Campvale Canal Options Investigations

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Hunter Water Corporation in partnership with Port Stephens Council

SR00036

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Project Manager:	Lewis Schneider
Author:	Lewis Schneider, Edward Moss, Jorja Vernon, Lih Chong, Shay Riley-Lewis
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Jacobs Australia Pty Ltd.

Level 4, 12 Stewart Avenue
Newcastle West, NSW 2302
PO Box 2147
Dangar, NSW 2309
Australia
T +61 2 4979 2600
F +61 2 4979 2666
www.jacobs.com

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Executive Summary

Jacobs were engaged by Hunter Water Corporation (HWC) to investigate options to widen and deepen Campvale Canal to improve conveyance through the current restriction known as the “pinch point”. The aim of these works is to minimise long duration inundation within Campvale Drain Inundation Area (CDIA), without negatively impacting on the water quality entering Grahamstown Dam or having other adverse environmental impacts.

Initially three options (2a, 2b, 2c) were explored, each with the same cross section (1m base width, 3H:1V batters) but varying longitudinal profiles. The options were developed to test the sensitivity of improvements to inundation and reduced risks of blackwater events against water quality function. A fourth option (2e) was later developed as a means to reduce the quantity of material excavated as opposed to Option 2c.

This investigation explored the water quality, ecological and environmental risks to Grahamstown Dam from the construction works and from the new altered hydrological regime imposed by modification of the pinch. Key findings from the investigations include:

- The canal widening options were successful at reducing the occurrences of inundation exceeding 10days duration within the CDIA. However, each of the options would also reduce the water-quality-treatment capacity of the wetland, to varying extents (3% to 31% reduction in Total Nitrogen). Therefore none of the options identified would achieve the objective of improving the inundation issue without impacting on water quality entering Grahamstown Dam.
- All options with the exception of 2e increase the potential of short duration dry periods within the wetland. The resulting additional drying of the wetland may increase the risk of exposing acid sulphate soils (ASS) to the atmosphere where they can oxidise and produce sulfuric acids and iron compounds. This may pose a risk to the aquatic ecosystem and to Grahamstown Dam water quality downstream as subsequent wetting of the soils and mobilisation of flows could exacerbate already acidic conditions in the canal and wetland.
- While some water quality monitoring has been previously undertaken in Campvale canal and the discharge point in Grahamstown Dam, the routine monitoring program was not designed to identify the occurrence of black water events. As such the data does not allow for the identification or analysis of blackwater events and potential correlations to rainfall and inundation events in the CDIA.
- There are uncertainties about the occurrence of blackwater events in the CDIA such as the duration of ponding required to produce blackwater events in the conditions specific to the CDIA. Johnston et al. (2003) suggests the duration to initiate anaerobic conditions can be variable (between three and 20 days), depending on weather conditions, vegetation species and the amounts of vegetation litter in the inundated area.
- It is not known how influential the Campvale canal inflows are to the overall water quality of the Dam, considering that these inflows are minor (approximately 6% of total inflows) compared to other inflows such as the offtake from the Williams River.
- The estimated increase in the number of additional short duration (less than 10 days) dry periods is not expected to impact on the overall function of the wetland nor are the proposed options expected to result in the wetland becoming terrestrialised. Simplistically the CDIA is a natural low point through which all the catchment runoff needs to flow through to reach the pinch and will continue to retain a permanent level of ponding, albeit a slight reduction (except Option 2e) due to improved conveyance through the pinch from lowering of outlet level. Note outlet level
- A review of LIDAR survey indicates the mapped Coastal Wetlands is located above the permanent water level in CDIA and therefore no impacts associated with change to permanent inundation are expected. The coastal wetland would continue to only be intermitted inundated when CDIA is in flood. More detailed investigations would be required to confirm these impacts.
- Improved conveyance as a result of the proposed options could impact on groundwater dependent ecosystems (GDEs) such that they may be impacted by changes in the wetting and drying cycle associated with all options (except option 2e). Groundwater assessment is outside the scope of this investigation.

- In addition to water quality changes, the anticipated altered water regime of the wetland is not expected to result in any long term or significant impacts to the overall ecological function of the wetland. However, to confirm how the altered water regime could impact on GDE function, an ecohydrological study would be required.
- Through field screening and quantitative laboratory analysis of the sediment and soil samples collected potential acid sulphate soils (PASS) has been identified in the Campvale Drain bottom sediments and soils. During handling of the generated soils and sediments, treatment and neutralisation of the PASS is required in accordance with ASSMAC (1998) and the ASSMP to be prepared for the site.
- Significant quantities of excavated material are generated from the options and due to narrow easement, there are no opportunities to spoil within the existing easement. Given the PASS, the spoil material would therefore require an environmental protection licence to process material and move offsite within Port Stephens LGA following successful treatment and verification for PASS. Following successful treatment and verification for PASS, the excavated material would have a preliminary offsite waste classification of 'General Solid Waste (non-putrescible)' and could be disposed of at waste disposal site but would incur significant disposal costs including waste disposal levy.
- Option 2c and 2e are the most favourable (due to their lower cost while still providing some level of reduction to the inundation times) however both still result in a reduction in the water quality treatment function of CDIA. If an engineering solution were to proceed then Option 2e would be preferred due to its lower impacts on water quality. If either of these options are implemented, additional catchment management interventions should be considered in the upstream catchment with the objective of reducing stormwater pollutant loads (TN, TP, TSS etc.). The catchment interventions would aim to compensate for the loss of treatment function and effectively maintain the same pollutant loads entering Grahamstown Dam as the existing case.
- The most likely delivery costs for the most favourable options ranges from Option 2c - $6.9 to Option 2e - $7.2M

The findings of this study indicate that through canal widening it is not possible to balance the removal of water from the wetland area to minimise inundation, whilst not impacting on the water quality entering Grahamstown Dam. Uncertainties about the occurrence of blackwater events in the CDIA and the ability to detect it in current routine monitoring program coupled with high capital construction costs, environmental impacts and water quality impacts worse than existing, it is recommended at this stage to adopt a least-risk approach and maintain the existing water quality treatment functioning and drainage conditions in CDIA.

1. Introduction

1.1 Background

The Campvale canal is an excavated earth channel located to the southwest of the township of Medowie, NSW and provides an outlet for the Campvale Drain Inundation Area (CDIA). The canal conveys water from the CDIA to Grahamstown Dam, where it is pumped from the canal to the reservoir via a pump station located adjacent to Grahamstown Road.

The CDIA is a large natural topographic low point with low flow outlet (canal) which acts as a detention basin, capturing runoff from the contributing catchment and filtering rainwater runoff. Landowners within the CDIA experience regular inundation of their land, at times for extended durations, due to capacity constraints of the Campvale canal and the localised constriction known as "the pinch". The inundation within CDIA may cause water quality concerns, as the extended retention time may lead to water becoming anaerobic which can result in release of metals and nutrients from sediments (Johnston S.G., Slavich P.G., Sullivan L.A. and Hirst P. (2003) Artificial drainage of floodwaters from sulfidic backswamps: effects on deoxygenation in an Australian estuary. Marine and Freshwater Research 54, 781-795).

Hunter Water Corporation (HWC) and Port Stephens Council (PSC) previously commissioned a water balance assessment to determine potential management options to reduce flooding within the Campvale area.

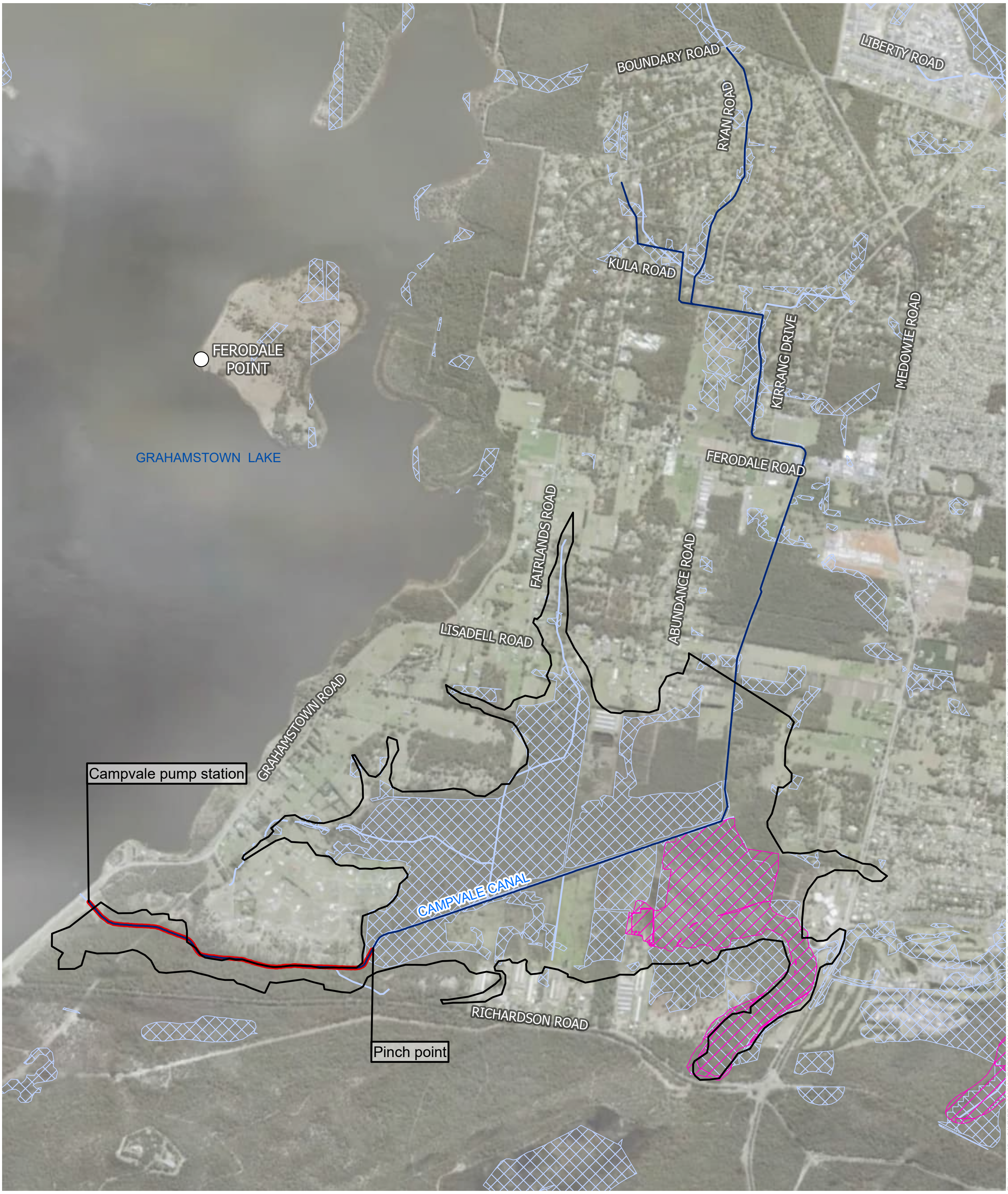
The preferred option from a previous Options Assessment (Option 2 from the Campvale Swamp Options Assessment Final Report, December 2020) is to widen and deepen approximately 1.7km of the pinch area within Campvale Canal. The second-ranked option (Option 3) is the installation of a small pump station and rising main to pump water around the pinch.

Jacobs have been engaged by HWC who are working in partnership with PSC to investigate options for minimising long duration inundation and maintaining or improving the water quality regime at Campvale Canal. This involves undertaking the assessment of options, constraints mapping, assessment of environmental impacts and develop of cost estimates to assist both organisations to make an informed decision on project feasibility. The solution needs to balance the need to remove water from the wetland area to minimise long duration inundation, whilst not impacting on the water quality entering Grahamstown Dam or causing other adverse environmental impacts.

Figure 1-1 shows an overview of Campvale Canal, its locality and key features pertaining to this project.

Note the CDIA area depicted has been digitised from the PSC Medowie Floodplain Risk Management Study and Plan (April 2016) and therefore the representation of CDIA extents, pertains to the level of accuracy of data used within that study.

For context, the extent of wetland mapping from Department of Planning and Environment (DPE) 2021 has been overlaid to enable comparison with CDIA. It can be seen that large portion of the CDIA upstream of the pinch is also mapped as wetland.



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Date: 4/07/2022 Created by : XX | QA by : XX

🟥	Proposal area
━	Campvale Canal
☐	Campvale drain inundation area (digitised from PSC Medowie Floodplain Risk Management Study
─	Watercourse
▨	Wetland (DPE 2021)
▨	Coastal Management Act - Wetlands

0 400 800 m

1:30,000 at A4

GDA 1994 MGA Zone 56

Data sources

Jacobs 2022
Aerometrex 2021
Department of Planning and Environment 2021
© Department of Customer Service 2020

Figure 1-1 Campvale Canal Overview

1.2 Purpose of report

The purpose of this report is to document the findings from investigations and assessments undertaken in exploring the high-level feasibility of preferred options for improvements to Campvale Canal to minimise long duration inundation. This will be achieved through understanding the water quality risks to Grahamstown Dam from the construction works and from the new altered hydrological regime imposed by modification of the pinch.

This report captures the following scope:

- Hydraulic Modelling
- Water Quality and Aquatic Ecology Assessment
- Contamination Assessment
- Environmental Constraints Mapping
- Environmental Planning Approval Advice
- Cost Estimation

1.3 Limitations

The sole purpose of this report and the associated services performed by Jacobs is to investigate the modifications to Campvale Canal and document key findings in accordance with the scope of services set out in the contract (and service request SR00036) between Jacobs and Hunter Water Corporation ('the Client'). That scope of services, as described in this report, was developed with the Client. HWC and Port Stephens Council are working on this project together and although engaged by HWC it is a joint project by both organisations.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full, and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, the Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

The subsurface environment can present substantial uncertainty due to it complex heterogeneity. Soil samples collected for contamination purposes are intended to be representative only of the broader Campvale Drain. Where required, sample locations and depths were relocated based on safety constraints, accessibility, and sample recovery. The conclusions presented in this report are based on limited investigation of conditions at specific sampling locations chosen. However, it is possible that this investigation may not have encountered all areas of contamination at the site due to the limited sampling and testing program undertaken.

1.3.1 Cost estimates

The sole purpose of the estimates in this report is to provide a project cost estimate for the Campvale Canal Options Assessment in accordance with the scope of services set out in the contract between Jacobs and Hunter Water Corporation. The scope of services, as described in this report, was developed with the Client.

This report is strictly indicative only and includes indicative estimated quantities, rates, values, etc. for various items. The report does not provide a guarantee that the indicative prices, quantities, or rates (individual or groups) will be required/obtained or that the break-down provided will match those submitted by Contractors / Sub-contractors, etc.

The Client acknowledges and accepts that the estimate is based on current cost estimates and that the Consultant has no control over cost fluctuations in labour or materials to be ultimately used in the project.

1.3.2 Cost Plan/Estimate Accuracy

Jacobs classifies cost plans and estimates, based on the amount and quality of information available at the time the estimate is developed. The amount of time available and effort expended to prepare the estimate has a significant bearing on the expected accuracy range.

As such, the level of accuracy, in this case, is based on a Class 4 Estimate due to the level of project definition being in the order of 1% to 15% design thus leading to an Expected Estimate range in the region of -20% to +50% as shown in Table 1-1.

Table 1-1 The Expected Accuracy Ranges stated in the Cost Estimate Classification Matrix

	Primary Characteristics	Secondary Characteristic		
ESTIMATE CLASS	**LEVEL OF PROJECT DEFINITION** Expressed as % of complete definition	**END USAGE** Typical purpose of the estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges [a]
Class 5 (Order of Magnitude)	***0% to 2%***	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	**L: -20% to -50%** **H: +30% to +100%**
Class 4 (Preliminary)	***1% to 15%***	Study or Feasibility	Equipment Factored or Parametric Models	**L: -15% to -30%** **H: +20% to +50%**
Class 3 (Early Budget)	***10% to 40%***	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	**L: -10% to -20%** **H: +10% to +30%**
Class 2 (Budget/Control)	***30% to 70%***	Control or Bid / Tender	Detailed Unit Cost with Forced Detailed Take-off	**L: -5% to -15%** **H: +5% to +20%**
Class 1 (Definitive/Construction)	***50% to 100%***	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	**L: -3% to -10%** **H: +3% to +15%**

The availability of applicable reference cost data affects the range markedly. The +/- value represents the typical percentage variation of actual costs from the cost estimate after the application of contingency for the given scope.

2. Hydraulic assessment

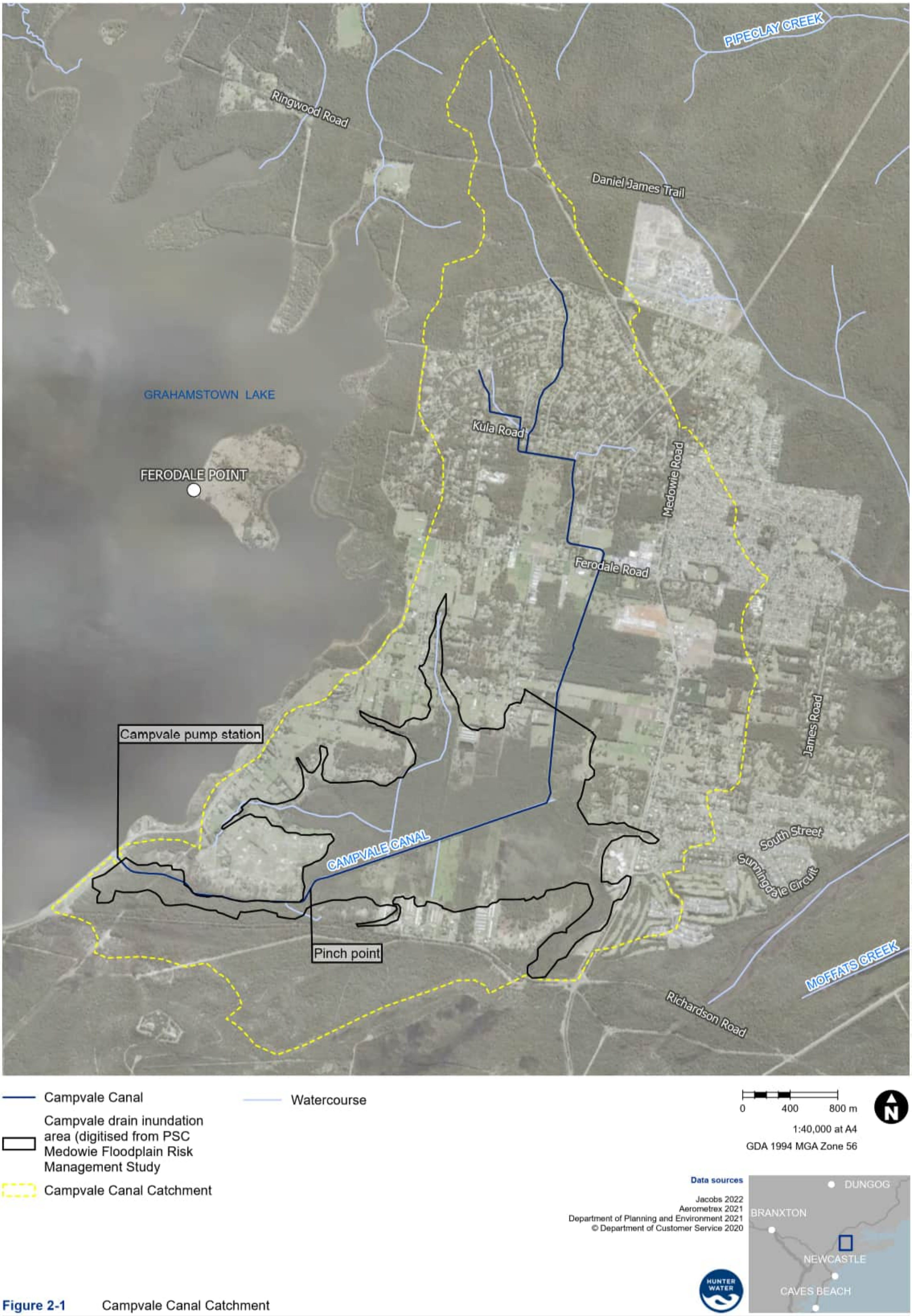
2.1 Background

The hydraulic assessment undertaken in this study was based on the hydrologic, hydraulic and water balance/water quality modelling previously undertaken by the Cooperative Research Centre (CRC) for Water Sensitive Cities for the Campvale Swamp Options Assessment (CRC, 2020) for HWC and PSC as a part of the preceding stage of this project. The scope of the CRC study was to complete a water balance assessment and report on potential management options to reduce flooding within the CDIA whilst protecting water quality pumped from the CDIA to Grahamstown Reservoir.

The CRC study assessed the existing drainage conditions and broadly assessed the potential options under scenarios including existing and future climate and catchment development conditions. Assessment of options considered a range of multi-aspect criteria, including frequency, extent and duration of property flooding, water quality of flows from the Campvale wetland to Grahamstown Dam, economic costs and political/organisation support for the options. The potential options assessed included regular maintenance (excess vegetation and sedimentation removal), channel upgrade and a new pump station to pump flows around the pinch.

2.2 Existing conditions

The CDIA is a flat, low-lying wet area which receives runoff from a 20.5km^2 catchment in the suburbs of Campvale and Medowie, to the east of Grahamstown Dam. The catchment includes urban, rural and rural residential land uses. Figure 2-1 shows the catchment area for Campvale Canal relative to the CDIA.



Data sources

Jacobs 2022
Aerometrex 2021
Department of Planning and Environment 2021
© Department of Customer Service 2020

Figure 2-1 Campvale Canal Catchment

The low-lying parts of the CDIA are mainly forested. The areas immediately bordering the forested areas are predominantly rural and rural residential, generally with a mix of open paddocks and vegetated areas. Elevations in the CDIA are above 5.2m AHD based on LiDAR which probably reflects the permanent water level, though lower ground elevations are expected down to about 4.2m AHD but not detected by LiDAR due to ponded water. Existing development (dwellings, sheds etc.) are generally situated at elevations of 6.5m AHD and higher. Some dwellings are located on raised fill pads and are surrounded by lower ground. Paddocks are mainly used for grazing, with a number of horse stud farms located in the area. Figure 2-2 shows the extents of inundation and land up to different elevations.

Water in the CDIA drains out at its south-western end via the Campvale Canal, at a location known as “the pinch”, which is an area of slightly higher land which constrains flows from more freely flowing out via the canal. There is a high point in the bed level of the canal itself at the pinch. Water then flows down the canal to the pump station at Grahamstown Dam, where it is pumped into the reservoir itself. The pump station consists of four separate pumps each with a capacity of 1.35m^3/s and a total capacity of 5.4m^3/s.

Landholders within the CDIA experience frequent inundation of their land, often for several days at a time, due to the flat topography and naturally impeded drainage of the CDIA. Planned future urban developments in the Medowie catchment will likely exacerbate this situation unless remedial action is taken to improve the drainage of ponded waters from the CDIA (CRC, 2020).

The CDIA provides an important natural filtering function for stormwater flows entering the CDIA from upstream land uses prior to this stormwater being pumped from the CDIA into Grahamstown Dam. As a natural topographic low point in the catchment with a nominal low flow channel (Campvale canal), the CDIA rapidly fills with stormwater during heavy seasonal rainfall events. Particulates transported within the stormwater runoff are readily filtered within the CDIA by physical processes, mostly sedimentation.

For a conceptual understanding of the water treatment processes in surface water wetlands refer to:

https://wetlandinfo.des.qld.gov.au/wetlands/management/treatment-systems/

However, during periods of extended ponding the stormwater detained in the CDIA can become anaerobic which promotes nutrients and environmentally toxic metals to be released from the sediments.

Johnston et al. (2003) suggests that the ponding duration to initiate anaerobic conditions could be around 10 days, based on research on coastal wetlands on the NSW North Coast, although the duration to initiate anaerobic conditions can be variable (between three and 20 days), depending on weather conditions, vegetation species and the amounts of vegetation litter in the inundated area. Warm weather conditions with higher levels of vegetation litter and presence of non-wetland vegetation species are expected to promote anaerobic conditions over shorter durations, while cool weather, low levels of dead vegetation matter and dominance of wetland-type vegetation species would require longer durations of inundation to produce anaerobic conditions. This advice was provided to HWC by DPE and UNSW Water Research Laboratory (WRL) in a meeting on 13 September 2021.

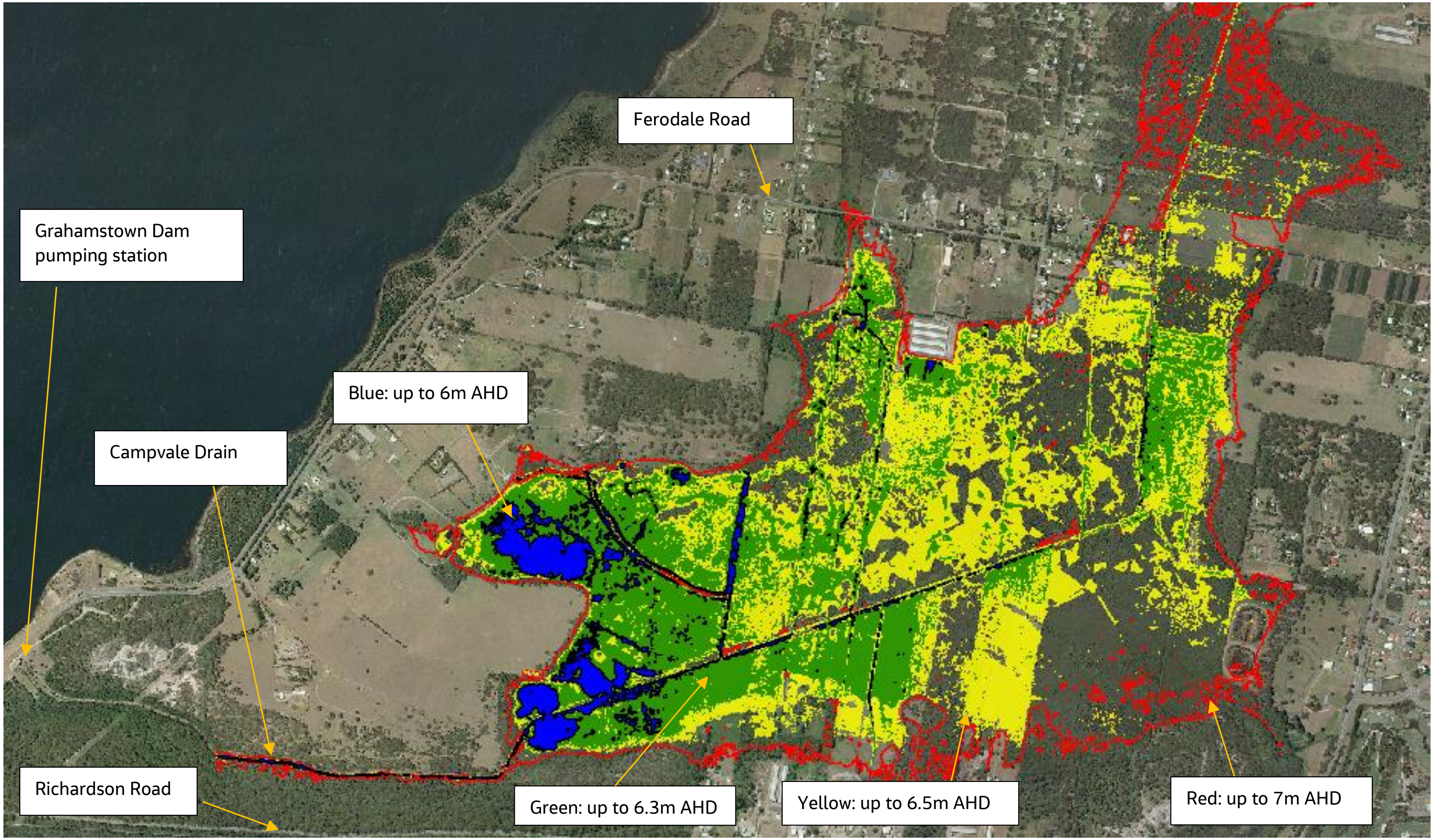


Figure 2-2 Extents of inundation at different water levels in Campvale Drainage Investigation Area

2.3 Methodology

2.3.1 Assessment steps

The steps in the hydraulic assessment included the following:

- Review of available models
- Update of models for the basis of assessment
- Confirmation of assessment objectives and criteria
- Define existing and proposed case hydraulic and water quality conditions
    - Run hydraulic model for different channel configurations and for a range of flows, to derive stage – discharge relationship for each configuration
    - Input the stage – discharge relationship into the water balance model and determine flooding/inundation and water quality conditions.
- Review of each proposed case option against objectives and criteria to select preferred option.

2.3.2 Review of available models

2.3.2.1 HEC-RAS hydraulic model

A HEC-RAS hydraulic model from the CRC study was provided and used as a basis for the hydraulic modelling in this current study. The model represented the Campvale canal from the Grahamstown Dam pump station up to about 1940m upstream of the pump station, and about 200m upstream of the pinch. The model terrain is based on 1m LiDAR (dated 2013), 2000 channel survey, 2014 channel survey and 2019 channel centerline survey (CRC, 2020). The extent of the model is shown on Figure 2-3.

The supplied model included geometry for the following scenarios:

- Existing case, with dense channel vegetation. Manning's n (hydraulic roughness parameter) = 0.1. It was observed that the model did not represent the existing timber bridge crossing located at the pinch (see Figure 2-4).
- Design case, with an upgraded channel cut into the canal in "clean"/maintained condition, minimal channel vegetation. Manning's n = 0.035. It was observed that the design case channel was not cut into the existing terrain accurately in some sections of the canal, refer to Figure 2-5. Modelling undertaken in this study improved the representation of the design case channel.

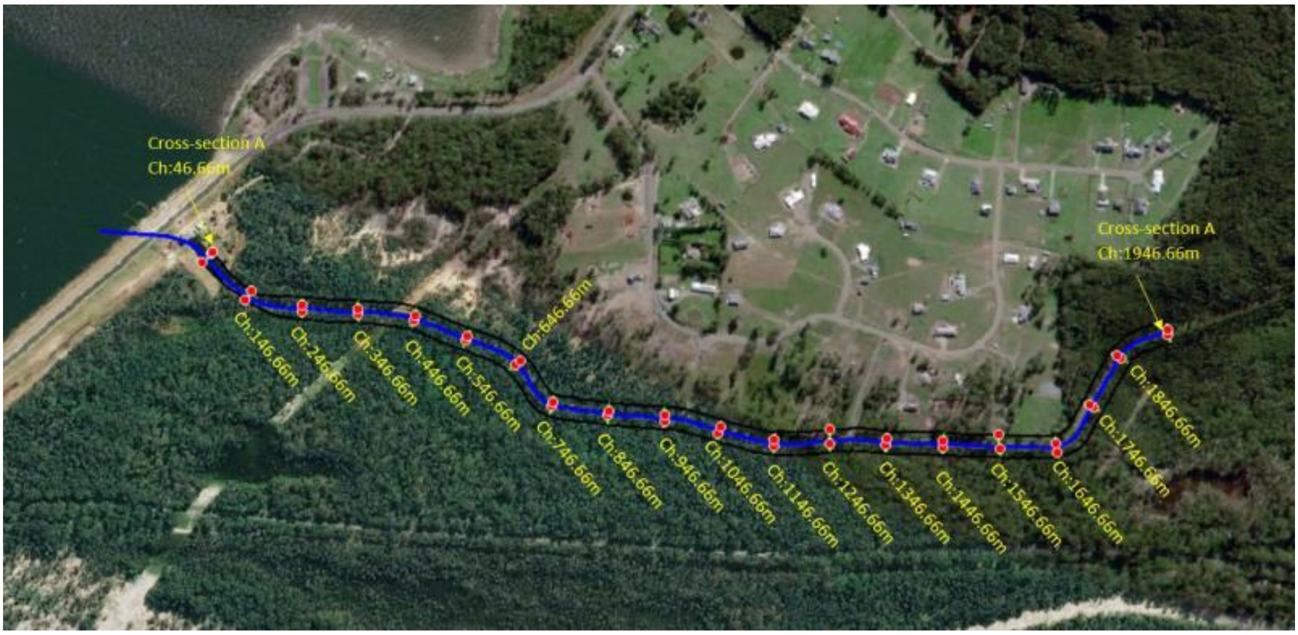


Figure 2-3 Locations of cross section stations in HEC-RAS model (source: CRC, 2020)

Figure 2-4 Existing timber bridge crossing of Campvale Canal at the pinch

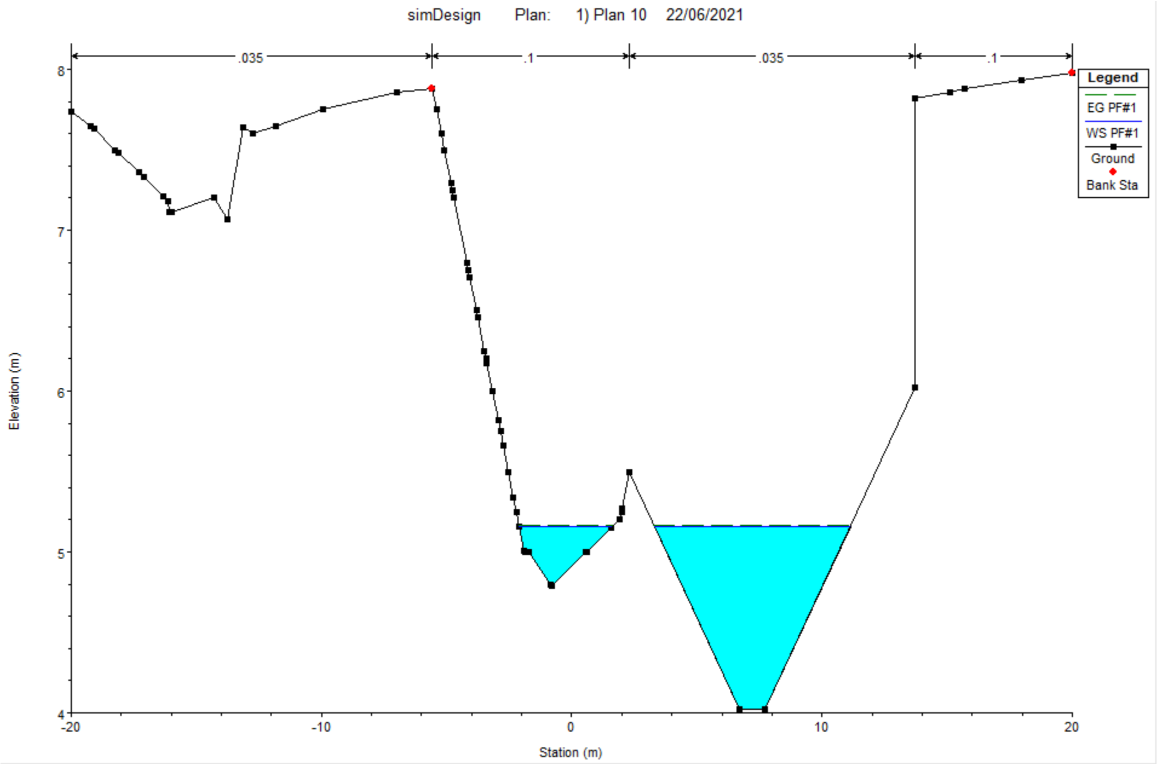


Figure 2-5 Example of poorly defined upgraded channel in supplied HEC-RAS model

2.3.2.2 Water balance model

A spreadsheet water balance model from the CRC study was supplied and used as a basis in this study. The CRC model was adapted from an earlier version of the water balance model developed by WMAwater for the Medowie Floodplain Risk Management Study and Plan (WMAwater, 2016). The water balance model represents fluxes of water into and out of and storage of water in the CDIA. The model also represents water quality inputs (pollutant loads) and processes in the CDIA. Inputs, calculations and outputs are summarized in Table 2-1.

Table 2-1 Summary of water balance model structure

Model element	Items
Inputs	▪ Elevation – storage volume – area data of CDIA, derived from LiDAR ▪ Meteorologic data for period 1956 – 2016: - Daily rainfall: BOM station 061078 Williamtown RAAF - Daily potential evapotranspiration: Daily Morton's wet environment areal PET values were adopted from the SILO database ▪ Inflows from upstream catchment – derived from MUSIC hydrologic model of upstream catchment ▪ Pollutant loads (total suspended solids, total phosphorus, total nitrogen) in catchment inflows – derived from MUSIC hydrologic model. The model assumes industry standard event mean concentrations (EMC) for influent TSS, TP and TN ▪ Elevation – discharge relationship for outflows through Campvale canal
Calculations	▪ Model simulates processes on a daily basis for the period 1956 – 2016 (based on available meteorologic data)

Model element	Items
	▪ Water balance: Total inflows (catchment flows, direct rainfall), total outflows (outflow via Campvale canal, infiltration) storage volume, water level (stage) ▪ Pollutant mass balance: Catchment inflow loads, decay of loads in CDIA (physical settling of pollutant particles, environmental assimilation, etc.), outflow of loads ▪ The pollutant load decay model is based on the exponential decay functions adopted in MUSIC – the CDIA is assumed to effectively act in a similar manner to the "pond" treatment node in the MUSIC software. ▪ The water balance model simulates existing conditions and is also configured to allow simulation of future development (increased catchment urbanization) and climate change (increased rainfall) conditions, based on separate flow and load time series from MUSIC for those scenarios. ▪ Note that the pollutant mass balance does not account for the resuspension of pollutants due to anaerobic conditions during prolonged ponding events, etc.
Outputs	▪ Time series of the water balance and pollutant mass balance calculation results ▪ Statistics of flood storage and inundation (e.g., frequency and duration of occurrences where stage exceeds a specified level, % of paddock areas flooded, etc.) ▪ Statistics of pollutant inflow, assimilation and outflow (% removal of loads i.e., ratio of outflow load to inflow load).

A number of observations were made of the CRC water balance model:

- The stage calculations were made based on 0.1m increments in water level. Although the Campvale canal stage - discharge relationship was defined at 0.01m increments, the water balance calculation meant that the daily outflow from CDIA would be rounded to the nearest 0.1m in the discharge relationship. This introduced an error of up to 16% in each daily discharge and storage calculation.
- The stage – discharge relationship for the existing case was derived by Hunter Water from monitored CDIA water level at Ferodale Road and Grahamstown Dam pump flow data, and separately validated by hydraulic modelling completed by the CRC (CRC, 2020). Note that the water level monitoring site is located 4km upstream of the pinch, and the water levels may not directly correlate with those at the pinch.
- The adopted stage – discharge relationship for the design case appears not to be based on the HEC-RAS hydraulic modelling, but rather assuming a nominal increase in the channel flow capacity. The existing discharge relationship was increased by a uniform 1.35m^3/s and 2.7m^3/s (representing increase by one and two pumps at Grahamstown Dam, respectively) for all water levels. This means that even with a very shallow flow in Campvale canal (say, 0.1m depth) it was assumed that the flow capacity could be increased by the same increment as for deep (say, 2m depth) channel flow. This is physically very difficult to achieve with a channel modification in the field and may have misrepresented outflows from CDIA particularly for shallower flow conditions. Hence, it was concluded that the CRC hydraulic assessment were not representative of the works proposed in the CRC report. Note that this uniform increase in the stage – discharge could potentially be provided by a pumped solution to pump flows from upstream to downstream of the pinch.
- Water level – storage and stage – discharge relationships only extend down to 5m AHD elevation. This precludes the assessment of channel upgrade options where the Campvale canal channel is excavated below 5m AHD.

2.3.3 Model updates

Table 2-2 summarises the updates made to the HEC-RAS and water balance models.

Table 2-2 Summary of model updates

Update	Comment
HEC-RAS model	
Inclusion of existing timber bridge at the pinch for existing case	The timber bridge is expected to influence the stage – discharge relationship
Representation of “clean” condition of channel for existing case	The HEC-RAS model only included an “uncleaned” condition for the existing case and appears to be highly conservative in terms of high blockage/hydraulic roughness compared to the reported “cleaned” condition in 2016 in the CRC report and the observed condition in 2021 during this study with minimal in-channel vegetation. It is reported that in more recent years more proactive vegetation maintenance has been able to be undertaken along the canal. Therefore, a “cleaned” condition was assumed for this assessment.
Representation of design case channel	A number of channel upgrade options were assessed. Refer to Section 2.4.
Water balance model	
Refinement (interpolation) of stage – storage volume – storage area relationship to 0.01m elevation increments.	Reduce the potential volume calculation error associated with previously adopted 0.1m increment (rounding error in Excel VLOOKUP function)
Lower the minimum elevation in stage – storage volume – storage area and stage – discharge relationships to 4m AHD	Allows channel upgrade options involving excavation below 5m AHD to be assessed
Update of stage – discharge relationship for existing and design cases, based on HEC-RAS model outputs	Update made for existing case to ensure consistency in approach (i.e., based on hydraulic model output) Update made for design cases based on more realistic discharge relationship, from hydraulic model outputs.

2.3.4 Assessment objectives and criteria

As stated in CRC (2020), previous studies have identified the primary issue of concern for landholders within the CDIA is the extended period of flood inundation that occurs on a near annual basis (WMAwater, 2016). Although ponding does not affect any dwellings in the CDIA many land holders use their land for grazing (WMAwater, 2016). There is a perception that this issue has become worse over time due to upstream development and lack of maintenance of the canal, and landholders in the CDIA are keen to see improvements in drainage of the CDIA for water levels below 6.5m AHD (WMAwater, 2016).

Stormwater from the upstream catchment flows through the CDIA which provides a level of treatment to the water before it is pumped into Grahamstown Dam, and with ongoing development in the catchment, the CDIA provides an important buffer between the urban area and the Dam. This has always been the case and Hunter Water values this treatment function of the CDIA in order to protect the water quality being pumped into the Dam. CRC (2020) proposed a number of objectives and metrics to evaluate various options. These have been adapted in this current study to assess the identified options, with updates to the objectives made as required. Additional criteria have been included as appropriate. Refer to Table 2-3.

Table 2-3 Adopted hydraulic assessment objectives and metrics

Item	Objective	Metric
Property flooding	Reduce the impact of inundation on yards and paddocks	Number of occurrences of inundation levels exceeding 6.3m AHD for durations of 10 days or longer. Inundation of this duration affects the utility of the land and is expected to result in pasture die-off. * Note: CRC (2020) proposed assessment of flooding above 6.0m AHD for this metric. Review of the terrain data indicates that areas up to 6.0m AHD are generally limited to the forested/vegetated areas in CDIA and include only a small area of paddock. At a flood level of 6.3m AHD, a more substantial area of paddocks is affected, hence this metric was updated for this study.
	Reduce the impact of inundation to properties and buildings in CDIA.	Number of occurrences of water levels exceeding 6.5m AHD. Peak flood levels and duration of inundation above 6.3m AHD for recent historic flood events.
Water quality in wetland and of water pumped to Grahamstown Dam	Protect water quality treatment function of the CDIA	Reduction in Total Nitrogen (TN) Load Removal by the CDIA as estimated by water balance model. That is, the % increase in TN average annual load discharged to Grahamstown Dam * Note, TN is used as the metric rather than TP due to it having higher sensitivity than TP to changes in detention time in the CDIA.

Item	Objective	Metric
	Reduce the potential of blackwater events in the CDIA and resuspension of TP and TN and heavy metals	Number of occurrences where flooding occurs above 6.3m AHD for an extended period of time. Given the variability of the ponding duration to produce blackwater events (indicatively 3 – 20 days), a median value duration of 10 days was assumed for the assessment as an indicator of the blackwater event occurrence. Die-off of dryland pasture species and non-wetland vegetation species and subsequent organic decay is a key cause of blackwater events. * Note, flooding above 6.3m AHD covers a significant % of the CDIA. Areas subjected to prolonged flooding can re-mobilise N and P back into the water column as dissolved bio-available forms.
	Wetting and drying effects on wetland water quality and ecology	Minimise impacts to existing wetland soil drying and wetting regime due to changed drainage conditions, to minimise risk of acid sulphate soil exposure and subsequent impacts to water quality and ecology.
Constructability	Minimise depth of excavation to limit spoil for disposal and limit risk of encountering acid sulphate soils	Reduce depth of excavation where possible.

2.4 Consideration of objectives in developing options

Development of potential Campvale canal channel upgrade options need to balance several main objectives:

- Day-to-day (i.e., during normal wet weather/rainfall events) water quality treatment function of the Campvale wetland: This generally requires maintaining a retention time of 3 – 5 days for normal daily flows to allow suspended sediment to settle out and for other pollutants (nutrients, etc.) to be assimilated. Providing significantly increased drainage capacity particularly for lower flows and water levels is expected to reduce retention times and subsequently reduce the treatment function.
- Inundation and risk of blackwater events: Generally promoted by poor drainage conditions. Improving the drainage capacity of Campvale canal would reduce the risk of blackwater events and the severity of inundation.
- Minimise impacts to wetland health, water quality and ecology: While significant improvements to drainage of CDIA may provide flooding and other benefits, there is risk that it may lead to a drier wetland condition and exposure of acid sulphate soils, with subsequent impacts to water quality and wetland ecology as well as impacts to Grahamstown Dam water quality

Hence increased drainage capacity could favour the inundation and blackwater event risk objective with a trade-off for a reduced day-to-day water quality treatment function and potential wetland health and water quality impacts, and vice-versa. The follow-on risks of changes to the wetting and drying regime of the wetland also need to be considered. Other objectives and criteria, such as constructability, spoil volumes and depths of excavation in addition to constraints such as available space (easements, minimise removal of trees etc.) are other considerations.

2.5 Canal options

A number of channel configurations were assessed for the existing and design (upgrade) cases:

- Existing channel. Assumed Manning's n = 0.1, based on validation in this study against the Hunter Water-derived stage – discharge relationship. Refer to Section 1.1.1.1 for discussion.
- Design option proposed in CRC study (proposed invert levels adopted). From 240m upstream of access track bridge for a length of 1700m. 1m base width and 1:3 (V:H) side slopes (same cross section as Jacobs options).
- Option 2a – minimal excavation of channel invert high points. And existing timber bridge retained. This option provides an indication of effectiveness of a "minimal works" option.
- Option 2b – channel upgrade/excavation from 40m upstream of timber bridge for a length of 1500m. 1m base width and 1:3 (V:H) side slopes.
- Option 2c – channel upgrade/excavation from 40m upstream of timber bridge for a length of 1400m. 1m base width and 1:3 (V:H) side slopes.
- Option 2e – generally retain existing channel, localized excavation of channel invert high points. 18m wide high flow channel bench at 6m AHD for conveyance of higher flows.
- Options 2b, 2c, 2e and CRC Design assume removal of the existing timber bridge and reinstatement by others with a design which does not affect the channel discharge capacity. The reinstatement of the bridge has not been modelled or designed in this study.

Note that in the development of the options, the following assumptions were made

- All channel upgrade options assume grassed/hydroseed lining. Channel grades are very gentle and flow velocities are low (less than 0.5m/s).
- All options have similar cross section (1m base width and 1:3 (V:H) side slopes), except that CRC design cross section has a maximum top width of 13m at the top of the 1:3 slopes, with vertical sides extending upwards above the side slopes.
- All options remain within the existing easement with allowance for access track, refer to Section 8.1 for further discussion.

Figure 2-6 shows the channel long section profiles for existing and design cases. Figure 2-3 in Section 2.3.2, shows the locations of the channel cross section stations from the HEC-RAS model and long section plot.

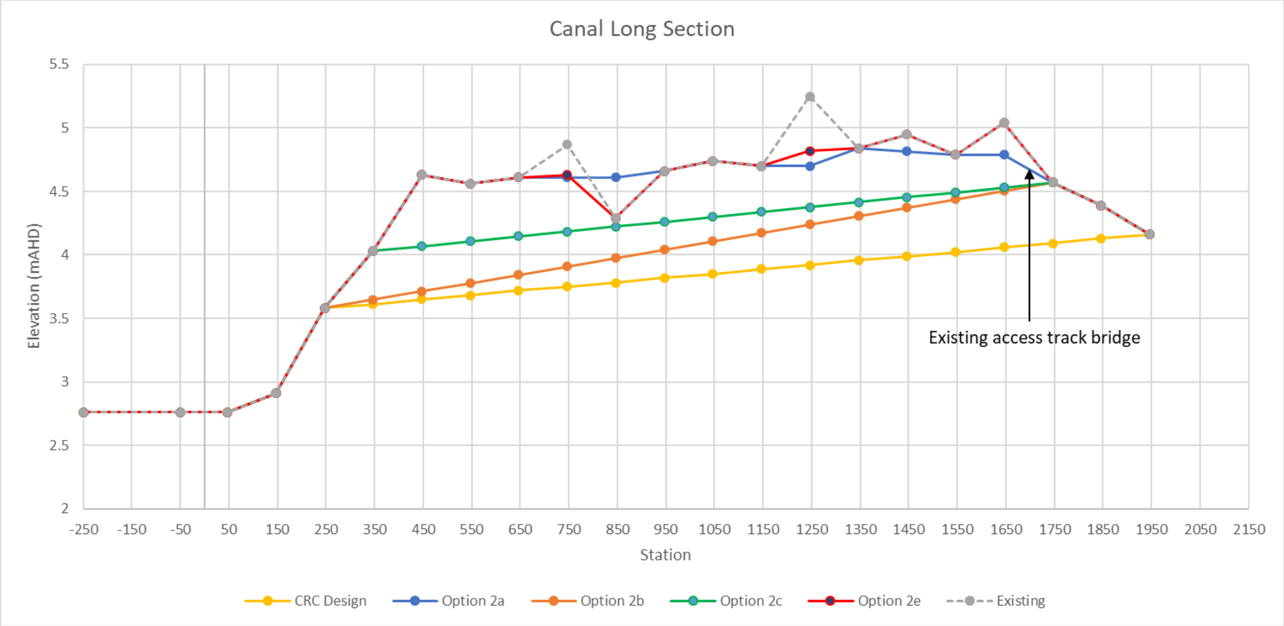


Figure 2-6 Channel bed invert level for existing and design cases

2.6 Modelling results

2.6.1 Campvale canal discharge capacities

The various channel configurations for existing and design cases were run in HEC-RAS for a range of steady flow conditions and the stage – discharge relationships at cross section Ch1946.66 and are shown on Figure 2-7. The curves represent the theoretical unrestricted flow through Campvale Canal. In reality, the flows through the Canal in the existing as well as the upgraded options scenarios are constrained by the existing pumping capacity of the Grahamstown Dam pumping station. A vertical line is plotted at 466,560ML/day (5.4m^3/s) representing this constraint. The stage-discharge curves input into the water balance model are capped at this flow capacity.

The “adopted existing case curve in CRC study water balance model” represents the actual stage-discharge curve derived from recorded water levels/flows and is a means for calibrating/validating the Jacobs hydraulic modelled curve for existing condition. Discussion on validation of the options assessment stage-discharge results is provided in Section 2.6.1.1.

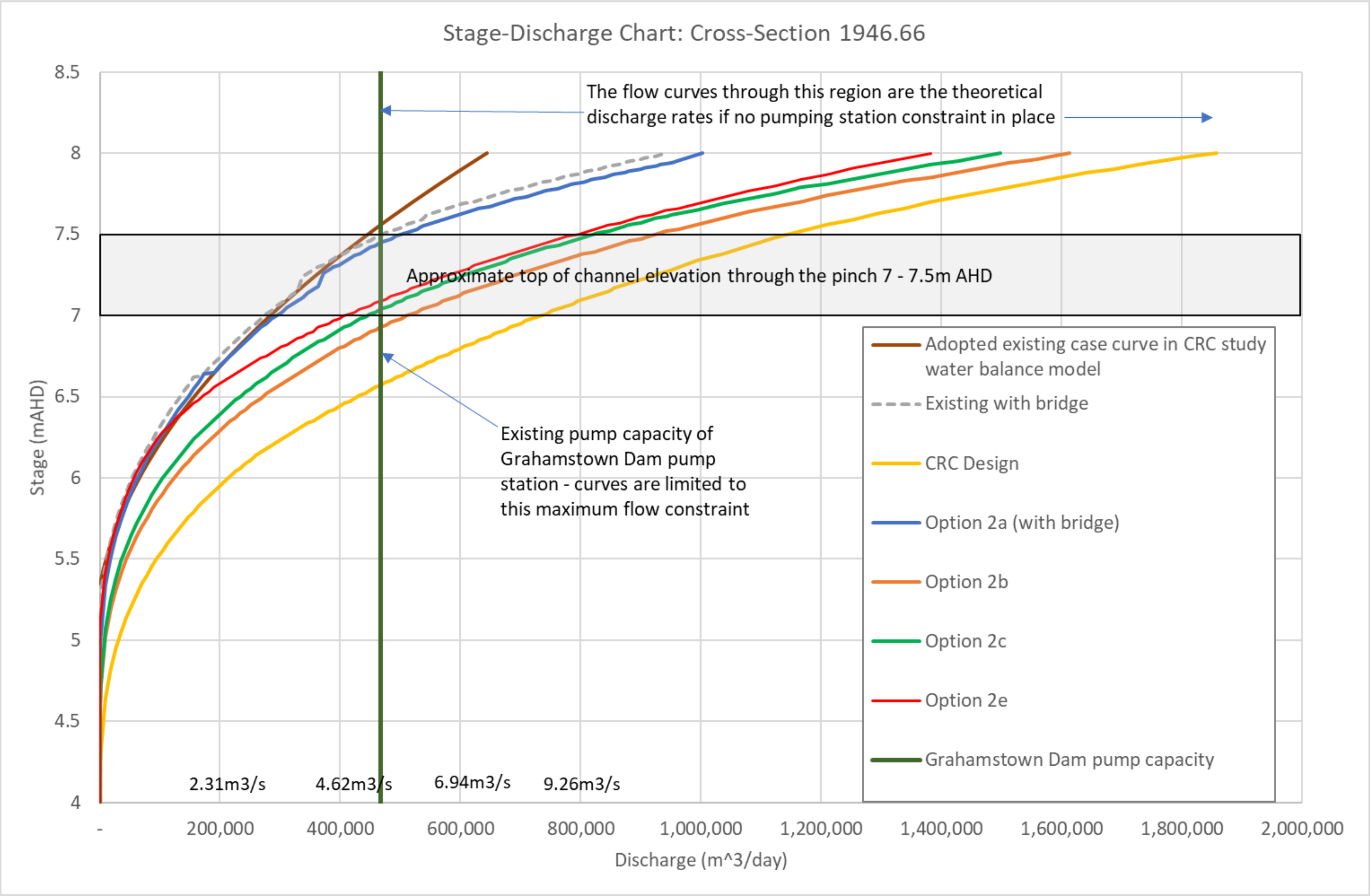


Figure 2-7 Stage – discharge curves for existing and design case channel configurations

2.6.1.1 Validation of existing case stage - discharge

The adopted existing case channel stage – discharge curve from this study's hydraulic modelling is compared to the Hunter Water stage – discharge curve which was previously used in the CRC study water balance ("Adopted existing case curve in CRC study water balance model"). Note that the Hunter Water relationship is based on monitored water levels at Ferodale Road, 4km upstream of the pinch. It is expected that the water levels would not correlate exactly with the water levels occurring at the pinch, as there would be a drop in water level as water flows through the wetland, particularly at higher flows. The stage – discharge relationship derived from the HEC-RAS model adopts a Manning's n value of 0.1, which is considered quite high when compared to photographs of the existing Campvale canal condition (a Manning's n of 0.04 – 0.05 might be more appropriate). The Manning's n of 0.1 is adopted to obtain a good fit with the Hunter Water stage – discharge relationship for the purposes of this study, and n = 0.1 has also been retained for each of the channel upgrade options and relates to a cleaned/maintained condition of the channel.

2.6.1.2 Discussion on stage – discharge curves

The following observations are made:

- Option 2a, with limited excavation to shave off the existing high points in the channel invert long section, provides minor improvement in capacity compared to existing
- Option 2b and 2c are similar, based mainly on the similar cross section levels at the upstream end of the channel upgrade. Option 2c has slightly lower capacity due to flatter channel gradient. Both provide approximately double the flow capacity compared to the existing case at water levels of 6 – 7m AHD, which are critical to flooding in the CDIA. Both allow outflows at lower levels due to excavation of the channel bed level and widening of the channel at low levels across the channel cross section.
- The CRC Design option has a significantly greater capacity than all other options due to deeper depths of excavation and longer section of channel upgrade. Note that the results for the CRC Design option are based on the hydraulic modelling undertaken in this study, and the discharge capacity and water balance model results differ from those reported by the CRC study. The CRC study incorrectly represented significantly higher flow capacity particularly at shallow flow depths than which can actually be achieved.
- Option 2e retains similar discharge characteristics to the existing case at lower levels, then increases in discharge capacity as the high flow bench channel activates at 6m AHD, with the curve approaching that of Option 2c.
- At the approximate bank-full level of 7m AHD, capping of the stage-discharge curves at the existing pumping station capacity significantly restricts the discharge potential for CRC Design, but has only minor effect on the discharge for the other options. This is because the CRC Design option involves significant capacity upgrade of the canal, with a resulting channel flow capacity above the pumping station capacity i.e., the pumping station becomes the flow constraint in the system. The canal in the CRC Design option is only part full when it reaches the pumping station flow capacity. In contrast, the other options (in particular 2b, 2c and 2e) are flowing at or near bank-full when they reach the pumping station capacity.

2.6.2 Water balance model results

The discharge curves (with Grahamstown Dam pumping station capacity constraint) were input into the water balance model. Results were output from the water balance model, including:

- Number of occurrences and durations of flood levels exceeding critical levels for the period 1958 – 2016, refer Table 2-4
- Water quality treatment effectiveness of CDIA wetland (% reduction in inflow loads), refer Table 2-5
- Peak flood levels and duration of inundation for recent major flood events, including the June 2007, April 2015 and January 2016 events, refer to Table 2-6.

Note that the modelled water levels (daily timestep) for the 2015 and 2016 flood events are compared to the maximum daily-averaged flood levels recorded at Ferodale Road to validate the model. It is observed that there is a good match between the modelled and the recorded water levels.

Table 2-4 Number of occurrences and durations of inundation levels exceeding critical levels

	Scenario					
Occurrences over 6.3m AHD						
Number of occurrences*	Existing	CRC - Design	Option 2a	Option 2b	Option 2c	Option 2e
3 day	184	70	176	116	131	175
5 day	137	20	124	56	68	120
10 day	50	1	43	6	13	24
20 day	8	0	6	0	0	2
30 day	1	0	0	0	0	0
Occurrences over 6.5m AHD						
3 day	104	27	96	46	60	89
5 day	72	9	64	19	29	47
10 day	17	1	15	1	2	9
20 day	2	0	2	0	0	0
30 day	0	0	0	0	0	0

* For simulation period of 1958 - 2016

Table 2-5 Water quality treatment effectiveness of CDIA wetland

Scenario	**% Removal of load**		
	TSS	**TP**	**TN**
Existing	89%	71%	46%
CRC - Design	88%	67%	34%
Option 2a	89%	71%	45%
Option 2b	88%	68%	37%
Option 2c	88%	69%	39%
Option 2e	89%	71%	44%

Table 2-6 Peak flood levels and duration of inundation for recent major flood events

Scenario	June 2007		April 2015		January 2016	
	Peak WL m AHD	Days above 6.3m AHD	Peak WL m AHD	Days above 6.3m AHD	Peak WL m AHD	Days above 6.3m AHD
Recorded at Ferodale Road*	-	-	7.38	-	7.46	-
Existing	7.16	24	7.36	21	7.45	19
CRC - Design	7.04	12	7.31	8	7.36	8
Option 2a	7.15	23	7.36	20	7.44	17
Option 2b	7.08	15	7.31	9	7.39	11
Option 2c	7.09	16	7.32	9	7.38	10
Option 2e	7.11	20	7.33	11	7.41	14

* Maximum daily average flood level is compared to the modelled water level (daily timestep) for validation.

2.6.3 Wetting and drying of wetland

Further interrogation of the water balance model was undertaken to explore the changes in number and duration of dry periods within the wetland for each upgrade option in comparison to existing conditions. This assessment focused on the water level within the CDIA with a dry period recorded when the RL fell below the inferred base level of wetland.

It was found that the number of days the wetland would experience short dry periods (up to 10 days) is increased for all options (CRC, 2a, 2b, 2c) compared with existing. Option 2e was found to cause no change to existing scenario.

As depicted in Figure 2-8, the results indicate the same estimated change in number of dry periods for the CRC, 2b and 2c options which is an increase of 21%, 9% and 7% for short durations of 3, 5, 10 days respectively. Option 2a is slightly better with only an increase of 18% for 3-day dry periods but reported the same as other options (CRC, 2b, 2c) for durations of 5 and 10 days.

Importantly, the number of dry periods lasting a longer period of time >10 days is not significantly altered above existing. It is important to note that this assessment is indicative only and further work would be required to validate the results.

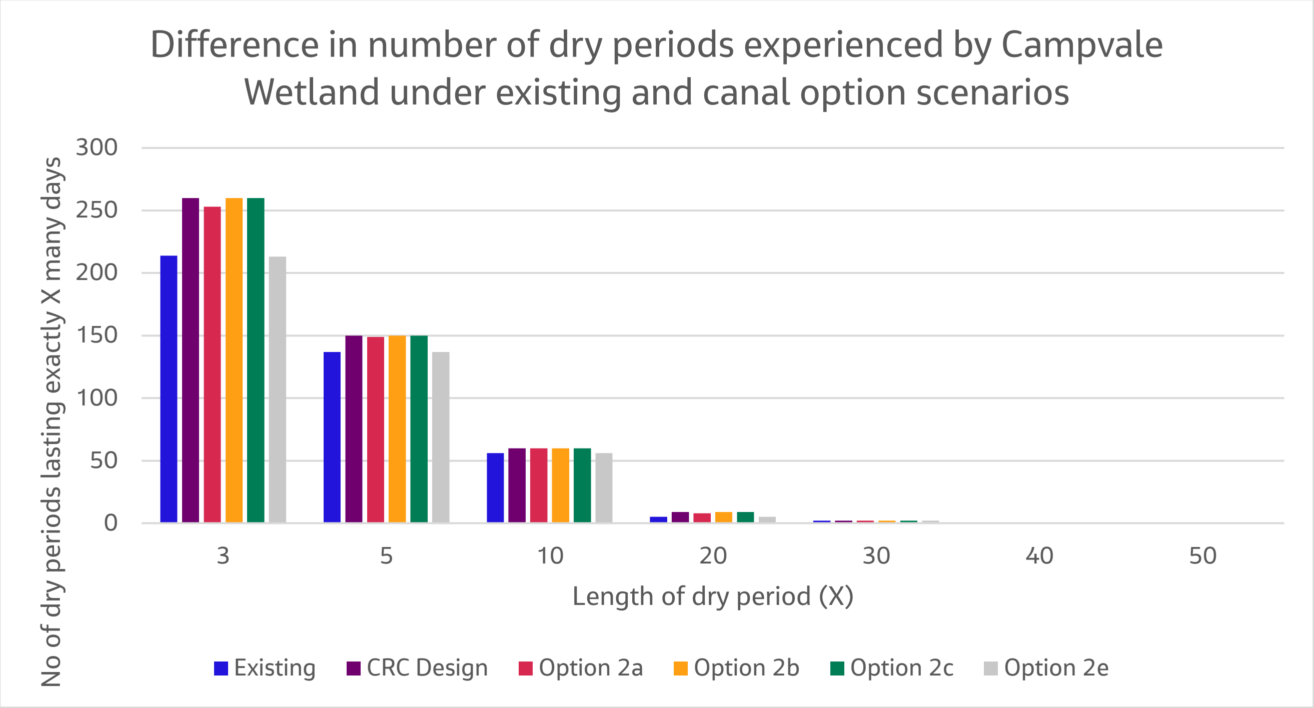


Figure 2-8 Difference in number of dry periods experienced by Campvale Wetland for each option

The changes to water quality due to wetting and drying of wetland is discussed in more detail in Section 3.3 including the potential for exposure of potential acid sulphate soils (ASS) in CDIA and the impacts to Grahamstown Dam.

The ecological changes to due to wetting and drying of the wetland is discussed in more detail in Section 4.3. However, the estimated increase in the number of additional short duration (less than 10 days) dry periods is not expected to impact on the overall function of the wetland due to the characteristics of NSW coastal wetlands being adapted to intermittent dry/drought periods (Margaret, et al, 2000). In particular, the proposed options are not expected to result in the wetland becoming terrestrialised. Refer to discussion in Section 4.2.2 regarding the presence of groundwater dependent ecosystems (GDEs) and associated impacts in Section 4.3.1.

2.6.4 Summary of hydraulic modelling results

Outcomes from the water balance modelling are summarized in Table 2-7.

Assessment of the options is provided below. In evaluating the options, this study attempted to achieve a balance of improvements to drainage, durations of inundation and risk of occurrence of blackwater events without having a detrimental impact on overall water quality of water draining from the CDIA. The objectives of increasing drainage capacity from the CDIA and maintaining water quality are somewhat diametrically opposed and that improvements to one factor would result in adverse impacts to the other.:

- CRC design option provides the highest drainage and improvements to property flooding, with potentially better reduction in risk of blackwater events. However, it requires the highest excavation depths and volumes (with increased risk of encountering acid sulphate soils), a high reduction in day-to-day water quality treatment in Campvale wetland. Based on this, this option is excluded from further consideration.
- Option 2a provides negligible-minor improvement to drainage/flooding and blackwater event risk. Based on this, this option is excluded from further consideration.
- Option 2b and 2c both provide substantial improvement to property inundation flooding occurrences, and minor-moderate improvements to flooding in recent major historic flood events. Both appear to substantially reduce the risk of blackwater events. Option 2b has relatively higher degradation in water quality treatment function and excavation depths and spoil quantities. As observed on Figure 2-6, the

depth of excavation at the downstream end of the channel upgrade with Option 2b is approximately double that with Option 2c, and hence excavation volumes and associated costs are approximately 30% greater. Based on this, Option 2c is slightly preferred of the two options and Option 2b is excluded from further assessment.

- Option 2e provides moderate improvements in drainage and minor improvements in major historic event flooding but maintains a reasonable level of water quality treatment function in Campvale wetland. The risk of excavation encountering ASS is minimal as the minimal level of excavation is generally above existing channel invert levels. Based on this Option 2e is retained as a potential option.

Table 2-7 Summary of modelling results

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
Property Inundation						
Reduce the impact on yards and paddocks of inundation levels exceeding 6.3m AHD for durations > 10 days	Model predicts 50 occurrences of > 6.3m AHD where the duration is over 10 days	Model predicts reduction to one event > 6.3m AHD where the duration is over 10 days Substantial (98%) reduction in occurrences	Reduction to 43 occurrences. 14% reduction in occurrences	Reduction to 6 occurrences. Substantial (92%) reduction in occurrences	Reduction to 13 occurrences. Substantial (74%) reduction in occurrences	Reduction to 24 occurrences. 52% reduction in occurrences
Reduce the impact on yards and paddocks of inundation levels exceeding 6.5m AHD.	104 in occurrences > 3 days; 17 occurrences >10 days; 2 occurrences > 20 days	74% reduction in occurrences > 3 days; 94% reduction for >10 days; elimination of occurrences >20 days	8% reduction in occurrences > 3 days; 12% reduction for >10 days; no change for > 20 days	56% reduction in occurrences > 3 days; 94% reduction for >10 days; elimination of occurrences for > 20 days	42% reduction in occurrences > 3 days; 88% reduction for >10 days; elimination of occurrences for > 20 days	14% reduction in occurrences > 3 days; 47% reduction for >10 days; elimination of occurrences for > 20 days
Peak flood levels and duration of inundation above 6.3m AHD for recent historic flood events.	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.16m AHD (24 days) ▪ 2015: 7.36m AHD (21 days) ▪ 2016: 7.45m AHD (19 days)	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.04m AHD (12 days) ▪ 2015: 7.31m AHD (8 days) ▪ 2016: 7.36m AHD (8 days) Reduced peak historic event flood levels by 0.05-0.1m and reduced duration from ~3 weeks to 8-12 days	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.15m AHD (2 days) ▪ 2015: 7.36m AHD (20 days) ▪ 2016: 7.44m AHD (17 days) Negligible improvements in historic flood event conditions	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.08m AHD (15 days) ▪ 2015: 7.31m AHD (9 days) ▪ 2016: 7.39m AHD (11 days) Reduced peak historic event flood levels by 0.05 – 0.08m and reduced duration from ~3 weeks to 1.5-2 weeks	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.09m AHD (16 days) ▪ 2015: 7.32m AHD (10 days) ▪ 2016: 7.40m AHD (12 days) Reduced peak historic event flood levels by 0.04 – 0.07m and reduced duration from ~3 weeks to 1.5-2 weeks	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.11m AHD (20 days) ▪ 2015: 7.33m AHD (11 days) ▪ 2016: 7.43m AHD (15 days) Reduced peak historic event flood levels by 0.02 – 0.05m and reduced duration from ~3 weeks to 1.5-3 weeks
Water quality pumped to Grahamstown Dam						
Protect water quality treatment function of CDIA *Change in Total Nitrogen (TN) Load Removal by CDIA* *Number of occurrences of flood levels exceeding 6.3m AHD for durations of ≥ 10 days (indicator of blackwater risk)*	Average annual load reductions: ▪ TSS 89% ▪ TP 71% ▪ TN 46%. Model predicts 50 occurrences of > 6.3m AHD and 10 days over the period 1958 - 2016	Reduction in day-to-day water quality treatment function by 31% from existing (i.e., average annual load of TN increases by 31% from existing). Model predicts elimination of occurrences of > 10 days above 6.3m AHD water level	Negligible reduction in day-to-day water quality treatment function by 3% from existing (i.e., average annual load of TN increases by 3% from existing). Minor reduction in occurrences of > 10 days above 6.3m AHD water level	Reduction in day-to-day water quality treatment function by 21% from existing (i.e., average annual load of TN increases by 21% from existing). Substantial reduction in occurrences of > 10 days above 6.3m AHD water level. Occurrences reduced by 92%	Reduction in day-to-day water quality treatment function by 17% from existing (i.e., average annual load of TN increases by 17% from existing). Substantial reduction in occurrences of > 10 days above 6.3m AHD water level. Occurrences reduced by 78%	Reduction in day-to-day water quality treatment function by 7% from existing (i.e., average annual load of TN increases by 7% from existing). Moderate reduction in occurrences of > 10 days above 6.3m AHD water level. Occurrences reduced by 52%
Constructability						
Minimise depth of excavation to limit spoil for disposal and limit risk of encountering acid sulphate soils *Reduce depth of excavation where possible*	N/A	High depth of excavation, up to 1.3m below existing channel bed level. Likely to encounter ASS.	Excavation depth is minimized and localized. Approx. 9,700m^3 spoil volume	Moderate spoil volume approx. 21,500m^3, 1m depth of excavation below existing channel bed level	Moderate spoil volume approx. 16,300m^3, 1m depth of excavation below existing channel bed level,	Moderate spoil volume approx. 18,000m^3,
Wetting and drying of the wetland						
Change in number of dry periods within wetland	No change in number of dry periods within wetland	Increase in the in number of dry periods within wetland ▪ 21% of 3-day dry period ▪ 9% of 5-day dry period ▪ 7% of 10-day dry period ▪	Increase in the in number of dry periods within wetland ▪ 18% of 3-day dry period ▪ 9% of 5-day dry period ▪ 7% of 10-day dry period	Increase in the in number of dry periods within wetland ▪ 21% of 3-day dry period ▪ 9% of 5-day dry period ▪ 7% of 10-day dry period	Increase in the in number of dry periods within wetland ▪ 21% of 3-day dry period ▪ 9% of 5-day dry period7% of 10-day dry period	No change in number of dry periods within wetland

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
Other						
Other comments	Relatively high day-to-day water quality treatment function, but high risk of inundation and blackwater events due to poor drainage.	Lowering the channel bed provides highly free-flowing conditions from CDIA.	Existing timber bridge can be retained with this option. Localised excavation would occur away from the bridge		Similar (slightly less) inundation improvements and lower reduction in water quality treatment function compared to Option 2b	

2.7 Comment on improvements to peak flood levels

The water balance modelling indicates that while flood levels would be slightly improved, the reductions in peak flood levels in CDIA are considered minor with each of the assessed options, with less than 0.1m reductions in peak flood levels in recent historic events achieved. This is largely due to the flat topography of the CDIA.

The main benefit of the channel upgrades is substantial reduction in durations of inundation. For example, with Option 2c the durations of inundation following the flooding event would be reduced from about 3 weeks in the existing case to 2 weeks or less (about 8 – 12 days reduction), for historic flood events such as the 2007, 2015 and 2016 events (refer to Table 2-6). Option 2e has lesser improvements, but still reduces inundation times for the historic events by 4 – 10 days. Given that the main impact to landowners is the inability to utilize their land due to prolonged inundation following a flood, this reduced inundation duration is thought to provide a significant benefit.

