

Kiama Council

Annual Surface & Groundwater Monitoring Report (EPL) Gerroa Waste Disposal Depot

EPL: May 2021 to February 2022 &
Ammonia Monitoring: March 2021 to September 2021

Report E2W-025 DR001 (V2)

25 March 2022

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Gerroa Waste Disposal Depot
(EPL: May 2021 to February 2022 & Ammonia Monitoring: March 2020 to February 2022)

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Water Sampling & Laboratory Analyses Completed By:
ALS Environmental Pty Ltd; EPL May 2021 to February 2022 (4 rounds)
Ammonia Monitoring; March 2021 to September 2021 (5 rounds)

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1. Introduction

Earth2Water Pty Ltd (E2W) was engaged by Kiama Municipal Council (Council) to provide an annual groundwater and surface water monitoring report for the Gerroa Waste Disposal Depot (GWDD). The GWDD Environment Protection Licence (EPL) was revoked in May 2008 and altered the previous reporting periods from August-July, to 1 April 2008 - 31 March 2009. The EPL reporting periods and monitoring periods have changed since 2009 (i.e. 2009-2010 monitoring report included results from five monitoring events including February 2009, May 2009, August 2009, November 2009 and February 2010. The 2010-2011 monitoring report included results from four monitoring events including May 2010, August 2010, November 2010 and February 2011. The 2011-2012 annual report includes results from five monitoring events including May 2011, August 2011, November 2011, February 2012 and May 2012.

The previous EPL reports (2010-2016) were provided as annual reports which included results from four regular quarterly monitoring events (May, August, November and February). The annual report from May 2016 to May 2018 included nine (9) quarterly monitoring events, whilst EPL (June 2018 to April 2019) included ten monitoring events (Ammonia only: 15 June 2018, 12 July 2018, 17 October 2018, 6 December 2018, 4 April 2019, and three EPL quarterly events; 22 August 2018, 16 November 2018, 12 February 2019. The annual EPL report (2019-2020) includes nine monitoring events (i.e. ammonia analyses @ June 2019, July 2019, September 2019, October 2019, & January 2020), and four quarterly EPL events; May 2019, August 2019, November 2019 and February 2019).

This annual EPL report (2021-2022) includes nine (9) monitoring events (i.e. ammonia analyses @ March 2021, May 2021, June 2021, July 2021, September 2021), and four quarterly EPL events; May 2021, August 2021, November 2021 and February 2022). This EPL is the seventeenth (17) provided by E2W to the NSWEPA on behalf of Council, and meets the general conditions outlined in the previous EPL (Lic No: 5959, R1.10).

This EPL report also follows NSW EPA correspondence and E2W previous report entitled "Second Interim Groundwater Report- Gerroa Waste Disposal Depot", dated 14 May 2018 which outlined the rising ammonia trends at several deep wells (e.g. MW-1D, MW-3, MW-4, MW-5, MW-6D, MW-7D, Appendix D). The additional monthly monitoring continues to be undertaken to assess the variable to rising ammonia trends at multiple well locations at the former landfill site.

1.1 Background and Remediation Activities

Council has owned and operated the GWDD since the 1960's. It was previously licensed as a Solid Waste Class 1 Landfill, operating under the EPL No. 5959. The site also functioned as a night soil depot for liquid pump out sullage. Land filling operations at the GWDD were discontinued in October 2003.

From July 2004 to February 2005, the landfill was rehabilitated to eliminate, or at least minimise the potential for landfill leachate generation. The waste mound was reshaped, capped with a 0.5 m thick clay barrier and 0.3 m thick combined drainage/re-vegetation layer. The former night soil trench was also remediated in August 2004 (i.e. approximately 300 tonnes of bio-solid sludge were excavated and placed underneath the clay cap).

In February 2005, an irrigation system was installed to assist with the re-vegetation of the landfill mound using a combination of native and annual grasses. A groundwater holding dam (30 x 30 m) was also constructed next to the two existing evaporation ponds to contain and supply water for the irrigation system. A spear point (yield ~2 L/sec) was installed on the north-west corner of the landfill mound to allow groundwater (and landfill leachate) to fill the holding dam as well as supply water for the irrigation system.

The sludge pond (southern lined dam) at Gerroa Landfill has not been used since Council ceased undertaking the septic clean-outs. Waste Processing Solutions Pty Ltd was engaged by KMC in September 2009 to de-water the sludge in the lined pond, and subsequently taken to a Soilco Pty Ltd owned site. Removal of the pond liner (HDPE) was undertaken in October 2011 by Council and disposed to Shellharbour landfill (note: spillage of residual sludge may have occurred during removal of the liner).

Up until November 2008, Ecowise Pty Ltd (now ALS) performed the quarterly surface and groundwater monitoring at the landfill site. E2W and Council undertook the monitoring in November 2008, and subsequently Council and/or ALS performing the quarterly monitoring rounds herein. Water samples are sent to ALS for laboratory analyses. The access to the landfill is currently secured, with gates locked.

1.2 Objectives

The objective of the ongoing monitoring is to assess the potential impact of the GWDD on local surface and groundwater systems. This round of monitoring provides an assessment of water quality trends associated with the landfill rehabilitation works completed in February 2005.

2. Scope of Work

E2W was commissioned by Council to collate and interpret surface and groundwater data from the GWDD on the following dates

- EPL Events: 20 May 2021, 18 August 2021, 25 November 2021, and 10 February 2022. Each monitoring event comprised the following:
    - Sampling of onsite & offsite groundwater wells; MW-1S, MW-1D, MW-3, MW-4, MW-5, MW-6S, MW-6D, MW-7S, MW-7D, MW-9, MW-10, MW-11.
    - Ammonia Monthly Monitoring: Sampling dates included: 25 March 2021, 5 May 2021, 18 June 2021, 8 July 2021, 10 September 2021. Well samples include; MW-1D, MW-3, MW-5, MW-6D, MW-7D, MW-11, MW-12, MW-13 & MW-14.
- Sampling of surface water at all five locations along Blue Angle Creek (ML-1, ML-2, ML-3, ML-4, ML-5[1]). In previous reporting periods, several testing locations (i.e. ML-1, ML-3 and ML-4) were inaccessible due to being located on private property belonging to Cleary Brothers).

Similar EPL reports were previously completed by E2W for the dates; 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010，2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016, 2016-2018, 2019-2020, and 2021-2022. Council has indicated

[1] November 2008 was the first time ML-5 had been sampled since October 2004.

(2017) that EPL reports are no longer required, however monitoring is conducted to assess the water quality and address any requirements for site management or remediation.

E2W completed the following scope of work to satisfy Council's surface and groundwater monitoring program at GWDD:

- Assist Council to interpret quarterly sampling results and provide recommendations.
- Prepare this annual report for May 2021 to February 2022 to provide information in accordance with Section R1.10 of the EPL (No. 5959). The annual report is to include the following:

    1. Tabulation of the monitoring data obtained for the period.
    2. Graphical representation of the current and previous monitoring data. Statistically significant variations or anomalies will be highlighted.
    3. Analyses and interpretation of monitoring data.
    4. Analyses and response to any complaints received.
    5. Identification of any deficiencies in the environmental performance of the GWDD, as highlighted by the monitoring data, trends and/or accidents.
    6. Proposal of recommendations to address the above identified deficiencies.
    7. Recommendations on improving the overall environmental performance of the facility.

This annual report includes four rounds of additional monitoring at key wells to assess ammonia trends at selected locations (refer to *E2W, "Second Interim Groundwater Report Gerroa Waste Disposal Depot, dated 14 May 2018*).

Based on NSWEPA correspondence, ammonia results from wells (MW-1D, MW-3) are as follows:

- MW-1D: On 10 November 2016 and 20 February 2017, ammonia levels at this monitoring point were 12.5mg/L and 6.65mg/L respectively. These are the highest recorded results since 2011 results.
- MW3: On 31 May 2016 and 10 November 2016, ammonia levels at this monitoring point were 4.31mg/L and 1.30mg/L respectively. It is noted that on 16 February 2016, ammonia was detected as 20.9mg/L however, Council's consultant indicated that this result was an anomaly. Aside from this result, and 7.78mg/L being detected on 18 February 2013, all other results have been below 1.00 mg/L.

The 6 wells located in proximity to the landfill mound (MW-1D, MW-3, MW-4, MW-5, MW-6D, MW-7D) are recommended to be monitored for ammonia on a more regular basis, including the three downgradient wells (MW-12,13, 14) next to MW-1D (refer to Figure 4).

3. Licence Criteria and Relevant Guidelines

The EPL for the GWDD was revoked by the DECC in May 2008. The ongoing groundwater monitoring is undertaken to assess the effectiveness of the capping works and environmental status of the landfill post closure and rehabilitation. The revocation notice is subject to the following conditions:

- The licensee must maintain the landfill capping works.

- The licensee must undertake groundwater monitoring at groundwater wells MW-1S, MW-1D, MW-3, MW-4, MW-5, MW-6S, MW-6D, MW-7S, MW-7D, MW-9, MW-10 and MW-11 (in accordance with Table 3.1 below).
- Should the monitoring results indicate ammonia concentrations greater than 20% above ammonia concentrations reported in Table GW-1 of Kiama Municipal Council, Gerroa Waste Disposal Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007, dated 17 August 2007, the licensee must notify the EPA within 7 days of receiving the results (Appendix C).
- The licensee must undertake surface water monitoring at surface water monitoring points ML-1, ML-2, ML-3, ML-4 and ML-5 (in accordance with Table 3.1 below).
- Should the monitoring results indicate ammonia concentrations greater than 10% above ammonia concentrations reported in Table SW-1 of Kiama Municipal Council, Gerroa Waste Disposal Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007, dated 17 August 2007, the licensee must notify the EPA within 7 days of receiving the results (Appendix C, exceedances are present).

Table 3.1: Surface and Groundwater Monitoring Requirements

Parameters	Monitoring Frequency – Groundwater	Monitoring Frequency – Surface water
Alkalinity	Quarterly (#1)	Quarterly (#1)
pH	Quarterly (#1)	Quarterly (#1)
Conductivity	Quarterly (#1)	Quarterly (#1)
Total Dissolved Solids	Quarterly (#1)	Quarterly (#1)
Nitrogen (Ammonia)	Quarterly (#1)	Quarterly (#1)
Phosphorous (Total)	Quarterly (#1)	Quarterly (#1)
Nitrate	Quarterly (#1)	Quarterly (#1)
Nitrite	Quarterly (#1)	Quarterly (#1)
Total Kjeldahl Nitrogen	Quarterly (#1)	Quarterly (#1)
Calcium	Annual	Annual
Chloride	Annual	-
Fluoride	Annual	-
Magnesium	Annual	Annual
Sulphate	Annual	-
Sodium	Annual	Annual
Bicarbonate	Annual	Annual
Carbonate	Annual	Annual
Potassium	Annual	Annual
Dissolved Organic Carbon	Annual	-
Iron	Annual	Annual
Manganese	Annual	Annual
Redox Potential	Annual	Annual
Faecal Coliforms (FC)	-	Annual
Enterococci	-	Annual

Note: Bicarbonate/alkalinity was conducted on quarterly basis (only an annual requirement).
Quarterly (#1) = monitoring is conducted on quarterly basis by KMC, however EPL requires sampling only "twice a year". The FC and enterococci analyses was not conducted for the surface water events during 2019 to 2022 (Note: FC or enterococci is not a reliable indicator of landfill leachate at the site).

The parameters listed in Table 3.1 were included in the three quarterly monitoring events from May 2021 to February 2022 (Table 6). Annual parameters were sampled during the August 2016,

November 2018, February 2019, and August 2019/2020/2021 monitoring periods. Ammonia concentrations were measured in the five monitoring rounds from March 2021 to September 2021.

Ongoing quarterly monitoring with the same parameters is proposed for the future monitoring reports. A temporary monthly monitoring program is underway (Since late 2017) to address the rising ammonia trends in several key wells at the landfill site.

The DECC's Contaminated Sites: Guidelines for Assessment and Management of Groundwater Contamination (March 2007) outlines a best-practice framework for assessing and managing groundwater contamination. The guidelines are made under the Contaminated Land Management Act (1997) and recommend adopting the ANZECC (2000) chemical concentration trigger values for the protection of (fresh and marine) aquatic ecosystems.

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000/2018) guidelines include risk-based trigger levels and indicative interim working levels (IIWLs). The IIWLs are of low reliability and used when insufficient data is available to calculate a trigger level. It should be noted that the ANZECC (2000) water quality guidelines are applicable to receiving water and not to groundwater. However, they form an appropriate basis for undertaking a screening level assessment of groundwater quality. The selection of the applicable guideline values should be based on an assessment of potential pathways by which human or environmental exposure might take place and the beneficial end use of the groundwater (i.e. ecosystem support).

The choice of a beneficial use classification for groundwater at the site depends on the quality of the water and its potential use in the long term. Although groundwater in the aquifer surrounding the waste disposal facility is likely to be of relatively good quality (depending on the presence of saline intrusions), there are no known groundwater extraction bores (agricultural or domestic) within the immediate vicinity. Therefore, the most appropriate beneficial use category of the groundwater is considered for the protection of aquatic ecosystems in the discharge zones of nearby Blue Angle Creek and Seven Mile Beach (i.e. fresh and marine water, respectively).

Based on the closest environmental receptors being both marine and fresh waters (i.e. Seven Mile Beach, Blue Angle Creek and Crooked River Estuary), the guidelines adopted for the site are based on the protection of both marine and freshwater aquatic ecosystems. These assessment guidelines are presented with the summarised analytical results (i.e. Tables; Groundwater GW-1, Surface Water SW-1).

Exceedances of ANZECC (2000) trigger values for marine water ecosystems have been highlighted in Tables GW-1 and SW-1.

4. Environmental Setting

The GWDD is located approximately 1.5 km southwest of the Gerroa Road bridge crossing of Crooked River and near the northern end of Seven Mile Beach. Blue Angle Creek is located around 80 m to the northwest of Crooked River Road (Figure 1).

The facility covers an area of approximately 3.2 hectares. The location and general layout of the site is shown in Figures 1 and 2. Prior to the remediation of the site in February 2005, the GWDD comprised the following:

- An elevated landfill mound ranging from 4 m to approximately 15 m AHD.
- Two lined evaporation sludge ponds. These ponds accepted septic sludge associated with Gerringong's upgraded sewerage system. These ponds are now lined and used to hold groundwater pumped from the site to enable irrigation on the landfill mound.
- A night soil deposit, which historically accepted night soil sludge; and
- A small recycling facility.

The former night soil depot was located adjacent to the north-western slope of the landfill mound (Figure 2). The former depot consisted of two excavated infiltration trenches which, up until August 2002, received pump-out wastewater from septics in the Gerringong/Gerroa region. The two trenches were approximately 100 m in length (5 m wide) and while operational, partially filled with untreated wastewater.

4.1 Climate

Between 1895 and 2011, the average yearly rainfall at Gerringong Mayflower Village (Latitude 34.75° S, Longitude 150.82° E) is 1,343.4 mm/year, with the heaviest rainfalls occurring in summer and autumn months.

However, rainfall data from Toolijooa (Nyora) Station is taken from July 2012 due to the closure of Mayflower Village Station. Climatic data indicates Gerringong/Gerroa received approximately 1559 mm of rain from February 2015 to February 2016[2] (Appendix B). The highest months of above average rainfall were recorded in April 2015 (426.4 mm), and August 2015 (378 mm), whilst January 2015 (316 mm i.e. just prior to reporting period).

The rainfall in 2016 and 2017 was only 953 mm/year and 889 mm/year (January to December) indicating drought conditions. The rainfall from January to July 2018 is 429 mm/7 months indicating the persistence of dry weather. The rainfall from May 2018 to April 2019 is only 860mm/year, indicating again the persistence of dry weather (drought conditions).

The rainfall from March 2019 to February 2020 was only 774 mm/year, which is approximately 35% less than the average annual rainfall (Appendix B). The below average rainfall since 2016/2017 and lowest in 2019/2020, is the key factor in ammonia trends around the landfill mound due to less dilution from the reduced runoff.

The rainfall during 2020 to 2021 of 1,152.8 mm indicates a return to the annual average. High rainfall during January/February 2022 (619 mm) increased the average rainfall to 1,562.8 mm/yr (March 2021 to February 2022) causing substantial flooding in the region.

4.2 Topography

A general layout of the site topography is presented in Figure 1. The GWDD is situated within an estuarine landscape consisting of dune ridges, swamps and lagoons. The vegetation surrounding the facility comprises scrub and a littoral rainforest. Local relief is less than 5 m AHD and slopes less than 5%. The landfill forms a mound, reaching some 12 m above the surrounding ground surface.

[2] Information obtained from the Bureau of Meteorology website (www.bom.gov.au/climate).

Ground levels (RL) of the landfill footprint area ranges from approximately 3.3 to 5.2 m AHD. The footprint area (23,000 m2) and height of the rehabilitated landfill mound (15.9 m AHD, July 2005) is practically the same as pre-remediation conditions (i.e. October 2003).

4.3 Geology

The GWDD is located within the Seven Mile Soil Landscape as defined by Hazelton (1992). Coastal Plain Quaternary marine sands and Quaternary alluvium underlie the site. Previous site investigations, as discussed in the URS report (2002), identified light brown fine-grained dune sands to a depth of 4 to 6 m below grade. The sands vary in thickness (between dune ridges and swales) and are largely contained above the groundwater table.

Beneath the dune sands, fine-grained grey beach sands containing shell fragments are present to a depth of approximately 14 m. The base of the sequence comprises estuarine silty and sandy clays. Further inland, the sedimentary sequence comprises estuarine clays closer to the surface, particularly in the vicinity of Blue Angle Creek where the ground surface is 2 to 3 m lower than the landfill area.

4.4 Hydrogeology

The GWDD is underlain by an unconfined and permeable sandy aquifer. Groundwater is encountered at a depth of approximately 3 - 4 m below ground level (i.e. approximately 1 m AHD) at the landfill area and becomes shallower towards Blue Angle Creek to the west and Seven Mile Beach to the east.

The groundwater quality varies from potable to saline, with electrical conductivities ranging from 0.3 to 50 mS/cm. The groundwater generally becomes more saline with depth and in the vicinity of tidal saline water bodies (i.e. Blue Angle Creek and Seven Mile Beach).

The hydraulic conductivity of the beach and dune sands at Gerroa has a geometric average of 10 m/day (Gerroa-Gerringong Sewerage Scheme EIS, 1999). It is noted that the organic silty sands between 0 - 0.15 mbgl have a lower permeability (approximately 0.1 m/day, E2W site investigations, March 2004).

In the area of the GWDD, groundwater gradients are controlled by topography, the Seven Mile Beach shoreline, Blue Angle Creek and Crooked River Estuary. It is interpreted that a natural groundwater divide runs through the landfill (URS 2003, E2W 2004), with groundwater to the west flowing towards Blue Angle Creek and groundwater to the east towards Seven Mile Beach. It is likely the natural groundwater divide is influenced by the coastal dunes and presence of the landfill mound (due to increased recharge). The position of the groundwater divide may change with the tide and seasons. During 2004/2005 (a drought period), the predominant flow direction is inferred to be towards Seven Mile Beach.

Groundwater discharge at Blue Angle Creek and Seven Mile Beach will be influenced by the presence of a fresh groundwater/salt water interface. The interface results from the density difference between the groundwater and sea water and is a dynamic and complex region with upward hydraulic gradients, tidal fluctuations, micro-biological processes, groundwater and surface interaction and substantial salinity variations. The groundwater/salt water interface can be associated with enhanced natural attenuation (biodegradation, dilution, sorption etc.), which acts to reduce the levels of contaminants prior to their discharge to marine ecosystems.

Groundwater is also interpreted to discharge as baseflow within Blue Angle Creek. Due to the action of tides, salt water is intermittently present in Blue Angle Creek with salinity governed by tide levels. The saline water intrusion at high tide extends approximately 2 km upstream of the confluence between Blue Angle Creek and Crooked River.

It is understood offsite migration of contaminants (nutrients, iron and some ammonia) has occurred in the local shallow and deep groundwater systems (URS 2002, 2003; E2W 2004, 2006). This groundwater contamination arises from nutrient enrichment, which is associated with the former landfilling operations at the GWDD.

The leachate plume identified in the well network arises from historical waste disposal at the site, which commenced in the 1960s. The landfill remediation (completed in February 2005) will reduce future landfill leachate generation, however shrinking/diminishing of the existing plume will depend on natural attenuation processes (i.e. dilution, adsorption, biodegradation dispersion etc.) over time (years).

The groundwater quality immediately outside the footprint area is subjected to increased dilution arising from runoff (1 ha) and groundwater recharge from the landfill mound. This dilution together with natural attenuation decreases the leachate levels in the aquifer.

4.5 Hydrology

The hydrology of the area is dominated by Blue Angle Creek, Crooked River and Seven Mile Beach (Figure 2).

The closest environmental receptors of water running through the GWDD are Blue Angle Creek, Seven Mile Beach and Crooked River Estuary (Figure 1). Blue Angle Creek flows into the Crooked River Estuary at the northern end of Seven Mile Beach. The estuary discharges into the ocean when the mouth is open.

Previous Crooked River and Blue Angle Creek surface water quality investigations were discussed in the URS report (2002). The results indicate a considerable variation in water quality, particularly between dry and wet conditions, which may be associated with inputs from the wider catchment area.

When the entrance to Crooked River is open, the lower part of the river is well flushed with oceanic waters. This results in levels of nutrients, bacteria and toxicants that generally comply with guideline levels. Immediately following wet weather, water quality in the estuarine section of Crooked River generally deteriorates, with increased levels of particulate material, bacteria, sulphide, nutrients and metals (URS, 2003).

Of the four main tributaries that feed into the estuarine section of Crooked River, water quality in Blue Angle Creek was the most degraded with phosphorus, nitrogen, hydrogen sulphide, copper and zinc (URS, 2003). Surface water runoff from the landfill mound is diffused and infiltrated into the surrounding sandy soils.

5. Previous Monitoring Results

The primary conclusion from the monitoring report submitted by URS (2002-2003) prior to remediation in 2005 is summarised below:

- High concentrations of nutrients, in particular ammonia-nitrogen, continue to be detected under the site and migrating offsite. The levels recorded are well in excess of ANZECC (2000) guidelines for the protection of fresh and marine water ecosystems.

The following key points are also noted:

- High concentrations of ammonia-nitrogen and TKN were consistently detected in monitoring wells MW-1 and MW-5, which are located on the outer extent of the facility. This indicates the potential for migration of the nutrient plume in a south-easterly direction towards Seven Mile Beach. High concentrations of ammonia-nitrogen were also detected in monitoring wells MW-3 and MW-7, which are also located on the outer extent of the facility, indicating the potential for migration of the nutrient plume in a north-westerly direction towards Blue Angle Creek.
- Elevated concentrations of ammonia-nitrogen were detected in the shallow monitoring wells MW-9 to MW-11, adjacent to Blue Angle Creek.

6. Surface and Groundwater Monitoring

Surface and groundwater monitoring between May 2021 and February 2022 for the EPL was undertaken by ALS Environmental. ALS also conducted the additional monitoring (ammonia only) at nine (9) key wells between March 2021 and September 2021 (Figure 4).

Sampling was carried out on the following dates for the ***EPL Wells:***

- 20 May 2021,
- 18 August 2021,
- 25 November 2021; and
- 10 February 2022.

Refer to Tables (GW-1 and SW-1). The August 2021 monitoring rounds include ammonia results at the three downgradient wells (MW-12,13,14).

The sample dates for assessing ammonia trends at the 9 key groundwater Wells (MW-1D, MW-3, MW-5, MW-6D, MW-7D, MW-11, MW-12, MW-13 & MW-14) are as follows:

- 25 March 2021,
- 8 May 2021,
- 18 June 2021,
- 8 July 2021,
- 10 September 2021.

Refer to Table 7 for the summary of ammonia results.

The recommended procedure for sample collection, storage, handling and quality control generally employed by ALS is outlined in the NEPM (2013). E2W used the November 2008 sampling round to instruct Council staff on surface and groundwater sampling protocol. The samples are all sent to

ALS (Sydney) for laboratory analyses. E2W understand that ALS carry out the quarterly sampling at the GWDD and submit the samples to ALS (Sydney via the Wollongong office) for analyses.

6.1 Monitoring locations

The following outlines the nature of the monitoring and analytical program at the site and the conditions at the time of sample collection from information provided by ALS and/or Council. Groundwater was sampled from six monitoring wells (MW-3, MW-4, MW-5, MW-9, MW-10, MW-11), and three nested wells (i.e. MW-1S/MW-1D, MW-6S[3]/MW-6D and MW-7S/MW-7D, where S = shallow, D = deep).

Additional samples were collected from three wells (MW-12,13,14) located on the east side of the waste mound to better assess the ammonia trends in proximity to MW-1 and MW-1D.

Surface water was sampled at five locations (ML-1, ML-2, ML-3, ML-4 and ML-5) along Blue Angle Creek (Figure 2). The available surface water monitoring results are presented in tables (SW-1).

Variable EC levels in surface water testing locations indicate that sampling may not have been undertaken during low tide (sampling at low tide provides a reflection of groundwater discharge).

6.2 Sampling Sites - Groundwater

The sampling sites are described below, while sampling depths for the bundled piezometers and conventional wells are summarised in Table 6.2.

- MW-1S (shallow - 6 m depth) and MW-1D (deep - 10.5 m depth) - Located next to the previous multilevel piezometer MW-1 and approximately 40 m from the SE corner of the landfill perimeter. The well is situated down-gradient of the landfill mound and intended to intersect flow heading towards Seven Mile Beach.
- MW3 - Approximately 20 m to the north of the landfill clearing, fronting native bushland. This well is to establish background water quality conditions and determine offsite migration of groundwater in a northerly direction.
- MW4 - Located immediately adjacent to the night soil depot, which is a source of potential nutrient and bacterial contamination.
- MW5 - Approximately 30 m to north of the night soil depot. The well is within the extent of contamination arising from the depot and landfill-impacted groundwater.
- MW-6S (shallow - 6 m depth) and MW-6D (deep - 10.5 m depth) - Located next to multilevel piezometer MW-6 and approximately 50 m NW of landfill and night soil depot. The well is situated down-gradient of the landfill and night soil depot.
- MW-7S (shallow - 6 m depth) and MW-7D (deep - 10.5 m depth) - Located 15 m to the east of multilevel piezometer MW-7 and approximately 100 m NW of landfill and night soil depot. This well was installed to establish background water quality conditions and determine offsite migration of groundwater contaminants towards Blue Angle Creek.
- MW9 - Located offsite and adjacent to Blue Angle Creek downstream of ML-1 to determine if potentially contaminated groundwater is discharging into the estuarine environment.

[3] *MW-6s was dry during the 2021-2022 monitoring period*

- MW10 - Located offsite and adjacent to Blue Angle Creek downstream of ML-1 to determine if potentially contaminated groundwater is discharging into the estuarine environment.
- MW11 - Located offsite and adjacent to Blue Angle Creek downstream of ML-1 to determine if potentially contaminated groundwater is discharging into the estuarine environment.
- MW-12,13,14: Shallow wells installed in July 2007 by E2W to assist with remedial works (if required) on the downgradient boundary of the landfill mound. The additional 3 wells have been monitored to better characterise the water quality trends (i.e. ammonia, refer to Table 7) on the downgradient boundary of the site (Figure 4).

6.3 Sampling Sites - Surface Water

Blue Angle Creek

- ML-1. Approximately 100 m upstream of the depot along Blue Angle Creek at the end of the tidal limit. Sampling location chosen to establish upstream water quality and offsite conditions.
- ML-2. Approximately 500 m downstream of the depot along Blue Angle Creek. This sampling location was chosen to establish offsite and downstream water quality and assess the potential for contamination associated with the depot.
- ML-3. Approximately 200 m upstream of the flood gates along Blue Angle Creek, and 100m upstream of ML-4. This sampling location was chosen to establish upstream water quality and offsite conditions due to agricultural activities in the catchment area.
- ML-4. Approximately 100 m upstream of the flood gates along Blue Angle Creek. This sampling location was chosen to establish upstream water quality and offsite conditions.
- ML-5. Approximately 400 m downstream of the flood gates along Blue Angle Creek, between MW-9 and MW-11. This midstream sampling location was chosen to establish offsite receptor water quality conditions.

The surface water and groundwater sample locations are illustrated in Figure 2, and Table 6.1.2.

Table 6.1.2: Monitoring Summary for May 2021 to February 2022

Sample ID	Screen Interval (m AHD) & Sample Location	May 2021 to February 2022
MW-1S	Approx. 0 to -3	Only May 2021
MW-1D	Approx. -4 to -7	X
MW-3	0 to 1.5	X
MW-4	0.79 to -0.71	X
MW-5	0.55 to -0.95	X
MW-6S	Approx 0 to -3	Dry
MW-6D	Approx -4 to -7	X
MW-7S	Approx 0 to -3	X
MW-7D	Approx -4 to -7	X
MW-9	-0.53 to -1.53	May/Nov 21 & Feb 22
MW-10	-0.525 to -1.525	Only Nov 2021
MW-11	0.095 to -0.905	X
ML-1	Upstream of landfill	4 dates sampled
ML-2	Downstream of landfill	4 dates sampled
ML-3	Upstream of landfill	4 dates sampled
ML-4	Upstream of landfill	4 dates sampled
ML-5	Opposite landfill	4 dates sampled

Notes: X = Sample collected. MW = Monitoring well sample from landfill site. ML = Surface water sample from Blue Angle Creek. The 6 wells (MW-1S/MW-1D etc) are considered more reliable monitoring locations (compared to multilevel piezometers) as they were constructed with standalone 50 mm diameter PVC screens and not the 7 mm poly tubing (low flow system). The MW-12,13,14 are constructed with 3m PVC (50mm diam) well screens at approx. 1 to -2 mAHD.

6.4 Sample Collection and Laboratory Analysis

The surface and groundwater analytical program from May 2021 to February 2022 is presented in Tables GW-1 (groundwater) and SW-1 (surface water). The nested wells (MW-1S, MW-1D, MW-6S, MW-6D, MW-7S, MW-7D) installed in 2006 have replaced the bundled piezometers 4 (i.e. MW-1, MW-6, MW-7). The results from the nested wells are graphed separately for the water quality trend assessment.

The 6 wells located in proximity to the landfill mound (MW-1D, MW-3, MW-4, MW-5, MW-6D, MW-7D and MW-12,13,14) are monitored for ammonia on a more regular basis to assess the ammonia trends (Figure 2, Table 7).

7. Water Monitoring Results

All groundwater and surface water analytical results from 2003 to 2022 are presented in Tables GW-1 and SW-1, with the most recent (9) monitoring data highlighted. The field records and laboratory reports are presented in Appendix A and Table 6 (summary of data set). Results for the additional wells (9) to assess ammonia trends are presented in Table 7.

Compliance exceedances are noted in Appendix C (i.e. ML-3 & ML-4, and mostly at MW-11 during 2019-2020). Further investigations were recommended to assess the ammonia trends at MW-11 and links to the onsite wells (MW-6D/MW-7D, with rising ammonia trend) as the data indicates leachate plume migration towards the Blue Angle Creek and 7 Mile beach (Figure 4).

A summary of all available monitoring data (2003 to 2022) is presented in Graph-1 to Graph-7. The graphs illustrate ammonia and total phosphorous concentrations (key indicators of leachate impact) for the groundwater wells[5] and surface water sampling locations as well as the depth to groundwater (m AHD, 2001 to 2022).

The graphs illustrate the ammonia concentrations in the shallow (Graph-1) and deep monitoring wells separately (Graph 2). Contaminant migration rates and flushing characteristics are different at shallow and deep levels of the aquifer.

The graphs highlight water quality trends with respect to seasonal and water level changes, as well as water quality improvements associated with the landfill rehabilitation completed in 2005.

The monitoring data shows that ammonia concentrations at MW-3 and MW-5 have returned to low levels (generally below ANZECC 2000) in late 2017 to April 2019, with several exceptions. Elevated ammonia concentrations at three EPL wells (MW-1D, MW-6D and MW-7D) required further monitoring to assess the trends, and potential remedial actions (as required). Well MW-1d has a decreasing trend for the past year. The previously rising ammonia trend at MW-11 may have

[4] The bundled wells were believed to provide spurious results due to the low purge volumes.
[5] Results from multilevel piezometers MW-1, MW-6 and MW-7 (Graph-01 & Graph-03) are considered anomalous due to well construction issues.

related to plume migration (or catchment influences), however has recently returned to low levels and decreasing ammonia trends.

The additional wells (MW-12,13,14) monitored on the downgradient boundary indicate elevated ammonia concentrations on the east flow path (i.e. ammonia between 11.8 to 89.6 mg/L). The ammonia concentrations on the eastern boundary have stabilised from the previous monitoring period.

7.1 Groundwater Data

Groundwater was collected from a network of twelve monitoring wells at onsite and offsite locations (Figure 2) from May 2021 to February 2022. The results of the groundwater results obtained are summarised in Table GW-1, Graph-1 to Graph-5 and the following subsections.

7.1.1 Groundwater Depth and Flow Regime

The depth to groundwater was measured prior to each sampling event (in conventional wells) using a water level probe. The depth to the groundwater below top of casing and relative to a common reference (i.e. Australian Height Datum, m AHD) is presented in Table GW-1. The inferred groundwater contours are presented in Figures 3A & 3B. Reduced groundwater levels (m AHD) between 2001 and 2022 is illustrated in Graph-5.

A broad groundwater divide is interpreted to occur at the landfill mound (sand dune area) and inferred to be located midway between Crooked River and Seven Mile Beach. As the position of the groundwater divide is influenced by the surface water bodies, the prevailing dry climate and recharge through the waste mound, it is likely local groundwater flow characteristics have altered over recent years. The drought conditions indicate a relatively flat hydraulic gradient directed to the west and east, respectively.

The drought period (2017 to 2019/2020) is interpreted to increase ammonia concentration around the landfill mound. The increased ammonia is interpreted to arise from the lower rainfall/runoff input and recharge over the leachate plume (i.e. less dilution from rainfall recharge) and plume movement from under the mound. The higher rainfall during 2021-2022 has stabilised and decreased the previous ammonia trend.

The reduced groundwater levels from the twelve wells indicate a moderate water table elevation. Field sampling records show that the depth to groundwater between October 2003 and February 2012 is below 1.87 mAHD. The groundwater levels recorded from the 2011-2012-2013, 2014-2015 monitoring round are similar to slighter lower than the 2015-2016 monitoring period, reflecting variable rainfall patterns and leachate movement over time. The 2015-2016 wet weather and higher water table is similar to the February 2011 wet period. The water levels during 2016-2018 show a decline due to lower than average annual rainfall during 2016 to 2018. Rainfall during from June 2018 to May 2019 (860 mm/yr) is lower than previous years and is reflected in the lowering water table trend (Graph-5).

The rainfall from March 2019 to February 2020 was 774 mm/year, causing a general lowering of the water table (i.e. <1m and around 0.5m AHD at most areas). The groundwater level rose in the past year given the higher rainfall in 2020/2021 (1,152. 8 mm). Groundwater levels were similar to 2021-2022 monitoring due to the continue high rainfall (1562 mm; March 2021 to February 2022).

The inferred groundwater contours for the site are presented in Figures 3A & 3B (reflecting dry and wet weather periods). The groundwater levels and degree of mounding has become more variable over the past year. The groundwater levels reflect a dynamic groundwater environment, variable rainfall and recharge around the footprint of the capped landfill mound.

Ammonia concentrations are considered to reflect the stormwater runoff and dilution around the landfill mound.

7.1.2 Field Parameters

The groundwater, field parameters measured during sampling are considered indicative only (small purge volumes). Insitu measurements (within borehole) are likely to provide a more accurate rendition of the field chemistry, especially with respect to dissolved oxygen.

7.1.3 pH (field) and Redox

The groundwater pH measured from the twelve wells ranges from approximately pH 5.8 to PH 8.0. The pH in each well was generally stable over the monitoring rounds (May 2021 to February 2022).

On its own, pH is not considered a reliable indicator of leachate contamination, as sediments and decomposing organic material associated with the creek bed also have an influence on pH.

Redox is not consistently measured during monitoring periods. Redox potential is measured annually (August 2016, 2017, 2018, 2019, 2020) with positive values (3.5 mV to 91.8 mV) and generally more oxidising relative to previous monitoring periods (i.e. affect from higher rainfall).

7.1.4 Total Dissolved Solids (TDS and EC)

The TDS levels in groundwater collected from the site range from approximately 148 to 9,420 mg/L (fresh to brackish). The lowest and highest TDS levels were obtained from MW-5 and MW-9, respectively. The elevated TDS level for MW-9/10/11 is related to the well's proximity to Blue Angle Creek and associated tide and estuary mouth closure influences.

Salinity increases as groundwater flows towards Blue Angle Creek (MW-9 to MW-11). A decrease in salinity (TDS) occurs in several wells close the landfill perimeter (i.e. MW-3, MW-4, MW-5), which is interpreted to occur from dilution arising from an increase in stormwater runoff from the landfill mound post-capping (& decreased leachate generation).

7.1.5 Dissolved Oxygen (DO)

Field analyses from the twelve wells recorded dissolved oxygen (DO) concentrations ranging from between approximately 0.84 and 7.84 mg/L. The concentrations of DO reported for the site from 2003 to 2022 are variable. However, measurements may reflect the instruments (imprecise) used and/or purging process.

Based on the distribution of DO in the groundwater at the site, it is inferred that landfill leachate caused a depletion of groundwater DO and is generally increasing due to decreasing nutrient concentrations. This phenomenon is seen on many landfill sites, where organic carbon and nutrients provide surplus electron acceptors, which react with and consume the available DO in the groundwater. It is likely the groundwater under the landfill mound is anaerobic due to the presence of the landfill leachate (DOC, ammonia etc) and poor flushing due to the landfill capping.

7.2 Nutrients

7.2.1 Nitrogen

Groundwater collected from the monitoring wells at the GWDD were analysed for ammonia-nitrogen, total Kjeldahl nitrogen (TKN) and oxidised nitrogen (nitrate and nitrite). Discussions regarding potential impact to the environment will focus on ammonia-nitrogen, as it is the main indicator of groundwater contamination from leachate.

The guidelines for total ammonia-nitrogen for the protection of fresh water and marine ecosystems vary according to pH and temperature. Given the range of pH and temperature measured across the site and in Blue Angle Creek, the guidelines are 1.88 and 2.84 mg/L for fresh and marine waters, respectively (at a pH of 7.3).

At least one groundwater samples collected from MW-1D, MW-6D, MW-7D (& MW-12,12,14) exceeded the ANZECC (2000) trigger value for ammonia. These monitoring wells are located east or west of the landfill mound, indicating leachate is migrating towards Blue Angle Creek and the beach.

Groundwater wells (MW-1, MW-3 and MW-4 pre-rehabilitation) initially reported the highest concentrations of ammonia. Following the landfill rehabilitation, ammonia levels have declined in the shallow groundwater system and are below ANZECC guidelines (Graph-1, except MW-3 in February 2016 which is inferred as an anomaly).

Groundwater from deep wells (MW-1D, MW-6D and MW-7D) showed a consistent declining trend until 2017/2018 (& below ANZECC 2000), however an increasing ammonia trend is evident from 2019 to 2020. The well (MW-1D) shows a clear declining trend in 2021-2022, whilst the trend has become variable (up/down) for the two wells (MW-7D, MW-6D) during the 2021-2022 period.

The ammonia results from the additional wells (MW-12,13,14) indicate a continue elevated and variable (slightly decreasing) concentrations on the east side of the mound (i.e. ammonia from 11.8 to 89.67 mg/l). The trends in 2020/2022 show potential decreasing trend.

Nitrate was analysed for all samples with MW-1D, MW-6S, MW-6D, MW-7D, MW-9, MW-10 are generally below or marginally exceeded the ANZECC (2000) guideline (freshwater trigger value, 0.7 mg/L).

All groundwater samples analysed on at least occasion from all wells during May 2021 to February 2022 exceed ANZECC (2000) fresh and marine water TKN trigger values (0.5 and 0.12 mg/L, respectively). Monitoring wells located adjacent to Blue Angle Creek (i.e. MW-9, MW-10) continue to report stable or decreasing concentrations of ammonia, (Graph-1). The ammonia concentrations at MW-11 (2019-2020) indicate potential increase and landfill leachate plume migration from the landfill mound (i.e. refer to ammonia trends at MW-7D/6D). The rising trend at MW-11 decreased in the 2020-2022 monitoring period.

Table 7.1.3 (below) and Figure 4 provide an overview of groundwater ammonia trends from May 2021 to February 2022 reporting period.

Table 7.1.3: Groundwater Ammonia Trends; May 2021 to February 2022

Well ID	Ammonia Trend	Exceedance of ANZECC (2000) Ammonia	Trigger 20% exceedance (Ammonia)	Comment
MW-1S	Decreasing to stable trend. below ANZECC	No exceedance	No exceedance	Shallow sample - east of landfill. One sample; May 2021
MW-1D	Recent rising trend. Since mid 2016 to 2019 data is variable with significant ammonia spikes. All results in 2018-2022 exceeds ANZECC. Reducing Trend in 2020-2022	Yes Exceedance	No Exceedance	Deep sample - east of landfill
MW-3	Overall decreasing & stable trend. Anomalous result in February 2016 (20.9 mg/L) and 4.31 mg/L in May 2016. Stable to decreasing ammonia in 2017-2022. (Feb 2022= 2.2 mg/L)	Yes Exceedance	No exceedance	North of landfill.
MW-4	Decreasing/stable trend. below ANZECC	No Exceedance	No exceedance	West of landfill
MW-5	Overall decreasing trend. Two ammonia results in mid 2016 exceed ANZECC (6.93 mg/L). Stable/decrease ammonia in 2017 - 2022	No Exceedance	No Exceedance	North of landfill.
MW-6S	Stable & reducing trend, below ANZECC (dry well – no samples 2021-2022)	No Exceedance	No Exceedance	Shallow sample - down-gradient of night soil deposit
MW-6D	Recent increasing & variable trend. Elevated and spiked ammonia results in 2017-2021 indicating variability and rising trend. Results in 2019-21 exceed ANZECC (2000)	Yes Exceedance	No Exceedance	Deep sample - down-gradient of night soil deposit
MW-7S	Decreasing/Stabilising trend. below ANZECC	No exceedance	No exceedance	Shallow sample - down-gradient and adjacent to Crooked River Road
MW-7D	Former decrease/stable trend to a rising trend (2019-20). Stable to variable trend in 2020 to 2022. Ammonia generally below 1 mg/L prior to mid 2018, and variable to 2022.	Yes Exceedance	No Exceedance	Deep sample - down-gradient and adjacent to Crooked River Road
MW-9	Stable/decreasing trend. below ANZECC	No exceedance	No exceedance	Next to Blue Angle Creek
MW-10	Stable/decreasing trend. below ANZECC	No exceedance	No exceedance	Next to Blue Angle Creek. 1 sample only in Nov2021
MW-11	Former decrease/Stabile trend to a rising trend (2019-20) & decreasing trend in 2020 to 2022	No Exceedance	No Exceedance	Next to Blue Angle Creek

Note: Three wells (MW-9, 10, 11) are located on the creek bank, potentially affected by flood waters and vegetation. ANZECC (2000) refers the marine trigger value (2.84 mg/L). The TKN/Ammonia ratio for MW-9/MW-10 are different to MW-11 (i.e. similar to MW7D/6D ammonia).

As outlined in the revocation notice, ammonia concentrations greater than 20% above ammonia concentrations reported in Table GW-1 of Kiama Municipal Council, Gerroa Waste Disposal

Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007, dated 17 August 2007 are to be highlighted (refer to Appendix C).

The results from ML-3 and ML-4 for the 2021 to 2022 period exceededed the 10% trigger value.

7.2.2 Total Phosphorus (TP)

The ANZECC (2000) TP guideline for fresh and marine ecosystems is 0.05 and 0.025 mg/L, respectively. Between May 2021 and February 2022, all groundwater sample results exceeded the ANZECC (2000) trigger values (Table GW-1 and Graphs 3 & 4).

The well MW-6D (former night soil deposit) reported a maximum of 12.1 mg/L on 10 November 2016. TP was at 6.84 mg/L in the 2011-2012 monitoring period, however decreased to a maximum of 4.8 mg/L in the 2012-2013 monitoring period. In 2013-2014 and 2014 -2015 total phosphorous was a maximum of 9.07 mg/L and 3.93 mg/L, respectively indicating variability.

In November 2015 the TP was reported at 12 mg/L at MW-6D. The highest TP was 2.54 mg/L from August 2018 to February 2019. During the 2019 to 2020 monitoring period, TP was more stable and ranged from 2.48 to 3.54 mg/L. TP ranged from 2.52 to 3.76 mg/L at MW-6D during 2020 to 2021.

The well (MW-7D) reported a maximum (TP =8.14 mg/L in November 2015) which is similar to previous years (TP =8.46 mg/L, November 2014). TP at MW-6D and MW-7D (near former night soil) shows variability (Graph-4) and may relate to the 2013 dewatering/sludge pond decommissioning and mobilisation of nutrients during rainfall. TP concentrations are relatively stable during 2019-2020, and 2020-2021 which ranged from 0.8 to 1.20 mg/L, and 0.81 to 0.89 mg/L, respectively.

An increase in TP occurs at MW-7D (0.84 to 1.57 mg/L) and MW-6D (3.06 to 4.06 mg/L) during the 2021-2022 monitoring period

The concentrations of TP immediately east and north of the landfill (MW-3 and MW-5) and next to Blue Angle Creek (MW-9 to MW-11) are lower, indicating that the former night soil deposit is the likely source of TP in the local groundwater.

In relation to the former night soil deposit (primary TP source), a localised TP plume is interpreted to potentially migrate towards Blue Angle Creek (MW-4/MW-6S to MW-7S, and to MW5).

The TP plume is also detected at MW-4 (south of the night soil deposit) has TP ranging from 0.19 to 1.07 mg/L during 2020 to 2021, and an increase during 2021-2022 (MW-4 TP= 1.45 to 7.04 mg/L). The high rainfall is interpreted to moibilise the TP from the former night soil area.

