



Lower Vasse River

EPBC2021/9051 Annual Compliance Report 2022-2023

**Prepared for
City of Busselton**

May 2023

● people ● planet ● professional

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1 Introduction

The Lower Vasse River Sediment Removal Project (the Project) was referred to the Department of Agriculture, Water and the Environment (DAWE, now the Department of Climate Change, Energy, the Environment and Water [DCCEEW]) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2021. The Project involves the removal of nutrient-rich sediment from the Lower Vasse River (LVR) in Busselton by mechanical means (dredging) and management of dredged sediments in geotextile tubes within an onshore laydown area (refer Figure 1). The primary objective is to reduce the nutrient load of the LVR to minimise the proliferation of toxic algal blooms during summer.

The Project was determined to be a 'Controlled Action' due to the potential direct (dredging) and indirect (habitat disturbance) impacts on a locally significant population of *Westralunio carteri* (Carter's Freshwater Mussel) and potential water quality impacts to the downstream Ramsar Vasse Wonnerup Wetland System.

The Project, and associated technical management plans, was formally assessed, and received approval in February 2022 (EPBC2021/9051; Attachment 1). The 'action', being the activities associated with sediment removal from the Lower Vasse River (LVR) in Busselton, Western Australia, was commenced on 4 April 2022 (refer Attachment 2) with the construction of the onshore laydown area.

1.1 Purpose of this Document

This annual compliance report (ACR) has been prepared in accordance with the Department of the Environment (DoE, now DCCEEW) Annual Compliance Report Guidelines (DoE 2014) to satisfy Condition 10 of EPBC2021/9051 (Attachment 1).

1.2 Timing

This ACR presents a summary of the compliance items related to the action for the period 4 April 2022 to 4 April 2023. In accordance with the signed letter of commencement, the ACR is due on 3 June 2023.

2 Declaration of Accuracy

In making this declaration, I am aware that sections 490 and 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed



Full name (please print) Anthony Graham Nottle

Position (please print) Chief Executive officer

Organisation (please print including ABN/ACN if applicable) City of Busselton

Date 01 / 06 / 2023

3 Description of Activities

Stage 1 of the Project consisted of targeted dredging of approximately 4,240 m³ of sediment (in-situ volume) along a 200 m stretch of the river between the Causeway Bridge and pedestrian bridge adjacent Rotary Park (Figure 2). The dredging was completed using a GeoProTM Microdredge with a horizontal auger between 28 April and 8 June 2022 with the dredge operational for a total of 28 days. Dredging temporarily ceased on 11 May 2022 due to discovery of a pipe in the river, which was removed by divers on 12 May, after which dredging recommenced.

The dredged sediments were pumped into GeoProTM desludging tubes located within an onshore lined and bunded laydown area. The laydown area was connected to a tailor-made return water channel fitted with a Phoslock dosing system to bind and hence reduce the phosphorous concentration in the return water prior to discharge, and a series of rock baffles and weirs, aimed at aiding oxidation/nitrification and hence reducing ammoniacal nitrogen concentrations prior to discharge to the LVR.

Silt curtains were in place at the upstream and downstream extents of the active works (dredging and return water discharge) area for the duration of the dredging. Following completion of the dredging on 8 June 2022, no residual turbid plume was reported and, after consultation with the Department of Water and Environmental Regulation (DWER), the silt curtains were removed on 9 June 2022.

On 10 June 2022, the plastic liner beneath the tubes was cut and the entrance to the return water channel blocked with sandbags to allow infiltration of remaining return water. The tubes remained in-situ for several months to facilitate further dewatering and to ensure the meteorological conditions were amicable to open the tubes and transport the sediment to the treatment facility (i.e. not raining).

It was confirmed that approximately 1,545 m³ (1,634 t) of sediment was removed from the LVR during the Stage 1 dredging campaign. The dewatered sediment was mixed with sand and lime at the treatment facility resulting in a total volume of 2,556 m³ (2,684 t) validated and characterised for disposal.

3.1 Management Plans

3.1.1 Acid Sulfate Soil and Dewatering Management Plan

The Acid Sulfate Soils and Dewatering Management Plan (ASSDMP; 360 Environmental 2023) was prepared to satisfy condition 2 of EPBC 2021/9051. The ASSDMP details the management actions and contingency measures that will be implemented for the duration of the project. Of most relevance is the water quality monitoring program undertaken for the duration of dredging and return water discharge. The water quality data was assessed during the initial stage of dredging, and it was concluded that there was no impact to the downstream Vasse Wonnerup

Wetland System. While there were elevated nutrient concentrations within the LVR during the dredging activities, the impacts were localised and dissipated quickly post-dredging.

The outcomes of the initial stage of dredging are detailed in the LVR Stage 1 Closure Report (Appendix C).

3.1.2 Dredge and Disposal Management Plan

The Dredge and Disposal Management Plan (DDMP; 360 Environmental 2022) was prepared to satisfy condition 3 of EPBC 2021/9051. The DDMP details the management actions and contingency measure that will be implemented for the duration of the project. The primary commitment of the DDMP is to provide appropriate management controls that would ensure no adverse impact to the water quality of the Vasse Wonnerup Wetland System. The outcome of this objective is measured by the monitoring of water quality in the LVR upstream downstream and adjacent to the dredging and return water discharge locations. The data is compared to baseline data and derived trigger levels as per the requirements of the ASSDMP.

3.1.3 Carter's Freshwater Mussel Management Plan

The Environmental Management Plan for Carter's Freshwater Mussel *Westralunio carteri* (Beatty et al. 2023) was prepared to satisfy condition 1 of EPBC 2021/9051.

The primary reason for the action being a "Controlled Action" under the EPBC Act was the potential impacts of the action on a locally significant population of Carter's Freshwater Mussel (*Westralunio carteri*). Unfortunately, due to a saline intrusion event in April 2021, there were no live mussels within the area subject to the initial stage of the dredging (refer Figure 2).

The management objectives of the plan included minimising mortality and restoring population abundance within the sediment removal site. Given that there were no mussels within the sediment removal site (dredge area), the management measures and controls detailed in the plan, including relocation, was not required to be implemented for this stage of dredging.

4 Compliance Summary

Table 1: Summary of Compliance with EPBC 2021/9051

Condition #	Condition	Compliance Status	Details
Part A – Conditions specific to the action			
1.	The approval holder must not undertake dredging outside the project area .	Compliant	Dredging was confined to the approved area.
2.	For the protection of Carter's Freshwater Mussels the approval holder must implement all avoidance, mitigation and management measures specified in the Carter's Freshwater Mussel Management Plan for the life of the approval .	Compliant	The plan was implemented; however no specific controls or provisions were required during the first stage of dredging due to no target species being present within the dredge area.
3.	For the protection of the ecological character of the Vasse Wonnerup Wetlands the approval holder must implement all avoidance, mitigation and management measures specified in the Dredge and Disposal Management Plan for the life of the approval .	Compliant	The Dredge and Disposal Management Plan (DDMP; 4513AA_Rev3) controls were implemented successfully during the first stage of dredging. There were no incidents, nor complaints, reported.
4.	For the protection of the ecological character of the Vasse Wonnerup Wetlands the approval holder must implement all avoidance, mitigation and management measures specified in the Acid Sulfate Soils and Dewatering Management Plan for the life of the approval .	Compliant	The Acid Sulfate Soils and Dewatering Management Plan (ASSDMP; 4602AA_Rev5) was implemented successfully during the initial stage of dredging. The water quality monitoring indicated that although nutrient concentrations in the return water were elevated, there was no resultant impact on the downstream Vasse Wonnerup Wetland System (refer Appendix C).

Condition #	Condition	Compliance Status	Details
Part B – Standard administrative conditions			
5.	The approval holder must notify the Department in writing of the date of commencement of the action within 10 business days after the date of commencement of the action .	Compliant	The action commenced on 4 April 2022 and the City of Busselton formally notified DAWE (now DCCEEW) of the commencement on 11 April 2022 and commencement was acknowledged by DAWE on 26 April 2022 (Appendix B).
6.	The approval holder must maintain accurate and complete compliance records .	Compliant	Internal compliance record management system.
7.	If the Department makes a request in writing, the approval holder must provide electronic copies of compliance records to the Department within the timeframe specified in the request	Not Applicable	No such requests were received.
8.	The approval holder must: a. submit plans electronically to the Department b. unless otherwise agreed to in writing by the Minister, publish each plan on the website within 20 business days of: i. if the version of the plan to be implemented is specified in these conditions, the date of this approval decision; or ii. the date a revised plan is approved by the Minister; or iii. the date a revised action management plan is submitted to the Minister or the Department in accordance with conditions 17 and 18 c. exclude or redact sensitive ecological data from plans published on the website or provided to a member of the public d. keep plans published on the website until the end date of this approval.	Compliant	All plans were submitted electronically to the Department and posted to the City of Busselton website upon receipt of notification of approval by the Department. The revised Carter's Freshwater Management Plan and ASSDMP were submitted to the Department under Conditions 17 and 18 of EPBC 2021/9051 on 14 February 2023 and the revised plans also published on the website. The City received confirmation by email from DCCEEW on 5 April 2023 that the revised plans could be implemented in place of the previously approved plans.

Condition #	Condition	Compliance Status	Details
9.	The approval holder must ensure that any monitoring data (including sensitive ecological data), surveys, maps, and other spatial and metadata required under a plan , is prepared in accordance with the Department's Guidelines for biological survey and mapped data (2018) and submitted electronically to the Department in accordance with the requirements of the plan .	Compliant	No monitoring data is required to be submitted directly to the Department under the approved plans. The LVR Stage 1 Closure Report, which presents an overview and the data from the first stage of dredging, has been issued separately to the Department.
10.	The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action , or as otherwise agreed in writing by the Minister. The approval holder must: <ul style="list-style-type: none"> a. publish each compliance report on the website within 60 business days following the relevant 12 month period b. notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within 5 business days of the date of publication c. keep all compliance reports publicly available on the website until this approval expires d. exclude or redact sensitive ecological data from compliance reports published on the website e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication. 	Compliant	This document covers the requirements of Condition 10 and will be published on the website prior to the due date stipulated on the letter of commencement (Appendix B) being 3 June 2023. Notification and a weblink will be provided to DCCEEW following the posting of this compliance report.

Condition #	Condition	Compliance Status	Details
11.	<p>The approval holder must notify the Department in writing of any: incident; non-compliance with the conditions; or non-compliance with the commitments made in plans. The notification must be given as soon as practicable, and no later than 2 business days after becoming aware of the incident or non-compliance. The notification must specify:</p> <ul style="list-style-type: none"> a. any condition which is or may be in breach b. a short description of the incident and/or non-compliance c. the location (including co-ordinates), date, and time of the incident and/or non-compliance. In the event the exact information cannot be provided, provide the best information available. 	Not Applicable	There were no reportable non-compliances during this reporting period.
12.	<p>The approval holder must provide to the Department the details of any incident or non-compliance with the conditions or commitments made in plans as soon as practicable and no later than 10 business days after becoming aware of the incident or non-compliance, specifying:</p> <ul style="list-style-type: none"> a. any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future b. the potential impacts of the incident or non-compliance c. the method and timing of any remedial action that will be undertaken by the approval holder. 	Not Applicable	There were no reportable non-compliances during this reporting period.
13.	The approval holder must ensure that independent audits of compliance with the conditions are conducted as requested in writing by the Minister .	Not Applicable	No independent audit was requested by the Minister.

Condition #	Condition	Compliance Status	Details
14.	For each independent audit , the approval holder must: a. provide the name and qualifications of the independent auditor and the draft audit criteria to the Department b. only commence the independent audit once the audit criteria have been approved in writing by the Department c. submit an audit report to the Department within the timeframe specified in the approved audit criteria.	Not Applicable	No independent audit was requested by the Minister.
15.	The approval holder must publish the audit report on the website within 10 business days of receiving the Department's approval of the audit report and keep the audit report published on the website until the end date of this approval.	Not Applicable	No independent audit was requested by the Minister.
16.	The approval holder may, at any time, apply to the Minister for a variation to an action management plan approved by the Minister , or as subsequently revised in accordance with these conditions, by submitting an application in accordance with the requirements of section 143A of the EPBC Act . If the Minister approves a revised action management plan (RAMP) then, from the date specified, the approval holder must implement the RAMP in place of the previous action management plan.	Not Applicable	The RAMPs provided to the Department during this reporting period were done so under Conditions 17 and 18.
17.	The approval holder may choose to revise an action management plan approved by the Minister , or as subsequently revised in accordance with these conditions, without submitting it for approval under section 143A of the EPBC Act , if the taking of the action in accordance with the RAMP would not be likely to have a new or increased impact .	Compliant	The Carter's Freshwater Mussel Management Plan and Acid Sulfate Soils and Dewatering Management Plan were both revised during the reporting period under the provision of Condition 17.

Condition #	Condition	Compliance Status	Details
18.	<p>If the approval holder makes the choice under condition 17 to revise an action management plan without submitting it for approval, the approval holder must:</p> <ul style="list-style-type: none"> a. notify the Department in writing that the approved action management plan has been revised and provide the Department with: <ul style="list-style-type: none"> i. an electronic copy of the RAMP ii. an electronic copy of the RAMP marked up with track changes to show the differences between the approved action management plan and the RAMP iii. an explanation of the differences between the approved action management plan and the RAMP iv. the reasons the approval holder considers that taking the action in accordance with the RAMP would not be likely to have a new or increased impact v. written notice of the date on which the approval holder will implement the RAMP (RAMP implementation date), being at least 20 business days after the date of providing notice of the revision of the action management plan, or a date agreed to in writing with the Department. b. subject to condition 20, implement the RAMP from the RAMP implementation date. 	Compliant	<p>The Department was notified of the intent to implement a RAMP on 14 February 2023. The correspondence included an email notification with an electronic copy of each plan, with tracked changes, accompanied by a letter detailing the changes with supporting information on how the changes were not likely to pose a new or increased impact.</p> <p>The RAMPs were not implemented during this reporting period as there were no activities being undertaken.</p>
19.	<p>The approval holder may revoke their choice to implement a RAMP under condition 17 at any time by giving written notice to the Department. If the approval holder revokes the choice under condition 21, the approval holder must implement the action management plan in force immediately prior to the revision undertaken under condition 21.</p>	Not Applicable	<p>The RAMPs will be implemented during the next stage of works.</p>

Condition #	Condition	Compliance Status	Details
20.	If the Minister gives a notice to the approval holder that the Minister is satisfied that the taking of the action in accordance with the RAMP would be likely to have a new or increased impact , then: a. condition 17 does not apply, or ceases to apply, in relation to the RAMP b. the approval holder must implement the action management plan specified by the Minister in the notice.	Not Applicable	The Department accepted the RAMPs under Condition 17.
21.	At the time of giving the notice under condition 20, the Minister may also notify that for a specified period of time, condition 17 does not apply for one or more specified action management plans.	Not Applicable	The Department accepted the RAMPs under Condition 17.
22.	Within 30 days after the completion of the action , the approval holder must notify the Department in writing and provide completion data .	Not Applicable	Action is in progress.

5 References

360 Environmental 2022, Dredge and Disposal Management Plan (4513AA_Rev3), prepared for the City of Busselton, January 2022.

360 Environmental 2023, Acid Sulfate Soils and Dewatering Management Plan (4602AF_Rev5), prepared for the City of Busselton, February 2023.

Beatty S, Cottingham A, Lymbery A, and Paice R, 2023, Environmental Management Plan for Carter's Freshwater Mussel *Westralunio carteri*, prepared for the City of Busselton, January 2023.





Commonwealth of Australia: Department of Environment (DoE) 2014, Annual Compliance Report Guidelines.

Commonwealth of Australia: Department of the Environment and Energy (DoEE) 2018, Guidelines for biological survey and mapped data.

Figures



Legend

-  Development Footprint
-  Proposed Dredge Area
-  Proposed Stage 1 Dredge Area
-  Proposed Laydown Areas for the temporary storage of Geomembrane bags

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2021
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2021
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

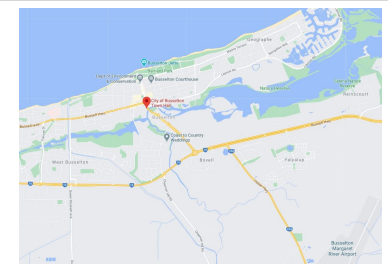


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0 100 200 300 m

Meters

LOCALITY MAP



PROJECT NO 4602	DATE 13/09/2021	REVISION 1
CREATED VM	CHECKED AW	APPROVED JP

City of Busselton, Lower Vasse River

Lower Vasse River Dredging Support

Figure 1

Development Footprint



Legend

- Site Boundary
- Dredge Laydown Area and Return Water Channel

Sampling Locations

- Water Sampling Locations
- DWER Sampling Locations

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2023
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2023
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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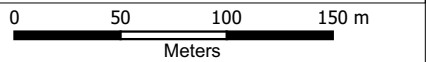
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10 Berrondsey Street

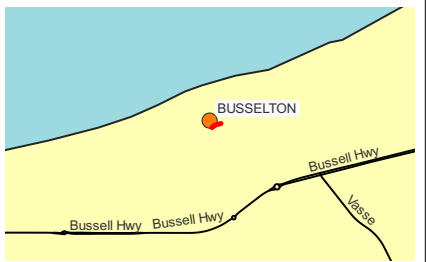
West Leederville WA 6007

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LOCALITY MAP



PROJECT NO 4602	DATE 13/02/2023	REVISION 0
CREATED VM	CHECKED AW	APPROVED JP

City of Busselton, Lower Vasse River

Stage 1 Closure Report

Figure 2
Sampling Locations

Appendices

Appendix A

EPBC 2021/9051 Approval



APPROVAL

Lower Vasse River Sediment Removal, Busselton, Western Australia (EPBC 2021/9051)

This decision is made under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (the EPBC Act). Note that section 134(1A) of the EPBC Act applies to this approval, which provides in general terms that if the approval holder authorises another person to undertake any part of the action, the approval holder must take all reasonable steps to ensure that the other person is informed of any conditions attached to this approval, and that the other person complies with any such condition.

Details

Person to whom the approval is granted (approval holder)	City of Busselton
ABN of approval holder	87 285 608 991
Action	To remove sediment from the Lower Vasse River between the Bussell Highway Bypass and the Butter Factory Museum, in Busselton, Western Australia [See EPBC Act referral 2021/9051]

Approval decision

My decisions on whether or not to approve the taking of the action for the purposes of each controlling provision for the action are as follows.


Controlling Provisions

Wetlands of international importance	
Section 16	Approve
Section 17B	Approve
Listed Threatened Species and Communities	
Section 18	Approve
Section 18A	Approve

Period for which the approval has effect

This approval has effect until 1 January 2032

Decision-maker

Name and position	Tanya Stacpoole Acting Assistant Secretary Environment Assessments West (WA, SA, NT) Branch
Signature	
Date of decision	16 February 2022

Conditions of approval

This approval is subject to the conditions under the EPBC Act as set out in ANNEXURE A.

ANNEXURE A – CONDITIONS OF APPROVAL

Part A – Conditions specific to the action

1. The approval holder must not undertake **dredging** outside the **project area**.
2. For the protection of **Carter’s Freshwater Mussels** the approval holder must implement all avoidance, mitigation and management measures specified in the **Carter’s Freshwater Mussel Management Plan** for the **life of the approval**.
3. For the protection of the **ecological character of the Vasse Wonnerup Wetlands** the approval holder must implement all avoidance, mitigation and management measures specified in the **Dredge and Disposal Management Plan** for the **life of the approval**.
4. For the protection of the **ecological character of the Vasse Wonnerup Wetlands** the approval holder must implement all avoidance, mitigation and management measures specified in the **Acid Sulfate Soils and Dewatering Management Plan** for the **life of the approval**.

Part B – Standard administrative conditions

Notification of date of commencement of the action

5. The approval holder must notify the **Department** in writing of the date of **commencement of the action** within 10 **business days** after the date of **commencement of the action**.

Compliance records

6. The approval holder must maintain accurate and complete **compliance records**.
7. If the **Department** makes a request in writing, the approval holder must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request.

Note: **Compliance records** may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department’s** website or through the general media.

Submission and publication of plans

8. The approval holder must:
 - a. submit **plans** electronically to the **Department**
 - b. unless otherwise agreed to in writing by the Minister, publish each **plan** on the **website** within 20 **business days** of:
 - i. if the version of the **plan** to be implemented is specified in these conditions, the date of this approval decision; or
 - ii. the date a revised **plan** is approved by the **Minister**; or
 - iii. the date a revised action management plan is submitted to the **Minister** or the **Department** in accordance with conditions 17 and 18
 - c. exclude or redact **sensitive ecological data** from **plans** published on the **website** or provided to a member of the public
 - d. keep **plans** published on the **website** until the end date of this approval.
9. The approval holder must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under a **plan**, is prepared in accordance

with the **Department's Guidelines for biological survey and mapped data (2018)** and submitted electronically to the **Department** in accordance with the requirements of the **plan**.

Annual compliance reporting

10. The approval holder must prepare a **compliance report** for each 12 month period following the date of **commencement of the action**, or as otherwise agreed in writing by the **Minister**. The approval holder must:
 - a. publish each **compliance report** on the **website** within 60 **business days** following the relevant 12 month period
 - b. notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within 5 **business days** of the date of publication
 - c. keep all **compliance reports** publicly available on the **website** until this approval expires
 - d. exclude or redact **sensitive ecological data** from **compliance reports** published on the **website**
 - e. where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within 5 **business days** of publication.

Note: **Compliance reports** may be published on the **Department's** website.

Reporting non-compliance

11. The approval holder must notify the **Department** in writing of any: **incident**; non-compliance with the conditions; or non-compliance with the commitments made in **plans**. The notification must be given as soon as practicable, and no later than 2 **business days** after becoming aware of the **incident** or non-compliance. The notification must specify:
 - a. any condition which is or may be in breach
 - b. a short description of the **incident** and/or non-compliance
 - c. the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.
12. The approval holder must provide to the **Department** the details of any **incident** or non-compliance with the conditions or commitments made in **plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying:
 - a. any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future
 - b. the potential impacts of the **incident** or non-compliance
 - c. the method and timing of any remedial action that will be undertaken by the approval holder.

Independent audit

13. The approval holder must ensure that **independent audits** of compliance with the conditions are conducted as requested in writing by the **Minister**.
14. For each **independent audit**, the approval holder must:
 - a. provide the name and qualifications of the independent auditor and the draft audit criteria to the **Department**
 - b. only commence the **independent audit** once the audit criteria have been approved in writing by the **Department**

- c. submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.
15. The approval holder must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.

Revision of action management plans

16. The approval holder may, at any time, apply to the **Minister** for a variation to an action management plan approved by the **Minister**, or as subsequently revised in accordance with these conditions, by submitting an application in accordance with the requirements of section 143A of the **EPBC Act**. If the **Minister** approves a revised action management plan (RAMP) then, from the date specified, the approval holder must implement the RAMP in place of the previous action management plan.
17. The approval holder may choose to revise an action management plan approved by the **Minister**, or as subsequently revised in accordance with these conditions, without submitting it for approval under section 143A of the **EPBC Act**, if the taking of the action in accordance with the RAMP would not be likely to have a **new or increased impact**.
18. If the approval holder makes the choice under condition 17 to revise an action management plan without submitting it for approval, the approval holder must:
- a. notify the **Department** in writing that the approved action management plan has been revised and provide the **Department** with:
 - i. an electronic copy of the RAMP
 - ii. an electronic copy of the RAMP marked up with track changes to show the differences between the approved action management plan and the RAMP
 - iii. an explanation of the differences between the approved action management plan and the RAMP
 - iv. the reasons the approval holder considers that taking the action in accordance with the RAMP would not be likely to have a **new or increased impact**
 - v. written notice of the date on which the approval holder will implement the RAMP (RAMP implementation date), being at least 20 **business days** after the date of providing notice of the revision of the action management plan, or a date agreed to in writing with the **Department**.
 - b. subject to condition 20, implement the RAMP from the RAMP implementation date.
19. The approval holder may revoke their choice to implement a RAMP under condition 17 at any time by giving written notice to the **Department**. If the approval holder revokes the choice under condition 21, the approval holder must implement the action management plan in force immediately prior to the revision undertaken under condition 21.
20. If the **Minister** gives a notice to the approval holder that the **Minister** is satisfied that the taking of the action in accordance with the RAMP would be likely to have a **new or increased impact**, then:
- a. condition 17 does not apply, or ceases to apply, in relation to the RAMP
 - b. the approval holder must implement the action management plan specified by the **Minister** in the notice.
21. At the time of giving the notice under condition 20, the **Minister** may also notify that for a specified period of time, condition 17 does not apply for one or more specified action management plans.