2.8 Consideration of further drainage improvements

This assessment has focused on improvements to the channel capacity at the pinch to improve drainage of the CDIA to address long duration inundation. It is acknowledged that, even with significant improvements to the drainage capacity at the pinch, the overall system would also be constrained by the existing pumping capacity at the Grahamstown Dam pumping station but only during the peak of large wet weather events.

Modifying the operations of the pumping station, such as the cut-in levels of each of the individual pumps, is not expected to provide significant benefit. During high flow conditions in Campvale Canal, each of the four pumps would be expected to be operating already under the current pumping regime.

Based on the assessments to date, an upgrade to the pumping station capacity could be expected to provide some further improvements to peak flooding levels which would be additional to the Option 2c channel upgrade.

- It is expected that peak flood levels in CDIA would not be substantially reduced with any potentially feasible upgrade of the pumping station capacity, e.g., doubling of capacity. This is due to flood inflows being significantly larger than pump capacity.
- The most benefit would be due to the reduction in the duration of flooding in CDIA particularly large flood events such as a 1% annual exceedance probability (AEP) event where a significant portion of flows are conveyed in the overbank areas out of the upgraded channel. The drainage of minor to moderate (e.g., 5% AEP) flood events which are conveyed mostly within the upgraded channel would be generally limited by the upgraded channel capacity and would have minimal benefit from the increased pumping station capacity.

Assessment to quantify and confirm the improvements to inundation in CDIA with upgraded pumping station capacity have not been undertaken to date as this is outside the scope of the current study.

2.9 Hydraulic assessment summary

Based on the need to balance drainage conditions and duration of inundation with maintaining as close as possible the water quality treatment function of the CDIA and also with consideration of environmental and constructability issues, initial screening of the assessed options concluded that Option 2c and Option 2e were the short-listed options:

- Option 2c provides substantial improvements to drainage and duration of inundation compared to the existing case. CRC Design option and Option 2b provide better improvements, but this comes at further expense of water quality from CDIA and increased excavation volumes and cost to construct (e.g., excavation volumes). Reduction in water quality treatment, which reflects the increase in average annual TN loads discharged to Grahamstown Dam, are relatively high for CRC Design and Option 2b (20-30%

reduction in treatment/increase in TN load), while Option 2c could be considered more tolerable (16% reduction in treatment/increase in TN load).

- Option 2e maintains close to (although with minor reduction from) the existing water quality treatment function in CDIA, with a 7% reduction in treatment/increase in TN load. It also provides moderate improvements in drainage and minor improvements in duration of property inundation. Shallower depths of excavation at Campvale canal also reduce risk of encountering acid sulphate soils.

Both Options 2c and 2e result in reduction in the water quality treatment function of CDIA. If these options are implemented, additional catchment management interventions should be considered in the upstream catchment with the objective of reducing stormwater pollutant loads (TN, TP, TSS etc.). The catchment interventions would aim to compensate for the loss of treatment function and effectively maintain the same pollutant loads entering Grahamstown Dam as the existing case, in addition to managing stormwater runoff volumes from built-up surfaces. Catchment management interventions may include incorporation of water sensitive urban design into future and existing development, appropriate planning controls on future development, buffer zones for diffuse pollutant sources etc.

It should be noted that interventions will already be required (and are promoted by HWC and PSC) to offset the impacts of future urban development on Campvale canal water quality, hence the interventions needed to compensate for the Campvale canal upgrades would be additional to these.

3. Water quality

3.1 Methodology

The methodology for the water quality assessment is outlined in the following sections and has broadly included:

- Desktop review of available information (literature, databases, reports) to identify the environmental values of the waterway and wetland.
- Analysis of surface water quality data to understand variation of water quality condition in Campvale Canal under different conditions (seasonal and changes in flow/water level). Information sources included:
  - NSW Water Quality Objectives (DECCW, 2006)
  - ANZG (2018) Water Quality Guidelines (ANZG, 2018)
  - Hunter Water monitoring data from Campvale Canal
- Field assessment, including collection of surface water in-situ physiochemical data and aquatic habitat assessment at nominated sites along Campvale Canal and in the Campvale Swamp (as a representative portion of the larger Campvale Wetland in the CDIA) (refer to Figure 3-1), to support and enhance findings of the desktop analysis and refine the understanding of potential issues.
- Description of water quality condition at assessment sites along Campvale Canal and in the Campvale Swamp at the time of inspection.
- Determination of the efficiency of the canal under different proposed retention time scenarios and a qualitative assessment of contaminants reaching the Campvale Canal based on findings.

3.1.1 Water quality analysis

Water quality and flow data used in this report to establish existing water quality were sourced from routine monitoring data made available by Hunter Water, and in-situ physiochemical water quality data collected for this assessment from nominated sites upstream and downstream of the study area (refer to Section 3.1.2).

Table 3-1 provides details of Hunter Water routine water quality monitoring locations.

Table 3-1 Routine monitoring site descriptions

Site Code	Monitoring location name	Eastings	Northings	Location description	Data range
15C9000	Campvale PS Inlet R9	0389355	6374420	Campvale Canal downstream at the pumping station	January 2015 – May 2021
15D2000	Campvale Canal @ Ferodale Rd	0393416	6376879	Campvale Canal upstream at Ferodale Road	January 2015 – May 2021

* No monitoring data was available for Campvale Wetland

Water quality analysis has involved the following steps:

- Available water quality data provided by Hunter Water was collated for indicators at upstream and downstream of 'the pinch' point between 2015 and 2021 (refer to Table 3-1 and Figure 3-1 for monitoring site locations). Note that only the most recent 5 years of data is used in this assessment as it is the most representative of existing conditions, due to land use changes within the area, and as guideline values have also changed over time so applying contemporary guideline concentrations would not be suitable for older data. The amount of data available for each site and indicator varied. When a data point for an indicator was below the detection limit, the data point was determined to be half the value of the detection limit. When samples for a given indicator were collected multiple times over one day, all data points were averaged to give a daily average concentration.

- Parameters that were analysed included:

    - Physiochemical indicators – Electrical conductivity (EC), pH and turbidity.

    - Nutrients – Ammonia (NH_3), Oxidised nitrogen (NO_x), total nitrogen (TN), total phosphorus (TP) and soluble reactive phosphorus (SRP).

    - Algal indicators - Chlorophyll-*a* (Chl-*a*) and cyanobacteria; and,

    - Heavy metals – Aluminum (Al), manganese (Mn) and iron (Fe). Note – metals data available for analysis are total metal concentrations.

- Summary statistics for the water quality data were calculated for each indicator at both sites, including number of samples, median, average, maximum and minimum concentrations over the whole data range.

- The water quality data was compared to Australian and New Zealand Water Quality Guidelines (ANZG, 2018) and the Australian Drinking Water Guidelines 6 (ADWG) (NHMRC and NRMMC, 2011) default guideline values (DGVs) to determine whether NSW Water Quality Objectives (DECCW, 2006) are currently being met. Applicable DGVs are provided in Appendix B. Percentage compliance against applicable DGVs for each indicator were calculated to determine indicators of concern.

- Data for upstream and downstream water quality parameters were plotted against time and flow to determine temporal variation in water quality and variation influenced by changes to flow.

Data sources

Jacobs 2021
Metromap (Aerometrex) 2021
Department Finance,
Services and Innovation 2020

Figure 3-1 Water quality routine monitoring sites and field assessment sites

Date: 25/05/2022 Path: \\ausyd0vs01\GISProj\NSW_BPO00M4W_HunterWater\IA410230_Campvale_Canal_Options\Apps\Figures\WATER QUALITY\HW_WQ_F001_CampvaleCanalOptionsInvestigation_v2.aprx
Created by : HK | QA by : LW

3.1.2 Field Assessment

Field assessment of water quality was undertaken by environmental scientists at nominated sites between 5th July and 6th July 2021. The purpose of the site visit was to collect in-situ water quality measurements and to visually assess the condition of the waterway and wetland at the sites.

According to Williamtown RAAF (#611078) weather station (BOM, 2021), 4.4 ml of rain had fallen within five days prior to monitoring. As the rainfall was minimal, the monitoring event has been classified as a dry weather monitoring event.

In-situ water quality parameters including temperature, conductivity (EC), salinity, pH and dissolved oxygen (DO) were measured using a calibrated *YSI Pro Plus* multi-parameter water quality meter. Turbidity was also measured in situ using a *Hach* turbidimeter.

A total of six sites along the Campvale Canal and two within the Campvale Wetland were assessed. Nominated sites are listed in Table 3-2 and shown in Figure 3-1.

Table 3-2 Monitoring location descriptions

Site number	Site name	Eastings	Northings	Description
Campvale Canal				
AS1	Assessment site 1	0389387	6374375	Campvale Canal – Ponded area immediately upstream of pumping station
AS2	Assessment site 2	0389753	6374283	Campvale Canal – 1.2km downstream of pinch point
AS3	Assessment site 3	0390329	6374078	Campvale Canal – 0.6km downstream of pinch point
AS4	Assessment site 4	0390022	6374124	Campvale Canal – At pinch point
AS5	Assessment site 5	0391028	6374239	Campvale Canal – 0.2km upstream of pinch point
AS6	Assessment site 6	0391466	6374382	Campvale Canal – 0.65km upstream of pinch point
Campvale Wetland				
AS7	Assessment site 7	0391074	6373974	Campvale Swamp – North west bank
AS8	Assessment site 8	0391139	6374017	Campvale Swamp – North bank

3.2 Existing water quality conditions

The datasets available for analysis at the upstream and downstream sites along Campvale Canal were variable. Dissolved oxygen was measured in mg/L and using an equation provided in APHA Standard Methods for the Examination of Water and Wastewater (2017) was converted to percent saturation which is the preferred measured recommended in the ANZG (2018). Additionally, for the metals of concern, they were only measured as total metals. Dissolved metals would be more suitable as these are typically the most toxic to aquatic species and the most difficult to remove from the water column as they generally don't settle out of solution. For parameters which had sufficient available data, there was generally a large amount of data available for the downstream site at the pumping station (15C9000) and a small amount collected from the upstream site at Ferodale Road (15D2000). No existing water quality data was available for Campvale Swamp. Summary statistics and percent compliance are provided for downstream (15C9000) and upstream (15D2000) sites in the canal in Table 3-3 and Table 3-4, respectively. Parameters have been categorised into compliance greater than (green) and less than (red) 60% of the time.

Overall, analysis of available water quality data from upstream and downstream indicated that EC, Mn and NO$_x$ generally remained within the recommended DGVs most (>60%), if not all of the time between January 2015 and May 2021 at both the upstream and downstream sites in the canal. Additionally, SRP was compliant most of the time at both sites. Accordingly, the aforementioned parameters will not be discussed further in this assessment.

Indicators of concern have been identified as those which did not comply with the guideline DGVs most (<60%) or all of the time at either site (where applicable). These include pH, dissolved oxygen, turbidity, Al, Fe, NH$_3$, TN, TP and Chlorophyll-a (Chl-*a*). The indicators have been further analysed to determine seasonal variation and changes influenced by flow regime in the following sections.

Table 3-3 Summary statistics for Campvale Canal downstream at the pumping station.

Parameter		**Guideline – Lowland river:(ANZG, 2018)**	**Sample Count**	**Median**	**Average**	**Min**	**Max**	**Percent compliance**
Electrical Conductivity (μS/cm)	(EC)	125 – 2200	337	310	340	**69**	**918**	98.5
pH		6.5 – 8.5	336	5.4	N/A[4]	3.3	7.9	4.8
Turbidity (NTU)		6 – 50	394	22.8	62.1	0.9	**650**	53.3
Dissolved oxygen (mg/L)	(DO)	-	161	2.495	2.76	0.1	12.5	-
Dissolved oxygen (% sat)	(DO)	85-110	324	26.71	28.03	0.94	117.31	0.0
Aluminium (mg/L)	(Al)	0.0008[1]	77	**0.61**	**0.84**	**0.045**	**4.08**	0.0
Manganese (mg/L)	(Mn)	1.9[2]	331	0.06	0.06	0.0	0.19	100.0
Iron (mg/L)	(Fe)	0.3[3]	334	**4.9**	**10.7**	0.05	**103**	4.9
Ammonia (mg/L)	(NH$_3$)	0.02[2]	227	**0.05**	**0.06**	0.0	0.26	37.0
Oxidised Nitrogen (mg/L)	(NO$_x$)	0.04	212	0.02	0.03	0.003	**0.19**	84.0
Total Nitrogen (mg/L)	(TN)	0.035	226	**0.4**	**0.51**	0.006	**2.12**	46.9
Total Phosphorus (mg/L)	(TP)	0.025	186	**0.05**	**0.06**	0.003	**0.34**	31.7
Soluble Reactive	(SRP)	0.02	186	0.01	**0.02**	0.0	**0.16**	76.9

Parameter		Guideline – Lowland river:(ANZG, 2018)	Sample Count	Median	Average	Min	Max	Percent compliance
Phosphorus (mg/L)								
Chlorophyll-a (µg/L)	(Chl-*a*)	3	165	3	**9.94**	0.5	**152**	46.05

1 – DGV for aluminium in freshwater with <6.5 pH concentration: 95% species protection (ANZG, 2018)

2 – DGVs for other heavy metals in freshwater: 95% species protection (ANZG, 2018)

3 – DGV for Iron: aesthetic value in the ADWG (NHMRC and NRMMC, 2011)

4 – average pH has not been reported due to the logarithmic nature of the pH scale

Table 3-4 Summary statistics for Campvale Canal upstream at Ferodale Road

Parameter		Guideline – Lowland river: (ANZG, 2018)	Sample Count	Median	Average	Min	Max	Percent compliance
Electrical Conductivity (µS/cm)	(EC)	125 – 2200	7	255.5	250.7	130	316.5	100.0
pH		6.5 – 8.5	7	6.52	N/A[5]	6.38	6.96	6.52
Turbidity (NTU)		6 – 50	56	37.5	43.2	4.4	**110.5**	37.5
Dissolved oxygen (% saturation)	(DO)	85-110	17	82.6	81.68	56.8	**91**	5.8
Aluminium (mg/L)	(Al)	0.0008[1]	-	-	-	-	-	-
Manganese (mg/L)	(Mn)	1.9[2]	3	0.08	0.08	0.07	0.09	100.0
Iron (mg/L)	(Fe)	0.3[3]	3	**3.29**	**3.33**	**3.23**	**3.48**	0.0
Ammonia (mg/L)	(NH_3)	0.02[2]	53	**0.021**	**0.027**	0.0025	**0.16**	45.3
Oxidised Nitrogen (mg/L)	(NO_x)	0.04	44	0.071	0.16	0.0075	**1.65**	88.6
Total Nitrogen (mg/L)	(TN)	0.035	3[4]	**1.063**	**1.025**	1.025	**1.155**	0.0
Total Phosphorus (mg/L)	(TP)	0.025	3[4]	**0.068**	**0.062**	0.025	**0.093**	33.3
Soluble Reactive Phosphorus (mg/L)	(SRP)	0.02	4	0.01	**0.02**	0.0	**0.16**	75.0

1 – DGV for aluminium in freshwater with <6.5 pH concentration: 95% species protection (ANZG, 2018)

2 – DGVs for heavy metals in freshwater: 95% species protection (ANZG, 2018)

3 – DGV for Iron: aesthetic value in the ADWG (NHMRC and NRMMC, 2011)

4 – Data range is 21-23 March 2018 only. Summary statistics are representative of conditions during this period only.

5 – average pH has not been reported due to the logarithmic nature of the pH scale

3.2.1 Long term trends

3.2.1.1 pH

While pH concentration remained below the lower DGV of 6.5 (ANZG, 2018) for the majority of the monitoring period, it appeared to generally fluctuate seasonally, with slightly higher pH concentrations over summer months (December to March) and lower during winter months (April to September) (refer to Figure 3-2). At the pumping station, median pH concentration was 6 in summer months, whereas during winter months, median pH was 4.79. Only a very small amount of data (7 data points) was collected for pH at the upstream site at Ferodale Road, however based on the data available the pH concentration appears to slightly higher upstream then downstream at the time of sampling.

Figure 3-3 demonstrates that pH tended to drop following a flow event within the canal. Conversely, when flow was low, pH generally rose to its peak which usually coincided with the summer period. It is suspected that the drop in pH could be due to oxidised ASS (refer to Section 5 for further details on presence of acid sulphate soils) being disturbed during and following a flow event and effecting downstream water quality. There are two primary issues with low pH concentrations in aquatic ecosystems (ANZECC/ARMCANZ, 2000):

- direct adverse effects on fish and invertebrates. Low pH can stress animal systems and reduce hatching and survival rates. The further outside of the optimum pH ranges the value is, the higher the mortality rates. The more sensitive a species, the more affected it is by changes in pH.

- Low pH levels can encourage the solubility of metal pollutants. As pH decreases, metal cations such as aluminum, lead, copper and cadmium are released into the water instead of being absorbed into the sediment. As the concentrations of metals increase, their toxicity also increases. Aluminum can limit growth and reproduction while increasing mortality rates at concentrations as low as 0.1-0.3 mg/L (see Section 3.2.1.6).

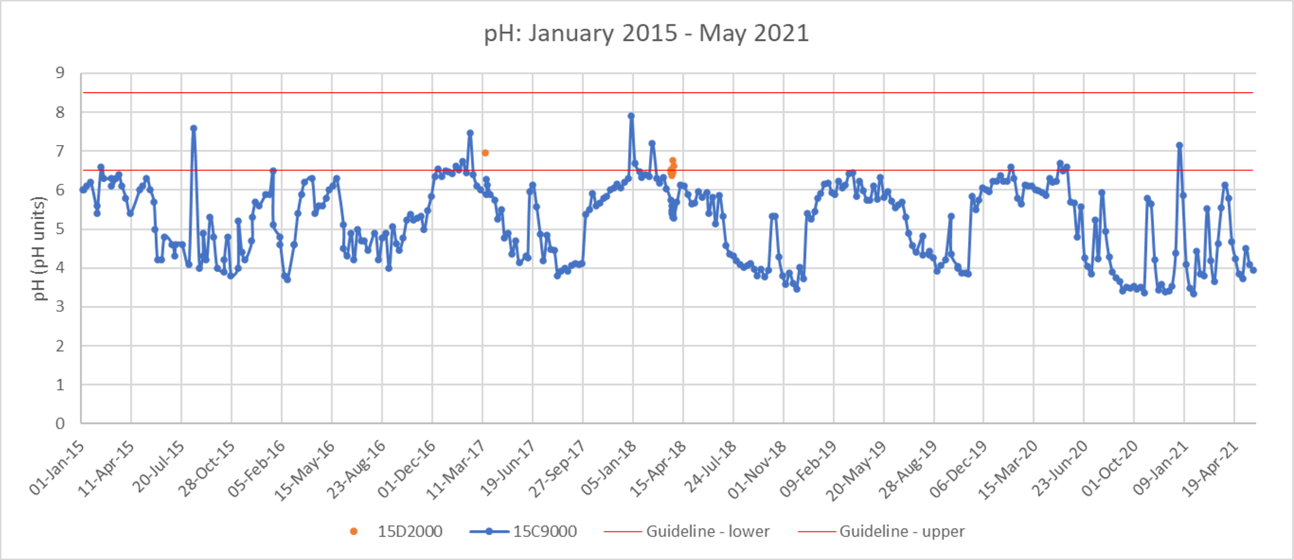


Figure 3-2 pH concentration at upstream (15D2000) and downstream (15C9000) sites in Campvale Canal over time. Compared with applicable ANZG (2018) DGV range 6.5 - 8.5 pH.

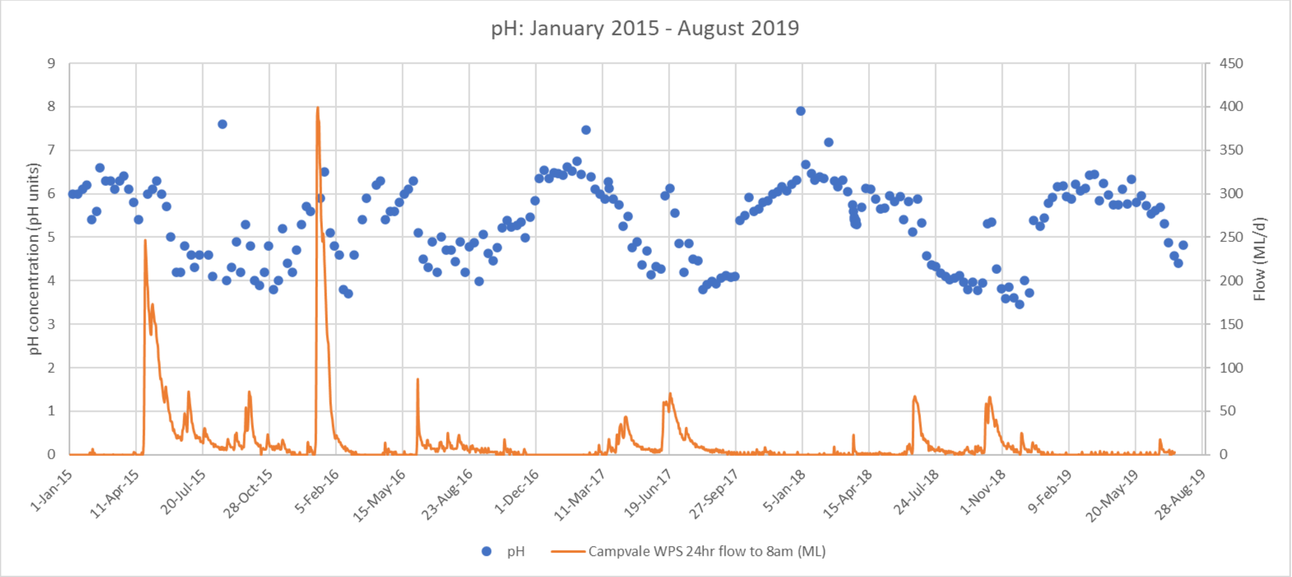


Figure 3-3 pH concentration at downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021). Compared with applicable ANZG (2018) DGV range 6.5 - 8.5 pH.

3.2.1.2 Turbidity

Turbidity concentrations in the canal also tended to peak during summer months (December to March) and decreased significantly during winter months (April to September) (refer to Figure 3-4). Median turbidity during the summer period was 98 NTU, whereas the median turbidity in winter was 11 NTU. Again, turbidity for the upstream section of the canal at Ferodale Road was not consistently monitored, however based on the available data turbidity was slightly higher upstream than downstream when both locations were sampled concurrently.

Figure 3-5 shows that turbidity tended to be higher during low/no flow and decreased during flow events. High turbidity may potentially reflect occurrence of algal blooms; however, this theory was not supported by the data as shown in Figure 3-6 . Turbidity was also compared with total phytoplankton and similarly did not show any correlation. Alternatively, higher turbidity concentration may be influenced by a large amount of iron oxides present in the water (refer to section 3.2.1.6 for further details on Fe) or due to less dilution (concentration of particulates) as water level and volume would be lower during these periods.

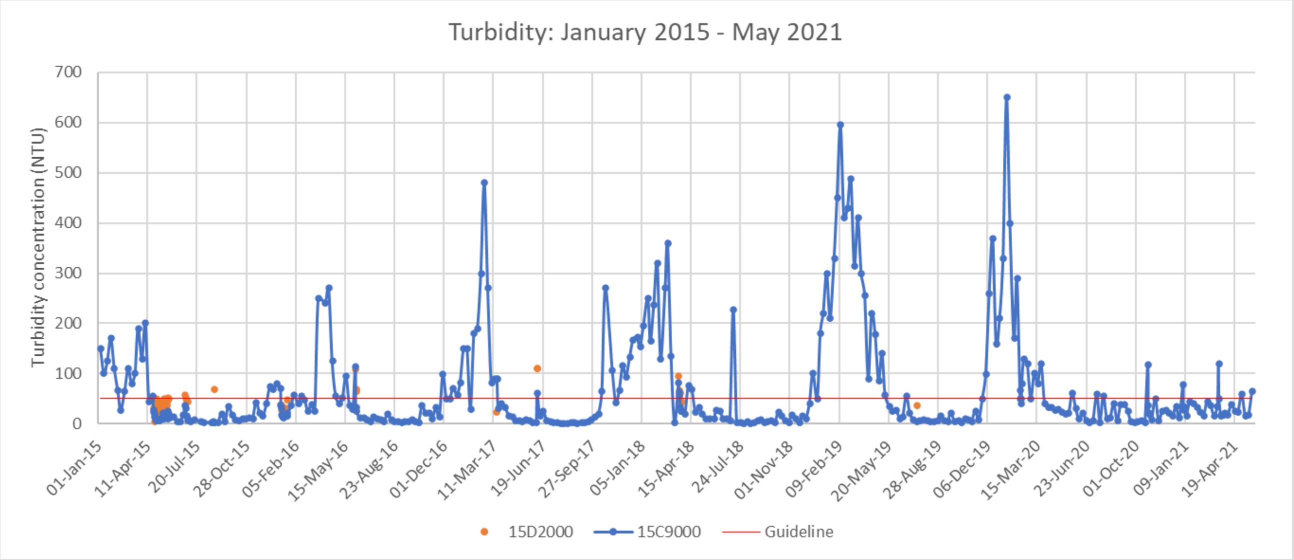


Figure 3-4 Turbidity concentration at upstream (15D2000) and downstream (15C9000) sites in Campvale Canal over time. Compared with applicable ANZG (2018) DGV - 50NTU.

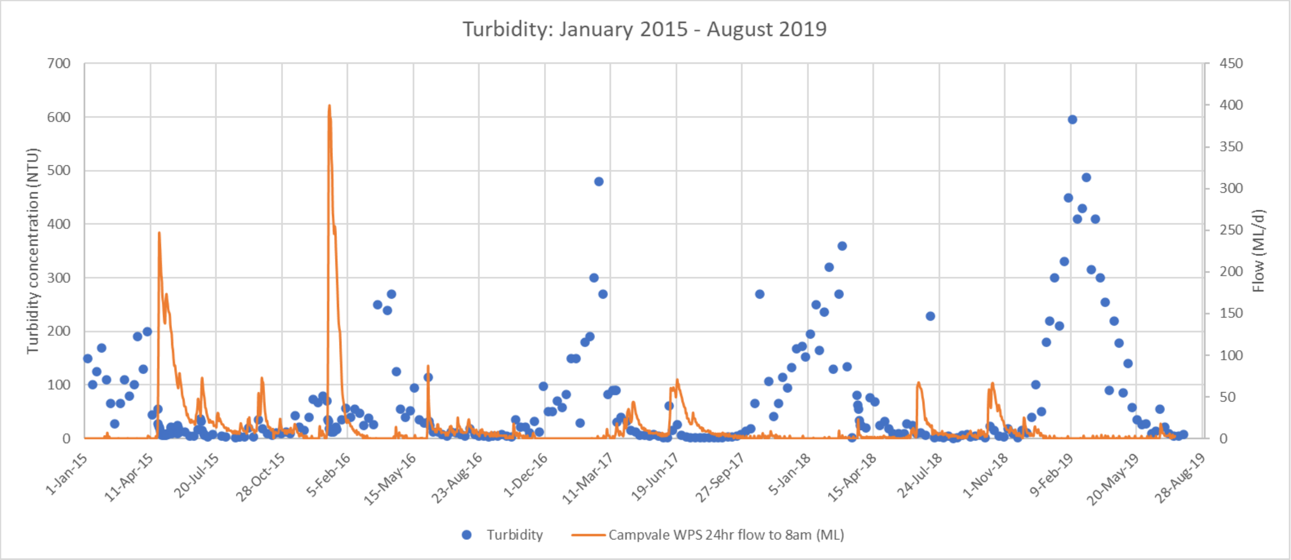


Figure 3-5 Turbidity concentration at downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021). Compared with applicable ANZG (2018) DGV - 50NTU.

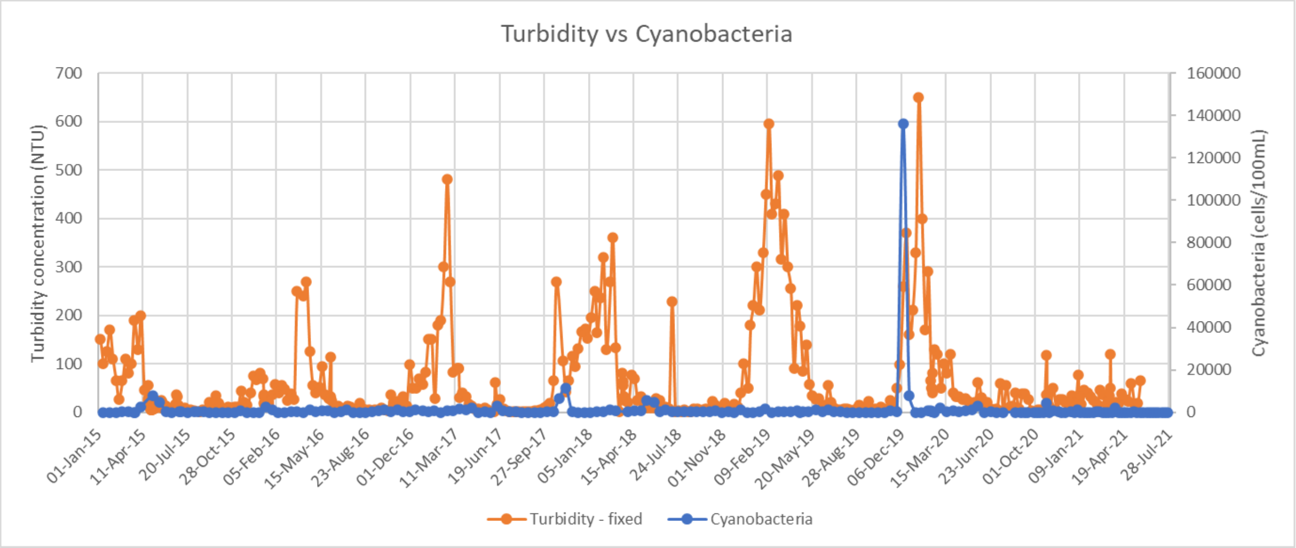


Figure 3-6 Relationship between turbidity and cyanobacteria at the downstream site in Campvale Canal over time

3.2.1.3 Dissolved oxygen

Dissolved oxygen concentrations in the canal were generally low and below 60 percent saturation which below the lower limit recommended for healthy ecosystems. As shown in Figure 3-7, low dissolved oxygen concentrations often corresponded with low flow. When increased flow in the canal was recorded, dissolved oxygen concentrations increased, however shortly after decreased to anoxic levels. Concentrations of dissolved oxygen were also typically higher in the top of the water column compared with the middle.

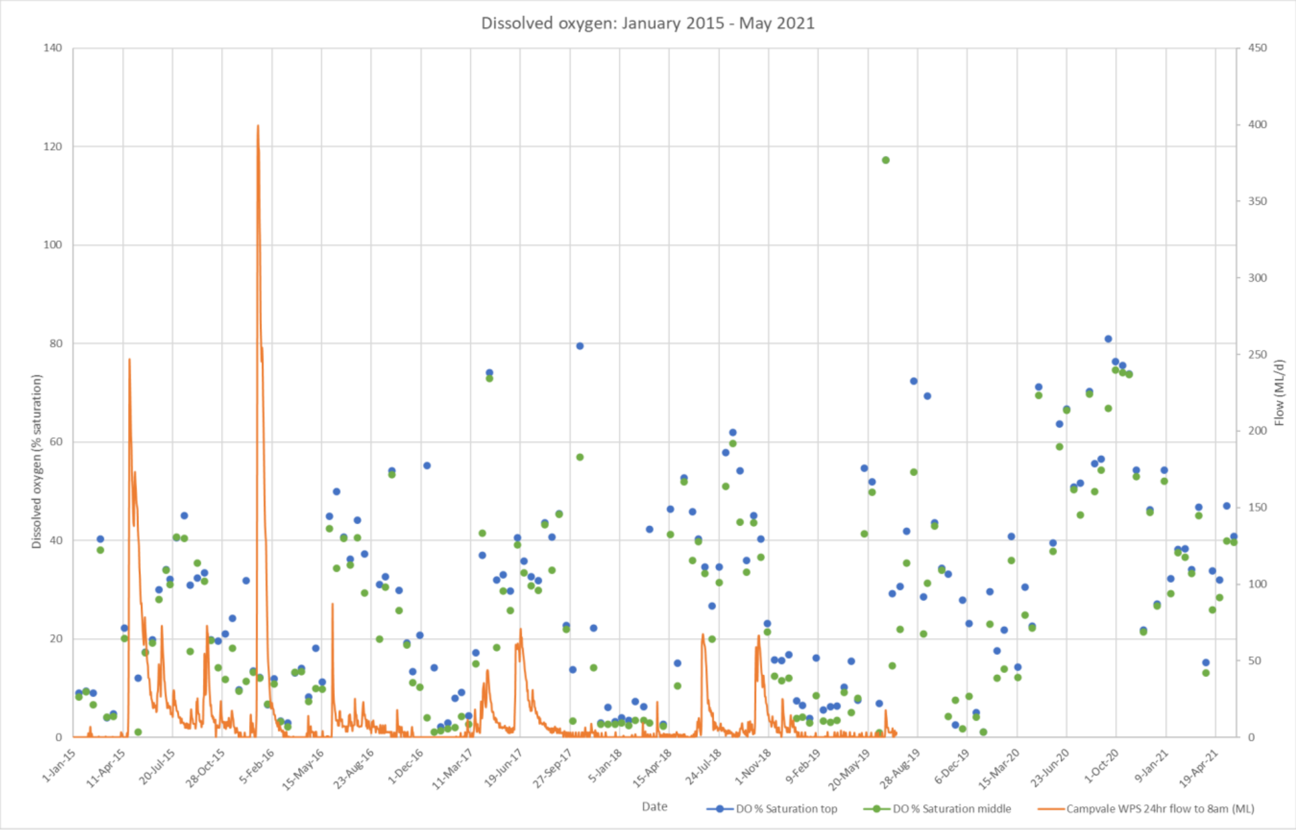


Figure 3-7 Dissolved oxygen concentrations (top and middle) at downstream site in Campvale Canal between January 2015 and May 2021 compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021)

3.2.1.4 **Nutrients**

Total ammonia

Total ammonia is the sum of unionised ammonia (NH_3) and ionised ammonium (NH_4^+) and is what is measured analytically in water. The unionised NH_3 form is considered to be the most toxic to organisms (toxicant), while NH_4^+ is most readily assimilated by plants therefore can result in indirect impacts on the aquatic ecosystem such as leading to nuisance plant growth (stressor). As we are referring to the stressor (nutrients) in this section, we are generally referring to the ammonium form below.

Total NH_3 did not appear to follow a seasonal trend (refer to Figure 3-8) although it did tend to be influenced by high and low flows whereby concentration appeared to generally increase during a flow event and decrease during low/no flow. Conversely, however, ammonia concentrations were also occasionally high during low/no flow periods (refer to Figure 3-9). These fluctuations may reflect that total NH_3 concentrations are being influenced by two phenomena.

1. Ammonia is being washed into the canal from the catchment during high rainfall periods and flooding, and/or via the wastewater network during times of overflows and
2. Ammonia is also potentially being leached into the water from sediments when DO concentrations are low during extended low/no flow periods (refer Figure 3-10).

It is observed from the available data that upstream concentrations appeared to be lower than downstream the majority of the time. This potentially reflects fewer nutrient sources from rural/farmland in the upstream catchment.

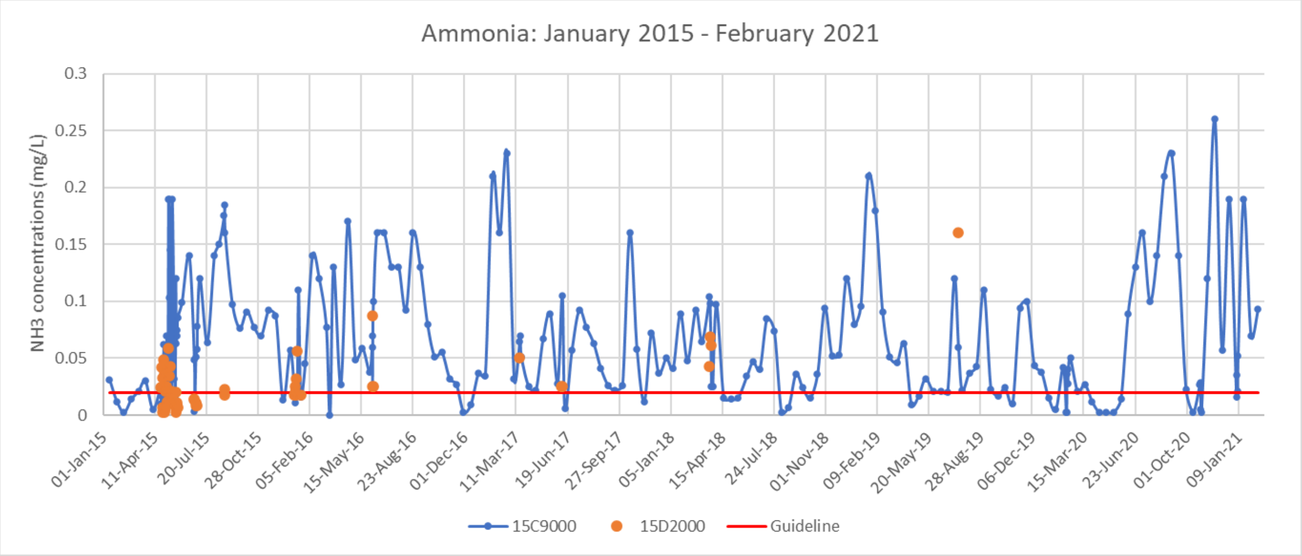


Figure 3-8 Ammonia concentration at upstream (15D2000) and downstream (15C9000) site in Campvale Canal over time. Compared with applicable ANZG (2018) DGV – 0.02mg/L.

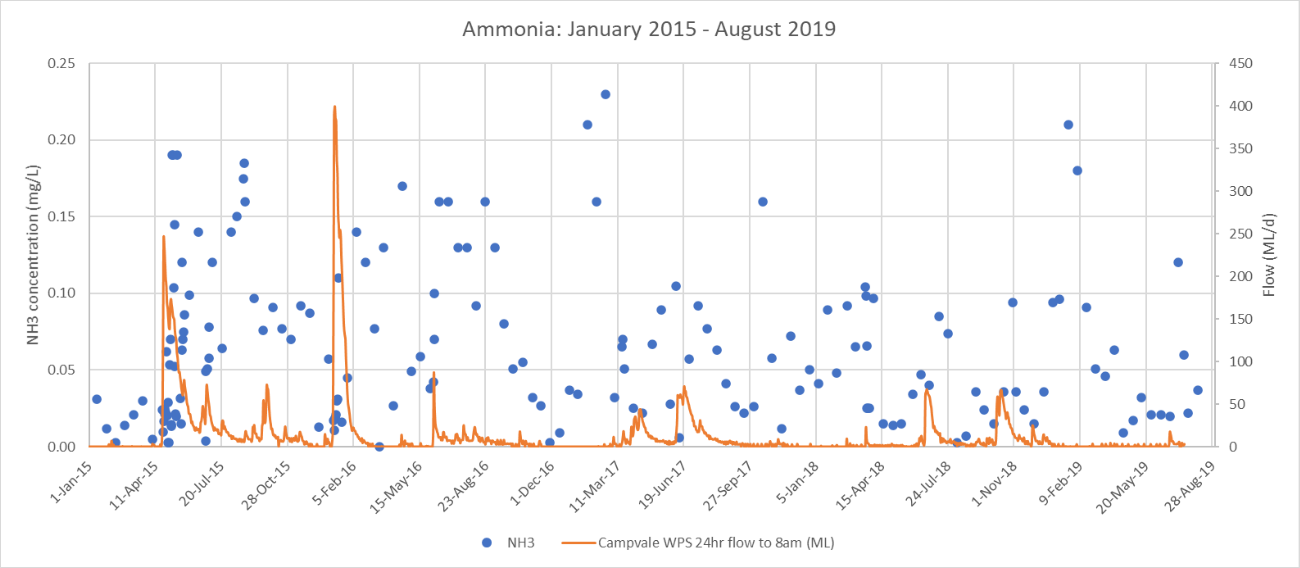


Figure 3-9 Ammonia concentration at downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021). Compared with applicable ANZG (2018) DGV – 0.02mg/L.

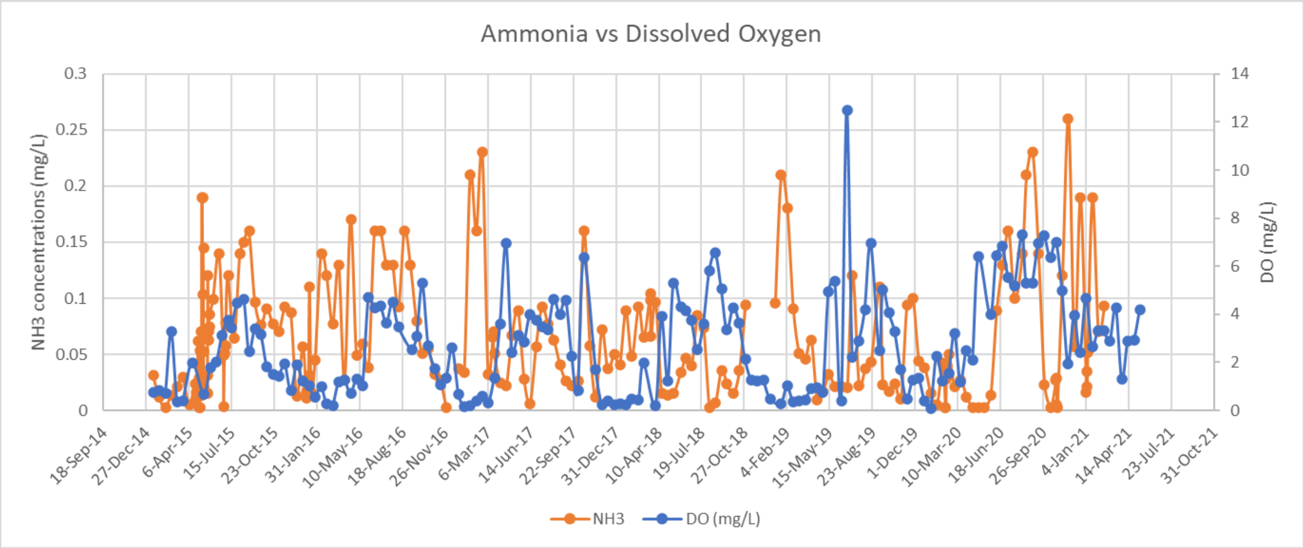


Figure 3-10 Relationship between NH_3 and DO at the downstream site in Campvale Canal over time. Compared with applicable ANZG (2018) DGV – 0.02mg/L.

Total Nitrogen

TN did not appear to follow a seasonal trend (refer to Figure 3-11), although, similar to ammonia, does appear to be influenced by flow (refer to Figure 3-12). In general, the canal has high concentrations of TN during high flow events. These concentrations are most likely to be sourced from the upstream catchment, particularly from rural land uses such as horse stud farms and cattle grazing. High concentrations of TN appear to continue during low/no flow periods which is suspected to reflect nitrogen released from sediments into the water due to low DO concentrations (refer to Figure 3-13 to Figure 3-15), or potentially algal blooms (refer to Section 3.2.1.5 for further information on algal data). No data was collected for TN at the upstream site at Ferodale Road, however it is suspected that TN would follow a similar trend as ammonia whereby concentrations would be lower upstream due to less nutrient sources from grazing/farming land.

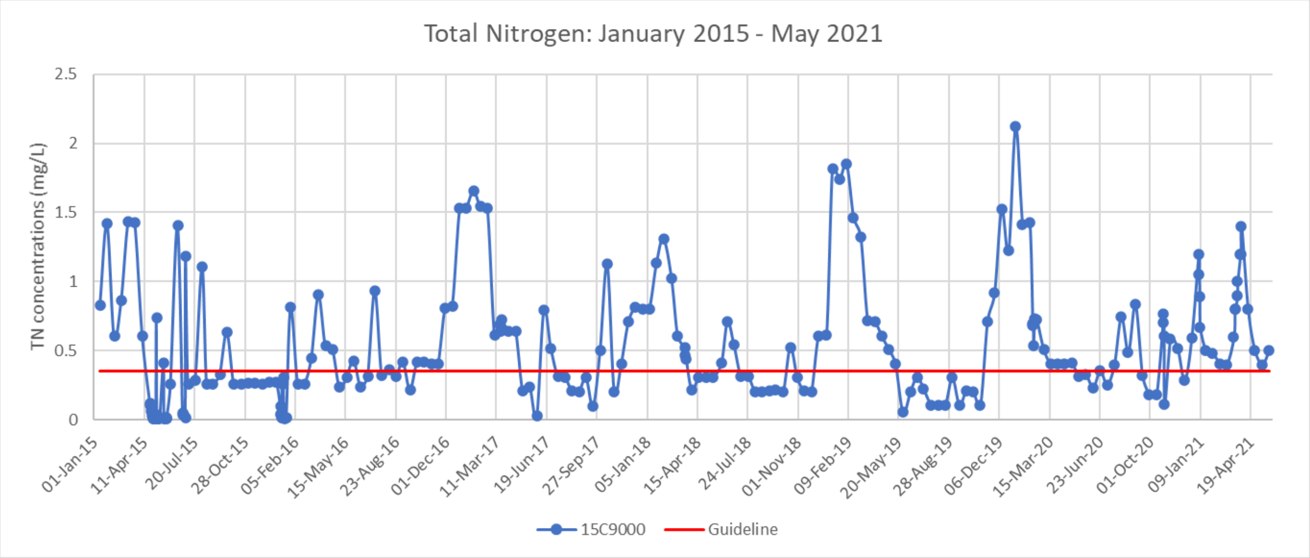


Figure 3-11 Total nitrogen concentration at the downstream (15C9000) site in Campvale Canal over time. Compared with applicable ANZG (2018) DGV – 0.35mg/L.

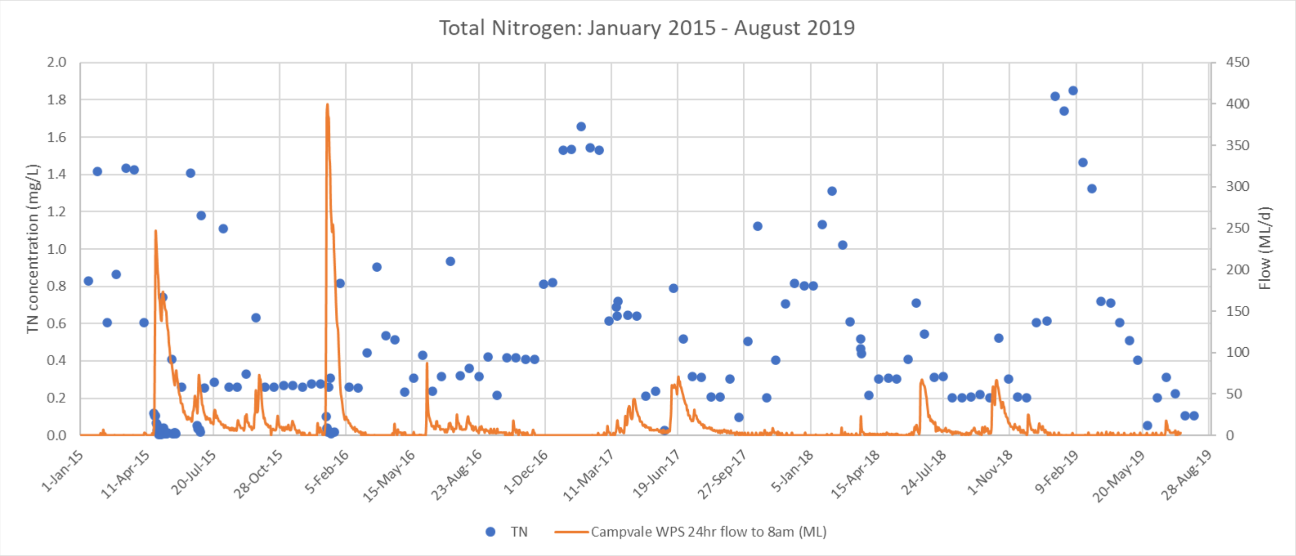


Figure 3-12 Total nitrogen concentration at the downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021). Compared with applicable ANZG (2018) DGV – 0.35mg/L.

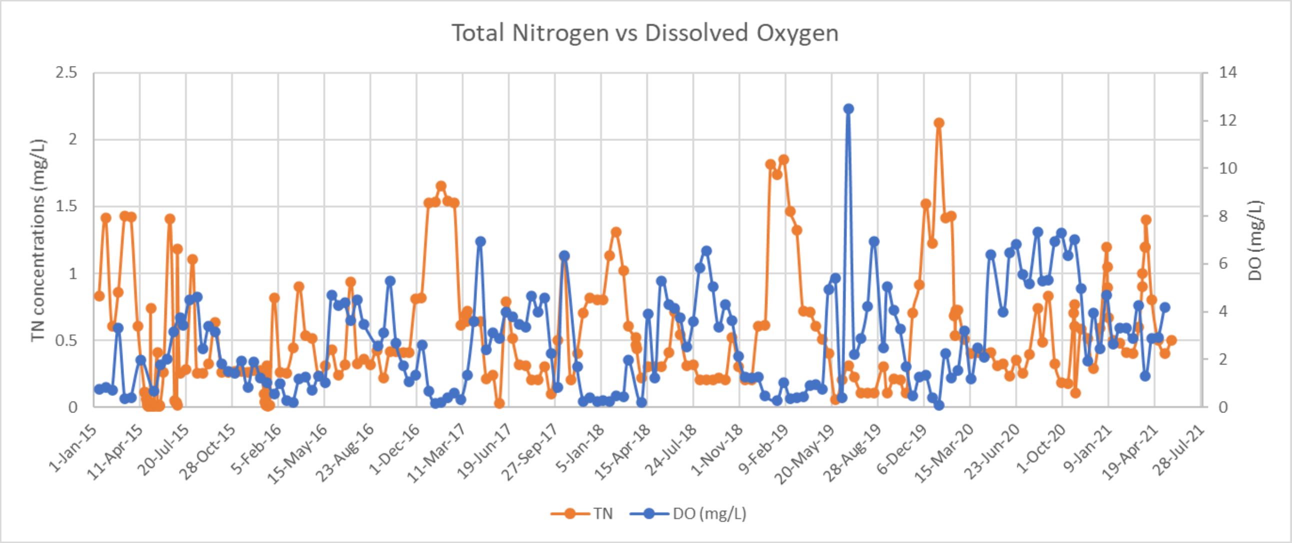


Figure 3-13 Relationship between TN and DO at the downstream site in Campvale Canal over time

Total Phosphorus

TP did not appear to follow a seasonal trend (refer to Figure 3-14), although appears to be influenced by flows with increased TP concentrations during higher flow (refer to Figure 3-15). As with other nutrients (TN and NH_3) it is expected this would be related to catchment runoff from rural practices. In addition to catchment runoff, TP appears to have a relationship with Fe concentration (refer to Figure 3-16) whereby elevated concentrations of TP tended to correspond with elevated concentration of Fe over time. Wang et al (2020) suggests that phosphorus can be adsorbed onto iron oxides when the solution has a pH concentration 'less than the pH of the point of zero charge (pH_{pzc})'. pH_{pzc} for iron oxides is generally 5.4-8.6. As such, there is potential that dissolved phosphorus in the water may be taken up by iron oxide present in the water.

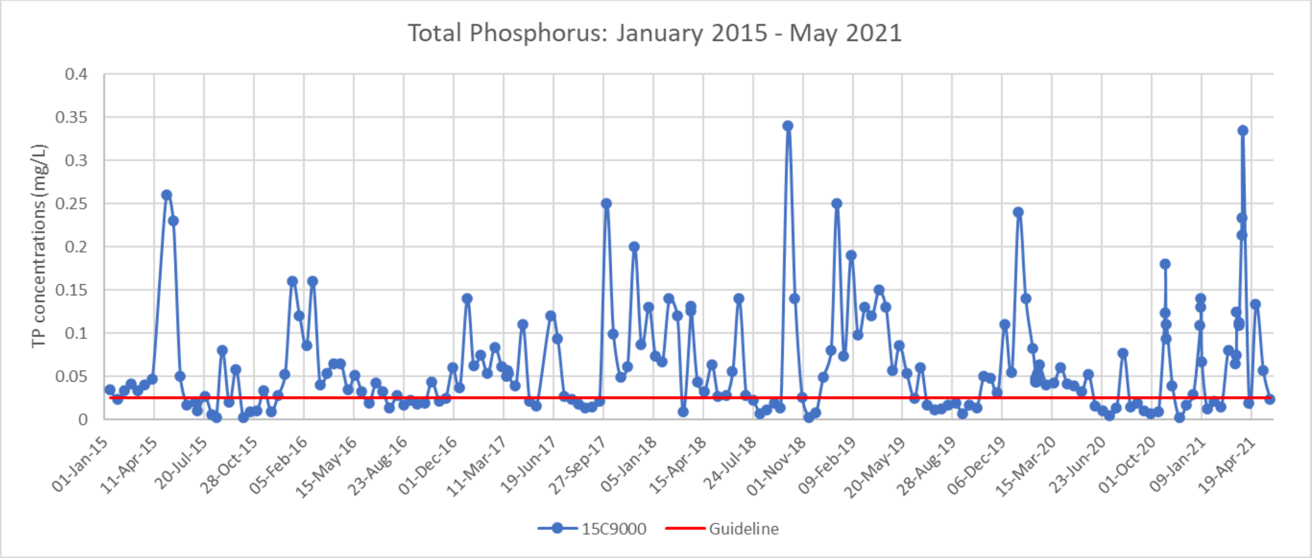


Figure 3-14 Total phosphorus concentration at the downstream (15C9000) site in Campvale Canal over time. Compared with applicable ANZG (2018) DGV – 0.025mg/L.

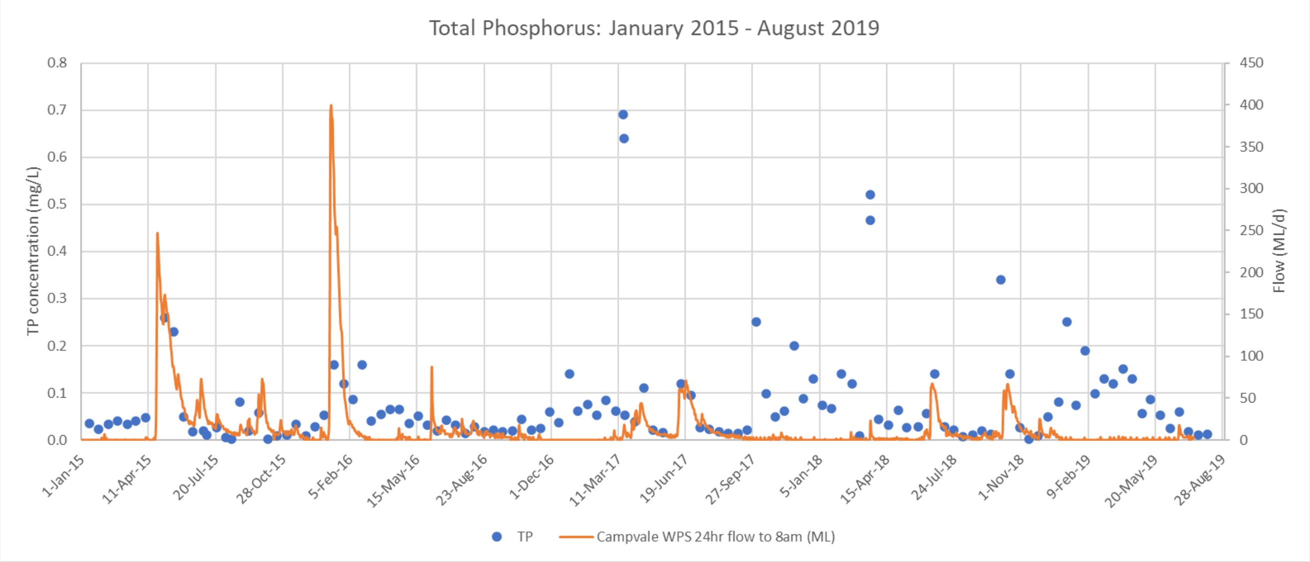


Figure 3-15 Total phosphorus concentration at the downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021). Compared with applicable ANZG (2018) DGV – 0.025mg/L.

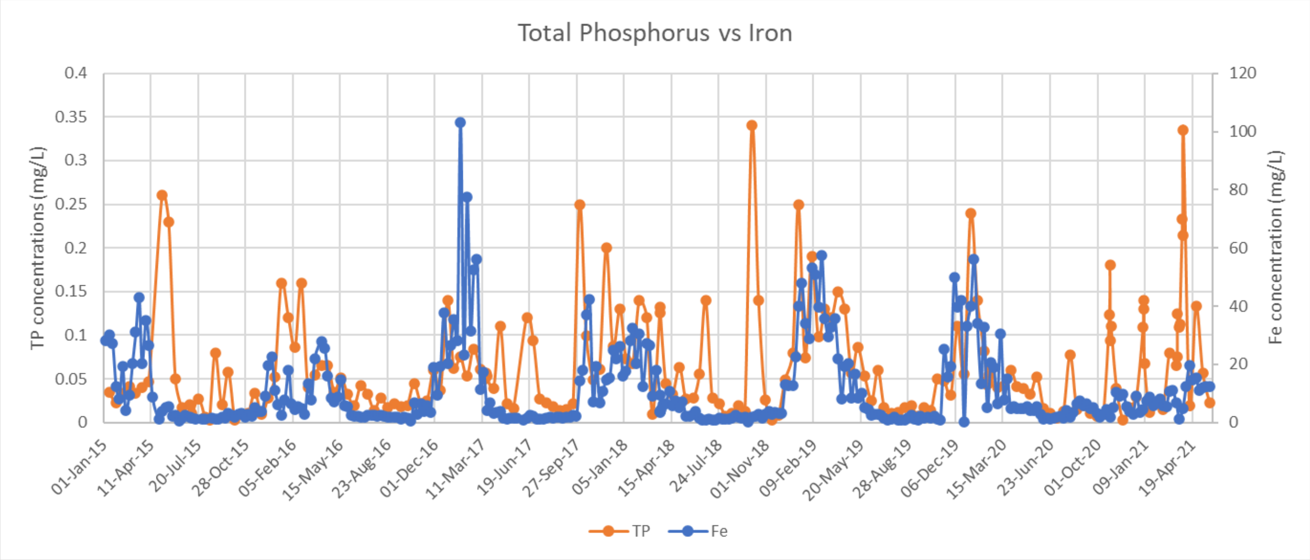


Figure 3-16 Relationship between TP and Fe at the downstream site in Campvale Canal over time.

3.2.1.5 Algal indicators

Chl-*a* concentrations were only available at the downstream site. Monitoring between 2015 and 2021 generally shows that Chl-*a* varies seasonally, with higher concentrations recorded over the summer months (refer Figure 3-17). Chl-*a* concentrations also follow a similar trend to nutrient concentrations, particularly total nitrogen, where elevated Chl-*a* corresponds to elevated nutrient loads reaching the pumping station. Despite these conditions, cyanobacteria numbers remained low, and showed no correlation with increases in Chl-*a* which may be attributable to data gaps, seasonality or species present (Figure 3-18). Increases in flow appear to flush the system, as shown by a decrease in Chl-*a* concentrations when flow increased, with higher concentrations generally occurring over prolonged low flow periods (refer Figure 3-19).

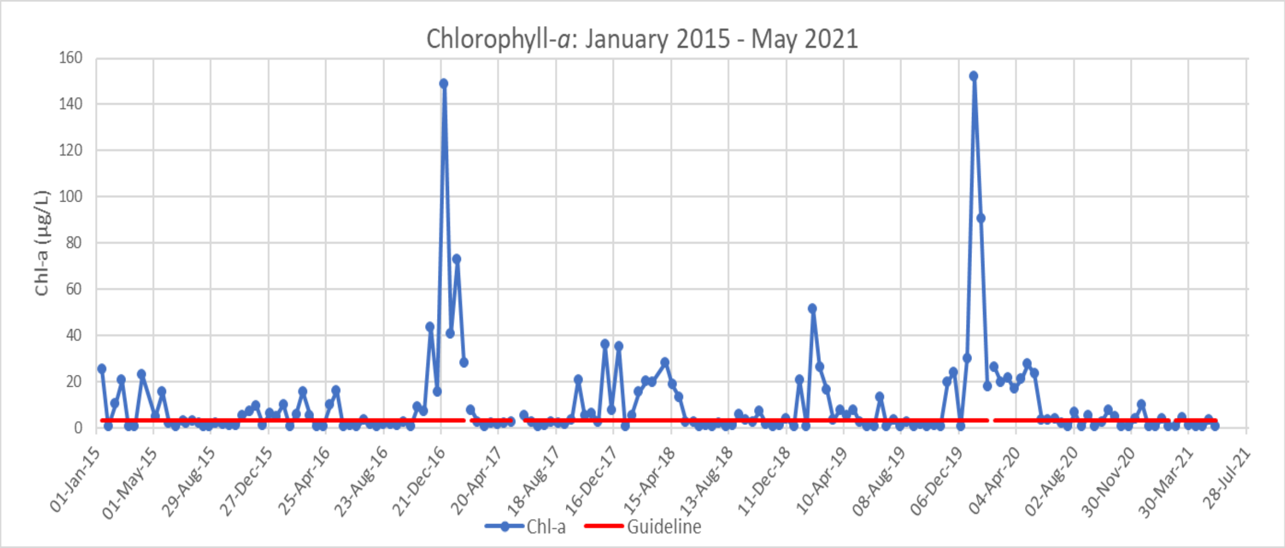


Figure 3-17 Chl-*a* concentrations at the downstream (15C9000) site in Campvale Canal over time. Compared with applicable ANZG (2018) DGV – 3µg/L

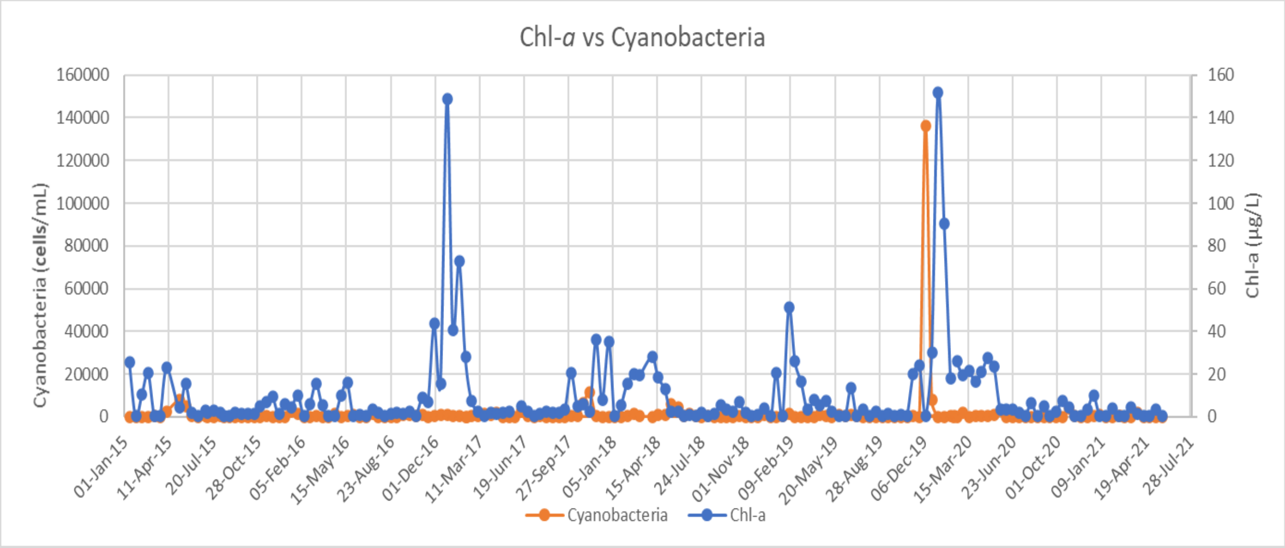


Figure 3-18 Relationship between Chl-*a* and cyanobacteria at the downstream site in Campvale Canal over time

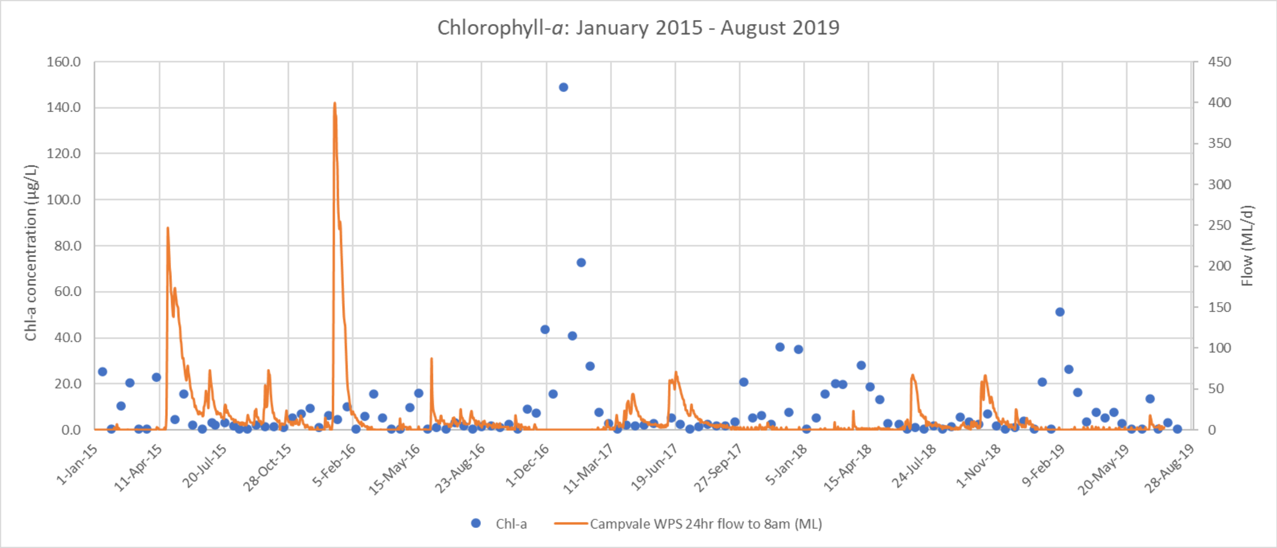


Figure 3-19 Chl-a concentration at downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019

3.2.1.6 Metals

Iron

Fe concentration was significantly higher over the summer period (December to March) than in winter (April to September), with median Fe concentration in summer found to be 19.9 mg/L whilst median Fe concentration in winter was 2.05 mg/L (refer to Figure 3-20) shows that Fe tended to be higher during low/no flow and decreased during flow events possibly due to dilution as volumes in the canal increase (refer Figure 3-21). It appears that these low/no flow events, which are when DO concentrations are lower, cause metals bound to sediments, including iron, to be released into water which then oxidise to form iron oxides (Ecological Associates, 2010), this relationship is considered to be confirmed as shown on Figure 3-21. Another potential source for the elevated concentrations of Fe during low/no flow could be the mobilization of iron from iron disulfide in acid sulfate soils as they oxidise under drier conditions that increases in iron over the summer period may be related to Fe content present in algae, however this latter theory was not supported by the data as shown in Figure 3-23, when only some months had correspondingly high algal numbers and iron concentrations. Therefore, it is unlikely that the source of high iron is from algae.

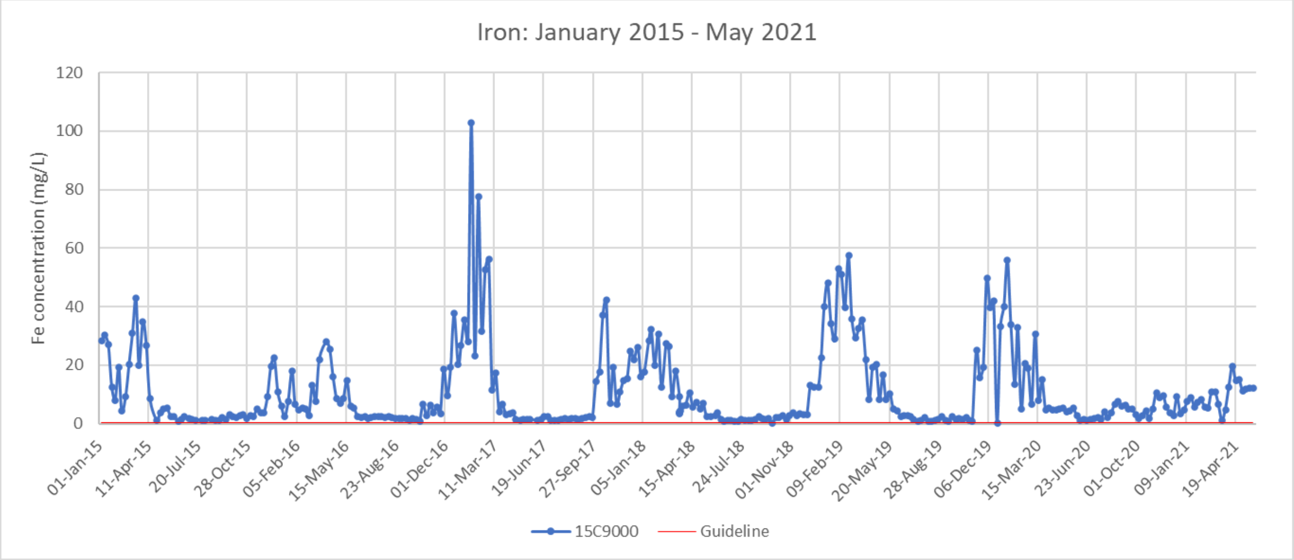


Figure 3-20 Iron concentration at upstream (15D2000) and downstream (15C9000) sites in Campvale Canal over time. Compared with applicable ADWG DGV – 0.3mg/L (NHMRC and NRMMC, 2011)

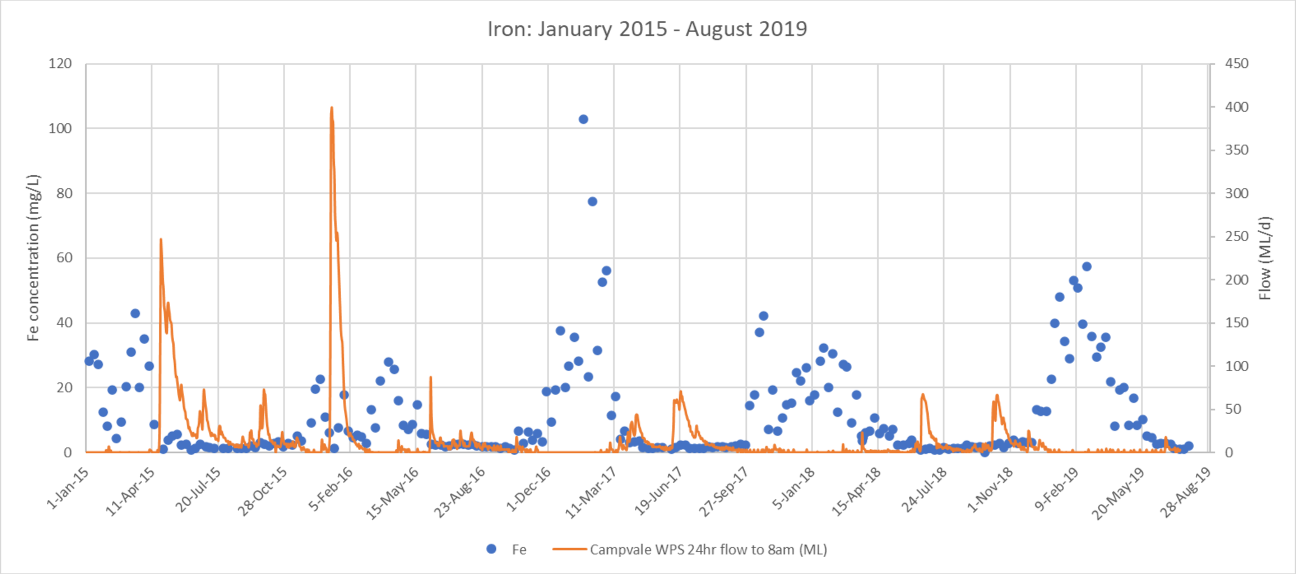


Figure 3-21 Iron concentration at downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021). Compared with applicable ADWG DGV – 0.3mg/L (NHMRC and NRMMC, 2011)

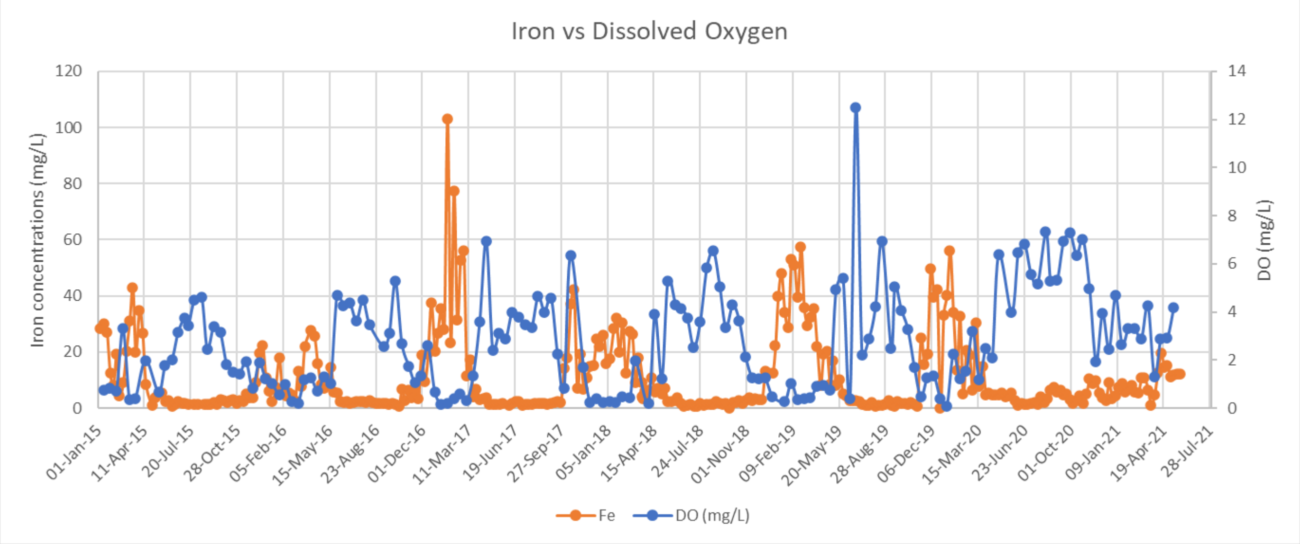


Figure 3-22 Relationship between Fe and DO at the downstream site in Campvale Canal over time.

