Intended for
Hydro Aluminium Kurri Kurri Pty Ltd

Document type
Revised Plan

Date
August, 2023

KURRI KURRI ALUMINIUM SMELTER DECOMMISSIONING, DEMOLITION AND REMEDIATION LEACHATE MANAGEMENT PLAN

KURRI KURRI ALUMINIUM SMELTER DECOMMISSIONING AND DEMOLITION LEACHATE MANAGEMENT PLAN

Ref	**318000533**
Document ID	**Hydro Kurri Kurri SWMP_Appendix 1_FINAL_V 1_Leachate Management Plan_20230810.docx**
Revision	**Final Rev 1**
Date	**10/08/2023**
Made by	**C Whitehill / C Lawrence**
Checked by	**S Taylor**
Approved by	**F Robinson**
Description	**Ramboll was engaged by Hydro Aluminium Kurri Kurri Pty Ltd to prepare an Environmental Management Plan (EMP) to describe how environmental management will be undertaken at the former Hydro Aluminium Kurri Kurri aluminium smelter at Hart Road Loxford, NSW and the surrounding land owned by Hydro. This Leachate Management Plan (LMP) forms a component of the SWMP.**

Ramboll Australia
Level 2, Suite 18
50 Glebe Road
PO Box 435
The Junction
NSW 2291
Australia
T +61 2 4962 5444
www.ramboll.com

CONTENTS

FIGURES

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AEP	Annual Exceedance Probability
EC	Electrical Conductivity
EMP	Environmental Management Plan
EP&A Act	*Environmental Planning and Assessment Act 1979*
F	Fluoride
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
LMP	Leachate Management Plan
SSD	State Significant Development
SWMP	Soil and Water Management Plan
TDS	Total Dissolved Solids
Total CN	Total Cyanide
TSS	Total Suspended Solids
TWTP	Temporary Water Treatment Plant
WHS	Workplace Health and Safety

GLOSSARY

Council	Cessnock City Council
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
Hydro Land	The land owned by Hydro Aluminium Kurri Kurri Pty Ltd which includes the Smelter and surrounding land.
Remediation	Remediation of contaminated land and soils at the Smelter and on Hydro Land, including the construction of a Containment Cell as addressed in the State Significant Development application to the Department of Planning and Environment SSD 6666.
Stage 1 Demolition	Demolition of Smelter buildings addressed in the development application to Cessnock City Council 8/2015/399/1.
Stage 2 Demolition	Demolition of Smelter buildings, three concrete stacks, a water tower, subsurface structures to 1.5m below ground surface and operation of a concrete crushing plant addressed in the development application to Cessnock City Council 8/2018/46/1.
The Smelter	The former Hydro Aluminium Kurri Kurri Pty Ltd aluminium smelter at Hart Road, Loxford.

1. INTRODUCTION

1.1 Background

This Leachate Management Plan (LMP) has been prepared by Ramboll Australia Pty Ltd on behalf of Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to support the Soil and Water Management Plan (SWMP) and the Environmental Management Plan (EMP) for the decommissioning, demolition and remediation activities at the former Hydro Aluminium Kurri Kurri Smelter (the Smelter) at Hart Road Loxford and the management of the surrounding land owned by Hydro (the Hydro Land).

1.2 Objectives

The objectives of this LMP are to:

- Detail how leachate from the Containment Cell, Capped Waste Stockpile and the Dickson Road Landfill will be managed to protect water quality within and surrounding the Smelter during the material removal and the placement of material in the Containment Cell.
- Provide a program to monitor leachate generation and quality
- Provide a mechanism to assess performance against the relevant assessment criteria.
- Detail the requirement for reporting exceedances of assessment criteria.
- Establish the roles and responsibilities of all parties involved in leachate management.
- Establish supervision, monitoring and reporting framework for the LMP.

1.3 Purpose and Scope

The purpose of the LMP is to:

- Specify procedures for leachate management during remediation of the Capped Waste Stockpile and other contaminated areas, and the placement of material into the Containment Cell
- Satisfy the relevant conditions of the Development Consent for State Significant Development (SSD) 6666 relating to remediation activities and specifically leachate management.

The LMP reflects the design and operational procedures of the Containment Cell leachate collection and management system detailed in the *Containment Cell Detailed Design Report* (GHD, 2018) and measures described in the *Response to Submissions Report: Former Hydro Aluminium Kurri Kurri Smelter Remediation* (Ramboll, 2020) (the RtS).

1.4 Regulatory Requirements

1.4.1 Development Consent

The development consent for SSD 6666 does not include specific conditions relating to leachate management. However as required by condition A2, leachate management will be undertaken in accordance with the Environmental Impact Statement (EIS) and the RtS. This LMP has been prepared to describe how the leachate management measures described in the EIS and RtS will be implemented. MOD 1 to SSD 6666 for the construction and operation of a Temporary Water Treatment Plant (TWTP) for leachate management was granted by DPIE on 13 September 2021. SSD 6666 MOD 1 included the addition of consent conditions B19A(a) through to B19A(e) and are outlined in **Table 1-1**.

Table 1-1: Relevant Project Approval Conditions

No.	Condition	Location in LMP
	Water Treatment Management Plan	
B19A	Prior to the operation of the Temporary Water Treatment Plant (TWTP), the Applicant must prepare, to the satisfaction of the Planning Secretary, a TWTP Management Plan that includes, but is not limited to, details regarding treatment processes and commissioning and operation stage management protocols. The TWTP Management Plan must be prepared in consultation with the EPA and include, at a minimum:	Appendix 1
B19A(a)	specifications and final design details of the TWTP, including expected treatment performance for all pollutants of concern;	Appendix 1
B19A(b)	a TWTP commissioning stage monitoring program that includes:	Appendix 1

No.	Condition	Location in LMP
	(i) the collection and collation of data on both the influent and treated effluent quality for all pollutants of concern; and (ii) a verification process to ensure that the treated water quality is consistent with the 'Treated Leachate Target Values' (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1): Additional information, dated 31 July 2021) before discharge to the North Dam	
B19A(c)	a TWTP operational stage monitoring program that ensures each treated effluent batch meets all the 'Treated Leachate Target Values' prior to discharge to the North Dam;	Appendix 1
B19A(d)	Protocols and operational rules in the event the treated effluent does not meet all the 'Treated Leachate Target Values' including but not limited to: (i) recirculation through the TWTP (ii) offsite removal by tanker for disposal at licensed facility	Appendix 1
B19A(e)	Details of the timing and implementation of decommissioning of the TWTP	Appendix 1
	Fluoride Treatment	
B19B	Prior to operation of the TWTP, the applicant must explore all practical and reasonable treatment measures to reduce specifically the fluoride concentration in the treated effluent from the TWTP to levels consistent with the ANZECC (2000) long term trigger values for irrigation. The fluoride target value in 'Treated Leachate Target Values' (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1): Additional Information, dated 31 July 2021) must be adjusted to reflect the final target fluoride level following investigation and implementation of further treatment measures.	Appendix 1
	Irrigation Management Plan	
B19C	Prior to operation of the TWTP, the Applicant must prepare, to the satisfaction of the Planning Secretary, an Irrigation Management Plan in consultation with the EPA. The Irrigation Management Plan must include, but is not limited to:	Appendix 2
B19C(a)	A plan showing the area to be irrigated by treated effluent from the TWTP;	Appendix 2
B19C(b)	Irrigation rules to ensure that irrigation water quality meets the North East Dam Target Values prior to irrigation (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1);	Appendix 2
B19C(c)	Details of ongoing treated effluent quality monitoring, including sample take location and frequency;	Appendix 2
B19C(d)	Identification of operational triggers (such as 'trigger action response plans') to ensure that the treatment process is functioning correctly and to prevent unacceptable impacts to the irrigated area. Triggers and associated responses must be provided for, but not limited to, the following: (i) excessive saturation of the soil profile (waterlogging) (ii) any surface water runoff of treated effluent from the North Dam; and (iii) any water quality impacts to downstream receiving environment.	Appendix 2
B19C(e)	Operating rules to ensure the North Dam maintains a 1 in 5-year rainfall event or 20% AEP design storm capacity;	Appendix 2
B19C(f)	Develops a Trigger Action Response Plan (TARP) which includes contingencies to identify and manage an unpredicted impacts (such as poor water quality within the North Dam) and ensure corrective actions are implemented. Contingency measures could include, but are not limited to: (i) additional treatment of leachate through the TWTP; (ii) treatment of the North Dam water quality through the TWTP: (iii) offsite removal by tanker for disposal at a licensed facility.	Appendix 2
	Water Quality Monitoring Program	
B19D	Prior to operation of the TWTP, the applicant must prepare a Water Quality Monitoring	Appendix 3

No.	Condition	Location in LMP
	Program in consultation with the EPA that informs the Irrigation Management Plan and Trigger Action Response Plans. The monitoring program should include, at a minimum:	
B19D(a)	water quality monitoring locations (including but not limited to the North Dam and downstream receiving environment)	Appendix 3
B19D(b)	analyte list for all pollutants with the potential to cause non-trivial harm (including all the 'Treated Leachate Target Values' (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1)	Appendix 3
B19D(c)	sampling method for each location	Appendix 3

1.4.2 Environmental Protection Licence

The *Protection of the Environment Operations Act 1997* (POEO Act) requires any person carrying out scheduled work (as described in Schedule 1 of the POEO Act) to obtain an environment protection licence (EPL) that authorises that work to be carried out at the premises.

Hydro holds Environment Protection Licence (EPL) No. 1548 for the Smelter operations. The EPL contains conditions relating to the groundwater interception trench and leachate management system association with the Capped Waste Stockpile. A list of the EPL conditions related to leachate management and where they are addressed in this document are outlined in **Table 1-2**.

Table 1-2: Relevant EPL Conditions

No.	Condition	Location in LMP
L1	Pollution of waters	**Section 2**
O5	Processes and management	**Section 0**
M1	Monitoring records	**Section 4.1**
R1	Annual return documents	**Section 4.1**
E1	Groundwater interception and monitoring - Capped Waste Stockpile	**Section 2.3** and **Section 4.1.3**

In addition, the plan aims to comply with the following legislation and guidelines:

- *Environmental Planning and Assessment Act 1979*
- *Protection of the Environment Operations Act 1997*
- *Protection of the Environment Operations (Waste) Regulation 2014*
- *Water Management Act 2000*
- *Water Act 2012*
- *National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000)
- *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004)
- *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination* (DEC, 2007)

2. EXISTING ENVIRONMENT AND POTENTIAL IMPACTS

2.1 Groundwater

Groundwater within the Smelter site has been impacted by Smelter activities primarily due to leaching of fluoride and aluminium from smelter materials into groundwater.

Groundwater immediately down gradient of the Capped Waste Stockpile has been impacted by leachate generated from contact of wastes in the Capped Waste Stockpile with shallow groundwater and from the infiltration of water through the Capped Waste Stockpile (prior to capping). The leachate plume extends approximately 350m north east of the eastern toe of the Capped Waste Stockpile and is characterised by elevated fluoride, cyanide and sodium concentrations and by a high pH.

A groundwater interception trench was constructed to intercept leachate impacted water from the Capped Waste Stockpile in order to mitigate potential off-site environmental impacts.

The groundwater interception trench was constructed with the following objectives:

- To intercept leachate impacted shallow, perched groundwater when it rises towards the ground surface (during high rainfall conditions); and
- Dispose of the captured water via the existing Smelter water management system.

The groundwater interception trench performance monitoring and reporting requirements are discussed in **Section 4**.

Groundwater interception during remediation will be limited to the excavation of the Capped Waste Stockpile and demolition works below 1.5m bgs. Construction of the Containment Cell is not expected to intercept groundwater with the base of excavation of the Containment Cell to be between one to three metres above the underlying aquifer however, management of groundwater is required during the initial phases of material emplacement as detailed within the SWMP.

Groundwater encountered in the Capped Waste Stockpile will be extracted using sumps or extraction wells within the Capped Waste Stockpile and either treated through an on site temporary water treatment plant (**Section 2.3.4.2**) or removed for treatment by a licenced waste contractor (**Section 2.3.4.3**) prior to discharge through the Smelter water management system.

Impacts to natural soils beneath the Capped Waste Stockpile have occurred to depths of less than 1.0m below the waste/natural soil interface. Excavation of these soils for relocation to the Containment Cell will also be required. Treatment of groundwater from this excavation will also be undertaken by draining groundwater to a sump. Where groundwater within the excavation is treated (removed), remediation of groundwater will be considered complete.

2.2 Surface Water

The Smelter has an existing stormwater and surface water management system. This includes:

- Subsurface and open surface water drainage throughout the Smelter.
- One dam in the west of the Smelter, one in the northeast of the Smelter and one on the southeast of the Smelter. These are the initial collection and treatment points for the water.
- Two dams located to the north of the Smelter. These have previously been used as part of the water collection and treatment system for the Smelter. These continue to capture surface water runoff from the Smelter, receiving water that has passed through the south, east and west surge ponds.
- Irrigation area. To the north of the Smelter is an irrigation area that receives water from the North Dams. The irrigation area is operated in accordance with the requirements of the EPL.

Surface water management of the Smelter site will be focused on the separation of clean stormwater from water that comes into contact with contaminated soils, waste or leachate. Clean stormwater will be directed into the Smelter water management system for dust suppression throughout the demolition and remediation activities. Water that comes into contact with any material from the Capped Waste Stockpile, waste in the Containment Cell or Dickson Road landfill will be classified as leachate and require collection and disposal and/or treatment as described in **Section 2.3.4**.

