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Cleanaway Banksia Road Landfill 2024 Annual Groundwater Monitoring Program (as per Licence L8904/2015/1) – Report Overview

Dear Les,

Geocontam Risk Management Pty Ltd (GRM) was commissioned by Cleanaway Solid Waste Pty Ltd (Cleanaway) to compile and evaluate the water quality monitoring results for groundwater, leachate ponds and stormwater dams collected during the 1 January to 31 December 2024 monitoring period for the Banksia Road Putrescible Waste Landfill (the site) located at Lot 2, Banksia Road, Crooked Brook, Western Australia (WA).

Water quality monitoring was undertaken by SLR Consulting Australia (SLR) in accordance with the requirements of Prescribed Premises Licence No. L8904/2015/1 issued by the Department of Water and Environment Regulation (DWER) on 3 August 2015 (with licence revisions dated 22 February 2024 and 12 December 2024 relevant to the 2024 monitoring program).

SITE OVERVIEW

Site Operations

The Site is an operational prescribed premise licenced by DWER to accept the following waste categories:

- Category 64: Class II and III putrescible landfill – premise on which waste is accepted for burial;
- DWER Category 61: Liquid water facility – premise on which liquid waste (other than sewerage waste) produced on other premises is storage, reprocessed, treated or irrigated; and
- Category 5: Processing or beneficiation of metallic or non-metallic ore – premise on which tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.

Accordingly, the site contains liquid waste cells, solid waste cells, tailings cells stormwater collection dams and leachate collection ponds. The Site is configured to allow acceptance of domestic and putrescible wastes in the eastern portion of the site and waste from the nearby Tronox (formally Millenium Inorganic Chemicals (MIC) and Cristal Pigment) minerals sands mining operations in the central/western portion of the site.

Between 2000 and 2006, the site operated as a Class II landfill receiving waste into cells 1 and 2. From 2006, the landfill has received both Class II and Class III waste comprising a mixture of municipal, commercial, and industrial waste, as well as residues from Water Corporation wastewater treatment plants. There are currently 11 landfill waste disposal cells (of which 10 are being actively filled and one (cell 5) has been final capped), and two tailings waste disposal cells. Asbestos and quarantine waste placement currently occurs at Cells 4, 4b, 12 and 12a.

Tronox waste residue from the mining operations is disposed of into high-density polyethylene (HDPE) lined, purpose-built cells known within the licence as the TDS Cell 1 (formerly TP1) and TDS Cell 2. Receival of tailings into TDS Cell 2 commenced in 2020 and drains to the TDS Cell 1 Leachate Pond (formerly TLP).

Landfill leachate is piped from the landfill cells into dedicated, HDPE lined leachate ponds (PLP, LEP1, LEP2, and LEP3) in the central and southwestern portion of the site. Additionally, two stormwater dams (PSD1 and PSD2) collect diverted stormwater into lined dams in the western portion of the site.

Environmental Setting

An ephemeral watercourse, Crooked Brook, is located approximately 1 km south and southwest of the site. The brook flows in a north-westerly direction into the Preston River approximately 5.5 km to the west of the site.

Two groundwater aquifers underly the site within the superficial formation and Leederville formation. Groundwater within the superficial aquifer generally flows to the northwest with a depth to groundwater between 20 m and 40 m (shallower in the western portion and deeper in the eastern higher elevation portion of the site). Previous investigations at the site have reported minimal groundwater within the superficial formation (i.e., in shallow groundwater wells) particularly in the eastern portion of the site and the likely interpretation of this is that the system is highly dependent on rainfall recharge and the geologic profile of and topography of the site results in the aquifer becoming thin to the east.

The underlying Leederville aquifer is confined to semi-confined occurring at depths varying between 30 m and 5 m below the surface across the site. The Leederville aquifer and generally serves as a domestic water supply for the Dardanup area with the Priority 1 Dardanup water reserve located approximately 2.5 km to the northwest of the site's northwestern boundary. The site itself is not located within a drinking water protection area.

MONITORING SITES

The groundwater monitoring network targets both the superficial and the Leederville aquifers through shallow and deep groundwater wells predominantly located in the western and central portion of the site. As per the licence, there are a total of 26 groundwater wells onsite however during the 2024 monitoring program 20 were sampled in March, 21 in June, and 25 in September and December, due to the several wells being blocked or seasonally dry. Dry/damaged monitoring wells SE3S-R, SE4S-R, GW13S and GW13D were replaced during 2024.

Leachate samples are collected from the primary leachate pond (PLP), leachate evaporation ponds (LEP1 and LEP3) and tailings leachate collection area at TDS Cell 1. Stormwater quality is also monitored at the primary stormwater dams (PSD1 and PSD2).

Refer to Section 3.3, Table 5 of the GRM 2024 Annual Compliance Report.

LABORATORY ANALYTICAL SUITE

The laboratory analytical suite utilised for the 2024 bi-annual and quarterly monitoring complies with Condition 50 (Table 17) and Condition 57 (Table 21) of the DWER Licence and comprised physicochemical parameters, major ions, metals, nutrients, organic analytes, and per- and polyfluoroalkyl substances (PFAS). All groundwater samples were submitted to laboratories that are National Association of Testing Authorities (NATA) accredited for the required analysis.

Refer to Section 1.2 and Section 3.3, Table 5 of the GRM 2024 Annual Compliance Report.

KEY FINDINGS

The key findings of the 2024 water quality monitoring program are summarised in the following sections with reference to the annual report (GRM, 2024) for further detail.

