a) and 59(1)(b) of the *Environmental Protection Act 1986*.

This BER has been prepared to satisfy the reporting requirements of the Environmental Licence between 1 October 2023 and 30 September 2025. This report includes:

- A brief background and overview of the project, its processes, and a current plan of the premises.
- Reporting requirements and monitoring results.
- A brief discussion of the incidents and complaints lodged in this reporting period as well as actions taken to minimise the likelihood of recurrence.
- Compliance with Environmental Licence conditions.
- A discussion of monitoring activities and results.
- A list of third-party environmental reports prepared during the reporting period.

- Groundwater Monitoring Summary.
- Annual Audit Compliance Report (AACR).
- ROM stacker overflow and tailings pipeline monitoring data.



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Legend

- Kemeron Silica Sand Mine
- Inland Waters
- Watercourses
- State Road
- Local Road

Figure 1

Location Plan

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W:\Kemerton Silica Sand\GIS\Location Plan_KSS.qgz 22/10/2025 L2 Location Plan Updated Template

2. Project Overview and Description

The current mining footprint is approximately 139 ha which is situated on freehold land, zoned rural. The site layout and operational areas are shown over an aerial photograph in Figure 2.

Land for the KSS property was released before 1899 and therefore the operation is not subject to the *Mining Act 1978*. Areas to be mined are cleared of vegetation and topsoil is removed and either directly replaced on rehabilitation areas or stockpiled for use in future rehabilitation of previously mined areas. The first 3.5 m of sand is treated as overburden. It is removed via excavator and used to reshape banks of mined lakes before rehabilitation takes place.

Once the overburden is removed, the water table is intersected with a suction cutter dredge that floats on the artificially created dredge pond. It extracts felspathic silica sand ore to a depth of between 15 and 20 m below the water table. The suction cutter dredge is capable of mining at a rate of 350 tonnes per hour. Slurried ore from the dredge is pumped to a staging hopper where it is screened and oversized material is removed. The slurry is dewatered with cyclones and excess water is returned to the dredge pond via the ROM stacker overflow pipe. Run of Mine (ROM) ore is stockpiled on a pad adjacent to the processing plant.

Ore is dewatered using a cyclone hopper before passing through a series of wet-separation, washing, milling and screening steps to produce a graded product which is stockpiled temporarily on site before being transported to the Port of Bunbury in covered trucks. The plant water circuit incorporates a thickener, which enables the majority of process water to be recirculated. The thickener receives water from several cyclones and overflow points within the process and enables the majority of water to be recycled through the plant.

A small proportion of the process water is used to return the coarse tailings to the dredge pond. ROM stacker overflow is also returned via a pipeline to the dredge pond. The return of these streams to the dredge pond, with an average flow rate from the ROM overflow of 750 m^3/hour and the tailings pipeline of 220 m^3/hour, ensures the water level in the dredge pond is maintained. The only chemical used in the process is flocculant which is added to the thickener. The flocculant is an oil based product, which is stored in a 4 tonne tank at the processing plant.

KSS is permitted to process up to 1.4 Mt of ore per annum, which results in approximately 840,000 tonnes of product.

Mining and processing activities during the 2023–2025 reporting period were higher overall compared to the 2021–2023 reporting period (525,216 t and 323,371 t respectively). Within the current reporting period, ore processing volumes were greater in 2023–2024 (458,627 t) than in 2024–2025 (445,102 t), reflecting a slight reduction in processing throughput in the latter year.

It is noted that the production figures reported for 2023–2024 in the previous AACR were incomplete, resulting in lower values being presented at that time. This has since been rectified, and the updated figures provided above reflect the actual production for that period.

There were several periods on site where operations temporarily ceased, being scheduled shutdown over the Christmas periods, 22 December 2023 to 2 January 2024 (11 days) and 24 December 2024

to 6 January 2025 (13 days). There were then periods of plant maintenance: 29 February to 17 March 2024 (17 days), 6 to 12 January 2025 (6 days), 16 January to 31 January 2025 (15 days), 20 to 28 February 2025 (8 days) and 15 to 25 May 2025 (10 days).

During the reporting period:

- Approximately 439,309 t in 2024, and 441,557 t in 2025, of sand material was dredged.
- Approximately 5,695 t of overburden in 2024 and 7,993 t in 2025 was removed and used in rehabilitation.
- Approximately 458,627 t of ore in 2024, and 445,102 t in 2025 were processed.
- Approximately 160,742 t in 2024, and 139,018 t in 2025, of process tailings were returned to the dredge pond.
- Approximately 296,885 t in 2024, and 306,084 t in 2025, of product were produced.
- In 2024, approximately 1.46 ha in the southern extension area (MS 730 area) were cleared of vegetation. In 2025, approximately 4.02 ha was cleared within the southern extension area (MS 730 area).
- The area mined was approximately 1.5 ha in 2024, and 2.5 ha in 2025.
- Approximately 2.9 ha of land in 2024 was rehabilitated (topsoil respread), and 1.88 ha in 2025.
- Approximately 299,871 t in 2024, and 317,000 t in 2025, of product was transported to the Port of Bunbury.

Figure 3 shows areas which where mining and clearing have been undertaken during the reporting period as well as areas planned for clearing and mining over the next 24 months.

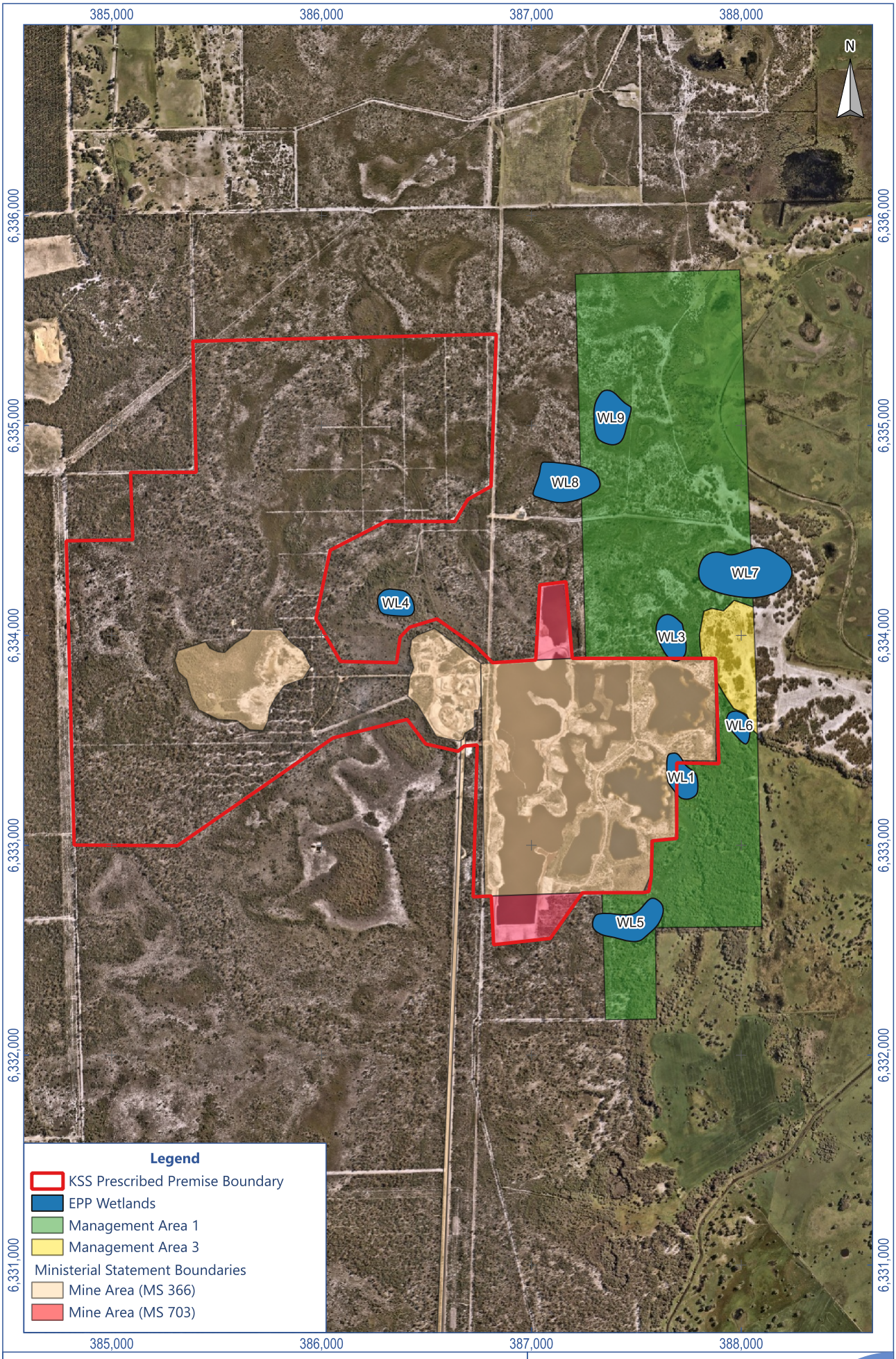

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Figure 2

Site Layout

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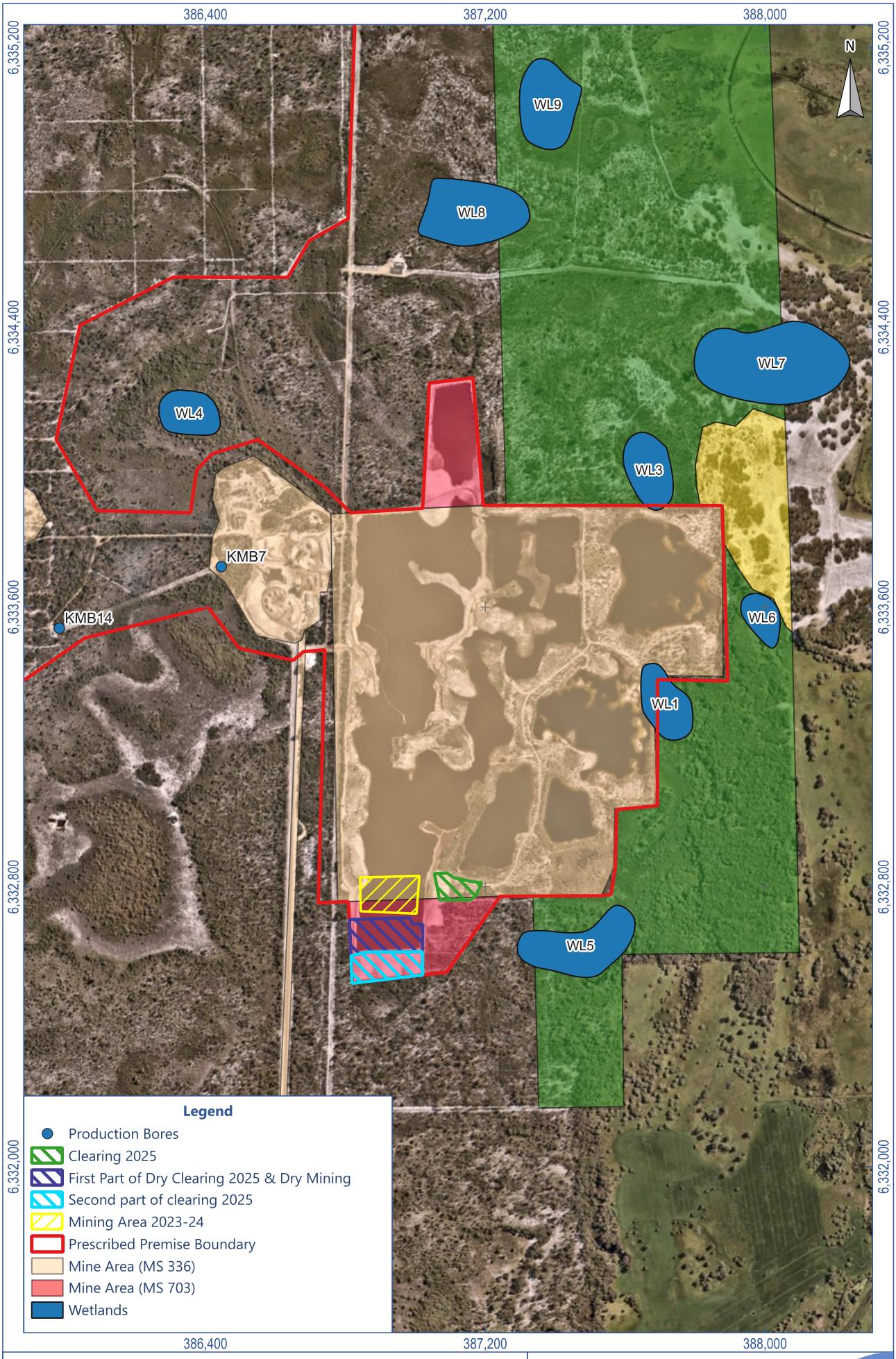

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Figure 3

Clearing & Mining Areas

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3. Reporting Requirements

Reporting, record-keeping and monitoring required under L6593/1995/8 is listed in Table 1. The emission point reference W1 which does not have a fixed location was located in the dredge pond in this reporting period as shown in Figure 3.

Table 1: Reporting, Record Keeping and Monitoring Requirements

Condition	Requirements
11	The licence holder must undertake monthly monitoring (when discharging) at emission point reference W1: • Volumetric flow rate (m^3/d). • pH (pH unit). • Electrical conductivity (EC) (mg/L). • Total Dissolved Solids (TDS) (mg/L). TDS target is less than 600 mg/L • Total acidity (mg/L as $CaCO_3$). Target value is less than 50 mg/L. • Total alkalinity (mg/L as $CaCO_3$). Target value is greater than 30 mg/L.
15	The licence holder must: • Undertake an audit of their compliance with the conditions of this licence during the preceding annual period. • Prepare and submit to the CEO, by no later than 1 March in each year, an Annual Audit Compliance Report in the approved form.
16	The licence holder shall submit to the CEO a Biennial Environmental Report (BER) within 31 calendar days after the end of the biennial period. The report shall contain the following information: • Details of calculation of fees payable in respect of this licence. • A summary of the amount of ore processed, product produced and tailings returned to the dredge pond; • A copy of the annual Groundwater Monitoring Summary for each year required by Licence to Take Water GWL60367. • Results of monitoring required by condition 11 for the preceding biennial period • A summary of any complaints received and management actions taken for each complaint; and • A summary of any environmental incidents and any action(s) taken. • An appraisal and trend analysis of the results against any baseline data and previous monitoring results.
17	The licence holder shall submit any target exceedances to the CEO within 28 days at the end of each quarter.

* *Targets and Limits for EC and TDS set in the license are noted as being variably below background groundwater concentrations of the area.*

4. Statement of Compliance and Environmental Management Activities

KSS was generally compliant with the conditions of L6593/1995/8 during the reporting period. Non-compliance of one condition (condition 7), related to water quality targets, occurred during the reporting period. Details are contained within the annual audit compliance report (AACR) which is provided in Appendix A as well as described below.

Environmental incidents and complaints are documented in accordance with the site Environmental Management Plan. There were no malfunctions or failures of any pollution containment or pollution control equipment. One complaint was received from the community regarding baiting programs in April 2024. KSS investigated and found that information about use of Strychnine poison was inaccurate and the area her neighbour received a notification about was DBCA managed land, not KSS land. This was communicated to the complainant.

During the reporting period exceedances of water quality targets were recorded relevant to the licence and reports regarding these were submitted to DWER in accordance with condition 17. The exceedances of targets were reported in January 2024 and 2025 (TDS and alkalinity), April 2024 (TDS and alkalinity), April 2025 (TDS), July 2024 (TDS and alkalinity), July 2025 (TDS) and October 2024 and 2025 (TDS and alkalinity). Monthly monitoring of the emission point reference W1 was conducted for all parameters except for the following:

- February 2025 - Samples for ROM and Tailings could not be taken due to dredge and plant maintenance.

Groundwater from production bore KMB14 was primarily used during this reporting period with production bore KMB7 maintained for use as a backup however a total of 6,342 kL was extracted from KMB7 between September to October 2024 while KMB14 was out of service. The 2024 and 2025 Groundwater Monitoring Summary reports prepared by Rockwater are provided in Appendix B and Appendix C respectively.

In accordance with Licence requirements and approved Management Plans required by MS 366 and MS 703, the following environmental management activities took place at KSS during the reporting period:

- Removal of overburden occurred within the southern area of the existing dredge pond, with an area of 1.68 ha (2024) and 1.95 ha (2025) being mined (Figure 3).
- Topsoil was spread over an area of about 2.9 ha in 2024 and 1.88 ha during 2025 (Figure 3). The areas focused on the central area of the Dredge Pond allowing further isolation of eastern areas as the dredge moves from Area 3 towards Area 2. In 2024 approximately 2,150 seedlings were infill planted across four existing rehabilitation areas. Seedling planting and infill planting was also conducted in mid to late June 2025 ensure rehabilitated land meets relevant criteria targets as specified by the Rehabilitation Plan (MBS Environmental, 2018). A total of 84 trays of native plants was sourced from an accredited nursery for planting. The seedlings were planted in four locations on site.

- KSS implemented weed control programs including both chemical application and manual removal of weeds. Key species targeted were *Trachyandra divaricata* (Dune Onion Weed), *Gomphocarpus fruticosus* (Cottonbush), *Pelargonium capitatum* (Pelargonium), *Conyza bonariensis* (Fleabane), and several others. Areas of weed control are shown in Figure 4.
- Maintenance/replacement of boundary fencing was carried out during the reporting period as part of ongoing maintenance activities. Inspections of boundary fencing were undertaken weekly.
- Annual maintenance of the firebreaks is scheduled to occur in November of each year. The next check is scheduled for November 2025.
- ALPHA Pest Animal Solutions carried out trapping and/or baiting for foxes and goats during the reporting period. 1080 baits were placed during May 2024 to target local fox populations, and any replacements required were placed during August 2024 and September 2025. Targeted feral goat control was conducted 25 September 2025.
- Native and pest animals are being monitored, with observation sheets being kept up to date with opportunistic sightings by KSS personnel as well as any trail camera sightings. This monitoring works as an effective tool in maintaining an understand of what pest species are in the area and how many individuals there are. Several pest species including foxes, goats, cats and pigs were noted during the monitoring period.
- Rehabilitation vegetation monitoring was undertaken in September 2023 and November 2024 by Mattiske Consulting Pty Ltd ((Mattiske Consulting, 2024, 2025).
- Water quality of the reconstructed lakes was monitored quarterly as outlined in the Rehabilitation Plan (MBS, 2018a)
- Water quality of selected unmined wetlands was monitored quarterly in accordance with the Wetland Monitoring and Management Plan (MBS, 2018b)
- Water level of the dredge pond was measured on a quarterly basis and visual inspections confirmed that the 500 mm freeboard was maintained on a daily basis.
- Inspections to assess the integrity of the pipelines to and from the dredge pond were undertaken daily.

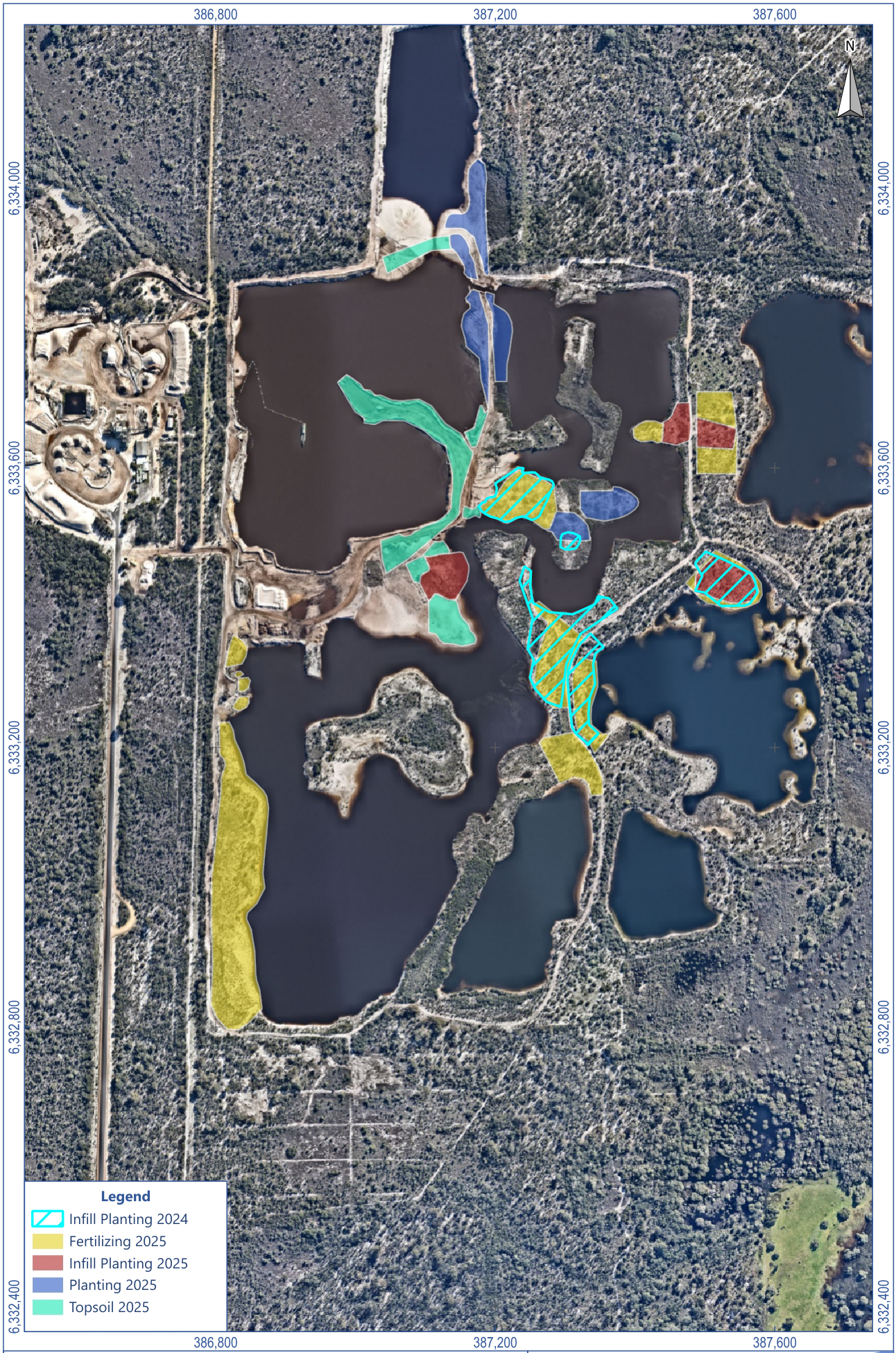

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Figure 4

Weed Control & Rehabilitation Areas

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5. Monitoring Results

Licence L6593/1995/8 requires monthly monitoring of volumetric flow rate, pH, electrical conductivity, TDS, total acidity, and total alkalinity at the W1 discharge pipes which discharge into the dredge pond during periods of operations. Results are measured against point source emission targets listed in the licence, except for volumetric flow rate, pH, and electrical conductivity, which do not have a target specified.

Monitoring results are provided in the following sub-sections and the collective monitoring details are presented in table format in Appendix D. Exceedances of targets were reported quarterly to DWER as required by L6593/1995/8.

5.1 Monthly Volume

The monthly volume of material returned to the dredge pond via the ROM stacker overflow pipe and process tailings pipe is shown in Table 2 This is determined by calculating the operational hours and the flow rate of the pumps. During the reporting period flows through the ROM stacker overflow are on average 235 m^3/h or 5,624 m^3/day and flows through the tailings pipeline averaged 104 m^3/h or 2,489 m^3/day.

Table 2: Monthly Volume of ROM Stacker Overflow and Process Tailings (m^3)

Month/Year	ROM Stacker Overflow Volume	Process Tailings Volume
October 2023	157,500	86,680
November	234,750	92,620
December	141,000	58,080
January 2024	146,250	69,300
February	187,500	64,460
March	168,750	29,920
April	157,500	48,620
May	218,250	89,540
June	65,250	58,520
July	195,000	79,640
August	229,500	92,180
September 2024	153,000	108,020
Subtotal 2023/24	***62,300***	***877,580***
October	183,000	89,320
November	153,000	69,300
December	112,500	52,360
January 2025	510,000	133,320

Month/Year	ROM Stacker Overflow Volume	Process Tailings Volume
February	NA	NA
March	141,000	72,600
April	115,500	72,600
May	109,500	51,260
June	180,000	91,740
July	181,500	93,500
August	186,750	79,860
September	184,500	68,200
Subtotal 2024/25	***67,044***	***874,060***
Total 2023-2025	**129,343**	**1,751,640**

5.2 pH

The pH is measured at both the ROM stacker overflow and tailings pipe and is shown in Chart 1 for the reporting period and Chart 2 for the previous twelve year period. Review of the data showed that:

- The process tailings slurry discharged from the tailings pipeline was neutral for the entire reporting period, ranging from pH 7.4 to 7.7.
- Reported values of pH from the ROM stacker overflow were slightly acidic to circumneutral, varying between pH 5.5 and pH 7.7 for an average of pH 6.86 for the current review period. The lowest pH of 5.5 was recorded in October 2023 and April 2024.
- Average pH of the tailings slurries both discharged to the dredge pond (W1) have increased during the current reporting period compared to the 2021 - 2023 reporting period.
- The pH of water used for processing in upgradient production bore KMB14 was more acidic (pH 5.10 to 5.60) over the reporting period (Appendix C). This follows a steady decreasing trend in recent years for production/regional water (Appendix C).

The increasing trend of pH in the ROM stacker overflow and tailings pipeline is consistent with a move away from mining within the northern part extension area (Area 3) which concluded in mid-2021 back to more historical sand types in the main dredge pond. Area 3 (previous reporting period), was indicated after investigation to contain higher levels of residual acidity and aluminium possibly as alunite (MBS 2021).

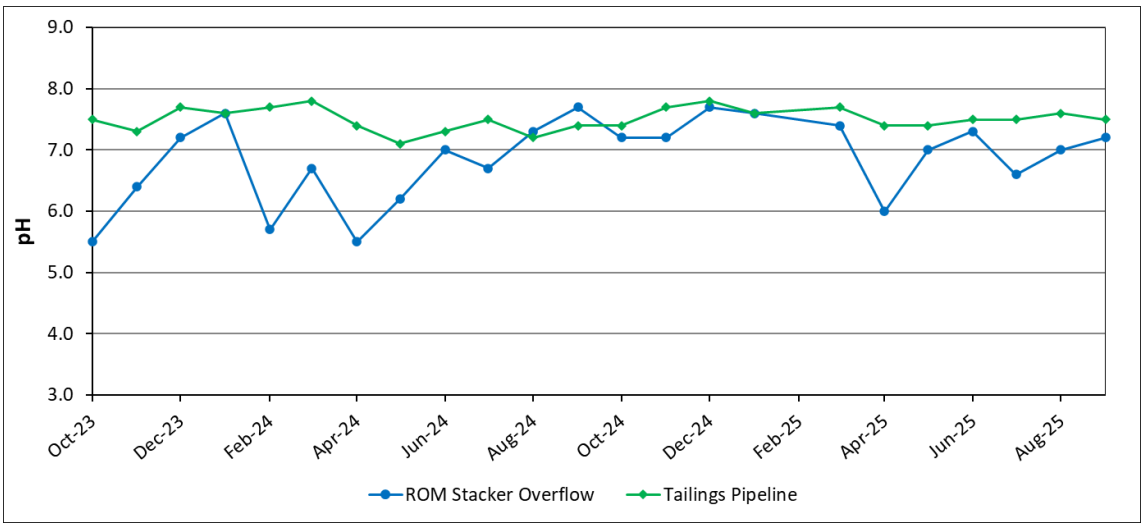


Chart 1: Laboratory pH of ROM Stacker Overflow and Tailings Pipe Discharges for the 2023-2025 Reporting Period

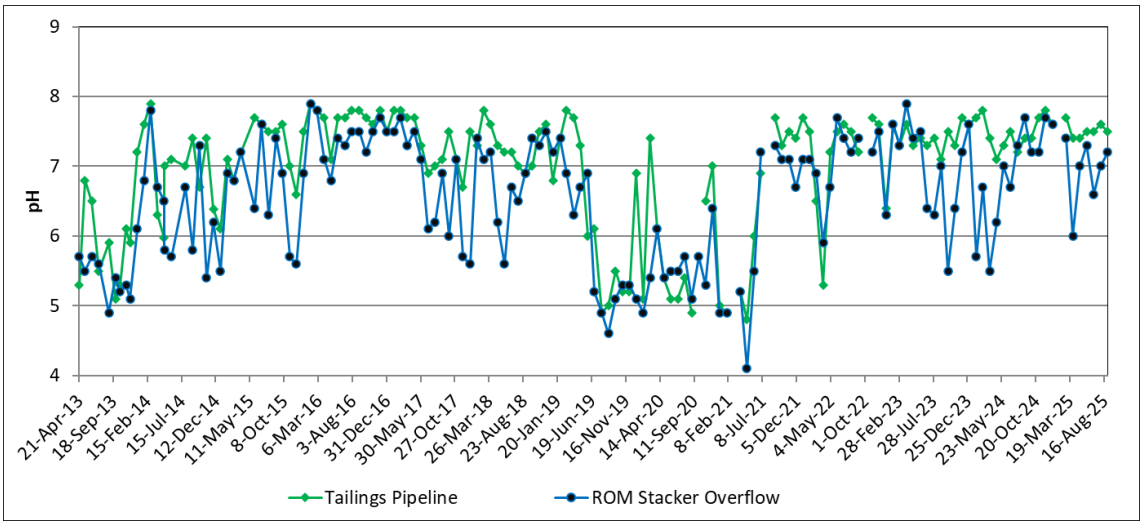


Chart 2: Long Term Laboratory pH Trend for ROM Stacker Overflow and Tailings Pipe Discharges

5.3 Electrical Conductivity

Electrical conductivity (EC) measured at both the ROM stacker overflow and tailings pipe is shown in Chart 3 for the 2025 reporting period. Long term EC in the ROM stacker overflow and tailings pipelines are shown in Chart 4.

Electrical conductivities of the ROM stacker overflow and the tailings pipe were very similar for the current reporting period 2023-2025. EC values were generally steady and varied between 1,200 and 1,600 µS/cm being within the upper range of fresh to marginally water type. Records indicated a long-term increasing trend of EC for the period 2013-2025 with annual EC averages rising from 1,286 to 1,484 µS/cm over the twelve years of monitoring. Although there has not been a current increase

in salinity of production water used, the increases appear consistent with increased and now long term water recycling in the plant and general evaporative loss and concentration of salts in the dredge pond especially during summer months and as a result of the drying climate.

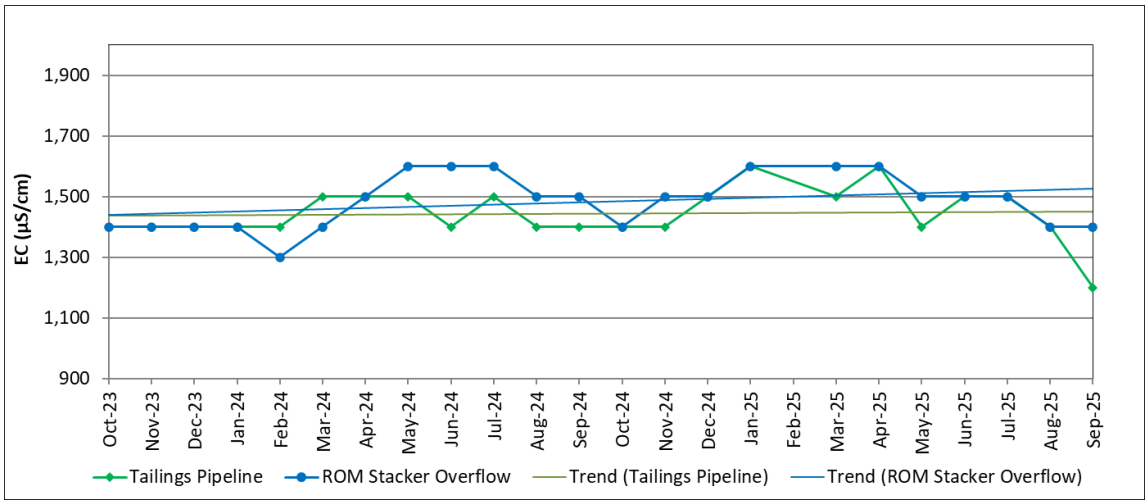


Chart 3: Electrical Conductivity of ROM Stacker Overflow and Tailings Pipe Discharges for the 2023 -2025 Reporting Period

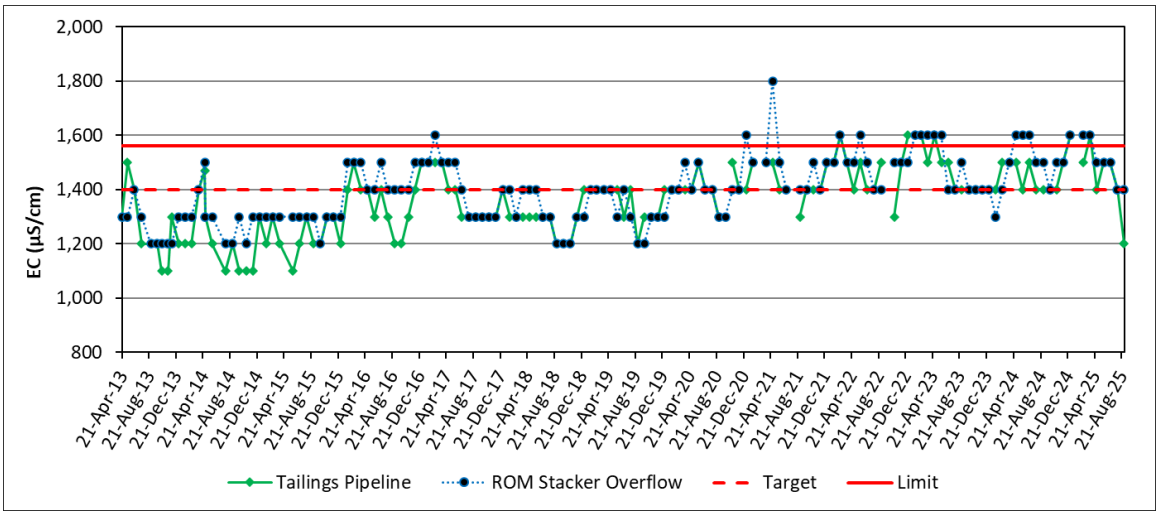


Chart 4: Long Term Electrical Conductivity of ROM Stacker Overflow and Tailings Pipe Discharges

5.4 Total Dissolved Solids

Gravimetric Total Dissolved Solids (TDS) measured at both the ROM stacker overflow and tailings pipe for the reporting period is shown in Chart 5 and for the previous twelve years in Chart 6. Review of the results shows that:

- The TDS in both discharge pipes ranged between 850 mg/L TDS and 1,600 mg/L TDS during the reporting period, consistently above the 600 mg/L Licence target. These results have been

reported to DWER as target exceedances on a quarterly basis during the reporting period as required by the license. This is an ongoing long-term issue, and it is considered that the target is not appropriate and as per EC is related to increased water recycling as well as increasing evapoconcentration within the dredge pond - especially over the extended dry period of Summer 2024 and 2025.

- Average TDS of the tailings slurry discharged into the dredge pond was very similar compared to the 2023 level (1,040 mg/L TDS compared to 1,026 mg/L TDS in 2025).
- Average TDS in the ROM stacker overflow pipe discharge has slightly decreased from 1,107 mg/L TDS in 2023 to 1,080 mg/L TDS in 2025.

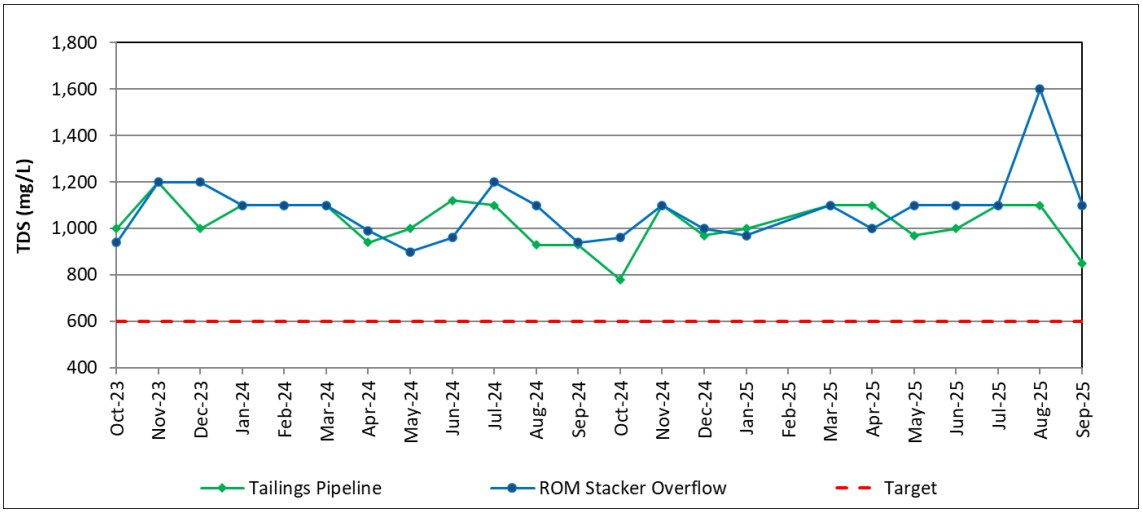


Chart 5: TDS of ROM Stacker Overflow and Tailings Pipe Discharges for the Reporting Period 2023-2025

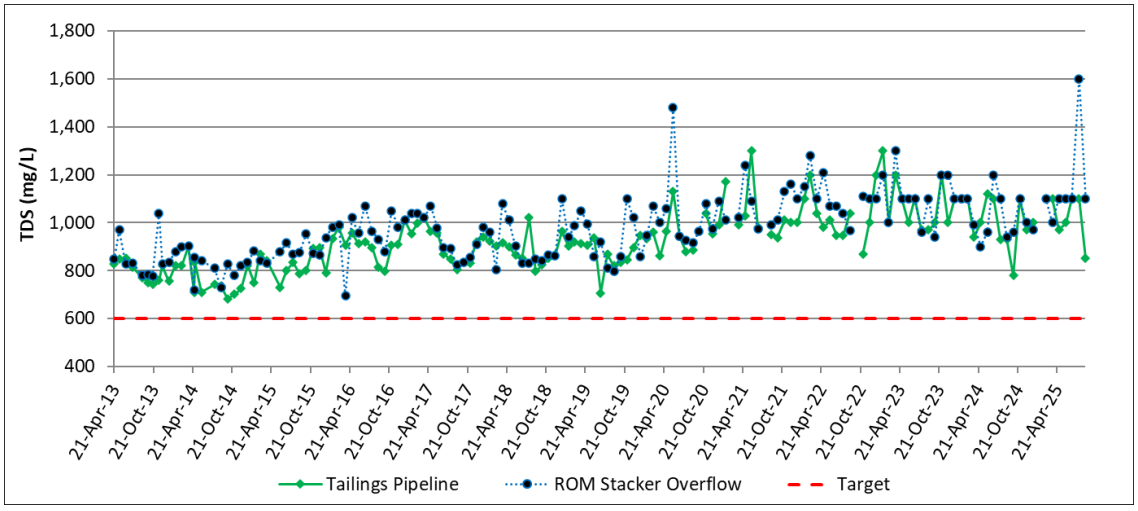


Chart 6: Long Term TDS of ROM Stacker Overflow and Tailings Pipe Discharges

5.5 Total Acidity

Total acidity measured at both the ROM stacker overflow and tailings pipes is shown in Chart 7 for the reporting period and Chart 8 for the previous twelve years.

Total acidity values were within the <50 mg/L $CaCO_3$ target for W1 locations between for the reporting period. Almost all months for acidity in the tailings pipeline discharge had less than reportable total acidity concentrations (< 50 mg/L $CaCO_3$) Review of the data shows that:

- Total acidity of the tailings pipeline was generally well below the 50 mg/L target ranging from 0 mg/L to 7.3 mg/L $CaCO_3$, with an average of 3.27 mg/L $CaCO_3$ which was a slight increase from the previous reporting period average of 1.63 mg/L $CaCO_3$.
- Total acidity of the ROM stacker overflow was higher than in the tailings pipe in all months during the reporting period with the exception of April 2024.
- Long term total acidity of the ROM stacker overflow significantly dropped from 2022 and follows a general decreasing trend. Average total acidity of the ROM stacker overflow pipe decreased significantly to 6.83 mg/L $CaCO_3$, while values were reported above 100 mg/L $CaCO_3$ during the 2019-2022 period.
- Overall, the total acidity continued to decline during the reporting period following the conclusion of mining within the northern part of Area 3 (which commenced during the previous reporting period (after June 2022). This correlates with increasing total alkalinity and a rise in pH values.

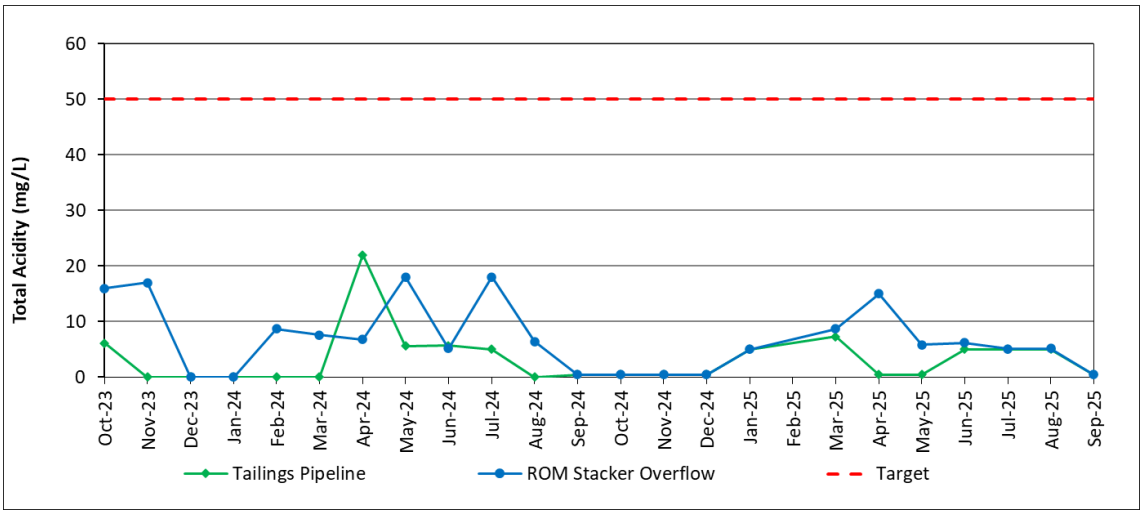


Chart 7: Total Acidity of ROM Overflow and Tailings Discharges for Reporting Period 2023/2025

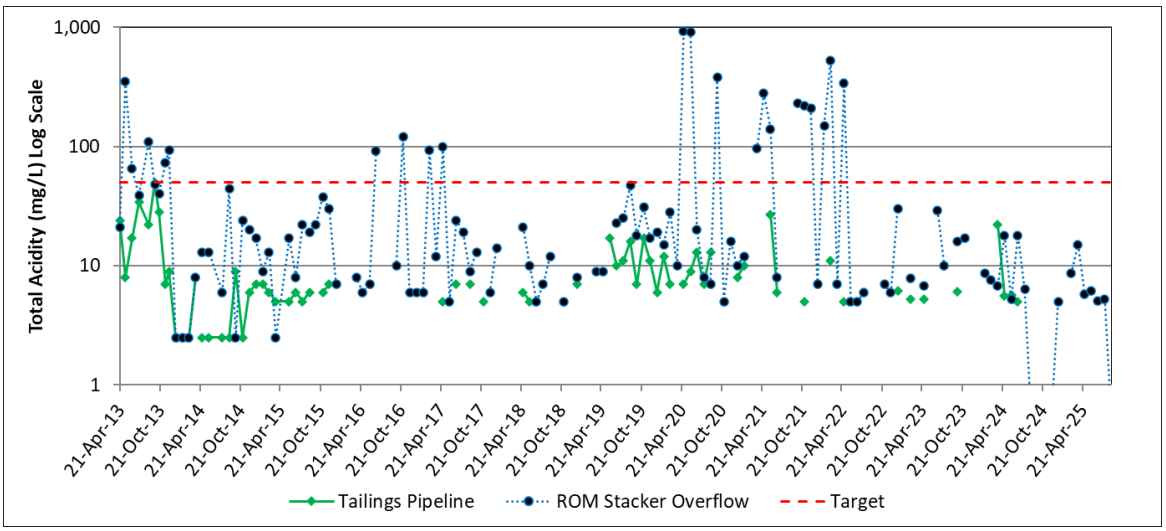


Chart 8: Total Acidity of Discharges Long Term Since 2013 (Log Scale)

5.6 Total Alkalinity

Total alkalinity results for both the ROM stacker overflow and tailings pipe discharges are shown in Chart 9 for the reporting period and Chart 10 for the previous twelve years. The monitoring results were above the target of >30 mg/L on most occasions. Review of the data shows that:

- Total alkalinity followed the same trend as pH and remained relatively stable for the reporting period.
- Total alkalinity of the discharged tailings slurry was stable to an average of 53 mg/L CaCO3 for the reporting period.
- Alkalinity of the ROM stacker overflow showed more variability during the reporting period with a general increasing trend from 6.7 to 42 mg/L $CaCO_3$ between October 2023 and September 2025.
- One of the ROM stacker overflow results showed an anomalously elevated total alkalinity of 230 mg/L (recorded in August 2024). This value is considered an outlier. Excluding this outlier, the average total alkalinity for the ROM stacker discharge was 35.6 mg/L as $CaCO_3$.

Total alkalinity has remained relatively stable in both the tailings pipe discharge and the ROM stacker overflow pipe discharge following the conclusion of mining in Area 3. This may indicate that total alkalinity levels are trending towards historic levels given mining of more characteristic ore types present in the main dredge pond.

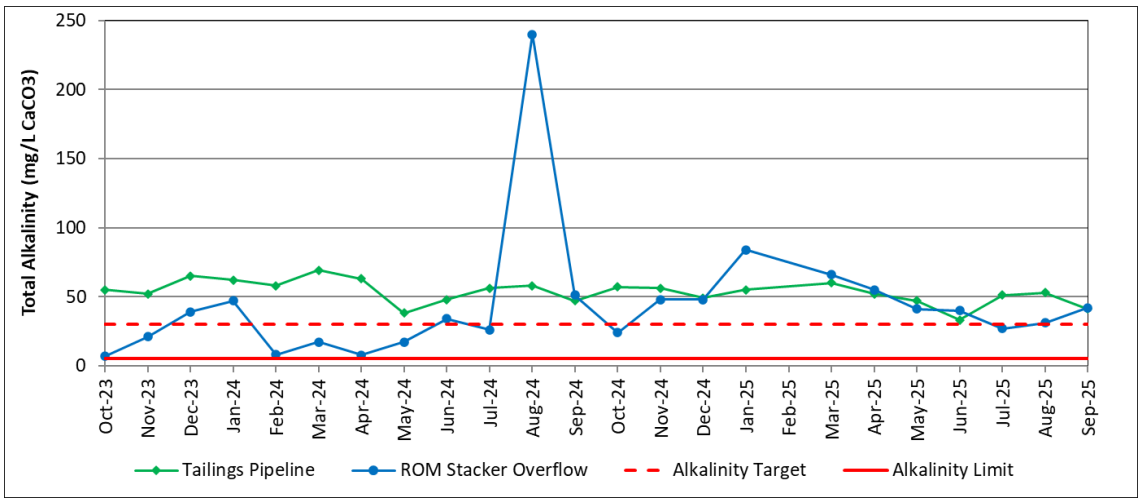


Chart 9: Total Alkalinity of ROM Stacker Overflow and Tailings Pipe Discharges 2025 Reporting Period (Log Scale)

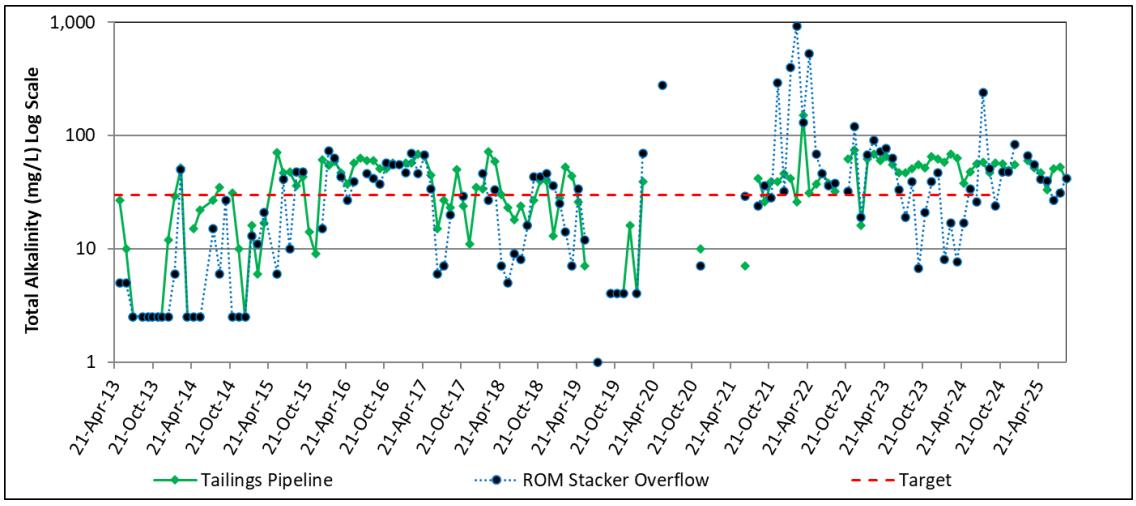


Chart 10: Total Alkalinity of Pipe Discharges Since 2013 (Log Scale)

5.7 Assessment Against Previous Monitoring Results

Monthly water quality monitoring for W1 discharge pipes commenced on 21 April 2013. Monitoring data for the reporting period are largely consistent with observed trends since April 2013 which are:

- Re-establishment of circumneutral pH values primarily in the range of pH 6.2 to 7.6 for the ROM stacker overflow and pH 7.1 to 7.7 in the tailings slurry discharged from the tailings pipeline.
- A continuing trend of increasing EC and TDS. TDS values have been consistently higher than the target values of 600 mg/L over this and the previous reporting periods. Although there has not been a current increase in salinity of production water used, the increases appear consistent with increased and now long term water recycling in the plant and general evaporative loss

and concentration of salts in the dredge pond especially during summer months and as a result of the drying climate.

- Significantly decreased total acidity in the ROM stacker overflow discharge in the current period versus the previous reporting period. A decrease in total acidity has also been seen in the tailings pipeline discharge since mid-2024.
- Results strongly indicate that release of existing acidity or (less likely), some oxidation (of sulfides) of the previous process material has now ceased, and total alkalinity and pH levels are continuing to recover.
- Water composition in the upgradient production bore KMB14 continues to gradually decrease in pH and alkalinity with a pH of 5.1 in the final reading for this reporting period being the lowest recorded (Appendix C).

5.8 List of Environmental Monitoring Reports Prepared During the Reporting Period

Environmental monitoring reports submitted to KSS from third parties during this reporting period are available on request. These include:

- Water monitoring results from MPL Laboratory (NATA accredited).
- Groundwater Monitoring Summary for Kemerton Silica Sands Limited. Prepared by Rockwater Hydrogeological and Environmental Consultants in October 2024.
- Groundwater Monitoring Summary for Kemerton Silica Sands Limited. Prepared by Rockwater Hydrogeological and Environmental Consultants in October 2025.
- 2023 Flora and Vegetation Monitoring of Rehabilitation Transects at Kemerton Silica Sand Pty Ltd. Prepared by Mattiske Consulting Pty Ltd, issued in January 2024.
- 2024 Flora and Vegetation Monitoring of Rehabilitation Transects at Kemerton Silica Sand Pty Ltd. Prepared by Mattiske Consulting Pty Ltd, issued in February 2025.

6. References

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ). 2000. *Australian and New Zealand guidelines for fresh and marine water quality*. Volume 2, Aquatic Ecosystems.

Australian and New Zealand Governments 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines.

Department of Water and Environmental Regulation (DWER), 2022. *Notice of amendment of schedule of licences with amended reporting conditions*. Available online [https://www.der.wa.gov.au/our-work/licences-and-works-approvals/current-licences]. Accessed 28/10/2025.

Mattiske Consulting, (Mattiske Consulting Pty Ltd) (2024) *2023 Flora and Vegetation Monitoring of Rehabilitation: Kemerton Silica Sand Pty Ltd*. Report prepared for Kemerton Silica Sand Pty Ltd, December 2024.

Mattiske Consulting, (Mattiske Consulting Pty Ltd) (2025) *2024 Flora and Vegetation Monitoring of Rehabilitation: Kemerton Silica Sand Pty Ltd*. Report prepared for Kemerton Silica Sand Pty Ltd, December 2024.

MBS, (Martinick Bosch Sell Pty Ltd) (2018a) *Kemerton Silica Sand Mine Rehabilitation Plan Revision 2, Kemerton Western Australia*. Report prepared for Kemerton Silica Sand Pty Ltd, February 2018.

MBS, (Martinick Bosch Sell Pty Ltd) (2018b) *Kemerton Silica Sand Mine Wetland Management and Monitoring Plan Revision 2, Kemerton Western Australia*. Report prepared for Kemerton Silica Sand Pty Ltd, February 2018.

MBS Environmental (MBS). Kemerton Silica Sand Mine Biennial Environmental Report, Kemerton Western Australia. Prepared for Kemerton Silica Sand Pty Ltd. October 2023

Rockwater Pty Ltd. 2021. *Groundwater Monitoring Summary 1 September 2023 to 31 August 2024*. Prepared by Rockwater Hydrogeological and Environmental Consultants, October 2021. Unpublished report prepared for Kemerton Silica Sand Pty Ltd.

Rockwater Pty Ltd. 2023. *Groundwater Monitoring Summary 1 September 2024 to 31 August 2025*. Prepared by Rockwater Hydrogeological and Environmental Consultants, October 2023. Unpublished report prepared for Kemerton Silica Sand Pty Ltd.

APPENDIX A

APPENDIX A:

ANNUAL AUDIT COMPLIANCE REPORT

MBS ENVIRONMENTAL

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Annual Audit Compliance Report Form

Environmental Protection Act 1986, Part V

Section A – Licence Details			
Licence number:	L6593/1995/8	Licence file number:	
Licence holder:	Kemerton Silica Sand Pty Ltd		
Trading as:	Kemerton Silica Sand		
ACN:	067 603 552		
Registered address:	5/363 -367 Albany Highway Victoria Park WA 6100		
Reporting period:	01/10/2024 **to** 30/09/2025		

Section B – Statement of Compliance with Licence Conditions
Did you comply with all of your licence conditions during the reporting period? (please tick the appropriate box)
☐Yes – please complete: • section C; • section D if required; and • sign the declaration in Section F.
☒No – please complete: • section C; • section D if required; • section E; and • sign the declaration at Section F.

Section C – Statement of Actual Production	
Provide the actual production quantity for this reporting period. Supporting documentation is to be attached.	
Prescribed Premises Category	**Actual Production Quantity**
5	445,102 tonnes (ore processed)

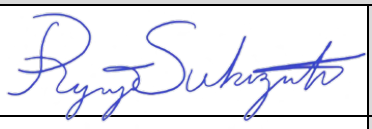
Section D – Statement of Actual Part 2 Waste Discharge Quantity	
Provide the actual Part 2 waste discharge quantity for this reporting period. Supporting documentation is to be attached.	
Prescribed Premises Category	**Actual Part 2 Waste Discharge Quantity**
5	139,018 tonnes (process tailings to dredge pond)

Section E – Details of Non-Compliance with Licence Condition			
Please use a separate page for each condition with which the licence holder was non-compliant at a time during the reporting period.			
Condition no:	7	Date(s) of non-compliance:	2024/2025
Details of non-compliance:			
During this reporting period exceedances of water quality targets were recorded relevant to Condition 7 of the licence and quarterly reports regarding these were submitted to DWER as per Condition 17 of the licence. Water quality results are consistent with previous monitoring periods going back to 2013. Monthly exceedances of the target for TDS occurred for both the ROM stacker overflow and tailings discharges to the Dredge Pond for all months in the reporting period. There were no exceedances of total alkalinity or total acidity targets for the tailings stream during the reporting period. There was one isolated exceedance of the total alkalinity target for the ROM stacker overflow for the reporting period (October 2024). There were no exceedances of the total acidity target for the reporting period from the ROM stacker overflow.			
What was the actual (or suspected) environmental impact of the non-compliance? **NOTE** – please attach maps or diagrams to provide insight into the precise location of where the non-compliance took place.			
Water quality results are consistent with previous reporting periods going back to 2013 for both dredge pond discharge points. KSS have previously reported exceedances quarterly to DWER. No additional impacts are considered to have occurred as a result of the ongoing exceedances of water quality targets.			
Cause (or suspected cause) of non-compliance:			
Water quality results are consistent with previous reporting periods going back to 2013. KSS have previously reported exceedances of targets quarterly to DWER. Results are consistent with elevated TDS being observed in local groundwater and other non-project related swan coastal plain wetland and lakes as a result of changing climatic conditions. Total acidity and total alkalinity results are similar to last year's reporting period and remain an improvement over previous reporting periods, with exceedances in total acidity targets no longer occurring. Improvements are consistent with a change in ore type being processed as dredging operations move southwards outside of Area 3 (northern portion of MS 703).			
Action taken to mitigate any adverse effects of non-compliance and prevent recurrence of the non-compliance:			
Discharges will continue to be monitored by KSS. Results will be assessed in the context with other impact monitoring required by Part IV EP Act approvals and the groundwater licence.			

Was this non-compliance previously reported to DWER?	
☒ Yes, and	
☐ Reported to DWER verbally	Date: / /
☒ Reported to DWER in writing	Date: Quarterly 2024/2025

Section F – Declaration

I/We declare that the information in this Annual Audit Compliance Report is true and correct and is not false or misleading in a material particular[1]. I/We consent to the Annual Audit Compliance Report being published on the Department of Water and Environmental Regulation's (DWER) website.

Signature[2]:		Signature:	
Name: (printed)	Ryuji Sakizaki	Name: (printed)	
Position:	Managing Director	Position:	
Date:	30/10/25	Date:	
Seal (if signing under seal):			

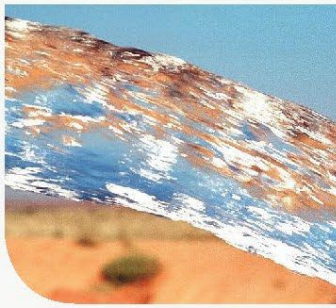
[1] It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular.

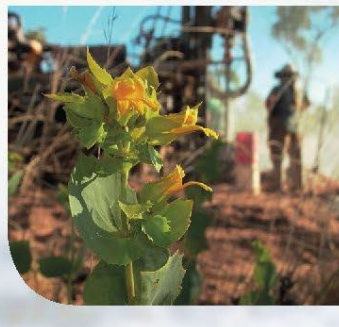
[2] AACRs can only be signed by the licence holder or an authorised person with the legal authority to sign on behalf of the licence holder.

APPENDIX B

APPENDIX B:
2024 GROUNDWATER MONITORING SUMMARY (PREPARED BY ROCKWATER)

MBS ENVIRONMENTAL





KEMERTON SILICA SAND MINE

GWL 60367(4) GROUNDWATER MONITORING SUMMARY

1 SEPTEMBER 2023 TO 31 AUGUST 2024

REPORT FOR KEMERTON SILICA SAND PTY LTD

OCTOBER 2024

Report No. 258.0/24/01

Rockwater
HYDROGEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

76 Jersey Street Jolimont 6014 Western Australia Postal: PO Box 201 Wembley 6913 Western Australia
Ph: 61 8 9284 0222 Fax: 61 8 9284 1785 Email: consult@rockwater.com.au www.rockwater.com.au ABN: 43 008 804 653

TABLE OF CONTENTS

Tables

TABLE OF CONTENTS

(Continued)

Figures

Appendices

REVISION	AUTHOR	REVIEW	AUTHORISED	ISSUED
Rev 0	MV	GB, GM & TT (KSS)	GB	2/10/24
Final	MV	GB	GB	8/10/24

1 INTRODUCTION

Kemerton Silica Sand Pty Ltd (KSS) screens and processes feldspathic silica sand at its Kemerton mine within the Shire of Harvey, Western Australia. The mine was commissioned in April 1996 and KSS has been exporting its products through the Port of Bunbury since July 1996, mostly to Asia for glass manufacturing. The site covers about 1,600 hectares of freehold land that spans the northern boundary of the Kemerton Industrial Estate, approximately 35 km north of Bunbury and 150 km south of Perth (Fig. 1). It is located within the groundwater management sub-areas of Kemerton Industrial Park North and Wellesley for the Superficial aquifer, and Kemerton North for confined aquifers; these sub-areas are within the South West Coastal Groundwater Area (Department of Water 2007).

Mining at the site is carried out using wet mining techniques following the removal of overburden. The mining entails a section cutter dredge that extracts the feldspathic silica sand ore to a depth of about 16 m below the water table. Sand slurry is then pumped to a ROM (run-of-mine) storage area where it is deslimed and stockpiled. Sand from the stockpile is then fed to a processing plant where it is screened and washed, and the heavy minerals removed by gravity separation. The sand is processed using cyclones and then stockpiled and transported by truck to the Port of Bunbury.

The water supply to the processing plant is provided from on-site groundwater sources. The processing plant water circuit incorporates a thickener to enable recirculation of the majority of the process water. Some of the process water is utilised to return coarse tailings and thickened slimes to the dredge Ponds. Overflow from the ROM stacker is also returned to the dredge Ponds, via a pipeline.

Groundwater extraction is licensed by the Department of Water and Environmental Regulation (DWER) via Licence to Take Water Groundwater Well Licence (GWL) 60367(4). The licence includes a Groundwater Monitoring Program (GMP) for the KSS mine. The GMP requires that a Groundwater Monitoring Summary be prepared for each year of borefield operation. KSS commissioned Rockwater to prepare a Groundwater Monitoring Summary for the water year from 1 September 2022 to 31 August 2023 (the 30th year of borefield operation), which is presented as this report.

2 GROUNDWATER WELL LICENCE MONITORING AND REPORTING REQUIREMENTS

GWL 60367(4) became active on 25 November 2013 and expired on 30 June 2023; it authorises KSS to extract 660,000 kL/a from the Superficial aquifer. KSS applied to the DWER for the renewal of the licence on the 2 March 2023, however at the time of this report submission, it had not been renewed. The DWER advised KSS on 9 August 2023 and also on the 23 July that as the application for renewal of the licence was submitted prior to its expiration. However, KSS is permitted to continue groundwater extraction as per the conditions of GWL 60367(4).

Copies of GWL 60367(4) and the GMP are presented in Appendix I and the monitoring requirements for the licence, detailed in the GMP, are summarised in Table 1.

Table 1: GWL 60367 (4) Monitoring Requirements

Licence	Requirement/s	Period	Bores	Submit Report
60367(4) Water year: 1 Sept to 31 Aug	**Water Meters**			
	Install and maintain cumulative water meters	-	KMB7, 14	Annually by 31 October
	Record volume of groundwater extracted	Monthly		
	Ensure meter accuracy is maintained within plus or minus 5% of the volume metered	-		
	Obtain authorisation from the DWER before removing, replacing or interfering with any meter under the licence	-		As required
	Notify the DWER of any meter malfunction within 7 days of the malfunction being noticed	-		As required
	Groundwater Monitoring Programme			
	Record water levels & operating status	Monthly	KMB7, 14 KMB1, 2, 4 , 5D[c], 6S[c], 8, 13, 15S, 16S, 16D, 17S, 18S and 19S KMB9, 10, 11 & 12	Annually by 31 October
	Obtain water samples and send to NATA-registered laboratory to analyse for: pH[a], Total Dissolved Solids (TDS) Electrical Conductivity (EC) @ 25°C Total acidity (as $CaCO_3$)[d] Total alkalinity (as $CaCO_3$) SO_4^{2-} (Sulphate) Cl^- (Chloride)	Quarterly[b] Annually[e]		

Notes: a = pH should be measured in the field as well as being analysed by the laboratory
b = Conduct in each of Sept or Oct, Dec or Jan, March or April & June or July
c = Monitoring bores KMB5D and KMB6S are replacement bores for KMB5 and KMB6 respectively
d = Total acidity is equivalent to total titrateable acidity
e = Conducted in March or April

The licence reporting conditions require an annual Groundwater Monitoring Summary (DoW 2009a) to be submitted to the Bunbury office of the DWER by 31 October each year. This annual monitoring summary has been prepared for the water year 1 September 2023 to 31 August 2024 with data collected by KSS personnel. The monitoring data for the review period and historical data are included as Appendices II and III. The report complies with DWER Operational Policy No. 5.12 (DoW 2009a).

3 CLIMATE

The Kemerton area has a climate characterised by warm dry summers and cool wet winters during which the majority of rainfall occurs. Rainfall data have been collected at the Kemerton Silica Sand mine since mid-1998 and at the Wokalup Agricultural Research Station (BoM Station Number 9642 located approximately 8 km east of the mine site) since 1951. Evaporation data were collected at the Harvey Station between 2001 and 2014 (BoM Station Number 9812) but the recordings were discontinued thereafter. The location of the Wokalup BoM weather station is shown in Figure 1 and the rainfall and evaporation data are presented Table 2 and Figure 2.

Table 2: Rainfall and Evaporation Data 2023/24

Month	Mine Site		Wokalup		Harvey
	Rainfall 2023/2024 (mm)	Average Rainfall [a] (mm)	Rainfall 2023/2024 (mm)	Average Rainfall [a] (mm)	Average Pot. Evaporation[b] (mm)
Jan-23	1.5	12.8	0.0	13.9	90.0
Feb-23	0.0	13.7	0.0	11.9	124.0
Mar-23	13.5	15.1	28.2	17.5	168.0
Apr-23	115.5	29.0	112.5	47.5	220.1
May-23	73.0	67.6	59.4	112.0	248.0
Jun-23	195.0	124.2	178.0	128.0	217.5
Jul-23	150.0	145.3	140.9	166.5	192.2
Aug-23	119.5	142.3	69.4	129.0	114.0
Sep-23	96.0	121.4	[c]	100.8	80.6
Oct-23	12.0	84.4	[c]	41.5	63.0
Nov-23	5.5	34.5	0.0	29.4	62.0
Dec-23	1.0	19.9	0.0	12.4	71.3
Calendar Year 2024	**782.5**	**798.3**	**588.4**	**812.0**	**1,650.7**
Jan-24	0.0	12.3	0.0	12.8	90.0
Feb-24	0.0	13.2	0.0	10.9	124.0
Mar-24	4.7	14.7	0.0	17.2	168.0
Apr-24	0.0	27.9	0.0	48.1	220.1
May-24	160.5	71.2	163.0	111.9	248.0
Jun-24	220.0	127.9	[c]	130.0	217.5
Jul-24	196.5	147.3	155.0	165.1	192.2
Aug-24	233.0	146.1	[c]	126.6	114.0
Water Year GWL60367(4) Sept 2023 – Aug 2024	**929.2**	**820.8**	**318.0**	**806.8**	**1,650.7**
Long-term Average [c]	N/A		958.5 (1951-2024)		N/A

Notes: a = average 1998/99 to month of recording in 2023 or 2043
b = short-term average 2001 to 2014 (when recordings ceased)
c = no data recorded
d = BoM average (years with incomplete records are excluded)

Annual rainfall for the Kemerton mine site shows a declining trend from 1999 until 2010, when the lowest total on record of 397 mm was recorded. The calendar-year annual rainfalls since 2010 have ranged from 390.5 mm to 1,023 mm. The total in the 2023 calendar year was 783 mm, 22 mm less than in 2022 and 177 mm less than in 2021, and 15 mm less the average (1999-2023) of 798 mm. Rainfall for the 2023/24 review period was 929.2 mm, which is 105 mm more than in the 2022/23 review period and 109 mm above the review-year average of 820.8 mm (1998/99 to 2023/24). Monthly rainfalls are generally similar to averages, with the exception of a very wet winter (May to August).

Similar rainfall patterns were recorded at the Wokalup Station in 2023, as in the previous years, with declining rainfall observed since 2021. The total for 2023 was 588.9 mm, about 209 mm below average since 1999 and about 370 mm below the average since 1951, the period of record for the station (Table 2). Rainfall for the 2023/24 water year was comparatively drier than previous year (318 mm) and was about 60% less than average (787.6 mm since 1998/99).

Drying trends at Wokalup station are particularly evident for the late-August, April and early-summer (November-January) periods. Monthly rainfall records for the mine site and Wokalup illustrate the high variability of rainfall across the coastal plain in the region.

The nearest BoM station with comparatively recent evaporation data is Harvey where recordings ceased in 2014. These data show average annual evaporation of 1,651 mm for 2001 to 2014. Average monthly rainfall at the mine site exceeds average monthly evaporation during August, September and October (Table 2, Fig. 2), which is the main period when there is potential for groundwater recharge.

4 HYDROGEOLOGY

4.1 PHYSIOGRAPHY

The Kemerton mining operation is located on the Swan Coastal Plain within the Bassendean Dune System. The topography of the area comprises low and irregular dunes with elevations as high as 25 m AHD on dune crests and about 10 m AHD in interdunal depressions. The Wellesley River, to the east of the mine site, flows south to southwest (Fig. 1) into the Leschenault Estuary, via the Collie River, and acts as a perennial drain for the local groundwater system. Ground elevations undulate across the site, ranging from 13.5 to 22 m AHD, with an average elevation of about 16 m AHD.

4.2 GEOLOGY

The mine area is underlain by about 30 m of Quaternary to Tertiary-age superficial formations, which unconformably overlie the Cretaceous-age Leederville Formation. The superficial formations comprise fine to medium grained quartz sand, with minor clay and clayey sand (Bassendean Sand), which overlies a basal 5 to 10 m of shell-rich sand and limestone (Ascot Formation). Thin marly limestone of the Muchea Limestone occurs at or near the surface towards the eastern side of the property.

4.3 GROUNDWATER OCCURRENCE

The superficial formations contain an unconfined groundwater system (Superficial aquifer) from which the KSS water supply is extracted. Groundwater within the Superficial aquifer is derived from rainfall recharge, whereby strong seasonality results in seasonal water table fluctuations of about one to two metres. The depth to the water table at the site varies from the surface, historically resulting in seasonal wetlands within topographical depressions, to over 10 m beneath surface in more elevated areas.

Regional groundwater flow in the Superficial aquifer beneath the KSS property is predominantly to the southeast from the Mialla Mound towards the Wellesley River, within the Myalup groundwater flow system (Deeney 1989). Groundwater discharge occurs via baseflow to the river and evapotranspiration, mainly from the wetlands. It is likely that a small proportion of groundwater leaks downwards into the underlying Leederville aquifer at the base of the Superficial aquifer. Groundwater flow within the Superficial aquifer beneath the western part of the property is west to southwest, towards the coast.

The groundwater in the Superficial aquifer is of fresh to marginal salinity, ranging from <100 mg/L to about 900 mg/L total dissolved solids (TDS). Groundwater salinity in the region is characteristically fresher near recharge areas and becomes more marginal near discharge areas. Local occurrences of higher salinity groundwater occur within plumes on the down-hydraulic-gradient sides of the wetlands as salinity increases due to the effects of evapotranspiration in the wetlands. Groundwater salinity may also be higher near the Wellesley River (Deeney 1989).

5 BOREFIELD

The production borefield comprises two bores, KMB7 and KMB14, located west of the plant site (Fig. 3). KMB14 is the main producer and KMB7 is retained as a standby water source and is used only rarely for short-term requirements when KMB14 is out of service (e.g. during bore maintenance). KMB 7 has not been used since June 2022. Both production bores are constructed to about 30 m depth and contain 12 m basal sections of 195 mm diameter stainless screen set against fine to medium-grained sand and limestone.

Sixteen operable monitoring bores are located within the mine site (Fig. 3). The monitoring bores are constructed with 50 mm uPVC casing, slotted over the basal 12 to 20 m for deeper bores and 2 to 8 m for shallower bores. The monitoring bores are constructed in pairs comprising both a shallow (bore-name suffix S) and a deep bore (no bore-name suffix or bore-name suffix D) bore at six locations: KMB4/KMB18S, KMB5D/KMB6S (replaced KMB5/KMB6 in 2013), KMB8/KMB17S, KMB13/KMB19S, KMB15S/KMB15D, and KMB16D/KMB16S. Shallow bore KMB16S has remained dry since its construction in May 2013. KMB4 was removed in February 2020 due an expansion of the mine area.

A summary of bore data is provided in the schedule of operating production and monitoring bores in Table 3.

Table 3: Schedule of Production and Monitoring Bores

Bore ID	MGA Coordinates		Reduced Level Top of Casing	Depth	Elevation at Base	Screen/ Slots	Comments
	mE	mN	(m AHD)	(m bTOC)	(m AHD)	(m bTOC)	
Production Bores							
KMB7[a]	386420	6333719	15.68	29.0	-13.3	16.5 – 28.5	Equipped Grundfos, SP8A-15; Installed January 2004
KMB14	385962	6333541	16.48	30.4	-13.9	16.6 – 28.6	Equipped Southern Cross, 8-Stage turbine, Model NAD2F; Constructed 21/12/95
Monitoring Bores							
KMB1	385842	6334149	17.60	24.0	-6.4	11.0 – 23.4	
KMB2	386398	6334378	16.81	23.8	-7.0	11.0 – 23.0	
KMB3	-	-	14.71	24.0	-9.3	10.0 – 24.0	Decommissioned in Feb. 2001 (covered by southern extension to Dredge Ponds)
KMB4	386853	6333700	16.03	23.0	-7.0	11.0 – 23.0	Removed in February 2020 due to an expansion of the mine area
KMB5	386821	6333100	16.33	22.1	-5.8	10.1 – 22.1	Monitoring ceased in 2001, recommenced in August 2008. Decommissioned June 2013
KMB5D	386658	6332982	16.07	22.0	-5.9	10.0 - 22.0	Constructed in May 2013; replacement for KMB5
KMB6	386817	6333133	15.60	19.0	-3.4	1.5 – 19.0	Decommissioned June 2013
KMB6S	386657	6332951	16.15	10.0	6.2	2.0 - 10.0	Constructed in May 2013; replacement for KMB6
KMB8	386369	6334051	15.67	ND	ND	? - 20.08	Slotted depth as probed in August 2000
KMB9	387371	6332634	14.46	ND	ND	? - 19.95	Slotted depth as probed in August 2000; monitoring ceased in 2001, recommenced in August 2008
KMB10	387567	6334009	15.28	ND	ND	? - 19.65	Slotted depth as probed in August 2000
KMB11	387720	6334243	16.16	ND	ND	? - 14.35	Slotted depth as probed in August 2000
KMB12	387933	6333605	13.83	ND	ND	? - 20.05	Slotted depth as probed in August 2000
KMB13	386173	6333648	16.06	ND	ND	? - 24.90	Slotted depth as probed in August 2000; silted-up Feb. 2001, cleared and monitoring recommenced May 2002
KMB15S	384828	6333095	18.93	6.0	12.9	4.0 - 6.0	Constructed in May 2013, identical water levels to those from deep bore KMB15D
KMB15D	384828	6333095	18.93	23.0	-4.1	11.0 - 23.0	Constructed in May 2013
KMB16S	384780	6334761	22.16	6.0	16.2	4.0 - 6.0	Constructed in May 2013; dry
KMB16D	384780	6334761	22.16	23.0	-0.8	11.0 - 23.0	Constructed in May 2013
KMB17S	386444	6333960	15.91	7.65	8.3	1.25-7.65	Constructed in May 2015
KMB18S	386843	6333624	16.20	7.65	8.6	1.25-7.65	Removed in June 2021 due to an expansion of the dredge Ponds
KMB19S	386178	6333642	16.07	7.65	8.4	1.25-7.65	Constructed in May 2015

Notes: ND = no data available
m bTOC = metres below top of casing
a = regular pumping from KMB7 ceased from May 2016 to August 2018 and again from 2022 onwards

6 GROUNDWATER EXTRACTION

Groundwater extraction for the water year, 1 September 2023 to 31 August 2024, totalled 121,750 kL (Table 4), which is about 18% of the 660,000 kL/a licensed groundwater entitlement. The total groundwater extraction and subsequent water usage have significantly declined from the period of peak usage from 1996 to 2003, when average annual extraction was about 750,000 kL, to an average annual extraction of about 112,950 kL since 2008/9. The reduction is principally due to more efficient water use within the circuit and effective implementation of an objective by KSS promoting reduced water consumption.

Table 4: Annual Groundwater Extraction

Water Year	KMB14 (kL)	KMB7[a] (kL)	Total (kL)	Use of Annual Entitlement
1 July to 30 June Water Year				
February 1996 – June 1996	200,079	164,528	364,607	36%
July 1996 – June 1997	393,747	533,190	926,937	93%
July 1997 – June 1998	360,202	503,988	864,190	86%
July 1998 – June 1999	348,488	461,931	810,419	81%
July 1999 – June 2000	328,194	447,407	775,601	78%
July 2000 – June 2001	324,586	480,213	804,799	80%
July 2001 – June 2002	306,042	410,596	716,638	72%
July 2002 – June 2003	233,883	309,854	543,737	54%
July 2003 – June 2004	280,472	96,541	377,013	38%
July 2004 – June 2005	98,007	189,374	287,381	29%
July 2005 – June 2006	40,277	270,013	310,290	31%
July 2006 – June 2007	77,679	260,579	338,258	34%
July 2007 – June 2008	53,927	170,297	224,224	34%
July 2008 – June 2009	52,162	73,171	125,333	19%
July 2009 – June 2010	29,661	42,022	71,683	11%
July 2010 – June 2011	4,459	37,649	42,108	6%
July 2011 – June 2012	15,199	78,509	93,708	14%
July 2012 – June 2013	3,324	60,491	63,815	10%
1 September to 31 August Water Year				
September 2008 – August 2009	52,298	42,139	94,437	14%
September 2009 – August 2010	32,146	46,601	78,747	12%
September 2010 – August 2011	2,896	60,477	63,373	10%
September 2011 – August 2012	13,270	57,301	70,571	11%
September 2012 – August 2013	6,662	58,599	65,261	10%
September 2013 – August 2014	108,365	51,005	159,370	24%
September 2014 – August 2015	150,836	44,385	195,221	30%
September 2015 – August 2016	93,803	29,821	123,624	19%
September 2016 – August 2017	95,766	0	95,766	15%
September 2017 – August 2018	74,872	220	75,092	11%
September 2018 – August 2019	95,007	55,709	150,716	23%
September 2019 - August 2020	80,682	5,813	86,495	13%
September 2020 - August 2021	70,580	2,414	72,994	10%
September 2021 - August 2022	116,523	5,681	122,204	19%
September 2022 - August 2023	129,268	0	129,268	20%
September 2023 - August 2024	117,988	3,762	121,750	18%

Note: a = pump not in use/bore out of service during 2016/17 and 2017/18 review periods, excluding August 2018

The demand for groundwater has remained steady since the last reporting period with the majority of the extraction occurring from KMB14 during the review period. KMB7 was only used between January and May 2024, to provide water to the sprayers at the plant, given failures with the dredge return water pump. Extraction for the review period totalled 121,750 kL and marks an decrease in extraction of only 2% compared to the 2022/23 review period. The monthly volumes that are extracted from the bore vary according to processing plant requirements. They are within the ranges of the monthly volumes that have been extracted in previous water years (Table 5, Fig. 4).

Minimal groundwater was extracted from KMB7 as part of a commitment by KSS to concentrate extraction on the fresher supply from KMB14 rather than the fresh to brackish supply from KMB7.

Table 5: Monthly Groundwater Extraction 2023/24

Period	KMB14	KMB7
	(kL)	(kL)
Sep-23	9,248	0
Oct-23	14,369	0
Nov-23	8,758	0
Dec-23	4,196	0
Jan-24	9,416	5
Feb-24	11,541	161
Mar-24	14,947	126
Apr-24	8,156	1,420
May-24	12,694	2,050
Jun-24	2,542	0
Jul-24	9,498	0
Aug-24	12,623	0
Total Extraction	**117,988**	**3,762**
Total Extraction 1 Sep 2023 to 31 Aug 2024		**121,750**

7 RESULTS OF MONITORING

Historical water-level and water-quality monitoring data are provided in Appendices II and III respectively.