A stormwater diversion drain will be installed around the perimeter of the Containment Cell (including the perimeter access track) to divert clean water around the Containment Cell and reduce the amount of water requiring treatment.

The Containment Cell will be constructed with four initial internal cells, separated by internal bunds. Material will be placed within one internal cell at a time. This will allow any rain collected within unfilled cells to be managed as clean water; only water within the filled cell will need to be managed as leachate as per **Section 2.3.4**.

The Temporary Water Treatment Plant (TWTP) is located to the west of the Capped Waste Stockpile (CWS) and is responsible for treating leachate generated from the Containment Cell and the CWS to a quality suitable for discharge to the existing Smelter water management system.

2.3 Leachate

Leachate will result from the remediation of the Capped Waste Stockpile and Dickson Road South, and from waste material emplacement into the Containment Cell. The Detailed Design Report (GHD, 2018) has estimated approximately 12,720kL of leachate will be generated and require treatment.

2.3.1 Capped Waste Stockpile

The Capped Waste Stockpile will require continued collection and treatment of the existing leachate as well as any stormwater collected within the exposed stockpile during remediation. Any water that comes in contact with leachate will be classified as leachate and treated accordingly. The remediation of the Capped Waste Stockpile will be staged to minimise the surface area of waste exposed to rainfall.

The area of the Capped Waste Stockpile uncovered at any time will be minimised. This will allow water from the remaining capped area to be diverted away from the exposed material and managed as clean water; only the water from the exposed material will need to be considered and managed as leachate.

Leachate within the Capped Waste Stockpile will be drained to a sump and either transported offsite or treated onsite as described in **Section 2.3.4**. Treatment will continue until the contents of the Capped Waste Stockpile are removed from the area.

2.3.2 Containment Cell

As stated in **Section 2.2**, waste material emplacement within the Containment Cell will occur as a staged process within four internal cells, separated by internal bunds. Each cell will contain a water collection/ sump system to enable the removal of leachate and/ or clean water for treatment or discharge into the Smelter water management system respectively.

Leachate within the Containment Cell will be drained to two sumps and will primarily be treated onsite via the TWTP for discharge into the existing Smelter water management system. In the event, treated effluent does not meet the 'Treated Leachate Target Values' it may be managed by via offsite transport and disposal at a licenced facility. Methods of leachate management are described in **Section 2.3.4**.

2.3.3 Dickson Road South

Remediation of the Dickson Road South site will require removal of the perched groundwater. The *Remedial Action Plan: Dickson Road South, Kurri Kurri, NSW* (Ramboll, 2018) concluded that the perched water is expected to be of sufficient quality to be pumped to the South Surge Pond to then be managed as part of the Smelter water management system. This water will be drained to a sump within the excavation bund.

The quality of this water will be regularly monitored to determine if it needs to be managed as part of the leachate management system, or if it can continue to be discharged directly into the Smelter water management system.

As with the Capped Waste Stockpile, the area of the landfill uncovered at any time will be minimised. This will allow water from the remaining capped area to be diverted away from the exposed material and managed as clean water; only the water from the exposed material will need to be considered for management as leachate.

2.3.4 Leachate Storage and Treatment

2.3.4.1 Leachate Storage

Figure 2-1 shows the locations of leachate storage within the Project site. This includes the basins at the Containment Cell and adjacent to the temporary water treatment plant.

2.3.4.2 On Site Temporary Water Treatment Plant

A modular temporary water treatment plant will be installed with the capacity to treat: existing leachate from within the Capped Waste Stockpile; contaminated stormwater collected within the exposed stockpile; contaminated stormwater and leachate from the Containment Cell; and the perched groundwater and leachate from Dickson Road South (if required).

The location of the temporary water treatment plant is shown in **Figure 2-1**. However, the temporary water treatment plant is modular. This allows it to be relocated closer to the leachate source and/or to facilitate access for demolition and remediation requirements where applicable.

The TWTP is expected to treat and discharge a maximum of 2,400 kL/month (Enviropacific, 2021). Based on estimates of leachate generation the temporary water treatment plant has a capacity of approximately 30 kL/day. The TWTP has a maximum storage capacity of 400 kL (four 100 kL capacity Treated Water Tanks) in addition to the two leachate storage ponds.

The TWTP is comprised of the following components:

- Leachate Holding Pond (1 ML capacity)
- Flow Balance Tank (50 kL capacity) & Recirculation system for pH adjustment
- Chemical dosing including storage and dosing pump systems for:
- Reaction Tank and Clarifier for precipitation and removal of large flocs
- LDAF with scraper for removal of remaining flocs, fine solids, grit removal and any oils and greases
- Sludge Dewatering bags for sludge removal
- Break tanks (3 x 10 kL capacity) with Recitculation systems for pH adjustment
- Media Filtration & Ion Exchange Filtration for removal of suspended solids, dissolved contaminated and polishing
- Treated Water Tanks (4 x 100 kL capacity) to be filled in batches where samples will be taken and analysed prior to discharge to the licensed discharge point.

. The TWTP includes Zeolite filtration, Granular Activated Carbon (GAC) filters and IX resins for targeted treatment of cyanide, fluoride, uranium, heavy metals and Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) contaminants. The leachate would be treated to a level suitable to be discharged to the Smelter water management system, where it could be reused during for dust suppression or irrigated in accordance with this plan.

2.3.4.3 Off Site Leachate Treatment

The ability to dispose of leachate via a licenced liquid waste contractor for treatment at a licensed waste facility will also be available in the event 'Target Leachate Values' are not met. Temporary leachate storage dams will be established at the Containment Cell and the Capped Waste Stockpile. The licensed liquid waste contractor will pump the leachate from these dams at a designated location into their truck.

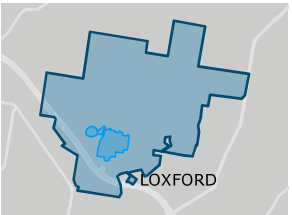
Based on a leachate removal truck with a capacity of 20 kL, this equates to approximately 636 truck movements by a licensed liquid waste contractor if all leachate was transported for off-site treatment. This will equate to approximately eight truck movements per week, or a maximum of two movements per day.

Aerial photography by Nearmap, flown 01.07.2023

Legend

- Project site
- Leachate management infrastructure
  - Leachate storage dam
  - Leachate treatment plant

A4
1:8,000



RAMBOLL AUSTRALIA - GIS MAP file : 318000533_GIS_F002_RemediationEMP | F011_LeachateMgtInf_V02 | 9/08/2023

Figure 2-1 | Location of Leachate Management Infrastructure

3. IMPLEMENTATION

3.1 Roles and Responsibilities

Key personnel responsible for implementation of this LMP are in **Table 3-1** and consistent with the overall EMP.

Table 3-1: Hydro Personnel and Environmental Management Responsibilities

Position	Responsibilities
OVERALL SITE MANAGEMENT	
Managing Director	Make certain that the Hydro Team and contractors are implementing this LMP. Provide adequate resources and funding for the implementation of this LMP. Review and approve EMP (including the SWMP and associated specialised plans).
Principal Environmental Consultant	Provide advice on and assistance in implementation, monitoring and auditing of environmental management and performance. Review and modify the LMP as directed by the Managing Director and/or Project Manager.
Principal Communications Consultant	Manage the mechanisms available for the community to receive information and to make enquiries or complaints about activities
SMELTER REMEDIATION ACTIVITIES	
Project Manager	Make certain that any proposed works or changes to existing activities, that may have an impact on the environment or the community (including leachate management), have the necessary legislative approval prior to the commencement of works. Make certain that the environmental aspects and issues, associated with proposed works or changes to existing activities, are adequately addressed in the LMP. Review and approve the LMP on an annual basis or when changes to activities at the Smelter occur. Facilitate implementation of the LMP.
Construction Manager	Verify that the work of contractors and Hydro personnel on the Project are undertaken in accordance with this LMP, relevant environmental management plans, procedures and standards. Provide appropriate training to contractors and Hydro personnel on the Project regarding environment and community requirements and responsibilities. Review and approve the contractors' environmental management documentation prior to commencement of activities and inform contractors of changes to the LMP.
Contract Administrator	Provide relevant environmental legislative, regulatory and management requirements in tender documentation. Verify that the work of contractors is undertaken in accordance with this LMP and other relevant environmental procedures and standards.
Workplace Health and Safety (WHS) Manager	Provide Hydro personnel with the necessary tools and training to enable effective implementation of the EMP and sub plans. Implement and maintain an induction package to be provided to all personnel working at the Smelter and Hydro Land, which will include information relevant to environmental and community management (including leachate management). Undertake a weekly inspection of the Project activities at the Smelter, for the duration of the Project. Maintain a record of personnel induction and training records.

Position	Responsibilities
Remediation Contractor	Comply with the requirements of the LMP as it applies to Smelter and relevant Hydro Land remediation activities. Implement the environmental measures and actions as described in the LMP through a Remediation EMP, sub-plans and specific procedures that comply with this LMP. Develop and implement procedures for self-checking management compliance with the Remediation Contractor's procedures and this LMP. Report potential or actual environmental incidents associated with remediation activities at the Smelter and relevant Hydro Land, and assist as required in the investigation, implementation of corrective actions and recording of the incident.
CARE, MAINTENANCE AND HYDRO LAND MANAGEMENT ACTIVITIES	
Environmental Officer/ Hydro Land Manager	Coordinate and implement the environmental monitoring program Verify that the work of contractors and Hydro personnel on Hydro Land are undertaken in accordance with this LMP and relevant environmental procedures and standards. Undertake a weekly inspection of activities on the Hydro Land that will occur for two weeks or more.
ALL AREAS AND ACTIVITIES	
Contractors	Comply with the requirements of the LMP as it applies to site environmental management and control. Implement the environmental measures and actions as described in the LMP through procedures and management plans that comply with this LMP. Develop and implement procedures for self-checking management compliance with Contractor's procedures and this LMP.
All Personnel	Implementation of the relevant environmental measures described in this LMP applicable to their activities.

3.2 Management Measures

Hydro will implement a number of controls to manage leachate generation, treatment and disposal resulting from activities at the Smelter and Hydro Lands. The leachate management measures to be implemented on Site are outlined in **Table 3-2**.

Table 3-2: Leachate Management Measures

Management Measures	Action	Timing / Frequency	Responsibility	Further Detail
Water encountering any waste fill will be classified as leachate and require collection and treatment.	Surface water will be diverted around active remediation areas to minimise the volume of leachate generated during remediation activities.	Prior to and during remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
	Perimeter bunds and diversion drains will be constructed around the Containment Cell, Capped Waste Stockpile and Dickson Road Landfill to prevent stormwater entering the active remediation area.	Prior to and during remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
	Leachate generation will be minimised by reducing the area of exposed waste at any one time and covering of waste as soon as practicable.	During remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
Controlled capture of leachate within the Capped Waste Stockpile	A sump will be constructed within the low point of the Capped Waste Stockpile to allow gravity drainage of leachate to one collection point.	Prior to remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
	The leachate will be transferred to an appropriately lined temporary leachate storage dam.	During remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
	Leachate will be pumped out by a licensed waste contractor for off site treatment and disposal or to the temporary water treatment plant for onsite treatment.	During remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design **Appendix 1** TWTP MP
Controlled capture of leachate within the Containment Cell	The Containment Cell will be subdivided into four sub-cells by intracell bunds. The sub-cells will be filled progressively, resulting in potential leachate generation occurring from only one cell at a time.	Prior to and during remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
	Leachate will be drained to one of two leachate sumps, located at the eastern boundary of the containment cell.	During remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
	Leachate extraction pumps will be used to extract the leachate and pumped to the leachate buffer storage dam for temporary storage.	During remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design
	The operation depth of leachate in the cell will be limited to no more than 300 mm except during large storm events. Where the level of leachate exceeds 300 mm it shall be lowered to 300 mm as soon as is practicable.	During remediation	Project Manager Remediation Contractor	Containment Cell Detailed Design

Management Measures	Action	Timing / Frequency	Responsibility	Further Detail
On site leachate treatment through a temporary water treatment plant prior to discharge into the Smelter water management system.	Submit a detailed design for the plant to the Department and the EPA for approval.	Prior to construction of the plant	Project Manager Remediation Contractor	**Appendix 1** TWTP MP
	The temporary water treatment plant will only operate during remediation activities and be decommissioned upon completion of the Containment Cell.	During remediation	Project Manager Remediation Contractor Environmental Officer	**Appendix 1** TWTP MP
	Discharge form the temporary water treatment plant will be of a suitable quality to be discharged to the Smelter water management system and applied as dust suppression.	During remediation	Project Manager Remediation Contractor Environmental Officer	**Appendix 1** TWTP MP
	Discharge from the temporary water treatment plant will be to the Smelter water management system or collected by a licensed contractor (if required).	During remediation	Project Manager Remediation Contractor Environmental Officer	**Appendix 1** TWTP MP
Leachate transported from the Smelter is to be managed in accordance with the Protection of the Environment Operations (Waste) Regulation 2005 (POEO Waste Regulation) and the *Waste Classification Guidelines.*	Any leachate requiring transportation from the Smelter to a licensed facility will be subjected to waste tracking.	Prior to and during remediation	Project Manager Remediation Contractor Site Services Manager Waste Removal Contractor	Section 2.3.3 (waste tracking, transport and disposal) of the WMP
	Leachate will be removed from the Smelter to a licensed facility by a licenced waste contractor and transported to a licenced waste facility.	Prior to and during remediation	Project Manager Remediation Contractor Site Services Manager Waste Removal Contractor	Section 2.3.3 (waste tracking, transport and disposal) of the WMP
	A Waste Consignment Authorisation must be obtained, prior to transporting the leachate. The licenced waste contractor who removes the leachate is responsible for completing the Waste Consignment Authorisation.	Prior to and during remediation	Project Manager Remediation Contractor Site Services Manager Waste Removal Contractor	Section 2.3.3 (waste tracking, transport and disposal) of the WMP
	The types, quantity and receiving location for all leachate transported from the Smelter will be recorded within a database.	During remediation	Project Manager Remediation Contractor Site Services Manager Waste Removal Contractor	Section 2.3.3 (waste tracking, transport and disposal) of the WMP
Wastes produced by the TWTP during the treatment of leachate are to be managed in accordance with the Protection of the Environment Operations (Waste) Regulation	Spent media (GAC, IX resin, zeolite, sand) wastes would be disposed of within the Containment Cell once used/saturated. If they cannot be disposed of within the Containment Cell (such as being generated following the capping pf the Containment	During remediation	Project Manager Remediation Contractor Site Services Manager	**Appendix 1** TWTP MP