The lower TP concentrations (2021-2022) to the east/north (MW-3; TP= 0.24 to 0.52 mg/L, and MW-5; TP=0.15 to 0.64 mg/L) are likely to originate from the landfill mound. TP concentrations at MW-1S (eastern side of landfill) show a variable trend over time.

The TP results show variability and likely to be linked to flushing and desorption/sorption within the sandy aquifer following rainfall/runoff.

7.3 Hydrogeochemical Indicators

Concentrations of major ions (i.e. chloride, sulphate, calcium, magnesium, sodium, alkalinity and potassium) are presented in Table GW-1. The concentrations at all monitoring wells are within previously reported ranges and characterised by the ions sodium, chloride and bicarbonate (alkalinity).

The landfill is interpreted to contribute some concentrations of ions including calcium, potassium, magnesium and bicarbonate/alkalinity. Contribution of sodium and chloride is difficult to ascertain as these ions are common in the marine environments (e.g. salt spray, tidal influence) and abundant in wells close to Blue Angle Creek (MW-9, MW-10, MW-11) or in proximity to Seven Mile Beach (MW-1S, MW-1D).

7.3.1 Inorganic Contaminants (Iron, Manganese and Fluoride)

Iron concentrations were only analysed for samples collected in August for each year (2016, 2017, 2018, 2019, 2020, 2021).

Concentrations of iron (filtered at the laboratory, Aug 2021) ranged between 0.1 and 10.4 mg/L (MW-6D @ maximum). All wells (excluding MW-7s) reported concentrations above the ANZECC (2000) guideline for iron in freshwater ecosystems (0.3 mg/L). Multiple natural and landfill related sources of iron are likely to exist at the site and offsite area (lithology and landfill).

The ANZECC (2000) guideline for iron is an indicative interim working level (IIWL) and is of low reliability. No guideline is available for iron in marine water, which is more relevant for Blue Angle Creek and Crooked River receiving water bodies.

Manganese concentrations were analysed for samples collected in August 2016, 2017, 2018, 2019, 2020 & 2021. Concentrations of manganese (Aug 2021) ranged between 0.001 and 0.183 mg/L, without exceeding the ANZECC (2000) freshwater guideline (1.9 mg/L).

The levels of filterable iron and manganese are generally similar to previous reporting periods. Variation in the concentrations may also reflect turbidity of water samples and filtering procedures.

Concentrations of fluoride (analysed in August 2016, 2017, 2018, 2019, 2020) ranged from <0.1 to 0.4 mg/L, which are similar to previous reporting periods. Concentrations of fluoride (analysed in August 2021) ranged from 0.06 to 7.04 mg/L (MW4 maximum).

No reliable ANZECC (2000) guideline exists for fluoride in fresh or marine waters. Fluoride was not analysed in August 2020.

7.4 Organic Contaminants

Dissolved organic carbon (DOC) concentrations were only analysed for samples collected on the August 2016, 2017, 2018, 2019, 2020, & 2021. The concentration of dissolved organic carbon (DOC) in samples from the twelve wells ranged from 2 mg/L to 43 mg/L (maximum at MW-11). The results are generally comparable to previous monitoring periods.

No recommended ANZECC (2000) guidelines exist for DOC and used to indicate potential organic carbon related to landfill leachate (DOC is linked with elevated landfill leachate concentrations at the site).

7.5 Discussion and Trends - Groundwater

The key trends in groundwater levels and nutrient contamination from 2003 to 2022 are presented in Graph-1 to Graph-5. The recent variable ammonia trends (2015 to 2022) at deep wells (MW-1D, MW-3, MD6D) are also included in the graphs. The three deep wells (& MW-12,13,14) are monitored monthly basis (March to September 2021) to assess if any remedial/control measures are required to address the variable ammonia trends.

The monitoring data indicates that ammonia concentrations in the deep groundwater were approaching the ANZECC guidelines following landfill rehabilitation works (Graph-2). Trends for the deep wells (MW-1D, MW-6D and MW-7D) show a declining trend from 2009 to 2017/2018, however an increasing to variable trend occurring during drought conditions (up to 2020).

The higher rainfall during 2020- 2022 is interpreted to stabilise and potentially decreasing ammonia trends. The well (MW-1D) shows a consistent declining ammonia trend, with a general decrease in the nearby wells (MW-12,13,14).

The ammonia concentrations continue to be elevated (Above ANZECC 2000) on the eastern side of the landfill as shown by MW-12,13,14 (Figures 2 & 4, Table 7).

Groundwater (ammonia) trends for the three wells (MW-9, 10) located adjacent Blue Angle Creek show a stable or declining trend (Graph-1). These two wells are influenced from tides and flooding (including estuary mouth closures).

The well (MW-11) also located near the creek show variable and increasing ammonia trend up to 2020, indicating the migration of the leachate plume from the former landfill site. Ammonia has decreased rapidly at MW-11 in the 2021-2022 monitoring results. The TKN/ammonia pattern of MW-11 is similar to MW-7D/6D indicating likely landfill leachate (note: MW-9 & MW-10 have different TKN/ammonia ratios related to the creek/catchment area).

Graph-1 indicates ammonia concentrations in the shallow wells have steadily decreased (generally below guidelines) since land-filling operations at the GWDD ceased in October 2003.

Prior to landfill rehabilitation, groundwater quality trends indicate landfill leachate generation may be related to rainfall recharge into buried waste and subsequent groundwater and contaminant migration. The results post-landfill rehabilitation indicates landfill leachate concentrations in the shallow groundwater are decreasing, becoming diluted from attenuation/rainfall via runoff from the landfill mound. The potential for landfill leachate generation was significantly reduced following remedial works, as the buried waste was capped with an impervious clay barrier.

The groundwater ammonia trends (ammonia being a key landfill leachate indicator) indicate shallow groundwater quality is improving.

The deep wells (MW-1D, MW-6D, MW-7D and MW-12,13,14) indicate the leachate plume in the deep parts of the aquifer has variable ammonia trends due to the prevailing rainfall (ammonia increases during drought and decreases during floods (Table 7). Ammonia trends are interpreted to be stabilising and/or decreasing following the return to average rainfall conditions in late 2020 through to 2022.

7.6 Surface Water

Surface water sampling was undertaken in 4 quarterly events from May 2021 to February 2022. Samples were collected from five locations (ML-1, ML-2, ML-3, ML-4 and ML-5) along Blue Angle Creek (Figure 2).

The data set from the 3 sample locations (ML-1, ML-3, ML-4) is limited due to previous restricted access (i.e. land is owned by Cleary Bros with access denied for sampling).

The upstream water quality may be degraded due to farming and areas of acid soil. Sample locations, ML-1, ML-4 (upstream) are considered appropriate to assess water quality impacts from the upstream sources (CBros agricultural & sand mining).

The sample locations (ML-5 @ midstream, ML-2& ML-3 @downstream) are suitable to assess impacts from the landfill, however it is noted that the creek also receives groundwater discharge, surface water runoff from the catchment and tidal movements which diminish the potential for observable impacts from the landfill, especially during the high and low tide flows.

All analytical results for surface water monitoring points (ML-1 to ML-5) are presented in Table SW-1.

Blue Angle Creek is tidally influenced and has a marine water influence at all sample locations, as shown by the broad range of TDS/conductivity results (i.e. fresh to saline, Table SW-1). The variable nutrient results (ammonia, TKN) at all surface water locations is interpreted to related to the water quality changes during high and low tide.

The surface water monitoring data at upstream/downstream locations is variable and likely to reflect a combination of tidal sampling regimes and inputs from the broader catchment area (e.g. samples should be coordinated with the tide so that both creek samples are collected during a run-out tide when the maximum amount of groundwater (potential leachate) discharges into the creek).

7.6.1 Field Parameters

pH (field) and Redox

The pH was similar at ML-1 to ML-5 and ranged from pH 6.3 to 8.4. Sampling results generally indicate that pH is more variable at upstream areas with Blue Angle Creek and may relate to the acid soils and runoff in the catchment.

Redox was measured in August 2016, 2017, 2018, 2019, 2020, & 2021 monitoring period at all five locations. Redox ranged from 45.9 to 54.8 mV from upstream to downstream creek locations (note: a slightly oxidising environment).

Total Dissolved Solids (TDS and EC)

Restricted access has limited the assessment of upstream and downstream locations in previous years. The monitoring data indicates large fluctuations in TDS/EC due to the tide (low, high) at all five locations. The TDS concentration upstream of the flood gates (ML-1, ML-3, ML-4) was less than those recorded downstream of the flood gates (ML-2).

The EC ranges from 532 uS/cm to 16,200 uS/cm, whilst the TDS ranges from 356 mg/L to 19,600 mg/L at ML-1 to ML-5.

The surface water samples are located in the creek that is known to be influenced by tides. The presence of mangroves and other aquatic plants also reflects the typically saline water in Blue Angle Creek.

Groundwater samples collected from MW-9, MW-10 and MW-11 are also brackish/saline (but less than the surface water) indicating a hydraulic connection with the tides in Blue Angle Creek. This data indicates that tidal waters from Crooked River Estuary can influence water quality and elevate the salinity of the 3 wells (MW-9, MW-10 and MW-11).

7.6.2 Nutrients

Nitrogen

Concentrations of ammonia in the surface waters collected from Blue Angle Creek have been and continue to vary with time (Graph-6 and Table 7.2.2). The upstream catchment area of Blue Angle creek has sand mining, and improved pastures and grazing (i.e. agricultural sources of nutrients).

Table 7.2.2: Surface Water Ammonia Trends – May 2021 to February 2022

Sample ID	Minimum (mg/L)	Maximum (mg/L)	Trend*	Trigger 10% Exceedance of Ammonia &Comments
ML-1	0.12	0.66	Increasing	No. Limited site access & below ANZECC guidelines
ML-2	0.15	1.0	Increasing	No. below ANZECC guidelines
ML-3	0.08	0.8	Increasing	Yes. below ANZECC guidelines
ML-4	0.08	1.44	Increasing	Yes below ANZECC guidelines
ML-5	0.15	1.92	Increasing	No Above ANZECC guidelines (FW).

*Note: Trend *= relates to increased in ammonia concentrations at each location from May 2021 to February 2022 relative to May 2020 to February 2021. All ammonia results (except ML-5 for FW) were all below the ANZECC (2000, MW) guidelines and results are similar or higher than the previous round. Highest concentrations generally associated with February 2022 due to high monthly rainfall (except ML-5 in August 2021).*

Highest ammonia (ML-5 @ 1.92 mg/L) concentration is associated with high TKN (2.9 mg/L), brackish water (TDS= 6,420 mg/L) which is inferred to reflect background water quality (downstream of fertilised farms, sewerage treatment plant) and potentially the landfill. The ammonia concentrations at the nearby well (MW-11) was showing a rising trend during 2018 to 2020, however has declined during 2021 to 2022.

Sampling at ML-5 (resumed in November 2008 but had not been sampled since October 2004) indicates that the water quality is variable (Table SW-1), indicating multiple pollutant sources and tidal influence.

Previous restricted access to upstream locations (ML-1, ML-3 and ML-4) limits conclusions regarding impacts due to the limited data set and dynamic environment of the creek. E2W note the recent ammonia results (2021 to 2022) from the five sample location indicate a potential rise in ammonia concentrations. However, the data set is variable given the salinity and different tide levels during sampling from upstream to downstream locations.

Elevated ammonia (&TKN) in surface water compared to groundwater wells in proximity to the creek (MW-9, MW-10, and MW-11) indicates that sources of ammonia also occur from the upstream catchment area (agricultural land and fertiliser use).

Concentrations of TKN exceeded the ANZECC (2000) guidelines for fresh and marine waters for all samples collected along Blue Angle Creek. The highest TKN concentration was reported at the mid stream location (ML-5 = 2.9 mg/L @ 25 November 2021), which may also indicate the influence of fertiliser and degraded runoff from the surrounding agricultural activities. Concentrations of TKN in groundwater are also elevated, but are similar to ammonia levels.

Increases in nitrogen from upstream and downstream of the landfill have been observed during previous monitoring periods. While these increases may be attributable to the discharge of ammonia-rich groundwater from the landfill, other sources (random) of nitrogen input such as runoff from sub-catchments and nutrients bound in sediments cannot be discounted. It is also possible that poor quality estuarine waters from Crooked River move up Blue Angle Creek during tidal cycles. Sewerage discharges into sand dunes may also occur due to capacity issues at the Gerroa sewerage treatment plant.

Interpretation of the nutrients into surface water bodies from the landfill is complicated by the sampling regime (i.e. sampling at various tides) and other potential sources of nitrogen. The fluctuating flow regime near Blue Angle Creek and wet weather events may reduce the potential for landfill leachate to impact the creek.

The recent monitoring data and lower ammonia at MW-11 and MW-7D/MW-6D indicate that multiple sources of nutrients influence the creek, especially during periods of high rainfall

Total organic carbon (TOC) was not measured during the 2018 to 2022 monitoring periods.

As stipulated in the revocation notice, ammonia concentrations greater than 10% above ammonia concentrations reported in Table SW-1 of Kiama Municipal Council, Gerroa Waste Disposal Depot - Annual Groundwater and Surface Water Monitoring Report - August 2006 to May 2007, dated 17 August 2007 are to be highlighted (Appendix C).

Exceedances greater than the trigger (10% above ammonia) were reported at ML-3, ML-4 in the 2021-2022 monitoring period (Appendix C). The ammonia trigger (10%) exceedances for ML-3 & ML-4 are below the ANZECC 2000 guidelines.

Total Phosphorous (TP)

Concentrations of TP from Blue Angle Creek were analysed from all samples collected in May 2021 to February 2022 (Table SW-1).

Previous levels (2011-2012 monitoring period) reported an increase in TP concentrations, which exceeded the IIWLs ANZECC 2000, (fresh 0.05 mg/L, marine 0.025 mg/L) at ML-2 and ML-5 for all sampling rounds. The 2012-2013 monitoring period reported an variable increase in TP

concentrations which exceeded the ANZECC 2000, (fresh 0.05 mg/L, marine 0.025 mg/L) at ML-2 (0.05 mg/L, May 2012 and 0.13 mg/L, February 2013) and ML-5 (1.95 mg/L, February 2013). The 2013-2014 monitoring period reported two exceedences of the ANZECC 2000 guidelines for ML-2 in May 2013 & February 2014 (0.09 mg/L and 0.12 mg/L, respectively) and one exceedence at ML-5 in 2013 (0.06 mg/L).

TP concentrations at ML-2 ranged from 0.04 mg/L to 0.09 mg/L and continue to show a variable trend for 2016-2018. During 2018 to 2019, the TP concentrations at ML-2 ranged from <0.05 mg/L to 0.2 mg/L and showing an ongoing variable trend. The trend is likely to reflect the dynamic nature of the surface water and surrounding rural environment.

ML-5 reported all TP concentrations ranged from 0.05 mg/L to 0.08 mg/L in 2016-2018, and <0.05 to 0.06 mg/L from 2018 to 2019. TP is variable over time (Graph-7). The variability is considered to reflect the dynamic nature of a tidal environment and multiple sources (agriculture, natural sources and possibly the landfill).

The following TP concentrations were reported for the 2019 to 2020, **2020 to 2021, and 2021 to 2022** monitoring periods;

- ML-1. TP ranges from 0.16 to 0.26 mg/L, **<0.05 to 0.1 mg/L, and <0.02 to 0.06 mg/L.**
- ML-2. TP ranges from <0.05 to 0.24 mg/L, **<0.05 to 0.09 mg/L, and 0.03 to 0.07 mg/L.**
- ML-3. TP ranges from 0.32 to 0.36 mg/L, and **0.02 to 0.13 mg/L, and 0.03 to 0.09 mg/L.**
- ML-4. TP ranges from 0.22 to 0.31 mg/L, and **<0.01 to 0.09 mg/L, and 0.04 to 0.09 mg/L.**
- ML-5. TP ranges from <0.05 to 0.32 mg/L, **0.02 to 0.11 mg/L, and 0.02 to 0.14 mg/L**.

The TP data indicates that TP is generally similar at the five locations, and slightly higher in the upstream/midstream samples. All sample locations exceed the ANZECC (2000) guidelines for TP and TKN, which is indicative of fertiliser/agricultural activities in the catchment area. The TP concentrations in 2021/2022 are lower than the previous years (2019/2020). The elevated TP detected in groundwater next to the landfill/former night soil (e.g. MW-4) does not appear to impact Blue Angle Creek.

7.6.3 Bacteriological Contaminants

Surface water sample locations (ML-2 and ML-5) were analysed for thermotolerant (faecal) coliforms and enterococcus coliforms in August 2016, 2017 & 2018 (Table SW-1), but not during the 2019 to 2022 monitoring period. The bacterialogical results are considered to relate to the local fauna and grazing in the area, and not the landfill leachate as the micro-organisms are filtered out in the groundwater system.

Previous monitoring results are as follows:

- Sample result from ML-2 (1 CFU/100 mL) and ML-5 (1 CFU/100 mL) in August 2018 for enterococcus were below the ANZECC (2000) fresh and marine guidelines (35 CFU/100 mL). Samples result from ML-2 (44 CFU) in August 2017 for enterococcus was above ANZECC (2000) fresh and marine guidelines (35 CFU/100 mL).
- For August 2016, August 2017 and August 2018, the downstream sample (ML-2) reported enterococcus of 28, 44 and 1 CFU/100 mL respectively, whilst the midstream sample (ML-5) reported 21, 6, 1 CFU/100 mL. The results are considered to reflect seasonal and biological conditions, and not the leachate. Both locations are significantly lower than 2010-2011 monitoring period results (ML-2, 1300 CFU/100 mL and ML-5, 1200 CFU/100

mL, November 2010) but above the 2011-2012 (ML-2, 18 CFU/100 mL and ML-5, 8 CFU/100 mL) and 2012-2013 (ML-2, 4 CFU/100 mL and ML-5, 15 CFU/100 mL).

Multiple sources of coliforms exist in the creek. The rehabilitated landfill represents an insignificant contribution, due to its distance from the creek (i.e. local fauna and flora, farms) and filtering in the aquifer.

7.6.4 Inorganic Contaminants

Total or dissolved organic carbon (TOC/DOC) concentrations were not analysed during the 2019-2022, and previous 2016-2018 monitoring periods. TOC was included for November 2018 and February 2019 monitoring period.

Surface water samples from August 2016, 2017 and 2018 reported elevated concentrations of iron (ML-5 =0.23 mg/L, 0.32 mg/L, 0.18 mg/L and ML-2 = 1.07 mg/L, 0.88 mg/L, 0.18 mg/L). Concentrations were below the ANZECC 2000 guidelines (0.3 mg/L) in August 2018 to May 2019. However, the ANZECC (2000) guideline for iron in fresh water is a low reliability IIWL.

The following Fe & Mn concentrations were reported for the 2019 to 2020 monitoring period;

- ML-2. The Fe (total) = 0.14 mg/L and Mn 0.019 mg/L
- ML-5. The Fe (total) = <0.1 mg/L and Mn 0.035 mg/L

The following elevated Fe & Mn concentrations were reported for the 2020 to 2021 monitoring period, and similar to previous years;

- ML-1 to ML-5. The Fe (total) ranging from 0.54 to 0.65 mg/L
- ML-1 to ML-5. The Mn (total) ranging from 0.01 to 0.012 mg/L

The following elevated Fe & Mn concentrations were reported for the 2021 to 2022 monitoring period, and similar to previous years (except Fe= 2.54 mg/L at ML-3 @ August 2021;

- ML-1 to ML-5. The Fe (total) ranging from 0.23 to 2.54 mg/L
- ML-1 to ML-5. The Mn (total) ranging from 0.023 to 0.11 mg/L

7.6.5 Major Ions

Concentrations of major cations (sodium, potassium, alkalinity, magnesium, calcium) in the surface water (Blue Angle Creek) indicate domination of sodium (marine water influence), which is consistent with previous monitoring rounds.

7.6.6 Quality Assurance/Quality Control

Interpretive Quality Control Reports (QCI, Appendix A) were not provided by ALS (Sydney) for the surface and groundwater laboratory data. ALS is NATA accredited for the analyses performed and appropriate sample bottles and analyses were carried for the monitoring works. Sample bottles are despatched (same day) from the site to the laboratory under chain of custody procedures with appropriately trained field sampling technicians.

The analytical data is considered to be suitable for the quarterly monitoring events during 2021 to 2022.

8. Leachate Plume and Landfill Rehabilitation

The monitoring results have been used to assess potential impacts to fresh and marine aquatic ecosystems. The groundwater migrating from the former landfill discharges to Blue Angle Creek and Seven Mile Beach. The range of groundwater contaminants identified from the latest monitoring events indicates the GWDD is a source of leachate (mostly ammonia and TKN), total phosphorous and iron.

Ammonia is the primary landfill leachate indicator. However, the waste is also a source of dissolved salts, metals and organics associated with the dissolution of ions (predominantly calcium and bicarbonate).

Following the closure of the landfill in 2003 and remedial works completed by Council and E2W in February 2005, the generation and migration of ammonia has declined in the shallow and deep groundwater system (Graphs-1 & 02). Monitoring wells MW-3, MW-4 and MW-5 are considered to reflect the typical groundwater quality arising from the landfill rehabilitation (>80% decrease in ammonia over time).

The deep groundwater monitoring wells (MW-1D, MW-6D and MW-7D) installed in 2006 show water quality improvements but at a slower rate relative to the shallow groundwater. The deep groundwater takes longer to improve due to the slower groundwater flushing and climatic conditions. However, during August 2009 to 2020 the ammonia concentrations in deep wells show a decreasing trend (Graph-2). Since 2018, the deep groundwater wells (MW-1D, MW-6D, MW-7D, and MW-12,13,14) show a rising ammonia trend due to the dry weather (i.e. drought 2017 to 2020).

The ammonia trends are stabilising and decreasing from 2020-2021-2022 due to the return of average rainfall conditions. The ammonia trends are interpreted to relate climatic patterns (low rainfall; 2017-2020, higher rainfall 2021-2022) and dilution of the leachate plume from runoff and rainfall infiltration through the aquifer. The ammonia concentrations at MW-1D show a declining trend, whilst deep wells (MW-6D/MW-7D) have variable to declining trends.

The most significant contaminant is ammonia-nitrogen, with a remnant plume extending in both north-west and south-east directions reflecting flows either side of the groundwater divide. Prior to rehabilitation, leachate originating from the landfill and night soil depot infiltrated the shallow aquifer, as well as migrating under the predominant groundwater flow regime towards Seven Mile Beach and Blue Angle Creek, respectively.

E2W consider the leachate plume in the shallow groundwater has shrunk due to the decrease in leachate generation and capping of the landfill. The time series trends show that significant groundwater quality improvements occurred since landfill closure.

Monitoring results indicate a clear improvement in water quality and aquifer restoration during average rainfall conditions. The water quality trends at the site during drought conditions indicate that more time is required to restore the local groundwater quality.

Some elevated phosphorous occurs around the former night soil and is interpreted to arise from rainfall and land disturbance around the source area (i.e. removal of lined ponds in ~2011).

The landfill rehabilitation conducted between July 2004 and February 2005 has resulted in a measurable improvement in the shallow groundwater quality at GWDD. While ammonia remains elevated but has began to fall below the ANZECC 2000 guidelines in the deep groundwater, E2W

consider that water quality will continue to improve in the shallow/deep aquifer due to the reduced leachate generation, natural attenuation and return of average rainfall conditions.

The surface water results from the 2019-2022 monitoring period reported ANZECC (2000) guideline exceedences (phospherous, TKN) at all sample locations (ML-1 to ML-5). The increasing ammonia in the creek during 2020/2021 and 2021/2022 are interpreted to reflect multiple sources which are enhanced during high rainfall. The previously elevated concentrations of MW-11 (near creek) have decreased during 2021/2022 monitoring period.

The surface water environment is dynamic and influenced by tidal flushing and discharges (runoff, seepage, baseflow) from the surrounding catchment and aquifer.

8.1 Ecological Issues

Groundwater migrating from the landfill to Seven Mile Beach is diluted by the dynamic processes operating in this environment. Contaminants contained within this discharge may be diluted and dispersed via biological, chemical and physical processes occurring at the groundwater/salt water interface. Plant uptake of excess nutrients in the groundwater may also occur as the depth to groundwater becomes shallower as it approaches the beach.

The effect of nutrient-impacted groundwater discharging to Blue Angle Creek and/or Crooked River Estuary is unclear and difficult to ascertain given the variability, dynamic environment, and multiple nutrient sources in the catchment area. The landfill contaminants (ammonia, TP) are not significant risk of harm chemicals (e.g. benzene or Pb) and can be naturally attenuated (biodegraded) and taken-up and reduced by the flora.

Potential impacts of landfill leachate to Blue Angle Creek would depend on the groundwater-surface water interaction, climate and the rehabilitation works. Results from MW-9, MW-10 and MW-11 (monitoring wells adjacent creek) recently indicate a reduction in ammonia (Graph-1). Previously, MW-11 has a history of variable ammonia concentrations; however since May 2010 to February 2018 ammonia was below ANZECC guidelines. The rising ammonia trends during 2018 to 2020 are linked with the drought period (2017-2020). The current high rainfall period is interpreted to cause a declining ammonia trend in the local groundwater.

E2W interpreted that some nitrogen-impacted groundwater would discharge to the creek (and mix with other water in the estuary), however the extent of natural attenuation of the nitrogen plume prior to discharge is unclear. Attenuation is likely to occur through a combination of dilution, uptake of nutrients by the dense riparian vegetation, mixing of groundwater in the creek, flows and tides and transformation of ammonia to nitrate/nitrogen gas.

9. Conclusions

Surface and groundwater quarterly monitoring (4 EPL rounds) were completed at the GWDD by ALS from May 2021 to February 2022. An additional 5 monitoring events were conducted by ALS to assess the ammonia trends at 9 wells (MW-1D, 3, 5, 6D, 7D, 11, & MW-12, 13, 14) from March 2021 to September 2021 (Table 7). The monthly & EPL results are also used to guide any further monitoring or management/remedial requirements.

The data has been assessed by E2W to identify potential impacts to the groundwater and surface water systems. This EPL follows E2W previous report "Second Interim Groundwater Report-Gerroa Waste Disposal Depot" dated May 2018, which assessed the variable ammonia trends in several deep wells (e.g. MW-1D, MW-3, MW-6D).

The following conclusions are offered:

- The rehabilitation of the landfill mound and night soil depot (completed February 2005) has improved the local groundwater quality. The improvement to local surface water quality is not clear, and impacts are not readily discernible from landfill or background sources (agricultural, tidal water & runoff quality).
- Groundwater at the landfill site is directed towards Blue Angle Creek (base-flow discharge) and Seven Mile Beach via a groundwater salt/water interface.
- The key landfill indicator (ammonia-nitrogen) shows a decreasing/stabilising trend in shallow and deep wells located next to the landfill mound and former night soil deposit. The deep wells (e.g. MW-1D, MW-6D, MW-7D, MW-11, and MW-12,13,14 mg/L) show a rising ammonia trend for 2019-2020, however the trend is variable with general decreases during the 2020/2021 and 2021/2022 monitoring periods. Two wells (MW-11, MW-1D) show clear declining trends, whilst ammonia concentrations at MW-12,13,14 mg/L are lower than previous years. The variable ammonia trends over the past few years relates to the climate, and drought and flood periods (2017 to 2020, 2021-2022). The return of high rainfall during 2020/2021 (1152.8 mm) and 2021/2022 (1,562 mm) is interpreted to dilute decrease the ammonia due to natural attenuation (dilution, biodegradation etc).
- Concentrations (above ANZECC 2000) of nutrients, in particular ammonia, continue to be elevated and variable in the groundwater (MW-6D, MW-7D and MW-12,13,14, Figure 4).
- Catchment area characteristics, climate and tidal regime influence the water quality in Blue Angle Creek and the adjacent wells (MW-9, MW-10 and MW-11). The elevated ammonia concentrations at MW-11 (foreshore well) in 2020 has reduced to below the guidelines in 2021/2022. Concentrations of ammonia are also below ANZECC (2000) guidelines at the foreshore wells (MW-9 and MW-10) and at MW-7s (upgradient of the creek).
- Concentrations of total phosphorous (TP) in the shallow/deep groundwater is generally variable, with elevated and variable trends at MW-1D, MW-3, MW-4, MW-5, MW-6D, MW-7D. Elevated and variable TP (MW-4 TP=7.04 mg/L in February 2022) is associated with the former night soil deposits and likely spike due to high rainfall in February 2022 (446 mm rain).
- Ammonia concentrations in surface water samples collected at downstream locations (Blue Angle Creek) are generally variable, similar to previous years, and below ANZECC (2000) guidelines.
- Exceedance (greater than 10% above ammonia values in Appendix C) were reported at two surface water locations (ML-3, ML-4). Ongoing monitoring of ammonia concentrations is

required at the creek to assess any potential impacts that may arise from migration of landfill leachate.

- TP concentrations for the 2019/2020, **2020/2021**, and **2021 to 2022** monitoring periods indicate generally similar levels at the five locations, and slightly higher in the upstream/midstream samples;
  - ML-1. TP ranges from 0.16 to 0.26 mg/L, **<0.05 to 0.1 mg/L, and <0.02 to 0.06 mg/L.**
  - ML-2. TP ranges from <0.05 to 0.24 mg/L, **<0.05 to 0.09 mg/L, and 0.03 to 0.07 mg/L.**
  - ML-3. TP ranges from 0.32 to 0.36 mg/L, and **0.02 to 0.13 mg/L, and 0.03 to 0.09 mg/L.**
  - ML-4. TP ranges from 0.22 to 0.31 mg/L, and **<0.01 to 0.09 mg/L, and 0.04 to 0.09 mg/L.**
  - ML-5. TP ranges from <0.05 to 0.32 mg/L, **0.02 to 0.11 mg/L, and 0.02 to 0.14 mg/L**.

- The TP in surface water is generally variable due to the dynamic nature of the tidal creek. It is likely that water quality in Blue Angle Creek reflects other nutrient sources (i.e. high TKN, TP) in agricultural catchment, and potentially from the GWDD.
- All other water quality indicators were consistent with the previous monitoring results.
- Monitoring results indicate an improvement in water quality and aquifer restoration at the former Gerroa landfill. Additional monitoring is required to verify the ammonia trends upon the return of average rainfall conditions.

The monitoring data shows that ammonia concentrations at MW-3 and MW-5 have returned to low levels (below ANZECC 2000) since 2018 to date. Elevated ammonia concentrations at three EPL wells (MW-1D, MW-7D, MW-6D) and new wells (MW; 12,13,14, ammonia ranges from 2.9 to 89.6 mg/L) require further monitoring to assess the trends, and need for any remedial actions (i.e. extraction of groundwater, as required). The rise in ammonia at the eastern boundary is linked to the previous drought (2017-2020), with recent ammonia trends stabilising and decreasing with the return to average annual rainfall in 2021/2022.

The previous rising ammonia trends are linked to the drought period (2017-2020). The above average rainfall in past year (20121-2022) has increased aquifer recharge and dilution causing a decline in overall ammonia concentrations.

The nutrient concentrations (particularly ammonia) in the shallow and deep groundwater are likely to continue to decrease over time (note: phosphorous may take longer to decline as it is likely to adsorb/retarded by the aquifer matrix and mobilised by rainfall as evident at MW-4 (TP= 7.04 mg/L @ February 2022). The landfill capping system reduces rainfall infiltration into the buried waste (reduces leachate generation) and diverts runoff from the 3 Ha capped mound into the aquifer, causing dilution and attenuation of the residual leachate.

Monitoring of surface and groundwater conditions at the GWDD following the completion of landfill remediation has provided beneficial data regarding the effectiveness of the rehabilitation works. The "surface and shallow" groundwater quality is improving and generally meeting the ANZECC (2000) guidelines.

The monitoring data indicates that the groundwater quality is linked to climate and a longer timeframe is required for ongoing and consistent decrease of ammonia/leachate concentrations. The above average annual rainfall is likely to continue to decrease the ammonia in the groundwater across the site. The increased annual rainfall may increase some degraded stormwater runoff from agricultural areas (fertiliser) to impact Blue Angle creek.

9.1 Recommendations

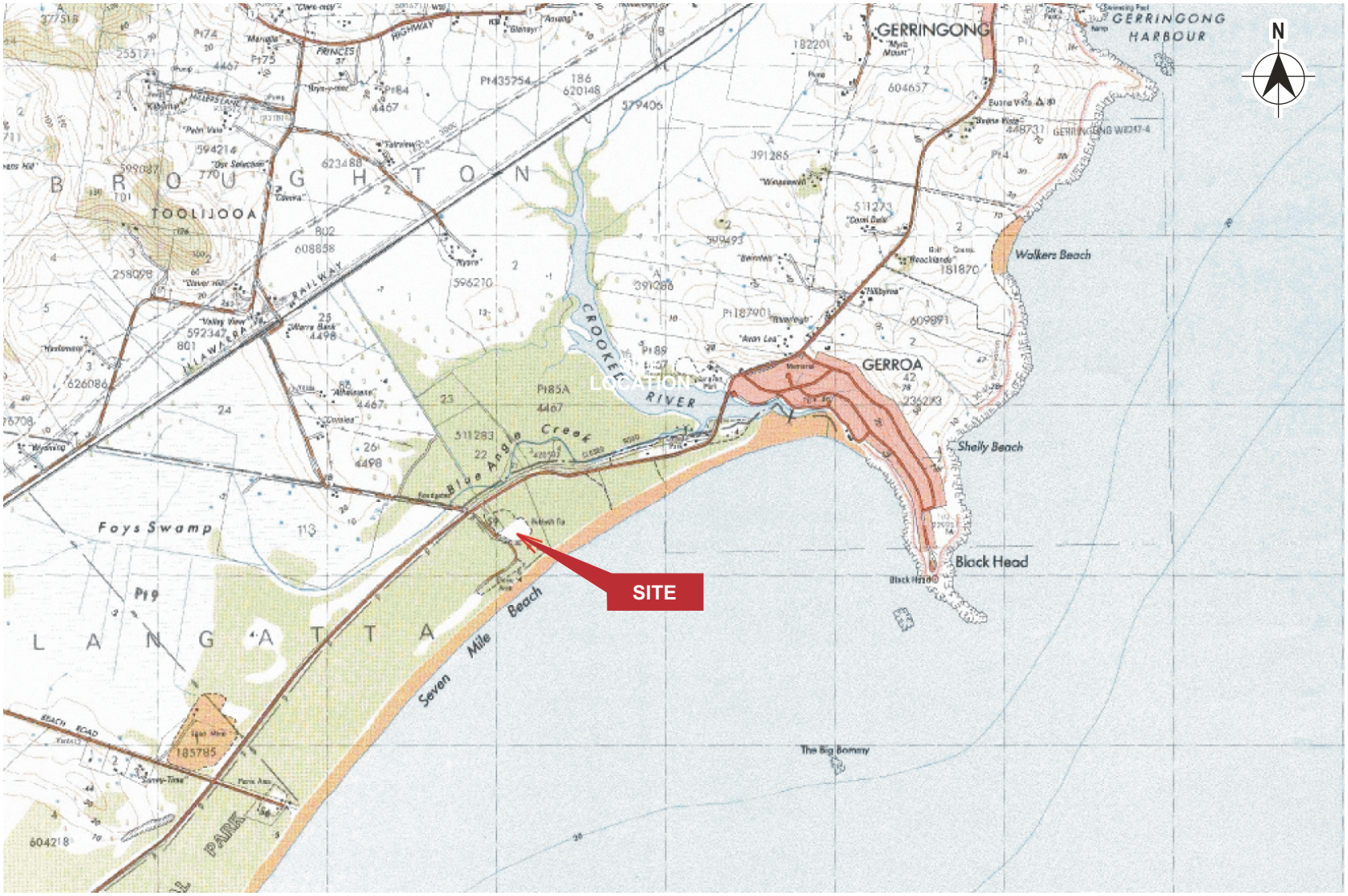
In order to improve the quality of monitoring at the site, E2W recommends that the following is incorporated into subsequent sampling rounds:

- Continue to monitor and assess ammonia trends of the 3 eastern boundary wells (MW-12,13,14) at approximately 2 month intervals. Remedial works are recommended at above 100 mg/L (ammonia) at the four wells (MW-12,13,14, MW-1D) located on the east boundary.
- E2W recommend that council should consider remedial works (e.g. such as groundwater extraction & irrigation of the mound) if the ammonia concentrations continue to rise and/or exceed 50 mg/L (ammonia) at the creek foreshore area (e.g. MW-11 or MW-7D).
- Obtain survey details (RL) for the 6 piezo-meter wells (MW-1S/MW-1D, MW-6S/MW-6D and MW-7S/MW-7D) to enable reduction of groundwater levels to mAHD.
- Assess quality assurance/control from laboratory and perform re-analyses for elevated results.
- Review tidal charts and climate prior to surface water sampling. Sample collection should be co-ordinated with the tide so that both creek samples are collected during a low run-out tide when the maximum amount groundwater discharges into the creek.

Figures

&

Graphs



Source: *Neil Charters Pty Ltd*

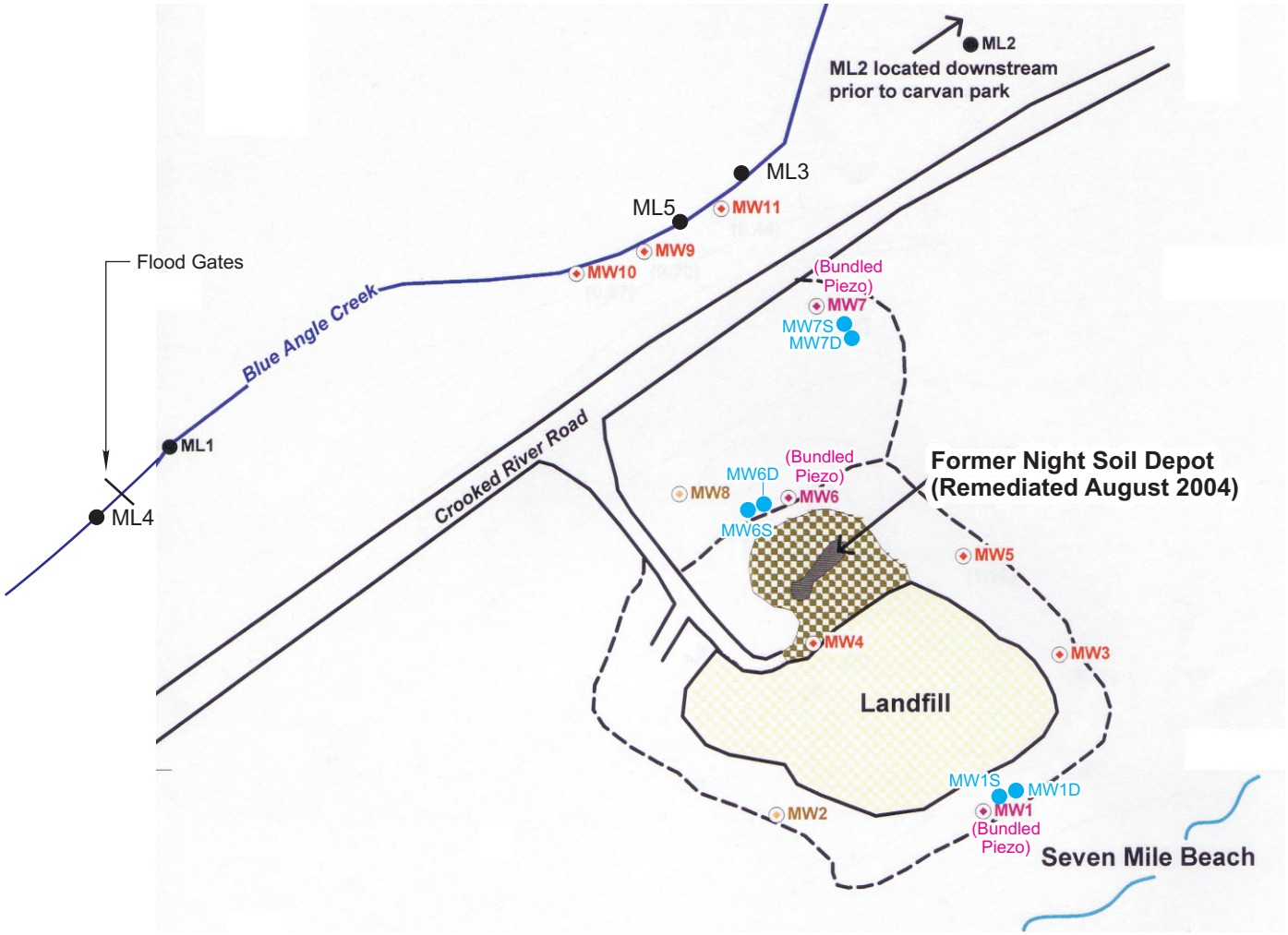
SITE LOCATION

GERROA ANNUAL MONITORING REPORT (2021-2022)

Date: *March 2022*

Reference: *E2W-025_55.cdr*

Figure 1



KEY

MW1S ● Monitoring Well - Shallow, August 2006

MW1D ● Monitoring Well - Deep, August 2006

MW1 ◉ Standard Monitoring Well

ML1 ● Surface Water Monitoring

Note: Bundled Piezometers MW1,6,7 - not sampled
ML-3 no longer sampled, ML-2 and ML-4 no access
Refer to Figure 4 for the location of MW-12,13, 14

Landfill Rehabilitation Works; 2004 to 2005

0 50 100m
Approximate Scale

Source: *URS Australia Pty Ltd*

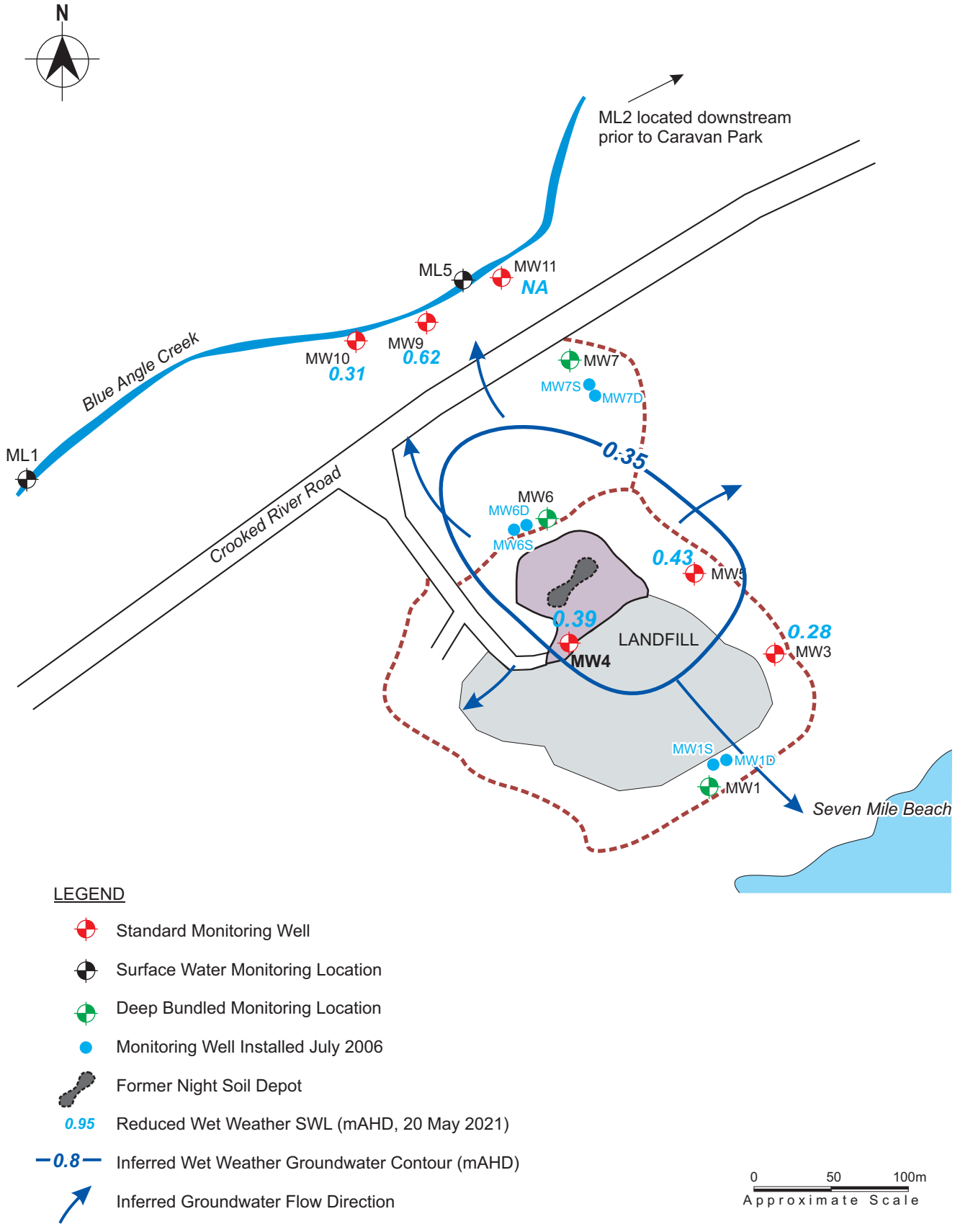
Date: *March 2022*

Reference: *E2W-025_01.cdr*

SITE LAYOUT & WELL LOCATIONS

GERROA ANNUAL MONITORING REPORT (2021-2022)

