EPL289-01 – ANNUAL GROUNDWATER MONITORING REPORT

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Authors: Alice Lorincz
Environmental Field Technician
South32 GEMCO

Ariane Eobob
Hydrogeologist Graduate
South32 GEMCO

I, Jeremy Barnett, Senior Environment Specialist, have reviewed this report and I confirm that to the best of my knowledge and ability all the information provided in the report is true and accurate.

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EXECUTIVE SUMMARY

Groundwater bores for GEMCO's Waste Management Facility (WMF) were monitored quarterly during FY25 in accordance with the conditions of Environment Protection Licence 289 (EPL289-01). During FY25, all bores were able to be sampled for each quarterly monitoring round with the exception of WT002A (dry during the August 2024, November 2024 and February 2025 rounds), WT029S (dry during the February 2025 round) and WT011A (dry since May 2020).

Laboratory analysis indicated that there were some exceedances from the adopted Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality (ANZG, 2018) toxicant default guidelines with a 95% level of protection for metals and metalloids for freshwaters. Specifically, all groundwater bores sampled quarterly across FY25, exceeded the trigger value for zinc (0.008 mg/L) at least in one monitoring round. Two bores (WT015S and WT029S) exceeded the trigger value for nickel (0.011 mg/L). One bore (WT015S) exceeded the trigger value for manganese (1.9 mg/L). Three bores (WT007, WT009 and WT012) exceeded the trigger value for lead (0.0034 mg/L).

The concentration of *Enterococci* and *Escherichia coli* was detected at low levels in several of the groundwater bores during the FY25 reporting period.

Based on the available data for the FY25 reporting period, there is a general absence of landfill seepage indicators.

WASTE SUMMARY

The main waste streams that are disposed of at the WMF are green waste, construction waste and putrescible/household waste. Grease trap waste is disposed in small volumes and sewage sludge is disposed following any routine maintenance of the Alyangula sewage treatment facility, in accordance with Table 1 of EPL289-01. A minor storage area is located within the facility for the temporary storage of batteries (potentially containing acid solutions or solids, and lead or lead compounds) as well as an area for the storage of tyres (see **Figure 1**).

GROUNDWATER MONITORING PROGRAM

The FY25 groundwater monitoring program was conducted in line with Appendix 2 – Groundwater Monitoring Programme of EPL289-01 (the Monitoring Plan). EPL289-01 commenced on 1 July 2024.

GEMCO conducts quarterly groundwater monitoring at 11 bores across eight locations within and adjacent to the WMF as specified in the conditions of EPL289-01. These bores have been installed in both the upper and deeper aquifers and are monitored for water level and quality to evaluate any potential increasing trends of the various analytes which may indicate generation and mobilisation of landfill leachate into the groundwater.

In November 2024, GEMCO conducted borehole camera inspections of the 11 groundwater bores at the WMF to confirm bore specification details (i.e., total depth, screen interval) and to determine if any of the bores required maintenance due to sediment build-up, fauna (e.g. frog) infestations or excessive organic matter (i.e., roots) within the bores.

In April 2025, GEMCO commissioned J&S Drilling to complete identified maintenance on eight of the monitoring bores at the WMF (specifically WT007, WT015S, WT0115D, WT025S, WT012D, WT029D, WT002A, and WT011A). WT007, WT015S, WT015D, WT025S, WT012D and WT029D were all successfully purged via airlifting to clean and remove any accumulated sediment at the base of the bores. Root blockages within WT002A were successfully removed to enable the future sampling of this bore. In contrast, it was determined that WT011A required abandonment due to root blockages not being able to be removed during the maintenance program. However WT011A (total depth 5.64 metres below top of casing (mbTOC)) has been dry since May 2020. **Table 1** outlines confirmed bore specification details (total depth and screening interval) following the recent camera investigation and maintenance program.

Table 1 *WMF Bore Specifications*

Bore ID	**Total depth (mbTOC)**	Top of Screen **(**mbTOC**)**	Bottom of Screen **(**mbTOC**)**
WT002A^	9.05	2.56	9.05
WT007	9.13	1.60	9.13
WT009	9.16	1.73	9.16
WT011A	5.64	2.73	5.64
WT012	9.40	1.63	9.40
WT015D	16.90	16.02	16.90
WT015S	13.88	11.08	13.88
WT025D	16.76	15.14	16.76
WT025S	13.95	11.15	13.95

Bore ID	Total depth (mbTOC)	Top of Screen (mbTOC)	Bottom of Screen (mbTOC)
WT029S	14.72	12.72	14.72
WT029D	16.65	14.73	16.65

^ Listed as WT02A in EPL289-01

Monitoring locations

There are 11 groundwater monitoring bores across eight locations within and adjacent to the WMF. The locations of these bores in relation to the waste disposal and storage areas are shown in **Figure 1.**

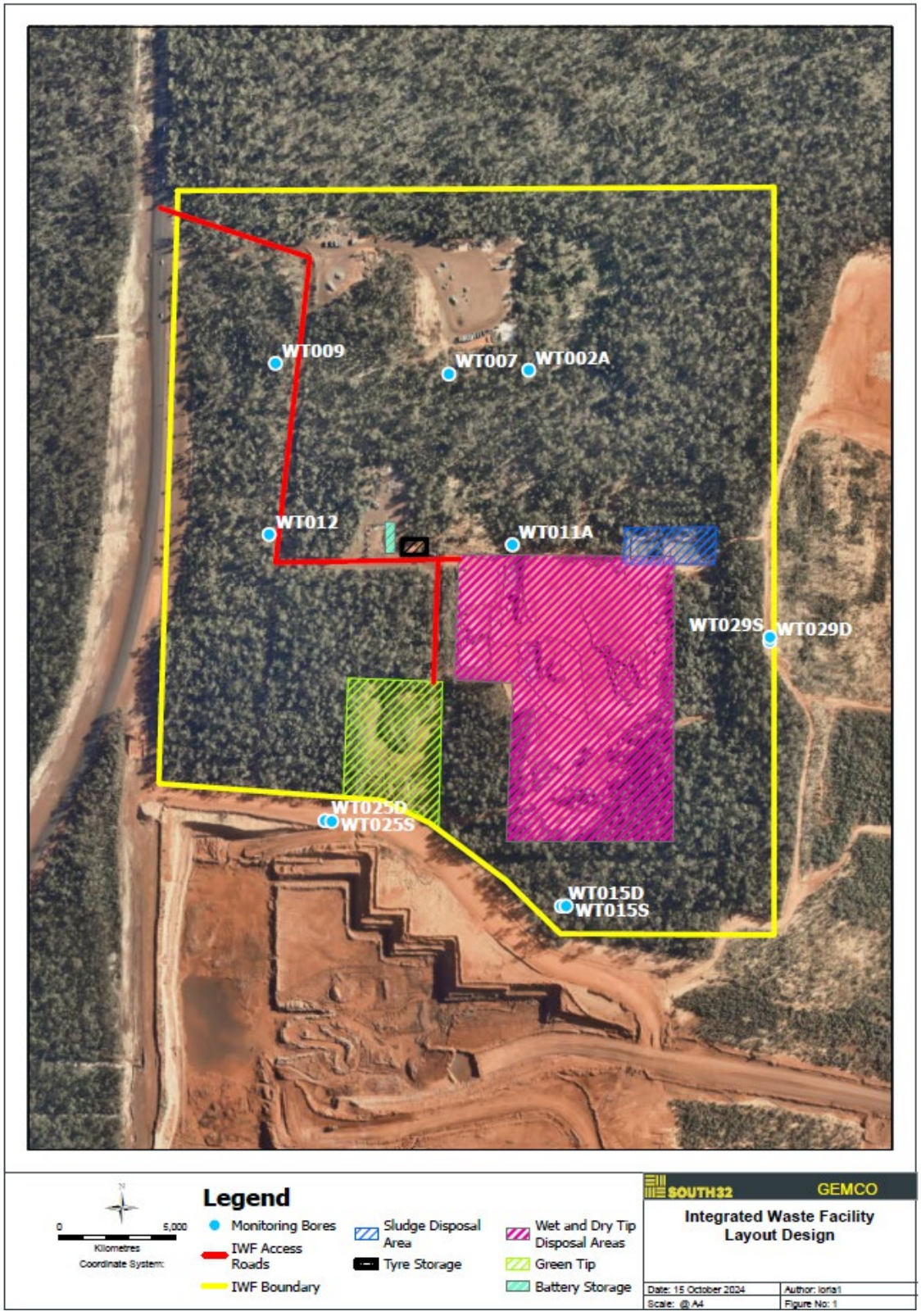

Figure 1 *WMF Layout and Groundwater Monitoring Network*

Field Sampling Methodology

Depth to groundwater (metres below top of casing (mbTOC)) was measured for each groundwater monitoring bore prior to sampling by using a manually operated electronic water level dip meter.