Management Measures	Action	Timing / Frequency	Responsibility	Further Detail
2005 (POEO Waste Regulation) and the *Waste Classification Guidelines.*	Cell) they would be sampled and analysed as per the Environmental Protection Authority Waste Classification Guidelines, then disposed of at a facility licenced to accept them.		Waste Removal Contractor	
	Sludge would be pumped to a geotube for de watering then disposed of within the Containment Cell. If it cannot be disposed of within the Containment Cell, sludge would be sampled and analysed as per the Environmental Protection Authority Waste Classification Guidelines and disposed of at a facility licenced to accept it.	During remediation	Project Manager Remediation Contractor Site Services Manager Waste Removal Contractor	**Appendix 1** TWTP MP
	Consumables (IBC, Carboys, containers) would generally be returned to the supplier for reuse. Where this is not possible, they will be recycled	During remediation	Project Manager Remediation Contractor Site Services Manager Waste Removal Contractor	**Appendix 1** TWTP MP
Regular visual inspection of stormwater drainage to ensure stormwater and leachate are segregated.	Conduct fortnightly and event based visual inspection of drainage controls including perimeter bunds and diversion drains.	During remediation	Environmental Officer	Section 5.2 of the EMP (inspections)
Continue the groundwater monitoring downgradient of the leachate impacted groundwater resulting from the Capped Waste Stockpile.	Continue quarterly on-going monitoring of groundwater wells down-gradient of the Capped Waste Stockpile in accordance with the EPL.	During remediation	Project Manager Remediation Contractor Environmental Officer	Section 4.1 of the SWMP **Appendix 3** TWTP WQMP
Continue the surface water monitoring program to assess the impact that activities have on sensitive receiving environments.	Continue the monthly surface water monitoring to assess compliance with the relevant surface water quality criteria.	During activities Monthly monitoring	Environmental Officer	Section 4.1 of the SWMP **Appendix** 3 TWTP WQMP
	Record, interpret and report on surface water monitoring data.	Prior to and during demolition	Environmental Officer	Section 4.1 of the SWMP **Appendix 3** TWTP WQMP

4. MONITORING AND REVIEW

4.1 Monitoring

4.1.1 Leachate Monitoring

Within the Containment Cell, leachate monitoring will be undertaken on a quarterly basis or after a significant storm event or immediately following an earthquake. Once the leachate collection sump reaches 300 mm level, it will be pumped out, temporarily stored in the leachate buffer storage dam and either collected by a licenced liquid waste contractor or treated through the water treatment plant.

4.1.2 Surface Water

Hydro will continue to monitor surface water quality to confirm remediation activities are not causing harm to the environment or community and to maintain compliance with relevant approvals and licences. Supplementary water quality monitoring is to be undertaken for the assessment of treated leachate discharge from the TWTP and in accordance with the TWTP Water Quality Monitoring Program (**Appendix 3**).

Further details on the surface water monitoring requirements are described in Section 4.1.1 of the SWMP.

4.1.3 Groundwater Monitoring

Hydro undertakes quarterly groundwater monitoring of selected groundwater wells at the Smelter. The program involves the collection of groundwater samples from 28 groundwater monitoring wells. This includes wells that assess the performance of the Capped Waste Stockpile leachate interception trench and the condition of the leachate plume that the trench was installed to mitigate.

The groundwater wells target the leachate plume that is migrating from the Capped Waste Stockpile in a north-easterly direction. The leading front of the leachate plume is approximately 300 m north-east of the Capped Waste Stockpile. The extent of the plume is shown on the attached figure. Characteristics of the leachate includes elevated concentrations of Fluoride, Cyanide, Aluminium and alkaline pH.

Further details on the groundwater monitoring requirements are described in Section 4.1.3 of the SWMP.

4.1.4 Monitoring Program

The surface water and groundwater monitoring program is described in Table 4-1 of the SWMP. The TWTP water quality monitoring program is described in the *TWTP Water Quality Monitoring Program* provided in **Appendix 3**.

4.1.5 Soil and Water Management

As noted in **Table 3-2** the erosion and sediment controls including stormwater drainage controls (such as those diverting clean water away from waste materials and leachate) will be inspected fortnightly and after a rain event (greater than 5mm in any one period up to 24 hours in duration). Also, as noted in **Table 3-2** the existing surface water drainage and dams will be inspected prior to commencing remediation activities, and on a monthly basis thereafter.

Where an issue is identified during the inspection, the controls or the system will be maintained or repaired as required.

Records are to be taken (and filed) during these inspections and made available for review upon request of the EPA and Cessnock City Council.

4.2 Reporting

All internal and external environmental reporting requirements will be undertaken in accordance with the EMP.

Reporting will also be undertaken in accordance with relevant legislation, guidelines and notification requirements, as outlined in **Section 1.4**.

4.3 Non-conformances

The need for preventative or corrective action arises from the identification of non-conformance with environmental legal requirements, Hydro environmental requirements or the potential for non-conformances to occur.

Non-conformances will be resolved and recorded in accordance with the EMP.

4.4 Complaints

Community Complaints are considered environmental incidents and are investigated and documented accordingly. This will include any complaints relating to Smelter-related soil and water quality issues.

Investigations will be conducted by the Environment Officer, including provision of feedback to the complainant. Corrective actions will be documented and regularly reviewed until complete and signed off.

Handling of complaints will be undertaken in accordance with the EMP.

4.5 Review and Improvement

Continual improvement of the LMP will be achieved by the continual evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The Environmental Officer is responsible for ensuring that a regular review of the EMP and specialist management plans is undertaken.

The EMP and specialist management plans will be reviewed annually by an independent consultant in conjunction with preparation of the Annual Environmental Management Report (AEMR), or if changes to existing operations occur.

Revisions of this plan will be recorded in the document control section of this plan.

5. REFERENCES

ANZECC. 2000. *National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality*.

Department of Environment and Conservation (DEC). 2007. *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination*.

Enviropacific Services. (2021). *Water Treatment Plant management Plan: HAKK Temporary Water Treatment Plant (TWTP)*.

Landcom. 2004. *Managing Urban Stormwater – Soils and Construction, Volume 1*.

Pulver Cooper and Blackley (PCB). 2018. *Flood Modelling and Hydrology Review*.

Ramboll Environ (2015) *Statement of Environmental Effects - Demolition of Former Aluminium Smelter Buildings at Kurri Kurri*

Ramboll Environ (2016) *Environmental Impact Statement: Former Hydro Aluminium Kurri Kurri Smelter Demolition and Remediation*

Ramboll (2018) *Environmental Impact Statement: Former Hydro Aluminium Kurri Kurri Smelter Stage 2 Demolition*

Ramboll (2020) *Response to Submissions Report: Former Aluminium Kurri Kurri Smelter Remediation*

6. LIMITATIONS

Ramboll Australia Pty Ltd prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Pty Ltd dated 20 July 2018 and in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and Ramboll Australia Pty Ltd disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll Australia Pty Ltd's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll Australia Pty Ltd's knowledge as at the date of the assessment.

Ramboll Australia Pty Ltd did not independently verify all of the written or oral information provided to Ramboll Australia Pty Ltd during the course of this investigation. While Ramboll Australia Pty Ltd has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll Australia Pty Ltd was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

6.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Pty Ltd. It may not be relied upon by any other person or entity without Ramboll Australia Pty Ltd's express written permission.

APPENDIX 1
TEMPORARY WATER TREATMENT PLANT MANAGEMENT PLAN

ENVIROPACIFIC SERVICES

Water Treatment Plant Management Plan

HAKK Temporary Water Treatment Plant (TWTP)

Document Number 105079-Q-1000

Revision	Date	Prepared	Reviewed	Approved	Issue Description
A	29/09/2021	AB	PP		Draft issued to Daracon/HAKK for comment
B2	12/12/2021	PP			Revised document after Hydro/Rambol comments

Table of Contents

1 General

1.1 Introduction

This Water Treatment Management Plan document has been prepared to provide design, commissioning, testing and operational methodology for the Temporary Water Treatment Plant (TWTP) that is to be constructed on site for the Hydro Aluminium Kurri Kurri (HAKK) Remediation Smelter Project.

1.2 Project Summary

The Hydro Aluminium Kurri Kurri (HAKK) Remediation Smelter Project will include the construction of an onsite Temporary Water Treatment Plant (TWTP) to treat leachate produced from the site to a quality suitable for discharge to the environment. The TWTP is expected to remain in operation for up to three years.

Figure 1 Site map showing location of the TWTP

Enviropacific is contracted to supply and install (including mechanical and electrical works) the TWTP as well as operate and maintain the system including supply of chemicals and materials as required throughout the duration of the project.

The proposed treatment system will be automated with each piece of the plant being controlled by Programmable Logic Controllers (PLC) which also allow for remote data access, remote monitoring/control

and process alarms and interlocks. Site attendance will be required for the operation of the plant to allow for the chosen batch operation methodology, process optimisation, various cleaning cycles and maintenance tasks.

The plant is expected to treat and discharge a maximum of 2,400 kL/month. Based on estimates of leachate generation from the relevant Project elements the TWTP will require an estimated capacity of 30 kL/day.

Once the TWTP has been installed a series of testing, commissioning and process proving processes will be conducted to ensure the system meets the design and performance requirements.

The TWTP will be supplied with leachate from a 1ML Capacity Leachate Holding Pond and includes 4 x 100kL capacity Treated Water Tanks which will be filled in batches to allow for sampling and testing of treated water to occur prior to discharge both during commissioning and normal operation. After successful commissioning of the TWTP has been completed, the batch tested treated water will be discharged via gravity from Treated Water Tanks to the chosen environmental discharge point.

1.3 Objectives of the Plan

The primary objective of this plan is to describe how the design, commissioning, testing and operational methodology for the TWTP. It is also to address the requirements of Condition B19A of the development consent for SSD 6666 (through Modification 1). The following table identifies these requirements, and where they are addressed in this plan.

Condition	**Where addressed in this plan**
B19A. Prior to operation of the Temporary Water Treatment Plant (TWTP), the Applicant must prepare, to the satisfaction of the Planning Secretary, a TWTP Management Plan that includes, but is not limited to, details regarding treatment processes and commissioning and operation stage management protocols. The TWTP Management Plan must be prepared in consultation with the EPA and include, at a minimum:	
(a) specifications and final design details of the TWTP, including expected treatment performance for all pollutants of concern;	Section 2
(b) a TWTP commissioning stage monitoring program that includes:	Section 3
i. the collection and collation of data on both the influent and treated effluent quality for all pollutants of concern; and	Section 3.3

Condition	Where addressed in this plan
ii. a verification process to ensure that the treated water quality is consistent with the 'Treated Leachate Target Values' (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1): Additional Information, dated 31 July 2021) before discharge to the North Dam	Section 3.3
(c) a TWTP operational stage monitoring program that ensures each treated effluent batch meets all the 'Treated Leachate Target Values' prior to discharge to the North Dam;	Section 4.3
(d) protocols and operational rules in the event the treated effluent does not meet all the 'Treated Leachate Target Values' including but not limited to:	Section 4
i. recirculation through the TWTP	Section 4.3
ii. offsite removal by tanker for disposal at a licensed facility	Section 4.2
(e) details of the timing and implementation of decommissioning of the TWTP	Section 5

As required by Condition 19A Hydro consulted with the Environment Protection Authority (EPA) during preparation of this Water Treatment Management Plan. As noted in the correspondence provided in Appendix 3 the EPA had no comments on specific content for the plan.