Figure 2



Source: *URS Australia Pty Ltd- baseplan*

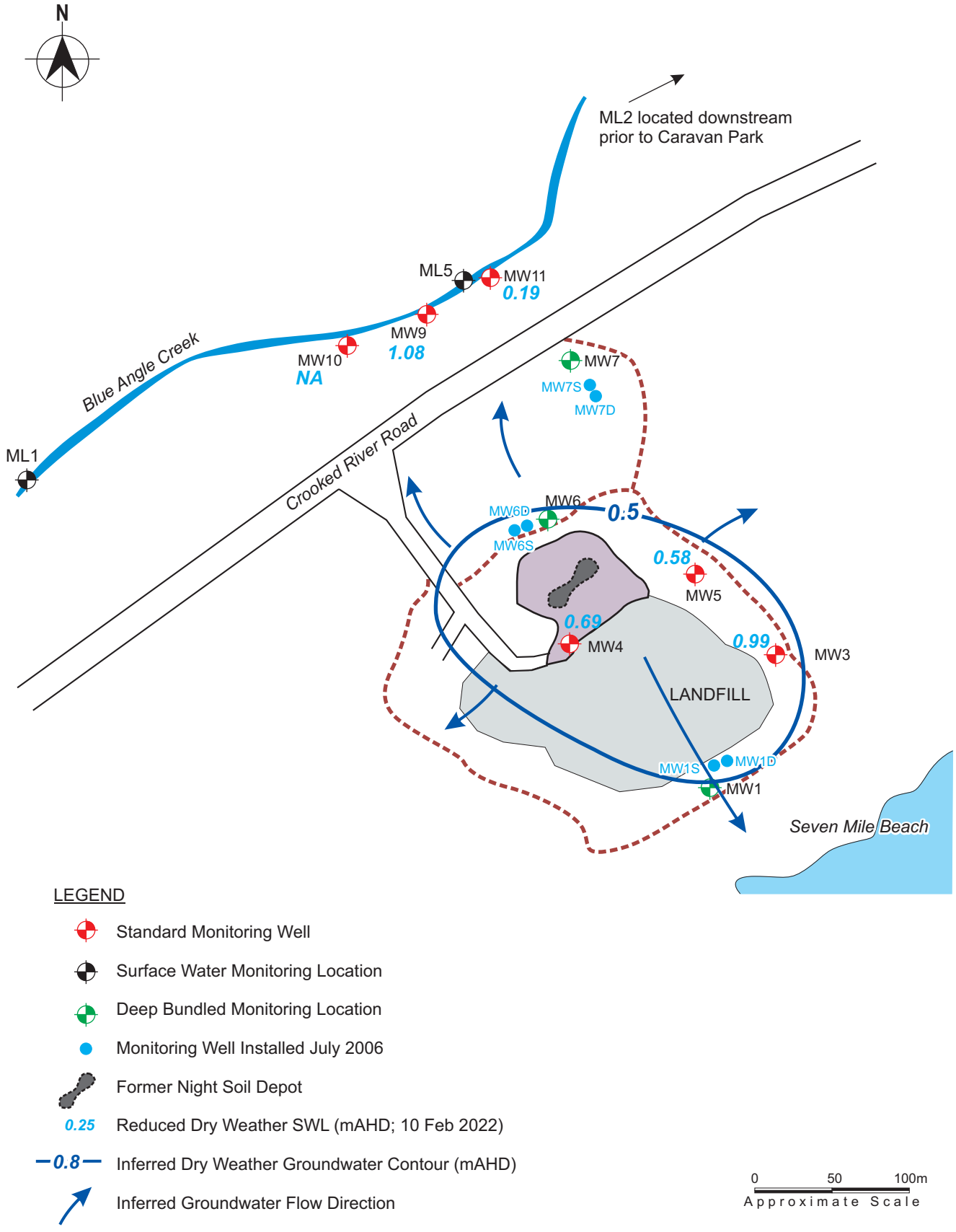
INFERRED GROUNDWATER FLOW REGIME (Dry, May 2021)

GERROA ANNUAL MONITORING REPORT (2021-2022)

Date: *March 2022*

Reference: *E2W-025_59.cdr*

Figure 3A



Source: *URS Australia Pty Ltd- baseplan*

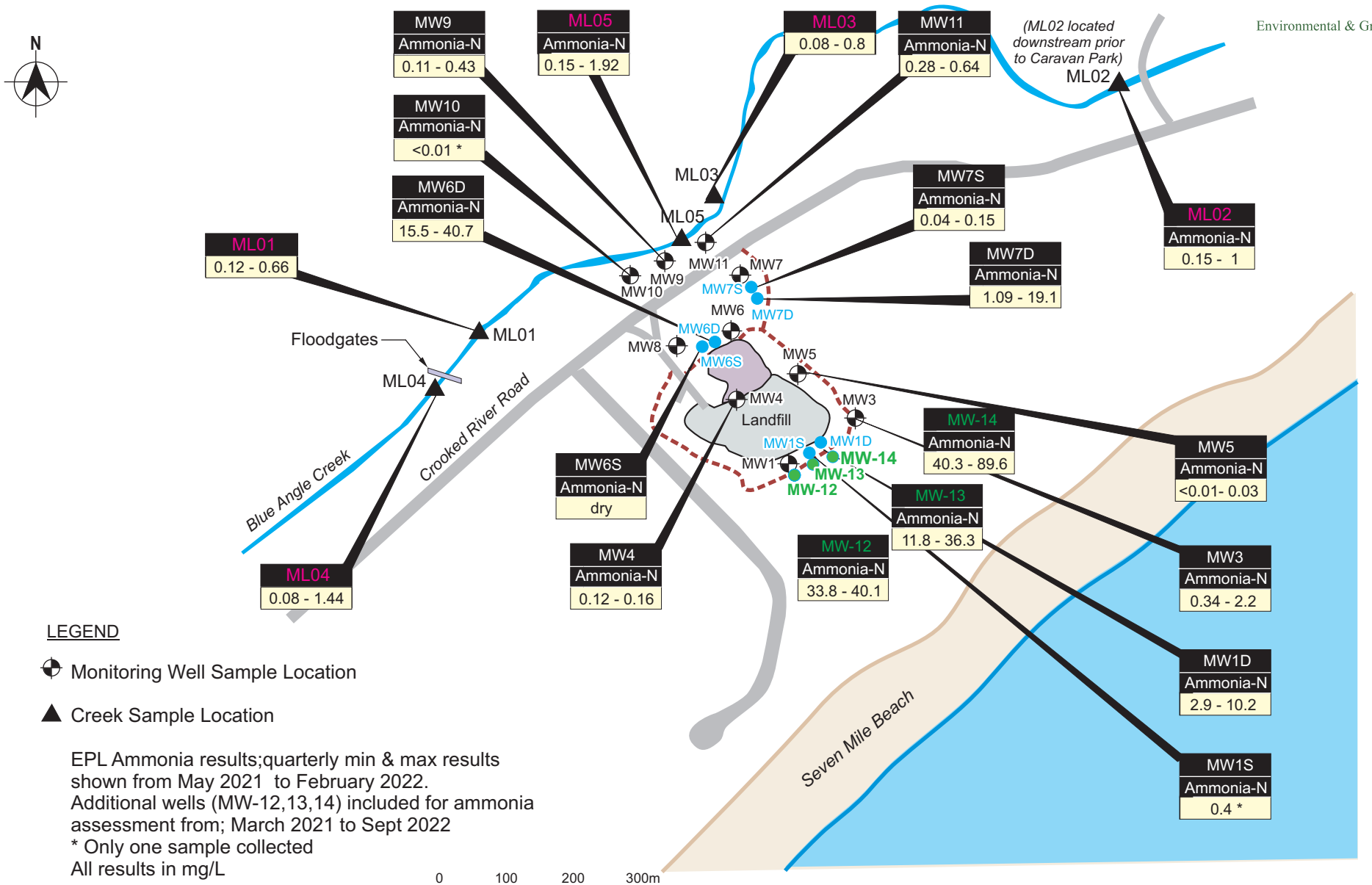
INFERRED GROUNDWATER FLOW REGIME (Wet, February 2022)

GERROA ANNUAL MONITORING REPORT (2021-2022)

Date: *March 2022*

Reference: *E2W-025_59.cdr*

Figure 3B



Source: *Base Plan, URS Australia Pty Ltd*

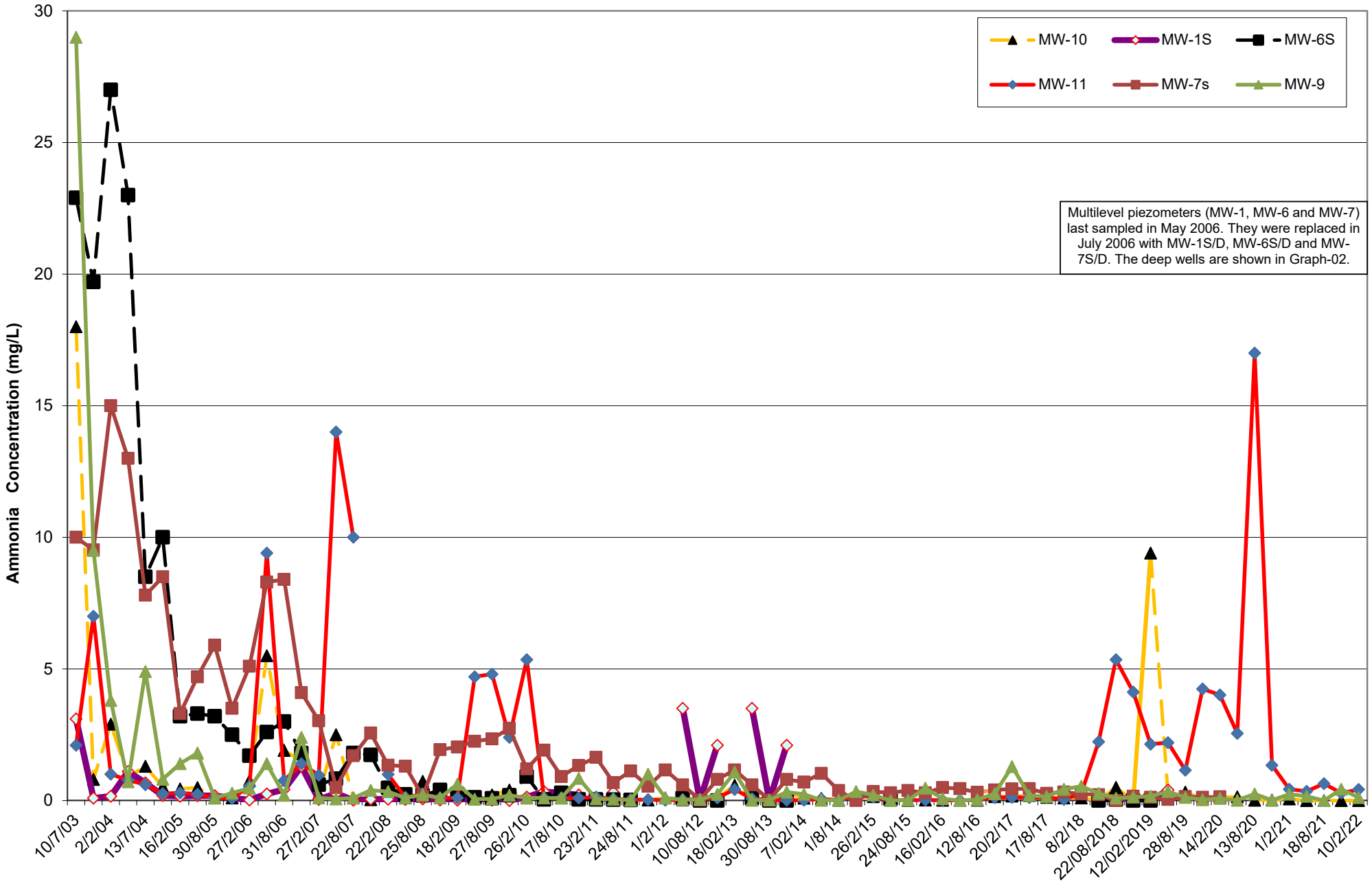
SUMMARY OF AMMONIA RESULTS (mg/L); 2021 to 2022

Date: *18 March 2022*

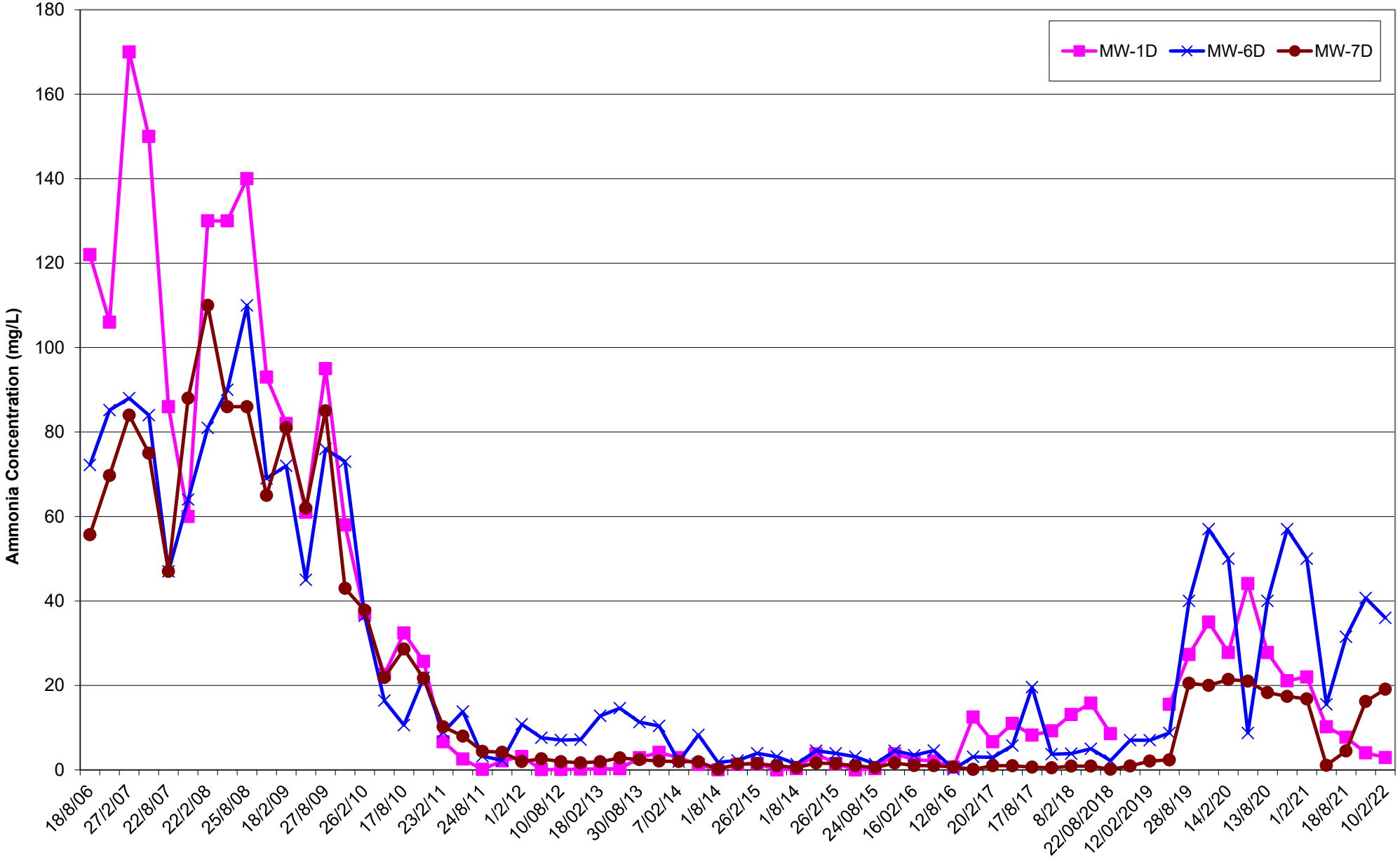
Reference: *E2W_025_58.cdr*

Figure 4

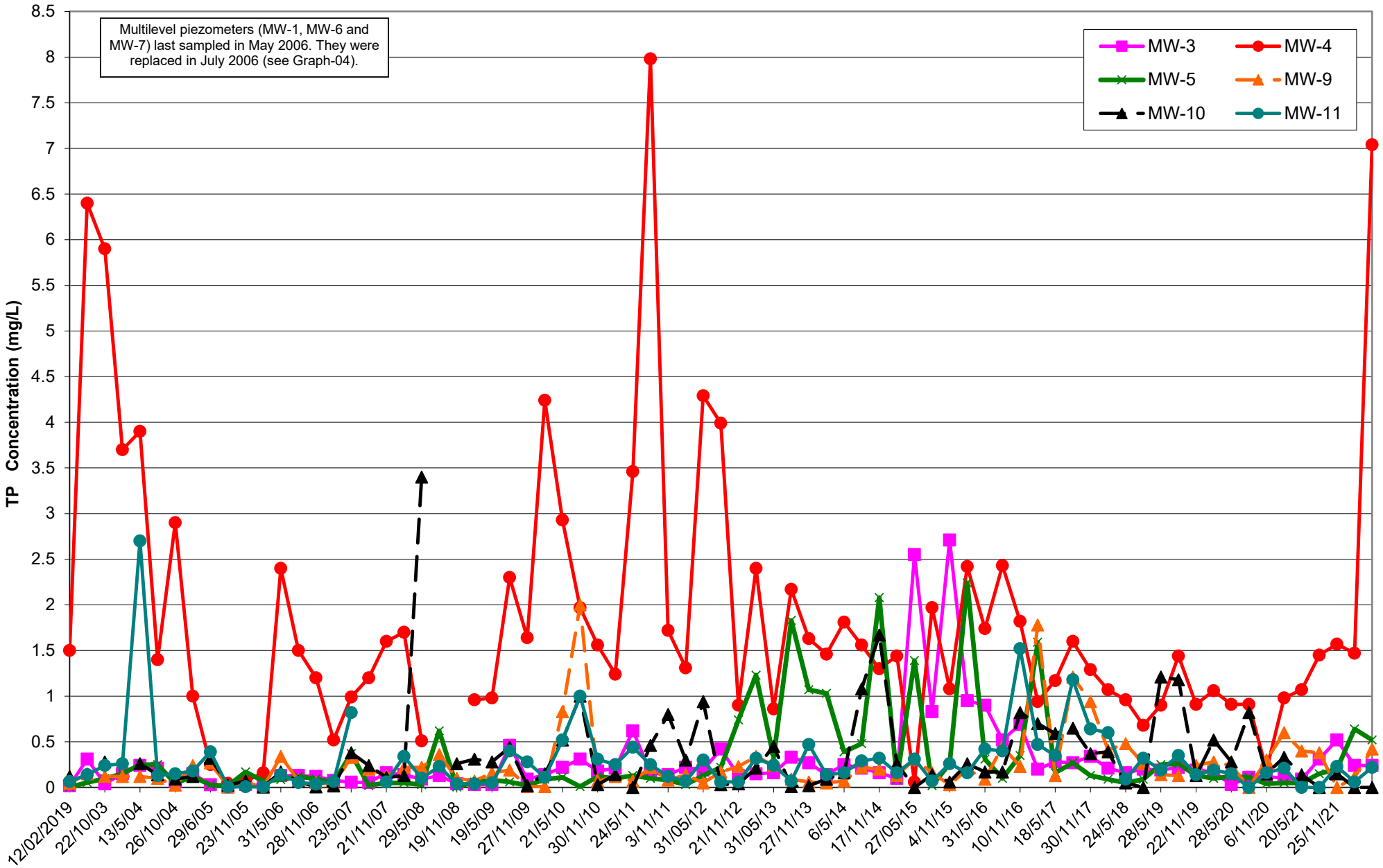
Graph-01: Groundwater Ammonia Time-Series Trends - Shallow & Creek Wells (2006 to 2022)



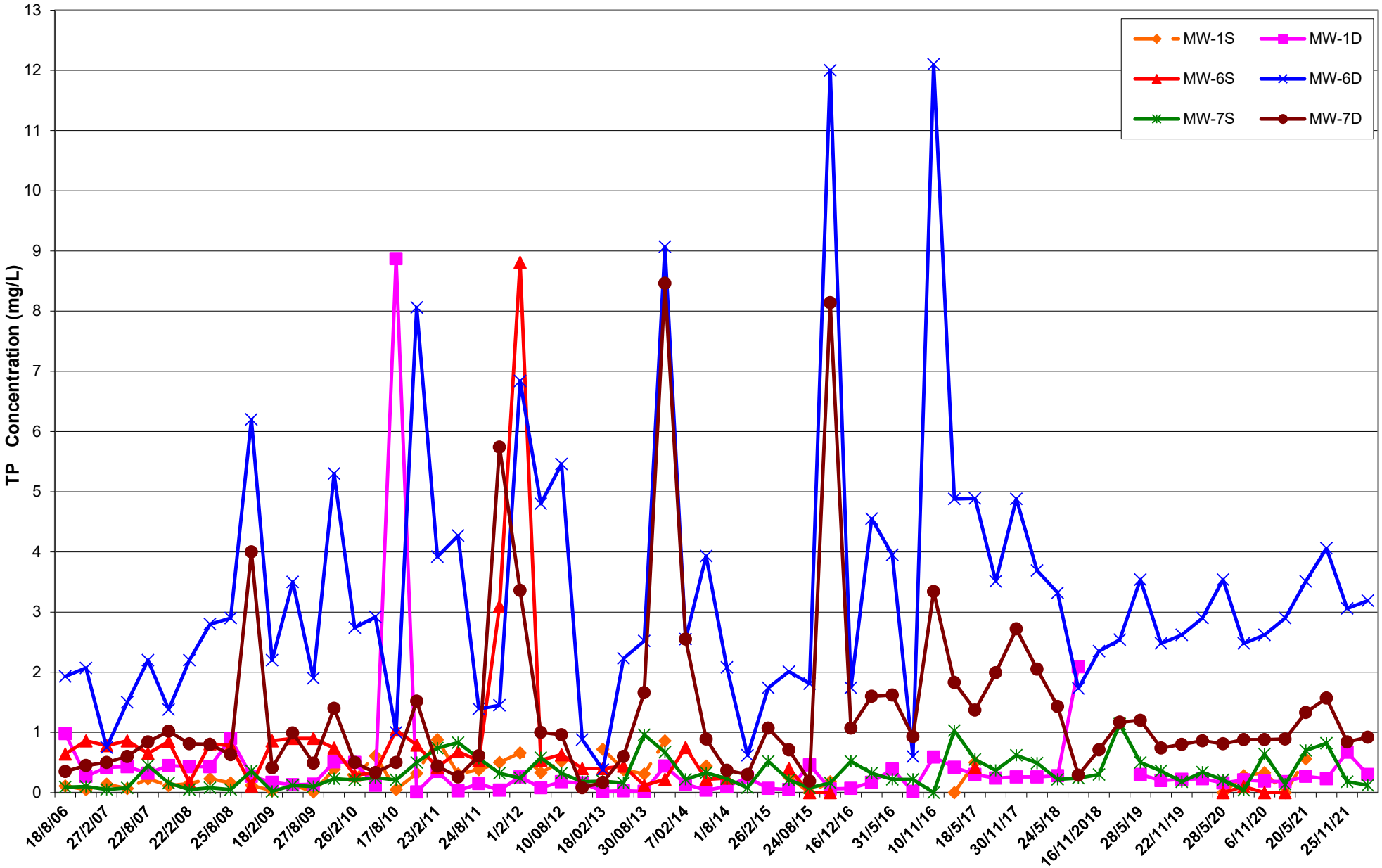
Graph -02: Groundwater Ammonia Time-Series Trends - Deep Wells (2006 to 2022)



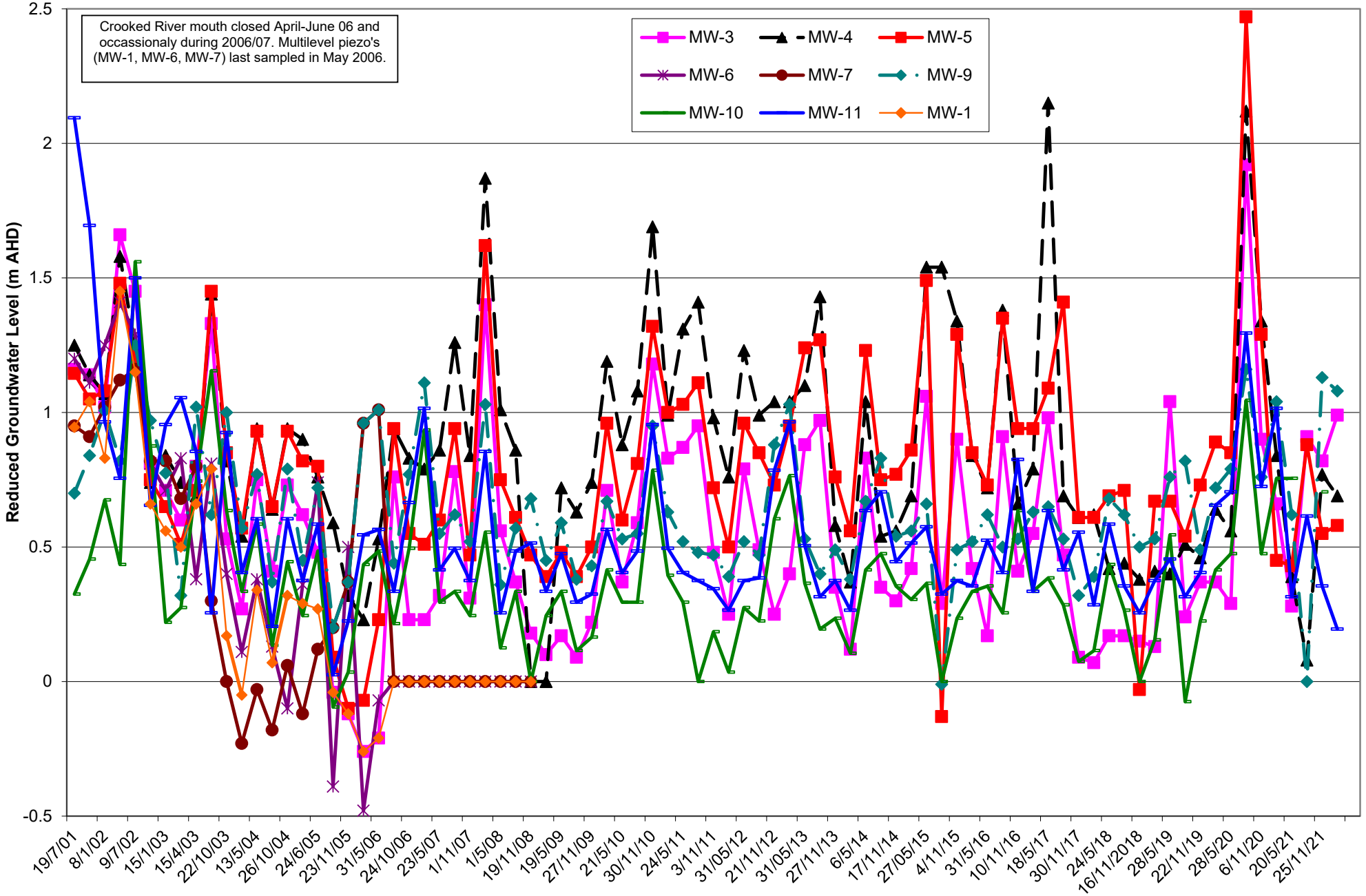
Graph-03: Groundwater Total Phosphorous Time-Series Trends - Standard Wells (2006 to 2022)



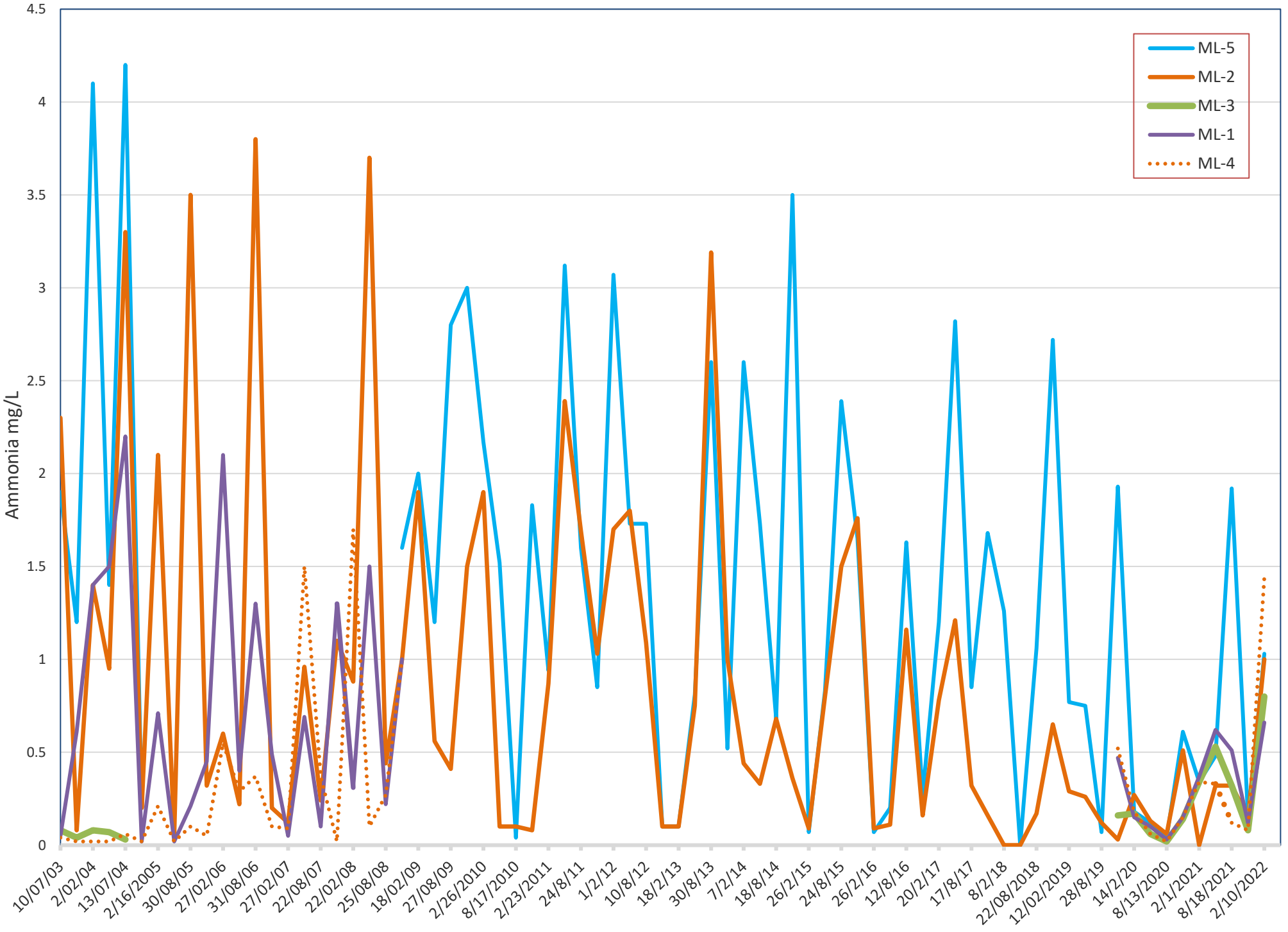
Graph-04: Groundwater Total Phosphorous Trends - New Shallow & Deep Wells (2006 to 2022)



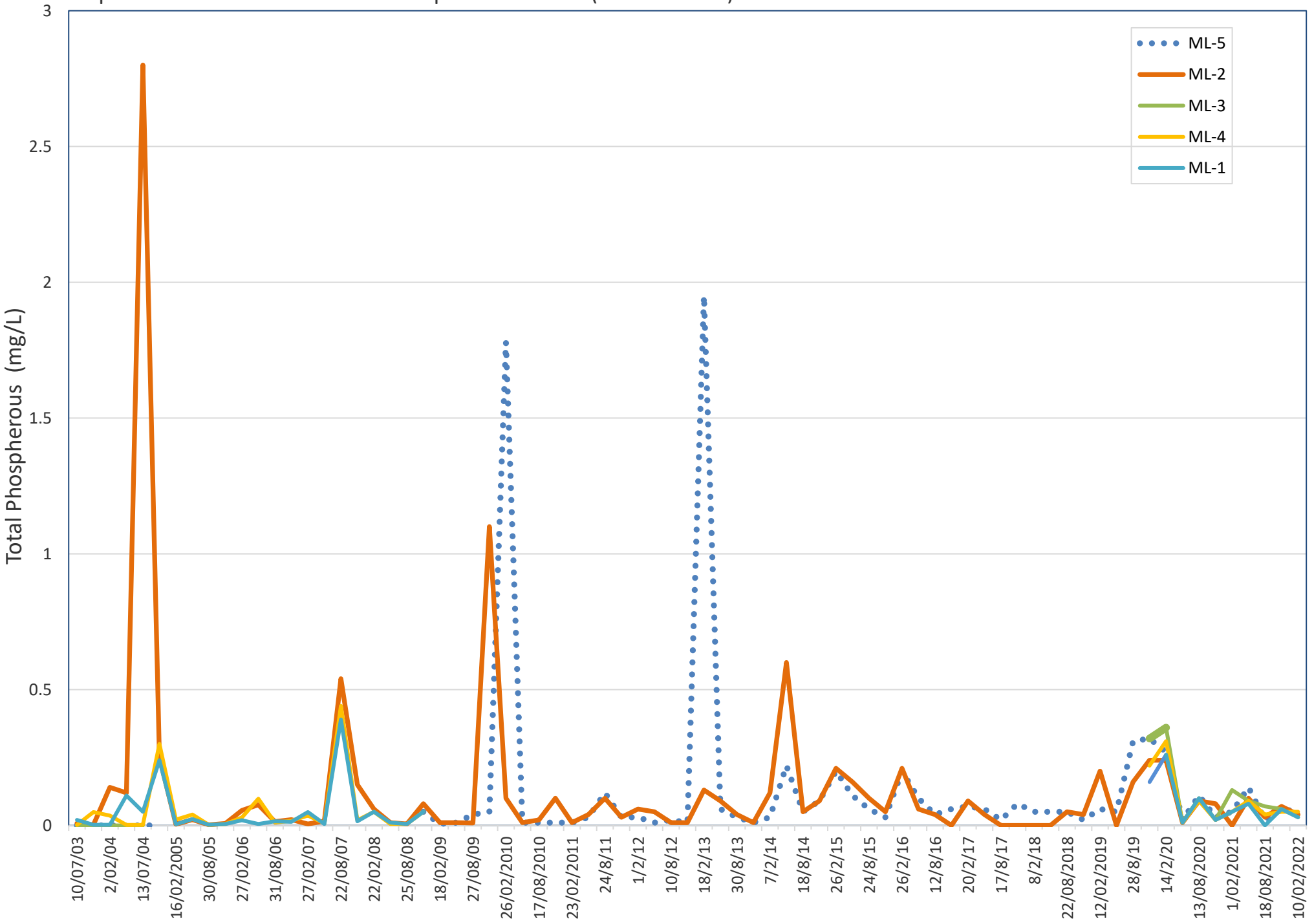
Graph-05: Depth to Groundwater (m AHD) Trends; 2001 to 2022



Graph-06: Surface Water Ammonia Trends (2003 to 2022)



Graph-07: Surface Water & Total Phospherous Trends (2003 to 2022)



Tables

Gerroa Waste Disposal Depot (2010-2022)

Sample ID	ANZECC, 2000		MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S	MW1S
Field Measurements	**Fresh**	**Marine**	21/5/10	18/2/13	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)			NA																										
Depth to Groundwater (m AHD)																													
Groundwater depth (m bTOC)			3.74	3.75	NA	NA	3.06	----	3.2	NA	NA	NA	NA	NA	3.11	NA	NA	NA	NA	NA	NA	NA	NA	4.21	----	----	----
Height of Stick up (m)			0.65	0.65			0.65		0.65						0.65						0.65	0.65		0.65	----	----	----
Groundwater Depth (mbgl)			3.09	3.1			2.41	----	2.55						2.46					----	2.24	3.21	----	3.56			
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.8	7			6.2	----	6						6.4					----	6.5	6.4	----	6.8	----	----	----
Temperature (T deg C)			-																										
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		1.95	1.1			0.772	----	0.342						0.691					----	0.482	0.315	----	663	----	----	----
Salinity (ppt)			-																										
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	1.39	1.48			2.19	----	2.2						2.29					----	2.35	4.14	----	3.1			
Dissolved Oxygen (%)			-																						----				
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-																						Dry Site	Dry Site	Dry site		
Redox Potential (mV)			-																		-44.6				----				
Comments			nc	nc																					----				
Sodium			-																	<10	61	<10	96.50		----				
Potassium			-																		2				----				
Calcium			-																		24				----				
Magnesium			-																		8				----	----	----		
Chloride			-																		111				----	----	----		
Alkalinity (as CaCO3)			386	362			102	----	51						139					----	70	76	----	49	----	----	----		
Bicarbonate			386	362			102	----	51						139					----	70	76	----	49	----				
Carbonate (as CaCO3)			<1	<1			<1	----	<1						<1					----	<1	<1	----	<1					
Sulphate (SO4)			-																	MB	<10	MB	LCS		----	----	----		
pH (lab)			-																										
Total Dissolved Solids (TDS)			1300	640			734	----	385						561					----	522	361	----	508					
Hardness (as CaCO3)			-																						----				
Total Suspended Solids (TSS)			-																						----				
Iron (filtered)	0.3 (1)		-																		**10.6**				----	----	----		
Manganese	1.90		-																		0.01				----	----	----		
Nitrate (NO3 as N)	0.7 (7)		0.26	<0.10			<0.01	----	<0.01						<0.01					----	<0.10	<0.01	----	<0.10	----	----	----		
Nitrite (NO2 as N)			<0.01	<0.10			<0.01	----	<0.01						<0.01					----	<0.10	<0.01	----	0.14	----	----	----		
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.27	0.13			0.09	----	0.23						0.31					----	<0.01	0.14	----	0.4	----				
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**4.4**	**1.8**			**3.5**	----	**2.1**						**5.5**					----	**4.3**	**2.9**	----	**5.5**	----				
Dissolved Organic Carbon			-																	----	124		----		----	----	----		
Fluoride (Electrode)			-																	----	0.3		----						
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**0.61**	**0.72**			**0.26**	----	**0.2**						**0.50**					----	**0.28**	**0.33**	----	**0.56**					

Note:

Exceeds ANZECC (2000) guidelines — **35**

marine/fresh water ecosystems

Focus of this monitoring report

nc = no comment — NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW1D	MW 1D	MW 1D	MW1D	MW1D	MW 1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14
Ground Level (m AHD)			NA												-	-	-	-
Depth to Groundwater (m AHD)															-	-	-	-
Groundwater depth (m bTOC)			3.62	3.39	2.77	3.16	3.12	3.04	3.5	3.73	3.2	3.48	3.77	3.6	3.1	3	3.64	3.54
Height of Stick up (m)			0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Groundwater Depth (mbgl)			3	2.77	2.15	2.54	2.5	2.42	2.88	3.11	2.58	2.86	3.15	2.98	2.48	2.38	3.02	2.92
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.9	7.2	6.8	7	7.30	7.60	7.60	7.50	7.80	7.5	7.5	7.5	7.30	7.5	7.5	7.5
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		2.4	2.43	2.22	1.95	1.72	11.00	1.26	0.99	0.59	<1	0.657	0.695	0.63	0.624	0.624	0.59
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.56	2.59	1.67	2.31	1.54	2.51	1.72	2.60	5.30	2.2	1.98	2.6	1.97	1.62	2.50	1.82
Dissolved Oxygen (%)			-	-	18.20	-	-	-	-	-	-	22.2			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-	-	-	-
Redox Potential (mV)			-	-	-	-	-	-91.6	-	-	-	<0.1			-	-78		-
Comments			nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	-	-	-	-
Sodium			-	-	239	-	-	118	-	-	-	22			-	22	-	-
Potassium			-	-	44	-	-	15	-	-	-	11			-	15	-	-
Calcium			-	-	115	-	-	68	-	-	-	64			-	62	-	-
Magnesium			-	-	64	-	-	27	-	-	-	23			-	24	-	-
Chloride			-	-	488	-	-	146	-	-	-	12			-	20	-	-
Alkalinity (as CaCO3)			611	494	231	345	297	316	322	363	279	288	293	292	284	316	298	254
Bicarbonate			611	494	231	345	297	316	322	363	259	288	293	292	284	316	298	254
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	21.00	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	160	-	-	34.00	-	-	-	6			-	6	-	-
pH (lab)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Dissolved Solids (TDS)			1340	1330	1420	1160	940	700	772	580	340	264	418	320	372	328	328	309
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-	-	-	-
Iron (filtered)	0.3 (1)		-	-	**9.93**	-	-	0.10	-	-	-	<0.05			-	<0.05	-	-
Manganese	1.90		-	-	0.036	-	-	0.008	-	-	-	0.001			-	0.010	-	-
Nitrate (NO3 as N)	0.7 (7)		**1.36**	**4.91**	**0.86**	**0.76**	**1.55**	**2.39**	**1.79**	<0.01	**1.57**	**2**	**2.13**	**2.38**	**1.06**	**0.97**	0.03	0.11
Nitrite (NO2 as N)			0.06	0.09	0.12	0.02	0.08	0.01	0.06	<0.01	0.01	<0.01	<0.01	<0.01	0.08	0.07	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	**22.6**	**32.4**	**25.7**	**6.67**	**2.56**	0.12	**2.15**	**3.16**	0.07	0.09	0.17	0.26	0.27	**2.88**	**4.13**	**2.9**
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**45.2**	**53.2**	**31.3**	**9.6**	**4.60**	**1.70**	**3.30**	**4.00**	**1.50**	**1.4**	**1.9**	**1.2**	**1.10**	**3.4**	**4.4**	**3.1**
Dissolved Organic Carbon			-	-	22	-	-	12	-	-	-	6			-	15	-	-
Fluoride (Electrode)			-	-	<0.1	-	-	0.2	-	-	-	0.1			-	0.2	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**0.12**	**8.87**	<0.01	**0.35**	**0.03**	**0.15**	**0.04**	**0.26**	**0.08**	**0.18**	**0.16**	0.02	0.03	0.02	**0.44**	**0.1**

Sample ID	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D
Field Measurements	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18
Ground Level (m AHD)																	
Depth to Groundwater (m AHD)																	
Groundwater depth (m bTOC)	3.15	3.65	3.68	3.54	2.92	3.84	3.09	3.6	7.81	3.08	3.56	3.46	2.99	3.46	3.9	3.90	3.83
Height of Stick up (m)	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Groundwater Depth (mbgl)	2.53	3.03	3.06	2.92	2.3	3.22	2.47	2.98	7.19	2.46	2.94	2.84	2.37	2.84	3.28	3.28	3.21
pH (field)		7.6			7.5	7.7	7.3	7.3	7.3	7.2	7.4	7.2	7.4	7.4	7.4	7.2	7.3
Temperature (T deg C)																	
Electrical Conductivity (mS/cm)		0.467	0.622	0.636	0.707	0.709	0.803	0.631	0.652	0.735	0.992	0.844	0.834	0.862	0.884	1.04	1.38
Salinity (ppt)																	
Dissolved Oxygen (mg/L)	1.88	3.50	2.90	2.50	3.45	3.05	1.71	3.7	3.00	1.98	3.40	2.97	3.20	2.90	3.1	2.12	2.74
Dissolved Oxygen (%)		36.2															
Turbidity (NTU)																	
Redox Potential (mV)		60				-37				-90.0				-115			
Comments																	
Sodium		14				37				31				48			
Potassium		10				13				13				17			
Calcium		65				72				81				62			
Magnesium		20				24				22				20			
Chloride		21				37				66				63			
Alkalinity (as CaCO3)	283	225	280	296	272	262	291	252	287	298	309	302	302	286	<1	<1	<1
Bicarbonate	283	225	280	296	272	262	291	252	287	298	309	302	302	286	333	371	358
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	333	371	358
Sulphate (SO4)						10				10				13			
pH (lab)	7.20	7.60	6.40	7.20						7.2				7.4			
Total Dissolved Solids (TDS)	272	334	397	355	379	443	480	419	378	408	476	440	460	400	466	542	671
Hardness (as CaCO3)																	
Total Suspended Solids (TSS)																	
Iron (filtered)		<0.05				<0.05				0.07				0.05			
Manganese		0.00				0.006				0.010				0.013			
Nitrate (NO3 as N)	0.17	**2.1**	**1.4**	0.35	**1.87**	0.02	0.13	0.02	0.16	**2.04**	0.02	0.53	0.03	**1.09**	**0.79**	0.03	0.04
Nitrite (NO2 as N)	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.03	0.02	0.03	<0.01	0.03	0.06	<0.01	0.02
Ammonia (NH3 as N)	1.29	0.02	1.3	1.51	<0.01	0.28	**3.78**	**2.43**	**2.08**	0.66	**12.5**	**6.65**	**11.0**	**8.22**	**9.24**	**13.1**	**15.8**
Total Kjeldhal Nitrogen (TKN)	**1.6**	**0.6**	**2.1**	**1.8**	**0.6**	**0.7**	**4.6**	**3.3**	**2.6**	**1.4**	**15.8**	**8.7**	**13.9**	**9**	**9.24**	**13.1**	**15.8**
Dissolved Organic Carbon		8				9				9				12			
Fluoride (Electrode)		0.10				0.20				0.1				0.2			
Total Phosphorus (TP)	**0.0**	**0.1**	**0.3**	**0.1**	**0.05**	**0.46**	**0.06**	**0.17**	**0.39**	**0.02**	**0.59**	**0.42**	**0.30**	**0.24**	**0.26**	**0.26**	**0.28**

