

# Monthly Water Quality Monitoring Results, Cabbage Tree Road Sand Quarry, NSW

## April 2024 Monthly Monitoring Event

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Suite 3, 240-244 Pacific Highway,  
Charlestown, NSW, 2290  
Phone: +61 2 49495200



Williamtown Sand Syndicate (WSS)  
PO Box 898  
Newcastle, NSW 2300

**Attention: Kristen McMahon**

**Subject:** Monthly Water Quality Monitoring Results, Cabbage Tree  
Road Sand Quarry, NSW  
April 2024 Monthly Monitoring Event

## 1 INTRODUCTION

This report presents water quality monitoring results for the April 2024 monitoring event undertaken by Kleinfelder Australia Pty Ltd (Kleinfelder) at the Cabbage Tree Road Sand Quarry, NSW (herein referred to as the 'site'). This report summarises the required monitoring data under the NSW Environment Protection Authority (EPA) Environment Protection License (EPL) No. 21264, and the site-specific Soil and Water Management Plan (SWMP).

The scheduled monthly monitoring event was conducted on 19<sup>th</sup> April 2024 and included:

- Gauging the depth to water and total depth (relative to the top of the groundwater well casing) within 12 groundwater monitoring wells,
- Recording of field parameters (including pH, electrical conductivity, temperature, dissolved oxygen, turbidity, total dissolved solids, and redox potential) for groundwater and surface water,
- The collection of water samples from 11 groundwater monitoring wells and 3 surface water locations, and
- Collection of a Wash Plant Water (WPW) sample.

All investigations were undertaken in accordance with relevant Australian Standards and applicable guidance material (sampling and investigation methodologies available upon request).

Monitoring locations are illustrated by the site plan provided in **Attachment 1**.

The following sections present the results obtained for monitoring conducted in April 2024. Results have been colour-coded to identify exceedances of the adopted trigger values, with a discussion provided for long-term trends and results exceeding the trigger values, where required. Surface water sampling was conducted during this monitoring event due to metals detections and low pH results during the previous monthly event. TRH/BTEXN sampling was also taken at all locations as part of this event due to laboratory errors during the previous event.

## 2 GROUNDWATER MONITORING

Groundwater monitoring is undertaken in accordance with National Environment Protection Council (2013), National Environment Protection (Assessment of Site Contamination) Measure (NEPM), and New South Wales Environment Protection Authority (2022), Contaminated Land Guidelines Sampling Design Part 1 – Application.



## 2.1 EPL Groundwater Monitoring Sites

**Table 1** below details the monitoring results for April 2024, in accordance with the requirements of the EPL and the SWMP.

**Table 1: Groundwater Monitoring Results – EPL Monitoring Sites**

Monitoring Well (LDP number in parentheses)	Metals (mg/L)			Inorganics & Other			Gauging			
	Arsenic	Iron	Manganese	Field EC (µS/cm)	Field pH (pH units)	Field Turbidity (NTU)	Depth to Water (mbTOC)	GWE	Max inferred <sup>1</sup>	Difference between max inferred and GWE
	SWMP Trigger Values						Refer to Section 2.3, Table 3			
	0.003	4.1	0.136	500	4.2 – 6.5	N/A				
EPL Monitoring Sites										
BH2 (LDP001)	<0.001	0.06	<0.001	80.3	4.37	565	5.213	2.577	3.8	1.223
BH4 (LDP002)	<0.001	0.05	0.010	93	4.45	8	1.366	1.694	3.0 <sup>2</sup>	1.326
BH6 (LDP003)	<0.001	1.34	0.007	203.3	4.65	12.71	1.360	2.260	4.4	2.140
BH7 (LDP004)	<0.001	0.83	0.071	1114	4.69*	17.9	1.338	1.642	3.7	2.058
BH9A (LDP005)	<0.001	0.33	0.034	124.5	4.59	36.4	8.996	1.754	4.0 <sup>2</sup>	2.266
BH11 (LDP006)	<0.001	0.61	0.002	119	4.64	12.51	2.982	3.648	5.5	1.852
MW239S (LDP007)	<0.001	0.56	0.003	131.3	4.41	53.7	1.699	1.341	3.9 <sup>3</sup>	2.589

**Notes:**

< – less than the laboratory limit of reporting

mg/L – milligrams per litre

µS/cm – micro siemens per centimetre

NTU – Nephelometric Turbidity Units

mbTOC – metres below top of casing

<sup>1</sup> – Sourced from Watershed HydroGeo ,2019, *Maximum Extraction Depth Management Plan, Cabbage Tree Road Sand Quarry, May 2019.*

<sup>2</sup> – Inferred Max Groundwater level based on adjacent wells (BH4 & BH9).

<sup>3</sup> – Inferred Max Groundwater level based on adjacent well (MW239S).

\* – Result based on laboratory analytical results



## 2.2 Non-EPL Groundwater Monitoring Sites

**Table 2** below details the monitoring results for April 2024 from monitoring sites which are included in the SWMP but are not required under the EPL.