2 TWTP Design

2.1 Discharge Criteria

The discharge criteria for the TWTP system is as per Table 1: Treated Leachate Target Values shown below:

Table 1 Treated Leachate Target Values

Treated Leachate Target Values		
Paremeter	Units of Measure	Limit
Fluoride	mg/L	15
Free Cyanide	mg/L	<0.005
Total oils and grease	-	No visual sheen
pH	-	6.5-8
Total Suspended Solids (TSS)	mg/L	<50
Total Dissolved Solids (TDS)	mg/L	None specified
Total Polyaromatic Hydrocarbons (PAHs)	µg/L	LOR (<1)
Total Recoverable Hydrocarbons (TRH)	µg/L	LOR (<100)
Aluminium	mg/L	5
Arsenic	mg/L	0.1
Beryllium	mg/L	0.1
Boron	mg/L	0.5
Cadmium	mg/L	0.01
Chromium	mg/L	0.1
Cobalt	mg/L	0.05
Copper	mg/L	0.2
Iron	mg/L	0.2
Lead	mg/L	2
Lithium	mg/L	2.5
Manganese	mg/L	0.2
Mercury	mg/L	0.002
Molybdenum	mg/L	0.01
Nickel	mg/L	0.2
Selenium	mg/L	0.02
Uranium	mg/L	0.01
Vanadium	mg/L	0.1
Zinc	mg/L	2
PFOS and PFHxS	µg/L	0.07[1]
PFOA	µg/L	0.56[1]

Note:

1. The ADWG for PFAS and PFHxS and PFOA has been adopted for discharge

2.2 Treatment System Components

The TWTP is comprised of the following main components:

- Leachate Holding Pond (1 ML capacity)
- Flow Balance Tank (50 kL capacity) & Recirculation system for pH adjustment
- Chemical dosing including storage and dosing pump systems for:
    - Acid (1,000L capacity)
    - Caustic (1,000L capacity)
    - Coagulants (500L capacity)
    - Oxidant (500L capacity)
    - Flocculent (500L capacity)
- Reaction Tank and Clarifier for precipitation and removal of large flocs
- LDAF with scraper for removal of remaining flocs, fine solids, grit removal and any oils and greases
- Sludge Dewatering bags for sludge removal
- Break tanks (3 x 10 kL capacity) with Recirculation systems for pH adjustment
- Media Filtration & Ion Exchange Filtration – Removal of suspended solids, dissolved contaminants and polishing
- Treated Water Tanks (4 x 100kL capacity)
    - Filled in batches where samples will be taken and analysed prior to discharge to the licensed discharge point.

2.3 Design Capacity

The maximum hydraulic capacity of the TWTP is 3L/s however the plant is designed and expected to treat and discharge a maximum of 2,400 kL/month. Based on estimates of leachate generation from the relevant Project elements the TWTP will require an estimated capacity of 30 kL/day.

2.4 Process Description

The purpose of the TWTP is to treat water from a 1ML capacity Leachate Holding Pond to produce treated water to meet the requirements outlined in *Table 1 Treated Leachate Target Values*

Leachate from the Leachate Holding Pond (1ML capacity) will be pumped to a 50kL Flow Balance Tank. At the inlet of the Flow Balance Tank the water will be sampled to take a representative sample of the raw leachate. The contents of the Flow Balance Tank is recirculated using a Recirculation Pump which allows the contents of the tank to be dosed with Acid (pH adjustment) and an Oxidant (To assist with the Oxidation of Cyanide) to start the pre-treatment process. The contents of the Flow Balance Tank is pH

adjusted to ensure that the high-pH leachate is optimized to remove targeted contaminants during the pre-treatment steps.

A Clarifier Feed Pump will pump water from the Flow Balance Tank to a Reaction Tank and Clarifier. The Clarifier Feed Pump will be interlocked if the pH of the leachate in the Flow Balance Tank is not within the operator set points. Coagulants and polymer are dosed in the feed pipework of the Reaction Tank to target the precipitation and removal of bulk solids as well as other contaminants including heavy metals and Fluoride. The Clarifier is designed to remove bulk solids that will settle out and reduce solids loading on the Dissolved Air Flotation (DAF) system. Water from the clarifier enters the DAF where any remaining fine and bulk solids, oils and grease will be removed via both flotation and settling.

DAF product water is collected in a Break Tank which includes a Recirculation Pump which operates to continuously provide a well-mixed tank and to allow pH adjustment of the Break Tank if required. Both Acid and Caustic can be dosed in to this Recirculation pipeline if required to meet the pH setpoint inputted at the control panel by the Operator. The pH of the water in the Break Tank is controlled to ensure an optimum pH level is maintained to feed water to Container 1 and Container 2 to ensure the selected Multimedia and Ion Exchange Resins in these systems are able to target specific contaminants of concern. A Filter Feed Pump in each Container will draw water from the Break Tank and pump it through the filter vessels to the next Break Tank.

Container 1 and 2 include Zeolite filtration, Granular Activated Carbon (GAC) filters as well as IX resins. GAC removes a range of compounds including dissolved phase hydrocarbons, fluoride and cyanide through the process of adsorption. Organic and inorganic compounds in the water are attracted to the surface of the activated carbon.

The second Break Tank also includes a Recirculation Pump which operates to continuously provide a well-mixed tank and to allow pH adjustment of the Break Tank if required. Both Acid and Caustic can be dosed in to this Recirculation pipeline if required to meet the pH setpoint inputted at the control panel by the Operator. The pH of the water in the Break Tank is controlled to ensure an optimum pH level is maintained to feed water to Container 3 to ensure the selected Multimedia and Ion Exchange Resins in these systems are able to target specific contaminants of concern. Different resins are more effective at certain pH levels so the pH adjustment in the Break Tanks is an important part of the treatment process. IX resins have been selected to target:

- Cyanide
- Fluoride
- Uranium
- Heavy metals

- PFOS and PFOA

A Filter Feed Pump in Container 3 will draw water from the second Break Tank and pump it through the filter vessels to the Treated Water Tanks. The Treated Water Tanks will include 4 x 100kL capacity tanks. The operation of the Treated Water Tanks will be manual and they will be isolated by the operator to ensure that only one tank is being filled at a time. Each of the tanks will have a Level Transmitter in them to alert and operator and to stop the Filter Feed Pump of Container 3 if the tank reaches capacity. If a tank reaches capacity, the operator will isolate the tank and open another tank to allow another batch process to occur.

Once a tank reaches capacity, a Recirculation Pump will be connected to the tank to mix the tank to ensure that a representative sample of the water in the tank can be taken. This water will be sent for analysis at the lab and if the water is suitable it will be gravity discharged to the environment.

If the water quality is not at the required discharge limits, the water in the treated water tank will be pumped back to the Leachate Holding Pond for re-treatment.

2.5 By-Product Management & Disposal

Sludge will be produced in the form of settled solids from both the Clarifier and DAF units. Sludge will be pumped out from the bottom of the Clarifier and DAF unit and into a sludge dewatering Geotube. The removed sludge will be dried and disposed of within the Containment Cell while available and to an offsite licensed waste facility when the Containment Cell has been capped. The filtered leachate will then pass back through the pre-treatment system.

Another by-product which will be generated by the TWTP is filter media which will be sucked out of the filters for disposal when required. The filter media will only be removed when “breakthrough” has occurred. Breakthrough occurs when the media is fully loaded with the contaminant and has no more capacity to remove any more of a targeted contaminant. The waste product will be removed from the filter and will be classified, collected and disposed offsite in a licenced facility.

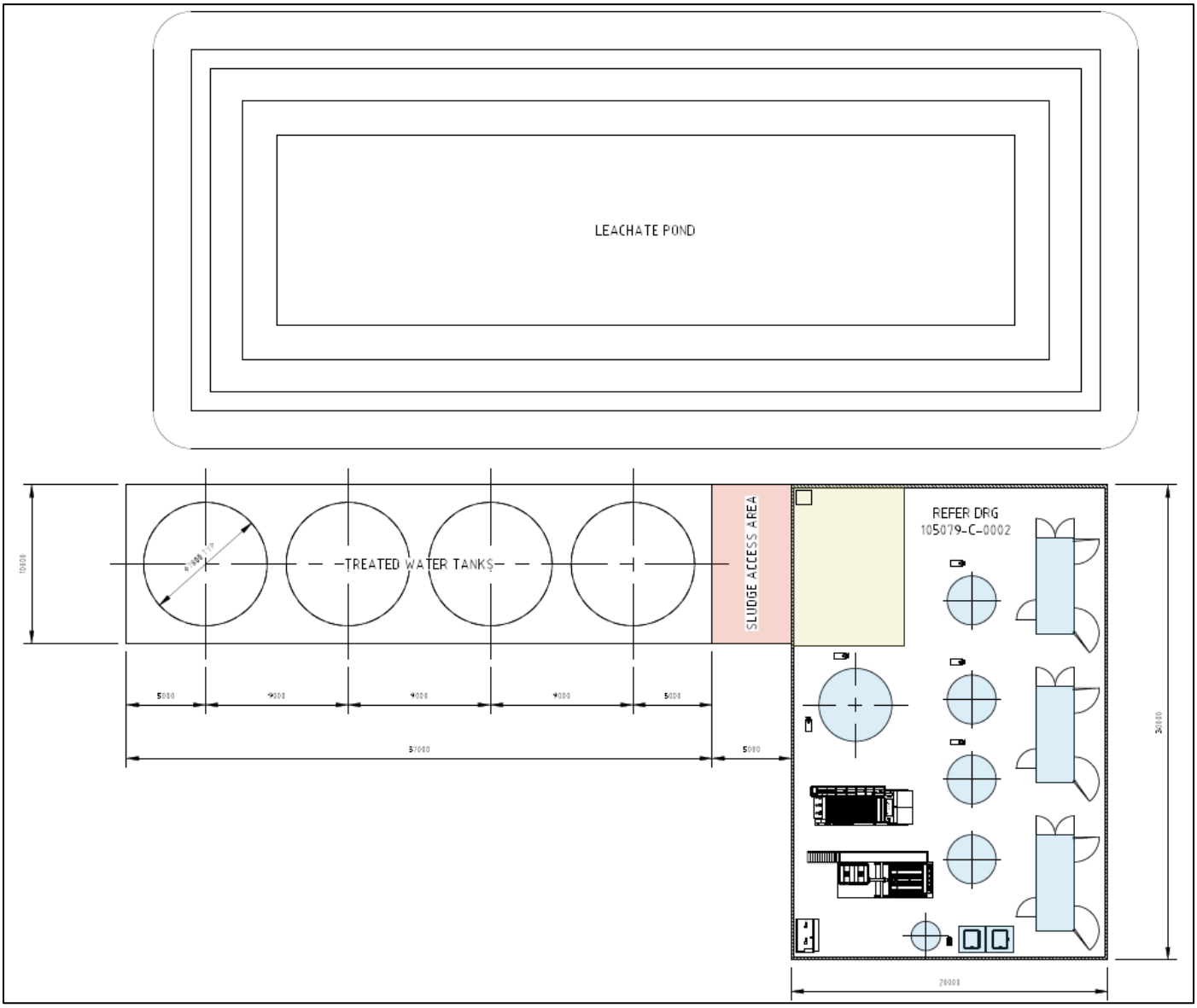


Figure 2 Layout of the TWTP

3 Commissioning & Testing Plan

3.1 General

3.1.1 Introduction

This plan includes the primary commissioning and testing information, but this document is to be used in association with the inspection test reports (ITRs) listed herein. This Plan has been developed to ensure:

- Testing and commissioning of the TWTP is undertaken in a systematic and safe manner
- TWTP process equipment functions and performs as per designs and specifications
- No uncontrolled discharge of water

3.1.2 Scope

The scope of the Commissioning & Testing Plan is to address TWTP commissioning and testing which involves three phases: Preparation, Implementation, and Closeout.

3.2 Preparation

3.2.1 Commissioning team roles and responsibilities

The below provides a breakdown of the commissioning team structure, roles, and responsibilities.

Table 2: Roles and Responsibilities

Role	Responsibility	Duties
Project Manager Patrick Puddefoot	Overall responsibility for project deliverables Oversee all works and provide assistance and sign off when required	Ensure all commissioning activities run to schedule Facilitate hand over General oversight and planning of commissioning and testing activities and progress
Safety Coordinator Fola Ladiran	Review work procedures and safe work method statements (SWMS) such that they comply with Enviropacific Safety Procedures	Develop safety documentation Ensuring all involved in commissioning are inducted and signed on to the SWMS Ensure that commissioning work complies with relevant safety standards and guidelines Ensure that all work procedures are followed, and work carried out according to SWMS
Site Supervisor James Bowden	Oversee all works and provide technical assistance and sign off when required. Supervise and direct staff	Assist Commissioning Manager and Commissioning Engineer Supervise works and co-ordinate Sub-Contractors Organise, execute and witness all mechanical inspections on pipe work, tanks, and equipment Assist in the development and completion of all documentation such that hydro testing, pipe work cleaning, tank installation, and equipment installation and initial run-in is completed to schedule and the plant is ready for process commissioning. Ensure that no equipment/vessel is finally closed prior to the inspection and approval from the commissioning team Address engineering deficiencies and punch list activities and close out Participate in all coordination, scheduling, safety and progress review meetings

Role	Responsibility	Duties
Commissioning Team Lead Patrick Puddefoot	Responsible for the management of commissioning activities; Systemization, planning, pre-commissioning, wet and dry commissioning	Organize, supervise and direct all commissioning activities and personnel. Systemize the TWTP into commissioning systems, to affect most efficient TWTP start up Manage development and validation of commissioning procedures and check sheets. Complete review and finalization of all documentation. Ensuring all related training and inductions are organized for the team Manage and direct all commissioning and start-up activities Participate in all coordination, scheduling, safety and progress review meetings Ensure all instrument and electrical checkouts and tests are completed. Ensure control system is checked addressing all scenarios of operations and interlocks. Review HAZOP actions and update all commissioning documentation post start up. Completion and coordination of third party sign off on all ITRs & ITPs for commissioning.