Low flow purging of groundwater monitoring bores was carried out by trained Environmental Staff using a Sample Pro® Portable Micropurge Pump with combined QED® MP50 compressor/controller unit. A Win-Situ Troll® 600 multi-parameter water quality meter with flow-through cell was used to determine when stabilisation criteria were met and field readings were recorded using a Microsoft application, EQuIS Collect. Field readings were uploaded from the field directly into GEMCO's Environmental Monitoring Database, EQuIS. After stabilisation criteria were met, groundwater samples were collected and stored in an esky before sending to a NATA (National Association of Testing Authorities) - Accredited Laboratory (ALS Laboratories) for analysis.

Analytical suites

The groundwater monitoring analytical schedule in accordance with EPL289-01 (Appendix 2: Groundwater Monitoring Programme) is summarised below:

- Metals and metalloids (Mn, Zn, Fe, Ni and Pb).
- pH.
- Dissolved oxygen (DO).
- Chloride (Cl^-).
- Potassium (K).
- Total organic nitrogen (TON).
- Total phosphorous (TP).
- Total dissolved solids (TDS).
- Chemical Oxygen Demand (COD).
- Ammonium (NH_4^+).
- E. coli.
- Enterococci.

Assessment Criteria

While EPL289-01 does not detail compliance trigger values for analytes, GEMCO compare metal concentrations to ANZG (2018) toxicant default guidelines for freshwaters with a 95% level of protection where available (**Table 2**). In addition to the analysis of metal concentrations, the analysis and interpretation of data within this report is focussed on nutrient concentrations and bacteria as indicators of potential mobilisation of landfill leachate and/or seepage from the sewage sludge facility.

Table 2 *GEMCO Water Quality Trigger Levels for WMF Groundwater*

Analyte	Water Quality Trigger Value (mg/L) (ANZG 2018)[1]
Ni	0.011
Pb	0.0034
Mn	1.9
Zn	0.008
Fe	N/A

N/A – no relevant trigger level applies

[1] ANZG (2018) toxicant default guidelines with a 95% level of protection for metals and metalloids for freshwaters

RESULTS AND DISCUSSION

Groundwater Levels and Sampling

Groundwater levels and samples are required to be collected on a quarterly basis. As seen in **Table 3**, most bores were sampled each round with the exception of WT002A, WT029S and WT011A. WT002A was dry throughout the FY except in May 2025. WT029S was dry temporarily in February 2025 likely due to nearby dewatering activities in an adjacent quarry to enable mining path. As discussed previously, WT011A has been dry since May 2020.

Table 3 *FY25 Sampling Rounds for WMF Bores*

Bore ID	August 2024	November 2024	February 2025	May 2025
WT002A	Dry	Dry	Dry	✓
WT007	✓	✓	✓	✓
WT009	✓	✓	✓	✓
WT011A	Dry	Dry	Dry	Dry
WT012	✓	✓	✓	✓
WT015D	✓	✓	✓	✓
WT015S	✓	✓	✓	✓
WT025D	✓	✓	✓	✓
WT025S	✓	✓	✓	✓
WT029D	✓	✓	✓	✓
WT029S	✓	✓	Dry	✓

✓ – Groundwater level successfully monitored and sample collected.

Groundwater levels are reported in **Table 4** for the FY.

Groundwater Quality

Metals:

Laboratory analysis indicated that there were some exceedances of the adopted ANZG (2018) toxicant default guideline values (DGVs)(for freshwaters with a 95% level of protection) for dissolved[1] metals and metalloids. All 10 groundwater bores sampled exceeded the trigger value for zinc (0.008 mg/L) at least once in the FY25 monitoring rounds. Two bores (WT015S and WT029S) exceeded the trigger value for nickel (0.011 mg/L) once during FY. Three bores (WT007, WT009 and WT012) exceeded the trigger value for lead (0.0034 mg/L) once during the FY (WT007 and WT012) or three times in the instance of WT009. One bore (WT015S) exceeded the trigger value for manganese (1.9 mg/L) once, during the May 2025 monitoring round. The concentration of iron was below the laboratory limit of reporting (LoR) for all bores except for WT002A (May 2025), WT007 (all rounds), WT012 (August 2025) and WT015S (February and May 2025); with no trigger value for freshwaters being provided for iron by ANZG (2018).

Overall, it is unlikely that elevated zinc concentrations are indicative of impacts from the WMF, as groundwater sampling across Groote Eylandt consistently shows variable and elevated zinc concentrations (Hansen and Bailey, 2015). This is considered to reflect the enrichment of zinc and other metals (manganese and copper) in the underlying geology of Groote Eylandt.

Long-term monitoring of metals in groundwater from bores associated with the WMF does not show any increasing trends in any of the metals analysed as part of this monitoring program **(Figure 2 - Figure 6)**. It should be noted that where metal concentrations were below the LoR, concentrations, these data points have been plotted as the LoR in **Figure 2** – **Figure 6**.

Nutrients:

Nutrient levels for each groundwater monitoring bores were either below the LoR or recorded at low concentrations during the FY25 reporting period (**Table 4**), in line with historical data (**Table 5**). The nutrient concentrations for groundwater at the WMF are similar to concentrations displayed more broadly across GEMCO's leases and are likely to reflect levels that naturally occur in the local aquifer(s) (Coffey, 2011).

Bacteria:

Enterococci and *Escherichia coli* were detected at low levels in several of the groundwater bores during the FY25 reporting period with no apparent pattern. Detections included WT007 (both bacteria types, two monitoring rounds), WT009 (*E. coli,* one round), WT015D (*E. coli,* two rounds), WT015S (both types, one round each), WT025D (3 rounds for *E. coli,* one for *Enterococci*), WT025S (*E. coli,* one round), and WT029D (*Enterococci,* one round).

Results for *Enterococci* and *E. coli* are shown in **Figure 7** and **Figure 8**. It should be noted that where bacteria concentrations were below the LoR, concentrations have been plotted as zero (no detect) for **Figure 7** and **Figure 8**. No trends are observed in bacteriological results (**Figure 7, Figure 8, Table 6**).

[1] Dissolved rather than total metal concentrations have been analysed and discussed within this report as this fraction is more relevant to the overarching aim of monitoring biological effects of potential contaminants, and for comparison to the relevant available default guideline values.

Discussion

In FY25 the management practices at GEMCO's WMF have continued, including the regular capping of waste cells. This assists in ensuring only minimal volumes of leachate are produced and that there is a minimal driving gradient of groundwater to mobilise leachate into the aquifer systems. Based on the available data, there is a general absence of landfill seepage indicators.

Historically, groundwater data was limited to the upper aquifer. In below-average rainfall years, the water table does not intersect the screened intervals of the bores, resulting in a lack of groundwater data for extended periods. Above average rainfall in 2024-2025 has meant greater groundwater recharge in the area and therefore more samples were able to be collected in comparison to previous recent years.

Quarterly groundwater monitoring will continue in FY26 to determine any trends in water quality parameters that may be the result of landfill leachate. This will be reported to the NT Environmental Protection Authority (EPA) in line with the current reporting requirements of GEMCO's licence EPL289-01 made effective on 1 July 2024.