Note: conditions 17, 18, 19, and 20 are not intended to limit the operation of section 143A of the **EPBC Act** which allows the approval holder to submit a revised action management plan, at any time, to the **Minister** for approval.

Completion of the action

22. Within 30 days after the **completion of the action**, the approval holder must notify the **Department** in writing and provide **completion data**.

Part C - Definitions

In these conditions, except where contrary intention is expressed, the following definitions are used:

Acid Sulfate Soils and Dewatering Management Plan means the *Lower Vasse River, Busselton Acid Sulfate Soil and Dewatering Management Plan*, dated February 2022, prepared for the City of Busselton, prepared by 360 Environmental, submitted to the **Department** on 10 February 2022 or a revised version of this plan approved by the **Minister**, in writing, or revised in accordance with conditions 17 to 21 of this approval.

Business day means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.

Carter's Freshwater Mussel means the **EPBC Act** listed threatened species *Westralunio carteri*.

Carter's Freshwater Mussel Management Plan means *Sediment removal in the lower Vasse River: Environmental Management Plan for Carter's Freshwater Mussel* *Westralunio carteri*, dated August 2021, prepared for City of Busselton, prepared by the Centre for Sustainable Aquatic Ecosystems, Harry Butler Institute, Murdoch University, Ottelia Ecology, submitted with the referral documentation or a revised version of this plan approved by the **Minister**, in writing, or revised in accordance with conditions 17 to 21 of this approval.

Clearing means the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of vegetation (but not including weeds – see the *Australian weeds strategy 2017 to 2027* for further guidance).

Commencement of the action means the first instance of any specified activity associated with the action including **dredging**, **clearing** and **construction**. **Commencement of the action** does not include minor physical disturbance necessary to:

- i. undertake pre-clearance surveys or monitoring programs
- ii. install signage and /or temporary fencing to prevent unapproved use of the project area
- iii. protect environmental and property assets from fire, weeds and pests, including installation of temporary fencing, and use of existing surface access tracks
- iv. install temporary site facilities for persons undertaking pre-commencement activities so long as these are located where they have no impact on the **protected matters**

Completion data means an environmental report and spatial data clearly detailing how the conditions of this approval have been met. The **Department's** preferred spatial data format is **shapefile**.

Completion of the action means the date on which all specified activities associated with the action have permanently ceased

Compliance records means all documentation or other material in whatever form required to demonstrate compliance with the conditions of approval in the approval holder's possession or that are within the approval holder's power to obtain lawfully.

Compliance reports means written reports:

- i. providing accurate and complete details of compliance, **incidents**, and non-compliance with the conditions and the **plans**

- ii. consistent with the *Annual Compliance Report Guidelines*, Commonwealth of Australia, 2014, available from: <https://www.awe.gov.au/sites/default/files/documents/annual-compliance-report-guidelines-revised.pdf>
- iii. include a **shapefile** of any clearance of any **protected matters**, or their habitat, undertaken within the relevant 12 month period
- iv. annexing a schedule of all **plans** prepared and in existence in relation to the conditions during the relevant 12 month period.

Construction means the erection of a building or structure that is or is to be fixed to the ground and wholly or partially fabricated on-site; the alteration, maintenance, repair or demolition of any building or structure; preliminary site preparation work which involves breaking of the ground (including pile driving); the laying of pipes and other prefabricated materials in the ground, and any associated excavation work.

Department means the Australian Government agency responsible for administering the **EPBC Act**.

Dredge and Disposal Management Plan means the *Lower Vasse River Dredge and Disposal Management Plan*, dated January 2022, prepared for the City of Busselton, prepared by 360 Environmental, submitted to the **Department** on 20 January 2022 or a revised version of this plan approved by the **Minister**, in writing, or revised in accordance with conditions 17 to 21 of this approval.

Dredging means activities related to or involving the removal of sediment from the channel of the Lower Vasse River.

Ecological character of the Vasse-Wonnerup Wetlands means the *Ecological Character Description for the Vasse-Wonnerup Wetlands Ramsar Site South-west Western Australia*, prepared on behalf of Department of Environment and Conservation and Geographe Catchment Council Inc. (GeoCatch), prepared by Wetland Research & Management, dated September 2007, available from the Australian Wetlands Database for Ramsar wetlands [available from: https://www.dpaw.wa.gov.au/images/documents/conservation-management/wetlands/ramsar/ECD_Vasse_Wonnerup.pdf]

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

Incident(s) means any event which has the potential to, or does, impact on one or more **protected matter(s)**, other than as authorised by this approval.

Independent audit means an audit conducted by an independent and **suitably qualified person** as detailed in the *Environment Protection and Biodiversity Conservation Act 1999 Independent Audit and Audit Report Guidelines*, Commonwealth of Australia, 2019, available from <https://www.awe.gov.au/sites/default/files/documents/independent-audit-report-guidelines-2019.pdf>

Life of the approval means the period for which this approval has effect.

Monitoring data means the data required to be recorded under the conditions of this approval.

Minister means the Australian Government Minister administering the **EPBC Act** including any delegate thereof.

New or increased impact means a new or increased environmental impact or risk relating to any **protected matter**, when compared to the likely impact of implementing the action management plan that has been approved by the **Minister** under conditions 2,3 and 4, including any subsequent revisions approved by the **Minister**, as outlined in the *Guidance on 'New or Increased Impact' relating to changes to approved management plans under EPBC Act environmental approvals*, Commonwealth of Australia, 2017, available from: <https://www.awe.gov.au/sites/default/files/documents/new-increased-impact-guidance.pdf>

Plan(s) means any of the documents required to be prepared, approved by the **Minister**, implemented by the approval holder and published on the **website** in accordance with these conditions (includes action management plans and/or strategies).

Protected matter(s) means a matter protected under a controlling provision in Part 3 of the **EPBC Act** for which this approval has effect.

Project area means the area represented on the map in Attachment A by the zone enclosed by the yellow line and labelled as “*Proposed Dredge Area*”

Sensitive ecological data means data as defined in the Australian Government Department of the Environment (2016) *Sensitive Ecological Data – Access and Management Policy V1.0, Commonwealth of Australia, 2016* available from:

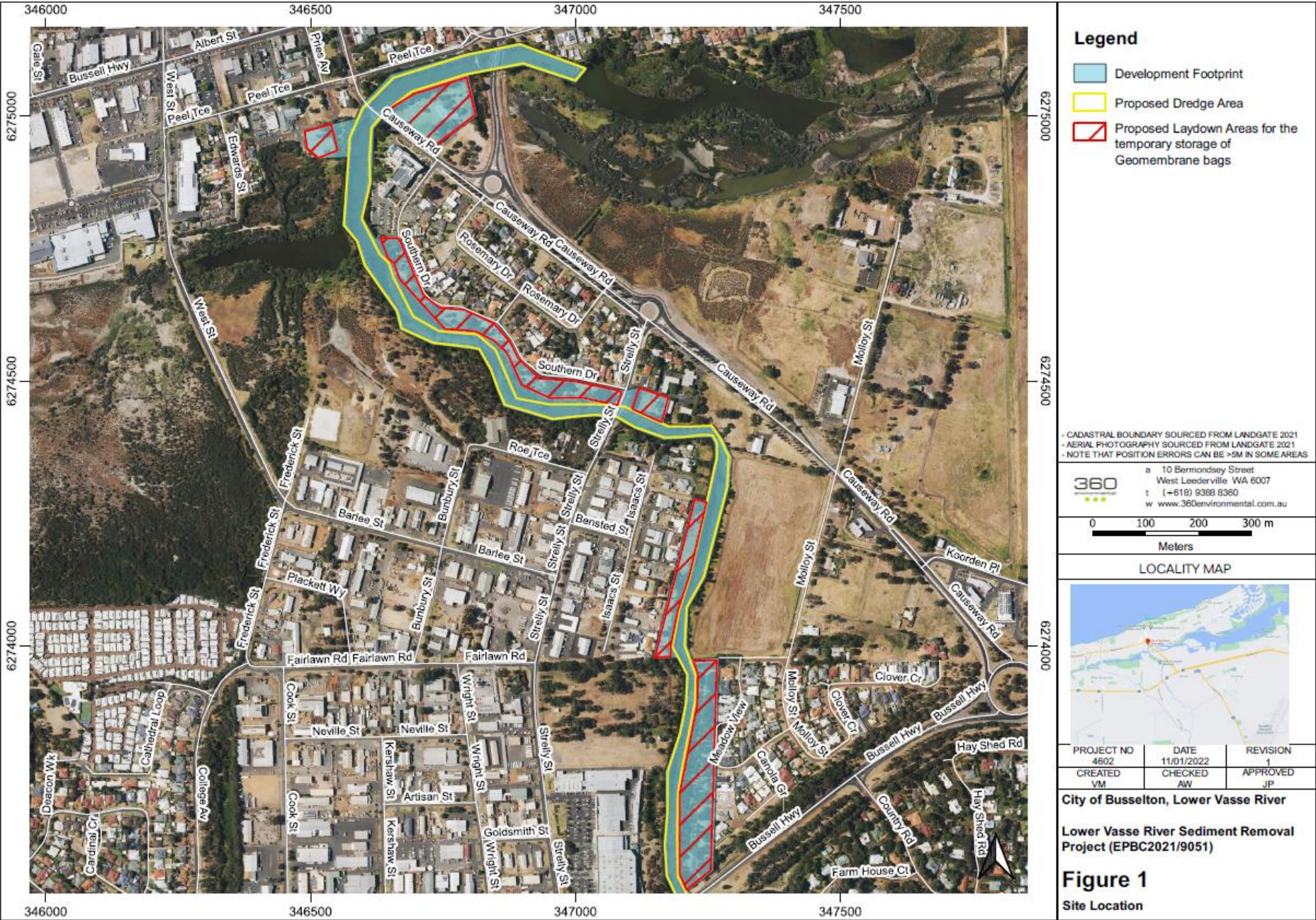
<https://www.awe.gov.au/sites/default/files/documents/sensitive-ecological-data-access-mgt-policy.pdf>

Shapefile means location and attribute information of the action provided in an Esri shapefile format. Shapefiles must contain ‘.shp’, ‘.shx’, ‘.dbf’ files and a ‘.prj’ file that specifies the projection/geographic coordinate system used. Shapefiles must also include an ‘.xml’ metadata file that describes the shapefile for discovery and identification purposes.

Suitably qualified person means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative independent assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.

Website means a set of related web pages located under a single domain name attributed to the approval holder and available to the public.

Attachment A – Map of the Project Area



Appendix B

EPBC 2021/9051 Letter of Commencement



Australian Government
**Department of Agriculture,
Water and the Environment**

Ref: EPBC 2021/9051

Email: epbcmonitoring@awe.gov.au

Mathilde Breton
Senior Sustainability/Environmental Officer
City of Busselton
2 Southern Drive
BUSSELTON WA 6280

Dear Mathilde Breton,

**Commencement of the Action – Lower Vasse River Sediment Removal, Busselton,
Western Australia (EPBC 2021/9051).**

I refer to your email of 11 April 2022 on behalf City of Busselton notifying the Department of Agriculture, Water and the Environment (the department) of commencement of the action for the Lower Vasse River Sediment Removal, Busselton WA in accordance with condition 5 of the *Environment Protection and Biodiversity Conservation Act 1999* (the Act) EPBC 2021/9051 approval.

I note that the action commenced on 4 April 2022.

Condition 10 –Compliance Reporting

Condition 10 states that the approval holder must prepare an Annual Compliance Report for each 12 month period following the date of the commencement of the action. The approval holder must continue to publish each report and notify the department of publication until the expiry of this approval on 1 January 2032. The reports must be published within 60 business days of every 12 month anniversary of commencement. Documentary evidence providing the date of publication must be provided to the department within 5 business days of the date of publication.

Please notify the department within 5 days of publication of the reports by email, including a link to where the report is publicly available to the epbcmonitoring@awe.gov.au. Please note the first Annual Compliance Report is **3 June 2023**.

When preparing the report please refer to the department's Annual Compliance Report Guidelines available on the department's website at <http://www.environment.gov.au/epbc/publications/annual-compliance-report-guidelines>

Please note that the conditions of approval require the approval holder to maintain accurate records of all activities associated with, or relevant to, the approval conditions so that they can be made available to the department on request. These documents may be subject to audit and be used to verify compliance. Summaries of audits may be published by the department.

More information about the department's Monitoring and Audit program is available on the department's website at <http://www.environment.gov.au/epbc/compliance-and-enforcement/auditing>.

Section 142 of the Act requires an approval holder to comply with conditions attached to an approval. Penalties may apply to approval holders who contravene conditions.

If you would like to discuss this matter further, please contact Olivia Moore at epbcmonitoring@awe.gov.au

Yours sincerely,

A handwritten signature in black ink, appearing to be 'TL' or 'Thomas Long', written over a horizontal line.

Thomas Long
Assistant Director
Environmental Audit Section

26 April 2022

Appendix C

LVR Stage 1 Closure Report



Lower Vasse River

Stage 1 Sediment Removal Closure Report

**Prepared for
City of Busselton**

May 2023

● people ● planet ● professional

Document Reference	Revision	Prepared by	Reviewed by	Admin Review	Submitted to Client	
					Copies	Date
4602AD_Rev0	Internal Draft	AW	JP	-	-	15/11/2022
4602AD_Rev1	Client Interim Draft	AW	JP	-	1 x electronic	17/11/2022
4602AD_Rev2	Client Final	AW	JP	RH	1 x electronic	18/05/2023

Disclaimer

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Executive Summary

The City of Busselton manages the Lower Vasse River (LVR) and due to high nutrient concentrations and resultant algal blooms, a sediment removal program (the Project) was initiated to remove a layer of nutrient-rich sediment to improve water quality and reduce occurrence of blooms. As part of the implementation of the Lower Vasse River Waterway Management Plan (DWER/DPIRD 2019), sediment is being removed in stages along a 2.5 km section of the LVR from the Butter Factory Museum to the Busselton Bypass (refer Figure 1).

The Project was assessed under the *Environment Biodiversity Conservation Act 1999* (EPBC Act) due to the potential impacts to the conservation significant Carter's Freshwater Mussel (*Westralunio carteri*) due to riverbed (habitat) disturbance and potential deleterious impacts to the LVR water quality with the potential to impact the downstream RAMSAR-listed Vasse Wonnerup Wetland System.

Stage 1 consisted of targeted dredging of approximately 4,240 m³ of sediment (in-situ volume) along a 200 m stretch of the river between the Causeway Bridge and pedestrian bridge adjacent Rotary Park (refer Figure 1). The dredging was completed using a GeoPro™ Microdredge with a horizontal auger between 28th April and 8th June 2022 with the dredge operational for a total of 28 days. The dredged sediments were pumped into GeoPro™ desludging tubes located within an onshore lined and bunded laydown area connected to a return water channel fitted with a Phoslock dosing system.

Water quality monitoring was undertaken for the duration of the dredging and return water discharge to the LVR at five sampling locations (refer Figure 2). The results of the monitoring indicated that while the return water had elevated concentrations of nutrients, the nutrient input did not result in a toxic algal bloom and the elevated nutrient concentrations did not extend far downstream and dissipated quickly following completion of return water discharge.

The sediments were transported to an interim facility, mixed with inert sand and treated with lime to neutralised potential acid sulfate soils post-dewatering. Post-treatment validation sampling and analysis confirmed that the material was suitably neutralised and waste characterisation data confirmed the material was then suitable for disposal at a Class I landfill facility. Following confirmation of neutralisation and waste classification, the material was transported to a Class I facility and used as day cover.

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Appendix A Lab Certificates

1 Introduction

360 Environmental Pty Ltd (360 Environmental), part of SLR Consulting, was commissioned by the City of Busselton (the City) to manage the environmental scope for the Lower Vasse River (LVR) Sediment Removal Project (the Project), which included an intensive water quality monitoring program during the sediment removal/dredging.

This report provides a summary of Stage 1 of the Project (refer Figure 1), presents the results of the water quality monitoring, and acts as a Stage 1 Acid Sulfate Soils (ASS) Closure Report.

1.1 Project Context

The City manages the LVR and due to high nutrient concentrations and resultant algal blooms, which are adversely impacting biodiversity and public amenity, dredging of a section of the LVR to remove a layer of nutrient-rich sediment was undertaken. The aim was to improve water quality in the LVR and the wider receiving sites, including the internationally listed Ramsar wetland (Vasse Wonnerup Wetland System), by the removal of the nutrient-rich sediment and to reduce the desorption of nutrients into the water column causing algal blooms in the warmer months of the year.

1.2 Regulatory Context

The Project was assessed under the *Environment Biodiversity Conservation Act 1999* (EPBC Act) due to the potential impacts to the conservation significant Carter's Freshwater Mussel (*Westralunio carteri*) due to riverbed (habitat) disturbance and potential deleterious impacts to the LVR water quality with the further potential to impact the downstream RAMSAR-listed Vasse Wonnerup Wetland System.

Three management plans were prepared to support the assessment:

- Dredge Management Plan (360 Environmental 2022a)
- Acid Sulfate Soils and Dewatering Management Plan (ASSDMP; 360 Environmental 2022b)
- Environmental Management Plan for Carter's Freshwater Mussel (*Westralunio carteri*) (Beatty et. al 2021).

The most relevant to this closure report is the ASSDMP as it detailed the requirements for water quality monitoring with associated trigger criteria.

2 Dredging Overview

As part of the implementation of the Lower Vasse River Waterway Management Plan (DWER/DPIRD 2019), it was proposed to remove sediment in stages along a 2.5 km section of the LVR from the Butter Factory Museum to the Busselton Bypass (refer Figure 1).

Stage 1 consisted of targeted dredging of approximately 4,240 m³ of sediment (in-situ volume) along a 200 m stretch of the river between the Causeway Bridge and pedestrian bridge adjacent Rotary Park (Figure 2). The dredging was completed using a GeoPro™ Microdredge with a horizontal auger between 28 April and 8 June 2022 with the dredge operational for a total of 28 days. Dredging temporarily ceased on 11 May 2022 due to discovery of a pipe in the river, which was removed by divers on 12 May, after which dredging re-commenced.

The dredged sediments were pumped into GeoPro™ desludging tubes located within an onshore lined and bunded laydown area (Plate 1).



Plate 1: GeoTubes Laydown Area

The laydown area was connected to a tailor-made return water channel fitted with a Phoslock dosing system (Plate 2) to bind and hence reduce the phosphorous concentration in the return water prior to discharge, and a series of rock baffles and weirs (Plate 3), aimed at aiding oxidation/nitrification and hence reducing ammoniacal nitrogen concentrations prior to discharge to the LVR.



Plate 2: Phoslock Dosing – Return Water Channel



Plate 3: Return Water Channel

Silt curtains were in place at the upstream and downstream extents of the active works (dredging and return water discharge) area for the duration of the dredging (Plate 4). Following completion of the dredging on 8 June 2022, no residual turbid plume was reported and, after consultation with DWER, the silt curtains were removed on 9 June 2022.



Plate 4: Dredge Area and Silt Curtains

On 10 June 2022, the plastic liner beneath the tubes was cut and the entrance to the return water channel blocked with sandbags to allow infiltration of remaining return water. The tubes remained in-situ for several months to facilitate further dewatering and to ensure the meteorological conditions were amicable to open the tubes and transport the sediment to the treatment facility (i.e. not raining).

It was confirmed during transport of the dewatered sediment offsite that approximately 1,545 m³ (1,634 t) of sediment was removed from the LVR during the Stage 1 dredging campaign. The dewatered sediment was mixed with sand and lime at the treatment facility resulting in a total volume of 2,556 m³ (2,684 t) validated and characterised for disposal.

3 Water Quality Monitoring

3.1 Overview

The primary objective of the monitoring program was to confirm that the return water from dewatering of dredge spoil did not adversely impact the LVR or downstream RAMSAR wetland.

The dredge monitoring program, undertaken in accordance with the DCCEEW-approved ASSDMP (360 Environmental 2022b) is outlined in Table 1. Water monitoring occurred at the following five locations (Figure 3):

- Near the return water outflow point from the GeoPro™ desludging tubes (LVR-RW1)
- Return water channel LVR discharge location (LVR-RW2)
- Immediately outside of the silt curtain on the upstream side of the sediment removal area (LVR-US)
- Immediately outside of the silt curtain on the downstream side of the sediment removal area (LVR-DS1)
- Suitable location further downstream of the silt curtain (LVR-DS2).

The water quality results at potential impact sites (LVR-RW2, LVR-DS1, LVR-DS2) were compared against the upstream reference location (LVR-US) and the pre-dredging baseline monitoring to ascertain any potential impact to LVR water quality.

The results from LVR-RW1 were used to inform the dosing rate and to understand the concentration of nutrients as a comparison to the baseline elutriate results as a guide for future stages.

In addition, the Department of Water and Environmental Regulation (DWER) provided results from the VASR2 sampling location at the downstream extent of the dredge area to enable further comparison and support the Project with additional data.

Table 1: Approved Surface Water and Return Water Monitoring Program

Stage	Media	Frequency	Monitoring Location	Field Measurements	Laboratory Analysis	Responsibility	Performance Criteria	Contingency Measure
During dredging	Surface Water	Daily for first week, then weekly thereafter	Two (2) downstream and one (1) upstream of the return water area and outside of the silt curtains.	pH, temperature, DO, EC, NTU, TA (field), Talk (field) (only if pH<7)	---	Dredging Contractor/ Environmental Consultant	pH >6 pH unit	If parameters exceed the performance criteria, one or more of the contingency measures was applied
		Twice for first week, then weekly thereafter	Two (2) downstream and one (1) upstream of the return water area and outside of the silt curtains for first week. One (1) downstream sample thereafter.	---	pH, TA, TALK (only for first 2 events or if field pH indicates decreasing trends) Nutrient suite (TN, TKN, TP, NOx, NH ₃ , FRP) Total metals (Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Zn)		Nutrients below lowland river criteria, or commensurate with background/baseline surface water quality Metals below FW and RW criteria, or commensurate with background/baseline	
	Return Water (from geotextile tubes)	Daily for first week, then weekly thereafter	One location within return chute near geo-tube water release area, one location at the LVR discharge point.	pH, NTU TA (field), TALK (field) (only if pH<7)	---	Dredging Contractor/ Environmental Consultant	N/A – to inform management strategies only	If return water results are exhibiting a continuous upward trend across three or more events, additional shall be implemented.
		Daily for duration of dredging		pH	---		pH >6 pH unit	
		Twice for first week, then weekly thereafter		---	pH, TA, TALK Nutrient suite (TN, TKN, TP, NOx, NH ₃ , FRP) Total Al/Fe and dissolved metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)		N/A – to inform management strategies only	

Stage	Media	Frequency	Monitoring Location	Field Measurements	Laboratory Analysis	Responsibility	Performance Criteria	Contingency Measure
Post dredging	Surface Water	Weekly until dewatering ceases (include one event at completion of dewatering)	One (1) downstream and one (1) upstream of the return water discharge location	pH, temperature, ORP, DO, EC, NTU, TA (field), TAlk (field) (only if pH<7)	Nutrient suite (TN, TKN, TP, NO _x , NH ₃ , FRP) Total Al/Fe and dissolved metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Dredging Contractor / Environmental Consultant	Turbidity comparable within and outside silt curtains Nutrient within 10% baseline/background surface water quality Metals below FW and RW criteria, or commensurate with background/baseline	If parameters exceed the performance criteria, then further monitoring will be required until levels are commensurate with baseline/background levels.
	Return Water (from geotextile tubes)	If acceptable during dredging – no monitoring required	---	---	---	---	---	If water quality during dredging exceeded performance criteria, monitoring shall continue as per the dredging regime until water flow cease.

In-situ monitoring was undertaken daily for the first week (28 April to 4 May 2022) and laboratory analysis was undertaken twice weekly during the period. Twice weekly sampling continued until the week ending 13 May after which it was reduced to once per week. The monitoring regime increased in early June with sampling location DS2 added back to the monitoring program in response to elevated nutrient concentrations at the other impact sites. The final sampling event was undertaken on 16 June 2022. A total of 12 sampling events were conducted at the site from 27 April 2022 to 16 June 2022.

It is noted that DWER concurrently undertook water sampling events at the Site to monitor the concentrations, variability, and types of nutrients in the return waters and the effectiveness of the mitigation strategies that were implemented to inform future Western Australian dredging projects. The complete DWER dataset and conclusions are presented in a separate report (DWER 2022) and the results from the LVR 'VASR2' monitoring location up to the end of June 2022 are included in the dataset and discussed herein.