7.1 WATER LEVELS

Groundwater levels beneath the mine site area vary seasonally each year in response to seasonal rainfall recharge. Hydrograph maxima are recorded generally in August-September and minima generally in April-June, depending on when significant quantities of the seasonal rainfall occur. The hydrograph patterns for the 2023/24 water year display evidence of recharge events, with water levels higher from September to December 2023, in response to rainfall from previous months, and lower in April and May 2023. Anomalous values are evident in the data (Fig. 5, Fig. 9), which are attributed to measurement or recording errors as they are outside the ranges of projected water level trends. Overall, water levels vary by between 0.71 m and 1.75 m in the monitoring bores, and by about 1.11 m and 1.33 m (rest water levels) in production bores KMB7 and KMB14 respectively.

7.1.1 PRODUCTION BORES

Resting water levels (pump status 'off') were recorded for nine of the 12 months in KMB7 and four of the 12 months in KMB14 during the review period (Table 6, Fig. 5). The bore hydrographs show a slight declining water-level trend in KMB14 since July 2017 with water levels during the current review period remaining similar to 2022/23.

Table 6: Production Bores Monthly Resting Water Levels 2023/24

DATE	KMB14	KMB7
	(m AHD)	(m AHD)
Sep-23	13.91	14.18
Oct-23	13.80	14.01
Nov-23	13.52	13.83
Dec-23	8.65[a]	13.70
Jan-24	8.60[a]	12.21[a]
Feb-24	12.81	13.24
Mar-24	8.11[a]	11.44[a]
Apr-24	8.95[a]	11.39[a]
May-24	7.24[a]	12.94
Jun-24	7.53[a]	13.28
Jul-24	7.95[a]	13.67
Aug-24	8.64[a]	14.27

7.1.1.1 KMB14

Standing water levels ranged from a minimum of 12.81 m AHD (February 2024) to a maximum of 13.91 m AHD (September 2023), and fall within the historical range for the bore. Eight pumping water levels were recorded during the review period with levels around 7.24 m AHD (May 2024) to 8.95 m AHD (April 2024). The minimum and maximum water levels for 2023/24 are similar to the water level for 2022/23 water year.

7.1.1.2 KMB7

Water levels ranged from 12.94 m AHD (May 2024) to 14.27 m AHD (August 2024) and averaged about 13.68 m AHD during the review period. Similar to KMB14, the minimum and maximum water levels for 2023/24 are similar to those recorded during the 2021/22 review period.

7.1.2 MONITORING BORES

Monitoring-bore water levels were recorded each month during the review period; the data are included in Table 7 and historical data in Appendix II. KMB4 was removed from the monitoring round in February 2020. KMB16S has been dry since construction in May 2013. KMB18S was removed in June 2021 due to the expansion of the dredge Ponds; therefore, there are no monitoring data for the bore.

Table 7: Monitoring Bores Monthly Water Levels 2023/24

Date/Bore	KMB1	KMB2	KMB4[a]	KMB5D	KMB6S	KMB8	KMB9	KMB10	KMB11
Sep-23	14.29	14.21	-	13.62	13.98	14.16	12.68	13.28	13.26
Oct-23	14.10	14.06	-	13.49	13.74	14.00	12.47	13.15	13.08
Nov-23	13.95	13.85	-	13.29	13.47	13.77	12.32	12.97	12.85
Dec-23	13.76	13.65	-	13.13	13.32	13.63	12.13	12.79	12.69
Jan-24	13.50	13.37	-	12.87	13.09	13.35	11.86	12.60	12.44
Feb-24	13.19	13.15	-	12.59	12.86	13.13	11.56	12.28	12.18
Mar-24	12.86	12.91	-	12.33	12.56	12.90	11.29	11.90	11.91
Apr-24	12.93	12.80	-	12.28	12.45	12.76	11.19	11.83	11.80
May-24	13.12	12.81	-	12.25	12.53	12.76	12.13	11.93	11.91
Jun-24	13.24	13.26	-	13.68[c]	13.42[c]	13.15	12.66	12.38	12.28
Jul-24	13.66	13.69	-	12.95	12.95	13.62	11.55[c]	12.78	12.61
Aug-24	14.23	14.28	-	13.51	14.20	14.24	12.77	13.29	13.10
Date/Bore	**KMB12**	**KMB13**	**KMB15D**	**KMB15S**	**KMB16D**	**KMB16S**	**KMB17S**	**KMB18S[b]**	**KMB19S**
Sep-23	12.68	14.06	13.48	13.47	13.72	dry	14.24	-	14.11
Oct-23	12.56	13.89	13.42	13.37	13.74	dry	14.09	-	13.95
Nov-23	12.38	13.70	13.29	13.34	13.66	dry	13.81	-	13.73
Dec-23	12.19	13.55	13.23	13.28	13.56	dry	13.67	-	13.59
Jan-24	11.92	13.26	13.09	13.14	8.75[c]	dry	13.36	-	13.30
Feb-24	11.63	13.02	12.93	12.98	13.28	dry	13.18	-	13.04
Mar-24	11.37	12.78	12.74	12.83	13.08	dry	12.95	-	12.81
Apr-24	11.27	12.62	12.75	12.73	13.00	dry	12.78	-	12.69
May-24	11.44	12.66	12.70	12.69	13.28	dry	12.79	-	12.64
Jun-24	11.76	13.01	12.78	12.78	10.48[c]	dry	13.74[c]	-	13.67
Jul-24	12.04	13.44	12.98	12.96	13.29	dry	13.66	-	13.47
Aug-24	12.46	14.07	13.27	13.27	13.63	dry	14.38	-	14.14

Notes: Water levels presented as m AHD
maxima (end-winter 2023 or Aug-2024), minima (end-summer 2023)
a = KMB4 was removed in February 2020 to allow for mining expansion
b = KMB18S was removed in June 2021 to allow for dredge Ponds expansion
c = Value is believed to be erroneous

Water level contour maps for the end-of-winter (August 2024) and end-of-summer (April 2024), are presented in Figures 6 and 7 respectively. They show the configuration of the water table at or close its recorded maximum elevation (August) and minimum elevation (April) for the review period.

The monitoring bores are divided into several group locations for the discussion of water level data based on their hydrograph forms and trends, which appear to be influenced by their locations.

Water levels in the monitoring bores have ranged from 9 m AHD to 17 m AHD since the commencement of monitoring in 1993. The hydrographs show annual, cyclical water-level variations associated with winter-dominated rainfall recharge to the aquifer (Figs 8 to 10, Appendix II). Long-term-declining water levels are evident in bores KMB5D, KMB6S, KMB9, KMB11, KMB12, KMB15S, KMB15D and KMB19S. All monitoring bores show slightly lower water levels in the last four to five years than previously. This is mainly evidenced by their annual hydrograph minima.

Water levels ranged from 11.19 to 14.35 m AHD during the review period with the recorded minima for individual bores being broadly consistent with those from the previous review period whereas the recorded minima for individual bores are lower than those from the previous review year by an average of about 0.1 m. The lower minima may be associated with the lower rainfall during the 2023/24 water year (Section 3). The cyclical water-level variations shown by the hydrographs are associated with winter-dominated rainfall recharge to the aquifer (Figs 8 to 10, Appendix II). Water levels in 2022/24 were generally lowest in April or May and highest in September to November 2023 or August 2024 (Table 7).

7.1.2.1 KMB1, KMB2, KMB8 and KMB17S (North-western Area)

Monitoring bores KMB1, KMB2, KMB8 and KMB17S are located north of the production bores (Fig. 3). Water levels declined at a rate of about 0.1 m/annum from December 2020 and then they have stabilised since May 2023. The hydrograph (Fig. 8) trends for the bores are similar.

7.1.2.2 KMB5D and KMB6S (Central and Southern Areas)

Monitoring bores KMB4, KMB5D, KMB6S, KMB9 and KMB18S are located in an area between and south of the plant infrastructure and the dredge Ponds (Fig. 3), with only KMB5D and KMB6S still operable. The hydrograph (Fig. 8) shows water level trends very similar to those in the north-western area. The lower water level elevations in KMB9, in the southeast, reflect the regional hydraulic gradient towards the southeast across the site (Figs 6 and 7).

7.1.2.3 KMB10, KMB11 and KMB12 (Dredge Ponds Area)

Monitoring bores KMB10, KMB11 and KMB12 are located northeast of the dredge Ponds (Fig. 3). The hydrographs for this area (Fig. 9) show declining water levels when compared to the first few years of data (monitoring commenced in 1996). Water levels in these bores indicate a overall declining trend since 2018, with the exception of a slight rising trend between mid 2021 to mid 2023. The lower water elevations in KMB12 reflect the regional hydraulic gradient towards the southeast across the site (Figs 6 and 7).

7.1.2.4 KMB15S, KMB15D, KMB16S and KMB16D (Western Area)

Monitoring bores KMB15S, KMB15D, KMB16S and KMB16D are located on the western boundary of the property (Fig. 3). Their purpose is to collect baseline monitoring data prior to a possible extension of the mining area. KMB16S has been dry since it was constructed in May 2013. KMB15S and KMB15D both displayed decreasing water-level trends over their periods of record, but have reamined stable during the last two review periods. The hydrograph for KMB16D shows a similar range of fluctuations during the review period to previous years and continues the pattern of slightly lower water levels over the last three to four years (Fig. 9).

7.1.2.5 KMB13 and KMB19S (Borefield Area)

KMB13 and KMB 19S are adjacent to each other and located about halfway between production bores KMB7 and KMB14 (Fig. 3). Water levels in KMB13 and KMB19S display declining trends, evident since 2018. Recorded water levels in the shallow monitoring bore, KMB19S are generally slightly lower than water levels deeper in the aquifer (Fig. 10).

The hydrographs show water levels exhibit seasonal variations and the water levels for the 2023/24 review period are within historical ranges.

7.2 GROUNDWATER QUALITY

KSS is required to undertake quarterly analyses of field and laboratory pH, and laboratory EC and salinity (TDS), as well as annual (in March or April) chloride, sulphate, total acidity and total alkalinity determinations on water samples from all production and monitoring bores. Water quality trigger levels are set for pH, total alkalinity and chloride : sulphate ratio in the conditions of GWL 60367(4); the trigger levels are shown in the plots of hydrochemical data in Figures 11 to 21. The triggers are:

- a change in the salinity category as described in the groundwater monitoring programme pursuant to GWL 60368(4) item 2.4 (Appendix I);
- field pH falling below 4;
- total alkalinity (as $CaCO_3$) falling below 10 mg/L; and
- Cl:SO_4 ratio less than 2.

The trigger levels are intended to provide indicators of whether groundwater is either acidifying or is vulnerable to acidification. They are designed to prompt action and do not indicate compliance breaches or limit exceedances. An elevated level of sulphate ions relative to chloride ions may indicate the presence of acid sulphate soils (ASS) in the landscape. The DWER mapping indicates that most of the KSS site is at "moderate to low risk of ASS occurring within 3 m of natural soil surface" (Landgate 2013) with only the wetland located about 200 m northeast from KMB11 being mapped as "high to moderate risk of ASS occurring within 3 m of natural soil surface".

The quarterly samples for field analyses in the 2023/24 water year were collected in April 2024, with the exception of KMB1 and KMB15S, which were collected on 1 July 2024. The results from the laboratory analyses, supported by the historical data, much of which is additional to the monitoring requirements of the current groundwater licence, are presented in Appendix III and discussed below. Laboratory certificates are included in Appendix IV.

7.2.1 PRODUCTION BORES

Laboratory analyses for the production bores are presented in Tables 8 and 9 and Figures 11 to 13. Field determinations of salinity and pH are provided in Figure 11 for comparison with the laboratory analysed water. There appear to be no anomalous results in the analyses during the review period and, as such, the veracity of the data is acceptable.

Salinity

Groundwater salinity, recorded as total dissolved solids (TDS) by evaporation , ranged from 150 to 620 mg/L TDS for the review period. These values are within the DoW (2009b) fresh (<500 mg/L) to marginal (500-1,000 mg/L) salinity classifications and are within historical ranges for each bore (Fig. 11, Appendices II and III).

KMB14 produces markedly fresher water than KMB7 (Fig. 11). Historical data for KMB14 indicate salinities range from 130 to 500 mg/L TDS. The salinity averaged about 195 mg/L during the 2023/24 review period (Fig. 11), which is very similar to the average for the previous water year (200 mg/L). Whereas salinities range from about 500 to 800 mg/L TDS in KMB7. KMB7 recorded field salinity in July 2024 is likely to be erroneous.

There is no definitive evidence of impact on groundwater salinities in KMB14 associated with a significant increase in extraction since mid-2013; salinities over the past four to five years have been generally towards the lower end of their historical range. Field and laboratory analysed salinity concentrations were similar in KMB14, and showed fresher groundwater.

Table 8: Production Bore Monthly pH and Salinity Data 2023/24

Month	Field pH	Field Salinity (mg/L Total Dissolved Solids)	Laboratory pH	Laboratory EC @ 25°C	Laboratory TDS[a]
				(µS/cm)	(mg/L)
KMB14					
Oct-23	5.00	129	5.30	250	220
Jan-24	5.10	125	5.20	240	210
Apr-24	4.40	139	5.20	300	150
Jul-24	5.20	510	5.20	240	200
KMB7					
Oct-23	6.05	419	6.40	830	560
Jan-24	6.36	430	6.30	780	610
Apr-24	-	-	6.40	950	500
Jul-24	5.40	110[b]	5.90	960	620

Notes: a = TDS by evaporation. b = likely erroneous result

Table 9: Production Bore Water Chemistry Data, April 2024

Bore	Date	Chloride (Cl)	Sulphate (SO_4)	Total Acidity (as $CaCO_3$)	Total Alkalinity (as CaCO3)	Cl:SO_4 ratio
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	
KMB14	18/04/2024	75	17	37	7.7	4.4
KMB7	18/04/2024	180	190	47	20	0.9

Notes: Trigger reached or exceeded

The average laboratory salinity for KMB7 was about 570 mg/L TDS for the 2023/24 review period, which is about 130 mg/L lower than that for 2022/23. The 2021/22 data showed a possible seasonal variation with a minimum of 617 mg/L TDS in October 2021 followed by a maximum of 713 mg/L, which was not observed during the last two review periods.. The laboratory salinity concentrations recorded are within the DOW (2009b) marginal salinity-classification range.

A gradual increase in salinity is evident in KMB7 from when monitoring began in 1996 until regular pumping from the bore ceased in May 2016 (Fig. 11);from 500 mg/L TDS in January 1997 to about 800 mg/L TDS in January 2015. Salinities measured since May-2016 show large variations. Only small volumes of water have been extracted from KMB7 other than from October 2018 to May 2019. KMB7 was not operated between June 2022 and January 2024, after which salinity concentrations have stabilised around 600 mg/L TDS. The previous long-term trend of rising salinity is not evident since May-2016, with salinities showing a decreasing trend since April 2022. Field measured salinities in KMB7 appear markedly fresher than laboratory salinites, remaining around 420 mg/L TDS, with the exception of the August 2024 value (110 mg/L TDS) which is likely to be erroneous. The cause of a potentially erroneous readings is believed to be due to faulty field monitoring equipment, which have since been replaced.

pH

The groundwater from the production bores has acidic to near-neutral pH with a field value of 5.4 for KMB7 and 5.2 for KMB14 recorded in August 2024 (Table 8, Fig. 11, Appendices II and III). pH values for both bores are now towards the base of their historical ranges, similarly to values during the 2022/23 review period. pH trends for both bores exhibit gradual increases from July 2012 (KMB7) and January 2013 (KMB14) until January 2015 but they have been gradually reducing since then. Values remain above the minimum pH trigger level (4.0). The April 2024 value recorded in KMB14 (4.40), for April 2024, is the lowest pH recorded since records began. Average pH values have been declining by approximately 0.2 pH units per year, since 2017. Generally the laboratory data over the last three water years show higher pH values than the field data for the same sample event, which is unusual given that degassing of carbon dioxide during the time between when the samples were collected and the laboratory analyses were undertaken tends to result in higher pH values for the laboratory results. KSS has since replaced its field monitoring equipment.

Chloride

Chloride concentrations over the review period varied little, averaging about 58 mg/L for KMB14 and 160 mg/L for KMB7 (Appendix III). The chloride concentrations for both bores are similar to the 2022/23 review period, within the historical ranges and show no trends of change.

Sulphate

Sulphate concentrations ranged from 13 to 19 mg/L in bore KMB14 during the review period, which are within the historical range for the bore (Appendix III). Bore KMB14 sulphate concentrations have gradually reduced since an historically high concentration of 85 mg/L in April 2010. Sulphate concentrations in KMB7 during the current review period ranged from 150 to 210 mg/L, the July 2024 high of 210 mg/L is slightly higher than the range of values that have been recorded since about 2016. Sulphate concentrations in KMB7 gradually increased from when monitoring began in 2002 to about 2016 but no trend of change is apparent since then.

Total Acidity

The total acidity (as $CaCO_3$) for the review period ranged from 37 to 72 mg/L in KMB14 and from 14 to 47 mg/L in KMB7 (Fig. 12). The value of 95 mg/L recorded in KMB14 for April 2023 was a new maximum value for the production bore and values during the 2023/34 review period were observed to have decreased. Both data for KMB7 and KMB14 are within the historical ranges for the bores. The data from both bores, particularly KMB7, continue to be highly variable (Appendix III). Total acidity in KMB14 was higher than in KMB7 for the current review period, which is attributed to KMB7 being operated sporadically. KMB14 shows a long term increasing trend of total acidity since December 2014. KMB7 displayed an increasing trend between 2014 and 2021 but displays a declining trend of total acidity since April 2021.

Total Alkalinity

Total alkalinity (as $CaCO_3$) ranged from 7.7 to 12.0 mg/L for KMB14 and from 19.0 to 30.0 mg/L in KMB7 for the review period (Fig. 12). Analyses of total alkalinity commenced in November 2013 although no data were recorded for the 2018/19 review period. Alkalinities were comparatively stable for KMB14 from August 2015 to the end of the 2017/18 review period but subsequently varied considerably, from 14 mg/L to 170 mg/L, in 2019/20; they have remained at consistently low levels since October 2020 and this trend continued during the current review period. Similar trends are evident in the data for KMB7, with the lowest values since recording began being recorded in April and June 2022, although values are slightly higher than those for KMB14. Total alkalinity values in KMB14, for April and July 2024 were below the 10 mg/L trigger level.

Cl:SO_4 ratio

Chloride and sulphate concentrations have been monitored monthly or quarterly since 2013. Prior to this, the monitoring was either annual or bi-annual. The Cl:SO_4 ratios ranged from 2.6 to 4.4 for KMB14 and 0.8 to 0.9 for KMB7 over the review period (Fig. 13). The trigger level specified in GWL 60367(4) for the Cl:SO_4 ratios is for the ratio to remain less than 2. Cl:SO_4 ratios for KMB14 increased from July 2013 to July 2015, which correlates with a period of increased extraction (Fig. 4), but they subsequently reduced and remained at comparatively stable, mainly below the trigger. They increased above the trigger during the 2018/19 review period where they have since remained. The trigger level has not been reached in most results for KMB14 over the last four review periods. No relationship between the Cl:SO_4 ratio and extraction volumes is evident in the recent data. The ratio for KMB7 has remained below the trigger since 2012 except for values in August 2020, April 2021 and in October 2021 (2.1, 2.6 and 5.4). The October 2021 ratioi is more than double the next highest recordings for the bore (2.6 in January 2003 and April 2021). There was no corresponding change in extraction from KMB7 in the months where the trigger was reached or exceeded. The monitoring programme that is attached with GWL 60367(4) indicates that further action involving either ecosystem specific investigations or implementation of management/remedial actions (ANZECC 2000) be undertaken should a water quality result move beyond a trigger level. The ratios during the 2023/24 review period are above the trigger for each of the quarterly monitoring events for KMB14 while all the ratios recorded were below the trigger level in KMB7. The licence conditions state that this should instigate further action.

7.2.2 MONITORING BORES

Analytical results are shown in Figures 14 to 21 and those for the samples taken in April 2024 are presented in Table 10. The full dataset, including historical data, is contained in Appendix III.

Table 10: Groundwater Analyses from Monitoring Bores, April 2024

Bore	Date	pH (field)	pH (lab)	EC @ 25°	TDS	Chloride Cl	Sulphate SO_4	Total Acidity as $CaCO_3$	Total Alkalinity as $CaCO_3$	Cl:SO_4 ratio
				(µS/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	
Trigger (minimum)	**-**	**<4.0**	**<4.0**	**-**	**-**	**-**	**-**	**-**	**<10.0**	**<2.0**
KMB1[a]	1/07/2024	5.60	5.10	260	240	36	5.3	20	4	6.8
KMB2	18/04/2024	6.56	6.80	620	340	110	2.5	190	29	44.0
KMB5D	18/04/2024	6.00	5.70	630	500	190	3.3	31	54	6.1
KMB6S	18/04/2024	5.33	5.90	150	100	13	21.0	28	33	0.6
KMB8	18/04/2024	4.60	5.50	830	470	250	14.0	22	48	17.9
KMB9	18/04/2024	6.20	5.00	390	200	96	35.0	7	37	2.7
KMB10	18/04/2024	4.57	3.70	510	440	130	22.0	0	90	5.9
KMB11	18/04/2024	6.34	5.60	410	320	120	0.0	22	38	>120
KMB12	18/04/2024	7.24	7.40	1100	720	130	50.0	21	430	2.6
KMB13	18/04/2024	5.15	5.60	270	160	76	4.5	15	32	16.9
KMB15D	18/04/2024	4.50	6.00	270	130	65	7.3	31	22	8.9
KMB15S[a]	1/07/2024	5.20	4.40	390	290	46	1000	98	5	0.5
KMB16D	18/04/2024	5.00	5.20	370	230	100	12.0	9.1	40	8.3
KMB16S[b]	18/04/2024	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
KMB17S	18/04/2024	6.10	6.50	360	330	34	14	44.0	110.0	2.4
KMB19S	18/04/2024	4.09	5.00	320	220	88	4.4	71	8.8	40

Notes: a = no water quality data recorded in April 2024, July 2024 data is presented
b = no water quality data available for KMB16S for current water year – bore dry
Trigger reached

Salinity

Laboratory analysed salinity determinations for the review period, calculated as TDS by evaporation, ranged from 100 mg/L in KMB6S (April 2024) to 720 mg/L in KMB12 (January 2024, Figs 14 and 15, Appendix III), which fall into the fresh to marginal salinity categories according to DoW (2009b).

Monitoring bores KMB1, KMB2, KMB8 and KMB17S on the north-western side of the plant area show overall stable trends (Fig. 14) with the exception of KMB1 which has displayed decreasing salinities since January 2020 and recent increasing salinity across the 2023/24 review period. Concentrations for KMB8 continue to show seasonal variations with an overall decrease in values in 2024. KMB1, KMB2 and KMB17S contain groundwater that falls within the fresh salinity category of DoW (2009b) whereas the groundwater in KMB8 varies within the marginal to fresh salinity category.

Salinities in monitoring bores within the central and southern areas (KMB5D, KMB6S and KMB9) display different trends (Fig. 14). KMB6S features the freshest groundwater of all the monitoring bores in most years with salinity varying by only small amounts over the monitoring record since October 2013, when it replaced the previous KMB6 monitoring bore at the site. Values over the period of record for KMB6S have ranged from 76 to 184 mg/L TDS and ranged from 100 to 150 mg/L TDS during the 2023/24 review period. KMB9 shows more seasonal variations ranging from 159 to 588 mg/L TDS over the last 10 years and 200 to 490 mg/L TDS in 2023/24. KMB5D Salinities have increased over the last two review periods, from 367 mg/L TDS, in July 2022 to 610 mg/L TDS in July 2024, and the groundwater is now considered marginal. The groundwater in KMB6 and KMB9 is relatively fresh.

Salinities for monitoring bores in the dredge Ponds area (KMB10, KMB11 and KMB12) exhibit overall stable salinity trends from about 2006 to late-2013, rising trends over 2012/13 and comparatively stable trends from then until near the end of 2018 (Fig. 15). KMB11 salinities remain stable at about 330 mg/L TDS. Salinities in KMB10 have been increasing since 2020 and continue to show some seasonal variations in response to rainfall recharge. They ranged from 390 to 520 mg/L TDS in 2023/24. The salinity in KMB10 varies over a larger annual range than in KMB11 due to its position down-gradient of a wetland. The salinity in KMB12 shows an overall gradually rising trend from about 2004 to mid-2019 but there was a subsequent comparatively large increase (at the beginning of the 2019/20 review period) and a comparatively steep rising trend over the 2020/21 review period. A significant reduction from 1,289 to 749 mg/L TDS is evident at the beginning of the 2021/22 review period with salinities then increasing over the calendar year to 927 mg/L TDS in April 2022. They have decreased and fluctuated around 700 mg/L TDS over the current review period (Fig. 15). Groundwater level contours imply groundwater flow is from the west towards the KMB12 site, which is downflow from an area of open water in a previous mining area and adjacent to a wetland. The rise in salinity is likely associated with evapo-concentration of dissolved salts in the groundwater on the downflow side of the open water area, which is considered to be a throughflow lake. KMB12 also shows a comparatively small but consistent increase in total acidity over the last and current review periods along with total alkalinity values that rose from 330 to 450 mg/L in the October 2023 analysis, remaining around 400 mg/L thereafter. Nonetheless, there were no seasonal variations in salinities over the review period. KMB10 and KMB11 contain relatively fresh groundwater with average salinities of 300-500 mg/L TDS since about 2014, although values for July 2023 and July 2024 were marginal (564 and 520 mg/L respectively). The groundwater from KMB12 is mainly of marginal salinity (500-1,000 mg/L) with an average of 683 mg/L in 2022/23 compared to 964 mg/L in the 2020/21 and 927 mg/L in 2021/22 review periods.

Salinities measured from several of the more western monitoring bores (KMB13, KMB15S, KMB15D and KMB16D) continue to be significantly lower than those for the other monitoring bores at the site and they fall within the DoW (2009b) fresh salinity category (Fig. 15). Exceptions are detailed for the western bore KMB19S. Bore KMB19S salinities show seasonal variations associated with rainfall recharge and possible effects on salinity due to groundwater flow from the area of a small wetland about 300 m upgradient to the south-southwest.The lower salinity concentrations recorded for KMB19S over recent years are similar to those for the other bores in this group (Fig. 15). KMB16D salinities have been trending upwards since January 2022 and that has continued for the 2023/24 review period, reaching 340 mg/L TDS in July 2024. The comparatively low salinities in this group of bores indicates that groundwater flows down-gradient, to the west, from the KSS site towards other users to the west is of relatively low salinity. However, it is likely that the groundwater monitored by KMB16D does not flow from beneath the area of active operations at the KSS site, based on groundwater flow directions that may be implied from the water level contours (Figs 6 and 7). Salinities for this group of bores ranged from 130 to 400 mg/L TDS during the review period (Appendix III).

pH

Groundwater in the monitoring bores ranged from acidic to slightly alkaline during the review period (Figs 16 and 17), with field pH ranging from 3.23 to 7.24 and laboratory pH from 3.40 to 7.40. These values are consistent with those from previous review periods.

The minimum field pH of 3.23 was recorded in October 2023 for KMB10. pH for this bore is consistently low and there are periodic values that are about 0.5 pH units below most other measurements.

The maximum field pH of 7.24 was recorded in April 2024 for KMB12. Values for all bores throughout the review period, except KMB2, KMB7, KMB9, KMB11, KMB12, KMB13 and KMb17S are below 6.0, which indicates slightly acidic to acidic groundwater. The groundwater from bores KMB10 and KMB19S continue to show the most acidic pH with recordings for both below the minimum pH trigger (pH 4). Both KMB10 and KMB19S were below the trigger on three monitoring occasions, with April 2024 values being above 4.00 pH. KMB15S had a single value below the trigger in October 2023. There were no pH readings in January or April 2024. The bore has only been below the trigger previously in July 2023.

Laboratory pH values are typically higher than field pH values for the same sample, which is attributed to degassing of carbon dioxide during the time between sample collection and the laboratory analyses. The field samples, therefore, should provide a better indication of the true groundwater pH. KSS has since replaced its field water quality monitoring equipment.

Acidic groundwater has likely resulted from the oxidation of sulphides associated with seasonal drying and wetting of organic matter within the adjacent wetlands. This impact has been exacerbated by generally declining groundwater levels over recent decades as a result of reduced rainfall and, consequently, reduced groundwater recharge.

Chloride

Chloride concentrations ranged from 7.4 to 250.0 mg/L during the review period and are within historical ranges. Unusually high chloride concentrations of 100 mg/L and 140 mg/L were recorded in KMB16D in April and July 2024, similar to the 110 mg/L values a year prior. Concentrations in KMB6S remain constant with the lowest value for the monitoring bores (7.4 to 12 mg/L in 2023/24).

Sulphate

Sulfate concentrations ranged from 0 mg/L to 100 mg/L during the review period and generally remained within historical ranges, including KMB15S, which recorded a value of 100 mg/L after having a gradual increase from <50 mg/L to 220 mg/L between October 2021 and July 2024 (Appendix III). Sulphate concentrations in KMB2, KMB11 and KMB16D are the lowest among all monitoring bore sites, historically ranging from 0 mg/L to 17 mg/L. Sulfate concentrations in KMB12 increased in July 2021, reaching up to 220 mg/L, but have since remained equal to or below 50 mg/L. KMB1 has displayed decreased sulphate concentrations from an average around 25 mg/L, pre-July 2022, to 5.8 mg/L. Elevated sulfate concentrations are considered to be from local oxidation of pyrite within the sediments, possibly due to stockpiles around the mine site or on the ROM, leading to the mobilisation of resulting salts into the groundwater.

Total Acidity

Total acidity values ranged from 4 to 120 mg/L as $CaCO_3$ during the review period (Figs 18 and 19). These values fall within historical ranges for most bore sites, except for KMB10. Notably, the 2023/24 review period values were all lower than the July 2023 high of 250 mg/L and within historical ranges.

A common trend observed in most monitoring bores is the higher total acidity between January and July 2024 compared to other months.

Several potential factors may contribute to the increase in total acidity in groundwater include but are not limited to, the potential for dissolution of carbon dioxide (CO2) and mineral weathering.

Total Alkalinity

Total alkalinity concentrations for the monitoring bores ranged from 0.0 mg/L at KMB9, KMB10 and KMB19S to 430.0 mg/L at KMB12. During the review period, five out of the 16 active monitoring bores recorded total alkalinity concentrations below the minimum trigger level of 10 mg/L on one or more occasions. These bores include KMB1, KMB10, KMB15D, KMB15S, KMB16D and KMB19S (Figures 18 and 19). The trigger level, set in GWL 606367(4), serves as an indicator of either groundwater acidification or vulnerability to acidification.

Down-gradient monitoring bore KMB12 (Figure 3) consistently exhibited the highest alkalinity levels, averaging approximately 395 mg/L as CaCO3. This represents an 8% decrease compared to the average for the 2022/23 review period, similar to the 2021/22 review period. These concentrations are significantly higher than those observed in other bores, where alkalinity levels are below 110 mg/L as CaCO3. KMB12 has shown an increasing trend in values between 2017 and 2022 with values becoming more stable from April 2022. KMB5D, KMB8, KMB13 and KMB11 have also shown increasing alkalinity values since July 2023.

$Cl:SO_4$ Ratio

Cl:SO4 ratios ranged from 0.4 to >120 during the review period (Figures 20 and 21). The minimum trigger level, as established in GWL 60367(4), is set at two. Five of the 16 active monitoring bores (KMB5D, KMB6S, KMB8, KMB15S, and KMB17S) recorded ratios below this trigger level during the review period. Historical records indicate that these bores consistently maintained trigger values below 2, with the exception of KMB5D and KMB8. KMB1 recorded an anomalously high Cl:SO4 ratio of 53.6 for January 2024 and KMB11 recorded high ratios of 110-120 during the review period. All other bores had $Cl:SO_4$ ratios within historical ranges.

7.2.3 GROUNDWATER QUALITY TRIGGER LEVEL BREACHES

The conditions of GWL 60367 state that any movement of water quality beyond a trigger level must trigger some action, either further ecosystem specific investigations or implementation of management/remedial actions' (ANZECC and ARMCANZ 2000). Trigger values have been reached or exceeded on numerous occasions, as summarised in Table 11, and historical data indicate that this occurs reasonably consistently for some bores, such as KMB10, KMB15S and KMB19S.

The salinity category change trigger occurrences are mainly evident for bores where their salinities are close to the salinity-category limits (fresh to marginal at 500 mg/L and marginal to brackish at 1,000 mg/L). KMB18S had consistently exceeded all trigger values before it was destroyed in June 2021. Only KMB15S exceeded all trigger values in 2023/24. Additionally, KMB1, KMB10, KMB14, KMB15D, KMB15S, KMB16D and KMB19S exceeded the trigger value for total alkalinity; KMB10 and KMB19S consistently exceed the field pH trigger value; and KMB5D, KMB6S, KMB7, KMB8, KMB15S KMB17S reached or exceeded the trigger value for Cl:SO_4.

Table 11: Water Quality Triggers Reached or Exceeded

Bore	Salinity category change			Field pH < 4			Total alkalinity (as CaCO3) < 10 mg/L			Cl:SO_4 ratio < 2		
	2021/22	2022/23	2023/24	2021/22	2022/23	2023/24	2021/22	2022/23	2023/24	2021/22	2022/23	2023/24
KMB1							<5	9.8	4.0			
KMB2	678	233					<5					
KMB4[a]												
KMB5D			550									0.4
KMB6S										1.0	0.9	0.6
KMB7							7.0			0.9	0.9	0.9
KMB8	758		250									1.8
KMB9				3.90			<5	<5				
KMB10		564	390	3.50	3.26	3.80	<5	<5		1.1	0.9	
KMB11												
KMB12	749											
KMB13				3.60			<5					
KMB14							6.0	6.2	7.7			
KMB15D							<5	6.5	7.6			
KMB15S		556	140		3.62	3.93	<5	<5	5.0	0.2	0.6	0.5
KMB16D							7.0	9.7	9.1			
KMB16S	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry	dry
KMB17S										1.3	1.1	0.9
KMB18S[b]												
KMB19S	504	200		3.00	3.34	3.80	<5	<5	8.8	1.9	1.3	

Notes: a = no data presented as KMB4 was removed in February 2020 – b = no data presented as KMB18S was removed in June 2021.
Trigger level exceeded.
No data. (see note "a" and "b" above)

7.2.4 COMPLIANCE WITH MONITORING REQUIREMENTS

This Groundwater Monitoring Summary has been prepared to fulfil the reporting conditions of GWL 60367(4) and it complies with the DWER Operational Policy No. 5.12 (DoW 2009a).

The monitoring programme (Table 1) for the review period (1 September 2023 to 31 August 2024) was carried out in accordance with the conditions of the GMP with the exceptions noted below. Monitoring frequencies either met or exceeded the licence conditions. Field measurements of water levels and extraction data were collected monthly. Laboratory analyses of total acidity, sulphate and chloride were carried out quarterly along with laboratory analysis of pH and salinity with the exception of KMB1 and KMB15S in April 2024. An overall compliance of 95% was achieved (Table 12). Non-compliances with the monitoring programme and/or instances where data were not provided or are in error include:

- Erroneous water level reading recorded in KMB5D, KMB6S, KMB9, KMB16D and KMB17S.
- No field pH or salinity data were recorded for KMB7 in April 2024 and there were five instances of missing quarterly field data during the 2023/24 review period.
- No laboratory water quality data were recorded for KMB1 in April 2024 due to access issues.

Table 12: Compliance with GWL 60367(4) Monitoring Conditions

Monitoring Requirement	Level of Compliance to GWL 60367(4)		
	Production Bores	Monitoring Bores [a]	Comment
Extraction volumes recorded	Yes	na	Nil
Extraction limits not exceeded	Yes	na	Nil
Monthly Water Levels	Yes	Yes	Erroneous readings recorded for KMB5D, KMB6S, KMB9, KMB16D and KMB17S
Quarterly pH (field) (Sep/Oct, Dec/Jan, March/April, June/July)	Mostly	Mostly	No quarterly measurements for April 2024 in KMB7 No quarterly field measurements for September/October in KMB8 and KMB17S and sampling completed in August for KMB19S. Erroneous reading for KMB7 in July 2024
Quarterly laboratory pH, EC and TDS (Sept/Oct, Dec/Jan, March/April, June/July)	Yes	Mostly	No laboratory analysis for KMB1 in April 2024
Annual laboratory analyses for total acidity, total alkalinity, SO4 & Cl (March/April)	Yes	Mostly	No laboratory analysis for KMB1 in April 2024
Overall compliance	Mostly		

Notes: na = not applicable
a = dry bores are excluded from the compliance assessment

Several non-compliances with trigger values were recorded on one or numerous occasions during the review period and include:

- Salinity category change in KMB5D, KMB8, KMB10 and KMB15S.
- Field pH value <4 in KMB10, KMB15S and KMB19S.
- Total alkalinity (as CaCO3) <10 mg/L in KMB1, KMB14, KMB15D, KMB15S, KMB16D and KMB19S.
- Cl:SO4 ratio <2 in KMB5D, KMB6S, KMB7, KMB8, KMB15S and KMB17S.

Bore KMB15S was non-compliant for all trigger levels during the current review period with KMB10 and KMB19S previously reaching all trigger values during the 2023/24 review period.

KSS updates DWER quarterly with a list of trigger level exceedances, and following the issuance of a new GWL may seek to increase some of the trigger levels, with support from DWER.

8 SUMMARY AND CONCLUSIONS

Annual rainfall for the Kemerton mine site for the 2023/24 review period was 929.2 mm, which is 105 mm more than in the 2022/23 review period and 109 mm above the review-year average of 820.8 mm (1998/99 to 2023/24). Monthly rainfall totals reflected the climate characterised by a drier summer and wetter winter. The August 2024 total was the highest monthly recording (233 mm) and was about 87 mm above the monthly average (146.1 mm).

Extraction volumes from production bores KMB7 and KMB14 were recorded and compiled both as monthly and annual volumes. KMB14 is the primary source for the KSS water supply ; it provides fresh groundwater. KMB7 provides fresh to brackish groundwater and, consequently, is used only to assist in meeting specific water requirements during operations and when KMB14 is unavailable. KMB7 was only used between January and May 2024. The demand for groundwater decreased marginally compared to the last reporting period with the total groundwater extraction for the water year, 1 September 2023 to 31 August 2024, totalling 121,750 kL.

The 2023/24 review period extraction is about 18% of the 660,000 kL/a licensed groundwater entitlement and a decrease of 7,518 kL (6%) over the total in 2022/23. Maximum monthly extraction volumes recorded for KMB14 peaked in October 2023 and March 2024 (14,369 kL and 14,947 kL).

Resting water levels in KMB14 ranged from 12.81 m AHD (February 2024) to a maximum of 13.91 m AHD (September 2023). Resting water levels in KMB7 ranged from 12.94 m AHD (May 2024) to 14.27 m AHD (August 2024). Changes in resting water levels appear to be related to seasonal and annual variations in rainfall or potential seepage from the dredge Ponds. It is understood that the volume of tailings reclaimed water is not metered, and that a water balance has not been estimated. In the absence of a site water balance it is difficult to discern the impact of the dredge Ponds on local water levels. The data indicate that groundwater extraction has had no discernible impact on regional groundwater levels.

Hydrographs for the monitoring bores display seasonal fluctuations, associated with seasonal variations in rainfall recharge, with maximum water levels during the review period mostly in September to November 2023 or August 2024 and minimum water levels mostly in March to May 2024. Water levels ranged from 11.19 to 14.35 m AHD during the review period with the recorded minima and maxima for individual bores being broadly consistent with those from the previous review period. All monitoring bores show slightly lower water levels in the last four to five years than previously. This is mainly evidenced by their annual hydrograph minima.

Water quality monitoring comprised field and laboratory salinity measurements, field and laboratory pH, and laboratory analyses for chloride, sulphate and total acidity. Quarterly field EC measurements were recorded for both production bores with the exception of KMB7 in April 2024. No quarterly field measurements were taken for September/October in KMB8 and KMB17S.

The laboratory analysed groundwater salinities in the production bores ranged from 150 and 220 mg/L TDS for KMB14, within the DWER (2009b) fresh salinity category, and 500 to 620 mg/L TDS for KMB7, within the marginal salinity category. Salinities for KMB14 have been comparatively stable over the last three monitoring periods and were towards the lower end of the historical range of salinity values during 2023/24. Salinity values recorded for KMB7 showed an increasing trend from 2007 to about May 2016, when regular pumping from the bore ceased.

Salinities have varied considerably since then but have remained within the historical range for the current review period. Salinity measurements in the field generally correlate poorly with the laboratory analysed samples. This is believed to be due to a faulty salinity probe or meter, which has since been replaced.

Groundwater pH for the production bores was acidic to slightly acidic (5.2 to 6.4 laboratory results; 4.40 to 6.36 field results) during the review period. Values have been gradually reducing in both bores since about January 2015 but remain well above the minimum pH trigger of pH 4.0. The April 2024 value recorded in KMB14 (4.40), for April 202, is the lowest recoded value since monitoring began.

Groundwater salinities for the monitoring bores are within the DWER fresh to saline categories, ranging from 100 mg/L TDS in KMB6S (April 2024) to 720 mg/L TDS in KMB12 (January 2024). Salinities from monitoring bores (KMB1, KMB6S, KMB13, KMB15D, KMB17S and KMB19S) are generally lower than the other monitoring bores. Most other bores show comparatively stable trends for the review period within their previous historical ranges. However, the salinity in dredge pond bore KMB10 and western bore KMB16D, during the 2023/24 period, exhibited increasing salinites during the 2023/24 review period. Previously highly salinity concentrations recorded in the eastern bore KMB12 were obserbed to decrease during the 2023/24 review period, while still remaining higher than historical values. Groundwater level contours imply groundwater flow is from the east towards the KMB12 site, which is downflow from an area of open water in a previous mining area and an adjacent to a wetland.

The rise in salinity is likely associated with evapo-concentration of dissolved salts in the groundwater on the downflow side of the open water area, which is presumed to be a throughflow lake. There were no seasonal variations in salinity concentratioins over the review period. The reason for the increased salinities in KMB12 and KMB10 over recent times is not clear, although recent values in KMB12 have been more stable and lower than the highest value for the bore that was recorded in July 2021 (1,289 mg/L TDS). KMB12 also shows a comparatively small but consistent increase in total acidity over the last two review periods.

The generally lower pH values and decreasing trends may indicate effects from the oxidation of sulphides and organic material in wetland deposits and the leaching of these effects into the groundwater. Oxidation of pyrite contained in ore stockpiles also has the potential to contribute to changes in water quality in some of the bores; however, it has not been directly associated with low pH during this or previous review periods. Mapping by the Department of Environment Regulation (now DWER) indicates that most of the KSS site is at “moderate to low risk of acid sulphate soils (ASS) occurring within 3 m of natural soil surface” (Landgate 2013) with only the wetland located about 200 m northeast from KMB11 being mapped as “high to moderate risk of ASS occurring within 3 m of natural soil surface”.

Field pH values ranged from acidic to slightly alkaline (3.23 to 7.24), which are consistent with previous recordings for the bores. However, all bores, except for KMB2, KMB7, KMB9, KMB11, KMB12, KMB13 and KMB17S, are below pH 6.0, which indicates most contain slightly acidic to acidic groundwater. The groundwater pH from KMB10 and KMB19S continue to show the most acidic groundwater. Values below the minimum pH trigger (pH 4) occurred in KMB10, KMB15S and KMB19S.

Values for all bores throughout the review period, except KMB2, KMB7, KMB9, KMB11, KMB12, KMB13 and KMB17S are below 6.0, which indicates slightly acidic to acidic groundwater.

KSS has since replaced its field water quality measuring equipment as the cause of a potentially erroneous readings is believed to be due to faulty field monitoring equipment or loss of calibration.

High total acidity and accompanying low pH, high sulphate concentrations (≥100 mg/L), total alkalinity values below detection limit (<5 mg/L) and low Cl:SO_4 ratios (≤1.6) highlight a risk for the generation of acidic groundwater at the KSS site. Trigger levels are used to provide indicators that groundwater is either acidifying or is vulnerable to acidification. The following water quality triggers are included in GWL 60367(4):

- A change in the salinity category
- Field pH falling below 4
- Total alkalinity (as $CaCO_3$) falling below 10 mg/L
- Cl:SO_4 ratio to remain greater than 2.

The data for 2023/24 water year indicate that the trigger values for each category were reached or exceeded in several of the bores during the review period.

- Only the groundwater from shallow monitoring bore KMB15S reached or exceeded each of the trigger values.
- Changes in salinity category were observed in bores KMB5D, KMB8, KMB10 and KMB15S.
- Field pH values less than 4 were observed in KMB10, KMB15S and KMB19S.
- The total alkalinity trigger was reached or exceeded in bores KMB1, KMB14, KMB15D, KMB15S, KMB16D and KMB19S.
- The Cl:SO_4 trigger was reached or exceeded in bores KMB5D, KMB6S, KMB7, KMB8, KMB15S KMB17S. A Cl:SO_4 ratio of less than 2 (the minimum trigger value) is an indication that there is another source of sulphate apart from seawater, particularly as attenuation of chloride is very rare (Mulvey 1993). All shallow monitoring bores feature or have featured Cl:SO_4 ratios below the minimum trigger value. The oxidation of sediments containing sulphides is the most likely source of additional sulphate in the groundwater from these bores. The stockpiled ore (sediment) on the ROM pad has also been suggested as a likely source in its vicinity and may contribute to the comparatively high sulphate concentrations that were evident in bores KMB4 and KMB18S. The data from more-distant monitoring bores suggest that groundwater quality in similar geomorphic positions in the region also has been impacted by ASS processes. These effects are believed to mainly result from reduced water table levels over recent years associated with the drying climate. There is no indication in the monitoring data that the groundwater extraction by KSS has affected water table levels.

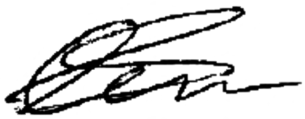
Sulphate is a by-product of the generation of acid sulphate soils. It does not have a concentration trigger level in GWL 60367(4). Production bore KMB7 has historically recorded the highest sulphate concentrations with values during the review period ranging from 150 to 210 mg/L. KMB15S values were observed to decrease to a value of 100 mg/L after having recorded a gradual increase from <50 mg/L to 220 mg/L between October 2021 and July 2024. Concentrations in KMB2, KMB11 and KMB16D are the lowest among all monitoring bore sites, historically ranging from 0 mg/L to 17 mg/L. Sulfate concentrations in KMB12 increased in July 2021, reaching up to 220 mg/L, but have since remained equal to or below 50 mg/L.

9 RECOMMENDATIONS

The following recommendations are based on the review of groundwater data for the reporting period 1 September 2023 to 31 August 2024.

- Field measurements of salinity should be compared with laboratory results and field instruments calibrated regularly.
- It is advisable that KSS undertake work to develop a water balance for the site. A site water balance would categorise and quantify water inputs and outputs relating to the Kemerton site and sites adjacent monitoring bores. Additionally, a water balance would assist in determining if potential seepage from the dredge Ponds is contributing to local groundwater mounding, reduced drawdown in production bores and seasonally rising water levels.
- Consult with the DWER regarding what action or investigations are appropriate at the various sites where the water-quality data reach trigger levels. Especially of interest are bores that frequently reach or exceed trigger values such as KMB10 and KMB19S during the 2021/22 and 2022/23 review periods and KMB15S which exceed all trigger values during the 2023/24 review period.

Dated: 8 October 2024 **Rockwater Pty Ltd**



Matthew Vear
Senior Hydrogeologist

REFERENCES

ANZECC and ARMCANZ (AUSTRALIAN and NEW ZEALAND ENVIRONMENT and CONSERVATION COUNCIL, and AGRICULTURAL AND RESOURCE MANAGEMENT COUNCIL OF AUSTRALIA AND NEW ZEALAND), 2000. An Introduction to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1 The Guidelines (Chapters 1–7): National Water Quality Management Strategy Publication 4a, Commonwealth of Australia.

DEENEY, A.C., 1989. Geology and groundwater resources of the superficial formations between Pinjarra and Bunbury, Perth Basin: Western Australia Geological Survey, Report 26, Professional Papers, p. 31 57.

DEPARTMENT OF WATER, 2007. Kemerton groundwater subareas water management plan: Water Resource Allocation and Planning Series Report No. WRAP 17.80.

DEPARTMENT OF WATER, 2009a. Operational Policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence: Department of Water, Perth, November 2009.

DEPARTMENT OF WATER, 2009b. South west groundwater areas allocation plan: Water Resource Allocation and Planning Series Report No 21.

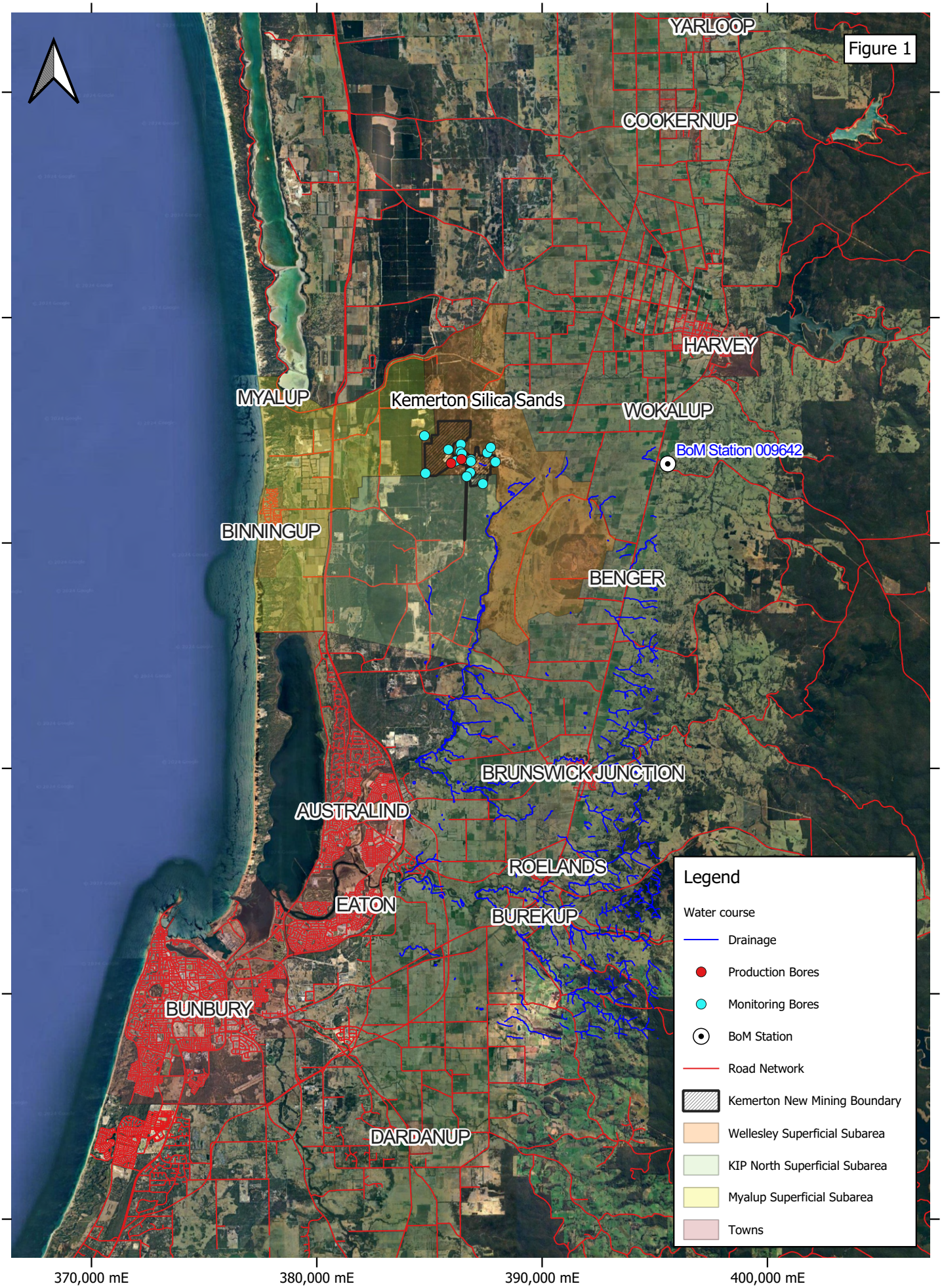
LANDGATE, 2013. https://www2.landgate.wa.gov.au/bmvf/app/waatlas/#, accessed 1 October 2015: Western Australian Land Information Authority, Perth, WA.

MULVEY, P., 1993. Pollution, prevention and management of sulfuric clays and sands: Proceedings of the First National Conference on Acid Sulfate Soils, 24-25 June, Coolangatta, Australia.

NHMRC & NRMMC. (2011). Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

ROCKWATER, 2022. Kemerton Silica Sand Mine GWL 60367(4) Groundwater Monitoring Summary 1 September 2021 to 31 August 2022: Report prepared for Kemerton Silica Sand Pty Ltd (unpublished).

FIGURES



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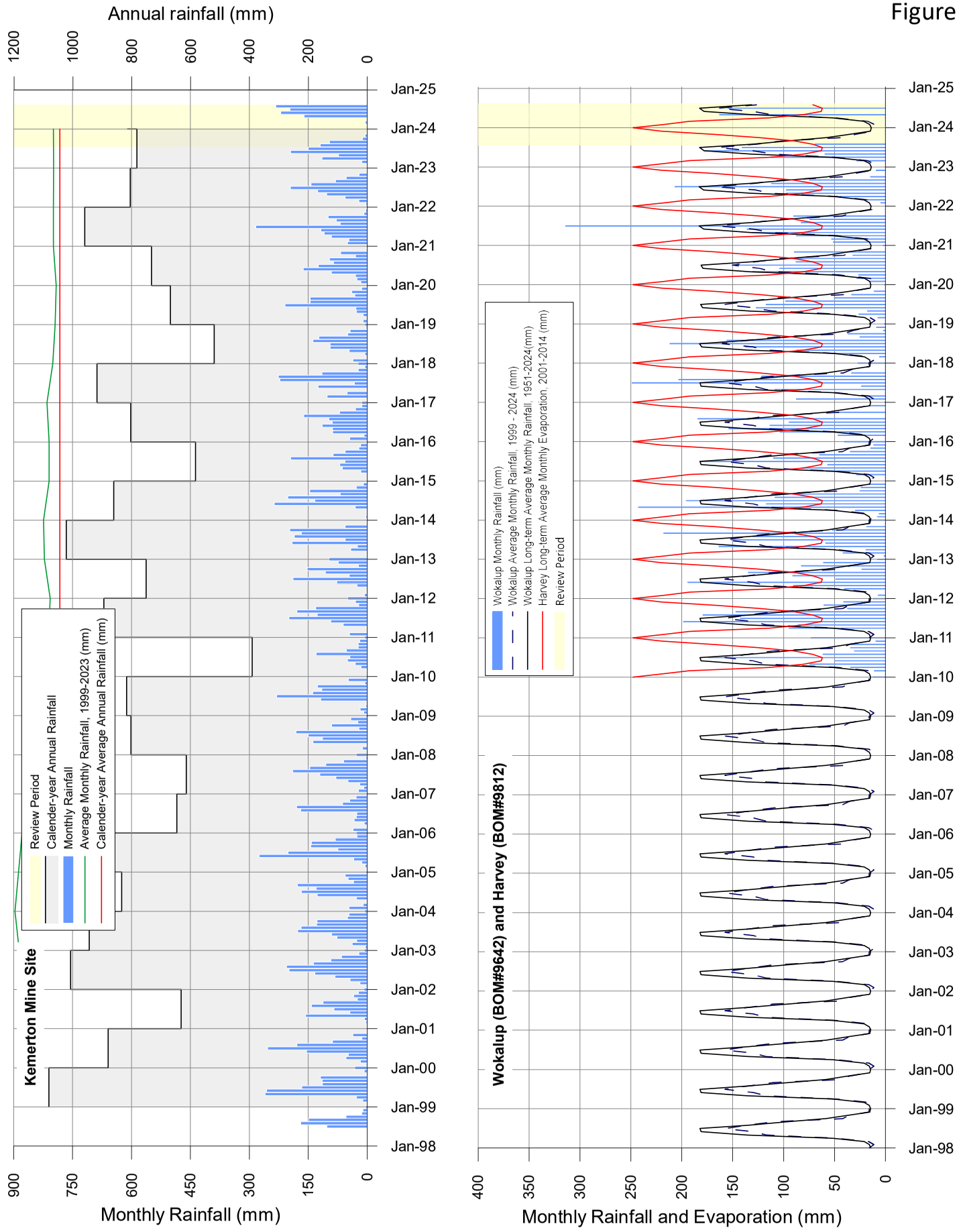
Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(4)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2024
Figure Number	258-0/24-01/1

LOCALITY MAP

Figure 2



258-0/Grapher/Fig2_Rainfall and Evaporation.grf

Client: Kemerton Silica Sand Pty Ltd

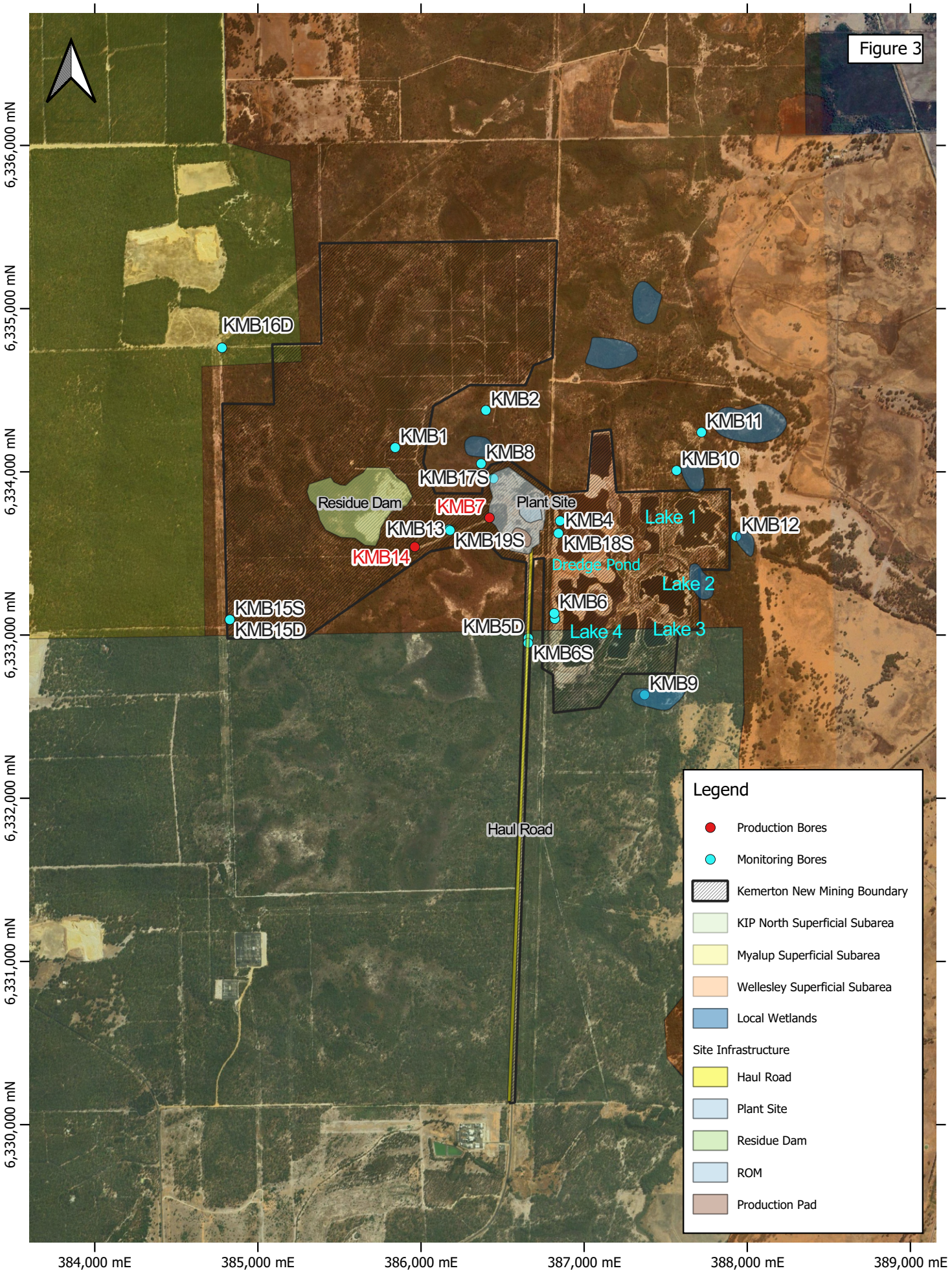
Project: Groundwater Monitoring Summary GWL 60367(4)

Date: October 2024

Dwg. No: 258.0/24/1-2

RAINFALL AND EVAPORATION KEMERTON MINE SITE, HARVEY AND WOKALUP STATIONS

Rockwater PROPRIETARY LIMITED



L:\QGIS Projects\258-0 KSS\KSS

Rockwater

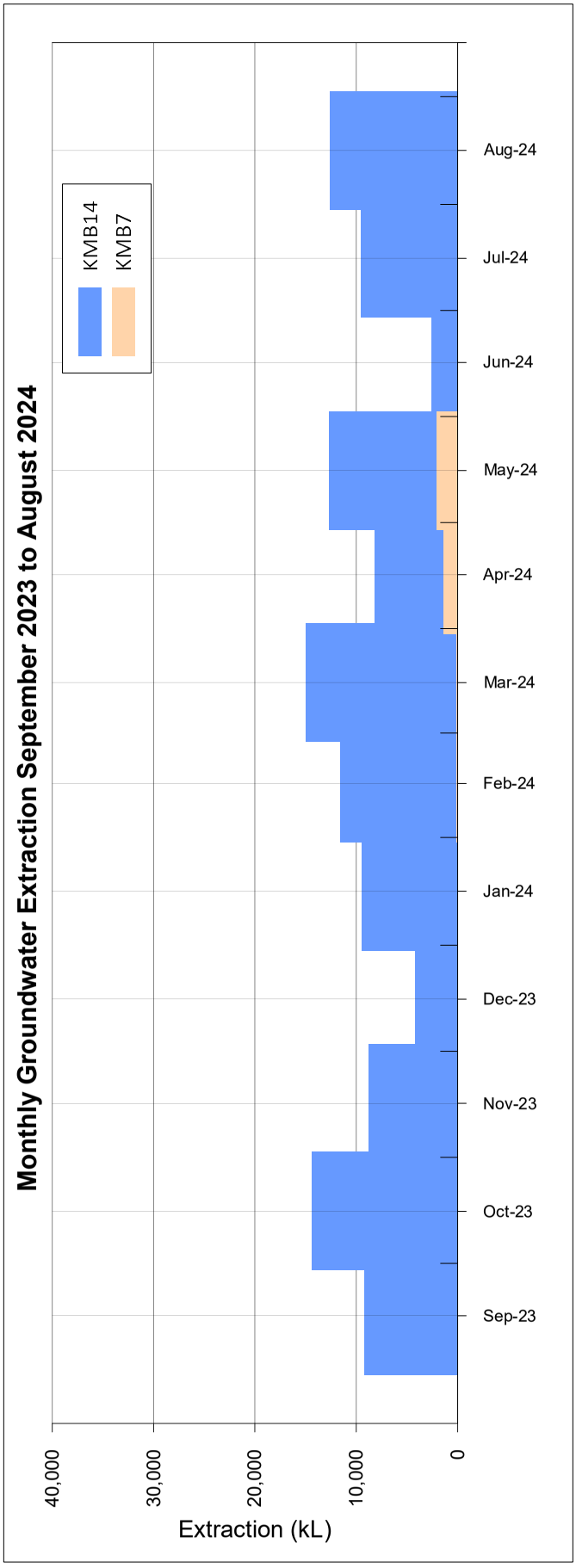
0 500 1,000 m

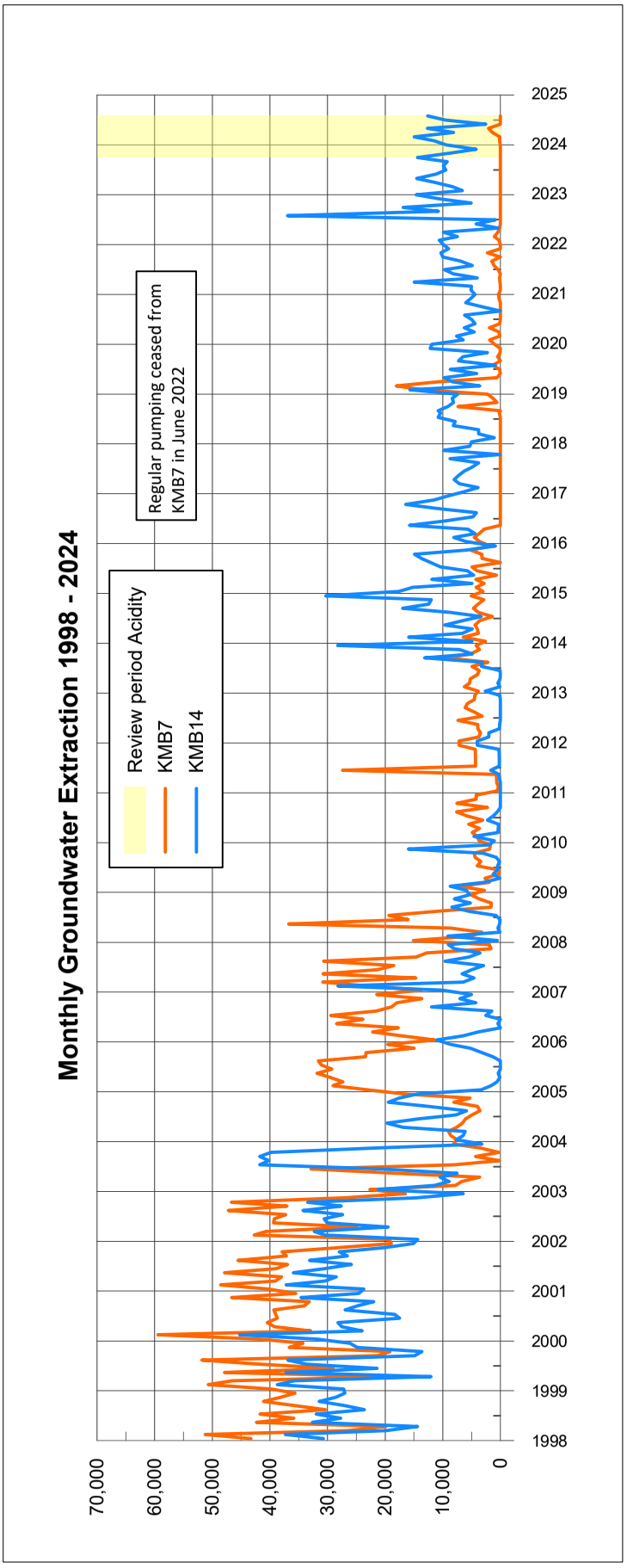
Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(4)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2024
Figure Number	258-0/24-01/3

BORE LOCATIONS

Figure 4





258-0/Grapher/Fig4_Rainfall and Evaporation.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(4)

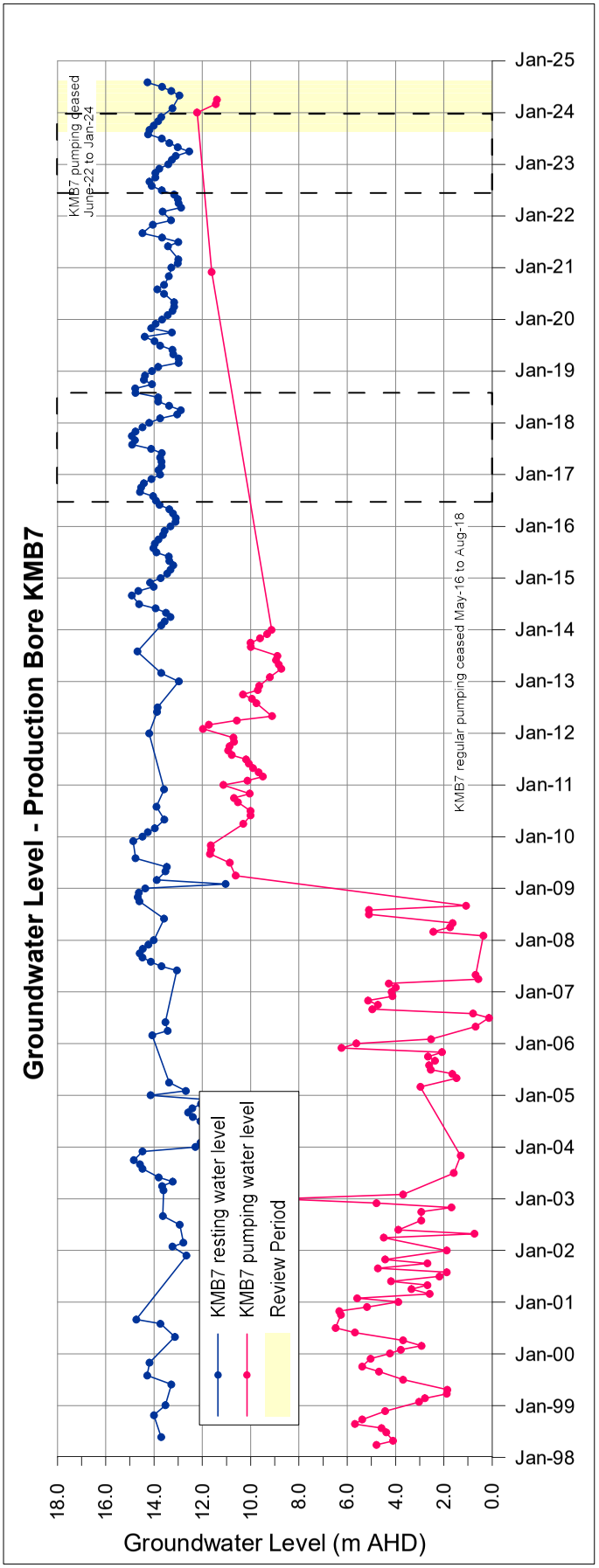
Date: October 2024

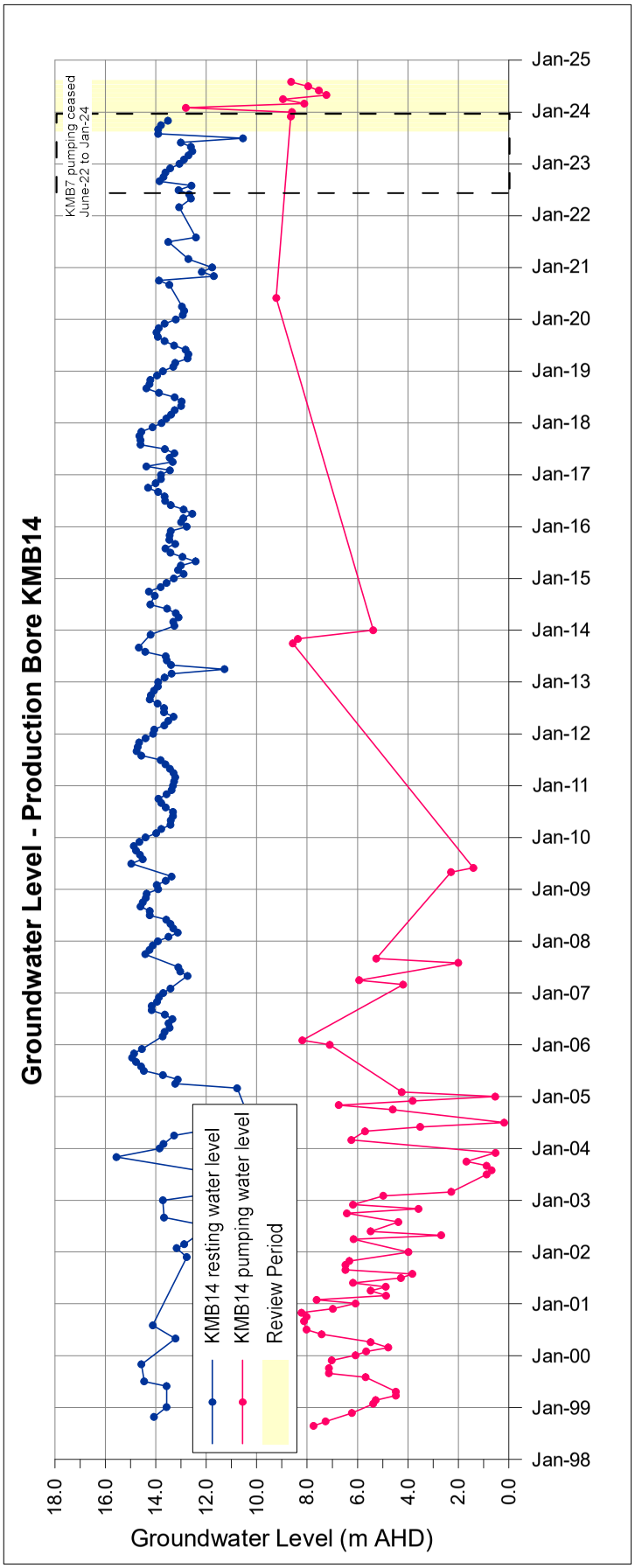
Dwg. No: 258.0/24/1-4

GROUNDWATER EXTRACTION

Rockwater PROPRIETARY LIMITED

Figure 5





258-0/Grapher/Fig 5_Hydrographs for KMB7, KMB14.grf

Client: Kemerton Silica Sand Pty Ltd

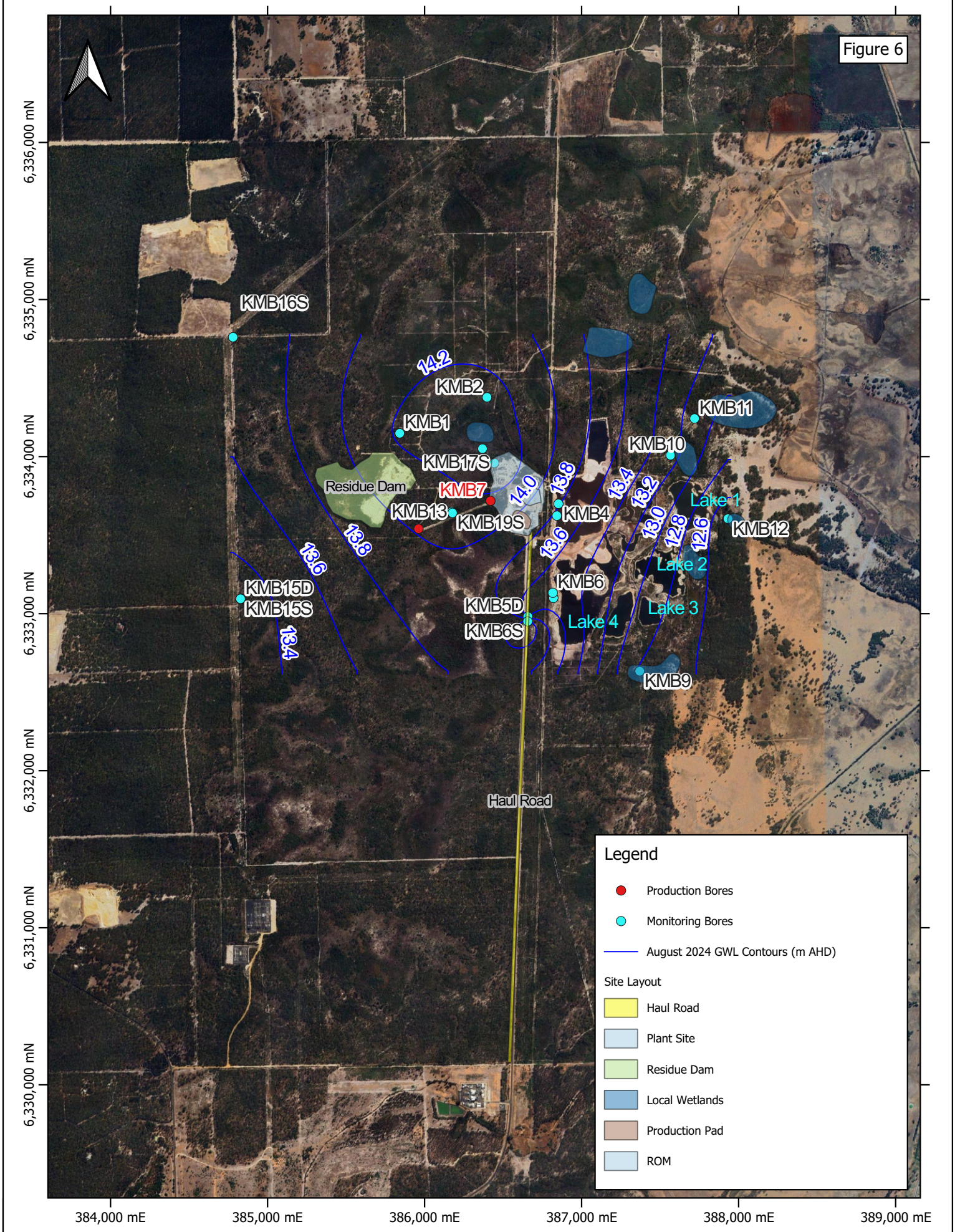
Project: Groundwater monitoring summary GWL 60367(4)

Date: October 2024

Dwg. No: 258.0/24/1-5

HYDROGRAPHS FOR PRODUCTION BORES KMB7 AND KMB14

Rockwater PROPRIETARY LIMITED



L:\QGIS Projects\258-0 KSS\KSS

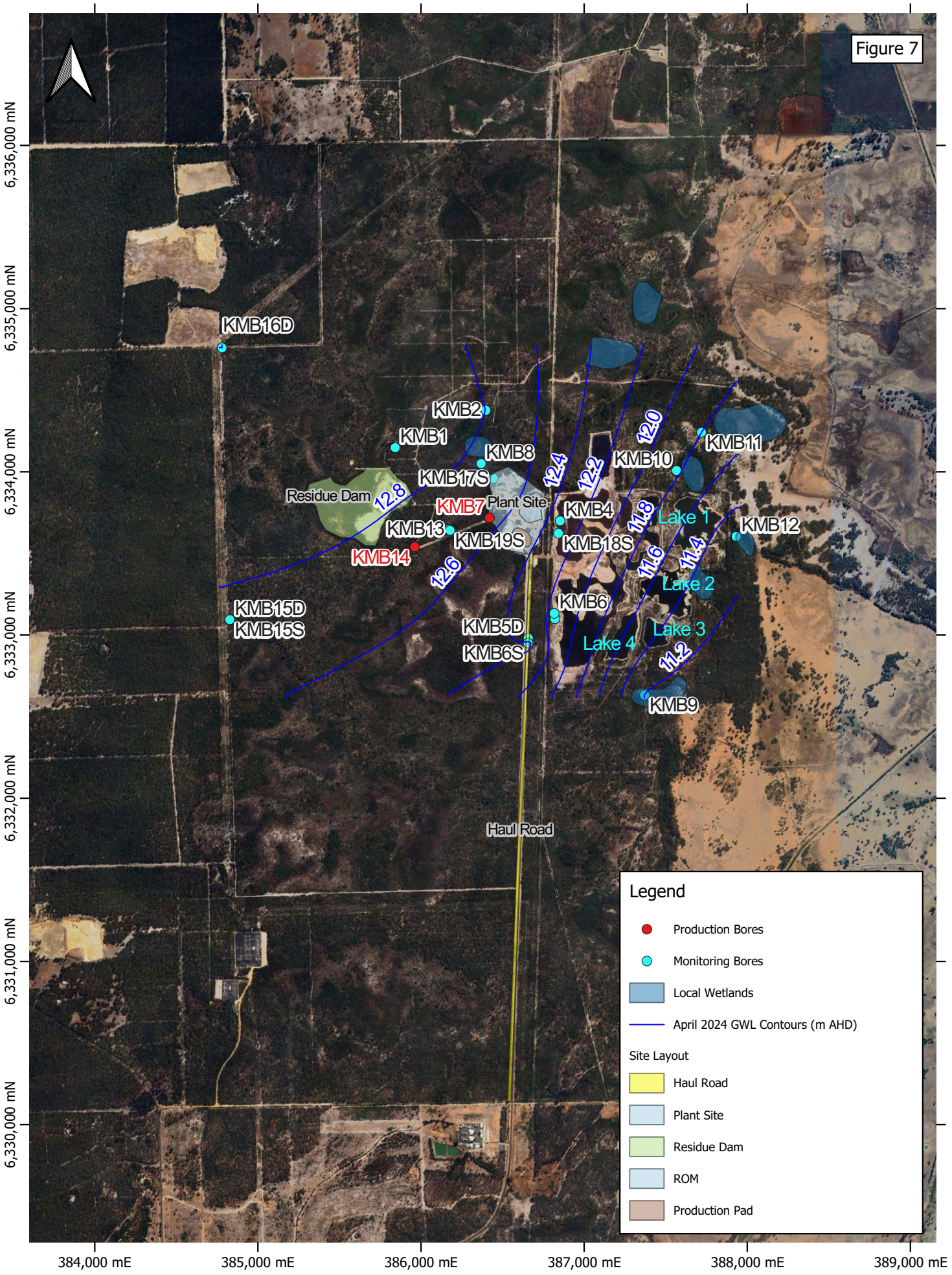
Rockwater

0 500 1,000 m

Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(4)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2024
Figure Number	258-0/24-01/6