Table 4 *FY25 Groundwater Analytical Results*

			General Chemistry								Inorganics	Dissolved Metals and Metalloids					Bacteriological	
Sample Location	Sample Date	Depth to water (mbTOC)	pH	Dissolved Oxygen (%)	Chloride (mg/L)	Potassium (mg/L)	Organic Nitrogen as N (mg/L)	Total Phosphorus as P (mg/L)	Total Dissolved Solids (mg/L)	Chemical Oxygen Demand (mg/L)	Ammonium as N (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Zinc (mg/L)	Enterococci (CFU/100mL)	Escherichia coli (CFU/100mL)
ANZG (2018) DGV												**N/A**	**0.0034**	**1.9**	**0.011**	**0.008**		
WT002A	15/05/2025	2.50	5.29	31.11	6	< 1	0.3	0.06	64	< 10	0.09	0.27	< 0.001	0.127	0.002	0.012	< 1	< 10
WT007	28/08/2024	5.65	5.76	55.85	9	2	0.3	< 0.01	285	13	0.04	0.06	0.001	0.046	0.002	0.019	< 10	< 100
WT007	6/11/2024	7.74	6.51	16.14	12	2	0.6	0.18	297	29	0.1	0.85	< 0.005	0.050	0.002	< 0.005	3	1
WT007	19/02/2025	5.50	6.68	8.60	8	2	0.8	0.12	253	38	0.19	1.19	< 0.001	0.034	< 0.001	< 0.005	1	1
WT007	15/05/2025	1.63	6.59	8.03	8	2	0.3	0.08	268	12	0.18	0.11	< 0.001	0.031	0.002	0.006	< 1	< 1
WT009	28/08/2024	7.07	5.67	67.25	11	1	< 0.1	< 0.01	66	< 10	0.02	< 0.05	0.128	0.016	0.002	0.028	< 10	< 10
WT009	6/11/2024	8.19	4.84	22.00	11	1	0.2	0.08	70	< 10	< 0.01	< 0.05	0.018	0.015	0.003	0.023	< 1	2
WT009	19/02/2025	6.92	4.92	37.82	11	1	< 0.1	< 0.01	64	< 10	0.45	< 0.05	0.007	0.012	0.002	0.019	< 1	< 1
WT009	15/05/2025	4.04	4.70	50.79	10	1	0.1	0.02	64	< 10	0.1	< 0.05	0.001	0.012	0.002	0.014	< 1	< 1
WT012	28/08/2024	7.63	5.77	62.89	7	< 1	< 0.1	< 0.01	25	< 10	< 0.01	0.06	0.129	0.056	0.002	0.031	< 10	< 10
WT012	6/11/2024	8.25	4.68	53.42	6	< 1	0.7	0.04	25	< 10	0.03	< 0.05	0.002	0.034	0.002	0.015	< 1	< 1
WT012	19/02/2025	8.09	4.90	61.59	5	< 1	< 0.1	< 0.01	22	< 10	0.11	< 0.05	0.002	0.036	0.002	0.014	< 1	< 1
WT012	15/05/2025	6.04	4.72	74.15	4	< 1	< 0.1	< 0.01	22	< 10	0.12	< 0.05	0.001	0.037	< 0.001	0.01	< 1	< 1
WT015D	26/08/2024	9.56	4.38	93.94	18	< 1	< 0.1	0.03	49	< 10	< 0.01	< 0.05	< 0.001	0.538	0.002	0.019	< 1	< 1
WT015D	7/11/2024	8.28	4.50	88.36	17	< 1	0.2	0.03	46	< 10	< 0.01	< 0.05	< 0.001	0.534	0.002	0.02	< 1	1
WT015D	18/02/2025	10.42	4.81	100.86	18	< 1	< 0.1	0.05	49	< 10	0.32	< 0.05	< 0.001	0.224	0.003	0.04	< 1	< 1
WT015D	14/05/2025	8.65	3.94	105.12	22	< 1	< 0.1	0.12	213	13	0.15	< 0.05	< 0.001	0.316	0.002	0.025	< 10	10
WT015S	26/08/2024	9.68	5.43	29.46	24	< 1	0.3	0.04	108	< 10	0.12	< 0.05	< 0.001	0.487	0.012	0.051	< 1	< 100
WT015S	7/11/2024	10.27	5.83	63.20	21	< 1	0.3	0.03	92	< 10	0.58	< 0.05	< 0.001	0.189	0.003	0.025	22	< 1
WT015S	18/02/2025	10.50	5.88	38.27	22	< 1	< 0.1	0.19	92	< 10	0.39	0.25	< 0.001	0.801	0.012	0.021	< 1	5
WT015S	14/05/2025	8.74	5.94	20.45	24	< 1	0.1	0.07	156	55	0.3	0.92	< 0.001	9.800	0.009	< 0.005	< 10	< 10
WT025D	26/08/2024	7.75	4.45	78.27	27	< 1	0.2	0.01	82	< 10	< 0.01	< 0.05	0.002	0.061	0.003	0.04	< 1	< 1
WT025D	6/11/2024	8.28	4.40	98.74	24	< 1	0.4	< 0.01	118	< 10	0.07	< 0.05	< 0.001	0.079	0.003	0.017	< 1	1
WT025D	18/02/2025	8.98	4.59	97.45	23	< 1	< 0.1	0.02	234	< 10	< 0.01	< 0.05	0.002	0.053	0.003	0.037	1	1
WT025D	14/05/2025	7.58	6.10	88.36	31	< 1	0.5	< 0.01	85	< 10	0.3	< 0.05	< 0.001	0.137	0.009	0.012	< 10	10
WT025S	26/08/2024	7.84	4.52	64.85	42	< 1	0.5	0.01	159	< 10	< 0.01	< 0.05	0.002	0.043	0.004	0.05	< 1	1
WT025S	6/11/2024	8.39	4.32	64.15	36	< 1	0.7	0.02	118	< 10	< 0.01	< 0.05	0.002	0.029	0.002	0.027	< 1	< 1
WT025S	18/02/2025	9.06	5.36	112.73	42	< 1	0.3	0.04	118	< 10	0.07	< 0.05	0.001	0.053	0.003	0.027	< 1	< 1
WT025S	14/05/2025	7.67	5.79	45.70	44	< 1	0.4	< 0.01	121	< 10	0.15	< 0.05	0.002	0.081	0.011	0.02	< 1	< 1
WT029D	26/08/2024	12.65	5.12	52.41	3	< 1	0.3	0.03	46	< 10	0.02	< 0.05	< 0.001	0.040	0.006	0.026	< 10	< 10
WT029D	7/11/2024	13.32	4.96	58.71	5	< 1	0.3	0.02	44	< 50	0.08	< 0.05	< 0.001	0.093	0.002	0.011	< 2	< 2
WT029D	18/02/2025	13.12	5.80	110.81	3	< 1	0.2	0.06	34	< 10	0.18	< 0.05	< 0.001	0.028	0.002	0.007	3	< 1
WT029D	14/05/2025	10.53	6.15	66.93	2	< 1	0.4	0.06	35	< 10	0.14	< 0.05	< 0.001	0.133	0.005	0.018	< 10	< 10
WT029S	26/08/2024	12.69	5.67	54.48	8	< 1	0.3	< 0.01	60	< 10	< 0.01	< 0.05	< 0.001	0.043	0.022	0.056	< 1	< 10
WT029S	7/11/2024	13.37	5.07	49.00	5	< 1	0.2	< 0.01	45	< 10	< 0.01	< 0.05	< 0.001	0.032	0.002	0.031	< 1	< 1
WT029S	14/05/2025	10.55	6.20	60.04	2	< 1	0.2	0.06	34	< 10	0.14	< 0.05	0.001	0.023	0.003	0.033	< 10	< 10

Note: Concentrations above adopted ANZG (2018) freshwater trigger values for 95% protection are indicated by red text and shading.

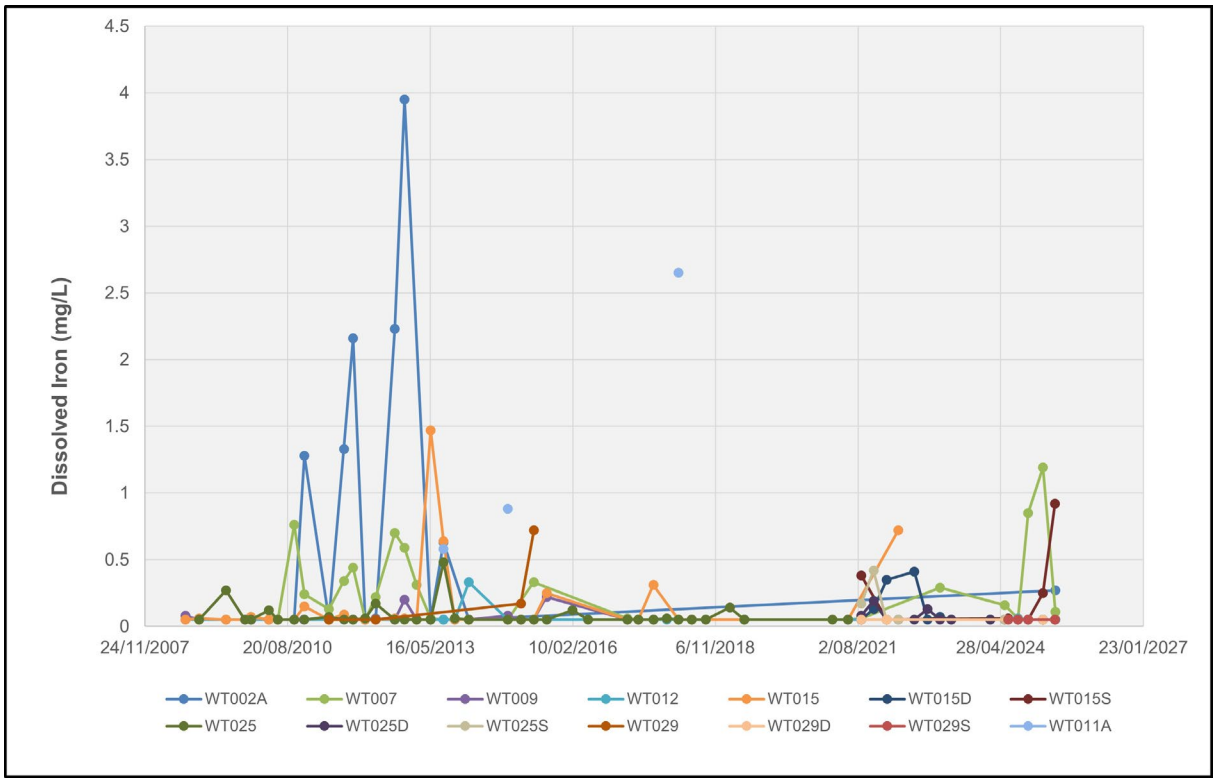

Figure 2 *Dissolved Iron Concentrations of Groundwater Monitoring Bores at the WFM*

Note: Bores WT011A, WT015, WT025, WT029 are no longer active (e.g. destroyed / replaced).