Sample ID	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D	MW1D
Field Measurements	22/8/18	22/8/18	22/8/18	22/8/18	22/8/18	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)																	
Depth to Groundwater (m AHD)																	
Groundwater depth (m bTOC)	3.81	3.81	3.81	3.81	3.81	3.94	1.98	3.89	3.73	3.73	3.73	3.73	3.73	3.87	4.34	3.72	3.58
Height of Stick up (m)	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Groundwater Depth (mbgl)	3.19	3.19	3.19	3.19	3.19	3.32	1.36	3.27	3.11	3.8	2.21	3.17	3.35	3.25	3.72	3.1	2.96
pH (field)	7.5	7.5	7.5	7.5	7.5	7.4	7.2	7.2	7.2	7.4	7.3	7.4	7.3	7.4	7.7	7.2	6.8
Temperature (T deg C)																	
Electrical Conductivity (mS/cm)	1.28	1.28	1.28	1.28	1.28	1.5	1.8	1.76	1.68	1600	1580	1380	1430	1050	1270	1340	1180
Salinity (ppt)																	
Dissolved Oxygen (mg/L)	4.13	4.13	4.13	4.13	4.13	3.36	17	1.22	0.96	1.81	1.11	1.29	2.31	2.94	5.22	1.05	1.15
Dissolved Oxygen (%)																	
Turbidity (NTU)																	
Redox Potential (mV)	152	152	152	152	152		-123				-129				28.3		
Comments														----	----	----	----
Sodium	78	78	78	78	78		119			<10	116	<10	<10		112		
Potassium	24	24	24	24	24		41				36				19		
Calcium	84	84	84	84	84		94				79				108		
Magnesium	29	29	29	29	29		50				38				36		
Chloride	205	205	205	205	205		243				234				301		
Alkalinity (as CaCO3)	308	308	308	308	308	384	425	479	487	542	452	407	398	309	304	263	324
Bicarbonate	308	308	308	308	308	384	425	479	487	542	452	407	398	309	304	263	324
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)	15	15	15	15	15		101				56				18		
pH (lab)																	
Total Dissolved Solids (TDS)	647	647	647	647	647	639	878	879	812	931	812	706	706	632	904	821	672
Hardness (as CaCO3)																	
Total Suspended Solids (TSS)																	
Iron (filtered)	<0.05	<0.05	<0.05	<0.05	<0.05		**4.53**				**4.26**				**3.75**		
Manganese	0.011	0.011	0.011	0.011	0.011		0.02				0.02				0.02		
Nitrate (NO3 as N)	**1.92**	**1.92**	**1.92**	**1.92**	**1.92**	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.04	0.48	0.01	<0.01
Nitrite (NO2 as N)	0.16	0.16	0.16	0.16	0.16	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Ammonia (NH3 as N)	**8.58**	**8.58**	**8.58**	**8.58**	**8.58**	**15.5**	**27.3**	**35**	**27.8**	**44.1**	**27.8**	**21.1**	**22.0**	**10.2**	**7.7**	**4.0**	**2.9**
Total Kjeldhal Nitrogen (TKN)	**8.8**	**8.8**	**8.8**	**8.8**	**8.8**	**17.2**	**26.5**	**34.2**	**25.0**	**43.2**	**27.9**	**23.3**	**20.7**	**10.2**	**8.3**	**4.7**	**3.6**
Dissolved Organic Carbon	10	10	10	10	10		17				19				14		
Fluoride (Electrode)	0.2	0.2	0.2	0.2	0.2		0.2				0.20				0.10		
Total Phosphorus (TP)	**2.09**	**2.09**	**2.09**	**2.09**	**2.09**	**0.3**	**0.2**	**0.22**	**0.23**	**0.16**	**0.21**	**0.19**	**0.18**	**0.27**	**0.23**	**0.67**	**0.3**

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems **35**

Focus of this monitoring report

nc = no comment NA = not available

Notes:
1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
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6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
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a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW3	MW 3	MW 3	MW3	MW3	MW 3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16
Ground Level (m AHD)			4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Depth 2 Groundwater (mAHD)			0.37	0.59	1.18	0.83	0.87	0.95	0.48	0.25	0.79	0.49	0.25	0.40	0.88	0.97	0.35	0.12	0.83	0.35	0.30	0.42	1.06	0.29	0.90	0.42
Groundwater depth (m bTOC)			4.08	3.86	3.27	3.62	3.58	3.5	3.97	4.2	3.66	3.96	4.2	4.05	3.57	3.48	4.1	4.33	3.62	4.1	4.15	4.03	3.39	4.16	3.55	4.03
Height of Stick up (m)			0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Groundwater Depth (mbgl)			3.63	3.41	2.82	3.17	3.13	3.05	3.52	3.75	3.21	3.51	3.75	3.6	3.12	3.03	3.65	3.88	3.17	3.65	3.70	3.58	2.94	3.71	3.10	3.58
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7	7.1	7	7.2	7.50	7.50	7.80	7.40	7.50	7.3	7.5	7.4	7.20	7.6	7.4	7.4		7.1			7.1	7.3	7.2	7
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-	-	-	-								
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.74	0.74	0.754	0.48	0.56	0.70	0.47	0.46	0.39	<1	0.633	0.631	0.51	0.704	0.760	0.787		0.946	0.932	0.812	0.598	0.962	0.843	0.822
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-	-	-	-								
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	3	1.91	2.67	1.68	4.50	2.07	1.58	1.76	2.66	0.7	1.75	1.94	1.68	1.84	1.54	2.36	2.69	1.4	2	3.8	3.05	3.21	1.54	2.8
Dissolved Oxygen (%)			-	-	28.20	-	-	-	-	-	-	7			-	-	-	-		14.5						
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-	-	-	-								
Redox Potential (mV)			-	-	-	-	-	-81.6	-	-	-	<0.1			-	-137	-	-		-114				-138		
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc								
Sodium			-	-	71	-	-	37	-	-	-	27			-	49	-	-		86				73		
Potassium			-	-	3	-	-	2	-	-	-	3			-	3	-	-		3				3		
Calcium			-	-	90	-	-	88	-	-	-	102			-	79	-	-		117				98		
Magnesium			-	-	6	-	-	8	-	-	-	9			-	8	-	-		12				13		
Chloride			-	-	127	-	-	53	-	-	-	130			-	92	-	-		205				106		
Alkalinity (as CaCO3)			329	274	215	171	125	259	193	235	165	183	295	270	238	227	216	194	292.00	211	245	236	204	250	169	230
Bicarbonate			329	274	215	171	125	259	193	235	157	183	295	270	238	227	216	194	292.00	211	245	236	204	250	169	230
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	8.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	28	-	-	3	-	-	-	<1			-	6	-	-		11.00				13		
pH (lab)			-	-	-	-	-	-	-	-	-				-	-	-	-	7.2	7.1	6.2	6.8				
Total Dissolved Solids (TDS)			384	436	484	318	390	414	322	340	238	496	432	268	298	363	494	443	387	729	585	485	366	565	488	476
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-	-	-	-								
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-	-	-	-								
Iron (filtered)	0.3 (1)		-	-	**14.3**	-	-	**7.55**	-	-	-	**9.44**			-	**6.86**	-	-		**15.0**						
Manganese	1.90		-	-	0.109	-	-	0.07	-	-	-	0.069			-	0.064	-	-		0.127						
Nitrate (NO3 as N)	0.7 (7)		0.1	0.02	0.04	0.21	0.07	0.02	<0.01	<0.01	0.02	0.09	**0.73**	**5.59**	0.6	<0.01	0.02	0.21	<0.01	<0.01	<0.01	0.06	0.01	0.03	0.02	0.02
Nitrite (NO2 as N)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.62	0.87	0.66	0.26	0.14	0.42	0.29	0.23	0.04	0.35	0.44	**7.78**	0.93	0.14	0.25	0.11	0.13	0.17	0.32	0.18	0.15	0.15	0.74	**20.9**
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**1.1**	**1.9**	**1.7**	**0.6**	**0.50**	**0.90**	**0.60**	**0.80**	**0.4**	0.5	**2.2**	**7.8**	**1.5**	**0.4**	**0.7**	**0.4**	0.5	**0.9**	**0.7**	**0.7**	0.5	**0.6**	**2.1**	**58.1**
Dissolved Organic Carbon			-	-	11	-	-	10	-	-	-	6			-	12	-	-		18				12		
Fluoride (Electrode)			-	-	<0.1	-	-	0.1	-	-	-	0.1			-	0.1	-	-		<0.1				0.10		
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**0.14**	**0.22**	**0.31**	**0.18**	**0.21**	**0.62**	**0.16**	**0.14**	**0.22**	**0.19**	**0.42**	**0.13**	**0.15**	**0.16**	**0.33**	**0.27**	**0.14**	**0.25**	**0.21**	**0.16**	**0.1**	**2.55**	**0.83**	**2.71**

Sample ID	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3
Field Measurements	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18	22/8/18	16/11/18	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Depth 2 Groundwater (mAHD)	0.17	0.91	0.41	0.55	0.98	0.47	0.09	0.07	0.17	0.17	0.15	0.13	1.04	0.24	0.37	0.37	0.29	1.92	0.90	0.66	0.28	0.91	0.82	0.99
Groundwater depth (m bTOC)	4.28	3.54	4.04	3.90	3.47	3.98	4.36	4.38	4.28	4.28	4.30	4.32	3.41	4.21	4.08	4.08	4.16	2.53	3.55	3.79	4.17	3.54	3.63	3.46
Height of Stick up (m)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Groundwater Depth (mbgl)	3.83	3.09	3.59	3.45	3.02	3.53	3.91	3.93	3.83	3.83	3.85	3.87	2.96	3.76	3.63	3.63	3.71	2.08	3.10	3.34	3.72	3.09	3.18	3.01
pH (field)	7.0	7.2	7.6	7.1	7.3	7.4	7.3	7.2	7.3	7.2	7.1	7.4	7.9	7.4	7.4	7.3	7.6	7.4	7.4	7.4	7.6	7.6	7.7	7.0
Temperature (T deg C)																								
Electrical Conductivity (mS/cm)	0.701	0.84	0.795	0.755	0.733	0.625	0.425	0.394	0.391	0.4	0.393	0.394	0.467	0.526	0.435	0.59	0.805	0.413	0.543	0.709	709	910	851	817
Salinity (ppt)																								
Dissolved Oxygen (mg/L)	1.38	2.46	3.01	1.86	2.41	1.80	2.88	2.27	3.53	4.16			3.48	3.12	2.61	9	4.03	1.08	1.67	2.47	3.57	5.76	2.77	1.72
Dissolved Oxygen (%)																								
Turbidity (NTU)																								
Redox Potential (mV)		-35.0				-134				77.1				-113				-132				85.7		
Comments																					----	----	----	----
Sodium		89				65				10				25			101	12	96.7	106		119		
Potassium		2				2				2				4				3				5		
Calcium		73				50				54				77				61				92		
Magnesium		11				7				5				6				5				10		
Chloride		126				52				27				61				25				211		
Alkalinity (as CaCO3)	238	253	217	254	201	208	<1	<1	<1	147	139	145	78	182	207	182	213	176	180	162	202	248	160	197
Bicarbonate	238	253	217	254	201	208	216	188	172	147	139	145	78	182	207	182	213	176	180	162	202	248	160	197
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	216	188	172	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)		13				1				<1				<1				<1				19		
pH (lab)																								
Total Dissolved Solids (TDS)	446	440	464	432	412	355	292	267	195	219	224	300	244	337	288	380	551	276	328	470	444	669	548	466
Hardness (as CaCO3)																								
Total Suspended Solids (TSS)																								
Iron (filtered)		**0.32**				**5.03**				**2.12**				**3.93**				**3.58**				**3.76**		
Manganese		0.110				0.092				0.050				0.107				0.049				0.11		
Nitrate (NO3 as N)	0.04	0.08	0.09	0.05	0.05	0.01	**1.1**	**1.1**	**0.9**	0.04	0.09	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.03	0.09	0.05	<0.01
Nitrite (NO2 as N)	0.02	<0.01	<0.01	0.02	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	**4.31**	0.56	**1.30**	0.43	0.18	0.19	0.24	0.27	0.3	0.21	0.64	0.30	0.34	0.38	0.37	0.42	0.44	0.22	0.3	0.35	0.35	0.34	0.68	**2.2**
Total Kjeldhal Nitrogen (TKN)	**5.9**	**2.9**	**3.4**	**3.2**	**1.2**	**1.3**	0.02	0.05	0.03	0.4	**0.7**	**0.8**	**0.8**	**0.8**	**0.9**	**1.4**	**1.1**	**0.5**	**0.5**	**0.8**	**1.0**	**2.0**	**1.7**	**2.7**
Dissolved Organic Carbon		11				21				7	3.23	2.76		9.00				11.00				16.00		
Fluoride (Electrode)		0.2				0.2				0.2				0.2				0.2				0.2		
Total Phosphorus (TP)	**0.95**	**0.90**	**0.52**	**0.69**	**0.20**	**0.28**	**0.27**	**0.34**	**0.21**	**0.16**	**0.20**	**0.19**	**0.22**	**0.19**	**0.17**	**0.03**	**0.11**	**0.12**	**0.1**	**0.09**	**0.31**	**0.52**	**0.24**	**0.24**

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems **35**

Focus of this monitoring report

nc = no comment NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW4	MW 4	MW 4	MW4	MW4	MW 4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4
Field Measurements	**Fresh**	**Marine**	**21/5/10**	**17/8/10**	**30/11/10**	**23/2/11**	**24/5/11**	**24/8/11**	**3/11/11**	**1/2/12**	**31/5/12**	**10/8/12**	**21/11/12**	**18/2/13**	**31/5/13**	**30/8/13**	**27/11/13**	**7/2/14**
Ground Level (m AHD)			4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79
Depth to Groundwater (m AHD)			0.88	1.08	1.69	0.99	1.31	1.41	0.98	0.76	1.23	0.99	1.04	1.04	1.1	1.43	0.58	0.37
Groundwater depth (m bTOC)			4.36	4.16	3.55	4.25	3.93	3.83	4.26	4.48	4.01	4.25	4.2	4.2	4.14	3.81	4.66	4.87
Height of Stick up (m)			0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Groundwater Depth (mbgl)			3.91	3.71	3.1	3.80	3.48	3.38	3.81	4.03	3.56	3.80	3.75	3.75	3.69	3.36	4.21	4.42
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.9	6.8	6.4	6.4	6.80	6.80	6.90	6.90	6.80	7	6.8	7	6.30	7	7.1	7
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.75	0.81	0.468	0.47	0.73	0.68	0.72	0.70	0.58	<1	0.7	0.829	0.44	0.47	0.632	0.683
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.55	2.32	1.46	2.21	1.78	3.09	2.64	2.34	3.22	1.1	2.48	1.7	2.26	2.49	2.32	1.97
Dissolved Oxygen (%)			-	-	15.90	-	-	-	-	-	-	10.8			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-	-	-	-
Redox Potential (mV)			-	-	-	-	-	-41.5	-	-	-	<0.1			-	-34	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc				-	-	-	-
Sodium			-	-	14.00	-	-	12	-	-	-	13			-	13	-	-
Potassium			-	-	1.00	-	-	2	-	-	-	4			-	4	-	-
Calcium			-	-	91.00	-	-	109	-	-	-	117			-	68	-	-
Magnesium			-	-	7.00	-	-	7	-	-	-	6			-	6	-	-
Chloride			-	-	23.00	-	-	25	-	-	-	14			-	13	-	-
Alkalinity (as CaCO3)			274	303	234	151	248	282	251	296	293	323	315	227	137	215	276	284
Bicarbonate			274	303	234	151	248	282	251	296	293	323	315	227	137	215	276	284
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	11.00	-	-	10.00	-	-	-	<1			-	10	-	-
pH (lab)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Dissolved Solids (TDS)			354	352	330	252	318	400	388	382	342	376	406	278	262	248	314	351
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-	-	-	-
Iron (filtered)	0.3 (1)		-	-	**21.40**	-	-	**17.10**	-	-	-	**7.98**			-	**1.61**	-	-
Manganese	1.90		-	-	0.38	-	-	0.35	-	-	-	0.299			-	0.272	-	-
Nitrate (NO3 as N)	0.7 (7)		0.26	0.03	0.06	0.31	0.39	0.04	0.1	0.04	0.07	0.19	0.05	0.15	0.36	0.09	0.03	0.02
Nitrite (NO2 as N)			<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.88	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.38	0.44	0.22	0.91	1.16	0.58	0.64	0.68	0.18	0.1	0.15	0.44	1.86	<0.01	0.37	0.22
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**1.3**	**1.5**	**1.5**	**3.1**	**2.60**	**1.70**	**2.60**	**1.60**	**0.90**	**1.2**	**1.2**	**0.8**	**15.30**	**0.6**	**1.7**	**0.7**
Dissolved Organic Carbon			-	-	6	-	-	9	-	-	-	7			-	12	-	-
Fluoride (Electrode)			-	-	0.20	-	-	0.2	-	-	-	0.2			-	0.2	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**4.24**	**2.93**	**1.97**	**1.56**	**1.24**	**3.46**	**7.98**	**1.72**	**1.31**	**4.29**	**3.99**	**0.9**	**2.4**	**0.86**	**2.17**	**1.6**

Sample ID	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4
Field Measurements	**6/5/14**	**1/8/14**	**17/11/14**	**26/2/15**	**27/5/15**	**24/8/15**	**4/11/15**	**16/2/16**	**31/5/16**	**12/8/16**	**10/11/16**	**20/2/17**	**18/5/17**	**17/8/17**	**30/11/17**	**8/2/18**
Ground Level (m AHD)	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79
Depth to Groundwater (m AHD)	1.04	0.54	0.56	0.69	1.54	1.54	1.34	0.84	0.72	1.38	0.66	0.79	2.15	0.69	0.61	0.62
Groundwater depth (m bTOC)	4.2	4.7	4.68	4.55	3.7	3.7	3.9	4.4	4.52	3.86	4.58	4.45	3.09	4.55	4.63	4.62
Height of Stick up (m)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Groundwater Depth (mbgl)	3.75	4.25	4.23	4.1	3.25	3.25	3.45	3.95	4.07	3.41	4.13	4	2.64	4.1	4.18	4.17
pH (field)		7.1			6.6	7	6.4	6.1	6.6	6.3	7.1	6.6	6.8	6.8	7	6.3
Temperature (T deg C)																
Electrical Conductivity (mS/cm)		0.472			0.555	0.555	0.418	0.207	0.685	0.392	0.561	0.58	0.523	0.675	0.738	0.774
Salinity (ppt)																
Dissolved Oxygen (mg/L)	4.10	2.70	2.10	3.60	3.57	3.39	3.03	2.4	2.12	2.23	3.68	1.34	3.45	3.20	3.72	2.79
Dissolved Oxygen (%)																
Turbidity (NTU)																
Redox Potential (mV)		-128				76										
Comments																
Sodium		10				14				13				13		
Potassium		3				2				4				5		
Calcium		88				90				59				105		
Magnesium		5				6				5				7		
Chloride		11				18				24				14		
Alkalinity (as CaCO3)	250	220	258	231	215	230	178	137	348	162	227	237	224	310	<1	<1
Bicarbonate	250	220	258	231	215	230	178	137	348	162	227	237	224	310	380	399
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	380	399
Sulphate (SO4)		7.00				9				19				8		
pH (lab)	6.8	7.1	6.2	6.3						6.3				6.8		
Total Dissolved Solids (TDS)	304	326	376	311	295	330	258	226	426	208	342	317	308	364	422	442
Hardness (as CaCO3)																
Total Suspended Solids (TSS)																
Iron (filtered)		**10.30**				<0.05				<0.05				**0.97**		
Manganese		0.424				0.086				0.013				0.252		
Nitrate (NO3 as N)	0.28	0.03	<0.01	0.19	0.16	0.09	<0.01	0.02	0.11	0.60	0.03	0.03	0.12	0.12	0.01	0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.28	0.09	0.35	0.09	0.75	0.02	0.26	0.12	0.74	0.16	0.11	0.05	0.12	0.13	0.15	0.10
Total Kjeldhal Nitrogen (TKN)	**1.0**	**0.7**	**0.8**	**0.9**	**2.1**	0.3	**0.7**	**0.6**	**2.7**	**0.8**	**1.6**	**1.0**	**1.2**	**0.9**	**0.8**	**0.8**
Dissolved Organic Carbon		9				3				4				9		
Fluoride (Electrode)		0.2				0.20				<0.1				0.2		
Total Phosphorus (TP)	**1.46**	**1.81**	**1.56**	**1.3**	**1.44**	**0.06**	**1.97**	**1.08**	**2.42**	**1.74**	**2.43**	**1.82**	**0.94**	**1.17**	**1.6**	**1.29**

Sample ID	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4	MW4
Field Measurements	**24/5/18**	**22/8/18**	**16/11/18**	**12/2/19**	**28/5/19**	**28/8/19**	**22/11/19**	**14/2/20**	**28/5/20**	**13/8/20**	**6/11/20**	**1/2/21**	**20/5/21**	**18/8/21**	**25/11/21**	**10/2/22**
Ground Level (m AHD)	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79	4.79
Depth to Groundwater (m AHD)	0.42	0.44	0.38	0.41	0.4	0.51	0.46	0.64	0.56	2.12	1.34	0.84	0.39	0.08	0.77	0.69
Groundwater depth (m bTOC)	4.82	4.80	4.86	4.83	4.84	4.73	4.78	4.6	4.68	3.12	3.9	4.4	4.85	5.16	4.47	4.55
Height of Stick up (m)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Groundwater Depth (mbgl)	4.37	4.35	4.41	4.38	4.39	4.28	4.33	4.15	4.23	2.67	3.45	3.95	4.4	4.71	4.02	4.1
pH (field)	7	6.6	6.6	7.0	7.2	6.9	7	6.8	7	7	7.2	7.2	6.8	7.6	7.1	7.2
Temperature (T deg C)																
Electrical Conductivity (mS/cm)	0.834	0.838	0.803	0.825	0.81	0.842	0.821	0.785	0.837	0.807	0.483	0.461	538	636	633	626
Salinity (ppt)																
Dissolved Oxygen (mg/L)	5.1	3.48			3.44	4	3.9	2.94	5.1	4.8	4.9	4.19	3.2	3.39	2.67	1.67
Dissolved Oxygen (%)																
Turbidity (NTU)																
Redox Potential (mV)		2.1				94				22.9				28.1		
Comments													----	----	----	----
Sodium		14				19			98.1	25	93	693		16		
Potassium		4				5				5				5		
Calcium		131				130				117				125		
Magnesium		9				10				11				10		
Chloride		20				45				59				24		
Alkalinity (as CaCO3)	<1	366	330	306	<1	290	364	332	371	288	240	198	247	353	252	289
Bicarbonate	432	366	330	306	<1	290	364	332	371	288	240	198	247	353	252	289
Carbonate (as CaCO3)	432	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)		7				25				24				12.00		
pH (lab)																
Total Dissolved Solids (TDS)	416	478	484	501	394	488	436	524	468	420	298	272	306	446	379	369
Hardness (as CaCO3)																
Total Suspended Solids (TSS)																
Iron (filtered)		**11.8**				**10.40**				**0.70**				**4.66**		
Manganese		0.241				0.283				0.074				0.162		
Nitrate (NO3 as N)	<0.01	0.02	0.01	<0.01	0.01	<0.01	0.06	0.15	0.09	6.32	<0.01	0.03	0.07	0.03	0.01	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.02	0.41	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.06	0.08	0.05	0.06	0.05	0.08	0.1	0.08	0.11	0.04	0.11	0.14	0.16	0.12	0.12	0.16
Total Kjeldhal Nitrogen (TKN)	**0.6**	**0.3**	**<0.1**	**0.7**	**1.2**	**0.8**	**0.7**	**0.8**	**0.9**	**1.8**	**1.2**	**1.1**	**1.5**	**1.5**	**1.2**	**3.8**
Dissolved Organic Carbon		6	3.55	3.74		4.00				5.00				6.00		
Fluoride (Electrode)		0.2				0.2				0.2				0.2		
Total Phosphorus (TP)	**1.07**	**0.96**	**0.68**	**0.90**	**1.44**	**0.91**	**1.06**	**0.91**	**0.91**	**0.19**	**0.98**	**1.07**	**1.45**	**1.57**	**1.47**	**7.04**

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems **35**

Focus of this monitoring report

nc = no comment NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW5	MW 5	MW 5	MW5	MW5	MW 5	MW5	MW5	MW5	MW5	MW5	MW5	MW5
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13
Ground Level (m AHD)			4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55
Depth to Groundwater (m AHD)			0.6	0.81	1.32	1	1.03	1.11	0.72	0.5	0.96	0.85	0.73	0.95	1.24
Groundwater depth (m bTOC)			4.15	3.94	3.43	3.75	3.72	3.64	4.03	4.25	3.79	3.9	4.02	3.8	3.51
Height of Stick up (m)			0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Groundwater Depth (mbgl)			3.95	3.74	3.23	3.55	3.52	3.44	3.83	4.05	3.59	3.7	3.82	3.6	3.31
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.8	7.7	7.2	7.6	8	8	8	7.9	8.1	7.7	7.7	7	7
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.52	0.51	0.414	0.31	0.44	0.31	0.38	0.345	0.36	<1	0.477	0.297	0.13
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.81	3.08	2.14	2.22	4.15	2.88	2.15	2.32	2.41	0.9	1.77	1.8	1.52
Dissolved Oxygen (%)			-	-	22.60	-	-	-	-	-	-	9.3			-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-
Redox Potential (mV)			-	-	-	-	-	-25	-	-	-	<0.1			-
Comments			nc	nc	nc	nc	-	-	-	-	nc				nc
Sodium			-	-	16	-	-	7	-	-	-	9			-
Potassium			-	-	6	-	-	4	-	-	-	5			-
Calcium			-	-	53	-	-	44	-	-	-	60			-
Magnesium			-	-	10	-	-	6	-	-	-	8			-
Chloride			-	-	30	-	-	13	-	-	-	15			-
Alkalinity (as CaCO3)			142	144	142	120	177	128	147	144	126	179	198	112	172
Bicarbonate			142	144	142	120	177	128	147	144	121	179	198	112	172
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	5	<1	<1	<1	<1
Sulphate (SO4)			-	-	14	-	-	4.00	-	-	-	7			-
pH (lab)			-	-	-	-	-	-	-	-	-				-
Total Dissolved Solids (TDS)			311	238	258	268	252	197	258	204	170	264	326	166	240
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-
Iron (filtered)	0.3 (1)		-	-	<0.05	-	-	<0.05	-	-	-	<0.05			-
Manganese	1.90		-	-	0.002	-	-	0.001	-	-	-	0.001			-
Nitrate (NO3 as N)	0.7 (7)		5.15	10.4	4.44	0.96	0.44	0.14	0.02	1.08	1	1.44	0.03	1.81	<0.01
Nitrite (NO2 as N)			0.22	0.21	0.14	0.15	<0.01	0.02	<0.01	0.12	0.18	0.1	0.08	0.03	0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.08	<0.01	0.04	0.03	0.03	0.03	0.08	0.02	0.03	0.05	0.23	0.55	0.45
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	1.7	2.6	2.7	0.6	0.80	0.30	0.70	1.30	1	1.4	2	2.6	17
Dissolved Organic Carbon			-	-	6	-	-	5	-	-	-	6			-
Fluoride (Electrode)			-	-	0.1	-	-	0.20	-	-	-	0.2			-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.09	0.11	<0.01	0.12	0.1	0.13	0.1	0.08	0.03	0.13	0.22	0.74	1.23

Sample ID	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5
Field Measurements	30/8/13	27/11/13	7/2/14	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17
Ground Level (m AHD)	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55
Depth to Groundwater (m AHD)	1.27	0.76	0.56	0.56	1.23	0.75	0.77	0.86	1.49	-0.13	1.29	0.85	0.73	1.35	0.94	1.09	1.41	0.94	0.61
Groundwater depth (m bTOC)	3.48	3.99	4.19	4.19	3.52	4	3.98	3.89	3.26	4.88	3.46	3.9	4.02	3.40	3.81	3.66	3.34	3.81	4.14
Height of Stick up (m)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Groundwater Depth (mbgl)	3.28	3.79	3.99	3.99	3.32	3.8	3.78	3.69	3.06	4.68	3.26	3.7	3.82	3.2	3.61	3.46	3.14	3.61	3.94
pH (field)	7.7	7	7.3			6.9			7.5	8.00	7.80	7.00	7.1	7.3	7.7	6.9	7.8	7.9	7.80
Temperature (T deg C)	-	-	-																
Electrical Conductivity (mS/cm)	0.427	0.395	0.425			0.126			0.361	0.331	0.41	0.123	0.43	0.35	0.264	0.236	0.276	0.328	0.292
Salinity (ppt)	-	-	-																
Dissolved Oxygen (mg/L)	1.62	2.13	2.09	2.09	2.74	3.2	3.1	2.4					1.39	1.42	3.49	1.63	2.87	2.57	3.64
Dissolved Oxygen (%)	-	-	-			32.7													
Turbidity (NTU)	-	-	-																
Redox Potential (mV)	-147	-	-			75.5				56				-144				-20.6	
Comments	nc	nc	nc																
Sodium	15	-	-			9				12									
Potassium	5	-	-			10				2									
Calcium	54	-	-			16				44									
Magnesium	7	-	-			3				5									
Chloride	34	-	-			26				18									
Alkalinity (as CaCO3)	170	158	155	155	158	41	118	113	102	118	147	72	186	166	96	109	99	127	<1
Bicarbonate	170	158	155	155	158	41	118	113	102	118	147	72	186	166	96	109	99	127	133
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	133
Sulphate (SO4)	4	-	-			<10				5				<10				6	
pH (lab)	-	-	-		7.20	6.90	6.70	6.40						7.3				7.9	
Total Dissolved Solids (TDS)	224	219	264	264	216	164	234	138	225	199	254	162	270	190	136	197	168	174	180
Hardness (as CaCO3)	-	-	-																
Total Suspended Solids (TSS)	-	-	-																
Iron (filtered)	3.22	-	-			0.25				<0.05				0.12				0.07	
Manganese	0.041	-	-			0.03				<0.001				0.006				0.004	
Nitrate (NO3 as N)	0.06	0.14	0.61	0.61	<0.01	0.63	0.61	<0.01	0.11	1.4	0.07	0.02	1.40	<0.01	0.10	<0.01	0.09	<0.01	0.06
Nitrite (NO2 as N)	0.01	<0.01	0.11	0.11	<0.01	0.03	0.09	<0.01	<0.01	0.05	0.06	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.06	5.88	0.64	0.64	4.47	1.28	1.4	14.5	0.03	1.77	0.03	<0.01	6.93	2.34	0.17	0.15	0.04	0.03	0.12
Total Kjeldhal Nitrogen (TKN)	1.1	9	2.2	2.2	6.3	2.5	3.2	18.9	0.6	2.0	0.40	1.0	12.8	3.0	2.8	18.0	1.9	1.0	2.3
Dissolved Organic Carbon	12	-	-			12				4.00				8				8	
Fluoride (Electrode)	0.1	-	-			<0.1				0.20				0.1				0.2	
Total Phosphorus (TP)	0.33	1.83	1.07	1.07	1.03	0.39	0.48	2.08	0.09	1.39	0.02	0.26	2.24	0.31	0.35	1.59	0.16	0.10	0.27

Sample ID	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5
Field Measurements	8/2/18	24/5/18	22/8/18	16/11/18	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55	4.55
Depth to Groundwater (m AHD)	0.61	0.69	0.71	-0.03	0.67	0.67	0.8	0.73	0.89	0.85	2.47	1.29	0.45	0.43	0.88	0.55	0.58
Groundwater depth (m bTOC)	4.14	4.06	4.04	4.78	4.08	4.08	3.95	4.02	3.86	3.9	2.28	3.46	4.3	4.32	3.87	4.2	4.17
Height of Stick up (m)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Groundwater Depth (mbgl)	3.94	3.86	3.84	4.58	3.88	3.88	3.75	3.82	3.66	3.7	2.08	3.26	4.1	4.12	3.67	4	3.97
pH (field)	7.7	7.80	7.6	7.6	7.8	8.10	7.70	7.80	7.70	7.80	7.60	8.00	8.00	8.00	8.00	7.50	7.10
Temperature (T deg C)																	
Electrical Conductivity (mS/cm)	0.31	0.392	0.401	0.371	0.37	0.538	0.44	0.39	0.48	0.429	0.655	0.402	0.287	223	225	308	317
Salinity (ppt)																	
Dissolved Oxygen (mg/L)	2.50	3.1	3.80			4.49	3	3.72	2.84	4.29	1.52	1.86	2.81	3.56	5.14	1.27	3.64
Dissolved Oxygen (%)																	
Turbidity (NTU)																	
Redox Potential (mV)			149				-62.8				-71.2				91.8		
Comments														----	----	----	----
Sodium			13				18				31				15		
Potassium			2				2				3				2		
Calcium			53				55				82				37		
Magnesium			5				5				8				4		
Chloride			20				44				86				12		
Alkalinity (as CaCO3)	<1	<1	156	132	141	132	134	154	226	173	155	119	114	101	129	124	136
Bicarbonate	135	180	156	132	141	132	134	154	226	173	155	119	114	101	129	124	136
Carbonate (as CaCO3)	135	180	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			7				8				32				4		
pH (lab)																	
Total Dissolved Solids (TDS)	241	220	212	227	250	282	240	236	304	240	464	250	191	148	165	180	181
Hardness (as CaCO3)																	
Total Suspended Solids (TSS)																	
Iron (filtered)			0.05				0.09				0.26				<0.05		
Manganese			0.002				0.01				0.00				0.00		
Nitrate (NO3 as N)	<0.01	<0.01	0.02	<0.01	0.02	<0.01	<0.01	0.02	<0.01	0.01	<0.01	<0.01	0.03	0.05	0.02	<0.01	0.04
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.14	0.08	0.02	0.08	0.06	0.03	0.08	0.05	0.04	0.07	<0.01	<0.01	<0.01	0.03	<0.01	0.02	0.03
Total Kjeldhal Nitrogen (TKN)	0.8	0.5	0.2	<0.1	1.2	0.6	0.5	0.6	0.40	0.50	0.20	0.20	0.30	0.6	0.8	0.30	1.5
Dissolved Organic Carbon			4	3.74	3.59		3.00				7.00				6.00		
Fluoride (Electrode)			0.2				0.2				0.10				0.20		
Total Phosphorus (TP)	0.13	0.09	0.05	0.09	0.25	0.26	0.13	0.1	0.12	0.11	0.04	0.05	0.05	0.15	0.2	0.64	0.52

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems **35**

Focus of this monitoring report

nc = no comment NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
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5. Trigger value for total Nitrogen in lowland rivers in NSW.
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7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW6D	MW 6D	MW 6D	MW6D	MW6D	MW 6D	MW6D	MW6D	MW6D	MW6D	MW6D
Field Measurements	**Fresh**	**Marine**	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12
Ground Level (m AHD)			NA										
Depth to Groundwater (m AHD)													
Groundwater depth (m bTOC)			4.95	4.82	4.19	4.73	4.7	4.65	4.97	5.12	4.77	4.94	4.91
Height of Stick up (m)			0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Groundwater Depth (mbgl)			4.25	4.12	3.49	4.03	4	3.95	4.27	4.42	4.07	4.24	4.21
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7	7	6.6	6.8	7.1	7.2	7.1	6.9	7	7.1	7.2
Temperature (T deg C)			-	-	-	-	-	-	-	-	-		
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		1.07	1.02	0.868	0.95	0.996	0.943	1.06	0.994	0.875	<1	0.798
Salinity (ppt)			-	-	-	-	-	-	-	-	-		
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.61	2.37	1.34	1.45	2.21	2.71	2.12	1.55	1.45	1	1.81
Dissolved Oxygen (%)			-	-	14.10	-	-	-	-	-	-	10.6	
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-		
Redox Potential (mV)			-	-	-	-	-	30.90	-	-	-	<0.1	
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc
Sodium			-	-	18	-	-	20	-	-	-	15	
Potassium			-	-	19	-	-	11	-	-	-	10	
Calcium			-	-	120	-	-	142	-	-	-	120	
Magnesium			-	-	14	-	-	16	-	-	-	11	
Chloride			-	-	24	-	-	31	-	-	-	21	
Alkalinity (as CaCO3)			544	409	441	408	396	399	375	410	388	332	342
Bicarbonate			544	409	441	408	396	399	375	410	388	332	342
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	8	-	-	27.00	-	-	-	33	
pH (lab)			-	-	-	-	-	-	-	-	-		
Total Dissolved Solids (TDS)			473	504	496	542	534	586	694	636	460	484	508
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-		
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-		
Iron (filtered)	0.3 (1)		-	-	**9.48**	-	-	<0.05	-	-	-	<0.05	
Manganese	1.90		-	-	0.184	-	-	0.12	-	-	-	0.122	
Nitrate (NO3 as N)	0.7 (7)		**1.99**	**9.29**	0.14	0.17	0.61	**5.61**	**2.93**	0.02	0.03	**1.29**	**3.14**
Nitrite (NO2 as N)			<0.01	0.09	<0.01	<0.01	0.02	0.04	0.32	<0.01	<0.01	0.08	0.17
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	**16.4**	**10.6**	**21.8**	**8.9**	**13.80**	**3.24**	**2.25**	**10.80**	**7.62**	**7.06**	**7.17**
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**22.5**	**17.5**	**26.4**	**16.1**	**15.20**	**6.70**	**9.20**	**12.40**	**11.6**	**9.4**	**12.4**
Dissolved Organic Carbon			-	-	15	-	-	11	-	-	-	11	
Fluoride (Electrode)			-	-	0.4	-	-	0.4	-	-	-	0.4	
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**2.92**	**1.00**	**8.06**	**3.92**	**4.27**	**1.39**	**1.45**	**6.84**	**4.80**	**5.46**	**0.88**

Sample ID	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D
Field Measurements	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15
Ground Level (m AHD)		-	-	-	-							
Depth to Groundwater (m AHD)		-	-	-	-							
Groundwater depth (m bTOC)	4.69	4.62	4.65	5.04	5.2	5.2	4.64	5.03	5.01	4.94	4.47	4.63
Height of Stick up (m)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Groundwater Depth (mbgl)	3.99	3.92	3.95	4.34	4.5	4.5	3.94	4.33	4.31	4.24	3.77	3.93
pH (field)	7.2	7.2	7.2	7.1	7.5			7.1			7	7.2
Temperature (T deg C)		-	-	-	-							
Electrical Conductivity (mS/cm)	0.86	0.867	0.896	0.851	0.476			0.599			0.821	0.801
Salinity (ppt)		-	-	-	-							
Dissolved Oxygen (mg/L)	2.67	1.77	1.58	1.88	1.94	2.75	1.85	1.1	3.1	1.9	2.38	2.51
Dissolved Oxygen (%)		-	-	-	-			11.70				
Turbidity (NTU)		-	-	-	-							
Redox Potential (mV)		-	13	-	-			43.00				30.00
Comments	nc	nc	nc	nc	nc							
Sodium		-	16	-	-			10				13
Potassium		-	15	-	-			6				6
Calcium		-	141	-	-			122				139
Magnesium		-	10	-	-			8				11
Chloride		-	14	-	-			12				17
Alkalinity (as CaCO3)	348	386	375	358	208	325	346	248	271	331	292	305
Bicarbonate	348	386	375	358	208	325	346	248	271	331	292	305
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)		-	107	-	-			71				69
pH (lab)		-	-	-	-		7	7	7	7		
Total Dissolved Solids (TDS)	436	454	496	475	280	438	418	514	497	514	468	522
Hardness (as CaCO3)		-	-	-	-							
Total Suspended Solids (TSS)		-	-	-	-							
Iron (filtered)		-	0.07	-	-			<0.05				
Manganese		-	0.161	-	-			0				
Nitrate (NO3 as N)	0.48	0.41	**0.96**	0.02	0.02	0.05	0.16	**2.92**	**1.79**	0.06	**1.13**	0.33
Nitrite (NO2 as N)	0.21	0.03	0.06	0.04	<0.01	<0.01	0.01	0.08	0.12	0.03	0.06	0.01
Ammonia (NH3 as N)	**12.8**	**14.60**	**11.30**	**10.40**	**1.97**	**9.08**	**8.27**	1.79	**2.23**	**3.92**	**3.13**	1.38
Total Kjeldhal Nitrogen (TKN)	**14**	**16.5**	**11.2**	**10.8**	**2.2**	**9.4**	**8.4**	**2.8**	**2.9**	**4.3**	**3.20**	**2.20**
Dissolved Organic Carbon		-	21	-	-			11				8.00
Fluoride (Electrode)		-	0.4	-	-			0.4				0.40
Total Phosphorus (TP)	**0.38**	**2.23**	**2.52**	**9.07**	**2.55**	**3.86**	**3.93**	**2.08**	**0.62**	**1.74**	**2.01**	**1.81**

Sample ID	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D
Field Measurements	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18	22/8/18	16/11/18
Ground Level (m AHD)													
Depth to Groundwater (m AHD)													
Groundwater depth (m bTOC)	4.71	5	5.06	4.64	4.86	4.83	4.56	4.92	5.24	5.20	5.08	5.08	5.08
Height of Stick up (m)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Groundwater Depth (mbgl)	4.01	4.3	4.36	3.94	4.16	4.13	3.86	4.22	4.54	4.5	4.38	4.38	4.38
pH (field)	7	6.8	6.9	7.1	7.3	6.8	7.0	6.9	7.1	6.2	7.1	7.0	7.1
Temperature (T deg C)													
Electrical Conductivity (mS/cm)	0.953	0.732	0.788	0.723	0.84	0.841	0.94	1.36	0.863	0.904	0.952	0.927	1.32
Salinity (ppt)													
Dissolved Oxygen (mg/L)	1.47	2.8	1.52	2.00	4.09	1.82	2.98	2.12	4.05	2.87	3.69	4.50	
Dissolved Oxygen (%)													
Turbidity (NTU)													
Redox Potential (mV)												126	
Comments													
Sodium				11				53				18	
Potassium				4				24				4	
Calcium				130				140				136	
Magnesium				10				16				10	
Chloride				19				73				27	
Alkalinity (as CaCO3)	347	318	347	368	334	352	366	517	<1	<1	<1	346	528
Bicarbonate	347	318	347	344	334	352	366	517	340	388	400	346	528
Carbonate (as CaCO3)	<1	<1	<1	24	<1	<1	<1	<1	340	388	400	<1	<1
Sulphate (SO4)				38				29				76	
pH (lab)				7.1				6.9					
Total Dissolved Solids (TDS)	574	486	496	468	466	493	514	554	522	577	526	486	748
Hardness (as CaCO3)													
Total Suspended Solids (TSS)													
Iron (filtered)				<0.05				**0.64**				**0.51**	
Manganese				0.050				0.143				0.118	
Nitrate (NO3 as N)	<0.01	0.26	0.08	**3.06**	0.04	0.06	0.04	0.24	<0.01	0.03	0.16	0.48	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	0.01	0.06	<0.01	<0.01	0.01	0.02	<0.01	0.02	0.10	<0.01
Ammonia (NH3 as N)	**4.53**	**3.48**	**4.55**	0.14	**3.10**	**2.96**	**5.76**	**19.6**	**3.71**	**3.85**	**4.99**	**2.20**	**22.7**
Total Kjeldhal Nitrogen (TKN)	**6.00**	**4.20**	**4.9**	**1.2**	**4.3**	**4.2**	**7.4**	**21.5**	**4.50**	**4.5**	**6.40**	**2.9**	**22.3**
Dissolved Organic Carbon				7				20				9	2.56
Fluoride (Electrode)				0.4				0.4				0.4	
Total Phosphorus (TP)	**12.00**	**4.55**	**3.95**	**0.60**	**12.1**	**4.88**	**4.89**	**3.51**	**4.88**	**3.69**	**3.32**	**1.73**	**2.35**

Sample ID	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	MW6D	**MW6D**	**MW6D**	**MW6D**	**MW6D**
Field Measurements	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	**20/5/21**	**18/8/21**	**25/11/21**	**10/2/22**
Ground Level (m AHD)													
Depth to Groundwater (m AHD)													
Groundwater depth (m bTOC)	5.08	5.11	5.3	5.08	5.71	5.61	4.13	5.38	4.9	5.39	5.71	4.89	4.91
Height of Stick up (m)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Groundwater Depth (mbgl)	4.38	4.41	4.6	4.38	4.2	4.91	3.43	4.68	4.53	4.69	5.01	4.19	4.21
pH (field)		7.4	7	7	6.9	7.1	7	7.1	7	7	7.3	6.8	6.6
Temperature (T deg C)													
Electrical Conductivity (mS/cm)	1.01	1.13	1.88	1.89	2.01	1.78	1.95	1.72	1.75	1170	1460	1830	1800
Salinity (ppt)													
Dissolved Oxygen (mg/L)		3.15	26	1.27	0.94	1.74	1.42	1.39	1.82	3.86	3.03	0.84	2.5
Dissolved Oxygen (%)													
Turbidity (NTU)													
Redox Potential (mV)			-132.00				-138.00				3.50		
Comments										----	----	----	----
Sodium			91			100	100	93			77		
Potassium			53				56				38		
Calcium			148				162				213		
Magnesium			24				25				25		
Chloride			156				150				119		
Alkalinity (as CaCO3)	384	411	614	769	841	799	859	761	717	565	777	740	849
Bicarbonate	384	411	614	769	841	799	859	761	717	565	777	740	849
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			23				9				27		
pH (lab)													
Total Dissolved Solids (TDS)	562	580	930	934	764	974	986	890	827	679	960	1000	1070
Hardness (as CaCO3)													
Total Suspended Solids (TSS)													
Iron (filtered)			**10.2**				**12.8**				10		
Manganese			0				0				0		
Nitrate (NO3 as N)	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.05	0.04	<0.01	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	**7.02**	**8.74**	**40.00**	**57.00**	**50.00**	**56.00**	**52.40**	**36.20**	**36.40**	**15.50**	**31.50**	**40.70**	**36.00**
Total Kjeldhal Nitrogen (TKN)	**7.1**	**10.20**	**40.40**	**52.20**	**46.20**	**52.3**	**49.9**	**37.2**	**39.0**	**15.6**	**31.6**	**40.9**	**37.0**
Dissolved Organic Carbon	3.49		26.00				33				20		
Fluoride (Electrode)			0.50				0.40				0.40		
Total Phosphorus (TP)	**2.54**	**3.54**	**2.48**	**2.62**	**2.90**	**2.5**	**2.9**	**3.8**	**2.9**	**3.5**	**4.1**	**3.1**	**3.2**