**Table 2: Groundwater Results Non-EPL Monitoring Sites**

Monitoring Well	Metals (mg/L)			Inorganics & Other			Gauging			
	Arsenic	Iron	Manganese	EC (µS/cm)	pH (pH units)	Turbidity (NTU)	Depth to Water (mbTOC)	GWE	Max Inferred <sup>1</sup>	Difference between Max inferred and GWE
	SWMP Trigger Values						Refer to Table 3			
	0.003	4.1	0.136	500	4.2 – 6.5	N/A				
Non-EPL Monitoring Sites										
BH1A	-	-	-	110.6	4.37	67.1	5.857	3.123	4.5 <sup>2</sup>	1.397
BH5	-	-	-	102.7	4.08	33.1	5.491	1.869	4.0	2.131
BH8	-	-	-	133.6	4.03	20.35	2.056	1.824	4.0	2.176
BH12A	-	-	-	129.4	4.95	88.4	3.127	2.493	4.0 <sup>3</sup>	1.537

**Notes:**

< – less than the laboratory limit of reporting

mg/L – milligrams per litre

µS/cm – micro siemens per centimetre

NTU – Nephelometric Turbidity Units

mbTOC – metres below top of casing

<sup>1</sup> – Sourced from Watershed HydroGeo ,2019, *Maximum Extraction Depth Management Plan, Cabbage Tree Road Sand Quarry*, May 2019.

<sup>2</sup> – Inferred Max Groundwater level based on former adjacent well (BH1).

<sup>3</sup> – Inferred Max Groundwater level based on former adjacent well (BH12).



## 2.3 Trigger Values for Groundwater Depth

**Table 3** presents the trigger values adopted for groundwater depth, as per Watershed HydroGeo (2019). The inferred maximum historical groundwater elevations are provided in Watershed HydroGeo (2019).

**Table 3: Groundwater Level Monitoring TARP Rules (Watershed HydroGeo, 2019)**

Level	Trigger	Action and Response	Report / Response Actions
0	Groundwater levels more than 0.5 m below <i>inferred</i> maximum historical level.	Standard operations – monthly dipping of operational on-site monitoring bores.	N/A
1	Groundwater levels within 0.5 m below <i>inferred</i> maximum historical level at any on-site bore.	Weekly (or more frequent) monitoring (dipping) of groundwater levels until water level declines to below high frequency level bores.	Internal and environmental consultant. Include note in Annual Report.
2	Groundwater levels within 0.25 m of <i>inferred</i> maximum historical level at any on-site bore.	Weekly (or more frequent) monitoring (dipping) of groundwater levels.  Re-analysis and review of Minimum Extraction Level (MEL).	WSS to issue letter to DPIE, documenting groundwater level and rainfall trends, review and make recommendations regarding MEL.
3	Groundwater levels within resource area rise above previously <i>inferred</i> maximum groundwater level.	Analysis of recent data by hydrogeologist, including site data and data from local HWC wells and local Defence wells (if available).  Revision of MEL.  Remediation of earlier excavations to revised MEL if required by DPIE.	WSS to issue letter to DPIE, DoI Water and HWC, documenting groundwater level trends, and revision (if necessary) of MEL.  Letter to outline remedial options, considering access, vegetation condition in previously rehabilitated areas. Re-grading of previously rehabilitated areas if required by DPIE.

## 2.4 Groundwater Trends and Discussion

In accordance with the SWMP, an exceedance of the trigger value does not necessarily indicate that there is an unacceptable risk on site, but rather a trigger for further investigation or evaluation of management options, as monitoring results may naturally exceed trigger values. pH at BH5 (4.08) and BH8 (4.03) marginally exceeded the site-specific trigger value range (4.2 - 6.5 pH) during the April monitoring event. EC at BH7 (1114  $\mu\text{S}/\text{cm}$ ) exceeded the site-specific trigger value (500  $\mu\text{S}/\text{cm}$ ) during the April monitoring event.

Reported exceedances of pH and EC were investigated and determined likely to be potentially due to development works being undertaken on a residential property adjacent to the site. These results, however, did not contribute to significantly increased solubility and mobility of metals concentrations within groundwater, which remained below the site-specific trigger values at all groundwater monitoring locations. Continued monitoring of pH and EC trends will be conducted during subsequent monitoring events. Based on the results obtained, the need for a site-specific trigger investigation was not required at this time.

Reported results for BTEXN and TRH constituents (provided in **Attachment 3**) were below the laboratory Limit of Reporting (LoR) in all groundwater monitoring well locations.

Gauging data and field measurements obtained during groundwater monitoring are provided in **Attachment 2**.

## 3 SURFACE WATER MONITORING

Surface water monitoring is undertaken in accordance with National Environment Protection Council (2013), National Environment Protection (Assessment of Site Contamination) Measure (NEPM), and New South Wales Environment Protection Authority (2022), Contaminated Land Guidelines Sampling Design Part 1 – Application.