Role	Responsibility	Duties
Commissioning Engineer Fola Ladiran	Responsible for execution of all commissioning activities, input as required into system planning, direct or execute pre-commissioning, pressure leak testing, wet and dry commissioning. Start up and validation testing of the systems, assist as required with loop, motor and interlock checking	Organize the execution of all commissioning activities Create all commissioning documentation and check sheets. These documents will be provided as we progress and upon completion of commissioning. Prepare and deliver training packages Develop punch lists Perform all commissioning and start-up activities safely and to schedule Participate in all coordination, scheduling, safety and progress review meeting Ensure and assist as required that all instruments and electrical tests are complete Ensure and assist as required to check the control system functions, interlocks and start-up and shut downs Ensure that instruments, major process equipment, and chemical piping labelled Update all commissioning documentation post start up
Control/Electrical/ Instrumentation Commissioning Engineer Micah Smith (represents MSI Electrical managed by Enviropacific)	Responsible for execution of all electrical, control and instrumentation checks	Organize, execute, witness and document all electrical, control and instrumentation checkout. Develop all loop testing and electrical documentation and check sheets Ensure standard is upheld on all instruments, instrument cables, motor cables, I/O panels and panel labelling Develop ITRs for loop testing, interlock testing, start-up testing, shutdown testing and electrical and motor checks Develop ITRs for PLC systems checking and testing Conduct site acceptance test (SAT) and get the approval from the commissioning team lead

3.2.2 Reviewing and updating engineering information

As part of the preparation phase, the following engineering documentation will be reviewed and updated to as built:

- PFD's
- Equipment and instrument schedules
- General arrangement diagram

3.2.3 Commissioning Documentation

For commissioning of the TWTP, pre-commissioning and commissioning inspection test plans (ITPs) are developed along with inspection test reports (ITRs) as an integral part of this commissioning and test plan.

Refer to the Appendices for the following ITPs:

- Formwork & Slab ITP-01
- Pre-commissioning: ITP-02
- Dry Commissioning: ITP-03
- Wet Commissioning: ITP-04
- Process Commissioning: ITP-05
- Operaton of the TWTP: ITP-06

Refer to Appendices for a full suite of commissioning ITRs

3.2.4 Operator Training

Enviropacific will conduct training sessions for their operations personnel. The first session will be classroom based. The first session will cover process fundamentals, design basis, major equipment items, plant operation and control including protection philosophy.

The second session of the training will be conducted at the completion of commissioning and it will cover troubleshooting, maintenance overview, daily system checks, equipment start-up, shutdown, standby. The site based (session#2) training will have two components;

- Operator training on the process
- Plant control system training

Operator competency to be assessed and documented by Enviropacific after commissioning and a record of trained and qualified operators will be kept.

3.2.5 Safety during commissioning activities

The SWMS and procedures developed at the preparation stage to ensure the safety of the personnel during commissioning is submitted in the Appendices.The following SWMS and procedure will be followed on the basis of requirement.

- TWTP establishment, construction and commissioning SWMS
- The equipment isolation and permit procedure will be followed as and when required. The entire plant should be locked out and then slowly released by the permit authorised person in control, so that it cannot be energised or allowed to introduce water prior to finalisation of the commissioning process. Adhere to lock out tag out procedure and permit to work on isolated energised systems.

3.2.6 Environmental considerations

Chemical spill prevention and control

During the process commissioning stage several chemicals are required to be available for the treatment process. The water treatment plant utilises the following chemicals during normal operation. The chemicals used are:

- Acid (1,000L capacity)
- Caustic (1,000L capacity)
- Coagulants (500L capacity)
- Oxidant (500L capacity)
- Flocculent (500L capacity)

All chemicals are transferred into the respective storage tanks from pails or are provided in IBC's. During unloading of chemicals, all precautionary measures will be taken to prevent any spillages and also ensure compatible spill kits are available to absorb the chemical should any spillage occur. Measures to be taken in the event of an accidental release are provided in the relevant SDS.

WARNING: *Care should be taken when interacting with the chemicals and anyone working with or around the chemicals should read and understand the relevant SDS documents. All appropriate PPE should be worn when interacting with the chemicals in the water treatment plant.*

WARNING: *A number of the chemicals utilised in the water treatment plant are incompatible with each other so extreme care must be taken when replacing chemicals to ensure that the correct chemicals are attached to the correct storage vessel prior to any chemicals being transferred.*

Disposing process streams during commissioning

Potable water will be used for pressure and hydrostatic testing. The water used for hydrostatic testing of any tanks will be used for pipe pressure testing and finally used for wet commissioning. This negates the need to discharge any water during plant commissioning. Any spills or leaks during commissioning process will flow into the plant sump which will then automatically pump (based on sump level) into the Flow Balance Tank. Once wet commissioning has been completed, the potable water in the plant will be treated and tested to confirm it meets discharge criteria before it is discharged to the ischarge location under batch conditions.

3.3 Implementation / Commissioning

3.3.1 Commissioning phases

Commissioning includes the following steps and activities:

Pre-commissioning

- Completion of mechanical and electrical installation
- Filling and flushing of equipment to remove swarf
- Loading of media into filter vessels

Dry Commissioning

- Plant control system
- Motor checks
- Calibration of instruments
- Testing of instruments
- Interlock testing;
- Equipment functional testing;
- Services testing – including service testing of pipework, rectification of defects such as leaks, quality testing, and inspection of lines
- Operational sequence testing, including start up, shut down;
- Out of service (OOS) mode testing

Wet commissioning with potable water:

Potable water is introduced to the process and initial commissioning of the system and its major plant items can be undertaken, putting the process through its operating scenarios to replicate, in the most suitable manner possible, the normal operation of the TWTP. This is to ensure that the plant operates as specified in the functional description, under all operating conditions.

Process commissioning

In this phase, raw water will be introduced to the TWTP. The plant will be operated in auto mode to check its intended functionality and operation. The system setpoints will be determined and optimised.

Performance testing

During commissioning, proof of performance testing will be carried out to confirm that the design satisfies the performance requirements.

During this period of commissioning the following will be demonstrated.

Table 3: Performance Parameters

Parameter	Requirement
Treatment capacity	TWTP is able to treat a continuous raw water flow up to a maximum of 3L/s
Performance	TWTP is able to reduce water contaminant levels to the limits outlined in Table 1
Control system	Control system operates as per the functional specification
Operation	The system can be operated safely and, in the manner intended
Sampling & Testing Regime	Raw leachate and treated leachate samples will be taken to be sent to a NATA accredited lab for analytes. Results will be compiled and shared with the client for approval prior to discharge of any treated leachate. If the treated water does not meet the Target Values (Refer Section 2.1), the leachate will be pumped back to the Leachate Holding Pond for re-treatment as shown in Figure 3.

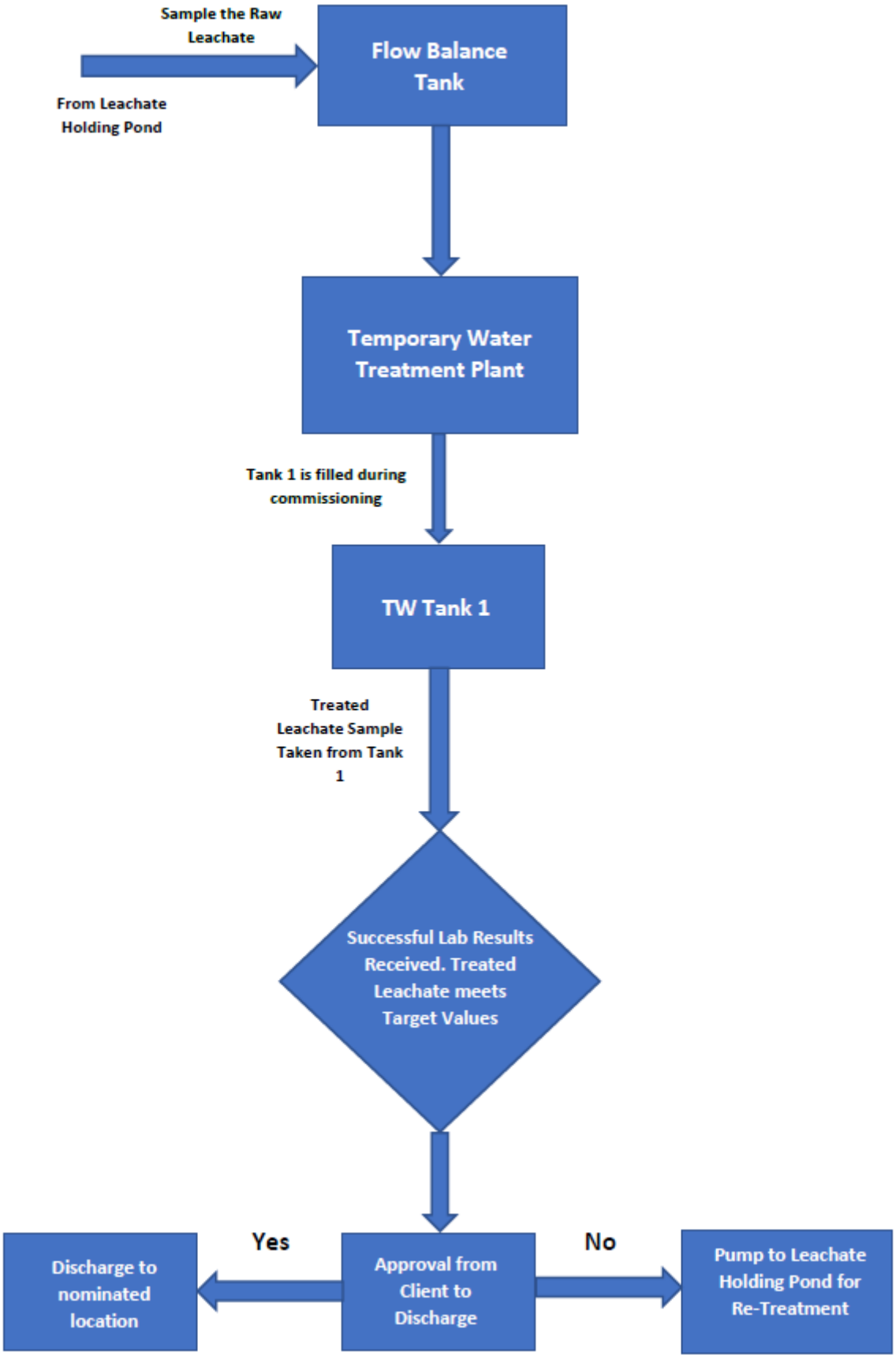


Figure 3 Commissioning sequence prior to any discharge of treated leachate

3.4 Close Out

3.4.1 Completion of punch list items

All ITR actions will be completed and all documentation will be reviewed. The punch list items that were generated in the commissioning phases that are outstanding will be closed out at this stage.

3.4.2 Commissioning Report

All signed ITP's and ITR's will be submitted as a combined commissioning report.

4 Operation of TWTP

4.1.1 Operation team roles and responsibilities

The below provides a breakdown of the Operations team structure, roles, and responsibilities.

Table 4: Roles and Responsibilities

Role	Responsibility	Duties
Project Manager Patrick Puddefoot	Overall responsibility for project deliverables Oversee all works and provide assistance and sign off when required	Ensure all operation activities run to schedule General oversight and planning of operation, maintenance activities and project progress
Site Manager and Operator James Bowden	Operate the TWTP Oversee all works and provide technical assistance and sign off when required. Supervise and direct staff Review work procedures and safe work method statements (SWMS) such that they comply with Enviropacific Safety Procedures	Operate and maintain the TWTP on a daily basis Ensure that Operation ITP's for discharge of treated leachate are completed prior to discharge of any treated leachate Supervise works and co-ordinate Sub-Contractors Organise, execute and witness all mechanical inspections on pipe work, tanks, and equipment during operation and maintenance activities Address engineering deficiencies and punch list activities and close out Participate in all coordination, scheduling, safety and progress review meetings Ensure that all work procedures are followed, and work carried out according to SWMS

4.2 Ongoing Operation & Maintenance

As part of the treatment process implementation, Enviropacific will have its trained operators undertake regular service and maintenance of the system throughout the operation phase. Even though the system is mostly automatic and can run by itself, attendance will be required for the following activities.