3.2 Physicochemical (In-situ) Data

The physicochemical results are presented in Table A. The following ranges physicochemical parameters, TTA, TALK, phosphate and ammonia were reported in the surface water:

- Temperature ranged between 11.7 °C (LVR-DS2 on 29 April 2022) and 23.3°C (LVR-RW1 on 16 June 2022). Temperature was generally colder in the upstream (LVR-US) and two downstream samples (LVR-DS1 and LVR-DS2) compared to the return water channel samples (LVR-RW1 and LVR-RW2).
- pH ranged between 7.5 and 8.9 (various samples). pH was above the ANZG (2018) range (6.5-8.0) in all the upstream samples and most of the downstream samples and LVR-RW2. None of the samples were below the DER (2015) ASS guideline (6) or LVR Baseline pH value (7.3).
- Specific conductivity ranged between 1,821 µS/cm and 9,474 µS/cm representative of brackish conditions which were similar between the upstream, downstream, and return water channel samples.
- Turbidity ranged between 14 NTU and 115 NTU with most of the results reported outside of the ANZG (2018) range (10-20 NTU). Only one sample from LVR-RW2 exceeded the LVR baseline value (74 NTU) on 27 April 2022. Turbidity results were generally similar between upstream, downstream, and return water channel samples.
- Dissolved oxygen ranged between 1.4 mg/L and 16.2 mg/L indicative of anoxic (<2 mg/L) to aerobic conditions. Dissolved oxygen was reported to be lower than the LVR baseline conditions in all LVR-RW1 samples and most of the LVR-RW2 samples, displaying slightly lower oxygen than the upstream and downstream samples.

- Total titratable acidity (TAA) ranged between 0 mg/L and 91 mg/L (LVR-RW1). TAA exceeded the DER (2015) ASS Guideline (40 mg/L) in four of the 13 samples collected over the monitoring period at LVR-RW1, whilst downstream sample LVR-DS2 reported two samples out of 10 above the DER (2015) ASS Guideline.
- Total alkalinity (TAlk) ranged between 180 mg/L and 684 mg/L (LVR-RW2). TAlk was generally slightly higher in the return water samples compared to the upstream and downstream samples.

In-situ nutrients were monitored during the dredging and dewatering process via a spectrophotometer, with results detailed as follows:

- Phosphate ranged between 0 mg/L and 5.55 mg/L (LVR-RW1) exceeding the ANZG (2018) criterion (0.04 mg/L) in most of the return water samples and in some of the upstream and downstream samples. The highest phosphate concentrations were reported in LVR-RW1, as expected, but significantly reduced after Phoslock dosing and subsequent discharge to the LVR (LVR-RW2). Concentrations in both LVR-RW1 and LVR-RW2 were generally above the LVR baseline level (0.2 mg/L).
- Ammonia ranged between 0 mg/L and 9.68 mg/L (LVR-RW1) exceeding the ANZG (2018) criterion (0.9 mg/L) in most of the return water samples and in some of the downgradient samples. The highest ammonia concentrations were reported in LVR-RW1, as expected, but significantly reduced after passing through the weirs and baffles of the return water channel and subsequent discharge to the LVR (LVR-RW2). Concentrations in both LVR-RW1 and LVR-RW2 were consistently above the LVR baseline concentration (0.01 mg/L), however it is noted that there was a recent algal bloom at the time of baseline monitoring event and hence nitrogenous compounds had likely been consumed by algal species.

It is noted that the field spectrophotometer did not perform as expected producing varied results on the same sample and hence will not be utilised in the next stage of dredge monitoring.

3.3 Geochemical (Laboratory) Results

The geochemical results are presented in Table B and the laboratory certificates of analyses are included as Appendix A. Laboratory analysis for nutrients, pH, acidity/alkalinity, chlorophyll, total and dissolved metals were undertaken as per the ASSDMP (360 Environmental 2022b).

3.3.1 Nutrients

The primary focus of the monitoring program was to determine impacts to the LVR likely to result from elevated nutrients; the summary of nutrient results is presented in Table 2. The baseline elutriate data (360 Environmental 2021b) provided a good indication of the return water nutrient concentration, which is important to inform management for future stages of the dredging.

Concentrations of total nitrogen, total phosphorous, reactive phosphorous and ammonia were above the ANZG (2018) criteria in all return water samples (LVR-RW1), as expected, and in most of the samples from LVR-RW2, but also in most of the upstream (LVR-US) and far downstream (LVR-DS2) samples. This suggests that while the return water exhibited elevated nutrient concentrations, the LVR background concentrations were also elevated during the dredge program and the return water had negligible impact on the LVR, or downstream Vasse Wonnerup Wetland System, which was the reason for the performance criteria defined in Table 1.

Table 2: Nutrient Results Summary

Analytes	Total Nitrogen (as N)	Ammonia (as N)	Total Phosphorous (as P)	Reactive Phosphorous (as P)
Baseline (mg/L)	1.70	0.01	0.45	0.20
LVR-RW1	6.50 – 11.00	1.64 – 7.98	0.55 – 1.59	0.34 – 1.44
LVR-RW2	1.70 – 6.20	0.01 – 2.80	0.14 – 0.67	0.01 – 0.37
LVR-US	1.70 – 4.80	<0.01 – 0.29	0.19 – 0.5	<0.01 – 0.01
LVR-DS1	2.50 – 6.40	<0.01 – 3.53	0.15 – 0.63	<0.01 – 0.14
LVR-DS2	3.50 – 8.00	0.02 – 4.23	0.16 – 1.01	0.02 – 0.15
VASR2	1.81 – 3.59	<0.01 – 1.53	0.11 – 0.32	<0.05 – 0.15

* Highlight indicates that the results are generally above baseline levels

There were several events during dredging that could have further contributed to elevated nutrient concentrations. These are discussed as follows:

- A pipe was located in the dredge area and had to be removed on 12 May 2022. This could have disturbed deeper sediment with different chemical constituents than previously sampled as the pipe was buried >2 m deep in sediment. The nutrient results subsequent to the pipe removal were somewhat more elevated than in previous events, with concentrations lowering over the following weeks.
- Dewatering effluent discharge from the Busselton Performing Arts and Cultural Centre (BPACC) Project also commenced around 12 May 2022, however laboratory results indicated ammonia levels in the dewatering effluent were ~0.55 mg/L. It is understood that there were two effluent discharge points: one upstream and one within the dredge area.
- Phytoplankton within and upstream of the dredge area (indicated by elevated chlorophyll results upstream but not downstream) would have increased oxygen levels, compared to downstream (DS1 and DS2) locations with low oxygen. Further, the silt curtains were likely hindering river flow and, hence, limiting natural oxygenation. Furthermore, downstream sites were shallower and potentially more impacted by anoxic sediments. All these factors could impact ammoniacal nitrogen concentrations as the decreased oxygen would hinder the nitrification process to convert to nitrate.

- Finally, zooplankton observed at the downstream locations (LVR-DS1, LVR-DS2) from mid-May onwards could have contributed to the elevated ammoniacal nitrogen concentrations by consuming nitrogen and excreting ammonia/ammonium. This may provide some explanation as to why the far downstream site (LVR-DS2) exhibited higher concentrations than potential impact sites (LVR-RW2, LVR-DS1).

Following the completion of dredging and dewatering of the tubes, and hence no return water entering the LVR, the final Project monitoring event and routine DWER monitoring at VASR2 confirmed that the water quality was commensurate with background condition within a week of the cessation of the program (VASR2 on 13 June 2022; Table B). Following this, the nutrient levels increased again due to upstream catchment nutrient sources via rainfall as the LVR entered its winter flow conditions.

3.3.2 Phytoplankton

Chlorophyll concentrations, as an indicator of phytoplankton abundance, were typically higher in the upstream sample (LVR-US) than in the downstream samples (LVR-DS1, LVR-DS2) indicating that the abundance was not related to the dredging and return water discharge.

It is noted that an algal bloom (toxic cyanobacteria) was present in the dredge area one week prior to the commencement of dredging operations.

3.3.3 Metals

The return water sampled immediately after discharge from the tubes (LVR-RW1) was only elevated in total aluminium (Al) and iron (Fe), with dissolved Al and Fe and all other total and dissolved metals below the ANZG (2018) Recreational and/or 95% freshwater species protection limits, and LVR baseline criteria. There were several exceedances of both total and dissolved metals in the LVR sampling locations, both upstream and downstream, but given the lack of metals in the return water itself it is considered that these are natural occurrences.

3.3.4 ASS Indicators

pH was consistently above 7.5 and commensurate with baseline/background results. Further laboratory acidity (as CaCO₃) and alkalinity (as CaCO₃) were compliant with the ASS guidelines [DER (now DWER) 2015].

3.4 DWER Monitoring Results

DWER completed monitoring upstream and downstream of the Phoslock dosing system in the return water channel during the dredging campaign (RW1 and RW2, respectively); the concentrations of nutrients and species of nutrients at the two sites were similar. Nutrient concentrations in the return water varied over time, but despite the fluctuations, nutrient concentrations remained high. The average total phosphorus (TP) and total nitrogen (TN) concentrations in the return water flowing into the river were 690 ug/L and 9,400 ug/L respectively.

The nutrient species of most concern are the dissolved inorganic nutrients, namely phosphate, total ammonia, and nitrate as these are the most bioavailable with the potential to fuel algal blooms. Most of the total phosphorus in the return water was phosphate. The average phosphate concentration discharging to the LVR was 620 ug/L, with a range of 160 ug/L to 1,200 ug/L. This represented 76% to 96% of the total phosphorus in the return water.

Total ammonia was the dominant form of nitrogen in the return water, making up an average of 60% of the TN at the point of discharge to the LVR. The remainder of the nitrogen was dissolved organic nitrogen (DON), with nitrate making up less than 2% of TN. The very low concentration of nitrate is expected, as porewater, the water found in sediment, is usually high in total ammonia and low in nitrate. This is because sediment and the return waters are low in oxygen and ammonium is more stable than nitrate in low oxygen environments. The average total ammonia concentration at the point of discharge was 5,600 ug/L with a range of 2,000 ug/L to 9,000 ug/L. The pH of the return water was 7.6 and at this pH the return water exceeds the ANZECC (2000) freshwater trigger value of 1,470 ug/L for ammonia toxicity.

The comparison of nutrient concentrations between the DWER monitoring location at the point of discharge to the LVR and the Project site in the LVR immediately following discharge (LVR-RW2) confirmed that the nutrient concentrations were significantly diluted immediately upon entering the LVR, with results at VASR2 (downstream but within the impact zone) and the downstream Project site (LVR-DS1) regularly exhibiting lower nutrient concentrations. More importantly, the chlorophyll results indicated that although elevated nutrients did enter the LVR via the return water discharge, no algal bloom, indicated by phytoplankton abundance, resulted due to the input.

The return water concentrations fell within the range of elutriate test results and this provides confidence that for future dredging projects the expected nutrient concentrations can be estimated by this standard laboratory test method prior to dredging.

4 Post-Dredge Sediment

Once the sediments sufficiently dewatered, samples were taken for the purpose of ASS and waste characterisation prior to removal from the tubes.

4.1 Acid Sulfate Soils: Initial Results

The sediments were sampled at a rate of one sample per 125 m³ (DER 2015) dewatered sediment, or 12 samples based on an estimated dewatered volume of 1,500 m³. ASS results are presented in Table C.

Initial ASS testing results indicated potential ASS (PASS) with extreme rates reaction in all samples. Chromium reducible sulfur (CRS) analysis was performed on five samples (>25% to provide greater certainty on results) and indicated that the samples were PASS, with no samples exhibiting signs of actual ASS.

The lime dosing rate calculated by the laboratory [highest being 146 kg/tonne (t)] surpassed the rate calculated in the ASSDMP (360 Environmental 2022b) using the baseline sediment data (130 kg/m³), so the laboratory liming rate was adopted as a conservative measure and to ensure the sediments did not require double treatment.

The ASS results indicated that the tubes provided a suitable environment to reduce the risk of acidification of the sediments, likely due to the anaerobic condition, and hence release of heavy metals into the LVR via the return water.

4.2 Waste Characterisation (Pre-Treatment) Results

The dewatered sediment was scheduled for waste characterisation for metals only based on a risk assessment from the sediment reuse options assessment (360 Environmental 2021a) and the baseline sediment quality data (360 Environmental 2021b) where metals were the key contaminant of concern. The solid waste characterisation results are included in Table D.

The initial contaminant threshold (CT) values for Class I were exceeded in all samples for six metals [arsenic (As), cadmium (Cd), lead (Pb), nickel (Ni), selenium (Se), and zinc (Zn)]. The Class III CT values were also exceeded for Pb in all samples and As in three of the 10 samples. All results were below the Class I Contaminant Level (CL) criteria so despite the noted exceedances of the CT Class III criteria, all samples were scheduled for leachate analysis by the Australia Standard Leachate Procedure (ASLP) with deionised water.

The leachate results are included in Table E and confirm that all samples are compliant with the Class I ASLP criteria meaning the material is suitable for disposal at a Class I landfill facility.

4.2.1 Uncontaminated Fill Assessment

Correspondence from DWER during the analysis process indicated that for the material to be used as day cover at a licensed landfill facility or to be applied as a soil amelioration, the material would be required to meet the Uncontaminated Fill (UC Fill) criteria (DER 2019). These discussions are ongoing however the results have been assessed against these criteria in the meantime and discussed below.

All samples exceeded the UC Fill criteria for Zn, As exceeded in five of the 10 samples, Ni in two of the 10 samples, and Se in four of the 10 samples. Assessment of the samples against the UC Fill leachable concentrations criteria confirmed that four of the 10 samples exceeded for As and six of the 10 samples exceeded for Zn. However, given the laboratory sample preparation and analysis had commenced when the request from DWER was received, the limits of reporting for some of the leachable concentrations were not able to be achieved with the standard waste characterisation methods. This does not change the overall assessment as there are still identified exceedances for two metals, however it is not possible to determine if other metals [Cd, hexavalent chromium (CrVI), cobalt (Co), copper (Cu), Pb, mercury (Hg), Se and silver (Ag)] would also exceed the UC Fill leachate criteria.

4.3 Acid Sulfate Soils: Post-Treatment Results

The sediments were transported to the Rendezvous Road Transfer Station and mixed with inert sand and treated with lime in accordance with Licence L7120/1997/12 (as amended August 2022). The lime dosing rate was 146 kg/t as recommended by the laboratory.

The post-treatment validation samples were analysed at a rate of one sample per 125 m³, or 28 samples based on the estimated total volume of material (2,556 m³) with sand and lime included, with 14 samples (50%) also analysed for the chromium reducible sulfur suite.

Most of the results, presented in Table F, confirmed that the sediments had been neutralised and were no longer classified as PASS with an ANC/PASS ratio ranging from 2.23 to 25.11 (average 10.18) which significantly exceeded the adopted safety factor of 1.5, with the exception of one result (TF_ASS14) which indicated that potential acidity remained. This could be expected given the clay content of the sediment. Given the excess acid neutralising capacity of all other samples, combined with the fact that the sediments would be further mixed during loading/unloading, it is concluded that the material was sufficiently neutralised for use as day cover at the landfill.

4.4 Waste Characterisation (Post-Treatment) Results

The sediment was scheduled for waste characterisation on 18 samples based on the dewatered sediment volume, including additional inert sand and lime (2,556 m³). Samples were taken following lime treatment on three separate occasions (dewatered sediment was treated in three separate batches) and scheduled for metals and a selection of other analytes to support a comprehensive risk assessment of the material for disposal.

All samples exceeded the CT1 criteria but were below the CL1 criteria for lead; four samples also exceeded the CT1 criteria but were below the CL1 criteria for arsenic and two samples also exceeded the CT1 criteria but were below the CL1 criteria for selenium.

Based on the CT and CL results, all samples were scheduled for ASLP leachate analysis for metals and the results, presented in Table H, confirmed that the material is below the ASLP1 criteria and therefore compliant with Class 1 criteria. The material is therefore suitable for disposal at a Class 1 landfill facility.

4.4.1 Uncontaminated Fill Assessment

Additional analysis on a selected number of samples was undertaken to allow comparison against the Uncontaminated Fill (UC Fill) criteria. There was a single exceedance of the UC fill maximum concentration criteria for sulfate and another for TRH (C16-34 fraction) in two separate samples (Table G). However, there were numerous exceedances of the UC Fill leachate criteria for metals and all samples that were scheduled for total nitrogen, total phosphorus and fluoride also exceeded the criteria (Table H), indicating that in its current state the material does not meet the definition of UC fill.

If the material was proposed for reuse it would require further treatment, revalidation and assessment against the UC fill criteria prior to deposition.

5 Conclusions and Recommendations

5.1 Conclusions

The primary environmental objective of the Stage 1 Dredging campaign was not to have an adverse impact on the water quality of the LVR or downstream wetland. The primary pathway was expected to be introduction of bioavailable nutrients resulting in a toxic algal bloom and although the discharge of the return water did introduce bioavailable nutrients at elevated concentrations, there was no resultant algal bloom as a result of the Project.

Concentrations of total nitrogen, total phosphorous, reactive phosphorous and ammonia were above the ANZG (2018) criteria in all return water samples (LVR-RW1), as expected, and in most of the samples from LVR-RW2, but also in most of the upstream (LVR-US) and far downstream (LVR-DS2) samples, which suggests that while the return water exhibited elevated nutrient concentrations, the LVR background concentrations were also elevated during the dredge program and the return water had negligible impact on the system, or downstream Vasse Wonnerup Wetland System.

The baseline elutriate data (360 Environmental 2022a) provided a good indication of the return water nutrient concentration, which is important to inform management for future stages of the dredging. On the other hand, the spectrophotometer (field nutrient analysis kit) did not perform reliably to provide in-situ nutrient concentrations.

The Phoslock dosing of the return water did not significantly reduce the phosphorous concentrations prior to discharge as hoped and the extended return water channel length with the inclusion of baffles and weirs also did not appear to be successful in reducing the ammoniacal nitrogen concentrations prior to discharge.

The dredging method was successful albeit progressing slower than initially expected due to the presence of debris (i.e. rocks, tree roots etc.) on the riverbed and with a temporary cessation due to the presence of a buried pipeline unexpectedly found in the dredge area. As expected, there was minimal riverbed disturbance resulting from the use of the microdredge and hence there was no visible turbid plume during the campaign.

There was no acidification of the sediments and generally the return water acidity was compliant with the guidelines (DER 2015a) and alkalinity was always in excess of the minimum criteria. It is expected that the lack of acidification is due to the enclosure of the sediments in the tubes providing anaerobic conditions and not facilitating oxygenation and acidification.

Post-treatment dredged sediments are suitable for disposal to a Class I landfill as day cover. However, in its current state the material does not meet the definition of UC fill. If the material was proposed for reuse it would therefore require further treatment, revalidation and assessment against the UC fill criteria prior to deposition.

5.2 Recommendations

Based on the outcomes of the Stage 1 Dredging, the following recommendations are made:

- Further investigation into phosphorous and/or ammoniacal nitrogen reduction methods to be implemented prior to the return water discharge into the LVR. One option is increasing the pH of the return water to convert ammonium to ammonia then oxygenate to volatilise ammonia.
- Prior to the Stage 2 dredging campaign, the ASSDMP should be updated and re-submitted to DCCEEW for approval to incorporate the following amendments:
 - Revised monitoring program to allow active site selection for each area based on suitability and access, rather than a pre-determined distance
 - Revised testing regime, including but not necessarily limited to:
 - Removal of the requirement for the in-situ nutrient analysis with the spectrophotometer
 - Reduction in the ASS testing regime based on field pH and titrations as suitable indicators
 - Remove the requirement to deploy silt curtains at the extent of the active works area¹.
- Discuss the approach for disposal/reuse of the dewatered and treated sediments with DWER to ensure the most beneficial outcome is achieved.

¹ There was no visual turbid plume present during the dredging works and the field turbidity results were consistently higher at the upstream location (LVR-US) when compared to the sampling location within the works area (LVR-RW2). Further, recent experience

6 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

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7 References

360 Environmental 2022a, Dredge Management Plan, prepared for the City of Busselton.

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DWER 2022, Report on water quality during the Lower Vasse River dredging project 2022, internal reference document, prepared

Tables

Analyte Group		Physicochemical Parameters					Acid Sulfate Soils		Nutrients	
Analyte		Temperature	pH	Specific Conductivity	Turbidity	Dissolved Oxygen	Total titratable acidity	Total alkalinity	Phosphate as P	Ammonia as N
Units		°C	pH units	µS/cm	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Assessment Criteria	ANZECC/ARMCANZ (2000) Lowland River	---	6.5-8.0	---	10-20	7.2-10.9	---	---	0.04	0.90
	DER 2015 ASS Guidelines	---	6.0	---	---	---	40	30*	---	---
	LVR Baseline (December 2021)	---	7.3	---	74	7.5	---	---	0.20	0.01
Sample ID	Date Sampled									
LVR-RW1	28-04-2022	19.7	7.6	6893	30	2.6	14	430	1.01	4.3
	29-04-2022	18.4	7.6	7071	34	3.1	20	400	0.13	2.75
	02-05-2022	20.4	8.0	7349	26	4.1	72	390	1.36	>10.0
	03-05-2022	17.3	7.6	7947	39	2.3	36	540	2.43	>10.0
	04-05-2022	18.5	7.5	5980	17	4.7	60	330	2.15	5.51
	10-05-2022	20.2	7.6	6626	25	4.1	91	480	1.45	9.68
	12-05-2022	16.1	7.7	5971	18	4.2	19	492	5.55	8.47
	19-05-2022	21.1	7.6	4441	17	4.6	29	462	2.27	3.00
	24-05-2022	17.9	7.6	6061	35	3.4	44	486	1.65	6.29
	01-06-2022	20.1	8.5	6894	21	5.3	12	366	1.85	6.21
	02-06-2022	16.9	7.6	4900	27	3.3	NT	NT	1.71	6.12
	07-06-2022	17.4	8.2	5394	17	6.8	23	468	1.86	4.10
	16-06-2022	23.3	8.7	4989	27	-	0	534	NT	NT
	27-04-2022	19.5	8.8	5475	115	12.0	10	380	0.00	0.44
LVR-RW2	28-04-2022	19.7	8.4	5721	31	9.8	10	300	0.72	0.49
	29-04-2022	16.8	8.6	5318	59	8.0	10	360	0.05	0.12
	02-05-2022	17.8	8.8	5428	43	16.2	0	267	0.02	0.28
	03-05-2022	16.7	8.3	5551	57	7.6	34	234	0.08	0.25
	04-05-2022	16.9	8.5	5660	41	11.6	36	267	1.09	4.20
	10-05-2022	19.0	8.2	5801	31	12.6	34	342	0.23	3.20
	12-05-2022	16.2	8.0	5182	24	6.7	26	312	0.60	2.32
	19-05-2022	17.6	8.1	3922	22	8.9	29	342	0.41	2.18
	24-05-2022	16.6	8.1	4386	21	8.6	25	484	0.63	2.77
	01-06-2022	16.8	7.9	5202	17	5.6	19	354	0.76	2.37
	02-06-2022	16.7	7.8	4433	17	6.0	NT	NT	0.97	3.24
	07-06-2022	15.8	8.3	4484	19	12.3	26	417	0.38	1.65
	16-06-2022	16.4	8.5	2477	16	14.0	0	408	NT	NT
	28-04-2022	19.1	8.9	6143	115	12.0	0	300	0.05	0.72
LVR-US	29-04-2022	17.0	8.7	6063	42	8.8	0	350	0.01	0.83
	02-05-2022	16.0	8.5	5936	59	9.2	0	180	0.05	0.36
	03-05-2022	16.5	8.6	5967	59	10.2	18	246	0.02	0.24
	04-05-2022	16.0	8.7	5627	65	12.6	0	234	0.03	0.35
	10-05-2022	15.9	8.6	5882	55	12.9	0	267	0.06	0.35
	12-05-2022	15.2	8.6	4722	41	10.6	0	276	0.30	0.20
	17-05-2022	15.8	8.3	4555	50	9.8	0	351	0.02	0.29
	19-05-2022	16.0	8.2	4082	43	9.1	20	364	0.00	0.41
	24-05-2022	17.2	8.3	4616	32	10.8	17	294	0.14	0.24
	01-06-2022	14.2	8.2	4890	24	10.4	15	279	0.05	0.36
	07-06-2022	13.6	8.3	4234	21	10.8	27	381	0.04	0.52
	16-06-2022	15.4	8.3	1821	16	12.3	18	351	NT	NT
	28-04-2022	18.1	8.4	6734	86	4.5	0	240	0.08	0.12
	29-04-2022	16.1	8.6	6134	41	4.5	5	300	0.06	0.00
LVR-D51	02-05-2022	16.6	8.9	6311	25	12.1	0	321	0.04	0.33
	03-05-2022	15.9	8.7	6991	31	6.5	0	345	0.16	0.33
	04-05-2022	16.4	8.7	6959	35	9.4	0	276	0.26	0.45
	10-05-2022	14.8	8.6	6751	32	9.0	0	360	0.03	0.48
	12-05-2022	15.6	8.5	4909	28	6.6	0	327	0.08	0.27
	17-05-2022	16.5	8.4	5375	26	9.4	0	381	0.11	0.30
	19-05-2022	16.0	8.2	4138	24	8.1	21	357	0.09	0.61
	24-05-2022	16.4	7.8	4256	79	6.2	33	411	0.36	1.35
	01-06-2022	14.3	7.5	5149	14	1.4	30	360	0.43	3.15
	07-06-2022	12.8	7.5	5091	16	2.7	32	417	0.29	3.74
	16-06-2022	15.7	8.6	2000	17	14.1	0	408	NT	NT
	28-04-2022	21.0	8.9	9119	28	14.9	0	300	0.21	0.36
	29-04-2022	11.7	8.7	4515	22	8.8	0	330	0.35	1.44
	02-05-2022	19.7	8.4	9474	28	8.4	0	267	0.47	0.47
LVR-D52	03-05-2022	15.4	8.2	9346	34	5.7	21	339	0.70	0.63
	04-05-2022	14.9	8.2	9027	50	6.8	31	315	0.53	0.68
	10-05-2022	13.7	8.3	9433	46	8.0	56	402	0.03	0.91
	12-05-2022	14.6	8.1	7045	31	5.4	46	366	0.23	0.52
	01-06-2022	14.0	7.5	6046	19	1.8	NT	NT	0.19	4.17
	07-06-2022	12.1	7.5	5718	19	2.5	34	384	0.12	4.98
	16-06-2022	15.5	7.8	2717	15	6.5	0	408	NT	NT

Notes

ANZECC & ARMCANZ 2010 - Values tabulated are based on slightly to moderately degraded ecosystems - 95% Protection Level

LVR Baseline - Values based on average of 80% of data obtained in December 2021

mg/L = milligrams per litre

--- = criteria have not been derived for these chemical constituents/compounds.