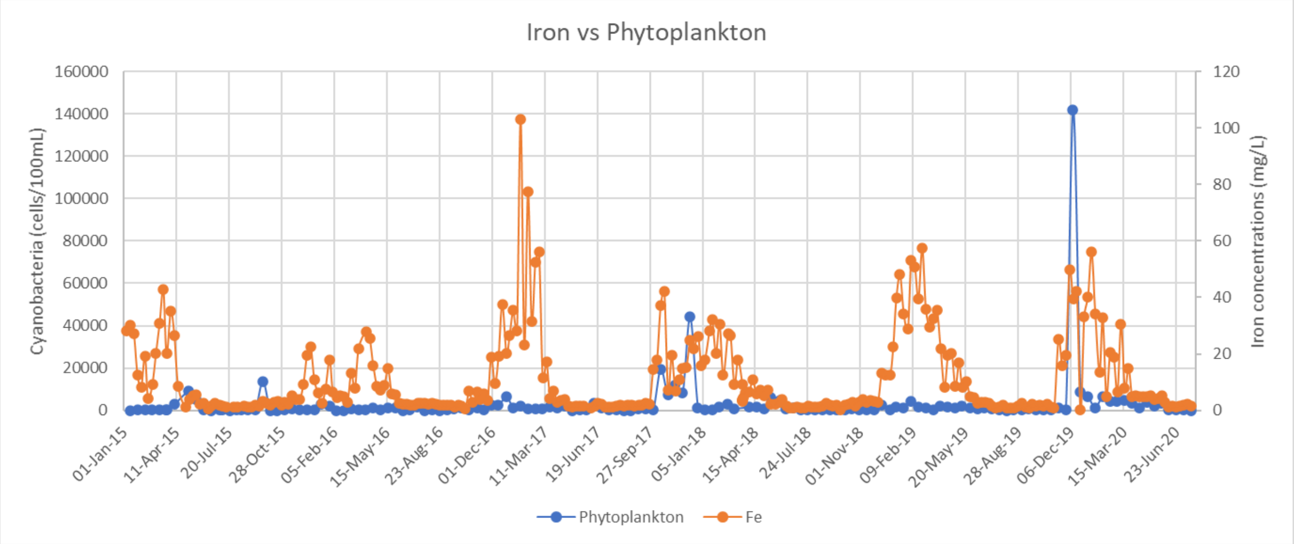


Figure 3-23 Relationship between Fe and phytoplankton at the downstream site in Campvale Canal over time.

Aluminium

Al concentration did not appear to follow a seasonal trend (refer to Figure 3-24), nor did it tend to strongly correlate with flows (refer to Figure 3-25), however elevated Al concentrations did appear to correlate with decreases in pH (refer to Figure 3-26).

Typical Al concentration appeared to fluctuate between 0.045mg/L and 1.6mg/L throughout the year with some occasional peaks between 2.8mg/L and 4.1mg/L which corresponded with significant decreases in pH to between 3.5 – 5.5. Elevated Al concentrations are suspected to be due to acidic precipitation (Rosseland, et al, 1990), where under acidic conditions, aluminium oxide compounds found in sediments dissolve to form the hydrated ion Al^{3+} in solution.

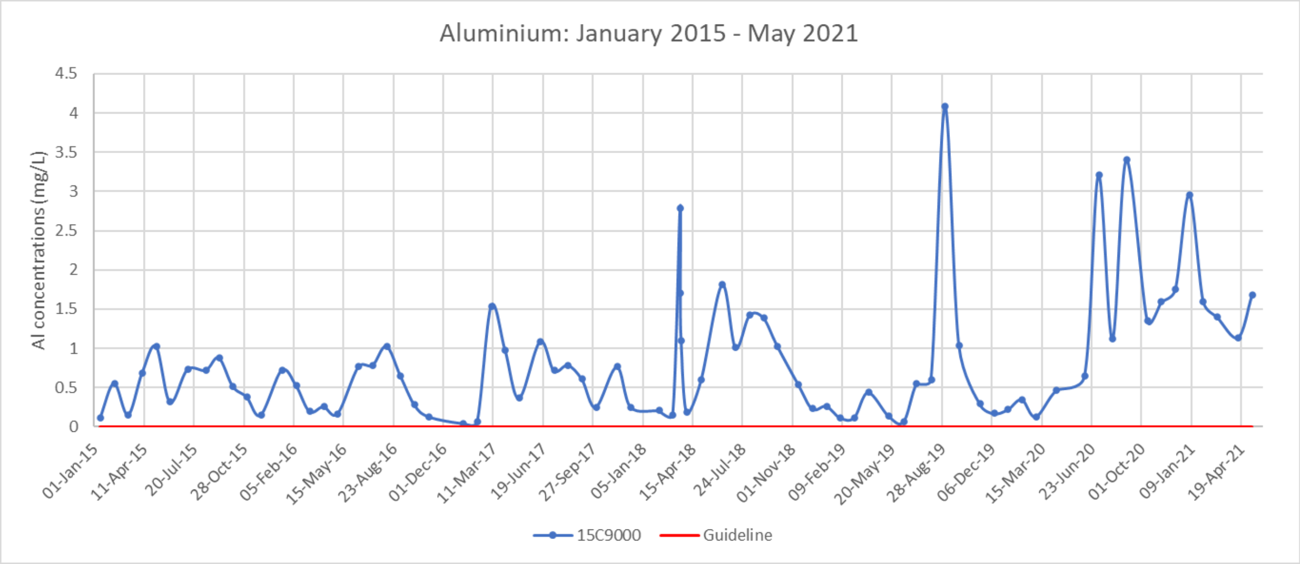


Figure 3-24 Aluminium concentration at the downstream (15C9000) site in Campvale Canal over time. Compared with applicable ANZG (2018) DGV – 0.0008mg/L.

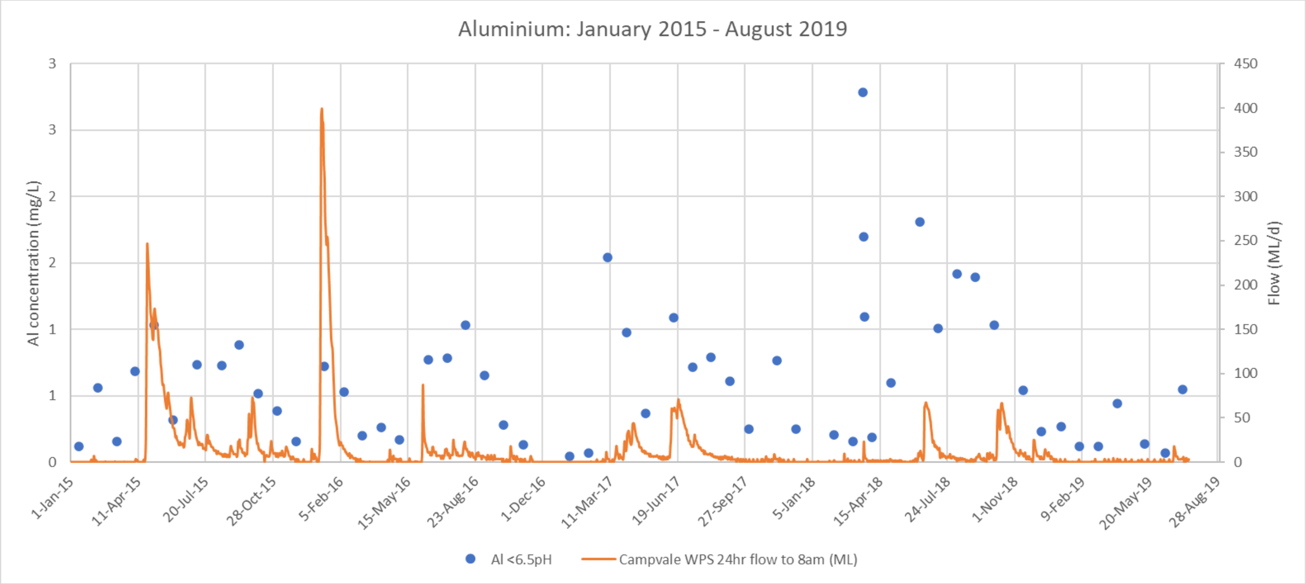


Figure 3-25 Aluminium concentration at the downstream site in Campvale Canal compared with estimated flow between January 2015 and August 2019 (Data source: HWC, 2021)

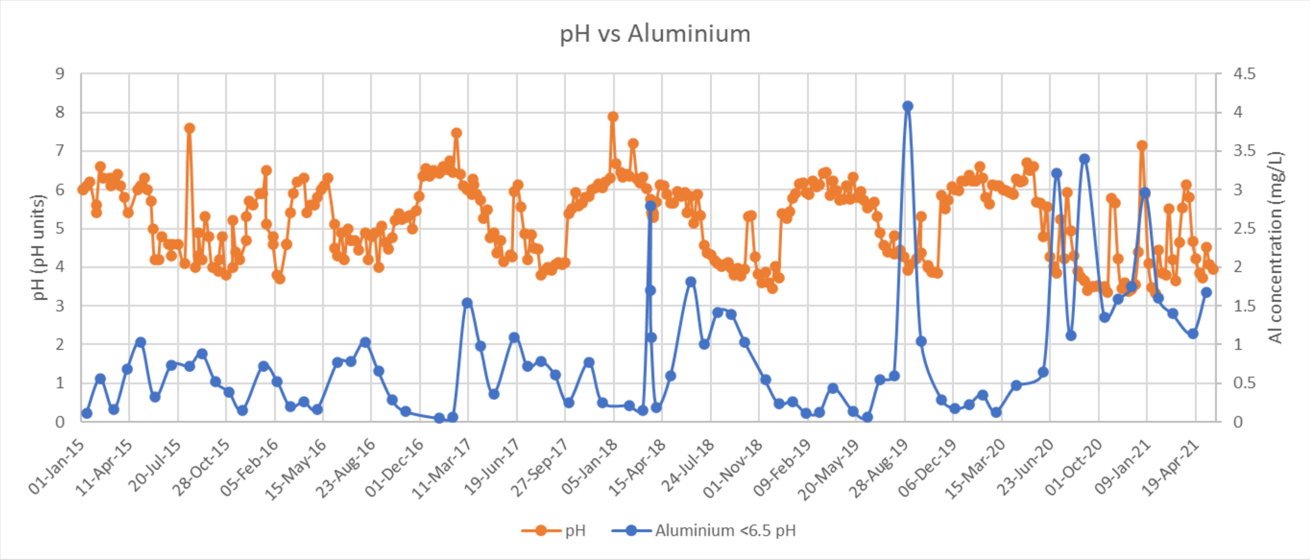


Figure 3-26 Relationship between pH and Al at the downstream site in Campvale Canal over time.

3.2.2 Field observations

Environmental scientists collected in-situ physiochemical water quality data from six monitoring locations along the Campvale Canal and two sites in the Campvale Wetland on the 5th and 6th July 2021. Figure 3-1 highlights the surface water monitoring locations. It should be noted, however, that the in-situ monitoring data is solely reflective of water quality at the time of collection and should not be interpreted as long term trends. A summary of field data and observations collected on site is provided in Table 3-5.

Overall, water quality within the Campvale Canal was mostly consistent across all main channel sites (AS1 – AS6). Based on the observational and in-situ data collected, the following water quality observations have been made:

- Average water temperature ranged between 12.3 and 13.5°C across the sites.
- Average electrical conductivity ranged between 354 – 380μS/cm across all sites which is consistently slightly above the typical range for NSW coastal rivers (200 – 330μS/cm). Despite being slightly above the typical range, EC concentrations remained within guideline limits of 125 – 2200μS/cm.
- Average dissolved oxygen concentrations were outside the recommended DGV range for lowland rivers (85-110% saturation) at all main channel sites. Results were consistently below the lower guideline limit, ranging between 36 and 49% saturation.
- Average turbidity remained within the guideline range of 6 to 50 NTU for all main channel sites. Turbidity concentrations ranged from 10 – 21 NTU across all sites. This is typical of the canal during the winter period as shown in Figure 3-4.
- Average pH was below the lower guideline limit of 6.5 for all main channel sites. pH ranged between 5.37 – 6.10 across all sites. This is typical water quality of the canal as shown in Figure 3-2.

Water quality in the Campvale Wetland was markedly different than the Campvale Canal but generally consistent across both sites (AS7 and AS8) at the time of inspection. It should be noted that there are currently now recommended guidelines for wetlands in south-east Australia. Based on the observational data collected, the following water quality observations have been made:

- Average water temperature in the wetland was significantly cooler than in the canal, ranging between 8.8 and 10.9°C across the two wetland sites.
- Average electrical conductivity ranged between 72.73 – 72.63μS/cm

- Average dissolved oxygen concentrations were outside the recommended guideline range for lakes and reservoirs (90-110% saturation) at both wetland sites, and both were below the lower guideline limit, ranging between 60.77% saturation at AS7 and 30.67% saturation at AS8.

- Turbidity remained within the guideline range of 1 to 20 NTU for both wetland sites. Turbidity concentrations ranged between 1.56 NTU at AS7 and 3.44 NTU at AS8.

- Average pH remained within the guideline range of 6.5 – 8 for both sites. pH ranged between 6.6 at AS8 and 6.72 at AS7.

Table 3-5 Summary of in-situ water quality data and field observations

Site Number	**Site description**	**Temp**	**pH**	**DO**	**EC**	**Turbidity**	**Water quality visual observations**
		(°C)	pH Units	(% sat)	(µS/cm)	NTU	
AS1	Campvale Canal main channel – ponded area upstream of pumping station	13.03	5.37	41.93	354.37	14.80	• Sediment within the canal was silty and had a light brown colour. • The water was mostly clear upon inspection but appeared turbid in the channel (could not see the channel bed). • There was filamentous algae and scum present on the surface of the water. • Lots of aquatic weeds covered the surface of the water (Cape waterlily). • At the time of inspection, the site had high water level and no flow except for some wind-blown surface ripples. • There was no odour and there was no frothing or oily sheen present on the surface of the water.
AS2	Campvale Canal main channel – approximately 1.2km downstream of pinch point	13.50	5.75	49.43	366.27	21.90	• Sediment within the canal was silty and had a light brown colour. • The water was mostly clear upon inspection but appeared turbid in the channel (could not see the channel bed). • There was no odour or frothing, however there was an oily sheen present on the surface of the water. • Filamentous algae were present on the surface of the water. • At the time of inspection, the site had moderate water level and low-moderate flow, flowing in a westerly direction toward the pumping station.
AS3	Campvale Canal main channel – approximately	12.47	6.00	41.97	370.20	13.07	• Sediment within the canal was silty and had a light brown colour. • The water was mostly clear upon inspection but appeared turbid in the channel (could not see the channel bed).

Site Number	Site description	Temp	pH	DO	EC	Turbidity	Water quality visual observations
		(°C)	pH Units	(% sat)	(µS/cm)	NTU	
	0.6km downstream of pinch point						• There was no odour or frothing, however there was an oily sheen present on the surface of the water. • Filamentous algae were present on the surface of the water. At the time of inspection, the site had moderate water level and low-moderate flow, flowing in a westerly direction toward the pumping station.
AS4	Campvale Canal main channel – At pinch point	12.30	6.10	42.47	380.33	10.05	• Sediment within the canal was silty and had a light brown colour. • The water was mostly clear upon inspection but appeared turbid in the channel (could not see the channel bed). • There was no odour, scum or frothing, however there was an oily sheen present on the surface of the water and some surface debris downstream. • At the time of inspection, the site had moderate water level and low flow, flowing in a westerly direction toward the pumping station. • Some evidence of minor erosion – undercutting on the southern bank. • There was some rubbish present on the southern bank next to the bridge, including sheets of corrugated iron.
AS5	Campvale Canal main channel – approximately 0.2km upstream of pinch point	13.10	5.91	36.17	376.20	11.93	• Sediment within the canal was silty and had a light brown colour. • The water was mostly clear upon inspection but appeared turbid in the channel (could not see the channel bed). • There were some filamentous algae present on the surface of the water. • Aquatic weeds covered about 20% of the surface of the water (Cape waterlily).

Site Number	Site description	Temp	pH	DO	EC	Turbidity	Water quality visual observations
		(°C)	pH Units	(% sat)	(µS/cm)	NTU	
							• At the time of inspection, the site had moderate water level and low flow, flowing in a westerly direction toward the pumping station. • There was no odour and no frothing, although there was an oily sheen present on the surface of the water.
AS6	Campvale Canal main channel – approximately 0.65m upstream of pinch point	13.13	5.77	47.13	379.70	14.43	• Sediment within the canal was silty and had a light brown colour. • The water was mostly clear upon inspection but appeared turbid in the channel (could not see the channel bed). • The water appeared clear, and you could see the bottom of the waterbody at the site. • There was no odour, scum or frothing, however there was an oily sheen present on the surface of the water. • Filamentous algae were present on the surface of the water. • At the time of inspection, the site had moderate water level and low flow, flowing in a westerly direction toward the pumping station. • Some evidence of erosion was present at the site, including undercutting on left bank and exposed roots.
AS7	Campvale Swamp – North west bank	10.87	6.72	60.77	175.00	1.56	• The water appeared clear, and you could see the bottom of the waterbody at the site. • Water was stagnant and had high water level. • Aquatic weeds covered about 20% of the surface of the waterbody (Cape waterlily). • Aquatic macrophytes (tall spike rush) in good condition occupied most of the waterbody. • There were some rubbish piles present on the north western bank.

Site Number	Site description	Temp	pH	DO	EC	Turbidity	Water quality visual observations
		(°C)	pH Units	(% sat)	(µS/cm)	NTU	
							• There was no odour, frothing or oily sheen present on the surface of the water.
AS8	Campvale Swamp – North bank	8.80	6.66	30.67	72.63	3.44	• The water appeared clear, and you could see the bottom of the waterbody at the site. • Water was stagnant and had high water level. • Aquatic macrophytes (tall spike rush) in good condition occupied most of the waterbody. • There was no odour, frothing or oily sheen present on the surface of the water.

3.3 Water quality changes due to canal options

Based on results and subsequent recommendations made in the hydraulic assessment (refer to Section 2), the following sections will discuss potential changes to water quality of the Campvale Canal based on canal Option 2c and 2e only. Water quality changes have been compared to existing conditions as described in Section 3.2.

Key outcomes of the hydraulic assessment which relate to this water quality assessment are reiterated in Table 3-6 and discussed below.

Table 3-6 Extract from option assessment

Variable	Option 2c	Option 2e
Water quality pumped to Grahamstown Dam	Reduction in day-to-day water quality treatment function by 17% from existing.	Reduction in day-to-day water quality treatment function by 7% from existing.
Constructability	Moderate spoil volume approx. 23,000m^3, 1m depth of excavation between existing channel bed level.	Moderate spoil volume approx. 18,000m^3.

Further, as described in Section 2.2, literature suggests that the ponding duration required to initiate anaerobic conditions could be around 10 days, based on research on coastal wetlands on the NSW North Coast (Johnson, et al, 2003) however it has been noted that duration to initiate anaerobic conditions can be variable (between three and 20 days), depending on weather conditions, vegetation species and the amounts of vegetation litter in the inundated area. Warm weather conditions with higher levels of vegetation litter and presence of non-wetland vegetation species are expected to promote anaerobic conditions over shorter durations, while cool weather, low levels of dead vegetation matter and dominance of wetland-type vegetation species would require longer durations of inundation to produce anaerobic conditions (pers comm. DPE and UNSW Water Research Laboratory (WRL),13 Sept 2021).

Given the study area largely exhibits similar coastal wetland conditions and soil type as those studied in Johnston et al (2003) (dominant wetland vegetation *Melaleuca quinquenervia* and acid sulphate soils), this assessment has assumed that a >10-day inundation would broadly represent the standard conditions required for blackwater events to be initiated in the study area, while >3-day inundation would represent potential initiation of anaerobic conditions should the study area experience warm temperatures, high leaf litter and terrestrial dominant vegetation. Greater than 20-day inundation would represent potential risk of blackwater event in cool temperatures, low leaf litter and wetland dominated vegetation.

Assuming conditions are equal between existing and design case, Table 3-7 describes the per-cent reduction in the risk of blackwater events under varying environmental conditions with respect to modelled Options 2c and 2e compared to existing.

Table 3-7 Risk of blackwater events at varying inundation durations for modelled options compared with existing conditions

Duration of inundation above 6.3 m AHD	Option 2c	Option 2e
>3 days	Modelling indicates occurrences may be reduce by 29% from existing. Minor-moderate reduction of risk of blackwater events in warm temperatures, high leaf litter and terrestrial vegetation dominated floodplain areas.	Modelling indicates occurrences may be reduced by ~5% from existing. Minor reduction of risk of blackwater events in warm temperatures, high leaf litter and terrestrial vegetation dominated floodplain areas.
>10 days	Modelling indicates occurrences may be reduced by 74% from existing. Moderate-substantial reduction of risk of blackwater events in moderate temperatures, with moderate leaf litter and dominated by seasonally inundated wetland specialist vegetation.	Modelling indicates occurrences may be reduced by 52% from existing. Moderate reduction of risk of blackwater events in moderate temperatures, with moderate leaf litter and dominated by seasonally inundated wetland specialist vegetation.
>20 days	Modelling indicates elimination of occurrences of >20 days inundation from existing. Very substantial reduction of risk of blackwater events in cool temperatures, minimal leaf litter and dominated by wetland vegetation.	Modelling indicates occurrences may be reduced by 75% from existing. Moderate-substantial reduction of risk of blackwater events in cool temperatures, minimal leaf litter and dominated by wetland vegetation.

3.3.1 Evaluation of canal options

Option 2c would result in decreased retention time of flows in the Campvale Wetland before reaching the pumping station thereby reducing the day-to-day water quality treatment function of the wetland by 17% from existing. Shorter retention times would cause a larger proportion of sediment-laden and nutrient-rich runoff from the catchment to flow directly to the pump station. This in turn may result in further eutrophication of the canal from nutrient sources including TN, TP and NH_3, increased suspended sediment (higher turbidity) and therefore potentially increase the occurrence of algal blooms.

Conversely, however, Option 2c is expected to provide a moderate-substantial reduction to the risk of blackwater events over all environmental conditions and inundation scenarios (refer Table 3-7). This can be interpreted to mean improved rates of flow and therefore less occurrences of stagnant, anaerobic water reaching the canal. In terms of water quality improvements, increased dissolved oxygen concentration is likely to result in a reduction of metals, particularly Fe, and other stressors (nitrogen and phosphorus) leaching from sediments during low flows. In the case of Fe, this would also contribute to a reduction in suspended iron oxide particulates floating in the water column, therefore potentially lowering turbidity. Increased flows, however, may also result in reduced pH concentrations which has been shown to be occurring during flows (refer to Section 3.2.1.1), and causes aluminium to be leached from sediment and become dissolved in solution (refer to Section 3.2.1.6).

Option 2c also leads to increased occurrence of dry days in the wetland due to improved outflow capacity of the canal from CDIA. The resulting additional drying of the wetland may increase the risk of exposing ASS to the atmosphere where they can oxidise and produce sulfuric acids and Fe compounds. This may pose a risk to the aquatic ecosystem and to Grahamstown Dam water quality downstream as subsequent wetting of the soils and mobilisation of flows could exasperate acidic conditions in the canal and wetland.

Option 2e is expected to result in longer retention time for water in the wetland when compared to Option 2c, however, still results in a reduction of the day-to-day water treatment capability of the wetland by 7% from existing. As such, Option 2e is still likely to result in additional sediment and nutrient-rich runoff from the catchment reaching the canal during high flows, however the proportion of which would be less when compared with Option 2c.

On the other hand, Option 2e would provide substantially less reduction to the risk of blackwater events than Option 2c under all environmental conditions and inundation scenarios (refer Table 3-7), therefore would not provide as much improvement to DO concentrations during low flow periods. Consequently, Option 2e is more likely to continue anaerobic conditions in the canal during low flow periods thereby exacerbating elevated concentrations of metals and nutrients caused by leaching Fe, NH_3 and TN from sediments. As previously mentioned, this not only results in higher concentrations of these toxicants in the available water but can also subsequently result in elevated turbidity, particularly for Fe when it forms iron oxide particulates in the water column. Lower flows, however, would assist in maintaining higher pH (approaching neutral pH) and therefore low concentrations of dissolved Al in the water due to less acidic precipitation.

Based on the wetting and drying assessment, Option 2e is not expected to result in a change in the number or length of dry periods experienced in the CDIA from existing. As such, this option does not pose an increased risk of exposing ASS to the atmosphere and subsequently further acidification of downstream water quality in the canal and wetland.

The main concerns to water quality during the construction phase would be related to management of ASS, turbidity and release of metals/nutrients bound to channel bed sediments during disturbance. It is expected, however, that these impacts would be mitigated by implementation of appropriate erosion and sediment controls, for instance, a coffer dam for instream works with a temporary creek diversion to allow natural flow to continue downstream as required. Water from the isolated instream works area would be pumped to a water retention basin or treatment plant and would be treated to ANZG (2018) guidelines (and ADWG where applicable) prior to any discharge downstream.

3.3.2 Potential impacts to Grahamstown Dam

While some water quality monitoring has been previously undertaken in Campvale canal and the discharge point in Grahamstown Dam, the routine monitoring program was not designed to identify the occurrence of black water events. As such the data does not allow for the identification or analysis of blackwater events and potential correlations to rainfall and inundation events in CDIA. Further, there are uncertainties about the occurrence of blackwater events in CDIA such as the duration of ponding required to produce blackwater events in the conditions specific to CDIA.

Water quality responses at Grahamstown Dam due to changed inflow conditions have not been studied in this assessment due to a lack of data availability from within the Dam, in proximity to the inflow point. As such, there are uncertainties about the sensitivity of water quality in the Dam due to changes to the Campvale canal flows and water quality. A key issue relevant to this study is how influential the Campvale canal inflows are to the overall water quality of the Dam, considering that these inflows are minor compared to other inflows such as the offtake from the Williams River comprising approximately 6% of total inflows (pers comm HWC). It is understood that HWC are in the process of developing an ecological lake model, which is a numerical model that reflects the conceptual understanding of the system.

Improvements to knowledge of these aspects of the Grahamstown Dam catchment water quality processes would better inform decisions on upgrading Campvale canal, with better quantification of benefits and reduced uncertainty of resultant impacts. Given these uncertainties, it would be prudent at this stage to adopt a least-risk approach and maintain existing water quality treatment functioning and drainage conditions in CDIA.

As discussed in Section 3.3.1, increased drying of wetland acid sulfate soils has the potential to mobilise Fe, Al, Mn and free H^+ (as indicated by pH monitoring) to water within the Campvale Canal. The increased frequency of wetland drying could result in a commensurate increase in the duration over which elevated concentrations of these analytes are realized in the canal. Conservatively, if it is assumed that even short durations of drying (3 days) can result in the mobilization of these analytes in response to drying, such water quality conditions could manifest for up to 21% longer than currently observed (as indicated in section 2.6.3), resulting in a similar increase in the associated loads to the dam.

However, given that water from the canal represents less than 25% of the water entering Grahamstown Dam (Hunter Water Corporation, 2021), this increase would be reduced to approximately 5% of the annual load to the dam. Furthermore, it is likely that atmospheric equilibration of water in the dam with O_2 and CO_2, as well as any existing alkalinity within dam itself or water entering the dam from Williams River would buffer the acidity entering the dam from the canal. The resulting increase in pH would result in the precipitation of dissolved Fe, Al and Mn which are less soluble at neutral pH values.

Based on the above, the potential impacts on water quality in the dam associated with increased wetland drying could range between a 5% increase in the load of metals and H^+, to a negligible change (or changes that are highly localized to the canal discharge point). Whilst there is detailed water quality monitoring within the canal, lack of corresponding routine monitoring of Grahamstown dam, or Williams River, limits the ability to quantitively determine the water quality outcomes associated with changes to the discharge of canal water which was not the objective of the monitoring program. However, this could be assessed simply via PHREEQC water quality modelling simulations at a later date should the exercise be deemed warranted and this information be made available.

4. Aquatic Ecology assessment

4.1 Methodology

The purpose of the aquatic ecology assessment was to understand what effect changes in the water quality of the canal and changes to the wetting and drying of the wetland under different options would have on aquatic ecosystems. The methodology for the aquatic ecology assessment has included:

- A desktop review of available literature, databases, and background information to determine ecological value of the aquatic environments in the canal and adjacent wetland (Campvale Wetland). Information sources included:
    - The Bionet – the Atlas of NSW Wildlife Threatened Species Profile Database (DPIE, 2021a) (accessed July 2021), which was searched for records of Commonwealth and state listed aquatic flora and fauna within a 10 km radius of the Campvale Canal.
    - Atlas of Living Australia (ALA, 2021) (accessed July 2021), which was searched for records of Commonwealth and state listed aquatic flora and fauna within the study area.
    - KFH Mapping and threatened species distribution maps (DPIE, 2021b) (accessed July 2021) available on the NSW Fisheries website, which were examined for the potential presence of threatened species in the study area.
    - Site-specific information provided by Hunter Water (per Comms, J. Van Den Broek, August 23, 2021).
- A visual assessment of the aquatic environments within Campvale Canal and the adjacent wetland (Campvale Wetland, refer to Figure 1-1) was undertaken by environmental scientists between 5th and 6th July 2021. Aquatic habitat assessment sites were at the same locations as water quality monitoring sites (refer to Figure 3-1). The purpose of the field assessment was to gain an understanding of the existing conditions of the aquatic environments within the area, and to characterise the aquatic habitat values that may be impacted by changes to the canal.
- A qualitative impact assessment on aquatic ecosystems based on changes to water quality (as outlined in Section 3.3) and altered water regime of the wetland under the preferred canal Option 2c.

4.2 Existing Conditions

4.2.1 Aquatic habitat

In general, the desktop assessment revealed that neither the Campvale Canal or any areas of the Campvale Wetland are Key Fish Habitat (KFH) (DPIE, 2021b), no threatened aquatic species under the *Fisheries Management Act 1979* (FM Act) have been recorded or have predicted habitat in these aquatic environments and no benthic aquatic species have been recorded in the canal or swamp in the vicinity of the proposal area (DPIE, 2021a; DPIE, 2021b). It is important to note that a section of the broader wetland (approximately 1.4kms east of the proposal area), has been mapped as ‘Coastal Wetland’ under the State *Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP). The location of ‘Coastal Wetland’ relative to the CDIA and proposal area is depicted in Figure 1-1. A review of LIDAR survey indicates the mapped Coastal Wetlands is located above the permanent water level in CDIA and therefore no impacts associated with change to permanent inundation are expected. The coastal wetland would continue as normal and only be intermittently inundated when CDIA is in flood. These impacts however would need to be investigated future through more detailed studies/investigations/assessment.

Despite the lack of available desktop information, field observations revealed that both Campvale Canal and Campvale Wetland exhibit aquatic habitat characteristics which are predicted to provide habitat for several non-benthic aquatic biota, including wetland specialists such as frogs, turtles, dragonflies, and macroinvertebrates. Further, it is important to note that the public databases used to determine species presence are limited and are potentially not spatially accurate (i.e., listings for sensitive species may be 'spatially denatured' to protect local populations). As such, flora and fauna composition of these habitats has not been thoroughly investigated and detailed biodiversity surveys would be required prior to any canal modification works.

The Campvale Canal is distinguished into three aquatic habitats, a wide and deep ponded section immediately upstream of the existing pumping station (AS1), the main channel downstream of the pinch point (AS2, AS3, AS4) and the main channel upstream of the pinch point (AS5 and AS6). Additionally, the Campvale Wetland (refer to Figure 1-1) is considered its own aquatic ecosystem and is generally hydrologically separate from the canal during dry conditions but becomes connected during flood events (AS7 and AS8) (refer to Section 2 for details on hydrological characteristics of the catchment). Campvale Wetland at the assessment sites were taken to be representative of the aquatic environment in the larger wetland area of the CDIA. The overall findings of the aquatic habitat assessment (based on both desktop assessment and field observations) have been summarised in the Table 4-1.

Refer to Figure 3-1 for plan location of field assessment sites.

Table 4-1 Aquatic habitat descriptions

Habitat	Habitat description	Photos
Campvale Canal – ponded area upstream of pumping station	The main channel of the Campvale Canal upstream of the pumping station is a perennial, second order stream which was wide and deep, and had no flow at the time of inspection. The channel at this location appeared to function more like a pond with the pumping station immediately downstream obstructing natural flow. Both the northern and southern banks are steep and densely vegetated. The channel spans a width of approximately 20 metres in this section of the canal. The riparian zone in this section of the canal is mostly cleared grass land on both banks, however the bank slopes are densely vegetated with macrophytes. The dominant emergent macrophyte species was the Common Reed (*Phragmites*). At the time of inspection, there was also a large infestation of non-native floating aquatic plant – Cape Waterlily (*Nymphaea caerulea*) present in this section of the channel, covering approximately 80% of the water surface. A substantial number of floating filamentous algae was present within the waterway. No aquatic species were observed in this section of the channel at the time of inspection; however, database searches indicate records of several species of native frog in the area (refer to Section 4.2.2). No turtles or dragonflies were observed at the time of inspection or have been officially recorded in the vicinity of the canal or wetland (DPIE, 2021a), however several dragonfly/damselfly species, including Darners (*Aeshnidae*), Club-tailed dragonflies (*Gomphidae*), and Narrow-winged damselflies (*Coenagrionidae*) have been	 Assessment site AS1 facing upstream  Assessment site AS1 facing upstream

Habitat	Habitat description	Photos
	sighted during inspections of the channel (per Comms, J. Van Den Broek, August 23, 2021)	
Campvale Canal – Downstream of pinch point	The main channel of the Campvale Canal downstream of the pinch point is a perennial, second order stream which was shallow and had low-moderate flow at the time of inspection. The channel did not exhibit any pool or riffles and there were no rocks or snags present in stream. The banks are low gradient in some sections and incised in others. The channel spans a width of approximately 5 metres in this section of the canal and the channel has been artificially straightened. Broadly, the channel flows through an open woodland dominated with paperbark gum (*Melaleuca quinquenervia*). The immediate riparian zone in this section generally consists of paperbark gums and riparian scrubs along the southern bank and the northern bank has been cleared for an access track. The northern bank slope has been cleared. No macrophytes were present in this section of the channel. No aquatic species were observed in this section of the channel at the time of inspection; however, database searches indicate records of several species of native frog in the area (refer to Section 4.2.2). No turtles or dragonflies were observed at the time of inspection or have been officially recorded in the vicinity of the canal or wetland (DPIE, 2021a), however several dragonfly species, including Darners (*Aeshnidae*), Club-tailed dragonflies (*Gomphidae*), and Narrow-winged damselflies (*Coenagrionidae*) have been sighted during inspections of the channel (per Comms, J. Van Den Broek, August 23, 2021)	 Assessment site AS2 facing upstream  Assessment site AS2 facing downstream

<table>
<tr><th>Habitat</th><th>Habitat description</th><th>Photos</th></tr>
<tr><td>Campvale Canal – Upstream of pinch point</td><td>The main channel of the Campvale Canal upstream of the pinch point is a perennial, second order stream which was shallow and had low flow at the time of inspection.
The channel has minimal instream vegetation, the banks are low gradient and are mostly cleared of vegetation. The channel does not exhibit any pool or riffles and there were no rocks or snags present in stream. The channel spans a width of approximately 5 metres in this section of the canal and the channel has been artificially straightened.
Broadly, the channel flows through an open woodland dominated with paperbark gum (*Melaleuca quinquenervia*)and the EEC Swamp Sclerophyll Forest. Some sections of the woodland on the southern side of the channel have been cleared for farmland. The immediate riparian zone in this section generally consists of some paperbark gums lining the southern bank and the northern bank has been cleared for an access track. No macrophytes or snags were present in this section of the channel, although some sections had patches of non-native floating aquatic plant – Cape Waterlily (*Nymphaea caerulea*). Water lilies are regarded as an environmental weed in NSW. Waterlilies have escaped cultivation and have become a weed of freshwater habitats where they displace similar native species and block waterways (NSW WeedWise, 2022).
No aquatic species were observed in this section of the channel at the time of inspection; however, database searches indicate records of several species of native frog in the area (refer to Section 4.2.2). No turtles or dragonflies were observed at the time of inspection or have been officially recorded in the vicinity of the canal or wetland (DPIE, 2021a), however several dragonfly/damselfly species, including Darners</td><td>
Assessment site AS6 facing upstream

Assessment site AS5 facing downstream</td></tr>
</table>

Habitat	Habitat description	Photos
	(*Aeshnidae*), Club-tailed dragonflies (*Gomphidae*), and Narrow-winged damselflies (*Coenagrionidae*) have been sighted during inspections of the channel (per Comms, J. Van Den Broek, August 23, 2021)	
Campvale Swamp	Campvale Swamp at the assessment sites is an isolated wetland environment located approximately 150 metres south east of the Campvale Canal main channel. The wetland is ephemeral and receives water flow from the Campvale Canal during flood events. The Campvale Swamp is representative habitat of the larger Campvale Wetland area in the CDIA. Refer to Figure 1-1 for extents of CDIA and wetland. At the time of inspection, the wetland appeared to be in good condition, with clear ponded water with no flow. There were dense macrophyte beds in good condition, dominated by tall spike rush (*Eleocharis sphacelate*) which covered most of the wetland. As depicted in Figure 1-1, a portion of the CDIA is classified as Coastal Wetlands under the Coastal Management SEPP. The NSW wetland dataset does not indicate any Freshwater Wetlands on Coastal Floodplains in the Campvale area. Further the OEH have a broadscale map that nominates the indicative distribution of Freshwater Wetlands on Coastal Floodplains throughout the area however it is not confirmed to occur in the vicinity of CDIA. Further investigations would be required to confirm the presence of Freshwater Wetlands on Coastal Floodplains. A small open body of water was present along the north-western extent of the wetland. There were some patches of non-native floating aquatic plant – Cape Waterlily (*Nymphaea caerulea*) present and moss was growing on the bank of the pond.	 Assessment site AS7 facing upstream

Habitat	Habitat description	Photos
	Broadly, the wetland was surrounded by open woodland dominated with Broad-leaf Paperbark (*Melaleuca quinquenervia*). Beyond the wetland is the EEC Swamp sclerophyll forest. The northern bank had been cleared for an access track. A pile of rubbish was located next to the wetland near the access track. No aquatic species were visually observed in wetland at the time of inspection, however loud frog calls were heard indicating presence. Database searches indicate records of several species of native frog in the area (refer to Section 4.2.2) therefore it is predicted to be utilised by these species. No turtles or dragonflies were observed at the time of inspection or have been officially recorded in the vicinity of the canal or wetland (DPIE, 2021a), however several dragonfly/damselfly species, including Darners (*Aeshnidae*), Club-tailed dragonflies (*Gomphidae*), and Narrow-winged damselflies (*Coenagrionidae*) have been sighted during inspections of the wetland (per Comms, J. Van Den Broek, August 23,2021)	 Assessment site AS7 facing downstream

4.2.2 Aquatic biodiversity

No aquatic species were observed in the canal or wetland at the time of inspection, however database searches indicate records of several species of native frog in the area including Tyler's Tree Frog (*Litoria tyleri*), Common Eastern froglet (*Crinia signifera*), Eastern Dwarf Tree Frog (*Litoria fallax*), Spotted Grass Frog (*Limnodynastes tasmaniensis*), Brown-striped Frog (*Limnodynastes peronii)*, Eastern Snake-necked Turtle (*Chelodina longicollis*), and Haswell's Froglet (*Paracrinia haswelli*). These native species are protected in NSW under the *Biodiversity Conservation Act 2016* (BC Act) however they are not considered threatened. One sighting of the Wallum Froglet (*Crinia tinnula*), which is listed as Vulnerable under the BC Act, has been recorded in the canal (DPIE, 2021b). Additionally, although not observed in the canal, the recently described (and listed as Endangered under the BC Act) Mahony's Toadlet (*Uperoleia mahonyi*), and the Green and Golden Bell Frog (*Litoria aurea*) (listed as Endangered under the BC Act and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)) are known to be present in similar wetland habitats in the broader Tilligerry/Tomago region (DPIE, 2021b), therefore have potential to utilise this area.

No benthic aquatic species have been recorded in the canal (DPIE, 2021b) and no threatened aquatic species listed under the FM Act have been recorded or have predicted habitat in the Campvale Canal (DPIE, 2021a). No turtles or dragonflies were observed at the time of inspection or have been officially recorded in the vicinity of the canal or wetland (DPIE, 2021a), however several dragonfly/damselfly species, including Darners (*Aeshnidae*), Club-tailed dragonflies (*Gomphidae*), and Narrow-winged damselflies (*Coenagrionidae*) have been sighted during inspections of the canal and wetland (per Comms, J. Van Den Broek, August 23, 2021)

As specified in Section 4.2.1, it is important to note that public databases used to determine species presence in this assessment are limited and are potentially not spatially accurate (i.e., listings for sensitive species may be 'spatially denatured' to protect local populations). As such, flora and fauna composition of the area has not been thoroughly investigated and detailed biodiversity surveys would be required to confirm species presence prior to any canal modification works. Whilst no direct evidence of the threatened wetland flora species *Maundia triglochinoides* was recorded during the field surveys, its presence in the canal has been recorded downstream of Ferodale Road (pers comm HWC) and would need to be further investigated. Targeted surveys for the Wallum Froglet, Mahony's Toadlet and the Green and Golden Bell Frog are recommended to determine likelihood of presence.

Groundwater dependent ecosystems (GDEs) have been mapped across the Hunter Region where groundwater depth is three metres or less. According to mapping by Bell and Driscoll (2006) some GDEs are known to occur on the edge of the CDIA including:

- Scribbly Gum-Apple-Bloodwood Forest, Facultative
- Tomago Blackbutt-apple Bloodwood Forest, Facultative
- Paperbark Swamp Forest, Obligate.

Facultative and Obligate GDEs have differing dependencies on groundwater. Generally Obligate GDEs comprise of species that depend entirely on groundwater and as such are able to live with their roots continually wet or during seasonal periods of inundation. Facultative GDEs however cannot cope with their roots being permanently inundated and they contain species that access groundwater via the subsurface layer or within the soil matrix above the subsurface layer.

4.3 Ecological changes due to canal options

As described in Section 3.3, proposed canal options are likely to result in changes to water quality of the Campvale Canal and Campvale Wetland which can subsequently result in changes to aquatic ecosystem function. Additionally, a change in the outflow from the wetland under the different canal option scenarios may potentially result in exposure of ASS to air which oxidise, potentially resulting in exasperation of acidic conditions in the canal and wetland during subsequent flows. The inferred changes to water quality and water regime based on canal options are summarised in Table 4-2

Table 4-2 Summary of identified water quality and water level changes due to canal options

Option	Inferred water quality impacts
Option 2c	▪ Option 2c is expected to result in a lower retention time of water in the wetland therefore would result in higher flows and subsequently increased direct input of suspended sediment and nutrients from catchment runoff. ▪ Water quality of the canal is likely to have increased concentrations of TN, TP, NH_3, and higher TSS (therefore higher turbidity), therefore more likely to contribute to eutrophication of the waterway and algal blooms. ▪ Higher flows and a reduction in occurrence of blackwater events is interpreted to mean higher concentrations of DO in water reaching the canal and in the wetland. ▪ Increased DO would result in a reduction in leaching of Fe and nutrients from sediment during low flow periods. ▪ Based on observed long term water quality trends, increased flows are likely to result in lower pH of the canal. ▪ Low pH is expected to cause Al to be released from sediments and become dissolved in solution as bioavailable Al^{3+} ions. ▪ Option 2c leads to increased dry days in the wetland due to improved drainage conditions of the CDIA. The resulting additional drying of the wetland may increase the risk of exposing ASS to the atmosphere which can become oxidised and produce sulfuric acid, then subsequent wetting of the soils and mobilisation of flows could lead to exasperation of acidic conditions which are already experienced in the canal and wetland.
Option 2e	▪ As with option 2c, option 2e will result in greater concentrations of nutrients and TSS reaching the canal due to a lower retention time in the wetland compared to existing. The modelled reduction in retention time, however, is lower for Option 2e than 2c, therefore direct inputs would be proportionally lower. ▪ Option 2e would also result in increased flows to the waterway from existing therefore higher concentrations of DO in the water. Although increases in DO would be significantly less for option 2e than for option 2c. ▪ Less improvement to DO concentrations in the water would mean metals and nutrients would continue to leach from sediment in low/no flow periods. ▪ Less change to flow rate would mean less likely to result in low pH concentrations in the canal. ▪ Higher pH means less likely to cause acidic precipitation of Al. ▪ Option 2e is not expected to result in a change in the number of dry periods experienced in the CDIA from existing. As such, this option does not pose an increased risk of exposing ASS to the atmosphere and subsequently further acidification of downstream water quality in the canal and wetland.

Implications of water quality changes and altered water regime of the wetland are assessed in the Section 4.3.1 below.

4.3.1 Evaluation of canal options

Under the option 2c scenario, increased flow from the rural catchment directly reaching the outlet is likely to exasperate eutrophic conditions (which are already experienced - refer to Section 3.2.1.4) from increased nutrient input. High concentrations of nutrients can cause increased growth of algae and plants which can in turn result in oxygen deficiency in the water due to decomposition of organic matter. Low dissolved oxygen can lead to ‘dead zones’ in water where aquatic organisms cannot survive. Further to causing decreased oxygen content, algal blooms can directly impact aquatic species by clogging fish gills.

In addition to increased nutrients, additional suspended sediment from catchment runoff would result in increased turbidity within the canal. Elevated turbidity has potential to directly harm aquatic species, result in degradation of aquatic environments or can favour the establishment and proliferation of pest species that may be able to tolerate poorer water quality. More specifically, direct impacts on aquatic biota from increased turbidity include fish kills from clogging gills, reduction in trophic interactions due to decreased visibility, reduced light penetration of the water column which can limit growth of aquatic vegetation or potential loss of habitat/reduced suitability of habitat for species that may be sensitive to changes to water quality or may be outcompeted/preyed upon by invasive species.

Conversely, however, Option 2c is expected to reduce the risk of blackwater events moderately-substantially, which are suspected to occur following significant rainfall when there is pooling of water on the inundated floodplain and large amounts of organic material are leached into the waterbody. This organic material is high in dissolved organic carbon (DOC) and nutrients of which bacteria rapidly metabolise this carbon, depleting oxygen from the water more rapidly than replenishment can occur (Whitworth, et al, 2013). This results in hypoxic blackwater which looks black and is depleted of oxygen.

The anoxic conditions during a blackwater event results in numerous negative impacts to water quality and therefore aquatic ecosystems and organisms. Water quality is degraded due to the depletion of oxygen which can result in the release of sediment bound toxicants such as iron, phosphorus and ammonium which can increase concentrations of nutrients available to support nuisance and harmful algal blooms (Ecological Associates 2010). Dissolved oxygen concentrations of less than 4mg/L within the water can impact on fish and oxygen less than 2mg/L can be lethal to many aquatic organisms (Whitworth et al, 2013). Therefore, anoxic conditions from a blackwater event may result in fish kills, reduced growth rates, disruption of endocrine systems, embryonic development in fish and degradation of aquatic macroinvertebrate communities (Ecological Associates, 2010). A reduction in blackwater events is interpreted to mean improved DO concentrations in the wetland and canal from additional flow, which subsequently would result in significant environmental benefits for aquatic organisms and a reduction of suspended iron oxide particulate matter therefore potential reduced turbidity.

On the other hand, increased flow is likely to result in reduced pH concentrations in the canal (based on long-term trends) which can potentially be harmful to aquatic organisms, particularly fish, that prefer pH range of 6.5-8.5. Low pH is additionally suspected to be causing aluminium to be leached from sediment and become dissolved in solution to form bioavailable Al^{3+} ions (refer to Section 3.2.1.6). Aluminium is generally more toxic to aquatic organisms over the pH range 4.4 to 5.4, with a maximum toxicity occurring around pH 5.0 to 5.2 (ANZECC/ARMCANZ, 2000), which is the range of pH concentration experienced in the canal. Aluminium in acidic aquatic habitats has been observed to be toxic to fish and amphibians, although fish are generally more sensitive to aluminum than other aquatic organisms (ANZECC/ARMCANZ, 2000). Aluminium is a gill toxicant to fish, causing both ion regulatory and respiratory effects (ANZECC/ARMCANZ, 2000). However, it is important to note, in the context of the Campvale Canal, that no benthic organisms have been found to utilise the waterway and wetland therefore these impacts are unlikely. Amphibians, which are known to be present in the waterway and wetland, are less sensitive to aluminium toxicity at the adult stage of the lifecycle and most sensitive during the spawning and early life stages, particularly as newly hatched tadpoles, followed in sensitivity by embryos and then older tadpoles (Freda, 1991). Contrarily, the Wallum Froglet prefers acidic wetlands (pH 4.3-5.2) and requires shallow acidic waters (pH < 6) for spawning. As such, higher flows resulting in lower pH may assist to create more suitable habitat for this endangered species.

Another consequence of higher flows from Option 2c are potential geomorphic impacts due to increased flow velocities in the canal and over the wetland. Higher flow velocities across the wetland could result in sheet erosion that deposits downstream into the canal and higher velocities in the canal have the potential to result in increased bank erosion and downstream sedimentation. Due to the lack of riparian vegetation and macrophytes present instream and on the banks, erosion potential in the canal is high. Erosion and downstream sedimentation may alter the aquatic environment by deposition of sediment in pools, smothering aquatic plants and increasing turbidity. While there is potential for these impacts, the risk is considered low as flow velocities are not expected to be significantly elevated above existing under the Option 2c scenario. As option 2e retains similar discharge and flow characteristics as existing (except under high flow events), geomorphic impacts from option 2e are unlikely.

The overall modelling outputs suggest that the wetland would reach very low water levels (to the point that it would be considered completely “dry”) more often under canal Option 2c than are experienced under existing conditions or under canal Option 2e conditions (refer to Section 2.9). This is due to the increased drainage capability of the wetland under the Option 2c scenario, resulting in an increased rate of water level draw down following rainfall. Additional dry periods under Option 2c could increase the risk of exposing ASS to the atmosphere which may then oxidise and produce sulfuric acid, potentially exasperating acidic conditions that are already experienced in the canal and wetland during subsequent flows. As described previously, an acidic environment may be harmful to some aquatic organisms within the ecosystem, especially fish, however, could create more suitable habitat for the Wallum Froglet, a threatened amphibian species that is known to occur in the catchment.

In terms of the relative length of dry periods, the modelling results indicate that short term dry periods (<10 days) would increase under Option 2c scenario, however, would not result in substantial changes to the number of times the wetland would experience long term dry periods (>10 days). Due to the predominantly variable climate experienced in the region, NSW coastal wetlands are largely adaptable to changes in water regime, withstanding periods of low (drought) and high (flood) water levels at a range of temporal scales (Margaret, et al, 2000). As such, an increase in the number of additional days spent dry over a short timeframe is not expected to impact on the overall function of the wetland, in particular, would not result in the wetland becoming terrestrialised. However, it is suggested that further investigation should be conducted to determine wetland species present to better understand potential impacts to individual species from more frequent dry conditions. Improved drainage as a result of the proposed options could impact on GDEs such that obligate GDEs which prefer permanent inundation may be impacted by changes in the wetting and drying cycle. Facultative GDEs which partially depend on groundwater are less likely to be impacted, however, groundwater drawdown, particularly within the depth of three metres should be further investigated to confirm impact on GDEs. Option 2e is not expected to result in any changes to the wetting and drying regime of the wetland, therefore does not pose a risk to the aquatic environment further than existing.

For both options, instream works during construction have the potential to directly impact aquatic organisms which are present in the waterway although due to the lack of evidence of aquatic species presence in the area, this risk is considered low and manageable through standard biodiversity management practices such as pre-clearance surveys. Although further work would be needed to confirm species composition of the canal and wetland prior to any channel modification works. Impacts to aquatic ecosystems would therefore be primarily related to changes in water quality, particularly elevated turbidity and release of metals/nutrients bound to channel bed sediments during disturbance. As mentioned in Section 3.3.1 however, these impacts are expected to be mitigated by implementation of appropriate erosion and sediment controls, including a coffer dam for instream works with a temporary creek diversion to allow natural flow to continue downstream as required. Water from the instream works area would be pumped to a water retention basin or treatment plant and would be treated to ANZG (2018) guidelines (and ADWG where applicable) prior to any discharge downstream.

5. Contamination assessment

5.1 Purpose and scope

Jacobs was commissioned by HWC to undertake a targeted contamination and waste classification assessment of the Campvale canal bed sediments, at specified locations. The field works and review of analytical data collected at selected sediment sample locations within the canal will inform the potential contamination risks associated with human and ecological health as a result of the potential canal upgrade options 2a, 2b, 2c and 2e. In the event of any soil or sediment materials being disturbed or excavated, a preliminary in-situ waste classification will capture the analytical data and support decisions relating to off-site disposal of the waste or possible reuse of excavated materials within the Project's footprint.

This contamination assessment has been prepared in accordance with the following guidelines (where applicable):

- Acid Sulfate Soil Management Advisory Committee (1998) Acid Sulfate Soil Manual (ASSMAC, 1998)
- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999, as revised 2013 (NEPM, 2013)
- PFAS National Environmental Management Plan – Version 2.0, January 2020 (PFAS NEMP, 2020)
- Water Quality Australia (2018) National Acid Sulfate Soils Guidance – National acid sulfate soils sampling and identification methods manual (WQA, 2018a)
- Water Quality Australia (2018) National Acid Sulfate Soils Guidance – National acid sulfate soils identification and laboratory methods manual (WQA, 2018b)
- NSW EPA Waste classification guidelines, Part 1: Classifying waste, November 2014 (NSW EPA 2014a)
- NSW EPA Waste classification guidelines, Part 4: Acid sulfate soils, November 2014 (NSW EPA 2014b)

5.2 Overview

In the context of this preliminary contamination assessment. contaminated land refers to soil and sediment, that have concentrations of hazardous constituents exceeding those specified in policies and regulations, with the potential to cause an unacceptable risk to human health and/or the environment. Contamination can be caused by historic land use management practices, particularly those related to industrial processes, waste disposal, and chemical storage. The context for this desktop assessment is consideration of potential for soil and sediment contaminant issues that may influence the development options being considered for the Canal management being proposed.

Soils and rock can also include naturally elevated concentrations of some constituents (for instance certain heavy metals) exceeding applied guideline criteria. Naturally occurring acid sulfate soils and rock may also be encountered, and if disturbed during excavation these soils and rock can oxidise and acidify the environment. Additionally, naturally occurring ground gases (such as hydrogen sulfide or methane) can be found in organic rich sediments. Both acid sulfate soils and rocks and naturally occurring methane require assessment and management similar to anthropogenic contamination.

Contaminated land is regulated in New South Wales through the *Contaminated Land Management Act 1997* (CLM) and Contaminated Land Management Regulation 2013 (CLM Regulation). Upon excavation, contaminated soils that are removed from a site as spoil may be classified as waste, the regulation and management of which is governed by the *Protection of the environment Operations Act 1997* (POEO Act) and NSW Environment Protection Authority (EPA) Waste Classification Guidelines, Parts 1 to 4, 2014 (NSW EPA, 2014).

At a practical level, the identification and management of contaminated land is a material consideration in the planning, construction, and long-term maintenance of many infrastructure projects, with issues relating to:

1) Health and safety of workers and wider public health issues,

2) Incompatibilities between the building materials from chemically aggressive ground conditions resulting in durability concerns,

3) Management of excavated soils,

4) Disturbance of ground impacted with contaminants and migration of contaminants with consequential adverse impacts on human health and the environment,

5) Incompatibilities of the proposed development and existing contamination status due to creation of contamination exposure pathways due to the proposed development itself.

Points 1 to 3, noted above, are key potential issues to be considered for this project. If encountered, the potential implications can generally be mitigated or managed at the construction stage. Points 4 and 5 are potential issues that if found, can generally be mitigated at the design stage.

The objective of this assessment is to provide preliminary information about the potential contamination within the project area and to identify potential hazards and/or constraints associated with ground conditions that may have implications on the proposed management options of the Campvale canal.

Site specific ground investigations of potential soil and sediment contamination at the project area were undertaken in early July 2021.

5.2.1 Potential Contamination Sources of the Project Area

Potentially contaminating activities likely to impact the project area can be divided into two general categories, 'diffuse' and 'point' sources:

- Diffuse sources of pollution are inputs and impacts which occur over a wide area and are not easily attributed to a single source. They are often associated with land uses, for instance including, but not limited to farming and agricultural uses surrounding the Campvale canal catchment.

- Point sources are a single, identifiable source of pollution such as a landfill, pipe or canal, contaminated fill from which contaminants of concern originate. Industrial wastes are commonly discharged to waterways or water bodies in this way.

5.2.2 Project and Site Description

The project area is located about 18.5km north-north-east of the City of Newcastle in the suburb of Campvale, in the Local Government Area (LGA) of Port Stephens Council. The project area of the Campvale canal watercourse and adjacent access track extends for approximately 2.7km from the Pumping Station adjacent Grahamstown Road in the west to north of the commercial properties between 907 and 987 Richardson Road. Access is via Grahamstown Road on HWC land extending 680m east from the Pumping Station and transitions to NSW National Parks and Wildlife Services (NPWS) land and PSC easement over private land.

The project area is currently zoned under the *Port Stephens Local Environmental Plan 2013* (PLEP) as 'Special Activities' (SP)1 in the west adjacent the Pumping Station, 'Large Lot Residential' (R)5 and 'National Parks and Nature Reserves' (E1) in the central portion and 'Rural Landscape' (RU)2 in the east.

The following lots (whole or a portion of) constitute the site:

- Lot 22 in Deposited Plan (DP)1216386
- Lot 6 in DP129025
- Lots 120, 120A and 120B in DP19680
- Lot 205 in DP1232550

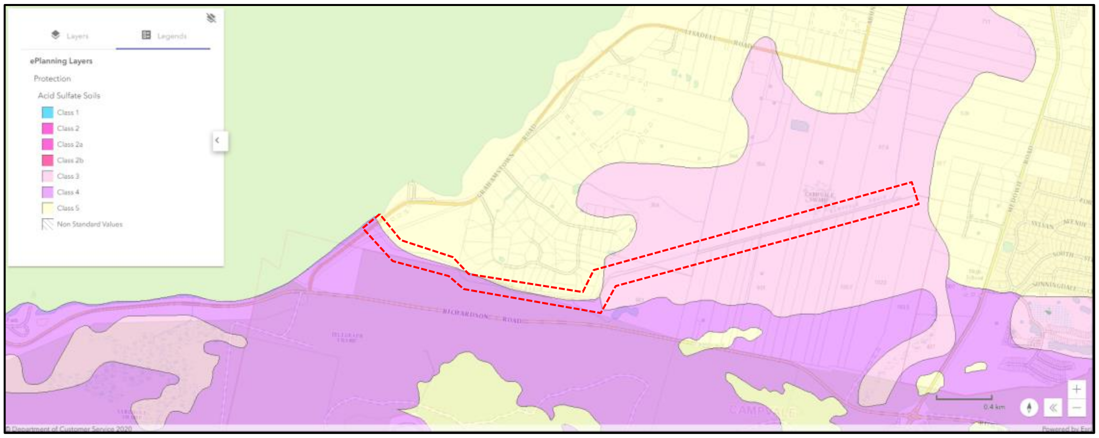
- Lot 236 in DP1224890
- Lot 2 in DP1105039
- Lot 1 in DP1151609
- DP100512956.

To the immediate east is the Grahamstown Reservoir which supplies drinking water to the Lower Hunter Valley. A portion (approximately 25%) of run-off entering the Grahamstown Reservoir comes directly from the urban settlement of Medowie through the Campvale Swamps located within and to the north of the proposal area. Water is pumped into the dam at the far western end of Campvale canal via the Campvale Pump Station.

Newcastle Airport and RAAF Base Williamtown are located approximately 4.3km and 3.3km to the south and south-east of the proposal area, respectively. South of the Campvale canal and before the airbase is extensive forested areas making up part of the Tilligerry State Conservation Area (Tilligerry SCA). To the east past the pinch point of the Campvale canal are several commercial businesses and include Gadget Irrigation, Campvale Landscape Supplies, Wilson's Landscaping Supplies and Chickens with Attitude poultry farm. To the west of the pinch point, rural and residential properties occupy the land north of the canal.

5.2.3 Geological setting

Table 5-1 Geological setting of the site

Environmental factors	Site description
Geology and soils	The Project is situated in two geological units, from the Pumping Station to the pinch point, the land is set is on the boundary of Quaternary (Qa) aged sands and Late Permian aged siltstone and sandstone. From the pinch point and for the remaining alignment extending to the east, the soils and rock were formed in the Quaternary Cainozoic era. Medowie (me) sediments (western portion of site) consist of weak to moderately strong, slightly porous massive medium-grained silicified lenses that alternate with tuff deposits and silica-kaolinitic clay lenses. The Tea Gardens variant b (tnb) soil landscape (eastern portion of site) are Pleistocene-aged beach ridges and sandsheets consisting of marine and aeolian quartz sands. A small pocket of Disturbed Terrain (xx) was noted adjacent the Pumping Station and are characterised by the original soils being removed, buried or greatly disturbed. These areas may be artificially topsoiled or covered by concrete and bitumen.
Topography and drainage	Topography is relatively flat and low lying forming a boundary between the northern and southern allotments. The land gently slopes in a westerly direction towards the Pumping Station and the upstream portion of the Campvale canal slightly increases in uphill gradient towards the pinch point. The site generally consists of the Campvale canal watercourse and unsealed access track on the northern side. The building structure of the Pumping Station is situated at the western end of the site with an unsealed gravel car park west of the building. Water falling onto the site is likely to infiltrate directly into soils and/or migrate laterally into the Campvale canal as runoff.
Acid sulfate soils	A review of the ASS risk map from The Port Stephens Council LEP (2013) indicates that the site is located within Classes 3, 4 and 5 of ASS risk. The classes are defined as: ▪ Class 3: Acid sulfate soils in a class 3 area are likely to be found beyond 1 meter below the natural ground surface ▪ Class 4: Acid sulfate soils in a class 4 area are likely to be found beyond 2 metres below the natural ground surface ▪ Class 5: Acid sulfate soils are not typically found in Class 5 areas. Areas classified as Class 5 are located within 500 metres on adjacent class 1,2,3 or 4 land.  Figure 5-1 Campvale canal and ASS risk mapping (image taken from NSW Planning Portal replanning Spatial Viewer; accessed 15/07/2021)
Hydrogeology and groundwater depth and quality	Groundwater is expected to flow from surrounding areas towards Campvale canal and Grahamstown Reservoir. A shallow groundwater table is expected beneath the site based on the local soil landscapes. It is expected that a porous, highly productive groundwater is recharged by surface water infiltration through unsealed surfaces at the site.
Groundwater beneficial users	Two registered groundwater bores are located within a 500m buffer from the site: ▪ GW079549 (unknown use) – 270m south-west adjacent to Richardson Road ▪ GW79550 (unknown use) – 255m south within the boundaries of 907 Richardson Road.
Sensitive local environments	Grahamstown Reservoir is located immediately to the west of the site and Grahamstown Road.
Contaminated Site Register	No properties located within a 500m buffer of the Site are listed on the NSW EPA List of Contaminated Sites.

5.2.4 Historical site activities

The Campvale canal was constructed more than 100 years ago to drain surrounding farmland in the Medowie region. As part of the construction of the Grahamstown Dam in the 1950s, the Campvale canal was terminated at the eastern edge of the Grahamstown Reservoir with a Pumping Station built to transfer water between the Drain and Dam.

The surrounding land uses including the Grahamstown Dam and Reservoir have remained unchanged with the commercial properties to the east and south of the Campvale Canal apparent since 1966. The rural and low-density residential properties to the north have gradually expanded to the east since 1985. Expansive earthworks are evident south of the Campvale Canal for RAAF Williamtown and Newcastle Airport including modification to the local surrounding roads since 1985.

Vegetation removal on HWC land was undertaken on a section of the Campvale Canal in June 2021 (as shown in Appendix C, Photograph 1). The vegetation removed was stockpiled near the Pumping Station. As part of the Campvale Canal's routine maintenance Review of Environmental Factors: Campvale Canal Routine Maintenance (Aquatic Vegetation Management (2020) (REF, 2020) , HWC operates in three zones and removes vegetation from each section on a cyclical basis to minimize water quality impacts.

HWC advised Jacobs that PSC removed a buildup of sediment from the pinch area in Oct 2019. PSC deposits this sediment on the sides of the canal near the existing access track within their easement and NPWS land.

5.2.5 Preliminary conceptual site model

A Preliminary Conceptual Site Model (PCSM) has been developed and data gaps identified for the site. The PCSM, as shown below in **Table 5-2** is designed to summarise the potential contaminant sources, pathways, and receptors (SPR) identified at the site that may present a potential risk to human health and/or the environment. The PCSM forms the basis for scoping the investigation works and will be revised following assessment of the sediment analytical results and other studies as part of this investigation.

Table 5-2 Preliminary conceptual site model

Activity / Area of Environmental Concern	Potential Issues / Source	Contaminants of Concern	Contamination Mechanism	Potential Receptors	Risk Rating	Data Gaps
Surrounding current and historic residential, rural and industrial activities	Potential sediment contamination from surrounding residential, rural and industrial premises since the 1960's. Potential for poor water quality inputs and impacted sediments More recently, because of Campvale Canal clearing works and movement of sediment up on to the northern banks of the watercourse, contaminants may be present in the retained sediments. No testing or assessment of these materials is known to have occurred	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOCs/SVOCs, herbicides	Aerial deposition from wind-blown industrial and Defence operations and emissions Diffuse and point source stormwater run-off generated by periods of heavy rain may transport impacted sediment from surrounding properties Impacted groundwater from surrounding groundwater reserves	Future construction workers Campvale Canal pumping station water quality and subsequent release into Grahamstown Reservoir Downgradient ecosystems of the Campvale Canal and Grahamstown Reservoir Surrounding site users	**Medium**	The shallow soil quality within the proposal area is considered a data gap as it is adjacent to locations of current and historic commercial/industrial residential, rural and industrial activities
	Potential groundwater and surface water contamination as a result of surrounding land uses	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRHs, PFAS, OCPs/OPPs, pesticides, nutrients	Application of heavy metals, herbicide/pesticides and nutrients in the fill materials across mainly rural portions of land adjacent to the canal as a result of grazing/agricultural practices Hydrocarbons associated with urban run-off Suspected Perflurooctane sulfonate (PFOS) contamination within the Campvale Pumping Station and broader canal waters		**Medium**	No water quality monitoring information prior to this investigation was available for the Campvale Pumping Station or waters across the broader Campvale Canal

Activity / Area of Environmental Concern	Potential Issues / Source	Contaminants of Concern	Contamination Mechanism	Potential Receptors	Risk Rating	Data Gaps
			(*Newcastle Herald, 14* August 2016)		🟧	
Imported fill materials	Shallow soils in unsealed areas adjacent to the proposed alignment. Stockpiling of sediments generated from aquatic vegetation management and removal known to have been beneficially re-used along the canal's banks Anecdotal information from a local council worker revealed no recent known illegal dumping / fly tipping activities along the alignment	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and asbestos	Broad contamination may exist in backfilled areas as material can be sourced from unknown offsite locations Industrial and household wastes may be present throughout imported fill materials	Future construction workers Downgradient users of waterways and ecosystems Surrounding site users	**Low**	Preliminary information associated with soils collected during the preliminary acid sulphate soil investigation (DP 2002) indicate a variable fill profile with the deepest recorded at ≤1.3m at bores 1, 2 and 4. The occurrence of contaminants such as heavy metals, PAHs and recoverable hydrocarbons likely at discrete locations that have been historically filled and reclaimed along the existing alignment is considered a data gap
Naturally occurring sediments and soils formed in the Qa aged sands and Pmm siltstones	Potential acidification of canal waters upon exposure to ASS. Management and controls required to prevent run-off from stockpiled soils/sediments	ASS	Presence of Actual Acid Sulphate Soil (AASS) and oxidation of Potential Acid Sulphate Soil (PASS) as a result of excavation and disturbance works within the Campvale Canal	Downgradient ecosystems of the Campvale Canal and Grahamstown Reservoir. Surrounding site users	**Low**	Further investigation recommended in DP (2002) to better delineate the presence and extent of ASS including potential or partial oxidation of the soil types along the alignment

5.2.6 Previous Investigations

Several reports were reviewed to evaluate potential contamination identified during previous investigations:

- Douglas Partners *Report on Preliminary Acid Sulphate Soil Investigation – Proposed Upgrade to Campvale Main Drain, Grahamstown Road, Campvale, NSW*. Prepared for Port Stephens Council. Project no. 31548, December 2002 (DP 2002)
    - Douglas Partners (DP) was engaged by Port Stephens Council to undertake a preliminary acid sulphate soil investigation in 2002. Based on the two geological units, from the HWC pumping station to the pinch point, the land is set is on the boundary of the Quaternary (Qa) aged sands and Late Permian aged siltstone and sandstone form the Mulbring siltstone subgroup (Pmm), ASS probability is low at depths >3m. From the pinch point and for the remaining alignment extending to the east, the soils and rock are formed in the Quaternary Cainozoic era and comprises of gravel, sand, silt and clay. The ASS probability is low between 1m and 3m.
    - DP drilled six bores to depths between 3.0m to 4.5m with spacing of the bores approximately 500m along the alignment. A total of 46 soil samples were tested for pH and pH oxidation with hydrogen peroxide (H_2O_2). Samples were collected discretely from the bores at depth intervals of 0.5m intervals. Based on the findings of DP (2002), the acid sulphate screening and laboratory testing indicated PASS was present for various soil types and depths along the investigation alignment (from Pumping Station to east of the pinch point). In addition, the screening and laboratory testing revealed the possible presence of actual ASS was present within the dark grey-black clayey silt/silty clay materials above the water table in bores 4-6, with some influence on the results due to the presence of peaty organics. It is important to note that Boreholes 4 to 6 (DP, 2002) further north-east of the pinch point and are not anticipated to be excavated and / or disturbed as part of the proposed Campvale Canal widening works.
    - Further investigation was recommended by DP to better delineate the presence and extent of ASS including potential or partial oxidation of the soil types. The previous results and additional investigation would then form development of an Acid Sulphate Soil Management Plan (ASSMP) for the alignment.
- WMAwater *Medowie Floodplain Risk Management Study and Plan*. Pages 49-50. Document ref Final_Medowie_FRSMP_160405, 5 April 2016 (WMAwater 2016)
    - As provided by HWC, the pages contained within the Medowie Floodplain Risk Management Study and Plan provides a summary of the recommended approaches to undertaking Campvale Canal improvements, namely, to reduce inundation within the catchment.
    - Residents living adjacent to the Campvale Canal have commented that the build-up vegetation and siltation in Campvale from the pinch point and upper catchment is directly causing exacerbated ponding and small flooding events. Drain and vegetation clearing is likely to reduce inundation in the short term, however there would be limited benefit in larger and longer duration events. Hunter Water Corporation *ET0022 Review of Environmental Factors – Campvale Canal Routine Maintenance (Aquatic Vegetation Management)*. November 2020 (HWC 2020).
- Hunter Water Corporation *ET0022 Review of Environmental Factors – Campvale Canal Routine Maintenance (Aquatic Vegetation Management)*. November 2020 (HWC 2020)
    - HWC prepared the review of environmental factors (REF) for the activities associated with the proposed Campvale Canal routine maintenance – aquatic vegetation management. Contextual information and listed items related to the Project from a contamination standpoint are outlined below.
    - Campvale Canal is the man-made formalisation of a natural drainage line through the Campvale Swamp and has a low gradient relative to its length, in line with the surrounding topography. The canal width varies from several metres in Zones 1 and 2 to about 20 metres in Zone 3. Flow velocities within the canal are usually very low and the water depth shallow, but this can increase significantly after heavy rain in the catchment.