GROUNDWATER CONTOUR MAP
AUGUST 2024



L:\QGIS Projects\258-0 KSS\KSS

Rockwater

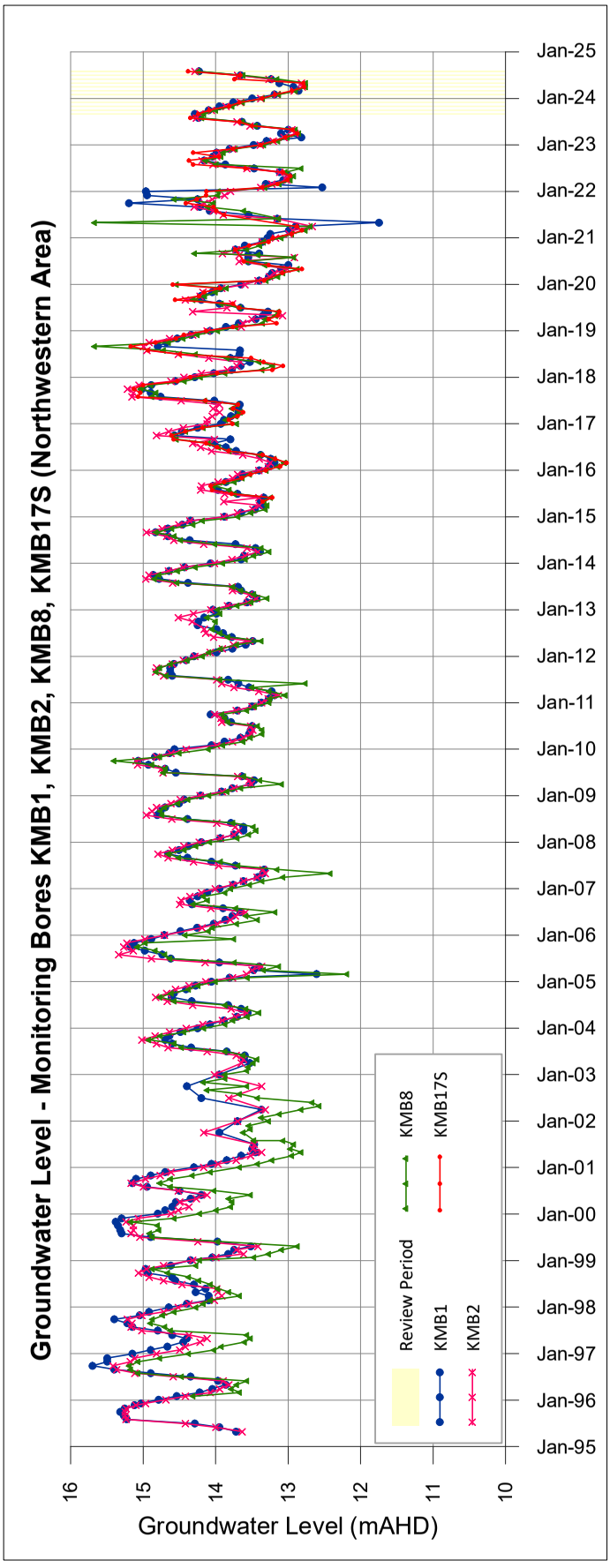
0 500 1,000 m

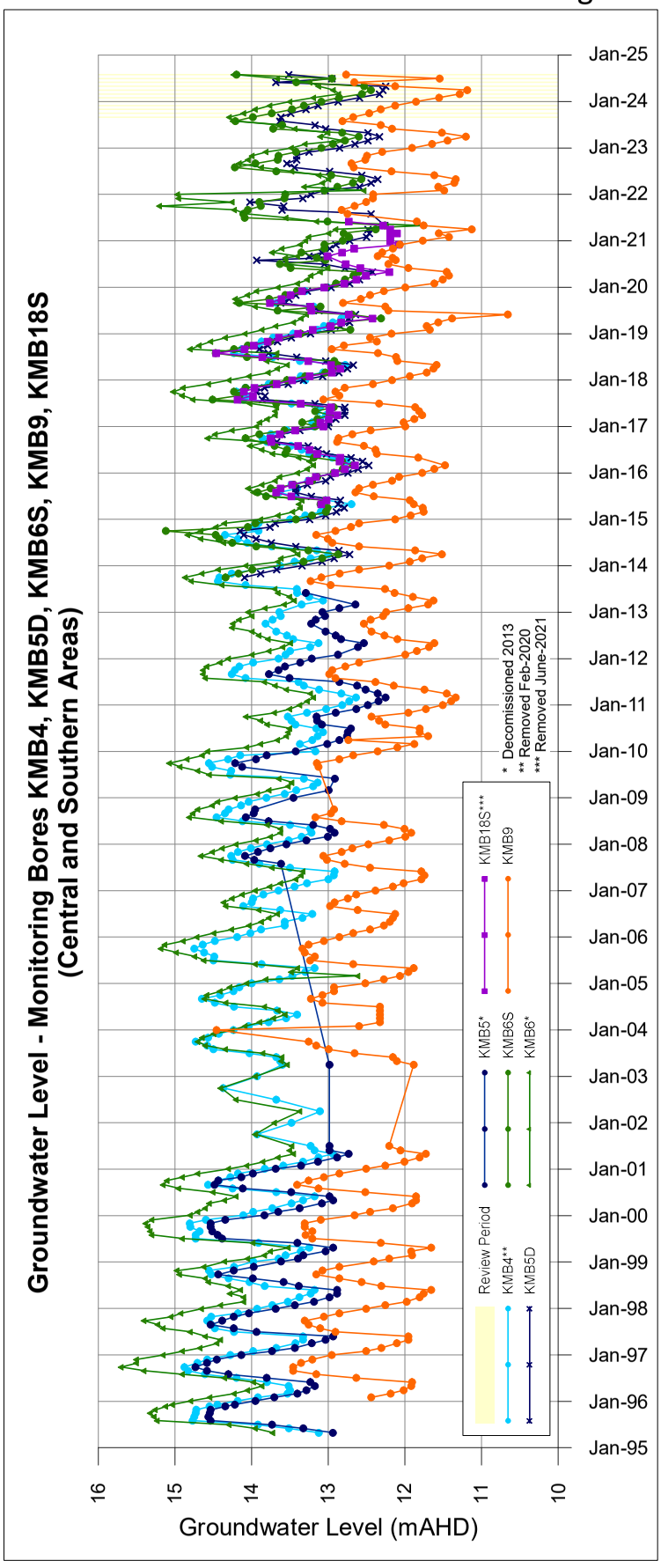
Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(4)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2024
Figure Number	258-0/24-01/7

GROUNDWATER CONTOUR MAP APRIL 2024

Figure 8





258-0/Grapher/Fig8_Hydrographs for monitoring bores (NW).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(4)

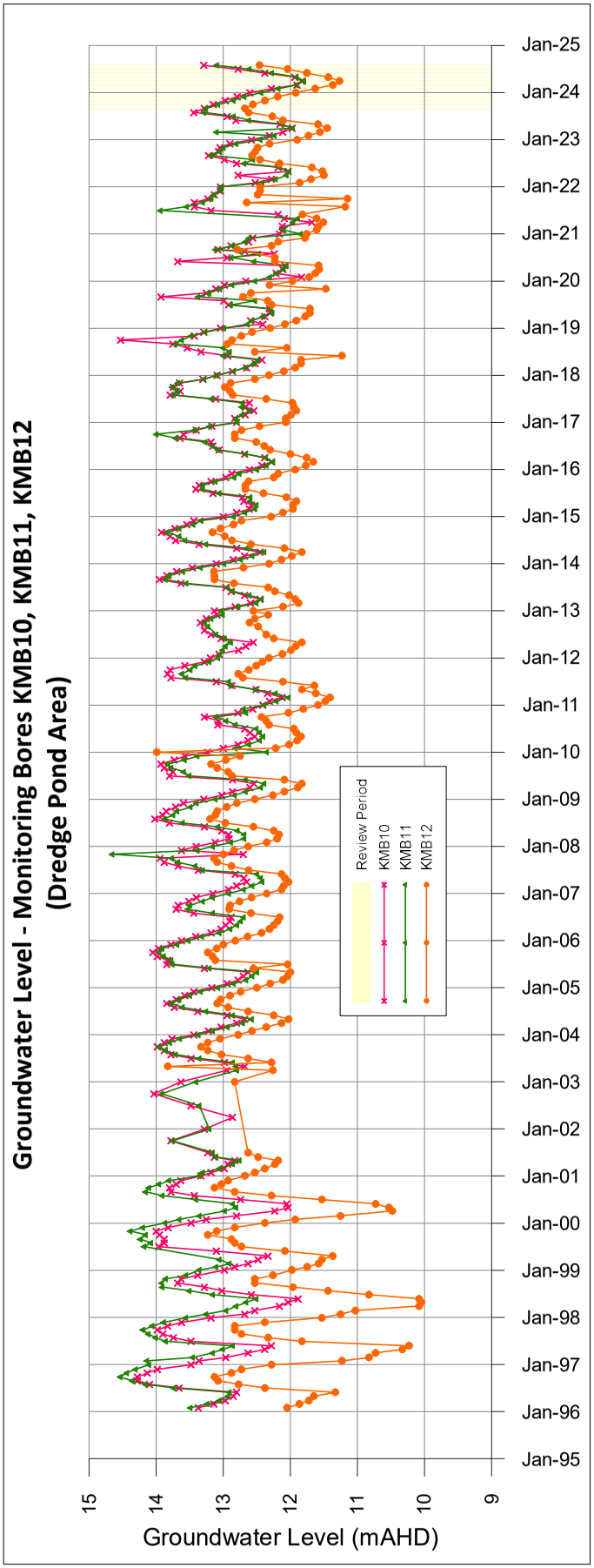
Date: October 2024

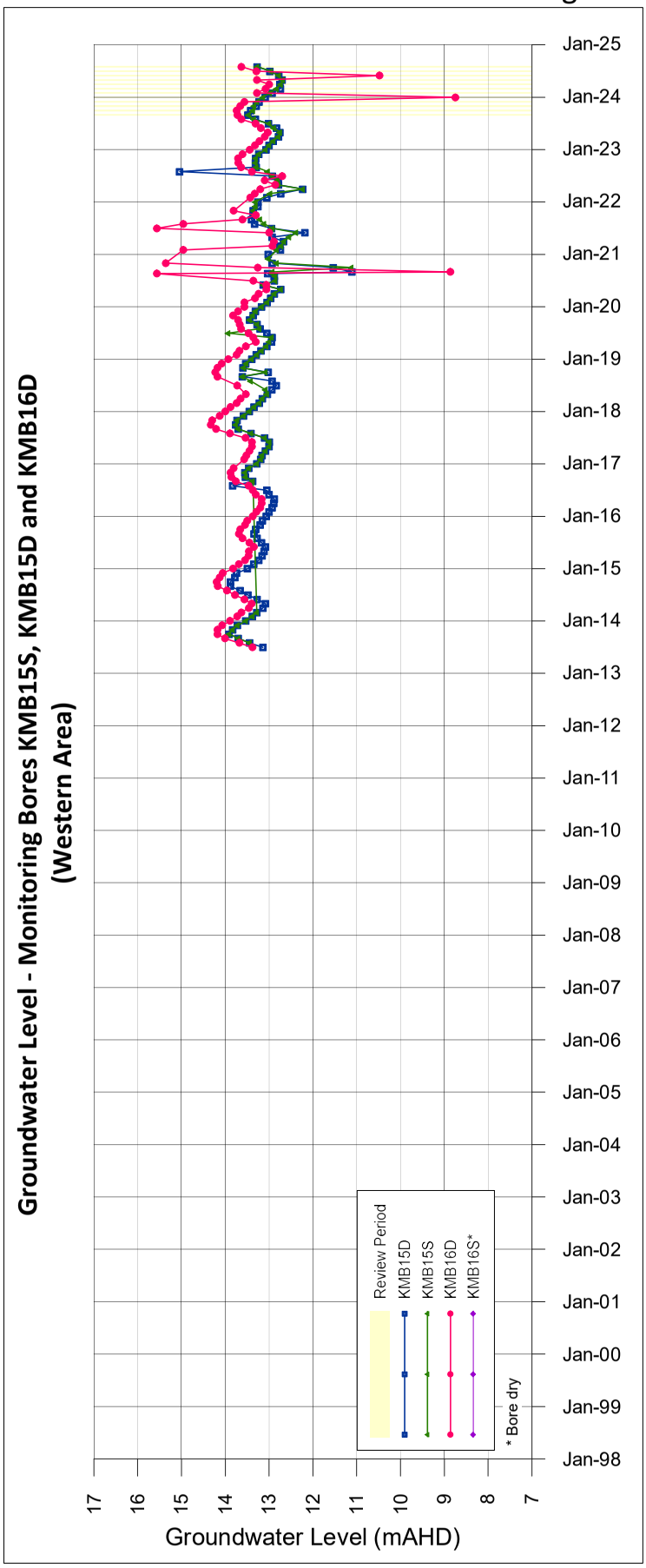
Dwg. No: 258.0/24/1-8

HYDROGRAPHS FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KMB17S AND KMB18S

Rockwater PROPRIETARY LIMITED

Figure 9





258-0/Grapher/Fig9_Hydrographs for monitoring bores (Dredge Pond).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(4)

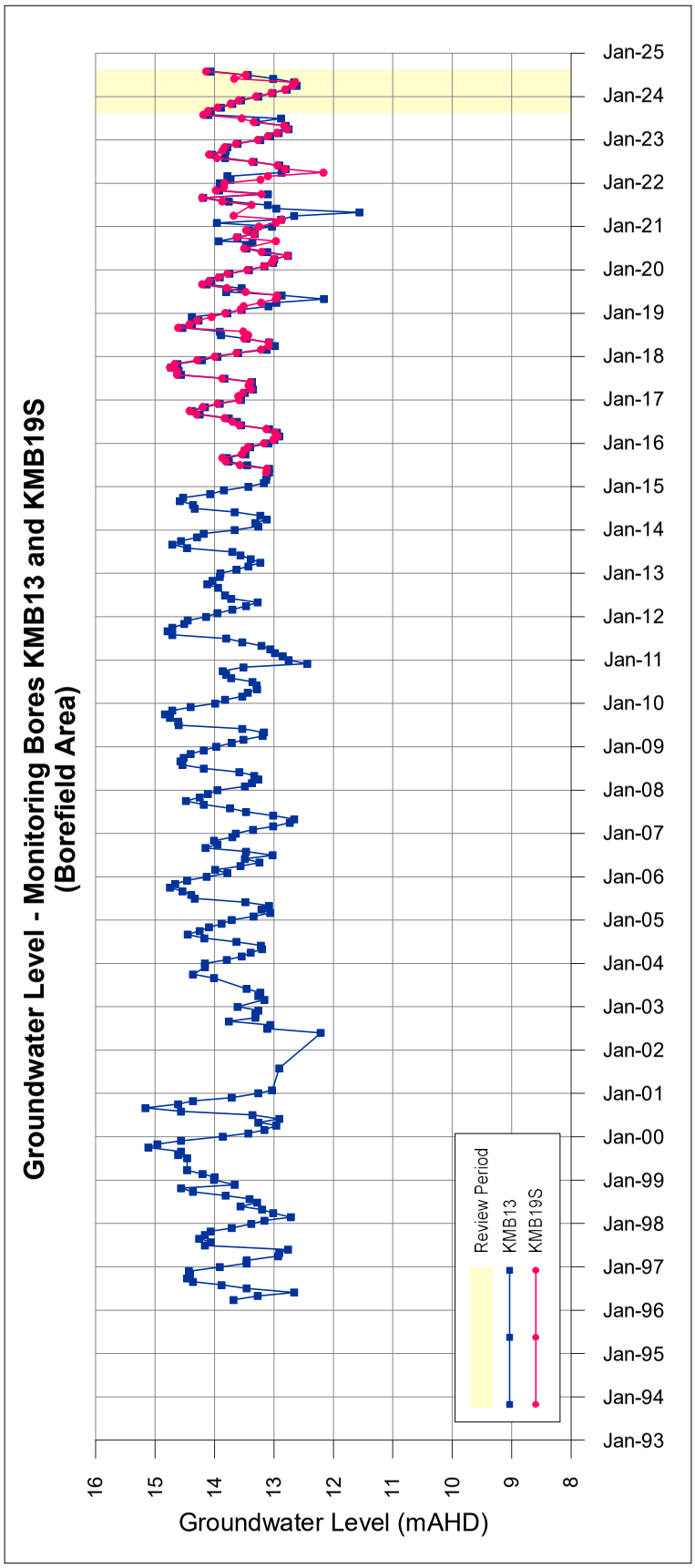
Date: October 2024

Dwg. No: 258.0/24/1-9

HYDROGRAPHS FOR MONITORING BORES KMB3, KMB10, KMB11, KMB12, KMB15S, KMB15D AND KMB16D

Rockwater PROPRIETARY LIMITED

Figure 10

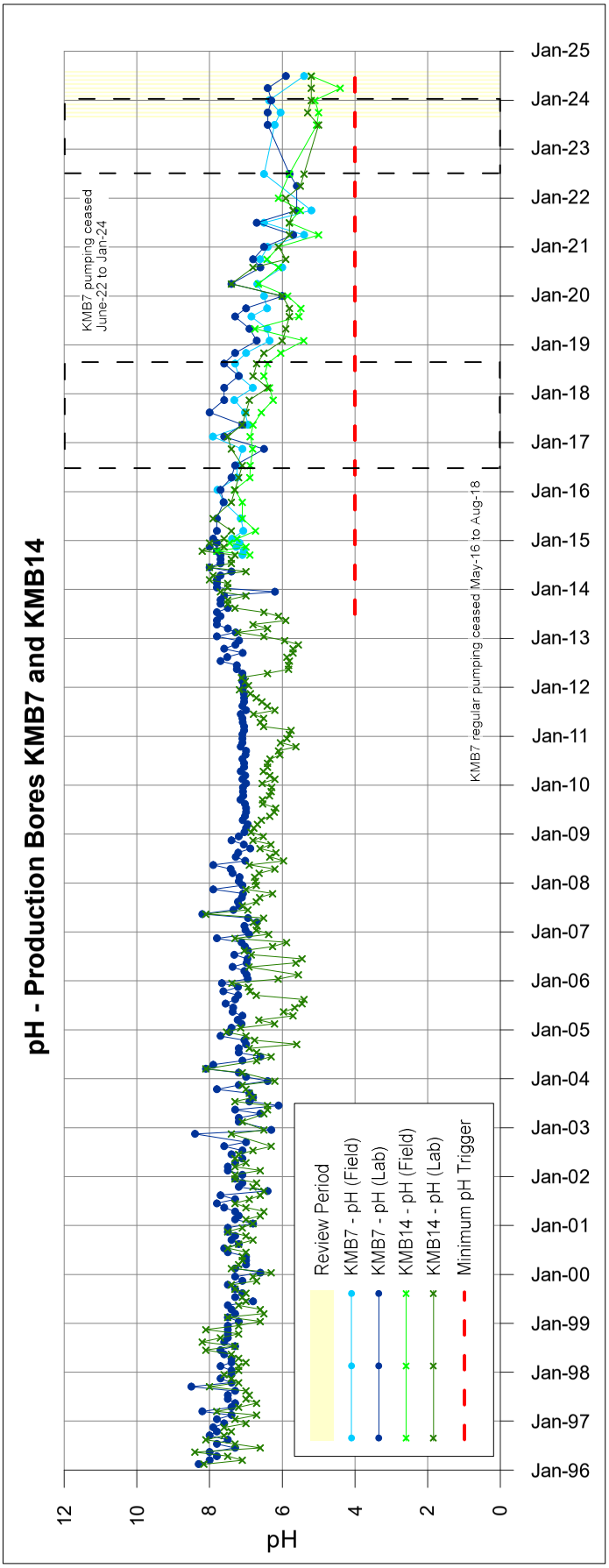


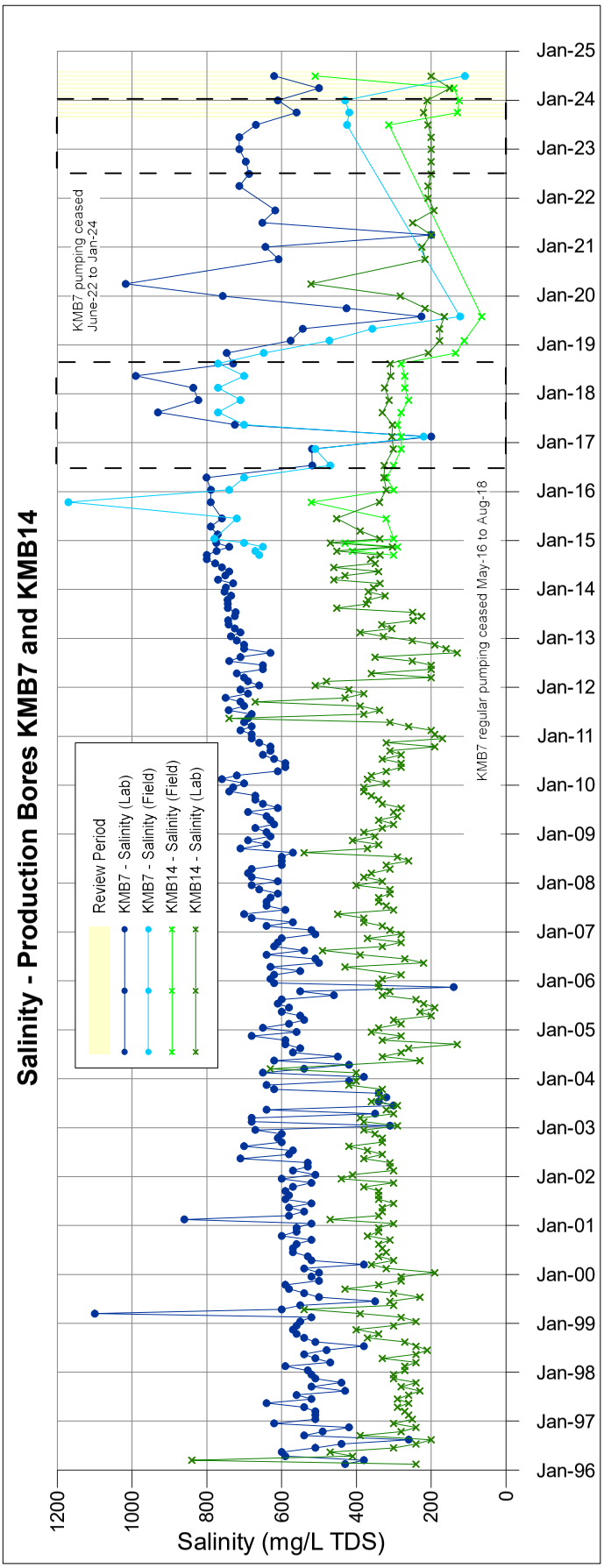
258-0/Grapher/Fig10_Hydrographs for monitoring bores (Borefield).grf

Client: Kemerton Silica Sand Pty Ltd Project: Groundwater monitoring summary GWL 60367(4) Date: October 2024 Dwg. No: 258.0/24/1-10	HYDROGRAPHS FOR MONITORING BORES KMB13 AND KMB19S

Rockwater PROPRIETARY LIMITED

Figure 11





258-0/Grapher/Fig11_Salinity and pH (Prod. Bores).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(4)

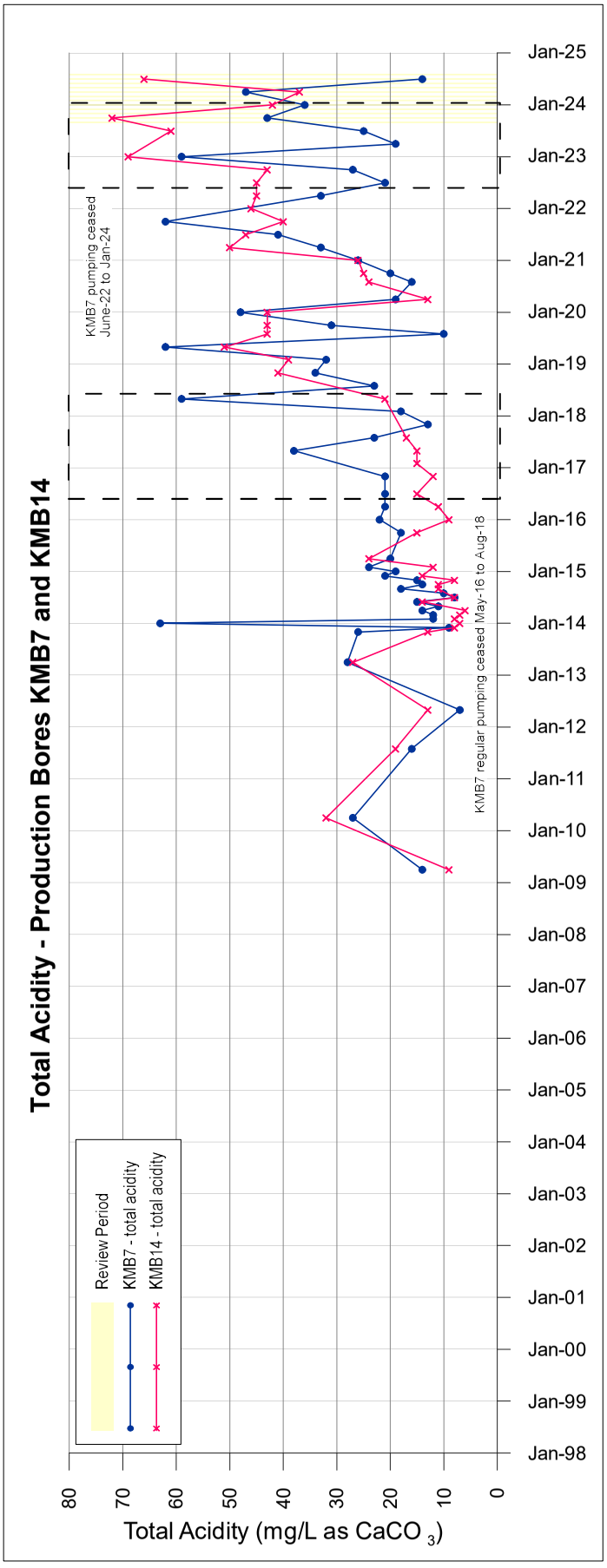
Date: October 2024

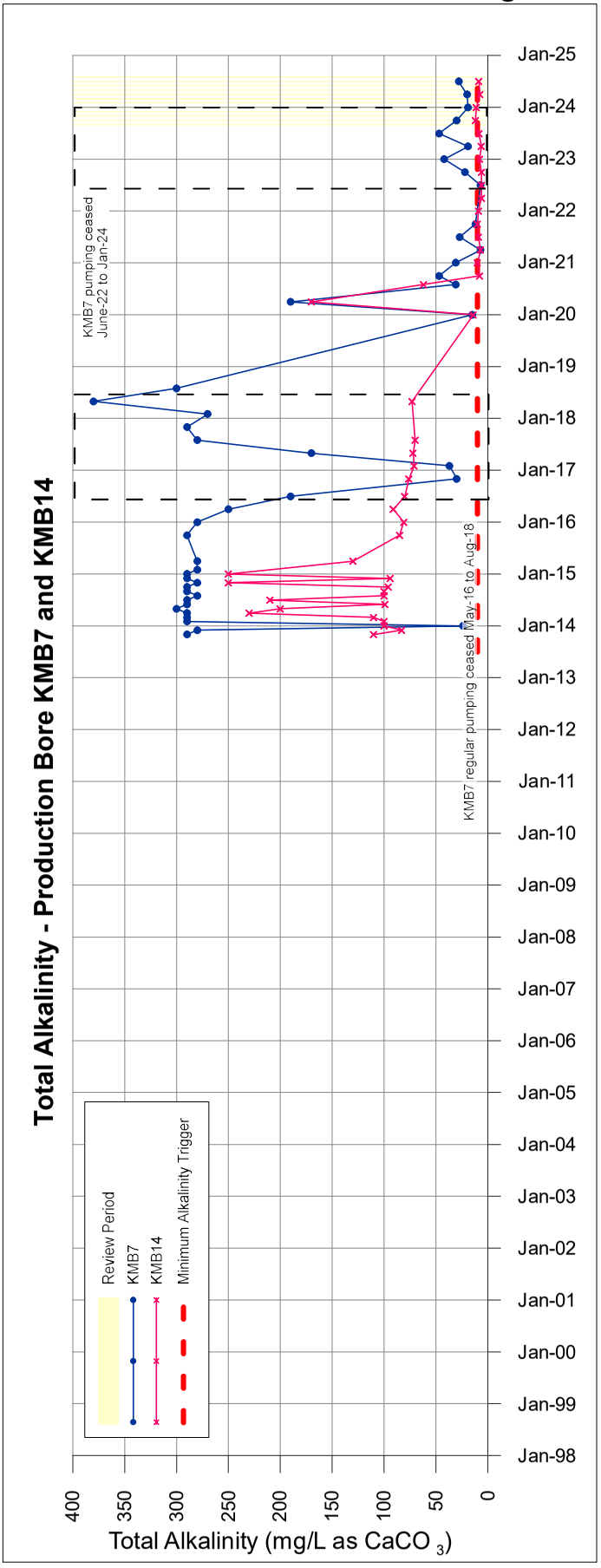
Dwg. No: 258.0/24/1-11

SALINITY AND pH IN PRODUCTION BORES KMB7 AND KMB14

Rockwater PROPRIETARY LIMITED

Figure 12





258-0/Grapher/Fig12_ttl acidity and alkalinity (Prod. Bores).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(4)

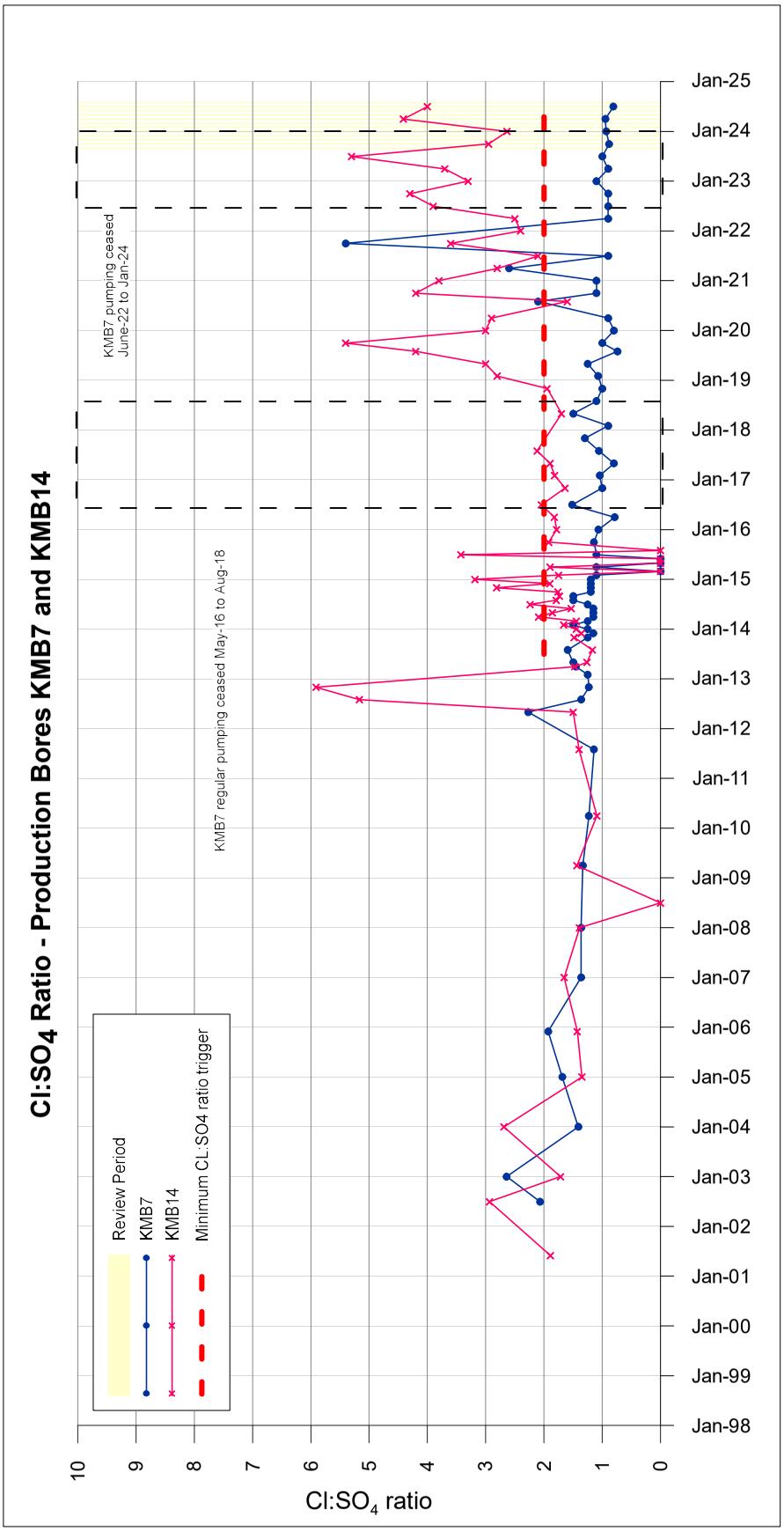
Date: October 2024

Dwg. No: 258.0/24/1-12

TOTAL ACIDITY AND ALKALINITY IN PRODUCTION BORES KMB7 AND KMB14

Rockwater PROPRIETARY LIMITED

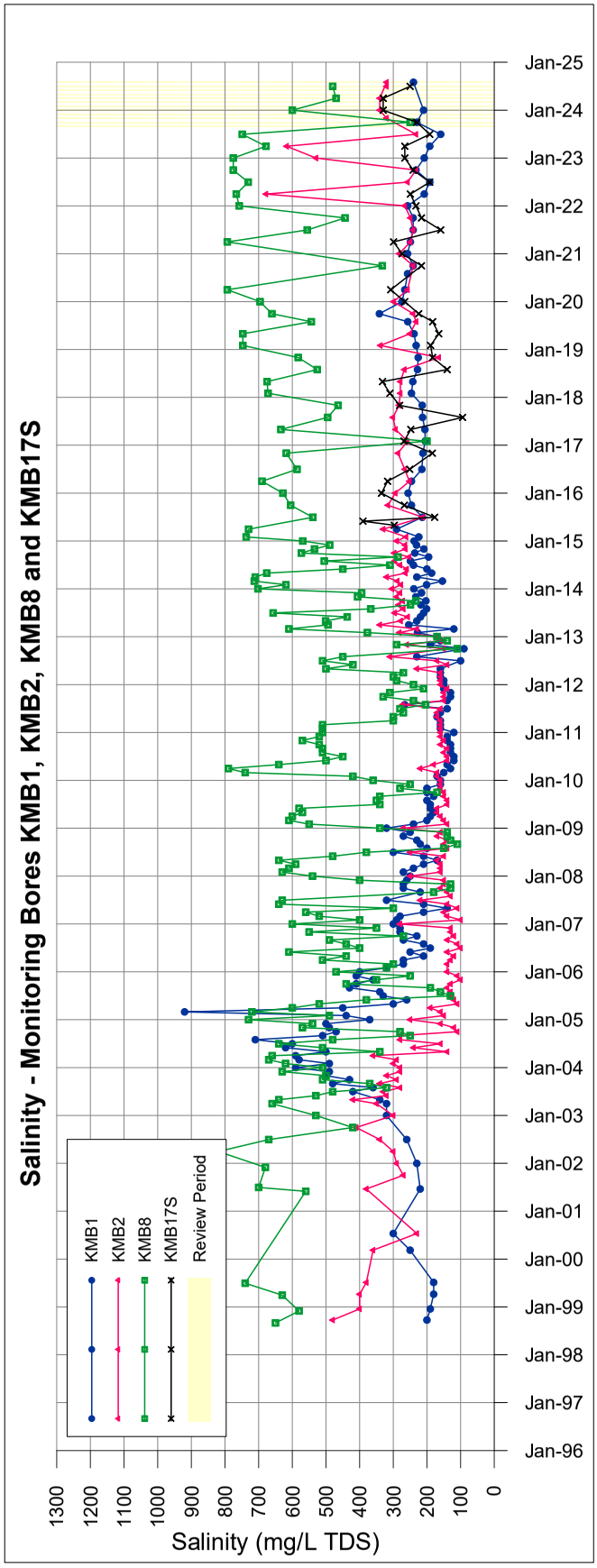
Figure 13

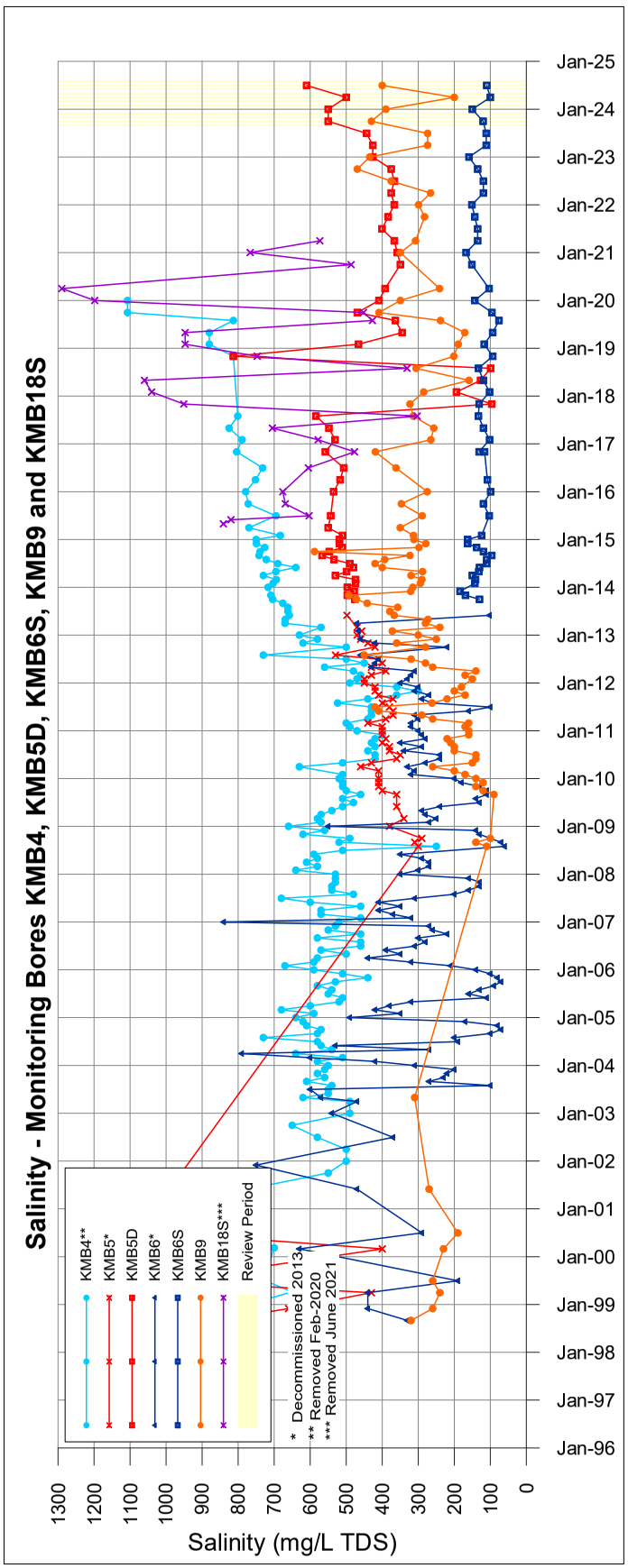


258-0/Grapher/Fig13_ClSO4_ratio.grf

Client: Kemerton Silica Sand Pty Ltd Project: Groundwater Monitoring Summary GWL 60367(4) Date: October 2024 Dwg. No: 258.0/24/1-13	$Cl:SO_4$ RATIOS IN PRODUCTION BORES KMB7 AND KMB14

Rockwater PROPRIETARY LIMITED





258-0/Grapher/Fig14_Salinity_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

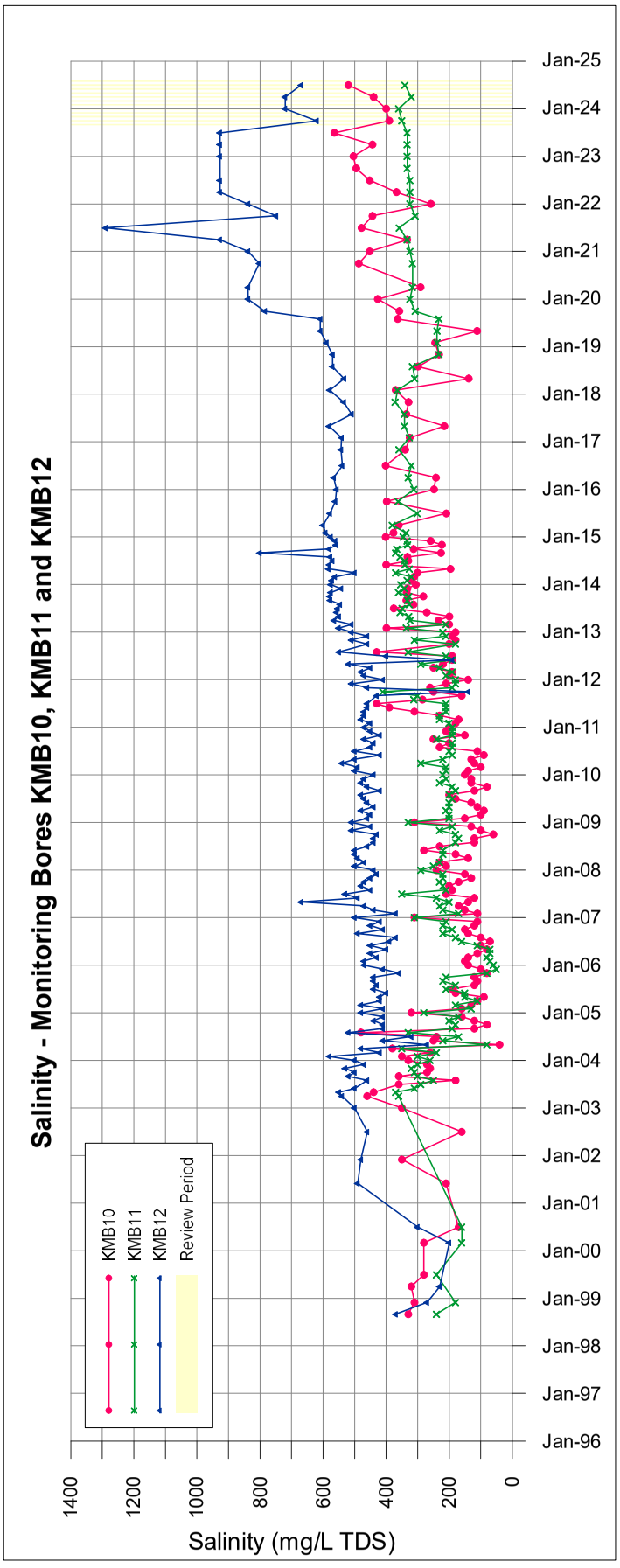
Project: Groundwater Monitoring Summary GWL 60367(4)

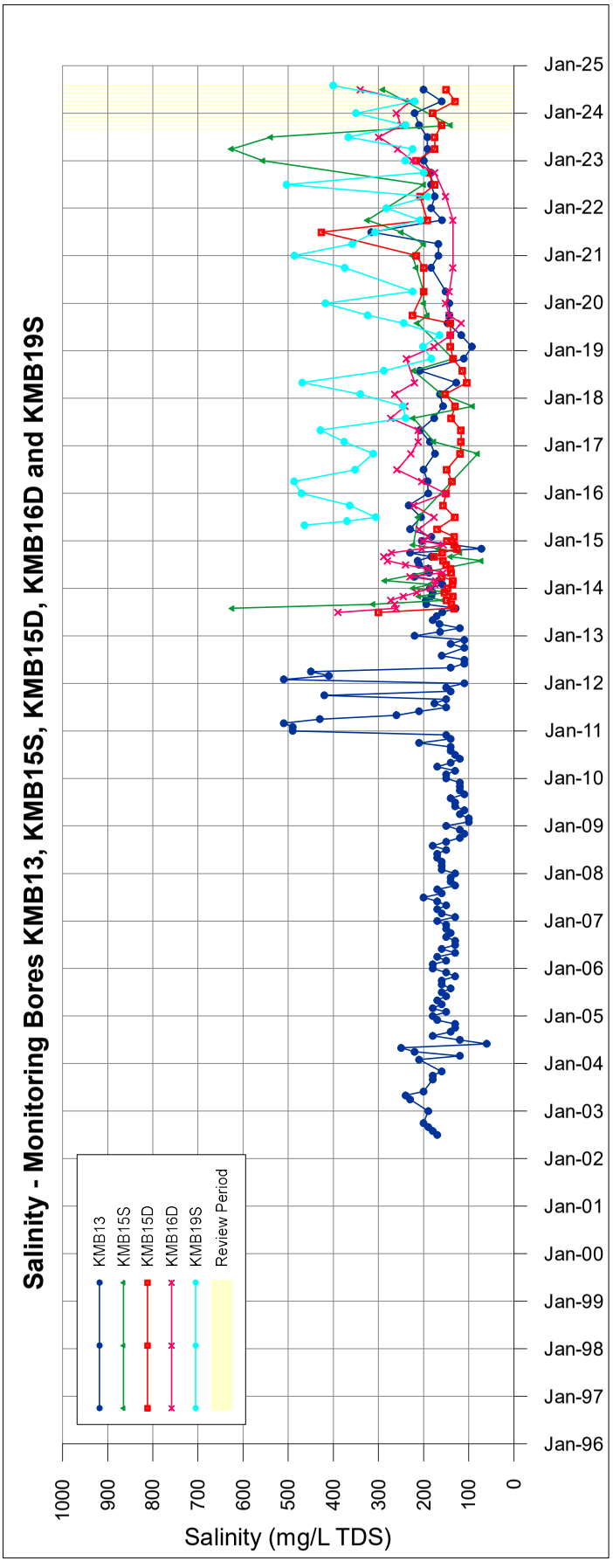
Date: October 2024

Dwg. No: 258.0/24/1-14

SALINITY FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KMB17S AND KMB18S

Rockwater PROPRIETARY LIMITED





258-0/Grapher/Fig15_Salinity_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(4)

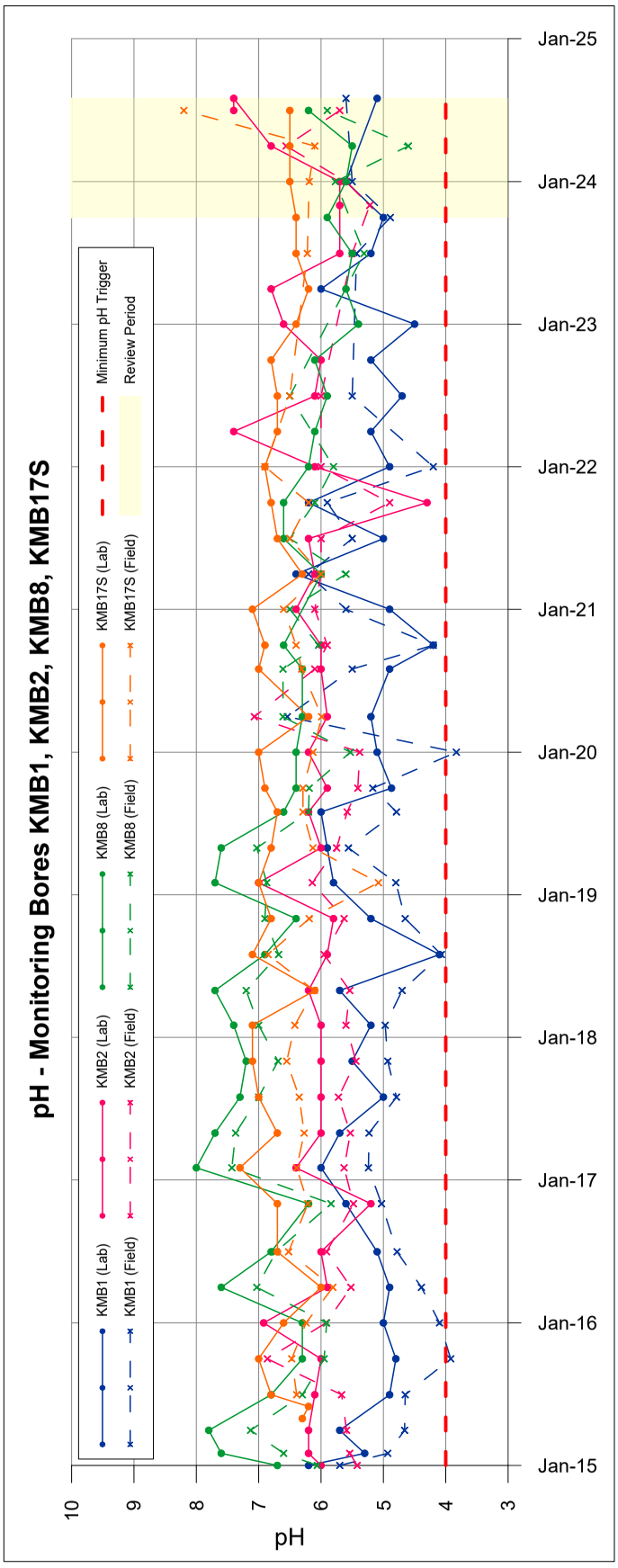
Date: October 2024

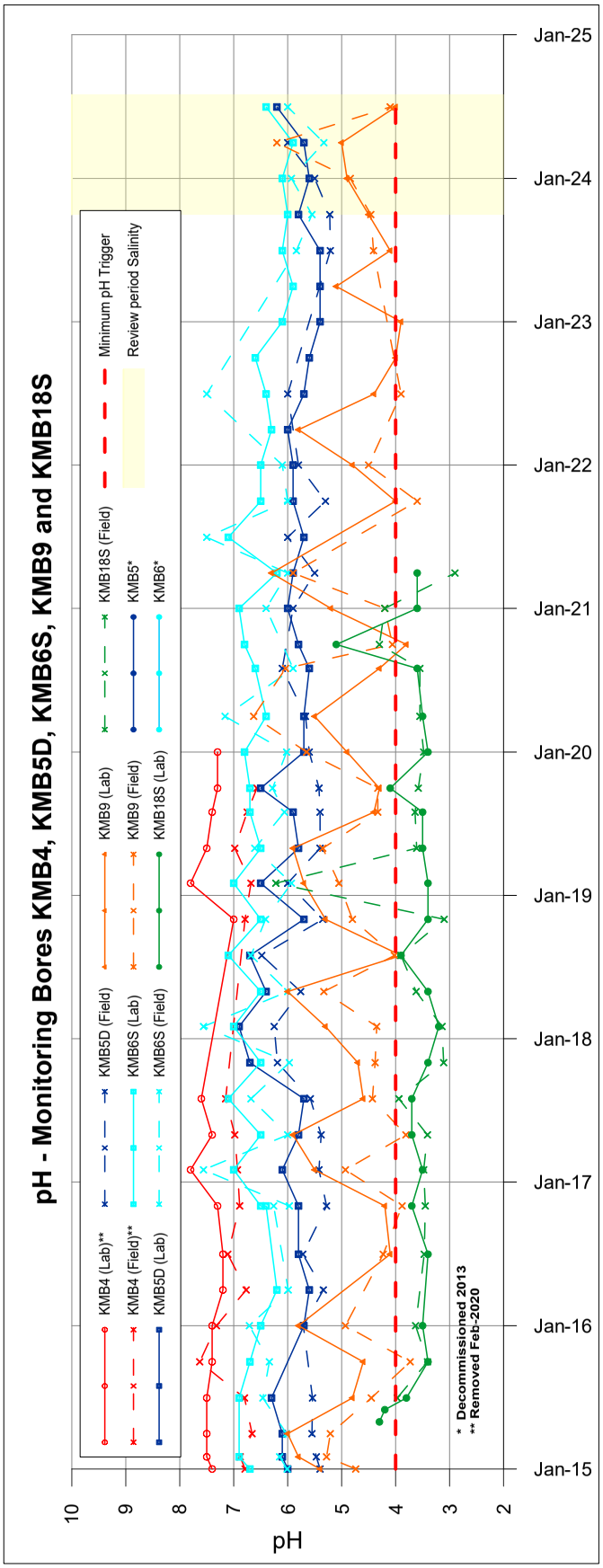
Dwg. No: 258.0/24/1-15

SALINITY FOR MONITORING BORES KMB10, KMB11, KMB12, KMB13, KMB15S, KM15D, KMB16D AND KMB19S

Rockwater PROPRIETARY LIMITED

Figure 16





258-0/Grapher/Fig16_pH_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(4)

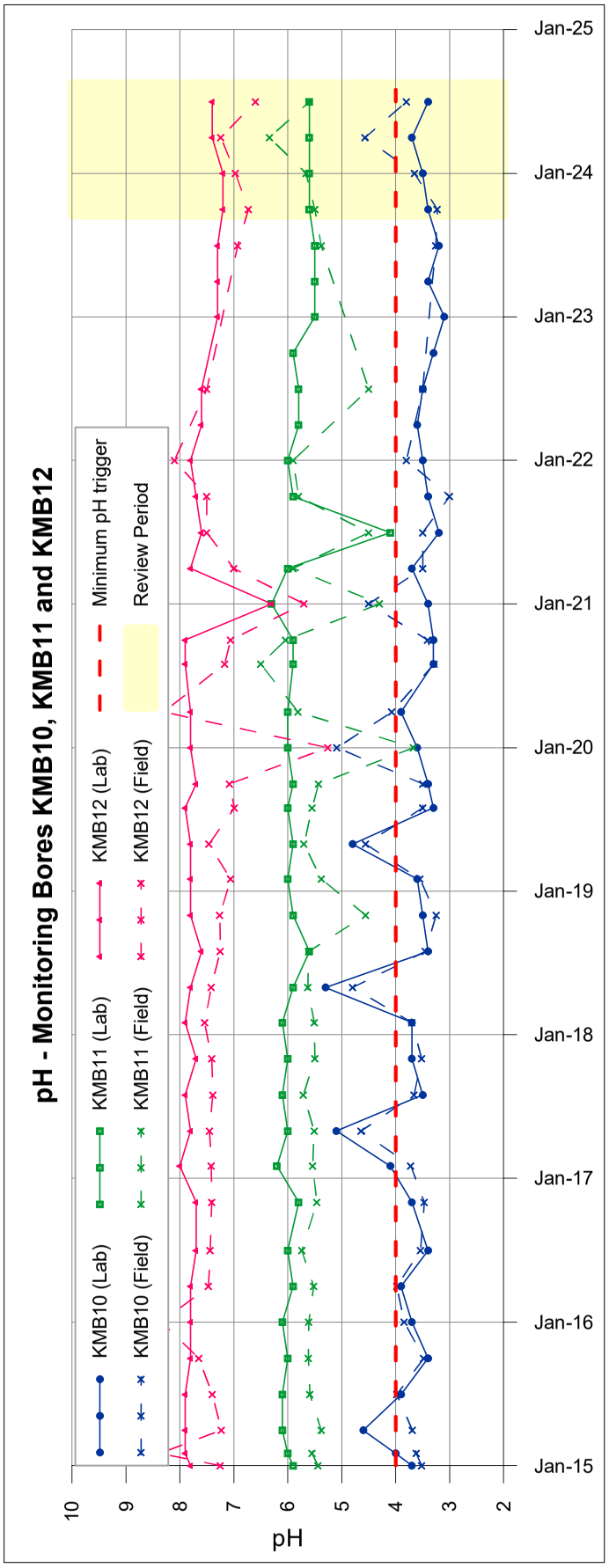
Date: October 2024

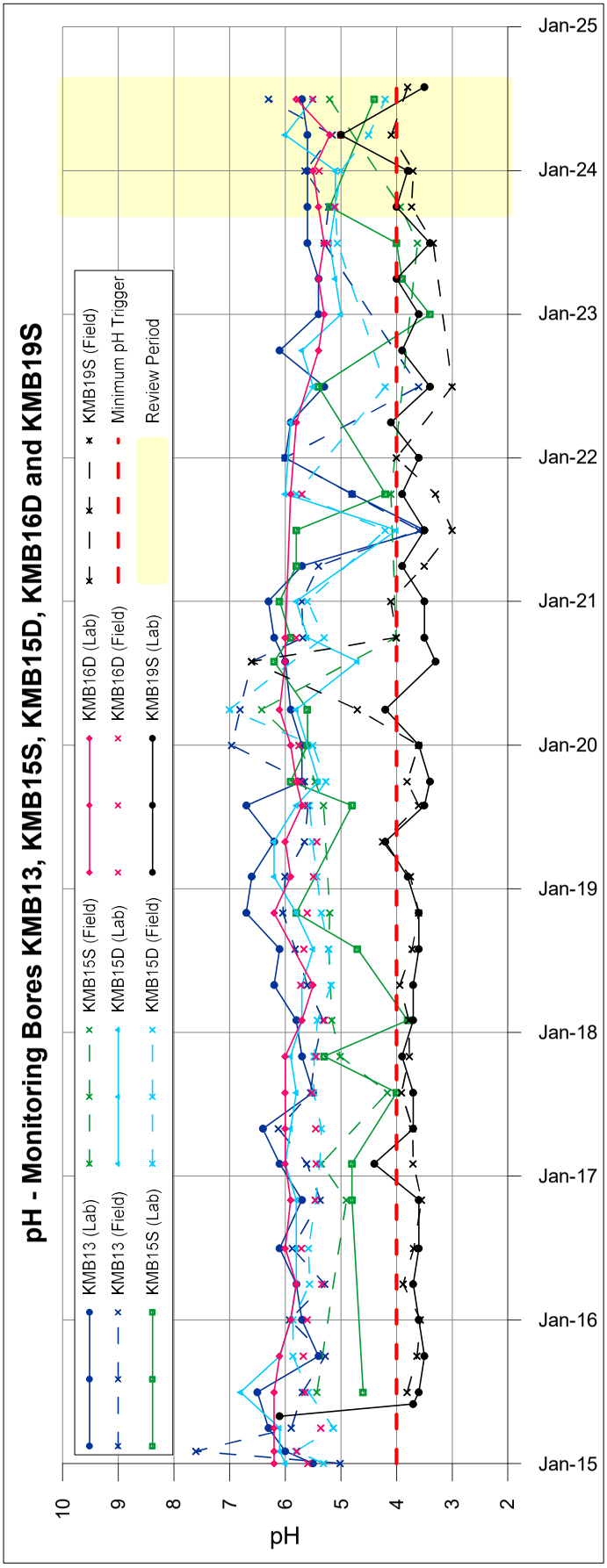
Dwg. No: 258.0/24/1-16

pH FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KM17S AND KMB18S

Rockwater PROPRIETARY LIMITED

Figure 17





258-0/Grapher/Fig17_pH_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(4)

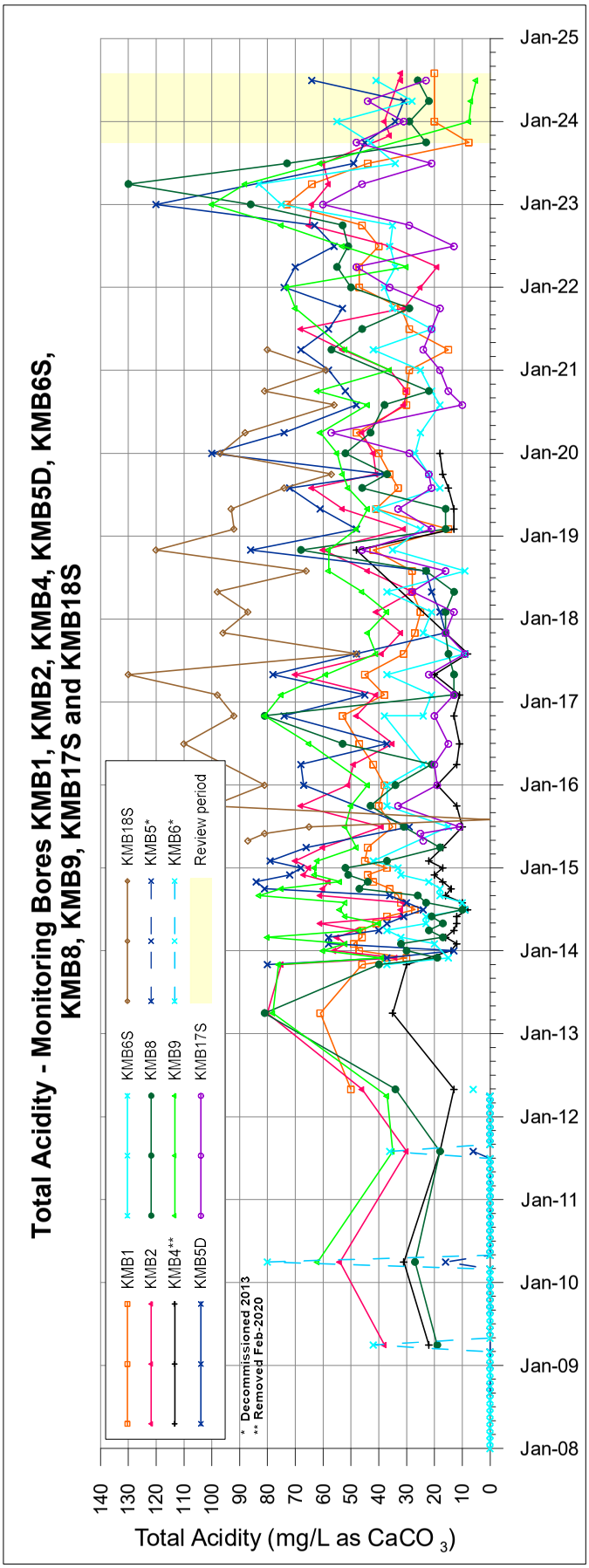
Date: October 2024

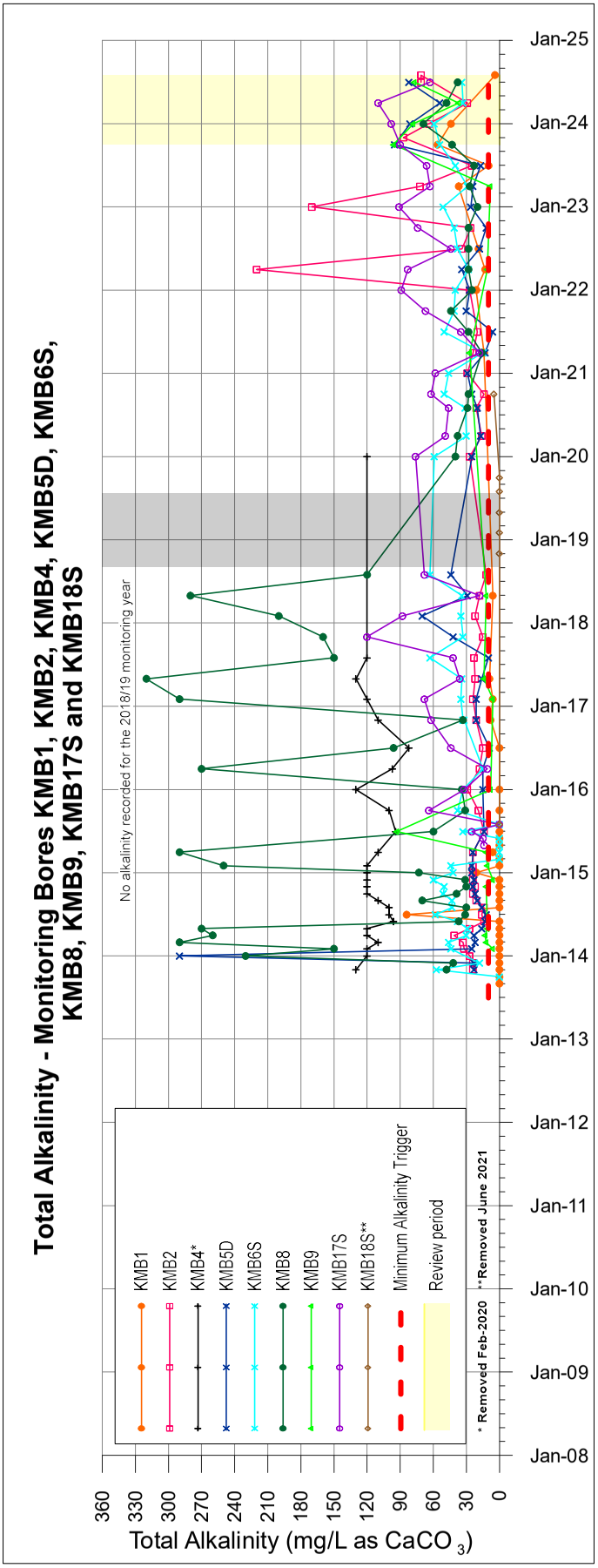
Dwg. No: 258.0/24/1-17

pH FOR MONITORING BORES KMB10, KMB11, KMB12, KMB13, KMB15S, KMB15D, KMB16D AND KMB19S

Rockwater PROPRIETARY LIMITED

Figure 18





258-0/Grapher/Fig18_Total Acidity and Alkalinity.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(4)

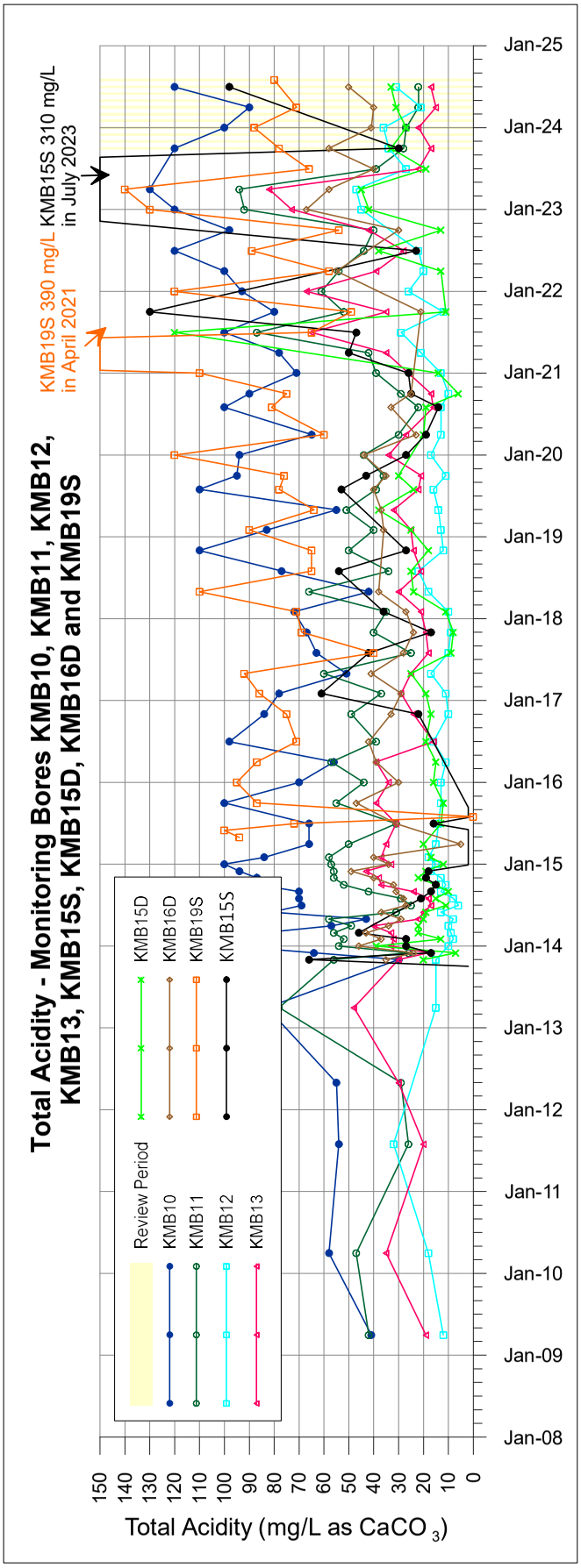
Date: October 2024

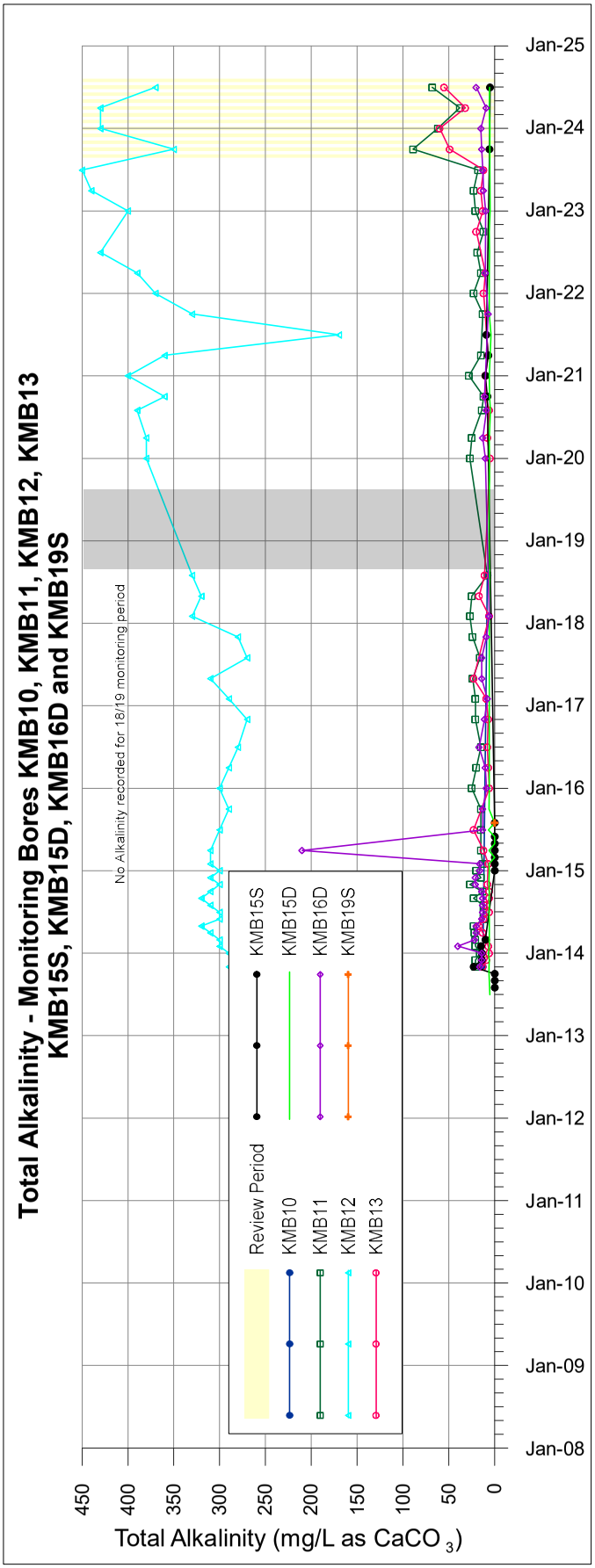
Dwg. No: 258.0/24/1-18

TOTAL ACIDITY AND ALKALINITY FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KMB17S AND KMB18S

Rockwater PROPRIETARY LIMITED

Figure 19





258-0/Grapher/Fig19_Total Acidity and Alkalinity.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(4)

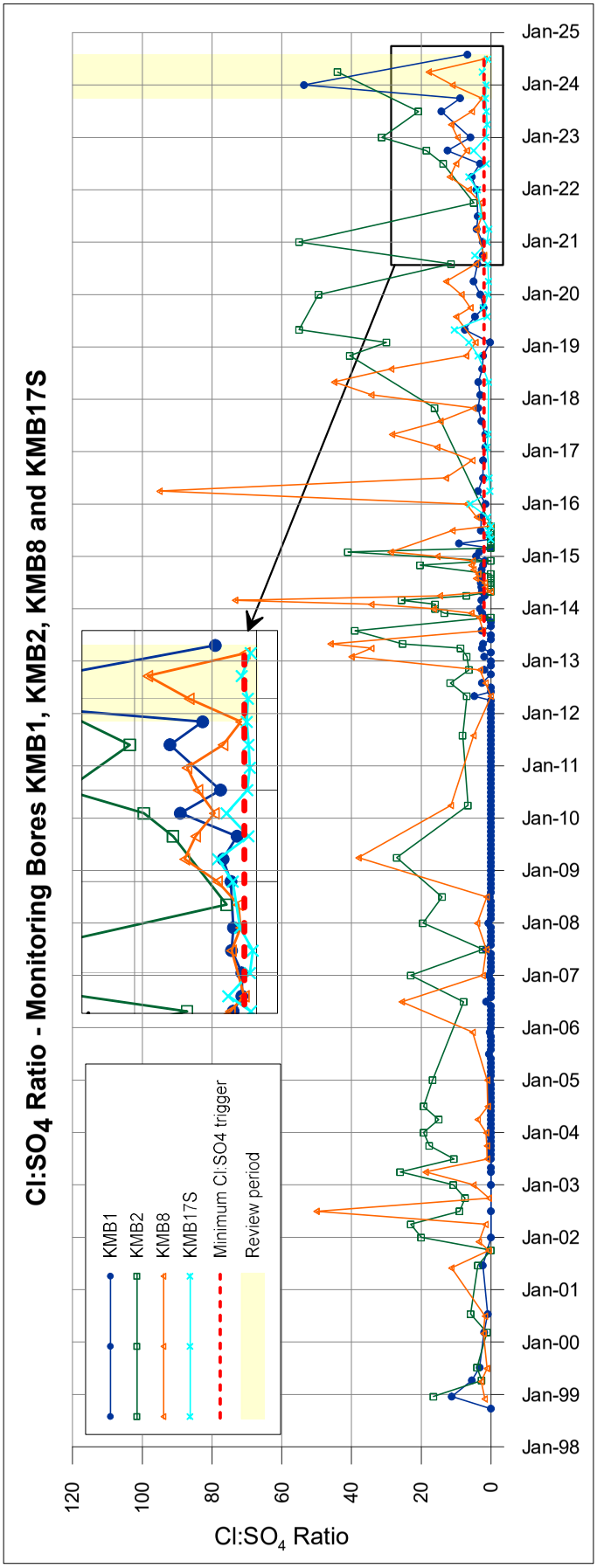
Date: October 2024

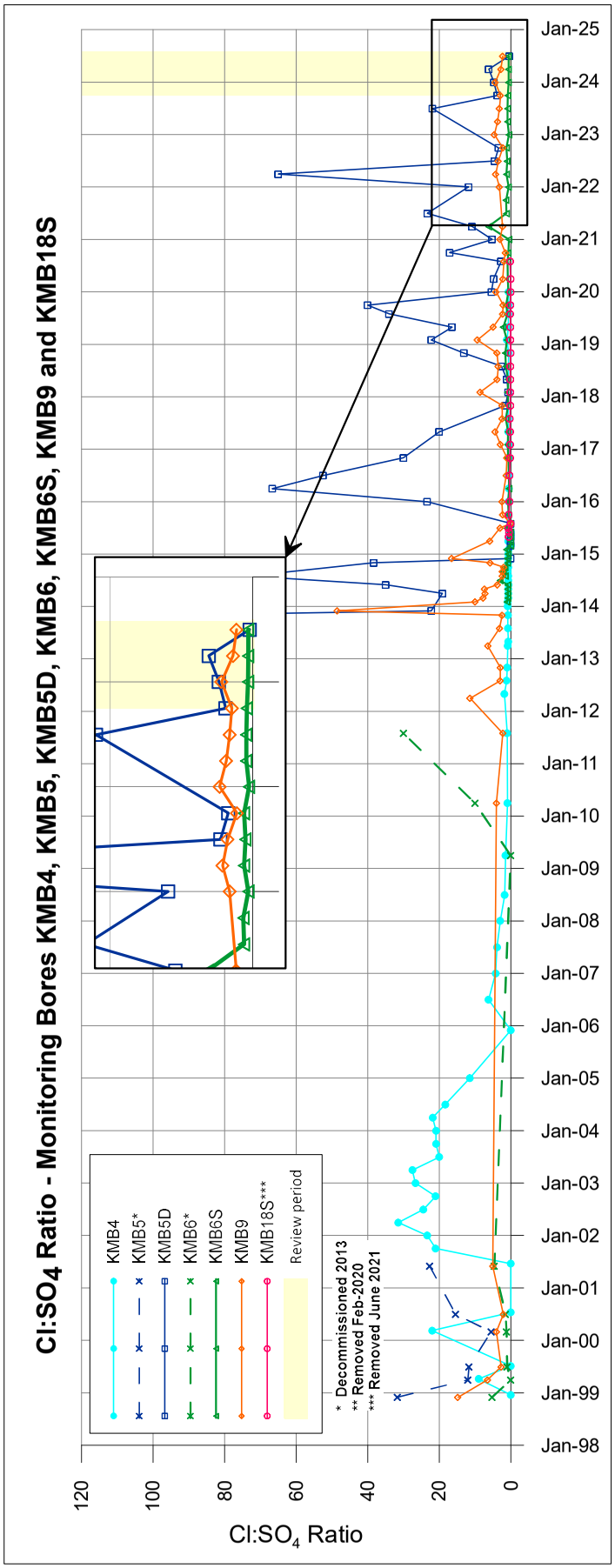
Dwg. No: 258.0/24/1-19

TOTAL ACIDITY AND ALKALINITY FOR MONITORING BORES KMB10, KMB11, KMB12, KMB13, KMB15S, KMB15D, KMB16D AND KMB19S

Rockwater PROPRIETARY LIMITED

Figure 20





258-0/Grapher/Fig20_ClSO4_ratio_monitoring bores.grf

Client: Kemerton Silica Sand Pty Ltd

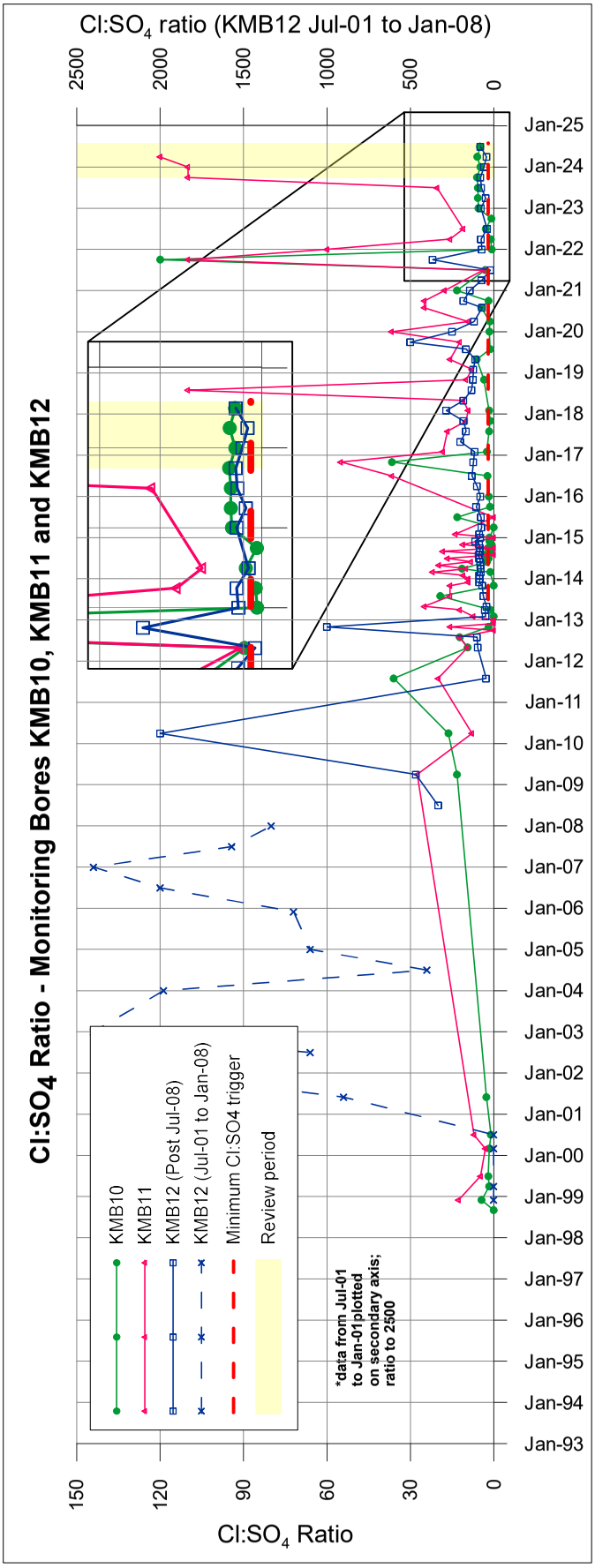
Project: Groundwater Monitoring Summary GWL 60367(4)

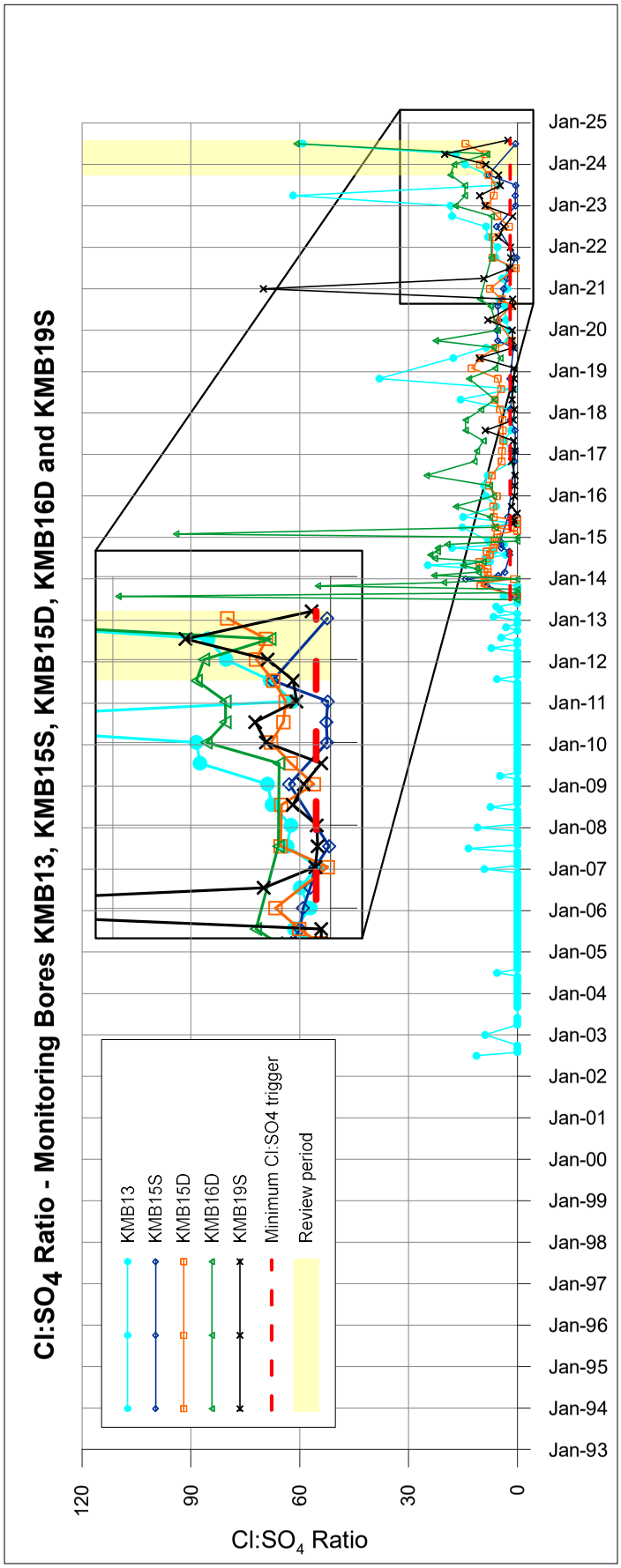
Date: October 2024

Dwg. No: 258.0/24/1-20

$Cl:SO_4$ RATIO FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KMB17S AND KMB18S

Rockwater PROPRIETARY LIMITED





258-0/Grapher/Fig21_ClSO4_ratio_monitoring bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(4)

Date: October 2024

Dwg. No: 258.0/24/1-21

$Cl:SO_4$ RATIO FOR MONITORING BORES KMB10, KMB11, KMB12, KMB13, KMB15S, KMB15D, KMB16D AND KMB19S

Rockwater PROPRIETARY LIMITED

APPENDIX I

LICENCE TO TAKE WATER GWL 60367(4)

Government of **Western Australia**
Department of **Water**

looking after all our water needs

Your ref:
Our ref: RF6385-03
Enquiries: Richard Watson
9726 4165

Mr Yoshihiro Abe
Deputy Managing Director
Kemerton Silica Sand Pty Ltd
PO Box A283
AUSTRALIND WA 6233

Dear Mr Abe

Re: *Renewal of Licence to Take Water – GWL60367*
Property: *Lot 32 Rhodes Road, Wokalup*

Thank you for your application to renew *Licence to Take Water* GWL60367, held by Kemerton Silica Sand Pty Ltd for sand mining operations at Kemerton. The application was received by the Department of Water on 23 April 2013.