* denotes minimum criteria

Font and Cell:

- Coloured cells indicate exceedance of relevant assessment criteria

- Bolded analytical data indicates detection above LOR

- Coloured and underlined values indicate exceedance of multiple assessment criteria

- Coloured cells indicate exceedance of relevant assessment criteria
- Bolded analytical data indicates detection above LOR
- Coloured and underlined values indicate exceedance of multiple assessment criteria

City of Bussetton
Lower Vasse River
Stage 1 Dredging
Table C: Pre-treatment Acid Sulfate Soil Analytical Results

Sample ID	Date Sampled	ALS Laboratory Sample Number	Acid Sulfate Soils Field				Laboratory Results and Calculations														ASS Interpretation	
			Field pH				pH _{act}	Potential Sulfidic Acidity		Actual Acidity		Acid Neutralising Capacity		Net Acidity		Net Acidity Minus Acid Neutralising Capacity		Lime Calculation				
			pH _i	pH _{act}	pH Change	Reaction	pH _{act}	Chromium Reducible Sulfur (CRS)		Titratable Actual Acidity		%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	Limiting Rate		Lime rate excl ANC
			0.1	0.1	0.1	-	0.1	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	kg/CaCO ₃ /t	kg Aglime/t			
pH units	pH units	pH units	-	pH Units	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	kg/CaCO ₃ /t	kg Aglime/t				
<5.5	<3.0	>3.0	>2	-	-	-	-	-	-	-	-	-	-	0.03	18	0.03	18	-	-			
SS01 ASS a	21-09-2022	EP2212605-003	7.8	1.8	6	Extreme	7.6	2.37	1480	<0.02	<2	0.39	243	2.11	1320	2.37	1480	99	111	PASS		
SS01 ASS b	21-09-2022	EP2212605-004	7.8	2	5.8	Extreme	6.5	2.04	1270	<0.02	<2	0.25	157	1.87	1160	2.04	1270	87	95	PASS		
SS02 ASS a	21-09-2022	EP2212605-007	7.7	2	5.7	Extreme	7.5	3.12	1950	<0.02	<2	0.63	395	2.7	1680	3.12	1950	126	146	PASS		
SS02 ASS b	21-09-2022	EP2212605-008	7.4	2	5.4	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-		
SS03 ASS a	21-09-2022	EP2212605-011	7.3	2.1	5.2	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-		
SS03 ASS b	21-09-2022	EP2212605-012	7.5	2.7	4.8	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-		
SS04 ASS a	21-09-2022	EP2212605-015	7.6	2.4	5.2	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-		
SS04 ASS b	21-09-2022	EP2212605-016	7.6	2.2	5.4	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-		
SS04 ASS c	21-09-2022	EP2212605-017	7.9	2.1	5.8	Extreme	7.7	2.91	1810	<0.02	<2	0.62	384	2.5	1560	2.91	1810	117	136	PASS		
SS05 ASS a	21-09-2022	EP2212605-020	7.7	2	5.7	Extreme	7.4	2.74	1710	<0.02	<2	0.49	304	2.42	1510	2.75	1710	113	128	PASS		
SS05 ASS b	21-09-2022	EP2212605-021	7.6	1.9	5.7	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-		
SS05 ASS c	21-09-2022	EP2212605-022	7.7	2.2	5.5	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-		

Acronyms:

mbgl indicates metres below ground level

%S = percentage sulfur

"..." = criteria have not been derived for these chemical constituents/compounds.

PASS = Potential Acid Sulfate Soil

NASS = Non Acid Sulfate Soil

AASS = Actual Acid Sulfate Soil

ANC = Acid Neutralising Capacity

NT = Not tested

Font and Cell:

- Coloured cells indicate exceedence of relevant assessment criteria

- Bolded analytical data indicates detection above LOR

**Department of Water and Environmental Regulation (formerly Department of Environment Regulation), 2015. Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes. Western Australia.*

City of Busseton
Lower Vasse River
Stage 1 Dredging
Table D: Pre-treatment Waste Characterisation Results

Analyte	Units	Sample ID				Sample Date				Laboratory Reference No.									
		Contaminant Threshold (CT)				Uncontaminated Fill				Contaminant Level (CL)									
		CT1/2 Class I	CT3 Class III	CT4 Class IV	UC Fill	CL1 Class III	CL3 Class III	CL4 Class IV		SS01a	SS01b	SS02a	SS02b	SS03a	SS03b	SS04a	SS04b	SS05a	SS05b
										21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022
										EP2214298-001	EP2214298-002	EP2214298-003	EP2214298-004	EP2214298-005	EP2214298-006	EP2214298-007	EP2214298-008	EP2214298-009	EP2214298-010
Metals																			
Aluminium ^a	mg/kg	50,000	100,000	200,000	-	50,000	100,000	200,000	10300	10200	15500	14800	15600	17800	14800	12200	14100	13300	
Arsenic	mg/kg	14	140	1,400	100	50,000	100,000	200,000	92	87	156	152	136	160	134	109	120	123	
Barium ^a	mg/kg	50,000	100,000	200,000	500	50,000	100,000	200,000	50	40	60	60	60	70	60	50	60	60	
Beryllium	mg/kg	2	20	200	4	50	500	2,000	<1	<1	2	2	2	2	<1	<1	2	<1	
Boron ^a	mg/kg	50,000	100,000	200,000	-	50,000	100,000	200,000	<50	<50	50	<50	50	60	50	<50	50	50	
Cadmium	mg/kg	0.4	4	40	1	50,000	100,000	200,000	0.5	0.4	0.7	0.6	0.6	0.6	0.6	0.5	0.6	0.6	
Chromium (hexavalent)	mg/kg	10	100	1,000	1	50,000	100,000	200,000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Cobalt ^a	mg/kg	50,000	100,000	200,000	50	500	5,000	20,000	10	9	11	11	12	14	11	10	11	11	
Copper ^a	mg/kg	50,000	100,000	200,000	50	100	1,000	4,000	41	36	77	66	62	67	60	51	52	51	
Lead	mg/kg	2	20	200	300	100	1,000	4,000	65	59	97	93	93	102	83	74	81	79	
Manganese ^a	mg/kg	50,000	100,000	200,000	500	----	----	----	154	148	178	181	210	238	190	163	181	181	
Mercury	mg/kg	0.2	2	20	0.5	50,000	100,000	200,000	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	
Molybdenum	mg/kg	10	100	1,000	10	1,500	15,000	60,000	5	6	6	6	7	8	7	6	7	6	
Nickel	mg/kg	4	40	400	10	75	750	3,000	8	7	11	10	10	12	10	9	10	9	
Selenium	mg/kg	2	20	200	1	1,000	10,000	40,000	2	2	3	3	3	3	3	2	2	3	
Silver	mg/kg	20	200	2,000	20	3,000	30,000	120,000	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Vanadium ^a	mg/kg	50,000	100,000	200,000	130	180	1,800	7,200	20	20	25	25	27	30	25	21	26	24	
Zinc ^a	mg/kg	50,000	100,000	200,000	120	50,000	100,000	200,000	214	152	229	241	256	295	252	198	199	198	

Note:

^a CT values derived as % by weight. If waste material contains significant quantities of these metals, preference should be given to recovery and recycling, rather than disposal.
CT1 Class I, CT2 Class II, CT3 Class III and CT4 Class IV are maximum values of total concentration for classification without the requirements to assess leachability.
Waste limits are in accordance with the Department of Environment Regulation (DER) Landfill Waste Classification and Waste Definitions 1996, (as amended 2018).

Acronyms:

CT = Contaminant Threshold
mbgl = meters below ground level
LOR = Limit of Reporting
mg/kg = milligrams per kilogram
---- = No CT guideline value has been developed for this analyte

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City of Busselton
Lower Vasse River
Stage 1 Dredging
Table E: Pre-treatment Waste Characterisation Leachate Results

Sample ID						SS01a	SS01b	SS02a	SS02b	SS03a	SS03b	SS04a	SS04b	SS05a	SS05b
Sample Date						21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022	21-09-2022
Analysis Type						Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate
Laboratory Reference No.						EP2214298-001	EP2214298-002	EP2214298-003	EP2214298-004	EP2214298-005	EP2214298-006	EP2214298-007	EP2214298-008	EP2214298-009	EP2214298-010
Analytes	Leachable Concentrations														
	Units	ASLP1 Class III	ASLP1 Class III	ASLP1 Class IV	UC Fill										
Metals															
Arsenic	mg/L	0.5	5	50	0.01	0.01	0.01	0.02	0.01	0.01	<0.01	0.02	0.01	0.02	0.02
Beryllium	mg/L	0.1	1	10	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.1	1	10	0.0002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium (hexavalent)	mg/L	0.5	5	50	0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt ^a	mg/L	----	----	----	0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper ^a	mg/L	----	----	----	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	mg/L	0.1	1	10	0.003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese ^a	mg/L	----	----	----	0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury	mg/L	0.01	0.1	1	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L	0.5	5	50	0.05	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02
Nickel	mg/L	0.2	2	20	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	mg/L	0.5	5	50	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	1	10	100	0.00005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc ^a	mg/L	----	----	----	0.01	0.02	0.01	0.01	0.02	0.02	<0.01	0.02	0.01	0.02	0.02

Note:

^a CL values derived as % by weight.

CL1 Class I, CL2 Class II, CL3 Class III and CL4 Class IV are the concentration limits for waste classification. CL values determined as: Class I = HIL Commercial Industrial, Class II = Class I, Class III = 10 x Class I, Class IV = 100 x Class I

ASLP values determined as: Class I = 10 x Australian Drinking Water Guideline (ADWG) value, Class II = Class I, Class III = 10 x Class I, Class IV = 100 x Class I

Uncontaminated Fill criteria were added after the laboratory analysis was completed and as a result some LORs do not meet the guidelines

Acronyms:

CL = Concentration Limit

ASLP = Leachable Concentration

UC Fill = Uncontaminated Fill

mbgl = meters below ground level

LOR = Limit of Reporting

mg/kg = milligrams per kilograms

mg/L = milligrams per litre

---- = No guideline value has been developed for this analyte.

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City of Bussetton
Lower Vasse River
Stage 1 Dredging
Table F: Post-treatment Acid Sulfate Soil Validation

Sample ID	Date Sampled	ALS Laboratory Sample Number	Acid Sulfate Soils Field				Laboratory Results and Calculations														ASS Interpretation
			Field pH				pH _{act}	Potential Sulfidic Acidity		Actual Acidity		Acid Neutralising Capacity		Net Acidity		Acid Neutralising Capacity/PASS Ratio		Lime Calculation			
			pH _i	pH _{ox}	pH Change	Reaction	pH _{act}	Chromium Reducible Sulfur (CRS)		Titratable Actual Acidity								Limiting Rate	Lime rate exd ANC		
			0.1	0.1	0.1	-	0.1	0.005	10	0.02	2	0.01	10	0.02	10	-	95				
pH units	pH units	pH units	-	pH Units	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	%S	mol H ⁺ /t	kg/CaCO3/t	kg Aglime/t							
<5.5	<3.0	>3.0	>2	-	-	-	-	-	-	-	0.03	18	>1.5	>1.5	-	-					
TF_ASS1	29-11-2022	EP2216255-001	8.0	5.8	2.2	Moderate	8.9	0.42	262	<0.02	<2	2.97	1850	<0.02	<10	7.07	7.06	<1	20	Neutralised	
TF_ASS2	29-11-2022	EP2216255-002	8.0	5.8	2.2	Moderate	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS3	29-11-2022	EP2216255-003	8.2	5.8	2.4	Moderate	9.1	0.406	253	<0.02	<2	3.24	2020	<0.02	<10	7.98	7.98	<1	19	Neutralised	
TF_ASS4	29-11-2022	EP2216255-004	8.0	5.8	2.2	Moderate	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS5	29-11-2022	EP2216255-005	8.2	5.8	2.4	Moderate	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS6	29-11-2022	EP2216255-006	8.2	5.7	2.5	Moderate	8.8	0.917	572	<0.02	<2	4.04	2520	<0.02	<10	4.41	4.41	<1	43	Neutralised	
TF_ASS7	23-01-2023	EP2300844-004	7.6	5.8	1.8	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS8	23-01-2023	EP2300844-005	7.3	5.8	1.5	Strong	8.8	0.592	369	<0.02	<2	3.42	2130	<0.02	<10	5.78	5.77	<1	28	Neutralised	
TF_ASS9	23-01-2023	EP2300844-006	7.3	5.7	1.6	Strong	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS10	02-03-2023	EP2302658010	7.5	5.9	1.6	Extreme	8.8	0.272	170	<0.02	<2	2.21	1380	<0.02	<10	8.13	8.12	<1	13	Neutralised	
TF_ASS11	02-03-2023	EP2302658011	7.5	6.4	1.1	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS12	02-03-2023	EP2302658012	7.4	6.5	0.9	Extreme	8.9	0.272	170	<0.02	<2	2.94	1830	<0.02	<10	10.81	10.76	<1	13	Neutralised	
TF_ASS13	02-03-2023	EP2302658013	7.6	6	1.6	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS14	02-03-2023	EP2302658014	7.6	3.2	4.4	Extreme	6.4	1.25	778	<0.02	2	NT	NT	1.25	780	NC	NC	59	59	Residual acidity present	
TF_ASS15	02-03-2023	EP2302658015	7.3	5.8	1.5	Strong	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS16	02-03-2023	EP2302658016	7.5	5.8	1.7	Strong	8.9	0.12	75	<0.02	<2	1.82	1140	<0.02	<10	15.17	15.20	<1	6	Neutralised	
TF_ASS17	02-03-2023	EP2302658017	7.4	6.4	1	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS18	02-03-2023	EP2302658018	7.3	6.1	1.2	Extreme	8.3	0.497	310	<0.02	<2	1.11	692	<0.02	<10	2.23	2.23	<1	23	Neutralised	
TF_ASS19	02-03-2023	EP2302658019	7.5	5.9	1.6	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS20	02-03-2023	EP2302658020	7.6	6	1.6	Strong	9.1	0.141	88	<0.02	<2	3.54	2200	<0.02	<10	25.11	25.00	<1	7	Neutralised	
TF_ASS21	02-03-2023	EP2302658021	7.5	5.8	1.7	Strong	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS22	02-03-2023	EP2302658022	7.6	5.1	2.5	Extreme	8.6	0.442	276	<0.02	<2	1.63	1020	<0.02	<10	3.69	3.70	<1	21	Neutralised	
TF_ASS23	02-03-2023	EP2302658023	7.5	5.8	1.7	Extreme	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS24	02-03-2023	EP2302658024	7.6	6.4	1.2	Extreme	9.1	0.178	111	<0.02	<2	2.77	1730	<0.02	<10	15.56	15.59	<1	8	Neutralised	
TF_ASS25	02-03-2023	EP2302658025	7.3	5.6	1.7	Strong	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS26	02-03-2023	EP2302658026	7.7	5.9	1.8	Strong	8.6	0.152	95	<0.02	<2	2.13	1330	<0.02	<10	14.01	14.00	<1	7	Neutralised	
TF_ASS27	02-03-2023	EP2302658027	7.5	6	1.5	Strong	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	-	
TF_ASS28	02-03-2023	EP2302658028	7.5	5.8	1.7	Strong	8.8	0.171	107	<0.02	<2	1.67	1040	<0.02	<10	7.07	7.06	<1	8	Neutralised	

Acronyms:

mbgl indicates metres below ground level
 %S = percentage sulfur
 "..." = criteria have not been derived for these chemical constituents/compounds.
 PASS = Potential Acid Sulfate Soil
 NASS = Non Acid Sulfate Soil
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**Department of Water and Environmental Regulation (formerly Department of Environment Regulation), 2015. Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes. Western Australia.*

^a CT values derived as % by weight. If waste material contains significant quantities of these metals, preference should be given to recovery and recycling, rather than disposal. CT1 Class I, CT2 Class II, CT3 Class III and CT4 Class IV are maximum values of total concentration for classification without the requirements to assess leachability. Waste limits are in accordance with the Department of Environment Regulation (DER) Landfill Waste Classification and Waste Definitions 1996, (as amended 2018).

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- mg/kg = milligrams per kilogram
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Sample ID		TF_2012	TF_2012	TF_2013	TF_2014	TF_2015	TF_2016	TF_2017	TF_2018	TF_2019	TF_2020	TF_2021	TF_2022	TF_2023	TF_2024	TF_2025	TF_2026	TF_2027	TF_2028	TF_2029	TF_2030	TF_2031	TF_2032	TF_2033	TF_2034	TF_2035	TF_2036	TF_2037	TF_2038	
Sample Date		29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	29/11/2022	
Analysis Type		Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate	Leachate
Laboratory Reference No.		EP2216258-001	EP2216258-002	EP2216258-003	EP2216258-004	EP2216258-005	EP2216258-006	EP2216258-007	EP2216258-008	EP2216258-009	EP2216258-010	EP2216258-011	EP2216258-012	EP2216258-013	EP2216258-014	EP2216258-015	EP2216258-016	EP2216258-017	EP2216258-018	EP2216258-019	EP2216258-020	EP2216258-021	EP2216258-022	EP2216258-023	EP2216258-024	EP2216258-025	EP2216258-026	EP2216258-027	EP2216258-028	
Analyte	Units	Leachate Concentration				ASLP Class I				ASLP Class II				ASLP Class III				ASLP Class IV				UC FIB								
		ASLP Class I	ASLP Class II	ASLP Class III	ASLP Class IV	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB	UC FIB
Metals																														
Acetic	mg/L	0.5	5	50	0.01	0.0031	0.0033	0.0034	0.0034	0.0038	0.0035	0.0038	0.0036	0.0039	0.0043	0.02	0.03	0.0028	0.02	0.01	0.0001	0.02	0.01							
Cadmium	mg/L	0.1	1	10	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium (hexavalent)	mg/L	0.5	5	50	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cash ¹	mg/L	---	---	---	0.001	0.002	0.002	0.002	0.0017	0.0018	0.0016	0.0016	0.0011	0.0025	0.0019	<0.01	<0.01	0.0017	<0.01	<0.01	0.0019	<0.01	<0.01							
Copper ²	mg/L	---	---	---	0.002	0.0007	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0012	0.0007	<0.006	<0.01	<0.004	<0.01	<0.01	0.006	<0.01	<0.01							
Lead	mg/L	0.1	1	10	0.003	0.0015	0.0018	0.0011	0.00149	0.0014	0.0014	0.0014	0.0015	0.0047	0.0049	0.004	0.02	0.01	0.0015	<0.01	<0.01	0.0014	<0.01	<0.01						
Manganese ⁴	mg/L	---	---	---	0.5	0.0016	0.0017	0.0014	0.0028	0.0016	0.0013	0.0014	0.0007	0.0003	0.0003	0.117	0.12	0.03	0.044	0.08	0.06	0.142	0.06	0.03						
Mercury	mg/L	0.01	0.1	1	0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Molybdenum	mg/L	0.5	5	50	0.05	0.0149	0.0141	0.0192	0.0194	0.0199	0.0118	0.0165	0.0118	0.0084	0.0043	0.01	0.03	0.0084	<0.01	<0.01	0.0083	0.01	0.02							
Nickel	mg/L	0.2	2	20	0.01	0.003	0.0025	0.0024	<0.002	0.002	0.002	<0.002	<0.002	0.0027	0.0026	<0.01	<0.01	0.0022	<0.01	<0.01	0.0047	<0.01	<0.01							
Selenium	mg/L	0.5	5	50	0.003	0.0006	0.0006	0.0008	0.0006	0.0007	0.0006	0.0005	0.0003	0.0005	0.0004	<0.01	<0.01	0.0004	<0.01	<0.01	0.0004	<0.01	<0.01							
Silver	mg/L	1	10	100	0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Zinc ⁵	mg/L	---	---	---	0.01	0.004	0.007	0.04	0.022	0.034	0.038	0.046	0.024	0.044	0.042	0.05	0.03	0.034	0.03	0.02	0.039	0.03	0.01							
Microbiological																														
Total Nitrogen as N	µg/L	---	---	---	2000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	3000	NT	NT	3000	NT	NT	NT	2700	NT						
Total Phosphorus as P	µg/L	---	---	---	200	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	400	NT	NT	240	NT	NT	NT	320	NT						
Ammonia as N	µg/L	---	---	---	300	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	120	NT	NT	70	NT	NT	NT	480	NT						
Organochlorine Pesticides																														
Aldrin	µg/L	---	---	---	0.001	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<0.001	NT	NT	<0.001	NT	NT	NT	<0.001	NT						
Dieldrin	µg/L	---	---	---	0.01	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<0.002	NT	NT	<0.002	NT	NT	NT	<0.002	NT						
Sum of DDE, DDD, DDT	µg/L	---	---	---	0.006	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<0.002	NT	NT	<0.002	NT	NT	NT	<0.002	NT						
Fluoride																														
Fluoride	µg/L	---	---	---	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	200	NT	NT	300	NT	NT	NT	200	NT						

Note:

¹ CL values derived as % by weight.

CL1 Class I, CL2 Class II, CL3 Class III and CL4 Class IV are the concentration limits for waste classification. CL values determined as: Class I - HL Commercial Industrial, Class II - 10 x Class I, Class III - 100 x Class I, Class IV - 1000 x Class I.

ASLP values determined as: Class I - 10 x Australian Drinking Water Health Guideline (ADHWG) value, Class II - 10 x Class I, Class III - 100 x Class I, Class IV - 1000 x Class I.

Uncontaminated FIB criteria were added after the laboratory analysis was completed and as a result some LORs do not meet the guidelines.

Acronyms:

CL - Concentration Limit

ASLP - Leachate Concentration

UC FIB - Uncontaminated FIB

mg/L - milligrams per litre

LOR - Limit of Reporting

mg/kg - milligrams per kilogram

mg/L - milligrams per litre

NT - not tested

--- = No guideline value has been developed for this analyte.