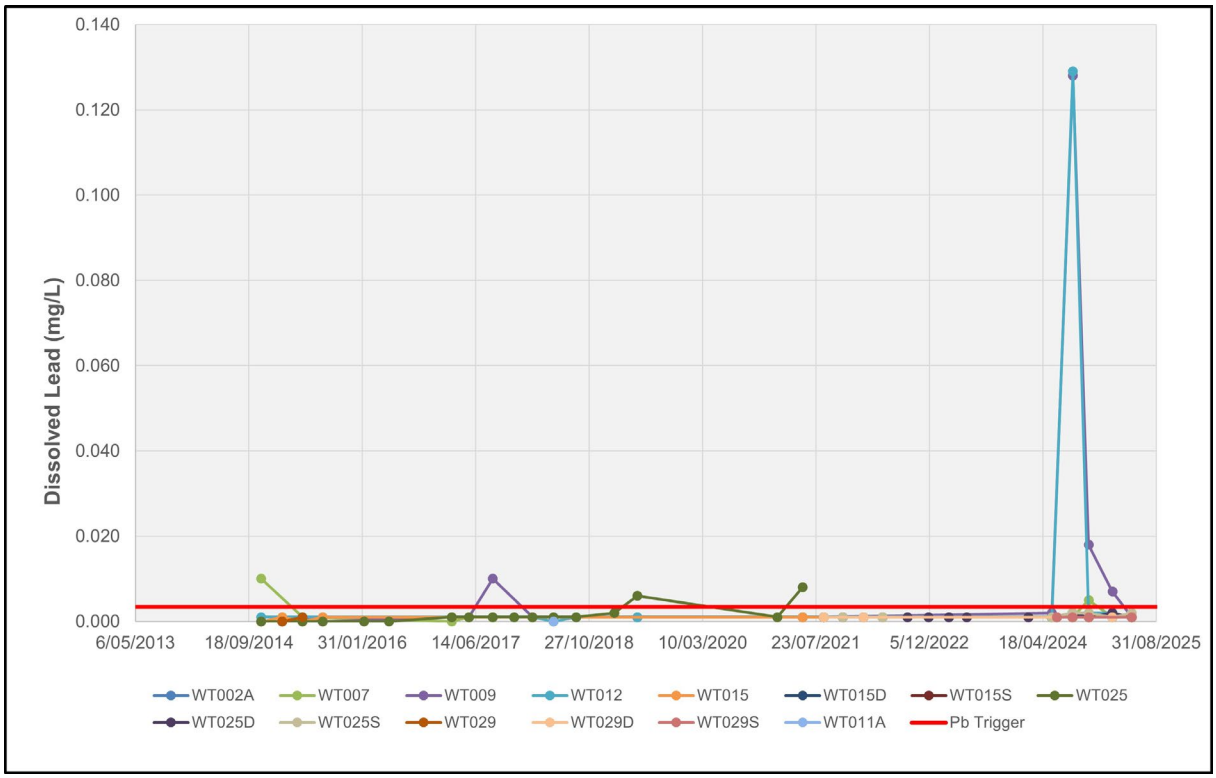

Figure 3 *Dissolved Lead Concentrations of Groundwater Monitoring Bores at the WFM*

Note: Bores WT011A, WT015, WT025, WT029 are no longer active (e.g. destroyed / replaced).

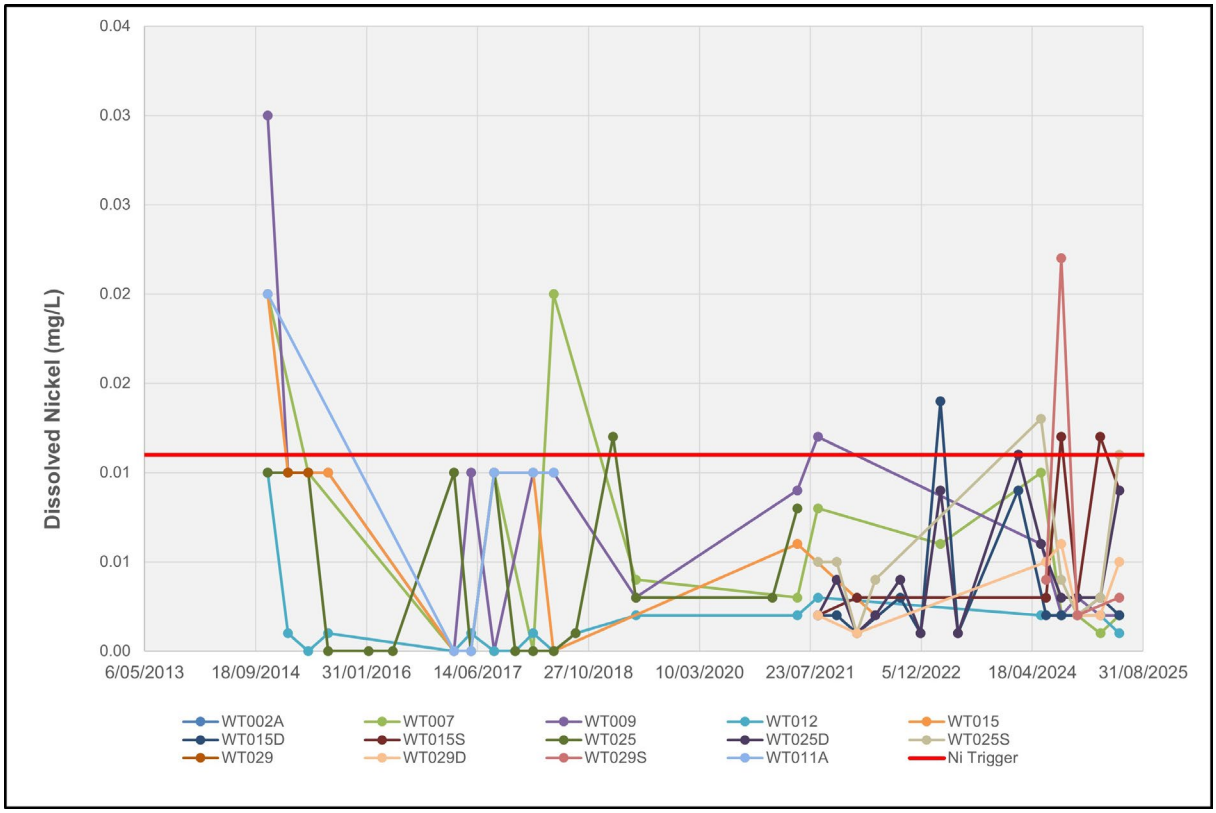

Figure 4 Dissolved Nickel Concentrations of Groundwater Monitoring Bores at the WFM

Note: Bores WT011A, WT015, WT025, WT029 are no longer active (e.g. destroyed / replaced).