  - The Port Stephens Acid Sulphate Soil Planning Map identified the site as 'low risk' of containing ASS. Upper sediments (to 200mm depth) were concluded not to be ASS, however deeper sediments (>200mm) showed potential for acid generation upon oxidation (DP 2002).
  - The REF outlined that canal bed sediments may contain contaminants typical of urban/rural stormwater runoff. The proposed aquatic vegetation management works are not anticipated to disturb the canal bed sediments or will be minimised as practicably possible. If sediments are generated, stockpiles will be temporarily stored on HWC land to rehabilitate certain areas or disposed off-site in accordance with relevant legislation and regulations.
- Cooperative Research Centre (CRC) for Water Sensitive Cities (2020) *Campvale Swamp Options Assessment*. Prepared for HWC and Port Stephens Council. December 2020 (CRC WSC 2020).
  - CRC WSC was requested in joint by Port Stephens Council and HWC to undertake a water balance assessment and report on potential management options within the CDIA whilst protecting water quality pumped from the CDIA to Grahamstown Reservoir.
  - The flat topography of the CDIA and impeded drainage often results in frequent inundation of the land often for several days at a time. A natural topographical feature of the CDIA known as "the pinch" restricts the rate of drainage of floodwaters causing extended periods of flooding. During extended flooding (>10 days), stormwater detained in the CDIA becomes anaerobic often termed a ''blackwater drainage'' event. Blackwater drainage is high in dissolved nutrients and can release environmentally toxic metals released from the sediments within the CDIA under anaerobic conditions.
  - During a blackwater event, phosphorus is released from the sediments (as reactive phosphorus) as iron oxides in the sediments/soils are reduced. Soluble nitrogen (as ammonium) is also released into the water column during the blackwater events through mineralisation of organic nitrogen. If maintenance works of the canal and greater CDIA is completed, modelling by CRC WRS indicates flooding as a result of the ''clogged'' drainage conditions would be reduced from 2 times a year to less than once every year (water levels above 6.2mAHD). As a result, blackwater events (common if flooding lasts longer than 10 days) would be less common with the presence of phosphorus and nitrogen through sedimentation in the canal and greater CDIA anticipated to be reduced.
  - The recommended CDIA management option presented in the report includes excavation of an additional drain cross-section through the pinch to increase water flow capacity to 1.35m^3/s and uniformly grade the drain invert starting upstream and terminating at the pumping station.
- Jacobs *Campvale Canal Options Investigations Assessment, Sampling, Analysis and Quality Plan – Drain Sediment Characterisation Report*. Prepared for Hunter Water Corporation. Document ref: IA410230-RPT-SAQP / DRAFT, 30 June 2021 (Jacobs 2021)
  - Jacobs was engaged to prepare a Sampling, Analysis and Quality Plan (SAQP) for a targeted contamination and waste classification assessment of the Campvale Canal bed sediments.
  - The purpose of the SAQP was to identify spatial and analytical data gaps of the canal bed sediments through a preliminary CSM and outline processes, methodology and standards used during the field works and sample collection.
  - Upon receipt and assessment of the analytical results, this will inform the potential contamination risks associated with human and ecological health as a result of the preferred future canal management options studies.

5.3 Data quality objectives

Data Quality Objectives (DQO) are an important component of any sampling and analysis program as they outline the aims and objectives of the investigation program with respect to the integrity of the data collection and interpretation. Jacobs has followed the Data Quality Objective (DQO) process presented in the National Environmental Protection Measure (NEPM 2013), which in turn references relevant guidelines published by the NSW EPA, Australia and New Zealand Environment and Conservation Council/Agriculture and Resource

Management Council of Australia and New Zealand (ANZECC/ARMCANZ) and the National Environmental Protection Council (NEPC).

The DQO process is recommended when site contamination data is being relied on to make a risk-based decision as part of a detailed site investigation, although a simplified planning process may be appropriate for straightforward screening assessments.

In order to address the DQO and to ensure that they have been achieved, the following seven step process will be undertaken.

Step 1 - State the problem

The problem is to establish and understand the potential for contamination typical of urban/rural stormwater runoff at the site in the canal bed soil and sediments within the proposed pinch area. This allows decisions to be made relating to potential exposure risks of construction workers to potential contamination in shallow soils/sediments, environmental risks and to provide preliminary in-situ waste classification data to support decisions relating to the fate and possible beneficial reuse of excavated material within the footprint during construction.

Jacobs have identified the following data gaps for investigation:

- Shallow soil quality and ASS analytical data of the Campvale Canal bed sediments and banks that are proposed to be disturbed during construction activities
- Review of water quality analytical data collected from the Campvale Pumping Station and waters across the broader Campvale Canal to determine stormwater run-off contamination analytes and links to quality of the canal bed sediments.

Step 2 - Identify the decision statement

The investigation is focused on the assessment of ASS and contamination associated with naturally occurring sediments/soils and surrounding impacts of residential, rural and industrial activities historical activities on the Campvale Canal and bed sediments. Upon review of the analytical results and if contamination is identified, conclusions can be inferred relating to the risks of this contamination to current and future users' human health and ecological receptors. Given that the proposed works will largely be confined to the fill and sand horizons (less than 0.5 metres below ground surface) and adjacent canal banks where former rehabilitation works have occurred, the areas of concern and depth of investigation will be confirmed to those horizons.

The decisions / statements that need to be answered from this investigation are:

- What is the subsurface condition, including surficial soil at the site?
- What is the extent of contamination within soil and sediments (if present) at the site?
- Does contamination at the site (if any) potentially present a risk to human and/or ecological health?

Step 3 - Identify inputs to the decision

The following informational inputs will be required to resolve the decision statement:

- The results of the investigation detailed in the SAQP
- Previous environmental assessments and investigation data for the site
- Observations, descriptions, photographs, logging and sample data to describe the type, extent and distribution of contaminated soils and sediments at the locations tested at the site
- Site assessment criteria as outlined in Section 5 of the SAQP (2021) and Appendix E.
- The revised CSM detailed in Section **5.5.7**

- NEPC (2013).

Step 4 - Define the boundaries of the study

The spatial boundary of this investigation is limited to the boundaries of the site as shown in Figure 6.1. Sampling will target ten core locations across the proposed pinch area and its shallow bed sediments. Soil sampling will be confined to the canal banks where sampling of the canal bed sediments is not possible or where rehabilitation works of the canal banks has occurred through re-use of bed sediments during past Campvale Canal clearing works.

Vertically, the different elements of the investigation will be bound by the following and proposed to be intrusively sampled using a hand auger:

- Sediment – The target investigation depth and extent of potentially contaminated sediments are considered to be relatively shallow, within the open channel and shallow foreshore sediments (<0.5 mBGL).
- Soil – The target investigation of the canal banks where past Campvale Canal clearing, and rehabilitation works have occurred will be 0.3 to 0.5 mBGL based on site observations.

In relation to temporal boundaries, the data collection program required a rapid field mobilisation, and with the proposed field sampling event to be undertaken as soon as the field team received approval from HWC to mobilise. Due to the anticipated high-water levels expected as a result of the wet weather event predicted for the week beginning 5 July 2021, some proposed sampling locations were not accessible at the time and moved to alternative, more easily/safely accessible locations.

Step 5 - Develop a decision rule

The purpose of this step is to define the parameter of interest, specify the action levels and combine the outputs of the previous DQO steps into an “if…then…” decision rule that defines the conditions that would cause the decision maker to choose alternative actions.

- The parameters of interest (or Contaminants of Concern) have been determined based on background information. The action level (Site Assessment Criteria as outlined in **Section 5**) will be used to decide if the parameter represents a potentially unacceptable risk for open space/recreational land use, human health and/or the environment. If the measured concentration of a compound exceeds the action levels in soil and/or sediments, then this is deemed to present a potential unacceptable risk considering the current land use, adjoining land use and environmental receptors.

This also indicates that refinement of the Site Assessment Criteria (SAC) by undertaking a Detailed Risk Assessment (DRA) is warranted. Should this DRA action value be exceeded then other management measures may be required.

Step 6 - Specify acceptable limits on decision errors

In order to assess the useability of the data for making decisions, the data will be assessed against a set of DQI, developed based on the following parameters:

- Precision: A quantitative measure of the variability (or reproducibility) of data. Precision will be assessed through the calculation of relative percentage differences (RPD’s) between primary and duplicate (or triplicate samples) to provide an estimate of random error.
- Accuracy: A quantitative measure of the closeness of reported data to the “true” value. Accuracy will be assessed for the primary and secondary laboratories by evaluating reagent blank results, laboratory duplicates, and the percent recoveries of matrix spike samples, surrogate spikes and laboratory control samples.
- Representativeness: The confidence (expressed qualitatively) that data are representative of each media. Representativeness will be ensured by executing consistent sample collection procedures, storage, shipping, equipment decontamination and proper laboratory sample handling procedures (e.g., Chain of

Custody procedures). Representativeness will be assessed by evaluating calibration standards, rinsate blank samples, method blank samples, duplicate samples and compliance with the sampling methodology and the field QA/QC procedures

- Completeness: A measure of the amount of useable data from a data collection activity. An assessment will be conducted to confirm the actual work was completed in accordance with the agreed scope in this SAQP
- Comparability: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event. Comparability for the sampling results will be achieved through the use of the Standard Operating Procedures, published guidance materials for sampling and investigation methodologies, comparison of QC sample results including duplicate samples, triplicate samples, reagent blank samples, matrix spike samples, surrogate spikes and laboratory control samples.

Further information regarding the above parameters and their acceptance criteria is outlined in the SAQP (2021).

Decision errors are incorrect decisions caused by using data that are not representative of site conditions due to sampling or analytical error.

There are two key types of decision errors that can occur:

1. Deciding that the risks posed by exposure to contaminants for a particular receptor are acceptable when these risks actually are not acceptable. The consequence of this error may be unacceptable impacts to human health or the receiving environment; or
2. Deciding that the risks posed by exposure to contaminants for a particular receptor are unacceptable when the risks actually are acceptable. The consequence of this error is that management actions will be undertaken to reduce the risks which are not necessary.

The more severe consequences are with decision error (a) since the risk of jeopardising human health and/or the environment outweighs the consequences of undertaking management actions that are not necessary.

Developing and assessing acceptance criteria for decisions based on confidence levels would require collection of a statistically significant set of samples for each human or ecological exposure scenario. This may not be feasible given the large number of potential scenarios. Therefore, a conservative approach will be adopted to minimise the likelihood that decision error (a) occurs. This will involve the collection of samples in the pinch area considered likely to have the highest concentrations of contaminants based on site history and site setting information, and the areas that would be most likely to be disturbed as part of management/upgrade activities. The maximum concentration of the contaminant of concern for each exposure scenario will be compared to the investigation criteria to determine the potential for risk and if further sampling is required. Where sufficient samples are collected for a given exposure scenario then a statistical approach for assessment against the criteria may be adopted in accordance with the NSW EPA (1995) Sampling Design Guidelines Schedule B1 of the NEPM.

Step 7 - Optimising the design for obtaining data

The purpose of this step is to identify a resource-effective data collection design for generating data that are expected to satisfy the DQO.

The investigation methodology and the QA/QC program has been designed so that Jacobs obtains the information required to prepare the contamination and waste classification assessment report for the site that meets the investigation objectives.

If the results of the contamination and waste classification assessment works indicate an unacceptable risk to humans and/or the environment, then further investigation, management and remedial works may be required.

5.4 Assessment methodology

5.4.1 Field investigation

Soil sampling was undertaken on 05 and 06 July 2021. Investigation locations were selected to provide representative coverage of soil/sediment conditions along the Campvale Canal with a spacing of each sample point approximately 180m to 200m apart. Soil/sediment samples were collected from a total of 11 hand auger cores advanced into the Drain bed sediments and banks. Three shallow grab samples were collected using hand tools at approximate locations where former Drain clearing works and relocation of the material on the northern canal bank had occurred. Sample locations across the site are shown on Figure 5-2 on the following pages.

The cores were advanced using a 70mm diameter hand auger to a maximum depth of 0.6 meters below ground level (mBGL) or until soil/sediment recovery was not possible. Soil samples were collected from the cores generally from the surface and/or at the target depth of 0.3 mBGL to 0.5 mBGL. Table 5-3 below summarises the samples collected and final depths for each location. Undisturbed soil/sediment samples were collected from the hand auger and placed in laboratory supplied containers suitable for the scheduled analysis using disposable nitrile gloves. For test pits, soil samples were collected directly from surface locations using disposable nitrile gloves and placed in laboratory supplied containers.

Table 5-3 Summary of sampling locations

Sample location ID	Location	Maximum depth (mbgl)	No. samples	Sample depths	Analytical schedule
SED01	55m south-east of Pumping Station along watercourse. Southern bank at water's edge.	0.3 m below ground/bed level	1	0.0-0.3m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS, pH/pH$_{OX}$, chromium reducible sulfur (S$_{CR}$), nutrients[2] and microbiological[3]
SED02	445m south-east of Pumping Station along watercourse. Northern side of Drain, 0.5m from water's edge.	0.3 mbgl	1	0.0-0.3m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS, pH/pH$_{OX}$, nutrients[2] and microbiological[3]
SED03	661m south-east of Pumping Station along watercourse. Northern side of Drain, 0.5m from water's edge.	0.5 mbgl	3	0.1-0.2m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX and PCB
				0.2-0.3m	PFAS
				0.3-0.5m	pH/pH$_{OX}$ and S$_{CR}$
SED04	767m south-east of Pumping Station along watercourse. Northern bank, on flat with no overlying water column.	0.6 mbgl	4	0.2-0.3m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX and PCB
				0.3-0.4m	pH/pH$_{OX}$ and S$_{CR}$
				0.4m	PFAS
				0.4-0.5m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX and PCB
SED05	959m south-east of Pumping Station along watercourse. Northern side of Drain, 0.5m from water's edge.	0.33 mbgl	1	0.0-0.3m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS, pH/pH$_{OX}$, S$_{CR}$, nutrients[2] and microbiological[3]
SED06	1,126m south-east of Pumping Station along watercourse. Northern side of Drain, 1.0m from water's edge.	0.28 mbgl	1	0.0-0.3m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS, pH/pH$_{OX}$, nutrients[2] and microbiological[3]

Sample location ID	Location	Maximum depth (mbgl)	No. samples	Sample depths	Analytical schedule
SED07	1465m south-east of Pumping Station along watercourse. Northern side of Drain, 0.5m from water's edge.	0.3 mbgl	1	0.0-0.3m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS, pH/pH$_{OX}$, S$_{CR}$, nutrients[2] and microbiological[3]
SED08	1604m south-east of Pumping Station along watercourse. Northern side of Drain, 1.0m from water's edge.	0.2 mbgl	1	0.0-0.2m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS and pH/pH$_{OX}$
SED09	1711m south-east of Pumping Station along watercourse and located in the "Pinch" area. Northern side of Drain, 0.5m from water's edge.	0.4 mbgl	2	0.0-0.25m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS, nutrients[2] and microbiological[3]
				0.25-0.4m	pH/pH$_{OX}$ and S$_{CR}$
SED10	1876m east of Pumping Station along watercourse. Northern side of Drain, 0.5m from water's edge.	0.5 mbgl	2	0.1m	PFAS
				0.1-0.5m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS, pH/pH$_{OX}$, nutrients[2] and microbiological[3]
SED11	2337m east of Pumping Station along watercourse, upstream background sample location. Northern side of Drain, 0.5m from water's edge.	0.5 mbgl	3	0.0-0.2m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB, PFAS and nutrients
				0.2-0.4m	pH/pH$_{OX}$ and S$_{CR}$
				0.2-0.5m	Microbiological[3]
SP01	567m south-east of Pumping Station along watercourse, top of Drain embankment on edge of access track.	0.2 mbgl	1	0.2m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB and PFAS
SP02		0.2 mbgl	1	0.2m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB and PFAS
SP03	575m south-east of Pumping Station along watercourse, top of Drain embankment on edge of access track.	0.2 mbgl	1	0.1m	Heavy metals[1], TRH, PAH, OCP, PCB, BTEX, PCB and PFAS

Notes:

1. Heavy metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc; TRH = total recoverable hydrocarbons; PAH = polycyclic aromatic hydrocarbons; OCP = organochlorine pesticides; PCB = polychlorinated biphenyls; PFAS = Per- and Poly-fluoroalkyl Substances (PFAS).
2. Nutrients: ammonia, nitrates, nitrites and phosphorus.
3. Microbiological: Escherichia coli (*E. coli*) and faecal coliforms.

Hand auger cores and material exhumed was logged by an experienced field scientist, including soil type, colour, consistency or density, moisture content and indications of contamination. Soil logs are provided in Appendix D.

Soil samples were kept in a cool box on ice until transport to the laboratory to minimise loss of volatile contaminants. Soil samples were transported to the laboratory under chain of custody (COC) documentation. COCs and laboratory reports are provided in Appendix D.

A handheld GPS accurate to +/- 5 m was utilised to record the coordinates of each soil sampling location.

●	Pinch Point
○	Pumping Station
▭	Campvale Canal
⊕	Sampling Locations
⊕	Test Pit Locations

0 200 400 m

1:20,000 at A4

GDA 1994 MGA Zone 56

Data sources

Jacobs 2021
Metromap (Aerometrex) 2021
OEH 2021
Department Finance,
Services and Innovation 2020

Figure 5-2 Sampling Locations

Date: 25/05/2022 Path: \\ausyd0vs01\GISProj\NSW_BPO00M4W_HunterWater\IA410230_Campvale_Canal_Options\Apps\Figures\CONTAM\HW_CONTAM_F001_CampvaleCanalOptionsInvestigation_v2.aprx
Created by : ASJ | QA by : SR

Quality assurance and quality control field procedures were implemented throughout the field program to prevent cross-contamination, including use of new disposable nitrile gloves for collection of each sample and decontamination of reusable equipment such as the hand auger with Liquinox®.

5.4.2 Laboratory analysis

A total of 23 primary soil samples were analysed by the laboratory. Select samples were analysed for a mixture of contaminants of interest at each sample location (refer to Table 5-3) including heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX, polycyclic aromatic hydrocarbons (PAH), OCP, OPP, PCBs, PFAS, pH/pH_{OX}, S_{CR}, nutrients and microbiological.

Quality assurance and quality control (QAQC) samples were also collected, including one set of duplicate and triplicate samples (two sets of duplicate and triplicate samples for PFAS), two equipment rinsates, two trip blanks and trip spikes. Duplicate and triplicate samples were analysed for the same contaminants as the associated primary sample. The trip blank and trip spike sample were analysed for BTEX. Further detail regarding QAQC samples is presented in Appendix E.

NATA laboratory reports are provided in Appendix F and the results tables in Appendix E.

5.4.3 Site Assessment Criteria

The assessment criteria adopted for the investigation are presented in the Section 5 of the SAQP (2021) and provided in Appendix E.

5.5 Assessment Results

5.5.1 Field Observations

Detailed lithology and field observations are provided in the borelogs in Appendix D.

5.5.2 Lithology

Subsurface lithology at the site generally comprised of sand, silt and silty or sandy clays. Organic material was commonly encountered.

The general description of the components and characteristics observed in the soils and sediments collected from the respective sample locations is detailed in Table 5-4.

Table 5-4 Campvale Canal soil / sediment profile

Sample Location	Depth (mbgl)	Description
SED01	0.0 - 0.3	Silty CLAY, high plasticity, dark grey to orange mottling brown, wet
SED02	0.0 - 0.1	SILT, medium plasticity, dark grey to lack, trace sand, wet
	0.1 - 0.3	Silty CLAY, high plasticity, pale to dark orange mottling grey, trace sand, moist
SED03	0.0 - 0.1	Organics, leaves, roots, black to dark brown, strong organic odor
	0.1 - 0.2	Silty SAND, black to grey, wet, loose to very loose
	0.2 - 0.5	SAND, coarse grained, poorly graded, grey, very loose
SED04	0.0 - 0.1	Organic, leaves, roots, dense organic matter, dark brown - black

Sample Location	Depth (mbgl)	Description
	0.1 - 0.4	Silty SAND, coarse grained, poorly graded, dark grey to black, organics
	0.4 - 0.6	SAND, coarse grained, grey to dark grey, with wood chips
SED05	0.0 - 0.33	SAND, medium to coarse grained, poorly graded, dark to pale grey, with organics, moist to wet, loose to very loose
SED06	0.0 - 0.3	SAND, coarse grained, poorly graded, dark brown to black, organics, wet, very loose
SED07	0.0 - 0.3	SAND, medium to coarse grained, poorly graded, pale grey to dark brown, black, moist to wet, loose to very loose
SED08	0.0 - 0.2	SAND, medium to coarse grained, poorly graded, grey to yellow to dark grey black, moist to wet, loose to very loose
SED09	0.0 - 0.25	SILT, trace fine sand, with organics, wet, soft
	0.25 - 0.4	Sandy CLAY, high plasticity, grey to orange mottling black, moist to wet, firm
SED10	0.0 - 0.5	SILT, black to dark brown, some organics, wet, soft to firm
SED11	0.0 - 0.5	SILT, medium plasticity, dark grey to black, trace sand, wet
SP01	0.0 – 0.3	Silty SAND, coarse grained, poorly graded, dark grey to black, organics
SPO2	0.0 – 0.3	Silty SAND, coarse grained, poorly graded, dark grey to black, organics
SPO3	0.0 – 0.3	Sandy CLAY, medium plasticity, brown to dark brown with grey mottling, moist

5.5.3 Observations of potential contamination

Visual indications of potential contamination were limited, however included the following:

- Minor quantities of general rubbish along the northern access track, e.g., aluminium can and corrugated iron sheeting beneath the pinch point wooden bridge
- Vehicle parking area adjacent the Pumping Station covered in gravels and aggregates
- Peaty odours were identified at sample locations SED08 and SED09
- Iron particulate on the water surface was identified in small, isolated locations along the Campvale Canal.

No visual observations of potential asbestos containing material were made during the investigation.

5.5.4 Analytical results

5.5.4.1 Contamination assessment

Soil analytical results are summarised in Table 1 of Appendix E.

No exceedances of adopted criteria for the protection of human health and ecosystems were reported in the samples analysed with the exception of TRH >C16 - C34 and TRH >C10 - C16 less Naphthalene (F2).

Six samples (SP01_0.2, SED04_0.2-0.3, SED04_0.4-0.5, SED09_0.0-0.25, SED10_0.1-0.5 and SED11_0.0-0.2) exhibit concentrations of TRH >C16 - C34 between 320mg/kg to 1,680mg/kg and exceed the adopted

Ecological Screening Level (ESL) (300mg/kg) for coarse soils in urban residential and public open space land settings. Statistical analysis using an Upper Confidence Limit (UCL) through ProCUL5.1 was not undertaken as the maximum concentration of 1,680mg/kg exceeded the assessment criteria by 2.5 times.

Two primary samples (SED09_0.0-0.25 and SED11_0.0-0.2) one intra-laboratory duplicate sample (QA01) exhibit concentrations of TRH >C10 - C16 less Naphthalene (F2) between 150mg/kg to 280mg/kg. Through application of an UCL using ProUCL5.1, the 95% average concentration is 120.6mg/kg mg/kg and remains above the adopted ESL (120mg/kg) for coarse soils in urban residential and public open space land settings.

Detections of faecal coliforms and *E. coli* of 18mg/kg were identified in sample SED06_0.0-0.3. No guideline criteria are available for these analytes and the detections are considered to be minor and low risk, based on the assumed usage of the Canal as a drainage easement.

5.5.4.2 Waste analysis and classification assessment

Soil analytical results are summarised against the NSW EPA *Waste classification guidelines, Part 1: classifying waste*, 2014 (NSW EPA 2014a) in Table 2 of Appendix E.

In accordance with Steps 1 to 6 of the NSW EPA (2014a), the following as been determined:

- *Step 1 - Is the waste special waste?* **No**, the material did not exhibit signs of clinical or related waste, asbestos waste, waste tyres or anything classified as special waste under an EPA gazettal notice.
- *Step 2: Is the waste liquid waste?* **No**, the material consisted of sands, silts and silty or sandy clays. The material did not have an angle of repose less than 5° above horizontal, did not become free flowing at or below 60°C or when transported, was capable of being picked up a spade or shovel and is not classified as liquid waste under the EPA gazettal notice.
- *Step 3: Is the waste pre-classified?* **No**, the material is not pre-classified under any waste types listed in Step 3 of the NSW EPA (2014).
- *Step 4: Does the waste possess hazardous characteristics?* **No**, the material is not considered 'hazardous waste' under Classes 1-8 of the Transport of Dangerous Goods Code.
- Step 5: *Determining a waste's classification using chemical assessment*. All chemical analytes of concern are identified to be less than Contaminant Threshold (CT)1 and Specific Contaminant Concentration (SCC)1. As such, no Toxicity Characteristic Leaching Potential (TCLP) analysis was required. Material meets the requirements for chemical classification as **'General Solid Waste' (pending treatment and neutralisation as per Section 5.5.5)**.
- *Step 6: Is the waste putrescible or non-putrescible?* The material is considered **'non-putrescible,'** i.e., does not readily decay under standard conditions, does not emit offensive odours and does not attract vermin or other vectors (such as flies, birds and rodents).

5.5.5 Acid sulfate results

Twelve (12) samples were submitted for pH and pH oxidation with ALS Global – Brisbane. Samples displayed pH between 4.0 and 6.0 indicating the material is unlikely to be Actual Acid Sulfate Soil (AASS). Following oxidation through the addition of H_2O_2, the pH_{OX} of all samples was less than 3.5 with the strength of reactions ranging from 2 to 4.

Seven duplicate samples were submitted for further Chromium Reducible Sulfur (S_{CR}) analysis and selected based on the lowest pH_{OX} values, largest pH/pH_{OX} drops and being representative of all soil types across the site. Six samples showed concentrations for Net Acidity (sulfur units) between 0.04 %S to 0.39 %S. Three of the six samples also contained concentrations of Titratable Actual Acidity (TAA) between 64 mole H+/t to 178 mole H+/t. These concentrations exceed the adopted ASSMAC (1998) action criteria for sulfur trail (0.03%S) and acid trail (18 mole H+/t) for more than 1,000 tonnes of material disturbed.

Based on the ASS field and laboratory analyses, the canal bed sediments and soils are indicative of Potential Acid Sulfate Soil (PASS) with the high organic matter content increasing the acidic nature of the sediments and soils. As part of the proposed future works, a detailed Acid Sulfate Soil Management Plan (ASSMP) should be prepared to document the environmental controls to implement during the construction phase and an outline of the treatment strategy of any excavated sediments / soils. The treatment strategy implemented should be developed to accommodate both beneficial re-use of the material within the Site's work boundaries and / or off-site disposal.

As outlined in the NSW EPA *Waste classification guidelines, Part 4: Acid sulfate soils*, 2014 (NSW EPA 2014b), PASS must be treated in accordance with the neutralising techniques stipulated in the ASSMAC (1998) and subsequent ASSMP prior to offsite disposal. After treatment and upon determination of the material's waste classification, the material can be disposed of to a landfill that can lawfully accept that class of waste.

5.5.6 Quality assurance and quality control

A quality assurance and quality control program were implemented during the investigation in accordance with the NEPC (2013) guidelines and AS4482.1-2005 (Standards Australia, 2005). Key elements of the program included:

- Use of qualified staff for all sampling activities
- Use of standardised sampling procedures including prescribed sample storage/transport and equipment decontamination (where applicable)
- Use of NATA accredited laboratories
- The collection and analysis of blind field duplicate and split samples and blank samples
- Laboratory quality control protocols, including analysis of matrix spike/matrix spike duplicates, laboratory duplicate samples and method (reagent) blanks, where applicable.

The data were assessed against a set of data quality indicators and data acceptance criteria in order to assess whether the data quality objectives outlined in **Section 5.3** were satisfied.

The data validation results presented in Appendix E indicate some minor non-conformances with the data acceptance criteria. Although the majority of the soil material sampled was reasonably homogenous, it is inherently difficult to obtain a fully representative duplicate pair from a soil matrix in samples which cannot be physically homogenised because of the potential loss of volatiles, as such, it is expected some non-conformances will occur. Overall, greater than 95% of the dataset is able to be replicated with comparable results and considered to satisfy the data quality objectives established for the investigation.

One trip blank was used each day of sampling with one inserted into each batch of cooler boxes used for sample storage. Two rinsate blanks from the hand auger for each day of use were collected to ensure that decontamination procedures were sufficient following transport and sampling between each sample location. The hand auger was scrubbed and washed with PFAS-free equipment and Liquinox prior to collection of the rinate samples. No detections above the laboratory detection limit were identified.

Two trip spikes prepared by the laboratory with a known concentration of TRHs and BTEX were inserted into the batches of samples collected on the 05/07/2021 and 06/07/2021. Review of the results of analysis indicates adequate recovery of the target analytes were obtained. All samples were analysed within the required holding times and collected in laboratory supplied containers and bottles relevant to the analytes scheduled for analysis. Laboratory certificates in Appendix F provide further information on holding times.

5.5.7 Revised conceptual site model

Based on the findings of this targeted assessment, the conceptual site model has been updated and is presented in Table 5-5.

Table 5-5 Revised conceptual site model

Activity / Area of Environmental Concern	Potential Issues / Source	Contaminants of Concern	Contamination Mechanism	Potential Receptors	Risk Rating	Comments / Data Gaps
Surrounding current and historic residential, rural and industrial activities	Potential sediment contamination from surrounding residential, rural and industrial premises due to stormwater/overland runoff.	TRH/TPH	Diffuse and point source stormwater run-off generated by periods of heavy rain may transport impacted sediment from surrounding properties	Construction workers Campvale Canal pumping station water quality and subsequent release into Grahamstown Reservoir Downgradient ecosystems of the Campvale Canal and Grahamstown Reservoir	**Low**	Contamination above the relevant screening levels for were not reported in the samples collected with the exception of TRH/TPH (exceedance of Ecological Screening Levels)
	Potential groundwater and surface water contamination as a result of surrounding land uses	Heavy metals, TRH/TPH, PFAS, OCPs/OPPs, pesticides, nitrogen, ammonia, physical parameters	Application of heavy metals, herbicide/pesticides and nutrients in the fill materials across mainly rural portions of land adjacent to the canal as a result of grazing/agricultural practices Hydrocarbons associated with urban run-off	Construction workers Campvale Canal pumping station water quality and subsequent release into Grahamstown Reservoir Downgradient ecosystems of the Campvale Canal and Grahamstown Reservoir	**Medium**	Water quality monitoring undertaken as part of this investigation generally revealed parameters including pH, turbidity, aluminium, iron, total phosphorus, total nitrogen and ammonia exceeding adopted guideline criteria. Additional surface water sampling for a broad contamination suite may be considered.
Former stockpiling and use of vehicles at the parking area west of the Pumping Station	Fill / aggregate material of unknown quality Former stockpiling area of generated sediments from past Campvale Canal clearing works	Heavy metals, TRH, PAH, OCP, PCB and asbestos	Fill materials at surface to shallow soils Oil/petrol spills and leaks on ground surface	Site users	**Low**	Excavation and disturbance of this area is not anticipated as a result of the Campvale Canal clearing works Potential for cross-contamination of generated sediments with underlying fill materials from stockpiling works

Activity / Area of Environmental Concern	Potential Issues / Source	Contaminants of Concern	Contamination Mechanism	Potential Receptors	Risk Rating	Comments / Data Gaps
Disturbed terrain identified immediately east of Pumping Station	Imported fill materials	Heavy metals, TRH, PAH, OCP, PCB, asbestos and ASS	Contaminated soil materials and waste sourced from a potential unknown offsite location	Surface and at depth	**Low**	Excavation and disturbance of this area is not anticipated as a result of the Campvale Canal clearing works
Illegal dumping	Miscellaneous areas of minor waste (on-site)	Heavy metals, TRH, PAH, OCP, PCB, asbestos	Dumping of waste materials	Surface	**Low**	Locations of waste observed were minor and very isolated
Naturally occurring sediments and soils formed in the Qa aged sands and Pmm siltstones	Mobilisation of acid and contaminants into waterways and wetlands during drying-wetting cycles	Heavy metals and low pH (acid)	Presence of PASS	Downgradient ecosystems of the Campvale Canal and Grahamstown Reservoir Campvale Canal pumping station water quality and subsequent release into Grahamstown Reservoir Surrounding soils/sediment quality of the Campvale Drain	**Medium**	Considered a potential risk if water levels at the Campvale Drain are reduced for excavations as part of Options 2a, 2b, 2c and 2e
	Potential acidification of canal waters upon exposure to ASS. Management and controls required to prevent run-off from stockpiled soils/sediments	ASS	Presence of PASS	Downgradient ecosystems of the Campvale Canal and Grahamstown Reservoir	**Low**	Development of an ASSMP to be implemented during the construction phase to mitigate environmental risk as a result of PASS excavation/disturbance of the Campvale Canal sediments

5.6 Conclusions and Recommendations

Jacobs has undertaken this contamination investigation to further understand the potential for contamination to be present throughout the Campvale Canal bed sediments and inform on the preferred management options. The investigation assessed representative soil and sediment samples across the Campvale Canal alignment and banks including the collection of 23 primary samples from 14 locations for various contaminants of potential concern based on in-field observations and requirements listed in the SAQP (Jacobs, 2021).

All samples collected as part of the investigation reported concentrations less than the relevant adopted site assessment criteria for the current public open space and recreational land use with the exception of ESL exceedances for the following analytes: TRH >C10-C34; and TRH >C10 - C16 less Naphthalene (F2). Application of UCL calculations through ProUCL5.1 were unsuccessful in achieving adherence to the adopted ESL site assessment criteria. Currently, the soil and sediment materials are unsuitable to be beneficially re-used within the defined site boundaries in a public open space and recreational land setting due to the ESL exceedances outlined above.

Petroleum hydrocarbons can be a contaminant of concern in freshwater and marine environments due to urban/stormwater runoff, spills and discharges by municipal/industrial premises into the surrounding catchment. Based on the results of the investigation and the in-field observations, the presence of TRH/TPH may be attributed to both naturally low concentrations in the bottom sediment and organic material, and to a larger extent, accumulation over time from petrogenic offsite sources. Further analysis of the soil and sediment samples through a silica gel-cleanup laboratory procedure may remove interferences from non-petroleum hydrocarbons (i.e., leaves, wood) and provide a more reliable and accurate estimate of actual petroleum hydrocarbons (if any) in the samples collected. Accordingly, a better representation of the TRH/TPH results against the adopted site assessment criteria and any exceedances would be well defined.

While there are no quantitative criteria available with which to assess aesthetic impacts to soils, the NEPM (NEPC, 2013) states that aesthetic impacts should be assessed based on a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity. Aesthetic issues were considered during site inspections undertaken by Jacobs. Where observed, these were noted on the field notes and borelogs. No potential asbestos containing materials were identified during the in-field investigation at the locations tested, and based on the current site conditions, its occurrence is considered to be low risk. Further sampling for asbestos in soil following excavation and stockpiling works is recommended to confirm this assumption.

Through field screening and quantitative laboratory analysis of the sediment and soil samples collected, in addition to the former findings of DP (2002), PASS has been identified in the Campvale Canal bottom sediments and soils. During handling of the generated soils and sediments, treatment and neutralisation of the PASS is required in accordance with ASSMAC (1998) and the ASSMP to be prepared for the site.

Pending environmental approvals and licensing, surplus materials may be disposed offsite to a licensed waste facility. Following successful treatment and verification for PASS, the subject sediment and soil materials have a preliminary offsite waste classification of ‘General Solid Waste (non-putrescible).’

For beneficial re-use of the bottom sediments to occur within the site work boundaries in a public open space and recreational land setting, additional sampling and/or analysis of TRH/TPH is required to further define the extent and magnitude of the exceedances above the adopted ESL criteria. If the sediments along the alignment and/or localised areas are found to be suitable, material should be treated and neutralised as required in accordance ASSMAC (1998) and ASSMP prior to being placed in designated fill zones.

The following recommendations are made based on the findings of this assessment:

- Prior to construction, develop an ASSMP in accordance with ASSMAC (1998) to outline environmental management procedures and controls to implement during handling, treatment and offsite disposal / beneficial re-use of the ASS (pending silica-gel clean-up analysis)

- Inclusion of usual protocols for unexpected finds and handling of soil in a Construction Environmental Management Plan
- If offsite disposal to a licensed waste facility of any surplus materials is required, all available in-ground data related to the site should be compiled into a site-specific waste analysis and classification report with comparison against the NSW EPA (2014a).

6. Environmental approvals

6.1 Overview

The potential environmental impacts of the proposal will be assessed in accordance with the environmental impact assessment requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act). HWC or Port Stephens Council (Council) may be the determining authority of the proposal in accordance with Division 5.1 of the (EP&A Act).

The REF will be prepared in accordance with clause 171 of the *Environmental Planning and Assessment Regulation 2021*.

The REF will also include detailed assessment of the impacts of the proposal in relation to:

- CLM Act (NSW)
- BC Act (NSW)
- *Biosecurity Act 2015* (NSW) (Biosecurity Act)
- FM Act (NSW)
- *Heritage Act 1977* NSW)(Heritage Act)
- POEO Act (NSW)
- *National Parks and Wildfire Act 1974 (NSW)*(NPW Act)
- *Water Management Act 2000* (NSW) (WM Act)
- EPBC Act (Commonwealth)
- *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&ISEPP)
- *State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP)*
- *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP)

The following additional approvals may also be required for the proposal:

- Works Activity Approval from the Natural Resources Access Regulator (NRAR) for dewatering works if required and a water access licence under Section 56 of the WM Act for extraction of more than three megalitres (ML) of groundwater (if encountered) in a financial year
- A permit under Part 7 of the FM Act maybe required for if dredging and reclamation, obstruction of fish passage and harm to marine vegetation would occur as part of the proposal.

6.2 Environmental approval legislation

6.2.1 Contaminated Lands Management Act 1997 (NSW)

Contaminated land is regulated in NSW CLM Act and CLM Regulation, 2013. Upon excavation, contaminated soils that are removed from a site as spoil may be classified as waste, the regulation and management of which is governed by the POEO Act and EPA Waste Classification Guidelines, Parts 1 to 4, 2014 (NSW EPA, 2014).

6.2.2 Biodiversity Conservation Act 2016 (NSW)

The BC Act provides for the protection of threatened species, populations and ecological communities in NSW. If a threatened species, population or ecological community, or its habitat, is likely to occur in any area that may be affected by the proposal, an assessment of significance must be prepared to determine whether the proposal would have a significant impact. If it is concluded that there would be a significant impact, then a species impact statement (SIS) must be prepared.

The potential for direct/indirect impacts on native vegetation and potentially threatened species, populations and ecological communities listed under the BC Act would need to be considered as part of a biodiversity assessment during the preparation of the REF.

6.2.3 Biosecurity Act 2015 (NSW)

Under the Biosecurity Act, everyone has a general biosecurity duty – this means anyone who deals with biosecurity matter is required to prevent, eliminate or minimise any biosecurity risks they encounter.

Excavation work would need to consider how aquatic weeds listed as Priority species in the Hunter Regional Strategic Weed Management Plan would be managed. Anyone who is engaged in dealing with biodiversity matter on the proposal would have a general biosecurity duty under the Biosecurity Act and risks breaching the Act if they do not take all reasonable steps that they ought reasonably to have been aware to prevent, eliminate or minimize any biosecurity risks they encounter.

The REF would include an assessment of the biosecurity risks associated with the proposal and the responsibilities of key personnel involved in managing the risks.

6.2.4 Fisheries Management Act 1994

The FM Act provides for the conservation, protection and management of fisheries, aquatic systems and habitats in NSW. The Act establishes mechanisms for the listing of threatened species, populations and ecological communities or key threatening processes, the declaration of critical habitat and the consideration and assessment of threatened species impacts in the development assessment process.

Under Part 7 of the FM Act, a permit is required for dredging and reclamation, obstruction of fish passage, harm to marine vegetation and use of electrical or explosive devices in a waterway.

As described in Section 4.2.1 and shown on Figure 7-1 the proposal area is not mapped as KFH and no threatened aquatic species under the FM Act have been recorded in the proposal area. However, the potential impacts to aquatic habitats and species including the potential impacts to fish passage would need to be considered in during the preparation of the REF.

6.2.5 Heritage Act 1977 (NSW)

The Heritage Act aims to protect and conserve non-Aboriginal cultural heritage in NSW, including scheduled heritage items, sites and relics.

The Heritage Act makes provision for a place, building, work, relic, moveable object, precinct, or land to be listed on the State Heritage Register. If an item is the subject of an interim listing, or is listed on the State Heritage Register, a person must obtain approval under Section 58 of the Heritage Act for works or activities that may impact on these items.

The potential for heritage impacts would need to be considered during preparation of the REF.

6.2.6 Protection of the Environment Operations Act 1997 (NSW)

The POEO Act provides the legal framework for the management of air, noise, water, and waste pollution. Under section 48 of the POEO Act, scheduled activities (as defined in Schedule 1 of the Act) require an Environment Protection Licence (EPL).

The proposed movement of excavated material from various lots along the proposal area to another lot is considered importing of waste. Clause 34 of Schedule 1 of the POEO Act requires an EPL for the receipt of general waste from offsite for processing within Port Stephens LGA if the proposal:

(a) involves having more than 1,000 tonnes or 1,000 cubic metres of waste is on site at any time, or

(b) involves processing more than 6,000 tonnes of waste per year

'The Excavated Natural Material Exemption 2014' does not apply to material that contains ASS or PASS.

The POEO Act and the *Protection of the Environment Operations (Waste) Regulation 2014* are the key pieces of legislation that regulate waste in NSW. Classification under the NSW EPA 'Waste Classification Guidelines' is required for all fill material brought to site and taken from the site. Preliminary contamination assessment (in Chapter 5) classifies the excavated spoil as 'General solid waste'. Following successful treatment and verification for PASS, the subject sediment and soil materials have a preliminary offsite waste classification of 'General Solid Waste (non-putrescible)' surplus materials may be disposed offsite to a licensed waste facility.

6.2.7 National Parks and Wildlife Act 1974 (NSW)

The NPW Act provides for:

- Protection of Aboriginal objects and Aboriginal places; and
- Reservation of land for protection under the Act, including State Conservation Areas.

The proposal would be partially carried out in the Tilligerry SCA. The proposed works must be undertaken in accordance with the prevailing plan of management (POM). In the absence of a POM, works within the SCA must be consistent within the intent of the NPW Act, the precautionary principle and be guides by the "Statement of Management Intent - Tilligerry State Conservation Area". Section 156A(2)(a) of the NPW Act requires consent from the National Parks and Wildlife Service (NPWS) as co-managers of the land. Alternatively, section 156A(2)(c)(ii) of the NPW Act provides the work may be carried out if approved under Part 5 of the EP&A Act, which will regardless require consultation with NPWS and consideration of their feedback pursuant clause 16(2)(b) of ISEPP.

Provisions of the NPW Act in relation Aboriginal heritage protection will be assessed in the REF following detailed field surveys.

6.2.8 Water Management Act 2000

The WM Act provides for the protection and management of water resources in NSW. The WM Act controls the extraction of water, how water can be used, the construction of work such as dams and weirs, and the carrying out of activities on or near water sources.

Sections 89 to 91 of the WM Act establish three types of approvals which may be required by a proponent: water use approvals, water management work approvals (including water supply work) and activity approvals. Water use approval is not likely to be required.

Activity approvals are required when a certain activity is likely to affect waterfront land or interfere with an aquifer. The proposal is not likely to interfere with an aquifer or affect waterfront land. Clause 41 of the *Water Management (General) Regulation 2018* provides that public authorities are exempt from a controlled activity approval in on or under waterfront land. Dewatering is not expected as part of the proposal.

Should groundwater extraction be required during construction a Works Activity Approval must be sought from NRAR. Where greater that 3 ML in a financial year.

HWC would consult with the NSW Office of Water to ensure that all applicable licences and/or approvals for any impacts to surface and ground water are obtained before construction. Potential impacts to surface and groundwater from the proposal will be addressed in the REF.

6.2.9 EPBC Act

Under the EPBC Act a referral is required to the Australian Government Department of Agriculture, Water and the Environment (DAWE) for proposed actions that have the potential to significant impact on matters of national environmental significance (MNES) or the environment of Commonwealth land.

The EPBC Act lists the MNES that are to be considered when determining whether an activity is a controlled action which requires referral to the Commonwealth Minister for the Environment. The REF will need to consider the proposal impacts on MNES.

6.2.10 State Environmental Planning Policy (Transport and Infrastructure) 2021

The *State Environmental Planning Policy (Transport and Infrastructure SEPP) 2021* (Transport and Infrastructure SEPP) incorporates and repeals the provisions of the *State Environmental Planning Policy (Infrastructure) 2007, State Environmental Planning Policy (Educational Establishments and Childcare Facilities) 2017, State Environmental Planning Policy (Major Infrastructure Corridors) 2020; State Environmental Planning Policy (Three Ports) 2013.*

The aim of Chapter 2 (Infrastructure) is to facilitate effective delivery of infrastructure projects across NSW. This chapter describes certain developments that may be carried out without consent in order to facilitate the delivery of infrastructure in NSW.

Clause 2.136 of the T&ISEPP permits development for the purpose of 'stormwater management systems' to be carried out without consent on any land. Pursuant to clause 2.135 of the T&ISEPP, a stormwater management system is defined as:

(a) 'works for the collection, detention, harvesting, distribution or discharge of stormwater (such as channels, aqueducts, pipes, drainage works, embankments, detention basins and pumping stations), and
(b) stormwater quality control systems (such as waste entrapment facilities, artificial wetlands, sediment ponds and riparian management), and
(c) stormwater reuse schemes.

As the proposal would form part of a development for the purpose of stormwater conveyance and HWC and PSC are public authority, it is considered permissible without consent pursuant to the provisions of T&ISEPP and can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The REF will include confirmation of any consultation requirements under Part 2.2 General, Division 1 of the T&ISEPP and will include NPWS under clause 2.15(2)(b).

6.2.11 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The Biodiversity and Conservation SEPP incorporates and repeals 11 SEPPs including the *State Environmental Planning Policy (Vegetation in Non-rural areas) 2017* (Vegetation SEPP) and the *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021).

Portions of the route zoned R5 Large Lot Residential and SP1 Infrastructure are affected by Chapter 2 (Vegetation in Non-rural areas) of the Biodiversity and Conservation SEPP, requiring approval from Council for vegetation clearing (clause 2.10). Clearing within a State Conservation Area is excluded from application of the Vegetation SEPP (pursuant clause 2.3(2)).

Port Stephens LGA is subject to the provisions of Chapter 4 (Koala SEPP 21) of the Biodiversity and Conservation SEPP. However, these chapters only apply to developments where Council are the consent authority. Chapter 4 does not apply to the State Conservation Area or land zoned RU2 pursuant cl6(3). The majority of the proposal area is mapped as 'Preferred Koala Habitat" in Port Stephens Comprehensive Koala Plan of Management. However, T& ISEPP prevails to the extent of the inconsistency and development consent from Council is not required.

6.2.12 State Environmental Planning Policy (Resilience and Hazards) 2021

The *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) incorporates and repeals the provisions of the *State Environmental Planning Policy (Coastal Management) 2018, State Environmental Planning Policy 33 – Hazardous and Offensive Development* and *State Environmental Planning Policy 55 – Remediation of Land.*

The aim of Chapter 2 (Coastal Management) is to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016*

(CM Act). The proposal area is not in areas mapped as Coastal Wetlands nor is it within land defined as a coastal environment area and coastal use area under the CM Act. A review of LIDAR survey indicates the mapped Coastal Wetlands is located above the permanent water level in CDIA and therefore no impacts associated with change to permanent inundation are expected. The coastal wetland would continue as normal and only be intermittently inundated when CDIA is in flood.

However, should additional investigations determine that the proposed works would impact on the mapped Coastal Wetlands, then the environmental approval path for the proposal will need to be reviewed. As development within Coastal Wetlands is classed as designated development and would require consent from the City of Newcastle under Part 4 of the EP&A Act. Works classified as designated development require an Environmental Impact Statement (EIS) to be prepared to assess the environmental impacts.

Chapter 4 (Remediation of land) of the Resilience and Hazards SEPP, provides a state-wide planning framework for the remediation of contaminated land and to minimise the risk of harm. Clause 4.6 of Resilience and Hazards SEPP requires consideration of whether the land is contaminated and whether it is suitable (or can be made suitable) for proposed development. As the proposal is being assessed under Division 5.1 of the EP&A Act, HWC is not required to consider Chapter 4 of the Resilience and Hazards SEPP. However, contamination would be considered during the preparation of the REF.

7. Environmental constraints mapping

The majority of the proposal would be contained within the vicinity of the existing canal, in an easement owned by PSC. The canal widening and realignment may require temporary impact on private properties during construction, requiring easements or access agreements. A portion of the works traverse through the Tilligerry SCA being Crown land. This area is managed by HWC and NPWS. NPWS will be consulted as required under clause 2.15(2)(b) of the T&ISEPP.

As discussed in Section 4.2.1 the proposal area is not mapped as KFH and no threatened aquatic species under the FM Act have been recorded or have predicted habitat in the in these aquatic environments.

A section of the broader wetland (approximately 1.4kms east of the proposal), however, has been mapped as 'Coastal Wetland' under the Resilience and Hazards SEPP. Part of the Coastal Wetland falls within the CDIA however a review of LIDAR survey indicates the mapped Coastal Wetlands is located above the permanent water level in CDIA and therefore no impacts associated with change to permanent inundation are expected. The coastal wetland would continue as normal and only be intermittently inundated when CDIA is in flood. These impacts would need to be investigated future through more detailed studies/investigations/assessment.

Vegetation mapping shows that eastern portion of the proposal area has fringing vegetation that may constitute the endangered ecological communities (EEC) Swamp sclerophyll forest on coastal floodplains of the NSW North Coast Sydney Basin and South East Corner Bioregions EEC, which may be affected by the proposal (refer Figure 7-1). Small areas of Tomago sandbed vegetation also occur along the alignment, and depending on the species composition and inundation potential, may or may not constitute EEC. The Tomago sandbed vegetation can vary significantly and would need to be inspected prior to categorising patches into Plant Community Types. This native vegetation may provide habitat for threatened species if present.

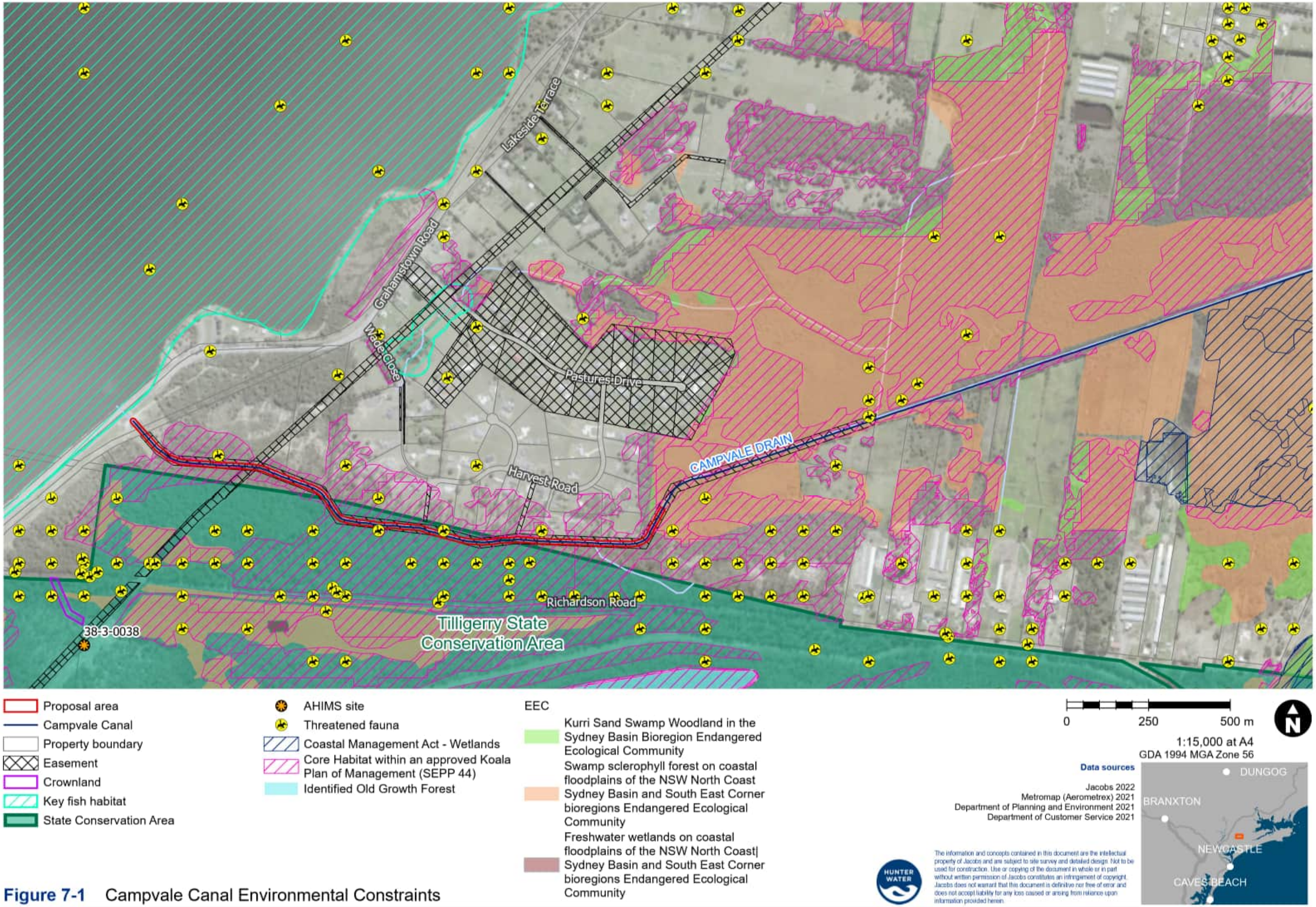
Detailed ecology surveys would be required to ground truth the vegetation mapping, and search for threatened species such as the Wallum Froglet and confirm presence of GDEs. If hollow-bearing trees are present within the proposal area, surveys for threatened arboreal mammals and microchiropteran bats may also be required (spring and summer). The extent of clearing required for the proposal and impacts of threatened species will be assessed in the REF to determine if the proposal is likely to have a significant impact on these. The REF will also need to consider the potential impacts of altered groundwater recharge on GDEs, refer to Section 4.2.2. An ecohydrological assessment by a specialist with an understanding of how GDEs function is required to assess the impact of the changes in inundation to the wetting / drying regime of the GDEs, potential changes in distribution of GDEs and potential for terrestrialisation of particular GDEs.

The proposal area includes areas mapped as High Biodiversity Values – core habitat with an approval Koala Plan of Management by the DPE, indicating areas of potential impact for vegetation clearing.

No known Aboriginal or non-Aboriginal heritage is recorded in the vicinity of the proposal and the proposal area is not within a mine subsidence area.

The proposal area is affected by acid sulphate soils; therefore excavation work would need to consider ASS management during construction.

The proposal area adjoins wetlands mapped under cl.7.9 of the *Port Stephens Local Environmental Plan 2013* (PLEP) and is within the mapped drinking water catchment under clause 7.8 of the PLEP. A determining authority is not required to consider the PLEP provisions under Part 5 of the EP&A Act.



Data sources

Jacobs 2022
Metromap (Aerometrex) 2021
Department of Planning and Environment 2021
Department of Customer Service 2021

Figure 7-1 Campvale Canal Environmental Constraints

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Created by : HK | QA by : LW

8. Preliminary cost estimates

8.1 Strategic level civil design

Strategic level civil design was undertaken to assist in the generation of preliminary quantities for cost estimation. The civil design was undertaken in 12d design software using predominantly the detailed survey provided from 2014 and LIDAR survey for extents beyond that of the 2014 survey. The strategic designs were produced as information to ascertain the order of magnitude earthworks quantities and footprint of works.

Basis of strategic design and preliminary quantities

- The existing easement is approximately 30m wide, therefore canal augmentation works are constrained to this width. Maintaining an access track on northern side (allowance of 6m, 1m off boundary, 4m wide access offset 2m from top of bank) and a small offset to boundary on southern side (2m), the resultant maximum width of canal was determined to be approximately 22m.
- Existing canal centerline was maintained for the majority of alignment and only deviated in select location to ensure the access track remains within the easement and/or to reduce vegetation clearing, particularly the southern side of channel
- It is assumed 150mm road base material would be used to reinstate the access track in locations where minor realignments of the canal are undertaken
- A trapezoidal channel, 1m wide with 3H:1V batters was modelled for each option at the vertical profile indicated by hydraulic study. The batter slopes adopted are suitable for site conditions
- The channel was assumed to be lined with jute mesh, 100mm topsoil and hydroseeded.
- Results of contamination assessment and soil sampling indicate that any excavated material is classified as general sold waste (non-putrescible) which requires lime treatment onsite prior to disposal of spoil material offsite.
- While a small proportion of excavated material may be reused onsite in the reshaping of canal, for now it is assumed that all cut material is to be disposed offsite. This is a worst-case scenario but also may account for any inconsistencies related to use of LIDAR survey at the lower portion of canal.

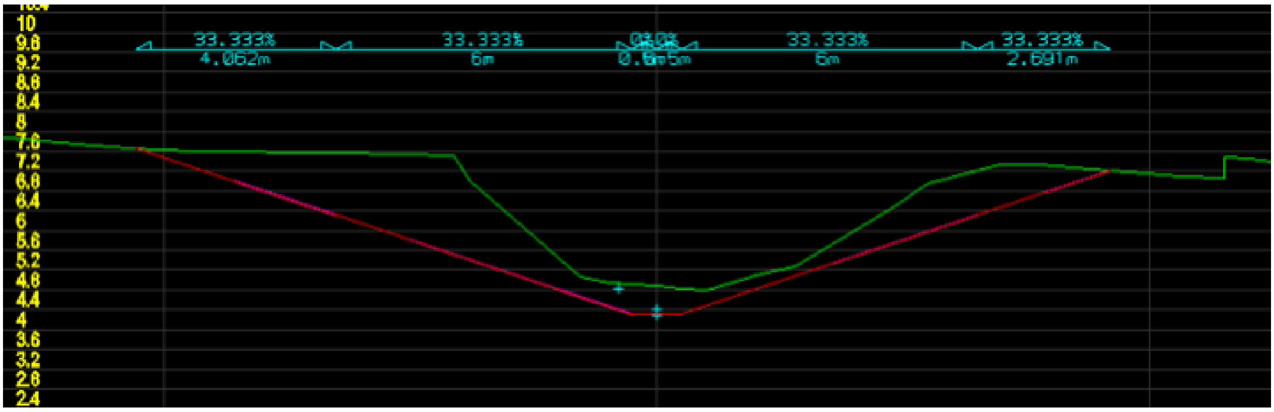

Figure 8-1 Typical cross section from 12d model

8.2 Cost estimates

As per the service request a Gateway 2 (G2) cost estimate has been prepared for each of the canal widening options for comparative purposes as well as a Gateway 1 (G1) cost estimate for the previous second-ranked option (Option 3) of a small pump station at pinch point. The estimates have been developed in accordance with HWC Capital Project Options Estimate template, Version 3 (02 Feb 2021). The tables provide a summary for each option.

Table 8-1 Total delivery costs

Total Project Cost	Option 2a	Option 2b	Option 2c	Option 2e	Option 3
Base Estimate- Delivery (HW costs + construction cost)	3,836,098	7,116,169	5,649,732	5,915,870	6,328,874
Contingency - Inherent Risk	376,155	699,050	553,957	580,156	648,542
Most Likely Delivery Cost	4,680,040	8,681,726	6,892,673	7,217,361	7,721,227
Contingency - Contingent Risk	1,074,108	1,992,527	1,581,925	1,656,444	1,772,085
Base Estimate + Contingency (Inherent + Contingent)	5,754,148	10,674,253	8,474,598	8,873,805	9,493,312

Assumptions

- Construction would be undertaken in segments with canal temporarily blocked to prevent water flow through immediate works site.
- No allowance made for temporary bypass pumping around immediate worksite
- All excavated material contains ASS and requires treatment I.e., Liming and verification of neutralisation
- Excavated material is transported to location near pump station (near Grahamstown Road) to be processed & treated
- Once treated, all excavated material is disposed off-site as general solid waste (non-putrescible), most likely Suez facility at Raymond Terrace (Newline Road)
- Project will be developed through concept/detailed design and documented for construction. Construction works would be undertaken as Construct Only contract.
- Appointed construction contractor is to cover all the costs for the disposal spoil material. Please note that savings could be made if Council or HWC pay for the waste levy included within the landfill disposal fees, to avoid incurring overheads and markups from contractor.

9. Summary

The aim of this investigations was to explore the high-level feasibility of preferred options for improvements to Campvale Canal to achieve a balance of improvements to drainage, durations of inundation and risk of occurrence of blackwater events without having a detrimental impact on overall water quality of water draining from the CDIA. In undertaking this feasibility assessment, the water quality, ecological and environmental risks to Grahamstown Dam from the construction works and from the new altered hydrological regime imposed by modification of the pinch were investigated.

Key findings from the investigations include

- The canal widening options were successful at reducing the occurrences of inundation exceeding 10days duration within the Campvale wetland. . However, each of the options would also reduce the water-quality-treatment capacity of the wetland, to varying extents (3% to 31% reduction in Total Nitrogen). Therefore none of the options identified would achieve the dual objectives of improving the inundation issue without impacting on water quality entering Grahamstown Dam.
- The options with the exception of 2e increase the potential of short duration dry periods within the wetland of 21%, 9% and 7% for durations of 3, 5 and10 days respectively. The resulting additional drying of the wetland may increase the risk of exposing ASS to the atmosphere where they can oxidise and produce sulfuric acids and Fe compounds. This may pose a risk to the aquatic ecosystem and to Grahamstown Dam water quality downstream as subsequent wetting of the soils and mobilisation of flows could exacerbate already acidic conditions in the canal and wetland.
- While some water quality monitoring has been previously undertaken in Campvale canal and the discharge point in Grahamstown Dam, the routine monitoring program was not designed to identify the occurrence of black water events. As such the data does not allow for the identification or analysis of blackwater events and potential correlations to rainfall and inundation events in CDIA
- There are uncertainties about the occurrence of blackwater events in the CDIA such as the duration of ponding required to produce blackwater events in the conditions specific to the CDIA. Johnston et al. (2003) suggests the duration to initiate anaerobic conditions can be variable (between three and 20 days), depending on weather conditions, vegetation species and the amounts of vegetation litter in the inundated area.
- It is not known how influential the Campvale canal inflows are to the overall water quality of the Dam, considering that these inflows are minor (approximately 6% of total inflow) compared to other inflows such as the offtake from the Williams River.
- The estimated increase in the number of additional short duration (less than 10 days) dry periods is not expected to impact on the overall function of the wetland nor are the proposed options expected to result in the wetland becoming terrestrialised. Simplistically the CDIA is a natural low point through which all the catchment runoff needs to flow through to reach the pinch and will continue to retain a permanent level of ponding, albeit a slight reduction (except Option 2e) due to improved conveyance through the pinch from lowering of outlet level. Note outlet level
- A review of LIDAR survey indicates the mapped Coastal Wetlands is located above the permanent water level in CDIA and therefore no impacts associated with change to permanent inundation are expected. The coastal wetland would continue to only be intermitted inundated when CDIA is in flood. More detailed investigations would be required to confirm these impacts.
- Improved conveyance as a result of the proposed options could impact on groundwater dependent ecosystems (GDEs) such that they may be impacted by changes in the wetting and drying cycle associated with all options (except option 2e). Groundwater assessment is outside the scope of this investigation.
- In addition to water quality changes, the anticipated altered water regime of the wetland is not expected to result in any long term or significant impacts to the overall ecological function of the wetland. However, to confirm how the altered water regime could impact on GDE function, an ecohydrological study would be required.

- Through field screening and quantitative laboratory analysis of the sediment and soil samples collected, in addition to the former findings of DP (2002), PASS has been identified in the Campvale Drain bottom sediments and soils. During handling of the generated soils and sediments, treatment and neutralisation of the PASS is required in accordance with ASSMAC (1998) and the ASSMP to be prepared for the site.
- Significant quantities of excavated material are generated from the options and due to narrow easement, there are no opportunities to place spoil within the existing easement. Given the PASS the spoil material would therefore require an environmental protection licence (EPL) to process material and move offsite within Port Stephens LGA following successful treatment and verification for PASS. Following successful treatment and verification for PASS, the excavated material would have a preliminary offsite waste classification of 'General Solid Waste (non-putrescible)' and could be disposed of at waste disposal site but would incur significant disposal costs including waste disposal levy.
- The most likely delivery costs for the most favourable options ranges from Option 2c - $6.9 to Option 2e - $7.2M

The findings of this study indicate that through canal widening it is not possible to balance the removal of water from the wetland area to minimise inundation, whilst not impacting on the water quality entering Grahamstown Dam or having negative environmental impacts. Uncertainties about the occurrence of blackwater events in the CDIA and ability to detect in current routine monitoring program coupled with high capital construction costs and water quality impacts worse than existing, it is recommended at this stage to adopt a least-risk approach and maintain the existing water quality treatment functioning and drainage conditions in CDIA.

9.1 Discussion of preferred canal widening options

In the event that either HWC or PSC seek to proceed with a canal widening option the results of investigations for the most favourable options 2c and 2e are summarised below

9.1.1 Hydraulic assessment summary

Based on the need to balance drainage conditions and duration of inundation with maintaining as close as possible the water quality treatment function of the CDIA and also with consideration of environmental and constructability issues, initial screening of the assessed options concluded that Option 2c and Option 2e were the short-listed options:

- Option 2c provides substantial improvements to drainage and duration of inundation compared to the existing case (17% reduction in treatment/increase in TN load).
- Option 2e maintains close to (although with minor reduction from) the existing water quality treatment function in CDIA, with a 7% reduction in treatment/increase in TN load. It also provides moderate improvements in drainage and minor improvements in duration of property inundation. Shallower depths of excavation at Campvale canal also reduce risk of encountering acid sulphate soils.

Both Options 2c and 2e result in reduction in the water quality treatment function of CDIA. If either of these options are implemented, additional catchment management interventions should be considered in the upstream catchment with the objective of reducing stormwater pollutant loads (TN, TP, TSS etc.). The catchment interventions would aim to compensate for the loss of treatment function and effectively maintain the same pollutant loads entering Grahamstown Dam as the existing case, in addition to managing stormwater runoff volumes from built-up surfaces. Catchment management interventions may include incorporation of water sensitive urban design into future and existing development, appropriate planning controls on future development, buffer zones for diffuse pollutant sources etc.

It should be noted that interventions will already be required (and are promoted by HWC and PSC) to offset the impacts of future urban development on Campvale wetland and canal water quality, hence the interventions needed to compensate for the Campvale canal upgrades would be additional to these.

9.1.2 Water quality changes

When comparing options for altering the pinch, Options 2c and 2e both present some potential benefits and impacts to water quality being transferred to Grahamstown Dam. In general, both options are likely to result in additional sediment and nutrient loading to the dam, which may cause proliferation of eutrophic conditions that are already experienced. Increased DO concentrations provided by higher flows would assist to limit metals, particularly Fe, and nutrients (TN, NH^3) from leaching out of sediments and into the water, however, drying out the wetland more frequently may result in an increased exposure of acid sulphate soils and subsequent higher flows are likely to cause pH to decrease which would in turn result in Al becoming dissolved in solution by acidic precipitation.

Overall, it is suggested that relative water quality benefits associated with conditions of Option 2e outweigh those of Option 2c. This is because Option 2e would result in flows which are lower when compared to Option 2c, but more consistent when compared to existing conditions. These conditions would allow some improvement in DO concentrations, but proportionally lower direct impacts associated with higher flows off the catchment.

9.1.3 Ecology changes

It is recommended that detailed biodiversity surveys are conducted to better understand wetland species (both flora and fauna) present and potential impacts to individual species from more frequent dry conditions. Ecological impacts are inextricably linked to changes in water quality, therefore as specified in above, higher flows associated with Option 2c would result in additional sediment and nutrient loading from larger volumes of catchment runoff which may subsequently impact aquatic ecosystem function. On the other hand, however, higher flows will assist to reduce blackwater events and therefore elevate DO concentrations (and reduce leaching of metals and nutrients from sediments), which may result in significant benefits to aquatic species. Option 2e is expected to result in similar changes as described for Option 2c, although does not impact water quality treatment capability of the wetland as much and may not provide as much improvement for reducing the risk of blackwater events.

Modelling suggests that Option 2c would result in increased flows, thus better drainage capability of the wetland and slightly longer duration dry periods between flows. For GDEs that prefer permanent inundation this may present a risk if the options lead to lowering of the water table however groundwater investigations would need to be undertaken to confirm this. Longer duration of dry periods presents an increased risk for the exposure of acid sulphate soils during dry periods which may exasperate low pH conditions already experienced in the CDIA during subsequent flows. Acidic environments and increased bioavailable Al^{3+} are expected to be most toxic to fish species therefore may not pose a high risk to aquatic biota in the canal as benthic species are not expected to utilise this area based on available data. Further to this, most amphibian species that have been recorded or predicted in this area are expected to be less susceptible to low pH and aluminum toxicity at the adult stage of the lifecycle and acidic environments are preferred for endangered species such as the Wallum Froglet. As such, higher flows associated with conditions of Option 2c may provide overall benefits to the aquatic and wetland community in the area if upstream land management practices are implemented to improve the nutrient and sediment load reaching the outlet. Option 2e is not expected to result in any change from existing scenario, in terms of the number of or length of dry periods experienced in the CDIA. As such, this option does not pose an increased risk of exposing acid sulphate soils and subsequently further acidification of downstream water quality in the canal and wetland. It is important to note, however, that these conclusions are based on desktop assessment only and would need to be further investigated including conducting detailed fauna surveys and impact assessment to confirm.

In addition to water quality changes, the anticipated altered water regime of the wetland is not expected to result in any long term or significant impacts to the overall ecological function of the wetland as canal Option 2c is not expected to increase the number of times the wetland experiences long dry periods (>10 days). As with risk of acid sulphate soil exposure, Option 2e is not expected to result in any changes from existing scenario to hydrological regime of the wetland, therefore does not pose a risk to the aquatic environment. With respect to the EEC Swamp sclerophyll forest, this community is typically found in soils that are waterlogged, or intermittently/episodically inundated (DAWE, 2021). Whilst we expect there to be little to no change in the number of long-term dry periods (refer to Section 2.6.3), indirect impacts from increased water depth is largely unknown. Swamp forest habitats can cope with natural fluctuations of wetting and drying. However, any prolonged increase or decrease in water depths from changed hydrology are likely to have a compounding effect resulting in changes to plant species composition and structure, favouring either wet or dry tolerant other swamp sclerophyll species.

10. Next steps

The following next steps would only be required should a canal widening option be selected to be further developed through more detailed design in preparation for construction activities:

- Undertake revised detailed topographic survey of canal easement all the way to pump station, including access track, lot boundaries, optic fibre service, large trees
- Concept and detailed design of canal widening
- Constructability workshop to facilitate construction planning
- Preparation of an REF including investigation/determination/approval
- General fauna habitat assessments and surveys targeting those species with potential to be impacted by the proposed works, namely Wallum Froglet, Green and Golden Bell Frog and Mahony's Toadlet within the Campvale Wetland area to understand presence and potential habitat and to inform the assessment of significance of impact to be prepared as part of the REF.
- Detailed flora surveys should be undertaken to better under wetland species and composition of plant community types for further impact assessment at the species level. Targeted searches for threatened flora species with potential to occur in the impact area, such as *Maundia triglochinoides,* broad-scale mapping of vegetation communities across Campvale Wetland, highlighting GDEs and TECs, as well as survey and mapping of Priority aquatic weeds within proposed excavation areas.
- An ecohydrological assessment is required to assess the impact of the changes in inundation to the wetting / drying regime of the GDEs, potential changes in distribution of GDEs and potential for terrestrialisation of particular GDEs.
- Development of a Weed Management Plan which includes weed hygiene protocols addressing the biosecurity risks associated with high risk weeds such as Alligator Weed. Consultation with Port Stephens Environmental Operations Team regarding measures to be included in a Weed Management Plan. The Weed Management Plan is to be provided to HWC's Environment Team for review and endorsement prior to works commencing.
- Prior to construction, develop an ASSMP in accordance with ASSMAC (1998) to outline environmental management procedures and controls to implement during handling, treatment and offsite disposal / beneficial re-use of the ASS (pending silica-gel clean-up analysis)
- Inclusion of usual protocols for unexpected finds and handling of soil in a Construction Environmental Management Plan
- If offsite disposal to a licensed waste facility of any surplus materials is required, all available in-ground data related to the site should be compiled into a site-specific waste analysis and classification report with comparison against the NSW EPA (2014a).