- Normal operation of the batch treatment process
- Safety & Quality documentation;
- Optimisation of the overall system performance & adapting to site requirements;
- Inspection and servicing of pumps and equipment;
- Probe cleaning and calibration;
- Clarifier and LDAF cleaning;
- Monitoring, procuring and pump out of chemicals and consumables;
- Sample collection and freighting to lab for analysis;

- Daily/weekly/monthly performance recording and reporting;
- Remote monitoring;
- Emergency attendance and troubleshooting;

4.3 Operational Methodology

During normal operation, the site-specific operation and sampling regime can be summarized as shown in Figure 4 below:

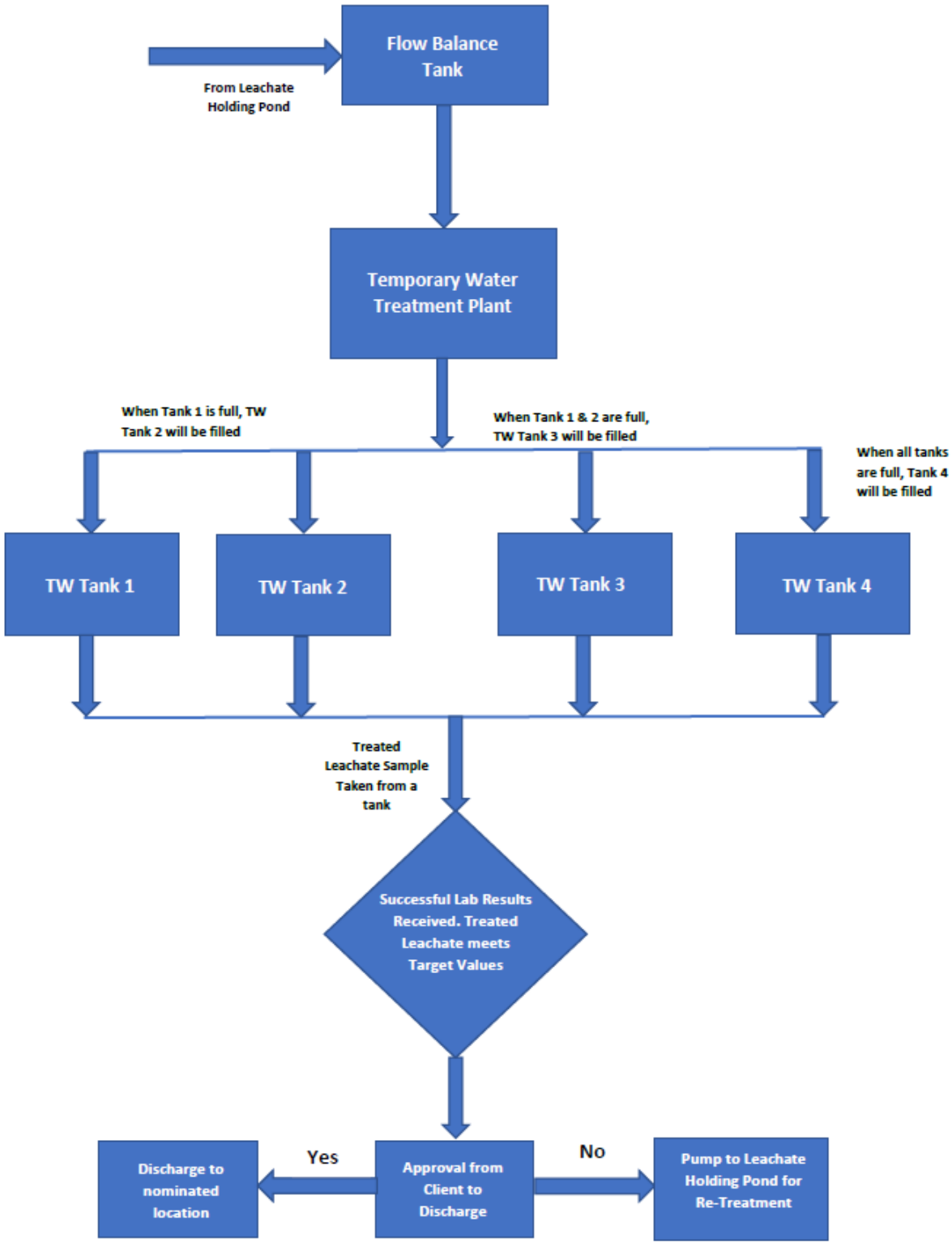


Figure 4 Operation and sampling regime for discharge of treated leachate

An Enviropacific operator will always be on site for the operation of the TWTP. During normal operation the TWTP will send treated water to one Treated Water Tank at a time. When that tank is full then the next tank will start filling.

When a Treated Water tank is full, a sample of the water will be taken and sent to a NATA accredited lab for analysis.

During normal operation, the plant operator will always complete an Inspection Test Report for the operation and sampling of raw and treated leachate. The relevant document is *ITR-06 – Operation of the TWTP, Discharge of Treated Leachate.* This report will include the following steps:

- Provide raw leachate to the TWTP
- Sample the raw feed to the Flow Balance Tank prior to pH correction
- Operate and optimize the TWTP operation
- Sample the Treated Leachate when one of the Treated Water Tanks is full and send to a NATA accredited lab for analysis
- Collate raw and treated analysis report and check if Target criteria has been met.
- Share the raw and treated analysis report with the client for review and approval
- Client sign off for approval to discharge the treated water

By implementing the use of the Inspection Test Plan and Report, the risk of discharging treated leachate that doesn't meet the Leachate Target Values will be greatly reduced as multiple people and approvals will be required prior to any water being released from a Treated Water Tank.

If there is a failure in the operation of the TWTP and the Approval to Discharge is not provided, the treated leachate will be pumped back into the Leachate Holding Pond for re-treatment as per the operation flow chart shown in Figure 4.

The capacity of water in the Leachate Holding Pond will be managed so that there is capacity left in the system to allow for this if a failure did occur. In the event that there was no capacity in the Leachate Holding Pond (e.g during a significant rain event) to allow for re-circulation of the treated leachate, the water will be removed from the Treated Water Tank using a tanker and it will be sent to an offsite water treatment plant for processing.

4.4 Monitoring and Alarms Management

Continuous monitoring of the water throughout the TWTP is done using built in instrumentation and alarm systems. If the water is ever measured to be out of spec at a particular part of the process, the automated system will interlock the necessary steps of the process. The system may automatically recover (e.g. by pH

correction dosing) and recommence operation or may require the water to be sent back to the head of the system for re-treating which can be facilitated by manually running pumps and opening/closing actuated valves.
pH, Turbidity and EC are monitored at the Treated Water to ensure that the water remains within the Discharge Criteria. pH and ORP are measured throughout the process to ensure that the treatment processes are operating at their optimum design requirements to remove the target contaminants.

Alarms and emails are also sent out to operators and managers to notify them of plant issues. If the operator is onsite, they will investigate the cause of the alarm immediately. If the operator is not present at site or the incident occurs outside of normal operation hours, then the operator will attempt to fix the problem remotely. If this is not possible then the operator will assess the urgency of the situation and attend site if necessary to rectify the issue. Enviropacific maintain a team with personnel on-call for these requirements.

If sample results of treated water indicate a failure, Enviropacific will notify the client via email and phone call and still follow the steps of ITR-06 to ensure that normal processes are followed and that relevant documentation is available for record keeping.

By implementing the batch treatment process, the likelihood of a treated water environmental breach occurring is significantly reduced.

4.5 Record keeping

The following is a list of documents which will be kept and recorded. Please not that this may be paper records or live excel documents. Either form will be occasionally backed up to Enviropacific servers.

Description	Frequency
ITP-06 – Operation of the TWTP & Discharge of Treated Leachate	Daily operation and completion prior to any discharge of treated leachate from Treated Water Tanks
NATA Accredited Laboratory Results	Prior to any discharge of treated Leachate from the Treated Water Tanks. To be submitted as part of ITP-06
Daily operator check sheet	While the plant is running
Maintenance Schedule log sheet	Check when attending site, sign completed items.

Additionally, TWTP operational data (flow, pH, level, operational status etc.) will be available live at all times via remote login and can be compiled and recorded for submission to HAKK at the nominated frequency to maintain any compliance requirements.

4.6 Enviropacific Contact List

Contacts, roles, responsibilities and training		
Name	**Title**	**Roles and responsibilities**
Patrick Puddefoot (Enviropacific) patrick.puddefoot@enviropacific.com.au	Project Manager & Lead Commissioning Engineer	Approval of design plans, inspection test plans, inspection test records, maintenance schedules, commissioning of the system. Stakeholder liaison including submission of weekly/monthly reports.
Chris Dogulin (Enviropacific)	Project Director	Stakeholder liaison
John Phipps (Enviropacific)	Engineering Manager	Management and approval of all design processes
Michael Stark (Enviropacific)	Lead Process Engineer	Design of the process and equipment selection for the water treatment plant
Peter Manning (Enviropacific)	Project Engineer & Draftsman	Creation of site documentation including inspection test plans, inspection test records. Design and installation of the water treatment plant. WTP troubleshooting, guidance and change management as necessary.
Dave Chisolm (Enviropacific) 0419 182 191 Karl Schwizler (Enviropacific) 0499 501 988	Operators	Day to day operation and maintenance of the TWTP. Testing and record keeping. Reporting to PE/PM
On call / After Hours Contact: 0409 797 404	On-call operator	Responds to after hours plant alarms and issues. Will attend site after hours if deemed necessary

5 Decommissioning of the TWTP

5.1 Timeline

The TWTP is expected to be operational on site for 3 years until early 2025. If leachate generation at the site is greatly reduced during this time, the TWTP may be decommissioned sooner.

5.2 By-Product Management & Disposal

At the time of decommissioning the TWTP will be operated to treat as much of the remaining leachate as possible. At the end of treatment the TWTP will be flushed with potable water to remove the remaining leachate left within the equipment and pipe systems of the plant.
After the system has been flushed and cleaned with potable water, the filter media will be removed from the filters. This media and resin waste product will be removed from the filter and will be classified, collected, and disposed offsite in a licenced facility.

5.3 Roles and Responsibilities

The below provides a breakdown of the Decommissioning team structure, roles, and responsibilities.

Table 5: Roles and Responsibilities

Role	Responsibility	Duties
Project Manager Patrick Puddefoot	Overall responsibility for project deliverables Oversee all works and provide assistance and sign off when required	Ensure all decommissioning activities run to schedule Facilitate hand over to Daracon General oversight and planning of decommissioning and testing activities and progress
Safety Coordinator Fola Ladiran	Review work procedures and safe work method statements (SWMS) such that they comply with Enviropacific Safety Procedures	Develop safety documentation Ensuring all involved in decommissioning are inducted and signed on to the SWMS Ensure that decommissioning work complies with relevant safety standards and guidelines Ensure that all work procedures are followed, and work carried out according to SWMS
Site Supervisor James Bowden	Oversee all works and provide technical assistance and sign off when required. Supervise and direct staff	Supervise works and co-ordinate Sub-Contractors Address engineering deficiencies and punch list activities and close out Participate in all coordination, scheduling, safety and progress review meetings

6 Appendices

1. Inspection Test Plans
2. Inspection Test Reports
3. EPA Consultation

INSPECTION AND TEST PLAN 01

ENVIROPACIFIC SERVICES

Project title: HAKK TWTP		**Project No:** 105079	
Description of activity: Formwork and slab	**Contract No/Ref:**	**ITP No.** 01	**Rev No.** A
Site Location for inspection/testing: Kurri Kurri, NSW		**Lot No:**	
ITP prepared by: Fahad Saleem **Date:** 29/09/2021		**ITP approved by:** Patrick Puddefoot **Date:**	
EPS Representative:		**Client:**	

ID #	Process Step	Responsibility	Stage	State Acceptance Criteria	Records of Inspection or Test (s)	Inspection/Test Responsibility		Date Inspected*	Comments or NCR
1.	Clear area	Daracon		Area for formwork is cleared and delineated					
2.	Identify underground services	Daracon		Ensure any underground services are identified and plans are made to avoid them					
3.	Formworking	Daracon		All formwork is completed per specifications/design					

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: A = Approve; T = Test; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; S = Submit; PM = Project Manager; SM = Site Manager; DM = Design Manager, EPS = Enviropacific; C = Consultant responsibility to EPS; NCR = Non-conformance; S. Con = Subcontractor

ID #	Process Step	Responsibility	Stage	State Acceptance Criteria	Records of Inspection or Test (s)	Inspection/Test Responsibility		Date Inspected*	Comments or NCR
4.	Pouring of slab/concrete bund	Daracon		Slab is poured, level/graded with concrete bund walls meeting design requirements					
5.	Allow to slab to set and check for deficiencies	Daracon		Slab is well set and has no deformities/deficiencies					

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: A = Approve; T = Test; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; S = Submit; PM = Project Manager; SM = Site Manager; DM = Design Manager, EPS = Enviropacific; C = Consultant responsibility to EPS; NCR = Non-conformance; S. Con = Subcontractor

AMENDMENTS			
No.	**Description of amendment made**	**Date**	**Approved by PM (sign)**

PERSONNEL COMPLETING THIS ITP				
No	**EPS Rep Name**	**Date**	**Position**	**Signature**

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: A = Approve; T = Test; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; S = Submit; PM = Project Manager; SM = Site Manager; DM = Design Manager, EPS = Enviropacific; C = Consultant responsibility to EPS; NCR = Non-conformance; S. Con = Subcontractor

INSPECTION AND TEST PLAN Q-02-01

ENVIROPACIFIC

Project title: HAKK TWTP		**Project No:** 105079	
Description of activity: Pre- Commissioning/ Installation	**Contract No/Ref:**	**ITP No.** 02	**Rev No.** A
Site Location for inspection/testing: Kurri Kurri, NSW		**Lot No:**	
ITP prepared by: Fahad Saleem **Date:** 29/09/2021		**ITP approved by:** Patrick Puddefoot **Date:**	