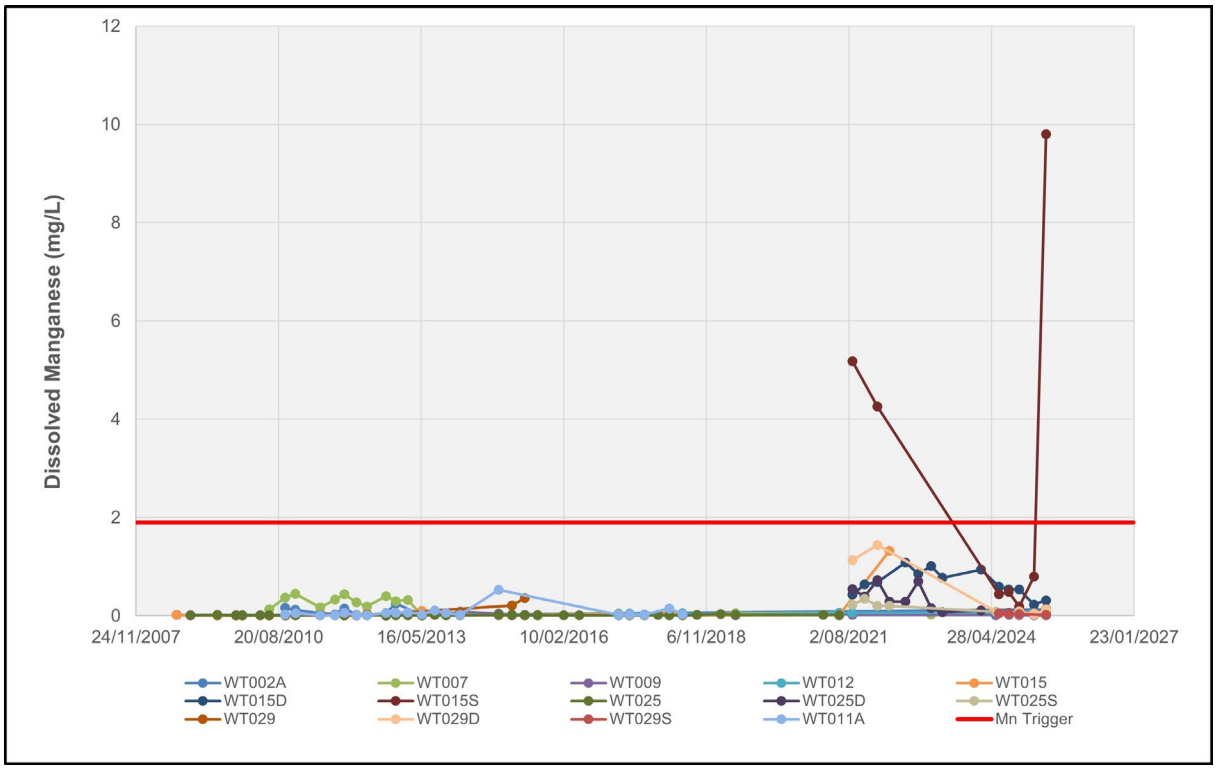

Figure 5 *Dissolved Manganese Concentrations of Groundwater Monitoring Bores at the WFM*

Note: Bores WT011A, WT015, WT025, WT029 are no longer active (e.g. destroyed / replaced).

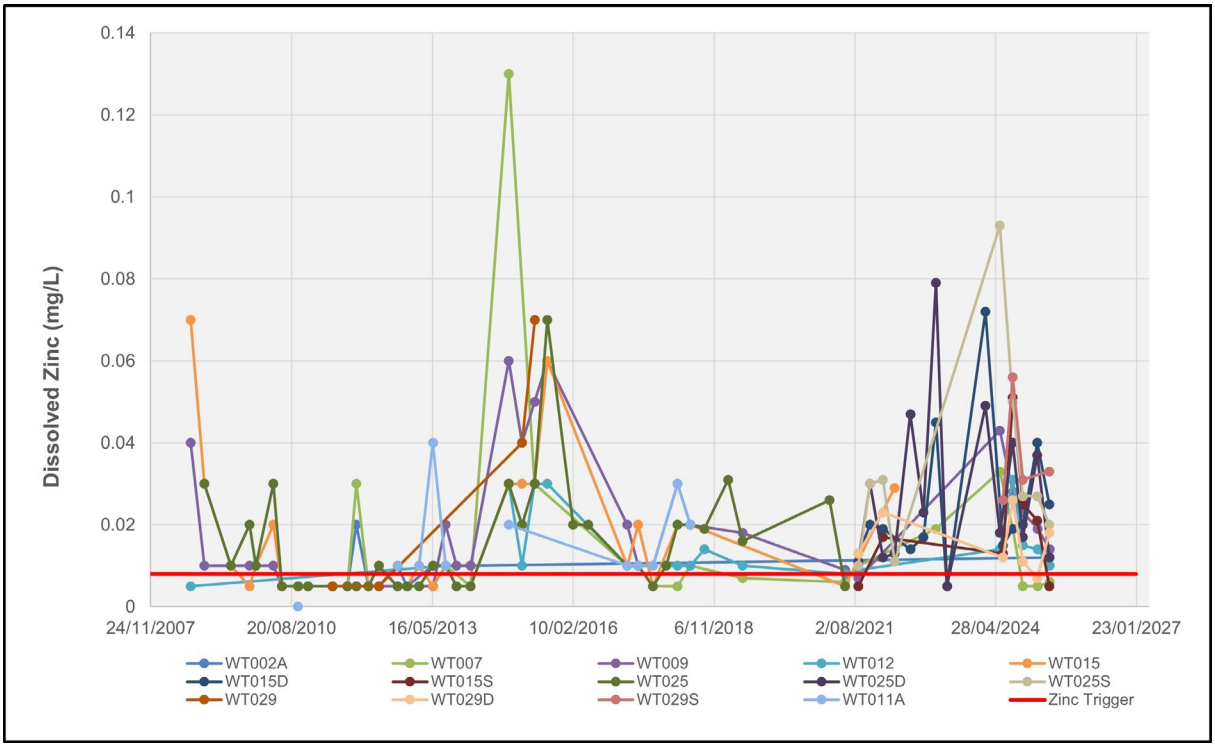

Figure 6 *Dissolved Zinc Concentrations of Groundwater Monitoring Bores at the WFM*

Note: Bores WT011A, WT015, WT025, WT029 are no longer active (e.g. destroyed / replaced).

Table 5 *Long-term Nutrient Concentrations of Groundwater Monitoring Bores at the WMF*

Sample Point	Sample Date	Ammonium as N (mg/L)	Organic Nitrogen as N (mg/L)	Potassium (mg/L)	Total Phosphorus as P (mg/L)
WT002A	5/10/2010	0.03		< 1	0.56
WT002A	15/12/2010	0.05		1	
WT002A	7/06/2011	0.04		< 1	
WT002A	19/09/2011	0.03		< 1	
WT002A	23/11/2011	0.05		< 1	
WT002A	16/02/2012	0.01		< 1	
WT002A	30/04/2012	0.03		< 1	
WT002A	10/09/2012	0.06		< 1	
WT002A	18/11/2012	0.09		1	
WT002A	20/05/2013	0.19		< 1	
WT002A	19/08/2013	0.18		1	
WT002A	12/02/2014	0.03		< 1	
WT002A	15/05/2025	0.09	0.3	< 1	0.06
WT007	13/06/2010	0.05		4	
WT007	5/10/2010	0.09		4	0.21
WT007	15/12/2010	0.22		4	
WT007	7/06/2011	0.06		3	
WT007	19/09/2011	0.11		3	
WT007	23/11/2011	0.2		3	
WT007	16/02/2012	0.06		4	
WT007	30/04/2012	0.08		3	
WT007	10/09/2012	0.2		2	
WT007	18/11/2012	0.2		2	

Sample Point	Sample Date	Ammonium as N (mg/L)	Organic Nitrogen as N (mg/L)	Potassium (mg/L)	Total Phosphorus as P (mg/L)
WT007	11/02/2013	0.21		3	
WT007	20/05/2013	0.1		3	
WT007	19/08/2013	0.08		2	
WT007	12/02/2014	0.01		2	
WT007	10/11/2014	< 0.01		2	0.01
WT007	12/05/2015	< 0.01		2	< 0.01
WT007	28/02/2017	< 0.01		3	0.05
WT007	15/05/2017	0.05		3	< 0.01
WT007	28/08/2017	0.04		3	0.15
WT007	19/02/2018	0.07		2	0.03
WT007	22/05/2018	0.04		3	0.04
WT007	28/05/2019	< 0.01	0.4	2	0.02
WT007	24/05/2021	< 0.01	0.5	3	< 0.05
WT007	25/08/2021		0.5	2	0.10
WT007	28/02/2023		0.1	2	0.01
WT007	27/05/2024	0.05	1	2	0.06
WT007	28/08/2024	0.04	0.3	2	< 0.01
WT007	6/11/2024	0.10	0.6	2	0.18
WT007	19/02/2025	0.19	0.8	2	0.12
WT007	15/05/2025	0.18	0.3	2	0.08
WT009	4/09/2008	0.02		3	
WT009	9/12/2008	< 0.01		3	
WT009	10/03/2009	< 0.01		2	
WT009	10/03/2009	< 0.01		2	
WT009	16/06/2009	0.07		2	
WT009	26/10/2009	< 0.01		2	
WT009	8/12/2009	0.01		2	
WT009	8/12/2009	0.01		2	
WT009	12/04/2010	< 0.01		1	
WT009	12/06/2010	< 0.01		2	
WT009	5/10/2010	0.06		2	0.05
WT009	14/12/2010	0.02		1	
WT009	7/06/2011	0.02		1	
WT009	19/09/2011	0.02		2	
WT009	22/11/2011	0.02		1	
WT009	16/02/2012	0.02		1	
WT009	30/04/2012	0.03		1	
WT009	10/09/2012	0.03		1	
WT009	18/11/2012	0.09		2	
WT009	11/02/2013	0.04		2	
WT009	20/05/2013	0.06		1	
WT009	19/08/2013	0.04		2	
WT009	4/11/2013	0.11		2	
WT009	12/02/2014	0.02		1	
WT009	10/11/2014	0.05		1	0.02
WT009	11/02/2015	0.04		1	0.04
WT009	12/05/2015	< 0.01		1	< 0.01
WT009	10/08/2015	< 0.01		1	< 0.01