Your licence has been renewed to 30 June 2023, being 10 years from the expiry date of the previous version (3) of the licence. Condition 10 of the licence refers to the Groundwater Monitoring Program negotiated with you and your consultants, MBS Environmental, over recent months.

Please find enclosed the following:

- Your *Licence to Take Water*
- The *Groundwater Monitoring Program* referred to in Condition 10
- FAQ sheet *Your licence to take water*
- FAQ sheet *Metering your water use*

Please take time to read these documents as they contain important information about your rights and responsibilities.

You may apply to the State Administrative Tribunal (SAT) for a review of our decision. You will need to contact the SAT office directly, within 28 days as follows:

In person State Administrative Tribunal
4th floor, 12 St Georges Terrace Perth WA 6000

In writing: State Administrative Tribunal
GPO Box U1991
Perth WA 6845

By telephone: Metro: (08) 9219 3111
Regional: 1300 306 017 (for the cost of a local call)

South West Region
35-39 McCombe Road Bunbury Western Australia 6230
PO Box 261 Bunbury Western Australia 6231
Telephone (08) 9726 4111 Facsimile (08) 9726 4100
www.water.wa.gov.au
wa.gov.au

By fax: (08) 9325 5099

For more information about the SAT please visit their website www.sat.justice.wa.gov.au.

You are also reminded that you may apply to amend your licence or groundwater monitoring program at any time during the 10 year term of the licence.

If you have any queries about this or any other water licensing matter please contact Richard Watson at the Bunbury office on 9726 4111.

Yours sincerely,

Mike McKenna
Program Manager
Bunbury District Water Licensing and Use
South West Region

26 November 2013

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	Kemerton Silica Sand Pty Ltd		
Description of Water Resource	South West Coastal Perth - Superficial Swan	**Annual Water Entitlement**	660000 kL
Location of Water Source	Lot 32 On Diagram 63554 - Volume/Folio 2128/998 - Lot 32 Rhodes Rd Wokalup Lot 100 On Plan 21567 - Volume/Folio 2167/550 - Lot 100 Wokalup		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Water for Industrial purposes	Lot 32 On Diagram 63554 - Volume/Folio 2128/998 - Lot 32 Rhodes Rd Wokalup
Duration of Licence	From 25 November 2013 to 30 June 2023	

This Licence is subject to the following terms, conditions and restrictions:

1 The volume of all water taken under this licence must be metered using an approved meter fitted to each draw-point.

2 The annual water year for water taken under this licence is defined as 1 September to 31 August the following year.

3 The water year is defined as a specified 12 month period for the purposes of groundwater management planning, annual water accounting and annual reporting.

4 The licensee must not, in any water year, take more water than the annual water entitlement specified in this licence.

5 The licensee must take and record the reading from each meter required under this licence, at the end of each month.

6 The licensee is to provide the recorded meter readings and the volume of water taken each month within the water year to the Department of Water by 31 October each year.

7 The licensee must ensure the installed meter(s) accuracy is maintained to within plus or minus 5% of the volume metered, in field conditions.

8 The licensee must notify the Department of Water in writing of any water meter malfunction within seven days of the malfunction being noticed.

9 The licensee must obtain authorisation from the Department of Water before removing, replacing or interfering with any meter required under this licence.

10 The licensee is to comply with the Groundwater Monitoring Program dated November 2013 and any amendments made by or with the approval of the Department.

End of terms, conditions and restrictions

Groundwater Monitoring Program

pursuant to

GWL60367(4)

Kemerton Silica Sand Pty Ltd

Licensee: Kemerton Silica Sand Pty Ltd

Location of Water Source: Lot 32 on Diagram 63554 , Rhodes Road, Wokalup

Location of Activity: Lot 32 on Diagram 63554 , Rhodes Road, Wokalup;
Lot 100 on Plan 21567, Wokalup

Description of Land Use Activity: Water for industrial purposes

1. Water source description:

The following tables identify the drawpoints and meters under this licence.

1.1 Drawpoint descriptions:

Groundwater Production Bores:

Lot No.	Production Bore Designation	Easting*	Northing*	Aquifer	Depth (m)
32	KMB7	386420	6333718	Superficial	29
32	KMB14	385960	6333537	Superficial	30.4

*Note: MGA coordinates in GDA94 datum coordinates – easting/northing/zone 50

1.2 Meter Details:

Drawpoint Designation	Meter No.	Details - meter make; installation date etc
KMB7	95W024210	Davies Shephard FD95
KMB14	n.a.	Davies Shephard FD95

Note: Conditions regarding the maintenance of meters, meter readings and reporting of volumes extracted are included on the licence instrument.

2. Groundwater Monitoring:

2.1 Superficial Aquifer Groundwater Monitoring Sites:

The following sites shall be monitored to satisfy the groundwater level and chemistry requirements:

Lot No.	Monitoring Site Designation	Easting	Northing	SWL^ (m btoc)	Slotted depth (m)
32	KMB1	385833	6334155	2.95	11.0 – 23.4
32	KMB2	386411	6334389	1.99	11.0 – 23.0
32	KMB4	386851	6333699	1.77	11.0 – 23.0
32	KMB5D#	386658	6332982	3.15 (May'13)	10.0 – 22.0
32	KMB6S#	386658	6332951	3.14 (May'13)	2.0 – 10.0
32	KMB7	386420	6333718	1.48 (Jan'12)	16.5 – 28.5
32	KMB8	386355	6334049	0.85	? – 20.08>
100	KMB9	387372	6332631	1.47	? – 19.95>
100	KMB10	387566	6334005	1.45	? – 19.65>
100	KMB11	387724	6334245	2.54	? – 14.35>
100	KMB12	387934	6333600	1.05	? – 20.05>
32	KMB13	386177	6333645	1.27	? – 24.90>
32	KMB14	385960	6333537	1.71	16.6 – 28.6
32	KMB15S	384828	6333095	5.16 (May'13)	4.0 – 6.0
32	KMB15D	384828	6333095	5.86 (May'13)	11.0 – 23.0
32	KMB16S	384780	6334762	6.34 (May'13)	4.0 – 6.0
32	KMB16D	384780	6334762	8.82 (May'13)	11.0 – 23.0
32	KMB17	386425*	6333985*	-	-
32	KMB18	386822*	6333652*	-	-
32	KMB19	386156*	6333657*	-	-

^ September 2011 unless otherwise stated
* approximate location – to be finalised when drilled.
# replacement bore
> as probed in August 2000

Locations of these monitoring sites are shown on the attached plan.

2.2 *Superficial Aquifer Water Level Monitoring:*

Water levels in each of the groundwater monitoring sites listed in Section 2.1 shall be measured **monthly** as follows:

1. Water levels shall be measured from a standard measuring point, for example top of casing. Any change in the position of the reference point shall be recorded and previous measurements adjusted accordingly.

2. Water levels shall be reported as metres below the standard reference point (mtoc) and metres above the Australian Height Datum (mAHD)

3. Water levels in production bores KMB7 and KMB14 shall be measured at least 1 hour after pumping has ceased. A comment shall be entered against any measurement taken while the pump is still operating.

4. Water levels shall be recorded to the nearest centimetre.

2.3 *Superficial Aquifer Groundwater Chemistry Analysis:*

At a minimum, a water sample from each of the groundwater monitoring sites listed in Section 2.1 shall be submitted for analysis on a **quarterly** basis as follows:

Sept or **Oct**	**Dec** or **Jan**	**March** or **April**	**June** or **July**
pH (Field)	pH (Field)	pH (Field)	pH (Field)
pH (Lab)	pH (Lab)	pH (Lab)	pH (Lab)
EC* @ 25°C	EC @ 25°C	Electrical Conductivity @ 25 °C	EC @ 25°C
TDS# (mg/l)	TDS (mg/l)	Salinity (TDS (mg/l))	TDS (mg/l)
		Sulphate (SO_4 mg/L)	
		Chloride (Cl mg/L)	
		Total acidity (as $CaCO_3$ mg/L)	
		Total alkalinity (as $CaCO_3$ mg/L)	

Notes:

- * Electrical Conductivity (µS/cm) compensated to 25°C
- # gravimetric @180°C
- All methods and equipment used in water quality sampling shall be undertaken in accordance with Australian Standard AS/NZS 5667 (1998) and wherever possible, a NATA registered laboratory should undertake the analyses, using NATA accredited analysis methods.

2.4 Superficial Aquifer Groundwater Chemistry Trigger Levels:

1. Trigger levels for salinity in all monitoring sites listed in Section 2.1 are set at the upper level of the *Salinity threshold categories* listed in Table 5 of *Policy Group 6.1* of the *South West groundwater areas allocation plan, May 2009*. These levels act as indicators of potentially unacceptable increases in salinity across the site.

2. Trigger levels[#] apply for the following chemistry parameters in all monitoring sites listed in Section 2.1. These levels act as indicators that groundwater is either acidifying or is vulnerable to acidification.

    - $pH_{(Field)}$: falling below **4**
    - Total alkalinity (as $CaCO_3$): falling below **10mg/L**
    - Cl:SO_4 ratio to remain greater than **2** (or SO_4:Cl ratio less than 0.5)

Notes:

1. Any movement in water quality beyond a trigger level must '*trigger some action, either further ecosystem specific investigations or implementation of management/remedial actions*' (ANZECC 2000)
2. [#] references:
    - Historic groundwater chemistry results
    - DEC/DER guidelines; 1) *Treatment and management of soils and water in acid sulphate soil landscapes; July 2011;* 2) *Investigation and management of acid sulfate soil hazards associated with silica and heavy mineral sand mining operations; 2012 (in draft)*

3. Reporting:

1. The licensee shall provide an **annual** Groundwater Monitoring Summary incorporating monitoring data recorded during the water year from **1 September** to **31 August** the following year. The report shall include:

    - tabulated meter readings and monthly volumes for each metered drawpoint over the reporting year
    - graphs of historical monthly and annual extraction data for each metered drawpoint and combined borefield extraction
    - tabulated chemistry data for nominated groundwater monitoring sites
    - graphs of historical chemistry data (for water level, pH and salinity as a minimum)
    - laboratory analysis sheets for the reporting year
    - an assessment of the effects of the licensee's draw and activities on the groundwater resource as determined from the monitoring data
    - a report of any movement in water quality beyond a chemistry trigger level including an assessment of any real risk to the resource or ecosystem, and specifying any course of action deemed appropriate
    - an audit table assessing compliance against licence conditions and the monitoring program
    - an assessment of the monitoring program and recommendations for any changes to the program

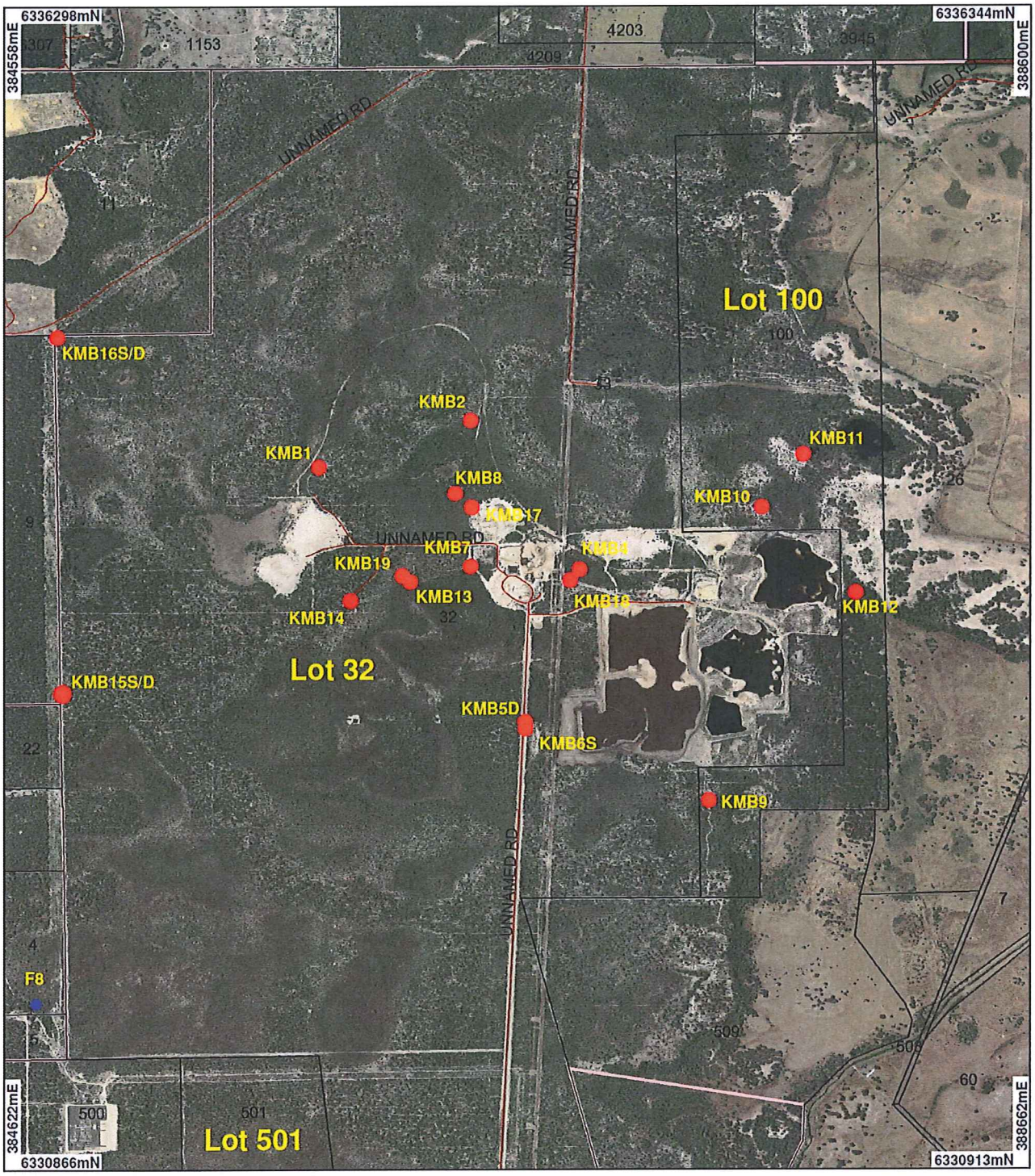
2. The report shall be forwarded to the Bunbury office of the Department of Water by **31 October** each year.

4. Relevant Management Plans:

1. Department of Water, *Kemerton Groundwater Subareas Water Management Plan*, December 2007
2. Department of Water, *South West groundwater areas allocation plan*, May 2009
3. Department of Water, *Leschenault Estuary water quality improvement plan*, October 2012

GWL60367(4)

Bore Location Plan



LEGEND

- WA Coastline - DoE
- Road Centrelines - Landgate
- Localities - DLI
- SW_Plan_Boundary *
- WIN Groundwater Sites, Monitoring - DoW
- WIN Groundwater Sites - Groundwater Assessment Network
- WRL DrawPoints
  - INSTRUMENT
  - IN_PROGRESS
- Cadastre - DLI

N

0 625 m

Scale 1:25000

(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

APPENDIX II

MONITORING DATA – WATER LEVELS & PRODUCTION BORE DATA

Appendix II - Production Bore Data

	KMB7 PRODUCTION BORE MONITORING							KMB14 PRODUCTION BORE MONITORING							PRODUCTION BORES	
Month	pH (Lab)	pH (Field)	Salinity (mg/L TDS, Lab)	Salinity (mg/L TDS, Field)	Meter	Flow (m3)	Annual Flow	pH (Lab)	pH (Field)	Salinity (mg/L TDS, Lab)	Salinity (mg/L TDS, Field)	Meter	Flow (m3)	Annual Flow	Total Monthly Flow (m3)	Total Annual Flow (m3)
Sep-19					55,948	27						139,535	7,288		7,315	
Oct-19	7.00	6.42	426	-	56,415	467		5.80	5.48	216	-	146,048	6,513		6,980	
Nov-19					56,467	52						148,296	2,248		2,300	
Dec-19					56,474	7						160,500	12,204		12,211	
Jan-20	6.00	6.50	758	-	57,487	1,013		6.00	5.85	283	-	172,394	11,894		12,907	
Feb-20					59,359	1,872						178,871	6,477		8,349	
Mar-20					59,455	96						186,501	7,630		7,726	
Apr-20	7.40	6.69	1017	-	59,709	254		7.40	6.65	521	-	191,050	4,549		4,803	
May-20					61,622	1,913						197,322	6,272		8,185	
Jun-20					61,731	109						201,712	4,390		4,499	
Jul-20					61,734	3						206,709	4,997		5,000	
Aug-20	6.60	6.00	-	-	61,734	0	5,813	6.80	6.10	-	-	212,929	6,220	80,682	6,220	86,495
Sep-20					61,734	0						212,929	0		0	
Oct-20	6.80	6.61	608	-	61,734	0		5.90	6.42	216	-	216,066	3,137		3,137	
Nov-20					61,743	9						222,084	6,018		6,027	
Dec-20					62,014	271						227,256	5,172		5,443	
Jan-21	6.50	6.40	643	-	62,363	349		6.10	6.10	224	-	231,642	4,386		4,735	
Feb-21					62,363	0						236,780	5,138		5,138	
Mar-21					62,377	14						241,786	5,006		5,020	
Apr-21	5.70	5.40	200	-	62,460	83		5.80	5.00	200	-	256,768	14,982		15,065	
May-21					62,638	178						260,775	4,007		4,185	
Jun-21					62,672	34						268,935	8,160		8,194	
Jul-21	6.70	6.50	652	-	63,048	376		5.80	5.80	249	-	278,630	9,695		10,071	
Aug-21					64,148	1,100	2,414					283,509	4,879	70,580	5,979	72,994
Sep-21					65,649	1,501						290,388	6,879		8,380	
Oct-21	5.60	5.20	617	-	65,649	0		5.70	5.50	192	-	300,378	9,990		9,990	
Nov-21					67,888	2,239						310,730	10,352		12,591	
Dec-21					67,901	13						319,746	9,016		9,029	
Jan-22	-	-	-	-	67,922	21		5.90	6.10	208	-	329,641	9,895		9,916	
Feb-22					68,164	242						340,239	10,598		10,840	
Mar-22					69,236	1,072						347,693	7,454		8,526	
Apr-22	5.60	-	713	-	69,670	434		5.50	-	208	-	357,614	9,921		10,355	
May-22					69,829	159						358,014	400		559	
Jun-22					69,829	0						362,236	4,222		4,222	
Jul-22	5.80	6.50	687	-	69,829	0		5.40	5.80	200	-	363,099	863		863	
Aug-22					69,829	0	5,681					400,032	36,933	116,523	36,933	122,204
Sep-22					69,829	0						410,795	10,763		10,763	
Oct-22	-	-	696	-	69,829	0		-	-	200	-	427,675	16,880		16,880	
Nov-22					69,829	0						432,730	5,055		5,055	
Dec-22					69,829	0						443,312	10,582		10,582	
Jan-23	-	-	713	-	69,829	0		-	-	200	-	457,937	14,625		14,625	
Feb-23					69,829	0						464,541	6,604		6,604	
Mar-23					69,829	0						472,809	8,268		8,268	
Apr-23	-	-	713	-	69,829	0		-	-	200	-	484,216	11,407		11,407	
May-23					69,829	0						498,752	14,536		14,536	
Jun-23					69,829	0						509,906	11,154		11,154	
Jul-23	6.40	6.21	669	425	69,829	0		5.00	5.05	208	313	519,396	9,490		9,490	
Aug-23					69,829	0	0					529,300	9,904	129,268	9,904	129,268
Sep-23					69,829	0						538,548	9,248		9,248	
Oct-23	6.40	6.05	560	419	69,829	0		5.30	5.00	220	129	552,917	14,369		14,369	
Nov-23					69,829	0						561,675	8,758		8,758	
Dec-23					69,829	0						565,871	4,196		4,196	
Jan-24	6.30	6.36	610	430	69,834	5		5.20	5.10	210	125	575,287	9,416		9,421	
Feb-24					69,995	161						586,828	11,541		11,702	
Mar-24					70,121	126						601,775	14,947		15,073	
Apr-24	6.40		500		71,541	1,420		5.20	4.40	150	139	609,931	8,156		9,576	
May-24					73,591	2,050						622,625	12,694		14,744	
Jun-24					73,591	0						625,167	2,542		2,542	
Jul-24	5.90	5.40	620	110	73,591	0		5.20	5.20	200	510	634,665	9,498		9,498	
Aug-24					73,591	0	3,762					647,288	12,623	117,988	12,623	121,750

Appendix II: Monitoring Data

DATE	KMB1	KMB2	KMB4	KMB5/5D	KMB6/6S	KMB7	KMB8	KMB9	KMB10	KMB11	KMB12	KMB13	KMB14	KMB15D	KMB15S	KMB16D	KMB16S	KMB17S	KMB18S	KMB19S	Month
ref - top of casing (mAHD)	17.597	16.814	16.028	16.334	15.596	15.684	15.667	14.456	15.28	16.156	13.829	16.06	16.475	18.93	18.93	22.16	22.16	15.29	15.52	15.47	
01-Sep-19	14.20	14.41	13.68	13.62	14.16	14.38	14.31	12.81	13.93	13.38	12.71	14.13	13.93	13.27	13.27	13.67	dry	14.56	13.76	14.21	Sep-19
01-Oct-19	14.21	14.21	13.57	13.51	13.77	13.26	14.15	12.58	13.25	13.21	12.59	14.05	13.98	13.44	13.44	13.71	dry	14.23	13.61	14.09	Oct-19
01-Nov-19	14.05	14.17	13.50	13.42	13.56	14.11	14.00	12.46	13.11	13.05	11.47	13.91	13.89	13.36	13.37	13.82	dry	14.16	13.49	13.93	Nov-19
01-Dec-19	13.93	13.91	13.30	13.27	13.41	13.93	13.85	12.28	12.98	12.87	12.31	13.75	13.65	13.31	13.31	13.71	dry	13.94	13.34	13.78	Dec-19
01-Jan-20	13.65	13.59	13.01	12.96	13.03	13.66	14.54	12.00	12.66	12.53	11.97	13.42	13.22	13.17	13.17	13.56	dry	14.59	13.05	13.45	Jan-20
01-Feb-20	13.40	13.41		12.72	12.90	13.43	13.30	11.62	11.83	12.31	11.72	13.16	12.94	13.04	13.04	13.56	dry	13.33	12.79	13.17	Feb-20
01-Mar-20	13.27	13.25		12.59	12.78	13.24	13.14	11.51	12.21	12.21	11.63	13.01	12.88	12.96	12.96	13.32	dry	-	12.63	13.04	Mar-20
01-Apr-20	13.22	13.18		12.50	12.67	13.16	13.07	11.43	12.11	12.10	11.57	12.99	12.97	12.88	12.88	13.24	dry	13.08	12.51	13.00	Apr-20
01-May-20	13.10	13.01		12.42	12.60	13.16	12.87	11.46	12.08	12.06	11.58	12.76	-	12.73	12.73	13.06	dry	12.81	12.20	12.77	May-20
01-Jun-20	13.00	-		12.78	13.49	-	13.32	11.96	13.68	12.54	12.23	13.11	-	13.13	13.13	13.06	dry	13.27	12.58	13.21	Jun-20
01-Jul-20	13.55	13.67		13.05	13.63	13.58	13.57	12.22	12.94	12.88	12.23	13.46	-	12.88	12.86	13.36	dry	13.61	12.77	13.50	Jul-20
01-Aug-20	13.55	12.91		13.93	13.04	13.87	12.92	12.12	12.24	12.47	-	13.47	11.68	12.88	12.86	-	dry	-	-	-	Aug-20
20-Aug-20	13.55	13.67		12.99	13.15	-	13.41	12.16	12.68	12.76	-	13.36	11.68	13.03	12.92	15.56	dry	-	-	-	Aug-20
01-Sep-20	13.40	13.90		13.25	10.57	13.58	14.29	12.36	13.08	13.12	12.79	13.93	13.47	11.11	12.92	8.86	dry	8.91	13.01	12.97	Sep-20
01-Oct-20	13.73	13.71		13.08	13.35	11.48	13.57	12.30	12.88	12.86	12.28	13.61	13.88	11.53	11.12	13.26	dry	13.73	12.82	13.63	Oct-20
01-Nov-20	13.60	5.74		12.98	13.05	13.38	13.39	12.16	12.62	12.67	12.18	13.32	11.70	12.93	12.83	15.36	dry	13.54	12.66	13.33	Nov-20
01-Dec-20	13.36	13.36		12.90	13.05	11.61	13.34	12.07	12.56	12.61	11.78	13.41	12.18	7.84	13.02	-	dry	13.27	12.08	13.47	Dec-20
01-Jan-21	13.29	13.17		12.72	12.81	13.28	13.09	11.77	12.16	11.85	11.76	13.03	11.77	13.02	6.02	-	dry	13.21	12.19	13.25	Jan-21
01-Feb-21	13.25	12.98		12.50	12.73	13.02	12.95	11.43	12.11	12.12	11.61	13.96	8.68	12.74	12.83	14.96	dry	12.95	12.19	12.97	Feb-21
01-Mar-21	12.99	12.93		12.46	12.80	12.99	12.76	11.56	12.12	11.36	11.58	12.88	12.70	12.75	12.72	12.92	dry	12.81	12.10	12.87	Mar-21
01-Apr-21	12.90	12.66		12.48	12.38	7.38	12.69	11.13	11.68	11.96	11.51	12.66	8.18	12.67	12.66	12.89	dry	12.88	12.19	13.68	Apr-21
01-May-21	11.75			12.26	12.26	11.36	15.67	11.76	12.09	11.89	11.61	11.56	7.82	12.93	12.54	-	dry	9.78	12.28	9.94	May-21
01-Jun-21	13.15	13.15		10.53	13.01	13.42	13.13	11.85	12.18	11.20	11.82	12.96	8.20	12.18	12.38	13.00	dry	9.71	12.73	8.29	Jun-21
01-Jul-21	13.55	13.89		11.09	14.09	12.99	2.93	-	13.18	13.94	9.33	13.10	13.51	12.94	12.92	15.56	dry	13.88		13.38	Jul-21
01-Aug-21	14.08	14.03		12.44	14.11	13.67	13.61	12.75	13.43	13.54	11.18	13.76	12.41	13.33	13.11	14.96	dry	13.99		13.87	Aug-21
01-Sep-21	14.22	14.29		13.60	14.05	14.48	14.11	12.83	13.43	13.31	12.65	14.19	10.40	13.40	13.21	13.61	dry	14.03		14.21	Sep-21
01-Oct-21	15.20	14.15		13.58	13.88	8.56	14.03	12.66	13.23	13.18	11.15	13.10	14.98	13.36	13.33	13.30	dry	14.41		13.21	Oct-21
01-Nov-21	14.25	14.04		14.02	13.90	14.05	14.57	12.51	13.13	13.14	12.49	13.92	10.34	13.36	13.36	13.81	dry	14.26		13.98	Nov-21
01-Dec-21	14.95	13.87		13.33	13.57	13.29	13.97	12.42	13.04	13.04	12.45	13.91	9.44	13.25	13.31	-	dry	14.13		13.84	Dec-21
01-Jan-22	14.96	13.79		13.23	13.56	-	13.96	12.41	13.04	13.03	12.45	13.91	-	13.25	13.31	-	dry	14.13		13.84	Jan-22
01-Feb-22	12.53	13.37		13.04	13.05	13.64	13.32	11.49	12.52	12.42	11.86	13.73	8.27	13.05	-	13.43	dry	13.36		13.23	Feb-22
01-Mar-22	13.31	13.22	Bore Removed	12.59	12.88	12.88	13.12	11.57	12.28	12.22	11.69	13.78	13.07	12.73	12.97	13.33	dry	13.15		13.10	Mar-22
01-Apr-22	13.07	13.01		12.44	12.68	12.98	12.97	11.36	12.78	12.06	11.50	12.87	8.02	12.23	12.23	13.20	dry	13.01		12.17	Apr-22
01-May-22	12.99	13.01		12.35	12.57	13.01	12.92	11.34	12.03	12.02	11.52	12.80	12.60	12.78	12.79	12.86	dry	12.97		12.82	May-22
01-Jun-22	13.12	13.11		12.56	12.96	13.16	13.04	11.62	12.18	12.16	11.68	12.91	12.68	12.79	12.80	13.10	dry	13.07		12.94	Jun-22
01-Jul-22	13.47	13.56		12.98	13.68	13.68	12.82	12.18	12.80	12.69	12.16	13.34	13.10	12.92	12.92	12.70	dry	13.59		13.37	Jul-22
01-Aug-22	13.87	14.03		13.44	14.22	14.09	13.99	12.67	12.98	12.56	12.45	13.82	12.59	15.04	13.03	13.39	dry	14.31		13.96	Aug-22
01-Sep-22	14.16	14.18		13.54	13.95	14.18	14.14	12.70	13.22	13.18	12.57	14.04	13.86	13.29	13.29	13.64	dry	14.37		14.09	Sep-22
01-Oct-22	14.04	13.98		13.41	13.66	13.94	13.92	12.52	13.07	13.05	12.52	13.81	13.70	13.31	13.31	13.70	dry	13.95		13.87	Oct-22
01-Nov-22	13.99	13.94		13.41	13.65	13.94	13.89	12.50	13.05	13.00	12.49	13.78	13.63	13.30	13.30	13.71	dry	14.31		13.83	Nov-22
01-Dec-22	13.81	13.76		13.25	13.42	13.78	13.72	12.30	12.90	12.81	12.31	13.61	13.44	13.23	13.23	13.61	dry	13.76		13.64	Dec-22
01-Jan-23	13.48	13.38		12.85	13.09	13.41	13.33	11.91	12.58	12.45	11.90	13.23	13.07	13.07	13.08	13.44	dry	13.38		13.27	Jan-23
01-Feb-23	13.30	13.20		12.65	12.94	13.26	13.14	11.65	12.31	12.24	11.73	13.06	12.89	13.00	13.00	13.32	dry	13.19		13.10	Feb-23
01-Mar-23	12.82	13.05		12.48	12.78	13.09	13.01	11.45	12.11	13.10	11.56	12.92	12.72	12.90	12.90	13.22	dry	13.04		12.95	Mar-23
01-Apr-23	13.10	12.90		12.33	12.60	12.54	12.85	11.21	11.97	11.97	11.45	12.75	12.56	12.78	12.79	13.10	dry	12.87		12.77	Apr-23
01-May-23	13.00	12.95		12.48	12.82	13.01	12.90	11.52	12.15	12.12	11.59	12.80	12.61	12.75	12.75	13.03	dry	12.94		12.83	May-23
01-Jun-23	13.43	13.52		13.03	13.72	13.36	13.45	12.17	12.81	12.62	12.11	13.30	13.02	12.83	12.89	13.19	dry	13.50		13.34	Jun-23
01-Jul-23	13.64	13.70		13.17	13.60	13.67	13.63	12.32	12.94	12.85	12.27	12.88	13.30	13.01	13.00	13.31	dry	13.67		13.54	Jul-23
01-Aug-23	14.24	14.26		13.63	14.21	14.24	14.19	12.82	13.44	13.29	12.62	14.10	13.92	13.31	13.35	13.63	dry	14.35		14.19	Aug-23
01-Sep-23	14.29	14.21		13.62	13.98	14.18	14.16	12.68	13.28	13.26	12.68	14.06	13.91	13.48	13.47	13.72	dry	14.24		14.11	Sep-23
01-Oct-23	14.10	14.06		13.49	13.74	14.01	14.00	12.47	13.15	13.08	12.56	13.89	13.80	13.42	13.37	13.74	dry	14.09		13.95	Oct-23
01-Nov-23	13.95	13.85		13.29	13.47	13.83	13.77	12.32	12.97	12.85	12.38	13.70	13.52	13.29	13.34	13.66	dry	13.81		13.73	Nov-23
01-Dec-23	13.76	13.65		13.13	13.32	13.70	13.63	12.13	12.79	12.69	12.19	13.55	8.65	13.23	13.28	13.56	dry	13.67		13.59	Dec-23
01-Jan-24	13.50	13.37		12.87	13.09	12.21	13.35	11.86	12.60	12.44	11.92	13.26	8.60	13.09	13.14	8.75	dry	13.36		13.30	Jan-24
01-Feb-24	13.19	13.15		12.59	12.86	13.24	13.13	11.56	12.28	12.18	11.63	13.02	12.81	12.93	12.98	13.28	dry	13.18		13.04	Feb-24
01-Mar-24	12.86	12.91		12.33	12.56	11.44	12.90	11.29	11.90	11.91	11.37	12.78	8.11	12.74	12.83	13.08	dry	12.95		12.81	Mar-24
01-Apr-24	12.93	12.80		12.28	12.45	11.39	12.76	11.19	11.83	11.80	11.27	12.62	8.95	12.75	12.73	13.00	dry	12.78		12.69	Apr-24
01-May-24	13.12	12.81		12.25	12.53	12.94	12.76	12.13	11.93	11.91	11.44	12.66	7.24	12.70	12.69	13.28	dry	12.79		12.64	May-24
01-Jun-24	13.24	13.26		13.68	13.42	13.28	13.15	12.66	12.38	12.28	11.76	13.01	7.53	12.78	12.78	10.48	dry	13.74		13.67	Jun-24
01-Jul-24	13.66	13.69		12.95	12.95	13.67	13.62	11.55	12.78	12.61	12.04	13.44	7.95	12.98	12.96	13.29	dry	13.66		13.47	Jul-24
01-Aug-24	14.23	14.28		13.51	14.20	14.27	14.24	12.77	13.29	13.10	12.46	14.07	8.64	13.27	13.27	13.63	dry	14.38		14.14	Aug-24

APPENDIX III

MONITORING DATA – WATER CHEMISTRY

KMB1																		
Analyte	pH (lab)	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as Nitrogen	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Date		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	5.50	330	214	77	21.0	<5	27	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.93
1-Feb-18	5.20	340	246	90	29.0	<5	25	3.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.97
1-May-18	5.70	350	242	83	23.0	6.0	28	3.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.70
1-Aug-18	4.10	380	228	77	31.0	<5	28	2.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.07
1-Nov-18	5.20	390	226	99	44.0	-	42	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.65
1-Feb-19	5.80	400	232	32	110.0	-	15	0.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.80
1-May-19	5.90	410	238	120	16.0	-	41	7.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.56
1-Aug-19	6.00	440	257	110	24.0	-	33	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.79
1-Oct-19	4.87	430	341	93	44.0	-	36	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.17
1-Jan-20	5.10	350	274	86	28.0	<5	40	3.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.83
1-Apr-20	5.20	340	266	90	18.0	<5	48	5.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.54
1-Aug-20	4.90	330	257	77	20.0	<5	30	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Oct-20	4.20	310	241	70	29.0	<5	30	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Jan-21	4.90	330	257	73	31.0	<5	29	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-21	6.40	320	249	77	19.0	14.0	15	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Jul-21	5.00	310	241	80	21.0	<5	29	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Oct-21	6.20	310	241	80	<1	<5	32	>80	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jan-22	4.90	330	257	88	21.0	21.0	47	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Apr-22	5.20	270	208	72	13.0	13.0	47	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	4.70	250	192	61	19.0	19.0	40	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Oct-22	5.20	300	233	75	6.0	<5	46	12.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	4.50	270	208	65	11.0	<5	73	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.00	250	192	55	<1	37.0	64	>55	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.20	210	159	47	3.3	9.8	44	14.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Oct-23	5.00	270	230	69	7.8	56.0	7.6	8.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.89
1-Jan-24	5.60	260	210	59	1.1	44.0	20	53.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Apr-23	5.20	330	210	47	3.4	9.8	44	13.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Jul-24	5.10	260	240	36	5.3	4.0	20	6.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60

KMB2

Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
DATE		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	6.00	320	283	81	5.0	15.0	32	16.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.44
1-Feb-18	6.00	290	279	79	<1	22.0	41	>79	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-May-18	6.20	310	279	77	<1	18.0	28	>77	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.54
1-Aug-18	5.90	290	267	77	<1	12.0	44	>77	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.95
1-Nov-18	5.80	290	165	81	2.0	-	60	40.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.63
1-Feb-19	7.00	570	338	120	4.0	-	31	30.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.14
1-May-19	6.00	430	251	110	2.0	-	53	55.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.75
1-Aug-19	6.20	400	232	110	0.0	-	64	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.58
1-Oct-19	5.90	310	241	80	<1	-	41	>80	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.41
1-Jan-20	6.20	380	299	99	2.0	27.0	42	49.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.38
1-Apr-20	5.90	330	257	67	<1	16.0	46	>67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.07
1-Aug-20	6.00	-	-	80	7.0	21.0	31	11.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Oct-20	6.00	310	241	81	<1	14.0	30	>81	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jan-21	6.40	360	282	110	2.0	29.0	36	55.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-21	6.10	320	249	81	<1	24.0	53	>81	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-21	6.20	310	241	79	<1	20.0	68	>79	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-21	4.30	320	249	83	17.0	<5	31	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.90
1-Jan-22	6.10	340	266	91	<1	27.0	25	>91	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Apr-22	7.40	820	678	130	<1	220.0	19	>130	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	6.10	330	257	82	6.0	34.0	36	13.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-22	6.00	300	233	74	4.0	26.0	65	18.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.60	650	530	100	3.2	170.0	64	31.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.80	750	617	130	<1	72.0	58	>130	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.70	300	233	77	3.7	25.0	60	20.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Nov-23	5.70	340	320	87	0.0	87.0	36	>87	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Jan-24	5.70	340	340	85	0.0	64.0	38	>85	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-24	6.80	620	340	110	2.5	29.0	190	44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.56
1-Jul-24	7.40	380	320	70	<0.5	71.0	32	>70	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70

KMB5/5D																			
Analyte	pH	Electrical Conductivity @ 25°C	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	6.70	140	96	12	8.0	42.0	16	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.19
1-Feb-18	6.90	260	194	17	26.0	70.0	18	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.25
1-May-18	6.40	160	127	18	17.0	29.0	21	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.76
1-Aug-18	6.70	150	99	13	5.0	44.0	23	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.48
1-Nov-18	5.70	1300	813	170	13.0	-	86	13.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.35
1-Feb-19	6.50	770	466	200	9.0	-	48	22.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-May-19	5.80	580	345	180	11.0	-	61	16.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Aug-19	5.90	610	364	170	5.0	-	72	34.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Oct-19	6.50	580	469	160	4.0	-	38	40.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.42
1-Jan-20	5.70	510	409	140	26.0	25.0	100	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-20	5.70	490	392	140	29.0	17.0	74	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.67
1-Aug-20	5.60	-	-	120	44.0	20.0	48	2.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Oct-20	5.80	440	350	120	7.0	25.0	52	17.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-21	6.00	450	358	130	25.0	29.0	58	5.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Apr-21	5.90	460	367	130	12.0	13.0	68	10.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Jul-21	5.70	500	401	140	6.0	6.0	58	23.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-21	5.90	480	384	140	<5	30.0	53	>140	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.30
1-Jan-22	5.90	460	367	130	11.0	27.0	74	11.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Apr-22	6.00	470	375	130	2.0	34.0	70	65.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.70	460	367	130	29.0	18.0	56	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-22	5.60	470	375	120	35.0	12.0	63	3.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.40	530	426	140	<5	26.0	120	>140	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.40	530	426	160	<5	24.0	150	>160	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.40	550	443	160	7.3	17.0	49	21.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.21
1-Oct-23	5.80	610	550	170	3.5	95.0	45	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Jan-24	5.60	610	550	160	1.2	81.0	34	4.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Apr-24	5.70	630	500	190	3.3	54.0	31	6.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-24	6.20	640	610	26	1.0	82.0	64	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-

KMB6/6S																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	6.50	160	131	13	18.0	33.0	24	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.97
1-Feb-18	7.00	150	102	13	15.0	35.0	21	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.56
1-May-18	6.50	140	119	13	18.0	34.0	37	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Aug-18	7.10	180	133	11	8.0	63.0	9	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.68
1-Nov-18	6.50	170	93	18	12.0	-	35	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.41
1-Feb-19	7.00	210	117	19	18.0	-	25	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.93
1-May-19	6.50	170	93	27	13.0	-	41	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.61
1-Aug-19	6.70	140	76	13	14.0	-	18	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.06
1-Oct-19	6.70	130	96	12	9.0	-	22	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.28
1-Jan-20	6.80	190	143	14	20.0	59.0	27	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.02
1-Apr-20	6.40	140	103	14	17.0	30.0	25	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.16
1-Aug-20	6.60	-	-	21	23.0	31.0	18	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Oct-20	6.80	200	151	18	27.0	50.0	21	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-21	6.90	220	167	18	36.0	46.0	25	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.40
1-Apr-21	6.20	180	135	160	26.0	15.0	42	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-21	7.10	180	135	18	15.0	50.0	21	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-21	6.50	190	143	21	16.0	41.0	35	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jan-22	6.50	200	151	20	34.0	40.0	38	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-22	6.30	160	119	20	17.0	28.0	34	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	6.40	160	119	17	17.0	38.0	36	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-22	6.60	180	135	17	14.0	41.0	35	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.10	210	159	15	24.0	51.0	75	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.90	150	111	16	18.0	29.0	83	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	6.10	150	111	12	14.0	40.0	34	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.84
1-Oct-23	6.00	170	120	13	16.0	54.0	43	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.55
1-Jan-24	6.10	180	150	12	19.0	59.0	55	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.93
1-Apr-24	5.90	150	100	13	21.0	33.0	28	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.33
1-Jul-24	6.40	160	110	7.4	12.0	34.0	41	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00

KMB7																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L		mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	7.60	1300	823	180	140.0	290.0	13	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.30
1-Feb-18	7.60	1200	836	170	180.0	270.0	18	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.20
1-May-18	7.20	1400	990	160	110.0	380.0	59	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.81
1-Aug-18	7.60	1300	808	170	150.0	300.0	23	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.32
1-Nov-18	7.30	1200	747	160	160.0	-	34	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00
1-Feb-19	6.70	940	576	150	140.0	-	32	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.35
1-May-19	6.90	890	543	150	120.0	-	62	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.41
1-Aug-19	7.30	390	226	34	46.0	-	10	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.85
1-Oct-19	7.00	530	426	73	73.0	-	31	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.42
1-Jan-20	6.00	910	758	150	190.0	15.0	48	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Apr-20	7.40	1200	1017	170	180.0	190.0	19	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.69
1-Aug-20	6.60	-	-	110	53.0	31.0	16	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-20	6.80	740	608	130	120.0	47.0	20	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.61
1-Jan-21	6.50	780	643	140	130.0	31.0	26	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.40
1-Apr-21	5.70	260	200	58	22.0	7.0	33	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Jul-21	6.70	790	652	140	160.0	27.0	41	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-21	5.60	750	617	750	140.0	12.0	62	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Jan-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-22	5.60	860	713	160	180.0	<5	33	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.80	830	687	150	170.0	7.0	21	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-22	6.40	840	696	140	160.0	22.0	27	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.20	860	713	150	140.0	42.0	59	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.20	860	713	160	170.0	19.0	19	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	6.40	810	669	150	150.0	47.0	25	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.21
1-Oct-23	6.40	830	560	150	170.0	30.0	43	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.05
1-Jan-24	6.30	780	610	140	150.0	19.0	36	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.36
1-Apr-24	6.40	950	500	180	190.0	20.0	47	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-24	5.90	960	620	170	210.0	28.0	14	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40

KMB8																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	7.20	660	464	100	20.0	160.0	16	5.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.69
1-Feb-18	7.40	1100	672	240	7.0	200.0	16	34.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00
1-May-18	7.70	1100	675	180	4.0	280.0	13	45.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.20
1-Aug-18	6.90	880	526	200	7.0	120.0	23	28.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.68
1-Nov-18	6.40	950	583	250	35.0	-	68	7.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.90
1-Feb-19	7.70	1200	747	200	45.0	-	16	4.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.87
1-May-19	7.60	1200	747	240	0.0	-	16	>240	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.03
1-Aug-19	6.60	890	543	230	23.0	-	46	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Oct-19	6.40	800	661	200	34.0	-	37	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.19
1-Jan-20	6.40	840	696	220	26.0	40.0	52	8.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.53
1-Apr-20	6.30	950	793	270	21.0	38.0	43	12.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.61
1-Aug-20	6.30	-	-	230	53.0	29.0	38	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.61
1-Oct-20	6.60	420	333	90	44.0	28.0	22	2.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Jan-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Apr-21	6.00	950	793	240	59.0	16.0	57	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Jul-21	6.60	680	556	160	62.0	28.0	46	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-21	6.60	550	443	130	44.0	44.0	29	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Jan-22	6.20	910	758	250	39.0	25.0	50	6.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Apr-22	6.10	920	766	260	22.0	28.0	55	11.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.90	880	731	250	25.0	28.0	51	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-22	6.10	930	775	240	35.0	28.0	53	6.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.40	930	775	250	26.0	20.0	86	9.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.60	820	678	250	22.0	27.0	130	11.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.50	900	749	260	47.0	23.0	73	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.31
1-Oct-23	5.90	260	250	49	19.0	43.0	23	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-24	5.60	730	600	210	19.0	69.0	29	11.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.77
1-Apr-24	5.50	830	470	250	14.0	48.0	22	17.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.60
1-Jul-24	6.20	710	480	120	65.0	38.0	26	1.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90

KMB9																		
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	4.70	380	323	90	37	<5	44	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.38
1-Feb-18	5.30	310	285	86	10	<5	37	8.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.35
1-May-18	6.00	310	159	73	19	12	46	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.33
1-Aug-18	3.90	460	306	110	31	<5	58	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.02
1-Nov-18	5.30	350	201	92	24	-	58	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.80
1-Feb-19	5.70	330	189	84	9	-	48	9.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.05
1-May-19	5.90	300	171	69	14	-	44	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.35
1-Aug-19	4.40	410	238	94	41	-	51	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.33
1-Oct-19	4.30	510	409	120	56	-	53	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.33
1-Jan-20	4.90	440	350	110	27	<5	55	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.65
1-Apr-20	5.50	310	241	73	33	<5	61	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.63
1-Aug-20	4.30	-	-	84	44	<5	44	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Oct-20	3.80	640	-	130	86	<5	62	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.06
1-Jan-21	5.20	440	350	110	37	<5	36	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Apr-21	6.30	390	308	84	37	27	52	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jul-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-21	4.00	360	282	82	<5	<5	70	>82	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Jan-22	4.80	380	299	99	31	<5	73	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Apr-22	5.80	340	266	84	20	11	30	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	4.40	470	375	120	34	<5	53	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.90
1-Oct-22	4.00	580	469	130	58	<5	75	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	3.90	540	435	130	28	<5	100	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.10	350	274	85	23	8.3	88	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	4.10	350	274	76	24	<5	61	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.41
1-Oct-23	4.50	490	430	130	45	96	0	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.46
1-Jan-24	4.90	410	390	100	23	78	8	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.84
1-Apr-24	5.00	390	200	96	35	37	7	2.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Jul-24	4.00	410	400	61	27	77	5	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.10

KMB10

Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	3.70	360	329	82	63.0	<5	67	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.52
1-Feb-18	3.70	300	370	76	44.0	<5	72	1.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.70
1-May-18	5.30	190	138	60	<1	<5	42	>60	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.80
1-Aug-18	3.40	420	299	83	<1	8.0	77	>83	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.45
1-Nov-18	3.50	400	232	92	26.0	-	110	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.25
1-Feb-19	3.60	420	244	95	<1	-	83	>95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.55
1-May-19	4.80	200	111	55	9.0	-	55	6.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.56
1-Aug-19	3.30	610	364	120	92.0	-	110	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Oct-19	3.40	450	358	99	<1	-	95	>99	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Jan-20	3.60	530	426	130	81.0	<5	94	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.09
1-Apr-20	3.90	370	291	93	65.0	<5	65	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.07
1-Aug-20	3.30	-	-	140	31.0	<5	100	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.29
1-Oct-20	3.30	600	486	130	70.0	<5	90	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.41
1-Jan-21	3.40	560	452	120	9.0	<5	71	13.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Apr-21	3.70	420	333	99	<1	<5	78	>99	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Jul-21	3.20	590	478	110	35.0	<5	100	3.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Oct-21	3.40	550	443	120	1.0	<5	80	120.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.00
1-Jan-22	3.50	330	257	64	84.0	<5	93	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.80
1-Apr-22	3.60	460	367	110	98.0	<5	100	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	3.50	560	452	120	42.0	<5	120	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Oct-22	3.30	610	495	130	140.0	<5	98	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	3.10	620	504	110	20.0	<5	120	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	3.40	550	443	130	23.0	<5	130	5.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	3.20	690	564	130	23.0	<5	250	5.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.26
1-Oct-23	3.40	440	390	90	15.0	<5	120.0	6.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.23
1-Jan-24	3.50	410	400	78	16.0	<5	100.0	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.65
1-Apr-24	3.70	510	440	130	22.0	<5	90.0	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.57
1-Jul-24	3.40	620	520	98	20.0	5.00	120.0	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.80

KMB11																			
Analyte	pH	Electrical Conductivity @ 25°C	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	6.00	410	371	110	11.0	24.0	40	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Feb-18	6.10	400	364	110	12.0	27.0	35	9.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.51
1-May-18	5.90	410	309	110	10.0	25.0	66	11.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.63
1-Aug-18	5.60	390	316	110	1.0	8.0	34	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.61
1-Nov-18	5.90	400	232	110	11.0	-	50	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.56
1-Feb-19	6.00	410	238	110	14.0	-	40	7.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.38
1-May-19	5.90	410	238	110	7.0	-	51	15.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70
1-Aug-19	6.00	400	232	110	<1	-	39	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.55
1-Oct-19	5.90	390	308	110	9.0	-	36	12.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Jan-20	6.00	410	324	110	3.0	27.0	44	36.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.67
1-Apr-20	6.00	400	316	110	12.0	25.0	30	9.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.81
1-Aug-20	5.90	-	-	100	4.0	14.0	22	25.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-20	5.90	400	316	100	4.0	12.0	29	25.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Jan-21	6.30	410	324	120	7.0	28.0	39	17.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.30
1-Apr-21	6.00	420	333	110	<1	15.0	42	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jul-21	4.10	450	358	120	31.0	<5	87	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Oct-21	5.90	390	308	110	1.0	13.0	52	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jan-22	6.00	410	324	120	2.0	23.0	61	60.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Apr-22	5.80	410	324	110	7.0	15.0	54	15.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.80	410	324	110	10.0	19.0	44	11.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Oct-22	5.90	420	333	110	<1	12.0	40	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.50	420	333	110	<1	21.0	92	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.50	420	333	120	<1	23.0	94	>120	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.50	420	333	110	5.4	18.0	39	20.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.38
1-Oct-23	5.60	410	350	110	0.0	89.0	28	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Jan-24	5.60	400	360	110	0.0	62.0	27	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.66
1-Apr-24	5.60	410	320	120	0.0	38.0	22	>120	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.34
1-Jul-24	5.60	420	340	87	<0.5	68.0	22	>87	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60

KMB12																		
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	7.70	880	534	120	11.0	280.0	9	10.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.41
1-Feb-18	7.90	920	579	120	7.0	330.0	10	17.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.54
1-May-18	7.80	960	533	120	11.0	320.0	18	10.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.42
1-Aug-18	7.60	940	570	120	15.0	330.0	22	8.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.25
1-Nov-18	7.80	930	570	120	16.0	-	12	7.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.26
1-Feb-19	7.80	960	589	110	15.0	-	13	7.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.06
1-May-19	7.80	990	609	120	18.0	-	14	6.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.46
1-Aug-19	7.90	990	609	120	12.0	-	16	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.99
1-Oct-19	7.70	940	784	120	4.0	-	11	30.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.08
1-Jan-20	7.80	1000	838	120	8.0	380.0	17	15.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.26
1-Apr-20	7.80	1000	838	120	17.0	380.0	13	7.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.30
1-Aug-20	7.90	-	-	110	26.0	390.0	13	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.17
1-Oct-20	7.90	960	802	120	11.0	360.0	10	10.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.06
1-Jan-21	6.30	1000	838	120	14.0	400.0	13	8.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70
1-Apr-21	7.80	1100	927	120	27.0	360.0	21	4.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00
1-Jul-21	7.60	1500	1289	270	220.0	170.0	29	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-21	7.70	900	749	110	5.0	330.0	12	22.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Jan-22	7.80	1000	838	120	28.0	370.0	26	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.10
1-Apr-22	7.60	1100	927	120	26.0	390.0	20	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	7.60	1100	927	120	50.0	430.0	22	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	7.30	1100	927	120	26.0	400.0	45	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	7.30	1100	927	120	41.0	440.0	47	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	7.30	1100	927	100	22.0	450.0	27	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.93
1-Oct-23	7.20	960	620	110	23.0	350.0	34	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.73
1-Jan-24	7.20	1000	720	110	31.0	430.0	36	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.97
1-Apr-24	7.40	1100	720	130	50.0	430.0	21	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.24
1-Jul-24	7.40	1100	670	120	25.0	370.0	31	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60

KMB13																		
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	5.70	140	157	25	16.0	<5	19	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.47
1-Feb-18	5.80	130	164	26	13.0	6.0	21	2.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.32
1-May-18	6.20	210	128	47	3.0	17.0	30	15.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Aug-18	6.10	160	208	28	22.0	11.0	21	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.82
1-Nov-18	6.70	200	111	38	1.0	-	24	38.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Feb-19	6.60	170	93	35	0.0	-	25	>35	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-May-19	6.20	210	117	53	3.0	-	32	17.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.65
1-Aug-19	6.70	260	147	52	6.0	-	22	8.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.59
1-Oct-19	5.70	190	143	38	16.0	-	21	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.65
1-Jan-20	5.70	190	143	42	17.0	5.0	34	2.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.96
1-Apr-20	5.90	200	151	48	15.0	8.0	27	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.81
1-Aug-20	6.00	-	-	49	14.0	6.0	16	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Oct-20	6.20	240	183	55	11.0	10.0	17	5.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.68
1-Jan-21	6.30	220	167	51	18.0	10.0	26	2.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70
1-Apr-21	5.70	220	167	50	12.0	7.0	35	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Jul-21	3.50	400	316	81	46.0	<5	65	1.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Oct-21	4.80	210	159	187	9.0	<5	35	6.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.80
1-Jan-22	6.00	240	183	171	11.0	12.0	67	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Apr-22	5.90	230	175	229	7.0	10.0	39	8.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.30	240	183	196	7.0	<5	28	8.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Oct-22	6.10	240	183	54	3.0	20.0	42	18.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.40	260	200	63	3.4	13.0	73	18.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.40	250	192	68	1.1	15.0	82	61.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.60	250	192	64	12.0	12.0	22	5.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.30
1-Oct-23	5.60	280	210	69	8.3	49.0	17	8.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Jan-24	5.60	270	220	65	4.5	60.0	22	14.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.64
1-Apr-24	5.60	270	160	76	4.5	32.0	15	16.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.15
1-Jul-24	5.70	280	200	71	1.2	55.0	17	59.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.30

KMB14																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-May-18	6.80	540	308	92	55.0	73.0	21	1.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.35
1-Nov-18	6.50	360	207	72	37.0	-	41	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Feb-19	6.00	310	177	70	25.0	-	39	2.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.41
1-May-19	5.90	310	177	72	24.0	-	51	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.75
1-Aug-19	5.80	290	165	63	15.0	-	43	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.54
1-Oct-19	5.80	280	216	65	12.0	-	43	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.48
1-Jan-20	6.00	360	282	80	27.0	14.0	43	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.85
1-Apr-20	7.40	640	521	91	31.0	170.0	13	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.65
1-Aug-20	6.80	-	-	86	53.0	62.0	24	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Oct-20	5.90	280	216	63	15.0	8.0	25	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.42
1-Jan-21	6.10	290	224	69	18.0	10.0	26	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-21	5.80	260	200	61	22.0	7.0	50	2.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jul-21	5.80	320	249	69	33.0	9.0	47	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Oct-21	5.70	250	192	58	16.0	10.0	40	3.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Jan-22	5.90	270	208	61	25.0	9.0	46	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-22	5.50	270	208	62	25.0	6.0	45	2.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.40	260	200	62	16.0	6.0	45	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Oct-22	5.60	260	200	56	13.0	6.0	43	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.10	260	200	59	18.0	8.0	69	3.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.00	260	200	73	20.0	6.2	95	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.00	270	208	64	12.0	8.4	61	5.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.05
1-Oct-23	5.30	250	220	56	19.0	12.0	72	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jan-24	5.20	240	210	50	19.0	11.0	42	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.10
1-Apr-24	5.20	300	150	75	17.0	7.7	37	4.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.40
1-Jul-24	5.20	240	200	52	13.0	8.6	66	4.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20

KMB15D															
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Soluble Iron	Manganese	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	5.90	240	130	58	14	<5	8	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.48
1-Feb-18	5.70	270	152	76	16	<5	11	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.42
1-May-18	5.70	260	104	68	11	<5	24	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.17
1-Aug-18	5.50	230	114	58	13	<5	25	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Nov-18	5.80	240	135	65	12	-	18	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.35
1-Feb-19	6.20	250	141	63	5	-	25	12.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-May-19	6.20	250	141	61	6	-	38	10.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.51
1-Aug-19	5.80	250	141	60	10	-	24	6.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.56
1-Oct-19	5.40	290	224	61	38	-	30	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.27
1-Jan-20	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Apr-20	5.80	260	200	67	12	<5	20	5.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00
1-Aug-20	4.70	-	-	66	41	<5	19	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Oct-20	5.60	260	200	65	15	<5	6	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.30
1-Jan-21	5.80	280	216	76	19	<5	14	7.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-21	4.00	530	426	62	170	<5	120	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Oct-21	6.00	250	192	69	10	<5	11	6.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jan-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-22	5.90	270	208	75	11	<5	13	6.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.50	230	175	28	12	<5	38	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Oct-22	5.70	250	192	64	12	<5	13	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.00	280	216	76	9.3	<5	42	8.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.10	230	175	71	11	6.5	45	6.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.20	230	175	58	9.4	6.0	19	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.06
1-Oct-23	5.10	270	160	75	9.5	5.6	33	7.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.10
1-Jan-24	5.10	280	180	77	7.5	6.2	27	10.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Apr-24	6.00	270	130	65	7.3	22.0	31	8.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Jul-24	5.50	280	150	74	5.2	7.6	33	14.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20

KMB15S																		
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	5.30	150	91	30	16.0	<5	17	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.01
1-Feb-18	3.80	410	160	87	43.0	<5	36	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.16
1-May-18	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Aug-18	4.70	420	222	88	63.0	<5	54	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Nov-18	5.80	240	135	53	27.0	-	27	2.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Feb-19	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-May-19	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Aug-19	4.80	370	214	68	59.0	-	53	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.31
1-Oct-19	5.90	250	192	65	12.0	-	43	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.46
1-Jan-20	5.60	260	200	67	12.0	<5	27	5.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.75
1-Apr-20	5.60	260	200	66	13.0	<5	19	5.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.42
1-Aug-20	6.20	-	-	59	11.0	<5	14	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Oct-20	5.90	280	216	63	15.0	8.0	25	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.01
1-Jan-21	6.10	290	224	69	18.0	10.0	26	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-21	5.80	260	200	61	22.0	7.0	50	2.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-21	5.80	320	249	69	33.0	9.0	47	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-21	4.20	410	324	36	160.0	<5	130	0.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.10
1-Jan-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Apr-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Jul-22	5.40	260	200	68	12.0	<5	23	5.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Jan-23	3.40	680	556	86	180.0	<5	200	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	3.90	760	625	120	190.0	<5	170	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	4.00	660	538	89	220.0	<5	310	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.62
1-Oct-23	5.20	260	140	75	9.4	5.6	30	8.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.93
1-Jan-24	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Jul-24	4.40	390	290	46	100.0	5.0	98	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20

KMB16D (no data for KMB16S as bore is dry)

Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Soluble Iron	Manganese	pH (field)
Units		**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	
1-Nov-17	6.00	380	241	100	7.0	9.0	24	14.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.44
1-Feb-18	5.70	380	264	110	11.0	6.0	27	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.30
1-May-18	5.50	430	220	120	19.0	<5	38	6.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.72
1-Aug-18	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.66
1-Nov-18	6.20	410	238	120	9.0	-	0	13.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Feb-19	5.90	310	177	74	12.0	-	36	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.49
1-May-19	6.00	250	141	56	12.0	-	37	4.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Aug-19	5.70	210	117	46	7.0	-	40	6.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.65
1-Oct-19	5.80	190	143	45	2.0	-	35	22.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.72
1-Jan-20	5.90	200	151	43	8.0	10.0	44	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.75
1-Apr-20	6.10	190	143	41	<1	13.0	23	>41	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Aug-20	6.00	-	-	59	8.0	9.0	33	7.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Oct-20	6.00	180	135	41	4.0	11.0	25	10.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jan-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-21	5.90	180	135	43	6.0	7.0	21	7.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.7
1-Jan-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-22	5.80	200	151	49	<1	10	55	>49	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Oct-22	5.40	230	175	57	8.0	<5	30	7.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.30	290	224	72	4.2	9.7	67	17.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.40	330	257	110	7.6	12.0	58	14.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.30	380	299	110	7.6	13.0	40	14.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.24
1-Oct-23	5.40	350	250	98	5.3	14.0	58	18.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.11
1-Jan-24	5.50	330	260	89	5.1	15.0	41	17.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.39
1-Apr-24	5.20	370	230	100	12.0	9.1	40	8.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jul-24	5.80	500	340	140	2.3	20.0	50	60.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50

KMB17S															
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Soluble Iron	Manganese	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	7.10	400	281	42	<1	120.0	16	>42	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.55
1-Feb-18	7.10	287	310	37	<1	88.0	13	>37	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.42
1-May-18	6.10	260	332	44	66.0	18.0	28	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.11
1-Aug-18	7.10	230	140	26	<1	68.0	16	>26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.85
1-Nov-18	6.80	320	183	44	12.0	-	46	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.19
1-Feb-19	7.00	330	189	44	7.0	-	21	6.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.08
1-May-19	6.80	290	165	73	7.0	-	33	10.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.13
1-Aug-19	6.70	320	183	45	42.0	-	21	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.29
1-Oct-19	6.90	290	224	38	17.0	-	22	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.29
1-Jan-20	7.00	340	266	39	49.0	76.0	29	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.13
1-Apr-20	6.20	390	308	60	88.0	49.0	57	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.99
1-Aug-20	7.00	-	-	59	66.0	46.0	10	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.31
1-Oct-20	6.90	280	216	37	8.0	62.0	15	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.40
1-Jan-21	7.10	350	274	50	46.0	58.0	18	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Apr-21	6.30	380	299	51	90.0	18.0	24	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-21	6.70	210	159	30	11.0	35.0	21	2.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-21	6.80	280	216	43	<1	67.0	18	>43	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Jan-22	6.90	300	233	39	10.0	89.0	36	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.90
1-Apr-22	6.70	320	249	50	8.0	83.0	48	6.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	6.70	250	192	38	30.0	44.0	13	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-22	6.80	310	241	39	8.0	74.0	29	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.40	340	266	38	26.0	91.0	60	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.20	340	266	51	48.0	63.0	46	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	6.40	250	192	24	19.0	66.0	21	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.22
1-Oct-23	6.40	260	230	24	15.0	90.0	48	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-24	6.50	310	330	27	19.0	98.0	31	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.19
1-Apr-24	6.50	360	330	34	14.0	110.0	44	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Jul-24	6.50	260	250	18	19.0	63.0	23	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20

KMB19S															
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Soluble Iron	Manganese	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	3.90	240	246	44	40.0	<5	69	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.77
1-Feb-18	3.70	230	340	60	71.0	<5	71	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.78
1-May-18	3.70	300	469	69	49.0	<5	110	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.94
1-Aug-18	3.60	320	288	66	55.0	<5	65	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.72
1-Nov-18	3.60	320	183	69	75.0	-	65	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Feb-19	3.80	350	201	76	82.0	-	90	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.75
1-May-19	4.20	290	165	73	7.0	-	64	10.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.25
1-Aug-19	3.50	420	244	81	77.0	-	78	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Oct-19	3.40	410	324	83	61.0	-	76	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.81
1-Jan-20	3.60	520	418	120	86.0	<5	120	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Apr-20	4.20	290	224	73	9.0	<5	60	8.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.70
1-Aug-20	3.30	-	-	120	90.0	<5	81	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Oct-20	3.50	470	375	100	76.0	<5	75	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.00
1-Jan-21	3.50	600	486	140	2.0	<5	110	70.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.10
1-Apr-21	3.90	450	358	110	12.0	78.0	390	9.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Jul-21	3.50	390	308	78	37.0	<5	65	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.00
1-Oct-21	3.90	270	208	62	34.0	<5	49	1.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.30
1-Jan-22	3.60	360	282	92	48.0	<5	120	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.00
1-Apr-22	4.10	250	192	62	12.0	<5	58	5.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	3.40	620	504	130	35.0	<5	89	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.00
1-Oct-22	3.90	260	200	54	41.0	<5	54	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	3.60	310	241	62	7.0	<5	130	8.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	4.00	290	224	83	8.0	<5	140	10.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	3.40	460	367	84	18.0	<5	66	4.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.34
1-Oct-23	4.00	180	240	33	6.4	0.0	78	5.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.73
1-Jan-24	3.80	210	350	39	4.5	0.0	88	8.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.70
1-Apr-24	5.00	320	220	88	4.4	8.8	71	20.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.09
1-Aug-24	3.50	340	400	34	13.0	<0.5	80	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.80

APPENDIX IV

LABORATORY CERTIFICATES

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
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16-18 Hayden Court Myaree WA 6154
ph +61 8 9317 2505 fax +61 8 9317 4163
lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PEJ1782

Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Chantelle Cawdell
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly/Quarterly Water Analysis
Number of Samples	25 Liquid
Date Samples Received	26/10/2023
Date Instructions Received	26/10/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	02/11/2023
Date of Issue	02/11/2023

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Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Heram Halim, Operations Manager
Laboratory Manager	Michael Kubiak

Certificate of Analysis PEJ1782

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PEJ1782-01	ROM O/F	Liquid	25/10/2023	26/10/2023
PEJ1782-02	TAILS	Liquid	25/10/2023	26/10/2023
PEJ1782-03	KMB 1	Liquid	25/10/2023	26/10/2023
PEJ1782-04	KMB 2	Liquid	25/10/2023	26/10/2023
PEJ1782-05	KMB 5D	Liquid	25/10/2023	26/10/2023
PEJ1782-06	KMB 6S	Liquid	25/10/2023	26/10/2023
PEJ1782-07	KMB 7	Liquid	25/10/2023	26/10/2023
PEJ1782-08	KMB 8	Liquid	25/10/2023	26/10/2023
PEJ1782-09	KMB 9	Liquid	25/10/2023	26/10/2023
PEJ1782-10	KMB 10	Liquid	25/10/2023	26/10/2023
PEJ1782-11	KMB 11	Liquid	25/10/2023	26/10/2023
PEJ1782-12	KMB 12	Liquid	25/10/2023	26/10/2023
PEJ1782-13	KMB 13	Liquid	25/10/2023	26/10/2023
PEJ1782-14	KMB 14	Liquid	25/10/2023	26/10/2023
PEJ1782-15	KMB 15D	Liquid	25/10/2023	26/10/2023
PEJ1782-16	KMB 15S	Liquid	25/10/2023	26/10/2023
PEJ1782-17	KMB 16D	Liquid	25/10/2023	26/10/2023
PEJ1782-18	KMB 17	Liquid	25/10/2023	26/10/2023
PEJ1782-19	KMB 19	Liquid	25/10/2023	26/10/2023
PEJ1782-20	LAKE 1	Liquid	25/10/2023	26/10/2023
PEJ1782-21	LAKE 2	Liquid	25/10/2023	26/10/2023
PEJ1782-22	LAKE 3	Liquid	25/10/2023	26/10/2023
PEJ1782-23	LAKE 4	Liquid	25/10/2023	26/10/2023
PEJ1782-24	DREDGE	Liquid	25/10/2023	26/10/2023
PEJ1782-25	WL5	Liquid	25/10/2023	26/10/2023

Certificate of Analysis PEJ1782

Inorganics - Physical Parameters (Liquid)

Envirolab ID	Units	PQL	PEJ1782-01	PEJ1782-02	PEJ1782-03	PEJ1782-04	PEJ1782-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
pH	pH units		5.5	7.5	5.0	5.7	5.8
Electrical Conductivity	µS/cm	2.0	1400	1400	270	340	610
Total Dissolved Solids	mg/L	5.0	940	1000	230 [1]	320 [1]	550 [1]

Envirolab ID	Units	PQL	PEJ1782-06	PEJ1782-07	PEJ1782-08	PEJ1782-09	PEJ1782-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
pH	pH units		6.0	6.4	5.9	4.5	3.4
Electrical Conductivity	µS/cm	2.0	170	830	260	490	440
Total Dissolved Solids	mg/L	5.0	120	560	250 [1]	430 [1]	390 [1]

Envirolab ID	Units	PQL	PEJ1782-11	PEJ1782-12	PEJ1782-13	PEJ1782-14	PEJ1782-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
pH	pH units		5.6	7.2	5.6	5.3	5.1
Electrical Conductivity	µS/cm	2.0	410	960	280	250	270
Total Dissolved Solids	mg/L	5.0	350 [1]	620	210	220 [1]	160

Envirolab ID	Units	PQL	PEJ1782-16	PEJ1782-17	PEJ1782-18	PEJ1782-19	PEJ1782-20
Your Reference			KMB 15S	KMB 16D	KMB 17	KMB 19	LAKE 1
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
pH	pH units		5.2	5.4	6.4	4.0	8.5
Electrical Conductivity	µS/cm	2.0	260	350	260	180	1400
Total Dissolved Solids	mg/L	5.0	140	250	230 [1]	240 [1]	930

Envirolab ID	Units	PQL	PEJ1782-21	PEJ1782-22	PEJ1782-23	PEJ1782-24	PEJ1782-25
Your Reference			LAKE 2	LAKE 3	LAKE 4	DREDGE	WL5
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
pH	pH units		8.1	7.7	7.5	7.6	5.4
Electrical Conductivity	µS/cm	2.0	1700	2000	1600	1500	920
Total Dissolved Solids	mg/L	5.0	1100	1400	1100	1000	780 [1]

Certificate of Analysis PEJ1782

Inorganics - Ionic Balance and Indexes (Liquid)

Envirolab ID	Units	PQL	PEJ1782-01	PEJ1782-02	PEJ1782-03	PEJ1782-04	PEJ1782-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	6.7	55	7.7	36	45
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	6.7	55	7.7	36	45
Chloride	mg/L	1.0	200	210	69	87	170
Sulfate	mg/L	1.0	420	410	7.8	<1.0	3.5

Envirolab ID	Units	PQL	PEJ1782-06	PEJ1782-07	PEJ1782-08	PEJ1782-09	PEJ1782-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	43	43	23	<5.0	<5.0
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	43	43	23	<5.0	<5.0
Chloride	mg/L	1.0	13	150	49	130	90
Sulfate	mg/L	1.0	16	170	19	45	15

Envirolab ID	Units	PQL	PEJ1782-11	PEJ1782-12	PEJ1782-13	PEJ1782-14	PEJ1782-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	28	350	17	12	5.6
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	28	350	17	12	5.6
Chloride	mg/L	1.0	110	110	69	56	75
Sulfate	mg/L	1.0	<1.0	23	8.3	19	9.5

Envirolab ID	Units	PQL	PEJ1782-16	PEJ1782-17	PEJ1782-18	PEJ1782-19	PEJ1782-20
Your Reference			KMB 15S	KMB 16D	KMB 17	KMB 19	LAKE 1
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	5.6	14	90	<5.0	230
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	22
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	5.6	14	90	<5.0	250
Chloride	mg/L	1.0	75	98	24	33	240
Sulfate	mg/L	1.0	9.4	5.3	15	6.4	180

Envirolab ID	Units	PQL	PEJ1782-21	PEJ1782-22	PEJ1782-23	PEJ1782-24	PEJ1782-25
Your Reference			LAKE 2	LAKE 3	LAKE 4	DREDGE	WL5
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	110	72	54	56	15
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	110	72	54	56	15
Chloride	mg/L	1.0	280	340	270	210	250
Sulfate	mg/L	1.0	390	500	400	410	24

Certificate of Analysis PEJ1782

Inorganics - Miscellaneous and Common Anions (Liquid)

Envirolab ID	Units	PQL	PEJ1782-01	PEJ1782-02	PEJ1782-03	PEJ1782-04	PEJ1782-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Acidity	mg/L	5.0	16	6.1	56	87	95

Envirolab ID	Units	PQL	PEJ1782-06	PEJ1782-07	PEJ1782-08	PEJ1782-09	PEJ1782-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Acidity	mg/L	5.0	54	30	43	96	120

Envirolab ID	Units	PQL	PEJ1782-11	PEJ1782-12	PEJ1782-13	PEJ1782-14	PEJ1782-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Acidity	mg/L	5.0	89	34	49	72	33

Envirolab ID	Units	PQL	PEJ1782-16	PEJ1782-17	PEJ1782-18	PEJ1782-19	PEJ1782-20
Your Reference			KMB 15S	KMB 16D	KMB 17	KMB 19	LAKE 1
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Acidity	mg/L	5.0	30	58	48	78	<5.0

Envirolab ID	Units	PQL	PEJ1782-21	PEJ1782-22	PEJ1782-23	PEJ1782-24	PEJ1782-25
Your Reference			LAKE 2	LAKE 3	LAKE 4	DREDGE	WL5
Date Sampled			25/10/2023	25/10/2023	25/10/2023	25/10/2023	25/10/2023
Acidity	mg/L	5.0	<5.0	5.5	5.7	5.4	30

Result Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode based on APHA latest edition, Method 4500-H+. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the APHA recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C based on APHA latest edition Method 2510. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PEJ1782

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly/Quarterly Water Analysis
Date Issued	02/11/2023

Recommended Holding Time Compliance

Recommended holding time exceedances exist - See detailed list below

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PEJ1782

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-25	25/10/2023	27/10/2023	27/10/2023	Yes
pH | Water	1-25	25/10/2023	27/10/2023	27/10/2023	No
TDS | Water	1-25	25/10/2023	30/10/2023	30/10/2023	Yes
Alkalinity Suite | Water	1-25	25/10/2023	27/10/2023	27/10/2023	Yes
Chloride | Water	1-25	25/10/2023	27/10/2023	30/10/2023	Yes
Sulfate | Water	1-25	25/10/2023	27/10/2023	30/10/2023	Yes
Acidity | Water	1-25	25/10/2023	27/10/2023	27/10/2023	Yes

Quality Control PEJ1782

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BEJ3084

Analyte	Units	PQL	Blank	DUP1 BEJ3084-DUP1# Samp | QC | RPD %	DUP2 PEJ1782-10 Samp | QC | RPD %	LCS %
pH	pH units		5.8	7.0 | 7.0 | 0.286	3.4 | 3.4 | 0.294	102
Electrical Conductivity	µS/cm	2.0	<2.0	233 | 230 | 1.34	443 | 444 | 0.158	94.5

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BEJ3085

Analyte	Units	PQL	Blank	DUP1 BEJ3085-DUP1# Samp | QC | RPD %	DUP2 PEJ1782-22 Samp | QC | RPD %	LCS %
pH	pH units		5.1	7.7 | 7.7 | 0.260	7.7 | 7.7 | 0.129	101
Electrical Conductivity	µS/cm	2.0	<2.0	528 | 532 | 0.660	1970 | 1970 | 0.254	104

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BEJ3258

Analyte	Units	PQL	Blank	DUP1 BEJ3258-DUP1# Samp | QC | RPD %	DUP2 PEJ1782-03 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	104 | 101 | 2.93	232 | 234 | 0.858 [1]	96.2

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BEJ3394

Analyte	Units	PQL	Blank	DUP1 PEJ1782-08 Samp | QC | RPD %	DUP2 PEJ1782-17 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	246 | 241 | 2.05 [1]	251 | 253 | 0.794	101

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BEJ3084

Analyte	Units	PQL	Blank	DUP1 BEJ3084-DUP1# Samp | QC | RPD %	DUP2 PEJ1782-10 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	42.2 | 41.4 | 1.84	<5.0 | <5.0 | [NA]	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	42.2 | 41.4 | 1.84	<5.0 | <5.0 | [NA]	[NA]

Analyte	Units	PQL	Blank	LCS %
Total Alkalinity as CaCO3	mg/L as CaCO3	5		102

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BEJ3085

Analyte	Units	PQL	Blank	DUP1 BEJ3085-DUP1# Samp | QC | RPD %	DUP2 PEJ1782-22 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	53.5 | 54.9 | 2.58	72.0 | 71.3 | 0.977	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	53.5 | 54.9 | 2.58	72.0 | 71.3 | 0.977	[NA]

Analyte	Units	PQL	Blank	LCS %
Total Alkalinity as CaCO3	mg/L as CaCO3	5		98.7

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

Quality Control PEJ1782

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BEJ3211

Analyte	Units	PQL	Blank	DUP1 PEJ1782-01 Samp | QC | RPD %	DUP2 PEJ1782-11 Samp | QC | RPD %	LCS %	Spike % PEJ1782-02
Chloride	mg/L	1.0	<1.0	202 | 201 | 0.0265	113 | 113 | 0.107	95.4	95.0
Sulfate	mg/L	1.0	<1.0	417 | 419 | 0.338	<1.0 | <1.0 | [NA]	98.6	90.5

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BEJ3212

Analyte	Units	PQL	Blank	DUP1 BEJ3212-DUP1# Samp | QC | RPD %	DUP2 PEJ1782-23 Samp | QC | RPD %	LCS %	Spike % BEJ3212-MS1#
Chloride	mg/L	1.0	<1.0	92200 | 92300 | 0.0291	265 | 265 | 0.0149	94.2	98.8
Sulfate	mg/L	1.0	<1.0	16800 | 16800 | 0.186	401 | 401 | 0.0432	97.6	116

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BEJ3081

Analyte	Units	PQL	Blank	DUP1 BEJ3081-DUP1# Samp | QC | RPD %	DUP2 PEJ1782-10 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	7.32 | 6.34 | 14.3	120 | 110 | 8.67	97.1

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BEJ3082

Analyte	Units	PQL	Blank	DUP1 PEJ1782-20 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	99.8

QC Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
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ph +61 8 9317 2505
lab@mpl.com.au
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Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Chantelle Cawdell
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Number of Samples	23 Water
Date Samples Received	05/01/2024
Date Instructions Received	05/01/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	12/01/2024
Date of Issue	11/01/2024

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Heram Halim, Operations Manager Lien Tang, Assistant Operations Manager
Laboratory Manager	Michael Kubiak

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Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PFA0187-01	ROM O/F	Water	04/01/2024	05/01/2024
PFA0187-02	TAILS	Water	04/01/2024	05/01/2024
PFA0187-03	KMB 1	Water	04/01/2024	05/01/2024
PFA0187-04	KMB 2	Water	04/01/2024	05/01/2024
PFA0187-05	KMB 5D	Water	04/01/2024	05/01/2024
PFA0187-06	KMB 6S	Water	04/01/2024	05/01/2024
PFA0187-07	KMB 7	Water	04/01/2024	05/01/2024
PFA0187-08	KMB 8	Water	04/01/2024	05/01/2024
PFA0187-09	KMB 9	Water	04/01/2024	05/01/2024
PFA0187-10	KMB 10	Water	04/01/2024	05/01/2024
PFA0187-11	KMB 11	Water	04/01/2024	05/01/2024
PFA0187-12	KMB 12	Water	04/01/2024	05/01/2024
PFA0187-13	KMB 13	Water	04/01/2024	05/01/2024
PFA0187-14	KMB 14	Water	04/01/2024	05/01/2024
PFA0187-15	KMB 15D	Water	04/01/2024	05/01/2024
PFA0187-16	KMB 16D	Water	04/01/2024	05/01/2024
PFA0187-17	KMB 17	Water	04/01/2024	05/01/2024
PFA0187-18	KMB 19	Water	04/01/2024	05/01/2024
PFA0187-19	LAKE 1	Water	04/01/2024	05/01/2024
PFA0187-20	LAKE 2	Water	04/01/2024	05/01/2024
PFA0187-21	LAKE 3	Water	04/01/2024	05/01/2024
PFA0187-22	LAKE 4	Water	04/01/2024	05/01/2024
PFA0187-23	DREDGE	Water	04/01/2024	05/01/2024

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Inorganics - Physical Parameters (Water)

Envirolab ID	Units	PQL	PFA0187-01	PFA0187-02	PFA0187-03	PFA0187-04	PFA0187-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		7.6	7.6	5.6	5.7	5.6
Electrical Conductivity	µS/cm	2.0	1400	1400	260	340	610
Total Dissolved Solids	mg/L	5.0	1100	1100 [2]	210	340 [1]	550

Envirolab ID	Units	PQL	PFA0187-06	PFA0187-07	PFA0187-08	PFA0187-09	PFA0187-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		6.1	6.3	5.6	4.9	3.5
Electrical Conductivity	µS/cm	2.0	180	780	730	410	410
Total Dissolved Solids	mg/L	5.0	150	610	600	390	400 [3]

Envirolab ID	Units	PQL	PFA0187-11	PFA0187-12	PFA0187-13	PFA0187-14	PFA0187-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		5.6	7.2	5.6	5.2	5.1
Electrical Conductivity	µS/cm	2.0	400	1000	270	240	280
Total Dissolved Solids	mg/L	5.0	360	720	220	210 [1]	180

Envirolab ID	Units	PQL	PFA0187-16	PFA0187-17	PFA0187-18	PFA0187-19	PFA0187-20
Your Reference			KMB 16D	KMB 17	KMB 19	LAKE 1	LAKE 2
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		5.5	6.5	3.8	8.7	8.2
Electrical Conductivity	µS/cm	2.0	330	310	210	1400	1700
Total Dissolved Solids	mg/L	5.0	260	330 [3]	350 [3]	1100	1300

Envirolab ID	Units	PQL	PFA0187-21	PFA0187-22	PFA0187-23
Your Reference			LAKE 3	LAKE 4	DREDGE
Date Sampled			04/01/2024	04/01/2024	04/01/2024
pH	pH units		7.8	7.6	7.7
Electrical Conductivity	µS/cm	2.0	2100	1800	1600
Total Dissolved Solids	mg/L	5.0	1500	1200	1200

Certificate of Analysis PFA0187

Inorganics - Ionic Balance and Indexes (Water)

Envirolab ID	Units	PQL	PFA0187-01	PFA0187-02	PFA0187-03	PFA0187-04	PFA0187-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	47	62	20	38	34
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	47	62	20	38	34
Chloride	mg/L	1.0	200	210	59	85	160
Sulfate	mg/L	1.0	430	410	1.1	<1.0	1.2

Envirolab ID	Units	PQL	PFA0187-06	PFA0187-07	PFA0187-08	PFA0187-09	PFA0187-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	55	36	29	7.6	<5.0
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	55	36	29	7.6	<5.0
Chloride	mg/L	1.0	12	140	210	100	78
Sulfate	mg/L	1.0	19	150	19	23	16

Envirolab ID	Units	PQL	PFA0187-11	PFA0187-12	PFA0187-13	PFA0187-14	PFA0187-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	27	430	22	11	6.2
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	27	430	22	11	6.2
Chloride	mg/L	1.0	110	110	65	50	77
Sulfate	mg/L	1.0	<1.0	31	4.5	19	7.5

Envirolab ID	Units	PQL	PFA0187-16	PFA0187-17	PFA0187-18	PFA0187-19	PFA0187-20
Your Reference			KMB 16D	KMB 17	KMB 19	LAKE 1	LAKE 2
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	15	98	<5.0	250	130
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	27	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	15	98	<5.0	280	130
Chloride	mg/L	1.0	89	27	39	260	290
Sulfate	mg/L	1.0	5.1	19	4.5	190	390

Envirolab ID	Units	PQL	PFA0187-21	PFA0187-22	PFA0187-23
Your Reference			LAKE 3	LAKE 4	DREDGE
Date Sampled			04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	78	61	63
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	78	61	63
Chloride	mg/L	1.0	340	270	210
Sulfate	mg/L	1.0	490	410	430

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Inorganics - Miscellaneous and Common Anions (Water)

Envirolab ID	Units	PQL	PFA0187-01	PFA0187-02	PFA0187-03	PFA0187-04	PFA0187-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	<5.0	<5.0	44	64	81

Envirolab ID	Units	PQL	PFA0187-06	PFA0187-07	PFA0187-08	PFA0187-09	PFA0187-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	59	19	69	78	100

Envirolab ID	Units	PQL	PFA0187-11	PFA0187-12	PFA0187-13	PFA0187-14	PFA0187-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	62	36	60	42	27

Envirolab ID	Units	PQL	PFA0187-16	PFA0187-17	PFA0187-18	PFA0187-19	PFA0187-20
Your Reference			KMB 16D	KMB 17	KMB 19	LAKE 1	LAKE 2
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	41	31	88	<5.0	<5.0

Envirolab ID	Units	PQL	PFA0187-21	PFA0187-22	PFA0187-23
Your Reference			LAKE 3	LAKE 4	DREDGE
Date Sampled			04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	<5.0	<5.0	<5.0

Result Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.
[2]	Some EC to TDS ratios are outside normal expected values. Note that some solid material appears to have passed through the glass fibre filter paper(s).
[3]	EC to TDS ratio is outside a normal expected value due to sample matrix - sample is dark brown coloured.