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems **35**

Focus of this monitoring report

nc = no comment NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
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8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s	MW6s
Field Measurements	**Fresh**	**Marine**	**21/5/10**	**17/8/10**	**30/11/10**	**23/2/11**	**24/5/11**	**24/8/11**	**3/11/11**	**1/2/12**	**31/5/12**	**10/8/12**	**21/11/12**	**18/2/13**	**31/5/13**	**30/8/13**	**27/11/13**	**7/2/14**	**7/2/14**	**6/5/14**	**1/8/14**	**27/5/15**	**18/5/17**	**2018-19**	**28/5/20**	**13/8/20**	**6/11/20**	**1/2/21**	**20/5/21**	**18/8/21**	**25/11/21**	**10/2/22**
Ground Level (m AHD)			NA												-	-	-	-				NA	Note #	dry					dry	dry	dry	dry
Depth to Groundwater (m AHD)			NA												-	-	-	-				NA										
Groundwater depth (m bTOC)			4.69	4.57	4.45	4.48	4.43	4.39	4.71	4.88	4.5	4.7	4.66	4.43	4.35	4.4	4.77	4.94	4.94	4.37	4.77	4.2	4.33		----	4.77	----	----				
Height of Stick up (m)			0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6		----	0.6	----	----				
Groundwater Depth (mbgl)			4.09	3.97	3.85	3.88	3.83	3.79	4.11	4.28	3.9	4.1	4.06	3.83	3.75	3.8	4.17	4.34	4.34	3.77	4.17	3.6	3.73		----	3.17	----	----				
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.5	7.3	6.8	6.9	7.2	7	7.6	7.3	7.5	7.4	7.6	6.9	6.9	7.1	7.4	7.2			7.3	6.2	6.6		----	6.7	----	----				
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-	-	-	-														
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.52	0.65	0.502	0.37	0.569	0.511	0.504	0.504	0.475	<1	0.396	1.06	0.432	0.474	0.679	0.662			0.659	573	644		----	881	----	----				
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-	-	-	-														
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	1.74	2.56	2.63	2.19	2.18	2.94	1.9	1.82	2.29	1.2	2.4	2.58	1.46	1.9	2.13	2.33	2.33	1.85	2	3.48	3.21		----	3.51	----	----				
Dissolved Oxygen (%)			-	-	27.70	-	-	-	-	-	-	11.8			-	-	-	-			20.9											
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-	-	-	-														
Redox Potential (mV)			-	-	-	-	-	-33.80	-	-	-	<0.1			-	-57	-	-			65					-79.9						
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	-	-	-	-														
Sodium			-	-	8	-	-	44	-	-	-	14			-	30	-	-			24					102						
Potassium			-	-	6	-	-	8	-	-	-	8			-	6	-	-			6					2						
Calcium			-	-	80	-	-	41	-	-	-	75			-	75	-	-			124					24						
Magnesium			-	-	9	-	-	7	-	-	-	6			-	7	-	-			10					23						
Chloride			-	-	14	-	-	42	-	-	-	21			-	34	-	-			30					214						
Alkalinity (as CaCO3)			182	263	208	176	130	133	196	226	227	202	237	315	62	217	273	248	<1	182	262	40	80		----	90	----	----				
Bicarbonate			182	263	208	176	130	133	196	226	206	202	237	315	62	217	273	248	248	182	262	40	80		----	90	----	----				
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	21	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		----	<1	----	----				
Sulphate (SO4)			-	-	26	-	-	40.00	-	-	-	18			-	34	-	-			60					26						
pH (lab)			-	-	-	-	-	-	-	-	-				-	-	-	-		7	7											
Total Dissolved Solids (TDS)			314	350	308	332	280	334	328	342	286	314	372	616	286	309	364	356	356	280	504	320	343		----	543	----	----				
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-	-	-	-														
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-	-	-	-														
Iron (filtered)	0.3 (1)		-	-	**5.59**	-	-	**3.13**	-	-	-	<0.05			-	**1.17**	-	-			<0.05					**0.61**						
Manganese	1.90		-	-	0.116	-	-	0.06	-	-	-	0.025			-	0.019	-	-			0.03					0.005						
Nitrate (NO3 as N)	0.7 (7)		0.37	**1.71**	0.01	**1.16**	**7.48**	0.04	<0.01	**0.8**	0.01	**0.76**	**3.54**	0.11	<0.01	**1.05**	0.62	0.05	0.05	0.06	**8.3**	<0.01	0.02		----	**0.1**	----	----				
Nitrite (NO2 as N)			0.01	0.02	<0.01	<0.01	0.03	<0.01	<0.01	0.31	0.01	0.08	0.32	<0.01	<0.01	0.92	0.1	0.04	0.04	<0.01	0.75	<0.01	<0.01		----	0.03	----	----				
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.83	1.8	1.73	0.48	0.23	0.19	0.4	0.25	0.12	0.08	0.2	0.91	0.04	0.29	0.04	0.04	0.04	0.03	0.02	0.09	0.06		----	0.03	----	----				
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**1.5**	**2.6**	**2.5**	**1**	**2.40**	**0.60**	**0.80**	**2.00**	**0.9**	**3.1**	**1**	**4.2**	**1.9**	**1.1**	**1**	**0.6**	**0.6**	**1.5**	**2.0**	**2.9**	**4.2**		----	**1.1**	----	----				
Dissolved Organic Carbon			-	-	8	-	-	7	-	-	-	4			-	9	-	-			10					14						
Fluoride (Electrode)			-	-	0.3	-	-	0.60	-	-	-	0.6			-	0.4	-	-			0					0						
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**0.33**	**1.04**	**0.79**	**0.42**	**0.68**	**0.53**	**3.10**	**8.81**	**0.54**	**0.63**	**0.4**	**0.4**	**0.44**	**0.12**	**0.2**	**0.8**	**0.8**	**0.2**	**0.2**	**0.4**	**0.42**		----	**0.1**	----	----				

Note:

Exceeds ANZECC (2000) guidelines **35**

marine/fresh water ecosystems

Focus of this monitoring report

nc = no comment NA = not available

Note #: Well is seldom sampled due to being dry at time of sampling

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water quality and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Prepared By: Earth2Water Pty Ltd
Checked By: DP

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW7D	MW 7D	MW 7D	MW7D	MW7D	MW 7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13
Ground Level (m AHD)			NA												-
Depth to Groundwater (m AHD)			NA												-
Groundwater depth (m bTOC)			4.76	4.59	4.25	4.46	4.46	4.41	4.72	4.88	4.53	4.7	4.67	4.46	4.38
Height of Stick up (m)			0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Groundwater Depth (mbgl)			4.16	3.99	3.65	3.86	3.86	3.81	4.12	4.28	3.93	4.1	4.07	3.86	3.78
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.4	7.4	6.9	7.1	7.5	7.4	7.5	7.4	7.5	7.2	7.4	7.5	7.4
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.96	0.86	0.712	0.68	0.634	0.649	0.694	0.625	0.661	<1	0.645	0.622	0.526
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	1.79	2.59	1.71	2.08	2.53	2.4	1.67	1.61	1.75	0.8	2.92	2.89	1.54
Dissolved Oxygen (%)			-	-	18.00	-	-	-	-	-	-	7.9			-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-
Redox Potential (mV)			-	-	-	-	-	23.50	-	-	-	<0.1			-
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc
Sodium			-	-	24	-	-	14	-	-	-	16			-
Potassium			-	-	16	-	-	6	-	-	-	6			-
Calcium			-	-	90	-	-	95	-	-	-	98			-
Magnesium			-	-	10	-	-	9	-	-	-	9			-
Chloride			-	-	20	-	-	14	-	-	-	41			-
Alkalinity (as CaCO3)			299	348	307	250	226	251	246	262	231	247	247	228	203
Bicarbonate			299	348	307	250	226	251	246	262	212	247	247	228	203
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	19	<1	<1	<1	<1
Sulphate (SO4)			-	-	15	-	-	44	-	-	-	24			-
pH (lab)			-	-	-	-	-	-	-	-	-				-
Total Dissolved Solids (TDS)			449	358	408	408	276	402	432	352	364	402	406	346	338
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-
Iron (filtered)	0.3 (1)		-	-	**5.8**	**-**	-	0.07	-	-	-	<0.05			-
Manganese	1.90		-	-	0.106	-	-	0.101	-	-	-	0.081			-
Nitrate (NO3 as N)	0.7 (7)		**3.5**	0.05	0.12	**1.06**	0.05	0.16	<0.01	0.06	0.06	0.47	**0.97**	0.46	0.16
Nitrite (NO2 as N)			0.04	0.04	0.06	0.05	0.02	<0.01	<0.01	<0.01	<0.01	0.06	0.01	0.01	0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	**21.9**	**28.6**	**21.7**	**10.2**	**7.99**	**4.38**	**4.17**	**1.98**	**2.61**	**1.94**	1.67	**1.93**	**2.82**
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**32.7**	**35.7**	**28.4**	**14.5**	**9.60**	**4.50**	**4.80**	**4.80**	**3.60**	**2.40**	**2**	**2.2**	**3.90**
Dissolved Organic Carbon			-	-	13	-	-	5	-	-	-	5			-
Fluoride (Electrode)			-	-	0.1	-	-	0.3	-	-	-	0.2			-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**0.33**	**0.5**	**1.52**	**0.44**	**0.26**	**0.61**	**5.74**	**3.36**	**1.00**	**0.96**	**0.08**	**0.17**	**0.60**

Sample ID	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D
Field Measurements	30/8/13	27/11/13	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17
Ground Level (m AHD)	-	-	-								NA							
Depth to Groundwater (m AHD)	-	-	-								NA							
Groundwater depth (m bTOC)	4.4	4.8	4.98	4.39	4.78	4.79	4.69	4.21	4.5	4.45	4.8	4.83	4.40	4.03	4.55	4.34	4.69	5
Height of Stick up (m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Groundwater Depth (mbgl)	3.8	4.2	4.38	3.79	4.18	4.19	4.09	3.61	3.9	3.85	4.2	4.23	3.8	3.43	3.95	3.74	4.09	4.4
pH (field)	7.4	7.4	7.5		7.7			7.4	7.4	7.3	7.3	7.4	7.2	7.3	7.2	7.4	7.2	7.4
Temperature (T deg C)	-	-	-															
Electrical Conductivity (mS/cm)	0.528	0.547	0.476		0.435			0.426	0.483	0.499	0.443	0.471	0.44	0.481	0.452	0.515	0.512	0.465
Salinity (ppt)	-	-	-															
Dissolved Oxygen (mg/L)	1.56	2.2	1.94	1.44	1.9	2.9	3.6	3.4	2.06	1.95	3.1	2.91	2.05	3.81	1.42	3.30	2.46	3.11
Dissolved Oxygen (%)	-	-	-		19.2													
Turbidity (NTU)	-	-	-															
Redox Potential (mV)	-28	-	-		73.5				66				16.0				-104	
Comments	nc	nc	nc															
Sodium	17	-	-		12				9				8				10	
Potassium	6	-	-		4				4				4				4	
Calcium	76	-	-		70				75				71				75	
Magnesium	7	-	-		6				7				6				8	
Chloride	16	-	-		8				9				14				16	
Alkalinity (as CaCO3)	250	265	208	220	178	212	209	175	214	215	182	203	214	209	195	209	224	<1
Bicarbonate	250	265	208	220	178	212	209	175	214	215	182	203	205	209	195	209	224	218
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	6	<1	<1	<1	<1	218
Sulphate (SO4)	18	-	-		8				7				8				7	
pH (lab)	-	-	-	7.2	7.7	5.9	6.5						7.2				7.2	
Total Dissolved Solids (TDS)	298	307	280	238	280	292	237	249	300	337	382	290	218	306	285	285	248	318
Hardness (as CaCO3)	-	-	-															
Total Suspended Solids (TSS)	-	-	-															
Iron (filtered)	0.09	-	-		<0.05				<0.05				0.06				<0.05	
Manganese	0.064	-	-		0.034				0.037				0.045				0.059	
Nitrate (NO3 as N)	0.49	<0.10	0.02	<0.01	**1.19**	0.25	<0.01	0.46	<0.01	<0.01	0.03	0.13	0.10	0.56	<0.01	0.02	0.20	<0.01
Nitrite (NO2 as N)	0.1	<0.10	<0.01	<0.01	0.04	0.01	0.02	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02
Ammonia (NH3 as N)	**2.43**	**2.09**	**1.97**	**1.91**	0.2	1.36	1.48	0.96	0.54	1.64	1.02	1.00	0.70	0.13	0.99	0.98	0.65	0.49
Total Kjeldhal Nitrogen (TKN)	**2.60**	**3**	**2**	**2.10**	**0.60**	**1.60**	**1.60**	**1.30**	**0.80**	**2.30**	**1.40**	**1.3**	**0.9**	**0.7**	**1.2**	**1.6**	**0.8**	**0.90**
Dissolved Organic Carbon	13	-	-		7				4				5				6	
Fluoride (Electrode)	0.2	-	-		0.2				0.2				0.2				0.2	
Total Phosphorus (TP)	**1.66**	**8.46**	**2.55**	**0.89**	**0.37**	**0.30**	**1.07**	**0.71**	**0.19**	**8.14**	**1.60**	**1.62**	**0.93**	**3.34**	**1.83**	**1.37**	**1.99**	**2.72**

Sample ID	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D	MW7D
Field Measurements	8/2/18	24/5/18	22/8/18	16/11/18	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)																	
Depth to Groundwater (m AHD)																	
Groundwater depth (m bTOC)	4.97	4.84	4.84	4.84	4.84	4.88	2.26	4.85	5.49	5.27	3.78	5.03	5.06	5.01	5.39	4.58	4.41
Height of Stick up (m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Groundwater Depth (mbgl)	4.37	4.24	4.88	4.94	4.89	4.89	4.89	4.89	4.89	4.67	3.18	4.43	4.46	4.41	4.79	3.98	3.81
pH (field)	6.5	7.3	7.3	7.3	7.3	7.6	7.1	7.1	7.1	7.2	7.2	7.2	7.1	7.4	7.3	6.8	6.5
Temperature (T deg C)																	
Electrical Conductivity (mS/cm)	0.503	0.527	0.496	0.554	0.661	0.714	1.09	1.14	1.21	1.1	1.15	1.09	1.129	485	711	1270	1250
Salinity (ppt)																	
Dissolved Oxygen (mg/L)	2.75	3.72	3.88			3.78	9	1.29	0.63	1.54	1.13	1.73	3.22	4.24	2.98	1.12	7.84
Dissolved Oxygen (%)																	
Turbidity (NTU)																	
Redox Potential (mV)			129				-121				-137				76.2		
Comments														----	----	----	----
Sodium			10				44				60				28		
Potassium			4				24				27				10		
Calcium			71				103				101				127		
Magnesium			6				18				16				13		
Chloride			28				73				64				41		
Alkalinity (as CaCO3)	<1	<1	188	216	268	286	388	435	486	516	486	480	492	213	391	420	518
Bicarbonate	227	238	188	216	268	286	388	435	486	516	486	480	492	213	391	420	518
Carbonate (as CaCO3)	227	238	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			6				12				21				16		
pH (lab)																	
Total Dissolved Solids (TDS)	319	296	289	328	424	334	552	584	510	574	596	574	584	290	534	644	632
Hardness (as CaCO3)																	
Total Suspended Solids (TSS)																	
Iron (filtered)			**0.33**				**8.73**				**3.38**				**4.75**		
Manganese			0.026				0.085				0.057				0.081		
Nitrate (NO3 as N)	0.02	0.01	0.44	0.12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.04	0.05	<0.01	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.89	0.89	0.15	0.91	**2.08**	**2.36**	**20.50**	**20.00**	**21.40**	**21.00**	**18.30**	**17.40**	**16.80**	**1.09**	**4.48**	**16.20**	**19.10**
Total Kjeldhal Nitrogen (TKN)	**1.3**	**1.30**	0.4	**1.4**	**2.5**	**3.00**	**15.10**	**18.50**	**21.20**	**21.80**	**18.30**	**18.30**	**17.20**	**1.40**	**5.40**	**16.40**	**21.50**
Dissolved Organic Carbon			4	3.38	2.93		9				14				2		
Fluoride (Electrode)			0.2				3				0.3				0.2		
Total Phosphorus (TP)	**2.05**	**1.43**	**0.29**	**0.71**	**1.17**	**1.20**	**0.74**	**0.80**	**0.86**	**0.81**	**0.88**	**0.88**	**0.89**	**1.33**	**1.57**	**0.84**	**0.92**

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems **35**

Focus of this monitoring report

nc = no comment NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.
a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW7S	MW 7S	MW 7S	MW7S	MW7S	MW 7S	MW7S	MW7S	MW7S
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12
Ground Level (m AHD)											
Depth to Groundwater (m AHD)											
Groundwater depth (m bTOC)			4.57	4.44	4.09	4.32	4.31	4.24	4.58	4.76	4.38
Height of Stick up (m)			0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Groundwater Depth (mbgl)			4.04	3.91	3.56	3.79	3.78	3.71	4.05	4.23	3.85
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.5	7.6	7.2	7.4	7.8	7	7.9	7.6	7.9
Temperature (T deg C)			-	-	-	-	-	-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		0.9	1.01	0.836	0.55	0.604	0.392	0.702	0.584	0.522
Salinity (ppt)			-	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.9	2.99	1.36	2.38	2.33	2.83	1.52	2.57	1.81
Dissolved Oxygen (%)			-	-	14.30	-	-	-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-
Redox Potential (mV)			-	-	-	-	-	10.50	-	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc
Sodium			-	-	109	-	-	34	-	-	-
Potassium			-	-	11	-	-	2	-	-	-
Calcium			-	-	67	-	-	31	-	-	-
Magnesium			-	-	9	-	-	6	-	-	-
Chloride			-	-	166	-	-	56	-	-	-
Alkalinity (as CaCO3)			200	177	204	151	154	85	166	172	147
Bicarbonate			200	177	204	151	154	85	166	172	136
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	11
Sulphate (SO4)			-	-	39	-	-	10	-	-	-
pH (lab)			-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS)			538	528	530	362	256	238	418	328	274
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-
Iron (filtered)	0.3 (1)		-	-	0.16	-	-	**1.22**	-	-	-
Manganese	1.90		-	-	0.02	-	-	0.01	-	-	-
Nitrate (NO3 as N)	0.7 (7)		0.01	0.01	0.02	0.06	<0.01	0.04	<0.01	0.12	<0.01
Nitrite (NO2 as N)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.49	1.7	**2.56**	1.34	1.3	0.16	**1.93**	**2.03**	**2.25**
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**0.8**	**2.6**	**4.5**	**1.6**	**2.2**	**0.4**	**2**	**3.3**	**2.6**
Dissolved Organic Carbon			-	-	9	-	-	6	-	-	-
Fluoride (Electrode)			-	-	<0.1	-	-	0.1	-	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**0.25**	**0.21**	**0.5**	**0.74**	**0.83**	**0.57**	**0.32**	**0.24**	**0.58**

Sample ID	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S
Field Measurements	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15
Ground Level (m AHD)				-	-	-	-						
Depth to Groundwater (m AHD)				-	-	-	-						
Groundwater depth (m bTOC)	4.54	4.56	4.32	4.23	4.26	4.68	4.84	4.84	4.25	4.64	4.67	4.55	4.06
Height of Stick up (m)	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Groundwater Depth (mbgl)	4.01	4.03	3.79	3.7	3.73	4.15	4.31	4.31	3.72	4.11	4.14	4.02	3.53
pH (field)	7.7	7.9	7.5	7.4	7.4	7.8	7.8			7.4			6.8
Temperature (T deg C)				-	-	-	-						
Electrical Conductivity (mS/cm)	<1	0.671	0.467	0.442	0.381	0.518	0.58			0.365			0.317
Salinity (ppt)				-	-	-	-						
Dissolved Oxygen (mg/L)	1.4	2.07	1.65	2.12	1.77	2.03	1.97	1.97	2.15	1.5	2.3	2.7	3.22
Dissolved Oxygen (%)	13.9			-	-	-	-			15.3			
Turbidity (NTU)				-	-	-	-						
Redox Potential (mV)	<0.1			-	-39	-	-			83			
Comments				nc	nc	nc	nc						
Sodium	44			-	40	-	-			33			
Potassium	6			-	4	-	-			6			
Calcium	56			-	24	-	-			56			
Magnesium	7			-	5	-	-			7			
Chloride	82			-	48	-	-			59			
Alkalinity (as CaCO3)	152	180	132	141	109	153	143	143	143	144	144	159	89
Bicarbonate	152	180	132	141	109	153	143	143	143	144	144	159	89
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	143	<1	<1	<1	<1
Sulphate (SO4)	14			-	9	-	-			8			
pH (lab)				-	-	-	-		7	7.4	6.8	6.9	
Total Dissolved Solids (TDS)	334	398	240	238	201	282	312	312	198	330	399	433	248
Hardness (as CaCO3)				-	-	-	-						
Total Suspended Solids (TSS)				-	-	-	-						
Iron (filtered)	**0.4**			-	**0.66**	-	-			0.18			
Manganese	0.014			-	0.01	-	-			0.013			
Nitrate (NO3 as N)	0.11	<0.01	0.1	<0.01	0.16	<0.10	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.04
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	0.04	<0.10	0.02	0.02	<0.01	0.01	0.01	0.02	<0.01
Ammonia (NH3 as N)	**2.34**	**2.74**	1.2	**1.91**	0.91	1.33	1.64	1.64	0.68	1.12	0.54	1.16	0.59
Total Kjeldhal Nitrogen (TKN)	**2.8**	**3.5**	**1.4**	**2.6**	**1.5**	**2**	**1.8**	**1.8**	**1.00**	**1.6**	**0.7**	**1.6**	**0.8**
Dissolved Organic Carbon	6			-	8	-	-			7			
Fluoride (Electrode)	0.1			-	<0.1	-	-			<0.1			
Total Phosphorus (TP)	**0.32**	**0.18**	**0.19**	**0.16**	**0.96**	**0.67**	**0.22**	**0.22**	**0.33**	**0.23**	**0.08**	**0.52**	**0.21**

Sample ID	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7S	MW7s	MW7s
Field Measurements	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18	24/5/18	22/8/18	16/11/18
Ground Level (m AHD)														
Depth to Groundwater (m AHD)														
Groundwater depth (m bTOC)	1.9	4.32	4.7	4.70	4.24	4.47	4.39	4.17	4.54	4.85	4.83	4.68	4.68	4.68
Height of Stick up (m)	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Groundwater Depth (mbgl)	1.37	3.79	4.17	4.17	3.71	3.94	3.86	3.64	4.01	4.32	4.3	4.15	4.73	5.78
pH (field)	8.1	7.1	7.3	7.7	7.0	7.8	6.9	7.0	7.7	7.7	7.6	7.7	7.7	7.7
Temperature (T deg C)														
Electrical Conductivity (mS/cm)	0.463	0.423	0.579	0.475	0.451	0.58	0.617	0.464	0.723	0.614	0.535	0.544	0.576	0.608
Salinity (ppt)														
Dissolved Oxygen (mg/L)	3.24	1.82	3.9	1.95	1.94	3.87	2.82	3.20	2.60	3.15	2.60	3.22	4.34	
Dissolved Oxygen (%)														
Turbidity (NTU)					-17.0				-62.2					
Redox Potential (mV)	-75												121	
Comments														
Sodium	41				32				72				43	
Potassium	3				3				4				4	
Calcium	42				48				54				52	
Magnesium	6				7				6				7	
Chloride	34				49				121				54	
Alkalinity (as CaCO3)	140	133	170	180	150	----	152	91	154	<1	<1	<1	176	176
Bicarbonate	140	133	170	180	150	----	152	91	154	172	189	195	176	176
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	----	<1	<1	<1	172	189	195	<1	<1
Sulphate (SO4)	12				13				15				11	
pH (lab)					7.0				7.7					
Total Dissolved Solids (TDS)	267	357	434	316	235	----	409	264	382	395	313	283	322	358
Hardness (as CaCO3)														
Total Suspended Solids (TSS)														
Iron (filtered)	**0.42**				0.17				<0.05				0.14	
Manganese	0.01				0.010				0.011				0.012	
Nitrate (NO3 as N)	0.05	<0.01	0.02	0.10	<0.01	----	0.15	0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	----	0.06	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.02	0.8	0.7	1.03	0.38	----	0.34	0.29	0.38	0.29	0.49	0.45	0.31	0.40
Total Kjeldhal Nitrogen (TKN)	**0.8**	**1.3**	**1.2**	**1.4**	**0.5**	----	**1.6**	**1.3**	**0.6**	**0.8**	**0.9**	**0.8**	**0.5**	**1.3**
Dissolved Organic Carbon	5				4				7				5	3.49
Fluoride (Electrode)	0.1				<0.1				<0.1				<0.1	
Total Phosphorus (TP)	**0.08**	**0.16**	**0.32**	**0.22**	**0.22**	----	**1.03**	**0.55**	**0.37**	**0.62**	**0.49**	**0.22**	**0.24**	**0.30**

Sample ID	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s	MW7s
Field Measurements	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)													
Depth to Groundwater (m AHD)													
Groundwater depth (m bTOC)	4.68	4.72	4.44	4.7	4.54	4.54	4.54	4.54	4.54	4.87	5.25	4.39	4.29
Height of Stick up (m)	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Groundwater Depth (mbgl)	4.68	4.68	4.68	4.68	4.68	4.52	3.03	4.27	4.65	4.34	4.72	3.86	3.76
pH (field)	7.7	8.1	7.5	7.7	7.5	7.8	7.2	7.5	7.6	7.1	7.4	7.2	6.9
Temperature (T deg C)													
Electrical Conductivity (mS/cm)	0.63	0.714	0.794	0.691	0.893	0.796	0.734	0.649	0.584	364	667	573	535
Salinity (ppt)													
Dissolved Oxygen (mg/L)		4.33	5	3.49	2.91	3.99	2.15	5.88	3.2	3.22	3.04	1.19	7.62
Dissolved Oxygen (%)													
Turbidity (NTU)													
Redox Potential (mV)			-65.1				-24				78.7		
Comments										----	----	----	----
Sodium			60			120	81	702			65		
Potassium			4				<1				3		
Calcium			66				30				75		
Magnesium			9				14				11		
Chloride			122				153				183		
Alkalinity (as CaCO3)	173	161	162	210	239	228	105	130	175	69	121	152	171
Bicarbonate	173	161	162	210	239	228	105	130	175	69	121	152	171
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			21				18				20		
pH (lab)													
Total Dissolved Solids (TDS)	411	340	412	378	525	431	396	432	331	228	536	330	292
Hardness (as CaCO3)													
Total Suspended Solids (TSS)													
Iron (filtered)			**0.6**				0.22				0.1		
Manganese			0.02				0.003				0.016		
Nitrate (NO3 as N)	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.04	0.01	<0.01	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.44	0.45	0.27	0.32	0.25	0.22	<0.01	0.16	0.12	0.04	0.15	0.12	0.14
Total Kjeldhal Nitrogen (TKN)	**1.2**	**1.00**	**1.00**	**0.5**	**0.9**	**0.8**	**0.3**	**0.8**	**0.4**	**1.2**	**1.2**	**0.3**	**0.4**
Dissolved Organic Carbon	3.72		5				8				5		
Fluoride (Electrode)			0.1				0.2				<0.1		
Total Phosphorus (TP)	**1.14**	**0.5**	**0.36**	**0.18**	**0.34**	**0.21**	0.04	**0.64**	**0.14**	**0.7**	**0.82**	**0.18**	**0.12**

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems: **35**

Focus of this monitoring report

nc = no comment   NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW9	MW 9	MW 9	MW9	MW9	MW 9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9
Field Measurements	**Fresh**	**Marine**	**21/5/10**	**17/8/10**	**30/11/10**	**23/2/11**	**24/5/11**	**24/8/11**	**3/11/11**	**1/2/12**	**31/5/12**	**10/8/12**	**21/11/12**	**18/2/13**	**31/5/13**	**30/8/13**	**27/11/13**	**7/2/14**
Ground Level (m AHD)			1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Depth to Groundwater (m AHD)			0.53	0.55	0.95	0.63	0.52	0.48	0.47	0.39	0.52	0.47	0.88	1.03	0.53	0.4	0.49	0.38
Groundwater depth (m bTOC)			1.79	1.77	1.37	1.69	1.8	1.84	1.85	1.93	1.8	1.85	1.44	1.29	1.79	1.92	1.83	1.94
Height of Stick up (m)			0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Groundwater Depth (mbgl)			0.84	0.82	0.42	0.74	0.85	0.89	0.9	0.98	0.85	0.9	0.49	0.34	0.84	0.97	0.88	0.99
pH (field)	6.5-8.0 (a)	8-8.4 (a)	5.9	6	6.3	6.5	6.7	6.8	6.8	6.3	6.7	6.3	6.5	6.7	6.4	6.2	6.4	6.2
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		21.7	16.6	1.4	8.66	7.39	4.91	6.23	13	6.41	11	9.32	12.7	6.39	1.08	10.2	18.9
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.74	5.42	3.36	8.68	2.24	2.89	2.14	2.89	3.31	1.2	1.73	1.68	3.71	1.97	2.14	1.9
Dissolved Oxygen (%)			-	-	35.60	-	-	-	-	-	-	12.5			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-	-	-	-
Redox Potential (mV)			-	-	-	-	-	101	-	-	-	<0.1			-	38	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc
Sodium			-	-	759	-	-	904	-	-	-	2330			-	190	-	-
Potassium			-	-	33	-	-	37	-	-	-	101			-	13	-	-
Calcium			-	-	34	-	-	31	-	-	-	147			-	6	-	-
Magnesium			-	-	67	-	-	77	-	-	-	392			-	14	-	-
Chloride			-	-	912	-	-	1410	-	-	-	4620			-	275	-	-
Alkalinity (as CaCO3)			85	61	288	129	118	147	116	78	174	79	194	191	125	53	130	86
Bicarbonate			85	61	288	129	118	147	116	78	174	79	194	191	125	53	130	86
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	33	-	-	258	-	-	-	679			-	37	-	-
pH (lab)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Dissolved Solids (TDS)			15600	10900	3270	6560	3900	2920	3660	9530	4000	7670	6540	8220	3320	671	7530	13100
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-	-	-	-
Iron (filtered)	0.3 (1)		-	-	**4.64**	-	-	**0.57**	-	-	-	0.11			-	**0.68**	-	-
Manganese	1.90		-	-	0.015	-	-	0.002	-	-	-	0.005			-	0.004	-	-
Nitrate (NO3 as N)	0.7 (7)		0.4	**1.98**	**6.83**	0.52	0.19	0.17	<0.01	<0.01	0.06	0.11	<0.10	0.02	<0.01	<0.10	<0.01	0.01
Nitrite (NO2 as N)			<0.01	<0.01	<0.50	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	<0.10	<0.10	0.84	0.06	0.05	<0.01	1	<0.10	0.03	0.04	0.23	1.08	<0.01	0.02	0.32	0.24
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**0.8**	**2.7**	**94.1**	**1.6**	**2.40**	**1.70**	**2.60**	**1.00**	**1.9**	**1.8**	**2.4**	**2.8**	**3.1**	**3.1**	**1.6**	**1.1**
Dissolved Organic Carbon			-	-	430	-	-	51	-	-	-	17			-	64	-	-
Fluoride (Electrode)			-	-	0.5	-	-	0.4	-	-	-	0.2			-	0.2	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	<0.01	**0.83**	**<2.00**	**0.07**	**0.12**	**0.07**	**0.22**	**0.08**	**0.14**	**0.05**	**0.17**	**0.23**	**0.34**	**0.24**	**0.09**	**0.06**

Sample ID	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9
Field Measurements	**7/2/14**	**6/5/14**	**1/8/14**	**17/11/14**	**26/2/15**	**27/5/15**	**24/8/15**	**4/11/15**	**16/2/16**	**31/5/16**	**12/8/16**	**10/11/16**	**20/2/17**	**18/5/17**	**17/8/17**	**30/11/17**	**8/2/18**
Ground Level (m AHD)	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Depth to Groundwater (m AHD)	0.38	0.67	0.83	0.54	0.56	0.66	-0.01	0.49	0.52	0.62	0.5	0.53	0.63	0.65	0.53	0.32	0.39
Groundwater depth (m bTOC)	1.94	1.65	1.49	1.78	1.76	1.66	2.33	1.83	1.8	1.70	1.82	1.79	1.69	1.67	1.79	2	1.93
Height of Stick up (m)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Groundwater Depth (mbgl)	0.99	0.7	0.54	0.83	0.81	0.71	1.38	0.88	0.85	0.75	0.87	0.84	0.74	0.72	0.84	1.05	0.98
pH (field)			5.7			6.4	6.7	6.5	6.3	5.9	6.5	6.2	6.2	6.5	6.3	6.3	6.4
Temperature (T deg C)																	
Electrical Conductivity (mS/cm)			23.4			9.12	7.69	4.61	9.52	31.4	9.45	13.4	21	10.6	17.2	24.9	37.4
Salinity (ppt)																	
Dissolved Oxygen (mg/L)	1.9	3.69	4.1	2.2	3.3	3.61	1.8	1.92	1.9	4.41	5.40	2.60	3.27	3.40	3.46	2.65	0.52
Dissolved Oxygen (%)			45.9														
Turbidity (NTU)											14.0				17.5		
Redox Potential (mV)			243				130										
Comments																	
Sodium			5370				1350				1780				2740		
Potassium			175				60				66				87		
Calcium			382				69				78				161		
Magnesium			772				165				177				396		
Chloride			8360				1960				3120				5070		
Alkalinity (as CaCO3)	86	97	39	146	135	142	135	133	84	64	84	90	112	156	98	<1	<1
Bicarbonate	86	97	39	146	135	142	135	133	84	64	84	90	112	156	98	90	81
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	90	81
Sulphate (SO4)			1450				384				415				731		
pH (lab)		6.1	5.7	6.1	6.3						6.5				6.3		
Total Dissolved Solids (TDS)	13100	6240	20900	8190	6730	3580	5160	2870	6840	21500	5220	8350	14000	6910	10900	18100	24600
Hardness (as CaCO3)																	
Total Suspended Solids (TSS)																	
Iron (filtered)			0.08				0.26				0.25				0.67		
Manganese			0.006				0.004				0.004				0.017		
Nitrate (NO3 as N)	0.01	0.13	**1.60**	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	**0.76**	0.19	0.05	<0.01	0.02	0.06	<0.01	**0.81**
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.24	<0.01	<0.01	0.34	0.21	<0.01	0.01	0.47	0.07	<0.05	0.03	0.26	1.29	0.19	0.15	0.43	0.54
Total Kjeldhal Nitrogen (TKN)	**1.10**	**0.40**	**1.00**	**2.10**	**2.60**	**2.40**	**4.90**	**2.20**	**1.40**	**2.0**	**1.4**	**4.0**	**4.1**	**22.3**	**1.9**	**13.70**	**11.8**
Dissolved Organic Carbon			14				0.3				24				34		
Fluoride (Electrode)			0.2				29				0.2				0.2		
Total Phosphorus (TP)	**0.06**	**0.05**	**0.07**	**0.22**	**0.20**	**0.13**	**0.31**	**0.16**	0.03	**0.20**	**0.09**	**0.45**	**0.23**	**1.78**	**0.13**	**1.21**	**0.94**

Sample ID	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9
Field Measurements	**24/5/18**	**22/8/18**	**16/11/18**	**12/2/19**	**28/5/19**	**28/8/19**	**22/11/19**	**14/2/20**	**28/5/20**	**13/8/20**	**6/11/20**	**1/2/21**	**20/5/21**	**18/8/21**	**25/11/21**	**10/2/22**
Ground Level (m AHD)	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Depth to Groundwater (m AHD)	0.68	0.45	0.35	0.6	0.76	0.94	0.49	0.72	0.79	1.16	0.76	1.04	0.62	NA	1.13	1.08
Groundwater depth (m bTOC)	1.64	1.87	1.97	1.72	1.56	1.38	1.83	1.6	1.53	1.16	1.56	1.28	1.7	----	1.19	1.24
Height of Stick up (m)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Groundwater Depth (mbgl)	0.69	0.92	1.02	0.77	0.61	0.43	0.88	0.65	0.58	0.21	0.61	0.33	0.75	----	0.24	0.29
pH (field)	6.1	6.1	6.1	6.2	6.4	6.2	6.2	6.2	6.3	6.7	6.7	6.4	6.5	----	5.9	6.1
Temperature (T deg C)																
Electrical Conductivity (mS/cm)	33.1	32.6	27.4	23.1	24.9	28.4	27.1	22.6	27	9.07	9.09	17	8580	----	12500	9890
Salinity (ppt)																
Dissolved Oxygen (mg/L)	4.54	4.32			4.6	11	4.48	5.44	6.46	3.59	7.27	5.05	5.46	----	2.73	2.63
Dissolved Oxygen (%)																
Turbidity (NTU)																
Redox Potential (mV)		165				83.1				-23.3				----		
Comments													----	DRY	----	----
Sodium		5360				4930			553	1500				----		
Potassium		182				168				59				----		
Calcium		267				230				56				----		
Magnesium		670				672				149				----		
Chloride		10200				10300				2740				----		
Alkalinity (as CaCO3)	<1	42	59	78	68	38	65	63	62	187	128	63	86	----	120	78
Bicarbonate	50	42	59	78	68	38	65	63	62	187	128	63	86	----	120	78
Carbonate (as CaCO3)	50	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	----	<1	<1
Sulphate (SO4)		1540				1600				363				----		
pH (lab)																
Total Dissolved Solids (TDS)	22700	21900	17900	15600	14700	19500	17800	11700	16800	5490	5720	11800	6380	----	9110	9420
Hardness (as CaCO3)																
Total Suspended Solids (TSS)																
Iron (filtered)		0.22				<0.05				**1.26**				----		
Manganese		0.012				0.013				0.01				----		
Nitrate (NO3 as N)	**0.75**	0.24	**0.72**	0.10	0.02	**1.23**	0.52	0.45	0.31	<0.01	0.07	0.01	0.1	----	0.02	0.06
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.01	<0.01
Ammonia (NH3 as N)	0.27	0.09	0.13	0.16	0.34	0.12	0.03	0.08	<0.01	0.25	0.01	0.24	0.16	----	0.43	0.11
Total Kjeldhal Nitrogen (TKN)	**5.30**	<0.5	**2.1**	**1.9**	**1.60**	**1.20**	**2.30**	**2.30**	**1.70**	**3.30**	**6.10**	**4.60**	**3.00**	----	**1.20**	**3.30**
Dissolved Organic Carbon		11	3.80	4.76		11				35				----		
Fluoride (Electrode)		0.2				0.2				0.4				----		
Total Phosphorus (TP)	**0.41**	**0.48**	**0.26**	**0.14**	**0.13**	**0.24**	**0.28**	**0.24**	<0.05	**0.30**	**0.60**	**0.40**	**0.38**	----	**0.11**	**0.42**

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems: **35**

Focus of this monitoring report

nc = no comment   NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Prepared By: Earth2Water Pty Ltd
Checked By: DP

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW10	MW 10	MW 10	MW10	MW10	MW 10	MW10	MW10	MW10	MW10	MW10	MW10	MW10
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13
Ground Level (m AHD)			1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475
Depth to Groundwater (m AHD)			0.295	0.295	0.785	0.395	0.295	NA	0.185	0.035	0.275	0.225	0.605	0.765	0.365
Groundwater depth (m bTOC)			2.14	2.14	1.65	2.04	2.14	-	2.25	2.4	2.16	2.21	1.83	1.67	2.07
Height of Stick up (m)			0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Groundwater Depth (mbgl)			1.18	1.18	0.69	1.08	1.18	NA	1.29	1.44	1.2	1.25	0.87	0.71	1.11
pH (field)	6.5-8.0 (a)	8-8.4 (a)	4	4.1	5.8	5	5.4	-	5.3	4.9	5.2	4.7	5	5.1	5
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		29	6.45	3.06	8.94	5.12	-	5.7	14.8	6.3	12	15.2	13.1	6.64
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.69	4.93	4.7	9.61	6.1	-	4.16	3.05	3.26	2.4	2.03	3.43	2.01
Dissolved Oxygen (%)			-	-	50.30	-	-	-	-	-	-	24.9			-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-
Redox Potential (mV)			-	-	-	-	-	-	-	-	-	<0.1			-
Comments			nc	nc	nc	nc	-	-	-	-	nc				nc
Sodium			-	-	406	-	-	-	-	-	-	2390			-
Potassium			-	-	20	-	-	-	-	-	-	102			-
Calcium			-	-	7	-	-	-	-	-	-	114			-
Magnesium			-	-	13	-	-	-	-	-	-	336			-
Chloride			-	-	449	-	-	-	-	-	-	4730			-
Alkalinity (as CaCO3)			<1	<1	28	3	10	-	6	2	6	4	1	<1	5
Bicarbonate			<1	<1	28	3	10	-	6	2	6	4	1	<1	5
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	42	-	-	-	-	-	-	642			-
pH (lab)			-	-	-	-	-	-	-	-	-				-
Total Dissolved Solids (TDS)			20500	10100	1810	5740	2700	-	3440	10500	3980	8280	10700	7550	3870
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-				-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-				-
Iron (filtered)	0.3 (1)		-	-	**10.4**	-	-	-	-	-	-	0.28			-
Manganese	1.90		-	-	0.003	-	-	-	-	-	-	0.015			-
Nitrate (NO3 as N)	0.7 (7)		0.2	0.3	**1.36**	0.44	0.05	-	0.15	<0.01	0.03	0.25	<0.01	0.01	<0.01
Nitrite (NO2 as N)			<0.01	<0.01	<0.50	0.02	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	<0.10	<0.10	<0.10	<0.10	0.03	-	0.02	<0.10	0.02	0.02	<0.10	0.58	0.05
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	**2.2**	**6.2**	**59.3**	**1.2**	**2.6**	-	**5.2**	**8**	**1.5**	**10**	**1.4**	**1.4**	**3.1**
Dissolved Organic Carbon			-	-	430	-	-	-	-	-	-	12			-
Fluoride (Electrode)			-	-	<0.1	-	-	-	-	-	-	0.2			-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	**0.15**	**0.52**	**<1.00**	**0.03**	**0.14**	-	**0.46**	**0.8**	**0.3**	**0.94**	**0.03**	**0.04**	**0.21**

Sample ID	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10
Field Measurements	30/8/13	27/11/13	7/2/14	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17
Ground Level (m AHD)	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475
Depth to Groundwater (m AHD)	0.195	0.235	0.105	0.415	0.475	0.355	0.305	0.365	0.235	0.335	0.355	0.255	0.635	0.335	0.385
Groundwater depth (m bTOC)	2.24	2.2	2.33	2.02	1.96	2.08	2.13	2.07	2.2	2.1	2.08	2.18	1.80	2.10	2.05
Height of Stick up (m)	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Groundwater Depth (mbgl)	1.28	1.24	1.37	1.06	1	1.12	1.17	1.11	1.24	1.14	1.12	1.22	0.84	1.14	1.09
pH (field)	5.4	5.3	5.1		4.2			5.5	5.6	5.1	4.8	5.2	5.1	5.2	5.8
Temperature (T deg C)	-	-	-												
Electrical Conductivity (mS/cm)	6.72	14.4	28.2		22.7			8.54	4.57	8.06	33.7	10.2	12.2	14.6	4.21
Salinity (ppt)	-	-	-												
Dissolved Oxygen (mg/L)	3.02	2.38	3.89	3.06	2.7	3.5	4.2	3.29	3.14	2.9	4.24	5.00	2.89	2.32	5.30
Dissolved Oxygen (%)	-	-	-		30.3										
Turbidity (NTU)	-	-	-												
Redox Potential (mV)	161	-	-		318							172			
Comments	nc	nc	nc												
Sodium	1100	-	-		5060							1860			
Potassium	48	-	-		156							61			
Calcium	44	-	-		265							78			
Magnesium	136	-	-		699							209			
Chloride	1760	-	-		7760							3420			
Alkalinity (as CaCO3)	9	10	4	<1	<1	2	3	16	16	8	2	6	<1	<1	24
Bicarbonate	9	10	4	<1	<1	2	3	16	16	8	2	6	<1	<1	24
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)	304	-	-		1410							439			
pH (lab)	-	-	-	5.20	4.20	5.10	5.10					5.2			
Total Dissolved Solids (TDS)	3760	10800	19400	7970	16900	12200	8070	3530	3370	6310	22000	6220	8160	10600	2640
Hardness (as CaCO3)	-	-	-												
Total Suspended Solids (TSS)	-	-	-												
Iron (filtered)	**0.54**	-	-		0.27							0.25			
Manganese	0.014	-	-		0.02							0.009			
Nitrate (NO3 as N)	0.04	0.02	0.16	<0.01	**0.72**	0.07	0.02	<0.01	0.05	0.09	0.31	0.10	0.02	<0.01	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.06	0.3	0.09	0.08	<0.01	0.13	0.15	0.05	0.02	<0.01	<0.05	<0.01	0.15	0.17	0.18
Total Kjeldhal Nitrogen (TKN)	**6.1**	**0.3**	**<0.2**	**1.00**	**2.2**	**11.4**	**17.3**	**3.2**	**2.5**	**1.7**	**2.9**	**2.6**	**2.6**	**9.0**	**10.4**
Dissolved Organic Carbon	24	-	-		14							15			
Fluoride (Electrode)	<0.1	-	-		0.30							<0.1			
Total Phosphorus (TP)	**0.45**	<0.01	<0.02	**0.09**	**0.16**	**1.08**	**1.67**	**0.26**	**0.14**	**0.06**	**0.26**	**0.17**	**0.17**	**0.82**	**0.70**