Sample Point	Sample Date	Ammonium as N (mg/L)	Organic Nitrogen as N (mg/L)	Potassium (mg/L)	Total Phosphorus as P (mg/L)
WT009	28/02/2017	0.03		1	< 0.01
WT009	15/05/2017	0.06		1	0.02
WT009	28/08/2017	0.01		1	0.03
WT009	19/02/2018	0.16		1	0.01
WT009	22/05/2018	0.04		1	0.02
WT009	28/05/2019	0.04	< 0.1	1	0.02
WT009	24/05/2021	< 0.01	< 0.1	2	< 0.01
WT009	25/08/2021		< 0.1	1	< 0.01
WT009	27/05/2024	< 0.01	< 0.1	1	< 0.01
WT009	28/08/2024	0.02	< 0.1	1	< 0.01
WT009	6/11/2024	< 0.01	0.2	1	0.08
WT009	19/02/2025	0.45	< 0.1	1	< 0.01
WT009	15/05/2025	0.1	0.1	1	0.02
WT011A	5/10/2010	0.03		< 1	
WT011A	16/12/2010	0.22		< 1	
WT011A	7/06/2011	0.01		< 1	
WT011A	19/09/2011	0.02		< 1	
WT011A	23/11/2011	0.06		< 1	
WT011A	16/02/2012	0.02		< 1	
WT011A	30/04/2012	0.04		< 1	
WT011A	10/09/2012	0.03		< 1	
WT011A	18/11/2012	0.09		< 1	
WT011A	11/02/2013	0.07		< 1	
WT011A	20/05/2013	0.08		< 1	
WT011A	19/08/2013	0.12		< 1	
WT011A	4/11/2013	0.07		< 1	
WT011A	12/02/2014	0.12		< 1	
WT011A	10/11/2014			< 1	
WT011A	28/02/2017	0.09		< 1	< 0.01
WT011A	15/05/2017	0.06		< 1	
WT011A	28/08/2017	0.04		< 1	
WT011A	19/02/2018	0.14		< 1	
WT011A	22/05/2018	0.02		< 1	< 0.01
WT012	4/09/2008	0.04		< 1	
WT012	19/08/2013	0.1		< 1	
WT012	4/11/2013	0.06		< 1	
WT012	12/02/2014	0.05		< 1	
WT012	10/11/2014	< 0.01		< 1	0.01
WT012	11/02/2015	0.01		< 1	0.06
WT012	12/05/2015	< 0.01		< 1	0.01
WT012	10/08/2015	< 0.01		< 1	< 0.01
WT012	28/02/2017	0.03		< 1	< 0.01
WT012	15/05/2017	0.1		< 1	0.01
WT012	28/08/2017	0.06		< 1	0.14
WT012	30/11/2017	0.27		< 1	0.02
WT012	19/02/2018	0.36		< 1	< 0.01
WT012	22/05/2018	0.07		< 1	< 0.01
WT012	30/08/2018		< 0.1	< 1	< 0.01

Sample Point	Sample Date	Ammonium as N (mg/L)	Organic Nitrogen as N (mg/L)	Potassium (mg/L)	Total Phosphorus as P (mg/L)
WT012	28/05/2019	< 0.01	< 0.1	< 1	< 0.01
WT012	24/05/2021	0.02	< 0.1	< 1	< 0.01
WT012	25/08/2021		0.3	< 1	< 0.01
WT012	27/05/2024	< 0.01	0.1	< 1	< 0.01
WT012	28/08/2024	< 0.01	< 0.1	< 1	< 0.01
WT012	6/11/2024	0.03	0.7	< 1	0.04
WT012	19/02/2025	0.11	< 0.1	< 1	< 0.01
WT012	15/05/2025	0.12	< 0.1	< 1	< 0.01
WT015	3/09/2008	0.04		< 1	
WT015	9/12/2008	< 0.01		< 1	
WT015	9/03/2009	< 0.01		< 1	
WT015	9/03/2009	< 0.01		< 1	
WT015	16/06/2009	0.08		< 1	
WT015	25/10/2009	0.03		< 1	
WT015	8/12/2009	0.03		< 1	
WT015	12/04/2010	< 0.01		< 1	
WT015	13/06/2010	0.05		< 1	
WT015	6/10/2010	0.08		< 1	0.01
WT015	16/12/2010	0.1		< 1	
WT015	7/06/2011	0.02		< 1	
WT015	19/09/2011	< 0.01		< 1	
WT015	22/11/2011	0.05		< 1	
WT015	16/02/2012	0.02		< 1	
WT015	30/04/2012	0.03		< 1	
WT015	10/09/2012	0.02		< 1	
WT015	18/11/2012	0.07		< 1	
WT015	11/02/2013	0.05		< 1	
WT015	20/05/2013	0.15		< 1	
WT015	19/08/2013	1.22		< 1	
WT015	4/11/2013	0.07		< 1	
WT015	12/02/2014	0.06		< 1	
WT015	10/11/2014	< 0.01		< 1	0.11
WT015	11/02/2015	0.01		< 1	0.04
WT015	12/05/2015	< 0.01		< 1	< 0.01
WT015	10/08/2015	0.04		< 1	< 0.01
WT015	28/02/2017	0.21		< 1	0.12
WT015	15/05/2017	0.05		< 1	< 0.01
WT015	28/08/2017	0.04		< 1	0.02
WT015	19/02/2018	0.04		< 1	< 0.01
WT015	22/05/2018	0.04		< 1	< 0.01
WT015	24/05/2021	< 0.01	< 0.1	< 1	< 0.01
WT015	12/05/2022	0.06	0.1	< 1	0.03
WT015D	25/08/2021		< 0.5	< 1	0.26
WT015D	18/11/2021		< 0.1	< 1	0.02
WT015D	17/02/2022	0.05	0.8	< 1	0.02
WT015D	31/08/2022	< 0.01	< 0.5	< 1	0.06
WT015D	1/12/2022	< 0.01	< 1	< 1	0.15
WT015D	28/02/2023		0.2	< 1	0.04

Sample Point	Sample Date	Ammonium as N (mg/L)	Organic Nitrogen as N (mg/L)	Potassium (mg/L)	Total Phosphorus as P (mg/L)
WT015D	18/05/2023	0.15	0.2	< 1	0.06
WT015D	14/02/2024	0.12	0.2	< 1	0.12
WT015D	18/06/2024	0.18	0.2	< 1	0.06
WT015D	27/08/2024	< 0.01	< 0.1	< 1	0.03
WT015D	7/11/2024	< 0.01	0.2	< 1	0.03
WT015D	18/02/2025	0.32	< 0.1	< 1	0.05
WT015D	14/05/2025	0.15	< 0.1	< 1	0.12
WT015S	25/08/2021		< 2	2	0.45
WT015S	17/02/2022	0.13	< 1	2	0.16
WT015S	18/06/2024	0.01	0.3	< 1	0.04
WT015S	27/08/2024	0.12	0.3	< 1	0.04
WT015S	7/11/2024	0.58	0.3	< 1	0.03
WT015S	18/02/2025	0.39	< 0.1	< 1	0.19
WT015S	14/05/2025	0.3	0.1	< 1	0.07
WT025	9/12/2008	< 0.01		< 1	
WT025	9/03/2009	< 0.01		< 1	
WT025	9/03/2009	< 0.01		< 1	
WT025	16/06/2009	0.08		< 1	
WT025	25/10/2009	< 0.01		< 1	
WT025	8/12/2009	0.01		< 1	
WT025	12/04/2010	< 0.01		< 1	
WT025	13/06/2010	0.02		< 1	
WT025	6/10/2010	0.05		< 1	0.04
WT025	16/12/2010	0.06		< 1	
WT025	7/06/2011	0.03		< 1	
WT025	19/09/2011	< 0.01		< 1	
WT025	22/11/2011	0.02		< 1	
WT025	16/02/2012	0.03		< 1	
WT025	30/04/2012	0.05		< 1	
WT025	10/09/2012	0.03		< 1	
WT025	18/11/2012	0.06		< 1	
WT025	11/02/2013	0.06		< 1	
WT025	20/05/2013	0.05		< 1	
WT025	19/08/2013	0.05		< 1	
WT025	4/11/2013	0.06		< 1	
WT025	12/02/2014	0.04		< 1	
WT025	10/11/2014	0.04		< 1	< 0.01
WT025	11/02/2015	0.02		< 1	0.04
WT025	12/05/2015	< 0.01		< 1	< 0.01
WT025	10/08/2015	< 0.01		< 1	< 0.01
WT025	8/02/2016	0.03		< 1	< 0.01
WT025	27/05/2016	0.02		< 1	< 0.01
WT025	28/02/2017	0.14		< 1	0.05
WT025	15/05/2017	0.05		< 1	< 0.01
WT025	28/08/2017	0.08		< 1	< 0.01
WT025	30/11/2017	0.12		< 1	0.03
WT025	19/02/2018	0.16		< 1	< 0.01
WT025	22/05/2018	0.01		< 1	< 0.01