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility (Signature)			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client		
1.	Access and inspection of slab area	Prior to Delivery	Access is suitable. Slab matches civil IFC drawings	- Visual inspection - dimensional checks - QA complete	- ITP 02 - ITP 01		V, D, H	V, D		
2.	Delivery / set- out of major equipment	After Delivery	Equipment set out as per General Layout DWG or as agreed on- site changes	- Visual inspection - dimensional checks	- ITP 02		V, D			
3.	Material Inspection - Pipework - Pumps/Skids - Process tanks - Instruments	Upon Delivery	Materials are as ordered, are not damage, are fit for use	Inspect materials for correctness and damage	- Delivery Dockets - ITP 02 - Photo's - ITR-02-01	X	V, D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility (Signature)			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client		
4.	General completion of plumbing installation	After Bulk Installation	Plumbing has been completed as per Piping and Instrumentation Diagram	- Compare plumbing installation against P&ID. - Verify supports are adequate - Check all fasteners are secure	- Delivery Dockets - ITP 02 - ITR-02-01	X	V, D			
5.	Flush and Fill	After Plumbing Installation	- Pipe/equipment adequately supported. - Exclusion zones established. - Bulk of swarf and debris removed. - Air removed from system.	- Check workers understand and have signed SWMS. - Inspect pipe and equipment. - Establish exclusion zone. - Mechanically remove debris. - Open air- bleed points. - Flush swarf from system. - Fill with water. - Close air- bleed points.	- ITR-02-02	X	D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility (Signature)			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client		
6.	Pressure Test	Each test section	- Pressure test system connected. - Appropriate test pressure gauge installed. - Test section passes pressure test. - Any leaks rectified. - Pressure test in accordance with AS/NZS 3500.1:2015 Plumbing and drainage Water service - Release pressure, remove equipment, store safetly	- Follow ITR-02-03	- ITR-02-03	X	D	W		LOR must be notified of the test periods and may spot-check any test they see fit. Works will be documented and continue whether or not a witness is provided.
7.	Load media into filter beds	After pressure testing	Correct media loaded into their corresponding vessels	- Follow SWMS for media loading procedures. - follow media loading schedule for each filter type.						
8.	General Completion of Electrical Installation	After Bulk Install	Electrical installation in accordance to Wiring Rules AS/NZS 3000- 2018, Electrical Installations AS/NZS 3012:2010 & as per electrical schematic drawings.	Compare electrical installation against electrical schematic drawings. Obtain Certificate of Compliance for Electrical Work	- ITP-02 - CCEW	D	D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility (Signature)			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client		
9.	Installation completed	After bulk mechanical & electrical installation.	All installation tasks completed		ITP Q-02-01 Electrical contractor ITR	H Electrical Supervisor	H Commissioning Manager	H Senior Package Engineer		*(Some pressure testing/rectification is typically outstanding at this stage and can be listed in the amendments below once considering risks and additional hold points placed on subsequent ITP's)*

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant

AMENDMENTS			
No.	**Description of amendment made**	**Date**	**Approved by PM (sign) &SPE (LOR)**

PERSONNEL COMPLETING THIS ITP				
No	**EPS Rep Name**	**Date**	**Position**	**Signature**

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant

INSPECTION AND TEST PLAN ITP 03

ENVIROPACIFIC

Project title: HAKK TWTP		**Project No:** 105079	
Description of activity: Dry Commissioning	**Contract No/Ref:**	**ITP No.** 03	**Rev No.** A
Site Location for inspection/testing: Kuri Kurri, NSW		**Lot No:**	
ITP prepared by: Fahad Saleem **Date** 29/09/2021		**ITP approved by:** Patrick Puddefoot **Date:**	

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client (LOR SPE)		
1.	General Site Safety	At the beginning of Dry Commissioning	- Completion of ITR 03-01. - Area is clear, hazards are controlled and identified, emergency exits are clear	Visual inspection	ITR 03-01		D			
2.	MCC Sub Circuits and Labelling	After Electrical Installation	-Completion of ITR 03-02 -Wiring and components installed as per Wiring Rules AS3000-2018 & Electrical Installations AS/NZS 3012:2018 & as per electrical schematic drawings - Submit Electrical Certificate of Compliance.	Visual and electrical inspection of all MCC components. Complete ITR-03-02	ITR 03-02 Electrical Certificate of Compliance	D (Electrician)	D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client (LOR SPE)		
3.	Drive motors with Direct Online Starters (DOL)	After Electrical Installation	-Completion of ITR 03-03 -Wiring and components installed as per Wiring Rules AS3000-2018 & Electrical Installations AS/NZS 3012:2018 & as per electrical schematic drawings -Submit Electrical Certificate of Compliance. -DOL motors installed correctly and functioning	Visual and electrical inspection of all MCC components. Settings and bump testing of DOL motors Complete ITR-03-03	ITR 03-03 Electrical Certificate of Compliance	D (Electrician)	D			
4.	Drive Motors with Variable Speed Drives	After Electrical Installation	-Completion of ITR 03-04 -Wiring and components installed as per Wiring Rules AS3000-2018 & Electrical Installations AS/NZS 3012:2018 & as per electrical schematic drawings - Submit Electrical Certificate of Compliance. -VSD driven motors installed correctly and functioning	Visual and electrical inspection of all MCC components. Settings and bump testing of VSD driven motors Complete ITR-03-04	ITR 03-04 Electrical Certificate of Compliance	D (Electrician)	D			
5.	Plant Control System	After Electrical Installation	-Completion of ITR 03-05 -Wiring and components installed as per Wiring Rules AS3000-2018 & Electrical Installations AS/NZS 3012:2018 & as per electrical schematic drawings - Submit Electrical Certificate of Compliance. -control systems installed correctly and functioning	Visual and electrical inspection of all MCC components. Settings and bump testing of VSD driven motors Complete ITR-03-05	ITR 03-05 Electrical Certificate of Compliance	D (Electrician)	D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client (LOR SPE)		
6.	Tanks (including all process water, chemical, reaction/mixed tanks)	After Mechanical Installation	-Completion of ITR 03-06 -Installation completed as per P&ID -Tank, valves and instruments are appropriately installed and functioning.	Visual, electrical, and mechanical inspection of tanks. Complete ITR-03-06	ITR 03-06		D			
7.	Process Pumps	After Mechanical Installation	-Completion of ITR 03-07 -Installation completed as per P&ID -Pump installed, protected, labelled, checked -All valves and instruments are appropriately installed and functioning	Visual, electrical, and mechanical inspection Complete ITR-03-07	ITR 03-07		D			
	Filter Press	After Mechanical Installation	-Completion of ITR 03-08 -Installation completed as per PID -Press has been installed level -Services and instruments fitted and functioning -Emergency stop lanyards functioning correctly -Mechanical guards in place	Visual, electrical and mechanical inspection Complete ITR-03-08	ITR 03-08		D			No Filter press on this project

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client (LOR SPE)		
8.	Filters	After Mechanical Installation	-Completion of ITR 03-09 -Installation completed as per P&ID -Filter filled with correct media type -Vessel sizings appropriate, distributors fitted and in good condition	Visual, electrical, and mechanical inspection Complete ITR-03-09	ITR 03-09		D			No filters in this project
9.	Chemical storage and dosing systems	After Mechanical Installation	-Completion of ITR 03-10 -Installation completed as per P&ID -Tank storage, level indication, fill point connection and bunding appropriate -Dosing pumps fitted and functioning -Chemical lines installed appropriately and mechanically protected	Visual, electrical and mechanical inspection Complete ITR-03-10	ITR 03-10		D			
10.	Air Compressors	After Mechanical Installation	-Completion of ITR 03-11 -Installation completed as per P&ID -External 3rd party commissioning documentation	Visual, electrical, and mechanical inspection ancillary items Complete ITR-03-11	ITR 03-11 External Commiss. Report	D	D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Work Group	Enviropacific (PE/PM)	Client (LOR SPE)		
11.	Ancillary Items (Safety shower, sump, potable manifold, air manifold)	After Mechanical Installation	-Completion of ITR 03-12 -Installation completed as per P&ID -Sump sufficient - Service water sufficient - Eyewash/Safety Showers shall be connected to potable water in accordance with AS 4775	Visual, electrical, and mechanical inspection ancillary items Complete ITR-03-12	ITR 03-12		D			
12.	Dry Commissioning completed	After Dry Commissioning	All Dry Commissioning tasks completed, and action items closed out.		ITP 03		H Commissioning Manager	H Senior Package Engineer		

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

AMENDMENTS			
No.	**Description of amendment made**	**Date**	**Approved by PM (sign)**

PERSONNEL COMPLETING THIS ITP				
No	**Name**	**Date**	**Position**	**Signature**

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

INSPECTION AND TEST PLAN ITP 04

ENVIROPACIFIC

Project title: HAKK TWTP		**Project No:** 105079	
Description of activity: Wet Commissioning	**Contract No/Ref:**	**ITP No.** 04	**Rev No.** A
Site Location for inspection/testing: Kurri Kurri, NSW		**Lot No:**	
ITP prepared by: Fahad Saleem **Date:** 29/09/2021		**ITP approved by:** Patrick Puddefoot **Date:**	

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Worker	Enviropacific (PE/PM)	Client		
1.	HMI Set and Test	Start of Wet Commissioning	- Setpoints entered on HMI as per functional description -Alarms and errors are cleared as best possible.	- Set values	ITP-04 ITR-04-01		D			
2.	Check Digital Inputs/Outputs	During Wet Commissioning	- Manually test all on/off input/output actions are correctly paired from controls to field as per electrical Schematics drawings.	- Test actions	ITP-04 ITR-04-01		D			
3.	Check Analogue Inputs/Outputs	During Wet Commissioning	-Set-up field instrument ranges, scale analogue signals to PLC as per functional description	-Set up instruments and pair to PLC	ITP-04 ITR-04-01		D			
4.	Test faults & interlocks	During Wet Commissioning	- Manually test all faults are triggered on HMI and shutdowns are appropriate as per functional description. - Check control setpoints trigger correctly in auto sequences - delays are appropriate	-Test actions -Turn to auto and manipulate variables	ITP-04 ITR-04-01		D			
5.	Check SMS Functionality	During Wet Commissioning	- Simcard installed and operational. - Verify SMS alerts received	-Observe and record	ITP-04 ITR-04-01		D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Worker	Enviropacific (PE/PM)	Client		
6.	Simulate Startup after Power Failure	During Wet Commissioning	- System can be restarted by operator as per functional description	-Shutdown system and restart	ITP-04 ITR-04-01		D			
7.	Wet Commissioning completed	After Wet Commissioning	All Wet Commissioning tasks completed and action items closed out		ITP-04 ITR-04-01		H Commissioning Manager	H PM / Package Engineer		

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

AMENDMENTS			
No.	**Description of amendment made**	**Date**	**Approved by PM (sign)**

PERSONNEL COMPLETING THIS ITP				
No	**EPS Rep Name**	**Date**	**Position**	**Signature**

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

INSPECTION AND TEST PLAN 05

ENVIROPACIFIC

Project title: HAKK TWTP		**Project No:** 105079	
Description of activity: Process Commissioning	**Contract No/Ref:**	**ITP No.** 05	**Rev No.** A
Site Location for inspection/testing: Kurri Kurri, NSW		**Lot No:**	
ITP prepared by: Fahad Saleem **Date:** 29/09/2021		**ITP approved by:** Patrick Puddefoot **Date:**	

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Worker	Enviropacific (PE/PM)	Client		
1.	Prepare Chemical Tanks for filling	Prior to handling chemicals	- Tanks drained of water after wet commissioning. - Filling in accordance to AS 3780- 2008 The storage and handling of corrosive substance & NSW Dangerous Goods Code of Practice 2005	- Drain and check tanks are empty. - Correct PPE is worn. - Spill kit available	ITP 05 ITR 05-01		D			
2.	Fill Chemical Tanks	Prior to Process Commissioning	- Piping is connected in a way to avoid leaking of chemicals - Tanks filled with Chemicals	- Inspect piping and connections prior to dispensing chemicals. - Fill with chemicals.	ITP 05 ITR 05-01		D			
3.	Provide Raw Water Feed to the WTP	Prior to Process Commissioning	- Sample raw water for analysis of inlet parameters	- Water analysis by NATA accredited lab	ITP 05 ITR 05-01		D			
4.	Determine the inlet pH dosing control settings	During Process Commissioning	- Dose rate established and set.	- Run raw water through WTP. - Tune to achieve desired pH.	ITP 05 ITR 05-01		D			
5.	Determine Coagulant/Polymer Dose Rate settings	During Process Commissioning	- Coagulant dose rate established and set. - Polymer dose rate established and set.	- Sample influent. - Conduct jar test to determine dose rate.	ITP 05 ITR 05-01		D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Worker	Enviropacific (PE/PM)	Client		
6.	Determine ISR sludge discharge settings	During Process Commissioning	-Discharge times and frequency etablsihed and set -Ensure clarifier performance is not compromised	-Adjust discharge time and rate -Conduct sampling of overflows and sludge pump outlets	ITP 05 ITR 05-01		D			
7.	Determine Filters Backwash Settings	During Process Commissioning	- Filtration and backwash operates effectively.	- Observe filtration to determine backwash intervals. - Observe complete backwash sequence and adjust as necessary.	ITP 05 ITR 05-01		D			
8.	Determine polymer make down system settings for Pipe Flocculator	During Process Commissioning	-Confirm dilution is 0.1-1% -Satisfy dilute polymer pumps are operating inside their pumping range	-Adjust dilution water inlet rate and neat polymer pump rrate -Measure dilution rate	ITP 05 ITR 05-01		D			
9.	Record all commissioning setpoints	After Process Commissioning	- All setpoints recorded	Inspect final state and record	ITP 05 ITR 05-01		D			
10.	Determine Discharge System Set points Sample and Report on Discharge Water Quality	During Process Commissioning	- Treated water parameter meet discharge limits.	Sample and test to ensure discharge criteria is met before any water is discharged Record results	ITP 05 ITR 05-01		D			