Foot and Cell:

Coloured cells indicate exceedance of relevant assessment criteria

Isolated analytical data indicates detection above LOR

Figures



Legend

Development Footprint

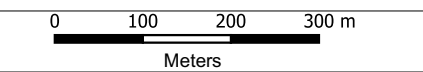
Proposed Dredge Area

Proposed Laydown Areas for the temporary storage of Geomembrane bags

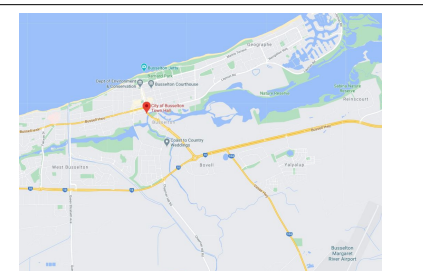
- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2021
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2021
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

360
environmental

a 10 Bermondsey Street
West Leederville WA 6007
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w www.360environmental.com.au



LOCALITY MAP




PROJECT NO 4602	DATE 11/01/2022	REVISION 1
CREATED VM	CHECKED AW	APPROVED JP

City of Bussellton, Lower Vasse River
Lower Vasse River Sediment Removal Project (EPBC2021/9051)

Figure 1
Site Location



Legend

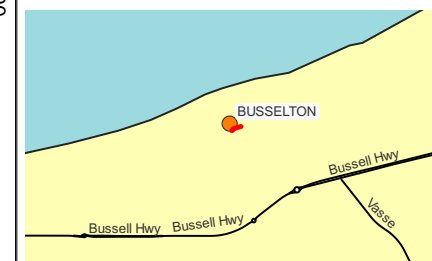
 Site Boundary - Stage 1 Dredge Area

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2022
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2022
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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0 50 100 150 m
Meters

LOCALITY MAP



PROJECT NO 4602	DATE 13/02/2023	REVISION 0
CREATED VM	CHECKED AW	APPROVED JP

City of Busselton, Lower Vasse River

Stage 1 Closure Report

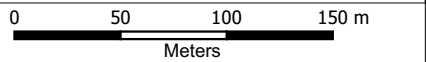
Figure 2
Site Location



- Legend**
- Site Boundary
 - Dredge Laydown Area and Return Water Channel
- Sampling Locations**
- Water Sampling Locations
 - DWER Sampling Locations

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2023
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2023
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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LOCALITY MAP



PROJECT NO 4602	DATE 13/02/2023	REVISION 0
CREATED VM	CHECKED AW	APPROVED JP

City of Busselton, Lower Vasse River

Stage 1 Closure Report

Figure 3
Sampling Locations

Appendices

Appendix A

Lab Certificates

CERTIFICATE OF ANALYSIS

Work Order : **EP2205048**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Roisin McCallum**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 29-Apr-2022 11:30
Date Analysis Commenced : 29-Apr-2022
Issue Date : 04-May-2022 21:23



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
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA



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 Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				28-Apr-2022 08:30	28-Apr-2022 09:00	28-Apr-2022 09:30	28-Apr-2022 10:00	28-Apr-2022 10:30
Compound	CAS Number	LOR	Unit	EP2205048-001	EP2205048-002	EP2205048-003	EP2205048-004	EP2205048-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.14	8.46	8.71	8.77	8.72
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	15	34	46	56
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	363	231	198	200	207
Total Alkalinity as CaCO3	----	1	mg/L	363	246	232	245	263
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	6	<1	<1	<1	<1
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.02	0.03	0.02	0.02
Arsenic	7440-38-2	0.001	mg/L	0.005	0.003	0.003	0.002	0.003
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.07	0.42
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.23	0.22	0.16	0.17	0.22
Arsenic	7440-38-2	0.001	mg/L	0.006	0.003	0.004	0.003	0.004
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	0.008	<0.005	<0.005	0.007
Iron	7439-89-6	0.05	mg/L	0.51	0.41	0.31	0.47	1.32
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	5810	680	40	30	100



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					28-Apr-2022 08:30	28-Apr-2022 09:00	28-Apr-2022 09:30	28-Apr-2022 10:00	28-Apr-2022 10:30
Compound	CAS Number	LOR	Unit		EP2205048-001	EP2205048-002	EP2205048-003	EP2205048-004	EP2205048-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		5710	620	30	30	80
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	<10	<10	<10	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		<10	<10	<10	<10	10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		<10	<10	<10	<10	10
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		8900	4600	4700	3800	5500
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		8900	4600	4700	3800	5500
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		1270	570	500	450	680
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		1170	30	<10	<10	120
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	337	156	78



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW2-1	----	----	----	----
Sampling date / time				27-Apr-2022 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2205048-006	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.59	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	22	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	206	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	228	----	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.02	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.002	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.51	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.003	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.019	----	----	----	----
Iron	7439-89-6	0.05	mg/L	0.85	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	----	----	----	----
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	40	----	----	----	----



Analytical Results

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

				Sample ID	LVR-RW2-1	----	----	----	----
				Sampling date / time	27-Apr-2022 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2205048-006	-----	-----	-----	-----
				Result	----	----	----	----	----
EK055G: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		30	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		<10	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		<10	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		6500	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		6500	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		770	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		<10	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2205217**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **PO BOX 14**
WEST PERTH WA, AUSTRALIA 6872
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Emily Evans (Ottelia Ecology)**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 03-May-2022 14:00
Date Analysis Commenced : 03-May-2022
Issue Date : 10-May-2022 15:27



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

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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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA



General Comments

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

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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 Results

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

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				02-May-2022 00:00	02-May-2022 00:00	02-May-2022 00:00	02-May-2022 00:00	02-May-2022 00:00
Compound	CAS Number	LOR	Unit	EP2205217-001	EP2205217-002	EP2205217-003	EP2205217-004	EP2205217-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.15	8.68	8.45	8.70	8.31
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	33	15	40	1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	399	212	214	228	296
Total Alkalinity as CaCO ₃	----	1	mg/L	399	245	229	267	298
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	20	<1	<1	<1	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.01	0.02	0.01	0.01
Arsenic	7440-38-2	0.001	mg/L	0.005	0.002	0.003	0.002	0.003
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.07	0.66
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.14	0.12	0.15	0.11	0.20
Arsenic	7440-38-2	0.001	mg/L	0.005	0.002	0.003	0.002	0.003
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Lead	7439-92-1	0.001	mg/L	0.001	<0.001	<0.001	<0.001	0.001
Zinc	7440-66-6	0.005	mg/L	0.007	<0.005	<0.005	<0.005	0.006
Iron	7439-89-6	0.05	mg/L	0.14	0.23	0.32	0.35	2.27
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	7260	10	<10	<10	410



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					02-May-2022 00:00	02-May-2022 00:00	02-May-2022 00:00	02-May-2022 00:00	02-May-2022 00:00
Compound	CAS Number	LOR	Unit		EP2205217-001	EP2205217-002	EP2205217-003	EP2205217-004	EP2205217-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		6990	<10	<10	<10	380
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	<10	<10	<10	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		<10	<10	<10	<10	<10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		<10	<10	<10	<10	<10
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		9600	3600	4800	3700	5900
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		9600	3600	4800	3700	5900
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		970	350	480	390	680
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		900	<10	<10	10	150
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	300	132	19

CERTIFICATE OF ANALYSIS

Work Order : **EP2205362**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Emily Evans**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 05-May-2022 12:05
Date Analysis Commenced : 05-May-2022
Issue Date : 09-May-2022 20:10



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
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA



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 Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				04-May-2022 00:00	04-May-2022 00:00	04-May-2022 00:00	04-May-2022 00:00	04-May-2022 00:00
Compound	CAS Number	LOR	Unit	EP2205362-001	EP2205362-002	EP2205362-003	EP2205362-004	EP2205362-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.20	8.33	8.55	8.55	8.27
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	4	20	27	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	377	279	203	257	309
Total Alkalinity as CaCO3	----	1	mg/L	377	284	224	284	309
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	5	<1	<1	<1	2
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.02	0.01	<0.01
Arsenic	7440-38-2	0.001	mg/L	0.006	0.003	0.002	0.002	0.002
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.12	0.64
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.07	0.11	0.12	0.61	1.29
Arsenic	7440-38-2	0.001	mg/L	0.007	0.004	0.004	0.003	0.004
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.009	<0.001	<0.001	<0.001	0.002
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	<0.001	0.001	0.002
Nickel	7440-02-0	0.001	mg/L	0.011	<0.001	<0.001	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	0.002	0.004
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	0.010	0.022
Iron	7439-89-6	0.05	mg/L	0.15	0.13	0.22	1.37	4.35
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	7980	2370	30	30	510



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					04-May-2022 00:00	04-May-2022 00:00	04-May-2022 00:00	04-May-2022 00:00	04-May-2022 00:00
Compound	CAS Number	LOR	Unit		EP2205362-001	EP2205362-002	EP2205362-003	EP2205362-004	EP2205362-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		7890	2180	30	30	440
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	<10	<10	<10	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		<10	<10	<10	<10	<10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		<10	<10	<10	<10	<10
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		10900	6200	4500	5100	8000
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		10900	6200	4500	5100	8000
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		1590	670	390	630	1010
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		1440	320	<10	90	150
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	394	145	160

CERTIFICATE OF ANALYSIS

Work Order : **EP2205637**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Emily Evans**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 11-May-2022 11:35
Date Analysis Commenced : 11-May-2022
Issue Date : 16-May-2022 17:10



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- Analytical Results

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Signatories

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Signatories	Position	Accreditation Category
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA



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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 Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				10-May-2022 00:00	10-May-2022 00:00	10-May-2022 00:00	10-May-2022 00:00	10-May-2022 00:00
Compound	CAS Number	LOR	Unit	EP2205637-001	EP2205637-002	EP2205637-003	EP2205637-004	EP2205637-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.15	8.27	8.77	8.64	8.22
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	37	39	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	330	284	178	247	312
Total Alkalinity as CaCO3	----	1	mg/L	330	284	215	286	312
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	8	<1	<1	<1	2
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.01	0.05	<0.01
Arsenic	7440-38-2	0.001	mg/L	0.004	0.003	0.002	0.002	0.002
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.16	0.50
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.39	0.18	0.08	0.11	0.17
Arsenic	7440-38-2	0.001	mg/L	0.005	0.003	0.004	0.003	0.003
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Lead	7439-92-1	0.001	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	0.56	0.19	0.13	0.46	3.66
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	4340	1850	30	20	50



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					10-May-2022 00:00	10-May-2022 00:00	10-May-2022 00:00	10-May-2022 00:00	10-May-2022 00:00
Compound	CAS Number	LOR	Unit		EP2205637-001	EP2205637-002	EP2205637-003	EP2205637-004	EP2205637-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		4270	1740	30	20	50
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	<10	<10	<10	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		10	10	<10	<10	<10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		10	10	<10	<10	<10
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		11000	5400	3900	4600	7000
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		11000	5400	3900	4600	7000
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		810	430	320	520	700
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		600	160	<10	<10	40
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	181	190	135

CERTIFICATE OF ANALYSIS

Work Order : **EP2205794**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Robyn Paice**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **5**
No. of samples analysed : **5**

Page : **1 of 4**
Laboratory : **Environmental Division Perth**
Contact : **Natalie Duncan**
Address : **26 Rigali Way Wangara WA Australia 6065**
Telephone : **+61-8-9406 1301**
Date Samples Received : **13-May-2022 11:40**
Date Analysis Commenced : **13-May-2022**
Issue Date : **19-May-2022 17:06**



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

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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
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA



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.

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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.

- EK067G/EK071G: It is recognised that Total Phosphorus is less than Reactive Phosphorus for sample EP2205794-001. However, the difference is within experimental variation of the methods.
- EG020: It is recognised that total Ni concentration is less than dissolved for sample EP2205794-005. However, the difference is within experimental variation of the methods



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				12-May-2022 00:00	12-May-2022 00:00	12-May-2022 00:00	12-May-2022 00:00	12-May-2022 00:00
Compound	CAS Number	LOR	Unit	EP2205794-001	EP2205794-002	EP2205794-003	EP2205794-004	EP2205794-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.75	7.95	8.44	8.36	7.86
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	11	6	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	354	262	204	249	273
Total Alkalinity as CaCO ₃	----	1	mg/L	354	262	215	254	273
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	12	5	<1	<1	8
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.01	0.01	0.03	<0.01
Arsenic	7440-38-2	0.001	mg/L	0.004	0.002	0.002	0.002	0.002
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	0.19
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.28	0.17	0.11	0.16	0.07
Arsenic	7440-38-2	0.001	mg/L	0.004	0.003	0.002	0.002	0.002
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	0.002	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	0.010	<0.005	0.011	<0.005
Iron	7439-89-6	0.05	mg/L	0.31	0.21	0.23	0.43	1.57
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	7210	2770	<10	<10	20



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					12-May-2022 00:00	12-May-2022 00:00	12-May-2022 00:00	12-May-2022 00:00	12-May-2022 00:00
Compound	CAS Number	LOR	Unit		EP2205794-001	EP2205794-002	EP2205794-003	EP2205794-004	EP2205794-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		7110	2690	<10	<10	20
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	<10	<10	<10	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		10	20	<10	<10	10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		10	20	<10	<10	10
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		9800	5300	3700	4200	6700
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		9800	5300	3700	4200	6700
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		1310	440	290	420	750
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		1320	370	<10	<10	80
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	242	156	121

CERTIFICATE OF ANALYSIS

Work Order : **EP2206183**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **PO BOX 14**
WEST PERTH WA, AUSTRALIA 6872
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **R. PAICE**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **4**
No. of samples analysed : **4**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara Western Australia Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-May-2022 11:30
Date Analysis Commenced : 23-May-2022
Issue Date : 27-May-2022 15:28



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 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
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, Western Australia
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, Western Australia



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.

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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.

- EG035F-LL: Positive Hg for EP2206183-004 confirmed by re-analysis.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	----
Sampling date / time				19-May-2022 13:30	19-May-2022 13:41	19-May-2022 09:24	19-May-2022 09:48	----
Compound	CAS Number	LOR	Unit	EP2206183-001	EP2206183-002	EP2206183-003	EP2206183-004	-----
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.93	8.28	8.07	8.08	----
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	239	220	194	227	----
Total Alkalinity as CaCO3	----	1	mg/L	239	220	194	227	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	13	3	5	6	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.01	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.002	0.002	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.09	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.06	0.07	0.10	0.08	----
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.002	0.002	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	0.006	<0.005	<0.005	0.006	----
Iron	7439-89-6	0.05	mg/L	0.13	0.14	0.33	0.40	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	0.00027	----
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	2680	1020	100	430	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	----
Sampling date / time					19-May-2022 13:30	19-May-2022 13:41	19-May-2022 09:24	19-May-2022 09:48	----
Compound	CAS Number	LOR	Unit		EP2206183-001	EP2206183-002	EP2206183-003	EP2206183-004	-----
				Result	Result	Result	Result	Result	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		2640	980	100	410	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		10	10	<10	10	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		30	50	10	30	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		40	60	10	40	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		7000	3200	4300	4000	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		7000	3300	4300	4000	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		550	140	400	390	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		340	20	<10	60	----
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	180	18	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2206285**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Robyn Paige**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara Western Australia Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-May-2022 12:30
Date Analysis Commenced : 25-May-2022
Issue Date : 01-Jun-2022 17:48



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

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Signatories	Position	Accreditation Category
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, Western Australia
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, Western Australia



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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.

- EG035F-LL: Positive dissolved mercury for EP2206285-004 has been confirmed by re-preparation and re-analysis (0.00012 mg/L and 0.00013 mg/L). Please scrutinize result accordingly.
- EK055G: Ammonia, EK061G: TKN and EK067G: Total Phosphorus results for sample #1 and 5 have been confirmed by re-preparation and re-analysis.
- EK071: Reactive Phosphorus result for sample #5 has been confirmed by re-preparation and re-analysis.



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-RW1b
Sampling date / time				24-May-2022 11:18	24-May-2022 11:42	24-May-2022 12:11	24-May-2022 12:29	24-May-2022 11:26
Compound	CAS Number	LOR	Unit	EP2206285-001	EP2206285-002	EP2206285-003	EP2206285-004	EP2206285-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.01	8.26	8.43	8.17	----
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	8	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	296	225	178	216	----
Total Alkalinity as CaCO3	----	1	mg/L	296	225	186	216	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	10	2	<1	4	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.002	0.002	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.42	0.12	0.04	0.05	----
Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.002	0.002	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	<0.001	0.019	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	0.002	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	0.012	----
Iron	7439-89-6	0.05	mg/L	0.62	0.14	0.24	0.46	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	0.00013	----
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	5510	1380	20	1000	4560



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-RW1b
Sampling date / time					24-May-2022 11:18	24-May-2022 11:42	24-May-2022 12:11	24-May-2022 12:29	24-May-2022 11:26
Compound	CAS Number	LOR	Unit		EP2206285-001	EP2206285-002	EP2206285-003	EP2206285-004	EP2206285-005
					Result	Result	Result	Result	Result
EK055G: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		5440	1330	20	980	4480
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	20	<10	20	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		40	60	10	70	40
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		40	80	10	90	40
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		10600	3800	2700	2800	9400
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		10600	3900	2700	2900	9400
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		580	140	220	150	440
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		490	90	<10	50	400
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	116	8	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2206711**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Emily Evans**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara Western Australia Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 02-Jun-2022 11:20
Date Analysis Commenced : 02-Jun-2022
Issue Date : 09-Jun-2022 18:03



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

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This Certificate of Analysis contains the following information:

- 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
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, Western Australia
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, Western Australia



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 Contract 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 Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				01-Jun-2022 13:00	01-Jun-2022 12:30	01-Jun-2022 10:50	01-Jun-2022 12:00	01-Jun-2022 11:30
Compound	CAS Number	LOR	Unit	EP2206711-001	EP2206711-002	EP2206711-003	EP2206711-004	EP2206711-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.44	8.15	8.17	8.04	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	19	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	319	273	200	260	----
Total Alkalinity as CaCO ₃	----	1	mg/L	338	273	200	260	----
ED038A: Acidity								
Acidity as CaCO ₃	----	1	mg/L	<1	6	2	8	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	0.005	0.003	0.002	0.002	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.30	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.13	0.07	0.10	0.05	----
Arsenic	7440-38-2	0.001	mg/L	0.005	0.003	0.002	0.002	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	0.07	0.08	0.32	0.86	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	4610	2570	220	2790	3660



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					01-Jun-2022 13:00	01-Jun-2022 12:30	01-Jun-2022 10:50	01-Jun-2022 12:00	01-Jun-2022 11:30
Compound	CAS Number	LOR	Unit		EP2206711-001	EP2206711-002	EP2206711-003	EP2206711-004	EP2206711-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		4110	2510	210	2770	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		10	50	10	10	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		20	100	10	20	<10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		30	150	20	30	<10
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		6500	3900	3100	6400	6600
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		6500	4000	3100	6400	6600
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		670	290	230	470	260
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		620	270	<10	140	60
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	134	<1	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2206770**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Emily Evans**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **2**
No. of samples analysed : **2**

Page : 1 of 3
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara Western Australia Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 03-Jun-2022 12:00
Date Analysis Commenced : 03-Jun-2022
Issue Date : 09-Jun-2022 15:32



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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
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, Western Australia



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.

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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 Results

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

Sample ID

				LVR-RW1	LVR-RW2	----	----	----
Sampling date / time				02-Jun-2022 14:35	02-Jun-2022 14:15	----	----	----
Compound	CAS Number	LOR	Unit	EP2206770-001	EP2206770-002	-----	-----	-----
Result				Result	Result	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	3930	2800	----	----	----
EK055G-NH4: Ammonium as N by DA								
Ammonium as N	14798-03-9_N	10	ug/L	3880	2740	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	10	µg/L	50	50	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	10	µg/L	70	90	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	10	µg/L	120	140	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	100	µg/L	8900	5400	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	100	µg/L	9000	5500	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	10	µg/L	580	360	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	10	µg/L	540	300	----	----	----

Page : 3 of 3
Work Order : EP2206770
Client : 360 ENVIRONMENTAL PTY LTD
Project : Lower Vasse River Dredge Monitoring



CERTIFICATE OF ANALYSIS

Work Order : **EP2206939**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Emily Evans**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 5
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara Western Australia Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 08-Jun-2022 12:10
Date Analysis Commenced : 08-Jun-2022
Issue Date : 14-Jun-2022 20:12



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 ISO/IEC 17025 - Testing

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- General Comments
- Analytical Results

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Signatories

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Signatories	Position	Accreditation Category
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, Western Australia
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, Western Australia



General Comments

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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.

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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 Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2 (a)	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				07-Jun-2022 14:50	07-Jun-2022 14:30	07-Jun-2022 10:20	07-Jun-2022 11:00	07-Jun-2022 10:50
Compound	CAS Number	LOR	Unit	EP2206939-001	EP2206939-002	EP2206939-003	EP2206939-004	EP2206939-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.04	8.18	8.21	7.88	----
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	308	268	211	274	----
Total Alkalinity as CaCO3	----	1	mg/L	308	268	211	274	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	2	<1	<1	4	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.002	0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.18	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.11	0.07	0.06	0.06	----
Arsenic	7440-38-2	0.001	mg/L	0.003	0.002	0.002	0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	0.12	0.16	0.25	0.84	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	3690	1580	290	3530	4230



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2 (a)	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					07-Jun-2022 14:50	07-Jun-2022 14:30	07-Jun-2022 10:20	07-Jun-2022 11:00	07-Jun-2022 10:50
Compound	CAS Number	LOR	Unit		EP2206939-001	EP2206939-002	EP2206939-003	EP2206939-004	EP2206939-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		3520	1490	280	3500	4200
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		40	70	20	10	<10
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		40	100	20	20	<10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		80	170	40	30	<10
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		6500	3200	3100	5600	6400
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		6600	3400	3100	5600	6400
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		630	260	240	320	160
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		540	190	<10	110	40
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	174	<1	----



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

			Sample ID	LVR-RW2 (b)	----	----	----	----
			Sampling date / time	07-Jun-2022 10:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2206939-006	-----	-----	-----	-----
				Result	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	1410	----	----	----	----
EK055G-NH4: Ammonium as N by DA								
Ammonium as N	14798-03-9_N	10	ug/L	1370	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	10	µg/L	70	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	10	µg/L	120	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	10	µg/L	190	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	100	µg/L	3300	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	100	µg/L	3500	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	10	µg/L	280	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	10	µg/L	140	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2207477**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **ROBYN PAICE**
Site : **----**
Quote number : **EP/219/22_V3**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Natalie Duncan
Address : 26 Rigali Way Wangara Western Australia Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 17-Jun-2022 11:15
Date Analysis Commenced : 17-Jun-2022
Issue Date : 22-Jun-2022 21:12



Accreditation No. 825
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 ISO/IEC 17025 - Testing

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- Analytical Results

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Signatories

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Signatories	Position	Accreditation Category
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, Western Australia
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, Western Australia



General Comments

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

- EG020: It is recognised that total As and Cu concentrations are less than dissolved for samples EP2207477 -001 to -004. However, the difference is within experimental variation of the methods.



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID

				LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time				16-Jun-2022 12:08	16-Jun-2022 11:49	16-Jun-2022 11:21	16-Jun-2022 10:53	16-Jun-2022 10:25
Compound	CAS Number	LOR	Unit	EP2207477-001	EP2207477-002	EP2207477-003	EP2207477-004	EP2207477-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.35	8.63	8.19	8.19	----
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	6	14	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	281	138	143	184	----
Total Alkalinity as CaCO3	----	1	mg/L	287	152	143	184	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	<1	<1	<1	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	0.02	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L	0.002	0.001	0.001	0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	0.002	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L	<0.05	0.20	0.26	0.19	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	0.10	0.04	0.04	0.08	----
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L	0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.006	<0.005	----
Iron	7439-89-6	0.05	mg/L	0.12	0.50	0.70	0.66	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	10	µg/L	1640	20	<10	490	1300



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	LVR-RW1	LVR-RW2	LVR-US	LVR-DS1	LVR-DS2
Sampling date / time					16-Jun-2022 12:08	16-Jun-2022 11:49	16-Jun-2022 11:21	16-Jun-2022 10:53	16-Jun-2022 10:25
Compound	CAS Number	LOR	Unit		EP2207477-001	EP2207477-002	EP2207477-003	EP2207477-004	EP2207477-005
					Result	Result	Result	Result	Result
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	10	ug/L		1320	20	<10	440	1280
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	10	µg/L		<10	<10	<10	20	50
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	10	µg/L		<10	<10	<10	10	10
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	10	µg/L		<10	<10	<10	30	60
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	100	µg/L		7700	1700	1700	2500	3400
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	100	µg/L		7700	1700	1700	2500	3500
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	10	µg/L		1450	180	190	190	230
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	10	µg/L		670	10	10	10	20
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		36	----	----	----	----
EP008: Chlorophyll a, b,c and Pheophytin a									
Chlorophyll a (Monochromatic)	----	1	µg/L		----	----	146	163	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2212605**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **PO BOX 14**
WEST PERTH WA, AUSTRALIA 6872
Telephone : **+61 08 93210420**
Project : **Lower Vass River Sediment Samples**
Order number : **4602**
C-O-C number : **----**
Sampler : **REBECCA COTTON**
Site : **----**
Quote number : **EN/222**
No. of samples received : **22**
No. of samples analysed : **22**

Page : 1 of 7
Laboratory : Environmental Division Perth
Contact : Genevieve De Souza
Address : 26 Rigali Way Wangara Western Australia Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 21-Sep-2022 17:00
Date Analysis Commenced : 04-Oct-2022
Issue Date : 06-Oct-2022 16:58



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 ISO/IEC 17025 - Testing

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- Analytical Results

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Signatories	Position	Accreditation Category
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, Western Australia
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, Western Australia



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~ = Indicates an estimated value.

- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS01 a	SS01 b	SS01 ASS a	SS01 ASS b	SS02 a
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EP2212605-001	EP2212605-002	EP2212605-003	EP2212605-004	EP2212605-005
				Result	Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit	----	----	----	7.8	7.8	----
ø pH (Fox)	----	0.1	pH Unit	----	----	----	1.8	2.0	----
ø Reaction Rate	----	1	-	----	----	----	Extreme	Extreme	----
EA055: Moisture Content									
Initial Weight	----	0.001	g	10.8	8.84	----	----	----	12.1
Final Weight	----	0.001	g	3.26	2.27	----	----	----	2.29
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	69.8	74.3	----	----	----	81.1



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS02 b	SS02 ASS a	SS02 ASS b	SS03 a	SS03 b
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EP2212605-006	EP2212605-007	EP2212605-008	EP2212605-009	EP2212605-010
				Result	Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis									
∅ pH (F)	----	0.1	pH Unit	----	7.7	7.4	----	----	----
∅ pH (Fox)	----	0.1	pH Unit	----	2.0	2.0	----	----	----
∅ Reaction Rate	----	1	-	----	Extreme	Extreme	----	----	----
EA055: Moisture Content									
Initial Weight	----	0.001	g	7.23	----	----	14.8	6.95	
Final Weight	----	0.001	g	2.32	----	----	4.12	1.55	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	67.9	----	----	72.2	77.7	



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				SS03 ASS a	SS03 ASS b	SS04 a	SS04 b	SS04 ASS a
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EP2212605-011	EP2212605-012	EP2212605-013	EP2212605-014	EP2212605-015
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	7.3	7.5	----	----	7.6
ø pH (Fox)	----	0.1	pH Unit	2.1	2.7	----	----	2.4
ø Reaction Rate	----	1	-	Extreme	Extreme	----	----	Extreme
EA055: Moisture Content								
Initial Weight	----	0.001	g	----	----	9.35	8.94	----
Final Weight	----	0.001	g	----	----	1.74	1.79	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	81.4	80.0	----



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				SS04 ASS b	SS04 ASS c	SS05 a	SS05 b	SS05 ASS a
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EP2212605-016	EP2212605-017	EP2212605-018	EP2212605-019	EP2212605-020
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	7.6	7.9	----	----	7.7
ø pH (Fox)	----	0.1	pH Unit	2.2	2.1	----	----	2.0
ø Reaction Rate	----	1	-	Extreme	Extreme	----	----	Extreme
EA055: Moisture Content								
Initial Weight	----	0.001	g	----	----	7.23	7.73	----
Final Weight	----	0.001	g	----	----	1.63	1.34	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	77.4	82.6	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS05 ASS b	SS05 ASS c	----	----	----
				Sampling date / time	21-Sep-2022 00:00	21-Sep-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EP2212605-021	EP2212605-022	-----	-----	-----
					Result	Result	----	----	----
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit		7.6	7.7	----	----	----
ø pH (Fox)	----	0.1	pH Unit		1.9	2.2	----	----	----
ø Reaction Rate	----	1	-		Extreme	Extreme	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2213176**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **4602 Lower Vasse River Sediment Samples**
Order number : **4602**
C-O-C number : **----**
Sampler : **REBECCA COTTON**
Site : **----**
Quote number : **EN/222**
No. of samples received : **5**
No. of samples analysed : **5**

Page : **1 of 3**
Laboratory : **Environmental Division Perth**
Contact : **Genevieve De Souza**
Address : **26 Rigali Way Wangara WA Australia 6065**
Telephone : **+61-8-9406 1301**
Date Samples Received : **29-Sep-2022 15:21**
Date Analysis Commenced : **13-Oct-2022**
Issue Date : **17-Oct-2022 21:27**



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Signatories	Position	Accreditation Category
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA



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- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- This workorder is a rebatch of EP2212605.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				SS01 ASS a	SS01 ASS b	SS02 ASS a	SS04 ASS c	SS05 ASS a
Sampling date / time				21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit	EP2213176-001	EP2213176-002	EP2213176-003	EP2213176-004	EP2213176-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	7.6	6.5	7.5	7.7	7.4
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	2.37	2.04	3.12	2.91	2.74
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1480	1270	1950	1810	1710
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	1.22	0.79	1.98	1.92	1.52
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	243	157	395	384	304
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.39	0.25	0.63	0.62	0.49
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	2.11	1.87	2.70	2.50	2.42
Net Acidity (acidity units)	----	10	mole H+ / t	1320	1160	1680	1560	1510
Liming Rate	----	1	kg CaCO3/t	99	87	126	117	113
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	2.37	2.04	3.12	2.91	2.75
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	1480	1270	1950	1810	1710
Liming Rate excluding ANC	----	1	kg CaCO3/t	111	95	146	136	128

CERTIFICATE OF ANALYSIS

Work Order : **EP2214298**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **PO BOX 14**
WEST PERTH WA, AUSTRALIA 6872
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Sediment Samples**
Order number : **4602**
C-O-C number : **----**
Sampler : **REBECCA COTTON**
Site : **----**
Quote number : **EN/222**
No. of samples received : **10**
No. of samples analysed : **10**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Genevieve De Souza
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 21-Sep-2022 17:00
Date Analysis Commenced : 31-Oct-2022
Issue Date : 04-Nov-2022 16:33



Accreditation No. 825
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 ISO/IEC 17025 - Testing

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Signatories	Position	Accreditation Category
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Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA



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- This guideline comparison report only provides evaluation data where chemical parameters specifically listed within the DEC Waste Classification and Waste Definitions 1996 (as amended December 2019) guideline are analysed by ALS using P-19/2 package.
- This Automated Guideline Comparison report assesses potential chemical 'contaminants' versus guideline criteria. Other parameters may impact classification and 95% upper control limits may also be applied - refer to EPA Regulations.
- This guideline comparison report only provides evaluation of total concentration data against upper limit thresholds for Classes I to IV.
- EG048G (Hexavalent Chromium by Alkaline Digest): poor Hexavalent Chromium matrix spike recovery possibly due to sample matrix interference. Confirmed by re-extraction and re-analysis.
- EG048G (Hexavalent Chromium by Alkaline Digestion): LOR raised for all samples due to possible sample matrix interference.
- EG048G (Hexavalent Chromium by Alkaline Digestion): Failed spike recoveries on sample #8 due to possible sample matrix interference. Results confirmed by re-extraction and re-analysis.
- For the 'Summary of Thresholds Reached or Exceeded' to accurately function, all samples must be analysed and included in the 'Analytical Results' section of the following report. Please verify that all required sample IDs are listed and analysed.



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

				Sample ID	SS01 a	SS01 b	SS02 a	SS02 b	SS03 a
				Sampling date / time	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EP2214298-001	EP2214298-002	EP2214298-003	EP2214298-004	EP2214298-005
					Result	Result	Result	Result	Result
EG035W: Water Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG050G-W: Hexavalent Chromium - Water Leachable									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EG005(ED093)W: Water Leachable Metals by ICPAES									
Aluminium	7429-90-5	0.10	mg/L		1.47	2.00	1.55	1.98	2.22
Arsenic	7440-38-2	0.01	mg/L		0.01	0.01	0.02	0.01	0.01
Barium	7440-39-3	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Beryllium	7440-41-7	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Boron	7440-42-8	0.1	mg/L		0.2	0.1	0.2	0.2	0.2
Cadmium	7440-43-9	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Copper	7440-50-8	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Lead	7439-92-1	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Manganese	7439-96-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	7440-02-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	0.01	<0.01	<0.01
Zinc	7440-66-6	0.01	mg/L		0.02	0.01	0.01	0.02	0.02
Molybdenum	7439-98-7	0.01	mg/L		0.02	0.02	0.02	0.03	0.03



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

				Sample ID	SS03 b	SS04 a	SS04 b	SS05 a	SS05 b
				Sampling date / time	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EP2214298-006	EP2214298-007	EP2214298-008	EP2214298-009	EP2214298-010
					Result	Result	Result	Result	Result
EG035W: Water Leachable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG050G-W: Hexavalent Chromium - Water Leachable									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EG005(ED093)W: Water Leachable Metals by ICPAES									
Aluminium	7429-90-5	0.10	mg/L		0.94	1.86	1.22	2.14	1.96
Arsenic	7440-38-2	0.01	mg/L		<0.01	0.02	0.01	0.02	0.02
Barium	7440-39-3	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Beryllium	7440-41-7	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Boron	7440-42-8	0.1	mg/L		0.1	0.2	0.2	0.2	0.2
Cadmium	7440-43-9	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Copper	7440-50-8	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Lead	7439-92-1	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Manganese	7439-96-5	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Nickel	7440-02-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L		<0.01	0.01	0.01	0.01	0.01
Zinc	7440-66-6	0.01	mg/L		<0.01	0.02	0.01	0.02	0.02
Molybdenum	7439-98-7	0.01	mg/L		0.02	0.02	0.02	0.02	0.02



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS01 a	SS01 b	SS02 a	SS02 b	SS03 a
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EP2214298-001	EP2214298-002	EP2214298-003	EP2214298-004	EP2214298-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		7.7	7.6	8.0	7.7	7.6
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		69.3	68.7	74.5	71.8	73.3
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		10300	10200	15500	14800	15600
Arsenic	7440-38-2	5	mg/kg		92	87	156	152	136
Barium	7440-39-3	10	mg/kg		50	40	60	60	60
Beryllium	7440-41-7	1	mg/kg		<1	<1	2	2	2
Boron	7440-42-8	50	mg/kg		<50	<50	50	<50	50
Cobalt	7440-48-4	2	mg/kg		10	9	11	11	12
Copper	7440-50-8	5	mg/kg		41	36	77	66	62
Manganese	7439-96-5	5	mg/kg		154	148	178	181	210
Molybdenum	7439-98-7	2	mg/kg		5	6	6	6	7
Nickel	7440-02-0	2	mg/kg		8	7	11	10	10
Silver	7440-22-4	2	mg/kg		<2	<2	<2	<2	<2
Vanadium	7440-62-2	5	mg/kg		20	20	25	25	27
Zinc	7440-66-6	5	mg/kg		214	152	229	241	256
EG020T: Total Metals by ICP-MS									
Cadmium	7440-43-9	0.1	mg/kg		0.5	0.4	0.7	0.6	0.6
Lead	7439-92-1	0.1	mg/kg		65.2	58.6	97.2	92.6	92.9
Selenium	7782-49-2	1	mg/kg		2	2	3	3	3
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		0.1	0.1	0.2	0.2	0.2
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<1.0	<1.0	<1.0	<1.0	<1.0
EN60-DI: Bottle Leaching Procedure - Inorganics/Non-Volatile Organics (Glass Vessel)									
Final pH	----	0.1	pH Unit		8.3	8.1	8.1	7.9	7.8



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS03 b	SS04 a	SS04 b	SS05 a	SS05 b
Sampling date / time					21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00	21-Sep-2022 00:00
Compound	CAS Number	LOR	Unit		EP2214298-006	EP2214298-007	EP2214298-008	EP2214298-009	EP2214298-010
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		7.8	7.8	8.0	7.7	8.0
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		77.7	76.5	76.9	74.0	75.0
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		17800	14800	12200	14100	13300
Arsenic	7440-38-2	5	mg/kg		160	134	109	120	123
Barium	7440-39-3	10	mg/kg		70	60	50	60	60
Beryllium	7440-41-7	1	mg/kg		2	<1	<1	2	<1
Boron	7440-42-8	50	mg/kg		60	50	<50	50	50
Cobalt	7440-48-4	2	mg/kg		14	11	10	11	11
Copper	7440-50-8	5	mg/kg		67	60	51	52	51
Manganese	7439-96-5	5	mg/kg		238	190	163	181	181
Molybdenum	7439-98-7	2	mg/kg		8	7	6	7	6
Nickel	7440-02-0	2	mg/kg		12	10	9	10	9
Silver	7440-22-4	2	mg/kg		<2	<2	<2	<2	<2
Vanadium	7440-62-2	5	mg/kg		30	25	21	26	24
Zinc	7440-66-6	5	mg/kg		295	252	198	199	198
EG020T: Total Metals by ICP-MS									
Cadmium	7440-43-9	0.1	mg/kg		0.6	0.6	0.5	0.6	0.6
Lead	7439-92-1	0.1	mg/kg		102	82.7	74.1	80.5	78.6
Selenium	7782-49-2	1	mg/kg		3	3	2	2	3
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		0.2	0.2	0.1	0.2	0.2
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<1.0	<1.0	<1.0	<1.0	<1.0
EN60-DI: Bottle Leaching Procedure - Inorganics/Non-Volatile Organics (Glass Vessel)									
Final pH	----	0.1	pH Unit		7.9	8.0	7.9	8.0	8.2

CERTIFICATE OF ANALYSIS

Work Order : **EP2216255**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.5**
C-O-C number : **----**
Sampler : **Paul Monaco**
Site : **----**
Quote number : **EP/931/22**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 4
Laboratory : Environmental Division Perth
Contact : Genevieve De Souza
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 01-Dec-2022 12:30
Date Analysis Commenced : 02-Dec-2022
Issue Date : 06-Dec-2022 17:57



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
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA



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 Contract 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.

- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				TF_ASS1	TF_ASS2	TF_ASS3	TF_ASS4	TF_ASS5
Sampling date / time				29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00
Compound	CAS Number	LOR	Unit	EP2216255-001	EP2216255-002	EP2216255-003	EP2216255-004	EP2216255-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.9	----	9.1	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	<0.02	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.420	----	0.406	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	262	----	253	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	9.28	----	10.1	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	1850	----	2020	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	2.97	----	3.24	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.42	----	0.41	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	262	----	253	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	20	----	19	----	----
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	8.0	8.0	8.2	8.0	8.2
ø pH (Fox)	----	0.1	pH Unit	5.8	5.8	5.8	5.8	5.8
ø Reaction Rate	----	1	-	Moderate	Moderate	Moderate	Moderate	Moderate



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TF_ASS6	----	----	----	----
			Sampling date / time	29-Nov-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2216255-006	-----	-----	-----	-----
Result				----	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	8.8	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	0.917	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	572	----	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	12.6	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	2520	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	4.04	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.92	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	572	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	43	----	----	----	----
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	8.2	----	----	----	----
ø pH (Fox)	----	0.1	pH Unit	5.7	----	----	----	----
ø Reaction Rate	----	1	-	Moderate	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2216258**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.3**
C-O-C number : **----**
Sampler : **Paul Monaco**
Site : **----**
Quote number : **EP/931/22**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 11
Laboratory : Environmental Division Perth
Contact : Genevieve De Souza
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 01-Dec-2022 12:30
Date Analysis Commenced : 02-Dec-2022
Issue Date : 13-Dec-2022 19:25



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
- Surrogate Control Limits

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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
David Viner	SENIOR LAB TECH	Perth Organics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Jarvis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC



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 Contract 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.

- This guideline comparison report only provides evaluation data where chemical parameters specifically listed within the DEC Waste Classification and Waste Definitions 1996 (as amended December 2019) guideline are analysed by ALS using P-19/1 and P-19/2 package.
- EK040T conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778
- EP035SF and EP202 conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP202: Particular samples required dilution due to matrix interferences. LOR values have been adjusted accordingly.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP074: Where reported, Total Trihalomethanes is the sum of the reported concentrations of all Trihalomethanes at or above the LOR.
- EP074: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP074: Where reported, Sum of chlorinated hydrocarbons includes carbon tetrachloride, chlorobenzene, chloroform, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethane, cis-1,2-dichloroethane, trans-1,2-dichloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, 1,2,4-trichlorobenzene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, vinyl chloride, hexachlorobutadiene and methylene chloride.
- EP074: Where reported, Total Trimethylbenzenes is the sum of the reported concentrations of 1.2.3-Trimethylbenzene, 1.2.4-Trimethylbenzene and 1.3.5-Trimethylbenzene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- This guideline comparison report only provides evaluation of total concentration data against upper limit thresholds for Classes I to IV.
- EP075(SIM): High LCS recovery deemed acceptable as all associated analyte results are less than LOR.
- EP068: Sample 'TF_WC3' shows poor matrix spike recovery due to matrix interference.
- EK026SF, EK028SF (Cyanide) Poor matrix spike recoveries for sample EP2216258-003 due to possible sample matrix interference. This was confirmed by re-analysis. Please scrutinise the results accordingly.
- For the 'Summary of Thresholds Reached or Exceeded' to accurately function, all samples must be analysed and included in the 'Analytical Results' section of the following report. Please verify that all required sample IDs are listed and analysed.
- EN60-DI: Where leachable PFAS analysis is requested, centrifugation rather than pressure filtration is used as the default approach for removal of particulates, in line with AS 4439.3.



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC1	TF_WC2	TF_WC3	TF_WC4	TF_WC5
Sampling date / time				29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00
Compound	CAS Number	LOR	Unit	EP2216258-001	EP2216258-002	EP2216258-003	EP2216258-004	EP2216258-005
				Result	Result	Result	Result	Result
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG049G-W: Trivalent Chromium in Water Leachates								
Trivalent Chromium	16065-83-1	0.005	mg/L	0.008	0.008	0.008	0.007	0.006
EG050G LL-W: Hexavalent Chromium in Water Leachates by Discrete Analyser - Low Level								
Hexavalent Chromium	18540-29-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
EG094W: Water Leachable Metals by ORC-ICPMS								
Antimony	7440-36-0	1.0	µg/L	1.6	1.6	1.9	1.0	1.5
Arsenic	7440-38-2	0.2	µg/L	3.1	3.3	3.4	2.4	2.8
Cadmium	7440-43-9	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Chromium	7440-47-3	5.0	µg/L	8.4	7.9	8.5	6.8	5.7
Cobalt	7440-48-4	0.1	µg/L	2.0	2.0	2.0	1.7	1.8
Copper	7440-50-8	2.0	µg/L	7.7	8.4	9.4	7.4	8.4
Lead	7439-92-1	0.2	µg/L	17.5	18.0	17.1	14.9	16.1
Manganese	7439-96-5	0.5	µg/L	31.6	37.0	19.4	22.8	19.6
Molybdenum	7439-98-7	1.0	µg/L	14.9	14.1	19.2	10.4	15.9
Nickel	7440-02-0	2.0	µg/L	3.0	2.5	2.4	<2.0	2.0
Selenium	7782-49-2	0.2	µg/L	0.6	0.6	0.8	0.6	0.7
Silver	7440-22-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	7440-28-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Uranium	7440-61-1	0.05	µg/L	3.06	3.02	3.68	2.58	3.14
Zinc	7440-66-6	5	µg/L	34	37	40	32	34



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC6	----	----	----	----
Sampling date / time				29-Nov-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2216258-006	-----	-----	-----	-----
Result				Result	----	----	----	----
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	----	----	----	----
EG049G-W: Trivalent Chromium in Water Leachates								
Trivalent Chromium	16065-83-1	0.005	mg/L	0.006	----	----	----	----
EG050G LL-W: Hexavalent Chromium in Water Leachates by Discrete Analyser - Low Level								
Hexavalent Chromium	18540-29-9	0.001	mg/L	<0.001	----	----	----	----
EG094W: Water Leachable Metals by ORC-ICPMS								
Antimony	7440-36-0	1.0	µg/L	1.1	----	----	----	----
Arsenic	7440-38-2	0.2	µg/L	2.5	----	----	----	----
Cadmium	7440-43-9	0.10	µg/L	<0.10	----	----	----	----
Chromium	7440-47-3	5.0	µg/L	6.4	----	----	----	----
Cobalt	7440-48-4	0.1	µg/L	1.6	----	----	----	----
Copper	7440-50-8	2.0	µg/L	7.4	----	----	----	----
Lead	7439-92-1	0.2	µg/L	14.6	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	19.3	----	----	----	----
Molybdenum	7439-98-7	1.0	µg/L	11.3	----	----	----	----
Nickel	7440-02-0	2.0	µg/L	2.0	----	----	----	----
Selenium	7782-49-2	0.2	µg/L	0.6	----	----	----	----
Silver	7440-22-4	0.2	µg/L	<0.2	----	----	----	----
Thallium	7440-28-0	0.05	µg/L	<0.05	----	----	----	----
Uranium	7440-61-1	0.05	µg/L	2.48	----	----	----	----
Zinc	7440-66-6	5	µg/L	38	----	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC1	TF_WC2	TF_WC3	TF_WC4	TF_WC5
Sampling date / time					29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00
Compound	CAS Number	LOR	Unit		EP2216258-001	EP2216258-002	EP2216258-003	EP2216258-004	EP2216258-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.2	8.2	8.4	8.5	8.4
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		29.5	27.1	36.8	18.9	26.5
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		3960	4120	4450	2760	3120
Arsenic	7440-38-2	5	mg/kg		14	14	21	10	11
Barium	7440-39-3	10	mg/kg		10	10	20	<10	10
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cobalt	7440-48-4	2	mg/kg		<2	<2	2	<2	<2
Copper	7440-50-8	5	mg/kg		9	10	13	5	8
Manganese	7439-96-5	5	mg/kg		44	49	48	23	37
Molybdenum	7439-98-7	2	mg/kg		<2	<2	<2	<2	<2
Nickel	7440-02-0	2	mg/kg		<2	<2	<2	<2	<2
Silver	7440-22-4	2	mg/kg		<2	<2	<2	<2	<2
Vanadium	7440-62-2	5	mg/kg		8	8	8	<5	6
Zinc	7440-66-6	5	mg/kg		28	29	37	17	25
EG020T: Total Metals by ICP-MS									
Cadmium	7440-43-9	0.1	mg/kg		<0.1	<0.1	0.1	<0.1	<0.1
Lead	7439-92-1	0.1	mg/kg		12.4	13.1	16.8	7.5	11.2
Selenium	7782-49-2	1	mg/kg		<1	<1	<1	<1	<1
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	1	mg/kg		<1	----	<1	----	<1
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser									
Weak Acid Dissociable Cyanide	----	1	mg/kg		<1	----	<1	----	<1
EK040T: Fluoride Total									
Fluoride	16984-48-8	40	mg/kg		80	----	150	----	120
EN60-DI: Bottle Leaching Procedure - Inorganics/PFAS (Plastic Vessel)									
Final pH	----	0.1	pH Unit		7.9	8.0	8.2	8.4	8.3

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC1	TF_WC2	TF_WC3	TF_WC4	TF_WC5
Sampling date / time				29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	
Compound	CAS Number	LOR	Unit	EP2216258-001	EP2216258-002	EP2216258-003	EP2216258-004	EP2216258-005	
				Result	Result	Result	Result	Result	
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	1	mg/kg	1	----	1	----	1	
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	----	<0.1	
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
4,4'-DDE	72-55-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Endrin	72-20-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
4,4'-DDD	72-54-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
4,4'-DDT	50-29-3	0.2	mg/kg	<0.2	----	<0.2	----	<0.2	
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	<0.2	----	<0.2	
^ Total OCP	----	0.05	mg/kg	<0.05	----	<0.05	----	<0.05	
EP070: Total Petroleum Hydrocarbons - Speciation									
Aliphatic C16-C35	----	100	mg/kg	<100	----	140	----	<100	
Aliphatic > C35	----	100	mg/kg	<100	----	<100	----	<100	
Aromatic C16-C35	----	90	mg/kg	<90	----	100	----	<90	
Aromatic > C35	----	100	mg/kg	<100	----	<100	----	<100	
EP074A: Monocyclic Aromatic Hydrocarbons									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC1	TF_WC2	TF_WC3	TF_WC4	TF_WC5
Sampling date / time					29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00
Compound	CAS Number	LOR	Unit		EP2216258-001	EP2216258-002	EP2216258-003	EP2216258-004	EP2216258-005
					Result	Result	Result	Result	Result
EP074A: Monocyclic Aromatic Hydrocarbons - Continued									
Styrene	100-42-5	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
EP075(SIM)A: Phenolic Compounds									
Phenol	108-95-2	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
2-Chlorophenol	95-57-8	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
2-Methylphenol	95-48-7	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
3- & 4-Methylphenol	1319-77-3	1	mg/kg		<1	----	<1	----	<1
2-Nitrophenol	88-75-5	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
2,4-Dimethylphenol	105-67-9	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
2,4-Dichlorophenol	120-83-2	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
2,6-Dichlorophenol	87-65-0	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
2,4,6-Trichlorophenol	88-06-2	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
2,4,5-Trichlorophenol	95-95-4	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Pentachlorophenol	87-86-5	2	mg/kg		<2	----	<2	----	<2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	0.7	----	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	0.7	----	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	0.6	----	0.6