Sample ID	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10
Field Measurements	17/8/17	30/11/17	8/2/18	24/5/18	22/8/18	16/11/18	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475	1.475		1.475		
Depth to Groundwater (m AHD)	0.285	0.075	0.115	0.435	0.175		0.035	0.545	0.415	0.225	0.415	0.475	1.045	0.475	0.755		0.705		
Groundwater depth (m bTOC)	2.15	2.36	2.32	2	2.26	----	2.40	1.89	2.02	2.21	2.02	1.96	1.39	1.96	1.68		1.73		
Height of Stick up (m)	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96		0.96		
Groundwater Depth (mbgl)	1.19	1.4	1.36	1.04	1.3		1.44	0.93	1.06	1.25	1.06	1	0.43	1	0.72	----	0.77	----	----
pH (field)	5.2	5	4.8	4.7	5.0	----	5.2	5.3	4.7	4.9	4.8	5.2	5.3	5.5	5.2	----	5.8	----	----
Temperature (T deg C)																			
Electrical Conductivity (mS/cm)	16.9	28.3	39.2	39.7	37.8		27.1	34	31.7	33	32.8	28.9	3.03	6.43	16	----	8090	----	----
Salinity (ppt)																			
Dissolved Oxygen (mg/L)	5.54	3.25	3.76	4.35	4.62			6.97	11	4.71	3.81	7.74	3.9	5.86	2.87	----	4.14	----	----
Dissolved Oxygen (%)																			
Turbidity (NTU)																			
Redox Potential (mV)	150				184				154				116					----	
Comments																DRY	----	DRY	DRY
Sodium	2700				6600				5650				474					----	
Potassium	86				224				194				21					----	
Calcium	127				291				251				14					----	
Magnesium	363				816				723				44					----	
Chloride	4980				11800				11300				817					----	
Alkalinity (as CaCO3)	7	<1	<1	<1	2	----	9	4	6	4	4	6	10	12	4	----	5	----	----
Bicarbonate	7	3	2	<1	2	----	9	4	6	4	4	6	10	12	4	----	5	----	----
Carbonate (as CaCO3)	<1	3	2	<1	<1	----	<1	<1	<1	<1	<1	<1	<1	<1	<1	----	<1	----	----
Sulphate (SO4)	736				1920				1810				138					----	
pH (lab)	5.2																		
Total Dissolved Solids (TDS)	10700	19700	23700	27600	26000	----	18800	23600	20500	23400	21800	18000	1490	3660	11300	----	6880	----	----
Hardness (as CaCO3)																			
Total Suspended Solids (TSS)																			
Iron (filtered)	**0.90**				0.14				**7.19**				**1.68**					----	
Manganese	0.015				<0.010				0.017				<0.001					----	
Nitrate (NO3 as N)	0.16	0.04	0.40	0.24	0.37	----	0.01	0.07	<0.01	0.24	0.17	0.54	<0.01	<0.01	0.01	----	0.03	----	----
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.01	----	----
Ammonia (NH3 as N)	0.12	0.1	0.10	<0.01	0.16	----	0.38	0.23	0.32	0.05	0.12	0.14	<0.01	0.02	0.06	----	<0.01	----	----
Total Kjeldhal Nitrogen (TKN)	**7.4**	**8.8**	**5.0**	**5.2**	<0.5	----	**9.4**	**10.9**	**1**	**1.4**	**1.9**	**10.3**	**2.2**	**4**	**2.3**	----	**1.9**	----	----
Dissolved Organic Carbon	23				10	----	4.90		11				31					----	
Fluoride (Electrode)	0.2				0.3				0.2				<0.1					----	
Total Phosphorus (TP)	**0.59**	**0.65**	**0.37**	**0.39**	<0.05	----	**1.21**	**1.18**	**0.13**	**0.52**	**0.28**	**0.82**	**0.15**	**0.33**	**0.14**	----	**0.15**	----	----

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems: **35**

Focus of this monitoring report

nc = no comment   NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Gerroa Waste Disposal Depot (2010 to 2022)

Sample ID	ANZECC, 2000		MW11	MW 11	MW 11	MW11	MW11	MW 11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11
Field Measurements	Fresh	Marine	21/5/10	17/8/10	30/11/10	23/2/11	24/5/11	24/8/11	3/11/11	1/2/12	31/5/12	10/8/12	21/11/12	18/2/13	31/5/13	30/8/13	27/11/13	7/2/14
Ground Level (m AHD)			1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695
Depth to Groundwater (m AHD)			0.405	0.485	0.955	0.495	0.405	0.375	0.345	0.265	0.375	0.385	0.785	0.965	0.505	0.315	0.375	0.265
Groundwater depth (m bTOC)			2.25	2.17	1.7	2.16	2.25	2.28	2.31	2.39	2.28	2.27	1.87	1.69	2.15	2.34	2.28	2.39
Height of Stick up (m)			0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Groundwater Depth (mbgl)			1.29	1.21	0.74	1.2	1.29	1.32	1.35	1.43	1.32	1.31	0.91	0.73	1.19	1.38	1.32	1.43
pH (field)	6.5-8.0 (a)	8-8.4 (a)	5.1	5.2	5.7	6.1	6.2	6.3	6.4	6	6.1	5.4	5.7	6.2	5.5	6.2	5.7	5.6
Temperature (T deg C)			-	-	-	-	-	-	-	-	-				-	-	-	-
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		18.6	16.2	0.178	6.12	4.05	1.67	3.83	6.26	3.4	8	12.1	7.05	7.3	1080	4.73	8.28
Salinity (ppt)			-	-	-	-	-	-	-	-	-				-	-	-	-
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	2.41	3.32	5.13	9.66	2.66	1.56	6.61	2.58	2.16	1.2	1.8	1.63	2.05	1.97	2.25	2.15
Dissolved Oxygen (%)			-	-	53.30	-	-	-	-	-	-	12.4			-	-	-	-
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-	-	-	-	-	-	-	-				-	-	-	-
Redox Potential (mV)			-	-	-	-	-	111	-	-	-	<0.1			-	38	-	-
Comments			nc	nc	nc	nc	-	-	-	-	nc	nc	nc	nc	nc	nc	nc	nc
Sodium			-	-	368	-	-	298	-	-	-	1900			-	190	-	-
Potassium			-	-	16	-	-	10	-	-	-	67			-	13	-	-
Calcium			-	-	10	-	-	31	-	-	-	100			-	6	-	-
Magnesium			-	-	15	-	-	40	-	-	-	249			-	14	-	-
Chloride			-	-	400	-	-	493	-	-	-	3690			-	275	-	-
Alkalinity (as CaCO3)			24	24	51	103	102	93	60	64	79	28	23	87	28	53	32	26
Bicarbonate			24	24	51	103	102	93	60	64	79	28	23	87	28	53	32	26
Carbonate (as CaCO3)			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)			-	-	30	-	-	121	-	-	-	471			-	37	-	-
pH (lab)			-	-	-	-	-	-	-	-	-				-	-	-	-
Total Dissolved Solids (TDS)			12800	10700	1530	3710	2260	1330	2370	3570	1990	6370	8300	4310	3950	671	2900	5480
Hardness (as CaCO3)			-	-	-	-	-	-	-	-	-					-	-	-
Total Suspended Solids (TSS)			-	-	-	-	-	-	-	-	-					-	-	-
Iron (filtered)	0.3 (1)		-	-	6.2	-	-	2.57	-	-	-	1.69			-	0.68	-	-
Manganese	1.90		-	-	0.005	-	-	0.01	-	-	-	0.028			-	0.004	-	-
Nitrate (NO3 as N)	0.7 (7)		0.06	0.17	0.93	0.48	<0.01	0.04	<0.01	<0.01	<0.01	0.08	<0.01	0.81	<0.01	<0.10	<0.01	<0.01
Nitrite (NO2 as N)			<0.01	<0.01	<0.50	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	<0.10	<0.10	<0.10	0.13	0.06	0.03	0.03	0.01	0.03	0.05	<0.10	0.42	0.07	0.02	0.01	<0.01
Total Kjeldhal Nitrogen (TKN)	0.5 (5)	0.12 (6)	2.8	3.9	67.7	3.2	4.30	4.70	2.60	3.40	3	5	2.7	2.3	6	3	1.2	5.0
Dissolved Organic Carbon			-	-	440	-	-	145	-	-	-	48			-	64	-	-
Fluoride (Electrode)			-	-	0.1	-	-	0.2	-	-	-	0.2			-	0.2	-	-
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.11	0.52	<1.00	0.31	0.25	0.44	0.25	0.12	0.07	0.3	0.06	0.06	0.32	0.2	0.07	0.47

Sample ID	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11
Field Measurements	6/5/14	1/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	30/11/17	8/2/18
Ground Level (m AHD)	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695
Depth to Groundwater (m AHD)	0.635	0.705	0.445	0.515	0.575	0.325	0.375	0.355	0.525	0.405	0.825	0.335	0.635	0.415	0.555	0.285
Groundwater depth (m bTOC)	2.02	1.95	2.21	2.14	2.08	2.33	2.28	2.3	2.13	2.25	1.83	2.32	2.02	2.24	2.10	2.37
Height of Stick up (m)	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Groundwater Depth (mbgl)	1.06	0.99	1.25	1.18	1.12	1.37	1.32	1.34	1.17	1.29	0.87	1.36	1.06	1.28	1.14	1.41
pH (field)		5.2			5.9	6.4	6.1	5.6	4.9	5.6	5.8	5.3	5.6	5.2	6.2	4.6
Temperature (T deg C)																
Electrical Conductivity (mS/cm)		15.5	4.62	7.85	4.2	1.73	1.59	6.37	22.6	9	6.89	11.7	11	13.8	3.03	33.1
Salinity (ppt)																
Dissolved Oxygen (mg/L)		3.1			2.11	1.8	1.99	2	2.97	2.02	2.23	3.6	2.62	4.45	4.43	3.47
Dissolved Oxygen (%)		33.5														
Turbidity (NTU)																
Redox Potential (mV)		206				-30				65.0				144		
Comments																
Sodium		3710				302				1610				2280		
Potassium		99				13				43				64		
Calcium		218				10				84				110		
Magnesium		582				23				202				316		
Chloride		6060								2980				4160		
Alkalinity (as CaCO3)	75	7	40	28	68	83	44	34	5	27	28	<1	23	11	62	<1
Bicarbonate	75	7	40	28	68	83	44	34	5	27	28	20	23	11	62	<1
Carbonate (as CaCO3)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	20	<1	<1	<1	<1
Sulphate (SO4)		1060								373				445		
pH (lab)	6	5	6	6						5.6				5.2		
Total Dissolved Solids (TDS)	1760	13800	2810	4840	2290	1470	1020	4510	13900	6060	4280	6190	7040	8500	2020	23900
Hardness (as CaCO3)																
Total Suspended Solids (TSS)																
Iron (filtered)		2.98				1.28				3.09				1.78		
Manganese		0.03				0.004				0.023				0.031		
Nitrate (NO3 as N)	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02	<0.01	<0.01	<0.10	<0.05	<0.01	<0.01
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia (NH3 as N)	0.06	<0.01	0.19	0.13	<0.01	0.01	0.02	<0.01	<0.05	0.02	0.11	0.12	0.11	0.12	0.04	0.27
Total Kjeldhal Nitrogen (TKN)	2.5	2.6	3.7	4.9	5.6	4.9	2.2	1.7	2.5	6.6	5.3	17.4	6.1	6.2	15.7	9.4
Dissolved Organic Carbon		31				102				58				135		
Fluoride (Electrode)		0.2				0.3				0.1				0.2		
Total Phosphorus (TP)	0.14	0.16	0.29	0.32	0.16	0.31	0.07	0.06	0.16	0.42	0.40	1.52	0.47	0.35	1.18	0.64

Sample ID	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11
Field Measurements	24/5/18	22/8/18	16/11/18	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	14/2/20	14/2/20	14/2/20	14/2/20	20/5/21	18/8/21	25/11/21	10/2/22
Ground Level (m AHD)	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695	1.695
Depth to Groundwater (m AHD)	0.585	0.355	0.255	0.375	0.455	0.805	0.405	0.655	0.705	1.295	0.725	1.015	0.315	0.615	0.355	0.195
Groundwater depth (m bTOC)	2.07	2.30	2.40	2.28	2.2	1.85	2.25	2	1.95	1.36	1.93	1.64	2.34	2.04	2.3	2.46
Height of Stick up (m)	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Groundwater Depth (mbgl)	1.11	1.34	1.44	1.32	1.24	0.89	1.29	1.04	0.99	0.4	0.97	0.68	1.38	1.08	1.34	1.5
pH (field)	5.4	6.2	6.2	6.3	6.6	5.6	6.7	6.1	6	7.4	6.8	6.4	6.8	7.9	6.3	6.4
Temperature (T deg C)																
Electrical Conductivity (mS/cm)	27.2	15	12.6	10.2	11.5	23.3	5.77	15.1	19.7	1.8	3.98	7.65	1210	3810	10400	5320
Salinity (ppt)																
Dissolved Oxygen (mg/L)	3.41	4.53			4.74	19	3.54	6.7	5.04	2.75	3.77	4.12	4.36	3.94	5.47	2.1
Dissolved Oxygen (%)																
Turbidity (NTU)																
Redox Potential (mV)		179				89.5				107				21.3		
Comments													----	----	----	----
Sodium		2370				4070				197				778		
Potassium		99				142				43				30		
Calcium		106				180				60				56		
Magnesium		276				503				32				81		
Chloride		4620				8030				332				1380		
Alkalinity (as CaCO3)	<1	99	128	139	129	43	205	108	77	396	142	68	101	103	39	113
Bicarbonate	36	99	128	139	129	43	205	108	77	396	142	68	101	103	39	113
Carbonate (as CaCO3)	36	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO4)		524				1320				53				187		
pH (lab)																
Total Dissolved Solids (TDS)	16200	8170	7730	6510	6690	15400	3030	7870	13800	908	2260	5310	774	2780	7580	4710
Hardness (as CaCO3)																
Total Suspended Solids (TSS)																
Iron (filtered)		0.61				4.33				0.32				2		
Manganese		0.018				0.032				0.006				0.007		
Nitrate (NO3 as N)	<0.10	0.08	<0.01	0.01	<0.10	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.10	0.03	0.02	<0.01	<0.10
Nitrite (NO2 as N)	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01	<0.10
Ammonia (NH3 as N)	2.2	5.35	4.12	2.14	2.2	1.15	4.2	4.0	2.6	17.0	1.34	0.43	0.35	0.64	0.28	0.42
Total Kjeldhal Nitrogen (TKN)	11.4	5.5	5.3	4.0	7.1	3.4	7.3	5.9	4.4	19.0	3.9	3.4	2.4	4.6	1.0	6.9
Dissolved Organic Carbon		22	4.36	4.63		19				25				43		
Fluoride (Electrode)		0.2				0.3				0.3				0.2		
Total Phosphorus (TP)	0.60	0.09	0.32	0.19	0.35	0.14	0.19	0.15	<0.05	0.16	0.21	<0.20	<0.20	0.23	0.06	0.22

Note:

Exceeds ANZECC (2000) guidelines marine/fresh water ecosystems — 35

Focus of this monitoring report

nc = no comment NA = not available

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water qualiity and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water Location (ML-1)

Gerroa Waste Disposal Depot (2003 to 2022)

Sample ID	ANZECC, 2000		ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1	ML-1
Field Measurements	Fresh	Marine	10/07/03	22/10/03	2/02/04	13/05/04	13/07/04	26/10/04	16/02/05	29/06/05	30/08/05	23/11/05	27/02/06	31/05/06	31/08/06	28/11/06	27/02/07	23/05/07	22/08/07	21/11/07	22/02/08	29/05/08	25/08/08	19/11/08	2008-2019	22/11/19	14/02/20	28/05/20	13/08/20	6/11/20	1/02/21	**20/5/21**	**18/8/21**	**25/11/21**	**10/2/22**
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.93	7.85	7.58	7.59	7.15	4.31	7.41	6.42	7.13	7.42	7.2	6.45	6.29	6.27	6.9	7.68	5.82	7.09	6.91	6.49	6.5	7.1	**No Access (2008 to 2019) Cleary Bros Land**	6.8	6.1	4.6	6.5	6.6	6.4	7.7	7.8	6.7	7.3
Temperature			12.75	21.66	22.54	17.36	13.33	19.15	18.89	13.65	16.71	19.18	23.57	11.57	15.92	22.4	22.48	11.93	13.53	23.93	20.87	15.26	15.1	20.5												
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		1.2	40	13	36.7	13.6	0.4	4.2	4.5	1.941	11.12	36.76	45	9.616	25.73	10.63	10.93	1.388	12.93	1.292	3.591	3.7	9.67		41.7	1.28	3.38	0.15	1.96	32.8	588	13600	1440	1750
Eh (ORP) (mV)			-67	nm	nm	nm	nm	nm	nm	-23	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	76					83.9							
Salinity (ppt)			0.65	25.53	7.48	23.16	7.93	0.21	2.22	2.4	0.99	6.35	23.27	29.03	5.43	15.73	6.03	6.23	0.7	7.43	0.7	2.37	2.5	nm												
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.8	6.2	3.8	2	0.5	0.8	5.1	7.8	8.97	8.26	2.34	5.83	14.29	6.81	4.67	7.88	8.93	5.69	5.36	5.25	7.9	nm		316	1.1	3.79	4.91	2.72	1.48	4.05	5.83	2.84	4.41
Dissolved Oxygen (%)			45	82.4	42.6	24.1	5.7	8.3	55.2	64.9	92.8	92.7	31.5	64.4	149.4	86	54.4	74.2	86.1	70.5	60.2	64.9	79	55												
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	12.7	29.3	28	24.8	22.3	13.8	12.4	10.8	10.7	1.9	12.1	17.5	40.3	3.9	15.6	4	4.7	5.3	25.5	3.9	4.9	nm												
Laboratory Analyses																																				
Sodium (ICP)			156	9695	2890	8881	2325	41	733	686	396	218	6700	8600	1200	<1	1600	1500	160	2100	150	1200	520	1300				112	17	119		3800				
Potassium (ICP)			8.3	362	122	374	115	8.8	32	33	22	9.4	240	400	83	2.7	76	80	10	96	9.4	53	25	54					3			141				
Calcium (ICP)			34	212	106	207	115	13	44	46	45	98	280	150	83	330	65	81	29	81	33	130	50	73					4			193				
Magnesium (ICP)			28	-	318	994	305	9.4	93	97	50	28	830	940	160	0.06	200	220	32	280	26	160	63	160					3			452				
Chloride							-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-												
Alkalinity (as CaCO3)			235	120	130	119	120	18	75	9.2	74	30	157	100	91	98	53	91	-	120	69	<2	64	90		134	21	<1	17	50	76	42	140	24	121
Sulphate (SO4)			-	-	-	-	-	-	-	-	-	-	-	-	-	0.013	-	-	-	-	-	-	-	-												
pH			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7												
Redox Potential (mV)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	160								51.1				
Total Dissolved Solids (TDS)			12692	32132	6716	19936	8866	220	2304	2404	2032	7664	26108	32000	5600	31000	6600	7500	728	7500	840	2400	2100	6400		28200	527	2040	88	1150	23300	388	13700	932	1600
Total Suspended Solids (TSS)			-	47	5	11	14	31	6	18	9	22	22	66	21	93	19	22	11	-	-	-	-	-												
Metals (mg/L)																																				
Iron (ICP)	0.3 (1)		0.21	0.12	0.18	<0.002	0.28	**3.5**	0.072	0.29	0.06	0.33	0.03	**2.1**	**2.7**	0.14	0.08	**0.41**	**0.39**	**0.51**	**2.5**	**1.5**	**0.47**	**0.7**					**0.54**			0.27				
Manganese (ICP)	1.90		0.15	0.028	0.02	0.02	0.027	0.49	0.007	0.29	<0.01	0.06	0.084	0.03	0.1	0.03	0.05	0.1	0.16	0.037	0.14	0.14	0.08	0.06					0.011			0.03				
Nutrients (mg/L)																																				
Nitrate (NO3 as N)	0.7 (7)		0.03	0.49	0.08	0.19	0.06	0.1	0.04	0.069	<0.04	<0.04	<0.04	0.14	<0.04	0.14	0.16	0.06	0.11	0.07	<0.04	-	-	0.05		0.03	<0.01	0.05	0.1	0.01	0.03	0.08	0.42	0.01	0.03
Nitrite (NO2 as N)			<0.02	0.09	<0.02	0.09	<0.02	<0.02	<0.02	0.016	0.015	0.028	0.022	0.011	0.004	0.06	0.012	0.004	0.03	0.031	0.012	-	-	0.01		0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	0.02
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.05	0.61	1.4	1.5	**2.2**	<0.02	0.71	<0.02	0.21	0.45	**2.1**	0.4	1.3	0.49	0.05	0.69	<0.10	1.3	0.31	1.5	0.22	<1		0.47	0.15	0.1	0.03	0.15	0.37	0.62	0.51	0.12	0.66
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	**0.38**	**0.92**	**1.6**	**1.6**	**2.9**	**1.1**	**0.94**	**0.62**	**0.86**	**0.94**	**3.1**	**1.1**	**2.3**	**2.7**	**0.83**	**1.4**	**0.57**	**1.7**	**1.3**	**2.2**	**0.93**	**0.8**		<0.5	**2.3**	**0.6**	**0.6**	**0.6**	**1.4**	**1.4**	**0.9**	**1.0**	**1.4**
Total Organic Carbon (TOC)			6	1	1	<1	3	27	18	9	7	3	<1	NR	8	<1	5		8	11	16	10	10	-												
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.02	<0.002	<0.002	**0.11**	**0.05**	**0.24**	0.004	0.023	<0.002	<0.005	0.019	<0.005	0.015	0.013	**0.049**	0.005	**0.39**	0.015	<0.05	0.01	<0.005	<0.05		**0.16**	**0.26**	<0.01	**0.1**	0.02	<0.05	**0.08**	<0.02	**0.06**	0.03
Biological (CFU/100 ml)																																				
Enterococcus	35 (8)	35 (8)	<1	12	**400**	4 (app)	40	**90**	**90**	<1	**38**	**120**	**36**	30 (app)	20 (app)	20 (app)	**1500 (app)**	**72 (app)**	<2	20	**102**	33	2 (app)	18 (app)												
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	<1	4	14 (app)	6 (app)	12 (app)	**250**	20 (app)	2	72	30	16	12 (app)	20 (app)	<2	**1800(app)**	12 (app)	<2	128	24	23	10	20												

Exceeds ANZECC (2000) guidelines **0.054**

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

Notes:

1. Trigger value is an indicative interim working level only (IIWL)
2. Ammonia trigger value specified at pH = 8.0, for a 95% protection level, is corrected for an average pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% Proetction level
8. Guidelinefor water quality and aesthetics: Primary Contact

a. Reference only, not dirtectly applicable to groundwater.

Table SW-1: Summary Analytical Results for Surface Water
(ML-2)

Gerroa Waste Disposal Depot (2016 to 2022)

Sample ID	ANZECC, 2000		ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2	ML-2
Field Measurements	Fresh	Marine	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	29/11/17	8/2/18	24/5/18	22/8/18	16/11/18	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.9	6.8	7.1	7.2	7.1	6.7	7.3	7.2	7.1	7.2	7.0	7.4	7.3	7.5	6.9	6.3	4.9	6.4	7.1	6.6	6.8	7.6	6.6	6.4
Temperature																										
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		43.2	5.24	47.3	30.1	15.3	29.1	30.8	41.8	47.2	43.6	34.8	45.4	43.6	51.2	46	2.91	5.43	0.449	22	34.7	4300	16200	2800	8650
Eh (ORP) (mV)				1.0				132				229								144						
Salinity (ppt)																										
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.82	5.66	4.73	4.87	6.38	4.90	3.21	3.25	3.25	5.72			6.76	3.43	2.87	0.87	4.47	5.08	5.59	3.2	3.36	5.85	3.19	3.32
Dissolved Oxygen (%)																										
Turbidity (NTU)	6-50 (a)	0.5-10 (a)																								
Laboratory Analyses																										
Sodium (ICP)				922				4750				7660				11200			112	64				5590		
Potassium (ICP)				35				180				272				412				5				205		
Calcium (ICP)				63				246				316				427				6				261		
Magnesium (ICP)				104				525				914				1360				8				653		
Chloride				----				----																		
Alkalinity (as CaCO3)			118	110	109	139	136	120	<1	<1	<1	111	114	116	106	102	128	24	<1	15	111	105	43	131	27	132
Sulphate (SO4)			118	----	109	139	136	----	153	145	121	----														
pH			<1		<1	<1	<1		153	145	121															
Redox Potential (mV)																								54.8		
Total Dissolved Solids (TDS)			33200	3070	33100	19400	9970	18800	21200	15800	27200	28600	24300	35800	27800	38000	31000	1480	3140	245	13800	24800	3310	19600	1540	7380
Total Suspended Solids (TSS)																										
Metals (mg/L)																										
Iron (ICP)	0.3 (1)			**1.07**				**0.88**				0.18				0.14				**0.65**				0.28		
Manganese (ICP)	1.90			0.042				0.028				0.012				0.019				0.012				0.023		
Nutrients (mg/L)																										
Nitrate (NO3 as N)	0.7 (7)		0.13	0.16	0.06	<0.01	0.02	0.31	0.01	<0.01	0.06	0.15	0.02	0.02	0.06	0.01	<0.01	<0.01	<0.01	0.1	0.06	0.06	0.1	0.3	0.02	0.03
Nitrite (NO2 as N)			<0.01	0.02	<0.01	<0.01	0.04	0.04	0.04	<0.01	0.01	0.02	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01	0.04	<0.01	0.02
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.11	1.16	0.16	0.78	1.21	0.32	0.16	<0.05	<0.10	0.17	0.65	0.29	0.26	0.12	0.03	0.27	0.13	0.06	0.51	<0.01	0.32	0.32	0.15	1.00
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	0.5	**1.9**	<0.5	**1.0**	**2.3**	**0.5**	**0.8**	<0.5	<0.5	<0.5	**0.7**	<0.5	0.5	<1.0	<0.5	**2.00**	**0.60**	**0.70**	**0.90**	**0.80**	**0.90**	**0.80**	**1.00**	**1.80**
Total Organic Carbon (TOC)				----				----				----	3.45	7.59												
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.06	0.04	<0.05	**0.09**	0.04	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	**0.20**	**<0.05**	**0.16**	**0.24**	**0.24**	<0.01	**0.09**	**0.08**	<0.05	**0.1**	0.03	**0.07**	0.04
Biological (CFU/100 ml)																										
Enterococcus	35 (8)	35 (8)		28				**44**				~5														
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)		18				~94				~1														

Exceeds ANZECC (2000) guidelines **0.054**

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection,corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water quality and aesthetics: primary contact.
a. Reference only, not dirtectly applicable to groundwater.

Prepared By: Earth2Water Pty Ltd
Checked By: DP

Table SW-1: Summary Analytical Results for Surface Water Location (ML-3)

Gerroa Waste Disposal Depot (2003 to 2022)

Sample ID	ANZECC, 2000		ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3	ML-3
Field Measurements	Fresh	Marine	22/10/03	2/02/04	13/05/04	13/07/04	26/10/04	2004-2019	22/11/19	14/02/20	28/05/20	13/08/20	6/11/20	1/02/21	**20/5/21**	**18/8/21**	**25/11/21**	**10/2/22**	
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.63	7.42	7.65	7.26	4.25	No access (Cleary Bros. Land) - no samples taken	6.7	6.1	4.6	6.4	6.4	6.4	7.3	8.4	6.3	6.4	
Temperature			20.5	21.34	13.03	13.16	18.75												
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		13.1	5.3	3.1	8.5	0.4		34.4	0.882	2590	110	1780	28200	532	3280	1370	2870	
Eh (ORP) (mV)			nm	nm	nm	nm	nm					118							
Salinity (ppt)			7.53	2.85	1.62	4.72	0.21												
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	4.6	4.5	2.2	0.8	1.2		1.34	1.09	3.89	4.87	5.57	1.77	3.17	5.31	2.17	2.6	
Dissolved Oxygen (%)			52.9	41.1	24	7.6	12.2												
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	30.1	27.1	21.5	20.6	15.1												
Laboratory Analyses																			
Sodium (ICP)			-	-	-	-	-					12				618			
Potassium (ICP)			-	-	-	-	-					3				27			
Calcium (ICP)			-	-	-	-	-					4				79			
Magnesium (ICP)			-	-	-	-	-					2				81			
Chloride			-	-	-	-	-												
Alkalinity (as CaCO3)			-	-	-	-	-		118	33	<1	13	43	73	38	127	22	125	
Sulphate (SO4)			-	-	-	-	-												
pH			-	-	-	-	-												
Redox Potential (mV)			-	-	-	-	-									45.9			
Total Dissolved Solids (TDS)			-	-	-	-	-		22800	602	1390	82	982	16000	356	2280	892	1640	
Total Suspended Solids (TSS)			-	-	-	-	-												
Metals (mg/L)																			
Iron (ICP)	0.3 (1)		-	-	-	-	-					**0.57**				**2.54**			
Manganese (ICP)	1.90		-	-	-	-	-					0.01				0.11			
Nutrients (mg/L)																			
Nitrate (NO3 as N)	0.7 (7)		-	-	-	-	-		<0.01	<0.01	0.04	0.1	<0.01	<0.01	0.08	0.15	0.02	0.04	
Nitrite (NO2 as N)			-	-	-	-	-		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.08	0.04	0.08	0.07	0.03		0.16	0.17	0.06	0.02	0.14	0.34	0.53	0.32	0.08	0.8	
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	-	-	-	-	-		<0.5	**2.3**	**0.6**	**0.6**	**0.6**	**1.1**	**1.4**	**0.7**	**0.9**	**1.6**	
Total Organic Carbon (TOC)			-	-	-	-	-												
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	-	-	-	-	-		**0.32**	**0.36**	<0.01	**0.1**	0.02	**0.13**	**0.09**	**0.07**	**0.06**	0.03	
Biological (CFU/100 ml)																			
Enterococcus	35 (8)	35 (8)	10	**390**	**72**	**60**	**140**												
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	16	32 (app)	50	18 (app)	**220**												

Exceeds ANZECC (2000) guidelines **0.054**

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

Notes:

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value specified at pH = 8.0, 95% protection level, corrected pH = 7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% Proetction level
8. Guidelinefor water quaility and aesthetics: Primary Contact

a. Reference only, not dirtectly applicable to groundwater.

Prepared By: Earth2Water Pty Ltd
Checked By: DP

Table SW-1: Summary Analytical Results for Surface Water Location (ML-4)

Gerroa Waste Disposal Depot (2003 to 2022)

Sample ID	ANZECC, 2000		ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4	ML-4
Field Measurements	Fresh	Marine	10/07/03	22/10/03	2/02/04	13/05/04	13/07/04	26/10/04	16/02/05	29/06/05	30/08/05	23/11/05	27/02/06	31/05/06	31/08/06	28/11/06	27/02/07	23/05/07	22/08/07	21/11/07	22/02/08	29/05/08	25/08/08	19/11/08	2008-2019	22/11/19	14/02/20	28/05/20	13/08/20	6/11/20	1/02/21	**20/5/21**	**18/8/21**	**25/11/21**	**10/2/22**
pH (field)	6.5-8.0 (a)	8-8.4 (a)	6.99	7.66	7.77	7.7	17.24	4.26	7.33	6.48	7.22	7.67	7.43	6.58	6.42	6.04	6.76	7.6	5.86	7.19	6.94	6.64	6.8	7.07	**No access**	6.7	6.2	4.7	6.4	6.5	6.3	6.8	8	6.5	6.5
Temperature			12.7	19.99	21.72	12.68	12.43	18.66	19	13.77	16.62	18.86	22.14	12.58	15.36	20.6	22.61	14.2	13.56	23.26	20.85	14.86	14.3	20														
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		1.2	13.3	5.4	3.2	8.1	0.4	2.7	4.4	1.98	5.547	10.24	15.62	5.126	13.68	10.9	24.37	1.381	9.749	1.825	1.533	1.7	5.49		40.2	1.04	3.09	0.125	1.9	30.3	4300	3470	1370	4060
Eh (ORP) (mV)			-67	nm	nm	nm	nm	nm	nm	-172	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	89					102									
Salinity (ppt)			0.63	7.63	2.93	1.7	4.48	0.21	1.44	2.33	1.01	3.01	5.79	9.15	2.77	7.92	6.19	14.84	0.7	5.49	1.01	0.97	1.1	nm														
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	5.1	4	4.1	2.5	0.6	0.5	4.6	7.4	9.48	8.26	5.06	6.3	14.45	7.36	5.02	4.71	8.19	5.31	4.88	5.11	8.2	nm		1.86	1.29	3.82	4.9	2.41	1.87	3.42	6.04	2.21	3.12
Dissolved Oxygen (%)			46.5	46.1	47.6	23.3	6.6	4.9	50.3	71.6	97.9	90.4	60	62.7	146.8	85.8	58.3	46.2	79	64.2	54.9	63.2	81	46														
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	17.3	28.8	28.4	22.7	20.4	14.7	26	32.8	10.5	1	3.2	20.2	31.6	2.8	14.4	5.6	4.7	0	30.5	1.1	4.6	nm														
Laboratory Analyses																																						
Sodium (ICP)			152	2612	1080	584	1589	40	461	677	219	907	3600	2500	670	3	1700	3600	150	1500	230	440	200	740					14				664					
Potassium (ICP)			8	103	48	26	57	9.3	23	33	13	38	230	130	39	0.75	75	160	10	70	14	20	11	30					3				29					
Calcium (ICP)			34	121	62	50	90	13	38	47	39	66	180	67	59	160	66	120	29	70	36	100	40	67					4				79					
Magnesium (ICP)			28	-	119	76	174	9.2	61	95	34	122	450	290	85	0.008	210	500	32	210	36	64	34	96					3				88					
Chloride			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-														
Alkalinity (as CaCO3)			282	93	108	83	95	14	60	11.5	71	49	119	15	63	83	52	100	-	90	97	<2	61	80		124	16	<1	12	45	72	42	128	22	138			
Sulphate (SO4)			-	-	-	-	-	-	-	-	-	-	-	-	-	0.017	-	-	-	-	-	-	-	-														
pH			6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2														
Redox Potential (mV)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	170									47					
Total Dissolved Solids (TDS)			744	8944	3480	1892	5176	160	1532	2496	1232	4236	13124	9400	3100	17000	6700	17400	602	6400	1000	1100	990	3100		26100	603	1920	86	1030	18000	3060	2370	757	2560			
Total Suspended Solids (TSS)			-	48	-	2	7	40	15	36	8	12	9	56	18	43	16	13	15	-	-	-	-	-														
Metals (mg/L)																																						
Iron (ICP)	0.3 (1)		0.23	**2.9**	**0.39**	0.27	0.2	**3.4**	0.095	0.1	0.05	0.28	0.05	**3.2**	**2.4**	<0.04	0.06	**0.36**	**0.4**	0.22	**2.9**	**0.68**	**0.43**	**1.3**					0.62				0.23					
Manganese (ICP)	1.90		0.15	0.096	0.007	0.04	0.032	0.48	<0.001	0.29	<0.01	0.06	0.053	0.1	0.1	0.03	0.05	0.06	0.16	0.017	0.12	0.04	0.09	0.08					0.011				0.025					
Nutrients (mg/L)																																						
Nitrate (NO3 as N)	0.7 (7)		0.04	0.03	0.12	<0.02	0.08	0.04	0.02	0.075	<0.04	<0.04	<0.04	1.4	<0.04	190	0.16	0.09	0.1	0.05	<0.04	-	-	0.05		<0.01	<0.01	0.04	0.1	<0.01	<0.01	0.09	0.17	0.02	0.03			
Nitrite (NO2 as N)			<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	0.019	0.01	0.003	0.008	0.016	0.003	4600	0.012	0.007	0.02	0.011	0.01	-	-	<0.01		0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02			
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.04	0.02	<0.02	<0.02	0.06	<0.02	0.21	<0.02	<0.10	0.05	0.55	0.29	0.37	<0.1	0.09	1.5	0.37	<0.02	1.7	<0.10	0.27	<1		0.52	0.18	0.06	0.02	0.15	0.34	0.33	0.12	0.08	1.44			
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	**0.37**	**0.15**	**0.75**	**0.48**	**0.7**	**2.1**	**0.8**	**0.66**	**0.62**	**0.42**	**1.3**	**2**	**1.4**	**0.75**	**0.83**	**2.3**	**0.44**	**0.49**	**2.9**	**0.53**	**0.76**	**0.8**		**0.8**	**2.2**	**0.6**	**0.6**	**0.6**	**1.1**	**1.1**	**0.4**	**0.8**	**2.3**			
Total Organic Carbon (TOC)			7	5	3	8	6	28	10	9	10	6	2	NR	10	3	6		8	11	16	10	10	-														
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	<0.002	**0.049**	**0.036**	<0.002	<0.002	**0.3**	0.021	**0.04**	<0.002	<0.005	**0.029**	**0.098**	0.01	0.017	**0.036**	0.008	**0.44**	**0.019**	0.05	<0.005	<0.005	<0.05		**0.22**	**0.31**	<0.01	**0.09**	0.02	<0.05	**0.09**	0.04	0.05	0.05			
Biological (CFU/100 ml)																																						
Enterococcus	35 (8)	35 (8)	<1	10	**320**	**60**	**72**	**100**	**180**	<1	**52**	**160**	**100**	**80**	**60**	30 (app)	**1800(ap)**	**230**	<2	32	**70**	18	8 (app)	14 (app)														
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	<1	15	28 (app)	44	20 (app)	**240**	24 (app)	<1	64	25	60	112	30 (app)	14 (app)	**2000**	12 (app)	<2	16 (app)	16 (app)	15	13	16 (app)														

Exceeds ANZECC (2000) guidelines **0.054**

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection,corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW
5. Trigger value for total Nitrogen in lowland rivers in NSW
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water quality and aesthetics: primary contact

a. Reference only, not dirtectly applicable to groundwater

Prepared By: Earth2Water Pty Ltd
Checked By: DP

Table SW-1: Summary Analytical Results for Surface Water Locations (ML-5; 2003 to 2022)

Gerroa Waste Disposal Depot (2013 to 2022)

Sample ID	ANZECC, 2000		ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5	ML-5
Field Measurements	Fresh	Marine	27/11/13	7/2/14	6/5/14	18/8/14	17/11/14	26/2/15	27/5/15	24/8/15	4/11/15	16/2/16	31/5/16	12/8/16	10/11/16	20/2/17	18/5/17	17/8/17	29/11/17	8/2/18	24/5/18	22/8/18	16/11/18	12/2/19	28/5/19	28/8/19	22/11/19	14/2/20	28/5/20	13/8/20	6/11/20	1/2/21	20/5/21	18/8/21	25/11/21	10/2/22
pH (field)	6.5-8.0 (a)	8-8.4 (a)	7.2		6.5	6.7	6.4	6.1	6.9	7.3	7.1	6.8	6.6	6.9	7.0	7.0	7.0	6.7	7.1	7.0	6.8	7.0	6.7	6.8	6.9	7	6.8	6.4	4.7	6.2	6.7	6.5	7.6	7.8	6.8	6.7
Temperature			-	-																																	
Electrical Conductivity (mS/cm)	0.125-2.2 (a)		4.26		26.8	12.9	26.8	0.357	1.21	2.38	1.82	9.9	36.6	1.22	47.1	14.4	10.6	17.3	14.9	40.2	44.4	39.5	19.4	32.7	36.9	48.8	41	1.42	3.85	0.223	2.44	35.6	613	7830	1500	7380
Eh (ORP) (mV)			-	-		208																204				36.1				104							
Salinity (ppt)			-	-																																	
Dissolved Oxygen (mg/L)	8.5-11.0 (a)	9.0-10.0 (a)	6.65		5.55	6.2	5.6	5.3	5.2	7.34	3.83	5.1	3.43	4.87	3.43	5.48	5.15	5.37	3.09	2.66	2.92	4.29			5.57	3.36	2.39	1.02	4.11	4.8	3.75	2.06	3.15	5.45	2.75	3.42
Dissolved Oxygen (%)			-	-		63.3																															
Turbidity (NTU)	6-50 (a)	0.5-10 (a)	-	-																																	
Laboratory Analyses																																					
Sodium (ICP)			-	-		2980				379				162				2580				7900				10400				29				1830		
Potassium (ICP)			-	-		138				19				10				108				290				387				3				72		
Calcium (ICP)			-	-		154				42				33				155				336				406				5				129		
Magnesium (ICP)			-	-		363				49				24				318				924				1250				4				222		
Chloride			-	-																																	
Alkalinity (as CaCO3)			112		138	105	157	15	60	134	134	102	118		106	121	159		195	168	118	121	107	124	118	102	174	20	<1	13	65	76	42	172	24	133
Sulphate (SO4)			-	-																																	
pH			-	-									6.6		7.0	7.0	7.0		7.1	7.0	6.8																
Redox Potential (mV)			-	-						95				38.0				118																	47.8		
Total Dissolved Solids (TDS)			2510		21400	8160	18500	281	538	1370	1270	6860	24000		25800	8900	6540		8840	20600	31300	27500	12000	26200	25500	36500	28800	736	2180	135	1330	15500	418	6420	894	6880
Total Suspended Solids (TSS)			-	-																																	
Metals (total, mg/L)																																					
Iron (ICP)	0.3 (1)		-	-		**0.6**				**2.09**				**1.15**				**0.32**				0.23				<0.10				**0.62**				0.58		
Manganese (ICP)	1.90		-	-		0.04				0.032				0.052				0.034				0.020				0.035				0.011				0.037		
Nutrients (mg/L)																																					
Nitrate (NO3 as N)	0.7 (7)		0.05	0.02	0.01	0.15	0.03	0.05	0.04	0.22	0.06	<0.01	0.14	0.21	0.04	0.02	<0.01	0.35	0.08	0.01	0.11	0.37	0.03	0.05	0.12	0.09	0.01	<0.01	0.02	0.1	0.01	<0.01	0.1	0.36	0.02	0.03
Nitrite (NO2 as N)			0.02	0.15	0.1	0.04	0.24	<0.01	0.01	0.02	0.02	0.02	0.01	<0.01	<0.01	<0.01	0.05	0.05	0.17	0.03	0.03	0.07	0.02	0.03	0.08	<0.01	0.09	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.05	<0.01	0.02
Ammonia (NH3 as N)	1.88 (2)	2.84 (2)	0.52	**2.6**	1.73	0.68	**3.5**	0.07	0.83	**2.39**	1.65	1.24	0.20	1.63	0.27	1.20	**2.82**	0.85	1.68	1.26	<0.10	1.06	**2.72**	0.77	0.75	0.07	**1.93**	0.18	0.12	0.04	0.61	0.34	0.48	**1.92**	0.15	1.03
Total Kjeldahl Nitrogen (TKN)	0.5 (5)	0.12 (6)	**0.6**	**2.7**	**2**	**1.2**	**4.3**	**1.6**	**1.7**	**2.6**	**2.7**	**2.5**	0.5	**2.4**	**1.4**	**1.9**	**4.2**	**1.1**	**2.4**	**1.9**	<0.5	<1.0	**3.2**	**1.1**	**0.9**	**<1.0**	**2.1**	**2.0**	**0.6**	**0.7**	**1.0**	**1.0**	**1.7**	**2.9**	**0.8**	**1.90**
Total Organic Carbon (TOC/ DOC)			-	-										----				----				----	2.75	4.23												
Total Phosphorus (TP)	0.05 (7)	0.025 (7)	0.01	0.03	**0.22**	0.05	**0.09**	**0.2**	**0.11**	**0.06**	0.03	0.03	0.10	0.04	**0.06**	**0.07**	**0.06**	<0.02	**0.08**	<0.05	0.05	<0.05	0.02	**0.06**	<0.05	**0.31**	**0.32**	**0.27**	0.02	**0.11**	0.03	0.05	**0.14**	0.02	**0.06**	0.05
Biological (CFU/100 ml)																																					
Enterococcus	35 (8)	35 (8)	-	-		**130**				**240**				18				~8				~1															
Thermotolerant (Faecal) coliforms	150 (8)	150 (8)	-	-		**220**				**1100**				21				~6				<1															

Exceeds ANZECC (2000) guidelines **0.054**

Focus of this monitoring report

nm = not measured (app) = approximately NR = no result

1. Trigger value is an indicative interim working level only (IIWL).
2. Ammonia trigger value at pH =8, 95% protection,corrected ave pH=7.3.
3. Trigger value for oxides of Nitrogen (NOx) for lowland rivers in NSW.
4. Trigger value for oxides of Nitrogen (NOx) for marine ecosystems in NSW.
5. Trigger value for total Nitrogen in lowland rivers in NSW.
6. Trigger value for total Nitrogen in marine ecosystems in NSW.
7. Trigger value for a 95% proetction level.
8. Guidelinefor water quality and aesthetics: primary contact.

a. Reference only, not dirtectly applicable to groundwater.