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode based on APHA latest edition, Method 4500-H+. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the APHA recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C based on APHA latest edition Method 2510. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PFA0187

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Date Issued	11/01/2024

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PFA0187

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes
pH | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes
TDS | Water	1-23	04/01/2024	08/01/2024	08/01/2024	Yes
Alkalinity Suite | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes
Chloride | Water	1-4	04/01/2024	05/01/2024	08/01/2024	Yes
	5-20	04/01/2024	05/01/2024	09/01/2024	Yes
	21-23	04/01/2024	09/01/2024	10/01/2024	Yes
Sulfate | Water	1-4	04/01/2024	05/01/2024	08/01/2024	Yes
	5-20	04/01/2024	05/01/2024	09/01/2024	Yes
	21-23	04/01/2024	09/01/2024	10/01/2024	Yes
Acidity | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes

Quality Control PFA0187

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BFA0470

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %
pH	pH units		5.6	7.6 | 7.6 | 0.132	5.6 | 5.6 | 0.00	[NA]
Electrical Conductivity	µS/cm	2.0	<2.0	1380 | 1400 | 1.42	398 | 396 | 0.403	[NA]

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BFA0473

Analyte	Units	PQL	Blank	DUP1 PFA0187-21 Samp | QC | RPD %	DUP2 BFA0473-DUP2# Samp | QC | RPD %	LCS %
pH	pH units		5.5	7.8 | 7.9 | 0.127	7.4 | 7.4 | 0.00	101
Electrical Conductivity	µS/cm	2.0	<2.0	2110 | 2110 | 0.142	1520 | 1520 | 0.0526	108

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFA0523

Analyte	Units	PQL	Blank	DUP1 BFA0523-DUP1# Samp | QC | RPD %	DUP2 BFA0523-DUP2# Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	120 | 125 | 4.08	219 | 220 | 0.456	114

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFA0524

Analyte	Units	PQL	Blank	DUP1 PFA0187-04 Samp | QC | RPD %	DUP2 PFA0187-14 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	342 | 341 | 0.293 [1]	213 | 214 | 0.468 [1]	113

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0414

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %	Spike % PFA0187-02
Chloride	mg/L	1.0	<1.0	200 | 200 | 0.135	106 | 106 | 0.0153	89.6	109
Sulfate	mg/L	1.0	<1.0	427 | 428 | 0.118	<1.0 | <1.0 | [NA]	86.1	96.5

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0470

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	47.4 | 47.1 | 0.741	26.9 | 26.4 | 1.91	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	47.4 | 47.1 | 0.727	26.9 | 26.4 | 1.94	95.5

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0473

Analyte	Units	PQL	Blank	DUP1 PFA0187-21 Samp | QC | RPD %	DUP2 BFA0473-DUP2# Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	78.1 | 84.2 | 7.52	401 | 401 | 0.00	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	78.1 | 84.2 | 7.52	401 | 401 | 0.00	[NA]

Analyte	Units	PQL	Blank	LCS %
Total Alkalinity as CaCO3	mg/L as CaCO3	5		104

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

Quality Control PFA0187

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0580

Analyte	Units	PQL	Blank	DUP1 BFA0580-DUP1# Samp | QC | RPD %	DUP2 BFA0580-DUP2# Samp | QC | RPD %	LCS %	Spike % BFA0580-MS1#
Chloride	mg/L	1.0	<1.0	89.8 | 89.5 | 0.376	<1.0 | <1.0 | [NA]	89.6	98.9
Sulfate	mg/L	1.0	<1.0	11.5 | 11.6 | 0.847	<1.0 | <1.0 | [NA]	88.4	98.9

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BFA0474

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	62.5 | 55.3 | 12.2	111

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BFA0475

Analyte	Units	PQL	Blank	DUP1 PFA0187-21 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	100

QC Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.

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Certificate of Analysis PFD1286

Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Chantelle Cawdell
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Number of Samples	22 Water
Date Samples Received	18/04/2024
Date Instructions Received	18/04/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	26/04/2024
Date of Issue	26/04/2024

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Authorisation Details

Results Approved By	Heram Halim, Operations Manager
Laboratory Manager	Michael Kubiak

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PFD1286-01	ROM O/F	Water	18/04/2024	18/04/2024
PFD1286-02	TAILS	Water	18/04/2024	18/04/2024
PFD1286-03	KMB 2	Water	18/04/2024	18/04/2024
PFD1286-04	KMB 5D	Water	18/04/2024	18/04/2024
PFD1286-05	KMB 6S	Water	18/04/2024	18/04/2024
PFD1286-06	KMB 7	Water	18/04/2024	18/04/2024
PFD1286-07	KMB 8	Water	18/04/2024	18/04/2024
PFD1286-08	KMB 9	Water	18/04/2024	18/04/2024
PFD1286-09	KMB 10	Water	18/04/2024	18/04/2024
PFD1286-10	KMB 11	Water	18/04/2024	18/04/2024
PFD1286-11	KMB 12	Water	18/04/2024	18/04/2024
PFD1286-12	KMB 13	Water	18/04/2024	18/04/2024
PFD1286-13	KMB 14	Water	18/04/2024	18/04/2024
PFD1286-14	KMB 15D	Water	18/04/2024	18/04/2024
PFD1286-15	KMB 16D	Water	18/04/2024	18/04/2024
PFD1286-16	KMB 17	Water	18/04/2024	18/04/2024
PFD1286-17	KMB 19	Water	18/04/2024	18/04/2024
PFD1286-18	LAKE 1	Water	18/04/2024	18/04/2024
PFD1286-19	LAKE 2	Water	18/04/2024	18/04/2024
PFD1286-20	LAKE 3	Water	18/04/2024	18/04/2024
PFD1286-21	LAKE 4	Water	18/04/2024	18/04/2024
PFD1286-22	DREDGE	Water	18/04/2024	18/04/2024

Certificate of Analysis PFD1286

Inorganics - Physical Parameters (Water)

Envirolab ID	Units	PQL	PFD1286-01	PFD1286-02	PFD1286-03	PFD1286-04	PFD1286-05
Your Reference			ROM O/F	TAILS	KMB 2	KMB 5D	KMB 6S
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
pH	pH units		5.3	7.4	6.8	5.7	5.9
Electrical Conductivity	µS/cm	2.0	1500	1500	620	630	150
Total Dissolved Solids	mg/L	5.0	990	940	340	500	100

Envirolab ID	Units	PQL	PFD1286-06	PFD1286-07	PFD1286-08	PFD1286-09	PFD1286-10
Your Reference			KMB 7	KMB 8	KMB 9	KMB 10	KMB 11
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
pH	pH units		6.4	5.5	5.0	3.7	5.6
Electrical Conductivity	µS/cm	2.0	950	830	390	510	410
Total Dissolved Solids	mg/L	5.0	540	470	200	440 [1]	320

Envirolab ID	Units	PQL	PFD1286-11	PFD1286-12	PFD1286-13	PFD1286-14	PFD1286-15
Your Reference			KMB 12	KMB 13	KMB 14	KMB 15D	KMB 16D
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
pH	pH units		7.4	5.6	5.2	6.0	5.2
Electrical Conductivity	µS/cm	2.0	1100	270	300	270	370
Total Dissolved Solids	mg/L	5.0	720	160	150	130	230

Envirolab ID	Units	PQL	PFD1286-16	PFD1286-17	PFD1286-18	PFD1286-19	PFD1286-20
Your Reference			KMB 17	KMB 19	LAKE 1	LAKE 2	LAKE 3
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
pH	pH units		6.5	5.0	8.6	8.1	7.8
Electrical Conductivity	µS/cm	2.0	360	320	1900	2100	2400
Total Dissolved Solids	mg/L	5.0	330 [1]	220	1100	1300	1500

Envirolab ID	Units	PQL	PFD1286-21	PFD1286-22
Your Reference			LAKE 4	DREDGE
Date Sampled			18/04/2024	18/04/2024
pH	pH units		7.7	7.6
Electrical Conductivity	µS/cm	2.0	1900	1700
Total Dissolved Solids	mg/L	5.0	1200	1200

Certificate of Analysis PFD1286

Inorganics - Ionic Balance and Indexes (Water)

Envirolab ID	Units	PQL	PFD1286-01	PFD1286-02	PFD1286-03	PFD1286-04	PFD1286-05
Your Reference			ROM O/F	TAILS	KMB 2	KMB 5D	KMB 6S
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	7.7	63	190	31	28
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	7.7	63	190	31	28
Chloride	mg/L	1.0	240	240	110	190	13
Sulfate	mg/L	1.0	470	420	2.5	3.3	21

Envirolab ID	Units	PQL	PFD1286-06	PFD1286-07	PFD1286-08	PFD1286-09	PFD1286-10
Your Reference			KMB 7	KMB 8	KMB 9	KMB 10	KMB 11
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	47	22	6.8	<5.0	22
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	47	22	6.8	<5.0	22
Chloride	mg/L	1.0	180	250	96	130	120
Sulfate	mg/L	1.0	190	14	35	22	<1.0

Envirolab ID	Units	PQL	PFD1286-11	PFD1286-12	PFD1286-13	PFD1286-14	PFD1286-15
Your Reference			KMB 12	KMB 13	KMB 14	KMB 15D	KMB 16D
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	430	15	7.7	22	9.1
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	430	15	7.7	22	9.1
Chloride	mg/L	1.0	130	76	75	65	100
Sulfate	mg/L	1.0	50	4.5	17	7.3	12

Envirolab ID	Units	PQL	PFD1286-16	PFD1286-17	PFD1286-18	PFD1286-19	PFD1286-20
Your Reference			KMB 17	KMB 19	LAKE 1	LAKE 2	LAKE 3
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	110	8.8	280	140	86
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	30	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	110	8.8	310	140	86
Chloride	mg/L	1.0	34	88	340	350	390
Sulfate	mg/L	1.0	14	4.4	220	440	530

Envirolab ID	Units	PQL	PFD1286-21	PFD1286-22
Your Reference			LAKE 4	DREDGE
Date Sampled			18/04/2024	18/04/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	71	71
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	71	71
Chloride	mg/L	1.0	300	230
Sulfate	mg/L	1.0	440	450

Certificate of Analysis PFD1286

Inorganics - Miscellaneous and Common Anions (Water)

Envirolab ID	Units	PQL	PFD1286-01	PFD1286-02	PFD1286-03	PFD1286-04	PFD1286-05
Your Reference			ROM O/F	TAILS	KMB 2	KMB 5D	KMB 6S
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Acidity	mg/L	5.0	6.8	22	29	54	33

Envirolab ID	Units	PQL	PFD1286-06	PFD1286-07	PFD1286-08	PFD1286-09	PFD1286-10
Your Reference			KMB 7	KMB 8	KMB 9	KMB 10	KMB 11
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Acidity	mg/L	5.0	20	48	37	90	38

Envirolab ID	Units	PQL	PFD1286-11	PFD1286-12	PFD1286-13	PFD1286-14	PFD1286-15
Your Reference			KMB 12	KMB 13	KMB 14	KMB 15D	KMB 16D
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Acidity	mg/L	5.0	21	32	37	31	40

Envirolab ID	Units	PQL	PFD1286-16	PFD1286-17	PFD1286-18	PFD1286-19	PFD1286-20
Your Reference			KMB 17	KMB 19	LAKE 1	LAKE 2	LAKE 3
Date Sampled			18/04/2024	18/04/2024	18/04/2024	18/04/2024	18/04/2024
Acidity	mg/L	5.0	44	71	<5.0	<5.0	<5.0

Envirolab ID	Units	PQL	PFD1286-21	PFD1286-22
Your Reference			LAKE 4	DREDGE
Date Sampled			18/04/2024	18/04/2024
Acidity	mg/L	5.0	<5.0	<5.0

Result Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PFD1286

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Date Issued	26/04/2024

Recommended Holding Time Compliance

Recommended holding time exceedances exist - See detailed list below

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PFD1286

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-22	18/04/2024	22/04/2024	22/04/2024	Yes
pH | Water	1-22	18/04/2024	22/04/2024	22/04/2024	No
TDS | Water	1-22	18/04/2024	22/04/2024	22/04/2024	Yes
Alkalinity Suite | Water	1-22	18/04/2024	22/04/2024	22/04/2024	Yes
Chloride | Water	1-22	18/04/2024	19/04/2024	22/04/2024	Yes
Sulfate | Water	1-22	18/04/2024	19/04/2024	22/04/2024	Yes
Acidity | Water	1-22	18/04/2024	22/04/2024	24/04/2024	Yes

Quality Control PFD1286

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFD2561

Analyte	Units	PQL	Blank	DUP1 BFD2561-DUP1# Samp | QC | RPD %	DUP2 BFD2561-DUP2# Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	1600 | 1550 | 2.92	1180 | 1140 | 3.28	105

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFD2562

Analyte	Units	PQL	Blank	DUP1 PFD1286-19 Samp | QC | RPD %	DUP2 PFD1286-20 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	1280 | 1200 | 6.28	1510 | 1390 | 8.55	93.2

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BFD2576

Analyte	Units	PQL	Blank	DUP1 PFD1286-01 Samp | QC | RPD %	DUP2 PFD1286-11 Samp | QC | RPD %	LCS %
pH	pH units		5.5	5.3 | 5.3 | 0.190	7.4 | 7.4 | 0.00	102
Electrical Conductivity	µS/cm	2.0	2.00	1500 | 1530 | 1.86	1120 | 1150 | 2.60	95.3

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BFD2577

Analyte	Units	PQL	Blank	DUP1 PFD1286-13 Samp | QC | RPD %	DUP2 BFD2577-DUP2# Samp | QC | RPD %	LCS %
pH	pH units		5.7	5.2 | 5.1 | 1.57	6.7 | 6.7 | 0.149	101
Electrical Conductivity	µS/cm	2.0	<2.0	300 | 302 | 0.764	2200 | 2200 | 0.114	106

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFD2476

Analyte	Units	PQL	Blank	DUP1 PFD1286-01 Samp | QC | RPD %	DUP2 PFD1286-11 Samp | QC | RPD %	LCS %	Spike % PFD1286-02
Chloride	mg/L	1.0	<1.0	241 | 241 | 0.0870	127 | 127 | 0.0596	103	86.2
Sulfate	mg/L	1.0	<1.0	473 | 474 | 0.288	49.6 | 49.7 | 0.167	107	98.5

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFD2477

Analyte	Units	PQL	Blank	DUP1 BFD2477-DUP1# Samp | QC | RPD %	DUP2 BFD2477-DUP2# Samp | QC | RPD %	LCS %	Spike % BFD2477-MS1#
Chloride	mg/L	1.0	<1.0	80.0 | 80.0 | 0.0614	357 | 357 | 0.00810	105	109
Sulfate	mg/L	1.0	<1.0	9.50 | 9.46 | 0.476	100 | 100 | 0.105	102	109

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFD2576

Analyte	Units	PQL	Blank	DUP1 PFD1286-01 Samp | QC | RPD %	DUP2 PFD1286-11 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	7.69 | 8.38 | 8.59	429 | 425 | 0.942	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	7.69 | 8.38 | 8.70	429 | 425 | 0.942	[NA]

Analyte	Units	PQL	Blank	LCS %
Total Alkalinity as CaCO3	mg/L as CaCO3	5		104

Quality Control PFD1286

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFD2577

Analyte	Units	PQL	Blank	DUP1 PFD1286-13 Samp | QC | RPD %	DUP2 BFD2577-DUP2# Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	7.70 | 7.60 | 1.31	305 | 290 | 5.11	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	7.70 | 7.60 | 1.31	305 | 290 | 5.11	[NA]

Analyte	Units	PQL	Blank	LCS %
Total Alkalinity as CaCO3	mg/L as CaCO3	5		98.4

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BFD2550

Analyte	Units	PQL	Blank	DUP1 PFD1286-01 Samp | QC | RPD %	DUP2 PFD1286-10 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	6.75 | 6.38 | 5.64	38.3 | 31.4 | 19.7	85.7

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BFD2551

Analyte	Units	PQL	Blank	DUP1 PFD1286-20 Samp | QC | RPD %	DUP2 BFD2551-DUP2# Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	74.3 | 72.2 | 2.84	80.0

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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Certificate of Analysis PFA0187

Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Chantelle Cawdell
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Number of Samples	23 Water
Date Samples Received	05/01/2024
Date Instructions Received	05/01/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date Results Requested by	12/01/2024
Date of Issue	11/01/2024

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Heram Halim, Operations Manager Lien Tang, Assistant Operations Manager
Laboratory Manager	Michael Kubiak

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Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PFA0187-01	ROM O/F	Water	04/01/2024	05/01/2024
PFA0187-02	TAILS	Water	04/01/2024	05/01/2024
PFA0187-03	KMB 1	Water	04/01/2024	05/01/2024
PFA0187-04	KMB 2	Water	04/01/2024	05/01/2024
PFA0187-05	KMB 5D	Water	04/01/2024	05/01/2024
PFA0187-06	KMB 6S	Water	04/01/2024	05/01/2024
PFA0187-07	KMB 7	Water	04/01/2024	05/01/2024
PFA0187-08	KMB 8	Water	04/01/2024	05/01/2024
PFA0187-09	KMB 9	Water	04/01/2024	05/01/2024
PFA0187-10	KMB 10	Water	04/01/2024	05/01/2024
PFA0187-11	KMB 11	Water	04/01/2024	05/01/2024
PFA0187-12	KMB 12	Water	04/01/2024	05/01/2024
PFA0187-13	KMB 13	Water	04/01/2024	05/01/2024
PFA0187-14	KMB 14	Water	04/01/2024	05/01/2024
PFA0187-15	KMB 15D	Water	04/01/2024	05/01/2024
PFA0187-16	KMB 16D	Water	04/01/2024	05/01/2024
PFA0187-17	KMB 17	Water	04/01/2024	05/01/2024
PFA0187-18	KMB 19	Water	04/01/2024	05/01/2024
PFA0187-19	LAKE 1	Water	04/01/2024	05/01/2024
PFA0187-20	LAKE 2	Water	04/01/2024	05/01/2024
PFA0187-21	LAKE 3	Water	04/01/2024	05/01/2024
PFA0187-22	LAKE 4	Water	04/01/2024	05/01/2024
PFA0187-23	DREDGE	Water	04/01/2024	05/01/2024

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Inorganics - Physical Parameters (Water)

Envirolab ID	Units	PQL	PFA0187-01	PFA0187-02	PFA0187-03	PFA0187-04	PFA0187-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		7.6	7.6	5.6	5.7	5.6
Electrical Conductivity	µS/cm	2.0	1400	1400	260	340	610
Total Dissolved Solids	mg/L	5.0	1100	1100 [2]	210	340 [1]	550

Envirolab ID	Units	PQL	PFA0187-06	PFA0187-07	PFA0187-08	PFA0187-09	PFA0187-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		6.1	6.3	5.6	4.9	3.5
Electrical Conductivity	µS/cm	2.0	180	780	730	410	410
Total Dissolved Solids	mg/L	5.0	150	610	600	390	400 [3]

Envirolab ID	Units	PQL	PFA0187-11	PFA0187-12	PFA0187-13	PFA0187-14	PFA0187-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		5.6	7.2	5.6	5.2	5.1
Electrical Conductivity	µS/cm	2.0	400	1000	270	240	280
Total Dissolved Solids	mg/L	5.0	360	720	220	210 [1]	180

Envirolab ID	Units	PQL	PFA0187-16	PFA0187-17	PFA0187-18	PFA0187-19	PFA0187-20
Your Reference			KMB 16D	KMB 17	KMB 19	LAKE 1	LAKE 2
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
pH	pH units		5.5	6.5	3.8	8.7	8.2
Electrical Conductivity	µS/cm	2.0	330	310	210	1400	1700
Total Dissolved Solids	mg/L	5.0	260	330 [3]	350 [3]	1100	1300

Envirolab ID	Units	PQL	PFA0187-21	PFA0187-22	PFA0187-23
Your Reference			LAKE 3	LAKE 4	DREDGE
Date Sampled			04/01/2024	04/01/2024	04/01/2024
pH	pH units		7.8	7.6	7.7
Electrical Conductivity	µS/cm	2.0	2100	1800	1600
Total Dissolved Solids	mg/L	5.0	1500	1200	1200

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Inorganics - Ionic Balance and Indexes (Water)

Envirolab ID	Units	PQL	PFA0187-01	PFA0187-02	PFA0187-03	PFA0187-04	PFA0187-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	47	62	20	38	34
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	47	62	20	38	34
Chloride	mg/L	1.0	200	210	59	85	160
Sulfate	mg/L	1.0	430	410	1.1	<1.0	1.2

Envirolab ID	Units	PQL	PFA0187-06	PFA0187-07	PFA0187-08	PFA0187-09	PFA0187-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	55	36	29	7.6	<5.0
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	55	36	29	7.6	<5.0
Chloride	mg/L	1.0	12	140	210	100	78
Sulfate	mg/L	1.0	19	150	19	23	16

Envirolab ID	Units	PQL	PFA0187-11	PFA0187-12	PFA0187-13	PFA0187-14	PFA0187-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	27	430	22	11	6.2
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	27	430	22	11	6.2
Chloride	mg/L	1.0	110	110	65	50	77
Sulfate	mg/L	1.0	<1.0	31	4.5	19	7.5

Envirolab ID	Units	PQL	PFA0187-16	PFA0187-17	PFA0187-18	PFA0187-19	PFA0187-20
Your Reference			KMB 16D	KMB 17	KMB 19	LAKE 1	LAKE 2
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	15	98	<5.0	250	130
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	27	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	15	98	<5.0	280	130
Chloride	mg/L	1.0	89	27	39	260	290
Sulfate	mg/L	1.0	5.1	19	4.5	190	390

Envirolab ID	Units	PQL	PFA0187-21	PFA0187-22	PFA0187-23
Your Reference			LAKE 3	LAKE 4	DREDGE
Date Sampled			04/01/2024	04/01/2024	04/01/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	78	61	63
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	78	61	63
Chloride	mg/L	1.0	340	270	210
Sulfate	mg/L	1.0	490	410	430

Certificate of Analysis PFA0187

Inorganics - Miscellaneous and Common Anions (Water)

Envirolab ID	Units	PQL	PFA0187-01	PFA0187-02	PFA0187-03	PFA0187-04	PFA0187-05
Your Reference			ROM O/F	TAILS	KMB 1	KMB 2	KMB 5D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	<5.0	<5.0	44	64	81

Envirolab ID	Units	PQL	PFA0187-06	PFA0187-07	PFA0187-08	PFA0187-09	PFA0187-10
Your Reference			KMB 6S	KMB 7	KMB 8	KMB 9	KMB 10
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	59	19	69	78	100

Envirolab ID	Units	PQL	PFA0187-11	PFA0187-12	PFA0187-13	PFA0187-14	PFA0187-15
Your Reference			KMB 11	KMB 12	KMB 13	KMB 14	KMB 15D
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	62	36	60	42	27

Envirolab ID	Units	PQL	PFA0187-16	PFA0187-17	PFA0187-18	PFA0187-19	PFA0187-20
Your Reference			KMB 16D	KMB 17	KMB 19	LAKE 1	LAKE 2
Date Sampled			04/01/2024	04/01/2024	04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	41	31	88	<5.0	<5.0

Envirolab ID	Units	PQL	PFA0187-21	PFA0187-22	PFA0187-23
Your Reference			LAKE 3	LAKE 4	DREDGE
Date Sampled			04/01/2024	04/01/2024	04/01/2024
Acidity	mg/L	5.0	<5.0	<5.0	<5.0

Result Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.
[2]	Some EC to TDS ratios are outside normal expected values. Note that some solid material appears to have passed through the glass fibre filter paper(s).
[3]	EC to TDS ratio is outside a normal expected value due to sample matrix - sample is dark brown coloured.

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode based on APHA latest edition, Method 4500-H+. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the APHA recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C based on APHA latest edition Method 2510. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PFA0187

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Date Issued	11/01/2024

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PFA0187

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes
pH | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes
TDS | Water	1-23	04/01/2024	08/01/2024	08/01/2024	Yes
Alkalinity Suite | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes
Chloride | Water	1-4	04/01/2024	05/01/2024	08/01/2024	Yes
	5-20	04/01/2024	05/01/2024	09/01/2024	Yes
	21-23	04/01/2024	09/01/2024	10/01/2024	Yes
Sulfate | Water	1-4	04/01/2024	05/01/2024	08/01/2024	Yes
	5-20	04/01/2024	05/01/2024	09/01/2024	Yes
	21-23	04/01/2024	09/01/2024	10/01/2024	Yes
Acidity | Water	1-23	04/01/2024	05/01/2024	05/01/2024	Yes

Quality Control PFA0187

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BFA0470

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %
pH	pH units		5.6	7.6 | 7.6 | 0.132	5.6 | 5.6 | 0.00	[NA]
Electrical Conductivity	µS/cm	2.0	<2.0	1380 | 1400 | 1.42	398 | 396 | 0.403	[NA]

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BFA0473

Analyte	Units	PQL	Blank	DUP1 PFA0187-21 Samp | QC | RPD %	DUP2 BFA0473-DUP2# Samp | QC | RPD %	LCS %
pH	pH units		5.5	7.8 | 7.9 | 0.127	7.4 | 7.4 | 0.00	101
Electrical Conductivity	µS/cm	2.0	<2.0	2110 | 2110 | 0.142	1520 | 1520 | 0.0526	108

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFA0523

Analyte	Units	PQL	Blank	DUP1 BFA0523-DUP1# Samp | QC | RPD %	DUP2 BFA0523-DUP2# Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	120 | 125 | 4.08	219 | 220 | 0.456	114

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFA0524

Analyte	Units	PQL	Blank	DUP1 PFA0187-04 Samp | QC | RPD %	DUP2 PFA0187-14 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	342 | 341 | 0.293 [1]	213 | 214 | 0.468 [1]	113

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0414

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %	Spike % PFA0187-02
Chloride	mg/L	1.0	<1.0	200 | 200 | 0.135	106 | 106 | 0.0153	89.6	109
Sulfate	mg/L	1.0	<1.0	427 | 428 | 0.118	<1.0 | <1.0 | [NA]	86.1	96.5

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0470

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	47.4 | 47.1 | 0.741	26.9 | 26.4 | 1.91	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	47.4 | 47.1 | 0.727	26.9 | 26.4 | 1.94	95.5

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0473

Analyte	Units	PQL	Blank	DUP1 PFA0187-21 Samp | QC | RPD %	DUP2 BFA0473-DUP2# Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	78.1 | 84.2 | 7.52	401 | 401 | 0.00	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	78.1 | 84.2 | 7.52	401 | 401 | 0.00	[NA]

Analyte	Units	PQL	Blank	LCS %
Total Alkalinity as CaCO3	mg/L as CaCO3	5		104

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

Quality Control PFA0187

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFA0580

Analyte	Units	PQL	Blank	DUP1 BFA0580-DUP1# Samp | QC | RPD %	DUP2 BFA0580-DUP2# Samp | QC | RPD %	LCS %	Spike % BFA0580-MS1#
Chloride	mg/L	1.0	<1.0	89.8 | 89.5 | 0.376	<1.0 | <1.0 | [NA]	89.6	98.9
Sulfate	mg/L	1.0	<1.0	11.5 | 11.6 | 0.847	<1.0 | <1.0 | [NA]	88.4	98.9

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BFA0474

Analyte	Units	PQL	Blank	DUP1 PFA0187-01 Samp | QC | RPD %	DUP2 PFA0187-11 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	62.5 | 55.3 | 12.2	111

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BFA0475

Analyte	Units	PQL	Blank	DUP1 PFA0187-21 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	100

QC Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.

APPENDIX C

APPENDIX C:
2025 GROUNDWATER MONITORING SUMMARY (PREPARED BY ROCKWATER)

MBS ENVIRONMENTAL

KEMERTON SILICA SAND MINE

GWL 60367(5) GROUNDWATER MONITORING SUMMARY

1 SEPTEMBER 2024 TO 31 AUGUST 2025

REPORT FOR KEMERTON SILICA SAND PTY LTD

OCTOBER 2025

Report No. 258.0/25/01

Rockwater
HYDROGEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

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TABLE OF CONTENTS

Tables

TABLE OF CONTENTS

(Continued)

Figures

Appendices

REVISION	AUTHOR	REVIEW	AUTHORISED	ISSUED
Rev 0	SO/MV	GB/TT (KSS)	GB	20 Oct 25

1 INTRODUCTION

Kemerton Silica Sand Pty Ltd (KSS) screens and processes feldspathic silica sand at its Kemerton mine within the Shire of Harvey, Western Australia. The mine was commissioned in April 1996 and KSS has been exporting its products through the Port of Bunbury since July 1996, mostly to Asia for glass manufacturing. The site covers about 1,600 hectares of freehold land that spans the northern boundary of the Kemerton Industrial Estate, approximately 35 km north of Bunbury and 150 km south of Perth (Fig. 1). It is located within the groundwater management sub-areas of Kemerton Industrial Park North and Wellesley for the Superficial aquifer, and Kemerton North for confined aquifers; these sub-areas are within the South West Coastal Groundwater Area (Department of Water 2007).

Mining at the site is carried out using wet mining techniques following the removal of overburden. The mining entails a section cutter dredge that extracts the feldspathic silica sand ore to a depth of about 16 m below the water table. Sand slurry is then pumped to a ROM (run-of-mine) storage area where it is deslimed and stockpiled. Sand from the stockpile is then fed to a processing plant where it is screened and washed, and the heavy minerals removed by gravity separation. The sand is processed using cyclones and then stockpiled and transported by truck to the Port of Bunbury.

The water supply to the processing plant is provided from on-site groundwater sources. The processing plant water circuit incorporates a thickener to enable recirculation of the majority of the process water. Some of the process water is utilised to return coarse tailings and thickened slimes to the dredge ponds. Overflow from the ROM stacker is also returned to the dredge Ponds, via a pipeline.

Groundwater extraction is licensed by the Department of Water and Environmental Regulation (DWER) via Licence to Take Water Groundwater Well Licence (GWL) 60367(5). The licence includes a Groundwater Monitoring Program (GMP) for the KSS mine. The GMP requires that a Groundwater Monitoring Summary be prepared for each year of borefield operation. KSS commissioned Rockwater to prepare a Groundwater Monitoring Summary for the water year from 1 September 2024 to 31 August 2025 which is presented as this report.

2 GROUNDWATER WELL LICENCE MONITORING AND REPORTING REQUIREMENTS

GWL 60367(5) became active on 13 March 2025 and is set to expire on 12 June 2035; it authorises KSS to extract 660,000 kL/a from the Superficial aquifer.

Copies of GWL 60367(5) and the GMP are presented in Appendix I and the monitoring requirements for the licence, detailed in the GMP, are summarised in Table 1.

Table 1: GWL 60367 (5) Monitoring Requirements

Licence	Requirement/s	Period	Bores	Submit Report
60367(5) Water year: 1 Sept to 31 Aug	**Water Meters**			
	Install and maintain cumulative water meters	-	KMB7, 14	Annually by 31 October
	Record volume of groundwater extracted	Monthly		
	Ensure meter accuracy is maintained within plus or minus 5% of the volume metered	-		
	Obtain authorisation from the DWER before removing, replacing or interfering with any meter under the licence	-		As required
	Notify the DWER of any meter malfunction within 7 days of the malfunction being noticed	-		As required
	Groundwater Monitoring Programme			
	Record water levels & operating status	Monthly	KMB7, 14 KMB1, 2, 4 , 5D[c], 6S[c], 8, 13, 15S, 16S, 16D, 17S, 18S and 19S KMB9, 10, 11 & 12	Annually by 31 October
	Obtain water samples and send to NATA-registered laboratory to analyse for: pH[a], Total Dissolved Solids (TDS) Electrical Conductivity (EC) @ 25°C Total acidity (as $CaCO_3$)[d] Total alkalinity (as $CaCO_3$) SO_4^{2-} (Sulphate) Cl^- (Chloride)	Quarterly[b] Annually[e]		

Notes: a = pH should be measured in the field as well as being analysed by the laboratory
b = Conduct in each of Sept or Oct, Dec or Jan, March or April & June or July
c = Monitoring bores KMB5D and KMB6S are replacement bores for KMB5 and KMB6 respectively
d = Total acidity is equivalent to total titrateable acidity
e = Conducted in March or April

The licence reporting conditions require an annual Groundwater Monitoring Summary (DoW 2009a) to be submitted to the Bunbury office of the DWER by 31 October each year. This annual monitoring summary has been prepared for the water year 1 September 2024 to 31 August 2025 with data collected by KSS personnel. The monitoring data for the review period and historical data are included as Appendices II and III. The report complies with DWER Operational Policy No. 5.12 (DoW 2009a).

3 CLIMATE

The Kemerton area has a climate characterised by warm dry summers and cool wet winters during which the majority of rainfall occurs. Rainfall data have been collected at the Kemerton Silica Sand mine since mid-1998 and at the Wokalup Agricultural Research Station (BoM Station Number 9642 located approximately 8 km east of the mine site) since 1951. Rainfall data at Wokalup Station are unavailable for the 2024/25 review period, therefor average rainfalls from 1951-2024 have been provided for comparison. Evaporation data were collected at the Harvey Station from 2001 to 2014 (BoM Station Number 9812) but the recordings were discontinued thereafter. The location of the Wokalup BoM weather station is shown in Figure 1 and the rainfall and evaporation data are presented Table 2 and Figure 2.

Table 2: Rainfall and Evaporation Data 2024/25

Month	Mine Site		Wokalup	Harvey
	Rainfall 2024/2025	Average Rainfall [a]	Average Rainfall [a]	Average Pot. Evaporation[b]
	(mm)	(mm)	(mm)	(mm)
Jan-24	0.0	12.3	13.9	90.0
Feb-24	0.0	13.2	11.9	124.0
Mar-24	4.40	14.7	17.5	168.0
Apr-24	0.00	27.9	47.5	220.1
May-24	160.50	71.2	112.0	248.0
Jun-24	220.0	127.9	128.0	217.5
Jul-24	195.50	147.3	166.5	192.2
Aug-24	233.00	146.1	129.0	114.0
Sep-24	46.5	118.6	100.8	80.6
Oct-24	53.0	83.2	41.5	63.0
Nov-24	82.5	36.4	29.4	62.0
Dec-24	6.0	19.3	12.4	71.3
Calendar Year 2025	**1,001.4**	**818.1**	**812.0**	**1,650.7**
Jan-25	1.5	11.9	12.8	90.0
Feb-25	7.5	13.0	10.9	124.0
Mar-25	12.0	14.6	17.2	168.0
Apr-25	16.5	27.5	48.1	220.1
May-25	44.5	70.2	111.9	248.0
Jun-25	157.5	129.0	130.0	217.5
Jul-25	194.5	149.0	165.1	192.2
Aug-25	188.0	147.8	126.6	114.0
Water Year GWL60367(5) Sept 2024 – Aug 2025	**810.0**	**820.5**	**806.8**	**1,650.7**
Long-term Average [c]	N/A		958.5 (1951-2024)	N/A

Notes: a = average 1998/99 to month of recording in 2024 or 2025
b = short-term average 2001 to 2014 (when recordings ceased)
c = no data recorded
d = BoM average (years with incomplete records are excluded)

Annual rainfall for the Kemerton mine site shows a declining trend from 1999 until 2010, when the lowest total on record of 397 mm was recorded. The calendar-year annual rainfalls since 2010 have ranged from 390.5 mm to 1,023 mm. The total in the 2024 calendar year was 1,001.4 mm, 219 mm more than in 2023 and 197.7 mm more than in 2022, and 195.1 mm more the average (1999-2024) of 806.2 mm. Rainfall for the 2024/25 review period was 810 mm, which is 119.2 mm less than in the 2023/24 review period and 10.4 mm above the review-year average of 820.5 mm (1998/99 to 2024/25). Monthly rainfalls are generally similar to averages, with the exception of a wet winter (June to August 2025).

Drying trends at Wokalup station are particularly evident for the late-August, April and early-summer (November-January) periods. Monthly rainfall records for the mine site and Wokalup illustrate the variability of rainfall across the coastal plain in the region.

The nearest BoM station with comparatively recent evaporation data is Harvey where recordings ceased in 2014. These data show average annual evaporation of 1,651 mm for 2001 to 2014. Average monthly rainfall at the mine site exceeds average monthly evaporation during August, September and October (Table 2, Fig. 2), which is the main period when there is potential for groundwater recharge.

4 HYDROGEOLOGY

4.1 PHYSIOGRAPHY

The Kemerton mining operation is located on the Swan Coastal Plain within the Bassendean Dune System. The topography of the area comprises low and irregular dunes with elevations as high as 25 m AHD on dune crests and about 10 m AHD in interdunal depressions. The Wellesley River, to the east of the mine site, flows south to southwest (Fig. 1) into the Leschenault Estuary, via the Collie River, and acts as a perennial drain for the local groundwater system. Ground elevations undulate across the site, ranging from 13.5 to 22 m AHD, with an average elevation of about 16 m AHD.

4.2 GEOLOGY

The mine area is underlain by about 30 m of Quaternary to Tertiary-age superficial formations, which unconformably overlies the Cretaceous-age Leederville Formation. The superficial formations comprise fine to medium grained quartz sand, with minor clay and clayey sand (Bassendean Sand), which overlies a basal 5 to 10 m of shell-rich sand and limestone (Ascot Formation). Thin marly limestone of the Muchea Limestone occurs at or near the surface towards the eastern side of the property.

4.3 GROUNDWATER OCCURRENCE

The superficial formations contain an unconfined groundwater system (Superficial aquifer) from which the KSS water supply is extracted. Groundwater within the Superficial aquifer is derived from rainfall recharge, whereby strong seasonality results in seasonal water table fluctuations of about one to two metres. The depth to the water table at the site varies from the surface, historically resulting in seasonal wetlands within topographical depressions, to over 10 m beneath surface in more elevated areas.

Regional groundwater flow in the Superficial aquifer beneath the KSS property is predominantly to the southeast from the Mialla Mound towards the Wellesley River, within the Myalup groundwater flow system (Deeney 1989). Groundwater discharge occurs via baseflow to the river and evapotranspiration, mainly from the wetlands. It is likely that a small proportion of groundwater leaks downwards into the underlying Leederville aquifer at the base of the Superficial aquifer. Groundwater flow within the Superficial aquifer beneath the western part of the property is west to southwest, towards the coast.

The groundwater in the Superficial aquifer is of fresh to marginal salinity, ranging from <100 mg/L to about 900 mg/L total dissolved solids (TDS). Groundwater salinity in the region is characteristically fresher near recharge areas and becomes more marginal near discharge areas. Local occurrences of higher salinity groundwater occur within plumes on the down-hydraulic-gradient sides of the wetlands as salinity increases due to the effects of evapotranspiration in the wetlands. Groundwater salinity may also be higher near the Wellesley River (Deeney 1989).

5 BOREFIELD

The production borefield comprises two bores, KMB7 and KMB14, located west of the plant site (Fig. 3). KMB14 is the main producer and KMB7 is retained as a standby water source and is used only rarely for short-term requirements when KMB14 is out of service (e.g. during bore maintenance). A total of 6,342 kL were extracted from KMB7 during September to October 2024 of this review period. Both production bores are constructed to about 30 m depth and contain 12 m basal sections of 195 mm diameter stainless screen set against fine to medium-grained sand and limestone.

Sixteen operable monitoring bores are located within the mine site (Fig. 3). The monitoring bores are constructed with 50 mm uPVC casing, slotted over the basal 12 to 20 m for deeper bores and 2 to 8 m for shallower bores. The monitoring bores are constructed in pairs comprising both a shallow (bore-name suffix S) and a deep bore (no bore-name suffix or bore-name suffix D) bore at six locations: KMB4/KMB18S, KMB5D/KMB6S (replaced KMB5/KMB6 in 2013), KMB8/KMB17S, KMB13/KMB19S, KMB15S/KMB15D, and KMB16D/KMB16S. Shallow bore KMB16S has remained dry since its construction in May 2013. KMB4 was removed in February 2020 due an expansion of the mine area.

A summary of bore data is provided in the schedule of operating production and monitoring bores in Table 3.

Table 3: Schedule of Production and Monitoring Bores

Bore ID	MGA Coordinates		Reduced Level Top of Casing	Depth	Elevation at Base	Screen/ Slots	Comments
	mE	mN	(m AHD)	(m bTOC)	(m AHD)	(m bTOC)	
Production Bores							
KMB7[a]	386420	6333719	15.68	29.0	-13.3	16.5 – 28.5	Equipped Grundfos, SP8A-15; Installed January 2004
KMB14	385962	6333541	16.48	30.4	-13.9	16.6 – 28.6	Equipped Southern Cross, 8-Stage turbine, Model NAD2F; Constructed 21/12/95
Monitoring Bores							
KMB1	385842	6334149	17.60	24.0	-6.4	11.0 – 23.4	
KMB2	386398	6334378	16.81	23.8	-7.0	11.0 – 23.0	
KMB3	-	-	14.71	24.0	-9.3	10.0 – 24.0	Decommissioned in Feb. 2001 (covered by southern extension to Dredge Ponds)
KMB4	386853	6333700	16.03	23.0	-7.0	11.0 – 23.0	Removed in February 2020 due to an expansion of the mine area
KMB5	386821	6333100	16.33	22.1	-5.8	10.1 – 22.1	Monitoring ceased in 2001, recommenced in August 2008. Decommissioned June 2013
KMB5D	386658	6332982	16.07	22.0	-5.9	10.0 - 22.0	Constructed in May 2013; replacement for KMB5
KMB6	386817	6333133	15.60	19.0	-3.4	1.5 – 19.0	Decommissioned June 2013
KMB6S	386657	6332951	16.15	10.0	6.2	2.0 - 10.0	Constructed in May 2013; replacement for KMB6
KMB8	386369	6334051	15.67	ND	ND	? - 20.08	Slotted depth as probed in August 2000
KMB9	387371	6332634	14.46	ND	ND	? - 19.95	Slotted depth as probed in August 2000; monitoring ceased in 2001, recommenced in August 2008
KMB10	387567	6334009	15.28	ND	ND	? - 19.65	Slotted depth as probed in August 2000
KMB11	387720	6334243	16.16	ND	ND	? - 14.35	Slotted depth as probed in August 2000
KMB12	387933	6333605	13.83	ND	ND	? - 20.05	Slotted depth as probed in August 2000
KMB13	386173	6333648	16.06	ND	ND	? - 24.90	Slotted depth as probed in August 2000; silted-up Feb. 2001, cleared and monitoring recommenced May 2002
KMB15S	384828	6333095	18.93	6.0	12.9	4.0 - 6.0	Constructed in May 2013, identical water levels to those from deep bore KMB15D
KMB15D	384828	6333095	18.93	23.0	-4.1	11.0 - 23.0	Constructed in May 2013
KMB16S	384780	6334761	22.16	6.0	16.2	4.0 - 6.0	Constructed in May 2013; dry
KMB16D	384780	6334761	22.16	23.0	-0.8	11.0 - 23.0	Constructed in May 2013
KMB17S	386444	6333960	15.91	7.65	8.3	1.25-7.65	Constructed in May 2015
KMB18S	386843	6333624	16.20	7.65	8.6	1.25-7.65	Removed in June 2021 due to an expansion of the dredge Ponds
KMB19S	386178	6333642	16.07	7.65	8.4	1.25-7.65	Constructed in May 2015

Notes: ND = no data available
m bTOC = metres below top of casing
a = regular pumping from KMB7 ceased from May 2016 to August 2018 and again from 2022 onwards

6 GROUNDWATER EXTRACTION

Groundwater extraction for the water year, 1 September 2024 to 31 August 2025, totaled 137,968 kL (Table 4), which is about 20% of the 660,000 kL/a licensed groundwater entitlement. The total groundwater extraction and subsequent water usage have significantly declined from the period of peak usage from 1996 to 2003, when average annual extraction was about 750,000 kL, to an average annual extraction of about 108,403 kL since 2008/9. The reduction is principally due to more efficient water use within the circuit and effective implementation of an objective by KSS promoting reduced water consumption.

Table 4: Annual Groundwater Extraction

Water Year	KMB14 (kL)	KMB7[a] (kL)	Total (kL)	Use of Annual Entitlement
1 July to 30 June Water Year				
February 1996 – June 1996	200,079	164,528	364,607	36%
July 1996 – June 1997	393,747	533,190	926,937	93%
July 1997 – June 1998	360,202	503,988	864,190	86%
July 1998 – June 1999	348,488	461,931	810,419	81%
July 1999 – June 2000	328,194	447,407	775,601	78%
July 2000 – June 2001	324,586	480,213	804,799	80%
July 2001 – June 2002	306,042	410,596	716,638	72%
July 2002 – June 2003	233,883	309,854	543,737	54%
July 2003 – June 2004	280,472	96,541	377,013	38%
July 2004 – June 2005	98,007	189,374	287,381	29%
July 2005 – June 2006	40,277	270,013	310,290	31%
July 2006 – June 2007	77,679	260,579	338,258	34%
July 2007 – June 2008	53,927	170,297	224,224	34%
July 2008 – June 2009	52,162	73,171	125,333	19%
July 2009 – June 2010	29,661	42,022	71,683	11%
July 2010 – June 2011	4,459	37,649	42,108	6%
July 2011 – June 2012	15,199	78,509	93,708	14%
July 2012 – June 2013	3,324	60,491	63,815	10%
1 September to 31 August Water Year				
September 2008 – August 2009	52,298	42,139	94,437	14%
September 2009 – August 2010	32,146	46,601	78,747	12%
September 2010 – August 2011	2,896	60,477	63,373	10%
September 2011 – August 2012	13,270	57,301	70,571	11%
September 2012 – August 2013	6,662	58,599	65,261	10%
September 2013 – August 2014	108,365	51,005	159,370	24%
September 2014 – August 2015	150,836	44,385	195,221	30%
September 2015 – August 2016	93,803	29,821	123,624	19%
September 2016 – August 2017	95,766	0	95,766	15%
September 2017 – August 2018	74,872	220	75,092	11%
September 2018 – August 2019	95,007	55,709	150,716	23%
September 2019 - August 2020	80,682	5,813	86,495	13%
September 2020 - August 2021	70,580	2,414	72,994	10%
September 2021 - August 2022	116,523	5,681	122,204	19%
September 2022 - August 2023	129,268	0	129,268	20%
September 2023 - August 2024	117,988	3,762	121,750	18%
September 2024 – August 2025	131,626	6,342	137,968	21%

Note: a = pump not in use/bore out of service during 2016/17 and 2017/18 review periods, excluding August 2018

The demand for groundwater has remained steady since the last reporting period with the majority of the extraction occurring from KMB14 during the review period. KMB7 was used only from September to October 2024, to provide water to the sprayers at the plant, given failures with the dredge return water pump. Extraction for the review period totalled 137,968 kL and marks an increase in extraction of 3% compared to the 2023/24 review period. The monthly volumes that are extracted from the bore vary according to processing plant requirements. They are within the ranges of the monthly volumes that have been extracted in previous water years (Table 5, Fig. 4).

Minimal groundwater was extracted from KMB7 as part of a commitment by KSS to concentrate extraction on the fresher supply from KMB14 rather than the fresh to brackish supply from KMB7.

Table 5: Monthly Groundwater Extraction 2024/25

Period	KMB14	KMB7
	(kL)	(kL)
Sep-24	12,755	4,501
Oct-24	13,627	1,841
Nov-24	5,517	0
Dec-24	9,061	0
Jan-25	14,223	0
Feb-25	7,681	0
Mar-25	9,165	0
Apr-25	5,400	0
May-25	10,455	0
Jun-25	14,259	0
Jul-25	7,875	0
Aug-25	21,608	0
Total Extraction	**131,626**	**6,342**
Total Extraction 1 Sep 2024 to 31 Aug 2025		**137,968**

7 RESULTS OF MONITORING

Water-level and water-quality monitoring data are provided in Appendices II and III respectively.

7.1 WATER LEVELS

Groundwater levels beneath the mine site area vary seasonally each year in response to seasonal rainfall recharge. Hydrograph maxima are recorded generally in August-September and minima generally in April-June, depending on when significant quantities of the seasonal rainfall occur. The hydrograph patterns for the 2024/25 water year display evidence of recharge events, with water levels higher from September to December 2024, in response to rainfall from previous months, and lower in April to June 2025. Anomalous values are evident in the data (Fig. 5, Fig. 9), which are attributed to measurement or recording errors as they are outside the ranges of projected water level trends. Overall, water levels vary by between 0.77 m and 1.81 m in the monitoring bores, and by about 1.63 m and 2.33 m in production bores KMB7 (resting water levels) and KMB14 (pumping water levels) respectively.

7.1.1 PRODUCTION BORES

Resting water levels (pump status 'off') were recorded for 11 of the 12 months in KMB7 and for all 12 months in KMB14 during the review period (Table 6, Fig. 5). Although the KMB14 pump status was 'on' each month, historical data indicate that water levels recorded during the review period were resting water levels. The bore KMB14 hydrographs show a slight declining water-level trend since July 2017 with those recorded during the current review period remaining similar to 2023/24.

Table 6: Production Bores Monthly Water Levels 2024/25

DATE	KMB14	KMB7
	(m AHD)	(m AHD)
Sep-24	12.46	14.84
Oct-24	14.24	12.65 (pumping)
Nov-24	12.62	14.38
Dec-24	12.40	14.39
Jan-25	11.91	13.89
Feb-25	12.86	13.68
Mar-25	12.73	13.41
Apr-25	12.90	13.28
May-25	12.79	13.21
Jun-25	12.62	13.21
Jul-25	12.93	13.55
Aug-25	13.53	14.01

7.1.1.1 KMB14

Resting water levels ranged from a minimum of 11.91 m AHD (January 2025) to a maximum of 14.24 m AHD (October 2024), and fall within the historical range for the bore. The minimum and maximum water levels for 2024/25 are similar to the water level for 2023/24 water year.

7.1.1.2 KMB7

Resting water levels ranged from 13.21 m AHD (May/June 2025) to 14.84 m AHD (September 2024) and averaged about 13.80 m AHD during the review period. The minimum and maximum water levels in KMB14 for 2024/25 are similar to those recorded during the 2023/24 review period.

7.1.2 MONITORING BORES

Monitoring-bore water levels were recorded each month during the review period; the data are included in Table 7 and historical data in Appendix II. KMB4 was removed from the monitoring round in February 2020. KMB16S has been dry since construction in May 2013. KMB18S was removed in June 2021 due to the expansion of the dredge Ponds.

Table 7: Monitoring Bores Monthly Water Levels 2024/25

Date/Bore	KMB1	KMB2	KMB4[a]	KMB5D	KMB6S	KMB8	KMB9	KMB10	KMB11
Sep-24	14.89	14.85	-	14.02	14.56	14.85	13.16	13.67	13.52
Oct-24	14.66	14.55	-	13.74	14.15	14.49	12.82	13.38	13.30
Nov-24	14.54	14.44	-	13.67	14.07	14.37	12.70	13.29	13.21
Dec-24	14.55	14.44	-	13.67	14.12	14.38	12.68	13.31	13.25
Jan-25	14.17	13.98	-	13.27	13.61	13.89	12.23	12.91	13.78
Feb-25	14.24	13.75	-	13.08	13.34	13.65	11.99	12.72	12.59
Mar-25	13.60	13.45	-	12.77	12.95	13.37	11.94	12.42	12.32
Apr-25	13.47	13.35	-	12.65	12.91	12.74	11.85	12.32	12.24
May-25	13.32	13.24	-	12.56	12.77	12.69	11.46	12.20	12.19
Jun-25	13.27	13.26	-	12.59	12.82	13.14	11.63	12.37	12.30
Jul-25	13.40	13.48	-	12.77	13.16	13.37	11.88	12.60	12.54
Aug-25	13.92	14.07	-	13.30	13.93	13.97	12.52	13.20	13.60
Date/Bore	**KMB12**	**KMB13**	**KMB15D**	**KMB15S**	**KMB16D**	**KMB16S**	**KMB17S**	**KMB18S[b]**	**KMB19S**
Sep-24	12.88	14.68	13.84	13.84	14.10	dry	15.05	-	14.76
Oct-24	12.75	14.33	13.78	13.78	14.16	dry	14.61	-	14.50
Nov-24	12.63	14.25	13.69	13.69	14.12	dry	14.56	-	14.37
Dec-24	12.60	14.25	13.73	13.73	14.12	dry	14.67	-	14.47
Jan-25	12.20	13.83	13.52	13.25	13.90	dry	13.97	-	13.88
Feb-25	12.03	13.59	13.41	13.41	13.87	dry	13.75	-	13.64
Mar-25	11.04[c]	13.26	13.19	13.19	13.54	dry	13.39	-	13.29
Apr-25	11.69	13.14	13.15	13.15	13.49	dry	13.15	-	13.16
May-25	11.63	13.02	13.05	13.05	13.38	dry	13.12	-	13.03
Jun-25	11.73	12.99	12.97	12.97	13.47	dry	13.16	-	13.04
Jul-25	12.13	13.18	13.00	13.00	13.29	dry	13.44	-	13.21
Aug-25	12.47	13.75	13.16	13.16	13.49	dry	14.15	-	13.73

Notes: Water levels presented as m AHD
maxima (end-winter 2024 or Aug-2025), minima (end-summer 2024)
a = KMB4 was removed in February 2020 to allow for mining expansion
b = KMB18S was removed in June 2021 to allow for dredge Ponds expansion
c = Value is believed to be erroneous

Water level contour maps for the end-of-winter (September 2024) and end-of-summer/autumn (May 2025), are presented in Figures 6 and 7 respectively. They show the configuration of the water table at or close to its recorded maximum elevation (September) and minimum elevation (April) for the review period.

The monitoring bores are divided into several group locations for the discussion of water level data based on their hydrograph forms and trends, which appear to be influenced by their locations.

Water levels in the monitoring bores have ranged from 9 m AHD to 17 m AHD since the commencement of monitoring in 1993. The hydrographs show annual, cyclical water-level variations, associated with winter-dominated rainfall recharge to the aquifer (Figs 8 to 10, Appendix II). Long-term-declining water levels are evident in bores KMB5D, KMB6S, KMB9, KMB11, KMB12, KMB15S, KMB15D and KMB19S. All monitoring bores previously showed slightly lower water levels in the last five years with water levels during the 2024/25 perioed being marginally higher than previously. This is mainly evidenced by their annual hydrograph minima.

Water levels ranged from 11.46 to 15.05 m AHD during the review period with the recorded minima for individual bores being broadly consistent. The cyclical water-level variations shown by the hydrographs are associated with winter-dominated rainfall recharge to the aquifer (Figs 8 to 10, Appendix II). Water levels in 2024/25 were generally lowest in May or June 2025 and highest in September 2024 (Table 7).

7.1.2.1 KMB1, KMB2, KMB8 and KMB17S (North-western Area)

Monitoring bores KMB1, KMB2, KMB8 and KMB17S are located north of the production bores (Fig. 3). Water levels declined at a rate of about 0.1 m/annum from December 2020 and then stabilised since May 2023. The hydrograph (Fig. 8) trends for the bores are similar to the previous review period.

7.1.2.2 KMB5D, KMB6S, KMB9 (Central and Southern Areas)

Monitoring bores KMB4, KMB5D, KMB6S, KMB9 and KMB18S are located in an area between and south of the plant infrastructure and the dredge Ponds (Fig. 3), with only KMB5D, KMB6S, and KMB9 remaining operable. The hydrograph (Fig. 8) shows water level trends very similar to those in the north-western area. The lower water level elevations in KMB9, in the southeast, reflect the regional hydraulic gradient towards the southeast across the site (Figs 6 and 7).

7.1.2.3 KMB10, KMB11 and KMB12 (Dredge Ponds Area)

Monitoring bores KMB10, KMB11 and KMB12 are located northeast of the dredge Ponds (Fig. 3). The hydrographs for this area (Fig. 9) show declining water levels when compared to the first few years of data (monitoring commenced in 1996), except a slight rising trend between mid 2021 to mid 2023. The lower water elevations in KMB12 reflect the regional hydraulic gradient towards the southeast across the site (Figs 6 and 7).

7.1.2.4 KMB15S, KMB15D, KMB16S and KMB16D (Western Area)

Monitoring bores KMB15S, KMB15D, KMB16S and KMB16D are located on the western boundary of the property (Fig. 3) to enable the collection of baseline monitoring data prior to a possible extension of the mining area. KMB16S has been dry since it was constructed in May 2013. KMB15S and KMB15D both displayed declining water-level trends over their periods of record, but remained stable from 2021 to 2024 and slightly increased during the current review period. The hydrograph for KMB16D shows a slight water level rise during the current review period when compared to previous years (Fig. 9). The water level of 13.87 m AHD recorded on 25 Febuary 2025 is erroneous.

7.1.2.5 KMB13 and KMB19S (Borefield Area)

KMB13 and KMB 19S are adjacent to each other and located about midway between production bores KMB7 and KMB14 (Fig. 3). Water levels in KMB13 and KMB19S had declining trends, evident since 2018, however they have risen during this review period (Fig. 10). Recorded water levels in the shallow monitoring bore, KMB19S are generally slightly lower than water levels deeper in the aquifer (Fig. 10).

The hydrographs show that water levels exhibit seasonal variations and those recorded during 2024/25 review period are within historical ranges but with a greater maximum of 14.76 m AHD recorded in September 2024.

7.2 GROUNDWATER QUALITY

KSS is required to undertake quarterly analyses of field and laboratory pH, and laboratory EC and salinity (TDS), as well as annual (in March or April) chloride, sulphate, total acidity and total alkalinity determinations on water samples from all production and monitoring bores. Water quality trigger levels are set for pH, total alkalinity, and total acidity in the conditions of GWL 60367(5); the trigger levels are shown in the plots of hydrochemical data in Figures 11 to 21. The triggers are:

- a change in the salinity category as described in the groundwater monitoring programme pursuant to GWL 60368(5) item 2.4 (Appendix I);
- field pH falling below 5 (warning) and below 4 (action);
- total alkalinity (as $CaCO_3$) falling below 30 mg/L (warning) and 10mg/L (action); and
- Total acidity (as $CaCO_3$) above 100 mg/L (warning), to be actioned if coupled with at least one other warning trigger

The trigger levels are intended to provide indicators of whether groundwater is either acidifying or is vulnerable to acidification. They are designed to prompt action and do not indicate compliance breaches or limit exceedances. An elevated level of sulphate ions relative to chloride ions may indicate the presence of acid sulphate soils (ASS) in the landscape. The DWER mapping indicates that most of the KSS site is at "moderate to low risk of ASS occurring within 3 m of natural soil surface" (Landgate 2013) with only the wetland located about 200 m northeast from KMB11 being mapped as "high to moderate risk of ASS occurring within 3 m of natural soil surface".

The quarterly samples for field analyses in the 2024/25 water year were collected in October 2024 and January, April, and July 2025. Samples for annual laboratory analyses were collected on 2 April 2025. The results from the laboratory analyses, supported by the historical data, much of which is additional to the monitoring requirements of the current groundwater licence, are presented in Appendix III and discussed below. Laboratory certificates are included in Appendix IV.

7.2.1 PRODUCTION BORES

Laboratory analyses for the production bores are presented in Tables 8 and 9 and Figures 11 to 13. Field determinations of salinity and pH are provided in Figure 11 for comparison with the laboratory analysed water. There appears to be no anomalous results in the analyses during the review period and, as such, the veracity of the data is acceptable.

Salinity

Groundwater salinity, recorded as total dissolved solids (TDS) by evaporation, ranged from 200 to 720 mg/L TDS for the review period. These values are within the DoW (2009b) fresh (<500 mg/L) to marginal (500-1,000 mg/L) salinity classifications and are within historical ranges for each bore (Fig. 11, Appendices II and III).

KMB14 produces markedly fresher water than KMB7 (Fig. 11). Historical data for KMB14 indicate salinities range from 130 to 500 mg/L TDS. The salinity averaged about 218 mg/L during the 2024/25 review period (Fig. 11), which is similar to the average for the previous water year (195 mg/L), whereas salinities ranged from about 490 to 720 mg/L TDS in KMB7.

There is no definitive evidence of impact on groundwater salinities in KMB14 associated with a significant increase in extraction since mid-2013.Salinity concentrations over the past four to five years have been generally towards the lower end of their historical ranges. Field and laboratory analysed salinity concentrations were similar in KMB14, and showed fresher groundwater.

Table 8: Production Bore Monthly pH and Salinity Data 2024/25

Month	Field pH	Field Salinity (mg/L Total Dissolved Solids)	Laboratory pH	Laboratory EC @ 25°C	Laboratory TDS[a]
				(µS/cm)	(mg/L)
KMB14					
Oct-24	5.63	200	5.6	250	200
Jan-25	5.27	210	5.2	270	210
Apr-25	4.90	260	5.4	390	260
Jul-25	4.98	200	5.1	260	200
KMB7					
Oct-24	5.90	720	5.6	1100	720
Jan-25	5.33	490	4.9	860	490
Apr-25	5.20	540	5.1	840	540
Jul-25	5.04	660	5.0	800	570

Notes: a = TDS by evaporation b = likely erroneous result Trigger reached or exceeded

Table 9: Production Bore Water Chemistry Data, April 2025

Bore	Date	Chloride (Cl)	Sulphate (SO_4)	Total Acidity (as $CaCO_3$)	Total Alkalinity (as CaCO3)	Cl:SO_4 ratio
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	
KMB14	02/04/2025	79	33	<5.0	11	2.4
KMB7	02/05/2025	150	140	<5.0	7.6	1.1

Notes: Trigger reached or exceeded

The average laboratory salinity for KMB7 was about 580 mg/L TDS for the 2024/25 review period, which is about 7 mg/L higher than that for 2023/24. The 2021/22 data showed a possible seasonal variation with a minimum of 617 mg/L TDS in October 2021 followed by a maximum of 713 mg/L, which was not observed during the last three review periods. The laboratory salinity concentrations recorded are within the DOW (2009b) marginal salinity-classification range.

A gradual increase in salinity is evident in KMB7 from when monitoring began in 1996 until regular pumping from the bore ceased in May 2016 (Fig. 11); from 500 mg/L TDS in January 1997 to about 800 mg/L TDS in January 2015.Salinities measured since May-2016 show large variations. Only small volumes of water have been extracted from KMB7 other than from October 2018 to May 2019. KMB7 was not operated between June 2022 and January 2024, between June and July 2024, or from November 2024 until present. Since January 2022, salinity concentrations have stabilised around 600 mg/L TDS. The previous long-term trend of rising salinity is not evident since May-2016, with salinities showing a levelling off or slight decreasing trend since April 2022. Field measured salinities in KMB7 appear are generally consistent with laboratory salinities, lending to the validity of the data.

pH

The groundwater from the production bores displays acidic to near-neutral pH with a field value of 5.04 for KMB7 and 4.98 for KMB14 recorded in July 2025 (Table 8, Fig. 11, Appendices II and III). pH values for both bores are now towards the base of their historical ranges, similarly to the 2023/24 review period. pH trends for both bores exhibit gradual increases from July 2012 (KMB7) and January 2013 (KMB14) until January 2015 but they have been gradually reducing since then. Values remain above the minimum pH trigger level (4.0). The April 2024 pH recorded in KMB14 (4.40), is the lowest recorded since records began. Average pH values have been declining by approximately 0.2 pH units per year, since 2017. Laboratory pH values have been equal the field data for the same sample event since KSS replaced its field monitoring equipment.

Chloride

Chloride concentrations over the review period varied little, averaging about 62 mg/L for KMB14 and 165 mg/L for KMB7 (Appendix III). The chloride concentrations for both bores are similar to the 2023/24 review period, within the historical ranges and show no trends of change.

Sulphate

Sulphate concentrations ranged from 15 to 33 mg/L in bore KMB14 during the review period, which are within the historical range for the bore (Appendix III). Bore KMB14 sulphate concentrations have gradually reduced since an historically high concentration of 85 mg/L in April 2010. Sulphate concentrations in KMB7 during the current review period ranged from 140 to 210 mg/L, the October 2024 high of 210 mg/L is slightly higher than the range of values that have been recorded since about 2016. Sulphate concentrations in KMB7 gradually increased from when monitoring began in 2002 to about 2016 but no trend of change is apparent since then.

Total Acidity

The total acidity (as $CaCO_3$) for the review period ranged from 5 to 75 mg/L in KMB14 and from 5 to 110 mg/L in KMB7 (Fig. 12). The value of 110 mg/L recorded in KMB7 for January 2025 was a new maximum value for the production bore and values recorded after January 2025 were significantly less and within historical ranges. Apart from the January 2025 maximum for KMB7, both data for KMB7 and KMB14 are within the historical ranges for the bores. The data from both bores continue to be highly variable (Appendix III). Total acidity in KMB7 was higher than in KMB14 for the current review period, which is attributed to KMB7 being operated sporadically. KMB14 shows a long term increasing trend of total acidity since December 2014. KMB7 displayed an increasing trend between 2014 and 2021 but has been too variable in recent years to determine any discernible trend..

Total Alkalinity

Total alkalinity (as $CaCO_3$) ranged from 7.6 to 14.0 mg/L for KMB14 and from 0.5 to 21.0 mg/L in KMB7 for the review period (Fig. 12). Analyses of total alkalinity commenced in November 2013 although no data were recorded for the 2018/19 review period. Alkalinities were comparatively stable for KMB14 from August 2015 to the end of the 2017/18 review period but subsequently varied considerably, from 14 mg/L to 170 mg/L, in 2019/20; they have remained at consistently low levels since October 2020 and this trend continued during the current review period. Similar trends are evident in the data for KMB7, with the lowest value since recording began being recorded in July 2025 (0.5). Total alkalinity values in KMB14, for January and July 2025 were below the 10 mg/L trigger level. Total alkalinity values for KMB7 were below the 10 mg/L trigger level in January, April, and July 2025.

7.2.2 MONITORING BORES

Analytical results are shown in Figures 13 to 18 and those for the samples taken in April 2025 are presented in Table 10. The full dataset, including historical data, is contained in Appendix III.

Table 10: Groundwater Analyses from Monitoring Bores, April 2025

Bore	Date	pH (field)	pH (lab)	EC @ 25°	TDS	Chloride Cl	Sulphate SO_4	Total Acidity as $CaCO_3$	Total Alkalinity as $CaCO_3$	Cl:SO_4 ratio
				(µS/cm)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	
Trigger (minimum)	-	**<4.0**	**<4.0**	-	-	-	-	-	**<10.0**	**<2.0**
KMB1[a]	02/04/2025	4.90	4.9	160	220	30	4.4	37	<5.0	6.8
KMB2	02/04/2025	5.70	5.7	380	300	94	<1.0	<5.0	25	<94
KMB5D	02/04/2025	5.80	6.2	630	600	140	7.2	<5.0	66	19.4
KMB6S	02/04/2025	5.60	6.1	190	130	11	22	<5.0	42	0.5
KMB8	02/04/2025	5.40	5.9	910	570	220	43	<5.0	32	5.1
KMB9	02/04/2025	5.90	5.4	460	320	100	33	48	12	3.0
KMB10	02/04/2025	3.50	3.6	240	220	33	4.8	5.3	<5.0	6.9
KMB11	02/04/2025	5.00	5.5	400	310	100	<1.0	6.0	21	>100
KMB12	02/04/2025	7.30	7.3	1300	690	120	55	<5.0	440	2.2
KMB13	02/04/2025	5.12	5.8	300	200	68	2.6	<5.0	21	26.2
KMB15D	02/04/2025	5.10	5.3	340	160	91	7.5	<5.0	22	12.1
KMB15S[a]	02/04/2025	5.60	5.6	510	400	72	120	110	12	0.6
KMB16D[a]	02/04/2025	5.40	5.4	310	240	77	7.8	54	12	9.9
KMB16S[b]	02/04/2025	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
KMB17S	02/04/2025	5.74	6.5	290	320	27	26	<5.0	63	1.0
KMB19S	02/04/2025	3.98	4.1	150	340	22	<1.0	49	<5.0	<22

Notes: a = no water quality data recorded in April 2025, July 2025 data is presented
b = no water quality data available for KMB16S for current water year – bore dry
Trigger reached

Salinity

Laboratory analysed salinity determinations for the review period, calculated as TDS by evaporation, ranged from 120 mg/L in KMB6S (January 2025) to 740 mg/L in KMB12 (July 2025, Figs. 13 and 14, Appendix III), which fall into the fresh to marginal salinity categories according to DoW (2009b).

Monitoring bores KMB1, KMB2, KMB8 and KMB17S on the north-western side of the plant area show overall stable trends apart from slight increases observed during the current review period (Fig. 13). However, KMB8 salinity concentrations have decrerased since January 2022. KMB1, KMB2 and KMB17S contain groundwater that falls within the fresh salinity category of DoW (2009b) whereas the groundwater in KMB8 varies within the marginal to fresh salinity category.

Salinities in monitoring bores within the central and southern areas (KMB5D, KMB6S and KMB9) display different trends (Fig. 13). KMB6S features the freshest groundwater of all the monitoring bores in most years with only small salinity varyiations since October 2013, when it replaced the previous KMB6 monitoring bore at the site. Values over the period of record for KMB6S have ranged from 76 to 184 mg/L TDS and ranged from 120 to 190 mg/L TDS during the 2024/25 review period. KMB9 shows more seasonal variations ranging from 159 to 588 mg/L TDS over the last 10 years and 320 to 570 mg/L TDS in 2024/25. KMB5D salinities have increased over the last three review periods, from 367 mg/L TDS, in July 2022 to 660 mg/L TDS in July 2025, and the groundwater is now considered marginal. The groundwater in KMB6 and KMB9 is relatively fresh.

Salinities in monitoring bores near the dredge Ponds (KMB10, KMB11 and KMB12) were stable from about 2006 to 2012, before rising during 2012/13 and again remaining stable from 2013 to the end of 2018 (Fig. 14). Following 2018, salinities have been highly variable with KMB12 and KMB10 rising up to late 2024 and KMb11 remainig comparatively stable after decreasing between 2018 and late 2019. KMB11 salinities remain stable at about 320 mg/L TDS. Salinities in KMB10 increased from 2020 to 2023 but decreased over the 2023/24 and 2024/25 review periods. Salinities continue to show some seasonal variations attributed to aquifer recharge from rainfall. KMB10 ranged from 220 to 340 mg/L TDS in 2024/25. The salinity in KMB10 varies over a larger annual range than in KMB11 due to its position down-gradient of a wetland. The salinity in KMB12 has a gradually rising trend from about 2004 to mid-2019 but there was a subsequent comparatively large increase (at the beginning of the 2019/20 review period) and a comparatively steep rising trend over the 2020/21 review period. A significant reduction from 1,289 to 749 mg/L TDS is evident at the beginning of the 2021/22 review period with salinities then increasing over the calendar year to 927 mg/L TDS in April 2022. They have decreased and fluctuated around 630 mg/L TDS over the current review period (Fig. 14). Groundwater level contours imply groundwater flow is from the west towards the KMB12 site, which is downflow from an area of open water in a previous mining area and adjacent to a wetland. The rise in salinity is likely associated with evapo-concentration of dissolved salts in the groundwater on the downflow side of the open water area, which is considered to be a throughflow lake. KMB10 and KMB11 contain relatively fresh groundwater with average salinities of 300-500 mg/L TDS since about 2014, although values for July 2023 and July 2024 were marginal (564 and 520 mg/L respectively). Salinities for both KMB10 and KMB11 ranged from 220 to 340 mg/L for this review period. The groundwater from KMB12 is mainly of marginal salinity (500-1,000 mg/L) with an average of 638 mg/L in 2024/25 compared to 683 mg/L in the 2023/24 and 927 mg/L in 2022/23 review periods.