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Appendix A. Summary of options

Table A-1 Summary of options

Objective/criteria	**Existing**	**CRC design**	**Option 2a**	**Option 2b**	**Option 2c**	**Option 2e**
Property Inundation						
Reduce the impact on yards and paddocks of inundation levels exceeding 6.3m AHD for durations > 10 days	Model predicts 50 occurrences of > 6.3m AHD where the duration is over 10 days	Model predicts reduction to one event > 6.3m AHD where the duration is over 10 days Substantial (98%) reduction in occurrences	Reduction to 43 occurrences. 14% reduction in occurrences	Reduction to 6 occurrences. Substantial (92%) reduction in occurrences	Reduction to 13 occurrences. Substantial (74%) reduction in occurrences	Reduction to 24 occurrences. 52% reduction in occurrences
Reduce the impact on yards and paddocks of inundation levels exceeding 6.5m AHD.	104 in occurrences > 3 days; 17 occurrences >10 days; 2 occurrences > 20 days	74% reduction in occurrences > 3 days; 94% reduction for >10 days; elimination of occurrences >20 days	8% reduction in occurrences > 3 days; 12% reduction for >10 days; no change for > 20 days	56% reduction in occurrences > 3 days; 94% reduction for >10 days; elimination of occurrences for > 20 days	42% reduction in occurrences > 3 days; 88% reduction for >10 days; elimination of occurrences for > 20 days	14% reduction in occurrences > 3 days; 47% reduction for >10 days; elimination of occurrences for > 20 days
Peak flood levels and duration of inundation above 6.3m AHD for recent historic flood events.	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.16m AHD (24 days) ▪ 2015: 7.36m AHD (21 days) ▪ 2016: 7.45m AHD (19 days)	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.04m AHD (12 days) ▪ 2015: 7.31m AHD (8 days) ▪ 2016: 7.36m AHD (8 days) Reduced peak historic event flood levels by 0.05-0.1m and	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.15m AHD (2 days) ▪ 2015: 7.36m AHD (20 days) ▪ 2016: 7.44m AHD (17 days)	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.08m AHD (15 days) ▪ 2015: 7.31m AHD (9 days) ▪ 2016: 7.39m AHD (11 days) Reduced peak historic event flood levels by 0.05 – 0.08m and reduced duration from	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.09m AHD (16 days) ▪ 2015: 7.32m AHD (10 days) ▪ 2016: 7.40m AHD (12 days) Reduced peak historic event flood levels by 0.04 – 0.07m and reduced duration from	Peak water levels (days> 6.3m AHD): ▪ 2007: 7.11m AHD (20 days) ▪ 2015: 7.33m AHD (11 days) ▪ 2016: 7.43m AHD (15 days) Reduced peak historic event flood levels by 0.02 – 0.05m and reduced duration from

Objective/criteria	**Existing**	**CRC design**	**Option 2a**	**Option 2b**	**Option 2c**	**Option 2e**
		reduced duration from ~3 weeks to 8-12 days	Negligible improvements in historic flood event conditions	~3 weeks to 1.5-2 weeks	~3 weeks to 1.5-2 weeks	~3 weeks to 1.5-3 weeks
Water quality pumped to Grahamstown Dam						
Protect water quality treatment function of CDIA *Change in Total Nitrogen (TN) Load Removal by CDIA* *Number of occurrences of flood levels exceeding 6.3m AHD for durations of ≥ 10 days*	Average annual load reductions: ▪ TSS 89% ▪ TP 71% ▪ TN 46%. Model predicts inundation of the wetland (> 6.3m AHD) over the period 1958 – 2016 ▪ 184 occurrences of >3 day inundation period ▪ 50 occurrences of >10 day inundation period ▪ 8 occurrences of >20 days inundation period	Reduction in day-to-day water quality treatment function by 31% from existing (i.e., average annual load of TN increases by 31% from existing). Reduction of risk of blackwater events (above 6.3m AHD water level) ▪ Occurrences of >3 day inundation period reduced by 62% ▪ Occurrences of >10 day inundation period reduced by 98% ▪ Elimination of >20 day inundation periods	Negligible reduction in day-to-day water quality treatment function by 3% from existing (i.e., average annual load of TN increases by 3% from existing). Reduction of risk of blackwater events (above 6.3m AHD water level) ▪ Occurrences of >3 day inundation period reduced by 4.3% ▪ Occurrences of >10 day inundation	Reduction in day-to-day water quality treatment function by 21% from existing (i.e., average annual load of TN increases by 21% from existing). Reduction of risk of blackwater events (above 6.3m AHD water level) ▪ Occurrences of >3 day inundation period reduced by 37% ▪ Occurrences of >10 day inundation period reduced by 88% ▪ Elimination of >20 day inundation periods	Reduction in day-to-day water quality treatment function by 17% from existing (i.e., average annual load of TN increases by 17% from existing). Reduction of risk of blackwater events (above 6.3m AHD water level) ▪ Occurrences of >3 day inundation period reduced by 29% ▪ Occurrences of >10 day inundation period reduced by 74% ▪ Elimination of >20 day inundation periods	Reduction in day-to-day water quality treatment function by 7% from existing (i.e., average annual load of TN increases by 7% from existing). Reduction of risk of blackwater events (above 6.3m AHD water level) ▪ Occurrences of >3 day inundation period reduced by 4.8% ▪ Occurrences of >10 day inundation period reduced by 52% ▪ Occurrences of >20 day inundation period reduced by 75%

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
			period reduced by 14% ▪ Occurrences of >20 day inundation period reduced by 25%			
Wetting and drying of the wetland						
Change in number of dry periods within wetland	No change in number of dry periods within wetland	Increase in the in number of dry periods within wetland ▪ 21% of 3-day dry period ▪ 9% of 5-day dry period ▪ 7% of 10-day dry period	Increase in the in number of dry periods within wetland ▪ 18% of 3-day dry period ▪ 9% of 5-day dry period ▪ 7% of 10-day dry period	Increase in the in number of dry periods within wetland ▪ 21% of 3-day dry period ▪ 9% of 5-day dry period ▪ 7% of 10-day dry period	Increase in the in number of dry periods within wetland ▪ 21% of 3-day dry period ▪ 9% of 5-day dry period7% of 10-day dry period	No change in number of dry periods within wetland
Environmental water quality impacts						
Protect environmental water quality objectives of the CDIA	Existing flows during rainfall result in nutrients and sediments reaching the pumping station. Flows also tend to	Higher flows will result in a significant amount of additional direct input of nutrients and sediments from upstream catchment runoff. Additional sediment and	Minimal change to flows will result in approximately the same amount of direct input of nutrients and sediments from	Higher flows will result in an additional amount of direct input of nutrients and sediments from upstream catchment runoff. Additional sediment and nutrients may	Higher flows will result in an additional amount of direct input of nutrients and sediments from upstream catchment runoff. Additional sediment and nutrients may	Higher flows will result in an additional amount of direct input of nutrients and sediments from upstream catchment runoff. Additional sediment and nutrients may contribute to

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
	correlate with lower pH concentrations and higher aluminium content in the water. Dissolved oxygen content in receiving environment is generally low, however tends to be lowest during low flows. Nutrients and sediments contribute to higher concentrations of heavy metals and algal blooms experienced.	nutrients may contribute to proliferation of eutrophic conditions and subsequently algal blooms. Substantial reduction of blackwater events will improve dissolved oxygen concentrations and is likely to substantial reduce or eliminate nutrient and heavy metals leached from sediments which are occurring from this cause. Higher flows are likely to result in lower pH and subsequently higher concentrations of ionised aluminium occurring due to acidic precipitation.	upstream catchment runoff as existing. Eutrophic conditions that are currently experienced will continue. A minor reduction of blackwater events will slightly improve dissolved oxygen concentrations and therefore will reduce the amount of nutrients and heavy metals leached from sediments which are occurring from this cause. Minimal change to flows is unlikely to result in significant changes to pH	contribute to proliferation of eutrophic conditions and subsequently algal blooms. Moderate-substantial reduction of blackwater events will provide significant improvement to dissolved oxygen concentrations and therefore will substantially reduce nutrient and heavy metals leached from sediments which are occurring from this cause. Higher flows are likely to result in lower pH and subsequently higher concentrations of ionised aluminium occurring due to acidic precipitation.	contribute to proliferation of eutrophic conditions and subsequently algal blooms. Moderate-substantial reduction of blackwater events will provide significant improvement to dissolved oxygen concentrations and therefore will substantially reduce nutrient and heavy metals leached from sediments which are occurring from this cause. Higher flows are likely to result in lower pH and subsequently higher concentrations of ionised aluminium occurring due to acidic precipitation.	proliferation of eutrophic conditions and subsequently algal blooms. Moderate-substantial reduction of blackwater events will improve dissolved oxygen concentrations and therefore will reduce nutrient and heavy metals leached from sediments which are occurring from this cause. Minimal change to flows is unlikely to result in significant changes to pH from existing. Amount of ionised aluminium occurring due to acidic precipitation would remain approximately the same.

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
			from existing. Amount of ionised aluminium occurring due to acidic precipitation would remain approximately the same.			
Impacts to aquatic ecosystem of the Campvale Wetland and canal						
Protect aquatic species and ecosystem function	Aquatic species composition of the Campvale Wetland environment is relatively unknown however upon inspection is suspected to be suitable habitat for wetland specialists. It is also suspected that benthic aquatic species are unlikely to utilise the Campvale Canal due to minimal aquatic habitat features present and complete	Significantly higher concentrations of nutrients and sediment reaching the receiving environment is likely to exasperate eutrophic and turbid conditions which may result in direct and indirect impacts to aquatic species. Impacts may include clogging gills, lead to oxygen deficient zones where species cannot survive, reduction in trophic interactions due to decreased visibility, reduced light penetration of the water column which can limit growth of	Minimal changes to flows and occurrence of blackwater events are unlikely to result in significant change to the aquatic ecosystem function of the wetland from existing conditions.	Higher concentrations of nutrients and sediment reaching the receiving environment may exasperate eutrophic and turbid conditions which could lead to direct and indirect impacts to aquatic species. Impacts may include clogging gills, lead to oxygen deficient zones where species cannot survive, reduction in trophic interactions due to decreased visibility, reduced light penetration of the water column which can limit growth of aquatic vegetation or	Higher concentrations of nutrients and sediment reaching the receiving environment may exasperate eutrophic and turbid conditions which could lead to direct and indirect impacts to aquatic species. Impacts may include clogging gills, lead to oxygen deficient zones where species cannot survive, reduction in trophic interactions due to decreased visibility, reduced light penetration of the water column which can limit growth of aquatic vegetation or	Higher concentrations of nutrients and sediment reaching the receiving environment may exasperate eutrophic and turbid conditions which could lead to direct and indirect impacts to aquatic species. Impacts may include clogging gills, lead to oxygen deficient zones where species cannot survive, reduction in trophic interactions due to decreased visibility, reduced light penetration of the water column which can limit growth of aquatic vegetation or potential loss of habitat/reduced

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
	barriers to fish passage. Existing water quality of the wetland is not considered to be suitable for healthy aquatic ecosystems. However, it is noted that the endangered species, the Wallum Froglet, is adapted to acidic wetland habitats and requires low pH conditions for spawning. Other amphibian species recorded or predicted in the wetland are likely to be able to tolerate acidic habitats and potentially higher concentrations of bio-available aluminium at	aquatic vegetation or potential loss of habitat/reduced suitability of habitat for species that may be sensitive to changes to water quality or may be outcompeted/preyed upon by invasive species. Substantial reduction or elimination of blackwater events would have significant benefits to aquatic species which require water to have high dissolved oxygen content to breathe. Aquatic species which are sensitive to heavy metal toxicity may also benefit from the reduction of leached metals from sediment under low dissolved oxygen conditions. As noted, it is suspected that this is not likely to be a major issue for the Campvale Canal or wetland as it is not		potential loss of habitat/reduced suitability of habitat for species that may be sensitive to changes to water quality or may be outcompeted/preyed upon by invasive species. Moderate-substantial reduction of blackwater events would have benefits to aquatic species which require water to have substantial dissolved oxygen content to breathe. Aquatic species which are sensitive to heavy metal toxicity may also benefit from the reduction of leached metals from sediment under low dissolved oxygen conditions. As noted, it is suspected that this is not likely to be a major issue for the Campvale Canal or wetland as it is not expected that benthic	potential loss of habitat/reduced suitability of habitat for species that may be sensitive to changes to water quality or may be outcompeted/preyed upon by invasive species. Moderate-substantial reduction of blackwater events would have benefits to aquatic species which require water to have substantial dissolved oxygen content to breathe. Aquatic species which are sensitive to heavy metal toxicity may also benefit from the reduction of leached metals from sediment under low dissolved oxygen conditions. As noted, it is suspected that this is not likely to be a major issue for the Campvale Canal or wetland as it is not expected that benthic	suitability of habitat for species that may be sensitive to changes to water quality or may be outcompeted/preyed upon by invasive species. Moderate-substantial reduction of blackwater events would have benefits to aquatic species which require water to have substantial dissolved oxygen content to breathe. Aquatic species which are sensitive to heavy metal toxicity may also benefit from the reduction of leached metals from sediment under low dissolved oxygen conditions. As noted, it is suspected that this is not likely to be a major issue for the Campvale Canal or wetland as it is not expected that benthic or water-bound aquatic species utilise the canal.

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
	the adult stage but are sensitive to these conditions during the early life stages. Despite the altered regime from natural conditions, the wetland still represents a relatively typical NSW coastal wetland environment that is naturally adapted to substantial fluctuations in low (drought) and high (flood) water level conditions.	expected that benthic or water-bound aquatic species utilise the canal. Low pH from higher flows is generally not preferred for aquatic species, and subsequent increase in bio-available aluminium would usually be toxic to aquatic organisms. However, it is noted that amphibian species which are recorded or predicted in the area are less sensitive to low pH and aluminium toxicity. The endangered Wallum Froglet requires low pH conditions for spawning therefore lower pH may assist to provide suitable habitat for this species. Increased frequency of short- term dry periods due to the		or water-bound aquatic species utilise the canal. Low pH from higher flows is generally not preferred for aquatic species, and subsequent increase in bio-available aluminium would usually be toxic to aquatic organisms. However, it is noted that amphibian species which are recorded or predicted in the area are less sensitive to low pH and aluminium toxicity than fish species. The endangered Wallum Froglet requires low pH conditions for spawning therefore lower pH may assist to provide suitable habitat for this species. Increased frequency of short- term dry periods due to the	or water-bound aquatic species utilise the canal. Low pH from higher flows is generally not preferred for aquatic species, and subsequent increase in bio-available aluminium would usually be toxic to aquatic organisms. However, it is noted that amphibian species which are recorded or predicted in the area are less sensitive to low pH and aluminium toxicity than fish species. The endangered Wallum Froglet requires low pH conditions for spawning therefore lower pH may assist to provide suitable habitat for this species. Increased frequency of short- term dry periods due to the	Low pH from higher flows is generally not preferred for aquatic species, and subsequent increase in bio-available aluminium would usually be toxic to aquatic organisms. However, it is noted that amphibian species which are recorded or predicted in the area are less sensitive to low pH and aluminium toxicity than fish species. The endangered Wallum Froglet requires low pH conditions for spawning therefore lower pH may assist to provide suitable habitat for this species. Increased frequency of short- term dry periods due to the increased drainage capability of the wetland are not expected to cause a long-term impact on the overall ecological function of the wetland, i.e., would not result in

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
		increased drainage capability of the wetland are not expected to cause a long-term impact on the overall ecological function of the wetland, i.e., would not result in terrestrialisation of the wetland.		increased drainage capability of the wetland are not expected to cause a long-term impact on the overall ecological function of the wetland, i.e., would not result in terrestrialisation of the wetland.	increased drainage capability of the wetland are not expected to cause a long-term impact on the overall ecological function of the wetland, i.e., would not result in terrestrialisation of the wetland.	terrestrialisation of the wetland.
Constructability						
Minimise depth of excavation to limit spoil for disposal and limit risk of encountering acid sulphate soils *Reduce depth of excavation where possible*	N/A	High depth of excavation, up to 1.3m below existing channel bed level	Excavation depth is minimized and localized. Approx. 9,700m^3 spoil volume	Moderate spoil volume approx. 21,500m^3, 1m depth of excavation below existing channel bed level	Moderate spoil volume approx. 16,300m^3, 1m depth of excavation below existing channel bed level,	Moderate spoil volume approx. 18,000m^3
Most likely project cost	N/A	Not costed	**$4.7M**	**$8.7M**	**$6.9M**	**$7.2M**
Other						
Other comments	Relatively high day-to-day water quality treatment function, but high risk of inundation and blackwater	Lowering the channel bed provides highly free-flowing conditions from CDIA. Further investigation indicates that there are no significant wetland communities	Existing timber bridge can be retained with this option. Localised excavation would occur		Similar (slightly less) inundation improvements and lower reduction in water quality treatment function compared to Option 2b	

Objective/criteria	Existing	CRC design	Option 2a	Option 2b	Option 2c	Option 2e
	events due to poor drainage.	present which would otherwise be impacted.	away from the bridge			

Appendix B. Applicable Water Quality Guidelines

Of relevance to this assessment, Table B-1 lists the applicable water quality guidelines for environmental values assigned to Campvale Canal and Campvale Wetland.

Table B-1 Key water quality indicators and related numerical criteria for environmental values using relevant national water quality guidelines (ANZG, 2018; NHMRC and NRMMC, 2011)

Environmental value	**Indicator**	**Default guideline value**	
		Lowland rivers	**Lakes and reservoirs**
Aquatic ecosystems – maintaining or improving the ecological condition of waterbodies and riparian zones over the long term	Total phosphorus	0.025mg/L	0.01mg/L
	Total nitrogen	0.35mg/L	0.35mg/L
	Chlorophyll-a	0.003mg/L	
	Turbidity	6-50NTU	1-20NTU
	Salinity (electrical conductivity)	125-2200µS/cm	20-30µS/cm
	Dissolved oxygen	85-110% saturation	90-110% saturation
	pH	6.5-8.5	6.5-8
	Toxicants	As per ANZG (2018) toxicant default guideline values (95% level of protection for slightly to moderately disturbed ecosystems and 99% level of protection for toxicants that bioaccumulate). Aluminium (<6.5 pH) – 0.0008mg/L Manganese – 1.9mg/L Ammonia – 0.02mg/L Oxidised nitrogen – 0.35mg/L Soluble reactive phosphorus – 0.02mg/L Iron – 0.03mg/L (as per Table 10.6 in the ADWG (NHMRC and NRMMC, 2011))	
Visual amenity – aesthetic qualities of waters	Visual clarity and colour	Natural visual clarity should not be reduced by more than 20%. Natural hue of water should not be changed by more than 10 points on the Munsell Scale. The natural reflectance of the water should not be changed by more than 50%.	
	Surface films and debris	Oils and petrochemicals should not be noticeable as a visible film on the water, nor should they be detectable by odour. Waters should be free from floating debris and litter n/a (no quantitative value specified)	

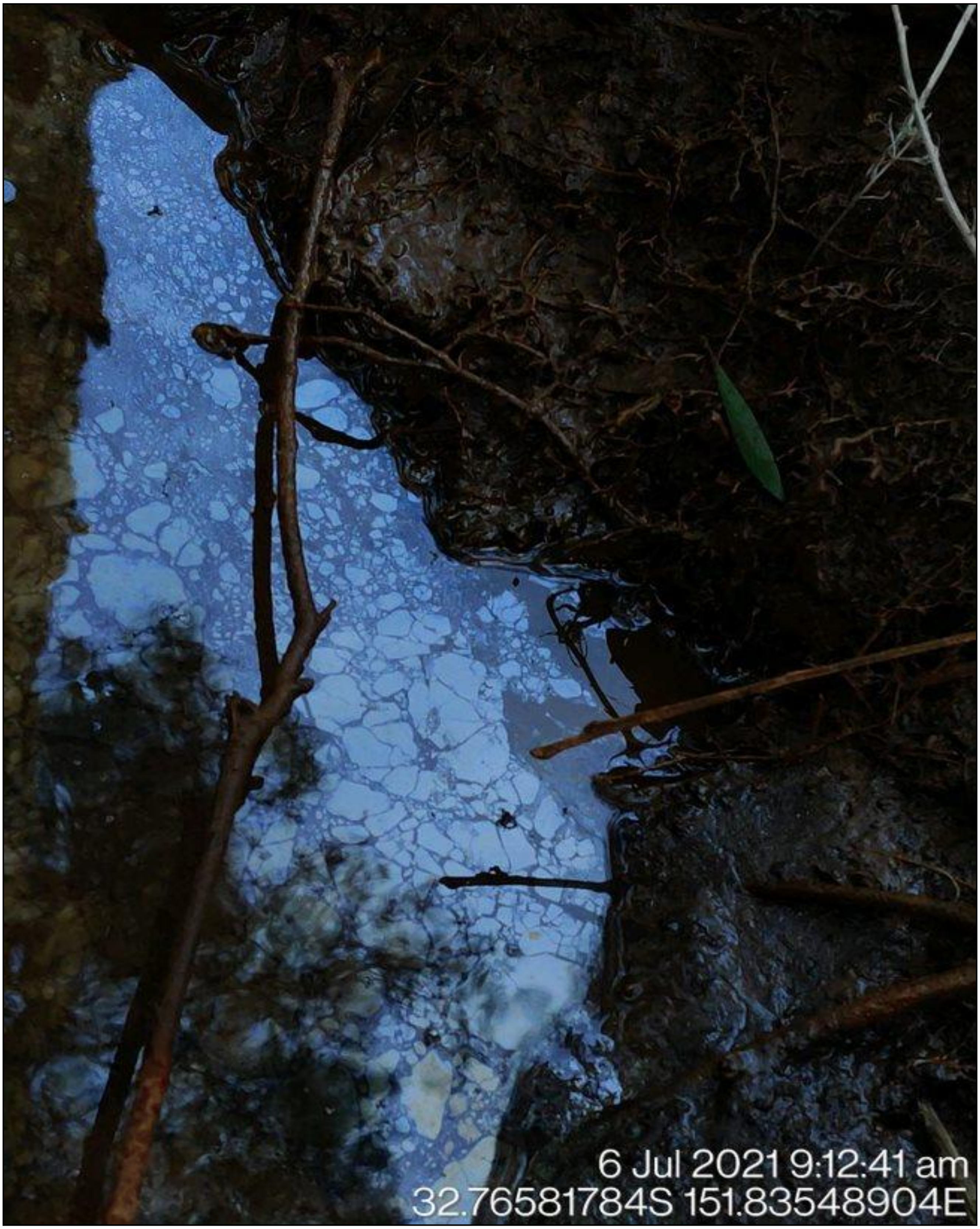
Environmental value	Indicator	Default guideline value	
		Lowland rivers	Lakes and reservoirs
	Nuisance organisms	Macrophytes, phytoplankton scums, filamentous algal mats, blue-green algae, sewage fungus and leeches should not be present in unsightly amounts n/a (no quantitative value specified)	

Appendix C. Photographs

Photograph 1 – Campvale Canal, near pump station. Vegetation clearing works undertaken in June 2021 (photo courtesy of HWC, provided to Jacobs on 28/06/2021)

Photograph 2 - Location of former vegetation clearing works (facing East) near pump station. Date: 06/07/2021

Photograph 3 – Hand augering at SED08. Date: 06/07/2021



Photograph 4 – Iron particulate identified on water's surface near SED08. Date: 06/07/2021

Photograph 5 – SED05 recovered material. Date: 06/07/2021

Photograph 6 – SED05 recovered material. Date: 06/07/2021

Photograph 7 – SED05 recovered material. Date: 06/07/2021

Appendix D. Logs

ENVIRONMENTAL LOG SED01

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS
DRILLING DATE 7/5/2021 11:00:31 AM -
LICENCE NO.

DRILLING COMPANY
DRILLER
DRILL RIG N/A
DRILLING METHOD Hand Auger
TOTAL DEPTH 0.300
DIAMETER 50mm

COORDINATES 151.819090145, 32.762950099
COORD SYS UTM
SURFACE ELEVATION
WELL TOC
LOGGED BY Luis Esteban
CHECKED BY Edward Moss

COMPLETION

CASING

SCREEN

COMMENTS

Depth (m)	Sample ID	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED01	▨	SILTY CLAY , high plasticity, dark grey to orange mottling brown, wet	W		Orange to brown staining from organics	
0.02							-0.02
0.04							-0.04
0.06							-0.06
0.08							-0.08
0.1							-0.1
0.12							-0.12
0.14							-0.14
0.16							-0.16
0.18							-0.18
0.2							-0.2
0.22							-0.22
0.24							-0.24
0.26							-0.26
0.28							-0.28
0.3			Termination Depth at:0.300 m.				-0.3

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ENVIRONMENTAL LOG SED02

PROJECT NUMBER IA410230	**DRILLING COMPANY**	**COORDINATES** 0389753, 6374283
PROJECT NAME Campvale Drain	**DRILLER**	**COORD SYS** UTM 56H
CLIENT Hunter Water Corporation	**DRILL RIG** N/A	**SURFACE ELEVATION**
ADDRESS	**DRILLING METHOD** Hand Auger	**WELL TOC**
DRILLING DATE 7/5/2021 8:29:33 AM -	**TOTAL DEPTH** 0.300	**LOGGED BY** Edward Moss
LICENCE NO.	**DIAMETER** 50mm	**CHECKED BY** Luis Esteban
COMPLETION	**CASING**	**SCREEN**

COMMENTS 300-400mm canal water overlying sample location. All material used for samples.

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
0.02 0.04 0.06 0.08	SED02	▥	SILT , medium plasticity, dark grey to black, trace sand, wet	W		Organics present	-0.02 -0.04 -0.06 -0.08
0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28		▨	SILTY CLAY , high plasticity, pale to dark orange mottling gray, trace sand, moist	M			-0.1 -0.12 -0.14 -0.16 -0.18 -0.2 -0.22 -0.24 -0.26 -0.28
0.3			Termination Depth at:0.300 m.				-0.3

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ENVIRONMENTAL LOG SED03

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS
DRILLING DATE 7/6/2021 9:23:15 AM -
LICENCE NO.

DRILLING COMPANY
DRILLER
DRILL RIG N/A
DRILLING METHOD Hand Auger
TOTAL DEPTH 0.500
DIAMETER 50mm

COORDINATES 0389949, 6374793
COORD SYS UTM 56H
SURFACE ELEVATION
WELL TOC
LOGGED BY Edward Moss
CHECKED BY Luis Esteban

COMPLETION
CASING
SCREEN

COMMENTS 3 x core recoveries required, approx 0.8m into bank.

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
0.02			Organics, leaves, roots, black to dark brown, strong organic odor.				-0.02
0.04							-0.04
0.06							-0.06
0.08							-0.08
0.1	SED03_0.1-0.2		SILTY SAND , black to grey, wet, loose to very loose	W	L-VL		-0.1
0.12							-0.12
0.14							-0.14
0.16							-0.16
0.18							-0.18
0.2	SED03_0.2-0.3		SAND , coarse grained, poorly graded, grey, very loose		VL		-0.2
0.22							-0.22
0.24							-0.24
0.26							-0.26
0.28							-0.28
0.3	SED03_0.3-0.5						-0.3
0.32							-0.32
0.34							-0.34
0.36							-0.36
0.38							-0.38
0.4							-0.4
0.42							-0.42
0.44							-0.44
0.46							-0.46
0.48							-0.48
0.5			Termination Depth at:0.500 m. Target depth				-0.5
0.52							-0.52

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ENVIRONMENTAL LOG SED04

PROJECT NUMBER IA410230	**DRILLING COMPANY**	**COORDINATES** 0390022, 6374124
PROJECT NAME Campvale Drain	**DRILLER**	**COORD SYS** UTM 56H
CLIENT Hunter Water Corporation	**DRILL RIG** N/A	**SURFACE ELEVATION**
ADDRESS	**DRILLING METHOD** Hand Auger	**WELL TOC**
DRILLING DATE 7/6/2021 9:31:59 AM -	**TOTAL DEPTH** 0.600	**LOGGED BY** Luis Esteban
LICENCE NO.	**DIAMETER** 50mm	**CHECKED BY** Edward Moss
COMPLETION	**CASING**	**SCREEN**

COMMENTS , Conducted on bank of canal. Unable to acquire core from canal bed

Depth (m)	Sample ID	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
			Organics, leaves, roots, dense organic matter. Dark brown - black.			No odour.	
0.05							-0.05
0.1			SILTY SAND , coarse grained, poorly graded, dark grey to black, organics			No odour, Dark organic components	-0.10
0.15							-0.15
0.2	SED04_0.2-0.3						-0.20
0.25							-0.25
0.3	SED04_0.3-0.4 SED04_0.4						-0.30
0.35							-0.35
0.4	SED04_0.4-0.5		SAND , coarse grained, grey to dark grey, with wood			No odour.	-0.40
0.45							-0.45
0.5	SED04_0.5-0.6						-0.50
0.55							-0.55
0.6			Termination Depth at:0.600 m. Target depth				-0.60

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ENVIRONMENTAL LOG SED05

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS
DRILLING DATE 7/6/2021 9:40:07 AM -
LICENCE NO.

DRILLING COMPANY
DRILLER
DRILL RIG N/A
DRILLING METHOD Hand Auger
TOTAL DEPTH 0.330
DIAMETER 50mm

COORDINATES 0390211, 6374104
COORD SYS UTM 56H
SURFACE ELEVATION
WELL TOC
LOGGED BY Edward Moss
CHECKED BY Luis Esteban

COMPLETION
CASING
SCREEN

COMMENTS 2 core recovered. Core completed 0.5m from waters edge at northern side of Campvale Drain.

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED05_0.0-0.3		SAND , medium to coarse grained, poorly graded, dark grey pale grey, with organics, moist to wet, loose to very loose	M-W	L-VL	Black organics, staining.	
0.02							-0.02
0.04							-0.04
0.06							-0.06
0.08							-0.08
0.1							-0.1
0.12							-0.12
0.14							-0.14
0.16							-0.16
0.18							-0.18
0.2							-0.2
0.22							-0.22
0.24							-0.24
0.26							-0.26
0.28							-0.28
0.3							-0.3
0.32							-0.32
0.34			Termination Depth at:0.330 m. inadequate recovery				-0.34

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ENVIRONMENTAL LOG SED06

PROJECT NUMBER IA410230	**DRILLING COMPANY**	**COORDINATES** 0390376, 6374066
PROJECT NAME Campvale Drain	**DRILLER**	**COORD SYS** UTM 56H
CLIENT Hunter Water Corporation	**DRILL RIG** N/A	**SURFACE ELEVATION**
ADDRESS	**DRILLING METHOD** Hand Auger	**WELL TOC**
DRILLING DATE 7/6/2021 9:45:54 AM -	**TOTAL DEPTH** 0.280	**LOGGED BY** Edward Moss
LICENCE NO.	**DIAMETER**	**CHECKED BY** Luis Esteban
COMPLETION	**CASING**	**SCREEN**

COMMENTS Sample collected 1m away from waters edge.

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED06_0.0-0.3 QA03 QA04	░	SAND , coarse grained, poorly graded, dark brown to black, organics, wet, very loose	W	VL	No staining.	
0.02		░					-0.02
0.04		░					-0.04
0.06		░					-0.06
0.08		░					-0.08
0.1		░					-0.10
0.12		░					-0.12
0.14		░					-0.14
0.16		░					-0.16
0.18		░					-0.18
0.2		░					-0.20
0.22		░					-0.22
0.24		░					-0.24
0.26		░					-0.26
0.28			Termination Depth at:0.280 m. inadequate soil recovery				-0.28

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ENVIRONMENTAL LOG SED07

PROJECT NUMBER IA410230	**DRILLING COMPANY**	**COORDINATES** 0390714, 6374056
PROJECT NAME Campvale Drain	**DRILLER**	**COORD SYS** UTM 56H
CLIENT Hunter Water Corporation	**DRILL RIG** N/A	**SURFACE ELEVATION**
ADDRESS	**DRILLING METHOD** Hand Auger	**WELL TOC**
DRILLING DATE 7/6/2021 9:50:25 AM -	**TOTAL DEPTH** 0.300	**LOGGED BY** Luis Esteban
LICENCE NO.	**DIAMETER** 50mm	**CHECKED BY** Edward Moss
COMPLETION	**CASING**	**SCREEN**

COMMENTS Four attempts for sample recovery.

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED07_0.0-0.3 QA02 Rinsate02		SAND , (SP), medium to coarse grained, poorly graded, pale grey to dark brown black, moist to wet, loose to very loose	M-W	L-VL	Organic odour.	
0.02							-0.02
0.04							-0.04
0.06							-0.06
0.08							-0.08
0.1							-0.1
0.12							-0.12
0.14							-0.14
0.16							-0.16
0.18							-0.18
0.2							-0.2
0.22							-0.22
0.24							-0.24
0.26							-0.26
0.28							-0.28
0.3			Termination Depth at:0.300 m. inadequate soil recovery				-0.3

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ENVIRONMENTAL LOG SED08

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS
DRILLING DATE 7/6/2021 9:53:22 AM -
LICENCE NO.

DRILLING COMPANY
DRILLER
DRILL RIG N/A
DRILLING METHOD Hand Auger
TOTAL DEPTH 0.200
DIAMETER 50

COORDINATES 0390811, 6374086
COORD SYS UTM 56H
SURFACE ELEVATION
WELL TOC
LOGGED BY Edward Moss
CHECKED BY Luis Esteban

COMPLETION

CASING

SCREEN

COMMENTS Sample recoveries poor, four attempts. Sample location 1m into canal from black.

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED08_0.0-0.2		SAND , (SP), medium to coarse grained, poorly graded, grey yellow to dark grey black, moist to wet, loose to very loose	M-W	L-VL	Organic odour, Oily sheen on water adjacent to sample location.	
0.01							-0.01
0.02							-0.02
0.03							-0.03
0.04							-0.04
0.05							-0.05
0.06							-0.06
0.07							-0.07
0.08							-0.08
0.09							-0.09
0.1							-0.1
0.11							-0.11
0.12							-0.12
0.13							-0.13
0.14							-0.14
0.15							-0.15
0.16							-0.16
0.17							-0.17
0.18							-0.18
0.19							-0.19
0.2			Termination Depth at:0.200 m. Sample depth terminated due to poor recovery				-0.2

ENVIRONMENTAL LOG SED09

PROJECT NUMBER IA410230	**DRILLING COMPANY**	**COORDINATES** 0390943, 6374098
PROJECT NAME Campvale Drain	**DRILLER**	**COORD SYS** UTM 56H
CLIENT Hunter Water Corporation	**DRILL RIG** N/A	**SURFACE ELEVATION**
ADDRESS	**DRILLING METHOD** Hand Auger	**WELL TOC**
DRILLING DATE 7/5/2021 12:50:18 PM -	**TOTAL DEPTH** 0.400	**LOGGED BY** Edward Moss
LICENCE NO.	**DIAMETER** 50	**CHECKED BY** Luis Esteban
COMPLETION	**CASING**	**SCREEN**

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED09_0.0-0.25 QA01		SILT , trace fine sand, with organics, wet, soft	W	S	Organics including sticks and twigs	
0.02							-0.02
0.04							-0.04
0.06							-0.06
0.08							-0.08
0.1							-0.1
0.12							-0.12
0.14							-0.14
0.16							-0.16
0.18							-0.18
0.2							-0.2
0.22							-0.22
0.24							-0.24
0.26	SED09_0.25-0.4		SANDY CLAY , high plasticity, grey to orange mottling black, moist to wet, firm	M-W	F		-0.26
0.28							-0.28
0.3							-0.3
0.32							-0.32
0.34							-0.34
0.36							-0.36
0.38							-0.38
0.4			Termination Depth at:0.400 m.				-0.4

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ENVIRONMENTAL LOG SED10

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS
DRILLING DATE 7/5/2021 12:59:13 PM -
LICENCE NO.

DRILLING COMPANY
DRILLER
DRILL RIG N/A
DRILLING METHOD Hand Auger
TOTAL DEPTH 0.500
DIAMETER 50

COORDINATES 32.7670701, 151.8385445
COORD SYS UTM 56H
SURFACE ELEVATION
WELL TOC
LOGGED BY Luis Esteban
CHECKED BY Edward Moss

COMPLETION
CASING
SCREEN

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED10_0.1		SILT , black to dark brown, some organics, wet, soft to firm	W	S-F	Dense	
0.02							-0.02
0.04							-0.04
0.06							-0.06
0.08							-0.08
0.1	SED10_0.1-0.5						-0.1
0.12							-0.12
0.14							-0.14
0.16							-0.16
0.18							-0.18
0.2							-0.2
0.22							-0.22
0.24							-0.24
0.26							-0.26
0.28							-0.28
0.3							-0.3
0.32							-0.32
0.34							-0.34
0.36							-0.36
0.38							-0.38
0.4							-0.4
0.42							-0.42
0.44							-0.44
0.46							-0.46
0.48							-0.48
0.5			Termination Depth at:0.500 m. Target depth				-0.5
0.52							-0.52

Jacobs

ENVIRONMENTAL LOG SED11

PROJECT NUMBER IA410230	**DRILLING COMPANY**	**COORDINATES** 0391466, 6374382
PROJECT NAME Campvale Drain	**DRILLER**	**COORD SYS** UTM 56H
CLIENT Hunter Water Corporation	**DRILL RIG** N/A	**SURFACE ELEVATION**
ADDRESS	**DRILLING METHOD** Hand Auger	**WELL TOC**
DRILLING DATE 7/5/2021 1:03:03 PM -	**TOTAL DEPTH** 0.500	**LOGGED BY** Edward Moss
LICENCE NO.	**DIAMETER** 50	**CHECKED BY** Luis Esteban
COMPLETION	**CASING**	**SCREEN**

COMMENTS On the edge of bank, 0.2m of overlying waste column.

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations	Elevation (m)
	SED11_0.0-0.2		SILT , medium plasticity, black to dark brown, organics, wet, soft to firm	W	S-F	No odour, Dense.	
0.02							-0.02
0.04							-0.04
0.06							-0.06
0.08							-0.08
0.1							-0.1
0.12							-0.12
0.14							-0.14
0.16							-0.16
0.18							-0.18
0.2	SED11_0.2-0.4 SED11_0.2-0.5						-0.2
0.22							-0.22
0.24							-0.24
0.26							-0.26
0.28							-0.28
0.3							-0.3
0.32							-0.32
0.34							-0.34
0.36							-0.36
0.38							-0.38
0.4							-0.4
0.42							-0.42
0.44							-0.44
0.46							-0.46
0.48							-0.48
0.5			Termination Depth at:0.500 m. Target depth				-0.5
0.52							-0.52

Disclaimer This log is intended for environmental not geotechnical purposes.

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Jacobs

ENVIRONMENTAL LOG SP01

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS Grahamstown Road, Campvale NSW 2318
DRILLING DATE 6/7/2021

EXCAVATION METHOD Shovel
TOTAL DEPTH 0.300

COORDINATES 0389883, 6374241
COORD SYS UTM 56H
SURFACE ELEVATION Unknown
LOGGED BY Edward Moss
CHECKED BY Luis Esteban

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
		▨	SILTY SAND , (SP), coarse grained, poorly graded, dark grey to black			Organics
0.02						
0.04						
0.06						
0.08						
0.1						
0.12						
0.14						
0.16						
0.18						
0.2	SP01_0.2					
0.22						
0.24						
0.26						
0.28						
0.3			Termination Depth at:0.300 m. Target depth			
0.32						
0.34						
0.36						
0.38						
0.4						
0.42						
0.44						
0.46						
0.48						

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 29 Jul 2021

ENVIRONMENTAL LOG SP02

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS Grahamstown Road, Campvale NSW 2318
DRILLING DATE 6/7/2021

EXCAVATION METHOD Shovel
TOTAL DEPTH 0.300

COORDINATES 0389873, 6374243
COORD SYS UTM 56H
SURFACE ELEVATION Unknown

LOGGED BY Edward Moss
CHECKED BY Luis Esteban

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
		▨	SILTY SAND , (SP), coarse grained, poorly graded, dark grey to black			Organics
0.02		▨				
0.04		▨				
0.06		▨				
0.08		▨				
0.1		▨				
0.12		▨				
0.14		▨				
0.16		▨				
0.18		▨				
0.2	SP02_0.2	▨				
0.22		▨				
0.24		▨				
0.26		▨				
0.28		▨				
0.3			Termination Depth at:0.300 m. Target depth			
0.32						
0.34						
0.36						
0.38						
0.4						
0.42						
0.44						
0.46						
0.48						

Disclaimer This log is intended for environmental not geotechnical purposes.

Jacobs

ENVIRONMENTAL LOG SP03

PROJECT NUMBER IA410230
PROJECT NAME Campvale Drain
CLIENT Hunter Water Corporation
ADDRESS Grahamstown Road, Campvale NSW 2318
DRILLING DATE 6/7/2021

EXCAVATION METHOD Shovel
TOTAL DEPTH 0.300

COORDINATES 0389873, 6374242
COORD SYS UTM 56H
SURFACE ELEVATION Unknown

LOGGED BY Edward Moss
CHECKED BY Luis Esteban

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28	SP03_0.1	▨	SANDY CLAY , medium plasticity, brown to dark grey mottling brown, moist	M		
0.3 0.32 0.34 0.36 0.38 0.4 0.42 0.44 0.46 0.48			Termination Depth at:0.300 m. Target depth			

Disclaimer This log is intended for environmental not geotechnical purposes.

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Appendix E. Results Tables

Table 1 - Soil Analytical Results
Contamination Assessment

					Polycyclic aromatic hydrocarbons (PAHs)																						Metals								Inorganics					
					Benzo(a)pyrene TEQ calc (zero)	Benzo(a)pyrene TEQ calc(half)	Benzo(a)pyrene TEQ calc(PQL)	Benzo[b+j]fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j) & Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	Total +ve PAHs	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury	Nickel	Zinc	Moisture Content	Nitrite + Nitrate as N (soluble)	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Reactive Phosphorus as P
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.05	4	0.4	1	1	1	0.1	1	1	0.1	0.1	20	0.1	0.1	0.1
ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)																									10,000[#1]		20[#2]	1.5[#2]	80[#2]	65[#2]	50[#2]	0.15[#2]		200[#2]						
PFAS NEMP 2020 Table 2 Public open space (HIL C)																																								
PFAS NEMP 2020 Table 3 Ecological direct exposure																																								
PFAS NEMP 2020 Table 3 Ecological indirect exposure																																								
NEPM 2013 Table 1A(1) HIL C Soil																									300[#5]		300[#6]	90		17,000	600[#7]	80[#8]	1,200	30,000						
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion																						NL[#10]																		
NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)																						170[#11]					100[#11]			190[#12]	1,100[#13]		270[#14]	590[#15]						
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space													0.7																											
ASSMAC (1998) Action criteria for greater than 1,000 tonnes disturbed, sands													0.7																											
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**																																				
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**6**	<5	<5	<0.1	<2	<5	**22.2**	<0.1	<20	<0.1	<0.1	<0.1
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	**9**	<1	**18**	<5	**9**	<0.1	<2	<5	**33.9**	**0.2**	<20	**0.2**	<0.1	<0.1
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1	<2	<5	**27.5**	-	-	-	-	-
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**18.7**	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**4**	<5	<5	<0.1	**2**	<5	**28.4**	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**27.6**	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	<0.5	**1.2**	**2.4**	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	-	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<1.0[#16]	<0.5	-	<5	<1	**13**	**6**	<5	<0.1	**13**	**9**	**79.0**	-	-	-	-	-
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1	<2	<5	**25.8**	<0.1	<20	<0.1	<0.1	<0.1
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1	<2	<5	**29.4**	<0.1	<20	<0.1	<0.1	<0.1
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1	<2	<5	**22.1**	<0.1	<20	<0.1	<0.1	<0.1
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**3**	<5	<5	<0.1	<2	<5	**28.9**	-	-	-	-	-
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**13**	<5	**6**	<0.1	<2	**7**	**30.8**	**0.2**	<20	**0.2**	<0.1	**0.2**
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**63.2**	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	<0.5	**1.0**	**1.9**	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	-	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.5	-	**19**	<1	**27**	**17**	**13**	**0.1**	**9**	**6**	**58.4**	**0.2**	<20	**0.2**	<0.1	<0.1
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	<0.5	**1.0**	**1.9**	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	-	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.8[#16]	<0.5	-	**19**	<1	**28**	**34**	**11**	<0.1	**29**	**12**	**74.5**	**0.9**	<20	**0.9**	<0.1	<0.1
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**80.4**	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	**6**	<1	**5**	<5	<5	<0.1	<2	**9**	**23.8**	-	-	-	-	-
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**4**	<5	**6**	<0.1	<2	<5	**20.5**	-	-	-	-	-
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**10**	**5**	**6**	<0.1	<2	<5	**21.2**	-	-	-	-	-
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	**8**	<1	**16**	<5	**7**	<0.1	<2	**13**	**36.5**	<0.1	<20	<0.1	<0.1	**0.1**
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<0.5	<0.5	<0.5	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.05	<4	<0.4	**2**	<1	<1	<0.1	<1	**2**	**21**	-	-	-	-	-
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**21.5**	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**22**	-	-	-	-	-

Comments

#1 The DGV and GV-high values for total PAHs (sum of PAHs) include the 18 parent PAHs
#2 Primarily adapted from the effects range low (ERL) and effects range median (ERM) values of Long et al. (1995).
#3 Primarily adapted from threshold effects level (TEL) and probable effects level (PEL) values of MacDonald et al. (2000) and CCME (2002).
#4 Where dieldrin or endrin are the major COPCs, it is recommended that ESB approaches are applied as described in Appendix A4 of Simpson et al. (2013a).
#5 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (should meet BaP TEQ HIL) & napthalene (should meet relevant HSL)
#6 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (refer Shedule B7).
#7 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific bioavailability should be considered where appropriate.
#8 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is present, or suspected to be present.
#9 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposure to all PCBs (inc dioxin like PCBs) should be undertaken
#10 Derived soil HSL exceeds soil saturation concentraiton
#11 Refer Table 1B(5)
#12 Assumed pH=6, refer Table 1B(2)
#13 Refer Table 1B(4)
#14 Assumed CEC=20cmol/kg, refer Table 1B(3)
#15 Assumed CEC=20cmol/kg and pH=6.5, refer Table 1B(1)
#16 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

ANZG, 2018, ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)
HEPA, January 2020, PFAS NEMP 2020 Table 2 Public open space (HIL C)
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1A(1) HIL C Soil
NEPM, April 2013, NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
ASSMAC, 1998 Table 4.4 Coarse Texture sands to loamy sands, Action Criteria if more than 1000 tonnes disturbed

Table 1 - Soil Analytical Results
Contamination Assessment

					TRH - NEPM 2013 Fractions							BTEX							Polychlorinated Biphenyls (PCBs)	Organochlorine Pesticides (OCPs)																				
					TRH >C6 - C10	TRH >C10 - C16	TRH >C16 - C34	TRH >C34 - C40	TRH >C10 - C40 (Sum of total)	TRH >C6 - C10 less BTEX (F1)	TRH >C10 - C16 less Naphthalene (F2)	Benzene	Ethylbenzene	Toluene	Total BTEX	Xylene (m & p)	Xylene (o)	Xylene Total	PCBs (Sum of total)	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
EQL					10	50	100	100	50	10	50	0.2	0.5	0.5	0.2	0.5	0.5	0.5	0.1	0.05	50	0.05	0.05	50	50	50	50	50	50	100	50	0.05	50	50	50	50	50	50	50	50
ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)																			34[#3]						4,500[#2]					1,200[#3]		2.8[#4]					2,700[#4]			900[#2]
PFAS NEMP 2020 Table 2 Public open space (HIL C)																																								
PFAS NEMP 2020 Table 3 Ecological direct exposure																																								
PFAS NEMP 2020 Table 3 Ecological indirect exposure																																								
NEPM 2013 Table 1A(1) HIL C Soil																			1[#9]				10		70,000						400,000		340,000				20,000			
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion										NL[#10]	NL[#10]	NL[#10]	NL[#10]	NL[#10]				NL[#10]																						
NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)																														180,000[#11]										
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space							300	2,800		180	120	50	70	85				105																						
ASSMAC (1998) Action criteria for greater than 1,000 tonnes disturbed, sands							300	2,800		180	120	50	70	85				105																						
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**																																				
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<10	<50	<100	<100	<50	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<10	<50	<100	<100	<50	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	<10	<50	<100	<100	<50	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	<10	<50	**450**	**160**	**610**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	<10	**70**	**1,680**	**860**	**2,610**	<10	**70**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.06[#16]	<60[#16]	<0.06[#16]	<0.05	<60[#16]	<50	<60[#16]	<60[#16]	<60[#16]	<60[#16]	<300[#16]	<50	<0.06[#16]	<50	<60[#16]	<60[#16]	<60[#16]	<60[#16]	<60[#16]	<60[#16]	<60[#16]
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<10	<50	**150**	<100	**150**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<10	<50	**120**	<100	**120**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<10	<50	<100	<100	<50	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<10	<50	**160**	<100	**160**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<10	**250**	**460**	**210**	**920**	<10	**250**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	<10	<50	**930**	**620**	**1,550**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	<10	**280**	**1,460**	**930**	**2,670**	<10	**280**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<10	<50	**320**	<100	**320**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<10	<50	**100**	**130**	**230**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<10	<50	**230**	<100	**230**	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<10	**150**	**260**	**260**	**670**	<10	**150**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<25	<50	<100	<100	<50	<25	<50	<0.2	<1	<0.5	-	<2	<1	<3	<0.1	<0.1	<100	<0.1	-	<100	-	<100	<100	<100	<100	<100	<100	<0.1	-	<100	<100	<100	<100	<100	-	<100
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments
#1 The DGV and GV-high values for total PAHs (sum of PAHs) include the 18 parent PAHs
#2 Primarily adapted from the effects range low (ERL) and effects range median (ERM) values of Long et al. (1995).
#3 Primarily adapted from threshold effects level (TEL) and probable effects level (PEL) values of MacDonald et al. (2000) and CCME (2002).
#4 Where dieldrin or endrin are the major COPCs, it is recommended that ESB approaches are applied as described in Appendix A4 of Simps
#5 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (shoul
#6 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (
#7 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific
#8 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is pre
#9 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposure t
#10 Derived soil HSL exceeds soil saturation concentraiton
#11 Refer Table 1B(5)
#12 Assumed pH=6, refer Table 1B(2)
#13 Refer Table 1B(4)
#14 Assumed CEC=20cmol/kg, refer Table 1B(3)
#15 Assumed CEC=20cmol/kg and pH=6.5, refer Table 1B(1)
#16 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards
ANZG, 2018, ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)
HEPA, January 2020, PFAS NEMP 2020 Table 2 Public open space (HIL C)
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1A(1) HIL C Soil
NEPM, April 2013, NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
ASSMAC, 1998 Table 4.4 Coarse Texture sands to loamy sands, Action Criteria if more than 1000 tonnes disturbed

Table 1 - Soil Analytical Results

Contamination Assessment

								Organophosphorous Pesticides (OPPs)																				
					Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenitrothion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos	Ronnel
					µg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					50	50	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.2	0.2	0.1	0.05	0.05	0.1
ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)																												
PFAS NEMP 2020 Table 2 Public open space (HIL C)																												
PFAS NEMP 2020 Table 3 Ecological direct exposure																												
PFAS NEMP 2020 Table 3 Ecological indirect exposure																												
NEPM 2013 Table 1A(1) HIL C Soil					10,000		400					250																
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion																												
NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)																												
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																												
ASSMAC (1998) Action criteria for greater than 1,000 tonnes disturbed, sands																												
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**																								
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	<60[#16]	<60[#16]	<0.3[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	<0.06[#16]	-	<0.06[#16]	<0.06[#16]	<0.3[#16]	<0.3[#16]	<0.3[#16]	<0.06[#16]	<0.06[#16]	-
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<100	<100	<0.1	<0.1	<0.1	-	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	-	-	<0.1	-	-	<0.1
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

					Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorooctanesulfonamide (PFOSA)	Perfluoropentane sulfonic acid (PFPeS)	Perfluoro-n-pentanoic acid (PFPeA)	Perfluorononanoic acid (PFNA)	Perfluorohexanoic acid (PFHxA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluoroheptanoic acid (PFHpA)	Perfluorododecanoic acid (PFDoA)	Perfluorodecanoic acid (PFDA)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorobutanesulfonic acid (PFBS)
					mg/kg	mg/kg	mg/kg	µg/kg	µg/kg	mg/kg	µg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg
EQL					0.0001	0.0001	0.0002	0.1	0.2	0.0001	0.1	0.0001	0.0001	0.2	0.0002	0.0001	0.0001
ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)																	
PFAS NEMP 2020 Table 2 Public open space (HIL C)						10											
PFAS NEMP 2020 Table 3 Ecological direct exposure					1	10											
PFAS NEMP 2020 Table 3 Ecological indirect exposure					0.01												
NEPM 2013 Table 1A(1) HIL C Soil																	
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion																	
NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)																	
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																	
ASSMAC (1998) Action criteria for greater than 1,000 tonnes disturbed, sands																	
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**													
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	**0.0003**	<0.0002	<0.0002	<0.2	<0.2	<0.0002	**0.4**	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	**0.0005**	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	**0.0025**	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	**0.0008**	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	**0.0003**	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<0.0001	<0.0001	<0.001	<0.1	<0.2	<0.0001	<0.1	<0.0001	<0.0001	<0.5	<0.0005	<0.0001	<0.0001
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.0002	<0.2	<0.0002	<0.0002	<0.2	<0.0002	<0.0002	<0.0002
QA04	SED06	0 - 0.3	6/07/2021	273787	<0.0001	<0.0001	<0.001	<0.1	<0.2	<0.0001	<0.1	<0.0001	<0.0001	<0.5	<0.0005	<0.0001	<0.0001

Comments

#1 The DGV and GV-high values for total PAHs (sum of PAHs) include the 18 parent PAHs
#2 Primarily adapted from the effects range low (ERL) and effects range median (ERM) values of Long et al. (1995).
#3 Primarily adapted from threshold effects level (TEL) and probable effects level (PEL) values of MacDonald et al. (2000) and CCME (2002).
#4 Where dieldrin or endrin are the major COPCs, it is recommended that ESB approaches are applied as described in Appendix A4 of Simpsc
#5 Total PAHs: Based on sum of 16 most common reported (WHO 98). HIL application should consider presence of carcinogenic PAHs (shoul
#6 Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability maybe important and should be considered where appropriate (
#7 Lead: HILs A,B,C based on blood lead models (IEUBK & HIL D on adult lead model for where 50% bioavailability considered. Site-specific b
#8 Elemental mercury: HIL does not address elemental mercury. a site specific assessment should be considered if elemental mercury is pres
#9 PCBs: HIL refers to non-dioxin like PCBs only. Where PCB source is known, or suspected at a site, a site-specific assessment of exposure tc
#10 Derived soil HSL exceeds soil saturation concentraiton
#11 Refer Table 1B(5)
#12 Assumed pH=6, refer Table 1B(2)
#13 Refer Table 1B(4)
#14 Assumed CEC=20cmol/kg, refer Table 1B(3)
#15 Assumed CEC=20cmol/kg and pH=6.5, refer Table 1B(1)
#16 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

ANZG, 2018, ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)
HEPA, January 2020, PFAS NEMP 2020 Table 2 Public open space (HIL C)
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Table 3 Ecological indirect exposure
NEPM, April 2013, NEPM 2013 Table 1A(1) HIL C Soil
NEPM, April 2013, NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion
NEPM, April 2013, NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)
NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
ASSMAC, 1998 Table 4.4 Coarse Texture sands to loamy sands, Action Criteria if more than 1000 tonnes disturbed

Table 1 - Soil Analytical Results

Contamination Assessment

					Per- and Poly-fluoroalkyl Substances (PFAS)																			Biological		Halogenated Benzenes	Acid Sulfate Soils - Field		pHF and pHFox	SPOCAS										
					Perfluorodecanesulfonic acid (PFDS)	Perfluorotetradecanoic aicd (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)	Perfluorobutanoic acid (PFBA)	1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2)	N-ethyl perfluorooctane sulfonamido acetic acid	N-ethyl perfluorooctane sulfonamide	N-methyl perfluorooctanesulfonamido ethanol	N-ethyl perfluorooctanesulfonamido ethanol	N-Methyl perfluorooctane sulfonamide	N-methyl perfluorooctane sulfonamido acetic acid	Sum (PFHxS + PFOS)	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of US EPA PFAS (PFOS + PFOA)*	Faecal Coliforms	E. Coli	Hexachlorobenzene	Reaction Rate	pH (F)	pHFox	s-Net Acidity with ANCE	ANC Fineness Factor	acidity - Chromium Reducible Sulfur (a-22B)	KCl Extractable Sulfur	Liming Rate	Liming Rate excluding ANC	Net Acidity (acidity units)	Net Acidity (sulfur units)	HCl Extractable Sulfur	sulfidic - Titratable Actual Acidity	Net Acid Soluble Sulfur
					mg/kg	mg/kg	mg/kg	µg/kg	µg/kg	mg/kg	µg/kg	mg/kg	mg/kg	µg/kg	mg/kg	µg/kg	mg/kg	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg	µg/kg	MPN/g	-	µg/kg	-	pH units	pH Units	%w/w S	-	mole H+/t	%	kg CaCO3/t	kg CaCO3/t	mole H+/t	%S	%S	%S	%S
EQL					0.0002	0.0005	0.0002	0.2	0.2	0.0001	0.1	0.0002	0.0002	0.2	0.0005	0.5	0.0005	0.5	0.2	0.1	0.0001	0.0002	0.1		2	50	1	0.1	0.1	10	0.5	10	0.02	1	1	10	0.02	0.02	0.02	0.02
ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)																																								
PFAS NEMP 2020 Table 2 Public open space (HIL C)																				1,000																				
PFAS NEMP 2020 Table 3 Ecological direct exposure																																								
PFAS NEMP 2020 Table 3 Ecological indirect exposure																																								
NEPM 2013 Table 1A(1) HIL C Soil																										10,000														
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion																																								
NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)																																								
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space																																								
ASSMAC (1998) Action criteria for greater than 1,000 tonnes disturbed, sands																												<4.0	≤3.5								0.03			
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**																																				
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**5.1**	**2.4**	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**46**	**1.5**	**12**	-	**3**	**3**	**46**	**0.07**	-	**0.05**	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	<2	<2	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**	**5.8**	**3.3**	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	<2	<2	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**5.4**	**2.4**	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**28**	**1.5**	**19**	-	**2**	**2**	**28**	**0.04**	-	<0.02	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**	**5.8**	**3.1**	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**56**	**1.5**	**42**	-	**4**	**4**	**56**	**0.09**	-	**0.02**	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	**0.3**	**0.0007**	**0.0007**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<60[#16]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**5.4**	**2.2**	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**4.7**	**1.8**	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**16**	**1.5**	**13**	-	**1**	**1**	**16**	**0.03**	-	<0.02	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	<2	<2	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**4.7**	**2.2**	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	**18**	**18**	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	**5.5**	**1.8**	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**19**	**1.5**	**15**	-	**1**	**1**	**19**	**0.03**	-	<0.02	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**	**5.5**	**2.6**	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	<2	<2	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**	**6.0**	**2.9**	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**103**	**1.5**	**39**	-	**8**	**8**	**103**	**0.16**	-	**0.10**	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	**0.5**	**0.0005**	**0.0005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**	**5.3**	**1.6**	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	**3.3**	**0.0033**	**0.0033**	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**	**4.0**	**1.7**	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**241**	**1.5**	**58**	**0.12**	**18**	**18**	**241**	**0.39**	**0.13**	**0.28**	<0.02
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5[#16]	<5[#16]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	**0.3**	**0.0003**	**0.0003**	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	-	-	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	<2	<2	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**136**	**1.5**	**73**	-	**10**	**10**	**136**	**0.22**	-	**0.10**	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<0.0002	<0.005	<0.0005	<0.5	<0.2	<0.0001	<0.1	<0.0002	<0.0002	<0.2	<0.001	<1	<0.005	<1	<0.2	<0.1	<0.0001	-	<0.1	-	-	<100	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	<0.0002	<0.0005	<0.0002	<0.2	<1	<0.0005	<0.5	<0.0005	<0.0005	<0.2	<0.0005	<0.5	<0.0005	<0.5	<0.2	<0.2	<0.0002	<0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	<0.0002	<0.005	<0.0005	<0.5	<0.2	<0.0001	<0.1	<0.0002	<0.0002	<0.2	<0.001	<1	<0.005	<1	<0.2	<0.1	<0.0001	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments

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#2 Primarily adapted from the effects range low (ERL) and effects range median (ERM) values of Long et al. (1995).
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Environmental Standards

ANZG, 2018, ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)
HEPA, January 2020, PFAS NEMP 2020 Table 2 Public open space (HIL C)
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NEPM, April 2013, NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space
ASSMAC, 1998 Table 4.4 Coarse Texture sands to loamy sands, Action Criteria if more than 1000 tonnes disturbed

Table 1 - Soil Analytical Results
Contamination Assessment

								Acid Sulfate Soils - CRS		
					Net Acid Soluble Sulfur (in acid units)	Net Acid Soluble Sulfur (in sulfur units)	Titratable Actual Acidity	Chromium Reducible Sulfur	Net Acidity excluding ANC (sulfur units)	pH (KCl)
					mole H+/t	%S	mole H+/t	%S	% S	pH units
EQL					10	0.02	2	0.005	0.02	0.1
ANZG (2018) Default Guideline Values for toxicants in sediment (DGV)										
PFAS NEMP 2020 Table 2 Public open space (HIL C)										
PFAS NEMP 2020 Table 3 Ecological direct exposure										
PFAS NEMP 2020 Table 3 Ecological indirect exposure										
NEPM 2013 Table 1A(1) HIL C Soil										
NEPM 2013 Table 1A(3) HSL C Sand for Vapour Intrusion										
NEPM 2013 Table 1B(1-5) EIL Urb Res Default (Aged)										
NEPM 2013 Table 1B(6) ESL, Coarse Soil, Urban Residential/Public Open Space										
ASSMAC (1998) Action criteria for greater than 1,000 tonnes disturbed, sands							18	0.03		
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**						
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	**34**	**0.018**	**0.07**	**4.6**
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	-	-	-	-	-	-
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	-	-	-	-	-	-
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	**9**	**0.030**	**0.04**	**5.3**
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	**14**	**0.068**	**0.09**	**5.1**
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	-	-	-	-	-	-
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	**4**	**0.020**	**0.03**	**5.5**
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	**4**	**0.024**	**0.03**	**5.4**
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	-	-	-	-	-	-
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	**64**	**0.063**	**0.16**	**4.5**
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	<10	<0.02	**178**	**0.094**	**0.39**	**3.8**
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	-	-	-	-	-	-
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	-	-	-	-	-	-
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	-	-	-	-	-	-
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	-	-	-	-	-	-
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	**63**	**0.117**	**0.22**	**4.5**
QA02	SED07	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-

Comments

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ASSMAC, 1998 Table 4.4 Coarse Texture sands to loamy sands, Action Criteria if more than 1000 tonnes disturbed

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.129/07/2021 9:19:32 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

TRH >C10 - C16 less Naphthalene (F2)

General Statistics

Total Number of Observations	15	Number of Distinct Observations	4
Number of Detects	3	Number of Non-Detects	12
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	70	Minimum Non-Detect	50
Maximum Detect	280	Maximum Non-Detect	50
Variance Detects	12900	Percent Non-Detects	80%
Mean Detects	200	SD Detects	113.6
Median Detects	250	CV Detects	0.568
Skewness Detects	-1.597	Kurtosis Detects	N/A
Mean of Logged Detects	5.135	SD of Logged Detects	0.77

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	80	KM Standard Error of Mean	23.07
KM SD	72.94	95% KM (BCA) UCL	N/A
95% KM (t) UCL	120.6	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	117.9	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	149.2	95% KM Chebyshev UCL	180.5
97.5% KM Chebyshev UCL	224	99% KM Chebyshev UCL	309.5

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	3.217	k star (bias corrected MLE)	N/A
Theta hat (MLE)	62.17	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	19.3	nu star (bias corrected)	N/A
Mean (detects)	200		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

	A	B	C	D	E	F	G	H	I	J	K	L
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58	Minimum					0.01	Mean					40.1
59	Maximum					280	Median					0.01
60	SD					93.23	CV					2.325
61	k hat (MLE)					0.13	k star (bias corrected MLE)					0.149
62	Theta hat (MLE)					307.8	Theta star (bias corrected MLE)					269.7
63	nu hat (MLE)					3.909	nu star (bias corrected)					4.46
64	Adjusted Level of Significance (β)					0.0324						
65	Approximate Chi Square Value (4.46, α)					0.912	Adjusted Chi Square Value (4.46, β)					0.735
66	95% Gamma Approximate UCL (use when n>=50)					196.2	95% Gamma Adjusted UCL (use when n<50)					N/A
67												
68	**Estimates of Gamma Parameters using KM Estimates**											
69	Mean (KM)					80	SD (KM)					72.94
70	Variance (KM)					5320	SE of Mean (KM)					23.07
71	k hat (KM)					1.203	k star (KM)					1.007
72	nu hat (KM)					36.09	nu star (KM)					30.21
73	theta hat (KM)					66.5	theta star (KM)					79.46
74	80% gamma percentile (KM)					128.7	90% gamma percentile (KM)					183.9
75	95% gamma percentile (KM)					239.1	99% gamma percentile (KM)					367.2
76												
77	**Gamma Kaplan-Meier (KM) Statistics**											
78	Approximate Chi Square Value (30.21, α)					18.65	Adjusted Chi Square Value (30.21, β)					17.54
79	95% Gamma Approximate KM-UCL (use when n>=50)					129.5	95% Gamma Adjusted KM-UCL (use when n<50)					137.7
80												
81	**Lognormal GOF Test on Detected Observations Only**											
82	Shapiro Wilk Test Statistic					0.811	**Shapiro Wilk GOF Test**					
83	5% Shapiro Wilk Critical Value					0.767	Detected Data appear Lognormal at 5% Significance Level					
84	Lilliefors Test Statistic					0.359	**Lilliefors GOF Test**					
85	5% Lilliefors Critical Value					0.425	Detected Data appear Lognormal at 5% Significance Level					
86	**Detected Data appear Lognormal at 5% Significance Level**											
87												
88	**Lognormal ROS Statistics Using Imputed Non-Detects**											
89	Mean in Original Scale					48.67	Mean in Log Scale					2.348
90	SD in Original Scale					89.97	SD in Log Scale					1.938
91	95% t UCL (assumes normality of ROS data)					89.59	95% Percentile Bootstrap UCL					88.01
92	95% BCA Bootstrap UCL					100.8	95% Bootstrap t UCL					214.9
93	95% H-UCL (Log ROS)					684.5						
94												
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
96	KM Mean (logged)					4.157	KM Geo Mean					63.85
97	KM SD (logged)					0.564	95% Critical H Value (KM-Log)					2.139
98	KM Standard Error of Mean (logged)					0.178	95% H-UCL (KM -Log)					103.4
99	KM SD (logged)					0.564	95% Critical H Value (KM-Log)					2.139
100	KM Standard Error of Mean (logged)					0.178						
101												
102	**DL/2 Statistics**											
103	**DL/2 Normal**						**DL/2 Log-Transformed**					
104	Mean in Original Scale					60	Mean in Log Scale					3.602
105	SD in Original Scale					84.22	SD in Log Scale					0.845
106	95% t UCL (Assumes normality)					98.3	95% H-Stat UCL					92.33
107	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
108												

	A	B	C	D	E	F	G	H	I	J	K	L
109	**Nonparametric Distribution Free UCL Statistics**											
110	**Detected Data appear Normal Distributed at 5% Significance Level**											
111												
112	**Suggested UCL to Use**											
113	95% KM (t) UCL					120.6						
114												
115	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
116	Recommendations are based upon data size, data distribution, and skewness.											
117	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
118	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
119												

Table 2 - Soil Analytical Results
Waste Analysis and Classification Assessment

					Polycyclic aromatic hydrocarbons (PAHs)																						Metals					
					Benzo(a)pyrene TEQ calc (zero)	Benzo(a)pyrene TEQ calc(half)	Benzo(a)pyrene TEQ calc(PQL)	Benzo[b+j]fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j) & Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	Total +ve PAHs	Arsenic	Cadmium	Chromium (III+VI)	Copper	Lead	Mercury
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.5	0.5	0.1	0.1	0.1	0.1	0.05	0.2	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.05	4	0.4	1	1	1	0.1
NSW 2014 General Solid Waste CT1													0.8														100	20			100	4
NSW 2014 Restricted Solid Waste CT2													3.2														400	80			400	16
NSW 2014 General Solid Waste TCLP1																																
NSW 2014 Restricted Solid Waste TCLP2																																
NSW 2014 General Solid Waste SCC1													10														500	100			1,500	50
NSW 2014 Restricted Solid Waste SCC2													23														2,000	400			6,000	200
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**																												
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**6**	<5	<5	<0.1
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	**9**	<1	**18**	<5	**9**	<0.1
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**4**	<5	<5	<0.1
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	<0.5	**1.2**	**2.4**	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	-	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<1.0$^{\#3}$	<0.5	-	<5	<1	**13**	**6**	<5	<0.1
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	<2	<5	<5	<0.1
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**3**	<5	<5	<0.1
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**13**	<5	**6**	<0.1
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	<0.5	**1.0**	**1.9**	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	-	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.5	-	**19**	<1	**27**	**17**	**13**	**0.1**
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	<0.5	**1.0**	**1.9**	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	-	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.8$^{\#3}$	<0.5	-	**19**	<1	**28**	**34**	**11**	<0.1
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	**6**	<1	**5**	<5	<5	<0.1
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**4**	<5	**6**	<0.1
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<5	<1	**10**	**5**	**6**	<0.1
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<0.5	**0.6**	**1.2**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	**8**	<1	**16**	<5	**7**	<0.1
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<0.5	<0.5	<0.5	-	<0.1	<0.1	<0.1	<0.1	<0.05	<0.2	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.05	<4	<0.4	**2**	<1	<1	<0.1
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments
#1 Endosulfan means the total of Endosulfan I, Endosulfan II and Endosulfan sulfate.
#2 Amendment to Table 2 to include TCLP and SCC values for PFOS, PFHxS and PFOA chemicals.
#3 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards
NSW EPA, NSW 2014 General Solid Waste CT1
NSW EPA, NSW 2014 Restricted Solid Waste CT2
NSW EPA, NSW 2014 General Solid Waste TCLP1
NSW EPA, NSW 2014 Restricted Solid Waste TCLP2
NSW EPA, NSW 2014 General Solid Waste SCC1
NSW EPA, NSW 2014 Restricted Solid Waste SCC2

Table 2 - Soil Analytical Results

Waste Analysis and Classification Assessment

							Inorganics						TPH - NEPM 1999 Fractions		BTEXN							Polychlorinated Biphenyls (PCBs)										
					Nickel	Zinc	Moisture Content	Nitrite + Nitrate as N (soluble)	Ammonia as N	Nitrate (as N)	Nitrite (as N)	Reactive Phosphorus as P	TPH C6 - C9	TPH C10 - C36 (Sum of total)	Benzene	Ethylbenzene	Toluene	Total BTEX	Xylene (m & p)	Xylene (o)	Xylene Total	PCBs (Sum of total)	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD
					mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
EQL					1	1	0.1	0.1	20	0.1	0.1	0.1	10	50	0.2	0.5	0.5	0.2	0.5	0.5	0.5	0.1	0.05	50	0.05	0.05	50	50	50	50	50	50
NSW 2014 General Solid Waste CT1					40										10	600	288				1,000											
NSW 2014 Restricted Solid Waste CT2					160										40	2,400	1,152				4,000											
NSW 2014 General Solid Waste TCLP1																																
NSW 2014 Restricted Solid Waste TCLP2																																
NSW 2014 General Solid Waste SCC1					1,050								650	10,000	18	1,080	518				1,800	50										
NSW 2014 Restricted Solid Waste SCC2					4,200								2,600	40,000	72	4,320	2,073				7,200	50										
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**																												
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<2	<5	**22.2**	<0.1	<20	<0.1	<0.1	<0.1	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<2	<5	**33.9**	**0.2**	<20	**0.2**	<0.1	<0.1	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	<2	<5	**27.5**	-	-	-	-	-	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	**18.7**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	**2**	<5	**28.4**	-	-	-	-	-	<10	**550**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	**27.6**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	**13**	**9**	**79.0**	-	-	-	-	-	<10	**2,110**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.06[#3]	<60[#3]	<0.06[#3]	<0.05	<60[#3]	<50	<60[#3]	<60[#3]	<60[#3]	<60[#3]
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<2	<5	**25.8**	<0.1	<20	<0.1	<0.1	<0.1	<10	**130**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<2	<5	**29.4**	<0.1	<20	<0.1	<0.1	<0.1	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<2	<5	**22.1**	<0.1	<20	<0.1	<0.1	<0.1	<10	<50	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<2	<5	**28.9**	-	-	-	-	-	<10	**120**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<2	**7**	**30.8**	**0.2**	<20	**0.2**	<0.1	**0.2**	<10	**780**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	**63.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	**9**	**6**	**58.4**	**0.2**	<20	**0.2**	<0.1	<0.1	<10	**1,230**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	**29**	**12**	**74.5**	**0.9**	<20	**0.9**	<0.1	<0.1	<10	**2,080**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	**80.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<2	**9**	**23.8**	-	-	-	-	-	<10	**280**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<2	<5	**20.5**	-	-	-	-	-	<10	**100**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<2	<5	**21.2**	-	-	-	-	-	<10	**190**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<2	**13**	**36.5**	<0.1	<20	<0.1	<0.1	**0.1**	<10	**490**	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.1	<0.05	<50	<0.05	<0.05	<50	<50	<50	<50	<50	<50
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<1	**2**	**21**	-	-	-	-	-	<25	-	<0.2	<1	<0.5	-	<2	<1	<3	<0.1	<0.1	<100	<0.1	-	<100	-	<100	<100	<100	<100
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	**21.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments

#1 Endosulfan means the total of Endosulfan I, Endosulfan II and Endosulfan sulfate.
#2 Amendment to Table 2 to include TCLP and SCC values for PFOS, PFHxS and PFOA chemicals.
#3 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

NSW EPA, NSW 2014 General Solid Waste CT1
NSW EPA, NSW 2014 Restricted Solid Waste CT2
NSW EPA, NSW 2014 General Solid Waste TCLP1
NSW EPA, NSW 2014 Restricted Solid Waste TCLP2
NSW EPA, NSW 2014 General Solid Waste SCC1
NSW EPA, NSW 2014 Restricted Solid Waste SCC2

Table 2 - Soil Analytical Results

Waste Analysis and Classification Assessment

					Organochlorine Pesticides (OCPs)														Organophosphorous Pesticides (OPPs)													
					DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenitrothion	Fenthion
					µg/kg	µg/kg	mg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					100	50	0.05	50	50	50	50	50	50	50	50	50	50	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05
NSW 2014 General Solid Waste CT1								60,000[#1]															4									
NSW 2014 Restricted Solid Waste CT2								240,000[#1]															16									
NSW 2014 General Solid Waste TCLP1																																
NSW 2014 Restricted Solid Waste TCLP2																																
NSW 2014 General Solid Waste SCC1								108,000															7.5									
NSW 2014 Restricted Solid Waste SCC2								432,000															30									
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**																												
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	<300[#3]	<50	<0.06[#3]	<50	<60[#3]	<60[#3]	<60[#3]	<60[#3]	<60[#3]	<60[#3]	<60[#3]	<60[#3]	<60[#3]	<0.3[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	<0.06[#3]	-	<0.06[#3]
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<200	<50	<0.05	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<100	<100	<0.1	-	<100	<100	<100	<100	<100	-	<100	<100	<100	<0.1	<0.1	<0.1	-	-	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	-	<0.1	-
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments

#1 Endosulfan means the total of Endosulfan I, Endosulfan II and Endosulfan sulfate.
#2 Amendment to Table 2 to include TCLP and SCC values for PFOS, PFHxS and PFOA chemicals.
#3 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

NSW EPA, NSW 2014 General Solid Waste CT1
NSW EPA, NSW 2014 Restricted Solid Waste CT2
NSW EPA, NSW 2014 General Solid Waste TCLP1
NSW EPA, NSW 2014 Restricted Solid Waste TCLP2
NSW EPA, NSW 2014 General Solid Waste SCC1
NSW EPA, NSW 2014 Restricted Solid Waste SCC2

Table 2 - Soil Analytical Results

Waste Analysis and Classification Assessment

												Per- and Poly-fluoroalkyl Substances (PFAS)					Biological		Halogenated Benzenes
					Malathion	Methyl parathion	Monocrotophos	Parathion	Pirimphos-ethyl	Prothiofos	Ronnel	Perfluorooctanoic acid (PFOA)	Sum (PFHxS + PFOS)	Sum of PFAS	Sum of PFAS (WA DER List)	Sum of US EPA PFAS (PFOS + PFOA)*	Faecal Coliforms	E. Coli	Hexachlorobenzene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	mg/kg	µg/kg	MPN/g	-	µg/kg
EQL					0.05	0.2	0.2	0.1	0.05	0.05	0.1	0.0001	0.1	0.0001	0.0002	0.1		2	50
NSW 2014 General Solid Waste CT1																			
NSW 2014 Restricted Solid Waste CT2																			
NSW 2014 General Solid Waste TCLP1																			
NSW 2014 Restricted Solid Waste TCLP2																			
NSW 2014 General Solid Waste SCC1												18[#2]	1,800[#2]						
NSW 2014 Restricted Solid Waste SCC2												72[#2]	7,200[#2]						
Field ID	**Location Code**	**Depth**	**Date**	**Lab Report Number**															
SED01	SED01	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED01	SED01	0 - 0.3	5/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	<2	<2	<50
SED02	SED02	0 - 0.3	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED02	SED02	0 - 0.3	5/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	<2	<2	<50
SED03_0.1-0.2	SED03	0.1 - 0.2	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	-	-	-	-	-	-	-	<50
SED03_0.2-0.3	SED03	0.2 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	<0.0002	<0.2	<0.0002	<0.0002	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED03_0.3-0.5	SED03	0.3 - 0.5	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.2-0.3	SED04	0.2 - 0.3	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	-	-	-	-	-	-	-	<50
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.3-0.4	SED04	0.3 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED04_0.4	SED04	0.4	6/07/2021	ES2125020	-	-	-	-	-	-	-	<0.0002	**0.3**	**0.0007**	**0.0007**	-	-	-	-
SED04_0.4-0.5	SED04	0.4 - 0.5	6/07/2021	ES2125020	<0.06[#3]	<0.3[#3]	<0.3[#3]	<0.3[#3]	<0.06[#3]	<0.06[#3]	-	-	-	-	-	-	-	-	<60[#3]
SED04_0.5-0.6	SED04	0.5 - 0.6	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED05_0.0-0.3	SED05	0 - 0.3	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	<2	<2	<50
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED06_0.0-0.3	SED06	0 - 0.3	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	**18**	**18**	<50
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED07_0.0-0.3	SED07	0 - 0.3	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	-	-	<50
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED08_0.0-0.2	SED08	0 - 0.2	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	-	-	<50
SED09_0.0-0.25	SED09	0 - 0.25	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	<2	<2	<50
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED09_0.25-0.4	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1	SED10	0.1	5/07/2021	ES2125020	-	-	-	-	-	-	-	<0.0002	**0.5**	**0.0005**	**0.0005**	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED10_0.1-0.5	SED10	0.1 - 0.5	5/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	-	-	-	-	-	<2	<2	<50
SED11_0.0-0.2	SED11	0 - 0.2	5/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	**3.3**	**0.0033**	**0.0033**	-	-	-	<50
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.4	SED11	0.2 - 0.4	5/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SED11_0.2-0.5	SED11	0.2 - 0.5	5/07/2021	ES2125020	-	-	-	-	-	-	-	-	-	-	-	-	<5[#3]	<5[#3]	-
SP01_0.2	SP01	0.2	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	-	-	<50
SP02_0.2	SP02	0.2	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	**0.3**	**0.0003**	**0.0003**	-	-	-	<50
SP03_0.1	SP03	0.1	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	-	-	<50
QA01	SED09	0 - 0.25	6/07/2021	ES2125020	<0.05	<0.2	<0.2	<0.2	<0.05	<0.05	-	<0.0002	<0.2	<0.0002	<0.0002	-	<2	<2	<50
QA01	SED09	0.25 - 0.4	6/07/2021	EB2119483	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA02	SED07	0 - 0.3	6/07/2021	273787	<0.1	-	-	<0.1	-	-	<0.1	<0.0001	<0.1	<0.0001	-	<0.1	-	-	<100
QA03	SED06	0 - 0.3	6/07/2021	ES2125020	-	-	-	-	-	-	-	<0.0002	<0.2	<0.0002	<0.0002	-	-	-	-
QA04	SED06	0 - 0.3	6/07/2021	273787	-	-	-	-	-	-	-	<0.0001	<0.1	<0.0001	-	<0.1	-	-	-

Comments

#1 Endosulfan means the total of Endosulfan I, Endosulfan II and Endosulfan sulfate.
#2 Amendment to Table 2 to include TCLP and SCC values for PFOS, PFHxS and PFOA chemicals.
#3 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

NSW EPA, NSW 2014 General Solid Waste CT1
NSW EPA, NSW 2014 Restricted Solid Waste CT2
NSW EPA, NSW 2014 General Solid Waste TCLP1
NSW EPA, NSW 2014 Restricted Solid Waste TCLP2
NSW EPA, NSW 2014 General Solid Waste SCC1
NSW EPA, NSW 2014 Restricted Solid Waste SCC2

Analytical data validation checklist

Project and Data Details			
Project number	**IA410230**	**Client**	
Site	**Campvale Drain**	**Laboratory report number**	Primary – EB2119102, EB2119483, ES2125020 Secondary – 273787
Validated by	**S. Yumul**	**Matrix type/s**	Soil
Validation date	**23 Jul 2021**	**Primary laboratory**	ALS
Sampling date range	**5-6 Jul 2021**	**Secondary laboratory**	Envirolab

Field QAQC	Yes	No	NA		Yes	No	NA
Correct sample naming on COC?	☒	☐	☐	**Were field blank/s collected?**	☒	☐	☐
Correct sample naming in laboratory SRN?	☒	☐	☐	**Trip blank/s collected?**	☒	☐	☐
Do the requested limits of reporting match the project SAQP?	☒	☐	☐	**Intra and inter laboratory duplicate/s?**	☒	☐	☐
Analysis on COC correct compared to project SAQP?	☒	☐	☐	**Do field blank/s results meet criteria?**	☒	☐	☐
Analysis on SRN correct as compared to COC?	☒	☐	☐	**Do trip blank/s results meet criteria?**	☒	☐	☐
All samples received intact and within acceptable temp. range?	☒	☐	☐	**Do duplicate results meet criteria?**	☐	☒	☐

Laboratory QAQC	Yes	No	NA		Yes	No	NA
Do samples meet analysis holding times?	☒	☐	☐	**Are laboratory duplicate RPDs < 30%?**	☒	☐	☐
Do analytes reported in COA match SRN?	☒	☐	☐	**Are LCS/standards within laboratory specified ranges?**	☒	☐	☐
Is internal laboratory QAQC frequency adequate?	☐	☒	☐	**Are laboratory MS recoveries within laboratory specified ranges?**	☒	☐	☐
Do lab reports and EDD match?	☒	☐	☐	**Are surrogate spikes recoveries within laboratory specified ranges?**	☐	☒	☐
Are all results below LOR for method blanks?	☒	☐	☐				

Acronyms

COA – Certificate of analysis

COC – Chain of custody

EDD – Electronic data deliverable

LCS – Laboratory control spike

LOR – Limit of reporting

MS – Matrix spike

RPD – Relative percentage difference

SAQP – Sample analysis quality plan

SRN – Service recipient notice

Comments

ES125020

Surrogate recovery non-compliance – OCP, rinsate samples

Sample Frequency non-compliance (matrix spike)

- *PAH/Phenols (GC/MS - SIM)*

- *Pesticides by GCMS*
- *Polychlorinated Biphenyls (PCB)*
- *TRH – Semi-volatile Fraction*

Comments – Edward Moss

- Do duplicate results meet criteria? Two RPD exceedances identified. Due to the heterogeneity of the material, some non-compliances are expected. Not considered to affect the dataset as a whole which had >95% compliance.
- Is internal laboratory QAQC frequency adequate? Meets QAQC frequency as outlined in the SAQP (2021). Due to time constraints, no inter-laboratory duplicate for Chromium Reducible Sulfur was submitted. Not considered to affect the dataset as a whole.
- Are surrogate spikes recoveries within laboratory specified ranges? Two surrogate non-recoveries were identified for DEF and Dibromo-DDE in Rinsate01 sample. Given no detections for DEF and Dibromo-DDE were identified in any of the primary samples, the two non-recoveries are considered minor and do not affect the dataset as whole.

Table 3 - Laboratory intra- and inter-laboratory duplicates

		Lab Report No.	EB2119102	273787	RPD	EB2119102	273787	RPD	ES2125020	ES2125020	RPD	ES2125020	ES2125020	RPD	EB2119483	EB2119483	RPD
		Field ID	SED06_0.0-0.3	QA04		SED07_0.0-0.3	QA02		SED06_0.0-0.3	QA03		SED09_0.0-0.25	QA01		SED09_0.25-0.4	QA01	
		Date	6/07/2021	6/07/2021		6/07/2021	6/07/2021		6/07/2021	6/07/2021		6/07/2021	6/07/2021		6/07/2021	6/07/2021	
		Matrix Type	Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
		Sample Type	Normal	Interlab_D		Normal	Interlab_D		Normal	Field_D		Normal	Field_D		Normal	Field_D	
	Unit	EQL															
PAH																	
Pyrene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Metals																	
Arsenic	mg/kg	4	-	-	-	-	<4	-	<5	-	-	<5	**8**	46	-	-	-
Cadmium	mg/kg	0.4	-	-	-	-	<0.4	-	<1	-	-	<1	<1	0	-	-	-
Chromium (III+VI)	mg/kg	1	-	-	-	-	**2**	-	<2	-	-	**13**	**16**	21	-	-	-
Copper	mg/kg	1	-	-	-	-	<1	-	<5	-	-	<5	<5	0	-	-	-
Lead	mg/kg	1	-	-	-	-	<1	-	<5	-	-	**6**	**7**	15	-	-	-
Mercury	mg/kg	0.1	-	-	-	-	<0.1	-	<0.1	-	-	<0.1	<0.1	0	-	-	-
Nickel	mg/kg	1	-	-	-	-	<1	-	<2	-	-	<2	<2	0	-	-	-
Zinc	mg/kg	1	-	-	-	-	**2**	-	<5	-	-	**7**	**13**	60	-	-	-
Inorganics																	
Nitrite + Nitrate as N (soluble)	mg/kg	0.1	-	-	-	-	-	-	<0.1	-	-	**0.2**	<0.1	67	-	-	-
Ammonia as N	mg/kg	20	-	-	-	-	-	-	<20	-	-	<20	<20	0	-	-	-
Nitrate (as N)	mg/kg	0.1	-	-	-	-	-	-	<0.1	-	-	**0.2**	<0.1	67	-	-	-
Nitrite (as N)	mg/kg	0.1	-	-	-	-	-	-	<0.1	-	-	<0.1	<0.1	0	-	-	-
Reactive Phosphorus as P	mg/kg	0.1	-	-	-	-	-	-	<0.1	-	-	**0.2**	**0.1**	67	-	-	-
Physiochemical parameters																	
Moisture Content	%	0.1	-	**22**	-	-	**21**	-	**29.4**	**21.5**	31	**30.8**	**36.5**	17	-	-	-
TRH - NEPM 2013 Fractions																	
TRH >C6 - C10	mg/kg	10	-	-	-	-	<25	-	<10	-	-	<10	<10	0	-	-	-
TRH >C10 - C16	mg/kg	50	-	-	-	-	<50	-	<50	-	-	**250**	**150**	50	-	-	-
TRH >C16 - C34	mg/kg	100	-	-	-	-	<100	-	**120**	-	-	**460**	**260**	56	-	-	-
TRH >C34 - C40	mg/kg	100	-	-	-	-	<100	-	<100	-	-	**210**	**260**	21	-	-	-
TRH >C10 - C40 (Sum of total)	mg/kg	50	-	-	-	-	<50	-	**120**	-	-	**920**	**670**	31	-	-	-
TRH >C6 - C10 less BTEX (F1)	mg/kg	10	-	-	-	-	<25	-	<10	-	-	<10	<10	0	-	-	-
TRH >C10 - C16 less Naphthalene (F2)	mg/kg	50	-	-	-	-	<50	-	<50	-	-	**250**	**150**	50	-	-	-
TPH - NEPM 1999 Fractions																	
TPH C6 - C9	mg/kg	10	-	-	-	-	<25	-	<10	-	-	<10	<10	0	-	-	-
TPH C10 - C14	mg/kg	50	-	-	-	-	<50	-	<50	-	-	<50	<50	0	-	-	-
TPH C15 - C28	mg/kg	100	-	-	-	-	<100	-	<100	-	-	**590**	**290**	68	-	-	-
TPH C29-C36	mg/kg	100	-	-	-	-	<100	-	<100	-	-	**190**	**200**	5	-	-	-
TPH C10 - C36 (Sum of total)	mg/kg	50	-	-	-	-	-	-	<50	-	-	**780**	**490**	46	-	-	-
Polycyclic aromatic hydrocarbons (PAHs)																	
Acenaphthene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Acenaphthylene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Anthracene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Benz(a)anthracene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Benzo(b+j+k)fluoranthene	mg/kg	0.2	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.5	-	-	-	-	-	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Benzo(b+j)fluoranthene	mg/kg	0.5	-	-	-	-	-	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Benzo(g,h,i)perylene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Benzo(a) pyrene	mg/kg	0.05	-	-	-	-	<0.05	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Benzo(a)pyrene TEQ calc (Half)	mg/kg	0.5	-	-	-	-	<0.5	-	**0.6**	-	-	**0.6**	**0.6**	0	-	-	-
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	-	-	-	-	<0.5	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	-	-	-	-	<0.5	-	**1.2**	-	-	**1.2**	**1.2**	0	-	-	-
Chrysene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Fluoranthene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Fluorene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Phenanthrene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
PAHs (Sum of total)	mg/kg	0.5	-	-	-	-	-	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
PAHs (Sum of positives)	mg/kg	0.05	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-
Monocyclic Aromatic Hydrocarbons (MAHs)																	
Benzene	mg/kg	0.2	-	-	-	-	<0.2	-	<0.2	-	-	<0.2	<0.2	0	-	-	-
Toluene	mg/kg	0.5	-	-	-	-	<0.5	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Ethylbenzene	mg/kg	0.5	-	-	-	-	<1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Xylene (m & p)	mg/kg	0.5	-	-	-	-	<2	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Xylene (o)	mg/kg	0.5	-	-	-	-	<1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Xylene Total	mg/kg	0.5	-	-	-	-	<3	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Naphthalene	mg/kg	0.1	-	-	-	-	<0.1	-	<0.5	-	-	<0.5	<0.5	0	-	-	-
Total BTEX	mg/kg	0.2	-	-	-	-	-	-	<0.2	-	-	<0.2	<0.2	0	-	-	-
Polychlorinated Biphenyls (PCBs)																	
Arochlor 1016	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Arochlor 1221	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Arochlor 1232	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Arochlor 1242	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Arochlor 1248	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Arochlor 1254	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Arochlor 1260	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-

Table 3 - Laboratory intra- and inter-laboratory duplicates

Lab Report No.			EB2119102	273787		EB2119102	273787		ES2125020	ES2125020		ES2125020	ES2125020		EB2119483	EB2119483	
Field ID			SED06_0.0-0.3	QA04		SED07_0.0-0.3	QA02		SED06_0.0-0.3	QA03		SED09_0.0-0.25	QA01		SED09_0.25-0.4	QA01	
Date			6/07/2021	6/07/2021	RPD	6/07/2021	6/07/2021	RPD	6/07/2021	6/07/2021	RPD	6/07/2021	6/07/2021	RPD	6/07/2021	6/07/2021	RPD
Matrix Type			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
Sample Type			Normal	Interlab_D		Normal	Interlab_D		Normal	Field_D		Normal	Field_D		Normal	Field_D	
	Unit	EQL															
PCBs (Sum of total)	mg/kg	0.1	-	-	-	-	<0.1	-	<0.1	-	-	<0.1	<0.1	0	-	-	-
Organochlorine Pesticides (OCPs)																	
4,4-DDE	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
a-BHC	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Aldrin	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Aldrin + Dieldrin	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
b-BHC	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Chlordane	µg/kg	50	-	-	-	-	-	-	<50	-	-	<50	<50	0	-	-	-
Chlordane (cis)	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Chlordane (trans)	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
d-BHC	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
DDD	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
DDT	µg/kg	100	-	-	-	-	<100	-	<200	-	-	<200	<200	0	-	-	-
DDT+DDE+DDD	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Dieldrin	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Endosulfan	µg/kg	50	-	-	-	-	-	-	<50	-	-	<50	<50	0	-	-	-
Endosulfan I	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Endosulfan II	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Endosulfan sulfate	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Endrin	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Endrin aldehyde	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Endrin ketone	µg/kg	50	-	-	-	-	-	-	<50	-	-	<50	<50	0	-	-	-
g-BHC (Lindane)	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Heptachlor	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Heptachlor epoxide	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Methoxychlor	µg/kg	100	-	-	-	-	<100	-	<200	-	-	<200	<200	0	-	-	-
Organophosphorous Pesticides (OPPs)																	
Azinophos methyl	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Bromophos-ethyl	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Carbophenothion	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Chlorfenvinphos	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Chlorpyrifos	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Chlorpyrifos-methyl	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Demeton-S-methyl	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Diazinon	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Dichlorvos	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Dimethoate	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Ethion	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Fenamiphos	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Fenitrothion	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Fenthion	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Malathion	mg/kg	0.05	-	-	-	-	<0.1	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Methyl parathion	mg/kg	0.2	-	-	-	-	-	-	<0.2	-	-	<0.2	<0.2	0	-	-	-
Monocrotophos	mg/kg	0.2	-	-	-	-	-	-	<0.2	-	-	<0.2	<0.2	0	-	-	-
Parathion	mg/kg	0.1	-	-	-	-	<0.1	-	<0.2	-	-	<0.2	<0.2	0	-	-	-
Pirimphos-ethyl	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Prothiofos	mg/kg	0.05	-	-	-	-	-	-	<0.05	-	-	<0.05	<0.05	0	-	-	-
Ronnel	mg/kg	0.1	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
Per- and Poly-fluoroalkyl Substances (PFAS)																	
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorooctanesulfonamide (PFOSA)	mg/kg	0.0002	-	<0.001	-	-	<0.001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluoro-n-pentanoic acid (PFPeA)	mg/kg	0.0002	-	<0.0002	-	-	<0.0002	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorononanoic acid (PFNA)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	-	<0.0005	-	-	<0.0005	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	-	<0.0005	-	-	<0.0005	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorobutanesulfonic acid (PFBS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002	-	<0.0002	-	-	<0.0002	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-

Table 3 - Laboratory intra- and inter-laboratory duplicates

Lab Report No.			EB2119102	273787	RPD	EB2119102	273787	RPD	ES2125020	ES2125020	RPD	ES2125020	ES2125020	RPD	EB2119483	EB2119483	RPD
Field ID			SED06_0.0-0.3	QA04		SED07_0.0-0.3	QA02		SED06_0.0-0.3	QA03		SED09_0.0-0.25	QA01		SED09_0.25-0.4	QA01	
Date			6/07/2021	6/07/2021		6/07/2021	6/07/2021		6/07/2021	6/07/2021		6/07/2021	6/07/2021		6/07/2021	6/07/2021	
Matrix Type			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
Sample Type			Normal	Interlab_D		Normal	Interlab_D		Normal	Field_D		Normal	Field_D		Normal	Field_D	
	Unit	EQL															
Perfluorotetradecanoic aicd (PFTeDA)	mg/kg	0.0005	-	<0.005	-	-	<0.005	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	-	<0.0005	-	-	<0.0005	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	-	<0.0005	-	-	<0.0005	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Perfluorobutanoic acid (PFBA)	mg/kg	0.0002	-	<0.0002	-	-	<0.0002	-	<0.001	<0.001	0	<0.001	<0.001	0	-	-	-
N-ethyl perfluorooctane sulfonamido acetic acid	mg/kg	0.0002	-	<0.0002	-	-	<0.0002	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
N-ethyl perfluorooctane sulfonamide	mg/kg	0.0005	-	<0.001	-	-	<0.001	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
N-methyl perfluorooctanesulfonamido ethanol	mg/kg	0.0005	-	<0.001	-	-	<0.001	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
N-ethyl perfluorooctanesulfonamido ethanol	mg/kg	0.0005	-	<0.005	-	-	<0.005	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
N-Methyl perfluorooctane sulfonamide	mg/kg	0.0005	-	<0.001	-	-	<0.001	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
N-methyl perfluorooctane sulfonamido acetic acid	mg/kg	0.0002	-	<0.0002	-	-	<0.0002	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Sum (PFHxS + PFOS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Sum of PFAS	µg/kg	0.1	-	<0.1	-	-	<0.1	-	<0.2	<0.2	0	<0.2	<0.2	0	-	-	-
Sum of PFAS (WA DER List)	mg/kg	0.0002	-	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.0002	0	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/kg	0.1	-	<0.1	-	-	<0.1	-	-	-	-	-	-	-	-	-	-
(n:2) Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0001	-	<0.0001	-	-	<0.0001	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002	-	<0.0002	-	-	<0.0002	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0002	-	<0.0002	-	-	<0.0002	-	<0.0005	<0.0005	0	<0.0005	<0.0005	0	-	-	-
Halogenated Benzenes																	
Hexachlorobenzene	µg/kg	50	-	-	-	-	<100	-	<50	-	-	<50	<50	0	-	-	-
Microbiological																	
Faecal Coliforms	MPN/g		-	-	-	-	-	-	**18**	-	-	<2	<2	0	-	-	-
E. Coli	-	2	-	-	-	-	-	-	**18**	-	-	<2	<2	0	-	-	-
Acid Sulfate Soils - Acid Base Accounting																	
Net Acidity (acidity units)	mole H+/t	10	-	-	-	-	-	-	-	-	-	-	-	-	**103**	**136**	28
Net Acidity (sulfur units)	%S	0.02	-	-	-	-	-	-	-	-	-	-	-	-	**0.16**	**0.22**	32
Acid Sulfate Soils - Acidity Trail																	
Titratable Actual Acidity (sulfur units)	%S	0.02	-	-	-	-	-	-	-	-	-	-	-	-	**0.10**	**0.10**	0
Titratable Actual Acidity	mole H+/t	2	-	-	-	-	-	-	-	-	-	-	-	-	**64**	**63**	2
Acid Sulfate Soils - ANC																	
ANC Fineness Factor	-	0.5	-	-	-	-	-	-	-	-	-	-	-	-	**1.5**	**1.5**	0
Net Acidity excluding ANC (sulfur units)	% S	0.02	-	-	-	-	-	-	-	-	-	-	-	-	**0.16**	**0.22**	32
Acid Sulfate Soils - CRS																	
Chromium Reducible Sulfur	%S	0.005	-	-	-	-	-	-	-	-	-	-	-	-	**0.063**	**0.117**	**60**
Chromium Reducible Sulphur (acidity units)	mole H+/t	10	-	-	-	-	-	-	-	-	-	-	-	-	**39**	**73**	61
pH (KCl)	pH units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	**4.5**	**4.5**	0
Acid Sulfate Soils - Field																	
Reaction Rate	-	1	**3**	-	-	**3**	-	-	-	-	-	-	-	-	-	-	-
pH (F)	pH Units	0.1	**4.7**	-	-	**5.5**	-	-	-	-	-	-	-	-	-	-	-
pHFox	pH Units	0.1	**2.2**	-	-	**1.8**	-	-	-	-	-	-	-	-	-	-	-
Acid Sulfate Soils - Liming Rate																	
Liming Rate	kg CaCO3/t	1	-	-	-	-	-	-	-	-	-	-	-	-	**8**	**10**	22
Liming Rate excluding ANC	kg CaCO3/t	1	-	-	-	-	-	-	-	-	-	-	-	-	**8**	**10**	22
SPOCAS																	
a-Net Acidity without ANCE_	mole H+/t	10	-	-	-	-	-	-	-	-	-	-	-	-	**103**	**136**	28

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 80 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

Table 4 - Blank samples

		Lab Report No.	ES2125020	ES2125020
		Field ID	RINSATE01	RINSATE02
		Sample Date	05-Jul-21	06-Jul-21
		Sample Type	Rinsate	Rinsate
ChemName	**output unit**	**EQL**		
PAH				
Pyrene	µg/L	1	<1	<1
Metals				
Arsenic (Filtered)	µg/L	1	<1	<1
Cadmium (Filtered)	µg/L	0.1	<0.1	<0.1
Chromium (III+VI) (Filtered)	µg/L	1	<1	<1
Copper (Filtered)	µg/L	1	<1	<1
Lead (Filtered)	µg/L	1	<1	<1
Mercury (Filtered)	µg/L	0.1	<0.1	<0.1
Nickel (Filtered)	µg/L	1	<1	<1
Zinc (Filtered)	µg/L	5	<5	<5
TRH - NEPM 2013 Fractions				
TRH >C6 - C10	µg/L	20	<20	<20
TRH >C10 - C16	µg/L	100	<100	<100
TRH >C16 - C34	µg/L	100	<100	<100
TRH >C34 - C40	µg/L	100	<100	<100
TRH >C10 - C40 (Sum of total)	µg/L	100	<100	<100
TRH >C6 - C10 less BTEX (F1)	µg/L	20	<20	<20
TRH >C10 - C16 less Naphthalene (F2)	µg/L	100	<100	<100
TPH - NEPM 1999 Fractions				
TPH C6 - C9	µg/L	20	<20	<20
TPH C10 - C14	µg/L	50	<50	<50
TPH C15 - C28	µg/L	100	<100	<100
TPH C29-C36	µg/L	50	<50	<50
TPH C10 - C36 (Sum of total)	µg/L	50	<50	<50
Polycyclic aromatic hydrocarbons (PAHs)				
Acenaphthene	µg/L	1	<1	<1
Acenaphthylene	µg/L	1	<1	<1
Anthracene	µg/L	1	<1	<1
Benz(a)anthracene	µg/L	1	<1	<1
Benzo(k)fluoranthene	µg/L	1	<1	<1
Benzo(b+j)fluoranthene	µg/L	1	<1	<1
Benzo(g,h,i)perylene	µg/L	1	<1	<1
Benzo(a) pyrene	µg/L	0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	mg/L	0.0005	<0.0005	<0.0005
Chrysene	µg/L	1	<1	<1
Dibenz(a,h)anthracene	µg/L	1	<1	<1
Fluoranthene	µg/L	1	<1	<1
Fluorene	µg/L	1	<1	<1
Indeno(1,2,3-c,d)pyrene	µg/L	1	<1	<1
Phenanthrene	µg/L	1	<1	<1
PAHs (Sum of total)	µg/L	0.5	<0.5	<0.5

Table 4 - Blank samples

ChemName	output unit	EQL		
		Lab Report No.	ES2125020	ES2125020
		Field ID	RINSATE01	RINSATE02
		Sample Date	05-Jul-21	06-Jul-21
		Sample Type	Rinsate	Rinsate
Monocyclic Aromatic Hydrocarbons (MAHs)				
Benzene	µg/L	1	<1	<1
Toluene	µg/L	2	<2	<2
Ethylbenzene	µg/L	2	<2	<2
Xylene (m & p)	µg/L	2	<2	<2
Xylene (o)	µg/L	2	<2	<2
Xylene Total	µg/L	2	<2	<2
Naphthalene	µg/L	1	<1	<1
Total BTEX	µg/L	1	<1	<1
Polychlorinated Biphenyls (PCBs)				
PCBs (Sum of total)	µg/L	1	<1	<1
Organochlorine Pesticides (OCPs)				
4,4-DDE	µg/L	0.5	<0.5	<0.5
a-BHC	µg/L	0.5	<0.5	<0.5
Aldrin	µg/L	0.5	<0.5	<0.5
Aldrin + Dieldrin	µg/L	0.5	<0.5	<0.5
b-BHC	µg/L	0.5	<0.5	<0.5
Chlordane	µg/L	0.5	<0.5	<0.5
Chlordane (cis)	µg/L	0.5	<0.5	<0.5
Chlordane (trans)	µg/L	0.5	<0.5	<0.5
d-BHC	µg/L	0.5	<0.5	<0.5
DDD	µg/L	0.5	<0.5	<0.5
DDT	µg/L	2	<2	<2
DDT+DDE+DDD	µg/L	0.5	<0.5	<0.5
Dieldrin	µg/L	0.5	<0.5	<0.5
Endosulfan I	µg/L	0.5	<0.5	<0.5
Endosulfan II	µg/L	0.5	<0.5	<0.5
Endosulfan sulfate	µg/L	0.5	<0.5	<0.5
Endrin	µg/L	0.5	<0.5	<0.5
Endrin aldehyde	µg/L	0.5	<0.5	<0.5
Endrin ketone	µg/L	0.5	<0.5	<0.5
g-BHC (Lindane)	µg/L	0.5	<0.5	<0.5
Heptachlor	µg/L	0.5	<0.5	<0.5
Heptachlor epoxide	µg/L	0.5	<0.5	<0.5
Methoxychlor	µg/L	2	<2	<2
Organophosphorous Pesticides (OPPs)				
Azinophos methyl	µg/L	0.5	<0.5	<0.5
Bromophos-ethyl	µg/L	0.5	<0.5	<0.5
Carbophenothion	µg/L	0.5	<0.5	<0.5
Chlorfenvinphos	µg/L	0.5	<0.5	<0.5
Chlorpyrifos	µg/L	0.5	<0.5	<0.5
Chlorpyrifos-methyl	µg/L	0.5	<0.5	<0.5
Demeton-S-methyl	µg/L	0.5	<0.5	<0.5

Table 4 - Blank samples

		Lab Report No.	ES2125020	ES2125020
		Field ID	RINSATE01	RINSATE02
		Sample Date	05-Jul-21	06-Jul-21
		Sample Type	Rinsate	Rinsate
ChemName	**output unit**	**EQL**		
Diazinon	µg/L	0.5	<0.5	<0.5
Dichlorvos	µg/L	0.5	<0.5	<0.5
Dimethoate	µg/L	0.5	<0.5	<0.5
Ethion	µg/L	0.5	<0.5	<0.5
Fenamiphos	µg/L	0.5	<0.5	<0.5
Fenthion	µg/L	0.5	<0.5	<0.5
Malathion	µg/L	0.5	<0.5	<0.5
Methyl parathion	µg/L	2	<2	<2
Monocrotophos	µg/L	2	<2	<2
Parathion	µg/L	2	<2	<2
Pirimphos-ethyl	µg/L	0.5	<0.5	<0.5
Prothiofos	µg/L	0.5	<0.5	<0.5
Per- and Poly-fluoroalkyl Substances (PFAS)				
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01
Perfluorooctanesulfonamide (PFOSA)	µg/L	0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.02	<0.02	<0.02
Perfluoro-n-pentanoic acid (PFPeA)	µg/L	0.02	<0.02	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	µg/L	0.02	<0.02	<0.02
Perfluorohexanesulfonic acid (PFHxS)	µg/L	0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	µg/L	0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.02	<0.02	<0.02
Perfluorobutanesulfonic acid (PFBS)	µg/L	0.02	<0.02	<0.02
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.02	<0.02	<0.02
Perfluorotetradecanoic aicd (PFTeDA)	µg/L	0.05	<0.05	<0.05
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.02	<0.02	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	<0.1
N-ethyl perfluorooctane sulfonamido acetic acid	µg/L	0.02	<0.02	<0.02
N-ethyl perfluorooctane sulfonamide	µg/L	0.05	<0.05	<0.05
N-methyl perfluorooctanesulfonamido ethanol	µg/L	0.05	<0.05	<0.05
N-ethyl perfluorooctanesulfonamido ethanol	µg/L	0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	<0.05	<0.05
N-methyl perfluorooctane sulfonamido acetic acid	µg/L	0.02	<0.02	<0.02
Sum (PFHxS + PFOS)	µg/L	0.01	<0.01	<0.01
Sum of PFAS	µg/L	0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	<0.01
(n:2) Fluorotelomer Sulfonic Acids				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.05	<0.05	<0.05
Halogenated Benzenes				
Hexachlorobenzene	µg/L	0.5	<0.5	<0.5

Table 5 - Trip Blank Trip Spikes

		Lab Report No.	ES2125020	ES2125020	ES2125020	ES2125020	ES2125020	ES2125020
		Field ID	TRIP BLANK 18	TRIP BLANK 19	TRIP SPIKE 18	TRIP SPIKE 19	TSC 18	TSC 19
		Sample Date	05-Jul-21	06-Jul-21	05-Jul-21	06-Jul-21	05-Jul-21	06-Jul-21
		Sample Type	Trip_B	Trip_B	Trip_S	Trip_S	TSC	TSC
ChemName	**output unit**	**EQL**						
TRH - NEPM 2013 Fractions								
TRH >C6 - C10	mg/kg	10	<10	<10	-	-	-	-
TRH >C6 - C10 less BTEX (F1)	mg/kg	10	<10	<10	-	-	-	-
TPH - NEPM 1999 Fractions								
TPH C6 - C9	mg/kg	10	<10	<10	-	-	-	-
Monocyclic Aromatic Hydrocarbons (MAHs)								
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	0.5	<0.5	<0.5	11.4	17.9	14.3	17.8
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	2.1	3.3	2.7	3.4
Xylene (m & p)	mg/kg	0.5	<0.5	<0.5	10.6	16.5	12.9	16.6
Xylene (o)	mg/kg	0.5	<0.5	<0.5	4.5	6.9	5.4	7
Xylene Total	mg/kg	0.5	<0.5	<0.5	15.1	23.4	18.3	23.6
Naphthalene	mg/kg	1	<1	<1	<1	<1	<1	<1
Total BTEX	mg/kg	0.2	<0.2	<0.2	28.6	44.6	35.3	44.8

Appendix F. Laboratory reports

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680
Ph: 07 7471 5600 E: gladstone@alsglobal.com

☐MACKAY 78 Harbour Road Mackay QLD 4740
Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850
Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐NEWCASTLE 5/585 Maitland Rd Mayfield West NSW 2304
Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541
Ph: 024423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: ~~Hunter Water Corporation~~ Jacobs
OFFICE: North Sydney
PROJECT:
ORDER NUMBER: 1A410230
PROJECT MANAGER: L. Schneider
CONTACT PH:
SAMPLER: E. Moss / L. Esteban
SAMPLER MOBILE: 0466 636 016
COC emailed to ALS? ([✓ YES] / NO) 07/07/21
EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed): Edward.Moss@Jacobs.com
Email Invoice to (will default to PM if no other addresses are listed):

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☒ ~~Standard TAT (List due date):~~ Refer to email
☐ Non Standard or urgent TAT **(List due date):**
ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No [✓ N/A]
Free ice / frozen ice bricks present upon receipt? [✓ Yes] No N/A
Random Sample Temperature on Receipt: °C
Other comment: 1·3

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
Edward Moss			
DATE/TIME: 06.07.21 / 1705	DATE/TIME: 6/7/21 17:06	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: CoC to be emailed through on 07.07.21

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS									Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	Re-sealable zip lock bags to be frozen													
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

UPDATED COC

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph 02 8784 8555 E samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E townsville.environmental@alsglobal.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph 08 8359 0890 E adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph 08 9209 7655 E samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E launceston@alsenviro.com

CLIENT: Jacobs
OFFICE: North Sydney
PROJECT: IA410230
ORDER NUMBER:
CONSULTANT: Edward Moss / Luis Esteban
CONTACT PH: 0466 636 016
SAMPLER: EM / LE
SAMPLER MOBILE: 0466 636 016
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default): ESDAT
Email Reports to: Luis.esteban@jacobs.com, Edward.moss@jacobs.com, robert.gauthier@jacobs.com
Email ESDAT Files to: As ABOVE
Email Invoice to: AS ABOVE

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT (List due date): 14/07/2021
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC 1 2 3 4 5 6 7
OF 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY: (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
EDWARD MOSS	*ALS Contact*		Helen
DATE/TIME: 06/07/2021 1705	DATE/TIME: 06/07/2021 1706	DATE/TIME:	DATE/TIME: 8.7.21 10.15am

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)		MATRIX				CONTAINER INFORMATION TYPE & PRESERVATIVE *(refer to codes below)*					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).						Additional Information
LAB ID	SAMPLE ID	DATE / TIME	WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE	No OF CONTAINERS	S-16	PFAS (Full Suite)	E.coli and Faecal Coliforms	Ammonia, Nitrates, Nitrites	BTEX	Reactive soluble phosphorus	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SED01	5/07/2021		■			■				2	x	x	x	x		x	
2	SED02	5/07/2021		■			■				3	x	x	x	x		x	
3	SED03_0.1-0.2	6/07/2021		■			■				1	x						
4	SED03_0.2-0.3	6/07/2021		■			■				1		x					
5	SED04_0.2-0.3	6/07/2021		■			■				1	x						
6	SED04_0.4-0.5	6/07/2021		■			■				1	x						
7	SED04_0.4	6/07/2021		■			■				1		x					
8	SED05_0.0-0.3	6/07/2021		■			■				4	x	x	x	x		x	
9	SED06_0.0-0.3	6/07/2021		■			■				3	x	x	x	x		x	
10	SED07_0.0-0.3	6/07/2021		■			■				3	x	x	x	x		x	
11	SED08_0.0-0.2	6/07/2021		■			■				2	x	x					Disregard Microbiological container - no analysis required
12	SED09_0.0-0.25	6/07/2021		■			■				6	x	x	x	x		x	
13	SED10_0.1-0.5	5/07/2021		■			■				2	x		x	x		x	
										TOTAL	27	10	9	7	7	0	7	

FORWARD Lab / Split to
Lab / Analysis: QA02, QA04 - Envirolab
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
WO No:
Attach COC / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES2125020

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2164 Ph 02 8784 8555 E samples.sydney@alsenviro.com
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsenviro.com
☐ **Brisbane:** 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E samples.brisbane@alsenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E townsville.environmental@alsenviro.com
☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsenviro.com
☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095 Ph 08 8359 0890 E adelaide@alsenviro.com
☐ **Perth:** 10 Hod Way, Malaga WA 6090 Ph 08 9209 7655 E samples.perth@alsenviro.com
☐ **Launceston:** 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E launceston@alsenviro.com

CLIENT: Jacobs
OFFICE: North Sydney
PROJECT: IA410230
ORDER NUMBER:
CONSULTANT: Edward Moss / Luis Esteban
CONTACT PH: 0466 636 016
SAMPLER: EM / LE
SAMPLER MOBILE: 0466 636 016
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default): ESDAT
Email Reports to: Luis.esteban@jacobs.com, Edward.moss@jacobs.com, robert.gauthier@jacobs.com
Email ESDAT Files to: As ABOVE
Email Invoice to: AS ABOVE

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT (List due date): 14/07/2021
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC 1 [✓ 2] 3 4 5 6 7
OF 1 [✓ 2] 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
EDWARD MOSS	ALS Contact		Helen
DATE/TIME: 06/07/2021 1705	DATE/TIME: 06/07/2021 1706	DATE/TIME:	DATE/TIME: 8.7.21 1015am

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)						CONTAINER INFORMATION					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).																Additional Information
			MATRIX				TYPE & PRESERVATIVE (refer to codes below)																					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
LAB ID	SAMPLE ID	DATE / TIME	WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE	No OF CONTAINERS	S-16	PFAS (Full Suite)	E.coli and Faecal Coliforms	Ammonia, Nitrates, Nitrites	BTEX	Reactive soluble phosphorus											
14	SED10_0.1	5/07/2021		■			■				1		X															
15	SED11_0.2-0.5	5/07/2021		■			■				1			X														
16	SED11_0.0-0.2	5/07/2021		■			■				2	X	X		X		X											
17	Rinsate01	5/07/2021	■				■				1	X	X															
18	Rinsate02	6/07/2021	■				■				1	X	X															
19	Trip Blank 18	5/07/2021		■			■				1					X												
20	Trip Spike 18	5/07/2021		■			■				1					X												
21	Trip Blank 19	6/07/2021		■			■				1					X												
22	Trip Spike 19	6/07/2021		■			■				1					X												
23	SP01_0.2	6/07/2021		■			■				2	X	X															
24	SP02_0.2	6/07/2021		■			■				2	X	X															
25	SP03_0.1	6/07/2021		■			■				2	X	X															
26	QA01	6/07/2021		■			■				3	X	X	X	X		X											
~~27~~	~~QA02~~	~~6/07/2021~~		■			■				~~2~~	~~X~~	~~X~~															→ Send to Envirolab
27 ~~28~~	QA03	6/07/2021		■			■				1		X															
~~29~~	~~QA04~~	~~6/07/2021~~		■			■				~~1~~		~~X~~															→ Send to Envirolab
										TOTAL	35	8	11	2	2	4	2											

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;

28. TSC-18 - 28/6/21
29. TSC-19 - 28/6/21

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2125020**

Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUIS ESTEBAN	Contact	: Tyler Anderson
Address	: 177 Pacific Highway North Sydney 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: Luis.esteban@jacobs.com	E-mail	: Tyler.Anderson@ALSGlobal.com
Telephone	: ----	Telephone	: +61 2 8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: IA410230	Page	: 1 of 4
Order number	: ----	Quote number	: EM2018SINKNI0011 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 07-Jul-2021 11:56	Issue Date	: 08-Jul-2021
Client Requested Due Date	: 14-Jul-2021	Scheduled Reporting Date	: **14-Jul-2021**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: 1.3'C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 29 / 29

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Forward sample QA02 & QA04 to Envirolab**
- **Micro jar not received for sample 10, SED07_0.0-0.3, analysis is not logged.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method ***Sample ID***	**Sample Container Received**	**Preferred Sample Container for Analysis**
Dissolved Mercury by FIMS : EG035F		
RINSATE01	- Clear Plastic Bottle - Nitric Acid; Unfiltered	- Clear Plastic Bottle - Nitric Acid; Filtered
RINSATE02	- Clear Plastic Bottle - Nitric Acid; Unfiltered	- Clear Plastic Bottle - Nitric Acid; Filtered
Dissolved Metals by ICP-MS - Suite A : EG020A-F		
RINSATE01	- Clear Plastic Bottle - Nitric Acid; Unfiltered	- Clear Plastic Bottle - Nitric Acid; Filtered
RINSATE02	- Clear Plastic Bottle - Nitric Acid; Unfiltered	- Clear Plastic Bottle - Nitric Acid; Filtered

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - EA055-103 Moisture Content	SOIL - EK055 (solids) Ammonia as N	SOIL - EK071G (solids) Reactive Phosphorus as P By Discrete	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - MM804 Thermotolerant Coliforms & E.coli by MPN	SOIL - NT-4S NO2 and NO3	SOIL - S-16 TRH/BTEXN/PAH/OC/OP/PCB/8Metals
ES2125020-001	05-Jul-2021 00:00	SED01	✓	✓	✓	✓	✓	✓	✓
ES2125020-002	05-Jul-2021 00:00	SED02	✓	✓	✓	✓	✓	✓	✓
ES2125020-003	06-Jul-2021 00:00	SED03_0.1-0.2	✓						✓
ES2125020-004	06-Jul-2021 00:00	SED03_0.2-0.3	✓			✓			
ES2125020-005	06-Jul-2021 00:00	SED04_0.2-0.3	✓						✓
ES2125020-006	06-Jul-2021 00:00	SED04_0.4-0.5	✓						✓
ES2125020-007	06-Jul-2021 00:00	SED04_0.4	✓			✓			
ES2125020-008	06-Jul-2021 00:00	SED05_0.0-0.3	✓	✓	✓	✓	✓	✓	✓
ES2125020-009	06-Jul-2021 00:00	SED06_0.0-0.3	✓	✓	✓	✓	✓	✓	✓
ES2125020-010	06-Jul-2021 00:00	SED07_0.0-0.3	✓	✓	✓	✓		✓	✓
ES2125020-011	06-Jul-2021 00:00	SED08_0.0-0.2	✓			✓			✓
ES2125020-012	06-Jul-2021 00:00	SED09_0.0-0.25	✓	✓	✓	✓	✓	✓	✓
ES2125020-013	05-Jul-2021 00:00	SED10_0.1-0.5	✓	✓	✓		✓	✓	✓
ES2125020-014	05-Jul-2021 00:00	SED10_0.1	✓			✓			
ES2125020-015	05-Jul-2021 00:00	SED11_0.2-0.5	✓				✓		
ES2125020-016	05-Jul-2021 00:00	SED11_0.0-0.2	✓	✓	✓	✓		✓	✓
ES2125020-023	06-Jul-2021 00:00	SP01_0.2	✓			✓			✓
ES2125020-024	06-Jul-2021 00:00	SP02_0.2	✓			✓			✓
ES2125020-025	06-Jul-2021 00:00	SP03_0.1	✓			✓			✓
ES2125020-026	06-Jul-2021 00:00	QA01	✓	✓	✓	✓	✓	✓	✓
ES2125020-027	06-Jul-2021 00:00	QA03	✓			✓			

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - EP080 BTEXN	SOIL - S-18 (NO MOIST) TRH(C6-C9)/BTEXN with No Moisture for TBs
ES2125020-019	05-Jul-2021 00:00	TRIP BLANK 18		✓
ES2125020-020	05-Jul-2021 00:00	TRIP SPIKE 18	✓	
ES2125020-021	06-Jul-2021 00:00	TRIP BLANK 19		✓
ES2125020-022	06-Jul-2021 00:00	TRIP SPIKE 19	✓	
ES2125020-028	05-Jul-2021 00:00	TSC 18	✓	
ES2125020-029	06-Jul-2021 00:00	TSC 19	✓	

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - EP231X PFAS - Full Suite (28 analytes)	WATER - W-16 TRH/BTEXN/PAH/OC/OP/PCB/8 Metals
ES2125020-017	05-Jul-2021 00:00	RINSATE01	✓	✓
ES2125020-018	06-Jul-2021 00:00	RINSATE02	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Edward Moss

- *AU Certificate of Analysis - NATA (COA)	Email	edward.moss@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	edward.moss@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	edward.moss@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	edward.moss@jacobs.com
- Chain of Custody (CoC) (COC)	Email	edward.moss@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	edward.moss@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	edward.moss@jacobs.com

ENVIRO COSTING INVOICE

- A4 - AU Tax Invoice (INV)	Email	envirocosting.brisbane@alsglobal.com

LUIS ESTEBAN

- *AU Certificate of Analysis - NATA (COA)	Email	Luis.esteban@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Luis.esteban@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Luis.esteban@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Luis.esteban@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	Luis.esteban@jacobs.com
- Chain of Custody (CoC) (COC)	Email	Luis.esteban@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	Luis.esteban@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	Luis.esteban@jacobs.com

ROBERT GAUTHIER

- *AU Certificate of Analysis - NATA (COA)	Email	robert.gauthier@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	robert.gauthier@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	robert.gauthier@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	robert.gauthier@jacobs.com
- Chain of Custody (CoC) (COC)	Email	robert.gauthier@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	robert.gauthier@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	robert.gauthier@jacobs.com

Sydney Invoices

- A4 - AU Tax Invoice (INV)	Email	Envirocosting.sydney@ALSGlobal.com

CERTIFICATE OF ANALYSIS

Work Order : **ES2125020**
Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : LUIS ESTEBAN
Address : 177 Pacific Highway
North Sydney 2060
Telephone : ----
Project : IA410230
Order number : 2094
C-O-C number : ----
Sampler : ----
Site : ----
Quote number : EN/222
No. of samples received : 29
No. of samples analysed : 29

Page : 1 of 41
Laboratory : Environmental Division Sydney
Contact : Tyler Anderson
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61 2 8784 8555
Date Samples Received : 07-Jul-2021 11:56
Date Analysis Commenced : 08-Jul-2021
Issue Date : 16-Jul-2021 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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- EP075 (SIM): Where reported, 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.
- 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.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- 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.
- EP075(SIM): LOR raised due to the high amount of moisture present.
- EP068: LOR for sample raised due to the high amount of moisture present.
- EP080: The trip spike and its control have been analysed for volatile TPH and BTEXN only. The trip spike and control were prepared in the lab using reagent grade sand spiked with petrol. The spike was dispatched from the lab and the control retained.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

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

			Sample ID	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	**18.7**	----
Moisture Content	----	1.0	%	**22.2**	**33.9**	**27.5**	----	**28.4**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	**9**	<5	----	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	<1
Chromium	7440-47-3	2	mg/kg	**6**	**18**	<2	----	**4**
Copper	7440-50-8	5	mg/kg	<5	<5	<5	----	<5
Lead	7439-92-1	5	mg/kg	<5	**9**	<5	----	<5
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	----	**2**
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	----	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	<0.1
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	<20	<20	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	<0.1	**0.2**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	**0.2**	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	<0.1	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<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	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<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	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<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	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	----	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	**370**
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	**180**
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	**550**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	<50

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	----	**450**
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	**160**
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	**610**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<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	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	----	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----

Analytical Results

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

			Sample ID	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	<2	<2	----	----	----
Escherichia coli	----	2	MPN/g	<2	<2	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**116**	**94.5**	**103**	----	**92.8**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**89.6**	**76.6**	**78.6**	----	**72.4**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**81.8**	**70.2**	**78.5**	----	**74.4**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**91.0**	**88.4**	**89.2**	----	**89.8**
2-Chlorophenol-D4	93951-73-6	0.5	%	**89.0**	**86.9**	**87.6**	----	**88.3**
2.4.6-Tribromophenol	118-79-6	0.5	%	**66.5**	**69.3**	**70.7**	----	**82.3**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**99.3**	**98.0**	**99.2**	----	**99.6**
Anthracene-d10	1719-06-8	0.5	%	**91.6**	**90.0**	**91.7**	----	**92.3**
4-Terphenyl-d14	1718-51-0	0.5	%	**84.6**	**85.6**	**84.1**	----	**84.2**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**78.3**	**74.4**	**83.6**	----	**78.2**
Toluene-D8	2037-26-5	0.2	%	**81.3**	**91.6**	**104**	----	**95.5**
4-Bromofluorobenzene	460-00-4	0.2	%	**82.9**	**82.7**	**90.4**	----	**85.4**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**98.0**	**81.5**	----	**108**	----
13C8-PFOA	----	0.0002	%	**76.0**	**83.0**	----	**76.0**	----

Analytical Results

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

			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	**27.6**	----	----	----
Moisture Content	----	1.0	%	**79.0**	----	**25.8**	**29.4**	**22.1**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**13**	----	<2	<2	<2
Copper	7440-50-8	5	mg/kg	**6**	----	<5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	----	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**13**	----	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	**9**	----	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	<0.1	<0.1	<0.1
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	----	----	<20	<20	<20
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05

Analytical Results

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

			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**1.2**	----	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**2.4**	----	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<60	----	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**1300**	----	**130**	<100	<100
C29 - C36 Fraction	----	100	mg/kg	**810**	----	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**2110**	----	**130**	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	**70**	----	<50	<50	<50

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	**1680**	----	**150**	**120**	<100
>C34 - C40 Fraction	----	100	mg/kg	**860**	----	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**2610**	----	**150**	**120**	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	**70**	----	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	<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	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	----	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	**0.0003**	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	**0.0004**	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	----	**0.0007**	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	**0.0003**	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	**0.0007**	<0.0002	<0.0002	<0.0002
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	----	----	<2	**18**	----
Escherichia coli	----	2	MPN/g	----	----	<2	**18**	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**121**	----	**97.4**	**114**	**124**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**97.0**	----	**86.6**	**98.1**	**105**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**99.8**	----	**77.2**	**90.2**	**93.2**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**88.6**	----	**92.4**	**89.8**	**93.6**
2-Chlorophenol-D4	93951-73-6	0.5	%	**87.2**	----	**90.4**	**87.4**	**91.2**
2.4.6-Tribromophenol	118-79-6	0.5	%	**78.4**	----	**77.8**	**77.7**	**74.9**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**96.5**	----	**99.8**	**97.2**	**102**
Anthracene-d10	1719-06-8	0.5	%	**86.4**	----	**93.2**	**91.9**	**96.0**
4-Terphenyl-d14	1718-51-0	0.5	%	**81.1**	----	**84.5**	**82.7**	**86.4**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**82.0**	----	**78.2**	**82.1**	**83.3**
Toluene-D8	2037-26-5	0.2	%	**78.4**	----	**90.6**	**96.6**	**96.6**
4-Bromofluorobenzene	460-00-4	0.2	%	**86.8**	----	**84.0**	**91.1**	**91.0**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	**89.5**	**95.5**	**106**	**72.0**
13C8-PFOA	----	0.0002	%	----	**76.5**	**79.5**	**78.5**	**81.5**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	**63.2**	**80.4**
Moisture Content	----	1.0	%	**28.9**	**30.8**	**58.4**	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	**19**	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	**3**	**13**	**27**	----	----
Copper	7440-50-8	5	mg/kg	<5	<5	**17**	----	----
Lead	7439-92-1	5	mg/kg	<5	**6**	**13**	----	----
Nickel	7440-02-0	2	mg/kg	<2	<2	**9**	----	----
Zinc	7440-66-6	5	mg/kg	<5	**7**	**6**	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	**0.1**	----	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	----	<20	<20	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	<0.1	<0.1	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	**0.2**	**0.2**	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	**0.2**	**0.2**	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	----	**0.2**	<0.1	----	----
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	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
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	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
^ **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**	**1.0**	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.9**	----	----
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	**120**	**590**	**610**	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	**190**	**620**	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**120**	**780**	**1230**	----	----
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	**250**	<50	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	**160**	**460**	**930**	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	**210**	**620**	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**160**	**920**	**1550**	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	**250**	<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	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	----	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	----	<2	<2	----	<5
Escherichia coli	----	2	MPN/g	----	<2	<2	----	<5
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**116**	**125**	**91.3**	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**93.2**	**98.3**	**80.9**	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**89.0**	**97.8**	**74.2**	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**90.2**	**86.6**	**84.6**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**88.3**	**83.3**	**82.5**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**77.9**	**79.1**	**73.9**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**98.6**	**92.7**	**90.9**	----	----
Anthracene-d10	1719-06-8	0.5	%	**92.4**	**87.8**	**83.2**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**83.3**	**80.3**	**77.4**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**81.1**	**90.4**	**78.6**	----	----
Toluene-D8	2037-26-5	0.2	%	**98.2**	**112**	**75.7**	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**88.3**	**97.4**	**100**	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**91.5**	**102**	----	**104**	----
13C8-PFOA	----	0.0002	%	**80.0**	**78.0**	----	**84.0**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**74.5**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**19**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**28**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**34**	----	----	----	----
Lead	7439-92-1	5	mg/kg	**11**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**29**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**12**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	<20	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	**0.9**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	**0.9**	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/5 0-2	0.05	mg/kg	<0.05	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	----	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	----	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.8	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.8	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.8	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.8	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.8	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.8	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.8	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.8	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.8	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.8	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.8	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.8	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.8	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.8	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.8	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.8	----	----	----	----
^ **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	**1.0**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.9**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	**1120**	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	**960**	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**2080**	----	----	----	----
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	**280**	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	**1460**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C34 - C40 Fraction	----	100	mg/kg	**930**	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**2670**	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	**280**	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	**11.4**	<0.5	**17.9**
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	**2.1**	<0.5	**3.3**
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	**10.6**	<0.5	**16.5**
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	**4.5**	<0.5	**6.9**
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	**28.6**	<0.2	**44.6**
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	**15.1**	<0.5	**23.4**
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0008**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0025**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----

Analytical Results

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

			Sample ID	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	**0.0033**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0033**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0033**	----	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**103**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**87.8**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**79.9**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**86.9**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**86.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**80.4**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**95.2**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	**85.3**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**80.9**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**90.4**	**108**	**103**	**107**	**105**
Toluene-D8	2037-26-5	0.2	%	**87.9**	**112**	**117**	**110**	**117**
4-Bromofluorobenzene	460-00-4	0.2	%	**107**	**105**	**106**	**102**	**107**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**77.5**	----	----	----	----
13C8-PFOA	----	0.0002	%	**80.0**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	----	**21.5**
Moisture Content	----	1.0	%	**23.8**	**20.5**	**21.2**	**36.5**	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**6**	<5	<5	**8**	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	**5**	**4**	**10**	**16**	----
Copper	7440-50-8	5	mg/kg	<5	<5	**5**	<5	----
Lead	7439-92-1	5	mg/kg	<5	**6**	**6**	**7**	----
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	----
Zinc	7440-66-6	5	mg/kg	**9**	<5	<5	**13**	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	----	----	----	<20	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	----	----	<0.1	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	----	----	<0.1	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	----	<0.1	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	----	----	----	**0.1**	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<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	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

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

			Sample ID	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<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	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<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	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	**280**	<100	**190**	**290**	----
C29 - C36 Fraction	----	100	mg/kg	<100	**100**	<100	**200**	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**280**	**100**	**190**	**490**	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	**150**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	**320**	**100**	**230**	**260**	----
>C34 - C40 Fraction	----	100	mg/kg	<100	**130**	<100	**260**	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**320**	**230**	**230**	**670**	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	**150**	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<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	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	----	----	----	<2	----
Escherichia coli	----	2	MPN/g	----	----	----	<2	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**112**	**122**	**125**	**130**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**93.1**	**91.6**	**96.6**	**96.1**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**84.6**	**78.9**	**80.2**	**84.3**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**91.2**	**91.7**	**92.7**	**86.0**	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**89.4**	**90.5**	**91.2**	**81.9**	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**81.2**	**78.6**	**80.0**	**78.6**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**98.2**	**99.4**	**102**	**94.2**	----
Anthracene-d10	1719-06-8	0.5	%	**91.8**	**92.7**	**95.4**	**88.6**	----
4-Terphenyl-d14	1718-51-0	0.5	%	**83.7**	**84.4**	**86.5**	**80.8**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**89.5**	**78.0**	**84.7**	**85.0**	----
Toluene-D8	2037-26-5	0.2	%	**110**	**91.8**	**105**	**96.4**	----
4-Bromofluorobenzene	460-00-4	0.2	%	**97.2**	**80.2**	**96.6**	**85.6**	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**96.0**	**98.0**	**98.5**	**83.5**	**94.0**
13C8-PFOA	----	0.0002	%	**76.0**	**73.5**	**75.5**	**80.5**	**77.0**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**TSC 18**	**TSC 19**	----	----	----
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-028**	**ES2125020-029**	--------	--------	--------
				Result	Result	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	**14.3**	**17.8**	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	**2.7**	**3.4**	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	**12.9**	**16.6**	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	**5.4**	**7.0**	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	**35.3**	**44.8**	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg	**18.3**	**23.6**	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**103**	**98.6**	----	----	----
Toluene-D8	2037-26-5	0.2	%	**119**	**115**	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**109**	**106**	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE01**	**RINSATE02**	----	----	----
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-017**	**ES2125020-018**	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
^ **Total Polychlorinated biphenyls**	----	1	µg/L	<1	<1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	----	----	----
^ **Total Chlordane (sum)**	----	0.5	µg/L	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE01**	**RINSATE02**	----	----	----
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-017**	**ES2125020-018**	--------	--------	--------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L	<0.5	<0.5	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE01**	**RINSATE02**	----	----	----
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-017**	**ES2125020-018**	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L	<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE01**	**RINSATE02**	----	----	----
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-017**	**ES2125020-018**	--------	--------	--------
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**RINSATE01**	**RINSATE02**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-017**	**ES2125020-018**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	1	%	**79.0**	**75.3**	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**75.2**	**63.8**	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**68.2**	**63.3**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	**27.8**	**22.8**	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	**51.5**	**42.4**	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	**52.5**	**38.8**	----	----	----
EP075(SIM)T: PAH Surrogates								

Analytical Results

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

			Sample ID	**RINSATE01**	**RINSATE02**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-017**	**ES2125020-018**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	1.0	%	**62.9**	**53.5**	**----**	**----**	**----**
Anthracene-d10	1719-06-8	1.0	%	**68.1**	**74.1**	**----**	**----**	**----**
4-Terphenyl-d14	1718-51-0	1.0	%	**69.2**	**60.7**	**----**	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**124**	**126**	**----**	**----**	**----**
Toluene-D8	2037-26-5	2	%	**109**	**111**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%	**118**	**117**	**----**	**----**	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**102**	**104**	**----**	**----**	**----**
13C8-PFOA	----	0.02	%	**96.9**	**98.1**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	*CAS Number*	*Recovery Limits (%)* Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	45	134
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	67	111
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	67	111
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

UPDATED COC

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph. 02 8784 8555 E samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph 08 8359 0890 E adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph 08 9209 7655 E samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E launceston@alsenviro.com

CLIENT: Jacobs
OFFICE: North Sydney
PROJECT: IA410230
ORDER NUMBER:
CONSULTANT: Edward Moss / Luis Esteban
CONTACT PH: 0466 636 016
SAMPLER: EM / LE
SAMPLER MOBILE: 0466 636 016
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default): ESDAT
Email Reports to: Luis.esteban@jacobs.com, Edward.moss@jacobs.com, robert.gauthier@jacobs.com
Email ESDAT Files to: As ABOVE
Email Invoice to: AS ABOVE

TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☐ Standard TAT (List due date): 14/07/2021
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC [✓ 1] 2 3 4 5 6 7
OF 1 [✓ 2] 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
EDWARD MOSS	*ALS Contact*		Helen
DATE/TIME: 06/07/2021 1705	DATE/TIME: 06/07/2021 1706	DATE/TIME:	DATE/TIME: 8.7.21 10.15am

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)						CONTAINER INFORMATION					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).						Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX				TYPE & PRESERVATIVE (refer to codes below)				No OF CONTAINERS							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
			WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE		S-16	PFAS (Full Suite)	E.coli and Faecal Coliforms	Ammonia, Nitrates, Nitrites	BTEX	Reactive soluble phosphorus	
1	SED01	5/07/2021		[redacted]			[redacted]				3	X	X	X	X		X	
2	SED02	5/07/2021		[redacted]			[redacted]				3	X	X	X	X		X	
3	SED03_0.1-0.2	6/07/2021		[redacted]			[redacted]				1	X						
4	SED03_0.2-0.3	6/07/2021		[redacted]			[redacted]				1		X					
5	SED04_0.2-0.3	6/07/2021		[redacted]			[redacted]				1	X						
6	SED04_0.4-0.5	6/07/2021		[redacted]			[redacted]				1	X						
7	SED04_0.4	6/07/2021		[redacted]			[redacted]				1		X					
8	SED05_0.0-0.3	6/07/2021		[redacted]			[redacted]				3	X	X	X	X		X	
9	SED06_0.0-0.3	6/07/2021		[redacted]			[redacted]				3	X	X	X	X		X	
10	SED07_0.0-0.3	6/07/2021		[redacted]			[redacted]				3	X	X	X	X		X	
11	SED08_0.0-0.2	6/07/2021		[redacted]			[redacted]				2	X	X					Disregard Microbiological container - no analysis required
12	SED09_0.0-0.25	6/07/2021		[redacted]			[redacted]				3	X	X	X	X		X	
13	SED10_0.1-0.5	5/07/2021		[redacted]			[redacted]				2	X		X	X		X	
										TOTAL	27	10	9	7	7	0	7	

FORWARD
Analysis: QA02, QA04- Envirolab
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
PO No:
Attach COC / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES2125020

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

#277787

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney 277 Woodpark Rd, Smithfield NSW 2176 Ph 02 8784 8555 E samples.sydney@alsenviro.com
☐ Newcastle 5 Rosegum Rd, Warabrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsenviro.com
☐ Brisbane 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E samples.brisbane@alsenviro.com
☐ Townsville 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E townsville.environmental@alsenviro.com
☐ Melbourne 2-4 Westall Rd, Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsenviro.com
☐ Adelaide 2-1 Burma Rd, Pooraka SA 5095 Ph 08 8359 0890 E adelaide@alsenviro.com
☐ Perth 10 Hod Way, Malaga WA 6090 Ph 08 9209 7655 E samples.perth@alsenviro.com
☐ Launceston 27 Wellington St, Launceston TAS 7250 Ph 03 6331 2158 E launceston@alsenviro.com

CLIENT: Jacobs
OFFICE: North Sydney
PROJECT: IA410230
ORDER NUMBER:
CONSULTANT: Edward Moss / Luis Esteban
CONTACT PH: 0466 636 016
SAMPLER: EM / LE
SAMPLER MOBILE: 0466 636 016
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default): ESDAT
Email Reports to: Luis.esteban@jacobs.com, Edward.moss@jacobs.com, robert.gaulhier@jacobs.com
Email ESDAT Files to: As ABOVE
Email Invoice to: AS ABOVE

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT (List due date): 14/07/2021
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC 1 [✓ 2] 3 4 5 6 7
OF 1 [✓ 2] 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
EDWARD MOSS	*ALS Contact*		Helen
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME:
06/07/2021 1705	06/07/2021 1706		8.7.21 10.15am

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)		MATRIX				CONTAINER INFORMATION TYPE & PRESERVATIVE *(refer to codes below)*					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).																Additional Information
LAB ID	SAMPLE ID	DATE / TIME	WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE	No OF CONTAINERS	S-16	PFAS (Full Suite)	E.coli and Faecal Coliforms	Ammonia, Nitrates, Nitrites	BTEX	Reactive soluble phosphorus											Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
14	SED10_0.1	5/07/2021		■			■				1		X															
15	SED11_0.2-0.5	5/07/2021		■			■				1			X														
16	SED11_0.0-0.2	5/07/2021		■			■				2	X	X		X		X											
17	Rinsate01	5/07/2021	■				■				7	X	X															
18	Rinsate02	6/07/2021	■				■				7	X	X															
19	Trip Blank 18	5/07/2021		■			■				1					X												
20	Trip Spike 18	5/07/2021		■			■				1					X												
21	Trip Blank 19	6/07/2021		■			■				1					X												
22	Trip Spike 19	6/07/2021		■			■				1					X												
23	SP01_0.2	6/07/2021		■			■				2	X	X															
24	SP02_0.2	6/07/2021		■			■				2	X	X															
25	SP03_0.1	6/07/2021		■			■				2	X	X															
26	QA01	6/07/2021		■			■				3	X	X	X	X		X											
1 ~~27~~	~~QA02~~	~~6/07/2021~~		■			■				~~2~~	~~X~~	~~X~~															Send to Envirolab
27 ~~28~~	QA03	6/07/2021		■			■				1		X															
2 ~~29~~	~~QA04~~	~~6/07/2021~~		■			■				~~1~~		~~X~~															Send to Envirolab
										TOTAL	35	8	11	2	2	4	2											

Envirolab Services
ENVIROLAB GROUP
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 273787
Date Received: 09/07/21
Time Received: 1520
Received By: CH
Temp: [✓ Cool]/Ambient
Cooling: [✓ Ice]/Icepack
Security: Intact/Broken/[✓ None]

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;

28. TSC-18 - 28/6/21

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 273787

Client Details

Client	Jacobs Group (Australia) Pty Ltd
Attention	Luis Esteban, Edward Moss
Address	Level 7, 177 Pacific Highway, North Sydney, NSW, 2060

Sample Details

Your Reference	**IA410230**
Number of Samples	2 Soil
Date samples received	09/07/2021
Date completed instructions received	09/07/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	14/07/2021
Date of Issue	14/07/2021

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Josh Williams, LC Supervisor
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil

Our Reference		273787-1
Your Reference	UNITS	QA02
Date Sampled		06/07/2021
Type of sample		Soil
Date extracted	-	12/07/2021
Date analysed	-	12/07/2021
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	111

svTRH (C10-C40) in Soil		
Our Reference		273787-1
Your Reference	UNITS	QA02
Date Sampled		06/07/2021
Type of sample		Soil
Date extracted	-	12/07/2021
Date analysed	-	14/07/2021
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	74

PAHs in Soil		
Our Reference		273787-1
Your Reference	UNITS	QA02
Date Sampled		06/07/2021
Type of sample		Soil
Date extracted	-	12/07/2021
Date analysed	-	13/07/2021
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	111

Organochlorine Pesticides in soil		
Our Reference		273787-1
Your Reference	UNITS	QA02
Date Sampled		06/07/2021
Type of sample		Soil
Date extracted	-	12/07/2021
Date analysed	-	13/07/2021
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	111

Organophosphorus Pesticides in Soil		
Our Reference	UNITS	273787-1
Your Reference		QA02
Date Sampled		06/07/2021
Type of sample		Soil
Date extracted	-	12/07/2021
Date analysed	-	13/07/2021
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Surrogate TCMX	%	111

PCBs in Soil		
Our Reference		273787-1
Your Reference	UNITS	QA02
Date Sampled		06/07/2021
Type of sample		Soil
Date extracted	-	12/07/2021
Date analysed	-	13/07/2021
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	111

Acid Extractable metals in soil		
Our Reference		273787-1
Your Reference	UNITS	QA02
Date Sampled		06/07/2021
Type of sample		Soil
Date prepared	-	12/07/2021
Date analysed	-	12/07/2021
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	2
Copper	mg/kg	<1
Lead	mg/kg	<1
Mercury	mg/kg	<0.1
Nickel	mg/kg	<1
Zinc	mg/kg	2

Moisture			
Our Reference		273787-1	273787-2
Your Reference	UNITS	QA02	QA04
Date Sampled		06/07/2021	06/07/2021
Type of sample		Soil	Soil
Date prepared	-	12/07/2021	12/07/2021
Date analysed	-	13/07/2021	13/07/2021
Moisture	%	21	22

