05 November 2019

Sean Silby
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Lot 2 Banksia Road
Crooked Brook WA 6236

Our ref: 12514660-37816
Your ref:

Dear Sean

Cleanaway - Banksia Road Waste Disposal Site
2019 Annual Groundwater Monitoring Program (as per Licence L8904/2015/1); Report Overview

Cleanaway commissioned GHD to undertake biannual groundwater monitoring at the Banksia Road Waste Disposal Site, located at Lot 2, Banksia Road, Crooked Brook, WA. The monitoring at the site is required under Prescribed Premise Licence No. L8904/2015/1, issued by the Department of Water and Environmental Regulation (DWER). Specifically, the monitoring objective is to provide a continual and updated dataset to characterise potential impacts to groundwater associated with the Site's operational activities.

The 2019 biannual monitoring program undertaken by GHD at the site complies with the groundwater monitoring requirements outlined in the DWER Licence (L8904/2015/1), with the full report presented to Cleanaway entitled: *Cleanaway Solid Waste Pty Ltd, Banksia Road Waste Disposal Site, 2019 Annual Groundwater Monitoring Report – Prescribed Premise License L8904/2015/1, November 2019.*

The key outcomes from the 2019 report are summarised below.

1 Site overview

The Site is operational as an active Class II and III landfill (DWER Category 64) and a liquid waste facility (DWER Category 61) and contains liquid waste cells, solid waste cells, stormwater collection dams and leachate collection ponds. The former Shire of Dardanup Class II unlined landfill is located to the immediate north of the site. 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.

The site has two main groundwater systems (aquifers) including:

- A shallow aquifer (superficial aquifer), with groundwater elevations at depths of around 20 meters below ground level in the low elevation areas (west of site) and up to 50 meters below ground level in the higher elevation areas (east of site),
- A deeper, underlying aquifer (Leederville), which appears to be hydraulically disconnected from the shallow aquifer and confined by a clay unit, comprised of dense grey to brown clay. The Leederville aquifer serves as a domestic water supply for the Dardanup area.

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2 Monitoring sites

The groundwater monitoring network targets both aquifers through shallow and deep groundwater wells at nine locations across the Site. There are a total of 28 groundwater wells onsite however during the 2019 monitoring program, only 18 (April 2019) and 16 (September 2019) groundwater wells were able to be sampled due to the majority of the shallow wells being found to have insufficient water available for sample collection.

Refer to Section 3.2, Section 3.3 (Table 3-1) and Figure 2 of the GHD (2019) report.

3 Analytical suite

The laboratory analytical suite utilised for the 2019 bi-annual monitoring complies with Table 2.4.1 of the DWER Licence and comprised major ions, metals, nutrients and organic analytes. All groundwater samples were submitted to laboratories that are National Association of Testing Authorities (NATA) accredited for the required analysis.

Refer to Section 3.4 (Table 3-3) of the GHD (2019) report.

4 Key findings

The key findings from the 2019 groundwater monitoring program are summarised below with references to the report for further detail:

4.1 Groundwater flow direction

Groundwater onsite is inferred to flow in a west-north-westerly direction (this is consistent with previous investigations)

Refer to Figure 3 and Figure 4 of the GHD (2019) report for further details.

4.2 Groundwater quality

The groundwater in both aquifers is considered slightly acidic and of a 'fresh' water quality (based on field measured electrical conductivity) suggesting it is suitable for non-potable and potable uses.

Refer to Section 2.2 and Section 5.3 the GHD (2019) report for further details.

4.3 Analytical results

- Detections of analytes in groundwater, above the laboratory limit of reporting, included the following:
  - Metals - aluminium, copper, cadmium, iron, lead, lithium, manganese, nickel and zinc
  - Nutrients – nitrogen (nitrate, ammonia and organic forms) and phosphorus (total)
  - Organics – concentrations of total recoverable hydrocarbons (TRH) were detected in five wells and concentrations of per- and polyfluoroalkyl substances (PFAS) were detected in six wells
- Analytes that were not detected above the laboratory limit of reporting included the following:
  - Metals – arsenic, chromium, mercury and selenium
  - Organics - benzene, toluene, ethyl benzene, xylene, polycyclic aromatic hydrocarbons, phenols, polychlorinated biphenyls and pesticides
- Detections of anaytes that are above the ***Australian drinking water*** guidelines:
  - Manganese
- Detections of anaytes that are above the ***non-potable water use*** guidelines:
  - Aluminium, chloride and iron
- Detections of anaytes that are above the ***fresh water ecological and/or irrigation*** guidelines:
  - Metals - aluminium, copper, iron, lead, manganese, nickel, and zinc
  - Nutrients – nitrogen (total) and phosphorus (total)

Refer to Section 5.4 and Appendix D of the GHD (2019) report for further details.

4.4 Interpretations

Spatial observations - the groundwater well located up-gradient (i.e up-stream) of the landfill infrastructure (GW5S) reported elevated concentrations of iron, manganese, aluminium, copper, zinc, total nitrogen and total phosphorus, as well as detections of TRH above the LOR. This indicates that elevated concentrations of these analytes may be naturally occurring in groundwater within the region or representative of ambient conditions (i.e. an up-gradient anthropogenic source)

Historical trends – the data collected within the 2019 monitoring round is considered to be consistent with the historical dataset and within the expected concentration range (fluctuations) observed across other annual monitoring periods. Some notable differences from the 2018 monitoring round include:

- An increase in concentrations of nutrients (e.g. phosphorus and nitrogen) and some dissolved metals (e.g. lead and zinc) were noted in monitoring wells located within the centre and down-gradient of the Site.
- A decrease of PFAS detections from the 2018 monitoring round in terms of the number of monitoring wells with detections (13 down to six in 2019), the number of different compounds detected (seven down to one in 2019) and the concentrations observed (marginally above the LOR). PFAS is considered ubiquitous in the environment and with very low levels of detection used in the analytical program for the groundwater monitoring onsite, minor detections above the LOR may be expected.

Refer to Section 7.6 and 7.7 of the GHD (2019) report.

5 Conclusions

There is limited evidence to suggest that groundwater at the site has been impacted by landfill leachate based on a comparison of the geochemical signature between the leachate and groundwater quality underlying the Site. Further to this, a review of the data, in conjunction with hydrogeological conditions, indicates that analytes that were reported above the adopted assessment criteria in the 2019 monitoring round were also generally present in groundwater up-gradient of the landfilling infrastructure onsite (i.e. east). On this basis, it is unclear whether elevated concentrations detected in groundwater may be attributable to naturally occurring background conditions, an up-gradient (anthropogenic) source and/or a localised on-site, other than the landfill.

This summary should be read in conjunction with the full GHD 2019 annual report.

Sincerely
GHD

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