Prepared By: Earth2Water Pty Ltd
Checked By: DP

Table 6: Groundwater and Surface Water Monitoring - 2021 to 2022 (EPL)

Analytes	Groundwater Wells & Blue Angle Creek									Detection Limit	Method Reference
	20/05/21	18/08/21	25/11/21	10/02/22	25/03/21	5/05/21	18/06/21	8/07/21	10/09/21		
Physical Properties											
pH	X	X	X	X						0.01 pH unit	pH meter and probe/APHA4500-HB
Electrical Conductivity	X	X	X	X						0.01 mS/cm	Conductivity meter and probe
Dissolved Oxygen	X	X	X	X						0.0001	DO meter and probe
Redox (Orp)		X								1 mV	Platinum electrode probe
Temperature										1 °C	Temperature meter and probe
Total Dissolved Solids	X	X	X	X						5 mg/L	Determined gravimetrically by drying (APHA 2540 C)
Suspended Solids										2 mg/L	APHA2540D
Turbidity										1 NTU	Turbidmeter
Nutrients											
Ammonia-nitrogen	X	X	X	X	X	X	X	X	X	0.01 mg/L	FIA
Total Phosphorus	X	X	X	X						2 µg/L	FIA
Nitrate-nitrogen	X	X	X	X						10 µg/L	FIA
Nitrite-nitrogen	X	X	X	X						1 µg/L	FIA
Total Kjeldhal Nitrogen	X	X	X	X						50 µg/L	FIA
Hydro-chemical											
Calcium		X								0.5 mg/L	USEPA 6010 A
Chloride		X								0.5 mg/L	Titrated with mercuric nitrate using diphenol-carbazonel/xylene cyanol FF indicator
Fluoride		X								0. 1 mg/L	APHA4500-FC
Magnesium		X								0.02 mg/L	USEPA 6010 A
Sulphate										1 mg/L	ICID/MS
Sodium		X								0.05 mg/L	USEPA 6010 A
Bicarbonate/Alkalinity		X	X	X						0.5 mg/L	APHA2340C
Potassium		X								0.05 mg/L	USEPA 6010 A
Organic Contaminants											
Dissolved Organic Carbon		X								0.50 mg/L	APHA 5310C
Total Organic Carbon										0.1 mg/L	APHA 5310C
Inorganic Contaminants											
Iron		X								1 µg/L	USEPA 6010 A
Manganese		X								1 µg/L	USEPA 6010
Biological Contaminants											
Thermotolerant (Faecal) coliforms MF										1cfu/100 ml	WMM 009 (~AS 4276.7 - 1995)
Enterococcus MF										1cfu/100 ml	WMM 013 (~AS 4276.9 - 1995)

16/11/21	Sampling of EPL Groundwater wells and surface water locations; quartely basis by ALS
12/07/21	Monthly sampling to assess groundwater ammonia trends at 9 key wells (refer to E2W letter, responding to EPA request) wells include: MW-12, MW-13, MW-14 and selected EPL wells; MW-1D, 6D, 7D, MW-11 and MW-3, MW-5

Prepared By: Earth2Water
Checked By: DP

Table 7: Gerroa Landfill Assessment- Ammonia Trends at Key Wells (9)
2018 to 2022

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	22/8/18	17/1/19	4/4/19	28/5/19	12/7/19	28/8/19	18/9/19	17/10/19	22/11/19	14/2/20	5/3/20	28/5/20	13/8/20	9/9/20	6/11/20	18/12/20	8/1/21	1/2/21	25/3/21	5/5/21	20/5/22	18/6/21	8/7/21	18/8/22	10/9/21	25/11/22	10/2/22
Well Location	**LOR**	**Fresh**	**Marine**	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D	MW 1D
Ammonia as N	**mg/L**	1.88 (2)	2.84 (2)	**13.0**	**8.18**	**8.58**	**----**	**15.0**	**15.5**	**20.5**	**27.3**	**34**	**24.9**	**35**	**27.8**	**30.9**	**44.1**	**27.8**	**23.3**	**21.1**	**32.5**	**16.4**	**22**	**12**	**19.7**	**10.2**	**5.98**	**9.68**	**7.71**	**4.77**	**4.02**	**2.92**
Water Quality Trend				**Variable to Rising trend (28-5-20) & above Guidelines to recently Decreasing Ammonia Trend**																													

Note:
(2) Ammonia trigger at pH = 8.0, for a 95% protection, corrected for average pH = 7.3.

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	22/8/18	17/10/18	16/11/18	6/12/18	17/1/19	12/2/19	4/4/19	28/5/19	12/7/19	28/8/19	18/9/19	17/10/19	22/11/19	14/2/20	**5/3/20**	**28/5/20**	**13/8/20**	**9/9/20**	**6/11/20**	**18/12/20**	**8/1/21**	**1/2/21**	**25/3/21**	**5/5/21**	**20/5/22**	**18/6/21**	**8/7/21**	**18/8/22**	**10/9/21**	**25/11/22**	**10/2/22**
Well Location	**LOR**	**Fresh**	**Marine**	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3	MW 3
Ammonia as N	**mg/L**	1.88 (2)	2.84 (2)	**0.29**	**8.55**	**0.21**	**0.34**	**0.64**	**0.35**	**0.33**	**0.30**	**0.39**	**0.34**	**0.35**	**0.38**	**0.41**	**0.32**	**0.37**	**0.42**	**0.3**	**0.44**	**0.22**	**0.25**	**0.3**	**0.43**	**0.31**	**0.35**	**0.45**	**0.37**	**0.35**	**0.36**	**0.29**	**0.34**	**0.82**	**0.68**	**2.21**
Water Quality Trend				**Generally stable & below guidelines (except Feb 2022)**																																

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	22/8/18	17/10/18	16/11/18	6/12/18	17/1/19	12/2/19	4/4/19	28/5/19	12/7/19	28/8/19	18/9/19	17/10/19	22/11/19	14/2/20	5/3/20	28/5/20	13/8/20	9/9/20	6/11/20	18/12/20	8/1/21	1/2/21	25/3/21	5/5/21	20/5/22	18/6/21	8/7/21	18/8/22	10/9/21	25/11/22	**10/2/22**
Well Location	**LOR**	**Fresh**	**Marine**	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5	MW 5
Ammonia as N	**mg/L**	1.88 (2)	2.84 (2)	**0.07**	**0.05**	**0.02**	**1.44**	**0.08**	**0.07**	**0.48**	**0.06**	**0.08**	**0.03**	**<0.01**	**0.08**	**0.05**	**0.04**	**0.05**	**0.04**	**0.02**	**0.07**	**<0.01**	**0.02**	**<0.01**	**0.18**	**0.02**	**<0.01**	**<0.01**	**0.01**	**0.16**	**0.04**	**0.01**	**0.12**	**0.03**	**0.12**	**0.16**
Water Quality Trend				**Generally Stable & Below Guidelines**																																

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	22/8/18	17/1/19	16/11/18	6/12/18	17/1/19	12/2/19	4/4/19	28/5/19	12/7/19	28/8/19	18/9/19	17/10/19	22/11/19	14/2/20	**5/3/20**	**28/5/20**	**13/8/20**	**9/9/20**	**6/11/20**	**18/12/20**	**8/1/21**	**1/2/21**	**25/3/21**	**5/5/21**	**20/5/22**	**18/6/21**	**8/7/21**	**18/8/22**	**10/9/21**	**25/11/22**	**10/2/22**
Well Location	**LOR**	**Fresh**	**Marine**	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D	MW 6D
Ammonia as N	**mg/L**	1.88 (2)	2.84 (2)	**6.40**	**4.97**	**2.20**	**7.69**	**7.02**	**8.45**	**5.78**	**7.02**	**5.05**	**8.74**	**4.87**	**40**	**44.4**	**36.3**	**57**	**50**	**44.5**	**56**	**52.4**	**41.5**	**36.2**	**42.5**	**37.2**	**36.4**	**45.8**	**38.4**	**15.5**	**12.6**	**5.05**	**31.5**	**5**	**40.7**	**36**
Water Quality Trend				**Previous rising Ammonia trend & above guidelines to recently decreasing but variable trend**																																

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	22/8/18	17/1/19	16/11/18	17/1/19	12/2/19	4/4/19	28/5/19	12/7/19	28/8/19	18/9/19	17/10/19	22/11/19	14/2/20	**5/3/20**	**28/5/20**	**13/8/20**	**9/9/20**	**6/11/20**	**18/12/20**	**8/1/21**	**1/2/21**	**25/3/21**	**5/5/21**	**20/5/22**	**18/6/21**	**8/7/21**	**18/8/22**	**10/9/21**	**25/11/22**	**10/2/22**
Well Location	**LOR**	**Fresh**	**Marine**	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D	MW 7D
Ammonia as N	**mg/L**	**1.88 (2)**	**2.84 (2)**	1.58	0.74	0.15	0.63	0.91	1.72	2.08	1.32	2.36	0.8	20.5	17.9	13.7	20	21.4	14.8	21	18.3	19.2	17.4	18.1	18.5	16.8	22	17.6	1.09	0.9	1.07	4.48	0.82	16.2	19.1
Water Quality Trend				**Previous rising Ammonia trend & above guidelines to recently decreasing but variable trend**																																

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	22/8/18	17/1/19	16/11/18	17/1/19	12/2/19	4/4/19	28/5/19	12/7/19	28/8/19	18/9/19	17/10/19	22/11/19	14/2/20	18/12/20	**5/3/20**	**28/5/20**	**13/8/20**	**9/9/20**	**6/11/20**	**8/1/21**	**1/2/21**	**25/3/21**	**5/5/21**	**20/5/22**	**18/6/21**	**8/7/21**	**18/8/22**	**10/9/21**	**25/11/22**	**10/2/22**
Well Location	**LOR**	**Fresh**	**Marine**	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11	MW 11
Ammonia as N	**mg/L**	**1.88 (2)**	**2.84 (2)**	3.17	6.05	5.35	5.79	2.26	2.24	2.14	1.60	2.2	1.9	1.15	47.4	5.3	4.24	4.01	1.31	5.79	2.55	17	2.15	1.34	0.97	0.43	0.66	0.38	0.35	0.42	0.43	0.64	0.53	0.28	0.42
Water Quality Trend				**Generally variable & recently decreasing and below guidelines**																																

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	17/10/18	6/12/18	17/1/19	4/4/19	12/7/19	18/9/19	14/2/20	17/10/19	**5/3/20**	**28/5/20**	**17/6/20**	**9/9/20**	**18/12/20**	**8/1/21**	**1/2/21**	**25/3/21**	**5/5/21**	**18/6/21**	**8/7/21**	**18/8/22**	**10/9/21**
Well Location	**LOR**	**Fresh**	**Marine**	MW 12	MW12	MW12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12	MW 12
Ammonia as N	**mg/L**	1.88 (2)	2.84 (2)	29.8	24.5	27.5	31.7	23.0	34.4	33.1	44	57	35.9	46.9	57.7	55.9	37.5	42.3	38.9	46.7	36.8	38.9	35.5	33.8	40.1	18.2
Water Quality Trend				Previous Increasing ammonia trend & above guidelines to recently decreasing trend																						

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	17/10/18	6/12/18	17/1/19	4/4/19	12/7/19	18/9/19	14/2/20	17/10/19	**5/3/20**	**28/5/20**	**17/6/20**	**9/9/20**	**18/12/20**	**8/1/21**	**1/2/21**	**25/3/21**	**5/5/21**	**18/6/21**	**8/7/21**	**18/8/22**	**10/9/21**
Well Location	**LOR**	**Fresh**	**Marine**	MW 13	MW13	MW13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13	MW 13
Ammonia as N	**mg/L**	1.88 (2)	2.84 (2)	26.7	24.8	32.8	32.8	26.1	26.0	24.7	46.8	36.5	62	43.6	54.7	52.3	26.6	46.6	34.6	83.5	27.6	36.3	12.4	16.2	32.9	11.8
Water Quality Trend				Previous Increasing ammonia trend & above guidelines to recently decreasing trend																						

Date		ANZECC 2000	ANZECC 2000	15/6/18	12/7/18	17/10/18	6/12/18	17/1/19	4/4/19	12/7/19	18/9/19	14/2/20	17/10/19	**5/3/20**	**28/5/20**	**17/6/20**	**9/9/20**	**18/12/20**	**8/1/21**	**1/2/21**	**25/3/21**	**5/5/21**	**18/6/21**	**8/7/21**	**18/8/22**	**10/9/21**
Well Location	**LOR**	**Fresh**	**Marine**	MW 14	MW14	MW14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14	MW 14
Ammonia as N	**mg/L**	1.88 (2)	2.84 (2)	1.83	27.2	39.4	46.3	34.0	40.9	54.9	81.4	83	96.5	81.1	97.7	95.3	73.1	84.4	69.9	40.4	71.1	89.6	65.2	75.5	83.9	40.3
Water Quality Trend				Previous Increasing ammonia trend & above guidelines to recently decreasing trend																						

Appendix A

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102217**	Page	: 1 of 7
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: +61 02 4232 0444	Telephone	: 02 42253125
Project	: Gerroa Landfill	Date Samples Received	: 20-May-2021 15:30
Order number	: 785	Date Analysis Commenced	: 22-May-2021
C-O-C number	: ----	Issue Date	: 01-Jun-2021 10:27
Sampler	: Tom Roose		
Site	: ----		
Quote number	: ----		
No. of samples received	: 17		
No. of samples analysed	: 17		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK067G: LOR raised for Total Phosphorus on sample 12 due to sample matrix.
- EK059G: LOR raised for NOx on sample 2 due to sample matrix.
- EK057G/EK059G: Nitrite and NOx results confirmed by re-analysis on sample 2
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW1D	MW1S	MW3	MW4	MW5
			Sampling date / time	20-May-2021 13:15	20-May-2021 13:30	20-May-2021 13:00	20-May-2021 13:50	20-May-2021 12:40
Compound	CAS Number	LOR	Unit	EW2102217-001	EW2102217-002	EW2102217-003	EW2102217-004	EW2102217-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.4	6.8	7.6	6.8	8.0
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1050	663	709	538	223
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	632	508	444	306	148
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	309	49	202	247	101
Total Alkalinity as CaCO3	----	1	mg/L	309	49	202	247	101
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	10.2	0.40	0.35	0.16	0.03
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.14	0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.04	<0.10	0.03	0.07	0.05
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.04	<0.10	0.04	0.07	0.05
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	10.2	5.5	1.0	1.5	0.6
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	10.2	5.5	1.0	1.6	0.6
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.27	0.56	0.31	1.45	0.15
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	2.94	3.10	3.57	3.20	3.56
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	3.25	3.56	3.72	4.40	4.12

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW6D	MW6S	MW7D	MW7S	MW9
				Sampling date / time	20-May-2021 14:20	20-May-2021 14:00	20-May-2021 12:10	20-May-2021 12:25	20-May-2021 10:21
					EW2102217-006	EW2102217-007	EW2102217-008	EW2102217-009	EW2102217-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.0**	----	**7.4**	**7.1**	**6.5**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1170**	----	**485**	**364**	**8580**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**679**	----	**290**	**228**	**6380**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**565**	----	**213**	**69**	**86**
Total Alkalinity as CaCO3	----	1	mg/L		**565**	----	**213**	**69**	**86**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**15.5**	----	**1.09**	**0.04**	**0.16**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.05**	----	**0.04**	**0.04**	**0.10**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.05**	----	**0.04**	**0.04**	**0.10**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**15.6**	----	**1.4**	**1.2**	**3.0**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**15.6**	----	**1.4**	**1.2**	**3.1**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**3.51**	----	**1.33**	**0.70**	**0.38**
EN67 PK: Field Tests									
Field Observations	----	0.01	--		**----**	**DRY**	**----**	**----**	**----**
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**3.86**	----	**4.24**	**3.22**	**5.46**
FWI-EN/001: Groundwater Sampling - Depth									
Depth	----	0.01	m		**4.69**	----	**4.41**	**4.34**	**1.70**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW10	MW11	ML-1	ML-2	ML-3
			Sampling date / time	20-May-2021 10:31	20-May-2021 10:10	20-May-2021 09:30	20-May-2021 11:15	20-May-2021 09:40
Compound	CAS Number	LOR	Unit	EW2102217-011	EW2102217-012	EW2102217-013	EW2102217-014	EW2102217-015
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	----	6.8	7.7	6.8	7.3
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	1210	588	4300	532
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	774	388	3310	356
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	101	42	43	38
Total Alkalinity as CaCO3	----	1	mg/L	----	101	42	43	38
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	----	0.35	0.62	0.32	0.53
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	----	<0.01	<0.01	0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	----	0.03	0.08	0.10	0.08
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	----	0.03	0.08	0.11	0.08
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	----	2.4	1.4	0.9	1.4
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	----	2.4	1.5	1.0	1.5
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	----	<0.20	0.08	0.10	0.09
EN67 PK: Field Tests								
Field Observations	----	0.01	--	DRY	----	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	----	4.36	4.05	3.36	3.17
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	----	2.34	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	ML-4	ML-5	----	----	----
			Sampling date / time	20-May-2021 09:50	20-May-2021 10:40	----	----	----
Compound	CAS Number	LOR	Unit	EW2102217-016	EW2102217-017	--------	--------	--------
				Result	Result	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.8	7.6	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	4300	613	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	3060	418	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	42	42	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	42	42	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.33	0.48	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.09	0.10	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.10	0.10	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.1	1.7	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	1.2	1.8	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.09	0.14	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	3.42	3.15	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser

(WATER) EK061G: Total Kjeldahl Nitrogen By Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EK067G: Total Phosphorus as P by Discrete Analyser

(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2103525**	Page	: 1 of 11
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MS JULIE MILEVSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: +61 02 4232 0557	Telephone	: +61 2 4225 3125
Project	: Gerroa Landfill Annual	Date Samples Received	: 18-Aug-2021 15:34
Order number	: 6592	Date Analysis Commenced	: 19-Aug-2021
C-O-C number	: ----	Issue Date	: 30-Aug-2021 12:31
Sampler	: Tom Roose		
Site	: Gerroa Landfill		
Quote number	: WO/010/2021		
No. of samples received	: 21		
No. of samples analysed	: 21		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the Chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- Tide was coming in for all Sites.
- EK067G:LOR raised due to sample matrix.
- It has been noted that Ammonia is greater than TKN, however this difference is within the limits of experimental variation.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- ORP (Oxidation Reduction Potential) performed by ALS Wollongong via in-house method EA075FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling via Bailer method.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW1D	MW1S	MW3	MW4	MW5
				Sampling date / time	18-Aug-2021 11:37	18-Aug-2021 11:40	18-Aug-2021 11:09	18-Aug-2021 12:45	18-Aug-2021 10:57
					EW2103525-001	EW2103525-002	EW2103525-003	EW2103525-004	EW2103525-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.7**	----	**7.6**	**7.6**	**8.0**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1270**	----	**910**	**636**	**225**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**904**	----	**669**	**446**	**165**
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		**28.3**	----	**85.7**	**28.1**	**91.8**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**304**	----	**248**	**353**	**129**
Total Alkalinity as CaCO3	----	1	mg/L		**304**	----	**248**	**353**	**129**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**18**	----	**19**	**12**	**4**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**301**	----	**211**	**24**	**12**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**108**	----	**92**	**125**	**37**
Magnesium	7439-95-4	1	mg/L		**36**	----	**10**	**10**	**4**
Sodium	7440-23-5	1	mg/L		**112**	----	**119**	**16**	**15**
Potassium	7440-09-7	1	mg/L		**19**	----	**5**	**5**	**2**
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.022**	----	**0.110**	**0.162**	**0.001**
Iron	7439-89-6	0.05	mg/L		**3.75**	----	**3.76**	**4.66**	<0.05
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.1**	----	**0.2**	**0.2**	**0.2**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**7.71**	----	**0.34**	**0.12**	<0.01
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.01**	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.48**	----	**0.09**	**0.03**	**0.02**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW1D	MW1S	MW3	MW4	MW5
				Sampling date / time	18-Aug-2021 11:37	18-Aug-2021 11:40	18-Aug-2021 11:09	18-Aug-2021 12:45	18-Aug-2021 10:57
Compound	CAS Number	LOR	Unit		EW2103525-001	EW2103525-002	EW2103525-003	EW2103525-004	EW2103525-005
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.49	----	0.09	0.03	0.02
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		8.3	----	2.0	1.5	0.8
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		8.8	----	2.1	1.5	0.8
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.23	----	0.52	1.57	0.20
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		14.9	----	11.3	7.98	3.00
ø Total Cations	----	0.01	meq/L		13.7	----	10.7	7.88	2.88
ø Ionic Balance	----	0.01	%		4.29	----	2.66	0.60	2.04
EN67 PK: Field Tests									
Field Observations	----	0.01	--		----	DRY	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		14	----	16	6	6
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		5.22	----	5.76	3.39	5.14
QWI-EN 67.11 Sampling of Groundwaters									
Depth	----	0.01	m		3.72	----	4.09	4.71	4.67

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW6D	MW6S	MW7D	MW7S	MW9
				Sampling date / time	18-Aug-2021 13:05	18-Aug-2021 12:50	18-Aug-2021 10:30	18-Aug-2021 10:45	18-Aug-2021 13:40
					EW2103525-006	EW2103525-007	EW2103525-008	EW2103525-009	EW2103525-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.3**	----	**7.3**	**7.4**	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1460**	----	**711**	**667**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**960**	----	**534**	**536**	----
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		**3.5**	----	**76.2**	**78.7**	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**777**	----	**391**	**121**	----
Total Alkalinity as CaCO3	----	1	mg/L		**777**	----	**391**	**121**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**27**	----	**16**	**20**	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**119**	----	**41**	**183**	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**213**	----	**127**	**75**	----
Magnesium	7439-95-4	1	mg/L		**25**	----	**13**	**11**	----
Sodium	7440-23-5	1	mg/L		**77**	----	**28**	**65**	----
Potassium	7440-09-7	1	mg/L		**38**	----	**10**	**3**	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.183**	----	**0.081**	**0.016**	----
Iron	7439-89-6	0.05	mg/L		**10.4**	----	**4.75**	**0.10**	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.4**	----	**0.2**	<0.1	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**31.5**	----	**4.48**	**0.15**	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	**0.01**	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.04**	----	**0.05**	**0.01**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW6D	MW6S	MW7D	MW7S	MW9
			Sampling date / time	18-Aug-2021 13:05	18-Aug-2021 12:50	18-Aug-2021 10:30	18-Aug-2021 10:45	18-Aug-2021 13:40
Compound	CAS Number	LOR	Unit	EW2103525-006	EW2103525-007	EW2103525-008	EW2103525-009	EW2103525-010
				Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.04	----	0.06	0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	31.6	----	5.4	1.2	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	31.6	----	5.5	1.2	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	4.06	----	1.57	0.82	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	19.4	----	9.30	8.00	----
ø Total Cations	----	0.01	meq/L	17.0	----	8.88	7.55	----
ø Ionic Balance	----	0.01	%	6.68	----	2.31	2.86	----
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	DRY	----	----	DRY
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	20	----	2	5	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	3.03	----	2.98	3.04	----
QWI-EN 67.11 Sampling of Groundwaters								
Depth	----	0.01	m	5.01	----	4.79	4.72	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW10	MW11	MW12	MW13	MW14
			Sampling date / time	18-Aug-2021 13:45	18-Aug-2021 13:24	18-Aug-2021 12:04	18-Aug-2021 11:45	18-Aug-2021 11:26
Compound	CAS Number	LOR	Unit	EW2103525-011	EW2103525-012	EW2103525-013	EW2103525-014	EW2103525-015
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	----	7.9	7.4	7.6	7.4
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	----	3810	1720	1390	2240
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	----	----	----	1300
Total Dissolved Solids @180°C	----	10	mg/L	----	2780	1050	865	----
EA075FD: Field Redox Potential								
Redox Potential	----	0.1	mV	----	21.3	9.4	18.0	66.6
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	----	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	----	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	----	103	648	544	829
Total Alkalinity as CaCO3	----	1	mg/L	----	103	648	544	829
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	----	187	36	62	46
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	----	1380	274	179	381
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	----	56	115	84	87
Magnesium	7439-95-4	1	mg/L	----	81	48	49	54
Sodium	7440-23-5	1	mg/L	----	778	156	110	183
Potassium	7440-09-7	1	mg/L	----	30	54	47	73
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	----	0.007	0.020	0.015	0.022
Iron	7439-89-6	0.05	mg/L	----	1.52	6.19	4.06	5.83
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	----	0.2	0.1	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	----	0.64	40.1	32.9	83.9
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	----	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW10	MW11	MW12	MW13	MW14
				Sampling date / time	18-Aug-2021 13:45	18-Aug-2021 13:24	18-Aug-2021 12:04	18-Aug-2021 11:45	18-Aug-2021 11:26
Compound	CAS Number	LOR	Unit		EW2103525-011	EW2103525-012	EW2103525-013	EW2103525-014	EW2103525-015
					Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser - Continued									
Nitrate as N	14797-55-8	0.01	mg/L		----	0.02	0.02	0.02	0.02
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	0.02	0.02	0.02	0.02
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	4.6	39.9	32.7	82.7
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	4.6	39.9	32.7	82.7
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	0.23	0.24	0.25	0.23
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		----	44.9	21.4	17.2	28.3
ø Total Cations	----	0.01	meq/L		----	----	----	----	24.6
ø Total Cations	----	0.01	meq/L		----	44.1	17.8	14.2	----
ø Ionic Balance	----	0.01	%		----	----	----	----	6.96
ø Ionic Balance	----	0.01	%		----	0.91	9.09	9.54	----
EN67 PK: Field Tests									
Field Observations	----	0.01	--		DRY	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	43	19	18	29
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	3.94	3.82	6.41	4.88
QWI-EN 67.11 Sampling of Groundwaters									
Depth	----	0.01	m		----	1.04	3.41	3.72	2.94

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	ML-1	ML-2	ML-3	ML-4	ML-5
				Sampling date / time	18-Aug-2021 14:20	18-Aug-2021 14:00	18-Aug-2021 14:40	18-Aug-2021 14:53	18-Aug-2021 13:50
					EW2103525-016	EW2103525-017	EW2103525-018	EW2103525-019	EW2103525-020
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.8**	**7.6**	**8.4**	**8.0**	**7.8**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**13600**	**16200**	**3280**	**3470**	**7830**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**13700**	**19600**	**2280**	**2370**	**6420**
EA075FD: Field Redox Potential									
Redox Potential	----	0.1	mV		**51.1**	**54.8**	**45.9**	**47.0**	**47.8**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	**6**	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**140**	**131**	**121**	**128**	**172**
Total Alkalinity as CaCO3	----	1	mg/L		**140**	**131**	**127**	**128**	**172**
ED093T: Total Major Cations									
Calcium	7440-70-2	1	mg/L		**193**	**261**	**79**	**79**	**129**
Magnesium	7439-95-4	1	mg/L		**452**	**653**	**81**	**88**	**222**
Sodium	7440-23-5	1	mg/L		**3800**	**5590**	**618**	**664**	**1830**
Potassium	7440-09-7	1	mg/L		**141**	**205**	**27**	**29**	**72**
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.030**	**0.023**	**0.110**	**0.025**	**0.037**
Iron	7439-89-6	0.05	mg/L		**0.27**	**0.28**	**2.54**	**0.23**	**0.58**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.51**	**0.32**	**0.32**	**0.12**	**1.92**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.05**	**0.04**	<0.01	<0.01	**0.05**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.42**	**0.30**	**0.15**	**0.17**	**0.36**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.47**	**0.34**	**0.15**	**0.17**	**0.41**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.9**	**0.8**	**0.7**	**0.4**	**2.9**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.4**	**1.1**	**0.8**	**0.6**	**3.3**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	ML-1	ML-2	ML-3	ML-4	ML-5
				Sampling date / time	18-Aug-2021 14:20	18-Aug-2021 14:00	18-Aug-2021 14:40	18-Aug-2021 14:53	18-Aug-2021 13:50
Compound	CAS Number	LOR	Unit		EW2103525-016	EW2103525-017	EW2103525-018	EW2103525-019	EW2103525-020
					Result	Result	Result	Result	Result
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.02	**0.03**	**0.07**	**0.04**	**0.02**
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**5.83**	**5.85**	**5.31**	**6.04**	**5.45**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BLANK	----	----	----	----
				Sampling date / time	18-Aug-2021 08:30	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2103525-021	--------	--------	--------	--------
					Result	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		<1	----	----	----	----
Magnesium	7439-95-4	1	mg/L		<1	----	----	----	----
Sodium	7440-23-5	1	mg/L		<1	----	----	----	----
Potassium	7440-09-7	1	mg/L		<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		<0.001	----	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	----	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP002: Dissolved Organic Carbon (DOC)
(WATER) EG020F: Dissolved Metals by ICP-MS
(WATER) ED093F: Dissolved Major Cations
(WATER) EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser
(WATER) EK061G: Total Kjeldahl Nitrogen By Discrete Analyser
(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser
(WATER) EK058G: Nitrate as N by Discrete Analyser
(WATER) EK057G: Nitrite as N by Discrete Analyser
(WATER) EK055G: Ammonia as N by Discrete Analyser
(WATER) EK067G: Total Phosphorus as P by Discrete Analyser
(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C
(WATER) EN055: Ionic Balance
(WATER) ED045G: Chloride by Discrete Analyser
(WATER) ED037P: Alkalinity by PC Titrator
(WATER) EK040P: Fluoride by PC Titrator
(WATER) ED041G: Sulfate (Turbidimetric) as SO4 2- by DA
(WATER) EG020T: Total Metals by ICP-MS
(WATER) ED093T: Total Major Cations

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2105016**	Page	: 1 of 7
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MS JULIE MILEVSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: +61 02 4232 0557	Telephone	: +61 2 4225 3125
Project	: Gerroa Landfill	Date Samples Received	: 25-Nov-2021 15:24
Order number	: 8287	Date Analysis Commenced	: 25-Nov-2021
C-O-C number	: ----	Issue Date	: 06-Dec-2021 12:45
Sampler	: Tom Roose		
Site	: Gerroa Landfill		
Quote number	: WO/010/2021		
No. of samples received	: 17		
No. of samples analysed	: 17		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ashesh Patel	Senior Chemist	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- TDS by method EA-015 may bias high for sample 5 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and sample data supplied by ALS Wollongong.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling Med to High flow.
- Sampling completed as per FWI-EN001 Groundwater Sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- Field tests completed on day of sampling/receipt.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW1D	MW1S	MW3	MW4	MW5
			Sampling date / time	25-Nov-2021 13:30	25-Nov-2021 13:39	25-Nov-2021 13:10	25-Nov-2021 13:52	25-Nov-2021 12:56
Compound	CAS Number	LOR	Unit	EW2105016-001	EW2105016-002	EW2105016-003	EW2105016-004	EW2105016-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.2	----	7.7	7.1	7.5
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1340	----	851	633	308
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	821	----	548	379	180
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	263	----	160	252	124
Total Alkalinity as CaCO3	----	1	mg/L	263	----	160	252	124
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	4.02	----	0.68	0.12	0.02
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.01	----	0.05	0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.01	----	0.05	0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	4.7	----	1.7	1.2	0.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	4.7	----	1.8	1.2	0.3
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.67	----	0.24	1.47	0.64
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	Dry Site	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	1.05	----	2.77	2.67	1.27
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	3.10	----	3.18	4.02	4.00

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW6D	MW6S	MW7D	MW7S	MW9
			Sampling date / time	25-Nov-2021 14:10	25-Nov-2021 14:20	25-Nov-2021 12:30	25-Nov-2021 12:42	25-Nov-2021 11:10
Compound	CAS Number	LOR	Unit	EW2105016-006	EW2105016-007	EW2105016-008	EW2105016-009	EW2105016-010
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.8	----	6.8	7.2	5.9
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1830	----	1270	573	12500
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1000	----	644	330	9110
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	740	----	420	152	120
Total Alkalinity as CaCO3	----	1	mg/L	740	----	420	152	120
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	40.7	----	16.2	0.12	0.43
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	<0.01	<0.01	0.02
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	<0.01	<0.01	0.02
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	40.9	----	16.4	0.3	1.2
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	40.9	----	16.4	0.3	1.2
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	3.06	----	0.84	0.18	0.11
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	Dry Site	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	0.84	----	1.12	1.19	2.73
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	4.19	----	3.98	3.86	1.19

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW10	MW11	ML-1	ML-2	ML-3
			Sampling date / time	25-Nov-2021 10:58	25-Nov-2021 11:21	25-Nov-2021 10:23	25-Nov-2021 11:40	25-Nov-2021 10:49
Compound	CAS Number	LOR	Unit	EW2105016-011	EW2105016-012	EW2105016-013	EW2105016-014	EW2105016-015
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	5.8	6.3	6.7	6.6	6.3
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	8090	10400	1440	2800	1370
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6880	7580	932	1540	892
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	5	39	24	27	22
Total Alkalinity as CaCO3	----	1	mg/L	5	39	24	27	22
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.28	0.12	0.15	0.08
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.03	<0.01	0.01	0.02	0.02
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	<0.01	0.01	0.02	0.02
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.9	1.0	1.0	1.0	0.9
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	1.9	1.0	1.0	1.0	0.9
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.15	0.06	0.06	0.07	0.06
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	4.14	5.47	2.84	3.19	2.17
FWI-EN/001: Groundwater Sampling - Depth								
Depth	----	0.01	m	1.73	2.30	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	ML-4	ML-5	----	----	----
			Sampling date / time	25-Nov-2021 10:37	25-Nov-2021 10:10	----	----	----
Compound	CAS Number	LOR	Unit	EW2105016-016	EW2105016-017	--------	--------	--------
				Result	Result	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**6.5**	**6.8**	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**1370**	**1500**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**757**	**894**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**22**	**24**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**22**	**24**	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.08**	**0.15**	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.02**	**0.02**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.02**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.8**	**0.8**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.8**	**0.8**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.05**	**0.06**	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	**2.21**	**2.75**	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser

(WATER) EK061G: Total Kjeldahl Nitrogen By Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EK067G: Total Phosphorus as P by Discrete Analyser

(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2200497**	Page	: 1 of 7
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MS JULIE MILEVSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: +61 02 4232 0557	Telephone	: +61 2 4225 3125
Project	: Gerroa Landfill	Date Samples Received	: 10-Feb-2022 15:25
Order number	: 10324	Date Analysis Commenced	: 10-Feb-2022
C-O-C number	: ----	Issue Date	: 21-Feb-2022 16:50
Sampler	: Tom Roose		
Site	: Gerroa Landfill		
Quote number	: WO/010/2021		
No. of samples received	: 17		
No. of samples analysed	: 17		

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

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- Analytical Results

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Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- LOR raised due to sample matrix.
- EK059G:LOR raised sue to sample matrix.
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling Hi Flow Method.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW1D	MW1S	MW3	MW4	MW5
			Sampling date / time	10-Feb-2022 12:00	10-Feb-2022 12:05	10-Feb-2022 11:43	10-Feb-2022 12:20	10-Feb-2022 11:32
Compound	CAS Number	LOR	Unit	EW2200497-001	EW2200497-002	EW2200497-003	EW2200497-004	EW2200497-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.8	----	7.0	7.2	7.1
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1180	----	817	626	317
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	672	----	466	369	181
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	324	----	197	289	136
Total Alkalinity as CaCO3	----	1	mg/L	324	----	197	289	136
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	2.92	----	2.21	0.16	0.03
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	<0.01	<0.01	0.04
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	<0.01	<0.01	0.04
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	3.6	----	2.7	3.8	1.5
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	3.6	----	2.7	3.8	1.5
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.30	----	0.24	7.04	0.52
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	Dry site	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	1.15	----	1.72	1.67	3.64
QWI-EN 67.11 Sampling of Groundwaters								
Depth	----	0.01	m	2.96	----	3.01	4.10	3.97

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW6D	MW6S	MW7D	MW7S	MW9
			Sampling date / time	10-Feb-2022 12:40	10-Feb-2022 12:35	10-Feb-2022 11:00	10-Feb-2022 11:12	10-Feb-2022 13:50
Compound	CAS Number	LOR	Unit	EW2200497-006	EW2200497-007	EW2200497-008	EW2200497-009	EW2200497-010
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.6	----	6.5	6.9	6.1
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1800	----	1250	535	9890
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1070	----	632	292	9420
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	849	----	518	171	78
Total Alkalinity as CaCO3	----	1	mg/L	849	----	518	171	78
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	36.0	----	19.1	0.14	0.11
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	<0.01	<0.01	0.06
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	<0.01	<0.01	0.06
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	37.0	----	21.5	0.4	3.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	37.0	----	21.5	0.4	3.4
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	3.19	----	0.92	0.12	0.42
EN67 PK: Field Tests								
Field Observations	----	0.01	--	----	Dry site	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	2.50	----	7.84	7.62	2.63
QWI-EN 67.11 Sampling of Groundwaters								
Depth	----	0.01	m	4.21	----	3.81	3.76	1.24

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW10	MW11	ML-1	ML-2	ML-3
				Sampling date / time	10-Feb-2022 14:00	10-Feb-2022 13:15	10-Feb-2022 13:30	10-Feb-2022 12:50	10-Feb-2022 14:10
					EW2200497-011	EW2200497-012	EW2200497-013	EW2200497-014	EW2200497-015
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		----	**6.4**	**7.3**	**6.4**	**6.4**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		----	**5320**	**1750**	**8650**	**2870**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		----	**4710**	**1600**	**7380**	**1640**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		----	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		----	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		----	**113**	**121**	**132**	**125**
Total Alkalinity as CaCO3	----	1	mg/L		----	**113**	**121**	**132**	**125**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	**0.42**	**0.66**	**1.00**	**0.80**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		----	<0.10	**0.02**	**0.02**	**0.01**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		----	<0.10	**0.03**	**0.03**	**0.04**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	<0.10	**0.05**	**0.05**	**0.05**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	**6.9**	**1.4**	**1.8**	**1.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	**6.9**	**1.4**	**1.8**	**1.6**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	**0.22**	**0.03**	**0.04**	**0.03**
EN67 PK: Field Tests									
Field Observations	----	0.01	--		**Dry - Insufficient sample**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		----	**2.10**	**4.41**	**3.32**	**2.60**
QWI-EN 67.11 Sampling of Groundwaters									
Depth	----	0.01	m		----	**2.46**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	ML-4	ML-5	----	----	----
			Sampling date / time	10-Feb-2022 13:40	10-Feb-2022 13:10	----	----	----
Compound	CAS Number	LOR	Unit	EW2200497-016	EW2200497-017	--------	--------	--------
				Result	Result	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.5	6.7	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	4060	7380	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	2560	6880	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	138	133	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	138	133	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	1.44	1.03	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.02	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.03	0.03	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.05	0.05	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.3	1.9	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	2.4	2.0	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.05	0.05	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	3.12	3.42	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK061G: Total Kjeldahl Nitrogen By Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EK067G: Total Phosphorus as P by Discrete Analyser

(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2101345**	Page	: 1 of 4
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: +61 02 4232 0444	Telephone	: 02 42253125
Project	: Gerroa Landfill Ammonia Testing	Date Samples Received	: 25-Mar-2021 14:40
Order number	: 126591	Date Analysis Commenced	: 27-Mar-2021
C-O-C number	: ----	Issue Date	: 01-Apr-2021 17:04
Sampler	: Tom Roose		
Site	: ----		
Quote number	: WO/015/18		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 1D**	**MW 3**	**MW 5**	**MW 6D**	**MW 7D**
			Sampling date / time	25-Mar-2021 10:47	25-Mar-2021 10:36	25-Mar-2021 10:25	25-Mar-2021 11:38	25-Mar-2021 10:09
Compound	*CAS Number*	*LOR*	*Unit*	**EW2101345-001**	**EW2101345-002**	**EW2101345-003**	**EW2101345-004**	**EW2101345-005**
				Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**12.0**	**0.45**	<0.01	**45.8**	**22.0**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 11**	**MW 12**	**MW 13**	**MW 14**	**----**
			Sampling date / time	25-Mar-2021 11:56	25-Mar-2021 11:10	25-Mar-2021 10:59	25-Mar-2021 11:21	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2101345-006**	**EW2101345-007**	**EW2101345-008**	**EW2101345-009**	**--------**
				Result	Result	Result	Result	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.66**	**36.8**	**27.6**	**71.1**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK055G: Ammonia as N by Discrete Analyser

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2101977**	Page	: 1 of 4
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: +61 02 4232 0444	Telephone	: 02 42253125
Project	: Gerroa Landfill Ammonia Testing	Date Samples Received	: 05-May-2021 15:52
Order number	: 126591	Date Analysis Commenced	: 10-May-2021
C-O-C number	: ----	Issue Date	: 12-May-2021 16:44
Sampler	: Tom Roose		
Site	: ----		
Quote number	: WO/015/18		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

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Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

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ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW 1D	MW 3	MW 45	MW 6D	MW 7D
				Sampling date / time	05-May-2021 13:15	05-May-2021 13:05	05-May-2021 13:09	05-May-2021 14:15	05-May-2021 12:45
					EW2101977-001	**EW2101977-002**	**EW2101977-003**	**EW2101977-004**	**EW2101977-005**
					Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**19.7**	**0.37**	**0.01**	**38.4**	**17.6**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 11**	**MW 12**	**MW 13**	**MW 14**	**----**
			Sampling date / time	05-May-2021 12:30	05-May-2021 14:00	05-May-2021 13:45	05-May-2021 13:30	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2101977-006**	**EW2101977-007**	**EW2101977-008**	**EW2101977-009**	**--------**
				Result	Result	Result	Result	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.38**	**38.9**	**36.3**	**89.6**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK055G: Ammonia as N by Discrete Analyser

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102690**	Page	: 1 of 4
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: +61 02 4232 0444	Telephone	: 02 42253125
Project	: Gerroa Landfill Ammonia Testing	Date Samples Received	: 18-Jun-2021 15:00
Order number	: 126591	Date Analysis Commenced	: 22-Jun-2021
C-O-C number	: ----	Issue Date	: 25-Jun-2021 08:42
Sampler	: Tom Roose		
Site	: ----		
Quote number	: WO/015/18		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

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- General Comments
- Analytical Results

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Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **Analytical work for this work order will be conducted at ALS Sydney.**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 1D**	**MW 3**	**MW 5**	**MW 6D**	**MW 7D**
			Sampling date / time	18-Jun-2021 11:42	18-Jun-2021 11:31	18-Jun-2021 11:22	18-Jun-2021 12:50	18-Jun-2021 11:10
Compound	*CAS Number*	*LOR*	*Unit*	**EW2102690-001**	**EW2102690-002**	**EW2102690-003**	**EW2102690-004**	**EW2102690-005**
				Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**5.98**	**0.36**	**0.04**	**12.6**	**0.90**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 11**	**MW 12**	**MW 13**	**MW 14**	**----**
			Sampling date / time	18-Jun-2021 10:55	18-Jun-2021 12:25	18-Jun-2021 12:10	18-Jun-2021 11:53	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2102690-006**	**EW2102690-007**	**EW2102690-008**	**EW2102690-009**	**--------**
				Result	Result	Result	Result	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.42**	**35.5**	**12.4**	**65.2**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK055G: Ammonia as N by Discrete Analyser

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2102972**	Page	: 1 of 4
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
Telephone	: +61 02 4232 0444	Telephone	: 02 42253125
Project	: Gerroa Landfill Ammonia Testing	Date Samples Received	: 08-Jul-2021 15:40
Order number	: 126591	Date Analysis Commenced	: 16-Jul-2021
C-O-C number	: ----	Issue Date	: 19-Jul-2021 11:47
Sampler	: Tom Roose		
Site	: ----		
Quote number	: WO/015/18		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW 1D	MW 3	MW 5	MW 6D	MW 7D
				Sampling date / time	08-Jul-2021 11:12	08-Jul-2021 10:45	08-Jul-2021 10:30	08-Jul-2021 12:00	08-Jul-2021 10:17
					EW2102972-001	**EW2102972-002**	**EW2102972-003**	**EW2102972-004**	**EW2102972-005**
					Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**9.68**	**0.29**	**0.01**	**5.05**	**1.07**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 11**	**MW 12**	**MW 13**	**MW 14**	**----**
			Sampling date / time	08-Jul-2021 10:00	08-Jul-2021 11:43	08-Jul-2021 11:29	08-Jul-2021 10:58	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2102972-006**	**EW2102972-007**	**EW2102972-008**	**EW2102972-009**	**--------**
				Result	Result	Result	Result	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.43**	**33.8**	**16.2**	**75.5**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK055G: Ammonia as N by Discrete Analyser

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2103848**	Page	: 1 of 4
Client	: **KIAMA COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: MR PAUL CZULOWSKI	Contact	: Aneta Prosaroski
Address	: 11 MANNING STREET KIAMA NSW, AUSTRALIA 2533	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: +61 02 4232 0444	Telephone	: 02 42253125
Project	: Gerroa Landfill Ammonia Testing	Date Samples Received	: 10-Sep-2021 14:00
Order number	: 126591	Date Analysis Commenced	: 14-Sep-2021
C-O-C number	: ----	Issue Date	: 16-Sep-2021 16:33
Sampler	: Tom Roose		
Site	: ----		
Quote number	: WO/015/18		
No. of samples received	: 9		
No. of samples analysed	: 9		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 1D**	**MW 3**	**MW 5**	**MW 6D**	**MW 7D**
			Sampling date / time	10-Sep-2021 13:15	10-Sep-2021 11:45	10-Sep-2021 11:30	10-Sep-2021 12:59	10-Sep-2021 11:20
Compound	*CAS Number*	*LOR*	*Unit*	**EW2103848-001**	**EW2103848-002**	**EW2103848-003**	**EW2103848-004**	**EW2103848-005**
				Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**4.77**	**0.82**	**0.03**	**5.00**	**0.82**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**MW 11**	**MW 12**	**MW 13**	**MW 14**	**----**
			Sampling date / time	10-Sep-2021 11:00	10-Sep-2021 12:40	10-Sep-2021 12:15	10-Sep-2021 12:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2103848-006**	**EW2103848-007**	**EW2103848-008**	**EW2103848-009**	**--------**
				Result	Result	Result	Result	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.53**	**18.2**	**11.8**	**40.3**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EK055G: Ammonia as N by Discrete Analyser

Appendix B

Climate Data for Gerroa Landfill (2002 to 2022)

Station: Bombo Headland

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Graph													
2001												11.2	
2002	99.6	288.2	125.4	62.8	52.4	28	18.2	12	9.6	7.2			
2003								41					
2007												87	
2008	55			102	12.6	127.8	86	46.2	69.2	88.4	12.6	99.4	
2009	11.6	87.4	48.6	66.4	0	75.8	53	2.8	21	187.8	56	106.2	716.6
2010	69	201	90.4	54.2	83.6	71.2	111.2	67.4	121	132.2	51	83.8	1136
2011	87.6	59	297.8	78.6	100.2	93	187.4	87.4	52.8	112.6	144.2	50.8	1351.4
2012	61	289	213.2	109.6	11.4	86	64.8	8	19.8	91.6	35.2	53.8	1043.4
2013	170.8	153.2	74.2	183.6	121.8	220.2	69.6	17.8	89	12.8	137.2	85.2	1335.4
2014	26.2	42	306.2	103.8	10.8	34.2	7.8	154.4	52.4	86.8	47.4	159.8	1031.8
2015	208	98.4	53	247.6	44.2	69.8	48	269.4	82.8	46.6	57.2	105.6	1330.6
2016	124.6	25.6	86.6	32.6	9.2	328.4	91.6	91.4	56.4	30.6	25.8	50.8	953.6
2017	18.8	158.8	309.6	76	49.4	54	1.4	35.2	0.4		116.8	46.4	
2018	69	111.6	43	15.6	16.6	172	3.2	54.2	40.4	137.4	88.6	82.4	834
2019	107.2	22.8	159.4	33.8	9.2	119	16.6	45.8	68.4	35	26.8	2	646
2020	44.8	213.4	76.4	36	59.8	35.6	216.2	100.4	24	68	76.2	80.2	1031
2021	166.6	115.6	192.6	11	190.2	66	25.8	88.6	52.8	60.4	163.4	92.8	1225.8
2022	172.6	446.6											