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC1	TF_WC2	TF_WC3	TF_WC4	TF_WC5
Sampling date / time					29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00
Compound	CAS Number	LOR	Unit		EP2216258-001	EP2216258-002	EP2216258-003	EP2216258-004	EP2216258-005
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	1.2	----	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg		<50	----	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg		<100	----	230	----	<100
C29 - C36 Fraction	----	100	mg/kg		<100	----	180	----	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	410	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	<10	----	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	----	<50	----	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	----	380	----	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	----	<100	----	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	380	----	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	<50	----	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	<0.5	----	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	<0.2	----	<0.2
Naphthalene	91-20-3	1	mg/kg		<1	----	<1	----	<1
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
2,4-D	94-75-7	0.02	mg/kg		<0.04	----	<0.04	----	<0.04
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		82.3	----	86.4	----	88.5
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		72.8	----	75.9	----	79.0
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		50.1	----	58.8	----	47.6



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC1	TF_WC2	TF_WC3	TF_WC4	TF_WC5
Sampling date / time					29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00	29-Nov-2022 00:00
Compound	CAS Number	LOR	Unit		EP2216258-001	EP2216258-002	EP2216258-003	EP2216258-004	EP2216258-005
					Result	Result	Result	Result	Result
EP070: Total Petroleum Hydrocarbons - Speciation									
2-Bromonaphthalene	580-13-2	1	%		126	----	116	----	125
2-Fluorobiphenyl	321-60-8	1	%		122	----	116	----	109
EP074S: VOC Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.5	%		75.6	----	69.1	----	74.4
Toluene-D8	2037-26-5	0.5	%		81.4	----	76.6	----	78.1
4-Bromofluorobenzene	460-00-4	0.5	%		83.2	----	76.1	----	81.1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		74.1	----	73.3	----	69.8
2-Chlorophenol-D4	93951-73-6	0.5	%		80.7	----	84.2	----	80.1
2,4,6-Tribromophenol	118-79-6	0.5	%		85.6	----	91.5	----	92.5
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		77.0	----	84.1	----	82.7
Anthracene-d10	1719-06-8	0.5	%		82.4	----	86.6	----	83.9
4-Terphenyl-d14	1718-51-0	0.5	%		94.0	----	86.4	----	94.8
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		86.3	----	79.4	----	84.5
Toluene-D8	2037-26-5	0.2	%		80.6	----	76.5	----	77.8
4-Bromofluorobenzene	460-00-4	0.2	%		87.9	----	79.9	----	87.6
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2,4-Dichlorophenyl Acetic Acid	19719-28-9	0.02	%		87.0	----	66.6	----	64.7



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TF_WC6	----	----	----	----
Sampling date / time				29-Nov-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2216258-006	-----	-----	-----	-----
Result				----	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.5	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	17.6	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	1470	----	----	----	----
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Barium	7440-39-3	10	mg/kg	<10	----	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	<2	----	----	----	----
Copper	7440-50-8	5	mg/kg	<5	----	----	----	----
Manganese	7439-96-5	5	mg/kg	16	----	----	----	----
Molybdenum	7439-98-7	2	mg/kg	<2	----	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	----	----	----	----
Silver	7440-22-4	2	mg/kg	<2	----	----	----	----
Vanadium	7440-62-2	5	mg/kg	<5	----	----	----	----
Zinc	7440-66-6	5	mg/kg	12	----	----	----	----
EG020T: Total Metals by ICP-MS								
Cadmium	7440-43-9	0.1	mg/kg	<0.1	----	----	----	----
Lead	7439-92-1	0.1	mg/kg	5.1	----	----	----	----
Selenium	7782-49-2	1	mg/kg	<1	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	----	----	----	----
EN60-DI: Bottle Leaching Procedure - Inorganics/PFAS (Plastic Vessel)								
Final pH	----	0.1	pH Unit	8.4	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	43	119
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	53	152
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	28	152
EP070: Total Petroleum Hydrocarbons - Speciation			
2-Bromonaphthalene	580-13-2	70	130
2-Fluorobiphenyl	321-60-8	70	130
EP074S: VOC Surrogates			
1,2-Dichloroethane-D4	17060-07-0	66	127
Toluene-D8	2037-26-5	66	126
4-Bromofluorobenzene	460-00-4	60	115
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	57	119
2-Chlorophenol-D4	93951-73-6	52	130
2,4,6-Tribromophenol	118-79-6	40	132
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	53	139
Anthracene-d10	1719-06-8	68	124
4-Terphenyl-d14	1718-51-0	66	132
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	63	132
Toluene-D8	2037-26-5	66	125
4-Bromofluorobenzene	460-00-4	60	124
EP202S: Phenoxyacetic Acid Herbicide Surrogate			
2,4-Dichlorophenyl Acetic Acid	19719-28-9	45	139

Inter-Laboratory Testing

Analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no. 13778 (Chemistry).

(SOIL) EK040T: Fluoride Total

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

(SOIL) EP202A: Phenoxyacetic Acid Herbicides by LCMS

(SOIL) EP202S: Phenoxyacetic Acid Herbicide Surrogate

(SOIL) EP035G: Total Phenol by Discrete Analyser

CERTIFICATE OF ANALYSIS

Work Order : **EP2300844**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **Lower Vasse River Dredge Monitoring**
Order number : **4602.5**
C-O-C number : **----**
Sampler : **Paul Monaco**
Site : **----**
Quote number : **EP/931/22**
No. of samples received : **9**
No. of samples analysed : **6**

Page : 1 of 11
Laboratory : Environmental Division Perth
Contact : Genevieve De Souza
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 24-Jan-2023 13:40
Date Analysis Commenced : 27-Jan-2023
Issue Date : 10-Feb-2023 21:08



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
- Descriptive Results
- Surrogate Control Limits

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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
David Viner	SENIOR LAB TECH	Perth Organics, Wangara, WA
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
MINNIE TRAN	Approved Asbestos Identifier	Melbourne Asbestos, Springvale, VIC
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA



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 Contract 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.

- This guideline comparison report only provides evaluation data where chemical parameters specifically listed within the DEC Waste Classification and Waste Definitions 1996 (as amended December 2019) guideline are analysed by ALS using P-19/2 package.
- Fluoride and Asbestos analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no 13778
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- This Automated Guideline Comparison report assesses potential chemical 'contaminants' versus guideline criteria. Other parameters may impact classification and 95% upper control limits may also be applied - refer to EPA Regulations.
- This guideline comparison report only provides evaluation of total concentration data against upper limit thresholds for Classes I to IV.
- EK025SF, EK026SF, EK028SF: LCS recovery for FCN (EK025SF) fall outside the ALS Dynamic Control Limit. However, they are within the acceptance criteria based on ALS DQO. No further action is required.
- EK025SF, EK026SF, EK028SF: Low Matrix spike recovery noted for sample #EP2300676-002, This was confirmed by re-preparation and re-analysis.
- EK025SF: Low Matrix spike recovery noted for sample #EP2300844-002, This was confirmed by re-preparation and re-analysis.
- EG048G (Hexavalent Chromium): Poor Hexavalent Chromium spike recoveries possibly due to sample matrix effects. Confirmed by re-extraction and re-analysis.
- **EA200: As only one sample container was submitted for multiple tests, at the client's request, sub sampling was conducted prior to Asbestos analysis. As this has the potential to understate detection, results should be scrutinised accordingly.**
- For the 'Summary of Thresholds Reached or Exceeded' to accurately function, all samples must be analysed and included in the 'Analytical Results' section of the following report. Please verify that all required sample IDs are listed and analysed.
- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.



- EA200N: Asbestos weights and percentages are not covered under the Scope of NATA Accreditation.
Weights of Asbestos are based on extracted bulk asbestos, fibre bundles, and/or ACM and do not include respirable fibres (if present)
The Asbestos (Fines and Fibrous) weight is calculated from the extracted Fibrous Asbestos and Asbestos Fines as an equivalent weight of 100% Asbestos
Percentages for Asbestos content in ACM are based on the 2013 NEPM default values.
All calculations of percentage Asbestos under this method are approximate and should be used as a guide only.
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- EA200 Legend
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200N: ALS laboratory procedures and methods used for the identification and quantitation of asbestos are consistent with AS4964-2004 and the requirements of the 2013 NEPM for Assessment of Site Contamination
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.
- EN60-DI: Where leachable PFAS analysis is requested, centrifugation rather than pressure filtration is used as the default approach for removal of particulates, in line with AS 4439.3.



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC7	TF_WC8	TF_WC9	----	----
Sampling date / time				23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	EP2300844-001	EP2300844-002	EP2300844-003	-----	-----
				Result	Result	Result	----	----
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	----	----
EG049G-W: Trivalent Chromium in Water Leachates								
Trivalent Chromium	16065-83-1	0.005	mg/L	<0.005	<0.005	0.008	----	----
EG050G LL-W: Hexavalent Chromium in Water Leachates by Discrete Analyser - Low Level								
Hexavalent Chromium	18540-29-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
EG094W: Water Leachable Metals by ORC-ICPMS								
Aluminium	7429-90-5	15	µg/L	4770	2520	8320	----	----
Antimony	7440-36-0	1.0	µg/L	1.5	<1.0	<1.0	----	----
Arsenic	7440-38-2	0.2	µg/L	2.8	1.6	3.9	----	----
Barium	7440-39-3	5.0	µg/L	33.6	21.6	31.4	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.2	----	----
Boron	7440-42-8	20	µg/L	120	85	72	----	----
Cadmium	7440-43-9	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Chromium	7440-47-3	5.0	µg/L	<5.0	<5.0	8.4	----	----
Cobalt	7440-48-4	0.1	µg/L	1.6	1.1	2.5	----	----
Copper	7440-50-8	2.0	µg/L	8.7	5.6	11.2	----	----
Lead	7439-92-1	0.2	µg/L	15.3	6.7	18.9	----	----
Manganese	7439-96-5	0.5	µg/L	26.6	30.7	90.3	----	----
Molybdenum	7439-98-7	1.0	µg/L	16.5	11.8	8.4	----	----
Nickel	7440-02-0	2.0	µg/L	<2.0	<2.0	2.7	----	----
Selenium	7782-49-2	0.2	µg/L	0.5	0.3	0.5	----	----
Silver	7440-22-4	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Thallium	7440-28-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
Uranium	7440-61-1	0.05	µg/L	2.26	2.77	2.22	----	----
Vanadium	7440-62-2	0.5	µg/L	9.9	5.6	14.5	----	----
Zinc	7440-66-6	5	µg/L	46	24	64	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				TF_WC7	TF_WC8	TF_WC9	TF_ASS7	TF_ASS8
Sampling date / time				23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00
Compound	CAS Number	LOR	Unit	EP2300844-001	EP2300844-002	EP2300844-003	EP2300844-004	EP2300844-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.0	8.0	8.2	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	----	8.8
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	----	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	----	----	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	----	----	0.592
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	----	----	369
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	----	10.7
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	----	2130
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	----	3.42
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	----	----	1.5
Net Acidity (sulfur units)	----	0.02	% S	----	----	----	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	----	----	<10
Liming Rate	----	1	kg CaCO3/t	----	----	----	----	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	----	----	0.59
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	----	----	369
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	----	----	28
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	----	----	----	7.6	7.3
ø pH (Fox)	----	0.1	pH Unit	----	----	----	5.8	5.8
ø Reaction Rate	----	1	-	----	----	----	Extreme	Strong
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	29.5	27.0	22.3	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	----	----
Asbestos Type	1332-21-4	-	--	-	-	-	----	----
Synthetic Mineral Fibre	----	0.1	--	No	No	No	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				TF_WC7	TF_WC8	TF_WC9	TF_ASS7	TF_ASS8
Sampling date / time				23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00
Compound	CAS Number	LOR	Unit	EP2300844-001	EP2300844-002	EP2300844-003	EP2300844-004	EP2300844-005
				Result	Result	Result	Result	Result

EA200: AS 4964 - 2004 Identification of Asbestos in Soils - Continued

Organic Fibre	----	0.1	--	Yes	Yes	Yes	----	----
Sample weight (dry)	----	0.01	g	38.7	39.1	38.9	----	----
APPROVED IDENTIFIER:	----	-	--	M. TRAN	M. TRAN	M. TRAN	----	----

EA200N: Asbestos Quantification (non-NATA)

Ø Asbestos (Fines and Fibrous <7mm)	1332-21-4	0.0004	g	<0.0004	<0.0004	<0.0004	----	----
Ø Asbestos (Fines and Fibrous FA+AF)	----	0.001	% (w/w)	<0.001	<0.001	<0.001	----	----
Ø Weight Used for % Calculation	----	0.0001	kg	0.0387	0.0391	0.0389	----	----
Ø Fibrous Asbestos >7mm	----	0.0004	g	<0.0004	<0.0004	<0.0004	----	----

ED040: Sulfur as SO4 2-

Sulfate as SO4 2-	14808-79-8	100	mg/kg	4230	3740	2970	----	----
-------------------	------------	-----	-------	------	------	------	------	------

EG005(ED093)T: Total Metals by ICP-AES

Aluminium	7429-90-5	50	mg/kg	5650	5210	4600	----	----
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	----	----
Arsenic	7440-38-2	5	mg/kg	18	12	7	----	----
Barium	7440-39-3	10	mg/kg	20	10	10	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Chromium	7440-47-3	2	mg/kg	10	10	9	----	----
Cobalt	7440-48-4	2	mg/kg	<2	<2	<2	----	----
Copper	7440-50-8	5	mg/kg	10	7	5	----	----
Lead	7439-92-1	5	mg/kg	14	10	6	----	----
Manganese	7439-96-5	5	mg/kg	59	61	52	----	----
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	----	----
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	----	----
Silver	7440-22-4	2	mg/kg	<2	<2	<2	----	----
Tin	7440-31-5	5	mg/kg	<5	<5	<5	----	----
Vanadium	7440-62-2	5	mg/kg	11	11	10	----	----
Zinc	7440-66-6	5	mg/kg	34	25	14	----	----

EG020T: Total Metals by ICP-MS

Thallium	7440-28-0	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
Uranium	7440-61-1	0.1	mg/kg	1.0	0.8	0.6	----	----
Lead	7439-92-1	0.1	mg/kg	14.8	11.5	7.4	----	----

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	TF_WC7	TF_WC8	TF_WC9	TF_ASS7	TF_ASS8
Sampling date / time				23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	
Compound	CAS Number	LOR	Unit	EP2300844-001	EP2300844-002	EP2300844-003	EP2300844-004	EP2300844-005	
				Result	Result	Result	Result	Result	
EG020T: Total Metals by ICP-MS - Continued									
Selenium	7782-49-2	1	mg/kg	<1	<1	<1	----	----	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----	
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	----	
EG049: Trivalent Chromium									
Trivalent Chromium	16065-83-1	2	mg/kg	10	10	9	----	----	
EK025SF: Free CN by Segmented Flow Analyser									
Free Cyanide	----	1	mg/kg	<1	<1	<1	----	----	
EK028SF: Weak Acid Dissociable CN by Segmented Flow Analyser									
Weak Acid Dissociable Cyanide	----	1	mg/kg	<1	<1	<1	----	----	
EK040T: Fluoride Total									
Fluoride	16984-48-8	40	mg/kg	150	120	110	----	----	
EN60-DI: Bottle Leaching Procedure - Inorganics/PFAS (Plastic Vessel)									
Final pH	----	0.1	pH Unit	7.9	7.8	8.2	----	----	
EP066: Polychlorinated Biphenyls (PCB)									
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	<0.1	----	----	
EP068A: Organochlorine Pesticides (OC)									
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----	
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	----	
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	----	----	
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	----	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	----	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	----	----	
EP071 SG-S: Total Petroleum Hydrocarbons in Soil - Silica gel cleanup									
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	----	
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	----	
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	----	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	----	----	
EP075(SIM)A: Phenolic Compounds									



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	TF_WC7	TF_WC8	TF_WC9	TF_ASS7	TF_ASS8
Sampling date / time					23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00
Compound	CAS Number	LOR	Unit		EP2300844-001	EP2300844-002	EP2300844-003	EP2300844-004	EP2300844-005
					Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued									
Phenol	108-95-2	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	----	----
>C10 - C16 Fraction	----	20	mg/kg		<20	<20	<20	----	----
>C16 - C34 Fraction	----	100	mg/kg		220	180	180	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	----	----
^ Total Xylenes	----	1.0	mg/kg		<1.0	<1.0	<1.0	----	----
EP066S: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		59.0	51.7	76.8	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		103	95.2	117	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		109	99.1	133	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		74.1	73.5	67.1	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		66.0	66.8	62.8	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%		64.9	72.0	67.6	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		71.0	73.5	65.7	----	----
Anthracene-d10	1719-06-8	0.5	%		74.0	73.4	70.2	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		75.3	73.9	71.3	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		89.9	92.6	97.7	----	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	TF_WC7	TF_WC8	TF_WC9	TF_ASS7	TF_ASS8
Sampling date / time					23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00	23-Jan-2023 00:00
Compound	CAS Number	LOR	Unit		EP2300844-001	EP2300844-002	EP2300844-003	EP2300844-004	EP2300844-005
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
Toluene-D8	2037-26-5	0.2	%		70.2	67.1	68.2	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		68.4	69.3	75.0	----	----



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				TF_ASS9	----	----	----	----
Sampling date / time				23-Jan-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2300844-006	-----	-----	-----	-----
Result					----	----	----	----
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	7.3	----	----	----	----
ø pH (Fox)	----	0.1	pH Unit	5.7	----	----	----	----
ø Reaction Rate	----	1	-	Strong	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SEDIMENT**

Method: Compound	Sample ID - Sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	TF_WC7 - 23-Jan-2023 00:00	Brown sandy soil with organic matter.
EA200: Description	TF_WC8 - 23-Jan-2023 00:00	Brown sandy soil with organic matter.
EA200: Description	TF_WC9 - 23-Jan-2023 00:00	Brown sandy soil with organic matter.



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	43	119
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	53	152
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	28	152
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	57	119
2-Chlorophenol-D4	93951-73-6	52	130
2,4,6-Tribromophenol	118-79-6	40	132
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	53	139
Anthracene-d10	1719-06-8	68	124
4-Terphenyl-d14	1718-51-0	66	132
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	63	132
Toluene-D8	2037-26-5	66	125
4-Bromofluorobenzene	460-00-4	60	124

Inter-Laboratory Testing

Analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no. 13778 (Chemistry).

(SOIL) EK040T: Fluoride Total

(SOIL) EA200N: Asbestos Quantification (non-NATA)

(SOIL) EA200: AS 4964 - 2004 Identification of Asbestos in Soils

CERTIFICATE OF ANALYSIS

Work Order : **EP2302658**
Client : **360 ENVIRONMENTAL PTY LTD**
Contact : **ALYSIA WOODWARD**
Address : **10 Bermondsey St**
West Leederville 6007
Telephone : **+61 08 93210420**
Project : **4602.5 Lower Vasse River Dredge Monitoring**
Order number : **4602.5**
C-O-C number : **----**
Sampler : **PAUL ROBERTSON**
Site : **----**
Quote number : **EP/205/23_V2**
No. of samples received : **28**
No. of samples analysed : **28**

Page : 1 of 20
Laboratory : Environmental Division Perth
Contact : Genevieve De Souza
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 02-Mar-2023 16:30
Date Analysis Commenced : 03-Mar-2023
Issue Date : 15-Mar-2023 16:09



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
- Surrogate Control Limits

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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA



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 Contract 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.

- For the 'Summary of Thresholds Reached or Exceeded' to accurately function, all samples must be analysed and included in the 'Analytical Results' section of the following report. Please verify that all required sample IDs are listed and analysed.
- This Automated Guideline Comparison report assesses potential chemical 'contaminants' versus guideline criteria. Other parameters may impact classification and 95% upper control limits may also be applied - refer to EPA Regulations.
- This guideline comparison report only provides evaluation data where chemical parameters specifically listed within the DEC Waste Classification and Waste Definitions 1996 (as amended December 2019) guideline are analysed by ALS using P-19/2 package.
- This guideline comparison report only provides evaluation of total concentration data against upper limit thresholds for Classes I to IV.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG048G (Hexavalent Chromium): Poor Hexavalent Chromium spike recoveries possibly due to sample matrix effects. Confirmed by re-extraction and re-analysis.
- EG048G (Hexavalent Chromium): LOR for sample EP2302658-001 raised due to possible sample matrix interference.
- EG005: Poor matrix spike recovery was obtained for As and V due to possible sample matrix interference and sample heterogeneity. Results have been confirmed by re-extraction and re-analysis.
- EK061G (Total Kjeldahl Nitrogen): Poor duplicate precision due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): ANC not required for sample #14 because pH KCl less than 6.5
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.
- EN60-DI: Where leachable PFAS analysis is requested, centrifugation rather than pressure filtration is used as the default approach for removal of particulates, in line with AS 4439.3.



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC10	TF_WC11	TF_WC12	TF_WC13	TF_WC14
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit	EP2302658-001	EP2302658-002	EP2302658-003	EP2302658-004	EP2302658-005
				Result	Result	Result	Result	Result
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	----	----	<0.00004	----
Mercury	7439-97-6	0.0001	mg/L	----	<0.0001	<0.0001	----	<0.0001
EG049G-W: Trivalent Chromium in Water Leachates								
Trivalent Chromium	16065-83-1	0.005	mg/L	0.015	----	----	0.008	----
EG050G LL-W: Hexavalent Chromium in Water Leachates by Discrete Analyser - Low Level								
Hexavalent Chromium	18540-29-9	0.001	mg/L	<0.001	----	----	<0.001	----
EG050G-W: Hexavalent Chromium - Water Leachable								
Hexavalent Chromium	18540-29-9	0.01	mg/L	----	<0.01	<0.01	----	<0.01
EG094W: Water Leachable Metals by ORC-ICPMS								
Antimony	7440-36-0	1.0	µg/L	<1.0	----	----	<1.0	----
Arsenic	7440-38-2	0.2	µg/L	4.3	----	----	2.8	----
Cadmium	7440-43-9	0.10	µg/L	<0.10	----	----	<0.10	----
Chromium	7440-47-3	5.0	µg/L	15.3	----	----	7.6	----
Cobalt	7440-48-4	0.1	µg/L	1.9	----	----	1.7	----
Copper	7440-50-8	2.0	µg/L	7.0	----	----	6.2	----
Lead	7439-92-1	0.2	µg/L	14.0	----	----	11.5	----
Manganese	7439-96-5	0.5	µg/L	117	----	----	68.4	----
Molybdenum	7439-98-7	1.0	µg/L	4.3	----	----	8.4	----
Nickel	7440-02-0	2.0	µg/L	3.6	----	----	2.2	----
Selenium	7782-49-2	0.2	µg/L	0.4	----	----	0.4	----
Silver	7440-22-4	0.2	µg/L	<0.2	----	----	<0.2	----
Thallium	7440-28-0	0.05	µg/L	<0.05	----	----	<0.05	----
Uranium	7440-61-1	0.05	µg/L	1.61	----	----	1.70	----
Zinc	7440-66-6	5	µg/L	43	----	----	36	----
EG005(ED093)W: Water Leachable Metals by ICPAES								
Aluminium	7429-90-5	0.10	mg/L	----	14.3	4.21	----	11.6
Arsenic	7440-38-2	0.01	mg/L	----	0.02	0.03	----	0.02
Barium	7440-39-3	0.1	mg/L	----	<0.1	<0.1	----	<0.1
Beryllium	7440-41-7	0.01	mg/L	----	<0.01	<0.01	----	<0.01
Boron	7440-42-8	0.1	mg/L	----	<0.1	0.2	----	<0.1
Cadmium	7440-43-9	0.005	mg/L	----	<0.005	<0.005	----	<0.005
Cobalt	7440-48-4	0.01	mg/L	----	<0.01	<0.01	----	<0.01
Copper	7440-50-8	0.01	mg/L	----	<0.01	<0.01	----	<0.01
Lead	7439-92-1	0.01	mg/L	----	0.02	0.01	----	<0.01



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC10	TF_WC11	TF_WC12	TF_WC13	TF_WC14
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit	EP2302658-001	EP2302658-002	EP2302658-003	EP2302658-004	EP2302658-005
				Result	Result	Result	Result	Result
EG005(ED093)W: Water Leachable Metals by ICPAES - Continued								
Manganese	7439-96-5	0.01	mg/L	----	0.12	0.03	----	0.08
Nickel	7440-02-0	0.01	mg/L	----	<0.01	<0.01	----	<0.01
Selenium	7782-49-2	0.01	mg/L	----	<0.01	<0.01	----	<0.01
Silver	7440-22-4	0.01	mg/L	----	<0.01	<0.01	----	<0.01
Vanadium	7440-62-2	0.01	mg/L	----	0.02	<0.01	----	0.02
Zinc	7440-66-6	0.01	mg/L	----	0.05	0.03	----	0.03
Molybdenum	7439-98-7	0.01	mg/L	----	0.01	0.03	----	<0.01