Sample Point	Sample Date	Ammonium as N (mg/L)	Organic Nitrogen as N (mg/L)	Potassium (mg/L)	Total Phosphorus as P (mg/L)
WT025	30/08/2018		< 0.1	< 1	< 0.01
WT025	14/02/2019		< 1	< 1	< 0.01
WT025	28/05/2019	0.06	< 0.1	< 1	< 0.01
WT025	2/02/2021	< 0.01	< 0.1	< 1	< 0.01
WT025	24/05/2021	< 0.01	0.1	< 1	< 0.01
WT025D	25/08/2021		0.1	< 1	0.01
WT025D	18/11/2021		0.4	< 1	0.04
WT025D	17/02/2022	0.05	2.0	< 1	0.22
WT025D	12/05/2022	0.06	0.5	< 1	0.10
WT025D	31/08/2022	< 0.01	< 0.5	< 1	< 0.05
WT025D	1/12/2022	< 0.01	< 1	< 1	0.26
WT025D	28/02/2023		0.2	< 1	0.04
WT025D	18/05/2023	0.04	0.5	< 1	0.04
WT025D	14/02/2024	< 0.01	0.4	< 1	< 0.01
WT025D	27/05/2024	0.13	0.2	< 1	< 0.01
WT025D	27/08/2024	< 0.01	0.2	< 1	0.01
WT025D	6/11/2024	0.07	0.4	< 1	< 0.01
WT025D	18/02/2025	< 0.01	< 0.1	< 1	0.02
WT025D	14/05/2025	0.3	0.5	< 1	< 0.01
WT025S	25/08/2021		0.1	< 1	< 0.01
WT025S	18/11/2021		0.9	< 1	0.07
WT025S	17/02/2022	0.02	< 0.5	< 1	< 0.05
WT025S	12/05/2022	< 0.01	0.6	< 1	0.02
WT025S	27/05/2024	0.02	0.6	< 1	0.02
WT025S	27/08/2024	< 0.01	0.5	< 1	0.01
WT025S	6/11/2024	< 0.01	0.7	< 1	0.02
WT025S	18/02/2025	0.07	0.3	< 1	0.04
WT025S	14/05/2025	0.15	0.4	< 1	< 0.01
WT029	7/06/2011	0.02		< 1	
WT029	30/04/2012	0.04		< 1	
WT029	11/02/2015	0.03		< 1	0.04
WT029	12/05/2015	< 0.01		< 1	0.08
WT029D	25/08/2021		< 2	< 1	< 0.20
WT029D	17/02/2022	< 0.01	< 1	< 1	0.16
WT029D	18/06/2024	0.22	0.3	< 1	0.04
WT029D	27/08/2024	0.02	0.3	< 1	0.03
WT029D	7/11/2024	0.08	0.3	< 1	0.02
WT029D	18/02/2025	0.18	0.2	< 1	0.06
WT029D	14/05/2025	0.14	0.4	< 1	0.06
WT029S	18/06/2024	0.18	0.3	< 1	< 0.02
WT029S	27/08/2024	< 0.01	0.3	< 1	< 0.01
WT029S	7/11/2024	< 0.01	0.2	< 1	< 0.01
WT029S	14/05/2025	0.14	0.2	< 1	0.06

Notes:

- Bores WT015, WT025, WT029 are no longer active as they were replaced with additional bores WT015D, WT015S, WT025S, WT025D, WT029D and WT029S.
- Gaps in the dataset are due to either lack of sample (dry) or, for earlier years, the lack of a requirement for routine monitoring of the relevant parameter.

Table 6 *Long-term Bacteriological Concentrations of Groundwater Monitoring Bores at the WMF*

Sample Point	Sample Date	*Enterococci* (CFU/100mL)	*Escherichia coli* (CFU/100mL)
WT002A	12/02/2014	10	
WT002A	15/05/2025	< 1	< 10
WT007	28/02/2017	10	
WT007	28/08/2017	1	
WT007	19/02/2018	1	
WT007	22/05/2018	210	190
WT007	28/05/2019	1	< 1
WT007	24/05/2021	< 1	< 1
WT007	25/08/2021	< 1	< 1
WT007	28/02/2023	< 1	< 10
WT007	27/05/2024	< 1	< 100
WT007	28/08/2024	< 10	< 100
WT007	28/08/2024	3	1
WT007	6/11/2024	1	1
WT007	19/02/2025	< 1	< 1
WT009	19/08/2013	10	
WT009	10/11/2014	500	
WT009	22/05/2018	< 1	< 1
WT009	28/05/2019	< 1	< 1
WT009	24/05/2021	< 1	< 1
WT009	25/08/2021	< 1	< 1
WT009	27/05/2024	< 10	< 10
WT009	28/08/2024	< 1	2
WT009	28/08/2024	< 1	< 1
WT009	6/11/2024	< 1	< 1
WT011A	12/02/2014	7	
WT011A	15/05/2017	2	
WT011A	28/08/2017	87	
WT012	12/02/2014	30	
WT012	15/05/2017	6	
WT012	30/11/2017	1000	
WT012	19/02/2018	< 1	< 1
WT012	22/05/2018	< 1	< 10
WT012	30/08/2018	< 1	< 1
WT012	28/05/2019	1	< 1
WT012	24/05/2021	< 1	< 1
WT012	25/08/2021	< 10	< 10
WT012	27/05/2024	< 1	< 1
WT012	28/08/2024	< 1	< 1
WT012	28/08/2024	< 1	< 1
WT015	19/08/2013	2	
WT015	15/05/2017	6	
WT015	28/08/2017	< 1	< 1
WT015	19/02/2018	< 1	< 1
WT015	22/05/2018	< 10	< 10
WT015	24/05/2021	< 1	< 1

Sample Point	Sample Date	*Enterococci* (CFU/100mL)	*Escherichia coli* (CFU/100mL)
WT015	12/05/2022	< 10	210
WT015D	25/08/2021	< 10	< 10
WT015D	18/11/2021	< 10	< 10
WT015D	17/02/2022	< 10	< 10
WT015D	31/08/2022	< 10	< 10
WT015D	1/12/2022	6300	540000
WT015D	28/02/2023	< 10	< 10
WT015D	18/05/2023	< 1	< 1
WT015D	14/02/2024	< 1	1
WT015D	18/06/2024	< 1	< 1
WT015D	27/08/2024	< 10	10
WT015D	26/08/2024	< 10	< 10
WT015D	7/11/2024	< 10	< 10
WT015D	18/02/2025	< 10	< 10
WT015D	14/05/2025	< 1	< 100
WT015S	25/08/2021	22	< 1
WT015S	17/02/2022	< 1	5
WT015S	18/06/2024	< 10	< 10
WT025	28/02/2017	2	3
WT025	15/05/2017	< 1	< 1
WT025	28/08/2017	< 1	1
WT025	30/11/2017	2	< 1
WT025	19/02/2018	< 1	< 1
WT025	22/05/2018	< 1	< 1
WT025	30/08/2018	< 1	< 1
WT025	14/02/2019	< 1	< 1
WT025	28/05/2019	< 10	< 10
WT025	2/02/2021	< 2	< 2
WT025	24/05/2021	< 10	< 10
WT025D	25/08/2021	< 10	< 10
WT025D	18/11/2021	< 10	< 10
WT025D	17/02/2022	< 10	< 10
WT025D	12/05/2022	1	< 1
WT025D	31/08/2022	< 1	< 1
WT025D	1/12/2022	< 1	< 1
WT025D	28/02/2023	< 1	1
WT025D	18/05/2023	1	1
WT025D	14/02/2024	< 10	10
WT025D	27/05/2024	< 1	< 1
WT025D	27/08/2024	< 1	< 1
WT025D	26/08/2024	< 10	10
WT025D	6/11/2024	< 1	< 1
WT025D	18/02/2025	< 1	1
WT025D	14/05/2025	< 1	1
WT025S	25/08/2021	< 1	< 1
WT025S	18/11/2021	< 1	< 1
WT025S	17/02/2022	< 1	< 1
WT025S	27/08/2024	< 10	< 10