PFAS in Soils Extended			
Our Reference		273787-1	273787-2
Your Reference	UNITS	QA02	QA04
Date Sampled		06/07/2021	06/07/2021
Type of sample		Soil	Soil
Date prepared	-	12/07/2021	12/07/2021
Date analysed	-	12/07/2021	12/07/2021
Perfluorobutanesulfonic acid	µg/kg	<0.1	<0.1
Perfluoropentanesulfonic acid	µg/kg	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	µg/kg	<0.1	<0.1
Perfluoroheptanesulfonic acid	µg/kg	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	µg/kg	<0.1	<0.1
Perfluorodecanesulfonic acid	µg/kg	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	<0.2	<0.2
Perfluoropentanoic acid	µg/kg	<0.2	<0.2
Perfluorohexanoic acid	µg/kg	<0.1	<0.1
Perfluoroheptanoic acid	µg/kg	<0.1	<0.1
Perfluorooctanoic acid PFOA	µg/kg	<0.1	<0.1
Perfluorononanoic acid	µg/kg	<0.1	<0.1
Perfluorodecanoic acid	µg/kg	<0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1
6:2 FTS	µg/kg	<0.1	<0.1
8:2 FTS	µg/kg	<0.2	<0.2
10:2 FTS	µg/kg	<0.2	<0.2
Perfluorooctane sulfonamide	µg/kg	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1
N-Ethyl perfluorooctanesulfon amide	µg/kg	<1	<1
N-Me perfluorooctanesulfonamid oethanol	µg/kg	<1	<1
N-Et perfluorooctanesulfonamid oethanol	µg/kg	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2
EtPerfluorooctanesulf amid oacetic acid	µg/kg	<0.2	<0.2
Surrogate $^{13}C_8$ *PFOS*	%	93	102
Surrogate $^{13}C_2$ *PFOA*	%	88	86
Extracted ISTD $^{13}C_3$ *PFBS*	%	94	98
Extracted ISTD $^{18}O_2$ *PFHxS*	%	87	85
Extracted ISTD $^{13}C_4$ *PFOS*	%	91	86
Extracted ISTD $^{13}C_4$ *PFBA*	%	93	92

PFAS in Soils Extended			
Our Reference		273787-1	273787-2
Your Reference	UNITS	QA02	QA04
Date Sampled		06/07/2021	06/07/2021
Type of sample		Soil	Soil
Extracted ISTD $^{13}C_3$ *PFPeA*	%	104	108
Extracted ISTD $^{13}C_2$ *PFHxA*	%	98	100
Extracted ISTD $^{13}C_4$ *PFHpA*	%	109	108
Extracted ISTD $^{13}C_4$ *PFOA*	%	99	102
Extracted ISTD $^{13}C_5$ *PFNA*	%	93	93
Extracted ISTD $^{13}C_2$ *PFDA*	%	83	89
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	83	84
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	92	98
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	104	96
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	116	115
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	94	111
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	80	97
Extracted ISTD $^{13}C_8$ *FOSA*	%	86	77
Extracted ISTD d_3 *N MeFOSA*	%	102	97
Extracted ISTD d_5 *N EtFOSA*	%	99	97
Extracted ISTD d_7 *N MeFOSE*	%	112	111
Extracted ISTD d_9 *N EtFOSE*	%	110	108
Extracted ISTD d_3 *N MeFOSAA*	%	94	95
Extracted ISTD d_5 *N EtFOSAA*	%	71	79
Total Positive PFHxS & PFOS	µg/kg	<0.1	<0.1
Total Positive PFOS & PFOA	µg/kg	<0.1	<0.1
Total Positive PFAS	µg/kg	<0.1	<0.1

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Date analysed	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	108	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	[NT]	[NT]	[NT]	[NT]	118	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	113	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	103	[NT]
o-Xylene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
naphthalene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	112	[NT]

Client Reference: IA410230

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	[NT]
Date extracted	-			13/07/2021	[NT]	[NT]	[NT]	[NT]	13/07/2021	[NT]
Date analysed	-			14/07/2021	[NT]	[NT]	[NT]	[NT]	14/07/2021	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	68	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	71	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	68	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	77	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	71	[NT]
Surrogate o-Terphenyl	%		Org-020	89	[NT]	[NT]	[NT]	[NT]	81	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Date analysed	-			13/07/2021	[NT]	[NT]	[NT]	[NT]	13/07/2021	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	70	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	93	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	107	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Date analysed	-			13/07/2021	[NT]	[NT]	[NT]	[NT]	13/07/2021	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	130	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	109	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Date analysed	-			13/07/2021	[NT]	[NT]	[NT]	[NT]	13/07/2021	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	126	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	76	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	117	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	109	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Date analysed	-			13/07/2021	[NT]	[NT]	[NT]	[NT]	13/07/2021	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-021	109	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Date analysed	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	92	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	91	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]

QUALITY CONTROL: PFAS in Soils Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Date analysed	-			12/07/2021	[NT]	[NT]	[NT]	[NT]	12/07/2021	[NT]
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	92	[NT]
Perfluorobutanoic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	98	[NT]
Perfluoropentanoic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	90	[NT]
Perfluorohexanoic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Perfluoroheptanoic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Perfluorononanoic acid	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Perfluorodecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	94	[NT]
Perfluoroundecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Perfluorododecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluorotridecanoic acid	µg/kg	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	111	[NT]
Perfluorotetradecanoic acid	µg/kg	5	Org-029	<5	[NT]	[NT]	[NT]	[NT]	105	[NT]
4:2 FTS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]
6:2 FTS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
8:2 FTS	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	98	[NT]
10:2 FTS	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	91	[NT]
Perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
N-Ethyl perfluorooctanesulfon amide	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
N-Me perfluorooctanesulfonamid oethanol	µg/kg	1	Org-029	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
N-Et perfluorooctanesulfonamid oethanol	µg/kg	5	Org-029	<5	[NT]	[NT]	[NT]	[NT]	100	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	89	[NT]
EtPerfluorooctanesulf amid oacetic acid	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	104	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	90	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	86	[NT]	[NT]	[NT]	[NT]	88	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	103	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	109	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	105	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	109	[NT]	[NT]	[NT]	[NT]	116	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	108	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	115	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	107	[NT]	[NT]	[NT]	[NT]	114	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	106	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	108	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	106	[NT]	[NT]	[NT]	[NT]	115	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	125	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	111	[NT]	[NT]	[NT]	[NT]	125	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	122	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	104	[NT]	[NT]	[NT]	[NT]	115	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	104	[NT]	[NT]	[NT]	[NT]	120	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	109	[NT]	[NT]	[NT]	[NT]	111	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	108	[NT]	[NT]	[NT]	[NT]	115	[NT]
Extracted ISTD d_5 *N EtFOSA*	%		Org-029	106	[NT]	[NT]	[NT]	[NT]	113	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	121	[NT]	[NT]	[NT]	[NT]	134	[NT]

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QUALITY CONTROL: PFAS in Soils Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD d₉ *N EtFOSE*	%		Org-029	118	[NT]	[NT]	[NT]	[NT]	129	[NT]
Extracted ISTD d₃ *N MeFOSAA*	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	115	[NT]
Extracted ISTD d₅ *N EtFOSAA*	%		Org-029	93	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

CHAIN OF CUSTODY

ALS Laboratory: *please tick →*

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Brisbane:** 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ **Perth:** 10 Hod Way, Malaga WA 60
Ph: 08 9209 7655 E: samples.perth@
☐ **Launceston:** 27 Wellington St, Lau
Ph: 03 6331 2158 E: launceston@als

Environmental Division
Brisbane
Work Order Reference
EB2119102

Telephone : +61-7-3243 7222

CLIENT: Jacobs
OFFICE: North Sydney
PROJECT: IA410230
ORDER NUMBER:
CONSULTANT: Edward Moss / Luis Esteban
CONTACT PH: 0466 636 016
SAMPLER: EM / LE
SAMPLER MOBILE: 0466 636 016
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default): ESDAT
Email Reports to: Luis.esteban@jacobs.com, Edward.moss@jacobs.com, robert.gauthier@jacobs.com
Email ESDAT Files to: As ABOVE
Email Invoice to: AS ABOVE

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)
☐ Standard TAT (List due date):
☐ Non Standard or urgent TAT (List due date): 08/07/2021

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC: [✓ 1] 2 3 4 5 6 7
OF: [✓ 1] 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Ci
Custody Seal Intact?
Free ice / frozen ice bricks present upon receipt?
Random Sample Temperature on Receipt:
Other comment:

RELINQUISHED BY: EDWARD MOSS
DATE/TIME:
06/07/2021 1705

RECEIVED BY:
ALS Contact
DATE/TIME:
06/07/2021 1706

RELINQUISHED BY:
DATE/TIME:

IVED BY:
TIME: 8/7/21

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: All samples to be kept in freezer

	SAMPLE DETAILS MATRIX: Solid(S) Water(W)						CONTAINER INFORMATION					ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).																Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX				TYPE & PRESERVATIVE (refer to codes below)				No OF CONTAINERS	pH / pHox for Acid Sulfate Soils	HOLD	S-26 + EP074A (TPH/TRH, MAH, PAH, Metals)	pH (cacl2)	CEC & pH (cacl2)	W-26 (TPH/TRH, MAH, PAH, Metals) (WATER)	W-18 (TRH C6-C10/BTEX) (WATER)	EA200N (Asbestos)									Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
			WATER	SOIL	AIR	SLUDGE	ICE	ACID	OTHER	NONE																		
1	SED01	5/07/2021		■			■				2	■																Analyse for pH/pHox on an urgent 24 hr TAT (1 zip lock bag per sample location). Please keep remaining spare zip-lock bag samples on hold (frozen) until results are received by Jacobs. Upon receipt of the results, samples will be selected and analysed for Scr.
2	SED02	5/07/2021		■			■				2	■																
3	SED03_0.3-0.5	6/07/2021		■			■				2	■																
4	SED04_0.3-0.4	6/07/2021		■			■				2	■																
5	SED04_0.5-0.6	6/07/2021		■			■				2	■																
6	SED05_0.0-0.3	6/07/2021		■			■				2	■																
7	SED06_0.0-0.3	6/07/2021		■			■				2	■																
8	SED07_0.0-0.3	6/07/2021		■			■				2	■																
9	SED08_0.0-0.2	6/07/2021		■			■				2	■																
10	SED09_0.25-0.4	6/07/2021		■			■				2	■																
11	SED10_0.1-0.5	5/07/2021		■			■				2	■																
12	SED11_0.2-0.4	5/07/2021		■			■				2	■																
13	QA01	6/07/2021		■			■				1		x															Hold until pH/pHox results are received
14	QA02	6/07/2021		■			■				1		x															Hold until pH/pHox results are received
										TOTAL	26	12	14 (HOLD)															

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB2119102**

Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : LUIS ESTEBAN
Address : 177 Pacific Highway
North Sydney 2060

E-mail : Luis.esteban@jacobs.com
Telephone : ----
Facsimile : ----

Project : IA410230
Order number : ----
C-O-C number : ----
Site : ----
Sampler : Edward Moss, Luis Esteban

Laboratory : Environmental Division Brisbane
Contact : Tyler Anderson
Address : 2 Byth Street Stafford QLD Australia 4053

E-mail : Tyler.Anderson@ALSGlobal.com
Telephone : +61 2 8784 8555
Facsimile : +61-7-3243 7218

Page : 1 of 3
Quote number : EB2020SINKNI0007 (BNBQ/005/20)
QC Level : NEPM 2013 B3 & ALS QC Standard

Dates

Date Samples Received : 08-Jul-2021 12:36
Client Requested Due Date : 09-Jul-2021
Issue Date : 08-Jul-2021
Scheduled Reporting Date : **12-Jul-2021**

Delivery Details

Mode of Delivery : Carrier
No. of coolers/boxes : 1
Receipt Detail : MEDIUM ESKY
Security Seal : Intact.
Temperature : 0.4°C - Ice present
No. of samples received / analysed : 14 / 12

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **The laboratory acknowledges your requested reporting date of 24 hours, however due to the analytical request and associated procedures involved the requested due date will not be possible. Please note the best practical due date has been assigned.**
- **A 20% surcharge applies for results returned within 2 days.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	(On Hold) SOIL No analysis requested	SOIL - EA003 pH field/fox
EB2119102-001	05-Jul-2021 00:00	SED01		✓
EB2119102-002	05-Jul-2021 00:00	SED02		✓
EB2119102-003	06-Jul-2021 00:00	SED03_0.3-0.5		✓
EB2119102-004	06-Jul-2021 00:00	SED04_0.3-0.4		✓
EB2119102-005	06-Jul-2021 00:00	SED04_0.5-0.6		✓
EB2119102-006	06-Jul-2021 00:00	SED_05_0.0-0.3		✓
EB2119102-007	06-Jul-2021 00:00	SED06_0.0-0.3		✓
EB2119102-008	06-Jul-2021 00:00	SED07_0.0-0.3		✓
EB2119102-009	06-Jul-2021 00:00	SED08_0.0-0.2		✓
EB2119102-010	06-Jul-2021 00:00	SED09_0.25-0.4		✓
EB2119102-011	05-Jul-2021 00:00	SED10_0.1-0.5		✓
EB2119102-012	05-Jul-2021 00:00	SED11_0.2-0.4		✓
EB2119102-013	06-Jul-2021 00:00	QA01	✓	
EB2119102-014	06-Jul-2021 00:00	QA02	✓	

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Edward Moss		
- *AU Certificate of Analysis - NATA (COA)	Email	edward.moss@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	edward.moss@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	edward.moss@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	edward.moss@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	edward.moss@jacobs.com
- Chain of Custody (CoC) (COC)	Email	edward.moss@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	edward.moss@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	edward.moss@jacobs.com
ENVIRO COSTING INVOICE		
- A4 - AU Tax Invoice (INV)	Email	envirocosting.brisbane@alsglobal.com
LUIS ESTEBAN		
- *AU Certificate of Analysis - NATA (COA)	Email	Luis.esteban@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Luis.esteban@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Luis.esteban@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Luis.esteban@jacobs.com
- Chain of Custody (CoC) (COC)	Email	Luis.esteban@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	Luis.esteban@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	Luis.esteban@jacobs.com
Robert Gauthier		
- *AU Certificate of Analysis - NATA (COA)	Email	robert.gauthier@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	robert.gauthier@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	robert.gauthier@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	robert.gauthier@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	robert.gauthier@jacobs.com
- Chain of Custody (CoC) (COC)	Email	robert.gauthier@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	robert.gauthier@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	robert.gauthier@jacobs.com

CERTIFICATE OF ANALYSIS

Work Order : **EB2119102**
Client : **JACOBS GROUP (AUSTRALIA) PTY LTD**
Contact : LUIS ESTEBAN
Address : 177 Pacific Highway
North Sydney 2060
Telephone : ----
Project : IA410230
Order number : ----
C-O-C number : ----
Sampler : Edward Moss, Luis Esteban
Site : ----
Quote number : BNBQ/005/20
No. of samples received : 14
No. of samples analysed : 12

Page : 1 of 5
Laboratory : Environmental Division Brisbane
Contact : Tyler Anderson
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61 2 8784 8555
Date Samples Received : 08-Jul-2021 12:36
Date Analysis Commenced : 12-Jul-2021
Issue Date : 12-Jul-2021 15:53

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*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

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.

- ASS: EA003 (NATA Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**SED01**	**SED02**	**SED03_0.3-0.5**	**SED04_0.3-0.4**	**SED04_0.5-0.6**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**EB2119102-001**	**EB2119102-002**	**EB2119102-003**	**EB2119102-004**	**EB2119102-005**
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**5.1**	**5.8**	**5.4**	**5.8**	**5.4**
pH (Fox)	----	0.1	pH Unit	**2.4**	**3.3**	**2.4**	**3.1**	**2.2**
Reaction Rate	----	1	Reaction Unit	**2**	**4**	**2**	**4**	**2**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**	**SED08_0.0-0.2**	**SED09_0.25-0.4**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**EB2119102-006**	**EB2119102-007**	**EB2119102-008**	**EB2119102-009**	**EB2119102-010**
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**4.7**	**4.7**	**5.5**	**5.5**	**6.0**
pH (Fox)	----	0.1	pH Unit	**1.8**	**2.2**	**1.8**	**2.6**	**2.9**
Reaction Rate	----	1	Reaction Unit	**3**	**3**	**3**	**2**	**4**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**SED10_0.1-0.5**	**SED11_0.2-0.4**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**EB2119102-011**	**EB2119102-012**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**5.3**	**4.0**	**----**	**----**	**----**
pH (Fox)	----	0.1	pH Unit	**1.6**	**1.7**	**----**	**----**	**----**
Reaction Rate	----	1	Reaction Unit	**4**	**4**	**----**	**----**	**----**

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB2119102**	Page	: 1 of 3
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: LUIS ESTEBAN	Contact	: Tyler Anderson
Address	: 177 Pacific Highway North Sydney 2060	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: IA410230	Date Samples Received	: 08-Jul-2021
Order number	: ----	Date Analysis Commenced	: 12-Jul-2021
C-O-C number	: ----	Issue Date	: 12-Jul-2021
Sampler	: Edward Moss, Luis Esteban		
Site	: ----		
Quote number	: BNBQ/005/20		
No. of samples received	: 14		
No. of samples analysed	: 12		

ilac-MRA NATA

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

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*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

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

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	***Sample ID***	***Method: Compound***	***CAS Number***	***LOR***	***Unit***	***Original Result***	***Duplicate Result***	***RPD (%)***	***Acceptable RPD (%)***
EA003 :pH (field/fox) (QC Lot: 3783774)									
EB2118738-005	Anonymous	EA003: pH (F)	----	0.1	pH Unit	4.4	4.6	2.7	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	2.9	2.8	0.0	0% - 20%
EB2119102-010	SED09_0.25-0.4	EA003: pH (F)	----	0.1	pH Unit	6.0	6.1	2.2	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	2.9	2.8	0.0	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

- **No Method Blank (MB) or Laboratory Control Spike (LCS) Results are required to be reported.**

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176
Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304
Ph:02 4968 9433 E:samples.newcastle@alsenviro.com

_ **Brisbane:** 32 Shand St, Stafford QLD 4053
Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818
Ph:07 4796 0600 E: townsville.environmental@alsenviro.com

☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171
Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095
Ph: 08 8359 0890 E:adelaide@alsenviro.com

☐ **Perth:** 10 Hod Way, Malaga WA 6090
Ph. 08 9209 7655 E: samples.perth@alsenviro.com
☐ **Launceston:** 27 Wellington St, Launceston TAS 7250
Ph: 03 6331 2158 E: launceston@alsenviro.com

Environmental Division
Brisbane
Work Order Reference
EB2119483

Telephone : +61-7-3243 7222

CLIENT: Jacobs
OFFICE: North Sydney
PROJECT: IA410230
ORDER NUMBER:
CONSULTANT: Edward Moss / Luis Esteban
CONTACT PH: 0466 636 016
SAMPLER: EM / LE
SAMPLER MOBILE: 0466 636 016
COC emailed to ALS? (YES / NO)
EDD FORMAT (or default): ESDAT
Email Reports to: Luis.esteban@jacobs.com, Edward.moss@jacobs.com, robert.gauthier@jacobs.com
Email ESDAT Files to: As ABOVE
Email Invoice to: AS ABOVE

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
☐ Standard TAT **(List due date):**
☐ Non Standard or urgent TAT **(List due date):** 16/07/2021

ALS QUOTE NO.:

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact?
Free ice / frozen ice bricks present upon receipt?
Random Sample Temperature on Receipt:
Other comment:

RELINQUISHED BY: EDWARD MOSS
DATE/TIME:
12/07/2021 1700 (via email)

RECEIVED BY:
ALS Contact
DATE/TIME:

RELINQUISHED BY:
DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: All samples to be kept in freezer

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)		CONTAINER INFORMATION									ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX: WATER	SOIL	AIR	SLUDGE	TYPE & PRESERVATIVE (refer to codes below): ICE	ACID	OTHER	NONE	No OF CONTAINERS	pH / pHox for Acid Sulfate Soils	Chromium Reducible Sulfur (full suite)	S-26 + EP074A (TPH/TRH, MAH, PAH, Metals)	pH (cacl2)	CEC & pH (cacl2)	W-26 (TPH/TRH, MAH, PAH, Metals) (WATER)	W-18 (TRH C6-C10/BTEX) (WATER)	EA200N (Asbestos)	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SED01	5/07/2021		■			■				1		■							Analyse the selected samples for Scr using duplicate zip-lock bags.
	SED02	5/07/2021		■			■				1									
2	SED03_0.3-0.5	6/07/2021		■			■				1		■							
3	SED04_0.3-0.4	6/07/2021		■			■				1		■							
	SED04_0.5-0.6	6/07/2021		■			■				1									
4	SED05_0.0-0.3	6/07/2021		■			■				1		■							
	SED06_0.0-0.3	6/07/2021		■			■				1									
5	SED07_0.0-0.3	6/07/2021		■			■				1		■							
	SED08_0.0-0.2	6/07/2021		■			■				1									
6	SED09_0.25-0.4	6/07/2021		■			■				1		■							
	SED10_0.1-0.5	5/07/2021		■			■				1									
7	SED11_0.2-0.4	5/07/2021		■			■				1		■							
8	QA01	6/07/2021		■			■				1		■							
	QA02	6/07/2021		■			■				1									
										TOTAL	14	0	8							

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EB2119483**		
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: LUIS ESTEBAN	Contact	: Tyler Anderson
Address	: 177 Pacific Highway North Sydney 2060	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: Luis.esteban@jacobs.com	E-mail	: Tyler.Anderson@ALSGlobal.com
Telephone	: ----	Telephone	: +61 2 8784 8555
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: IA410230	Page	: 1 of 3
Order number	: ----	Quote number	: EB2020SINKNI0007 (BNBQ/005/20)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Edward Moss, LUIS ESTEBAN		

Dates

Date Samples Received	: 12-Jul-2021 16:54	Issue Date	: 13-Jul-2021
Client Requested Due Date	: 16-Jul-2021	Scheduled Reporting Date	: **16-Jul-2021**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	: REBATCH	No. of samples received / analysed	: 8 / 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **This workorder has been created to rebatch samples from EB2119102**
- **Please be advised; due to the late submission of analysis request, an accurate TAT is unable to be confirmed. A standard TAT has been assigned for all analysis to be reviewed by the laboratory at a later date. This due date will be updated if a faster turnaround is possible. If you wish to discuss this please contact client services at ALSEnviro.Brisbane@alsglobal.com**
- ***13/07/2021*: SRN has been resent to acknowledge the change in reporting date to the requested 16/07/2021. For any further information regarding these adjustments please contact client services at ALSEnviro.Brisbane@alsglobal.com.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB2119483-001	05-Jul-2021 00:00	SED01	✓
EB2119483-002	06-Jul-2021 00:00	SED03_0.3-0.5	✓
EB2119483-003	06-Jul-2021 00:00	SED04_0.3-0.4	✓
EB2119483-004	06-Jul-2021 00:00	SED05_0.0-0.3	✓
EB2119483-005	06-Jul-2021 00:00	SED07_0.0-0.3	✓
EB2119483-006	06-Jul-2021 00:00	SED09_0.25-0.4	✓
EB2119483-007	05-Jul-2021 00:00	SED11_0.2-0.4	✓
EB2119483-008	06-Jul-2021 00:00	QA01	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Edward Moss		
- *AU Certificate of Analysis - NATA (COA)	Email	edward.moss@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	edward.moss@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	edward.moss@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	edward.moss@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	edward.moss@jacobs.com
- Chain of Custody (CoC) (COC)	Email	edward.moss@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	edward.moss@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	edward.moss@jacobs.com
ENVIRO COSTING INVOICE		
- A4 - AU Tax Invoice (INV)	Email	envirocosting.brisbane@alsglobal.com
LUIS ESTEBAN		
- *AU Certificate of Analysis - NATA (COA)	Email	Luis.esteban@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Luis.esteban@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Luis.esteban@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Luis.esteban@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	Luis.esteban@jacobs.com
- Chain of Custody (CoC) (COC)	Email	Luis.esteban@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	Luis.esteban@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	Luis.esteban@jacobs.com
ROBERT GAUTHIER		
- *AU Certificate of Analysis - NATA (COA)	Email	robert.gauthier@jacobs.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	robert.gauthier@jacobs.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	robert.gauthier@jacobs.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	robert.gauthier@jacobs.com
- A4 - AU Tax Invoice (INV)	Email	robert.gauthier@jacobs.com
- Chain of Custody (CoC) (COC)	Email	robert.gauthier@jacobs.com
- EDI Format - ENMRG (ENMRG)	Email	robert.gauthier@jacobs.com
- EDI Format - ESDAT (ESDAT)	Email	robert.gauthier@jacobs.com

CERTIFICATE OF ALYSIS

Work Order	: **ES2125020**	Page	: 1 of 41
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUIS ESTEBAN	Contact	: Tyler Anderson
Address	: 177 Pacific Highway North Sydney 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: IA410230	Date Samples Received	: 07-Jul-2021 11:56
Order number	: 2094	Date Analysis Commenced	: 08-Jul-2021
C-O-C number	: ----	Issue Date	: 16-Jul-2021 10:28
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 29		
No. of samples analysed	: 29		

NATA

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- EP075 (SIM): Where reported, 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.
- 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.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- 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.
- EP075(SIM): LOR raised due to the high amount of moisture present.
- EP068: LOR for sample raised due to the high amount of moisture present.
- EP080: The trip spike and its control have been analysed for volatile TPH and BTEXN only. The trip spike and control were prepared in the lab using reagent grade sand spiked with petrol. The spike was dispatched from the lab and the control retained.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	**18.7**	----
Moisture Content	----	1.0	%	**22.2**	**33.9**	**27.5**	----	**28.4**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	**9**	<5	----	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	<1
Chromium	7440-47-3	2	mg/kg	**6**	**18**	<2	----	**4**
Copper	7440-50-8	5	mg/kg	<5	<5	<5	----	<5
Lead	7439-92-1	5	mg/kg	<5	**9**	<5	----	<5
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	----	**2**
Zinc	7440-66-6	5	mg/kg	<5	<5	<5	----	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	<0.1
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	<20	<20	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	<0.1	**0.2**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	**0.2**	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	<0.1	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<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	----	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<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	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<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	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	----	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	----	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	----	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	----	**370**
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	----	**180**
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	**550**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	----	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	----	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	----	<50

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	----	**450**
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	----	**160**
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	----	**610**
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<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	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	----	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----

Analytical Results

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

			Sample ID	**SED01**	**SED02**	**SED03_0.1-0.2**	**SED03_0.2-0.3**	**SED04_0.2-0.3**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-001**	**ES2125020-002**	**ES2125020-003**	**ES2125020-004**	**ES2125020-005**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	<2	<2	----	----	----
Escherichia coli	----	2	MPN/g	<2	<2	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**116**	**94.5**	**103**	----	**92.8**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**89.6**	**76.6**	**78.6**	----	**72.4**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**81.8**	**70.2**	**78.5**	----	**74.4**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**91.0**	**88.4**	**89.2**	----	**89.8**
2-Chlorophenol-D4	93951-73-6	0.5	%	**89.0**	**86.9**	**87.6**	----	**88.3**
2.4.6-Tribromophenol	118-79-6	0.5	%	**66.5**	**69.3**	**70.7**	----	**82.3**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**99.3**	**98.0**	**99.2**	----	**99.6**
Anthracene-d10	1719-06-8	0.5	%	**91.6**	**90.0**	**91.7**	----	**92.3**
4-Terphenyl-d14	1718-51-0	0.5	%	**84.6**	**85.6**	**84.1**	----	**84.2**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**78.3**	**74.4**	**83.6**	----	**78.2**
Toluene-D8	2037-26-5	0.2	%	**81.3**	**91.6**	**104**	----	**95.5**
4-Bromofluorobenzene	460-00-4	0.2	%	**82.9**	**82.7**	**90.4**	----	**85.4**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**98.0**	**81.5**	----	**108**	----
13C8-PFOA	----	0.0002	%	**76.0**	**83.0**	----	**76.0**	----

Analytical Results

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

			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	**27.6**	----	----	----
Moisture Content	----	1.0	%	**79.0**	----	**25.8**	**29.4**	**22.1**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**13**	----	<2	<2	<2
Copper	7440-50-8	5	mg/kg	**6**	----	<5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	----	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**13**	----	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	**9**	----	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	<0.1	<0.1	<0.1
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	----	----	<20	<20	<20
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.3	----	<0.2	<0.2	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05

Analytical Results

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

			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.06	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<1.0	----	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**1.2**	----	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**2.4**	----	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<60	----	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	**1300**	----	**130**	<100	<100
C29 - C36 Fraction	----	100	mg/kg	**810**	----	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**2110**	----	**130**	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	**70**	----	<50	<50	<50

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	**1680**	----	**150**	**120**	<100
>C34 - C40 Fraction	----	100	mg/kg	**860**	----	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**2610**	----	**150**	**120**	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	**70**	----	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	<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	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	----	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	----	**0.0003**	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	----	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	----	**0.0004**	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

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

			Sample ID	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	----	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	----	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	----	**0.0007**	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED04_0.4-0.5**	**SED04_0.4**	**SED05_0.0-0.3**	**SED06_0.0-0.3**	**SED07_0.0-0.3**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-006**	**ES2125020-007**	**ES2125020-008**	**ES2125020-009**	**ES2125020-010**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	----	**0.0003**	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	----	**0.0007**	<0.0002	<0.0002	<0.0002
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	----	----	<2	**18**	----
Escherichia coli	----	2	MPN/g	----	----	<2	**18**	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**121**	----	**97.4**	**114**	**124**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**97.0**	----	**86.6**	**98.1**	**105**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**99.8**	----	**77.2**	**90.2**	**93.2**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**88.6**	----	**92.4**	**89.8**	**93.6**
2-Chlorophenol-D4	93951-73-6	0.5	%	**87.2**	----	**90.4**	**87.4**	**91.2**
2.4.6-Tribromophenol	118-79-6	0.5	%	**78.4**	----	**77.8**	**77.7**	**74.9**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**96.5**	----	**99.8**	**97.2**	**102**
Anthracene-d10	1719-06-8	0.5	%	**86.4**	----	**93.2**	**91.9**	**96.0**
4-Terphenyl-d14	1718-51-0	0.5	%	**81.1**	----	**84.5**	**82.7**	**86.4**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**82.0**	----	**78.2**	**82.1**	**83.3**
Toluene-D8	2037-26-5	0.2	%	**78.4**	----	**90.6**	**96.6**	**96.6**
4-Bromofluorobenzene	460-00-4	0.2	%	**86.8**	----	**84.0**	**91.1**	**91.0**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	----	**89.5**	**95.5**	**106**	**72.0**
13C8-PFOA	----	0.0002	%	----	**76.5**	**79.5**	**78.5**	**81.5**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	**63.2**	**80.4**
Moisture Content	----	1.0	%	**28.9**	**30.8**	**58.4**	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	**19**	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	**3**	**13**	**27**	----	----
Copper	7440-50-8	5	mg/kg	<5	<5	**17**	----	----
Lead	7439-92-1	5	mg/kg	<5	**6**	**13**	----	----
Nickel	7440-02-0	2	mg/kg	<2	<2	**9**	----	----
Zinc	7440-66-6	5	mg/kg	<5	**7**	**6**	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	**0.1**	----	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	----	<20	<20	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	<0.1	<0.1	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	**0.2**	**0.2**	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	**0.2**	**0.2**	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	----	**0.2**	<0.1	----	----
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	----	----

Analytical Results

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

			Sample ID	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
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	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SED08_0.0-0.2	SED09_0.0-0.25	SED10_0.1-0.5	SED10_0.1	SED11_0.2-0.5
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	ES2125020-011	ES2125020-012	ES2125020-013	ES2125020-014	ES2125020-015
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.8	----	----
^ **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**	**1.0**	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.9**	----	----
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	**120**	**590**	**610**	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	**190**	**620**	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**120**	**780**	**1230**	----	----
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	**250**	<50	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	**160**	**460**	**930**	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	**210**	**620**	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**160**	**920**	**1550**	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	**250**	<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	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	----	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	----	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	----	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	<0.0005	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED08_0.0-0.2**	**SED09_0.0-0.25**	**SED10_0.1-0.5**	**SED10_0.1**	**SED11_0.2-0.5**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-011**	**ES2125020-012**	**ES2125020-013**	**ES2125020-014**	**ES2125020-015**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	----	**0.0005**	----
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	----	<2	<2	----	<5
Escherichia coli	----	2	MPN/g	----	<2	<2	----	<5
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**116**	**125**	**91.3**	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**93.2**	**98.3**	**80.9**	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**89.0**	**97.8**	**74.2**	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**90.2**	**86.6**	**84.6**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**88.3**	**83.3**	**82.5**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**77.9**	**79.1**	**73.9**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**98.6**	**92.7**	**90.9**	----	----
Anthracene-d10	1719-06-8	0.5	%	**92.4**	**87.8**	**83.2**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**83.3**	**80.3**	**77.4**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**81.1**	**90.4**	**78.6**	----	----
Toluene-D8	2037-26-5	0.2	%	**98.2**	**112**	**75.7**	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**88.3**	**97.4**	**100**	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**91.5**	**102**	----	**104**	----
13C8-PFOA	----	0.0002	%	**80.0**	**78.0**	----	**84.0**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**74.5**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**19**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**28**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**34**	----	----	----	----
Lead	7439-92-1	5	mg/kg	**11**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**29**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**12**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	<20	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	**0.9**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	**0.9**	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	----	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	----	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	----	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.8	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.8	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.8	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.8	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.8	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.8	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.8	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.8	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.8	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.8	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.8	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.8	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.8	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.8	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.8	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.8	----	----	----	----
^ **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	**1.0**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.9**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	**1120**	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	**960**	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**2080**	----	----	----	----
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	**280**	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	**1460**	----	----	----	----

Analytical Results

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

			Sample ID	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C34 - C40 Fraction	----	100	mg/kg	**930**	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**2670**	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	**280**	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	**11.4**	<0.5	**17.9**
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	**2.1**	<0.5	**3.3**
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	**10.6**	<0.5	**16.5**
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	**4.5**	<0.5	**6.9**
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	**28.6**	<0.2	**44.6**
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	**15.1**	<0.5	**23.4**
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0008**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0025**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----

Analytical Results

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

			Sample ID	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	**0.0033**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SED11_0.0-0.2**	**TRIP BLANK 18**	**TRIP SPIKE 18**	**TRIP BLANK 19**	**TRIP SPIKE 19**
			Sampling date / time	05-Jul-2021 00:00	05-Jul-2021 00:00	05-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-016**	**ES2125020-019**	**ES2125020-020**	**ES2125020-021**	**ES2125020-022**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0033**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0033**	----	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**103**	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**87.8**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**79.9**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**86.9**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**86.4**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**80.4**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**95.2**	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	**85.3**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**80.9**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**90.4**	**108**	**103**	**107**	**105**
Toluene-D8	2037-26-5	0.2	%	**87.9**	**112**	**117**	**110**	**117**
4-Bromofluorobenzene	460-00-4	0.2	%	**107**	**105**	**106**	**102**	**107**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**77.5**	----	----	----	----
13C8-PFOA	----	0.0002	%	**80.0**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	----	**21.5**
Moisture Content	----	1.0	%	**23.8**	**20.5**	**21.2**	**36.5**	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**6**	<5	<5	**8**	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	----
Chromium	7440-47-3	2	mg/kg	**5**	**4**	**10**	**16**	----
Copper	7440-50-8	5	mg/kg	<5	<5	**5**	<5	----
Lead	7439-92-1	5	mg/kg	<5	**6**	**6**	**7**	----
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	----
Zinc	7440-66-6	5	mg/kg	**9**	<5	<5	**13**	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----
EK055: Ammonia as N								
Ammonia as N	7664-41-7	20	mg/kg	----	----	----	<20	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	----	----	----	<0.1	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg	----	----	----	<0.1	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	----	----	----	<0.1	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	----	----	----	**0.1**	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<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	<0.05	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<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	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<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	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg	**280**	<100	**190**	**290**	----
C29 - C36 Fraction	----	100	mg/kg	<100	**100**	<100	**200**	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	**280**	**100**	**190**	**490**	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	**150**	----

Analytical Results

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

			Sample ID	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C16 - C34 Fraction	----	100	mg/kg	**320**	**100**	**230**	**260**	----
>C34 - C40 Fraction	----	100	mg/kg	<100	**130**	<100	**260**	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	**320**	**230**	**230**	**670**	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	**150**	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<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	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SP01_0.2**	**SP02_0.2**	**SP03_0.1**	**QA01**	**QA03**
			Sampling date / time	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00	06-Jul-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-023**	**ES2125020-024**	**ES2125020-025**	**ES2125020-026**	**ES2125020-027**
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	**0.0003**	<0.0002	<0.0002	<0.0002
MM804: Faecal Coliforms & E.coli by MPN								
Faecal Coliforms	----	2	MPN/g	----	----	----	<2	----
Escherichia coli	----	2	MPN/g	----	----	----	<2	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**112**	**122**	**125**	**130**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**93.1**	**91.6**	**96.6**	**96.1**	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**84.6**	**78.9**	**80.2**	**84.3**	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**91.2**	**91.7**	**92.7**	**86.0**	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**89.4**	**90.5**	**91.2**	**81.9**	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**81.2**	**78.6**	**80.0**	**78.6**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**98.2**	**99.4**	**102**	**94.2**	----
Anthracene-d10	1719-06-8	0.5	%	**91.8**	**92.7**	**95.4**	**88.6**	----
4-Terphenyl-d14	1718-51-0	0.5	%	**83.7**	**84.4**	**86.5**	**80.8**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**89.5**	**78.0**	**84.7**	**85.0**	----
Toluene-D8	2037-26-5	0.2	%	**110**	**91.8**	**105**	**96.4**	----
4-Bromofluorobenzene	460-00-4	0.2	%	**97.2**	**80.2**	**96.6**	**85.6**	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**96.0**	**98.0**	**98.5**	**83.5**	**94.0**
13C8-PFOA	----	0.0002	%	**76.0**	**73.5**	**75.5**	**80.5**	**77.0**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**TSC 18**	**TSC 19**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-028**	**ES2125020-029**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	**14.3**	**17.8**	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	**2.7**	**3.4**	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	**12.9**	**16.6**	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	**5.4**	**7.0**	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	**35.3**	**44.8**	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg	**18.3**	**23.6**	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**103**	**98.6**	----	----	----
Toluene-D8	2037-26-5	0.2	%	**119**	**115**	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**109**	**106**	----	----	----

Analytical Results

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

			Sample ID	**RINSATE01**	**RINSATE02**	----	----	----
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-017**	**ES2125020-018**	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
^ **Total Polychlorinated biphenyls**	----	1	µg/L	<1	<1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	----	----	----
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	----	----	----
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	----	----	----
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	----	----	----
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	----	----	----
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	----	----	----
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	----	----	----
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	----	----	----
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	----	----	----
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	----	----	----
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	----	----	----
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	----	----	----
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	----	----	----
4.4`-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	----	----	----
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	----	----	----
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	----	----	----
^ **Total Chlordane (sum)**	----	0.5	µg/L	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE01**	**RINSATE02**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-017**	**ES2125020-018**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.5	µg/L	<0.5	<0.5	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L	<0.5	<0.5	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.5	µg/L	<0.5	<0.5	----	----	----
Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	<0.5	----	----	----
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	----	----	----
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	----	----	----
Diazinon	333-41-5	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	----	----	----
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	----	----	----
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	----	----	----
Parathion	56-38-2	2.0	µg/L	<2.0	<2.0	----	----	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	<0.5	----	----	----
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<0.5	----	----	----
Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	<0.5	----	----	----
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	----	----	----
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	----	----	----
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	----	----	----
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<0.5	----	----	----
Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	<1.0	----	----	----

Analytical Results

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

			Sample ID	**RINSATE01**	**RINSATE02**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-017**	**ES2125020-018**	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	µg/L	<0.5	<0.5	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	µg/L	<0.5	<0.5	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L	<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE01**	**RINSATE02**	----	----	----
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-017**	**ES2125020-018**	--------	--------	--------
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE01**	**RINSATE02**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2125020-017**	**ES2125020-018**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	1	%	**79.0**	**75.3**	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.5	%	**75.2**	**63.8**	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.5	%	**68.2**	**63.3**	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	**27.8**	**22.8**	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	**51.5**	**42.4**	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	**52.5**	**38.8**	----	----	----
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**RINSATE01**	**RINSATE02**	**----**	**----**	**----**
			Sampling date / time	05-Jul-2021 00:00	06-Jul-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2125020-017**	**ES2125020-018**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	1.0	%	**62.9**	**53.5**	**----**	**----**	**----**
Anthracene-d10	1719-06-8	1.0	%	**68.1**	**74.1**	**----**	**----**	**----**
4-Terphenyl-d14	1718-51-0	1.0	%	**69.2**	**60.7**	**----**	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**124**	**126**	**----**	**----**	**----**
Toluene-D8	2037-26-5	2	%	**109**	**111**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%	**118**	**117**	**----**	**----**	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**102**	**104**	**----**	**----**	**----**
13C8-PFOA	----	0.02	%	**96.9**	**98.1**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	*CAS Number*	*Recovery Limits (%)* Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	45	134
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	67	111
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	67	111
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2.4.6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	71	137
Toluene-D8	2037-26-5	79	131
4-Bromofluorobenzene	460-00-4	70	128
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: **ES2125020**	Page	: 1 of 25
Client	: **JACOBS GROUP (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUIS ESTEBAN	Contact	: Tyler Anderson
Address	: 177 Pacific Highway North Sydney 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61 2 8784 8555
Project	: IA410230	Date Samples Received	: 07-Jul-2021
Order number	: 2094	Date Analysis Commenced	: 08-Jul-2021
C-O-C number	: ----	Issue Date	: 16-Jul-2021
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 29		
No. of samples analysed	: 29		

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3787069)									
ES2124679-015	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	5	5	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	38	40	6.5	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	68	73	5.9	0% - 50%
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	30	29	0.0	No Limit
ES2125020-002	SED02	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	18	18	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	9	<5	54.6	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	9	9	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3787072)									
ES2125051-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	15	12	27.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	8	15	59.2	No Limit
ES2125020-016	SED11_0.0-0.2	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	28	34	19.2	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	29	27	5.6	0% - 50%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3787072) - continued									
ES2125020-016	SED11_0.0-0.2	EG005T: Arsenic	7440-38-2	5	mg/kg	19	10	59.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	34	32	5.7	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	11	12	9.9	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	12	10	15.7	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3784707)									
ES2125020-002	SED02	EA055: Moisture Content	----	0.1	%	33.9	33.5	1.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3787077)									
ES2124679-017	Anonymous	EA055: Moisture Content	----	0.1	%	13.4	12.9	3.3	0% - 50%
ES2125020-010	SED07_0.0-0.3	EA055: Moisture Content	----	0.1	%	22.1	21.9	1.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3789408)									
ES2124123-008	Anonymous	EA055: Moisture Content	----	0.1	%	31.2	30.7	1.7	0% - 20%
ES2124648-014	Anonymous	EA055: Moisture Content	----	0.1	%	2.7	2.6	0.0	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3787070)									
ES2124679-015	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2125020-002	SED02	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3787071)									
ES2125051-002	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2125020-016	SED11_0.0-0.2	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK055: Ammonia as N (QC Lot: 3791634)									
ES2125020-001	SED01	EK055: Ammonia as N	7664-41-7	20	mg/kg	<20	<20	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3784704)									
ES2125020-001	SED01	EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3787075)									
ES2125020-008	SED05_0.0-0.3	EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3784705)									
ES2125020-001	SED01	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3787074)									
ES2125020-008	SED05_0.0-0.3	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 3784706)									
ES2125020-001	SED01	EK071G: Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 3787073)									
ES2125020-008	SED05_0.0-0.3	EK071G: Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3781600)									
ES2125020-001	SED01	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2125020-013	SED10_0.1-0.5	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3781599)									
ES2125020-001	SED01	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3781599) - continued									
ES2125020-001	SED01	EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES2125020-013	SED10_0.1-0.5	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3781599) - continued									
ES2125020-013	SED10_0.1-0.5	EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3781599)									
ES2125020-001	SED01	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
ES2125020-013	SED10_0.1-0.5	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3781598)									
ES2125020-001	SED01	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES2125020-013	SED10_0.1-0.5	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.8	<0.8	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3781597)									
ES2125020-001	SED01	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2125020-013	SED10_0.1-0.5	EP071: C15 - C28 Fraction	----	100	mg/kg	610	620	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	620	480	24.7	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3781666)									
ES2125020-001	SED01	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2125020-023	SP01_0.2	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3782659)									
ES2125234-002	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2125234-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3781597)									
ES2125020-001	SED01	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
ES2125020-013	SED10_0.1-0.5	EP071: >C16 - C34 Fraction	----	100	mg/kg	930	910	2.8	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	620	420	37.5	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3781666)									
ES2125020-001	SED01	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2125020-023	SP01_0.2	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3782659)									
ES2125234-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2125234-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080: BTEXN (QC Lot: 3781666)									
ES2125020-001	SED01	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2125020-023	SP01_0.2	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 3781666) - continued									
ES2125020-023	SP01_0.2	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP080: BTEXN (QC Lot: 3782659)									
ES2125234-002	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2125234-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3786732)									
ES2125020-001	SED01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
ES2125020-016	SED11_0.0-0.2	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0003	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0008	0.0009	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0025	0.0025	0.0	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3786732)									
ES2125020-001	SED01	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3786732) - continued									
ES2125020-001	SED01	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
ES2125020-016	SED11_0.0-0.2	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3786732)									
ES2125020-001	SED01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2125020-016	SED11_0.0-0.2	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3786732)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3786732) - continued									
ES2125020-001	SED01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2125020-016	SED11_0.0-0.2	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3782652)									
ES2125034-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.031	0.029	7.2	No Limit
ES2125126-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3782653)									
ES2125020-018	RINSATE02	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2125260-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3781772)									
ES2124925-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2124997-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	180	170	6.4	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3781772)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3781772) - continued									
ES2124925-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2124997-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	90	80	0.0	No Limit
EP080: BTEXN (QC Lot: 3781772)									
ES2124925-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2124997-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3787176)									
ES2125046-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3787176)									
ES2125046-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3787176)									
ES2125046-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3787176) - continued									
ES2125046-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3787176)									
ES2125046-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3787176)									
ES2125046-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3787069)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	93.2	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	101	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	101	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	103	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	94.1	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	93.5	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	88.7	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3787072)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	99.2	88.0	113
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	104	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	108	68.0	132
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	108	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	100	82.0	119
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	100	80.0	120
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	97.2	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3787070)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	101	70.0	125
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3787071)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	104	70.0	125
EK055: Ammonia as N (QCLot: 3791634)								
EK055: Ammonia as N	7664-41-7	20	mg/kg	<20	125 mg/kg	99.2	84.0	104
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3784704)								
EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	2.5 mg/kg	100	85.0	111
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3787075)								
EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	2.5 mg/kg	102	85.0	111
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3784705)								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.5 mg/kg	102	88.0	118
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3787074)								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.5 mg/kg	103	88.0	118
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 3784706)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	2.5 mg/kg	99.0	86.0	118
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 3787073)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.1	mg/kg	<0.1	2.5 mg/kg	106	86.0	118

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3781600)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	99.4	62.0	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 3781599)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	97.4	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	104	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	103	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	93.7	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.9	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	103	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	104	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	101	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	107	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	100	66.0	116
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.2	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	99.4	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	106	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	87.7	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	89.6	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	88.6	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	93.1	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	87.1	54.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3781599)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	90.7	59.0	119
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	87.6	62.0	128
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	78.6	54.0	126
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	103	67.0	119
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	99.3	70.0	120
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	102	72.0	120
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	106	68.0	120
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	102	68.0	122
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	102	69.0	117
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	101	76.0	118
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	105	64.0	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	105	70.0	116
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	101	69.0	121
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	100	66.0	118
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	101	68.0	124

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3781599) - continued								
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	103	62.0	112
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	104	68.0	120
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	90.2	65.0	127
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	71.4	41.0	123
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3781598)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	94.8	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	92.9	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	92.2	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	93.0	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	96.0	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	93.7	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	94.0	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	95.1	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	86.0	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	93.1	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	84.2	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	95.2	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	89.7	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	98.4	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	96.0	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	88.3	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3781597)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	99.0	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	96.4	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	99.5	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3781666)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	104	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3782659)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	103	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3781597)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	99.3	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	95.9	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	83.8	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3781666)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	105	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3782659)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	103	68.4	128

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 3781666)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	106	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	108	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	105	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	102	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	99.8	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	107	63.0	119
EP080: BTEXN (QCLot: 3782659)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	103	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	102	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	99.1	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	96.9	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	97.9	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	78.6	63.0	119
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3786732)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.2	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.4	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.4	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3786732)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	86.2	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.2	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	114	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.6	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.6	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3786732)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.1	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.6	69.8	131

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3786732) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.1	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3786732)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.4	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	83.2	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	109	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	99.2	69.2	143

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 3782652)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	97.6	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	97.4	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	100	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	96.9	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	98.7	83.0	111
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.3	82.0	112
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	96.6	81.0	117
EG035F: Dissolved Mercury by FIMS (QCLot: 3782653)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	98.9	83.0	105
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3781746)								
EP066: Total Polychlorinated biphenyls	----	1	µg/L	<1	10 µg/L	86.3	68.9	113
EP068A: Organochlorine Pesticides (OC) (QCLot: 3781745)								
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	80.5	64.9	107
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	78.8	58.3	111
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	87.3	69.0	117
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	80.8	70.0	112
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	90.9	68.9	110
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	79.1	65.2	108
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	81.9	65.8	109
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	88.5	67.1	107
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	86.7	64.1	110

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068A: Organochlorine Pesticides (OC) (QCLot: 3781745) - continued								
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	89.6	66.7	112
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	87.8	63.2	111
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	92.6	65.2	113
EP068: 4.4`-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	90.4	66.0	112
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	82.6	65.2	113
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	92.0	67.3	114
EP068: 4.4`-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	93.1	72.0	122
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	88.7	66.9	109
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	87.4	65.2	112
EP068: 4.4`-DDT	50-29-3	2	µg/L	<2.0	5 µg/L	85.3	65.2	112
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	94.7	63.8	110
EP068: Methoxychlor	72-43-5	2	µg/L	<2.0	5 µg/L	88.0	61.1	114
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3781745)								
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	76.1	65.6	114
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	80.0	63.7	113
EP068: Monocrotophos	6923-22-4	2	µg/L	<2.0	5 µg/L	24.5	19.7	48.0
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	87.5	69.5	110
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	84.9	71.1	110
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	87.7	77.0	119
EP068: Parathion-methyl	298-00-0	2	µg/L	<2.0	5 µg/L	81.3	70.0	124
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	98.3	68.4	116
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	89.1	68.6	112
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	88.9	75.0	119
EP068: Parathion	56-38-2	2	µg/L	<2.0	5 µg/L	81.5	67.0	121
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	90.7	69.0	121
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	97.4	71.8	110
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	90.0	67.5	112
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	98.7	64.1	116
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	91.7	67.8	114
EP068: Ethion	563-12-2	0.5	µg/L	<0.5	5 µg/L	87.1	74.0	120
EP068: Carbophenothion	786-19-6	0.5	µg/L	<0.5	5 µg/L	91.2	66.2	114
EP068: Azinphos Methyl	86-50-0	0.5	µg/L	<0.5	5 µg/L	104	51.6	128
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3781744)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	75.3	50.0	94.0
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	78.3	63.6	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	76.5	62.2	113
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	79.9	63.9	115
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	92.7	62.6	116
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	84.6	64.3	116

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3781744) - continued								
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	89.5	63.6	118
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	89.3	63.1	118
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	89.6	64.1	117
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	87.2	62.5	116
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	77.2	61.7	119
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	86.2	63.0	115
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	82.5	63.3	117
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	78.3	59.9	118
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	77.0	61.2	117
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	80.1	59.1	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3781743)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	76.6	55.8	112
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	78.4	71.6	113
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	92.5	56.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3781772)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	78.8	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3781743)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	72.1	57.9	119
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	82.0	62.5	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	86.0	61.5	121
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3781772)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	84.2	75.0	127
EP080: BTEXN (QCLot: 3781772)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	86.5	70.0	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	93.2	69.0	123
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	101	70.0	120
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	98.3	69.0	121
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	102	72.0	122
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	103	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3787176)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	98.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	98.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	100	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	106	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	105	53.0	142

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3787176)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	96.4	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	114	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	113	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	110	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	107	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	102	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3787176)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	109	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	101	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	98.2	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	100	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	102	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	115	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	112	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3787176)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	127	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	117	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	116	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	118	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3787069)							
ES2124679-015	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	104	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	100.0	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3787069) - continued							
ES2124679-015	Anonymous	EG005T: Chromium	7440-47-3	50 mg/kg	104	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	116	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	101	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	108	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	98.2	66.0	133
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3787072)							
ES2125020-016	SED11_0.0-0.2	EG005T: Arsenic	7440-38-2	50 mg/kg	91.2	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	96.8	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	95.8	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	90.4	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	96.2	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	88.3	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	97.3	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3787070)							
ES2124679-015	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	122	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3787071)							
ES2125020-016	SED11_0.0-0.2	EG035T: Mercury	7439-97-6	5 mg/kg	105	70.0	130
EK055: Ammonia as N (QCLot: 3791634)							
ES2125020-001	SED01	EK055: Ammonia as N	7664-41-7	125 mg/kg	99.4	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3784704)							
ES2125020-001	SED01	EK057G: Nitrite as N (Sol.)	14797-65-0	2.5 mg/kg	101	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3787075)							
ES2125020-008	SED05_0.0-0.3	EK057G: Nitrite as N (Sol.)	14797-65-0	2.5 mg/kg	101	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3784705)							
ES2125020-001	SED01	EK059G: Nitrite + Nitrate as N (Sol.)	----	2.5 mg/kg	103	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3787074)							
ES2125020-008	SED05_0.0-0.3	EK059G: Nitrite + Nitrate as N (Sol.)	----	2.5 mg/kg	111	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 3784706)							
ES2125020-001	SED01	EK071G: Reactive Phosphorus as P	14265-44-2	2.5 mg/kg	100.0	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 3787073)							
ES2125020-008	SED05_0.0-0.3	EK071G: Reactive Phosphorus as P	14265-44-2	2.5 mg/kg	104	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3781600)							
ES2125020-001	SED01	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	84.1	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 3781599)							
ES2125020-001	SED01	EP068: gamma-BHC	58-89-9	0.5 mg/kg	91.7	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 3781599) - continued							
ES2125020-001	SED01	EP068: Heptachlor	76-44-8	0.5 mg/kg	92.2	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	87.7	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	81.0	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	86.3	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	87.3	70.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3781599)							
ES2125020-001	SED01	EP068: Diazinon	333-41-5	0.5 mg/kg	93.6	70.0	130
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	82.1	70.0	130
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	79.9	70.0	130
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	78.3	70.0	130
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	86.8	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3781598)							
ES2125020-001	SED01	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	81.8	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	86.6	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3781597)							
ES2125020-001	SED01	EP071: C10 - C14 Fraction	----	480 mg/kg	118	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	112	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	112	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3781666)							
ES2125020-001	SED01	EP080: C6 - C9 Fraction	----	32.5 mg/kg	79.3	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3782659)							
ES2125234-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	106	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3781597)							
ES2125020-001	SED01	EP071: >C10 - C16 Fraction	----	860 mg/kg	125	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	109	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	120	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3781666)							
ES2125020-001	SED01	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	79.6	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3782659)							
ES2125234-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	106	70.0	130
EP080: BTEXN (QCLot: 3781666)							
ES2125020-001	SED01	EP080: Benzene	71-43-2	2.5 mg/kg	80.5	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	89.8	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	95.7	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	89.1	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080: BTEXN (QCLot: 3781666) - continued							
ES2125020-001	SED01	EP080: ortho-Xylene	95-47-6	2.5 mg/kg	95.4	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	79.9	70.0	130
EP080: BTEXN (QCLot: 3782659)							
ES2125234-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	95.2	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	91.0	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	95.6	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	93.1	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	95.4	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	84.7	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3786732)							
ES2125020-001	SED01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	90.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	75.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	72.0	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	71.6	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	71.6	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	109	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3786732)							
ES2125020-001	SED01	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	83.1	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	85.2	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	91.6	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	71.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	80.8	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	116	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	102	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	67.6	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	86.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	84.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	93.9	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3786732)							
ES2125020-001	SED01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	74.8	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	72.6	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	82.4	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	102	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	93.3	65.1	134

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3786732) - continued							
ES2125020-001	SED01	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	90.4	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	90.0	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3786732)							
ES2125020-001	SED01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	75.2	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	80.0	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	70.4	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	73.6	69.2	143

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 3782652)							
ES2125020-018	RINSATE02	EG020A-F: Arsenic	7440-38-2	1 mg/L	92.3	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	94.1	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	87.8	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	87.0	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	83.4	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	92.4	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	92.9	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 3782653)							
ES2125020-017	RINSATE01	EG035F: Mercury	7439-97-6	0.01 mg/L	98.5	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3781772)							
ES2124925-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	101	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3781772)							
ES2124925-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	101	70.0	130
EP080: BTEXN (QCLot: 3781772)							
ES2124925-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	102	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	105	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	107	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	25 µg/L	100	70.0	130
		EP080: ortho-Xylene	95-47-6	25 µg/L	105	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	102	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3787176)							
ES2124968-011	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	97.2	72.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3787176) - continued							
ES2124968-011	Anonymous	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	96.8	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	96.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	98.4	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	103	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	100	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3787176)							
ES2124968-011	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	89.9	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	105	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	102	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	100	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	107	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	103	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	104	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	106	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	108	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	98.8	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	95.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3787176)							
ES2124968-011	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	102	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	108	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	96.3	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	99.1	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	95.7	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	111	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	107	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3787176)							
ES2124968-011	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	123	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	110	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	117	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	122	71.4	144

Appendix G. Cost estimates

Terms	2021-22	2021-22	2020-21	2020-21	2020-21	0/01/1900		
	Option 2a	**Option 2b**	**Option 2c**	**Option 2e**	**Option 3**	**Option 5**		
Option Name	**{option name}**	**{option name}**	**{option name}**	**{option name}**	**{option name}**	**{option name}**		
Subtotal Concept Development								
Base Estimate (HW costs + development cost)	197,919	367,815	301,341	315,126	383,498	-		
Contingency - Inherent Risk	4,948	9,195	7,534	7,878	9,587	-		
Most Likely Development Cost	202,867	377,010	308,874	323,004	393,086	-		-
Contingency - Contingent Risk	55,417	102,988	84,375	84,375	107,380	-		
Base Estimate + Contingency (Inherent + Contingent)	258,284	479,998	393,250	407,379	500,465	-		-
Subtotal Detail Development								
Base Estimate (HW costs + development cost)	177,755	330,341	261,659	274,039	-	-		
Contingency - Inherent Risk	4,444	8,259	6,541	6,851	-	-		
Most Likely Development Cost	182,199	338,600	268,200	280,890	-	-		-
Contingency - Contingent Risk	49,771	92,496	73,264	73,264	-	-		
Base Estimate + Contingency (Inherent + Contingent)	231,970	431,096	341,465	354,155	-	-		-
Total Development Costs								
Base Estimate (HW costs + development cost)	375,674	698,156	562,999	589,165	433,498	-		
Contingency - Inherent Risk	9,392	17,454	14,075	14,729	10,837	-		
Most Likely Development Cost	385,066	715,610	577,074	603,894	444,336	-		
Contingency - Contingent Risk	105,189	195,484	157,640	164,966	121,380	-		
Base Estimate + Contingency (Inherent + Contingent)	490,254	911,094	734,714	768,860	565,715	-		
Total Delivery Cost								
Base Estimate- Delivery (HW costs + construction cost)	3,460,425	6,418,012	5,086,733	5,326,705	5,895,376	-		
Contingency - Inherent Risk	366,763	681,596	539,882	565,427	637,705	-		
Most Likely Delivery Cost	3,827,188	7,099,608	5,626,615	5,892,132	6,533,081	-		
Contingency - Contingent Risk	968,919	1,797,043	1,424,285	1,491,477	1,650,705	-		
Base Estimate + Contingency (Inherent + Contingent)	4,796,106	8,896,652	7,050,900	7,383,610	8,183,786	-		
Total Project Cost								
Base Estimate- Total Project (HW costs + construction cost)	3,836,098	7,116,169	5,649,732	5,915,870	6,328,874	-		
Contingency - Inherent Risk	376,155	699,050	553,957	580,156	648,542	-		
Most Likely Project Cost	4,680,040	8,681,726	6,892,673	7,217,361	7,721,227	#N/A		
Contingency - Contingent Risk	1,074,108	1,992,527	1,581,925	1,656,444	1,772,085	-		
Base Estimate + Contingency (Inherent + Contingent)	5,754,148	10,674,253	8,474,598	8,873,805	9,493,312	#N/A		
Total contingency	1,918,049	2,691,577	2,135,882	2,236,600	2,420,627	-		
Most Likely Estimate (rounded)	4,690,000	8,690,000	6,900,000	7,220,000	7,730,000	#N/A		
Control Estimate (rounded)	5,760,000	10,680,000	8,480,000	8,880,000	9,500,000	#N/A		
Portfolio estimate	4,690,000	8,690,000	6,900,000	7,220,000	7,730,000	#N/A		

< Cells locked, can't edit option names

	Most Likely	**Most Likely**	**Most Likely**	**Most Likely**			
Loading factor	1,343,354	2,496,502	1,980,243	2,073,807	1,958,934	-	
Unit rate	2,597,934	4,815,150	3,827,129	4,007,029	4,491,320	-	
First principles	-	-	-	-	-	-	
Total	3,941,287	7,311,652	5,807,372	6,080,836	6,450,254		
	Percentage	**Percentage**	**Percentage**	**Percentage**			
Loading factor	34%	34%	34%	34%	30%	#DIV/0!	
Unit rate	66%	66%	66%	66%	70%	#DIV/0!	
First principles	0%	0%	0%	0%	0%	#DIV/0!	
Total	100%	100%	100%	100%	100%	#DIV/0!	