### 3.1 Surface Water Monitoring Results

Surface water monitoring is completed on a quarterly basis as per the SWMP. April 2024 monthly water quality monitoring event would not normally include surface water monitoring within the scope of works, however due to metals detections and low pH results from the previous event, surface water sampling has been conducted again.

**Table 4** below details the monitoring results for April 2024 from surface water monitoring sites.

**Table 4: Surface Water Monitoring Results**

Location	Metals (mg/L)						Inorganics & Other			
	Arsenic	Barium	Cobalt	Iron	Manganese	Nickel	Ammonia as N	EC (µS/cm)	pH (pH units)	Turbidity (NTU)
	SWMP Trigger Values									
	0.003	0.08	0.017	4.1	0.136	0.02	0.2	500	4.2 – 6.5	N/A
SW1	<0.001	0.008	<0.001	0.47	0.027	<0.001	<0.01	68.8	6.06*	0.63
SW3	<0.001	0.036	0.015	1.92	0.046	0.014	<0.01	404.9	3.79*	0.36
SW4	<0.001	0.036	0.012	0.91	0.070	0.012	<0.01	480.8	3.70*	0.45

**Notes:**

- < – less than the laboratory limit of reporting
- mg/L – milligrams per litre
- µS/cm – micro siemens per centimetre
- NTU – Nephelometric Turbidity Units
- \* - Result based on laboratory analytical results



### 3.2 Surface Water Trends and Discussion

In accordance with the SWMP, an exceedance of the trigger value does not necessarily indicate that there is an unacceptable risk on site, but rather a trigger for further investigation or evaluation of management options, as monitoring results may naturally exceed trigger values. pH at SW3 (3.79) and SW4 (3.70) marginally exceeded the site-specific trigger value range (4.2 - 6.5 pH) during the April monitoring event.

Reported exceedances of pH were investigated and determined likely to be potentially due to development works being undertaken on a residential property adjacent to the site. These results, however, did not contribute to significantly increased solubility and mobility of metals concentrations within groundwater, which remained below the site-specific trigger values at all groundwater monitoring locations. Continued monitoring of pH and EC trends will be conducted during subsequent monitoring events. Based on the results obtained, the need for a site-specific trigger investigation was not required at this time.

Reported results for BTEXN and TRH constituents (provided in **Attachment 3**) were below the laboratory Limit of Reporting (LoR) in all surface water monitoring well locations.

Gauging data and field measurements obtained during surface water monitoring are provided in **Attachment 2**.

## 4 PFAS MONITORING

In accordance with the SWMP, Per- and Polyfluoroalkyl Substances (PFAS) monitoring was undertaken at the wash plant during the April 2024 monitoring event. Results of PFAS monitoring are provided in **Table 5**. Concentrations of PFAS were below the laboratory LOR in the sample collected from the wash plant in April 2024.



**Table 5: PFAS Monitoring Results**

Monitoring Point	PFAS (µg/L) (water analysis)			PFAS (mg/kg) (Wash Plant Fines)		
	PFOA	Sum of PFOS + PFHxS	Other PFAS	PFOA	Sum of PFOS + PFHxS	Other PFAS
	SWMP Trigger Values					
	0.56	0.07	N/A	0.1	0.01	N/A
Wash Plant Water						
WPW2	<0.01	<0.01	<0.05	-	-	-

Notes: ug/L – micrograms per litre, mg/kg – milligrams per kilogram, < – less than the laboratory limit of reporting





## 5 METEOROLOGY

Rainfall data was obtained from the Bureau of Meteorology Williamtown RAAF AWS (Station No. 061078, [Williamtown, NSW - Daily Weather Observations \(bom.gov.au\)](http://www.bom.gov.au)) for the 12 months preceding the April 2024 monitoring event.

Since May 2023, the recorded monthly rainfall total has fallen below the historical average, except during the February 2024 event which reported an elevated albeit average rainfall. The rainfall total to date for April 2024 has been above the monthly mean and previous months total. Based on current rainfall data (mean and monthly totals) for April 2024, it is expected that groundwater elevations will rise during the subsequent months due to a lag in groundwater response, consistent with current groundwater trend data.

## 6 ATTACHMENTS

Attachment 1 ..... Site Monitoring Locations  
Attachment 2 ..... Gauging Data and Field Records  
Attachment 3 ..... Long-term Results Tables  
Attachment 4 ..... NATA Accredited Laboratory reports and Chain of Custody (COC) Documentation  
Attachment 5 ..... Long-term Trends

Attachments available online via [Cabbage Tree Road Sand Quarry](#)

Prepared	Reviewed
Aaron King	Michael Gosling
Environmental Scientist	Environmental Scientist
<a href="mailto:Aking@kleinfelder.com">Aking@kleinfelder.com</a>	<a href="mailto:mgosling@kleinfelder.com">mgosling@kleinfelder.com</a>
0457 426 013	0421 765 729