All results in mm

BOM data 15/3/22

March 2021 to Feb 2022: 1562.80 Annual Rainfall (mm)

Prepared By: Earth2Water
Checked By: DP

Appendix C

H24.011.000

Ammonia levels and 20% trigger factor for Groundwater and 10% trigger factor for Surface water at Gerroa Landfill

Date sampled and Report Number	MW1D	MW1S	MW3	MW4	MW5	MW6D	MW6S	MW7D	MW7S	MW9	MW10	MW11				ML-1	ML-2	ML-3	ML-4	ML-5
20% trigger level (mg/L)	**164.4**	**1.32**	**39.24**	**21.8**	**7.07**	**98.8**	**27.78**	**85.32**	**14.3**	**4.26**	**2.85**	**2.96**								
10% trigger level (mg/L)																**0.836**	**1.38**	**0.066**	**0.23**	**2.38**
22/02/08	130	0.16	-	0.88	0.1	81	3.2	**110**	3.3	0.34	0.3	0.99				0.31	0.88	-	**1.7**	-
29/05/08	130	0.18	0.75	0.65	0.10	90	3.3	**86**	4.7	0.10	0.10	0.12				**1.5**	**3.7**	-	0.10	-
25/08/08	140	0.18	0.77	0.65	0.10	**110**	3.2	**86**	5.9	0.22	0.73	0.24				0.22	0.44	-	0.27	
19/11/08	93	0.10	0.78	-	0.10	69	2.5	65	3.5	0.10	-	0.10				<1	<1	-	<1	1.6
18/02/09	82	0.02	0.60	-	0.02	72	1.7	81	5.1	0.62	0.25	0.10				Cleary Bros land	**1.9**	Cleary Bros land	Cleary Bros land	2
19/05/09	61	0.25	0.73	0.79	0.03	45	2.6	62	8.3	0.05	0.08	**4.7**				-	0.56	-	-	1.2
27/08/09	95	0.42	0.89	0.54	0.02	76	3.0	85	8.4	0.06	0.21	**4.8**				-	0.41	-	-	**2.8**
27/11/09	58	1.3	0.8	0.5	0.1	73	1.8	43	4.1	0.2	0.4	2.4				-	**1.5**	-	-	**3.0**
26/02/10	37	0.04	0.31	0.24	0.02	36.5	0.6	37.8	3.03	<0.1	<0.1	**5.36**					**1.9**			2.17
21/05/10	22.6	0.27	0.62	0.38	0.08	16.4	0.83	21.9	0.49	<0.10	<0.10	<0.10				-	<0.10			1.52
30/11/10	25.7	0.05	0.66	0.22	0.04	21.8	1.73	21.7	2.56	0.84	<0.10	<0.10				-	0.08	-	-	0.04
24/02/11	6.67	0.05	0.26	0.91	0.03	8.90	0.48	10.2	1.34	0.06	<0.10	0.13					0.87	-	-	1.83
24/05/11	2.56	0.04	0.14	1.16	0.03	13.8	0.23	7.99	1.30	0.05	0.03	0.06					**2.39**			**3.12**
24/08/11	0.12	0.06	0.42	0.58	0.03	3.24	0.19	4.38	0.16	<0.01	-	0.03					**1.69**	-	-	**1.60**
03/11/11	2.15	0.02	0.29	0.64	0.08	2.25	0.40	4.17	1.93	1.00	0.02	0.03					1.03			0.85
01/02/12	3.16	<0.01	0.23	0.68	0.02	10.8	0.25	1.98	2.03	<0.10	<0.10	0.01				-	**1.70**	-	-	**3.07**
31/05/12	0.07	0.05	0.04	0.18	0.03	7.62	0.12	2.61	2.25	0.03	0.02	0.03					1.08			1.73
10/08/12	0.09	<0.01	0.35	0.10	0.05	7.06	0.08	1.94	2.34	0.04	0.02	0.05					1.09			1.73
21/11/12	0.17	-	0.44	0.15	0.23	7.17	0.20	1.67	2.74	0.23	<0.10	<0.10				-	<0.10	-	-	<0.10

Date sampled and Report Number	MW1D	MW1S	MW3	MW4	MW5	MW6D	MW6S	MW7D	MW7S	MW9	MW10	MW11	MW12	MW13	MW14	ML-1	**ML-2**	ML-3	ML-4	**ML-5**
20% trigger level (mg/L)	164.4	1.32	39.24	21.8	7.07	98.8	27.78	85.32	14.3	4.26	2.85	2.96								
10% trigger level (mg/L)																0.836	1.38	0.066	0.23	2.38
18/02/13	0.26	0.13	7.78	0.44	0.55	12.8	0.91	1.93	1.2	1.08	0.58	0.42					<0.10			<0.10
31/05/13	2.2	1.9	2.1	16.5	16.8	14.6	0.04	2.82	1.91	<0.01	0.05	0.07					0.75			0.81
21/06/13	0.01	0.15		0.46	0.04	17.5														
30/08/13	2.88	0.28	0.14	<0.01	0.06	11.3	0.29	2.43	0.91	0.84	0.06	0.02					**3.19**			**2.6**
Re-sample 20/09/13																	0.01			0.04
27/11/13	4.13	0.21	0.25	0.37	5.88	10.4	0.04	2.09	1.33	0.32	0.30	0.01					1.00			0.52
07/02/14	2.88		0.11	0.22	0.64	9.08	0.04	1.97	1.64	0.24	0.09	<0.01					0.44			**2.60**
06/05/14	1.29	0.31	0.13	0.28	4.47	8.27	0.03	1.91	0.68	<0.01	0.08	0.06					0.33			1.73
18/08/14	0.02	-	0.17	0.09	1.28	1.79	0.02	0.20	1.12	<0.01	<0.01	<0.01				-	0.68	-	-	0.04
17/11/14	1.30	-	0.32	0.35	1.40	2.23	-	1.36	0.54	0.34	0.13	0.19				-	0.36	-	-	**3.50**
26/02/15	1.51	-	0.18	0.09	**14.5**	3.92	-	1.48	1.16	0.21	0.15	0.13				-	0.09	-	-	0.07
27/05/15	<0.01	0.09	0.15	0.75	0.03	3.13	0.09	0.96	0.59	<0.01	0.05	<0.01				-	0.80	-	-	0.83
24/08/15	0.77	-	0.28	0.15	0.02	1.77	-	1.38	0.54	0.02	-	0.01				-	**1.50**	-	-	**2.39**
04/11/15	3.78	0.23	0.74	0.26	0.03	4.53	-	1.64	0.80	0.47	0.02	0.02					0.05			1.65
16/02/16	2.43	-	20.9	0.12	<0.01	3.48	-	1.02	0.7	0.07	<0.01	<0.01				-	0.02	-	-	1.24
31/05/16	2.08	-	4.31	0.74	**6.93**	4.55	-	1.00	1.03	<0.05	<0.05	<0.05				-	0.11	-	-	0.20
12/08/16	0.66	-	0.56	0.16	2.34	0.14	-	0.70	0.38	0.03	<0.01	0.02				-	1.16	-	-	1.63
10/11/16	12.5	-	1.30	0.11	0.17	3.10	-	0.13	-	0.26	0.15	0.11				-	0.16	-	-	0.27
20/02/17	6.65	-	0.43	0.05	0.15	2.96	-	0.99	0.34	1.29	0.17	0.11				-	0.78-		-	1.20
18/05/17	11	0.31	0.18	0.12	0.04	5.76	0.06	0.98	0.29	0.19	0.18	0.04				-	**1.21**	No access	-	**2.82**
17/08/17	8.22		0.19	0.13	0.03	19.6	-	0.65	0.38	0.15	0.12	0.12				-	0.32	No access	-	0.85

Date sampled and Report Number	MW1D	MW1S	MW3	MW4	MW5	MW6D	MW6S	MW7D	MW7S	MW9	MW10	MW11	MW12	MW13	MW14	ML-1	**ML-2**	ML-3	ML-4	**ML-5**
20% trigger level (mg/L)	164.4	1.32	39.24	21.8	7.07	98.8	27.78	85.32	14.3	4.26	2.85	2.96								
10% trigger level (mg/L)																0.836	1.38	0.066	0.23	2.38
29/11/17	9.24	-	0.24	0.15	0.12	3.71	-	0.49	0.29	0.43	0.10	0.12				-	0.16	-	-	1.68
8/02/18	13.1	-	0.27	0.10	0.14	3.85	-	0.89	0.49	0.54	0.10	0.27				-	<0.05	-	-	1.26
01/03/18 (ammonia only)	9.83	-	0.27	0.07	0.09	7.40		0.83												
15/03/18 (ammonia only)	16.2	-	0.28	0.15	0.08	4.43	-	0.93												
05/04/18 (ammonia only)	12.1	-	0.27	0.09	0.08	12.1	-	1.24												
18/04/18	22.8	-	0.3	0.14	0.07	6.71	-	1.35												
24/05/18	15.8	Dry	0.3	0.06	0.08	4.99	Dry	0.89	0.45	0.27	<0.01	2.23				-	<0.10	-	-	<0.10
12/07/18	8.18		8.55		0.05	4.97		0.74				**6.05**	24.5	24.8	27.2					
22/08/18	8.58	Dry	0.21	0.08	0.02	2.2	Dry	0.15	0.31	0.09	0.16	**5.35**	17.7	18.6	30.8		0.17			1.06
17/10/18			0.34		1.44	7.69		0.63				**5.79**	27.5	32.8	39.4					
16/11/18	damaged	Dry	0.64	0.05	0.08	7.02	Dry	0.91	0.4	0.13	Dry	**4.12**	35.2	37.5	54.7	no access	0.65	no access	no access	**2.72**
06/12/18	damaged		0.35		0.07	8.45		1.11				2.26	31.7	32.8	46.3					
17/01/19	Damaged		0.33		0.48	5.78		1.72				2.24	23	26.1	34					
12/02/19	11.7		0.3	0.06	0.06	22.7	DRY	2.08	0.44	0.16	0.38	0.29				No access		No access	No access	0.77
15/03/19 (ammonia only)	14.0		0.30		0.12	4.43		0.81				0.90	24.7	25.7	32.2					

Date sampled and Report Number	MW1D	MW1S	MW3	MW4	MW5	MW6D	MW6S	MW7D	MW7S	MW9	MW10	MW11	MW12	MW13	MW14	ML-1	**ML-2**	ML-3	ML-4	**ML-5**
20% trigger level (mg/L)	164.4	1.32	39.24	21.8	7.07	98.8	27.78	85.32	14.3	4.26	2.85	2.96								
10% trigger level (mg/L)																0.836	1.38	0.066	0.23	2.38
04/04/19	15.0		0.39		0.08	5.05		1.32				1.60	34.4	26.0	40.9					
28/05/19	15.5	Dry	0.34	0.05	0.03	8.74	Dry	2.36	0.45	0.34	0.23	2.20				No access	0.26	No access	No access	0.75
21/06/19	23.1		0.39		0.04	1.37						0.56	29.6	32.7	52.9					
27/08/19	27.3	-	0.42	0.08	0.08	40.0	-	20.5	0.27	0.12	0.32	1.15	43.8	41.8	68.4	-	0.12			0.07
12/07/19	20.5		0.35		<0.01	4.87		0.80				1.90	33.1	24.7	54.9					
17/10/19	24.9		0.32		0.04	36.3		13.7				**5.3**	36.5		83.0					
22/11/19	35		0.38	0.10	0.05	57	-	20.0	0.32	0.03	0.05	**4.24**				0.47	0.03	**0.16**	**0.52**	1.93
05/12/19	41.0		0.43		0.09	53.6		19.6				**3.29**	58.2	55.7	93.6					
31/01/20	26.9	-	0.39	0.10	0.10	35.8	-	17.1				**4.52**	38.6	38.2	57.9					
14/02/20	27.8	dry	0.37	0.08	0.04	50	-	21.4	0.25	0.08	0.12	**4.01**	57	62	96.5	0.15	0.27	**0.17**	0.18	0.18
08/04/20	35.6		0.32		<0.01	48.2		19.4				**5.86**	51.9	51.1	86.7					
28/05/20	44.1	dry	0.44	0.11	0.07	56.0	dry	21.0	0.22	<0.01	0.14	2.55	57.7	54.7	97.7	0.10	0.13	0.06	0.06	0.12
17/06/20	37.2		0.34		0.04	50.2		20.8				5.91	55.9	52.3	95.3					
15/07/20	38.6		0.22		0.02	47.8		22.7				5.41	56.8	51.9	94.8					
13/08/20	27.8	<0.01	0.22	0.04	<0.01	52.4	0.03	18.3	<0.01	0.25	<0.01	17.0	36.8	27.8	69.9	0.03	0.06	0.02	0.02	0.04
09/09/20	23.3		0.25		0.02	41.5		19.2				2.15	37.5	26.6	73.1					
08/10/20	21.0		0.26		0.02	39.0		17.2				1.13	36.1	28.9	68.5					
06/11/20	21.1	0.14	0.30	0.11	<0.01	36.2		17.4	0.16	0.01	0.02	1.34				0.15	0.51	0.14	0.15	0.61
18/12/20	32.5		0.43		0.18	42.5		18.1				1.31	42.3	46.6	84.4					
08/01/21	16.4		0.31		0.02	37.2		18.5				0.97	38.9	34.6	69.9					
01/02/21	22.0		0.35	0.14	<0.01	36.4		16.8	0.12	0.24	0.06	0.43	46.7	83.5	40.4	1.48	3.20	1.77	0.34	0.34
25/03/21	12.0		0.45		.01	45.8		22.0				0.66	36.8	27.6	71.1					
05/05/21	19.7		0.37		0.01	38.4		17.6				0.38	38.9	36.3	89.6					
20/05/21	10.2	0.40	0.35	0.16	0.03	15.5		1.09	0.04	0.16		0.35				0.62	0.32	0.53	0.33	0.48
18/06/21				0.36	0.04	12.6		0.90			5.98	0.42	35.5	12.4	65.2					

Date sampled and Report Number	MW1D	MW1S	MW3	MW4	MW5	MW6D	MW6S	MW7D	MW7S	MW9	MW10	MW11	MW12	MW13	MW14	ML-1	**ML-2**	ML-3	ML-4	**ML-5**
20% trigger level (mg/L)	164.4	1.32	39.24	21.8	7.07	98.8	27.78	85.32	14.3	4.26	2.85	2.96								
10% trigger level (mg/L)																0.836	1.38	0.066	0.23	2.38
08/06/21	9.68	-	0.29	-	0.01	5.05	-	1.07	-	-	-	0.43	33.8	16.2	75.5					
18/08/21	7.71		0.34	0.12	0.01	31.5		4.48	0.01			0.64	40.1	32.9	83.9	0.51	0.32	0.32	0.12	1.92
10/09/21	4.77		0.82		0.03	5.00		0.82				0.53	18.2	11.8	40.3					
25/11/21	4.02		0.68	0.12	0.02	40.7		16.2		0.43	0.01	0.28				0.12	0.15	0.08	0.08	0.15
10/02/22	2.92		2.21	0.16	0.03	36.0		19.1	0.14	0.11		0.42				0.66	1.00	0.80	1.44	1.03

Appendix D

DOC17/218276

The General Manager
Kiama Municipal Council
Via e-mail at: council@kiama.nsw.gov.au

Attention: Ms Julie Milevski

07 September 2017

Dear Mr Forsyth

Gerroa Waste Disposal & Recycling Facility
Ground and Surface Water Monitoring Results

I refer to the email from Ms Julie Milevski of Kiama Municipal Council (Council) to the Environment Protection Authority (EPA) dated 7 April 2017 providing ground and surface water monitoring results for the Gerroa Waste Disposal & Recycling Facility located at 349 Crooked River Road, Gerroa (the Premises). I apologise for the delay in responding to this matter.

The results have been reviewed and the EPA is seeking further information as below.

MW1D
On 10 November 2016 and 20 February 2017, ammonia levels at this monitoring point were 12.5mg/L and 6.65mg/L respectively. These are the highest recorded results since 2011 results.

MW3
On 31 May 2016 and 10 November 2016, ammonia levels at this monitoring point were 4.31mg/L and 1.30mg/L respectively. It is noted that on 16 February 2016, ammonia was detected as 20.9mg/L however, Council's consultant indicated that this result was an anomaly. Aside from this result, and 7.78mg/L being detected on 18 February 2013, all other results have been below 1.00mg/L.

The EPA is seeking further explanation as to the cause of the suspected elevated ammonia results and whether any remediation action is required. Please provide the requested response in writing to Unit Head Waste Compliance, PO Box 513, WOLLONGONG, NSW, 2520 or by email to waste.operations@epa.nsw.gov.au or by Fax at (02) 4224 4110. The submission must be made by **5pm on 29 September 2017**.

If you have any questions about this matter, please contact Greg Frost on (02) 4224 4113.

Yours sincerely

MATTHEW CORRADIN
Unit Head Waste Compliance
Environment Protection Authority

PO BOX 513 Wollongong NSW 2520
Level 3, 84 Crown Street, Wollongong NSW 2500
Tel: (02) 4224 4100 Fax: (02) 4224 4110
ABN 43 692 285 758
www.epa.nsw.gov.au

earth2water Pty Ltd
Environmental & Groundwater Consulting
ABN 64 100 859 238
175 Fern Street Gerringong NSW 2534
Phone (02) 4234 0829 Mobile 0422 334102

Client: Kiama Municipal Council

Project: Second Interim Groundwater Report
Gerroa Waste Disposal Depot

Prepared for: Tony Hardy
Kiama Municipal Council
P.O. Box 75, Kiama, NSW, 2533.

Report: 14 May 2018
Reference: E2W-025 Gerroa R002 (V1)

Authorised by: Earth2Water Pty Ltd

Dino Parisotto - Director
BAppSc Geology (Hons); MAppSc (Groundwater)
SCPA Certified Practitioner- Site Assessment and Management

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Reports Distributed to:
Kiama Municipal Council: pdf copy

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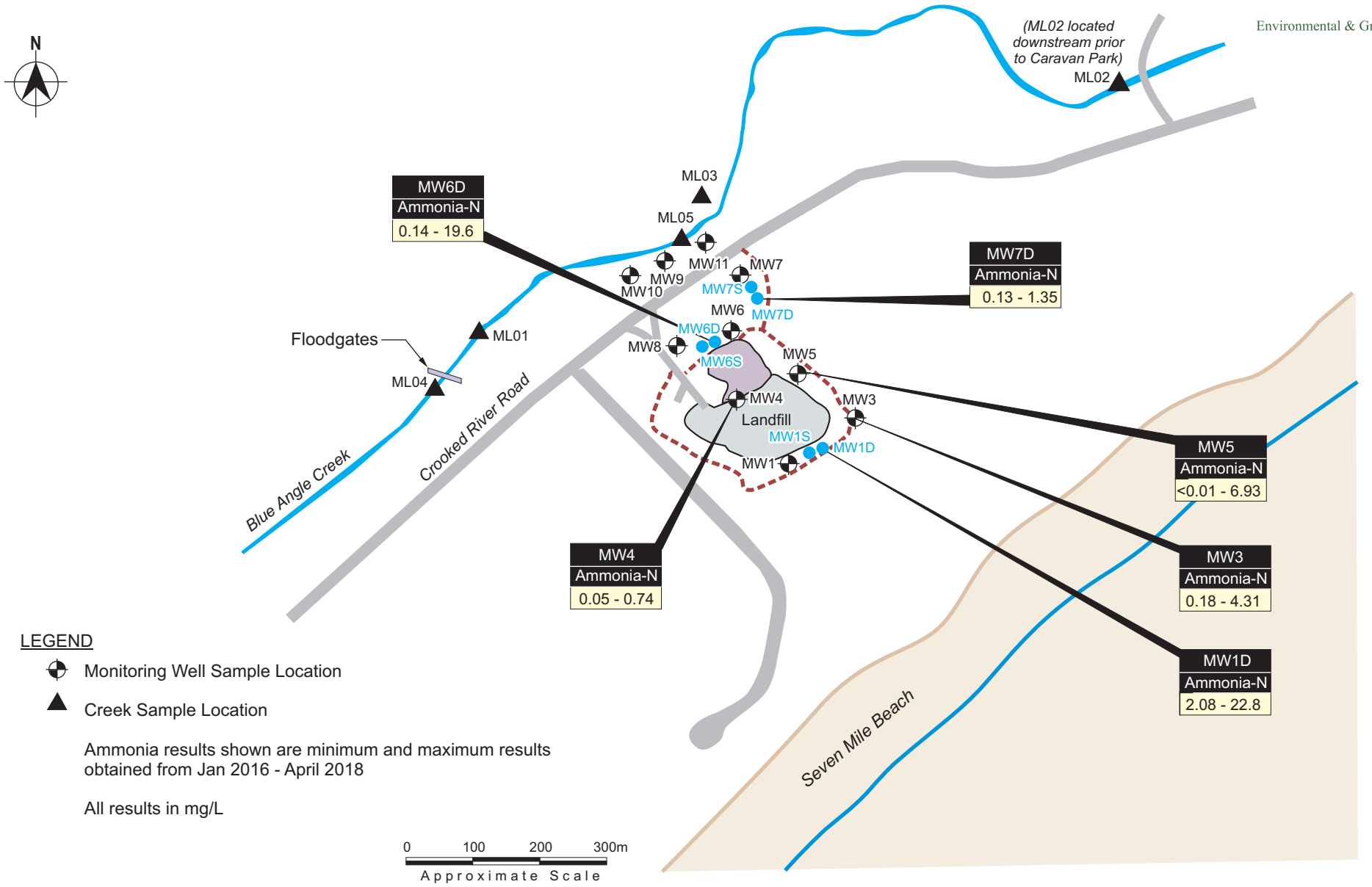
Environmental & Groundwater Consulting



Source: *Base Plan, URS Australia Pty Ltd*

GROUNDWATER AMMONIA RESULTS (mg/L) 2016-2018

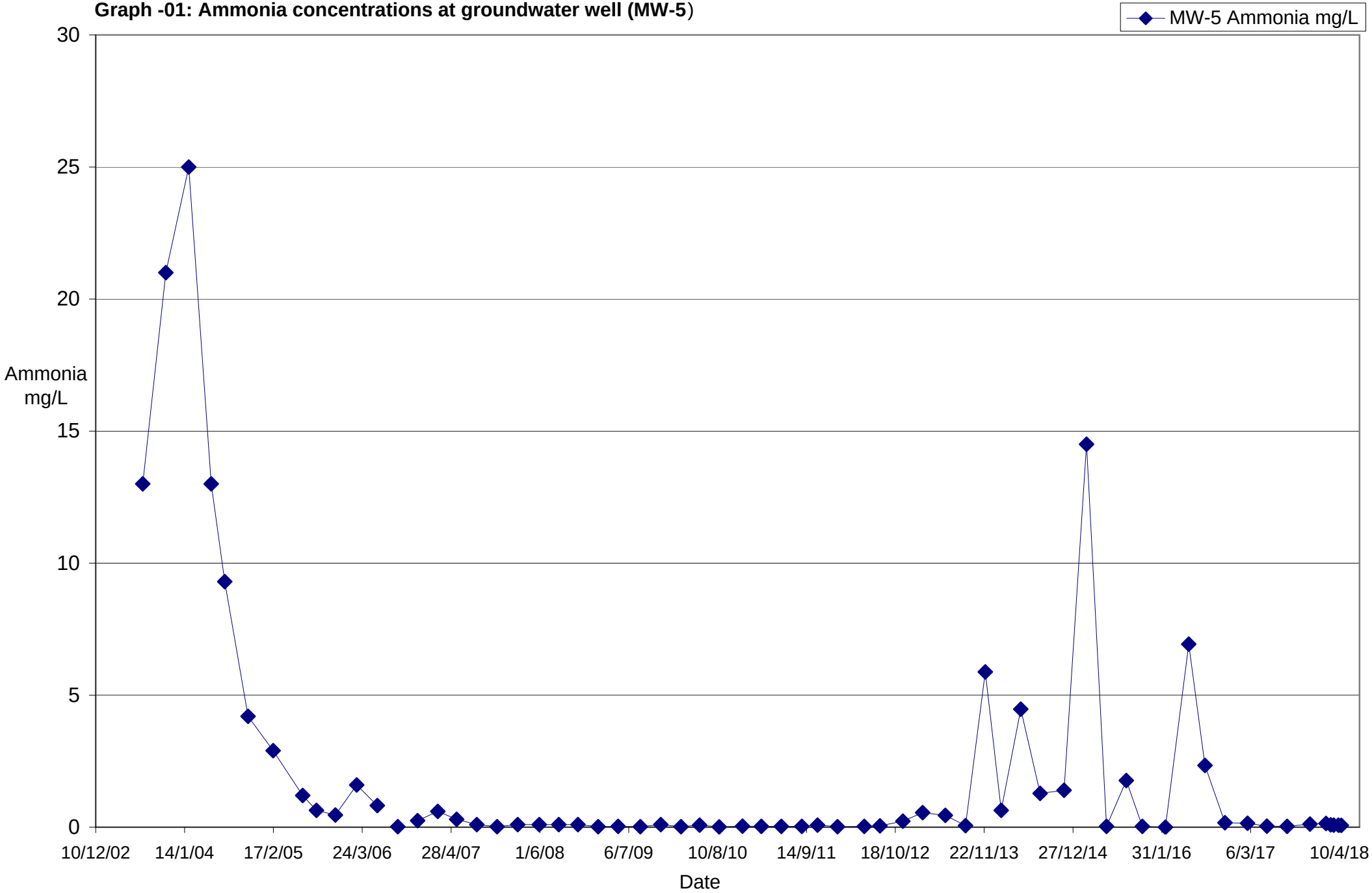
GERROA INTERIM REPORT

Date: *April 2018*

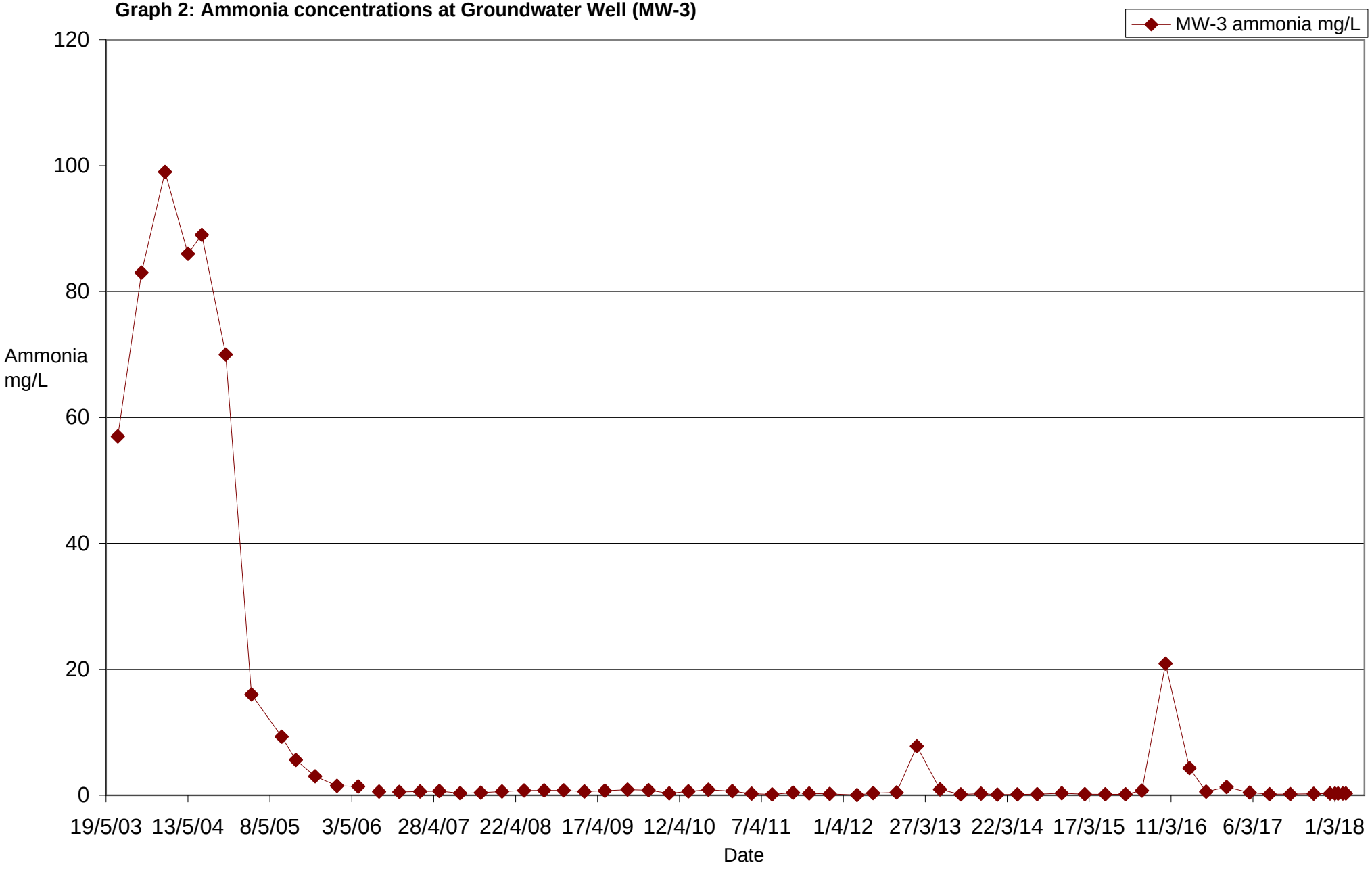
Reference: *E2W_025_58.cdr*

Figure 1

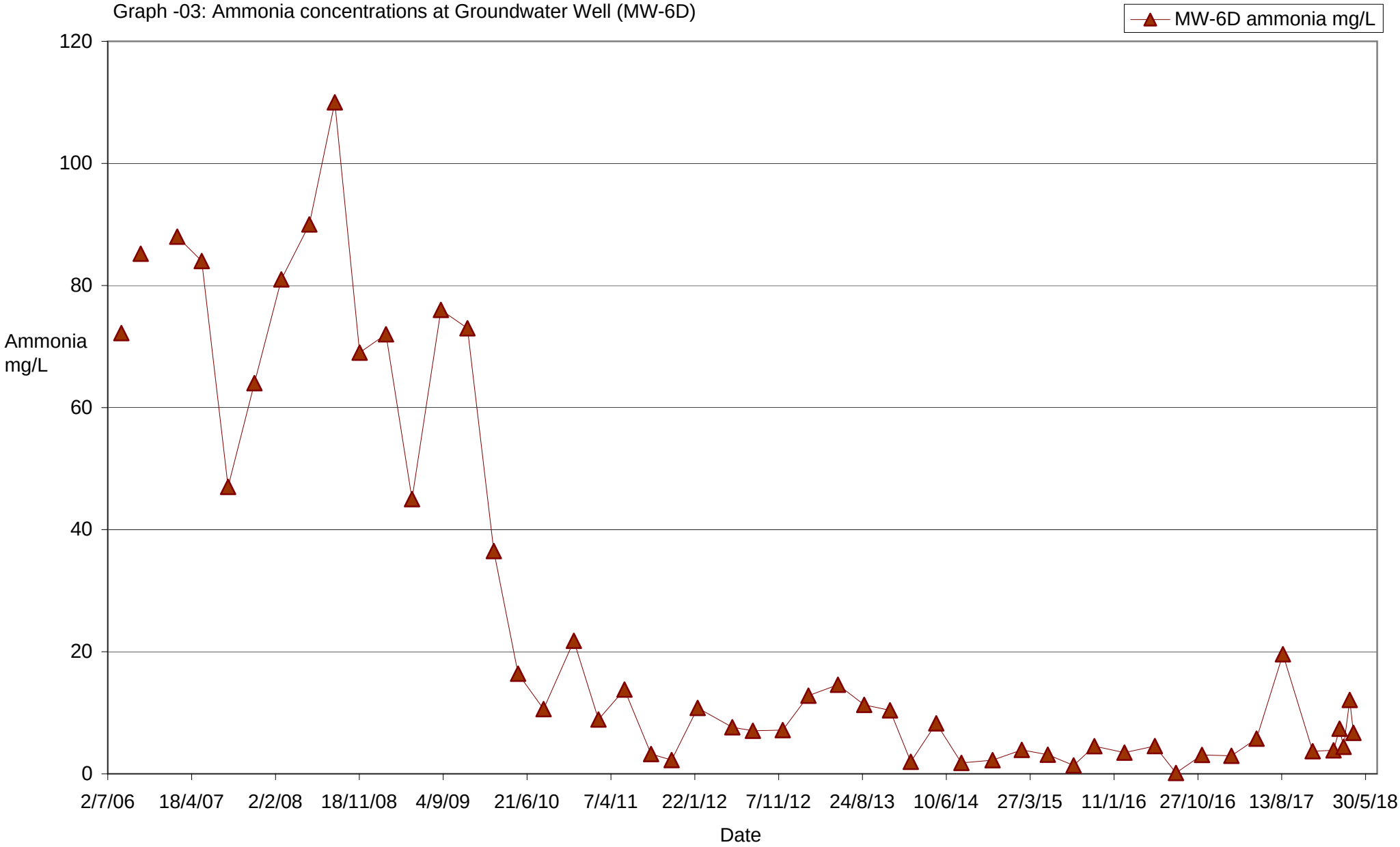
Graph -01: Ammonia concentrations at groundwater well (MW-5)



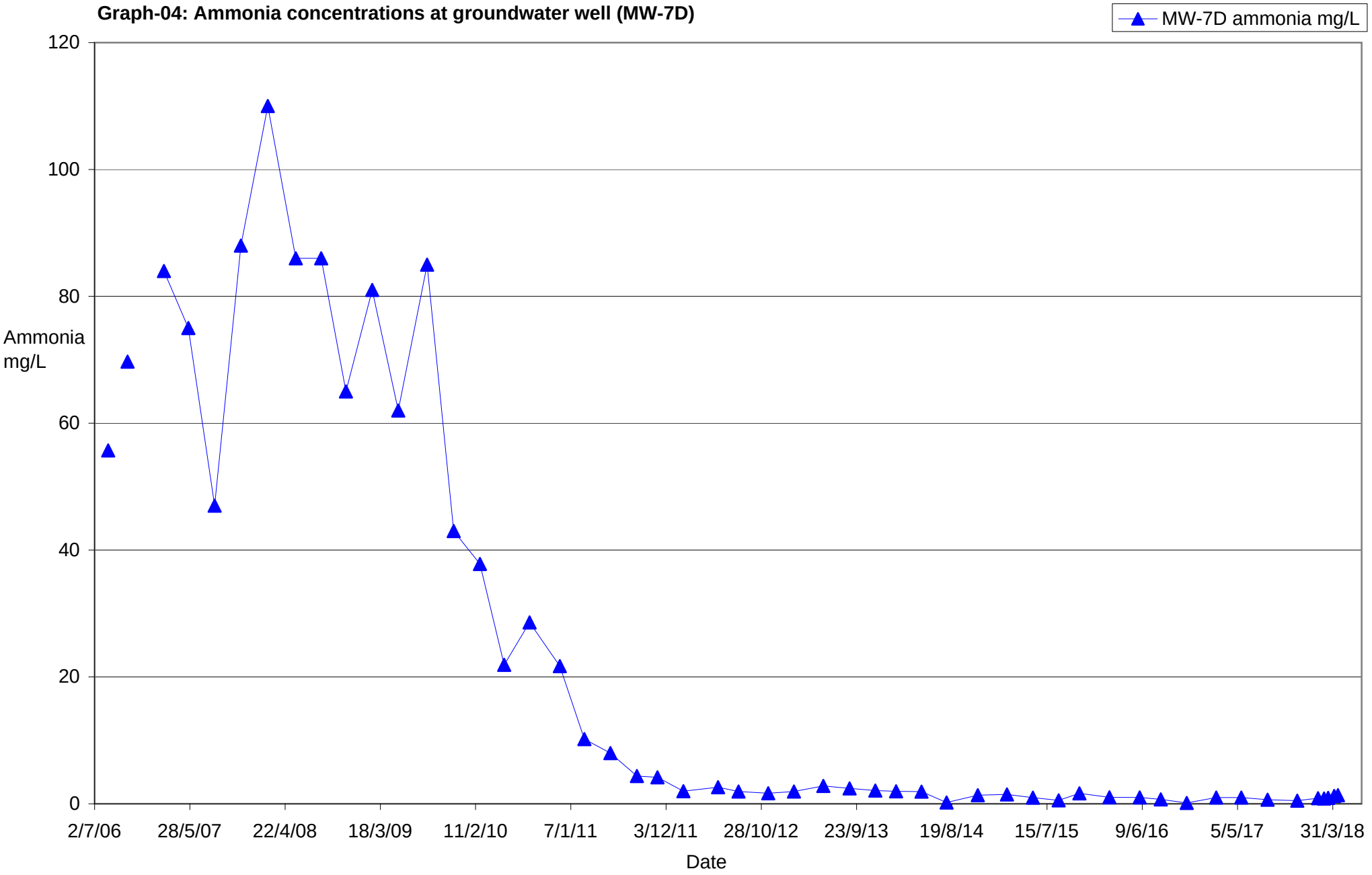
Graph 2: Ammonia concentrations at Groundwater Well (MW-3)



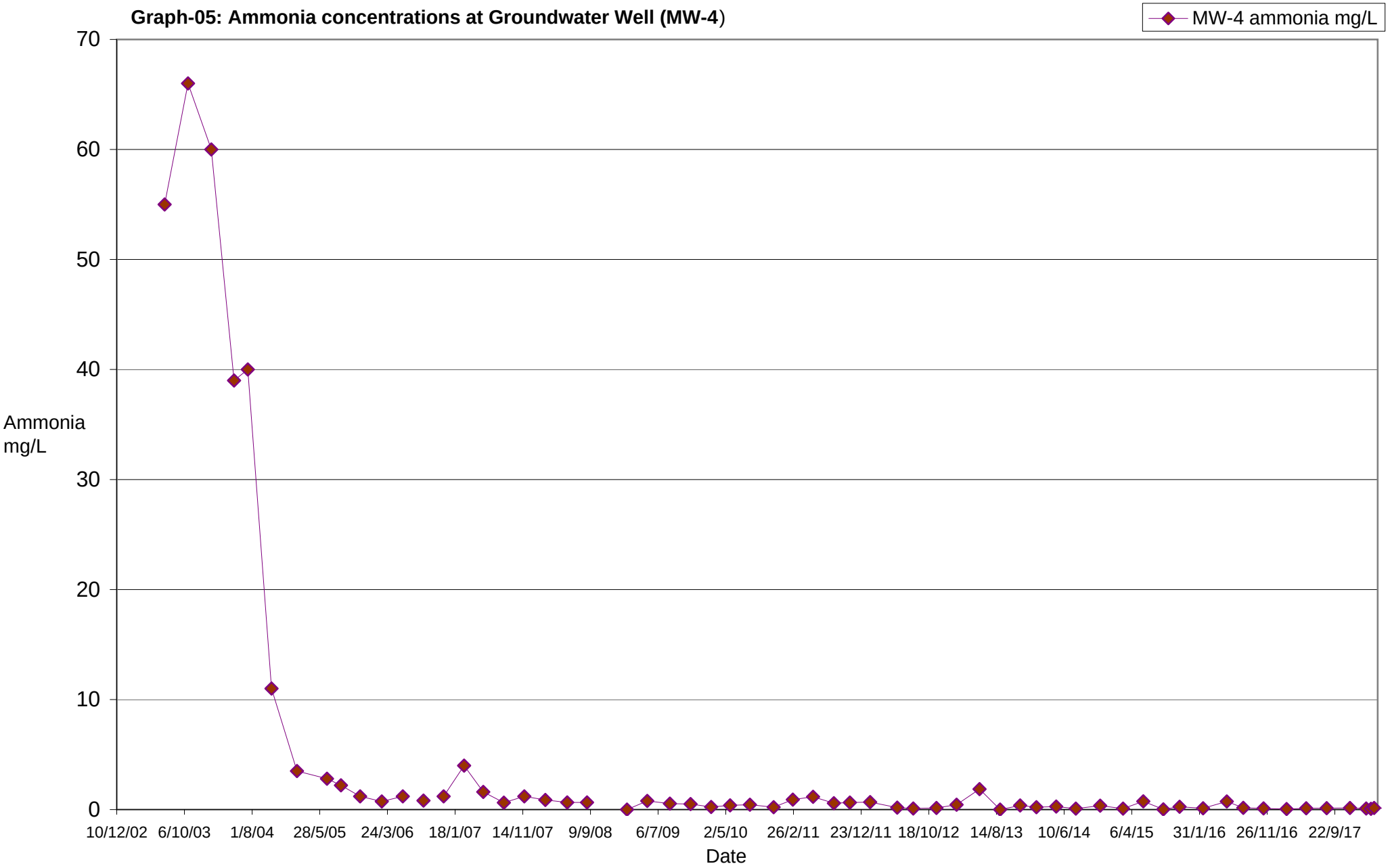
Graph -03: Ammonia concentrations at Groundwater Well (MW-6D)



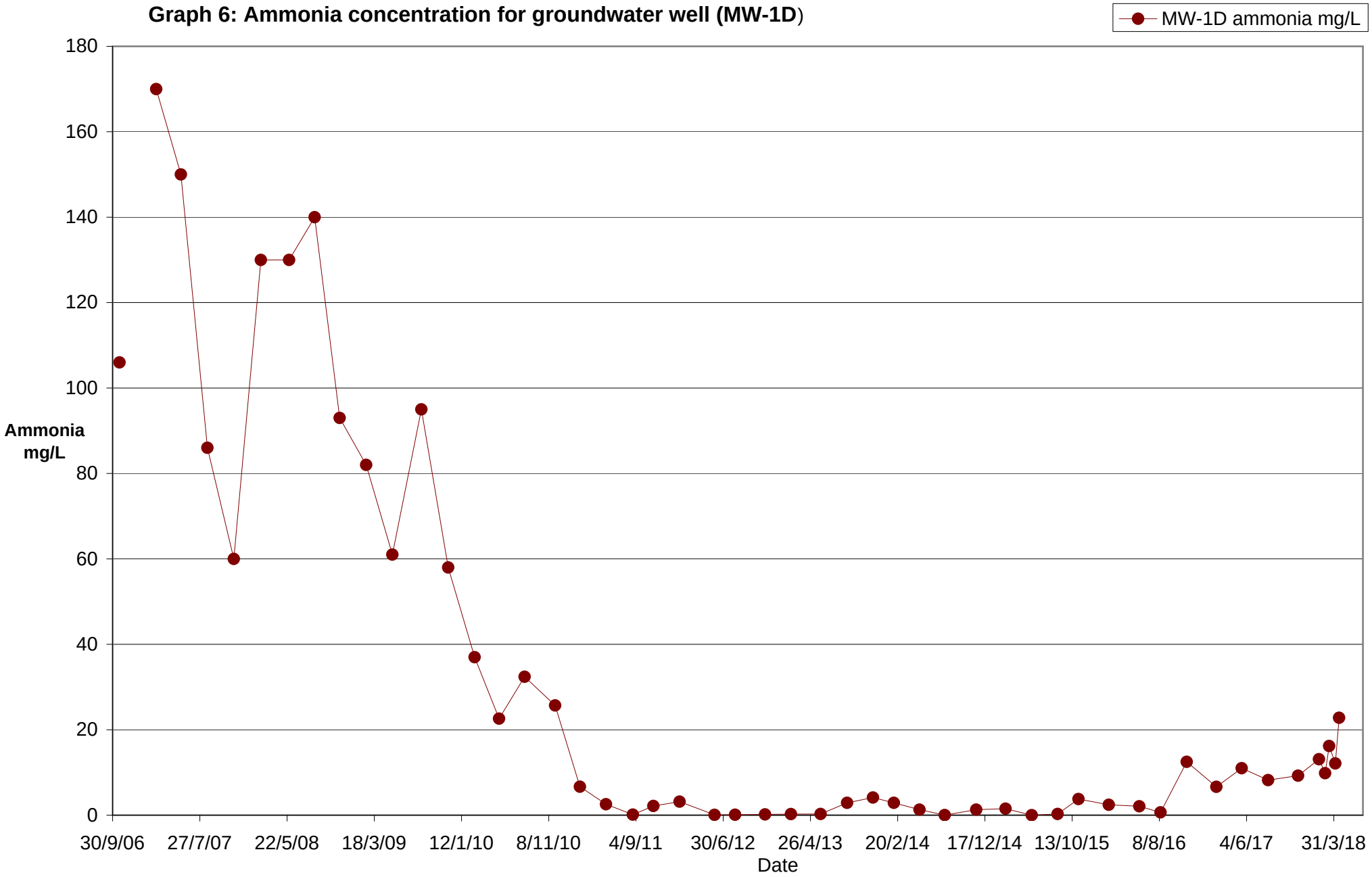
Graph-04: Ammonia concentrations at groundwater well (MW-7D)



Graph-05: Ammonia concentrations at Groundwater Well (MW-4)



Graph 6: Ammonia concentration for groundwater well (MW-1D)



Appendix E

Limitations

Earth2Water Pty Ltd has prepared this report for the use of Kiama Council in accordance with the standard terms and conditions of the consulting profession. This report is prepared in accordance with the scope of work and for the purpose outlined in the proposal. The methodology adopted and sources of information used by E2W are outlined in this report.

This report was prepared in August 2018 and is based on the information reviewed at the time of preparation. This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

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

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

LAST PAGE OF REPORT

Thank you for the opportunity to work with Kiama Council.

Your feedback is appreciated at Earth2Water (dino@earth2water.com.au)

earth2water Pty Ltd
Environmental & Groundwater Consulting

Appendix E

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