Groundwater Flow Direction

Groundwater elevations were consistent with previous investigations and groundwater flow direction in the shallow superficial aquifer was consistently to the northwest. In the Leederville aquifer, groundwater flow was reported towards the west or southwest.

Refer to Section 5.1.1 of the GRM 2024 Annual Compliance Report.

Groundwater Quality

Physicochemical characteristics

Results of the 2024 water quality monitoring indicate that groundwater at the site is generally acidic and fresh with pH values below the lower pH range for drinking water and non-potable groundwater uses. In contrast, groundwater in the leachate ponds is generally alkaline and saline. Based on the pH and salinity, groundwater could be variably suitable for non-potable, potable, and livestock watering purposes, depending on the location as the pH is noted to be generally below the applicable range.

Refer to Section 5.1.2 of the GRM 2024 Annual Compliance Report

Licenced chemicals of interest

Laboratory analysis results for 2024 are summarised as follows:

- The majority of shallow superficial and Leederville groundwater is generally characterised as a sodium-chloride type water. At the western end of the site, GW22D and GW23D plot close to the boundary between the sodium-chloride and mixed water type boundaries, which may reflect a longer migration time in the Leederville aquifer as water travels away from the interpreted recharge zone to the east of the site.
- The Australian drinking water guidelines (ADWG) were exceeded in for arsenic (2 monitoring locations), manganese (3 monitoring locations), nickel (1 monitoring location), and ammonia (2 monitoring locations).
- The non-potable use guidelines (NPUG) were exceeded for aluminium (10 monitoring locations), chloride (3 monitoring locations), total iron (12 monitoring locations), sodium (5

monitoring locations), manganese (1 monitoring location), and ammonia (2 monitoring locations).

- The long-term irrigation guidelines (LTIG) were exceeded for total iron (17 monitoring locations), and manganese (6 monitoring locations).
- No exceedances of stock water guidelines (SWG) were reported in groundwater.
- Limited or isolated occurrences of other heavy metals (chromium, copper, lead, selenium, and Zn), nitrogen, phosphorus and ammonia were reported above the limit of reporting (LOR) but were below assessment criteria indicating concentrations present do not pose a risk to potential receptors.
- PFAS compounds were variably reported above the LOR in five superficial aquifer monitoring wells (SE3S-R, SE4S-R, SE6S, GW7S, and GW13S) and Leederville aquifer monitoring well GW7D, however concentrations were below all applicable water quality guidelines.
- Except for a singular trace detection of phenol in GW10D in September 2024, all other chemicals of interest including hydrocarbons, phenols, polychlorinated biphenyls, pesticides, TCE/PCE, and atrazine were all reported below LOR in the groundwater.

Refer to Sections 5.1.3 to 5.1.9 of the GRM 2024 Annual Compliance Report

Groundwater Quality Interpretation

The results of the 2024 groundwater quality monitoring program indicate that:

- With the exception of those analytes that can be naturally occurring in the environment (e.g., major ions, metals, and nutrients), analyte concentrations are low and spatially isolated indicating an absence of source associated with the landfill operations.
- There are significant differences between the leachate ponds and the groundwater with respect to key landfill leachate indicators with concentrations of metals, nitrogen compounds and other chemicals of interest notably higher in concentration in the leachate pond with comparison to the groundwater.
- Metals concentrations monitoring well pairs GW1S/GW1D, SE3S-R/GW3D, SE4S-R/SE4D, and SE6S/GW6D located on a north-south orientation in the centre of site, and GW5S, located upgradient of operations in the south-eastern corner of the site, generally exhibit higher metals concentrations compared to other monitoring wells. These relatively elevated metals concentrations do not appear to have laterally migrated towards the downgradient western boundary over the life of the landfill and therefore may be geologically related.
- Except for Fe, metals concentrations within the Leederville aquifer monitoring wells are generally lower than in the superficial aquifer. Metals concentrations within the Leederville aquifer also exhibit less concentration variance across the site than within the superficial aquifer.
- Inconsistent and elevated water quality results reported in new monitoring wells SE3S-R and SE4S-R are interpreted to be associated with residual drilling fluid in the annulus of the

monitoring well as elevated concentrations in these well are inconsistent with the chemical signature of the adjacent leachate ponds.

- The majority of analytes exhibited stable concentration during the 2024 monitoring period and within previously observed historical ranges. Gradual increases in total nitrogen and chloride were observed in select wells, noting that increases in total nitrogen concentrations are more gradual than observed in previous monitoring years and chloride increases are limited to select monitoring wells in the Leederville aquifer.
- PFAS compounds were identified in the leachate ponds (PLP, LEP1 and LEP3) with concentration sums above the ADWG and NPUG, however concentrations observed above the LOR in superficial aquifer monitoring wells were below the assessment criteria. PFAS congeners were only reported above the LOR in Leederville aquifer monitoring well GW7D-R in March 2024 but were below the assessment criteria.

Refer to Section 6 of the GRM 2024 Annual Compliance Report.

CONCLUSIONS

In consideration of the 2024 and groundwater and leachate pond analysis results, the observed groundwater quality assessment criteria exceedances are considered more likely to be representative of background conditions as opposed to representative of impacts from landfill leachate migration. It is concluded that there is insufficient evidence to suggest that the landfill operations have impacted the underlying groundwater aquifer.

This summary should be read in conjunction with the 2024 Annual Compliance Report (GRM, 2025).

GEOCONTAM RISK MANAGEMENT PTY LTD

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