Salinities measured from three of the western monitoring bores (KMB13, KMB15D and KMB16D) continue to be significantly lower than those for the other monitoring bores at the site and they fall within the DoW (2009b) fresh salinity category (Fig. 14). Exceptions are the western bores KMB15S and KMB19Swhere salinities have seasonal variations associated with rainfall recharge and possibly groundwater flow from the area of a small wetland about 300 m upgradient to the south-southwest. The lower salinity concentrations recorded for KMB19S over recent years are similar to those for the other bores in this group (Fig. 14). KMB16D salinities had been trending upwards since January 2022 and this trend continued for the 2023/24 review period, reaching 340 mg/L TDS in July 2024. However, they had decreased during the 2024/25 review period with a maximum salinity of 240 mg/L TDS recorded in July 2025. The comparatively low salinities in this group of bores indicates that groundwater flows down-gradient, to the west, from the KSS site towards other users to the west is of relatively low salinity. However, it is likely that the groundwater monitored by KMB16D does not flow from beneath the area of active operations at the KSS site, based on groundwater flow directions that may be implied from the water level contours (Figs 6 and 7). Salinities for this group of bores ranged from 190 to 400 mg/L TDS during the review period (Appendix III).

pH

Groundwater in the monitoring bores ranged from acidic to slightly alkaline during the review period (Figs 15 and 16), with field pH ranging from 2.93 to 7.11 and laboratory pH from 3.70 to 7.40. These values are consistent with those from previous review periods.

The minimum field pH of 2.93 was recorded in July 2025 for KMB10 which was also the most acidic reading from the previous review period. pH for this bore is consistently low and there are periodic values that are about 0.5 pH units less than surrounding monitoring bores.

The maximum field pH of 7.24 was recorded in January 2025 for KMB12, which also displayed the most alkaline pH in the previous review period. Values for all bores throughout the review period, except KMB5D, KMB6S, KMB12, and KMB17S are below 6.0, which indicates slightly acidic to acidic groundwater. The groundwater from bores KMB10 and KMB19S are the most acidic, with pH recordings below the minimum pH trigger (pH 4). KMB9 had a reading below the trigger in October 2024 (3.8). KMB10 was below the trigger on all four monitoring occassions and KMB19S was at or below the trigger on two monitoring occasions, January 2025 (4.0) and July 2025 (3.7).

Laboratory pH values are generally slightly higher than field pH values, which is attributed to degassing of carbon dioxide during the time between sample collection and the laboratory analyses. The field samples, therefore, should provide a better indication of the true groundwater pH. KSS replaced its field water quality monitoring equipment in 2023,which has resulted in more consistent pH values between field and lab analyses.

Acidic groundwater has likely resulted from the oxidation of sulphides associated with seasonal drying and wetting of organic matter within the adjacent wetlands. This impact has been exacerbated by generally declining groundwater levels over recent decades as a result of reduced rainfall and, consequently, reduced groundwater recharge.

Chloride

Chloride concentrations ranged from 10 to 240 mg/L during the review period and are within historical ranges for all monitoring bores. The highest concentration of 240 mg/L was recorded in July 2025 for KMB8, which has historically reached as high as 270 mg/L in April 2020. Concentrations in KMB6S remain constant with the lowest value for the monitoring bores 10 to 15 mg/L as it was during the 2023/24 review period (7.4 to 12 mg/L).

Sulphate

Sulphate concentrations ranged from <1 mg/L to 120 mg/L during the review period and generally remained within historical ranges, including KMB15S, which recorded a value of 120 mg/L in July 2025 after having a gradual increase from <50 mg/L to 220 mg/L between October 2021 and July 2024 (Appendix III). Sulphate concentrations in KMB2, KMB11 and KMB16D are the lowest among all monitoring bore sites, historically ranging from below detection limits to 17 mg/L. Sulfate concentrations in KMB12 increased in July 2021, reaching up to 220 mg/L, but have since remained equal to or below 55 mg/L. KMB1 has displayed decreased sulphate concentrations from an average around 25 mg/L, pre-July 2022, to 5.9 mg/L with the exception of October 2024, which showed a concentration of 23 mg/L. Elevated sulfate concentrations are considered to be from local oxidation of pyrite within the sediments, possibly due to stockpiles around the mine site or on the ROM, leading to the mobilisation of resulting salts into the groundwater.

Total Acidity

Total acidity values ranged from <5 to 110 mg/L as $CaCO_3$ during the review period (Figs 17 and 18). These values fall within historical ranges for most bore sites, except for KMB9 (110 mg/L). Notably, the 2024/25 review period values were all lower than the July 2023 high of 250 mg/L and within historical ranges.

A common trend observed in most monitoring bores is the higher total acidity between January and July 2025 compared to other months.

Several potential factors may contribute to the increase in total acidity in groundwater include but are not limited to, the potential for dissolution of carbon dioxide (CO_2) and mineral weathering.

Total Alkalinity

Total alkalinity concentrations for the monitoring bores ranged from <5 mg/L at KMB1, KMB9, KMB10, KMB15S and KMB19S, which is below the minimum trigger level of 10 mg/L, to 450 mg/L at KMB12 (Figures 17 and 18). The trigger level, set in GWL 606367(5), serves as an indicator of either groundwater acidification or vulnerability to acidification.

Down-gradient monitoring bore KMB12 (Figure 3) consistently exhibited the highest alkalinity levels, averaging approximately 383 mg/L as CaCO3. This represents an 3.3% decrease compared to the average for the 2023/24 review period. These concentrations are significantly higher than those observed in other bores, where alkalinity levels are well below 140 mg/L as CaCO3. KMB12 has shown an increasing trend in values between 2017 and 2022 with values than decreasing from April 2022.

7.2.3 GROUNDWATER QUALITY ACTION TRIGGER LEVEL BREACHES

The conditions of GWL 60367(5) state that any movement of water quality beyond a trigger level must trigger some action, either further ecosystem specific investigations or implementation of management/remedial actions' (ANZECC and ARMCANZ 2000). Trigger values have been reached or exceeded on numerous occasions, as summarised in Table 11, and historical data indicate that this occurs reasonably consistently for some bores, such as KMB10, KMB15S and KMB19S.

The salinity category change trigger occurrences are mainly evident for bores where their salinities are close to the salinity-category limits (fresh to marginal at 500 mg/L and marginal to brackish at 1,000 mg/L). KMB5D became marginal in the previous review period and has remained >500 mg/L for this review period. Salinities at KMB7 have remained close to the category limits with a high of 720 mg/L (marginal) in October 2024 and a low of 490 mg/L (fresh) in January 2025. KMB10 remained within the fresh category for the entire 2024/25 review period which hasn't occurred since the 2021/22 review period. Additionally, KMB1, KMB7, KMB9, KMB10, KMB14, KMB15D, KMB15S, and KMB19S exceeded the action trigger value for total alkalinity; KMB7, KMB9, KMB10, and KMB15S exceeded the warning trigger level for total acididity, and KMB10 and KMB19S consistently exceed the field pH trigger value.

Table 11: Water Quality Action Triggers Reached or Exceeded

Bore	Salinity category change			Field pH < 4			Total alkalinity (as CaCO3) < 10 mg/L			Total acidity (as CaCO3) > 100 mg/L		
	2022/23	2023/24	2024/25	2022/23	2023/24	2024/25	2022/23	2023/24	2024/25	2022/23	2023/24	2024/25
KMB1							9.8	4.0	<5			
KMB2	233										190	
KMB4[a]												
KMB5D		550								150		
KMB6S												
KMB7			490						<5			110
KMB8		250	630							130		
KMB9			570				<5		<5	100		110
KMB10	564	390		3.26	3.80	2.93	<5	<5	<5	250	120	110
KMB11												
KMB12												
KMB13												
KMB14							6.2	7.7	7.6			
KMB15D							6.5	7.6	5.3			
KMB15S	556	140		3.62	3.93		<5	<5	<5	310		110
KMB16D							9.7	9.1				
KMB16S	dry	dry	dry	dry	dry	dry	dry	dry	dry			
KMB17S												
KMB18S[b]												
KMB19S	200			3.34	3.80	3.58	<5	8.8	<5	140		

Notes: a = no data presented as KMB4 was removed in February 2020 – b = no data presented as KMB18S was removed in June 2021
Trigger level exceeded.
c = believed to be erroneous

7.2.4 COMPLIANCE WITH MONITORING REQUIREMENTS

This Groundwater Monitoring Summary has been prepared to fulfil the reporting conditions of GWL 60367(5) and it complies with the DWER Operational Policy No. 5.12 (DoW 2009a).

The monitoring programme (Table 1) for the review period (1 September 2024 to 31 August 2025) was carried out in accordance with the conditions of the GMP with the exceptions noted below. Monitoring frequencies either met or exceeded the licence conditions. Field measurements of water levels and extraction data were collected monthly. Laboratory analyses of total acidity, sulphate and chloride were carried out quarterly along with laboratory analysis of pH and salinity with the exception of KMB15S and KMB16D in April 2025. An overall compliance of 95% was achieved (Table 12). Non-compliances with the monitoring programme and/or instances where data were not provided or are in error include:

- No quarterly analyses of in April 2025 for KMB15S or KMB16D due to pump issues which have been resolved
- Annual laboratory analyses for total acidity, alkalinity, SO4 & Cl conducted in July 2025 instead of April for KMB15S and KMB16D

Table 12: Compliance with GWL 60367(5) Monitoring Conditions

Monitoring Requirement	Level of Compliance to GWL 60367(5)		
	Production Bores	Monitoring Bores [a]	Comment
Extraction volumes recorded	Yes	na	Nil
Extraction limits not exceeded	Yes	na	Nil
Monthly Water Levels	Yes	Yes	Nil
Quarterly pH (field) (Sep/Oct, Dec/Jan, March/April, June/July)	Mostly	Mostly	No quarterly measurements in April 2025 for KMB15S or KMB16D due to pump issues which were resolved.
Quarterly laboratory pH, EC and TDS (Sept/Oct, Dec/Jan, March/April, June/July)	Yes	Mostly	No quarterly lab samples in April 2025 for KMB15S or KMB16D.
Annual laboratory analyses for total acidity, total alkalinity, SO4 & Cl (March/April)	Yes	Mostly	Annual laboratory analyses completed July for KMB15S and KMB16D.
Overall compliance	Mostly		

Notes: na = not applicable a = dry bores are excluded from the compliance assessment

Several non-compliances with trigger values were recorded on one or numerous occasions during the review period and include:

- Salinity category change in KMB7, KMB8, and KMB9.
- Field pH value <4 in KMB10, KMB12 and KMB19S.
- Total alkalinity (as CaCO3) <10 mg/L in KMB1, KMB7, KMB9, KMB10, KMB14, KMB15D, KMB15S, and KMB19S.
- The total acidity (as CaCO3) trigger of >100 mg/L was reached or exceeded KMB7, KMB9, KMB10, and KMB15S.

8 SUMMARY AND CONCLUSIONS

Annual rainfall for the Kemerton mine site for the 2024/25 review period was 810.0 mm, which is 119.2 mm less than in the 2023/24 review period and 10.5 mm below the review-year average of 820.5 mm (1998/99 to 2024/25). Monthly rainfall totals reflected the climate characterised by a drier summer and wetter winter. The July 2025 total was the highest monthly recording (194.5 mm) and was about 45.5 mm above the monthly average (149.0 mm).

Extraction volumes from production bores KMB7 and KMB14 were recorded and compiled both as monthly and annual volumes. KMB14 is the primary source for the KSS water supply ; it provides fresh groundwater. KMB7 provides fresh to brackish groundwater and, consequently, is used only to assist in meeting specific water requirements during operations and when KMB14 is unavailable. KMB7 was only used from September to October 2024. The demand for groundwater increased marginally compared to the last reporting period with the groundwater extraction for the water year, 1 September 2024 to 31 August 2025, totalling 137,968 kL.

The 2024/25 review period extraction is about 20% of the 660,000 kL/a licensed groundwater entitlement and an increase of 16,218 kL (12%) over the total in 2023/24. Maximum monthly extraction volumes recorded for KMB14 peaked in January 2025 (14,233 kL) and again in June 2025 (14,259 kL) and August 2025 (21,608 kL).

Pumping water levels were not recorded in KMB14 during the review period, because the pump was turned off when measurements were taken. Resting water levels in the bore ranged from 11.91 m AHD (January 2025) to a maximum of 14.24 m AHD (October 2024). Resting water levels in KMB7 ranged from 13.21 m AHD (May 2025) to 14.84 m AHD (September 2024). Changes in resting water levels appear to be related to seasonal and annual variations in rainfall or potential seepage from the dredge ponds. It is likely that some water levels were measured before they had fully recovered after pumping cycles.

It is understood that the volume of tailings reclaimed water is not metered, and that a water balance has not been estimated. In the absence of a site water balance it is difficult to discern the impact of the dredge ponds on local water levels.

Hydrographs for the monitoring bores display seasonal fluctuations, associated with seasonal variations in rainfall recharge, with maximum water levels during the review period in September to October 2024 and minimum water levels mostly in May to June 2025. Water levels ranged from 11.04 to 15.05 m AHD during the review period with the recorded minima and maxima for individual bores being broadly consistent with those from the previous review period. The data indicate that groundwater extraction has had no discernible impact on regional groundwater levels. Groundwater level contours imply groundwater flow is from the east towards the KMB12 site, which is downgradient from an area of open water in a previous mining area and an adjacent to a wetland.

Water quality monitoring comprised field and laboratory salinity measurements, field and laboratory pH, and laboratory analyses for chloride, sulphate and total acidity. Quarterly field EC measurements were recorded for both production bores. No quarterly field measurements were taken in March/April in KM15S and KMB16D due to sampling pump issues which were resolved prior to the July quarterly measurements.

The laboratory analysed groundwater salinities in the production bores ranged from 200 and 260 mg/L TDS for KMB14, within the DWER (2009b) fresh salinity category, and 490 to 720 mg/L TDS for KMB7, within the fresh to marginal salinity category.

Salinities for KMB14 had been relatively stable over the last three prior review periods but fluctuated over this current review period. Salinity values recorded for KMB7 showed an increasing trend from 2007 to about May 2016, when regular pumping from the bore ceased. Salinities have varied considerably since then, but remained within the historical ranges during the current review period. Salinity measurements in the field generally correlate well with the laboratory analysed samples.

Groundwater pH in the production bores was acidic to slightly acidic (4.9 to 5.6 laboratory results; 4.9 to 6.6 field results) during the review period. Values have been gradually reducing in both bores since about January 2015 but remain well above the minimum pH trigger of pH 4.0.

Groundwater salinities for the monitoring bores are within the DWER fresh to saline categories, ranging from 120 mg/L TDS in KMB6S (January 2025) to 740 mg/L TDS in KMB12 (July 2025). Salinities in monitoring bores KMB1, KMB2, KMB6S, KMB13, KMB15D, KMB17S and KMB19S are generally lower than the others. Most other bores show comparatively stable trends for the review period within their previous historical ranges with the exception of KMB5D which has increased steadily over the last five review periods. Groundwater level contours imply groundwater flow is from the east towards the KMB12 site, which is downflow from an area of open water in a previous mining area and an adjacent to a wetland.

Field pH values ranged from acidic to slightly alkaline (3.5 to 7.3), which are consistent with previous recordings for the bores. However, all bores, except for KMB5D, KMB6S, KMB12, and KMB17s are below pH 6.0, which indicates most contain slightly acidic to acidic groundwater, althought the field pH recorded in KMB12 on two occasions was below 6 (October 2024 and April 2025).

The groundwater pH from KMB10 and KMB19S continue to show the most acidic groundwater. Field pH values below the minimum pH trigger (pH 4) occurred in KMB10, KMB12, and KMB19S.The generally lower pH values and decreasing trends may indicate effects from the oxidation of sulphides and organic material in wetland deposits and the leaching of these effects into the groundwater. Oxidation of pyrite contained in ore stockpiles also has the potential to contribute to changes in water quality in some of the bores; however, it has not been directly associated with low pH during this or previous review periods. Mapping by the Department of Environment Regulation (now DWER) indicates that most of the KSS site is at "moderate to low risk of acid sulphate soils (ASS) occurring within 3 m of natural soil surface" (Landgate 2013) with only the wetland located about 200 m northeast from KMB11 being mapped as "high to moderate risk of ASS occurring within 3 m of natural soil surface".

High total acidity and accompanying low pH, high sulphate concentrations (≥100 mg/L), total alkalinity values below detection limit (<5 mg/L) and low Cl:SO_4 ratios (≤2.0) highlight a risk for the generation of acidic groundwater at the KSS site. Trigger levels are used to provide indicators that groundwater is either acidifying or is vulnerable to acidification. The following water quality triggers are included in GWL 60367(5):

- A change in the salinity category
- Field pH falling below 4
- Total alkalinity (as $CaCO_3$) falling below 10 mg/L
- Total acidity (as $CaCO_3$) rising above 100 mg/L.

The data for 2024/25 water year indicate that the trigger values for each category were reached or exceeded in several of the bores during the review period.

- Salinity category change in KMB7, KMB8, and KMB9.
- Field pH values <4 were observed in KMB10, KMB12 and KMB19S.
- The total alkalinity (as CaCO3) trigger of <10 mg/L was reached or exceeded in KMB1, KMB7, KMB9, KMB10, KMB14, KMB15S, KMB15D and KMB19S.
- The total acidity (as CaCO3) trigger of >100 mg/L was reached or exceeded KMB7, KMB9, KMB10, and KMB15S.

Sulphate is a by-product of the generation of acid sulphate soils. It does not have a concentration trigger level in GWL 60367(5). Production bore KMB7 has historically recorded the highest sulphate concentrations with values during the review period ranging from 140 to 210 mg/L. KMB10 values decreased from an average of 18.3 mg/L during the previous review period to 6.0 mg/L during the current review period. Concentrations in KMB2, KMB11 and KMB16D are the lowest among all monitoring bore sites, historically ranging from 0 mg/L to 17 mg/L.

9 RECOMMENDATIONS

The following recommendations are based on the review of groundwater data for the reporting period 1 September 2024 to 31 August 2025.

- Ensure that both pumping water levels and static water levels are recorded monthly in production bores KMB7 and KMB14.
- It is advisable that KSS undertake work to develop a water balance for the site. A site water balance would categorise and quantify water inputs and outputs relating to the Kemerton site and sites adjacent monitoring bores. Additionally, a water balance would assist in determining if potential seepage from the dredge Ponds is contributing to local groundwater mounding, reduced drawdown in production bores and seasonally rising water levels.
- Consult with the DWER regarding what action or investigations are appropriate at the various sites where the water-quality data reach trigger levels, especially of interest are bores that frequently reach or exceed trigger values such as KMB9, KMB10, KMB15S and KMB19S.

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REFERENCES

ANZECC and ARMCANZ (AUSTRALIAN and NEW ZEALAND ENVIRONMENT and CONSERVATION COUNCIL, and AGRICULTURAL AND RESOURCE MANAGEMENT COUNCIL OF AUSTRALIA AND NEW ZEALAND), 2000. An Introduction to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1 The Guidelines (Chapters 1–7): National Water Quality Management Strategy Publication 4a, Commonwealth of Australia.

DEENEY, A.C., 1989. Geology and groundwater resources of the superficial formations between Pinjarra and Bunbury, Perth Basin: Western Australia Geological Survey, Report 26, Professional Papers, p. 31 57.

DEPARTMENT OF WATER, 2007. Kemerton groundwater subareas water management plan: Water Resource Allocation and Planning Series Report No. WRAP 17.80.

DEPARTMENT OF WATER, 2009a. Operational Policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence: Department of Water, Perth, November 2009.

DEPARTMENT OF WATER, 2009b. South west groundwater areas allocation plan: Water Resource Allocation and Planning Series Report No 21.

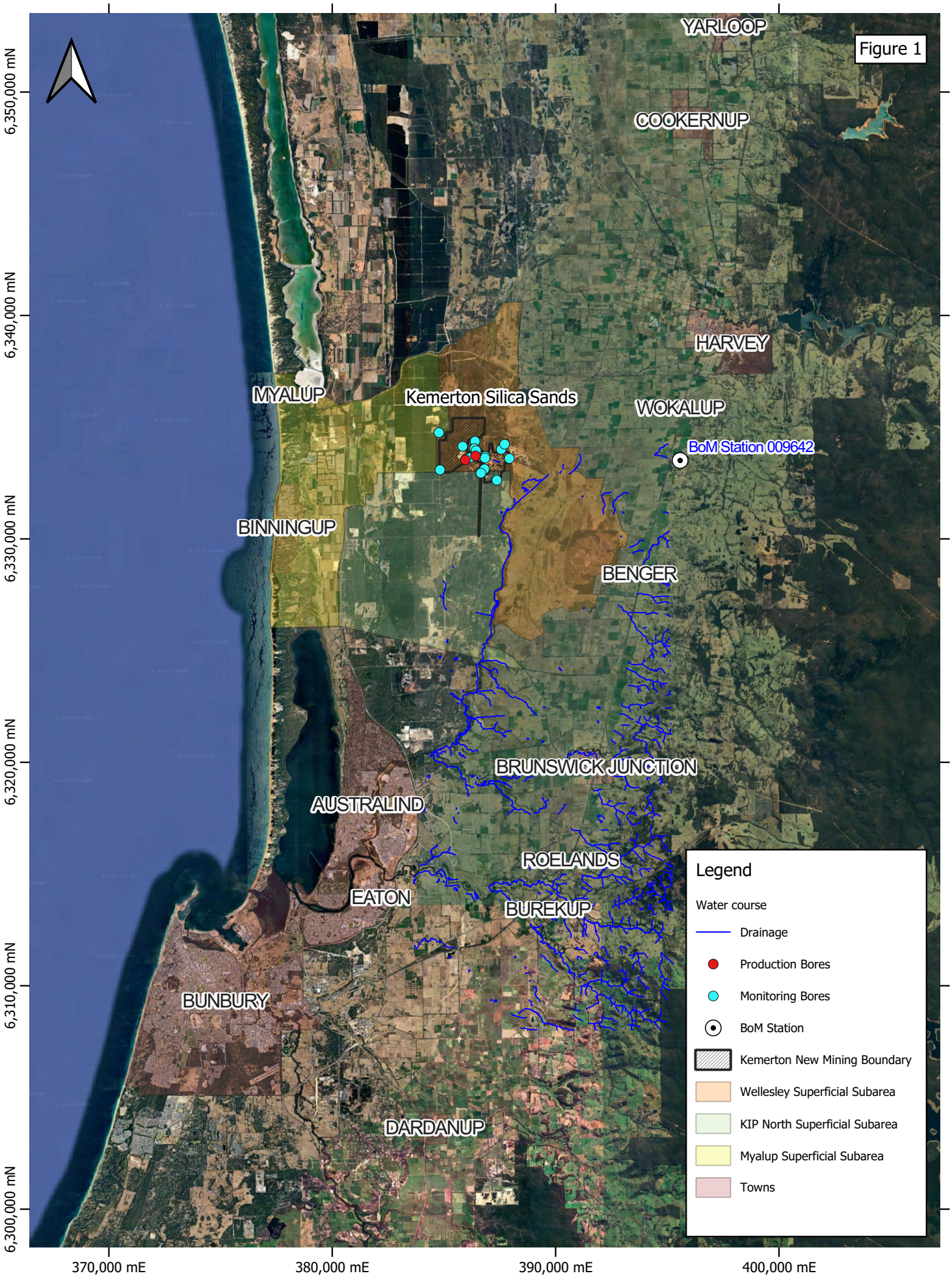
LANDGATE, 2013. https://www2.landgate.wa.gov.au/bmvf/app/waatlas/#, accessed 1 October 2015: Western Australian Land Information Authority, Perth, WA.

MULVEY, P., 1993. Pollution, prevention and management of sulfuric clays and sands: Proceedings of the First National Conference on Acid Sulfate Soils, 24-25 June, Coolangatta, Australia.

NHMRC & NRMMC. (2011). Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

ROCKWATER, 2022. Kemerton Silica Sand Mine GWL 60367(4) Groundwater Monitoring Summary 1 September 2021 to 31 August 2022: Report prepared for Kemerton Silica Sand Pty Ltd (unpublished).

FIGURES



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Rockwater

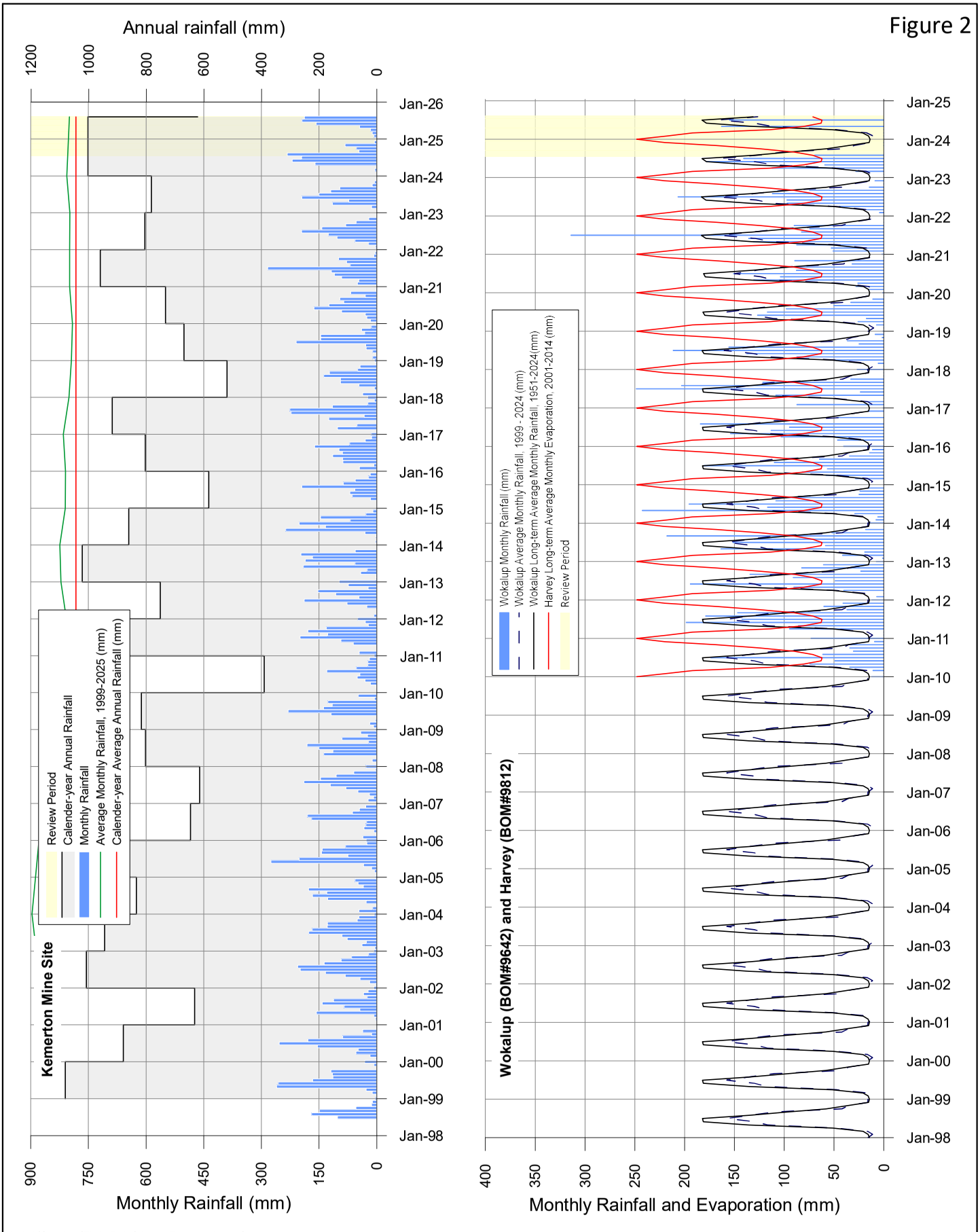
0 4 8 km

Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(5)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2025
Figure Number	258-0/25-01/1

LOCALITY MAP

Figure 2



258-0/Grapher/Fig2_Rainfall and Evaporation.grf

Client: Kemerton Silica Sand Pty Ltd

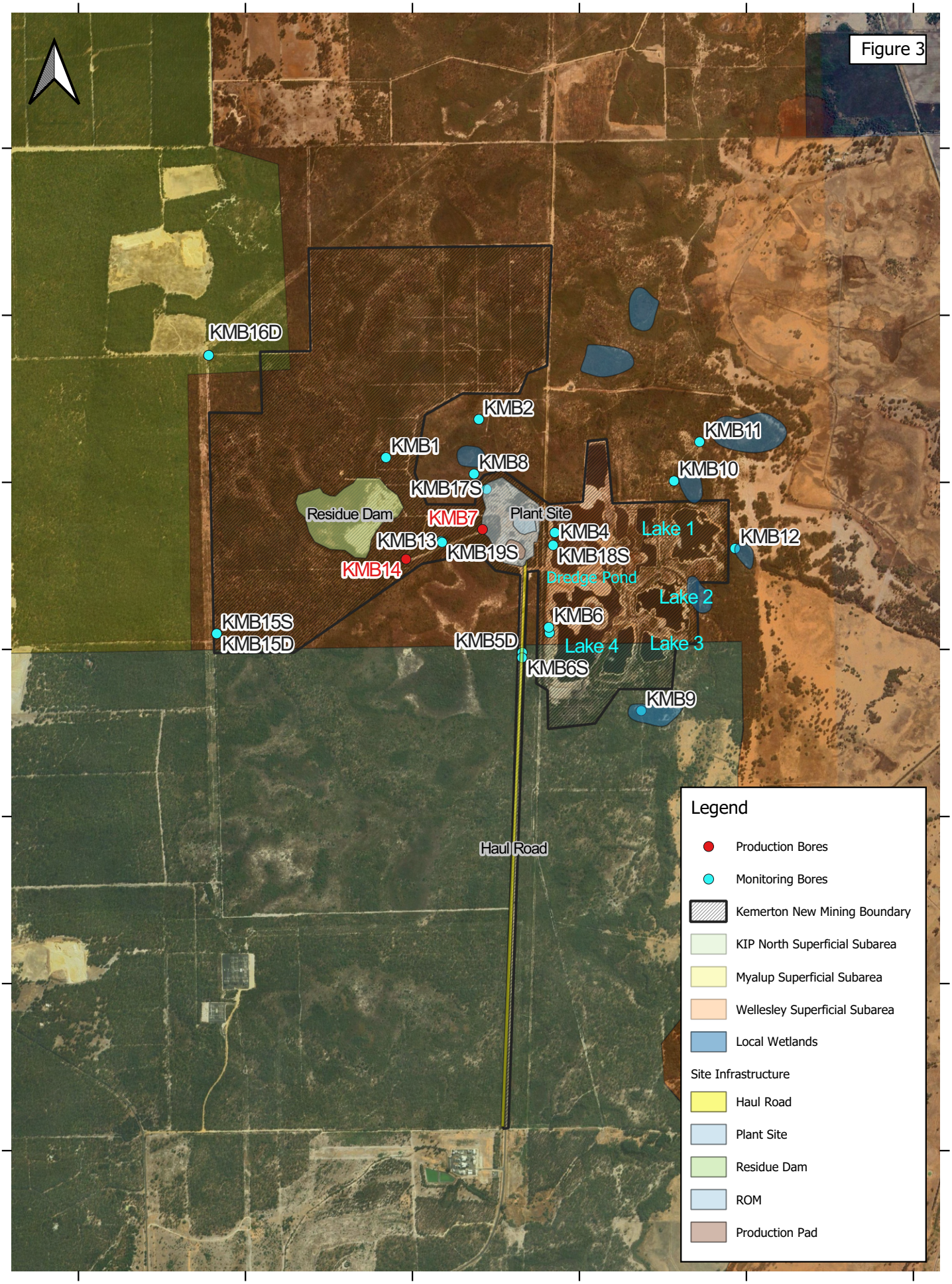
Project: Groundwater Monitoring Summary GWL 60367(5)

Date: October 2025

Dwg. No: 258.0/25/1-2

RAINFALL AND EVAPORATION KEMERTON MINE SITE, HARVEY AND WOKALUP STATIONS

Rockwater PROPRIETARY LIMITED



L:\QGIS Projects\258-0 KSS\KSS

Rockwater

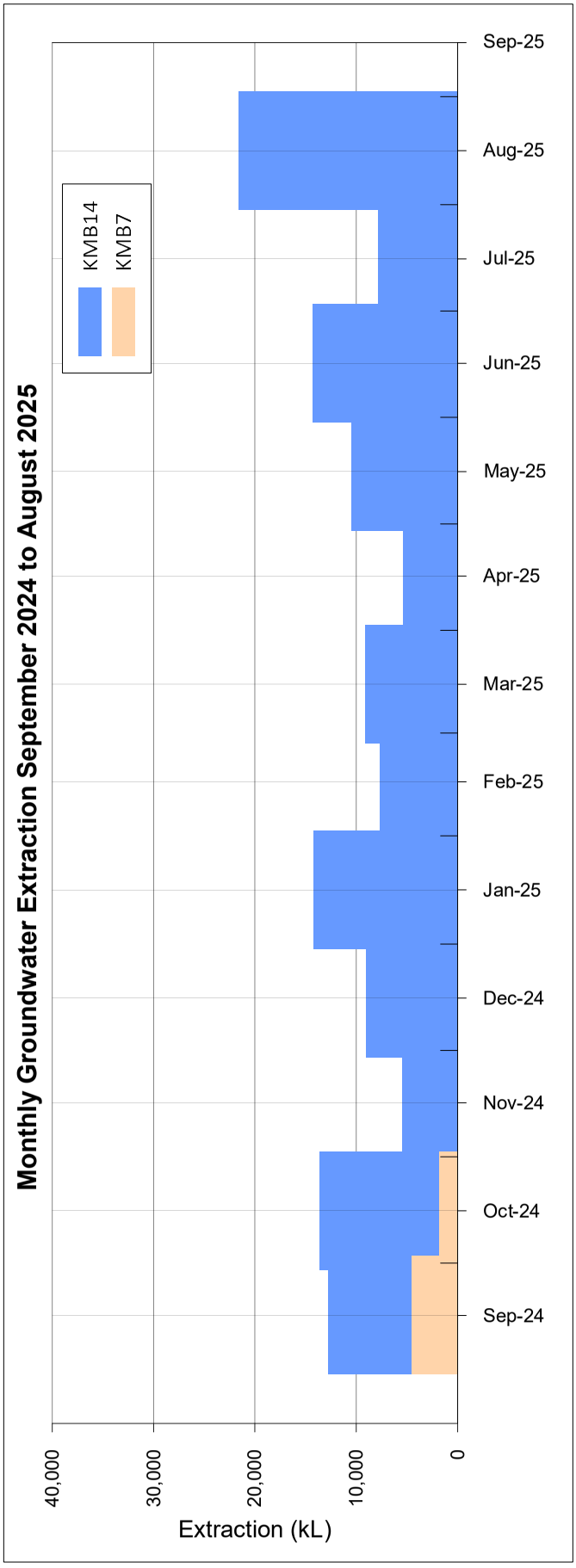
0 500 1,000 m

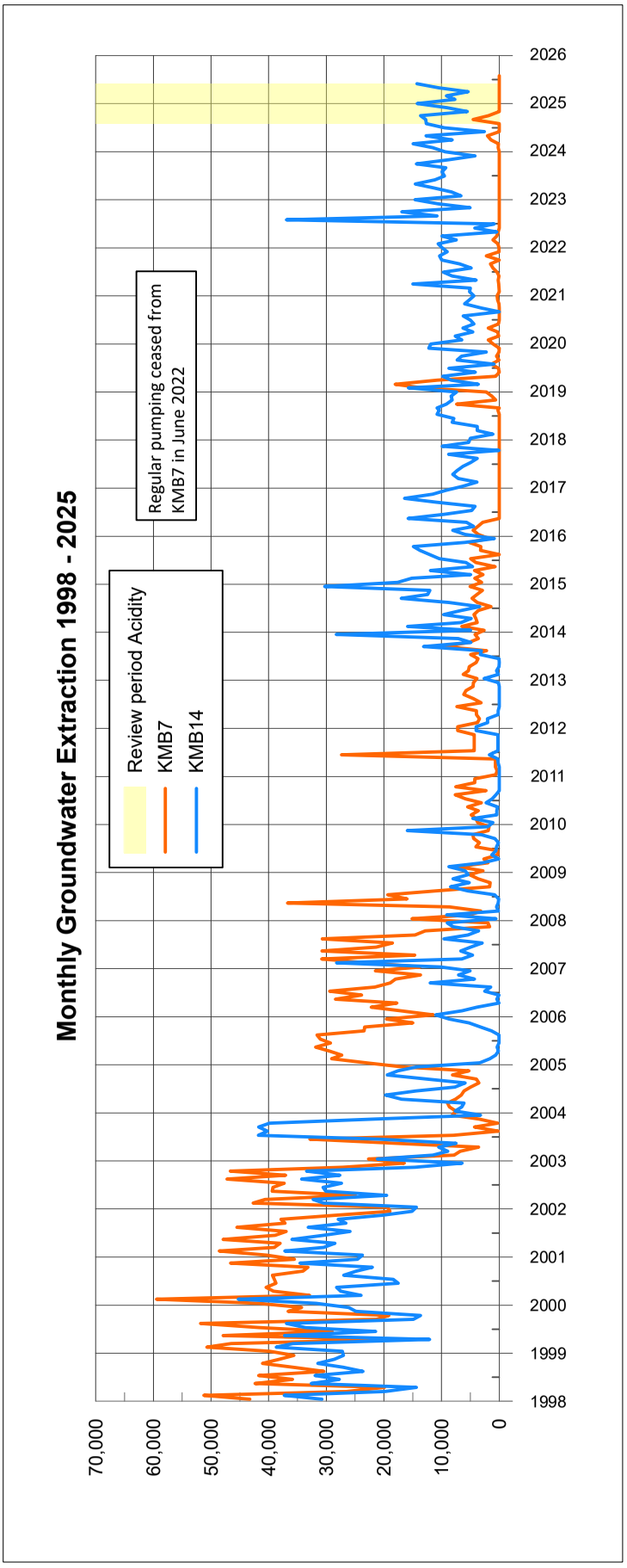
Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(5)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2025
Figure Number	258-0/25-01/3

BORE LOCATIONS

Figure 4





258-0/Grapher/Fig4_Rainfall and Evaporation.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(5)

Date: October 2025

Dwg. No: 258.0/25/1-4

GROUNDWATER EXTRACTION

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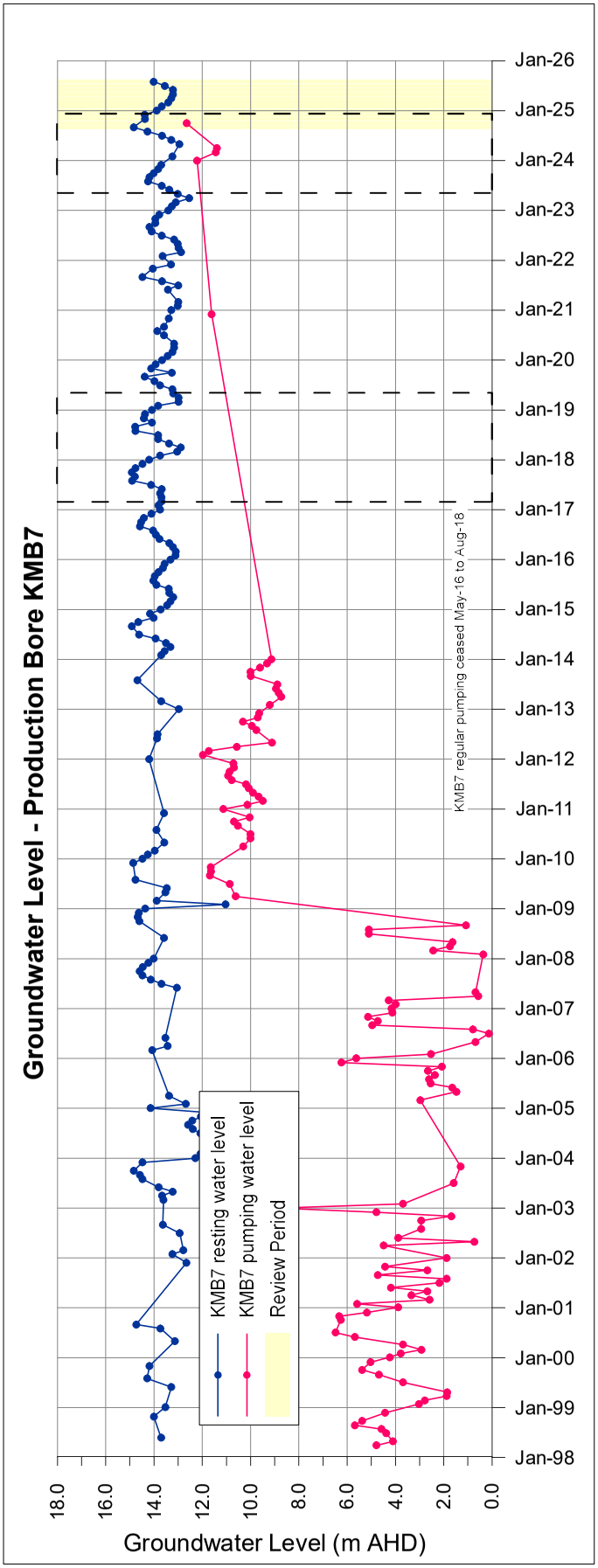
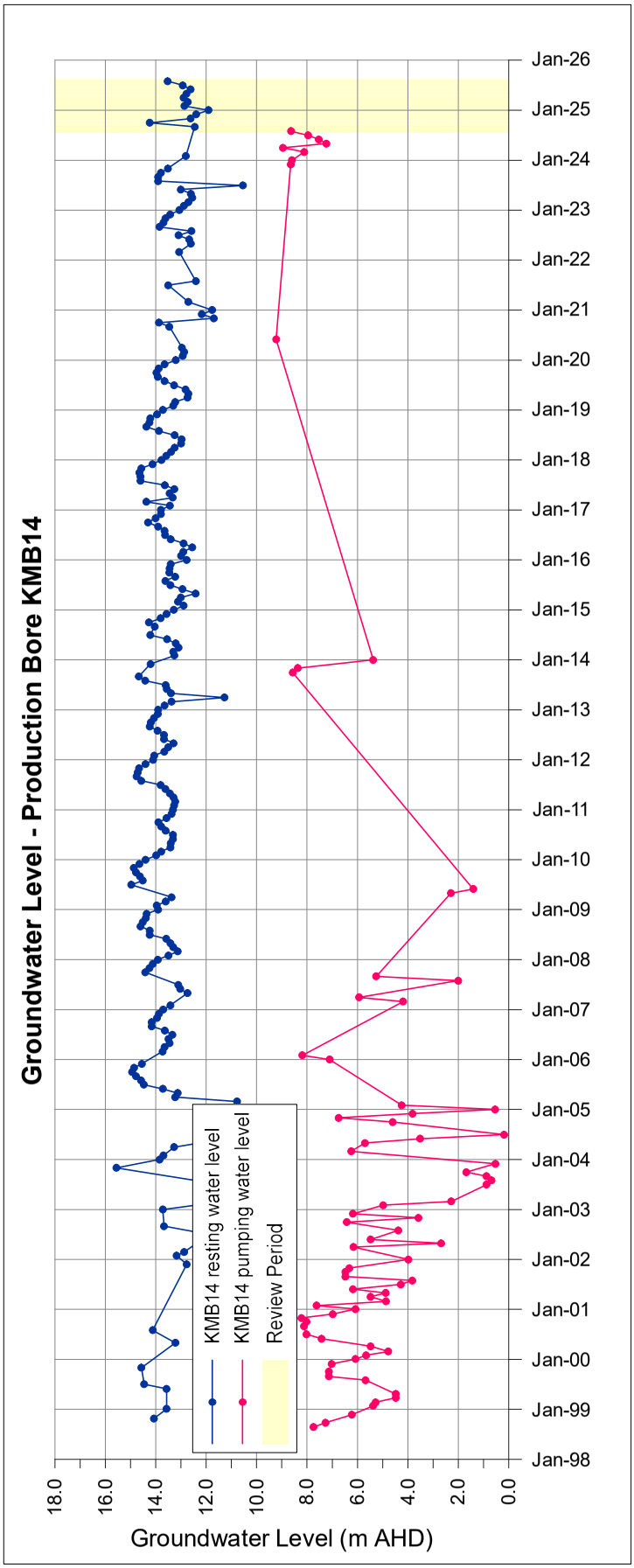
Figure 5





258-0/Grapher/Fig 5_Hydrographs for KMB7, KMB14.grf

Client: Kemerton Silica Sand Pty Ltd

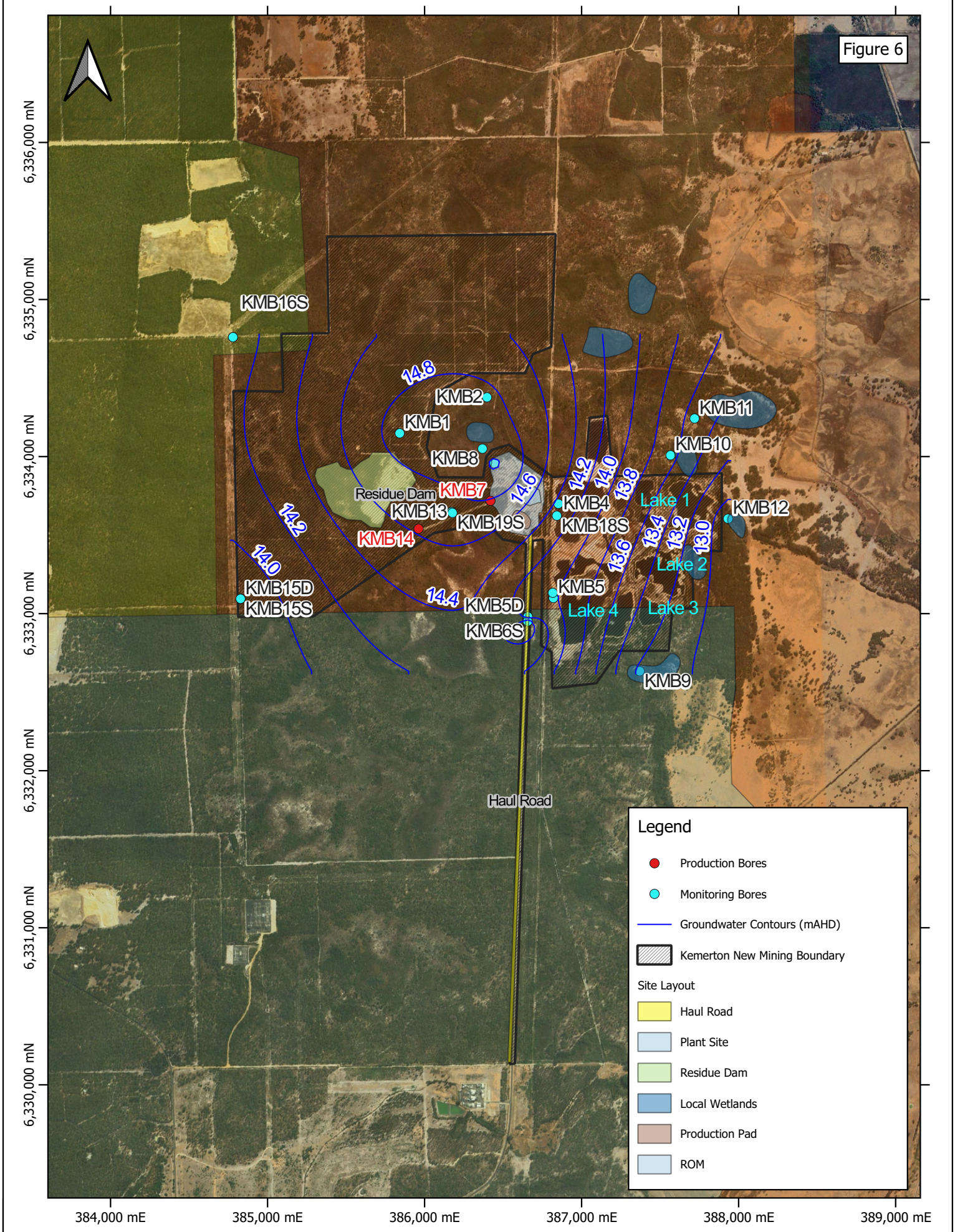
Project: Groundwater monitoring summary GWL 60367(5)

Date: October 2025

Dwg. No: 258.0/25/1-5

HYDROGRAPHS FOR PRODUCTION BORES KMB7 AND KMB14

Rockwater PROPRIETARY LIMITED



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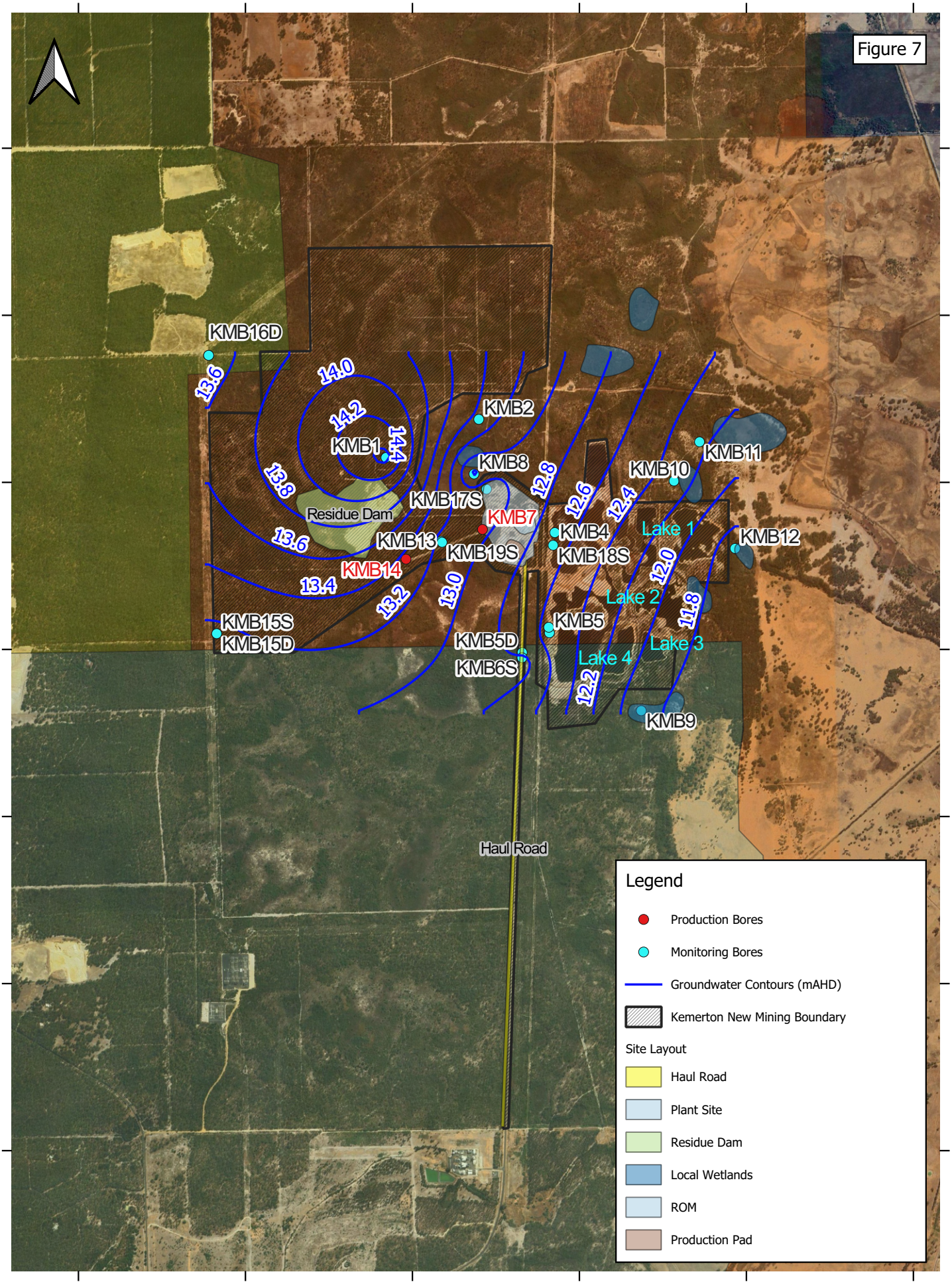
Rockwater

0 500 1,000 m

Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(4)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2025
Figure Number	258-0/25-01/6

GROUNDWATER CONTOUR MAP
SEPTEMBER 2024



L:\QGIS Projects\258-0 KSS\KSS

Rockwater

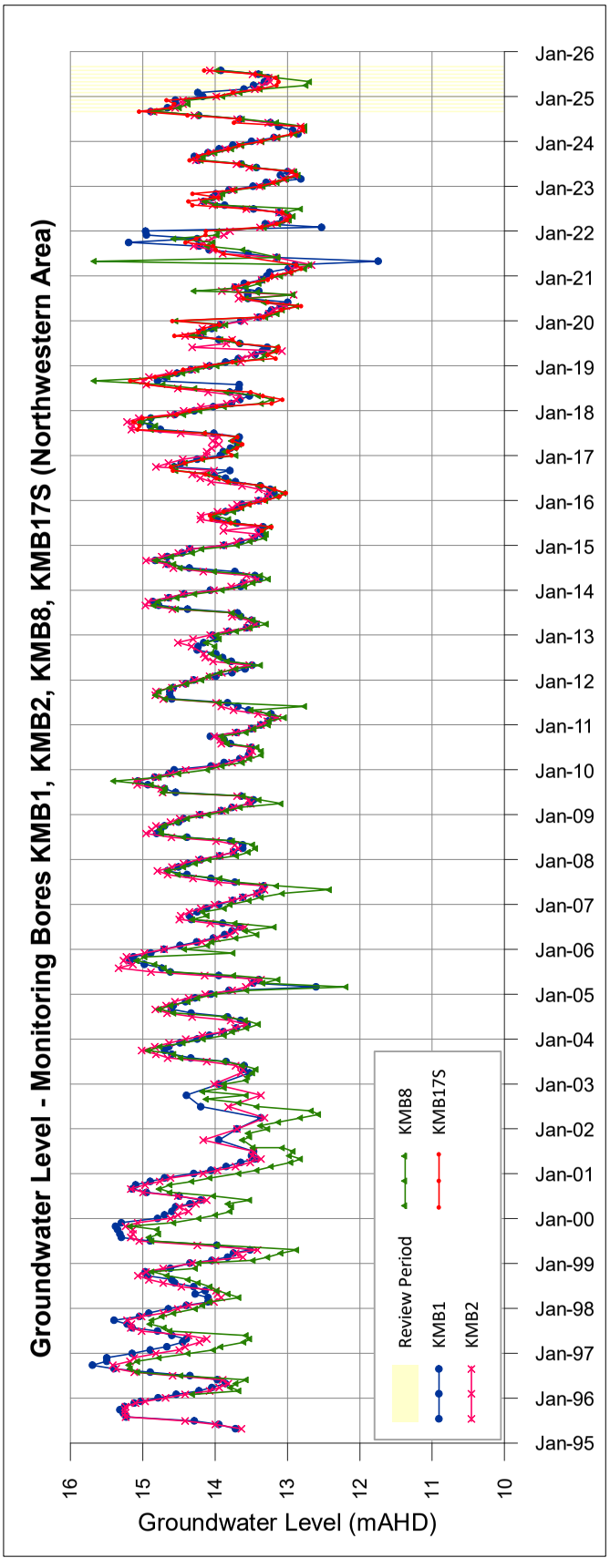
0 500 1,000 m

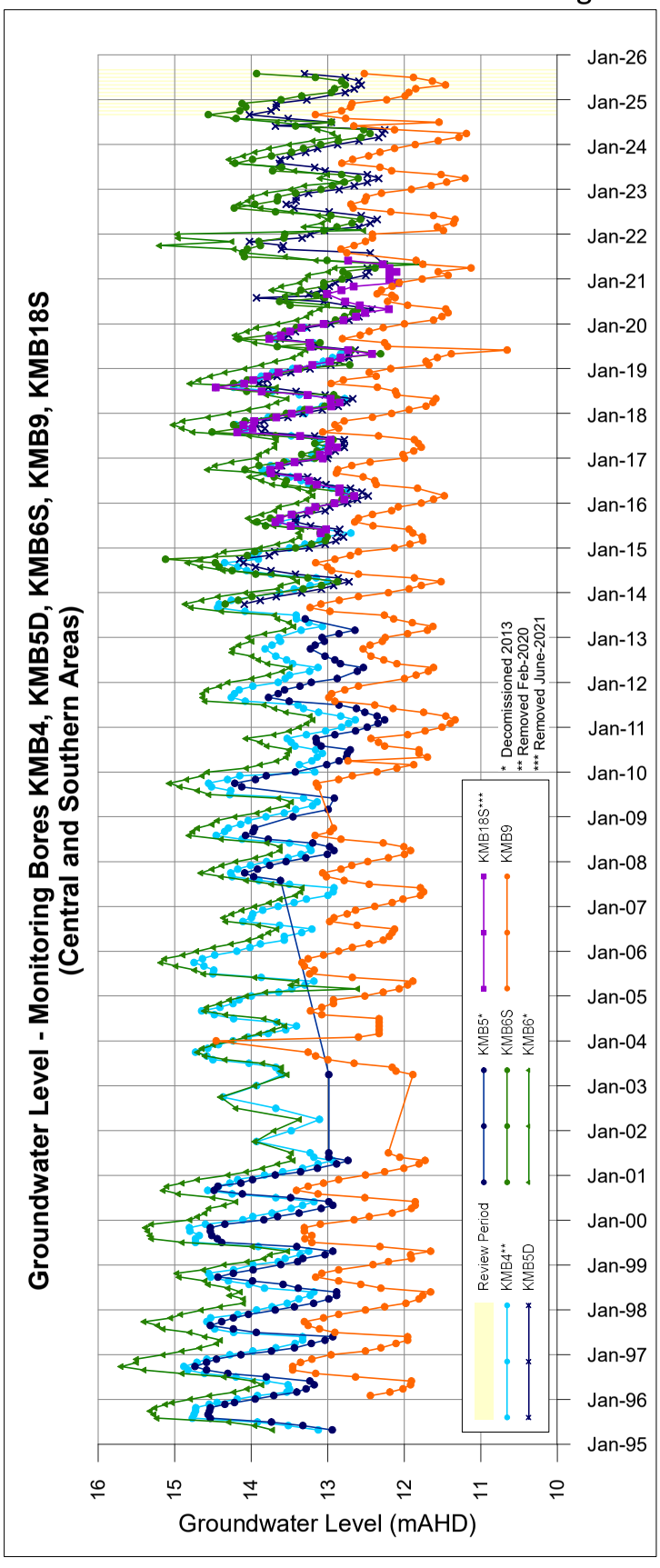
Coordinate System: GDA2020
MGA Zone 50

Project	Groundwater Monitoring Summary GWL 60367(4)
Client	Kemerton Silica Sand Pty Ltd
Date	October 2025
Figure Number	258-0/25-01/7

GROUNDWATER CONTOUR MAP
APRIL 2025

Figure 8





258-0/Grapher/Fig8_Hydrographs for monitoring bores (NW).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(5)

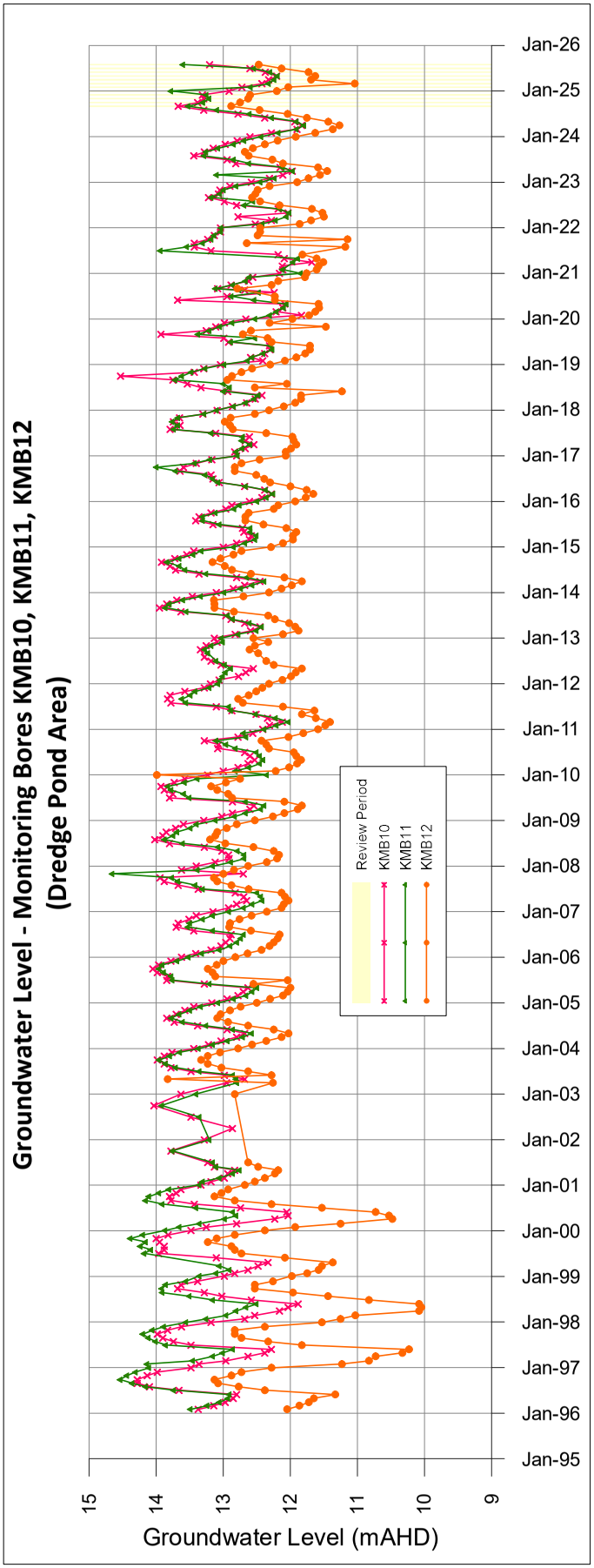
Date: October 2025

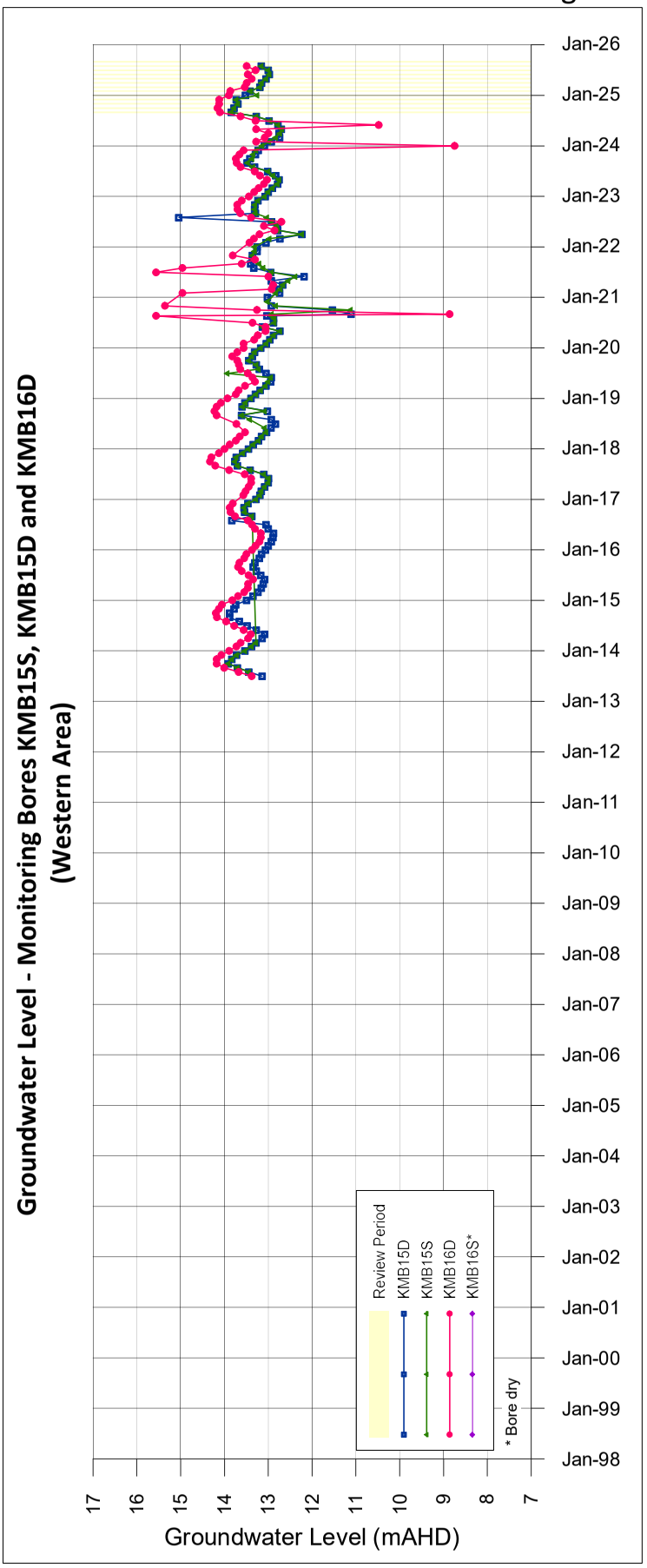
Dwg. No: 258.0/25/1-8

HYDROGRAPHS FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KMB17S AND KMB18S

Rockwater PROPRIETARY LIMITED

Figure 9





258-0/Grapher/Fig9_Hydrographs for monitoring bores (Dredge Pond).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(5)

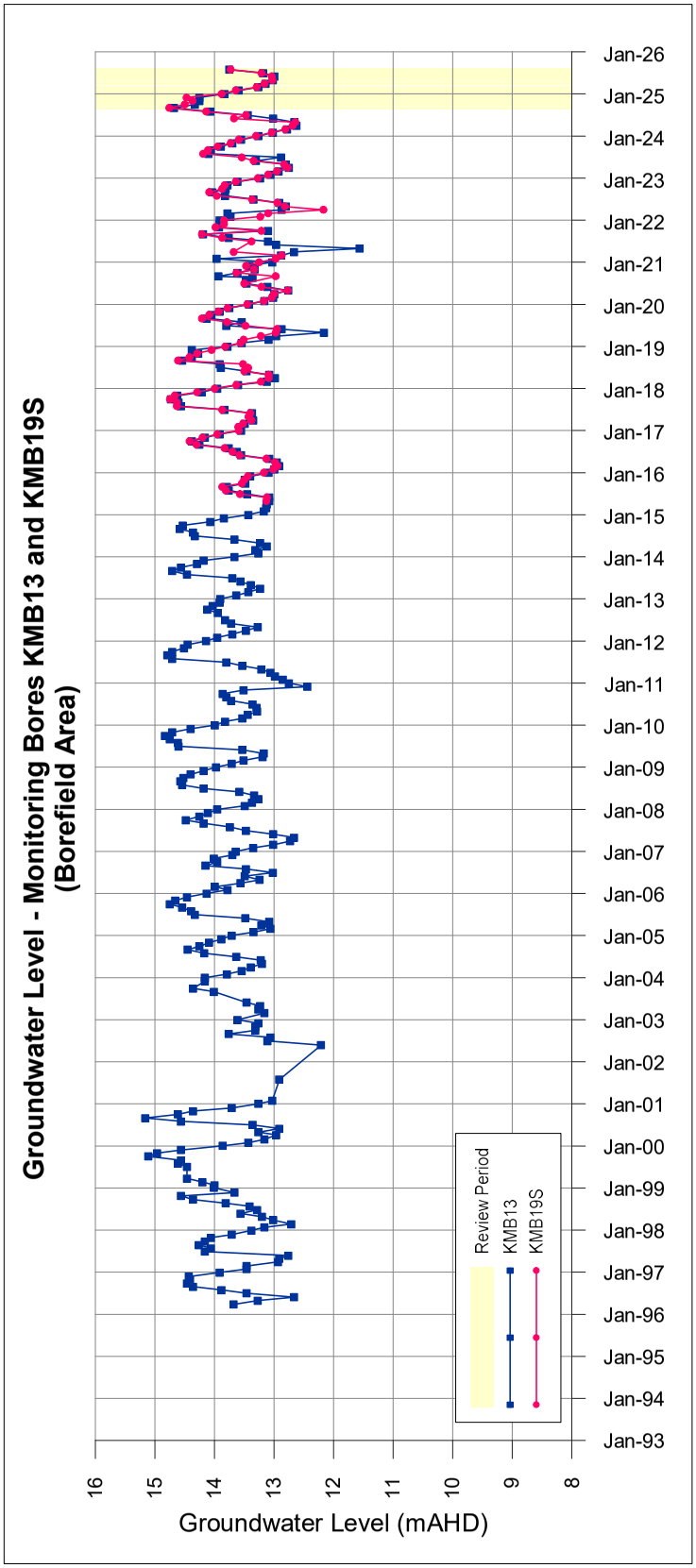
Date: October 2025

Dwg. No: 258.0/25/1-9

HYDROGRAPHS FOR MONITORING BORES KMB3, KMB10, KMB11, KMB12, KMB15S, KMB15D AND KMB16D

Rockwater PROPRIETARY LIMITED

Figure 10



258-0/Grapher/Fig10_Hydrographs for monitoring bores (Borefield).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(5)

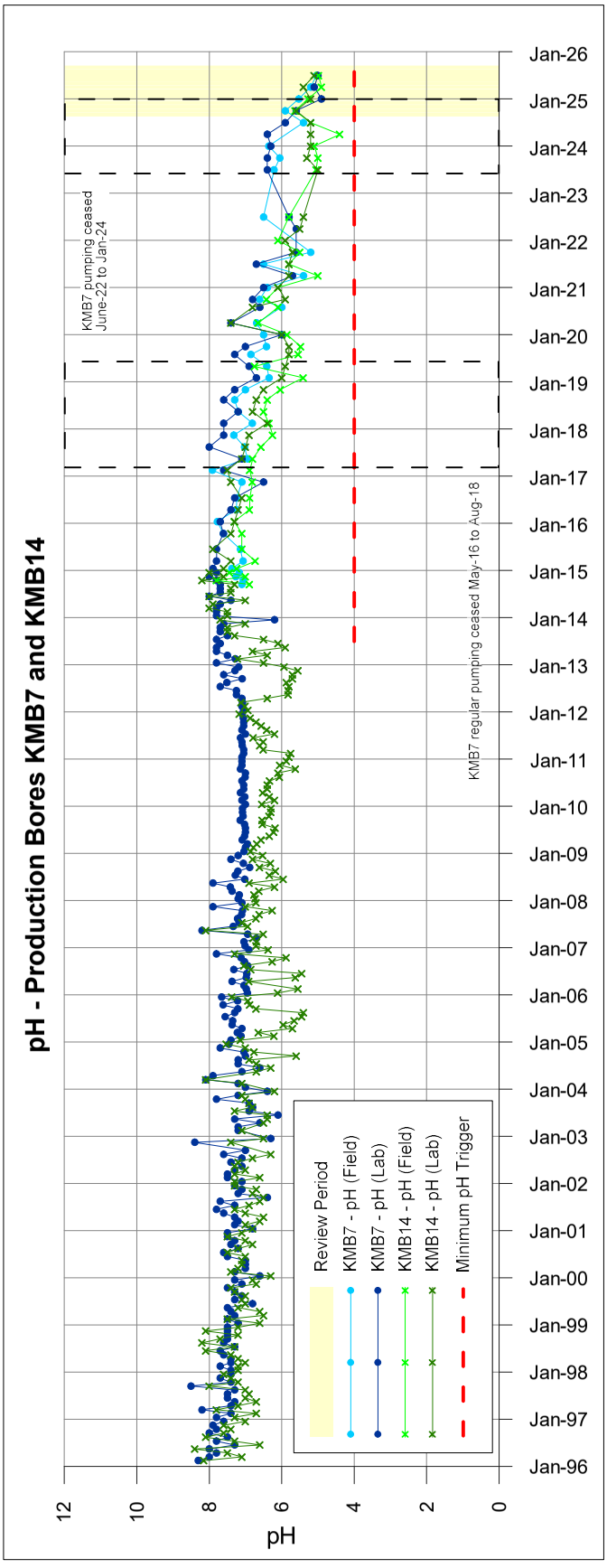
Date: October 2025

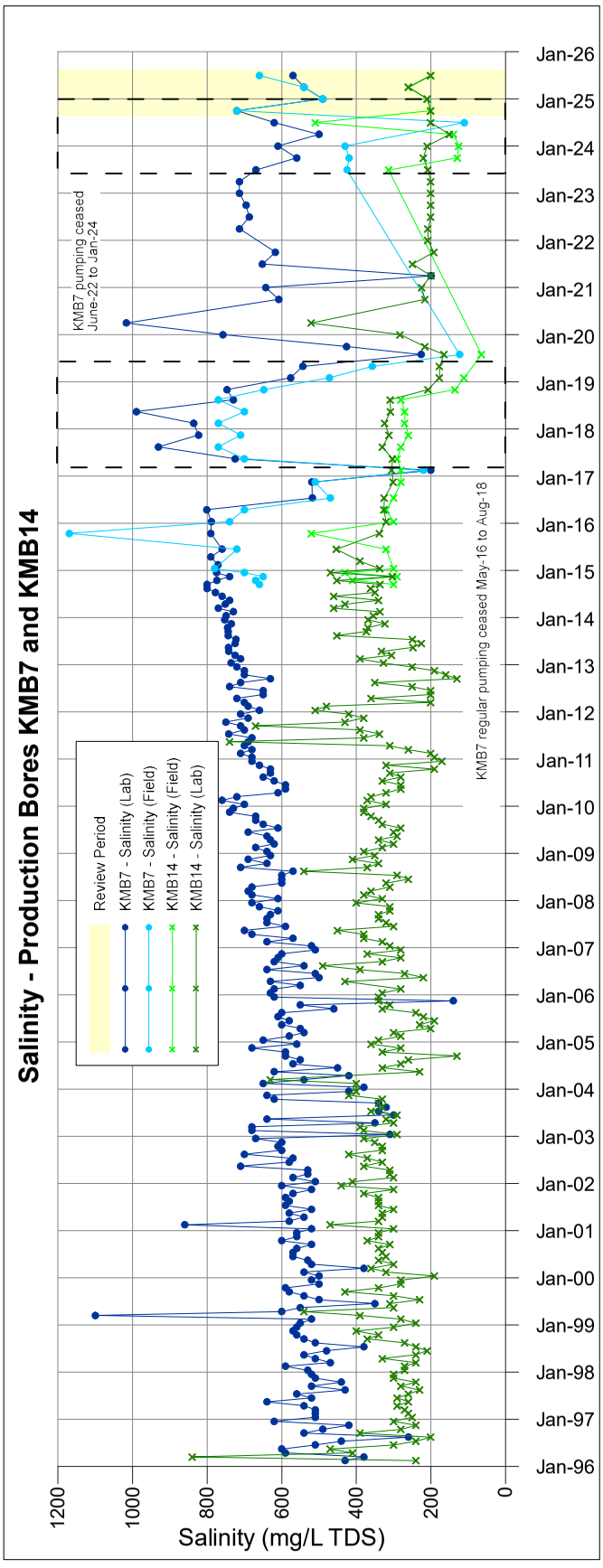
Dwg. No: 258.0/25/1-10

HYDROGRAPHS FOR MONITORING BORES KMB13 AND KMB19S

Rockwater PROPRIETARY LIMITED

Figure 11





258-0/Grapher/Fig11_Salinity and pH (Prod. Bores).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(5)

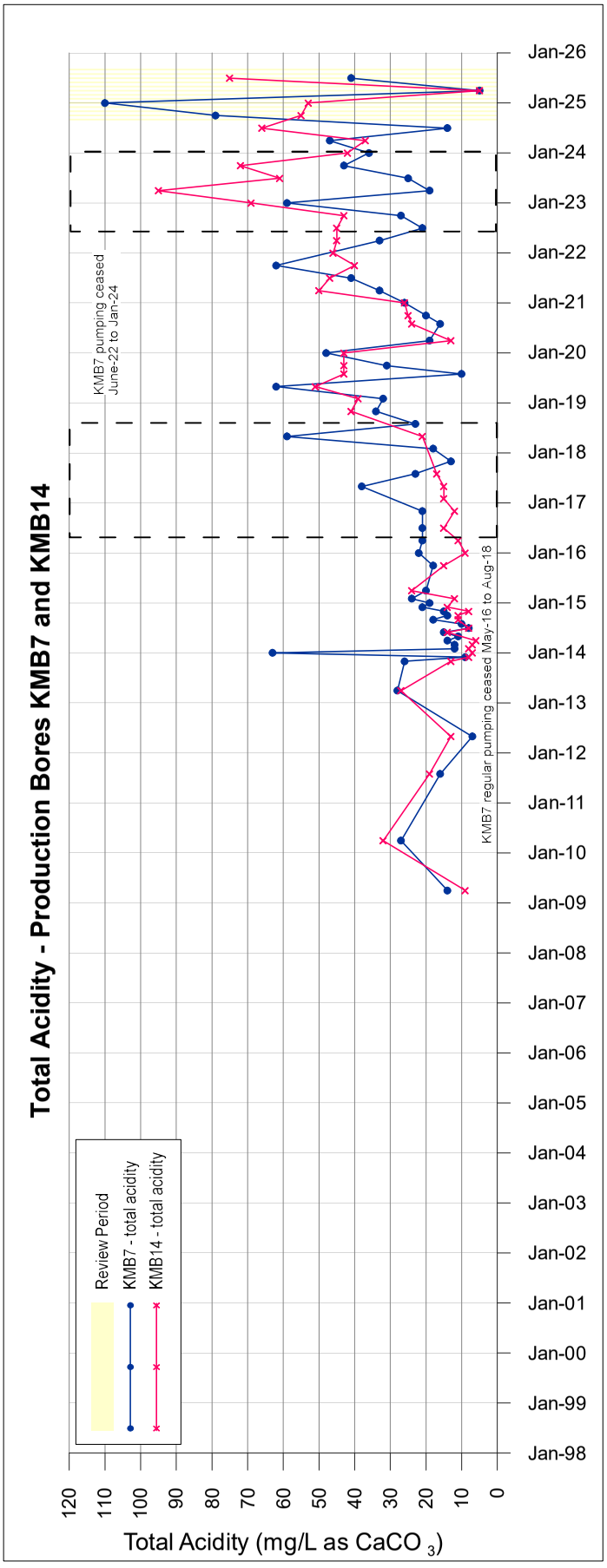
Date: October 2025

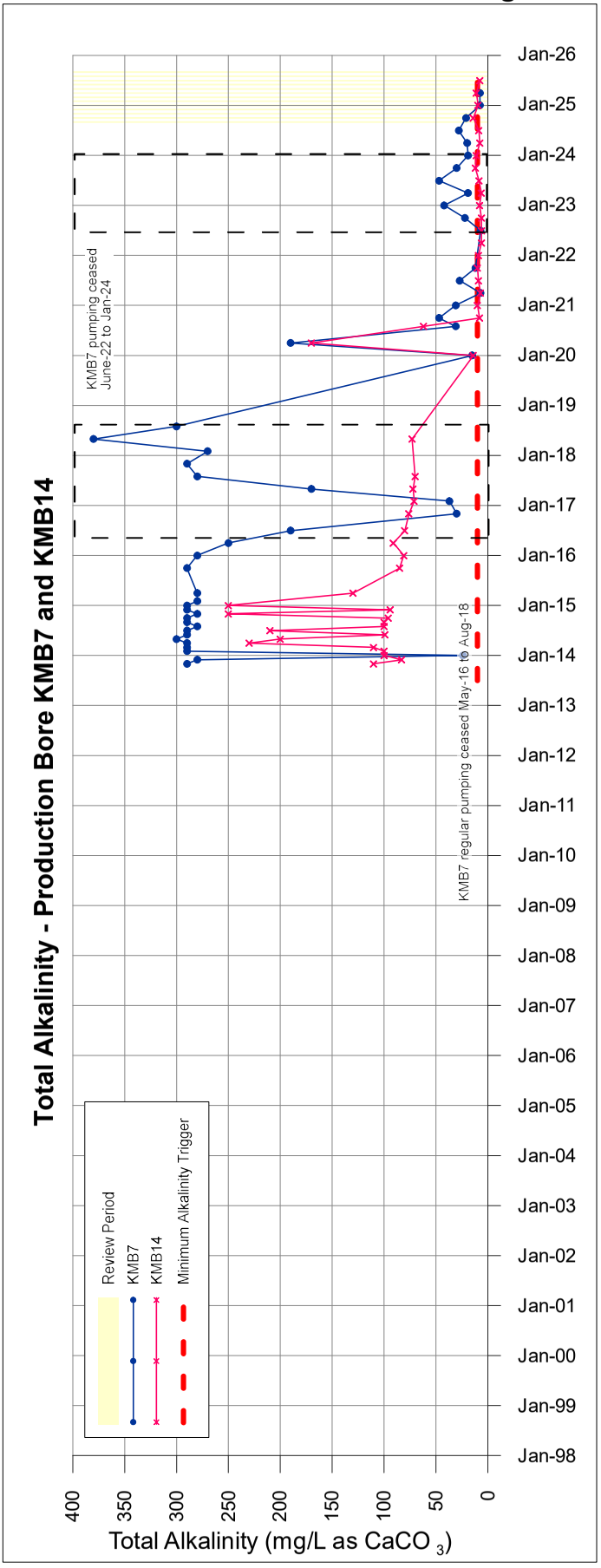
Dwg. No: 258.0/25/1-11

SALINITY AND pH
IN PRODUCTION BORES
KMB7 AND KMB14

Rockwater
PROPRIETARY LIMITED

Figure 12





258-0/Grapher/Fig12_ttl acidity and alkalinity (Prod. Bores).grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater monitoring summary GWL 60367(5)