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC15	TF_WC16	TF_WC17	TF_WC18	----
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	----
Compound	CAS Number	LOR	Unit	EP2302658-006	EP2302658-007	EP2302658-008	EP2302658-009	-----
				Result	Result	Result	Result	----
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	----	<0.00004	----	----	----
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	<0.0001	<0.0001	----
EG049G-W: Trivalent Chromium in Water Leachates								
Trivalent Chromium	16065-83-1	0.005	mg/L	----	0.017	----	----	----
EG050G LL-W: Hexavalent Chromium in Water Leachates by Discrete Analyser - Low Level								
Hexavalent Chromium	18540-29-9	0.001	mg/L	----	<0.001	----	----	----
EG050G-W: Hexavalent Chromium - Water Leachable								
Hexavalent Chromium	18540-29-9	0.01	mg/L	<0.01	----	<0.01	<0.01	----
EG094W: Water Leachable Metals by ORC-ICPMS								
Antimony	7440-36-0	1.0	µg/L	----	<1.0	----	----	----
Arsenic	7440-38-2	0.2	µg/L	----	5.1	----	----	----
Cadmium	7440-43-9	0.10	µg/L	----	<0.10	----	----	----
Chromium	7440-47-3	5.0	µg/L	----	16.8	----	----	----
Cobalt	7440-48-4	0.1	µg/L	----	1.9	----	----	----
Copper	7440-50-8	2.0	µg/L	----	6.0	----	----	----
Lead	7439-92-1	0.2	µg/L	----	12.4	----	----	----
Manganese	7439-96-5	0.5	µg/L	----	162	----	----	----
Molybdenum	7439-98-7	1.0	µg/L	----	3.3	----	----	----
Nickel	7440-02-0	2.0	µg/L	----	4.7	----	----	----
Selenium	7782-49-2	0.2	µg/L	----	0.3	----	----	----
Silver	7440-22-4	0.2	µg/L	----	<0.2	----	----	----
Thallium	7440-28-0	0.05	µg/L	----	<0.05	----	----	----
Uranium	7440-61-1	0.05	µg/L	----	1.28	----	----	----
Zinc	7440-66-6	5	µg/L	----	39	----	----	----
EG005(ED093)W: Water Leachable Metals by ICPAES								
Aluminium	7429-90-5	0.10	mg/L	6.09	----	9.29	2.18	----
Arsenic	7440-38-2	0.01	mg/L	0.01	----	0.02	0.01	----
Barium	7440-39-3	0.1	mg/L	<0.1	----	<0.1	<0.1	----
Beryllium	7440-41-7	0.01	mg/L	<0.01	----	<0.01	<0.01	----
Boron	7440-42-8	0.1	mg/L	<0.1	----	<0.1	0.2	----
Cadmium	7440-43-9	0.005	mg/L	<0.005	----	<0.005	<0.005	----
Cobalt	7440-48-4	0.01	mg/L	<0.01	----	<0.01	<0.01	----
Copper	7440-50-8	0.01	mg/L	<0.01	----	<0.01	<0.01	----
Lead	7439-92-1	0.01	mg/L	<0.01	----	<0.01	<0.01	----



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC15	TF_WC16	TF_WC17	TF_WC18	----
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	----
Compound	CAS Number	LOR	Unit	EP2302658-006	EP2302658-007	EP2302658-008	EP2302658-009	-----
				Result	Result	Result	Result	----
EG005(ED093)W: Water Leachable Metals by ICPAES - Continued								
Manganese	7439-96-5	0.01	mg/L	0.06	----	0.06	0.02	----
Nickel	7440-02-0	0.01	mg/L	<0.01	----	<0.01	<0.01	----
Selenium	7782-49-2	0.01	mg/L	0.10	----	0.03	0.02	----
Silver	7440-22-4	0.01	mg/L	<0.01	----	<0.01	<0.01	----
Vanadium	7440-62-2	0.01	mg/L	0.01	----	0.02	<0.01	----
Zinc	7440-66-6	0.01	mg/L	0.02	----	0.03	0.01	----
Molybdenum	7439-98-7	0.01	mg/L	<0.01	----	0.01	0.02	----

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC10	TF_WC11	TF_WC12	TF_WC13	TF_WC14
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	
Compound	CAS Number	LOR	Unit	EP2302658-001	EP2302658-002	EP2302658-003	EP2302658-004	EP2302658-005	
				Result	Result	Result	Result	Result	
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	----	8.0	8.0	----	8.1	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	11.4	11.8	32.6	17.4	24.4	
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg	2100	----	----	3040	----	
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg	5070	4150	6160	4470	5560	
Antimony	7440-36-0	5	mg/kg	<5	----	----	<5	----	
Arsenic	7440-38-2	5	mg/kg	<5	<5	37	7	29	
Barium	7440-39-3	10	mg/kg	<10	10	20	10	20	
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1	
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50	
Chromium	7440-47-3	2	mg/kg	10	----	----	10	----	
Cobalt	7440-48-4	2	mg/kg	<2	<2	3	<2	3	
Copper	7440-50-8	5	mg/kg	<5	<5	21	<5	18	
Lead	7439-92-1	5	mg/kg	<5	----	----	7	----	
Manganese	7439-96-5	5	mg/kg	42	48	76	49	64	
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	<2	<2	
Nickel	7440-02-0	2	mg/kg	<2	<2	3	<2	3	
Silver	7440-22-4	2	mg/kg	<2	<2	<2	<2	<2	
Tin	7440-31-5	5	mg/kg	<5	----	----	<5	----	
Vanadium	7440-62-2	5	mg/kg	11	9	13	11	11	
Zinc	7440-66-6	5	mg/kg	6	9	67	14	66	
EG020T: Total Metals by ICP-MS									
Selenium	7782-49-2	1	mg/kg	<1	----	----	<1	----	
Thallium	7440-28-0	0.1	mg/kg	<0.1	----	----	<0.1	----	
Cadmium	7440-43-9	0.1	mg/kg	<0.1	----	----	<0.1	----	
Cadmium	7440-43-9	0.1	mg/kg	----	<0.1	0.2	----	0.2	
Uranium	7440-61-1	0.1	mg/kg	0.5	----	----	0.8	----	
Lead	7439-92-1	0.1	mg/kg	----	8.4	28.4	----	26.8	
Selenium	7782-49-2	1	mg/kg	----	<1	5	----	4	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	
EG048: Hexavalent Chromium (Alkaline Digest)									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC10	TF_WC11	TF_WC12	TF_WC13	TF_WC14
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit		EP2302658-001	EP2302658-002	EP2302658-003	EP2302658-004	EP2302658-005
					Result	Result	Result	Result	Result
EG048: Hexavalent Chromium (Alkaline Digest) - Continued									
Hexavalent Chromium	18540-29-9	0.5	mg/kg		<2.5	<0.5	<0.5	<0.5	<0.5
EG049: Trivalent Chromium									
Trivalent Chromium	16065-83-1	2	mg/kg		10	----	----	10	----
EK040T: Fluoride Total									
Fluoride	16984-48-8	40	mg/kg		70	----	----	100	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		15.4	14.6	13.3	20.0	15.3
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		620	720	1890	1510	900
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		640	730	1900	1530	920
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		167	166	344	263	197
EN60-DI: Bottle Leaching Procedure - Inorganics/Non-Volatile Organics (Glass Vessel)									
Final pH	----	0.1	pH Unit		----	7.8	7.6	----	8.1
EN60-DI: Bottle Leaching Procedure - Inorganics/PFAS (Plastic Vessel)									
Final pH	----	0.1	pH Unit		8.2	----	----	8.0	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		1.78	1.94	2.13	3.85	1.91
EP070: Total Petroleum Hydrocarbons - Speciation									
Aliphatic C16-C35	----	100	mg/kg		<100	----	----	<100	----
Aliphatic > C35	----	100	mg/kg		<100	----	----	<100	----
Aromatic C16-C35	----	90	mg/kg		<90	----	----	<90	----
Aromatic > C35	----	100	mg/kg		<100	----	----	<100	----
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	<100	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	<50	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	<50	----
EP071 SG-S: Total Petroleum Hydrocarbons in Soil - Silica gel cleanup									
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	<50	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC10	TF_WC11	TF_WC12	TF_WC13	TF_WC14
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit		EP2302658-001	EP2302658-002	EP2302658-003	EP2302658-004	EP2302658-005
					Result	Result	Result	Result	Result
EP071 SG-S: Total Petroleum Hydrocarbons in Soil - Silica gel cleanup - Continued									
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	----	<50	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	----	----	0.6	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	----	----	1.2	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	----	----	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	----	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	<10	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC10	TF_WC11	TF_WC12	TF_WC13	TF_WC14
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit		EP2302658-001	EP2302658-002	EP2302658-003	EP2302658-004	EP2302658-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	<50	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	130	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	<100	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	130	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	<50	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	<0.2	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	----	<0.5	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	<1	----
EP070: Total Petroleum Hydrocarbons - Speciation									
2-Bromonaphthalene	580-13-2	1	%		77.0	----	----	84.2	----
2-Fluorobiphenyl	321-60-8	1	%		88.7	----	----	88.7	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		105	----	----	105	----
2-Chlorophenol-D4	93951-73-6	0.5	%		107	----	----	106	----
2,4,6-Tribromophenol	118-79-6	0.5	%		69.9	----	----	80.9	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		111	----	----	110	----
Anthracene-d10	1719-06-8	0.5	%		96.3	----	----	99.2	----
4-Terphenyl-d14	1718-51-0	0.5	%		96.4	----	----	104	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		108	----	----	89.4	----
Toluene-D8	2037-26-5	0.2	%		83.7	----	----	73.9	----
4-Bromofluorobenzene	460-00-4	0.2	%		100	----	----	92.7	----

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC15	TF_WC16	TF_WC17	TF_WC18	TF_ASS10
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	
Compound	CAS Number	LOR	Unit	EP2302658-006	EP2302658-007	EP2302658-008	EP2302658-009	EP2302658-010	
				Result	Result	Result	Result	Result	
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	8.2	----	8.2	7.6	----	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	----	----	----	----	8.8	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	----	<2	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	----	----	<0.02	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	----	----	----	0.272	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	----	----	----	170	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	----	6.89	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	----	1380	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	----	2.21	
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	----	<0.02	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	----	<10	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	----	<0.02	
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	----	----	<0.02	
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	<0.02	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	----	----	----	----	1.5	
Net Acidity (sulfur units)	----	0.02	% S	----	----	----	----	<0.02	
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	----	----	<10	
Liming Rate	----	1	kg CaCO3/t	----	----	----	----	<1	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	----	----	0.27	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	----	----	170	
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	----	----	13	
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit	----	----	----	----	7.5	
ø pH (Fox)	----	0.1	pH Unit	----	----	----	----	5.9	
ø Reaction Rate	----	1	-	----	----	----	----	Extreme	
EA055: Moisture Content (Dried @ 105-110°C)									

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC15	TF_WC16	TF_WC17	TF_WC18	TF_ASS10
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	
Compound	CAS Number	LOR	Unit	EP2302658-006	EP2302658-007	EP2302658-008	EP2302658-009	EP2302658-010	
				Result	Result	Result	Result	Result	
EA055: Moisture Content (Dried @ 105-110°C) - Continued									
Moisture Content	----	1.0	%	16.4	14.0	20.8	29.2	----	
ED040: Sulfur as SO4 2-									
Sulfate as SO4 2-	14808-79-8	100	mg/kg	----	1420	----	----	----	
EG005(ED093)T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg	4080	3960	4460	4800	----	
Antimony	7440-36-0	5	mg/kg	----	<5	----	----	----	
Arsenic	7440-38-2	5	mg/kg	8	7	9	9	----	
Barium	7440-39-3	10	mg/kg	10	10	10	10	----	
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	----	
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	----	
Chromium	7440-47-3	2	mg/kg	----	8	----	----	----	
Cobalt	7440-48-4	2	mg/kg	<2	<2	<2	<2	----	
Copper	7440-50-8	5	mg/kg	<5	<5	6	6	----	
Lead	7439-92-1	5	mg/kg	----	7	----	----	----	
Manganese	7439-96-5	5	mg/kg	54	50	60	59	----	
Molybdenum	7439-98-7	2	mg/kg	<2	<2	<2	<2	----	
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	----	
Silver	7440-22-4	2	mg/kg	<2	<2	<2	<2	----	
Tin	7440-31-5	5	mg/kg	----	<5	----	----	----	
Vanadium	7440-62-2	5	mg/kg	10	10	11	13	----	
Zinc	7440-66-6	5	mg/kg	15	15	19	16	----	
EG020T: Total Metals by ICP-MS									
Selenium	7782-49-2	1	mg/kg	----	<1	----	----	----	
Thallium	7440-28-0	0.1	mg/kg	----	<0.1	----	----	----	
Cadmium	7440-43-9	0.1	mg/kg	----	<0.1	----	----	----	
Cadmium	7440-43-9	0.1	mg/kg	<0.1	----	<0.1	<0.1	----	
Uranium	7440-61-1	0.1	mg/kg	----	0.6	----	----	----	
Lead	7439-92-1	0.1	mg/kg	8.3	----	10.4	9.5	----	
Selenium	7782-49-2	1	mg/kg	<1	----	1	1	----	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----	
EG048: Hexavalent Chromium (Alkaline Digest)									
Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
EG049: Trivalent Chromium									



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC15	TF_WC16	TF_WC17	TF_WC18	TF_ASS10
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit		EP2302658-006	EP2302658-007	EP2302658-008	EP2302658-009	EP2302658-010
					Result	Result	Result	Result	Result
EG049: Trivalent Chromium - Continued									
Trivalent Chromium	16065-83-1	2	mg/kg		----	8	----	----	----
EK040T: Fluoride Total									
Fluoride	16984-48-8	40	mg/kg		----	80	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		13.4	12.8	22.4	20.5	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg		620	680	500	3600	----
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg		630	690	520	3620	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg		165	174	149	499	----
EN60-DI: Bottle Leaching Procedure - Inorganics/Non-Volatile Organics (Glass Vessel)									
Final pH	----	0.1	pH Unit		8.2	----	8.0	7.4	----
EN60-DI: Bottle Leaching Procedure - Inorganics/PFAS (Plastic Vessel)									
Final pH	----	0.1	pH Unit		----	8.3	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		1.84	1.98	2.75	5.22	----
EP070: Total Petroleum Hydrocarbons - Speciation									
Aliphatic C16-C35	----	100	mg/kg		----	<100	----	----	----
Aliphatic > C35	----	100	mg/kg		----	<100	----	----	----
Aromatic C16-C35	----	90	mg/kg		----	<90	----	----	----
Aromatic > C35	----	100	mg/kg		----	<100	----	----	----
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	50	mg/kg		----	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		----	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	----	----	----
EP071 SG-S: Total Petroleum Hydrocarbons in Soil - Silica gel cleanup									
C10 - C14 Fraction	----	50	mg/kg		----	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg		----	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg		----	<100	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC15	TF_WC16	TF_WC17	TF_WC18	TF_ASS10
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit		EP2302658-006	EP2302658-007	EP2302658-008	EP2302658-009	EP2302658-010
					Result	Result	Result	Result	Result
EP071 SG-S: Total Petroleum Hydrocarbons in Soil - Silica gel cleanup - Continued									
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg		----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg		----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg		----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg		----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg		----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg		----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	<0.5	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		----	<0.5	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		----	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		----	1.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		----	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg		----	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg		----	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg		----	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		----	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		----	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		----	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		----	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		----	<100	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC15	TF_WC16	TF_WC17	TF_WC18	TF_ASS10
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit		EP2302658-006	EP2302658-007	EP2302658-008	EP2302658-009	EP2302658-010
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C34 - C40 Fraction	----	100	mg/kg		----	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		----	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		----	<50	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg		----	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		----	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		----	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		----	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		----	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg		----	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg		----	<1	----	----	----
EP070: Total Petroleum Hydrocarbons - Speciation									
2-Bromonaphthalene	580-13-2	1	%		----	80.7	----	----	----
2-Fluorobiphenyl	321-60-8	1	%		----	86.7	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		----	103	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		----	105	----	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%		----	70.8	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		----	107	----	----	----
Anthracene-d10	1719-06-8	0.5	%		----	95.8	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		----	100	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		----	114	----	----	----
Toluene-D8	2037-26-5	0.2	%		----	91.6	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		----	109	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TF_ASS11	TF_ASS12	TF_ASS13	TF_ASS14	TF_ASS15
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit	EP2302658-011	EP2302658-012	EP2302658-013	EP2302658-014	EP2302658-015
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	8.9	----	6.4	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.272	----	1.25	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	170	----	778	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	9.17	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	1830	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	2.94	----	----	----
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	<0.02	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	<10	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.02	----	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	<0.02	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	<0.02	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	1.25	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	780	----
Liming Rate	----	1	kg CaCO3/t	----	<1	----	59	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.27	----	1.25	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	170	----	780	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	13	----	59	----
EA037: Ass Field Screening Analysis								
ø pH (F)	----	0.1	pH Unit	7.5	7.4	7.6	7.6	7.3
ø pH (Fox)	----	0.1	pH Unit	6.4	6.5	6.0	3.2	5.8
ø Reaction Rate	----	1	-	Extreme	Extreme	Extreme	Extreme	Strong



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_ASS16	TF_ASS17	TF_ASS18	TF_ASS19	TF_ASS20
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00
Compound	CAS Number	LOR	Unit		EP2302658-016	EP2302658-017	EP2302658-018	EP2302658-019	EP2302658-020
					Result	Result	Result	Result	Result
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		8.9	----	8.3	----	9.1
Titrateable Actual Acidity (23F)	----	2	mole H+ / t		<2	----	<2	----	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	----	<0.02	----	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		0.120	----	0.497	----	0.141
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		75	----	310	----	88
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		5.69	----	3.46	----	11.0
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		1140	----	692	----	2200
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		1.82	----	1.11	----	3.54
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	----	<0.02	----	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	----	<10	----	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	----	<0.02	----	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.02	----	<0.02	----	<0.02
HCl Extractable Sulfur (20Be)	----	0.02	% S		<0.02	----	<0.02	----	<0.02
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	----	1.5	----	1.5
Net Acidity (sulfur units)	----	0.02	% S		<0.02	----	<0.02	----	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		<10	----	<10	----	<10
Liming Rate	----	1	kg CaCO3/t		<1	----	<1	----	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.12	----	0.50	----	0.14
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		75	----	310	----	88
Liming Rate excluding ANC	----	1	kg CaCO3/t		6	----	23	----	7
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit		7.5	7.4	7.3	7.5	7.6
ø pH (Fox)	----	0.1	pH Unit		5.8	6.4	6.1	5.9	6.0
ø Reaction Rate	----	1	-		Strong	Extreme	Extreme	Extreme	Strong



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_ASS21	TF_ASS22	TF_ASS23	TF_ASS24	TF_ASS25
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	
Compound	CAS Number	LOR	Unit	EP2302658-021	EP2302658-022	EP2302658-023	EP2302658-024	EP2302658-025	
				Result	Result	Result	Result	Result	
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit	----	8.6	----	9.1	----	
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	<2	----	
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	<0.02	----	<0.02	----	
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.442	----	0.178	----	
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	276	----	111	----	
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	5.10	----	8.66	----	
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	1020	----	1730	----	
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	1.63	----	2.77	----	
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	<0.02	----	<0.02	----	
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	<10	----	<10	----	
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.02	----	<0.02	----	
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	<0.02	----	<0.02	----	
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	<0.02	----	<0.02	----	
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-	----	1.5	----	1.5	----	
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	<0.02	----	
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	<10	----	
Liming Rate	----	1	kg CaCO3/t	----	<1	----	<1	----	
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.44	----	0.18	----	
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	276	----	111	----	
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	21	----	8	----	
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit	7.5	7.6	7.5	7.6	7.3	
ø pH (Fox)	----	0.1	pH Unit	5.8	5.1	5.8	6.4	5.6	
ø Reaction Rate	----	1	-	Strong	Extreme	Extreme	Extreme	Strong	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_ASS26	TF_ASS27	TF_ASS28	----	----
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EP2302658-026	EP2302658-027	EP2302658-028	-----	-----
					Result	Result	Result	----	----
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		8.6	----	8.8	----	----
Titrateable Actual Acidity (23F)	----	2	mole H+ / t		<2	----	<2	----	----
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	----	<0.02	----	----
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		0.152	----	0.171	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		95	----	107	----	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		6.64	----	5.21	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		1330	----	1040	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		2.13	----	1.67	----	----
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	----	<0.02	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	----	<10	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	----	<0.02	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.02	----	<0.02	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		<0.02	----	<0.02	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	----	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S		<0.02	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		<10	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t		<1	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.15	----	0.17	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		95	----	107	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t		7	----	8	----	----
EA037: Ass Field Screening Analysis									
ø pH (F)	----	0.1	pH Unit		7.7	7.5	7.5	----	----
ø pH (Fox)	----	0.1	pH Unit		5.9	6.0	5.8	----	----
ø Reaction Rate	----	1	-		Strong	Strong	Strong	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP070: Total Petroleum Hydrocarbons - Speciation			
2-Bromonaphthalene	580-13-2	70	130
2-Fluorobiphenyl	321-60-8	70	130
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	57	119
2-Chlorophenol-D4	93951-73-6	52	130
2,4,6-Tribromophenol	118-79-6	40	132
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	53	139
Anthracene-d10	1719-06-8	68	124
4-Terphenyl-d14	1718-51-0	66	132
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	63	132
Toluene-D8	2037-26-5	66	125
4-Bromofluorobenzene	460-00-4	60	124

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EP003: Total Organic Carbon (TOC) in Soil

Analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no. 13778 (Chemistry).

(SOIL) EK040T: Fluoride Total



CERTIFICATE OF ANALYSIS

Work Order : EP2303864
Client : 360 ENVIRONMENTAL PTY LTD
Contact : ALYSIA WOODWARD
Address : 10 Bermondsey St
West Leederville 6007
Telephone : +61 08 93210420
Project : 4602.5 Lower Vasse River Dredge Monitoring
Order number : 4602.5
C-O-C number : ----
Sampler : PAUL ROBERTSON
Site : ----
Quote number : EP/205/23_V2
No. of samples received : 3
No. of samples analysed : 3

Page : 1 of 5
Laboratory : Environmental Division Perth
Contact : Genevieve De Souza
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 03-Mar-2023 16:30
Date Analysis Commenced : 28-Mar-2023
Issue Date : 11-Apr-2023 10:28



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
- Surrogate Control Limits

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
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Rassem Ayoubi	Senior Organic Chemist	Sydney Organics, 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 Contract 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.

- EP131A-ST conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- This workorder is a rebatch of EP2302658.



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Sample ID

				TF_WC10	TF_WC13	TF_WC17	----	----
Sampling date / time				02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	EP2303864-001	EP2303864-002	EP2303864-003	-----	-----
				Result	Result	Result	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.3	0.2	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.12	0.07	0.48	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.78	1.09	0.48	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.5	1.9	2.2	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	3.3	3.0	2.7	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.43	0.26	0.32	----	----
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.001	µg/L	<0.001	<0.001	<0.001	----	----
4,4'-DDD	72-54-8	0.002	µg/L	<0.002	<0.002	<0.002	----	----
4,4'-DDE	72-55-9	0.002	µg/L	<0.002	<0.002	<0.002	----	----
4,4'-DDT	50-29-3	0.002	µg/L	<0.002	<0.002	<0.002	----	----
Dieldrin	60-57-1	0.002	µg/L	<0.002	<0.002	<0.002	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.002	µg/L	<0.002	<0.002	<0.002	----	----
EG005(ED093)W: Water Leachable Metals by ICPAES								
Aluminium	7429-90-5	0.10	mg/L	13.0	4.39	16.4	----	----
Boron	7440-42-8	0.1	mg/L	<0.1	0.1	<0.1	----	----
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.002	%	81.7	108	114	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	TF_WC10	TF_WC13	TF_WC17	----	----
Sampling date / time					02-Mar-2023 00:00	02-Mar-2023 00:00	02-Mar-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EP2303864-001	EP2303864-002	EP2303864-003	-----	-----
					Result	Result	Result	----	----
EN60-DI: Bottle Leaching Procedure - Inorganics/Non-Volatile Organics (Glass Vessel)									
Final pH	----	0.1	pH Unit		8.2	7.9	8.2	---	---



Surrogate Control Limits

Sub-Matrix: DI WATER LEACHATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	41	136

Inter-Laboratory Testing

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

(WATER) EP131A: Organochlorine Pesticides

(WATER) EP131S: OC Pesticide Surrogate