Sample Point	Sample Date	*Enterococci* (CFU/100mL)	*Escherichia coli* (CFU/100mL)
WT025S	26/08/2024	< 10	< 10
WT025S	6/11/2024	< 10	< 10
WT025S	18/02/2025	< 10	< 10
WT025S	14/05/2025	< 2	< 2
WT029	11/02/2015	3	< 1
WT029	12/05/2015	< 10	< 10
WT029D	25/08/2021	< 100	< 100
WT029D	17/02/2022	< 10	10
WT029D	18/06/2024	< 1	< 10
WT029D	27/08/2024	< 1	< 1
WT029D	26/08/2024	< 10	< 10
WT029D	18/02/2025	10	
WT029D	14/05/2025	< 1	< 10
WT029S	7/11/2024	10	

Notes:

- Bores WT015, WT025, WT029 are no longer active as they were replaced with additional bores WT015D, WT015S, WT025S, WT025D, WT029D and WT029S.
- Gaps in the dataset are due to either lack of sample (dry) or, for earlier years, the lack of a requirement for routine monitoring of the relevant parameter.

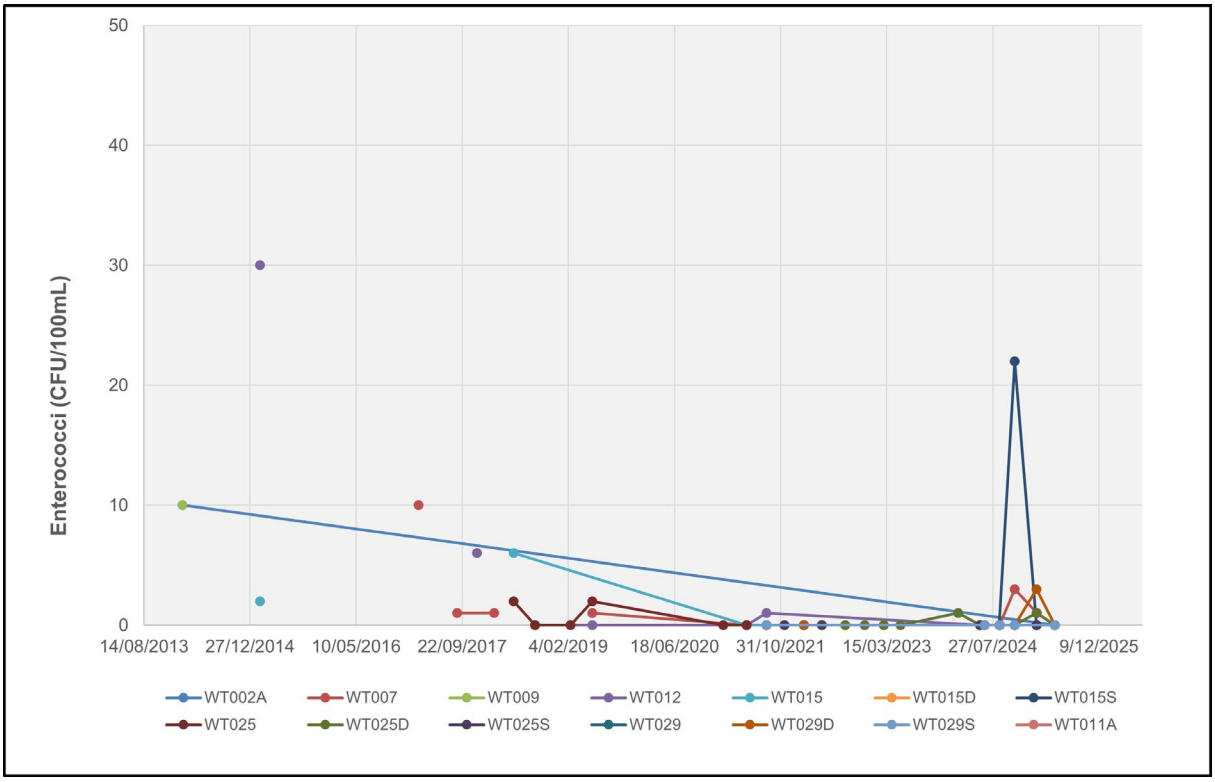

Figure 7 Enterococci *Concentrations of Groundwater Monitoring Bores at the WFM*

Notes: Bores WT011A, WT015, WT025, WT029 are no longer active (e.g. destroyed / replaced). Outlier results (1 data point each) from bores WT007, WT009, WT012 and WT015 has been removed to show general trending of data.

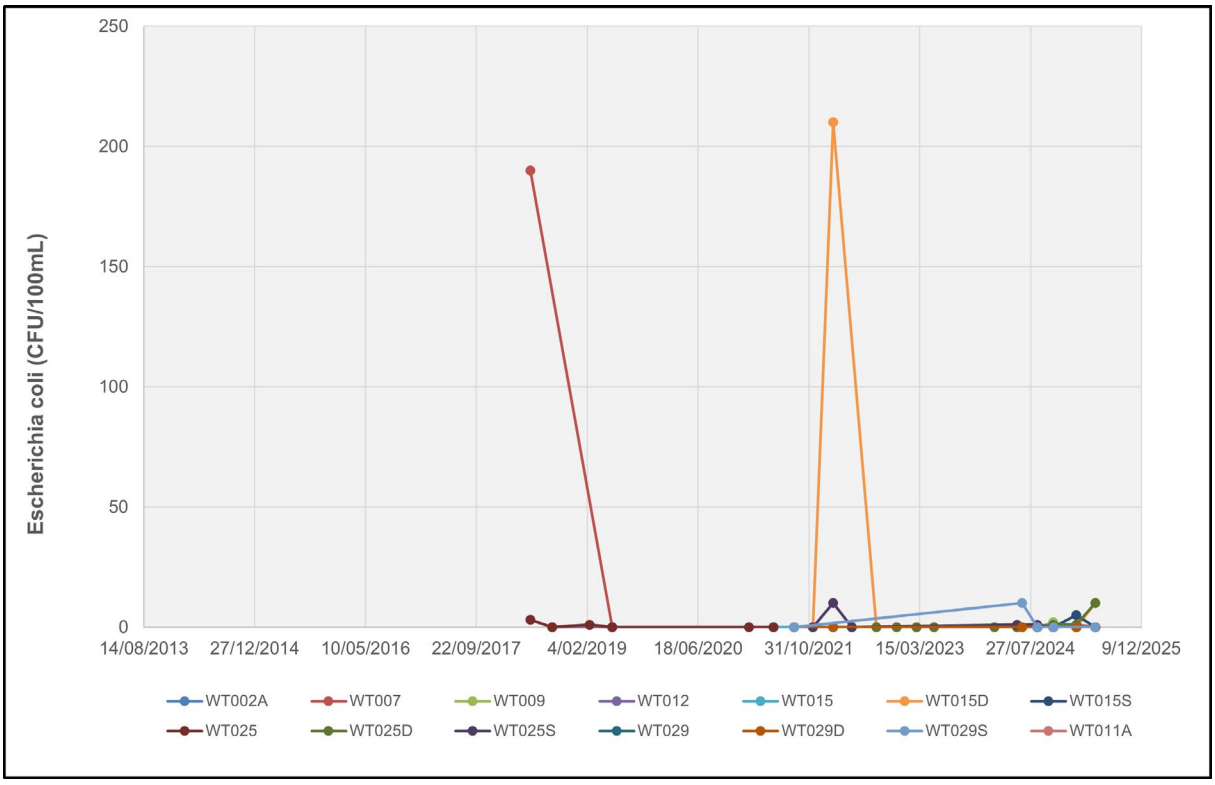

Figure 8 Escherichia coli *Concentrations of Groundwater Monitoring Bores at the WFM*

Note: Bores WT011A, WT015, WT025, WT029 are no longer active (e.g. destroyed / replaced). Outlier result (one point) from bore WT015 has been removed to show general trending of data.

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