	Option 2a	**Option 2b**	**Option 2c**	**Option 2e**	**Option 3**
TOTAL CONSTRUCTION COST	**$ 3,132,204**	**$ 5,820,920**	**$ 4,610,666**	**$ 4,828,823**	**$ 5,345,796**
HWC CONSTRUCTION LICENCES	**$ 15,000**	**$ 15,000**	**$ 15,000**	**$ 15,000**	**$ 15,000**
CONSTRUCTION MANAGEMENT	**$ 313,220**	**$ 582,092**	**$ 461,067**	**$ 482,882**	**$ 534,580**
BASE ESTIMATE	**$ 3,460,425**	**$ 6,418,012**	**$ 5,086,733**	**$ 5,326,705**	**$ 5,895,376**
check	$ -	$ -	$ -	$ -	$ -
CONTROL ESTIMATE	**$ 5,760,000**	**$ 10,680,000**	**$ 8,480,000**	**$ 8,880,000**	**$ 9,500,000**
					^Pumpstation
	100% of 2a	185% of 2a	147% of 2a	154% of 2a	165% of 2a

Capital Project Estimate

Project Scope Definition

Option	Campvale Canal Options - Option 2a
Project	Campvale Canal Options
Cap. No.	{Cap no.}
Estimator	Howard Chinn / JACOBS (Wherever Blue Text)
Reviewer 1 - BC team leader	
Reviewer 2 - ID project controller	
Reviewer 3 - Peer review	
Reviewer 4 - Manager ID	
Approval	
Date of estimate	22/07/2021
Estimate Base year	2021-22
Project Risk	Low
Purpose of Estimate	Options estimate
Project Type	2

Preference is to use detailed WBS structure from QT103

Cost	Network	Treatment	Unique
<=$3.0m	3 (low)	2 (medium)	2 (medium)
>$3m	2 (medium)	1 (high)	1 (high)
>$10m	1 (high)	1 (high)	1 (high)

Physical Scope

Add/delete scope rows as required

Scope Item	Scope Details
Item 1	Clean Out, Widen, and / or Deepen the Canal
Item 2	Pumpstation and Pipeline
Item 3	Brief description
Item 4	Brief description
Item X	Brief description

Estimate

Code	ID	Item	Method	Qty	Unit	Rate - $/ Unit	Most Likely (base)	Lowest %	Lowest $	Highest %	Highest $	range	mid point	Inherent Contingency $	Base Estimate + Inherent Contingency (range risk)	% of Most Likely Total Project Estimate	Comments
	1.0	**Concept Design**						%	$	%	$						
	1.01	Concept Design Consultancy	Loading factor	7	% of [N]	2,269,713	158,880	95%	150,936	110%	174,768	23,832	162,852	3,972	162,852		
	1.02	REF/ EIA	Loading factor	1	% of [N]	2,269,713	22,697	95%	21,562	110%	24,967	3,405	23,265	567	23,265		
	1.03	Specialist assessments	Loading factor		% of [N]	2,269,713	-		-		-	-	-	-	-		
	1.04	<>					-		-		-	-	-	-	-		
	1.05	**Subtotal Concept Development - external**	[A]				181,577		172,498		199,735	27,237	186,116	4,539	186,116		
	1.06	Project Management	Loading factor	5	% of [A]	181,577	9,079	95%	8,625	110%	9,987	1,362	9,306	227	9,306		
	1.07	Project Control	Loading factor	1	% of [A]	181,577	1,816	95%	1,725	110%	1,997	272	1,861	45	1,861		
	1.08	Project Support	Loading factor	3	% of [A]	181,577	5,447	95%	5,175	110%	5,992	817	5,583	136	5,583		
	1.09	Community Consultation	Unit rate	1	Lump sum	-	-	95%	-	110%	-	-	-	-	-		
	1.10	<>					-		-		-	-	-	-	-		
	1.11	**Subtotal Concept Development - Hunter Water costs**	[B]				16,342		15,525		17,976	2,451	16,750	409	16,750		
	1.12	**Subtotal Concept Development**	[C]			[A + B]	197,919		188,023		217,711	29,688	202,867	4,948	202,867		
	2	**Detail Design**															
	2.01	Detail Design Consultancy	Loading factor	7	% of [N]	2,269,713	158,880	95%	150,936	110%	174,768	23,832	162,852	3,972	162,852		
	2.02	<>	Unit rate	-	Lump sum		-		-		-	-	-	-	-		
	2.03	<>	Unit rate		wks		-		-		-	-	-	-	-		
	2.04	**Subtotal Detail Development - external**	[D]				158,880		150,936		174,768	23,832	162,852	3,972	162,852		
	3.00	Project Management	Loading factor	7.48	% of [D]	158,880	11,884	95%	11,290	110%	13,073	1,783	12,181	297	12,181		
	3.01	Project Control	Loading factor	3.30	% of [D]	158,880	5,243	95%	4,981	110%	5,767	786	5,374	131	5,374		
	3.02	Project Support	Loading factor	1.10	% of [D]	158,880	1,748	95%	1,660	110%	1,922	262	1,791	44	1,791		
	3.03	<>					-		-		-	-	-	-	-		
	3.04	**Subtotal Detail Development - Hunter Water costs**	[E]				18,875		17,931		20,762	2,831	19,347	472	19,347		
		Subtotal Detail Development	[F]			[D + E]	177,755		168,867		195,530	26,663	182,199	4,444	182,199		
		Land issues - development phase															
	4	Aquire land	Unit rate		Lump sum	-	-		-		-	-	-	-	-		
	4.01	Legal costs	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.02	Property management support	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.03	<>					-		-		-	-	-	-	-		
	4.04	**Subtotal land Issues**	[G]				-		-		-	-	-	-	-		
	4.05	**Other Hunter Water Costs - development phase**															
	5	<>	Unit rate	1	Lump sum	-	-	90%	-	120%	-	-	-	-	-		
	5.01	<>	Loading factor	-	% of	-	-	90%	-	120%	-	-	-	-	-		
	5.02	<>	Loading factor	5	% of	-	-	75%	-	150%	-	-	-	-	-		
	5.03	<>	Unit rate	1	Lump sum	-	-	75%	-	150%	-	-	-	-	-		
	5.04	<>					-		-	300%	-	-	-	-	-		
	5.05	**Subtotal Other Hunter Water Costs**	[H]				-		-		-	-	-	-	-		
		Total Development Costs					375,674		356,890		413,241	56,351	385,066	9,392	385,066		
		Base Estimate (HW costs + development cost)	[I]			[C+F+G+H]	375,674										
		Contingency - Inherent Risk	[J]				9,392	3%									
		Most Likely Development Cost	[K]			[I+J]	385,066										
		Contingency - Contingent Risk	loading factor	28	% of [I]	375,674	105,189	28%									
		Base Estimate + Contingency (Inherent + Contingent)	[L]				490,254	31%									
		Delivery															
		Contractors Direct Costs															
	1	Preparation and implementation of Construction Program	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.01	Preparation, Submission & Maintenance of Project OHS Mar	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.02	Preparation and updating of Quality Assurance documents,	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.03	Preparation, Submission & Maintenance of Project Environm	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.04	Site establishment	Unit rate	1	Lump sum	20,000	20,000	75%	15,000	150%	30,000	15,000	22,500	2,500	22,500		
	1.05	Site disestablishment	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.06	Provision of Work as Executed Drawings	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.07	Provision of Operations and Maintenance Manuals	Unit rate	1	Lump sum	2,500	2,500	75%	1,875	150%	3,750	1,875	2,813	313	2,813		
	1.08	Revise Automatic Control and Monitoring Manual	Unit rate	-	Lump sum	-	-	0%	-	300%	-	-	-	-	-		
	1.09	Training - Operation and Maintenance	Unit rate	-	Lump sum	-	-	0%	-	300%	-	-	-	-	-		
	1.10			-		-	-		-		-	-	-	-	-		
	2.0	**Scope item 1**					-		-		-	-	-	-	-		
	2.01	Clear and grub	Unit rate	8,003	m2	4.50	36,013	75%	27,009	150%	54,019	27,009	40,514	4,502	40,514		Narrow long site
	2.02	Removal of Trees	Unit rate	20	no.	1,800	36,000	75%	27,000	150%	54,000	27,000	40,500	4,500	40,500		allow for 20 as directed
	2.03	Cut (m3) material	Unit rate	9,700	m3	53.34	517,398	75%	388,049	150%	776,097	388,049	582,073	64,675	582,073		low productivity, long reach excavator, 25km cartage
	2.04	Treatment for ASS	Unit rate	9,700	m3	11.49	111,453	75%	83,590	150%	167,180	83,590	125,385	13,932	125,385		3% of lime
	2.05	Sub Consultant Testing and Reports	Unit rate	9,700	m3	13.66	132,502	75%	99,377	150%	198,753	99,377	149,065	16,563	149,065		Every 50m2 area testing
	2.06	Disposal of cut material (General Waste)	Unit rate	9,700	m3	74.87	726,239	75%	544,679	150%	1,089,359	544,679	817,019	90,780	817,019		$30 tip fee per tonne
	2.07	Topsoil batters	Unit rate	22,300	m2	13.26	295,698	75%	221,774	150%	443,547	221,774	332,660	36,962	332,660		\$80m^3 x 100mm Thk plus spread
	2.08	Jute mesh stabilisation of batters	Unit rate	22,300	m2	9.88	220,324	75%	165,243	150%	330,486	165,243	247,865	27,541	247,865		Previous Project rate, adjusted for low productivity
	2.09	Hydroseed batters	Unit rate	22,300	m2	3.11	69,353	75%	52,015	150%	104,030	52,015	78,022	8,669	78,022		Previous Project rate adjusted for low productivity
	2.10	Reconstruct access road - 150mm road base material	Unit rate	342	m3	123.49	42,234	75%	31,675	150%	63,350	31,675	47,513	5,279	47,513		Previous Project rate adjusted for low productivity
	2.11	Removal of existing timber bridge	Unit rate	1	Lump sum	10,000	10,000	75%	7,500	150%	15,000	7,500	11,250	1,250	11,250		Size unknown
	2.12		Unit rate				-	0%	-	300%	-	-	-	-	-		
	3.0	**Pumpstation and Pipeline**	Unit rate				-	0%	-	300%	-	-	-	-	-		
	3.01	$ Carried Fwd from Option 3	Unit rate	-	Lump sum	3,951,069	-	90%	-	120%	-	-	-	-	-		Refer Option 3 for breakdown
	3.02		Unit rate		Lump sum		-	0%	-	300%	-	-	-	-	-		
	4.0	**General civil work**					-		-		-	-	-	-	-		
	4.01		Unit rate		Lump sum		-	0%	-	300%	-	-	-	-	-		
	4.02		Unit rate		m		-	0%	-	300%	-	-	-	-	-		
	4.03	**Sub total (items 1-4)**	[M]				2,269,713		1,702,285		3,404,570	1,702,285	2,553,427	283,714	2,553,427		
	5.0	**Electricals, instrumentation and control**	Loading Factor	-	% of [Item 1]	2,197,213	-	0%	-	300%	-	-	-	-	-		All EI&C incl in Pumps Station Value
	6.0	**Plant commissioning costs**	Unit rate	-	% of PS	3,951,069	-	90%	-	120%	-	-	-	-	-		incl in Pumpstation value above
		Subtotal Contractors Direct Costs	[N]				2,269,713		1,702,285		3,404,570	1,702,285	2,553,427	283,714	2,553,427		
		Contractors indirect Costs															
		On-site	Loading Factor	20	% of	2,269,713	453,943	80%	363,154	140%	635,520	272,366	499,337	45,394	499,337		
		Contractor's offsite overhead and margin	Loading Factor	15	% of	2,723,656	408,548	90%	367,694	120%	490,258	122,565	428,976	20,427	428,976		
		Subtotal Contractors Indirect Costs	[O]				862,491		730,848		1,125,778	394,930	928,313	65,822	928,313		
		Total Construction Cost	[P]			[N+O]	3,132,204		2,433,133		4,530,348	2,097,215	3,481,740	349,536	3,481,740		
		Construction Management															
		Project Management	Unit rate	4	% of	3,132,204	125,288	90%	112,759	120%	150,346	37,586	131,553	6,264	131,553		
		Project Control	Unit rate	1	% of	3,132,204	31,322	90%	28,190	120%	37,586	9,397	32,888	1,566	32,888		
		WHS	Unit rate	1	% of	3,132,204	31,322	80%	25,058	140%	43,851	18,793	34,454	3,132	34,454		
		Environmental	Unit rate	1	% of	3,132,204	31,322	90%	28,190	120%	37,586	9,397	32,888	1,566	32,888		
		Operations and Maintenance	Unit rate	1	% of	3,132,204	31,322	90%	28,190	120%	37,586	9,397	32,888	1,566	32,888		
		Inspections	Unit rate	2	% of	3,132,204	62,644	90%	56,380	120%	75,173	18,793	65,776	3,132	65,776		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Construction Management	[Q]				313,220		278,766		382,129	103,363	330,448	17,227	330,448		
		Principal Supplied Materials	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Disposal Levy of cut material (contaminated)	Unit rate	-	m3	288	-	90%	-	120%	-	-	-	-	-		assumed levy not applying due to treatment at site and consider they are clean fill
		Construction Licences (Private Land Access)	Unit rate	1	Lump sum	15,000	15,000	90%	13,500	120%	18,000	4,500	15,750	750	15,750		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Principal Supplied Materials	[R]				15,000		13,500		18,000	4,500	15,750	750	15,750		
		Total Delivery Cost							2,711,899		4,912,476	2,200,578	3,812,188	366,763	3,812,188		
		Base Estimate- Delivery (HW costs + construction cost)	[S]			[P+Q+R]	3,460,425										
		Contingency - Inherent Risk	[T]				366,763	11%									
		Most Likely Delivery Cost	[U]			[S+T]	3,827,188										
		Contingency - Contingent Risk	loading factor	28	% of	3,460,425	968,919	28%									
		Base Estimate + Contingency (Inherent + Contingent)					4,796,106	39%									
		Total Project Cost															
		Base Estimate- Total Project (HW costs + construction cost)	[V]			[I+S]	3,836,098										
		Contingency - Inherent Risk - identified	[W]			[J+T]	376,155	9.8%									
		Contingency - Inherent Risk - additional strategic calculated					467,787	12.2%		Calculated inherent Risk			22%				
		Most Likely Project Cost	[X]			[V+W]	4,680,040										
		Contingency - Contingent Risk	[Y]				1,074,108	28.0%		Calculated Contingent Risk			28%				
		Base Estimate + Contingency (Inherent + Contingent)	[Z]				5,754,148	50.0%		Calculated Strategic Contingency			50%				
		Total contingency					1,918,049										
		Most Likely Estimate (rounded)					4,690,000										
		Control Estimate					5,754,148										
		Control Estimate (rounded)					5,760,000									2.54	
		Portfolio estimate					4,690,000										

Last CPI update Dec 2020

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total	check = 0	Total	Check = 0
Inflation %	1.9%	2.1%	1.6%	-0.35%	1.00%	1.3%	1.50%	1.50%	1.8%	2.0%	2.25%	2.50%	2.5%	2.5%				
Annual Index Number	110.7	113.0	114.8	114.4	115.5	117.0	118.7	120.5	122.6	125.1	127.9	131.1	134.4	137.7				

Estimate (real) Unit Scale 1 Base year 20/21 Index for base year 115.5

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total	check = 0	Total	Check = 0
Development					1,000.0										1,000.0	- 489,254.4		
Delivery															-	- 4,796,106.45		
Total	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-	1,000	- 5,753,148		
Adjustment Factor	0.96	0.98	0.99	0.99	1.00	1.01	1.03	1.04	1.06	1.08	1.11	1.13	1.16	1.19				
Nominal Estimate																		
Development	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-				
Delivery	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Total	-	-	-	-	1,000.0	-	-	-	-	-	-	-	-	-				
N.B. Inflation Allowance	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Agreed inflation allowance																		

Summary
Development Contracts
Delivery Contracts

Hunter Water Costs	348,437
Sub total	
Inherent Risk	
Contingent Risk	
Control Estimate	

	Most Likely	%
Loading factor	1,343,354	34%
Unit rate	2,597,934	66%
First principles	-	0%
Total	3,941,287	100%
Check = 0	- 0	

Capital Project Estimate

Project Scope Definition

Option	Campvale Canal Options - Option 2b
Project	Campvale Canal Options
Cap. No.	{Cap no.}
Estimator	Howard Chinn / JACOBS (Wherever Blue Text)
Reviewer 1 - BC team leader	
Reviewer 2 - ID project controller	
Reviewer 3 - Peer review	
Reviewer 4 - Manager ID	
Approval	
Date of estimate	22/07/2021
Estimate Base year	2021-22
Project Risk	Low
Purpose of Estimate	Options estimate
Project Type	2

Cost	Network	Treatment	Unique
<=$3.0m	3 (low)	2 (medium)	2 (medium)
>$3m	2 (medium)	1 (high)	1 (high)
>$10m	1 (high)	1 (high)	1 (high)

Physical Scope

Add/delete scope rows as required

Scope Item	Scope Details
Item 1	Clean Out, Widen, and / or Deepen the Canal
Item 2	Brief description
Item 3	Brief description
Item 4	Brief description
Item X	Brief description

Estimate

Code	ID	Item	Method	Qty	Unit	Rate - $/ Unit	Most Likely (base)	Lowest %	Lowest $	Highest %	Highest $	range	mid point	Inherent Contingency $	Base Estimate + Inherent Contingency (range risk)	% of Most Likely Total Project Estimate	Comments
	1.0	**Concept Design**						%	$	%	$						
	1.01	Concept Design Consultancy	Loading factor	7	% of [N]	4,218,058	295,264	95%	280,501	110%	324,790	44,290	302,646	7,382	302,646		
	1.02	REF/ EIA	Loading factor	1	% of [N]	4,218,058	42,181	95%	40,072	110%	46,399	6,327	43,235	1,055	43,235		
	1.03	Specialist assessments	Loading factor		% of [N]	4,218,058	-		-		-	-	-	-	-		
	1.04	<>					-		-		-	-	-	-	-		
	1.05	**Subtotal Concept Development - external**	[A]				337,445		320,572		371,189	50,617	345,881	8,436	345,881		
	1.06	Project Management	Loading factor	5	% of [A]	337,445	16,872	95%	16,029	110%	18,559	2,531	17,294	422	17,294		
	1.07	Project Control	Loading factor	1	% of [A]	337,445	3,374	95%	3,206	110%	3,712	506	3,459	84	3,459		
	1.08	Project Support	Loading factor	3	% of [A]	337,445	10,123	95%	9,617	110%	11,136	1,519	10,376	253	10,376		
	1.09	Community Consultation	Unit rate	1	Lump sum	-	-	95%	-	110%	-	-	-	-	-		
	1.10	<>					-		-		-	-	-	-	-		
	1.11	**Subtotal Concept Development - Hunter Water costs**	[B]				30,370		28,852		33,407	4,556	31,129	759	31,129		
	1.12	**Subtotal Concept Development**	[C]			[A + B]	367,815		349,424		404,596	55,172	377,010	9,195	377,010		
	2	**Detail Design**															
	2.01	Detail Design Consultancy	Loading factor	7	% of [N]	4,218,058	295,264	95%	280,501	110%	324,790	44,290	302,646	7,382	302,646		
	2.02	<>	Unit rate	-	Lump sum		-		-		-	-	-	-	-		
	2.03	<>	Unit rate		wks		-		-		-	-	-	-	-		
	2.04	**Subtotal Detail Development - external**	[D]				295,264		280,501		324,790	44,290	302,646	7,382	302,646		
	3.00	Project Management	Loading factor	7.48	% of [D]	295,264	22,086	95%	20,981	110%	24,294	3,313	22,638	552	22,638		
	3.01	Project Control	Loading factor	3.30	% of [D]	295,264	9,744	95%	9,257	110%	10,718	1,462	9,987	244	9,987		
	3.02	Project Support	Loading factor	1.10	% of [D]	295,264	3,248	95%	3,086	110%	3,573	487	3,329	81	3,329		
	3.03	<>					-		-		-	-	-	-	-		
	3.04	**Subtotal Detail Development - Hunter Water costs**	[E]				35,077		33,324		38,585	5,262	35,954	877	35,954		
		Subtotal Detail Development	[F]			[D + E]	330,341		313,824		363,376	49,551	338,600	8,259	338,600		
		Land issues - development phase															
	4	Aquire land	Unit rate		Lump sum	-	-		-		-	-	-	-	-		
	4.01	Legal costs	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.02	Property management support	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.03	<>					-		-		-	-	-	-	-		
	4.04	**Subtotal land Issues**	[G]				-		-		-	-	-	-	-		
	4.05	**Other Hunter Water Costs - development phase**															
	5	<>	Unit rate	1	Lump sum	-	-	90%	-	120%	-	-	-	-	-		
	5.01	<>	Loading factor	-	% of	-	-	90%	-	120%	-	-	-	-	-		
	5.02	<>	Loading factor	5	% of	-	-	75%	-	150%	-	-	-	-	-		
	5.03	<>	Unit rate	1	Lump sum	-	-	75%	-	150%	-	-	-	-	-		
	5.04	<>					-		-	300%	-	-	-	-	-		
	5.05	**Subtotal Other Hunter Water Costs**	[H]				-		-		-	-	-	-	-		
		Total Development Costs					698,156		663,248		767,972	104,723	715,610	17,454	715,610		
		Base Estimate (HW costs + development cost)	[I]			[C+F+G+H]	698,156										
		Contingency - Inherent Risk	[J]				17,454	3%									
		Most Likely Development Cost	[K]			[I+J]	715,610										
		Contingency - Contingent Risk	loading factor	28	% of [I]	698,156	195,484	28%									
		Base Estimate + Contingency (Inherent + Contingent)	[L]				911,094	31%									
		Delivery															
		Contractors Direct Costs															
	1	Preparation and implementation of Construction Program	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.01	Preparation, Submission & Maintenance of Project OHS Mar	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.02	Preparation and updating of Quality Assurance documents.	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.03	Preparation, Submission & Maintenance of Project Environm	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.04	Site establishment	Unit rate	1	Lump sum	20,000	20,000	75%	15,000	150%	30,000	15,000	22,500	2,500	22,500		
	1.05	Site disestablishment	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.06	Provision of Work as Executed Drawings	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.07	Provision of Operations and Maintenance Manuals	Unit rate	1	Lump sum	2,500	2,500	75%	1,875	150%	3,750	1,875	2,813	313	2,813		
	1.08	Revise Automatic Control and Monitoring Manual	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.09	Training - Operation and Maintenance	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.10			-		-	-		-		-	-	-	-	-		
	1.11	**Scope item 1**					-		-		-	-	-	-	-		
	2.0	Clear and grub	Unit rate	10,219	m2	4.50	45,987	75%	34,490	150%	68,980	34,490	51,735	5,748	51,735		Narrow long site
	2.01	Removal of Trees	Unit rate	20	no.	1,800	36,000	75%	27,000	150%	54,000	27,000	40,500	4,500	40,500		allow for 20 as directed
	2.02	Cut (m3) material	Unit rate	21,500	m3	53.34	1,146,810	75%	860,108	150%	1,720,215	860,108	1,290,161	143,351	1,290,161		low productivity, long reach excavator, 25km cartage
	2.03	Treatment for ASS	Unit rate	21,500	m3	11.49	247,035	75%	185,276	150%	370,553	185,276	277,914	30,879	277,914		3% of lime
	2.04	Sub Consultant Testing and Reports	Unit rate	21,500	m3	13.66	293,690	75%	220,268	150%	440,535	220,268	330,401	36,711	330,401		Every 50m2 area testing
	2.05	Disposal of cut material (General Waste)	Unit rate	21,500	m3	74.87	1,609,705	75%	1,207,279	150%	2,414,558	1,207,279	1,810,918	201,213	1,810,918		\$30 tip fee per tonne
	2.06	Topsoil batters	Unit rate	27,500	m2	13.26	364,650	75%	273,488	150%	546,975	273,488	410,231	45,581	410,231		\$80m^3 x 100mm Thk plus spread
	2.07	Jute mesh stabilisation of batters	Unit rate	27,500	m2	9.88	271,700	75%	203,775	150%	407,550	203,775	305,663	33,963	305,663		Previous Project rate, adjusted for low productivity
	2.08	Hydroseed batters	Unit rate	27,500	m2	3.11	85,525	75%	64,144	150%	128,288	64,144	96,216	10,691	96,216		Previous Project rate adjusted for low productivity
	2.09	Reconstruct access road - 150mm road base material	Unit rate	360	m3	123.49	44,456	75%	33,342	150%	66,685	33,342	50,013	5,557	50,013		Previous Project rate adjusted for low productivity
	2.10		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	2.11		Unit rate		Centrifuges		-	80%	-	140%	-	-	-	-	-		
	3.0	**Pumpstation and Pipeline**	Unit rate				-	0%	-	300%	-	-	-	-	-		
	3.01	\$ Carried Fwd from Option 3	Unit rate	-	Lump sum	3,951,069	-	90%	-	120%	-	-	-	-	-		Refer Option 3 for breakdown
	3.02		Unit rate		Lump sum		-	0%	-	300%	-	-	-	-	-		
	4.0	**General civil work**					-		-		-	-	-	-	-		
	4.01		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	4.02		Unit rate		m		-	80%	-	140%	-	-	-	-	-		
		Sub total (items 1-4)	[M]				4,218,058		3,163,544		6,327,087	3,163,544	4,745,316	527,257	4,745,316		
	5.0	**Electricals, instrumentation and control**	Loading Factor	-	% of [Item 1]	4,145,558	-	0%	-	300%	-	-	-	-	-		All EI&C incl in Pumps Station Value
	6.0	**Plant commissioning costs**	Unit rate	-	% of PS	3,951,069	-	90%	-	120%	-	-	-	-	-		incl in Pumpstation value above
		Subtotal Contractors Direct Costs	[N]				4,218,058		3,163,544		6,327,087	3,163,544	4,745,316	527,257	4,745,316		
		Contractors indirect Costs															
		On-site	Loading Factor	20	% of	4,218,058	843,612	80%	674,889	140%	1,181,056	506,167	927,973	84,361	927,973		
		Contractor's offsite overhead and margin	Loading Factor	15	% of	5,061,670	759,250	90%	683,325	120%	911,101	227,775	797,213	37,963	797,213		
		Subtotal Contractors Indirect Costs	[O]				1,602,862		1,358,215		2,092,157	733,942	1,725,186	122,324	1,725,186		
		Total Construction Cost	[P]			[N+O]	5,820,920		4,521,758		8,419,244	3,897,486	6,470,501	649,581	6,470,501		
		Construction Management															
		Project Management	Unit rate	4	% of	5,820,920	232,837	90%	209,553	120%	279,404	69,851	244,479	11,642	244,479		
		Project Control	Unit rate	1	% of	5,820,920	58,209	90%	52,388	120%	69,851	17,463	61,120	2,910	61,120		
		WHS	Unit rate	1	% of	5,820,920	58,209	80%	46,567	140%	81,493	34,926	64,030	5,821	64,030		
		Environmental	Unit rate	1	% of	5,820,920	58,209	90%	52,388	120%	69,851	17,463	61,120	2,910	61,120		
		Operations and Maintenance	Unit rate	1	% of	5,820,920	58,209	90%	52,388	120%	69,851	17,463	61,120	2,910	61,120		
		Inspections	Unit rate	2	% of	5,820,920	116,418	90%	104,777	120%	139,702	34,926	122,239	5,821	122,239		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Construction Management	[Q]				582,092		518,062		710,152	192,090	614,107	32,015	614,107		
		Principal Supplied Materials	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Disposal Levy of cut material (contaminated)	Unit rate	-	m3	288	-	90%	-	120%	-	-	-	-	-		assumed levy not applying due to treatment at site and consider they are clean fill
		Construction Licences (Private Land Access)	Unit rate	1	Lump sum	15,000	15,000	90%	13,500	120%	18,000	4,500	15,750	750	15,750		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Principal Supplied Materials	[R]				15,000		13,500		18,000	4,500	15,750	750	15,750		
		Total Delivery Cost							5,039,820		9,129,397	4,089,576	7,084,608	681,596	7,084,608		
		Base Estimate- Delivery (HW costs + construction cost)	[S]			[P+Q+R]	6,418,012										
		Contingency - Inherent Risk	[T]				681,596	11%									
		Most Likely Delivery Cost	[U]			[S+T]	7,099,608										
		Contingency - Contingent Risk	loading factor	28	% of	6,418,012	1,797,043	28%									
		Base Estimate + Contingency (Inherent + Contingent)					8,896,652	39%									

Total Project Cost

Base Estimate- Total Project (HW costs + construction cost	[V]	[I+S]	7,116,169			
Contingency - Inherent Risk - identified	[W]	[J+T]	699,050	9.8%		
Contingency - Inherent Risk - additional strategic calculated			866,507	12.2%	Calculated inherent Risk	22%
Most Likely Project Cost	[X]	[V+W]	8,681,726			
Contingency - Contingent Risk	[Y]		1,992,527	28.0%	Calculated Contingent Risk	28%
Base Estimate + Contingency (Inherent + Contingent)	[Z]		10,674,253	50.0%	Calculated Strategic Contingency	50%
Total contingency			2,691,577			

Most Likely Estimate (rounded)	8,690,000	
Control Estimate	10,674,253	
Control Estimate (rounded)	10,680,000	2.53
Portfolio estimate	8,690,000	

Last CPI update Dec 2020

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total	check = 0		Total	Check = 0
Inflation %	1.9%	2.1%	1.6%	-0.35%	1.00%	1.3%	1.50%	1.50%	1.8%	2.0%	2.25%	2.50%	2.5%	2.5%					
Annual Index Number	110.7	113.0	114.8	114.4	115.5	117.0	118.7	120.5	122.6	125.1	127.9	131.1	134.4	137.7					

Estimate (real) Unit Scale 1 Base year 20/21 Index for base year 115.5

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total	check = 0	
Development					1,000.0										1,000.0	-	910,093.7
Delivery															-	-	8,896,651.93
Total	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-	1,000	-	10,673,253
Adjustment Factor	0.96	0.98	0.99	0.99	1.00	1.01	1.03	1.04	1.06	1.08	1.11	1.13	1.16	1.19			

Nominal Estimate

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Development	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-
Delivery	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	1,000.0	-	-	-	-	-	-	-	-	-
N.B. Inflation Allowance	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agreed inflation allowance														

Summary
Development Contracts
Delivery Contracts

Hunter Water Costs	647,539
Sub total	
Inherent Risk	
Contingent Risk	
Control Estimate	

	Most Likely	%
Loading factor	2,496,502	34%
Unit rate	4,815,150	66%
First principles	-	0%
Total	7,311,652	100%
Check = 0	0	

Capital Project Estimate

Project Scope Definition

Option	Campvale Canal Options - Option 2c
Project	Campvale Canal Options
Cap. No.	{Cap no.}
Estimator	Howard Chinn / JACOBS (Wherever Blue Text)
Reviewer 1 - BC team leader	
Reviewer 2 - ID project controller	
Reviewer 3 - Peer review	
Reviewer 4 - Manager ID	
Approval	
Date of estimate	21/07/2021
Estimate Base year	2020-21
Project Risk	Low
Purpose of Estimate	Options estimate
Project Type	1

Cost	Network	Treatment	Unique
<=$3.0m	3 (low)	2 (medium)	2 (medium)
>$3m	2 (medium)	1 (high)	1 (high)
>$10m	1 (high)	1 (high)	1 (high)

Physical Scope

Add/delete scope rows as required

Scope Item	Scope Details
Item 1	Clean Out, Widen, and / or Deepen the Canal
Item 2	Brief description
Item 3	Brief description
Item 4	Brief description
Item X	Brief description

Estimate

Code	ID	Item	Method	Qty	Unit	Rate - $/ Unit	Most Likely (base)	Lowest %	Lowest $	Highest %	Highest $	range	mid point	Inherent Contingency $	Base Estimate + Inherent Contingency (range risk)	% of Most Likely Total Project Estimate	Comments
	1.0	**Concept Design**						%	$	%	$						
	1.01	Concept Design Consultancy	Loading factor	7	% of [N]	3,341,062	233,874	95%	222,181	110%	257,262	35,081	239,721	5,847	239,721		
	1.02	REF/ EIA	Loading factor	1	% of [N]	3,341,062	33,411	95%	31,740	110%	36,752	5,012	34,246	835	34,246		
	1.03	Specialist assessments	Loading factor		% of [N]	3,341,062	-		-		-	-	-	-	-		
	1.04	<>					-		-		-	-	-	-	-		
	1.05	**Subtotal Concept Development - external**	[A]				267,285		253,921		294,013	40,093	273,967	6,682	273,967		
	1.06	Project Management	Loading factor	5	% of [A]	267,285	13,364	95%	12,696	110%	14,701	2,005	13,698	334	13,698		
	1.07	Project Control	Loading factor	1	% of [A]	267,285	2,673	95%	2,539	110%	2,940	401	2,740	67	2,740		
	1.08	Project Support	Loading factor	3	% of [A]	267,285	8,019	95%	7,618	110%	8,820	1,203	8,219	200	8,219		
	1.09	Community Consultation	Unit rate	1	Lump sum	10,000	10,000	95%	9,500	110%	11,000	1,500	10,250	250	10,250		
	1.10	<>					-		-		-	-	-	-	-		
	1.11	**Subtotal Concept Development - Hunter Water costs**	[B]				34,056		32,353		37,461	5,108	34,907	851	34,907		
	1.12	**Subtotal Concept Development**	[C]			[A + B]	301,341		286,274		331,475	45,201	308,874	7,534	308,874		
	2	**Detail Design**															
	2.01	Detail Design Consultancy	Loading factor	7	% of [N]	3,341,062	233,874	95%	222,181	110%	257,262	35,081	239,721	5,847	239,721		
	2.02	<>	Unit rate	-	Lump sum		-		-		-	-	-	-	-		
	2.03	<>	Unit rate		wks		-		-		-	-	-	-	-		
	2.04	**Subtotal Detail Development - external**	[D]				233,874		222,181		257,262	35,081	239,721	5,847	239,721		
	3.00	Project Management	Loading factor	7.48	% of [D]	233,874	17,494	95%	16,619	110%	19,243	2,624	17,931	437	17,931	7.5%	
	3.01	Project Control	Loading factor	3.30	% of [D]	233,874	7,718	95%	7,332	110%	8,490	1,158	7,911	193	7,911	3.3%	
	3.02	Project Support	Loading factor	1.10	% of [D]	233,874	2,573	95%	2,444	110%	2,830	386	2,637	64	2,637	1.1%	
	3.03	<>					-		-		-	-	-	-	-		
	3.04	**Subtotal Detail Development - Hunter Water costs**	[E]				27,784		26,395		30,563	4,168	28,479	695	28,479		
		Subtotal Detail Development	[F]			[D + E]	261,659		248,576		287,825	39,249	268,200	6,541	268,200		
		Land issues - development phase															
	4	Aquire land	Unit rate		Lump sum	-	-		-		-	-	-	-	-		
	4.01	Legal costs	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.02	Property management support	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.03	<>					-		-		-	-	-	-	-		
	4.04	**Subtotal land Issues**	[G]				-		-		-	-	-	-	-		
	4.05	**Other Hunter Water Costs - development phase**															
	5.05	**Subtotal Other Hunter Water Costs**	[H]				-		-		-	-	-	-	-		
		Total Development Costs					562,999		534,849		619,299	84,450	577,074	14,075	577,074		
		Base Estimate (HW costs + development cost)	[I]			[C+F+G+H]	562,999										
		Contingency - Inherent Risk	[J]				14,075	3%									
		Most Likely Development Cost	[K]			[I+J]	577,074										
		Contingency - Contingent Risk	loading factor	28	% of [I]	562,999	157,640	28%									
		Base Estimate + Contingency (Inherent + Contingent)	[L]				734,714	31%									
		Delivery															
		Contractors Direct Costs															
	1	Preparation and implementation of Construction Program	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.01	Preparation, Submission & Maintenance of Project OHS Mar	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.02	Preparation and updating of Quality Assurance documents. a	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.03	Preparation, Submission & Maintenance of Project Environm	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.04	Site establishment	Unit rate	1	Lump sum	20,000	20,000	75%	15,000	150%	30,000	15,000	22,500	2,500	22,500		
	1.05	Site disestablishment	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.06	Provision of Work as Executed Drawings	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.07	Provision of Operations and Maintenance Manuals	Unit rate	1	Lump sum	2,500	2,500	75%	1,875	150%	3,750	1,875	2,813	313	2,813		
	1.08	Revise Automatic Control and Monitoring Manual	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.09	Training - Operation and Maintenance	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.10			-		-	-		-		-	-	-	-	-		
	1.11	**Scope item 1**					-		-		-	-	-	-	-		
	2.0	Clear and grub	Unit rate	9,711	m2	4.50	43,700	75%	32,775	150%	65,549	32,775	49,162	5,462	49,162		Narrow long site
	2.01	Removal of Trees	Unit rate	20	no.	1,800	36,000	75%	27,000	150%	54,000	27,000	40,500	4,500	40,500		allow for 20 as directed
	2.02	Cut (m3) material	Unit rate	16,300	m3	53.34	869,442	75%	652,082	150%	1,304,163	652,082	978,122	108,680	978,122		low productivity, long reach excavator, 25km cartage
	2.03	Treatment for ASS	Unit rate	16,300	m3	11.49	187,287	75%	140,465	150%	280,931	140,465	210,698	23,411	210,698		3% of lime
	2.04	Sub Consultant Testing and Reports	Unit rate	16,300	m3	13.66	222,658	75%	166,994	150%	333,987	166,994	250,490	27,832	250,490		Every 50m2 area testing
	2.05	Disposal of cut material (General Waste)	Unit rate	16,300	m3	74.87	1,220,381	75%	915,286	150%	1,830,572	915,286	1,372,929	152,548	1,372,929		$30 tip fee per tonne
	2.06	Topsoil batters	Unit rate	24,600	m2	13.26	326,196	75%	244,647	150%	489,294	244,647	366,971	40,775	366,971		$80m³ x 100mm Thk plus spread
	2.07	Jute mesh stabilisation of batters	Unit rate	24,600	m2	9.88	243,048	75%	182,286	150%	364,572	182,286	273,429	30,381	273,429		Previous Project rate, adjusted for low productivity
	2.08	Hydroseed batters	Unit rate	24,600	m2	3.11	76,506	75%	57,380	150%	114,759	57,380	86,069	9,563	86,069		Previous Project rate adjusted for low productivity
	2.09	Reconstruct access road - 150mm road base material	Unit rate	351	m3	123.49	43,345	75%	32,509	150%	65,017	32,509	48,763	5,418	48,763		Previous Project rate adjusted for low productivity
	2.10		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	2.11		Unit rate		Centrifuges		-	80%	-	140%	-	-	-	-	-		
	3.0	**Pumpstation and Pipeline**	Unit rate				-	0%	-	300%	-	-	-	-	-		
	3.01	$ Carried Fwd from Option 3	Unit rate	-	Lump sum	3,951,069	-	90%	-	120%	-	-	-	-	-		Refer Option 3 for breakdown
	3.02		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	4.0	**General civil work**					-		-		-	-	-	-	-		
	4.01		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	4.02		Unit rate		m		-	80%	-	140%	-	-	-	-	-		
		Sub total (items 1-4)	[M]				3,341,062		2,505,797		5,011,594	2,505,797	3,758,695	417,633	3,758,695		
	5.0	**Electricals, instrumentation and control**	Loading Factor	-	% of [Item 1]	3,268,562	-	0%	-	300%	-	-	-	-	-		All EI&C incl in Pumps Station Value
	6.0	**Plant commissioning costs**	Unit rate	-	% of PS	3,951,069	-	90%	-	120%	-	-	-	-	-		incl in Pumpstation value above
		Subtotal Contractors Direct Costs	[N]				3,341,062		2,505,797		5,011,594	2,505,797	3,758,695	417,633	3,758,695		
		Contractors indirect Costs															
		On-site	Loading Factor	20	% of	3,341,062	668,212	80%	534,570	140%	935,497	400,927	735,034	66,821	735,034		
		Contractor's offsite overhead and margin	Loading Factor	15	% of	4,009,275	601,391	90%	541,252	120%	721,669	180,417	631,461	30,070	631,461		
		Subtotal Contractors Indirect Costs	[O]				1,269,604		1,075,822		1,657,167	581,345	1,366,495	96,891	1,366,495		
		Total Construction Cost	[P]			[N+O]	4,610,666		3,581,619		6,668,761	3,087,142	5,125,190	514,524	5,125,190		
		Construction Management															
		Project Management	Unit rate	4	% of	4,610,666	184,427	90%	165,984	120%	221,312	55,328	193,648	9,221	193,648		
		Project Control	Unit rate	1	% of	4,610,666	46,107	90%	41,496	120%	55,328	13,832	48,412	2,305	48,412		
		WHS	Unit rate	1	% of	4,610,666	46,107	80%	36,885	140%	64,549	27,664	50,717	4,611	50,717		
		Environmental	Unit rate	1	% of	4,610,666	46,107	90%	41,496	120%	55,328	13,832	48,412	2,305	48,412		
		Operations and Maintenance	Unit rate	1	% of	4,610,666	46,107	90%	41,496	120%	55,328	13,832	48,412	2,305	48,412		
		Inspections	Unit rate	2	% of	4,610,666	92,213	90%	82,992	120%	110,656	27,664	96,824	4,611	96,824		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Construction Management	[Q]				461,067		410,349		562,501	152,152	486,425	25,359	486,425		
		Principal Supplied Materials	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Disposal Levy of cut material (contaminated)	Unit rate	-	m3	288	-	90%	-	120%	-	-	-	-	-		$160 Cat 2 Levy + Cartage per tonne if not treated first
		Construction Licences (Private Land Access)	Unit rate	1	Lump sum	15,000	15,000	90%	13,500	120%	18,000	4,500	15,750	750	15,750		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Principal Supplied Materials	[R]				15,000		13,500		18,000	4,500	15,750	750	15,750		
		Total Delivery Cost							3,991,968		7,231,262	3,239,294	5,611,615	539,882	5,611,615		
		Base Estimate- Delivery (HW costs + construction cost)	[S]			[P+Q+R]	5,086,733										
		Contingency - Inherent Risk	[T]				539,882	11%									
		Most Likely Delivery Cost	[U]			[S+T]	5,626,615										
		Contingency - Contingent Risk	loading factor	28	% of	5,086,733	1,424,285	28%									
		Base Estimate + Contingency (Inherent + Contingent)					7,050,900	39%									
		Total Project Cost															
		Base Estimate- Total Project (HW costs + construction cost'	[V]			[I+S]	5,649,732										
		Contingency - Inherent Risk - identified	[W]			[J+T]	553,957	9.8%									
		Contingency - Inherent Risk - additional strategic calculated					688,984	12.2%		Calculated inherent Risk			22%				
		Most Likely Project Cost	[X]			[V+W]	6,892,673										
		Contingency - Contingent Risk	[Y]				1,581,925	28.0%		Calculated Contingent Risk			28%				
		Base Estimate + Contingency (Inherent + Contingent)	[Z]				8,474,598	50.0%		Calculated Strategic Contingency			50%				
		Total contingency					2,135,882										
		Most Likely Estimate (rounded)					6,900,000										
		Control Estimate					8,474,598										
		Control Estimate (rounded)					8,480,000									2.54	
		Portfolio estimate					6,900,000										

Last CPI update Dec 2020

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total	check = 0		Total	Check = 0
Inflation %	1.9%	2.1%	1.6%	-0.35%	1.00%	1.3%	1.50%	1.50%	1.8%	2.0%	2.25%	2.50%	2.5%	2.5%					
Annual Index Number	110.7	113.0	114.8	114.4	115.5	117.0	118.7	120.5	122.6	125.1	127.9	131.1	134.4	137.7					
Estimate (real)		Unit Scale	1		Base year	20/21			Index for base year	115.5									
Development					1,000.0										1,000.0	-	733,714.1		
Delivery															-	-	7,050,900.35		
Total	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-	1,000	-	8,473,598		
Adjustment Factor	0.96	0.98	0.99	0.99	1.00	1.01	1.03	1.04	1.06	1.08	1.11	1.13	1.16	1.19					
Nominal Estimate																			
Development	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-					
Delivery	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Total	-	-	-	-	1,000.0	-	-	-	-	-	-	-	-	-					
N.B. Inflation Allowance	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Agreed inflation allowance																			

Summary	
Development Contracts	
Delivery Contracts	
Hunter Water Costs	522,907
Sub total	
Inherent Risk	
Contingent Risk	
Control Estimate	

	Most Likely	**%**
Loading factor	1,980,243	34%
Unit rate	3,827,129	66%
First principles	-	0%
Total	5,807,372	100%
Check = 0	-	

Capital Project Estimate

Project Scope Definition

Option: Campvale Canal Options - Option 2e
Project: Campvale Canal Options
Cap. No.: {Cap no.}
Estimator: Howard Chinn / JACOBS (Wherever Blue Text)
Reviewer 1 - BC team leader
Reviewer 2 - ID project controller
Reviewer 3 - Peer review
Reviewer 4 - Manager ID
Approval

Date of estimate: 21/07/2021

Estimate Base year: 2020-21

Project Risk: Low

Purpose of Estimate: Options estimate

Project Type: 1

Cost	Network	Treatment	Unique
<=$3.0m	3 (low)	2 (medium)	2 (medium)
>$3m	2 (medium)	1 (high)	1 (high)
>$10m	1 (high)	1 (high)	1 (high)

Physical Scope

Add/delete scope rows as required

Scope Item	Scope Details
Item 1	Clean Out, Widen, and / or Deepen the Canal
Item 2	Brief description
Item 3	Brief description
Item 4	Brief description
Item X	Brief description

Estimate

Code	ID	Item	Method	Qty	Unit	Rate - $/ Unit	Most Likely (base)	Lowest %	Lowest $	Highest %	Highest $	range	mid point	Inherent Contingency $	Base Estimate + Inherent Contingency (range risk)	% of Most Likely Total Project Estimate	Comments
	1.0	**Concept Design**						%	$	%	$						
	1.01	Concept Design Consultancy	Loading factor	7	% of [N]	3,499,147	244,940	95%	232,693	110%	269,434	36,741	251,064	6,124	251,064		
	1.02	REF/ EIA	Loading factor	1	% of [N]	3,499,147	34,991	95%	33,242	110%	38,491	5,249	35,866	875	35,866		
	1.03	Specialist assessments	Loading factor		% of [N]	3,499,147	-		-		-	-	-	-	-		
	1.04	<>					-		-		-	-	-	-	-		
	1.05	**Subtotal Concept Development - external**	[A]				279,932		265,935		307,925	41,990	286,930	6,998	286,930		
	1.06	Project Management	Loading factor	5	% of [A]	279,932	13,997	95%	13,297	110%	15,396	2,099	14,347	350	14,347		
	1.07	Project Control	Loading factor	1	% of [A]	279,932	2,799	95%	2,659	110%	3,079	420	2,869	70	2,869		
	1.08	Project Support	Loading factor	3	% of [A]	279,932	8,398	95%	7,978	110%	9,238	1,260	8,608	210	8,608		
	1.09	Community Consultation	Unit rate	1	Lump sum	10,000	10,000	95%	9,500	110%	11,000	1,500	10,250	250	10,250		
	1.10	<>					-		-		-	-	-	-	-		
	1.11	**Subtotal Concept Development - Hunter Water costs**	[B]				35,194		33,434		38,713	5,279	36,074	880	36,074		
	1.12	**Subtotal Concept Development**	[C]			[A + B]	315,126		299,369		346,638	47,269	323,004	7,878	323,004		
	2	**Detail Design**															
	2.01	Detail Design Consultancy	Loading factor	7	% of [N]	3,499,147	244,940	95%	232,693	110%	269,434	36,741	251,064	6,124	251,064		
	2.02	<>	Unit rate	-	Lump sum		-		-		-	-	-	-	-		
	2.03	<>	Unit rate		wks		-		-		-	-	-	-	-		
	2.04	**Subtotal Detail Development - external**	[D]				244,940		232,693		269,434	36,741	251,064	6,124	251,064		
	3.00	Project Management	Loading factor	7.48	% of [D]	244,940	18,322	95%	17,405	110%	20,154	2,748	18,780	458	18,780	7.5%	
	3.01	Project Control	Loading factor	3.30	% of [D]	244,940	8,083	95%	7,679	110%	8,891	1,212	8,285	202	8,285	3.3%	
	3.02	Project Support	Loading factor	1.10	% of [D]	244,940	2,694	95%	2,560	110%	2,964	404	2,762	67	2,762	1.1%	
	3.03	<>					-		-		-	-	-	-	-		
	3.04	**Subtotal Detail Development - Hunter Water costs**	[E]				29,099		27,644		32,009	4,365	29,826	727	29,826		
		Subtotal Detail Development	[F]			[D + E]	274,039		260,337		301,443	41,106	280,890	6,851	280,890		
		Land issues - development phase															
	4	Aquire land	Unit rate		Lump sum	-	-		-		-	-	-	-	-		
	4.01	Legal costs	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.02	Property management support	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.03	<>					-		-		-	-	-	-	-		
	4.04	**Subtotal land Issues**	[G]				-		-		-	-	-	-	-		
	4.05	**Other Hunter Water Costs - development phase**															
	5.05	**Subtotal Other Hunter Water Costs**	[H]				-		-		-	-	-	-	-		
		Total Development Costs					589,165		559,707		648,081	88,375	603,894	14,729	603,894		
		Base Estimate (HW costs + development cost)	[I]			[C+F+G+H]	589,165										
		Contingency - Inherent Risk	[J]				14,729	3%									
		Most Likely Development Cost	[K]			[I+J]	603,894										
		Contingency - Contingent Risk	loading factor	28	% of [I]	589,165	164,966	28%									
		Base Estimate + Contingency (Inherent + Contingent)	[L]				768,860	31%									
		Delivery															
		Contractors Direct Costs															
	1	Preparation and implementation of Construction Program	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.01	Preparation, Submission & Maintenance of Project OHS Mar	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.02	Preparation and updating of Quality Assurance documents. a	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.03	Preparation. Submission & Maintenance of Project Environm	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.04	Site establishment	Unit rate	1	Lump sum	20,000	20,000	75%	15,000	150%	30,000	15,000	22,500	2,500	22,500		
	1.05	Site disestablishment	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.06	Provision of Work as Executed Drawings	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.07	Provision of Operations and Maintenance Manuals	Unit rate	1	Lump sum	2,500	2,500	75%	1,875	150%	3,750	1,875	2,813	313	2,813		
	1.08	Revise Automatic Control and Monitoring Manual	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.09	Training - Operation and Maintenance	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.10			-		-	-		-		-	-	-	-	-		
	1.11	**Scope item 1**					-		-		-	-	-	-	-		
	2.0	Clear and grub	Unit rate	11,158	m2	4.50	50,211	75%	37,658	150%	75,316	37,658	56,487	6,276	56,487		Narrow long site
	2.01	Removal of Trees	Unit rate	20	no.	1,800	36,000	75%	27,000	150%	54,000	27,000	40,500	4,500	40,500		allow for 20 as directed
	2.02	Cut (m3) material	Unit rate	18,000	m3	53.34	960,120	75%	720,090	150%	1,440,180	720,090	1,080,135	120,015	1,080,135		low productivity, long reach excavator, 25km cartage
	2.03	Treatment for ASS	Unit rate	18,000	m3	11.49	206,820	75%	155,115	150%	310,230	155,115	232,673	25,853	232,673		3% of lime
	2.04	Sub Consultant Testing and Reports	Unit rate	18,000	m3	13.66	245,880	75%	184,410	150%	368,820	184,410	276,615	30,735	276,615		Every 50m2 area testing
	2.05	Disposal of cut material (General Waste)	Unit rate	18,000	m3	74.87	1,347,660	75%	1,010,745	150%	2,021,490	1,010,745	1,516,118	168,458	1,516,118		$30 tip fee per tonne
	2.06	Topsoil batters	Unit rate	20,400	m2	13.26	270,504	75%	202,878	150%	405,756	202,878	304,317	33,813	304,317		$80m³ x 100mm Thk plus spread
	2.07	Jute mesh stabilisation of batters	Unit rate	20,400	m2	9.88	201,552	75%	151,164	150%	302,328	151,164	226,746	25,194	226,746		Previous Project rate, adjusted for low productivity
	2.08	Hydroseed batters	Unit rate	20,400	m2	3.11	63,444	75%	47,583	150%	95,166	47,583	71,375	7,931	71,375		Previous Project rate adjusted for low productivity
	2.09	Reconstruct access road - 150mm road base material	Unit rate	360	m3	123.49	44,456	75%	33,342	150%	66,685	33,342	50,013	5,557	50,013		Previous Project rate adjusted for low productivity
	2.10		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	2.11		Unit rate		Centrifuges		-	80%	-	140%	-	-	-	-	-		
	3.0	**Pumpstation and Pipeline**	Unit rate				-	0%	-	300%	-	-	-	-	-		
	3.01	$ Carried Fwd from Option 3	Unit rate	-	Lump sum	3,951,069	-	90%	-	120%	-	-	-	-	-		Refer Option 3 for breakdown
	3.02		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	4.0	**General civil work**					-		-		-	-	-	-	-		
	4.01		Unit rate		Lump sum		-	80%	-	140%	-	-	-	-	-		
	4.02		Unit rate		m		-	80%	-	140%	-	-	-	-	-		
		Sub total (items 1-4)	[M]				3,499,147		2,624,360		5,248,720	2,624,360	3,936,540	437,393	3,936,540		
	5.0	**Electricals, instrumentation and control**	Loading Factor	-	% of [Item 1]	3,426,647	-	0%	-	300%	-	-	-	-	-		All EI&C incl in Pumps Station Value
	6.0	**Plant commissioning costs**	Unit rate	-	% of PS	3,951,069	-	90%	-	120%	-	-	-	-	-		incl in Pumpstation value above
		Subtotal Contractors Direct Costs	[N]				3,499,147		2,624,360		5,248,720	2,624,360	3,936,540	437,393	3,936,540		
		Contractors indirect Costs															
		On-site	Loading Factor	20	% of	3,499,147	699,829	80%	559,864	140%	979,761	419,898	769,812	69,983	769,812		
		Contractor's offsite overhead and margin	Loading Factor	15	% of	4,198,976	629,846	90%	566,862	120%	755,816	188,954	661,339	31,492	661,339		
		Subtotal Contractors Indirect Costs	[O]				1,329,676		1,126,725		1,735,577	608,852	1,431,151	101,475	1,431,151		
		Total Construction Cost	[P]			[N+O]	4,828,823		3,751,086		6,984,297	3,233,212	5,367,691	538,869	5,367,691		
		Construction Management															
		Project Management	Unit rate	4	% of	4,828,823	193,153	90%	173,838	120%	231,783	57,946	202,811	9,658	202,811		
		Project Control	Unit rate	1	% of	4,828,823	48,288	90%	43,459	120%	57,946	14,486	50,703	2,414	50,703		
		WHS	Unit rate	1	% of	4,828,823	48,288	80%	38,631	140%	67,604	28,973	53,117	4,829	53,117		
		Environmental	Unit rate	1	% of	4,828,823	48,288	90%	43,459	120%	57,946	14,486	50,703	2,414	50,703		
		Operations and Maintenance	Unit rate	1	% of	4,828,823	48,288	90%	43,459	120%	57,946	14,486	50,703	2,414	50,703		
		Inspections	Unit rate	2	% of	4,828,823	96,576	90%	86,919	120%	115,892	28,973	101,405	4,829	101,405		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Construction Management	[Q]				482,882		429,765		589,116	159,351	509,441	26,559	509,441		
		Principal Supplied Materials	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Disposal Levy of cut material (contaminated)	Unit rate	-	m3	288	-	90%	-	120%	-	-	-	-	-		$160 Cat 2 Levy + Cartage per tonne if not treated first
		Construction Licences (Private Land Access)	Unit rate	1	Lump sum	15,000	15,000	90%	13,500	120%	18,000	4,500	15,750	750	15,750		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Principal Supplied Materials	[R]				15,000		13,500		18,000	4,500	15,750	750	15,750		
		Total Delivery Cost							4,180,851		7,573,414	3,392,563	5,877,132	565,427	5,877,132		
		Base Estimate- Delivery (HW costs + construction cost)	[S]			[P+Q+R]	5,326,705										
		Contingency - Inherent Risk	[T]				565,427	11%									
		Most Likely Delivery Cost	[U]			[S+T]	5,892,132										
		Contingency - Contingent Risk	loading factor	28	% of	5,326,705	1,491,477	28%									
		Base Estimate + Contingency (Inherent + Contingent)					7,383,610	39%									
		Total Project Cost															
		Base Estimate- Total Project (HW costs + construction cost'	[V]			[I+S]	5,915,870										
		Contingency - Inherent Risk - identified	[W]			[J+T]	580,156	9.8%									
		Contingency - Inherent Risk - additional strategic calculated					721,335	12.2%		Calculated inherent Risk			22%				
		Most Likely Project Cost	[X]			[V+W]	7,217,361										
		Contingency - Contingent Risk	[Y]				1,656,444	28.0%		Calculated Contingent Risk			28%				
		Base Estimate + Contingency (Inherent + Contingent)	[Z]				8,873,805	50.0%		Calculated Strategic Contingency			50%				
		Total contingency					2,236,600										
		Most Likely Estimate (rounded)					7,220,000										
		Control Estimate					8,873,805										
		Control Estimate (rounded)					8,880,000									2.54	
		Portfolio estimate					7,220,000										

Last CPI update Dec 2020

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total	check = 0		Total	Check = 0
Inflation %	1.9%	2.1%	1.6%	-0.35%	1.00%	1.3%	1.50%	1.50%	1.8%	2.0%	2.25%	2.50%	2.5%	2.5%					
Annual Index Number	110.7	113.0	114.8	114.4	115.5	117.0	118.7	120.5	122.6	125.1	127.9	131.1	134.4	137.7					

Estimate (real) Unit Scale 1 Base year 20/21 Index for base year 115.5

	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total	check = 0	
Development					1,000.0										1,000.0	-	767,860.1
Delivery															-	-	7,383,609.65
Total	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-	1,000	-	8,872,805
Adjustment Factor	0.96	0.98	0.99	0.99	1.00	1.01	1.03	1.04	1.06	1.08	1.11	1.13	1.16	1.19			
Nominal Estimate																	
Development	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-			
Delivery	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total	-	-	-	-	1,000.0	-	-	-	-	-	-	-	-	-			
N.B. Inflation Allowance	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Agreed inflation allowance																	

Summary	
Development Contracts	
Delivery Contracts	
Hunter Water Costs	547,175
Sub total	
Inherent Risk	
Contingent Risk	
Control Estimate	

	Most Likely	%
Loading factor	2,073,807	34%
Unit rate	4,007,029	66%
First principles	-	0%
Total	6,080,836	100%
Check = 0	-	

Capital Project Estimate

Project Scope Definition

Option	Campvale Canal Options - Option 3
Project	Campvale Canal Options
Cap. No.	{Cap no.}
Estimator	
Reviewer 1 - BC team leader	
Reviewer 2 - ID project controller	
Reviewer 3 - Peer review	
Reviewer 4 - Manager ID	
Approval	
Date of estimate	26/07/2021
Estimate Base year	2020-21
Project Risk	Medium
Purpose of Estimate	Options estimate
Project Type	2

Cost	Network	Treatment	Unique
<=$3.0m	3 (low)	2 (medium)	2 (medium)
>$3m	2 (medium)	1 (high)	1 (high)
>$10m	1 (high)	1 (high)	1 (high)

Physical Scope

Add/delete scope rows as required

Scope Item	Scope Details
Item 1	Pump around Pinchpoint
Item 2	Brief description
Item 3	Brief description
Item 4	Brief description
Item X	Brief description

Estimate

Code	ID	Item	Method	Qty	Unit	Rate - $/ Unit	Most Likely (base)	Lowest %	Lowest $	Highest %	Highest $	range	mid point	Inherent Contingency $	Base Estimate + Inherent Contingency (range risk)	% of Most Likely Total Project Estimate	Comments
	1.0	**Concept Design**						%	$	%	$						
	1.01	Concept Design Consultancy	Loading factor	7	% of [N]	3,951,069	276,575	95%	262,746	110%	304,232	41,486	283,489	6,914	283,489		
	1.02	REF/ EIA	Loading factor	1	% of [N]	3,951,069	39,511	95%	37,535	110%	43,462	5,927	40,498	988	40,498		
	1.03	Specialist assessments	Loading factor		% of [N]	3,951,069	-		-		-	-	-	-	-		
	1.04	<>					-		-		-	-	-	-	-		
	1.05	**Subtotal Concept Development - external**	[A]				316,086		300,281		347,694	47,413	323,988	7,902	323,988		
	1.06	Project Management	Loading factor	10	% of [A]	316,086	31,609	95%	30,028	110%	34,769	4,741	32,399	790	32,399		
	1.07	Project Control	Loading factor	4	% of [A]	316,086	12,643	95%	12,011	110%	13,908	1,897	12,960	316	12,960		
	1.08	Project Support	Loading factor	1	% of [A]	316,086	3,161	95%	3,003	110%	3,477	474	3,240	79	3,240		
	1.09	Community Consultation	Unit rate	1	Lump sum	20,000	20,000	95%	19,000	110%	22,000	3,000	20,500	500	20,500		
	1.10	<>					-		-		-	-	-	-	-		
	1.11	**Subtotal Concept Development - Hunter Water costs**	[B]				67,413		64,042		74,154	10,112	69,098	1,685	69,098		
	1.12	**Subtotal Concept Development**	[C]			[A + B]	383,498		364,323		421,848	57,525	393,086	9,587	393,086		
	2	**Detail Design**															
	2.01	Detail Design Consultancy	Loading factor	-	% of [N]	3,951,069	-	0%	-	0%	-	-	-	-	-		NIL procure as D&C
	2.02	<>	Unit rate	-	Lump sum		-		-		-	-	-	-	-		
	2.03	<>	Unit rate		wks		-		-		-	-	-	-	-		
	2.04	**Subtotal Detail Development - external**	[D]				-		-		-	-	-	-	-		NIL procure as D&C
	3.00	Project Management	Loading factor	-	% of [D]	-	-	0%	-	0%	-	-	-	-	-		
	3.01	Project Control	Loading factor	-	% of [D]	-	-	0%	-	0%	-	-	-	-	-		
	3.02	Project Support	Loading factor	-	% of [D]	-	-	0%	-	0%	-	-	-	-	-		
	3.03	<>					-		-		-	-	-	-	-		
	3.04	**Subtotal Detail Development - Hunter Water costs**	[E]				-		-		-	-	-	-	-		
		Subtotal Detail Development	[F]			[D + E]	-		-		-	-	-	-	-		
		Land issues - development phase															
	4	Aquire land	Unit rate	1	Lump sum	50,000	50,000	95%	47,500	110%	55,000	7,500	51,250	1,250	51,250		
	4.01	Legal costs	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.02	Property management support	Loading factor		% of	-	-		-		-	-	-	-	-		
	4.03	<>					-		-		-	-	-	-	-		
	4.04	**Subtotal land Issues**	[G]				50,000		47,500		55,000	7,500	51,250	1,250	51,250		
	4.05	**Other Hunter Water Costs - development phase**															
	5.05	**Subtotal Other Hunter Water Costs**	[H]				-		-		-	-	-	-	-		
		Total Development Costs					433,498		411,823		476,848	65,025	444,336	10,837	444,336		
		Base Estimate (HW costs + development cost)	[I]			[C+F+G+H]	433,498										
		Contingency - Inherent Risk	[J]				10,837	3%									
		Most Likely Development Cost	[K]			[I+J]	444,336										
		Contingency - Contingent Risk	loading factor	28	% of [I]	433,498	121,380	28%									
		Base Estimate + Contingency (Inherent + Contingent)	[L]				565,715	31%									
		Delivery															
		Contractors Direct Costs															
	1	Preparation and implementation of Construction Program	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.01	Preparation. Submission & Maintenance of Project OHS Mar	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.02	Preparation and updating of Quality Assurance documents, a	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.03	Preparation, Submission & Maintenance of Project Environm	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.04	Site establishment	Unit rate	1	Lump sum	20,000	20,000	75%	15,000	150%	30,000	15,000	22,500	2,500	22,500		
	1.05	Site disestablishment	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		
	1.06	Provision of Work as Executed Drawings	Unit rate	1	Lump sum	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		
	1.07	Provision of Operations and Maintenance Manuals	Unit rate	1	Lump sum	2,500	2,500	75%	1,875	150%	3,750	1,875	2,813	313	2,813		
	1.08	Revise Automatic Control and Monitoring Manual	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.09	Training - Operation and Maintenance	Unit rate	-	Lump sum	-	-	80%	-	140%	-	-	-	-	-		
	1.10		Unit rate				-		-		-	-	-	-	-		
	2.0	**Pumpstation**					-		-		-	-	-	-	-		
	2.01	Clear and grub	Unit rate	400	m2	5	1,800	75%	1,350	150%	2,700	1,350	2,025	225	2,025		Eng Qty
	2.02	Removal of Trees	Unit rate	6	no.	1,800	10,800	75%	8,100	150%	16,200	8,100	12,150	1,350	12,150		Assumption
	2.03	Cut (m3) material	Unit rate	100	m3	66.7	6,668	75%	5,001	150%	10,001	5,001	7,501	833	7,501		Assumption
	2.04	Treatment for ASS	Unit rate	100	m3	11.49	1,149	75%	862	150%	1,724	862	1,293	144	1,293		3% of lime
	2.05	Sub Consultant Testing and Reports	Unit rate	100	m3	13.66	1,366	75%	1,025	150%	2,049	1,025	1,537	171	1,537		Every 50m2 area testing
	2.06	Disposal of cut material (General Waste)	Unit rate	100	m3	74.87	7,487	75%	5,615	150%	11,231	5,615	8,423	936	8,423		$30 tip fee per tonne
	2.07	Ground Improvements	Unit rate	60	m3	120	7,200	75%	5,400	150%	10,800	5,400	8,100	900	8,100		Assumption
	2.08	Excavation of Foundations	Unit rate	6.6	m3	110	724	75%	543	150%	1,086	543	814	90	814		Measured
	2.09	Concrete Foundations - Pumpstation	Unit rate	6.6	m3	2,000	13,158	75%	9,869	150%	19,737	9,869	14,803	1,645	14,803		Measured
	2.10	Concrete Slab - Pumpstation	Unit rate	83.5	m3	2,200	183,678	75%	137,759	150%	275,517	137,759	206,638	22,960	206,638		Measured
	2.11	Excavation of Foundations - Diesel Bund	Unit rate	2.9	m3	90	258	75%	194	150%	388	194	291	32	291		Measured
	2.11	Concrete Slab - Diesel Bund	Unit rate	12.4	m3	2,000	24,840	75%	18,630	150%	37,260	18,630	27,945	3,105	27,945		Measured
	2.12	Concrete Pump Plinths	Unit rate	4.3	m3	2,200	9,504	75%	7,128	150%	14,256	7,128	10,692	1,188	10,692		Measured
	2.13	Building Structure incl Roof	Unit rate	-	m²		-	75%	-	150%	-	-	-	-	-		No Bldg
	2.14	Building Doors	Unit rate	-	ea		-	0%	-	300%	-	-	-	-	-		No Bldg
	2.15	Building Ventilation	Unit rate	-	ea		-	0%	-	300%	-	-	-	-	-		No Bldg
	2.16	Building Security	Unit rate	-	ea		-	0%	-	300%	-	-	-	-	-		No Bldg
	2.17	Building Light and Power	Unit rate	-	ea		-	0%	-	300%	-	-	-	-	-		No Bldg
	2.18	Supply Pumps	Unit rate	4	No.	119,714	478,856	90%	430,970	120%	574,627	143,657	502,799	23,943	502,799		Quote
	2.19	Unload and Depackage Pumps	Unit rate	8	Hrs	330	2,640	75%	1,980	150%	3,960	1,980	2,970	330	2,970		Estimated
	2.20	Install Pumps	Unit rate	48	Mhrs	90	4,320	75%	3,240	150%	6,480	3,240	4,860	540	4,860		Estimated
	2.21	Supply Diesel Tank - 10kL Self Bunded	Unit rate	1	No.	80,000	80,000	75%	60,000	150%	120,000	60,000	90,000	10,000	90,000		Assumption
	2.22	Unload and Depackage Diesel; Tank	Unit rate	4	Hrs	330	1,320	75%	990	150%	1,980	990	1,485	165	1,485		Estimated
	2.22	Install Diesel Pipework between Pumps and Tank	Unit rate	1	No.	35,000	35,000	75%	26,250	150%	52,500	26,250	39,375	4,375	39,375		Estimated
	2.23	Fence 2m tall w/ 3 strand barb wire	Unit rate	52	m	150	7,740	60%	4,644	180%	13,932	9,288	9,288	1,548	9,288		Assumption
	2.23	Personnel Gates	Unit rate	2	No.	1,500	3,000	60%	1,800	180%	5,400	3,600	3,600	600	3,600		Assumption
	2.24	Surface Finishes - Pumpstation	Unit rate	1	Lump sum	30,000	30,000	60%	18,000	180%	54,000	36,000	36,000	6,000	36,000		Assumption
	3.0	**Pipework - Pumpstation**	Unit rate				-	0%	-	300%	-	-	-	-	-		
	3.01	DN300 DICL PN35-Suction Pipe	Unit rate	4	No.	13,500	54,000	75%	40,500	150%	81,000	40,500	60,750	6,750	60,750		Eng Qty
	3.02	DN355 HDPE PN10 SDR 17-Discharge Pipe	Unit rate	4	No.	7,988	31,950	75%	23,963	150%	47,925	23,963	35,944	3,994	35,944		Eng Qty
	3.03	DN710 HDPE PN10 SDR 17-Discharge manifold	Unit rate	1	No.	59,750	59,750	75%	44,813	150%	89,625	44,813	67,219	7,469	67,219		Eng Qty
	3.04	DN710 HDPE PN10 SDR 17-Rising main section 1	Unit rate	-	m	-	-	75%	-	150%	-	-	-	-	-		Moved below
	3.05	DN300 Bellmouth-Suction pipes	Unit rate	4	No.	1,500	6,000	75%	4,500	150%	9,000	4,500	6,750	750	6,750		Eng Qty
	3.06	DN300 45° Bend-Suction pipes	Unit rate	10	No.	2,500	25,000	75%	18,750	150%	37,500	18,750	28,125	3,125	28,125		Eng Qty
	3.07	DN300 90° L/R bend-Suction pipes	Unit rate	20	No.	2,800	56,000	75%	42,000	150%	84,000	42,000	63,000	7,000	63,000		Eng Qty
	3.08	DN355 90° L/R bend-	Unit rate	3	No.	2,800	8,400	75%	6,300	150%	12,600	6,300	9,450	1,050	9,450		Eng Qty
	3.09	DN710 90° L/R bend-Discharge manifold	Unit rate	3	No.	8,500	25,500	75%	19,125	150%	38,250	19,125	28,688	3,188	28,688		Eng Qty
	3.10	DN710 Tee-	Unit rate	3	No.	12,500	37,500	75%	28,125	150%	56,250	28,125	42,188	4,688	42,188		Eng Qty
	3.11	DN710 Reducer-DN710 - DN355	Unit rate	4	No.	5,600	22,400	75%	16,800	150%	33,600	16,800	25,200	2,800	25,200		Eng Qty
	3.12	DN355 NRV-ON PUMP	Unit rate	4	No.	4,500	18,000	75%	13,500	150%	27,000	13,500	20,250	2,250	20,250		Eng Qty
	3.13	DN355 GATEVALVE-ON PUMP + AT TEE	Unit rate	8	No.	9,500	76,000	75%	57,000	150%	114,000	57,000	85,500	9,500	85,500		Eng Qty
	3.14	Structural Steel Pipe Supports	Unit rate	30	No.	1,250	36,875	75%	27,656	150%	55,313	27,656	41,484	4,609	41,484		Assumption
	3.15		Unit rate				-	0%	-	300%	-	-	-	-	-		
	4.0	**Pipeline**															
	4.01	DN710 HDPE PN10 SDR 17-Rising main section 1	Unit rate	1,200	m	1,290	1,547,520	75%	1,160,640	150%	2,321,280	1,160,640	1,740,960	193,440	1,740,960		Assumption
	4.02	Headwall and Apron	Unit rate	1	No.	5,000	5,000	75%	3,750	150%	7,500	3,750	5,625	625	5,625		Assumption
	4.03	Rip Rap Protection	Unit rate	24	m2	300	7,200	75%	5,400	150%	10,800	5,400	8,100	900	8,100		Assumption
	4.04	Make Good Channel at Discharge Site	Unit rate	1	Lump sum	15,000	15,000	75%	11,250	150%	22,500	11,250	16,875	1,875	16,875		Assumption
	4.05		Unit rate				-	0%	-	300%	-	-	-	-	-		
	5.0	**Concrete Well**					-	0%	-	300%	-	-	-	-	-		
	5.01	Excavation in Canal	Unit rate	90	m3	300	27,000	60%	16,200	180%	48,600	32,400	32,400	5,400	32,400		Assumption
	5.02	Temporary Works	Unit rate	1	Lump sum	50,000	50,000	60%	30,000	180%	90,000	60,000	60,000	10,000	60,000		Assumption
	5.03	Ground Improvements	Unit rate	1	Lump sum	50,000	50,000	60%	30,000	180%	90,000	60,000	60,000	10,000	60,000		Assumption
	5.04	Concrete Base - 500 Thk	Unit rate	3.5	m3	1,800	6,362	60%	3,817	180%	11,451	7,634	7,634	1,272	7,634		Assumption
	5.05	Concrete Walls - 400 Thk	Unit rate	19	m3	2,800	52,779	80%	42,223	140%	73,890	31,667	58,057	5,278	58,057		Assumption
	5.06	Trash Screen	Unit rate	1	No.	20,000	20,000	80%	16,000	140%	28,000	12,000	22,000	2,000	22,000		Assumption
	5.07	Structural Steel Access Platform	Unit rate	9	m2	2,500	22,500	80%	18,000	140%	31,500	13,500	24,750	2,250	24,750		Assumption
	5.08	Access Path - Concrete	Unit rate	9	m2	200	1,800	80%	1,440	140%	2,520	1,080	1,980	180	1,980		Assumption
	5.09	Handrail	Unit rate	15	m	360	5,400	80%	4,320	140%	7,560	3,240	5,940	540	5,940		Assumption
	5.10	Surface Finishes - Canal at Well Site	Unit rate	1	Lump sum	50,000	50,000	80%	40,000	140%	70,000	30,000	55,000	5,000	55,000		
	5.11		Unit rate				-		-	300%	-	-	-	-	-		
	6.0	**Power Supply and Backup**	Unit rate				-	0%	-	300%	-	-	-	-	-		
	6.01	Solar Panels	Unit rate	1	Lump sum	20,000	20,000	60%	12,000	180%	36,000	24,000	24,000	4,000	24,000		Assumption
	6.02	UPS	Unit rate	1	Lump sum	30,000	30,000	60%	18,000	180%	54,000	36,000	36,000	6,000	36,000		Assumption
	6.03		Unit rate		m		-	0%	-	300%	-	-	-	-	-		
	6.04		Unit rate		m		-	0%	-	300%	-	-	-	-	-		
	7.0	**All Weather Track 150mm thk 4m wide 1800m long**	Unit rate				-	0%	-	300%	-	-	-	-	-		
	7.01	Clearing and Grubbing	Unit rate	-	m2	8	-	60%	-	180%	-	-	-	-	-		Already clear path, just top up
	7.02	Topsoil Stripping	Unit rate	-	m3	19	-	60%	-	180%	-	-	-	-	-		Already clear path, just top up
	7.03	Cut	Unit rate	-	m3	13	-	60%	-	180%	-	-	-	-	-		Already clear path, just top up
	7.04	Fill	Unit rate	-	m3	20	-	60%	-	180%	-	-	-	-	-		Already clear path, just top up
	7.05	Type A Fill	Unit rate	-	m3	150	-	60%	-	180%	-	-	-	-	-		Already clear path, just top up
	7.06	Class 2 crushed rock 300mm thk	Unit rate	2,160	m3	209	452,326	60%	271,395	180%	814,186	542,791	542,791	90,465	542,791		300mm thk
	7.07	Asphalt seal to crushed rock pavement	Unit rate		N/A		-	0%	-	300%	-	-	-	-	-		Already clear path, just top up
	7.08	Tip Fees for Green Waste	Unit rate	-	m3	33.34	-	60%	-	180%	-	-	-	-	-		Already clear path, just top up
	7.09	ASS Treatment and Disposal for Spoil (Clean Waste)	Unit rate	-	m3	100.02	-	60%	-	180%	-	-	-	-	-		Already clear path, just top up
	7.10	Allowance for Drainage for Access Track	Unit rate	-	%	452,326	-	60%	-	180%	-	-	-	-	-	$ 62.82	m² for access track
		Sub total (items 1-4)	[M]				3,794,269		2,823,690		5,735,427	2,911,737	4,279,558	485,289	4,279,558		
	8.0	**Electricals, instrumentation and control**	Loading Factor	15	% of [Equip]	528,856	79,328	90%	71,396	120%	95,194	23,799	83,295	3,966	83,295		
	9.0	**Plant commissioning costs**	Unit rate	2	% of [M+EI&(	3,873,597	77,472	90%	69,725	120%	92,966	23,242	81,346	3,874	81,346		
		Subtotal Contractors Direct Costs	[N]				3,951,069		2,964,810		5,923,587	2,958,777	4,444,198	493,129	4,444,198		
		Contractors indirect Costs															
		On-site	Loading Factor	18	% of	3,951,069	711,192	80%	568,954	140%	995,669	426,715	782,312	71,119	782,312		
		Contractors Design	Loading Factor	5	% of	3,951,069	197,553	80%	158,043	140%	276,575	118,532	217,309	19,755	217,309		
		Contractor's offsite overhead and margin	Loading Factor	10	% of	4,859,815	485,981	90%	437,383	120%	583,178	145,794	510,281	24,299	510,281		
		Subtotal Contractors Indirect Costs	[O]				1,394,727		1,164,380		1,855,422	691,042	1,509,901	115,174	1,509,901		
		Total Construction Cost	[P]			[N+O]	5,345,796		4,129,190		7,779,009	3,649,819	5,954,100	608,303	5,954,100		
		Construction Management															
		Project Management	Unit rate	4	% of	5,345,796	213,832	90%	192,449	120%	256,598	64,150	224,523	10,692	224,523		
		Project Control	Unit rate	1	% of	5,345,796	53,458	90%	48,112	120%	64,150	16,037	56,131	2,673	56,131		
		WHS	Unit rate	1	% of	5,345,796	53,458	80%	42,766	140%	74,841	32,075	58,804	5,346	58,804		
		Environmental	Unit rate	1	% of	5,345,796	53,458	90%	48,112	120%	64,150	16,037	56,131	2,673	56,131		
		Operations and Maintenance	Unit rate	1	% of	5,345,796	53,458	90%	48,112	120%	64,150	16,037	56,131	2,673	56,131		
		Inspections	Unit rate	2	% of	5,345,796	106,916	90%	96,224	120%	128,299	32,075	112,262	5,346	112,262		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Subtotal Construction Management	[Q]				534,580		475,776		652,187	176,411	563,982	29,402	563,982		
		Principal Supplied Materials	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		
		Disposal Levy of cut material (contaminated)	Unit rate	-	m3	288	-	90%	-	120%	-	-	-	-	-		$160 Cat 2 Levy + Cartage per tonne if not treated first
		Construction Licences (Private Land Access)	Unit rate	1	Lump sum	15,000	15,000	90%	13,500	120%	18,000	4,500	15,750	750	15,750		
		<>	Unit rate		Lump sum	-	-	90%	-	120%	-	-	-	-	-		

	L	W	Thk	
Pumpstation	12.1	9.2	0.3	
Diesel Bund	4.5	9.2	0.3	
Pump Plinth	4	1.8	0.15	
Well	3	3	5	
add for flood protection, a concrete slab				
	12.1	9.2	0.45	50.094
				110207

Length each
10
5
50
1200

Pipe Supply	Trench	Pea Gravel	Lay	Welding	Testing	Disposal	Sub Con	DJC
$ 400.00	$198.00	$150.00	$202.50	$ 29.17	$ 5.00	$ 90.00	$214.93	$ 1,289.60

2	
80	
10	
150	
########	
5	welds / day
$ 350.00	per weld
12	m
$ 29.17	/m

7200 m2

Subtotal Principal Supplied Materials	**[R]**				**15,000**		**13,500**		**18,000**	**4,500**	**15,750**	**750**	**15,750**	
Total Delivery Cost							**4,604,966**		**8,431,196**	**3,826,230**	**6,518,081**	**637,705**	**6,518,081**	
Base Estimate- Delivery (HW costs + construction cost)	**[S]**			**[P+Q+R]**	**5,895,376**									
Contingency - Inherent Risk	**[T]**				637,705	11%								
Most Likely Delivery Cost	**[U]**			**[S+T]**	**6,533,081**									
Contingency - Contingent Risk	loading factor	28	% of	5,895,376	1,650,705	28%								
Base Estimate + Contingency (Inherent + Contingent)					**8,183,786**	39%								
Total Project Cost														
Base Estimate- Total Project (HW costs + construction cost)	**[V]**			**[I+S]**	**6,328,874**									
Contingency - Inherent Risk - identified	**[W]**			**[J+T]**	648,542	10.2%								
Contingency - Inherent Risk - additional strategic calculated					743,810	11.8%		Calculated inherent Risk			22%			
Most Likely Project Cost	**[X]**			**[V+W]**	**7,721,227**									
Contingency - Contingent Risk	**[Y]**				1,772,085	28.0%		Calculated Contingent Risk			28%			
Base Estimate + Contingency (Inherent + Contingent)	**[Z]**				**9,493,312**	50.0%		Calculated Strategic Contingency			50%			
Total contingency					2,420,627									
Most Likely Estimate (rounded)					7,730,000									
Control Estimate					9,493,312									
Control Estimate (rounded)					9,500,000									2.40
Portfolio estimate					7,730,000									

Last CPI update Dec 2020

	16/17	**17/18**	**18/19**	**19/20**	**20/21**	**21/22**	**22/23**	**23/24**	**24/25**	**25/26**	**26/27**	**27/28**	**28/29**	**29/30**	**Total**			**Total**	**Check = 0**
																	check = 0		
Inflation %	1.9%	2.1%	1.6%	-0.35%	1.00%	1.3%	1.50%	1.50%	1.8%	2.0%	2.25%	2.50%	2.5%	2.5%					
Annual Index Number	110.7	113.0	114.8	114.4	115.5	117.0	118.7	120.5	122.6	125.1	127.9	131.1	134.4	137.7					
Estimate (real)		Unit Scale	1		Base year	20/21			Index for base year	115.5									
Development					1,000.0										**1,000.0**				
Delivery															**-**	**-**	**564,715.3**		
Total	**-**	**-**	**-**	**-**	**1,000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,000**	**-**	**8,183,786.30**		
																-	**9,492,312**		
Adjustment Factor	0.96	0.98	0.99	0.99	1.00	1.01	1.03	1.04	1.06	1.08	1.11	1.13	1.16	1.19					
Nominal Estimate																			
Development	-	-	-	-	1,000	-	-	-	-	-	-	-	-	-					
Delivery	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Total	**-**	**-**	**-**	**-**	**1,000.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**					
N.B. Inflation Allowance	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Agreed inflation allowance																			
Summary																			
Development Contracts																			
Delivery Contracts																			
Hunter Water Costs					651,992														
Sub total																			
Inherent Risk																			
Contingent Risk																			
Control Estimate																			

	Most Likelv	**%**
Loading factor	1,958,934	30%
Unit rate	4,491,320	70%
First principles	-	0%
Total	6,450,254	100%
Check = 0	- 0	