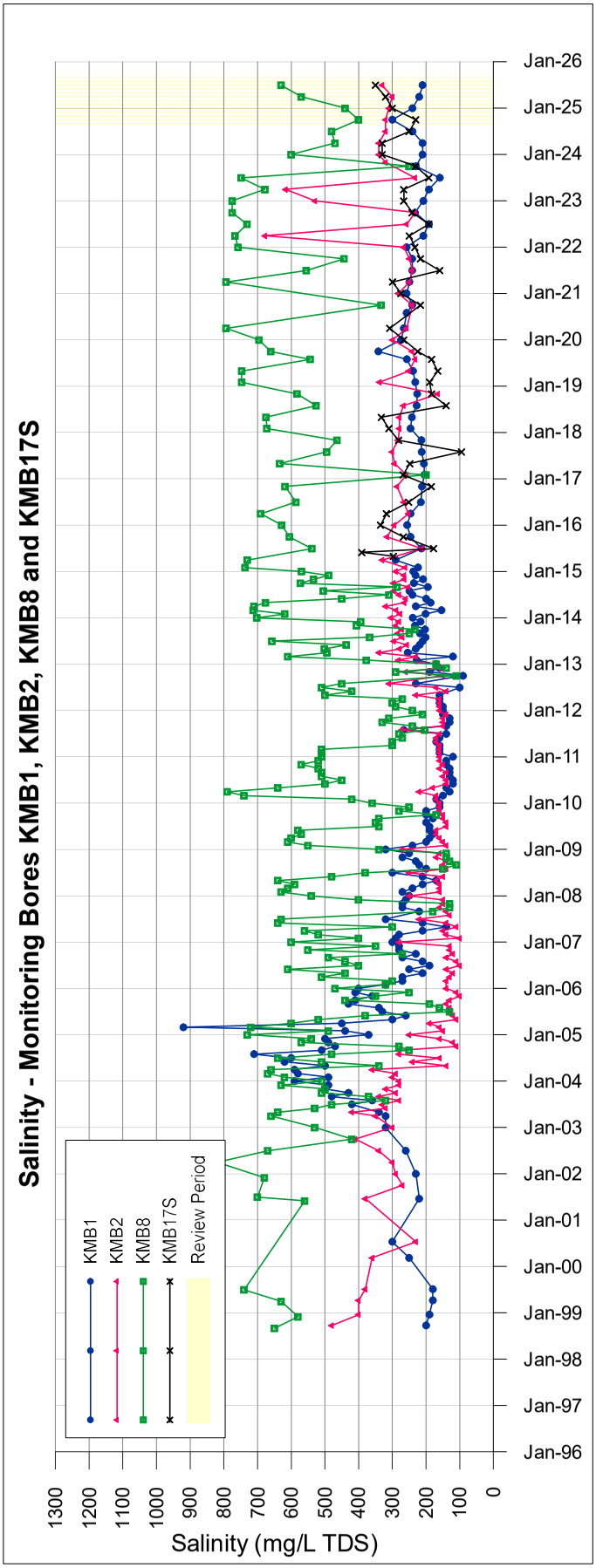
Date: October 2025

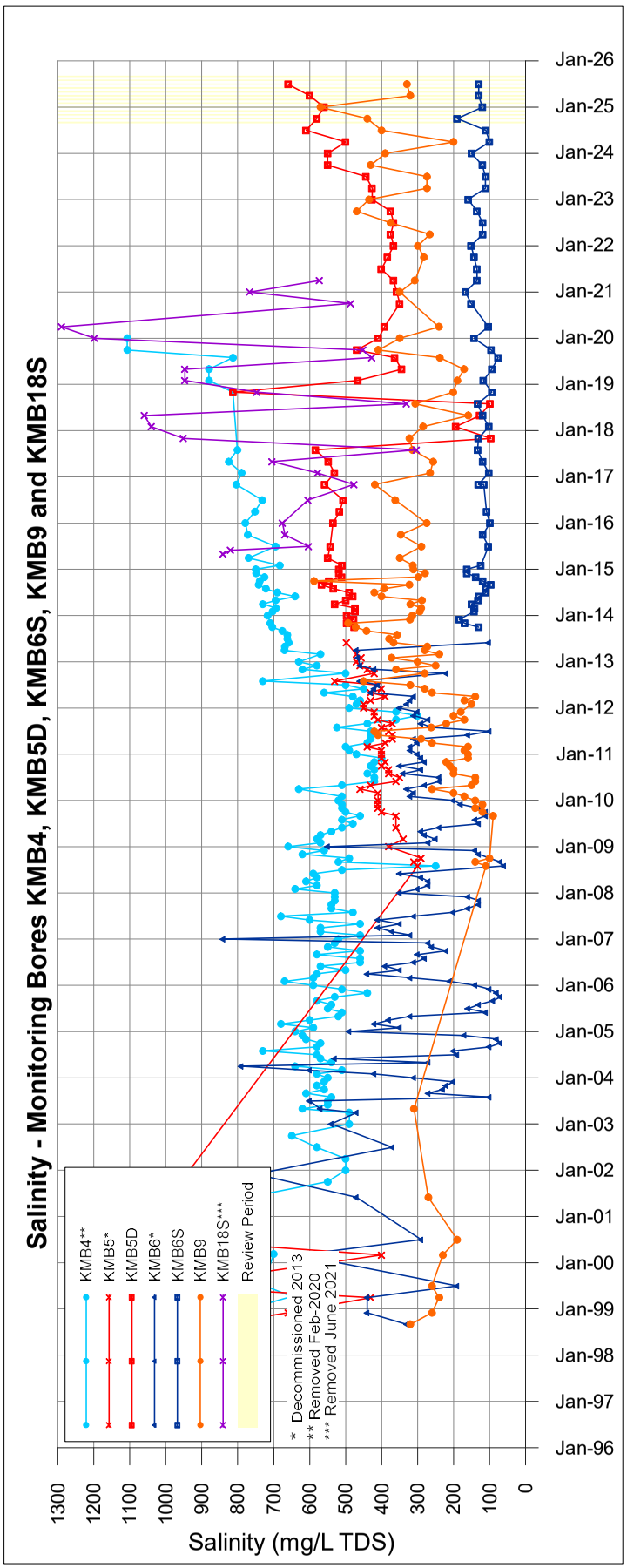
Dwg. No: 258.0/25/1-12

TOTAL ACIDITY AND ALKALINITY IN PRODUCTION BORES KMB7 AND KMB14

Rockwater PROPRIETARY LIMITED

Figure 13





258-0/Grapher/Fig13_Salinity_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(5)

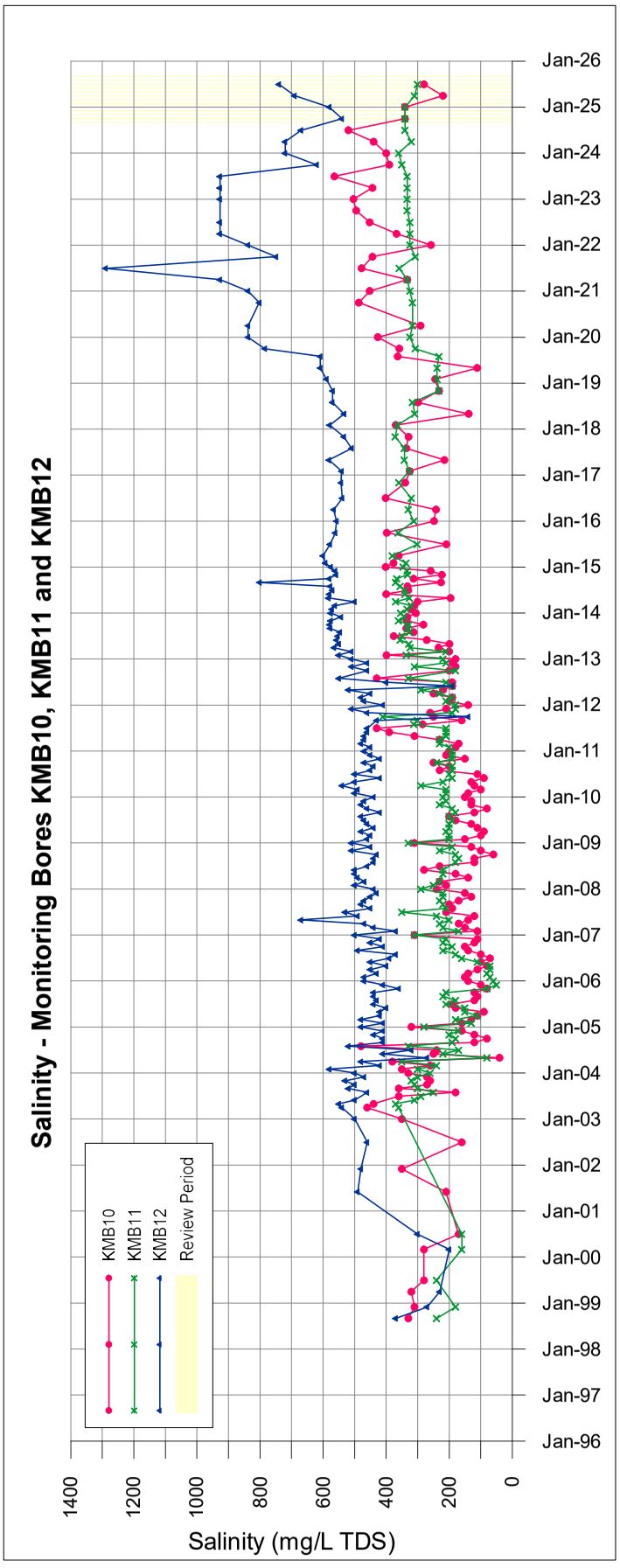
Date: October 2025

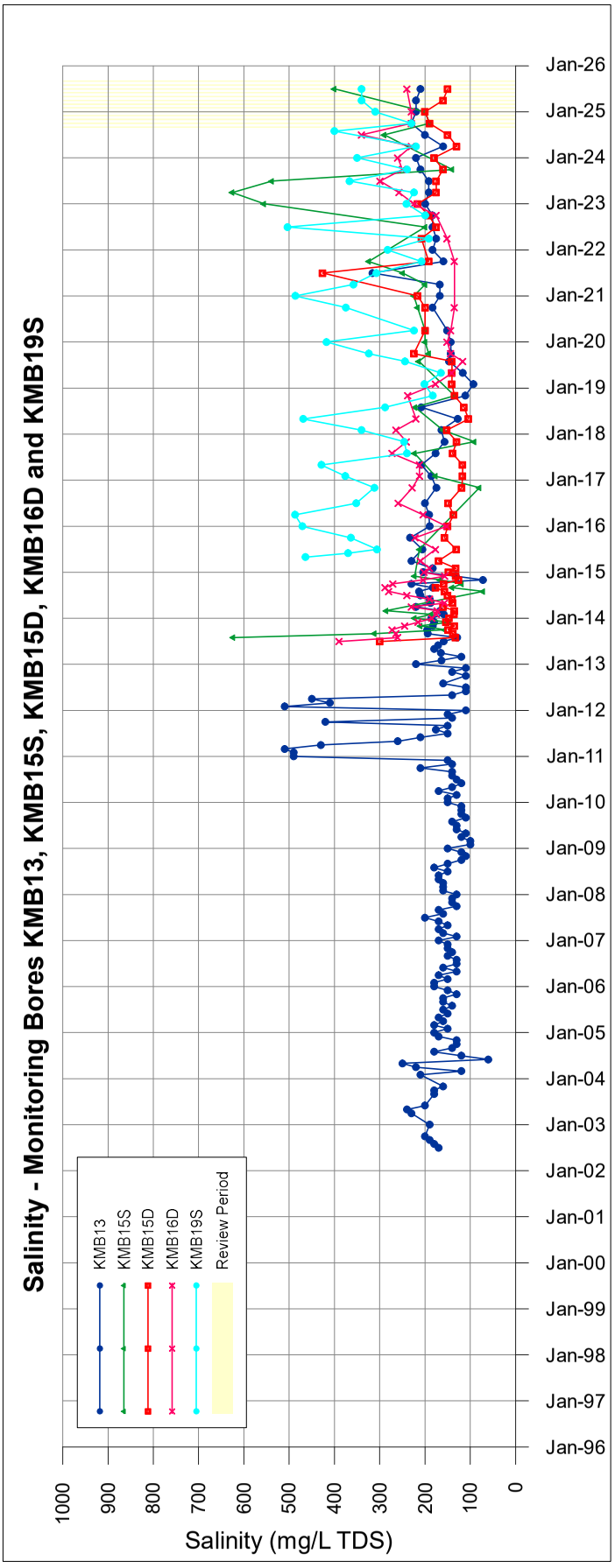
Dwg. No: 258.0/25/1-13

SALINITY FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KMB17S AND KMB18S

Rockwater PROPRIETARY LIMITED

Figure 14





258-0/Grapher/Fig14_Salinity_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(5)

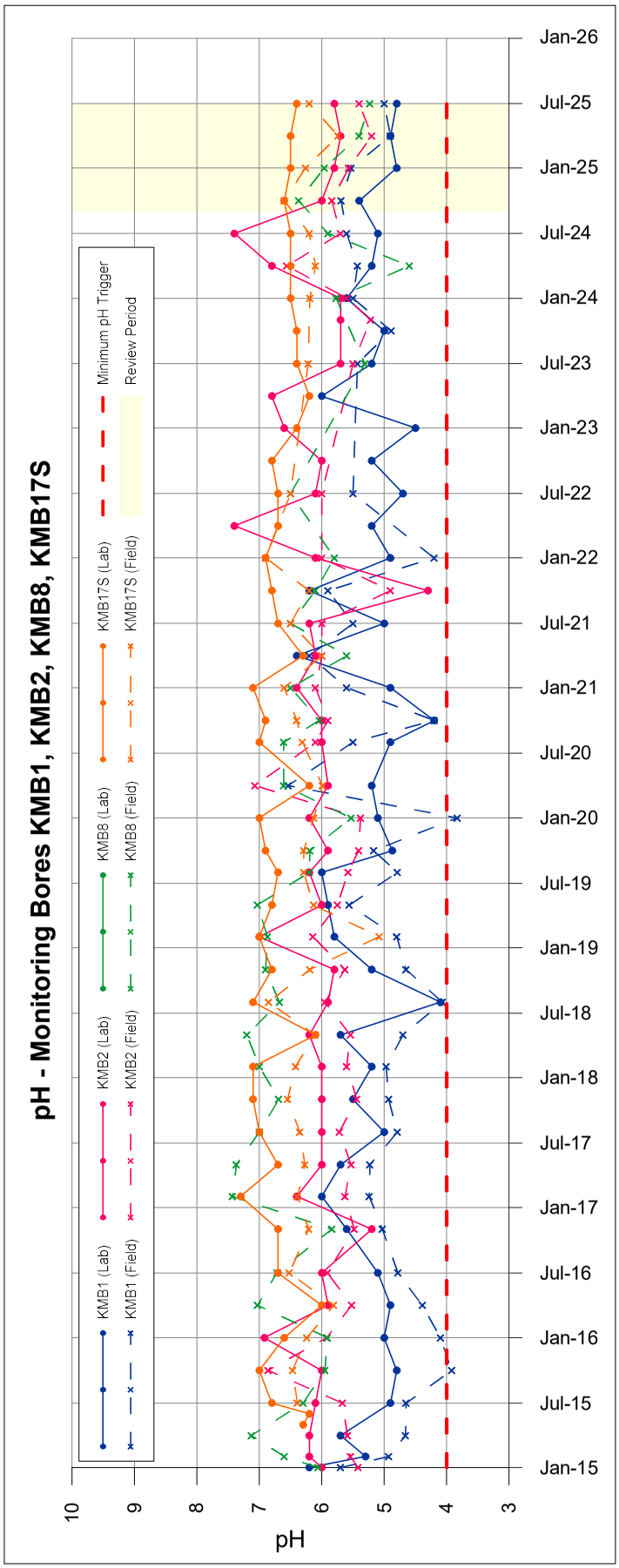
Date: October 2025

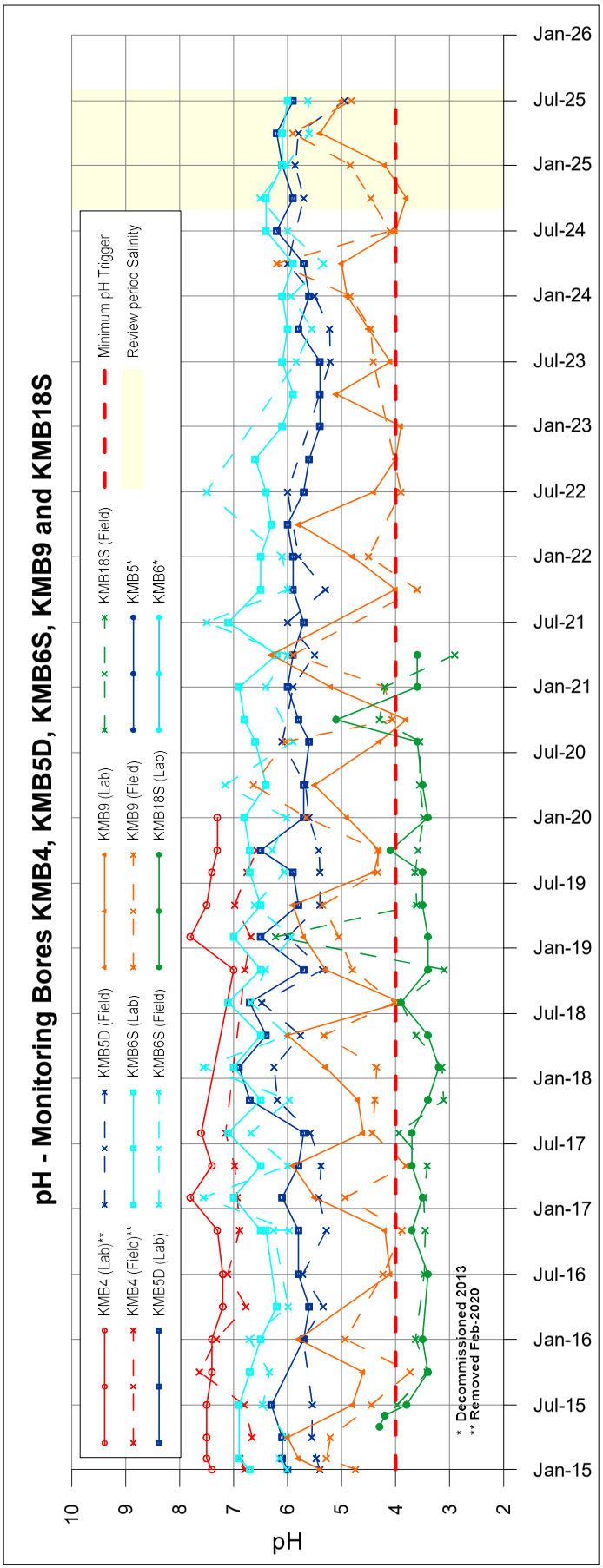
Dwg. No: 258.0/25/1-14

SALINITY FOR MONITORING BORES KMB10, KMB11, KMB12, KMB13, KMB15S, KM15D, KMB16D AND KMB19S

Rockwater PROPRIETARY LIMITED

Figure 15





258-0/Grapher/Fig15_pH_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(5)

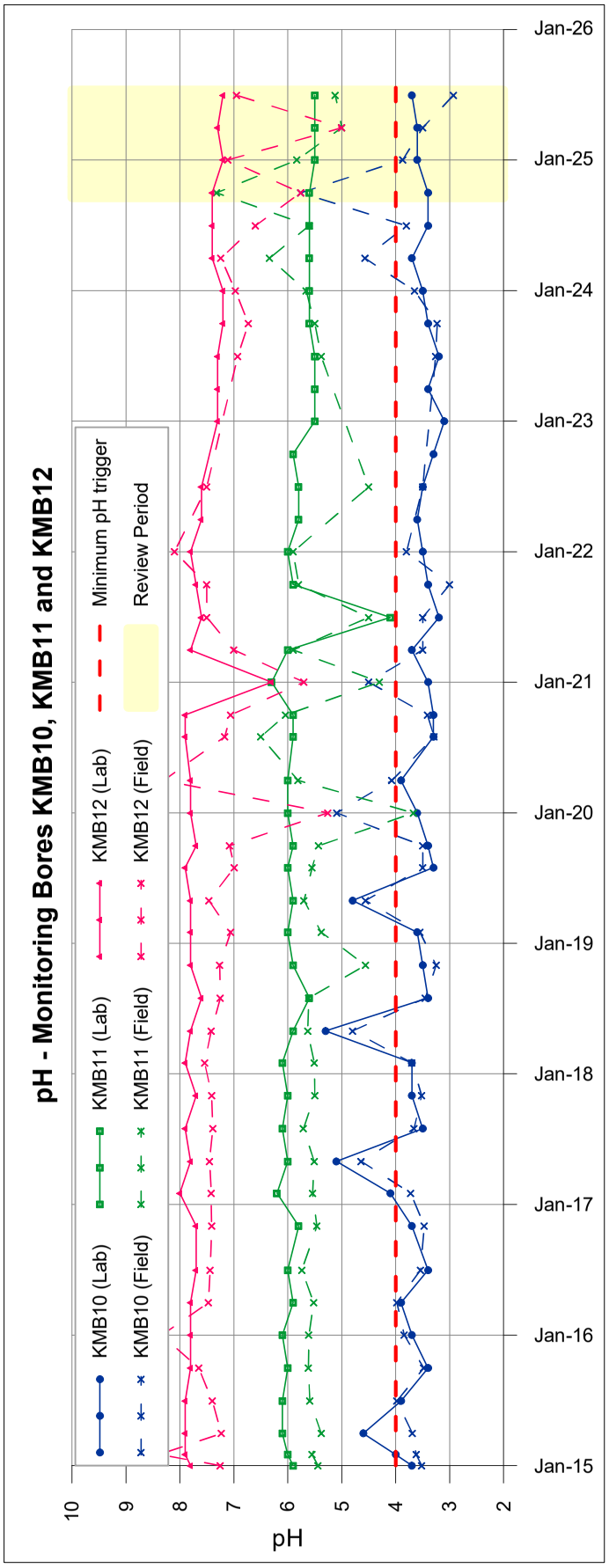
Date: October 2025

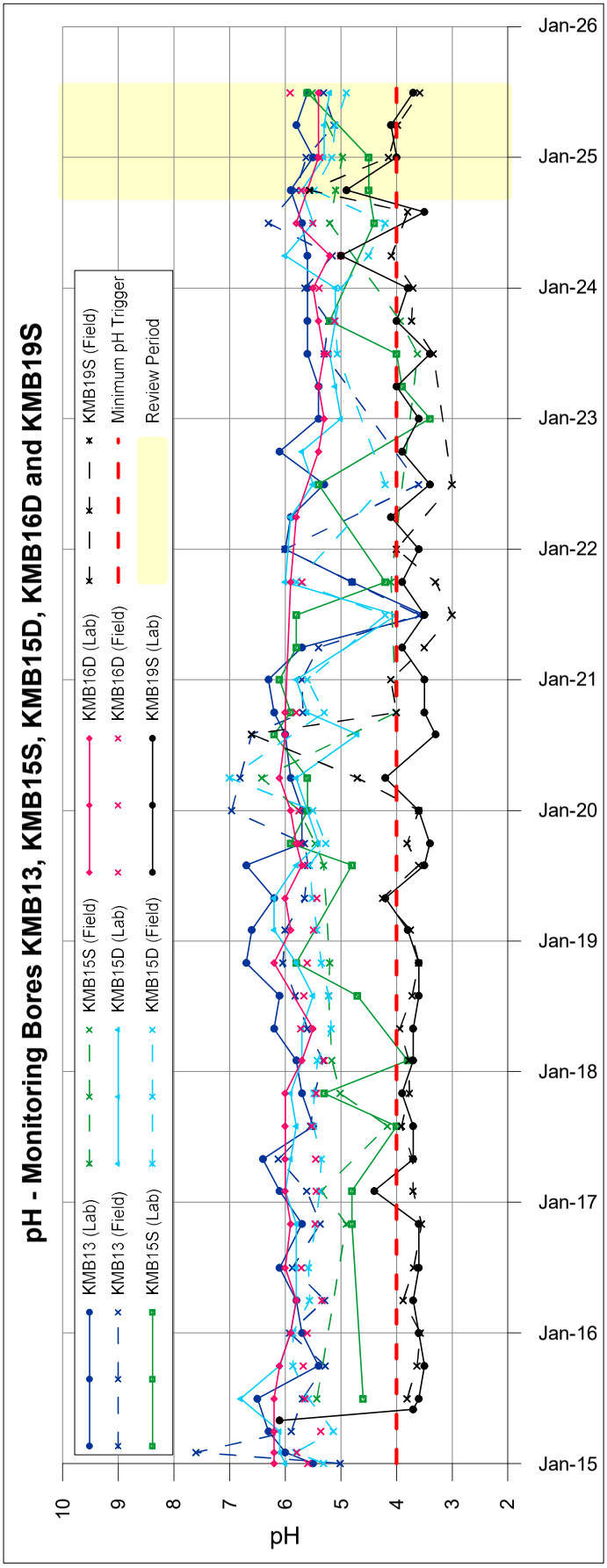
Dwg. No: 258.0/25/1-15

pH FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KM17S AND KMB18S

Rockwater PROPRIETARY LIMITED

Figure 16





258-0/Grapher/Fig16_pH_monitoring_bores.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(5)

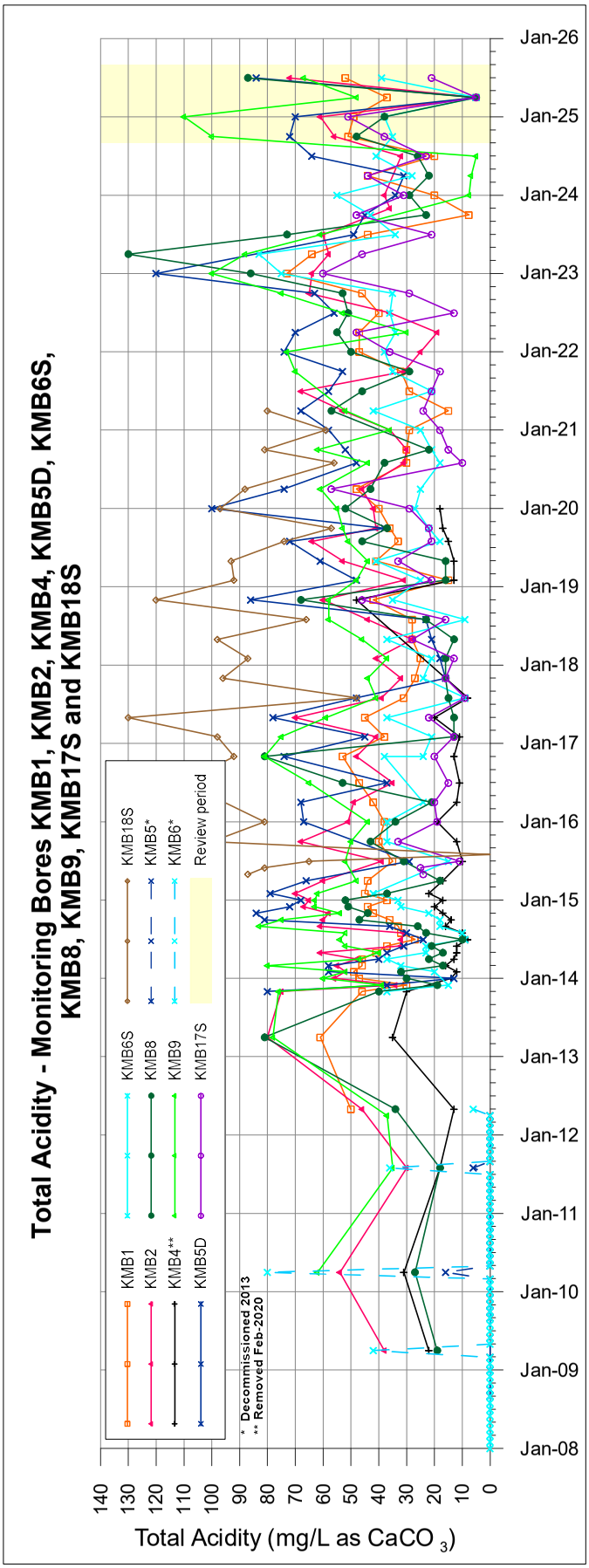
Date: October 2025

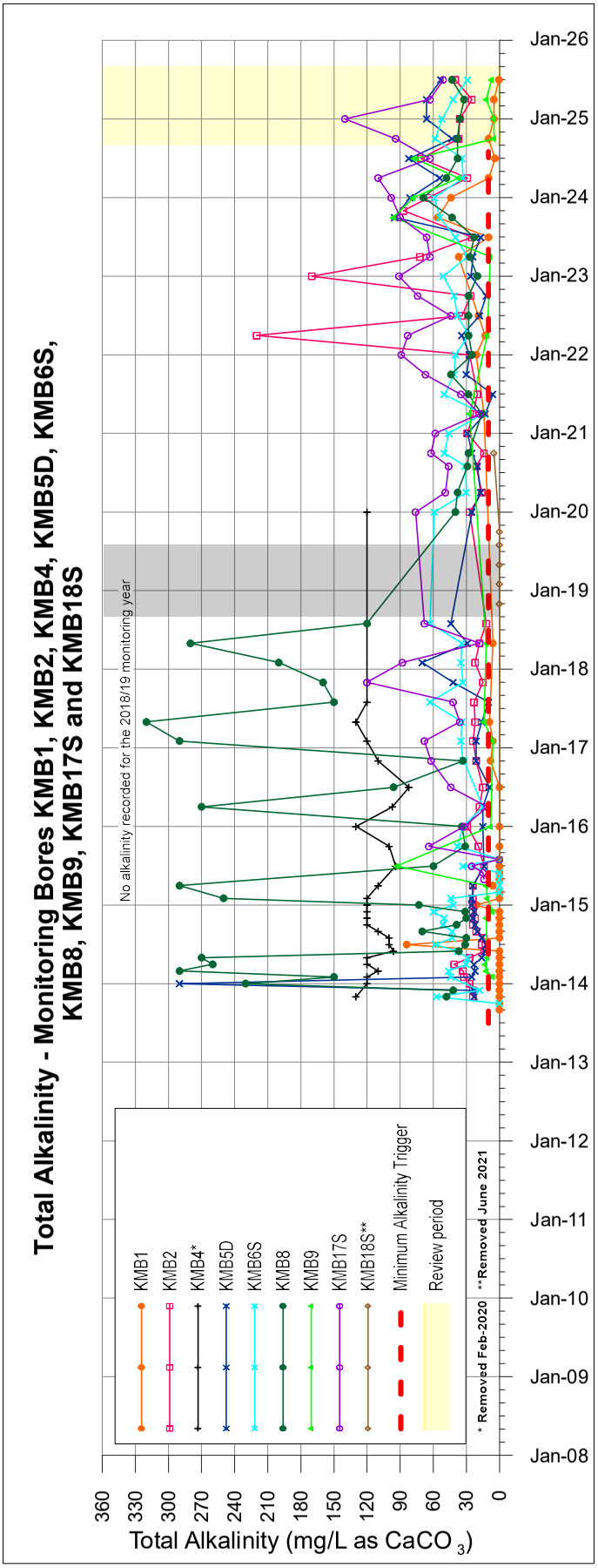
Dwg. No: 258.0/25/1-16

pH FOR MONITORING BORES KMB10, KMB11, KMB12, KMB13, KMB15S, KMB15D, KMB16D AND KMB19S

Rockwater PROPRIETARY LIMITED

Figure 17





258-0/Grapher/Fig17_Total Acidity and Alkalinity.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(5)

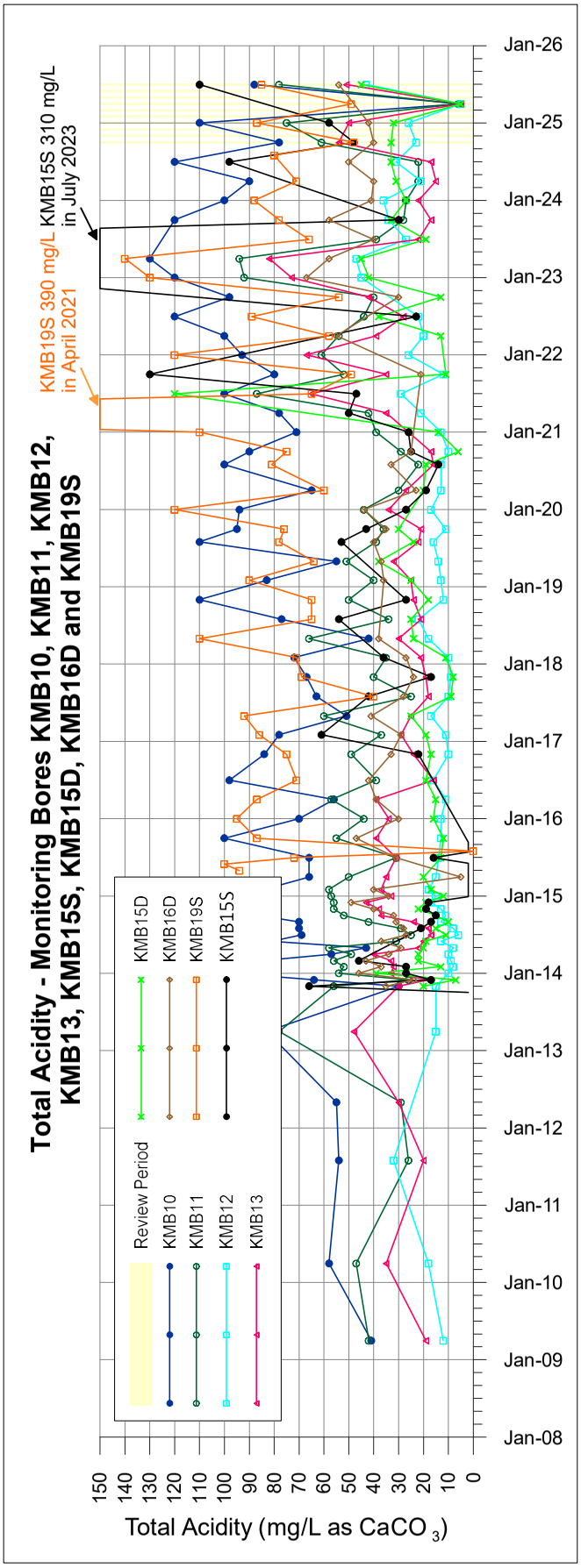
Date: October 2025

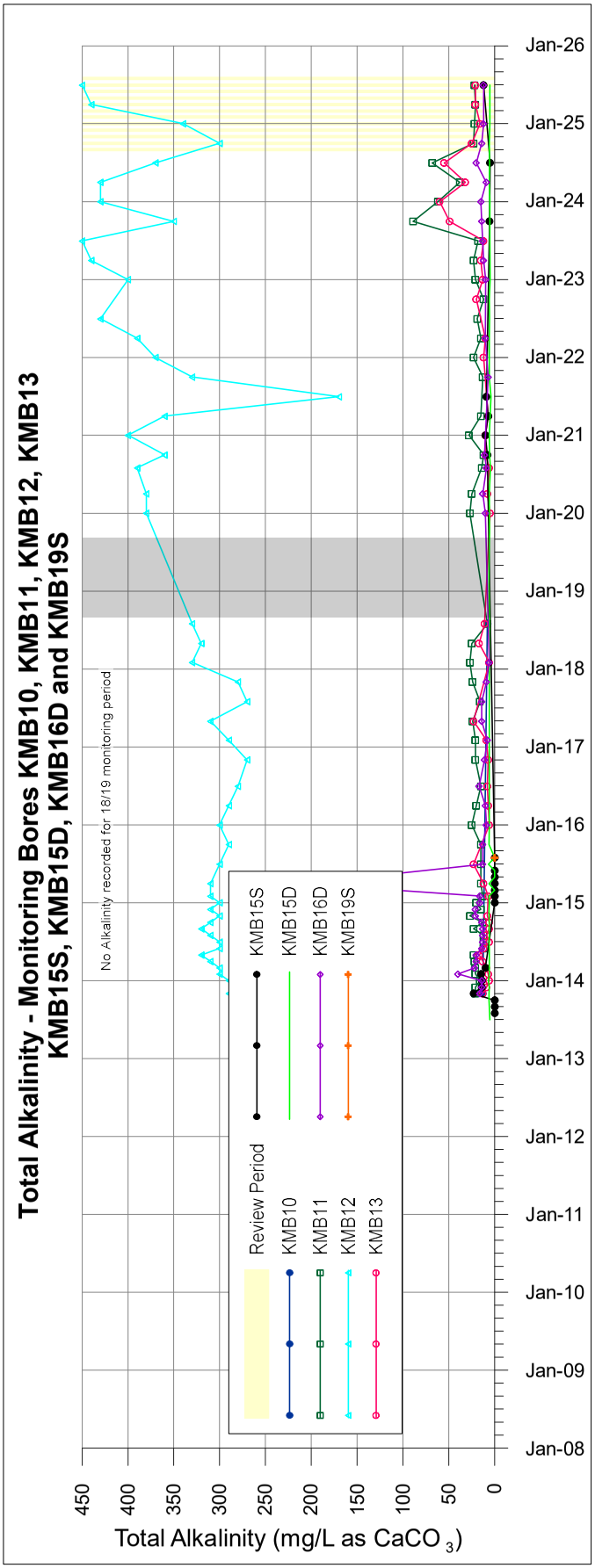
Dwg. No: 258.0/25/1-17

TOTAL ACIDITY AND ALKALINITY FOR MONITORING BORES KMB1, KMB2, KMB4, KMB5D, KMB6S, KMB8, KMB9, KMB17S AND KMB18S

Rockwater PROPRIETARY LIMITED

Figure 18





258-0/Grapher/Fig18_Total Acidity and Alkalinity.grf

Client: Kemerton Silica Sand Pty Ltd

Project: Groundwater Monitoring Summary GWL 60367(5)

Date: October 2025

Dwg. No: 258.0/25/1-18

TOTAL ACIDITY AND ALKALINITY FOR MONITORING BORES KMB10, KMB11, KMB12, KMB13, KMB15S, KMB15D, KMB16D AND KMB19S

Rockwater PROPRIETARY LIMITED

APPENDIX I

LICENCE TO TAKE WATER GWL 60367(5)

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	Kemerton Silica Sand Pty Ltd		
Description of Water Resource	South West Coastal Perth - Superficial Swan	**Annual Water Entitlement**	660,000kL
Location of Water Source	Lot 250 on Plan 405458 - Volume/Folio 2938/67 - Lot 250 Treasure Road Wokalup		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Washing and processing silica sands	Lot 250 on Plan 405458 - Volume/Folio 2938/67 - Lot 250 Treasure Road Wokalup
Duration of Licence	From 13 March 2025 to 12 March 2035	

This Licence is subject to the following terms, conditions and restrictions:

1. The annual water year for water taken under this licence is defined as 1 September to 31 August.
2. The licensee must not, in any water year, take more water than the annual water entitlement specified in this licence.
3. The licensee must notify the Department of Water and Environmental Regulation in writing of any water meter malfunction within seven days of the malfunction being noticed.
4. The licensee is to comply with the Monitoring and Management Plan for Licence to Take Water GWL60367(5) and any amendments made by or with the approval of the Department.
5. The licensee must submit to the Department of Water and Environmental Regulation the recorded meter readings and the volume of water taken within the water year, every 12 Months commencing 30/09/2025.

End of terms, conditions and restrictions

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

(under Schedule 1, clause 15 of the *Rights in Water and Irrigation Act 1914*)

Licensee(s):	Kemerton Silica Sand Pty Ltd
Location of water source:	Lot 250 in Plan 405458 – Volume/Folio 2938/67 – Treasure Road, Wokalup
Location of activity:	Lot 250 in Plan 405458 – Volume/Folio 2938/67 – Treasure Road, Wokalup
Authorised activity:	Washing and processing silica sands.

EXPLANATORY NOTES

These explanatory notes do not form part of the licence requirements.

1. Water source description

The following table identifies the drawpoints under this licence. A 'drawpoint' is defined as a location from which water is taken.

1.1 Groundwater production bores

Lot No.	Drawpoint Designation	Easting	Northing	Drawpoint Type	Aquifer	Depth (m)
250	KMB7	386420	6333718	Bore	Superficial	29
250	KMB14	385960	6333537	Bore	Superficial	30.4

*MGA coordinates in GDA94 datum coordinates – easting/northing/zone 50

1.2 Superficial aquifer Groundwater Monitoring Bores

Lot No.	Drawpoint Designation	Easting	Northing	SWL^ (mbtoc)	Slotted Depth (m bTOC)
250	KMB1	385833	6334155	2.95	11.0 – 23.4
401	KMB2	386411	6334389	1.99	11.0 – 23.0
250	KMB5D	386658	6332982	3.15 (May'13)	10.0 – 22.0
250	KMB6S	386658	6332951	3.14 (May'13)	2.0 – 10.0
401	KMB8	386355	6334049	0.85	? – 20.08>
405	KMB9	387372	6332631	1.47	? – 19.95>
405	KMB10	387566	6334005	1.45	? – 19.65>

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

Lot No.	Drawpoint Designation	Easting	Northing	SWL^ (mbtoc)	Slotted Depth (m bTOC)
405	KMB11	387724	6334245	2.54	? – 14.35>
405	KMB12	387934	6333600	1.05	? – 20.05>
250	KMB13	386177	6333645	1.27	? – 24.90>
250	KMB15S	384828	6333095	5.16 (May'13)	4.0 – 6.0
250	KMB15D	384828	6333095	5.86 (May'13)	11.0 – 23.0
400	KMB16S	384780	6334762	6.34 (May'13)	4.0 – 6.0
400	KMB16D	384780	6334762	8.82 (May'13)	11.0 – 23.0
250	KMB17S	386444	6333960	-	1.25-7.65
250	KMB19S	386178	6333642	-	1.25-7.65

^ September 2011 unless otherwise stated
> as probed in August 2000

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

2. Risk identification

The following table identifies the potential risks to the water resources, other users and groundwater dependent environments (GDE) from the take and use of water on this property. Groundwater and surface water monitoring to support the sustainable management of the water resources and land-use are summarised below and detailed in following sections.

Potential Risk	Required Monitoring to Address Risk
A. Excessive drawdown within the Superficial aquifer	○ Metering, **monthly** meter readings and **annual** reporting of extraction volumes from each licensed drawpoint
B. Excessive drawdown influencing overlying aquifers and . GDEs	○ **Monthly** water level measurements from monitoring sites to monitor for effects on aquifers and drying out of Acid Sulphate Soils and GDEs.
C. Adverse water quality trends in the Superficial aquifer, e.g. saline incursion; recycling of salts; mobilisation of nutrients; acid generation from the drying out of Acid Sulphate Soils	Analysis of water from representative monitoring sites as follows: **Quarterly** (Sept or Oct, Dec or Jan, March or April **&** June or July): ○ pH and salinity **Annually** (March or April) laboratory analyses: ○ pH, salinity, chloride and sulphate ○ Additional analytes required as Acid Sulphate Soils have been identified in the area.

3. Chemistry trigger levels

Trigger levels are defined as '*the concentrations (or loads) of key performance indicators measured for the protection of existing users and the ecosystem, below which there exists a low risk that adverse impacts to existing users or biological (ecological) effects will occur. They indicate a risk if exceeded and should 'trigger' some action, either further ecosystem specific investigations or implementation of management/remedial actions*' (reference ANZECC Guidelines for Fresh and Marine Water Quality (2000)).

If any movement beyond a groundwater chemistry trigger level occurs, then management and/or remedial actions will be discussed between the Department of Water and Environmental Regulation and the licensee. These may include, but are not limited to:

- Increased monitoring requirements; that is, increased sampling frequency, additional chemistry parameters, or additional monitoring sites.
- Conducting a water efficiency audit to investigate methods of reducing water demand
- Changing pumping schedules to reduce extraction from the area concerned

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

Trigger levels for salinity in all monitoring sites listed in Section C1 are set at the upper level of the Salinity threshold categories listed in Table 5 of *Policy Group 6.1* of the *South West groundwater areas allocation plan*, *May 2009*, part of which is reproduced below:

Salinity type	Range (mg/L TDS)
Fresh	< **500**
Marginal	500 - **1,000**
Brackish	1,000 - **2,000**
Moderately saline	2,000 - **5,000**
Saline	5,000 - **10,000**

These levels act as indicators of potentially unacceptable increased in salinity across the site.

Superficial aquifer groundwater chemistry trigger levels

1. Trigger levels apply for the following chemistry parameters in all monitoring site listed in Section C1. These levels act as an indicator that groundwater is either acidifying or is vulnerable to acidification:

Parameter	Warning Trigger	Action Trigger
pH (field)	<5[1]	<4
Total alkalinity (as $CaCO_3$)	<30mg/L[1]	<10mg/L
Total acidity (as $CaCO_{3)}$	>100mg/L[1]	In conjunction with at least one other warning trigger.
Net Acidity (as $CaCO_3$)		- 30mg/L

*Identified as being above the trigger in at least two consecutive samples.

Sources
[1]DWER Guidelines – *Treatment and management of soils and water in acid sulphate soil landscapes; June 2015*

4. Additional notes

- Any new information will be included in an Addendum to this Monitoring Plan

END OF EXPLANATORY NOTES

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

MONITORING REQUIREMENTS

A. Monitoring plan terms, conditions and restrictions

A1) The following describe the terms, conditions and restrictions that the licensee shall comply with under this monitoring plan, and which form part of the conditions of licence.

B. Water monitoring - general

B1) All methods and equipment used in water quality sampling should be undertaken in accordance with the Australian Standard AS/NZS 5667 (1998) and wherever possible, a NATA registered laboratory should undertake the analyses, using NATA accredited analysis methods.

B2) Electrical Conductivity (EC; µS/cm) shall be compensated to 25°C.

B3) The method used for the determination of salinity as Total Dissolved Solids in mg/L shall be reported as gravimetric @ 180°C.

C. Groundwater monitoring

Superficial aquifer groundwater chemistry

C1) The licensee shall maintain the following monitoring sites for the purpose of monitoring Superficial aquifer groundwater resources (refer Appendix 1 – Location plan).

Lot No.	Monitoring Site Designation	Easting	Northing
250	KMB1	385842	6334149
401	KMB2	386398	6334378
250	KMB5D	368858	6332982
250	KMB6S	386657	6332951
250	KMB7	386420	6333718
401	KMB8	386369	6334051
405	KMB9	387371	6332634
405	KMB10	387567	6334009
405	KMB11	387720	6334243
405	KMB12	387933	6333605

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

Lot No.	Monitoring Site Designation	Easting	Northing
250	KMB13	38617	6333648
250	KMB14	385960	6333537
250	KMB15S	384828	6333095
250	KMB15D	384828	6333095
400	KMB16S	384780	6334761
400	KMB16D	384780	6334761
250	KMB17S	386444	6333960
250	KMB19S	386178	6333642

C2) The licensee shall undertake monitoring of the groundwater resource from the monitoring sites listed in **C1)** in accordance with the dates and parameters specified in the following table.

Monitoring Period	**Sept** or **Oct**	**Dec** or **Jan**	**March** or **April**	**June** or **July**
Chemistry parameters to be analysed*	pH (Field) pH (Lab) EC# @ 25°C TDS gravimetric @ 180°C	pH (Field) pH (Lab) EC#@ 25°C TDS gravimetric @ 180°C	pH (Field) pH (Lab) Electrical Conductivity (µS/cm @ 25°C) Total Dissolved Solids (gravimetric @ 180°C) Sulphate (SO_4) Chloride (Cl) Total acidity (as $CaCO_3$) Total alkalinity (as $CaCO_3$) Bicarbonate (as $CaCO_3$) Aluminium (Al - filtered) Iron (Fe - filtered)	pH (Field) pH (Lab) EC#@ 25°C TDS gravimetric @ 180°C

* Concentrations in mg/L (milligrams per litre) unless otherwise stated
# Electrical Conductivity (µS/cm) compensated to 25°C

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

D. Water level monitoring

D1) The licensee shall measure water levels **monthly** from the monitoring sites listed in **C1)** (refer Appendix 1 – Location plan).

D2) Water levels shall be measured from a standard measuring point; for example top of casing. Any change in the position of the reference point shall be recorded and previous measurements adjusted accordingly.

D3) Water levels shall be reported as metres below the standard reference point (mtoc), below ground level (mbgl) and (if surveyed) metres above the Australian Height Datum (mAHD)

D4) Water levels in production wells KMB7 and KMB14 shall be measured at least 1 hour after pumping has ceased. A comment shall be entered against any measurement taken while the pump is still operating.

D5) Water levels shall be recorded to the nearest centimetre.

E. Reporting

E1) By **31 October** each year, the licensee shall submit a concise **annual** report prepared by a qualified professional covering monitoring data recorded during the preceding water year. The report will include:

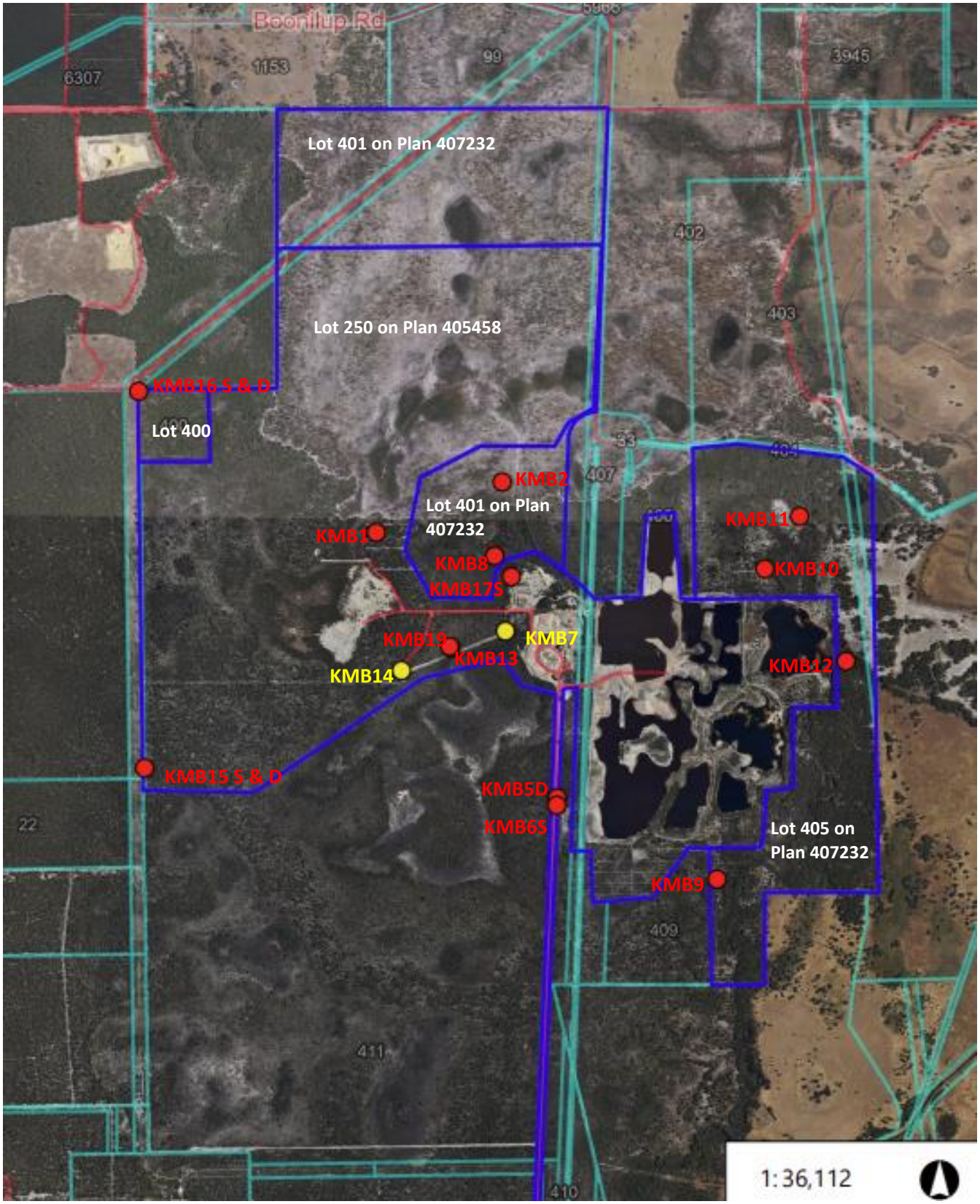
i) tabulated monthly extraction data for each metered drawpoint over the water year.
ii) graphs of historical monthly and annual extraction data for each metered drawpoint and combined drawpoint extraction
iii) tabulated chemistry data for nominated groundwater bores
iv) graphs of historical chemistry and water level data
v) laboratory analysis sheets for the water year
vi) an assessment of the effects of the licensee's draw on the groundwater resource as determined from the monitoring data.
vii) a report of any movement in water quality beyond a chemistry trigger level, including an assessment of any risk to the resource or ecosystem, and specifying any course of action deemed appropriate.
viii) an audit table assessing compliance against licence conditions and the monitoring program.
ix) an assessment of the monitoring plan and any recommendations for changes to the plan

END OF MONITORING REQUIREMENTS

Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

Appendix 1: Location Plan



Government of Western Australia
Department of Water and Environmental Regulation

Monitoring and Management Plan for *Licence To Take Water* GWL60367(5)

Appendix 2: Schedule of all Production and Monitoring Bores

Lot No.	Site Designation	Easting	Northing	Slotted depth (m bTOC)	Comment
250	KMB7	386420	6333718	16.5-28.5	Constructed 7 April 1995.
250	KMB14	385960	6333537	16.6-28.6	Constructed 21 December 1995.
250	KMB1	385842	6334149	11.0 – 23.4	Constructed January 1993.
401	KMB2	386398	6334378	11.0 – 23.0	Constructed January 1993.
-	KMB3	-	-	10-24.0	Constructed January 1993. Decommissioned in February 2001 (covered by southern extension of dredge pond).
250	KMB4	386851	6333699	11.0 – 23.0	Constructed January 1993. Removed in February 2020 due to an expansion of the mine area.
250	KMB5	386821	6333100	10.1-22.1	Constructed January 1993. Decommissioned June 2013.
250	KMB5D	368858	6332982	10.0 – 22.0	Constructed in May 2013; replacement for KMB5.
250	KMB6	386817	6333133	1.5-19.0	Constructed April 1995. Decommissioned June 2013.
250	KMB6S	386657	6332951	2.0 – 10.0	Constructed in May 2013; replacement for KMB6.
401	KMB8	386369	6334051	? – 20.08$^{>}$	Slotted depth as probed in August 2000.
405	KMB9	387371	6332634	? – 19.95$^{>}$	Slotted depth as probed in August 2000.
405	KMB10	387567	6334009	? – 19.65$^{>}$	Slotted depth as probed in August 2000.
405	KMB11	387720	6334243	? – 14.35$^{>}$	Slotted depth as probed in August 2000.
405	KMB12	387933	6333605	? – 20.05$^{>}$	Slotted depth as probed in August 2000.
250	KMB13	38617	6333648	? – 24.90$^{>}$	Slotted depth as probed in August 2000; silted up Feb 2001, cleared and monitoring recommenced May 2002.
250	KMB15S	384828	6333095	4.0 – 6.0	Constructed in May 2013.
250	KMB15D	384828	6333095	11.0 – 23.0	Constructed in May 2013.
400	KMB16S	384780	6334761	4.0 – 6.0	Constructed in May 2013.
400	KMB16D	384780	6334761	11.0 – 23.0	Constructed in May 2013.
250	KMB17S	386444	6333960	1.25-7.65	Constructed in May 2015.
250	KMB18S	386843	6333624	1.25-7.65	Removed in June 2021 due to an expansion of the dredge pond
250	KMB19S	386178	6333642	1.25-7.65	Constructed in May 2015.

APPENDIX II

MONITORING DATA – WATER LEVELS & PRODUCTION BORE DATA

Appendix II: Monitoring Data

DATE	KMB1	KMB2	KMB4	KMB5/5D	KMB6/6S	KMB7	KMB8	KMB9	KMB10	KMB11	KMB12	KMB13	KMB14	KMB15D	KMB15S	KMB16D	KMB16S	KMB17S	KMB18S	KMB19S	Month
ref - top of casing (mAHD)	17.597	16.814	16.028	16.334	15.596	15.684	15.667	14.456	15.28	16.156	13.829	16.06	16.475	18.93	18.93	22.16	22.16	15.29	15.52	15.47	
01-Sep-20	13.40	13.90		13.25	10.57	13.58	14.29	12.36	13.08	13.12	12.79	13.93	13.47	11.11	12.92	8.86	dry	8.91	13.01	12.97	Sep-20
01-Oct-20	13.73	13.71		13.08	13.35	11.48	13.57	12.30	12.88	12.86	12.28	13.61	13.88	11.53	11.12	13.26	dry	13.73	12.82	13.63	Oct-20
01-Nov-20	13.60	5.74		12.98	13.05	13.38	13.39	12.16	12.62	12.67	12.18	13.32	11.70	12.93	12.83	15.36	dry	13.54	12.66	13.33	Nov-20
01-Dec-20	13.36	13.36		12.90	13.05	11.61	13.34	12.07	12.56	12.61	11.78	13.41	12.18	7.84	13.02	-	dry	13.27	12.08	13.47	Dec-20
01-Jan-21	13.29	13.17		12.72	12.81	13.28	13.09	11.77	12.16	11.85	11.76	13.03	11.77	13.02	6.02	-	dry	13.21	12.19	13.25	Jan-21
01-Feb-21	13.25	12.98		12.50	12.73	13.02	12.95	11.43	12.11	12.12	11.61	13.96	8.68	12.74	12.83	14.96	dry	12.95	12.19	12.97	Feb-21
01-Mar-21	12.99	12.93		12.46	12.80	12.99	12.76	11.56	12.12	11.36	11.58	12.88	12.70	12.75	12.72	12.92	dry	12.81	12.10	12.87	Mar-21
01-Apr-21	12.90	12.66		12.48	12.38	7.38	12.69	11.13	11.68	11.96	11.51	12.66	8.18	12.67	12.66	12.89	dry	12.88	12.19	13.68	Apr-21
01-May-21	11.75			12.26	12.26	11.36	15.67	11.76	12.09	11.89	11.61	11.56	7.82	12.93	12.54	-	dry	9.78	12.28	9.94	May-21
01-Jun-21	13.15	13.15		10.53	13.01	13.42	13.13	11.85	12.18	11.20	11.82	12.96	8.20	12.18	12.38	13.00	dry	9.71	12.73	8.29	Jun-21
01-Jul-21	13.55	13.89		11.09	14.09	12.99	2.93	-	13.18	13.94	9.33	13.10	13.51	12.94	12.92	15.56	dry	13.88		13.38	Jul-21
01-Aug-21	14.08	14.03		12.44	14.11	13.67	13.61	12.75	13.43	13.54	11.18	13.76	12.41	13.33	13.11	14.96	dry	13.99		13.87	Aug-21
01-Sep-21	14.22	14.29		13.60	14.05	14.48	14.11	12.83	13.43	13.31	12.65	14.19	10.40	13.40	13.21	13.61	dry	14.03		14.21	Sep-21
01-Oct-21	15.20	14.15		13.58	13.88	8.56	14.03	12.66	13.23	13.18	11.15	13.10	14.98	13.36	13.33	13.30	dry	14.41		13.21	Oct-21
01-Nov-21	14.25	14.04		14.02	13.90	14.05	14.57	12.51	13.13	13.14	12.49	13.92	10.34	13.36	13.36	13.81	dry	14.26		13.98	Nov-21
01-Dec-21	14.95	13.87		13.33	13.57	13.29	13.97	12.42	13.04	13.04	12.45	13.91	9.44	13.25	13.31	-	dry	14.13		13.84	Dec-21
01-Jan-22	14.96	13.79		13.23	13.56	-	13.96	12.41	13.04	13.03	12.45	13.91	-	13.25	13.31	-	dry	14.13		13.84	Jan-22
01-Feb-22	12.53	13.37		13.04	13.05	13.64	13.32	11.49	12.52	12.42	11.86	13.73	8.27	13.05	-	13.43	dry	13.36		13.23	Feb-22
01-Mar-22	13.31	13.22		12.59	12.88	12.88	13.12	11.57	12.28	12.22	11.69	13.78	13.07	12.73	12.97	13.33	dry	13.15		13.10	Mar-22
01-Apr-22	13.07	13.01		12.44	12.68	12.98	12.97	11.36	12.78	12.06	11.50	12.87	8.02	12.23	12.23	13.20	dry	13.01		12.17	Apr-22
01-May-22	12.99	13.01		12.35	12.57	13.01	12.92	11.34	12.03	12.02	11.52	12.80	12.60	12.78	12.79	12.86	dry	12.97		12.82	May-22
01-Jun-22	13.12	13.11		12.56	12.96	13.16	13.04	11.62	12.18	12.16	11.68	12.91	12.68	12.79	12.80	13.10	dry	13.07		12.94	Jun-22
01-Jul-22	13.47	13.56		12.98	13.68	13.68	12.82	12.18	12.80	12.69	12.16	13.34	13.10	12.92	12.92	12.70	dry	13.59		13.37	Jul-22
01-Aug-22	13.87	14.03		13.44	14.22	14.09	13.99	12.67	12.98	12.56	12.45	13.82	12.59	15.04	13.03	13.39	dry	14.31		13.96	Aug-22
01-Sep-22	14.16	14.18		13.54	13.95	14.18	14.14	12.70	13.22	13.18	12.57	14.04	13.86	13.29	13.29	13.64	dry	14.37		14.09	Sep-22
01-Oct-22	14.04	13.98		13.41	13.66	13.94	13.92	12.52	13.07	13.05	12.52	13.81	13.70	13.31	13.31	13.70	dry	13.95		13.87	Oct-22
01-Nov-22	13.99	13.94		13.41	13.65	13.94	13.89	12.50	13.05	13.00	12.49	13.78	13.63	13.30	13.30	13.71	dry	14.31		13.83	Nov-22
01-Dec-22	13.81	13.76		13.25	13.42	13.78	13.72	12.30	12.90	12.81	12.31	13.61	13.44	13.23	13.23	13.61	dry	13.76		13.64	Dec-22
01-Jan-23	13.48	13.38	Bore Removed	12.85	13.09	13.41	13.33	11.91	12.58	12.45	11.90	13.23	13.07	13.07	13.08	13.44	dry	13.38		13.27	Jan-23
01-Feb-23	13.30	13.20		12.65	12.94	13.26	13.14	11.65	12.31	12.24	11.73	13.06	12.89	13.00	13.00	13.32	dry	13.19		13.10	Feb-23
01-Mar-23	12.82	13.05		12.48	12.78	13.09	13.01	11.45	12.11	13.10	11.56	12.92	12.72	12.90	12.90	13.22	dry	13.04		12.95	Mar-23
01-Apr-23	13.10	12.90		12.33	12.60	12.54	12.85	11.21	11.97	11.97	11.45	12.75	12.56	12.78	12.79	13.10	dry	12.87		12.77	Apr-23
01-May-23	13.00	12.95		12.48	12.82	13.01	12.90	11.52	12.15	12.12	11.59	12.80	12.61	12.75	12.75	13.03	dry	12.94		12.83	May-23
01-Jun-23	13.43	13.52		13.03	13.72	13.36	13.45	12.17	12.81	12.62	12.11	13.30	13.02	12.83	12.89	13.19	dry	13.50	Bore Removed	13.34	Jun-23
01-Jul-23	13.64	13.70		13.17	13.60	13.67	13.63	12.32	12.94	12.85	12.27	12.88	13.30	13.01	13.00	13.31	dry	13.67		13.54	Jul-23
01-Aug-23	14.24	14.26		13.63	14.21	14.24	14.19	12.82	13.44	13.29	12.62	14.10	13.92	13.31	13.35	13.63	dry	14.35		14.19	Aug-23
01-Sep-23	14.29	14.21		13.62	13.98	14.18	14.16	12.68	13.28	13.26	12.68	14.06	13.91	13.48	13.47	13.72	dry	14.24		14.11	Sep-23
01-Oct-23	14.10	14.06		13.49	13.74	14.01	14.00	12.47	13.15	13.08	12.56	13.89	13.80	13.42	13.37	13.74	dry	14.09		13.95	Oct-23
01-Nov-23	13.95	13.85		13.29	13.47	13.83	13.77	12.32	12.97	12.85	12.38	13.70	13.52	13.29	13.34	13.66	dry	13.81		13.73	Nov-23
01-Dec-23	13.76	13.65		13.13	13.32	13.70	13.63	12.13	12.79	12.69	12.19	13.55	8.65	13.23	13.28	13.56	dry	13.67		13.59	Dec-23
01-Jan-24	13.50	13.37		12.87	13.09	12.21	13.35	11.86	12.60	12.44	11.92	13.26	8.60	13.09	13.14	8.75	dry	13.36		13.30	Jan-24
01-Feb-24	13.19	13.15		12.59	12.86	13.24	13.13	11.56	12.28	12.18	11.63	13.02	12.81	12.93	12.98	13.28	dry	13.18		13.04	Feb-24
01-Mar-24	12.86	12.91		12.33	12.56	11.44	12.90	11.29	11.90	11.91	11.37	12.78	8.11	12.74	12.83	13.08	dry	12.95		12.81	Mar-24
01-Apr-24	12.93	12.80		12.28	12.45	11.39	12.76	11.19	11.83	11.80	11.27	12.62	8.95	12.75	12.73	13.00	dry	12.78		12.69	Apr-24
01-May-24	13.12	12.81		12.25	12.53	12.94	12.76	12.13	11.93	11.91	11.44	12.66	7.24	12.70	12.69	13.28	dry	12.79		12.64	May-24
01-Jun-24	13.24	13.26		13.68	13.42	13.28	13.15	12.66	12.38	12.28	11.76	13.01	7.53	12.78	12.78	10.48	dry	13.74		13.67	Jun-24
01-Jul-24	13.66	13.69		12.95	12.95	13.67	13.62	11.55	12.78	12.61	12.04	13.44	7.95	12.98	12.96	13.29	dry	13.66		13.47	Jul-24
01-Aug-24	14.23	14.28		13.51	14.20	14.27	14.24	12.77	13.29	13.10	12.46	14.07	8.64	13.27	13.27	13.63	dry	14.38		14.14	Aug-24
01-Sep-24	14.89	14.85		14.02	14.56	14.84	14.85	13.16	13.67	13.52	12.88	14.68	12.46	13.84	13.84	14.10	dry	15.05		14.76	Sep-24
01-Oct-24	14.66	14.55		13.74	14.15	12.65	14.49	12.82	13.38	13.30	12.75	14.33	14.24	13.78	13.78	14.16	dry	14.61		14.50	Oct-24
01-Nov-24	14.54	14.44		13.67	14.07	14.38	14.37	12.70	13.29	13.21	12.63	14.25	12.62	13.69	13.69	14.12	dry	14.56		14.37	Nov-24
01-Dec-24	14.55	14.44		13.67	14.12	14.39	14.38	12.68	13.31	13.25	12.60	14.25	12.40	13.73	13.73	14.12	dry	14.67		14.47	Dec-24
01-Jan-25	14.17	13.98		13.27	13.61	13.89	13.89	12.23	12.91	13.78	12.20	13.83	11.91	13.52	13.25	13.90	dry	13.97		13.88	Jan-25
01-Feb-25	14.24	13.75		13.08	13.34	13.68	13.65	11.99	12.72	12.59	12.03	13.59	12.86	13.41	13.41	13.87	dry	13.75		13.64	Feb-25
01-Mar-25	13.60	13.45		12.77	12.95	13.41	13.37	11.94	12.42	12.32	11.04	13.26	12.73	13.19	13.19	13.54	dry	13.39		13.29	Mar-25
01-Apr-25	13.47	13.35		12.65	12.91	13.28	12.74	11.85	12.32	12.24	11.69	13.14	12.90	13.15	13.15	13.49	dry	13.15		13.16	Apr-25
01-May-25	13.32	13.24		12.56	12.77	13.21	12.69	11.46	12.20	12.19	11.63	13.02	12.79	13.05	13.05	13.38	dry	13.12		13.03	May-25
01-Jun-25	13.27	13.26		12.59	12.82	13.21	13.14	11.63	12.37	12.30	11.73	12.99	12.62	12.97	12.97	13.47	dry	13.16		13.04	Jun-25
01-Jul-25	13.40	13.48		12.77	13.16	13.55	13.37	11.88	12.60	12.54	12.13	13.18	12.93	13.00	13.00	13.29	dry	13.44		13.21	Jul-25
01-Aug-25	13.92	14.07		13.30	13.93	14.01	13.97	12.52	13.20	13.60	12.47	13.75	13.53	13.16	13.16	13.49	dry	14.15		13.73	Aug-25

Appendix II - Production Bore Data

	KMB7 PRODUCTION BORE MONITORING							KMB14 PRODUCTION BORE MONITORING							PRODUCTION BORES	
Month	pH (Lab)	pH (Field)	Salinity (mg/L TDS, Lab)	Salinity (mg/L TDS, Field)	Meter	Flow (m3)	Annual Flow	pH (Lab)	pH (Field)	Salinity (mg/L TDS, Lab)	Salinity (mg/L TDS, Field)	Meter	Flow (m3)	Annual Flow	Total Monthly Flow (m3)	Total Annual Flow (m3)
Sep-20					61,734	0						212,929	0		0	
Oct-20	6.80	6.61	608	-	61,734	0		5.90	6.42	216	-	216,066	3,137		3,137	
Nov-20					61,743	9						222,084	6,018		6,027	
Dec-20					62,014	271						227,256	5,172		5,443	
Jan-21	6.50	6.40	643	-	62,363	349		6.10	6.10	224	-	231,642	4,386		4,735	
Feb-21					62,363	0						236,780	5,138		5,138	
Mar-21					62,377	14						241,786	5,006		5,020	
Apr-21	5.70	5.40	200	-	62,460	83		5.80	5.00	200	-	256,768	14,982		15,065	
May-21					62,638	178						260,775	4,007		4,185	
Jun-21					62,672	34						268,935	8,160		8,194	
Jul-21	6.70	6.50	652	-	63,048	376		5.80	5.80	249	-	278,630	9,695		10,071	
Aug-21					64,148	1,100	2,414					283,509	4,879	70,580	5,979	72,994
Sep-21					65,649	1,501						290,388	6,879		8,380	
Oct-21	5.60	5.20	617	-	65,649	0		5.70	5.50	192	-	300,378	9,990		9,990	
Nov-21					67,888	2,239						310,730	10,352		12,591	
Dec-21					67,901	13						319,746	9,016		9,029	
Jan-22	-	-	-	-	67,922	21		5.90	6.10	208	-	329,641	9,895		9,916	
Feb-22					68,164	242						340,239	10,598		10,840	
Mar-22					69,236	1,072						347,693	7,454		8,526	
Apr-22	5.60	-	713	-	69,670	434		5.50	-	208	-	357,614	9,921		10,355	
May-22					69,829	159						358,014	400		559	
Jun-22					69,829	0						362,236	4,222		4,222	
Jul-22	5.80	6.50	687	-	69,829	0		5.40	5.80	200	-	363,099	863		863	
Aug-22					69,829	0	5,681					400,032	36,933	116,523	36,933	122,204
Sep-22					69,829	0						410,795	10,763		10,763	
Oct-22	-	-	696	-	69,829	0		-	-	200	-	427,675	16,880		16,880	
Nov-22					69,829	0						432,730	5,055		5,055	
Dec-22					69,829	0						443,312	10,582		10,582	
Jan-23	-	-	713	-	69,829	0		-	-	200	-	457,937	14,625		14,625	
Feb-23					69,829	0						464,541	6,604		6,604	
Mar-23					69,829	0						472,809	8,268		8,268	
Apr-23	-	-	713	-	69,829	0		-	-	200	-	484,216	11,407		11,407	
May-23					69,829	0						498,752	14,536		14,536	
Jun-23					69,829	0						509,906	11,154		11,154	
Jul-23	6.40	6.21	669	425	69,829	0		5.00	5.05	208	313	519,396	9,490		9,490	
Aug-23					69,829	0	0					529,300	9,904	129,268	9,904	129,268
Sep-23					69,829	0						538,548	9,248		9,248	
Oct-23	6.40	6.05	560	419	69,829	0		5.30	5.00	220	129	552,917	14,369		14,369	
Nov-23					69,829	0						561,675	8,758		8,758	
Dec-23					69,829	0						565,871	4,196		4,196	
Jan-24	6.30	6.36	610	430	69,834	5		5.20	5.10	210	125	575,287	9,416		9,421	
Feb-24					69,995	161						586,828	11,541		11,702	
Mar-24					70,121	126						601,775	14,947		15,073	
Apr-24	6.40		500		71,541	1,420		5.20	4.40	150	139	609,931	8,156		9,576	
May-24					73,591	2,050						622,625	12,694		14,744	
Jun-24					73,591	0						625,167	2,542		2,542	
Jul-24	5.90	5.40	620	110	73,591	0		5.20	5.20	200	510	634,665	9,498		9,498	
Aug-24					73,591	0	3,762					647,288	12,623	117,988	12,623	121,750
Sep-24					73,591	4,501						660,043	12,755		17,256	
Oct-24	5.60	6	720	720	78,092	1,841		5.60	5.63	200	200	673,670	13,627		15,468	
Nov-24					79,933	0						679,187	5,517		5,517	
Dec-24					79,933	0						688,248	9,061		9,061	
Jan-25	4.90	6	490	490	79,933	0		5.20	5.27	210	210	702,471	14,223		14,223	
Feb-25					79,933	0						710,152	7,681		7,681	
Mar-25					79,933	0						719,317	9,165		9,165	
Apr-25	5.10	5.20	540	540	79,933	0		5.40	4.90	260	260	724,717	5,400		5,400	
May-25					79,933	0						735,172	10,455		10,455	
Jun-25					79,933	0						749,431	14,259		14,259	
Jul-25	5.00	5.04	570	660	79,933	0		5.10	4.98	200	200	757,306	7,875		7,875	
Aug-25					79,933	0	6,342					778,914	21,608	131,626	21,608	137,968

APPENDIX III

MONITORING DATA – WATER CHEMISTRY

KMB1

Analyte	pH (lab)	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as Nitrogen	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Date		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	5.20	390	226	99	44.0	-	42	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.65
1-Feb-19	5.80	400	232	32	110.0	-	15	0.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.80
1-May-19	5.90	410	238	120	16.0	-	41	7.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.56
1-Aug-19	6.00	440	257	110	24.0	-	33	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.79
1-Oct-19	4.87	430	341	93	44.0	-	36	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.17
1-Jan-20	5.10	350	274	86	28.0	<5	40	3.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.83
1-Apr-20	5.20	340	266	90	18.0	<5	48	5.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.54
1-Aug-20	4.90	330	257	77	20.0	<5	30	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Oct-20	4.20	310	241	70	29.0	<5	30	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Jan-21	4.90	330	257	73	31.0	<5	29	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-21	6.40	320	249	77	19.0	14.0	15	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Jul-21	5.00	310	241	80	21.0	<5	29	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Oct-21	6.20	310	241	80	<1	<5	32	>80	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jan-22	4.90	330	257	88	21.0	21.0	47	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Apr-22	5.20	270	208	72	13.0	13.0	47	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	4.70	250	192	61	19.0	19.0	40	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Oct-22	5.20	300	233	75	6.0	<5	46	12.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	4.50	270	208	65	11.0	<5	73	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.00	250	192	55	<1	37.0	64	>55	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.20	210	159	47	3.3	9.8	44	14.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Oct-23	5.00	270	230	69	7.8	56.0	7.6	8.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.89
1-Jan-24	5.60	260	210	59	1.1	44.0	20	53.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Apr-24	5.20	330	210	47	3.4	9.8	44	13.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Jul-24	5.10	260	240	36	5.3	4.0	20	6.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Oct-24	5.40	420	300	120	23.0	10.0	51	5.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.69
1-Jan-25	4.80	270	240	59	7.5	5.0	49	7.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.53
1-Apr-25	4.90	160	220	30	4.4	5.0	37	6.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.90
1-Jul-25	4.80	190	210	36	5.7	5.0	52	6.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00

KMB2

Analyte	pH	Electrical Conductivity @ 25°C	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
DATE		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	5.80	290	165	81	2.0	-	60	40.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.63
1-Feb-19	7.00	570	338	120	4.0	-	31	30.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.14
1-May-19	6.00	430	251	110	2.0	-	53	55.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.75
1-Aug-19	6.20	400	232	110	0.0	-	64	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.58
1-Oct-19	5.90	310	241	80	<1	-	41	>80	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.41
1-Jan-20	6.20	380	299	99	2.0	27.0	42	49.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.38
1-Apr-20	5.90	330	257	67	<1	16.0	46	>67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.07
1-Aug-20	6.00	-	-	80	7.0	21.0	31	11.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Oct-20	6.00	310	241	81	<1	14.0	30	>81	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jan-21	6.40	360	282	110	2.0	29.0	36	55.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-21	6.10	320	249	81	<1	24.0	53	>81	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-21	6.20	310	241	79	<1	20.0	68	>79	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-21	4.30	320	249	83	17.0	<5	31	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.90
1-Jan-22	6.10	340	266	91	<1	27.0	25	>91	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Apr-22	7.40	820	678	130	<1	220.0	19	>130	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	6.10	330	257	82	6.0	34.0	36	13.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-22	6.00	300	233	74	4.0	26.0	65	18.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.60	650	530	100	3.2	170.0	64	31.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.80	750	617	130	<1	72.0	58	>130	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.70	300	233	77	3.7	25.0	60	20.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Nov-23	5.70	340	320	87	0.0	87.0	36	>87	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Jan-24	5.70	340	340	85	0.0	64.0	38	>85	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-24	6.80	620	340	110	2.5	29.0	190	44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.56
1-Jul-24	7.40	380	320	70	<0.5	71.0	32	>70	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70
1-Oct-24	6.00	380	320	100	1.0	37.0	56	100	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.84
1-Jan-25	5.80	420	310	97	1.0	36.0	61	97	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.57
1-Apr-25	5.70	380	300	94	0.9	25.0	5	104.4444444	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Jul-25	5.80	370	330	89	1.0	40.0	72	89	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40

KMB5/5D																			
Analyte	pH	Electrical Conductivity @ 25°C	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	5.70	1300	813	170	13.0	-	86	13.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.35
1-Feb-19	6.50	770	466	200	9.0	-	48	22.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-May-19	5.80	580	345	180	11.0	-	61	16.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Aug-19	5.90	610	364	170	5.0	-	72	34.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Oct-19	6.50	580	469	160	4.0	-	38	40.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.42
1-Jan-20	5.70	510	409	140	26.0	25.0	100	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-20	5.70	490	392	140	29.0	17.0	74	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.67
1-Aug-20	5.60	-	-	120	44.0	20.0	48	2.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Oct-20	5.80	440	350	120	7.0	25.0	52	17.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-21	6.00	450	358	130	25.0	29.0	58	5.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Apr-21	5.90	460	367	130	12.0	13.0	68	10.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Jul-21	5.70	500	401	140	6.0	6.0	58	23.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-21	5.90	480	384	140	<5	30.0	53	>140	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.30
1-Jan-22	5.90	460	367	130	11.0	27.0	74	11.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Apr-22	6.00	470	375	130	2.0	34.0	70	65.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.70	460	367	130	29.0	18.0	56	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-22	5.60	470	375	120	35.0	12.0	63	3.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.40	530	426	140	<5	26.0	120	>140	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.40	530	426	160	<5	24.0	150	>160	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.40	550	443	160	7.3	17.0	49	21.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.21
1-Oct-23	5.80	610	550	170	3.5	95.0	45	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Jan-24	5.60	610	550	160	1.2	81.0	34	4.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Apr-24	5.70	630	500	190	3.3	54.0	31	6.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-24	6.20	640	610	26	1.0	82.0	64	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-24	5.90	610	580	170	9.0	43.0	72	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70
1-Jan-25	6.10	650	560	140	5.3	66.0	70	2.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.86
1-Apr-25	6.20	630	600	140	7.2	66.0	5	28.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jul-25	5.90	580	660	140	5.1	53.0	84	1.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.95

KMB6/6S																		
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	6.50	160	131	13	18.0	33.0	24	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.97
1-Feb-18	7.00	150	102	13	15.0	35.0	21	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.56
1-May-18	6.50	140	119	13	18.0	34.0	37	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-19	6.70	130	96	12	9.0	-	22	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.28
1-Jan-20	6.80	190	143	14	20.0	59.0	27	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.02
1-Apr-20	6.40	140	103	14	17.0	30.0	25	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.16
1-Aug-20	6.60	-	-	21	23.0	31.0	18	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Oct-20	6.80	200	151	18	27.0	50.0	21	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-21	6.90	220	167	18	36.0	46.0	25	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.40
1-Apr-21	6.20	180	135	160	26.0	15.0	42	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-21	7.10	180	135	18	15.0	50.0	21	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-21	6.50	190	143	21	16.0	41.0	35	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jan-22	6.50	200	151	20	34.0	40.0	38	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-22	6.30	160	119	20	17.0	28.0	34	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	6.40	160	119	17	17.0	38.0	36	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-22	6.60	180	135	17	14.0	41.0	35	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.10	210	159	15	24.0	51.0	75	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.90	150	111	16	18.0	29.0	83	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	6.10	150	111	12	14.0	40.0	34	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.84
1-Oct-23	6.00	170	120	13	16.0	54.0	43	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.55
1-Jan-24	6.10	180	150	12	19.0	59.0	55	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.93
1-Apr-24	5.90	150	100	13	21.0	33.0	28	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.33
1-Jul-24	6.40	160	110	7.4	12.0	34.0	41	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-24	6.40	240	190	15	16.0	58.0	35	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.51
1-Jan-25	6.10	190	120	11	16.0	52.0	38	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.02
1-Apr-25	6.10	190	130	11	22.0	42.0	5	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Jul-25	6.00	130	130	10	12.0	29.0	39	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.62

KMB7

Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L		mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	7.30	1200	747	160	160.0	-	34	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00
1-Feb-19	6.70	940	576	150	140.0	-	32	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.35
1-May-19	6.90	890	543	150	120.0	-	62	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.41
1-Aug-19	7.30	390	226	34	46.0	-	10	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.85
1-Oct-19	7.00	530	426	73	73.0	-	31	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.42
1-Jan-20	6.00	910	758	150	190.0	15.0	48	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Apr-20	7.40	1200	1017	170	180.0	190.0	19	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.69
1-Aug-20	6.60	-	-	110	53.0	31.0	16	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-20	6.80	740	608	130	120.0	47.0	20	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.61
1-Jan-21	6.50	780	643	140	130.0	31.0	26	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.40
1-Apr-21	5.70	260	200	58	22.0	7.0	33	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Jul-21	6.70	790	652	140	160.0	27.0	41	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-21	5.60	750	617	750	140.0	12.0	62	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Jan-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-22	5.60	860	713	160	180.0	<5	33	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.80	830	687	150	170.0	7.0	21	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-22	6.40	840	696	140	160.0	22.0	27	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.20	860	713	150	140.0	42.0	59	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.20	860	713	160	170.0	19.0	19	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	6.40	810	669	150	150.0	47.0	25	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.21
1-Oct-23	6.40	830	560	150	170.0	30.0	43	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.05
1-Jan-24	6.30	780	610	140	150.0	19.0	36	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.36
1-Apr-24	6.40	950	500	180	190.0	20.0	47	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-24	5.90	960	620	170	210.0	28.0	14	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Oct-24	5.60	110	720	210	210.0	21.0	79	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jan-25	4.90	860	490	150	140.0	7.5	110	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.53
1-Apr-25	5.10	840	540	150	140.0	7.6	5	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Jul-25	5.00	800	570	150	140.0	0.5	41	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.04

KMB8																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO_3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Oct-19	6.40	800	661	200	34.0	-	37	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.19
1-Jan-20	6.40	840	696	220	26.0	40.0	52	8.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.53
1-Apr-20	6.30	950	793	270	21.0	38.0	43	12.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.61
1-Aug-20	6.30	-	-	230	53.0	29.0	38	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.61
1-Oct-20	6.60	420	333	90	44.0	28.0	22	2.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Jan-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Apr-21	6.00	950	793	240	59.0	16.0	57	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Jul-21	6.60	680	556	160	62.0	28.0	46	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-21	6.60	550	443	130	44.0	44.0	29	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Jan-22	6.20	910	758	250	39.0	25.0	50	6.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Apr-22	6.10	920	766	260	22.0	28.0	55	11.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.90	880	731	250	25.0	28.0	51	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-22	6.10	930	775	240	35.0	28.0	53	6.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.40	930	775	250	26.0	20.0	86	9.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.60	820	678	250	22.0	27.0	130	11.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.50	900	749	260	47.0	23.0	73	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.31
1-Oct-23	5.90	260	250	49	19.0	43.0	23	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-24	5.60	730	600	210	19.0	69.0	29	11.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.77
1-Apr-24	5.50	830	470	250	14.0	48.0	22	17.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.60
1-Jul-24	6.20	710	480	120	65.0	38.0	26	1.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Oct-24	6.10	550	400	140	31.0	38.0	48	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.37
1-Jan-25	6.00	600	440	120	45.0	36.0	38	2.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.96
1-Apr-25	5.90	910	570	220	43.0	32.0	5	5.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Jul-25	5.90	880	630	240	17.0	43.0	87	14.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.23

KMB9																		
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	5.30	350	201	92	24	-	58	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.80
1-Feb-19	5.70	330	189	84	9	-	48	9.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.05
1-May-19	5.90	300	171	69	14	-	44	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.35
1-Aug-19	4.40	410	238	94	41	-	51	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.33
1-Oct-19	4.30	510	409	120	56	-	53	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.33
1-Jan-20	4.90	440	350	110	27	<5	55	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.65
1-Apr-20	5.50	310	241	73	33	<5	61	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.63
1-Aug-20	4.30	-	-	84	44	<5	44	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Oct-20	3.80	640	-	130	86	<5	62	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.06
1-Jan-21	5.20	440	350	110	37	<5	36	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Apr-21	6.30	390	308	84	37	27	52	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jul-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-21	4.00	360	282	82	<5	<5	70	>82	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Jan-22	4.80	380	299	99	31	<5	73	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Apr-22	5.80	340	266	84	20	11	30	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	4.40	470	375	120	34	<5	53	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.90
1-Oct-22	4.00	580	469	130	58	<5	75	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	3.90	540	435	130	28	<5	100	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.10	350	274	85	23	8.3	88	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	4.10	350	274	76	24	<5	61	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.41
1-Oct-23	4.50	490	430	130	45	96	0	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.46
1-Jan-24	4.90	410	390	100	23	78	8	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.84
1-Apr-24	5.00	390	200	96	35	37	7	2.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Jul-24	4.00	410	400	61	27	77	5	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.10
1-Oct-24	3.80	480	440	110	49	5	100	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.46
1-Jan-25	4.20	430	570	96	20	5	110	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.84
1-Apr-25	5.40	460	320	100	33	12	48	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jul-25	5.00	430	330	99	31	7.2	67	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.82

KMB10																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO_3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	3.50	400	232	92	26.0	-	110	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.25
1-Feb-19	3.60	420	244	95	<1	-	83	>95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.55
1-May-19	4.80	200	111	55	9.0	-	55	6.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.56
1-Aug-19	3.30	610	364	120	92.0	-	110	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Oct-19	3.40	450	358	99	<1	-	95	>99	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Jan-20	3.60	530	426	130	81.0	<5	94	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.09
1-Apr-20	3.90	370	291	93	65.0	<5	65	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.07
1-Aug-20	3.30	-	-	140	31.0	<5	100	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.29
1-Oct-20	3.30	600	486	130	70.0	<5	90	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.41
1-Jan-21	3.40	560	452	120	9.0	<5	71	13.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Apr-21	3.70	420	333	99	<1	<5	78	>99	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Jul-21	3.20	590	478	110	35.0	<5	100	3.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Oct-21	3.40	550	443	120	1.0	<5	80	120.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.00
1-Jan-22	3.50	330	257	64	84.0	<5	93	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.80
1-Apr-22	3.60	460	367	110	98.0	<5	100	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	3.50	560	452	120	42.0	<5	120	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Oct-22	3.30	610	495	130	140.0	<5	98	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	3.10	620	504	110	20.0	<5	120	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	3.40	550	443	130	23.0	<5	130	5.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	3.20	690	564	130	23.0	<5	250	5.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.26
1-Oct-23	3.40	440	390	90	15.0	<5	120.0	6.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.23
1-Jan-24	3.50	410	400	78	16.0	<5	100.0	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.65
1-Apr-24	3.70	510	440	130	22.0	<5	90.0	5.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.57
1-Jul-24	3.40	620	520	98	20.0	<5	120.0	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.80
1-Oct-24	3.40	380	340	83	9.1	<5	78.0	9.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.76
1-Jan-25	3.60	280	340	44	1.9	<5	110.0	23.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.87
1-Apr-25	3.60	240	220	33	4.8	<5	5.3	6.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Jul-25	3.70	300	280	57	8.3	<5	88.0	6.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	2.93

KMB11																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	6.00	410	371	110	11.0	24.0	40	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Feb-18	6.10	400	364	110	12.0	27.0	35	9.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.51
1-May-18	5.90	410	309	110	10.0	25.0	66	11.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.63
1-Aug-18	5.60	390	316	110	1.0	8.0	34	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.61
1-Nov-18	5.90	400	232	110	11.0	-	50	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.56
1-Feb-19	6.00	410	238	110	14.0	-	40	7.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.38
1-Oct-19	5.90	390	308	110	9.0	-	36	12.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Jan-20	6.00	410	324	110	3.0	27.0	44	36.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.67
1-Apr-20	6.00	400	316	110	12.0	25.0	30	9.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.81
1-Aug-20	5.90	-	-	100	4.0	14.0	22	25.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-20	5.90	400	316	100	4.0	12.0	29	25.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Jan-21	6.30	410	324	120	7.0	28.0	39	17.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.30
1-Apr-21	6.00	420	333	110	<1	15.0	42	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Jul-21	4.10	450	358	120	31.0	<5	87	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Oct-21	5.90	390	308	110	1.0	13.0	52	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jan-22	6.00	410	324	120	2.0	23.0	61	60.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.90
1-Apr-22	5.80	410	324	110	7.0	15.0	54	15.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.80	410	324	110	10.0	19.0	44	11.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Oct-22	5.90	420	333	110	<1	12.0	40	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.50	420	333	110	<1	21.0	92	>110	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.50	420	333	120	<1	23.0	94	>120	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.50	420	333	110	5.4	18.0	39	20.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.38
1-Oct-23	5.60	410	350	110	0.0	89.0	28	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Jan-24	5.60	400	360	110	0.0	62.0	27	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.66
1-Apr-24	5.60	410	320	120	0.0	38.0	22	120.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.34
1-Jul-24	5.60	420	340	87	<0.5	68.0	22	>87	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Oct-24	5.60	400	340	120	1.0	23.0	61	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.32
1-Jan-25	5.50	440	340	110	1.0	22.0	75	110.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.83
1-Apr-25	5.50	400	310	100	0.9	21.0	6	120.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jul-25	5.50	370	300	95	1.0	22.0	78	95.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.12

KMB12																		
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	7.80	930	570	120	16.0	-	12	7.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.26
1-Feb-19	7.80	960	589	110	15.0	-	13	7.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.06
1-May-19	7.80	990	609	120	18.0	-	14	6.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.46
1-Aug-19	7.90	990	609	120	12.0	-	16	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.99
1-Oct-19	7.70	940	784	120	4.0	-	11	30.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.08
1-Jan-20	7.80	1000	838	120	8.0	380.0	17	15.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.26
1-Apr-20	7.80	1000	838	120	17.0	380.0	13	7.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.30
1-Aug-20	7.90	-	-	110	26.0	390.0	13	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.17
1-Oct-20	7.90	960	802	120	11.0	360.0	10	10.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.06
1-Jan-21	6.30	1000	838	120	14.0	400.0	13	8.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70
1-Apr-21	7.80	1100	927	120	27.0	360.0	21	4.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.00
1-Jul-21	7.60	1500	1289	270	220.0	170.0	29	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-21	7.70	900	749	110	5.0	330.0	12	22.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Jan-22	7.80	1000	838	120	28.0	370.0	26	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	8.10
1-Apr-22	7.60	1100	927	120	26.0	390.0	20	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	7.60	1100	927	120	50.0	430.0	22	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.50
1-Oct-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	7.30	1100	927	120	26.0	400.0	45	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	7.30	1100	927	120	41.0	440.0	47	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	7.30	1100	927	100	22.0	450.0	27	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.93
1-Oct-23	7.20	960	620	110	23.0	350.0	34	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.73
1-Jan-24	7.20	1000	720	110	31.0	430.0	36	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.97
1-Apr-24	7.40	1100	720	130	50.0	430.0	21	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.24
1-Jul-24	7.40	1100	670	120	25.0	370.0	31	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Oct-24	7.40	880	540	120	18.0	300.0	23	6.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.76
1-Jan-25	7.20	990	580	110	11.0	340.0	26	10.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	7.11
1-Apr-25	7.30	1300	690	120	55.0	440.0	5	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jul-25	7.20	1100	740	120	54.0	450.0	43	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.95

KMB13																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	5.70	140	157	25	16.0	<5	19	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.47
1-Feb-18	5.80	130	164	26	13.0	6.0	21	2.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.32
1-May-18	6.20	210	128	47	3.0	17.0	30	15.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Aug-18	6.10	160	208	28	22.0	11.0	21	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.82
1-Nov-18	6.70	200	111	38	1.0	-	24	38.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.04
1-Feb-19	6.60	170	93	35	0.0	-	25	>35	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Oct-19	5.70	190	143	38	16.0	-	21	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.65
1-Jan-20	5.70	190	143	42	17.0	5.0	34	2.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.96
1-Apr-20	5.90	200	151	48	15.0	8.0	27	3.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.81
1-Aug-20	6.00	-	-	49	14.0	6.0	16	3.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Oct-20	6.20	240	183	55	11.0	10.0	17	5.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.68
1-Jan-21	6.30	220	167	51	18.0	10.0	26	2.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.70
1-Apr-21	5.70	220	167	50	12.0	7.0	35	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.40
1-Jul-21	3.50	400	316	81	46.0	<5	65	1.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Oct-21	4.80	210	159	187	9.0	<5	35	6.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.80
1-Jan-22	6.00	240	183	171	11.0	12.0	67	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Apr-22	5.90	230	175	229	7.0	10.0	39	8.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.30	240	183	196	7.0	<5	28	8.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Oct-22	6.10	240	183	54	3.0	20.0	42	18.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.40	260	200	63	3.4	13.0	73	18.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.40	250	192	68	1.1	15.0	82	61.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.60	250	192	64	12.0	12.0	22	5.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.30
1-Oct-23	5.60	280	210	69	8.3	49.0	17	8.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Jan-24	5.60	270	220	65	4.5	60.0	22	14.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.64
1-Apr-24	5.60	270	160	76	4.5	32.0	15	16.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.15
1-Jul-24	5.70	280	200	71	1.2	55.0	17	59.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.30
1-Oct-24	5.90	340	230	88	12.0	25.0	54	7.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jan-25	5.50	320	220	71	5.2	16.0	50	13.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.62
1-Apr-25	5.80	300	220	68	2.6	21.0	5	26.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.12
1-Jul-25	5.60	280	210	67	1.3	21.0	51	51.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.31

KMB14																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Oct-19	5.80	280	216	65	12.0	-	43	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.48
1-Jan-20	6.00	360	282	80	27.0	14.0	43	3.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.85
1-Apr-20	7.40	640	521	91	31.0	170.0	13	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.65
1-Aug-20	6.80	-	-	86	53.0	62.0	24	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Oct-20	5.90	280	216	63	15.0	8.0	25	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.42
1-Jan-21	6.10	290	224	69	18.0	10.0	26	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-21	5.80	260	200	61	22.0	7.0	50	2.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jul-21	5.80	320	249	69	33.0	9.0	47	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Oct-21	5.70	250	192	58	16.0	10.0	40	3.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Jan-22	5.90	270	208	61	25.0	9.0	46	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Apr-22	5.50	270	208	62	25.0	6.0	45	2.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.40	260	200	62	16.0	6.0	45	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Oct-22	5.60	260	200	56	13.0	6.0	43	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.10	260	200	59	18.0	8.0	69	3.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.00	260	200	73	20.0	6.2	95	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.00	270	208	64	12.0	8.4	61	5.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.05
1-Oct-23	5.30	250	220	56	19.0	12.0	72	2.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jan-24	5.20	240	210	50	19.0	11.0	42	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.10
1-Apr-24	5.20	300	150	75	17.0	7.7	37	4.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.40
1-Jul-24	5.20	240	200	52	13.0	8.6	66	4.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Oct-24	5.60	250	200	55	23.0	14.0	55	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.63
1-Jan-25	5.20	270	210	55	18.0	9.4	53	3.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.27
1-Apr-25	5.40	390	260	79	33.0	11.0	5	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.90
1-Jul-25	5.10	260	200	60	15.0	7.6	75	4.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.98

KMB15D															
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Soluble Iron	Manganese	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	5.90	240	130	58	14	<5	8	4.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.48
1-Feb-18	5.70	270	152	76	16	<5	11	4.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.42
1-May-18	5.70	260	104	68	11	<5	24	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.17
1-Aug-18	5.50	230	114	58	13	<5	25	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.22
1-Nov-18	5.80	240	135	65	12	-	18	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.35
1-Feb-19	6.20	250	141	63	5	-	25	12.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-May-19	6.20	250	141	61	6	-	38	10.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.51
1-Aug-19	5.80	250	141	60	10	-	24	6.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.56
1-Oct-19	5.40	290	224	61	38	-	30	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.27
1-Oct-20	5.60	260	200	65	15	<5	6	4.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.30
1-Jan-21	5.80	280	216	76	19	<5	14	7.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Apr-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-21	4.00	530	426	62	170	<5	120	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Oct-21	6.00	250	192	69	10	<5	11	6.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jan-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-22	5.90	270	208	75	11	<5	13	6.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	5.50	230	175	28	12	<5	38	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Oct-22	5.70	250	192	64	12	<5	13	5.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.00	280	216	76	9.3	<5	42	8.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.10	230	175	71	11	6.5	45	6.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.20	230	175	58	9.4	6.0	19	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.06
1-Oct-23	5.10	270	160	75	9.5	5.6	33	7.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.10
1-Jan-24	5.10	280	180	77	7.5	6.2	27	10.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Apr-24	6.00	270	130	65	7.3	22.0	31	8.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.50
1-Jul-24	5.50	280	150	74	5.2	7.6	33	14.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.20
1-Oct-24	5.70	310	190	97	5.1	8.3	33	19.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.48
1-Jan-25	5.30	340	200	88	5.5	6.9	32	16.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.16
1-Apr-25	5.30	340	160	91	7.5	5.3	5	12.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.10
1-Jul-25	5.20	230	150	57	7.8	5.8	45	7.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.90

KMB15S																			
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Nitrate, NO3 as NO_3 (Nitrate Nitrogen, NO_3 as N)	Cobalt	Copper	Soluble Iron	Manganese	Nickel	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	5.80	240	135	53	27.0	-	27	2.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Feb-19	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-May-19	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Aug-19	4.80	370	214	68	59.0	-	53	1.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.31
1-Oct-19	5.90	250	192	65	12.0	-	43	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.46
1-Jan-20	5.60	260	200	67	12.0	<5	27	5.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.75
1-Apr-20	5.60	260	200	66	13.0	<5	19	5.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.42
1-Aug-20	6.20	-	-	59	11.0	<5	14	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Oct-20	5.90	280	216	63	15.0	8.0	25	4.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.01
1-Jan-21	6.10	290	224	69	18.0	10.0	26	3.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-21	5.80	260	200	61	22.0	7.0	50	2.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-21	5.80	320	249	69	33.0	9.0	47	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-21	4.20	410	324	36	160.0	<5	130	0.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.10
1-Jan-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Apr-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Jul-22	5.40	260	200	68	12.0	<5	23	5.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Jan-23	3.40	680	556	86	180.0	<5	200	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	3.90	760	625	120	190.0	<5	170	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	4.00	660	538	89	220.0	<5	310	0.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.62
1-Oct-23	5.20	260	140	75	9.4	5.6	30	8.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.93
1-Jan-24	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Jul-24	4.40	390	290	46	100.0	5.0	98	0.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.20
1-Oct-24	4.50	220.00	190	34.00	47.0	<5	48.00	0.72	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.09
1-Jan-25	4.50	390	200	73	50.0	<5	58	1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.97
1-Jul-25	5.60	510	400	72	120.0	12.0	110	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.51

KMB16D (no data for KMB16S as bore is dry)															
Analyte	**pH**	**Electrical Conductivity @ 25ºC**	**Total Dissolved Solids – by evaporation**	**Chloride**	**Sulphate**	**Total Alkalinity (as $CaCO_3$)**	**Total Acidity (as $CaCO_3$)**	**Cl:SO4 ratio**	**Total Nitrogen**	**Nitrate / Nitrite as N**	**Total Phosphorus**	**Phosphorus**	**Soluble Iron**	**Manganese**	**pH (field)**
Units		**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	
1-Nov-18	6.20	410	238	120	9.0	-	0	13.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.60
1-Feb-19	5.90	310	177	74	12.0	-	36	6.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.49
1-May-19	6.00	250	141	56	12.0	-	37	4.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.43
1-Aug-19	5.70	210	117	46	7.0	-	40	6.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.65
1-Oct-19	5.80	190	143	45	2.0	-	35	22.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.72
1-Jan-20	5.90	200	151	43	8.0	10.0	44	5.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.75
1-Apr-20	6.10	190	143	41	<1	13.0	23	>41	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Aug-20	6.00	-	-	59	8.0	9.0	33	7.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Oct-20	6.00	180	135	41	4.0	11.0	25	10.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.80
1-Jan-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-21	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Oct-21	5.90	180	135	43	6.0	7.0	21	7.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.7
1-Jan-22	-	-	-	-	-	-	-	-	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-22	5.80	200	151	49	<1	10	55	>49	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	Dry
1-Oct-22	5.40	230	175	57	8.0	<5	30	7.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	5.30	290	224	72	4.2	9.7	67	17.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	5.40	330	257	110	7.6	12.0	58	14.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	5.30	380	299	110	7.6	13.0	40	14.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.24
1-Oct-23	5.40	350	250	98	5.3	14.0	58	18.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.11
1-Jan-24	5.50	330	260	89	5.1	15.0	41	17.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.39
1-Apr-24	5.20	370	230	100	12.0	9.1	40	8.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.00
1-Jul-24	5.80	500	340	140	2.3	20.0	50	60.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.50
1-Oct-24	5.60	310	230	86	5.3	14.0	40	16.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.71
1-Jan-25	5.40	310	230	70	4.2	12.0	42	16.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.38
1-Jul-25	5.40	513	240	77	7.8	12.0	54	9.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.91

KMB17S															
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Soluble Iron	Manganese	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-18	6.80	320	183	44	12.0	-	46	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.19
1-Feb-19	7.00	330	189	44	7.0	-	21	6.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.08
1-May-19	6.80	290	165	73	7.0	-	33	10.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.13
1-Aug-19	6.70	320	183	45	42.0	-	21	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.29
1-Oct-19	6.90	290	224	38	17.0	-	22	2.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.29
1-Jan-20	7.00	340	266	39	49.0	76.0	29	0.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.13
1-Apr-20	6.20	390	308	60	88.0	49.0	57	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.99
1-Aug-20	7.00	-	-	59	66.0	46.0	10	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.31
1-Oct-20	6.90	280	216	37	8.0	62.0	15	4.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.40
1-Jan-21	7.10	350	274	50	46.0	58.0	18	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Apr-21	6.30	380	299	51	90.0	18.0	24	0.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.00
1-Jul-21	6.70	210	159	30	11.0	35.0	21	2.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-21	6.80	280	216	43	<1	67.0	18	>43	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Jan-22	6.90	300	233	39	10.0	89.0	36	3.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.90
1-Apr-22	6.70	320	249	50	8.0	83.0	48	6.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	6.70	250	192	38	30.0	44.0	13	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.50
1-Oct-22	6.80	310	241	39	8.0	74.0	29	4.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	6.40	340	266	38	26.0	91.0	60	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	6.20	340	266	51	48.0	63.0	46	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	6.40	250	192	24	19.0	66.0	21	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.22
1-Oct-23	6.40	260	230	24	15.0	90.0	48	1.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-24	6.50	310	330	27	19.0	98.0	31	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.19
1-Apr-24	6.50	360	330	34	14.0	110.0	44	2.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.10
1-Jul-24	6.50	260	250	18	19.0	63.0	23	0.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20
1-Oct-24	6.60	270	230	21	14.0	94.0	38	1.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Jan-25	6.50	380	300	23	10.0	140.0	51	2.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.26
1-Apr-25	6.50	290	320	27	26.0	63.0	5	1.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.74
1-Jul-25	6.40	330	350	36	49.0	51.0	21	0.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.20

KMB19S															
Analyte	pH	Electrical Conductivity @ 25ºC	Total Dissolved Solids – by evaporation	Chloride	Sulphate	Total Alkalinity (as $CaCO_3$)	Total Acidity (as $CaCO_3$)	Cl:SO4 ratio	Total Nitrogen	Nitrate / Nitrite as N	Total Phosphorus	Phosphorus	Soluble Iron	Manganese	pH (field)
Units		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
1-Nov-17	3.90	240	246	44	40.0	<5	69	1.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.77
1-Oct-19	3.40	410	324	83	61.0	-	76	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.81
1-Jan-20	3.60	520	418	120	86.0	<5	120	1.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.60
1-Apr-20	4.20	290	224	73	9.0	<5	60	8.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.70
1-Aug-20	3.30	-	-	120	90.0	<5	81	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	6.60
1-Oct-20	3.50	470	375	100	76.0	<5	75	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.00
1-Jan-21	3.50	600	486	140	2.0	<5	110	70.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.10
1-Apr-21	3.90	450	358	110	12.0	78.0	390	9.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.50
1-Jul-21	3.50	390	308	78	37.0	<5	65	2.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.00
1-Oct-21	3.90	270	208	62	34.0	<5	49	1.8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.30
1-Jan-22	3.60	360	282	92	48.0	<5	120	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.00
1-Apr-22	4.10	250	192	62	12.0	<5	58	5.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-22	3.40	620	504	130	35.0	<5	89	3.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.00
1-Oct-22	3.90	260	200	54	41.0	<5	54	1.3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jan-23	3.60	310	241	62	7.0	<5	130	8.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Apr-23	4.00	290	224	83	8.0	<5	140	10.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	-
1-Jul-23	3.40	460	367	84	18.0	<5	66	4.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.34
1-Oct-23	4.00	180	240	33	6.4	0.0	78	5.2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.73
1-Jan-24	3.80	210	350	39	4.5	0.0	88	8.7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.70
1-Apr-24	5.00	320	220	88	4.4	8.8	71	20.0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.09
1-Aug-24	3.50	340	400	34	13.0	<0.5	80	2.6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.80
1-Oct-24	4.90	130	230	24	5.3	5.2	48	4.5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	5.56
1-Jan-25	4.00	150	310	20	2.2	<0.5	87	9.1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	4.14
1-Apr-25	4.10	150	340	22	0.9	<0.5	49	24.4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.98
1-Jul-25	3.70	210	340	23	12.0	<0.5	85	1.9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	3.58

APPENDIX IV

LABORATORY CERTIFICATES

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
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16-18 Hayden Court Myaree WA 6154
ph +61 8 9317 2505
lab@mpl.com.au
www.mpl.com.au

Certificate of Analysis PFJ1677

Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Tarlia Turner
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Number of Samples	18 Water
Date Samples Received	23/10/2024
Date Instructions Received	23/10/2024

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for soils and on an as received basis for other matrices.

Report Details

Date Results Requested by	30/10/2024
Date of Issue	30/10/2024

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Lien Tang, Assistant Operations Manager Lucas Yii, Inorganics Team Leader Michael Mowle, Inorganics Supervisor
Laboratory Manager	Michael Kubiak

Certificate of Analysis PFJ1677

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PFJ1677-01	TAILS	Water	18/10/2024	23/10/2024
PFJ1677-02	KMB 1	Water	18/10/2024	23/10/2024
PFJ1677-03	KMB 2	Water	18/10/2024	23/10/2024
PFJ1677-04	KMB 5D	Water	18/10/2024	23/10/2024
PFJ1677-05	KMB 6S	Water	18/10/2024	23/10/2024
PFJ1677-06	KMB 7	Water	18/10/2024	23/10/2024
PFJ1677-07	KMB 8	Water	18/10/2024	23/10/2024
PFJ1677-08	KMB 9	Water	18/10/2024	23/10/2024
PFJ1677-09	KMB 10	Water	18/10/2024	23/10/2024
PFJ1677-10	KMB 11	Water	18/10/2024	23/10/2024
PFJ1677-11	KMB 12	Water	18/10/2024	23/10/2024
PFJ1677-12	KMB 13	Water	18/10/2024	23/10/2024
PFJ1677-13	KMB 14	Water	18/10/2024	23/10/2024
PFJ1677-14	KMB 15D	Water	18/10/2024	23/10/2024
PFJ1677-15	KMB 15S	Water	18/10/2024	23/10/2024
PFJ1677-16	KMB 16D	Water	18/10/2024	23/10/2024
PFJ1677-17	KMB 17	Water	18/10/2024	23/10/2024
PFJ1677-18	KMB 19	Water	18/10/2024	23/10/2024

Certificate of Analysis PFJ1677

Inorganics - Physical Parameters (Water)

Envirolab ID	Units	PQL	PFJ1677-01	PFJ1677-02	PFJ1677-03	PFJ1677-04	PFJ1677-05
Your Reference			TAILS	KMB 1	KMB 2	KMB 5D	KMB 6S
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
pH	pH units		7.4	5.4	6.0	5.9	6.4
Electrical Conductivity	µS/cm	2.0	1400	420	380	610	240
Total Dissolved Solids	mg/L	5.0	780	300	320	580	190

Envirolab ID	Units	PQL	PFJ1677-06	PFJ1677-07	PFJ1677-08	PFJ1677-09	PFJ1677-10
Your Reference			KMB 7	KMB 8	KMB 9	KMB 10	KMB 11
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
pH	pH units		5.6	6.1	3.8	3.4	5.6
Electrical Conductivity	µS/cm	2.0	1100	550	480	380	400
Total Dissolved Solids	mg/L	5.0	720	400	440	340	340

Envirolab ID	Units	PQL	PFJ1677-11	PFJ1677-12	PFJ1677-13	PFJ1677-14	PFJ1677-15
Your Reference			KMB 12	KMB 13	KMB 14	KMB 15D	KMB 15S
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
pH	pH units		7.4	5.9	5.6	5.7	4.5
Electrical Conductivity	µS/cm	2.0	880	340	250	310	220
Total Dissolved Solids	mg/L	5.0	540	230	200	190	190

Envirolab ID	Units	PQL	PFJ1677-16	PFJ1677-17	PFJ1677-18
Your Reference			KMB 16D	KMB 17	KMB 19
Date Sampled			18/10/2024	18/10/2024	18/10/2024
pH	pH units		5.6	6.6	4.9
Electrical Conductivity	µS/cm	2.0	310	270	130
Total Dissolved Solids	mg/L	5.0	230	230	230

Certificate of Analysis PFJ1677

Inorganics - Ionic Balance and Indexes (Water)

Envirolab ID	Units	PQL	PFJ1677-01	PFJ1677-02	PFJ1677-03	PFJ1677-04	PFJ1677-05
Your Reference			TAILS	KMB 1	KMB 2	KMB 5D	KMB 6S
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	57	10	37	43	58
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	57	10	37	43	58
Chloride	mg/L	1.0	220	120	100	170	15
Sulfate	mg/L	1.0	390	23	<1.0	9.0	16

Envirolab ID	Units	PQL	PFJ1677-06	PFJ1677-07	PFJ1677-08	PFJ1677-09	PFJ1677-10
Your Reference			KMB 7	KMB 8	KMB 9	KMB 10	KMB 11
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	21	38	<5.0	<5.0	23
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	21	38	<5.0	<5.0	23
Chloride	mg/L	1.0	210	140	110	83	120
Sulfate	mg/L	1.0	210	31	49	9.1	<1.0

Envirolab ID	Units	PQL	PFJ1677-11	PFJ1677-12	PFJ1677-13	PFJ1677-14	PFJ1677-15
Your Reference			KMB 12	KMB 13	KMB 14	KMB 15D	KMB 15S
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	300	25	14	8.3	<5.0
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	300	25	14	8.3	<5.0
Chloride	mg/L	1.0	120	88	55	97	34
Sulfate	mg/L	1.0	18	12	23	5.1	47

Envirolab ID	Units	PQL	PFJ1677-16	PFJ1677-17	PFJ1677-18
Your Reference			KMB 16D	KMB 17	KMB 19
Date Sampled			18/10/2024	18/10/2024	18/10/2024
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	14	94	5.2
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	14	94	5.2
Chloride	mg/L	1.0	86	21	24
Sulfate	mg/L	1.0	5.3	14	5.3

Certificate of Analysis PFJ1677

Inorganics - Miscellaneous and Common Anions (Water)

Envirolab ID	Units	PQL	PFJ1677-01	PFJ1677-02	PFJ1677-03	PFJ1677-04	PFJ1677-05
Your Reference			TAILS	KMB 1	KMB 2	KMB 5D	KMB 6S
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
Acidity	mg/L	5.0	<5.0	51	56	72	35

Envirolab ID	Units	PQL	PFJ1677-06	PFJ1677-07	PFJ1677-08	PFJ1677-09	PFJ1677-10
Your Reference			KMB 7	KMB 8	KMB 9	KMB 10	KMB 11
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
Acidity	mg/L	5.0	79	48	100	78	61

Envirolab ID	Units	PQL	PFJ1677-11	PFJ1677-12	PFJ1677-13	PFJ1677-14	PFJ1677-15
Your Reference			KMB 12	KMB 13	KMB 14	KMB 15D	KMB 15S
Date Sampled			18/10/2024	18/10/2024	18/10/2024	18/10/2024	18/10/2024
Acidity	mg/L	5.0	23	54	55	33	48

Envirolab ID	Units	PQL	PFJ1677-16	PFJ1677-17	PFJ1677-18
Your Reference			KMB 16D	KMB 17	KMB 19
Date Sampled			18/10/2024	18/10/2024	18/10/2024
Acidity	mg/L	5.0	40	38	48

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PFJ1677

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Date Issued	30/10/2024

Recommended Holding Time Compliance

Recommended holding time exceedances exist - See detailed list below

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PFJ1677

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-18	18/10/2024	24/10/2024	24/10/2024	Yes
pH | Water	1-18	18/10/2024	24/10/2024	24/10/2024	No
TDS | Water	1	18/10/2024	25/10/2024	25/10/2024	Yes
	2-18	18/10/2024	25/10/2024	28/10/2024	Yes
Alkalinity Suite | Water	1-18	18/10/2024	24/10/2024	24/10/2024	Yes
Chloride | Water	2-18	18/10/2024	24/10/2024	24/10/2024	Yes
	1	18/10/2024	24/10/2024	25/10/2024	Yes
Sulfate | Water	2-18	18/10/2024	24/10/2024	24/10/2024	Yes
	1	18/10/2024	24/10/2024	25/10/2024	Yes
Acidity | Water	1-18	18/10/2024	28/10/2024	28/10/2024	Yes

Quality Control PFJ1677

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BFJ4745

Analyte	Units	PQL	Blank	DUP1 BFJ4745-DUP1# Samp | QC | RPD %	DUP2 PFJ1677-09 Samp | QC | RPD %	LCS %
pH	pH units		5.6	6.4 | 6.4 | 0.156	3.4 | 3.4 | 0.00	103
Electrical Conductivity	µS/cm	2.0	<2.0	353 | 352 | 0.0851	384 | 383 | 0.0782	103

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFJ4934

Analyte	Units	PQL	Blank	DUP1 BFJ4934-DUP1# Samp | QC | RPD %	DUP2 BFJ4934-DUP2# Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	6890 | 6640 | 3.70	23500 | 22900 | 2.67	94.2

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BFJ4937

Analyte	Units	PQL	Blank	DUP1 BFJ4937-DUP1# Samp | QC | RPD %	DUP2 PFJ1677-10 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	222 | 204 | 8.45	341 | 333 | 2.37	101

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFJ4739

Analyte	Units	PQL	Blank	DUP1 PFJ1677-01 Samp | QC | RPD %	DUP2 PFJ1677-10 Samp | QC | RPD %	LCS %	Spike % PFJ1677-02
Chloride	mg/L	1.0	<1.0	221 | 220 | 0.289	119 | 119 | 0.272	97.2	110
Sulfate	mg/L	1.0	<1.0	385 | 385 | 0.0689	<1.0 | <1.0 | [NA]	88.7	111

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BFJ4745

Analyte	Units	PQL	Blank	DUP1 BFJ4745-DUP1# Samp | QC | RPD %	DUP2 PFJ1677-09 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	29.8 | 29.9 | 0.335	<5.0 | <5.0 | [NA]	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	29.8 | 29.9 | 0.335	<5.0 | <5.0 | [NA]	96.0

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BFJ5160

Analyte	Units	PQL	Blank	DUP1 PFJ1677-01 Samp | QC | RPD %	DUP2 PFJ1677-10 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	61.5 | 60.0 | 2.39	90.1

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Certificate of Analysis PGA0728

Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Tarlia Turner
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Number of Samples	24 Water
Date Samples Received	15/01/2025
Date Instructions Received	15/01/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for soils and on an as received basis for other matrices.

Report Details

Date Results Requested by	22/01/2025
Date of Issue	22/01/2025

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Lucas Yii, Inorganics Team Leader Varsha Ho Wing, Inorganics and Metals Supervisor
Laboratory Manager	Michael Kubiak

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PGA0728-01	KMB 01	Water	14/01/2025	15/01/2025
PGA0728-02	KMB 02	Water	14/01/2025	15/01/2025
PGA0728-03	KMB 5D	Water	14/01/2025	15/01/2025
PGA0728-04	KMB 6S	Water	14/01/2025	15/01/2025
PGA0728-05	KMB 07	Water	14/01/2025	15/01/2025
PGA0728-06	KMB 08	Water	14/01/2025	15/01/2025
PGA0728-07	KMB 09	Water	14/01/2025	15/01/2025
PGA0728-08	KMB 10	Water	14/01/2025	15/01/2025
PGA0728-09	KMB 11	Water	14/01/2025	15/01/2025
PGA0728-10	KMB 12	Water	14/01/2025	15/01/2025
PGA0728-11	KMB 13	Water	14/01/2025	15/01/2025
PGA0728-12	KMB 14	Water	14/01/2025	15/01/2025
PGA0728-13	KMB 15S	Water	14/01/2025	15/01/2025
PGA0728-14	KMB 15D	Water	14/01/2025	15/01/2025
PGA0728-15	KMB 16D	Water	14/01/2025	15/01/2025
PGA0728-16	KMB 17	Water	14/01/2025	15/01/2025
PGA0728-17	KMB 19	Water	14/01/2025	15/01/2025
PGA0728-18	Lake 1	Water	14/01/2025	15/01/2025
PGA0728-19	Lake 2	Water	14/01/2025	15/01/2025
PGA0728-20	Lake 3	Water	14/01/2025	15/01/2025
PGA0728-21	Lake 4	Water	14/01/2025	15/01/2025
PGA0728-22	Dredge Pond	Water	14/01/2025	15/01/2025
PGA0728-23	ROM	Water	14/01/2025	15/01/2025
PGA0728-24	Tails	Water	14/01/2025	15/01/2025

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Inorganics - Physical Parameters (Water)

Envirolab ID	Units	PQL	PGA0728-01	PGA0728-02	PGA0728-03	PGA0728-04	PGA0728-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
pH	pH units		4.8	5.8	6.1	6.1	4.9
Electrical Conductivity	µS/cm	2.0	270	420	650	190	860
Total Dissolved Solids	mg/L	5.0	240 [1] [2]	310 [1] [2]	560 [1] [2]	120	490

Envirolab ID	Units	PQL	PGA0728-06	PGA0728-07	PGA0728-08	PGA0728-09	PGA0728-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
pH	pH units		6.0	4.2	3.6	5.5	7.2
Electrical Conductivity	µS/cm	2.0	600	430	280	440	990
Total Dissolved Solids	mg/L	5.0	440	570 [1] [2]	340 [1] [2]	340	580

Envirolab ID	Units	PQL	PGA0728-11	PGA0728-12	PGA0728-13	PGA0728-14	PGA0728-15
Your Reference			KMB 13	KMB 14	KMB 15S	KMB 15D	KMB 16D
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
pH	pH units		5.5	5.2	4.5	5.3	5.4
Electrical Conductivity	µS/cm	2.0	320	270	390	340	310
Total Dissolved Solids	mg/L	5.0	220	210	200	200	230

Envirolab ID	Units	PQL	PGA0728-16	PGA0728-17	PGA0728-18	PGA0728-19	PGA0728-20
Your Reference			KMB 17	KMB 19	Lake 1	Lake 2	Lake 3
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
pH	pH units		6.5	4.0	8.7	8.3	7.9
Electrical Conductivity	µS/cm	2.0	380	150	1600	1900	2300
Total Dissolved Solids	mg/L	5.0	300	310 [1] [2]	960	1200	1500

Envirolab ID	Units	PQL	PGA0728-21	PGA0728-22	PGA0728-23	PGA0728-24
Your Reference			Lake 4	Dredge Pond	ROM	Tails
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025
pH	pH units		7.9	7.9	7.6	7.6
Electrical Conductivity	µS/cm	2.0	1900	1600	1600	1600
Total Dissolved Solids	mg/L	5.0	1200	1100	970	1000

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Inorganics - Ionic Balance and Indexes (Water)

Envirolab ID	Units	PQL	PGA0728-01	PGA0728-02	PGA0728-03	PGA0728-04	PGA0728-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	36	66	52	7.5
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	36	66	52	7.5
Chloride	mg/L	1.0	59	97	140	11	150
Sulfate	mg/L	1.0	7.5	<1.0	5.3	16	140

Envirolab ID	Units	PQL	PGA0728-06	PGA0728-07	PGA0728-08	PGA0728-09	PGA0728-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	36	<5.0	<5.0	22	340
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	36	<5.0	<5.0	22	340
Chloride	mg/L	1.0	120	96	44	110	110
Sulfate	mg/L	1.0	45	20	1.9	<1.0	11

Envirolab ID	Units	PQL	PGA0728-11	PGA0728-12	PGA0728-13	PGA0728-14	PGA0728-15
Your Reference			KMB 13	KMB 14	KMB 15S	KMB 15D	KMB 16D
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	16	9.4	<5.0	6.9	12
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	16	9.4	<5.0	6.9	12
Chloride	mg/L	1.0	71	55	73	88	70
Sulfate	mg/L	1.0	5.2	18	50	5.5	4.2

Envirolab ID	Units	PQL	PGA0728-16	PGA0728-17	PGA0728-18	PGA0728-19	PGA0728-20
Your Reference			KMB 17	KMB 19	Lake 1	Lake 2	Lake 3
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	140	<5.0	220	130	84
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	23	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	140	<5.0	240	130	84
Chloride	mg/L	1.0	23	20	260	290	350
Sulfate	mg/L	1.0	10	2.2	190	390	500

Envirolab ID	Units	PQL	PGA0728-21	PGA0728-22	PGA0728-23	PGA0728-24
Your Reference			Lake 4	Dredge Pond	ROM	Tails
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	62	56	84	55
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	62	56	84	55
Chloride	mg/L	1.0	290	210	200	210
Sulfate	mg/L	1.0	410	410	400	420

Certificate of Analysis PGA0728

Inorganics - Miscellaneous and Common Anions (Water)

Envirolab ID	Units	PQL	PGA0728-01	PGA0728-02	PGA0728-03	PGA0728-04	PGA0728-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Acidity	mg/L	5.0	49	61	70	38	110

Envirolab ID	Units	PQL	PGA0728-06	PGA0728-07	PGA0728-08	PGA0728-09	PGA0728-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Acidity	mg/L	5.0	38	110	110	75	26

Envirolab ID	Units	PQL	PGA0728-11	PGA0728-12	PGA0728-13	PGA0728-14	PGA0728-15
Your Reference			KMB 13	KMB 14	KMB 15S	KMB 15D	KMB 16D
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Acidity	mg/L	5.0	50	53	58	32	42

Envirolab ID	Units	PQL	PGA0728-16	PGA0728-17	PGA0728-18	PGA0728-19	PGA0728-20
Your Reference			KMB 17	KMB 19	Lake 1	Lake 2	Lake 3
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025	14/01/2025
Acidity	mg/L	5.0	51	87	<5.0	<5.0	<5.0

Envirolab ID	Units	PQL	PGA0728-21	PGA0728-22	PGA0728-23	PGA0728-24
Your Reference			Lake 4	Dredge Pond	ROM	Tails
Date Sampled			14/01/2025	14/01/2025	14/01/2025	14/01/2025
Acidity	mg/L	5.0	40	<5.0	<5.0	<5.0

Result Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Note that some solid material appears to have passed through the glass fibre filter paper(s).
[2]	Sample is highly coloured

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PGA0728

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Date Issued	22/01/2025

Recommended Holding Time Compliance

Recommended holding time exceedances exist - See detailed list below

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PGA0728

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-24	14/01/2025	17/01/2025	17/01/2025	Yes
pH | Water	1-24	14/01/2025	17/01/2025	17/01/2025	No
TDS | Water	1-24	14/01/2025	17/01/2025	17/01/2025	Yes
Alkalinity Suite | Water	1-24	14/01/2025	17/01/2025	17/01/2025	Yes
Chloride | Water	1-24	14/01/2025	16/01/2025	17/01/2025	Yes
Sulfate | Water	1-24	14/01/2025	16/01/2025	17/01/2025	Yes
Acidity | Water	1-24	14/01/2025	17/01/2025	17/01/2025	Yes

Quality Control PGA0728

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BGA2020

Analyte	Units	PQL	Blank	DUP1 PGA0728-01 Samp | QC | RPD %	DUP2 PGA0728-11 Samp | QC | RPD %	LCS %
pH	pH units		5.7	4.8 | 4.8 | 0.207	5.5 | 5.5 | 0.00	102
Electrical Conductivity	µS/cm	2.0	<2.0	273 | 273 | 0.0733	320 | 320 | 0.0625	109

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BGA2105

Analyte	Units	PQL	Blank	DUP1 PGA0728-21 Samp | QC | RPD %	DUP2 BGA2105-DUP2# Samp | QC | RPD %	LCS %
pH	pH units		5.8	7.9 | 7.9 | 0.00	6.2 | 6.2 | 0.161	102
Electrical Conductivity	µS/cm	2.0	<2.0	1850 | 1850 | 0.0108	13.0 | 13.4 | 3.03	109

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BGA2191

Analyte	Units	PQL	Blank	DUP1 BGA2191-DUP1# Samp | QC | RPD %	DUP2 BGA2191-DUP2# Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	1220 | 1230 | 0.163	134 | 129 | 3.80	95.2

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BGA2192

Analyte	Units	PQL	Blank	DUP1 BGA2192-DUP1# Samp | QC | RPD %	DUP2 PGA0728-15 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	2040 | 2070 | 1.75	226 | 222 | 1.79	96.9

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGA1973

Analyte	Units	PQL	Blank	DUP1 PGA0728-01 Samp | QC | RPD %	DUP2 PGA0728-11 Samp | QC | RPD %	LCS %	Spike % PGA0728-02
Chloride	mg/L	1.0	<1.0	58.7 | 59.1 | 0.610	70.9 | 69.1 | 2.57	95.4	89.8
Sulfate	mg/L	1.0	<1.0	7.52 | 7.77 | 3.29	5.15 | 5.17 | 0.320	90.8	105

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGA1974

Analyte	Units	PQL	Blank	DUP1 BGA1974-DUP1# Samp | QC | RPD %	DUP2 BGA1974-DUP2# Samp | QC | RPD %	LCS %	Spike % BGA1974-MS1#
Chloride	mg/L	1.0	<1.0	123 | 124 | 0.885	<1.0 | <1.0 | [NA]	95.2	80.1
Sulfate	mg/L	1.0	<1.0	20.4 | 20.9 | 2.30	<1.0 | <1.0 | [NA]	91.1	108

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGA2020

Analyte	Units	PQL	Blank	DUP1 PGA0728-01 Samp | QC | RPD %	DUP2 PGA0728-11 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	16.3 | 16.7 | [NA]	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	16.3 | 16.7 | [NA]	103

Quality Control PGA0728

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGA2105

Analyte	Units	PQL	Blank	DUP1 PGA0728-21 Samp | QC | RPD %	DUP2 BGA2105-DUP2# Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	62.3 | 62.8 | 0.799	<5.0 | <5.0 | [NA]	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	62.3 | 62.8 | 0.799	<5.0 | <5.0 | [NA]	101

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BGA2233

Analyte	Units	PQL	Blank	DUP1 PGA0728-01 Samp | QC | RPD %	DUP2 PGA0728-11 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	49.3 | 44.3 | 10.6	49.7 | 41.5 | 17.9	91.5

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BGA2234

Analyte	Units	PQL	Blank	DUP1 PGA0728-21 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	40.5 | 44.8 | 10.2	93.3

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Certificate of Analysis PGD0434

Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Enviro-Results
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Number of Samples	22 Water
Date Samples Received	04/04/2025
Date Instructions Received	04/04/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for soils and on an as received basis for other matrices.

Report Details

Date Results Requested by	11/04/2025
Date of Issue	10/04/2025

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Lucas Yii, Inorganics Team Leader
Laboratory Manager	Michael Kubiak

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PGD0434-01	KMB 01	Water	02/04/2025	04/04/2025
PGD0434-02	KMB 02	Water	02/04/2025	04/04/2025
PGD0434-03	KMB 5D	Water	02/04/2025	04/04/2025
PGD0434-04	KMB 6S	Water	02/04/2025	04/04/2025
PGD0434-05	KMB 07	Water	02/04/2025	04/04/2025
PGD0434-06	KMB 08	Water	02/04/2025	04/04/2025
PGD0434-07	KMB 09	Water	02/04/2025	04/04/2025
PGD0434-08	KMB 10	Water	02/04/2025	04/04/2025
PGD0434-09	KMB 11	Water	02/04/2025	04/04/2025
PGD0434-10	KMB 12	Water	02/04/2025	04/04/2025
PGD0434-11	KMB 13	Water	02/04/2025	04/04/2025
PGD0434-12	KMB 14	Water	02/04/2025	04/04/2025
PGD0434-13	KMB 15D	Water	02/04/2025	04/04/2025
PGD0434-14	KMB 17	Water	02/04/2025	04/04/2025
PGD0434-15	KMB 19	Water	02/04/2025	04/04/2025
PGD0434-16	Lake 1	Water	02/04/2025	04/04/2025
PGD0434-17	Lake 2	Water	02/04/2025	04/04/2025
PGD0434-18	Lake 3	Water	02/04/2025	04/04/2025
PGD0434-19	Lake 4	Water	02/04/2025	04/04/2025
PGD0434-20	Dredge Pond	Water	02/04/2025	04/04/2025
PGD0434-21	ROM	Water	02/04/2025	04/04/2025
PGD0434-22	Tails	Water	02/04/2025	04/04/2025

Certificate of Analysis PGD0434

Inorganics - Physical Parameters (Water)

Envirolab ID	Units	PQL	PGD0434-01	PGD0434-02	PGD0434-03	PGD0434-04	PGD0434-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
pH	pH units		4.9	5.7	6.2	6.1	5.1
Electrical Conductivity	µS/cm	2.0	160	380	630	190	840
Total Dissolved Solids	mg/L	5.0	220 [1]	300	600 [1]	130	540

Envirolab ID	Units	PQL	PGD0434-06	PGD0434-07	PGD0434-08	PGD0434-09	PGD0434-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
pH	pH units		5.9	5.4	3.6	5.5	7.3
Electrical Conductivity	µS/cm	2.0	910	460	240	400	1300
Total Dissolved Solids	mg/L	5.0	570	320	220 [1]	310	690

Envirolab ID	Units	PQL	PGD0434-11	PGD0434-12	PGD0434-13	PGD0434-14	PGD0434-15
Your Reference			KMB 13	KMB 14	KMB 15D	KMB 17	KMB 19
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
pH	pH units		5.8	5.4	5.3	6.5	4.1
Electrical Conductivity	µS/cm	2.0	300	390	340	290	150
Total Dissolved Solids	mg/L	5.0	200	260	160	320 [1]	340 [1]

Envirolab ID	Units	PQL	PGD0434-16	PGD0434-17	PGD0434-18	PGD0434-19	PGD0434-20
Your Reference			Lake 1	Lake 2	Lake 3	Lake 4	Dredge Pond
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
pH	pH units		8.5	8.1	7.8	7.7	7.6
Electrical Conductivity	µS/cm	2.0	1800	2100	2400	2000	1700
Total Dissolved Solids	mg/L	5.0	1100	1200	1400	1100	1000

Envirolab ID	Units	PQL	PGD0434-21	PGD0434-22
Your Reference			ROM	Tails
Date Sampled			02/04/2025	02/04/2025
pH	pH units		6.9	7.4
Electrical Conductivity	µS/cm	2.0	1600	1600
Total Dissolved Solids	mg/L	5.0	1000	1100

Certificate of Analysis PGD0434

Inorganics - Ionic Balance and Indexes (Water)

Envirolab ID	Units	PQL	PGD0434-01	PGD0434-02	PGD0434-03	PGD0434-04	PGD0434-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	25	66	42	7.6
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	25	66	42	7.6
Chloride	mg/L	1.0	30	94	140	11	150
Sulfate	mg/L	1.0	4.4	<1.0	7.2	22	140

Envirolab ID	Units	PQL	PGD0434-06	PGD0434-07	PGD0434-08	PGD0434-09	PGD0434-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	32	12	<5.0	21	440
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	32	12	<5.0	21	440
Chloride	mg/L	1.0	220	100	33	100	120
Sulfate	mg/L	1.0	43	33	4.8	<1.0	55

Envirolab ID	Units	PQL	PGD0434-11	PGD0434-12	PGD0434-13	PGD0434-14	PGD0434-15
Your Reference			KMB 13	KMB 14	KMB 15D	KMB 17	KMB 19
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	21	11	5.3	63	<5.0
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	21	11	5.3	63	<5.0
Chloride	mg/L	1.0	68	79	91	27	22
Sulfate	mg/L	1.0	2.6	33	7.5	26	<1.0

Envirolab ID	Units	PQL	PGD0434-16	PGD0434-17	PGD0434-18	PGD0434-19	PGD0434-20
Your Reference			Lake 1	Lake 2	Lake 3	Lake 4	Dredge Pond
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	220	130	84	63	66
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	21	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	240	130	84	63	66
Chloride	mg/L	1.0	300	320	380	300	210
Sulfate	mg/L	1.0	200	430	540	440	430

Envirolab ID	Units	PQL	PGD0434-21	PGD0434-22
Your Reference			ROM	Tails
Date Sampled			02/04/2025	02/04/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	55	52
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	55	52
Chloride	mg/L	1.0	220	210
Sulfate	mg/L	1.0	410	420

Certificate of Analysis PGD0434

Inorganics - Miscellaneous and Common Anions (Water)

Envirolab ID	Units	PQL	PGD0434-01	PGD0434-02	PGD0434-03	PGD0434-04	PGD0434-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Acidity	mg/L	5.0	37	<5.0	<5.0	<5.0	<5.0

Envirolab ID	Units	PQL	PGD0434-06	PGD0434-07	PGD0434-08	PGD0434-09	PGD0434-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Acidity	mg/L	5.0	<5.0	48	5.3	6.0	<5.0

Envirolab ID	Units	PQL	PGD0434-11	PGD0434-12	PGD0434-13	PGD0434-14	PGD0434-15
Your Reference			KMB 13	KMB 14	KMB 15D	KMB 17	KMB 19
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Acidity	mg/L	5.0	<5.0	<5.0	<5.0	<5.0	49

Envirolab ID	Units	PQL	PGD0434-16	PGD0434-17	PGD0434-18	PGD0434-19	PGD0434-20
Your Reference			Lake 1	Lake 2	Lake 3	Lake 4	Dredge Pond
Date Sampled			02/04/2025	02/04/2025	02/04/2025	02/04/2025	02/04/2025
Acidity	mg/L	5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Envirolab ID	Units	PQL	PGD0434-21	PGD0434-22
Your Reference			ROM	Tails
Date Sampled			02/04/2025	02/04/2025
Acidity	mg/L	5.0	15	<5.0

Result Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Note that some solid material appears to have passed through the glass fibre filter paper(s).

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PGD0434

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Date Issued	10/04/2025

Recommended Holding Time Compliance

Recommended holding time exceedances exist - See detailed list below

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PGD0434

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-22	02/04/2025	07/04/2025	07/04/2025	Yes
pH | Water	1-22	02/04/2025	07/04/2025	07/04/2025	No
TDS | Water	1-20	02/04/2025	07/04/2025	08/04/2025	Yes
	21-22	02/04/2025	08/04/2025	08/04/2025	Yes
Alkalinity Suite | Water	1-22	02/04/2025	07/04/2025	07/04/2025	Yes
Chloride | Water	1-22	02/04/2025	07/04/2025	08/04/2025	Yes
Sulfate | Water	1-22	02/04/2025	07/04/2025	08/04/2025	Yes
Acidity | Water	1-20	02/04/2025	04/04/2025	07/04/2025	Yes
	21-22	02/04/2025	07/04/2025	07/04/2025	Yes

Quality Control PGD0434

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BGD1070

Analyte	Units	PQL	Blank	DUP1 PGD0434-01 Samp | QC | RPD %	DUP2 PGD0434-11 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	216 | 204 | 5.71	196 | 200 | 2.02	118

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BGD1174

Analyte	Units	PQL	Blank	DUP1 PGD0434-01 Samp | QC | RPD %	DUP2 PGD0434-11 Samp | QC | RPD %	LCS %
pH	pH units		5.7	4.9 | 4.9 | 0.204	5.8 | 5.8 | 0.172	102
Electrical Conductivity	µS/cm	2.0	<2.0	163 | 162 | 0.617	295 | 294 | 0.305	106

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BGD1175

Analyte	Units	PQL	Blank	DUP1 PGD0434-21 Samp | QC | RPD %	DUP2 BGD1175-DUP2# Samp | QC | RPD %	LCS %
pH	pH units		5.8	6.9 | 6.9 | 0.581	6.4 | 6.5 | 0.777	102
Electrical Conductivity	µS/cm	2.0	3.20	1620 | 1630 | 0.209	404 | 402 | 0.472	106

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BGD1475

Analyte	Units	PQL	Blank	DUP1 BGD1475-DUP1# Samp | QC | RPD %	DUP2 BGD1475-DUP2# Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	1520 | 1390 | 8.92	1490 | 1540 | 3.69	116

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGD1174

Analyte	Units	PQL	Blank	DUP1 PGD0434-01 Samp | QC | RPD %	DUP2 PGD0434-11 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	20.8 | 21.0 | [NA]	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	20.8 | 21.0 | [NA]	91.2

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGD1175

Analyte	Units	PQL	Blank	DUP1 PGD0434-21 Samp | QC | RPD %	DUP2 BGD1175-DUP2# Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	55.3 | 56.0 | 1.26	45.5 | 45.3 | 0.441	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	55.3 | 56.0 | 1.26	45.5 | 45.3 | 0.441	89.6

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGD1224

Analyte	Units	PQL	Blank	DUP1 PGD0434-01 Samp | QC | RPD %	DUP2 PGD0434-11 Samp | QC | RPD %	LCS %	Spike % PGD0434-02
Chloride	mg/L	1.0	<1.0	30.2 | 30.1 | 0.206	67.9 | 67.9 | 0.0136	95.2	100
Sulfate	mg/L	1.0	<1.0	4.41 | 4.44 | [NA]	2.61 | 2.53 | [NA]	90.4	105

Quality Control PGD0434

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGD1233

Analyte	Units	PQL	Blank	DUP1 BGD1233-DUP1# Samp | QC | RPD %	DUP2 BGD1233-DUP2# Samp | QC | RPD %	LCS %	Spike % BGD1233-MS1#
Chloride	mg/L	1.0	<1.0	79.5 | 79.4 | 0.126	93.5 | 93.7 | 0.181	95.2	106
Sulfate	mg/L	1.0	<1.0	14.1 | 14.1 | 0.273	256 | 256 | 0.00371	91.1	93.2

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BGD1028

Analyte	Units	PQL	Blank	DUP1 PGD0434-01 Samp | QC | RPD %	DUP2 PGD0434-11 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	37.4 | 36.8 | 1.70	<5.0 | <5.0 | [NA]	107

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BGD1337

Analyte	Units	PQL	Blank	DUP1 BGD1337-DUP1# Samp | QC | RPD %	DUP2 BGD1337-DUP2# Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	31.0 | 26.7 | 14.8	<5.0 | <5.0 | [NA]	107

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

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Certificate of Analysis PGG0272

Client Details

Client	Kemerton Silica Sand Pty Ltd
Contact	Chantelle Cawdell
Address	Cnr Treasure & Wellesley Rds, KEMERTON, WA, 6233

Sample Details

Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Number of Samples	22 Liquid
Date Samples Received	03/07/2025
Date Instructions Received	03/07/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for soils and on an as received basis for other matrices.

Report Details

Date Final Results Expected	10/07/2025
Date of Issue	09/07/2025

Accredited for compliance with ISO/IEC 17025. Tests not covered by NATA are denoted with *.

Authorisation Details

Results Approved By	Lien Tang, Assistant Operations Manager Michael Mowle, Development Chemist - Inorganics and Metals
Laboratory Manager	Michael Kubiak

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PGG0272-01	KMB 01	Liquid	02/07/2025	03/07/2025
PGG0272-02	KMB 02	Liquid	02/07/2025	03/07/2025
PGG0272-03	KMB 5D	Liquid	02/07/2025	03/07/2025
PGG0272-04	KMB 6S	Liquid	02/07/2025	03/07/2025
PGG0272-05	KMB 07	Liquid	02/07/2025	03/07/2025
PGG0272-06	KMB 08	Liquid	02/07/2025	03/07/2025
PGG0272-07	KMB 09	Liquid	02/07/2025	03/07/2025
PGG0272-08	KMB 10	Liquid	02/07/2025	03/07/2025
PGG0272-09	KMB 11	Liquid	02/07/2025	03/07/2025
PGG0272-10	KMB 12	Liquid	02/07/2025	03/07/2025
PGG0272-11	KMB 13	Liquid	02/07/2025	03/07/2025
PGG0272-12	KMB 14	Liquid	02/07/2025	03/07/2025
PGG0272-13	KMB 15D	Liquid	02/07/2025	03/07/2025
PGG0272-14	KMB 17	Liquid	02/07/2025	03/07/2025
PGG0272-15	KMB 19	Liquid	02/07/2025	03/07/2025
PGG0272-16	Lake 1	Liquid	02/07/2025	03/07/2025
PGG0272-17	Lake 2	Liquid	02/07/2025	03/07/2025
PGG0272-18	Lake 3	Liquid	02/07/2025	03/07/2025
PGG0272-19	Lake 4	Liquid	02/07/2025	03/07/2025
PGG0272-20	Dredge Pond	Liquid	02/07/2025	03/07/2025
PGG0272-21	ROM	Liquid	02/07/2025	03/07/2025
PGG0272-22	Tails	Liquid	02/07/2025	03/07/2025

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Inorganics - Physical Parameters (Liquid)

Envirolab ID	Units	PQL	PGG0272-01	PGG0272-02	PGG0272-03	PGG0272-04	PGG0272-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
pH	pH units		4.8	5.8	5.9	6.0	5.0
Electrical Conductivity	µS/cm	2.0	180	370	580	130	800
Total Dissolved Solids	mg/L	5.0	210 [3]	330 [3]	660 [3]	130 [3]	570

Envirolab ID	Units	PQL	PGG0272-06	PGG0272-07	PGG0272-08	PGG0272-09	PGG0272-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
pH	pH units		5.9	5.0	3.7	5.5	7.2
Electrical Conductivity	µS/cm	2.0	880	430	300	370	1100
Total Dissolved Solids	mg/L	5.0	630	330	280 [3]	300 [3]	740

Envirolab ID	Units	PQL	PGG0272-11	PGG0272-12	PGG0272-13	PGG0272-14	PGG0272-15
Your Reference			KMB 13	KMB 14	KMB 15D	KMB 17	KMB 19
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
pH	pH units		5.6	5.1	5.2	6.4	3.7
Electrical Conductivity	µS/cm	2.0	280	260	230	330	210
Total Dissolved Solids	mg/L	5.0	210	200	150	350 [2]	340 [2]

Envirolab ID	Units	PQL	PGG0272-16	PGG0272-17	PGG0272-18	PGG0272-19	PGG0272-20
Your Reference			Lake 1	Lake 2	Lake 3	Lake 4	Dredge Pond
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
pH	pH units		8.5	8.0	7.8	7.6	7.2
Electrical Conductivity	µS/cm	2.0	1600	1800	2000	1700	1400
Total Dissolved Solids	mg/L	5.0	1100	1300	1500	1300	1100

Envirolab ID	Units	PQL	PGG0272-21	PGG0272-22
Your Reference			ROM	Tails
Date Sampled			02/07/2025	02/07/2025
pH	pH units		6.6	7.5
Electrical Conductivity	µS/cm	2.0	1500	1500
Total Dissolved Solids	mg/L	5.0	1100	1100

Certificate of Analysis PGG0272

Inorganics - Ionic Balance and Indexes (Liquid)

Envirolab ID	Units	PQL	PGG0272-01	PGG0272-02	PGG0272-03	PGG0272-04	PGG0272-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	40	53	29	<5.0
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	40	53	29	<5.0
Chloride	mg/L	1.0	36	89	140	10	150
Sulfate	mg/L	1.0	5.7	<1.0	5.1	12	140

Envirolab ID	Units	PQL	PGG0272-06	PGG0272-07	PGG0272-08	PGG0272-09	PGG0272-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	43	7.2	<5.0	22	450
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	43	7.2	<5.0	22	450
Chloride	mg/L	1.0	240	99	57	95	120
Sulfate	mg/L	1.0	17	31	8.3	<1.0	54

Envirolab ID	Units	PQL	PGG0272-11	PGG0272-12	PGG0272-13	PGG0272-14	PGG0272-15
Your Reference			KMB 13	KMB 14	KMB 15D	KMB 17	KMB 19
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	21	7.6	5.8	51	<5.0
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	21	7.6	5.8	51	<5.0
Chloride	mg/L	1.0	67	60	57	36	23
Sulfate	mg/L	1.0	1.3	15	7.8	49	12

Envirolab ID	Units	PQL	PGG0272-16	PGG0272-17	PGG0272-18	PGG0272-19	PGG0272-20
Your Reference			Lake 1	Lake 2	Lake 3	Lake 4	Dredge Pond
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	230	130	83	61	36
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	17	<5.0	<5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	250	130	83	61	36
Chloride	mg/L	1.0	280	300	360	280	200
Sulfate	mg/L	1.0	190	380	480	380	380

Envirolab ID	Units	PQL	PGG0272-21	PGG0272-22
Your Reference			ROM	Tails
Date Sampled			02/07/2025	02/07/2025
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	27	51
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	27	51
Chloride	mg/L	1.0	200	200
Sulfate	mg/L	1.0	390	370

Certificate of Analysis PGG0272

Inorganics - Miscellaneous and Common Anions (Liquid)

Envirolab ID	Units	PQL	PGG0272-01	PGG0272-02	PGG0272-03	PGG0272-04	PGG0272-05
Your Reference			KMB 01	KMB 02	KMB 5D	KMB 6S	KMB 07
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Acidity	mg/L	5.0	52	75	84	39	41

Envirolab ID	Units	PQL	PGG0272-06	PGG0272-07	PGG0272-08	PGG0272-09	PGG0272-10
Your Reference			KMB 08	KMB 09	KMB 10	KMB 11	KMB 12
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Acidity	mg/L	5.0	87	67	88	78	43

Envirolab ID	Units	PQL	PGG0272-11	PGG0272-12	PGG0272-13	PGG0272-14	PGG0272-15
Your Reference			KMB 13	KMB 14	KMB 15D	KMB 17	KMB 19
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Acidity	mg/L	5.0	51	75	45	21	85

Envirolab ID	Units	PQL	PGG0272-16	PGG0272-17	PGG0272-18	PGG0272-19	PGG0272-20
Your Reference			Lake 1	Lake 2	Lake 3	Lake 4	Dredge Pond
Date Sampled			02/07/2025	02/07/2025	02/07/2025	02/07/2025	02/07/2025
Acidity	mg/L	5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Envirolab ID	Units	PQL	PGG0272-21	PGG0272-22
Your Reference			ROM	Tails
Date Sampled			02/07/2025	02/07/2025
Acidity	mg/L	5.0	5.1	<5.0

Result Comments

Identifier	Description
[2]	EC/TDS ratio biased high due highly coloured sample matrix - Note the dried residue was unusual in appearance and organic material may have been present.
[3]	EC/TDS ratio biased high due highly coloured sample matrix - Note the dried residue was unusual in appearance and organic material may have been present.

Method Summary

Method ID	Methodology Summary
INORG-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis can be completed outside of the recommended holding times. Solids are reported from a 1:5 water extract unless otherwise specified. Alternatively, pH is determined in a 1:5 extract using 0.01M calcium chloride or a solid is extracted at a ratio of 1:2.5 (AS1289.4.3.1), pH is measured in the extract.
INORG-002	Conductivity and Salinity - measured using a conductivity cell at 25°C. Soil results reported from a 1:5 Soil:Water extract unless otherwise specified. Please note Resistivity is estimated by calculation and may not correlate with results otherwise obtained using the Resistivity current method (based on AS 1289.4.4.1), depending on the nature of the soil being analysed.
INORG-005	Acidity - determined by titration based on APHA latest edition 2310 B. Solids reported from a 1:5 water extract unless otherwise specified. Free Carbon Dioxide - determined titrimetrically in accordance with APHA latest edition,4500-CO2 C.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition 2320-B. Solids reported from a 1:5 water extract unless otherwise specified. Total Carbon Dioxide - determined by calculation in accordance with APHA latest edition,4500-CO2 D.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation: TDS = EC*0.6
INORG-081	Anions determined by Ion Chromatography. Waters samples are filtered on receipt prior to analysis. Solids are analysed from a water extract. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

Surrogate Spike

Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

LCS (Laboratory Control Sample)

This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Matrix Spike

A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria. Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction. Spikes for Physical and Aggregate Tests are not applicable. For VOCs in water samples, three vials are required for duplicate or spike analysis.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% - see ELN-P05 QAQC tables for details (available on request); <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase. Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volume(s) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PGG0272

Client Details

Client	Kemerton Silica Sand Pty Ltd
Your Reference	Monthly Production Water and Quarterly Ground & Surface Water Analysis
Date Issued	09/07/2025

Recommended Holding Time Compliance

Recommended holding time exceedances exist - See detailed list below

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	No	Duplicate Outliers Exist - See detailed list below
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PGG0272

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
EC | Water	1-22	02/07/2025	04/07/2025	04/07/2025	Yes
pH | Water	1-22	02/07/2025	04/07/2025	04/07/2025	No
TDS | Water	1-22	02/07/2025	07/07/2025	07/07/2025	Yes
Alkalinity Suite | Water	1-22	02/07/2025	04/07/2025	04/07/2025	Yes
Chloride | Water	1-5, 21-22	02/07/2025	04/07/2025	04/07/2025	Yes
	6-20	02/07/2025	04/07/2025	05/07/2025	Yes
Sulfate | Water	1-5, 21-22	02/07/2025	04/07/2025	04/07/2025	Yes
	6-20	02/07/2025	04/07/2025	05/07/2025	Yes
Acidity | Water	1-22	02/07/2025	04/07/2025	04/07/2025	Yes

Outliers: Duplicates

INORG-018|Inorganics - Physical Parameters (Water)| Batch BGG1094

Sample ID	Duplicate ID	Analyte	% Limits	RPD
BGG1094-DUP1#	DUP1	Total Dissolved Solids	20.00	200[1]

Quality Control PGG0272

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BGG0853

Analyte	Units	PQL	Blank	DUP1 PGG0272-01 Samp | QC | RPD %	DUP2 PGG0272-11 Samp | QC | RPD %	LCS %
pH	pH units		5.8	4.8 | 4.8 | 0.209	5.6 | 5.6 | 0.00	102
Electrical Conductivity	µS/cm	2.0	<2.0	177 | 176 | 0.340	279 | 279 | 0.251	98.2

INORG-001 | Inorganics - Physical Parameters (Water) | Batch BGG0854

Analyte	Units	PQL	Blank	DUP1 PGG0272-21 Samp | QC | RPD %	DUP2 BGG0854-DUP2# Samp | QC | RPD %	LCS %
pH	pH units		5.9	6.6 | 6.6 | 0.152	7.0 | 7.0 | 0.143	102
Electrical Conductivity	µS/cm	2.0	<2.0	1490 | 1490 | 0.0402	110000 | 110000 | 0.162	103

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BGG1094

Analyte	Units	PQL	Blank	DUP1 BGG1094-DUP1# Samp | QC | RPD %	DUP2 PGG0272-03 Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	83.0 | <5.0 | 200 [1]	662 | 637 | 3.85	111

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-018 | Inorganics - Physical Parameters (Water) | Batch BGG1095

Analyte	Units	PQL	Blank	DUP1 BGG1095-DUP1# Samp | QC | RPD %	LCS %
Total Dissolved Solids	mg/L	5.0	<5.0	902 | 1100 | 19.6	114

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGG0830

Analyte	Units	PQL	Blank	DUP1 PGG0272-01 Samp | QC | RPD %	DUP2 PGG0272-11 Samp | QC | RPD %	LCS %	Spike % PGG0272-02
Chloride	mg/L	1.0	<1.0	35.5 | 35.5 | 0.139	67.5 | 67.2 | 0.344	92.4	94.1
Sulfate	mg/L	1.0	<1.0	5.74 | 5.72 | 0.330	1.25 | 1.19 | [NA]	90.9	91.9

INORG-081 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGG0831

Analyte	Units	PQL	Blank	DUP1 BGG0831-DUP1# Samp | QC | RPD %	DUP2 BGG0831-DUP2# Samp | QC | RPD %	LCS %	Spike % BGG0831-MS1#
Chloride	mg/L	1.0	<1.0	95.3 | 95.4 | 0.0945	1.25 | 1.23 | [NA]	92.5	93.4
Sulfate	mg/L	1.0	<1.0	11.7 | 11.7 | 0.101	1.01 | 1.01 | [NA]	91.0	92.0

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGG0853

Analyte	Units	PQL	Blank	DUP1 PGG0272-01 Samp | QC | RPD %	DUP2 PGG0272-11 Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	21.1 | 21.4 | [NA]	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	21.1 | 21.4 | [NA]	94.7

Quality Control PGG0272

INORG-006 | Inorganics - Ionic Balance and Indexes (Water) | Batch BGG0854

Analyte	Units	PQL	Blank	DUP1 PGG0272-21 Samp | QC | RPD %	DUP2 BGG0854-DUP2# Samp | QC | RPD %	LCS %
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	27.3 | 27.8 | 1.81	128 | 130 | 1.16	[NA]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0 | <5.0 | [NA]	<5.0 | <5.0 | [NA]	[NA]
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	27.3 | 27.8 | 1.81	128 | 130 | 1.16	100

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BGG0877

Analyte	Units	PQL	Blank	DUP1 PGG0272-01 Samp | QC | RPD %	DUP2 PGG0272-11 Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	51.6 | 57.8 | 11.4	50.8 | 57.9 | 13.0	93.7

INORG-005 | Inorganics - Miscellaneous and Common Anions (Water) | Batch BGG0882

Analyte	Units	PQL	Blank	DUP1 BGG0882-DUP1# Samp | QC | RPD %	DUP2 BGG0882-DUP2# Samp | QC | RPD %	LCS %
Acidity	mg/L	5.0	<5.0	6.96 | 7.08 | [NA]	8.82 | 9.94 | [NA]	94.9

The QC reported was not specifically part of this workorder but formed part of the QC process batch.

QC Comments

Identifier	Description
[1]	Some EC to TDS ratios are outside normal expected values. Results were confirmed.

APPENDIX D

APPENDIX D:

2023 TO 2025 ROM OVERFLOW AND TAILINGS PIPELINE DISCHARGE MONITORING DATA

MBS ENVIRONMENTAL

Table A3-1: ROM Overflow and Tailings Pipelines Monitoring Data

Date	ROM Overflow Pipeline (750 m^3/h)						Tailings Pipeline (220 m^3/h)					
	pH	EC (us/cm)	TDS (mg/L)	Acidity (mg/L)	Alkalinity (mg/L)	Flow Volume (m^3)	pH	EC	TDS	Acidity (mg/L)	Alkalinity (mg/L)	Flow Volume (m^3)
Target	-	-	600	<50	>30	-	-		600	<50	>30	-
Oct-23	5.5	1400	940	16	6.7	157500	7.5	1400	1000	6.1	55	86680
Nov-23	6.4	1400	1200	17	21	234750	7.3	1400	1200	0	52	92620
Dec-23	7.2	1400	1200	0	39	141000	7.7	1400	1000	0	65	58080
Jan-24	7.6	1400	1100	0	47	146250	7.6	1400	1100	0	62	69300
Feb-24	5.7	1300	1100	8.7	8	187500	7.7	1400	1100	0	58	64460
Mar-24	6.7	1400	1100	7.6	17	168750	7.8	1500	1100	0	69	29920
Apr-24	5.5	1500	990	6.8	7.7	157500	7.4	1500	1100	22	63	48620
May-24	6.2	1600	900	18	17	218250	7.1	1500	1000	5.6	38	89540
Jun-24	7	1600	960	5.2	34	65250	7.3	1400	1120	5.7	48	58520
Jul-24	6.7	1600	1200	18	26	195000	7.5	1500	1100	5	56	79640
Aug-24	7.3	1500	1100	6.4	230	229500	7.2	1400	930	0	58	92180
Sep-24	7.7	1500	940	0.5	51	153000	7.4	1400	930	0.5	47	108020
Oct-24	7.2	1400	960	0.5	24	183000	7.4	1400	780	0.5	57	89320
Nov-24	7.2	1500	1100	0.5	48	153000	7.7	1400	1100	0.5	56	69300
Dec-24	7.7	150	1000	0.5	48	112500	7.8	1500	970	0.5	49	52360
Jan-25	7.6	1600	970	5	84	510000	7.6	1600	1000	5	55	133320
Feb-25	-	-	-	-	-	-	-		-	-	-	-
Mar-25	7.4	1600	1100	8.7	66	141000	7.7	1500	1100	7.3	60	72600
Apr-25	6	1600	1000	15	55	115500	7.4	1600	1100	0.5	52	72600
May-25	7	1500	1100	5.8	41	109500	7.4	1400	970	0.5	47	51260
Jun-25	7.3	1500	1100	6.2	40	180000	7.5	1500	1000	5	33	91740
Jul-25	6.6	1500	1100	5.1	27	181500	7.5	1500	1100	5	51	93500
Aug-25	7	1400	1600	5.2	31	186750	7.6	1400	1100	5	53	79860
Sep-25	7.2	1400	1100	0.5	42	184500	7.5	1200	850	0.5	41	68200