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

INSPECTION AND TEST PLAN 05

ENVIROPACIFIC

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Worker	Enviropacific (PE/PM)	Client		
11.	Process Commissioning completed	After Process Commissioning	All Process Commissioning tasks completed and action items closed out		ITP 05 ITR 05-01		H Commissioning Manager	H PM / Package Engineer		

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

AMENDMENTS			
No.	Description of amendment made	Date	Approved by PM (sign)

PERSONNEL COMPLETING THIS ITP				
No	EPS Rep Name	Date	Position	Signature

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

INSPECTION AND TEST PLAN 06

ENVIROPACIFIC

Project title: HAKK TWTP		**Project No:** 105079	
Description of activity: Operation of TWTP - Discharge of Treated Leachate	**Contract No/Ref:**	**ITP No.** 06	**Rev No.** A
Site Location for inspection/testing: Kurri Kurri, NSW		**Lot No:**	
ITP prepared by: Fahad Saleem **Date:** 29/09/2021		**ITP approved by:** Patrick Puddefoot **Date:**	

ID #	Process Step	Stage / Frequency	State Quality Acceptance Criteria:	Inspection Test Procedure	Records of Inspection or Test (s)	Inspection/Test Responsibility			Date Inspected*	Comments or NCR
						Worker	Enviropacific (PE/PM)	Client		
1.	Provide Raw Water Feed to the TWTP	Start up of system at start of day			ITP 06 ITR 06-01		D			
2.	Sample raw leachate	During Operation of the TWTP	Raw Leachate is within the Influent Design Criteria	- Water analysis by NATA accredited lab	ITP 06 ITR 06-01		D			
3.	Operate the TWTP until a Treated Water Tank is at capacity	During Operation of the TWTP		Level measurement shown at the HMI	ITP 06 ITR 06-01		D			System can still operate and fill another Treated Water Tank while the water from one of the tanks is being analysed
4.	Sample the full Treated Water Tank and Report the water analysis	During Process Commissioning	- Treated water parameter meet discharge limits.	Sample and test to ensure discharge criteria is met before any water is discharged Record results	ITP 06 ITR 06-01		D, H	R		Hold Point for EPS. Report results of treated leachate to client for review prior to discharge to the environment.

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

AMENDMENTS			
No.	**Description of amendment made**	**Date**	**Approved by PM (sign)**

PERSONNEL COMPLETING THIS ITP				
No	**EPS Rep Name**	**Date**	**Position**	**Signature**

Records of Inspection or Test Legend: List Inspection and Test Report Type. * For activities with multiple frequencies write date of initial inspection. Those Items requiring multiple inspections should be documented on a separate ITR.

Inspection/Test Responsibility Legend: X = Worker or workgroup self-inspection; H = Hold Point; D = Document; R = Review; V = Visual; W = Witness; C = Consultant responsibility to EPS

ENVIROPACIFIC SERVICES PTY LTD
INSPECTION AND TEST RECORD ITR-02-01
General Completion of Plumbing Install

Project Title: HAKK TWTP		**Project No:** 105079
Location: Kurri Kurri, NSW		**ITR Rev:** A
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**
ITP completed by:		**Date:**

Step	Step No.	Acceptance Criteria	Conformation	Comment / Initial
Preliminary	**1.1**	Licence / up to date qualifications available	Yes/No/NA	
	1.2	PID and General Arrangement Layout available	Yes/No/NA	
	1.3	Materials are suitable for the installation and no damages No foreign materials, flora or fauna in the pipe	Yes/No/NA	
Pumps, Tanks and Equipment	**2.1**	Orientation of equipment is correct with connections typically at 90 or 45 degree placements	Yes/No/NA	
	2.2	Positioning allows for: - 600mm walkways - 2200mm headroom - sufficient access to manways - space for pipe-racks outside of walkways	Yes/No/NA	
	2.3	Equipment is bolted down - Stainless studs chemset into floor surfaces - Stainless or HDG into raised surfaces - Nylon isolation washers used for dissimilar metals	Yes/No/NA	
Piping installation	**3.1**	Check P&ID, GA and Pick List, discuss each pipe run with project engineer before commencing	Yes/No/NA	
	3.2	Consider the operation of the equipment being installed (vents, access points, travel of moving parts, rain/sun)	Yes/No/NA	
	3.3	Consider operator pathways and work areas. Reach to valves or controls.	Yes/No/NA	
	3.4	Consider the ability to remove equipment/instruments (E.g. flanges and unions)	Yes/No/NA	
	3.5	Consider spacing: - between pipes for flange diameter - >5 Diameters before flow meters >2D after - provision for future cut-in / repairs	Yes/No/NA	
	3.6	Pipe supports at no greater than 1.5m spacing	Yes/No/NA	

	3.7	Ensure cut supports and all metal cuts are appropriately passivated (E.g. Cold Gal)	Yes/No/NA	
	3.8	Swarf removed from each pipe cut.	Yes/No/NA	
	3.9	Correct clear Primer and Glue is available, sealed, new and free from water ingress.	Yes/No/NA	
	3.10	Joins are glued to full fitting depth (twisted and held), evidence of glue around the full joint circumference is present. Joins are not glued in the rain / on wet surfaces.	Yes/No/NA	
	3.11	Ensure no glue enters the valve (glue sockets and flanges before installing the valve)	Yes/No/NA	
	3.12	Final pipe installation is parallel with minimised bends & fittings.	Yes/No/NA	
	3.13	Threads are scratched before applying PTFE tape (Pink) and paste (Loctite 567). No evidence of thread slippage during installation.	Yes/No/NA	
	3.14	Flange bolts are tightened in a rotating star pattern to prevent gasket bunching. All bolt holes on flanges are used.	Yes/No/NA	
	3.15	Bolts on lugged valves do not 'bottom-out' (touch in the centre when fully tightened)	Yes/No/NA	
Chemical Systems	**4.1**	Adhere to or seek advice: Sulphuric Acid 51% – Viton seals Hypochlorite 12.5% – Viton seals Sodium Hydroxide 30% – EPDM seals Aluminium Chlorohydrate 23% – EPDM seals Soda Ash 5% – EPDM seals Sodium Metabisulphite – EPDM seals Polymers – EPDM seals (Viton if >2 year duty)	Yes/No/NA	
	4.2	Safety showers <7m from chemical dosing systems. In direct line of site without obstruction. Fed by >1.25" pipe. Take-off is before any RPZ device. If in direct sunlight: Lagged or thermal valve installed.	Yes/No/NA	
	4.3	For corrosive chemicals: - Pipe/Tubing is double contained - Splash-screens are installed where double containment is not possible & around dosing points - Flushing systems installed as per the P&ID	Yes/No/NA	
Instrument Installation	**5.1**	- Tee's for gauges are on top of pipes - No instrument should be facing down (silt ingress/blockage)		

		- Samples are on the side of pipes (representative)		
	5.2	pH probes must be vertical only		
	5.3	Consider if the instrument must be within the flow path (flow switch, pH probe, dosing quills…)		
	5.4	Install a cover for added protection of rain & UV damage to digital screens.		
	5.5	Flow meters must be in horizontal or vertical (up) flow. Ground-rings installed. Minimum 5D spacing upstream, 2D spacing downstream. Never in pump suction lines.		
Hold Point		Installation Complete and satisfactory?	Yes/No	

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT ITR-02-02
Pre-Commissioning Flushing and Filling

ENVIROPACIFIC

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev:** A	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Setup	SWMS read and understood by all workers		SWMS No. _____	Yes/No	
	Pipes inspected for damage	Are any of the pipes damaged? Rectify if damaged		Yes/No	
	For each section of pipe and equipment to be flushed and filled, **allocate an ID number** and mark up on a P&ID		Test Record Below		
	Each section of pipe and equipment **is adequately supported** to avoid excess movement and support the weight of additional water	Are all sections of pipe and equipment appropriately supported?	Test Record Below	Yes/No	
	2m Exclusion zones set up or as appropriate	What is the control? COMMENT		Yes/No	
Flushing	For each section of pipe and equipment, **remove the bulk of swarf/debris** mechanically prior to filling	What is the method? COMMENT	Test Record Below	Yes/No	
	For each section of pipe and equipment, **open air-bleed points** as necessary to removal all air from system		Test Record Below	Yes/No	
	For each section of pipe and equipment, fill with water via sample points or pressure gauge isolation valves, then **flush such that swarf is removed** from system	What is the method? COMMENT	Test Record Below	Yes/No	
Filling	For each section of pipe and equipment, completely fill with water via sample points or pressure gauge isolation valves then close air-bleed points and valves around the section	Have all valves and seals been checked?	Test Record Below	Yes/No	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT ITR-02-02
Pre-Commissioning Flushing and Filling

Step	Action	Item	Reference	Confirmation	Initial/Sign
Hold Point	Ready for pressure test?			Yes/No	

COMMENTS

Cleaning Test Record

ID	Description (Air-bleed/Valve)	Section Physically Supported	Mechanical Clean Completed	Opened to allow air to bleed	Water Flush Completed	Closed off

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT ITR-02-03
Pre-Commissioning Pressure Test

ENVIROPACIFIC

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev:** A	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Setup	SWMS read and understood by all workers		SWMS No. _____	Yes/No	
	For each section of pipe and equipment to be pressure tested, allocate an **ID number and mark up on a P&ID**. It is recommended to use the same IDs as per ITR 02-02 Flushing and Filling		Test Record Below		
	For each section of pipe and equipment, to be pressure tested, pressurise via sample points or pressure gauge isolation valves	Connect to pressure test bucket		Yes/No	
		Ensure an isolation valve is between the system and test bucket		Yes/No	
		Ensure an appropriate test pressure gauge is installed	Pressure gauge capacity _____	Yes/No	
Pressure Test – Consult Pressure Reference Table Below	For each section of pipe and equipment pressurise to 50% of test pressure	Leaks detected?	Test Record Below	Yes/No	
		Rectification COMMENT		Yes/No	
	Release Pressure For each section of pipe and equipment follow SWMS and safely release pressure via an appropriate	Leaks detected?	Test Record Below	Yes/No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
	sample valve or pressure gauge isolation valve	SWMS read and understood by all workers	SWMS No. _____	Yes/No	
Release Pressure	Remove temporary blinds / test equipment Open valves as appropriate for safe storage. Note: Avoid draining or allowing air ingress into the system where possible.			Yes/No	
				Yes/No	
	Water used for pressure testing to remain in pipes and vessels until Process Commissioning stage.			Yes/No	
	Hold Point	Ready for Operation?		Yes/No	

COMMENTS

Pressure Reference Table		
Section	**Max Test Pressure**	**Min Duration**
Note: An initial air pressure test of <10kPa can be conducted to determine major leaks. Higher pressure is not permitted due to risk of projectiles with PVC pipe.	<10 kPa	N/A

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT ITR-02-03
Pre-Commissioning Pressure Test

Pressure Test Record							
ID	**Section**	**Start Time**	**End Time**	**Start Pressure**	**End Pressure**	**Pass / Fail / Comment**	**Initial**
Commissioning Manager Signoff:						**Date:**	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-01
General Site Safety

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev: A**	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Bunded Area of TWTP				
Step	**Action**	**Item**	**Reference**	**Confirmation**
General Site Safety	No slip, trip & fall hazards existing			Yes / No
	Adequate lighting is available during the day and night			Yes / No
	Accessibility for inspection/maintenance of equipment is adequate and reasonably practicable			Yes / No
	Warning signs / labelling available to warn of hazards (confined space, hot surface, electrical, rotating parts, corrosive etc.)			Yes / No
	Emergency escape route/s are clear			Yes / No

Treated Water Tanks Area				
Step	**Action**	**Item**	**Reference**	**Confirmation**
General Site Safety	No slip, trip & fall hazards existing			Yes / No
	Adequate lighting is available during the day and night			Yes / No
	Accessibility for inspection/maintenance of equipment is adequate and reasonably practicable			Yes / No
	Warning signs / labelling available to warn of hazards (confined space, hot surface, electrical, rotating parts, corrosive etc.)			Yes / No
	Emergency escape route/s are clear			Yes / No

	Hold Point	Ready for Operation?		Yes / No

COMMENTS

Action Required

Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project

Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion

ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-02
Dry Commissioning MCC Sub Circuits and Cables

ENVIROPACIFIC

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev: A**	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Check MCC cabinets, ventilation, and sealing	Check the cabinets for cleanliness (vacuumed, cleaned and dirt removed). All tools, scrap wire and other debris removed.			Yes / No	
	Check that fans used for forced air cooling have: a. Shafts that rotate freely b. Blades with no dust or debris build-up			Yes / No	
	The bottom openings of the MCC container for incoming cables from the field are properly sealed			Yes / No	
	Verify vents are free from obstructions			Yes / No	
	Check that the cabinet is free of any non-superficial rust			Yes / No	
	Check that all filters are in place and clean			Yes / No	
Check Protective Earthing (PE)	Check and verify earthing continuity from main earth link to field equipment, record results.		Highest resistance _____ohms	Yes / No	
Check wiring and sub circuit components	Check termination schedule connections as per schematic diagrams and labelled accordingly		Drawing No.	Yes / No	
	Check cable polarities, cable sizes and cable types against drawings		Wiring rules AS3000 AS3012	Yes / No	
	Check all terminals for proper connections			Yes / No	
	Check for proper fuse ratings of all control circuits using drawings and schematic diagrams		Drawing No. _____	Yes / No	
	Check all switches and pushbuttons for completeness of movement, installation, adjustment, rating and labelling			Yes / No	
	Check for proper segregation of wires			Yes / No	
	Check instrumentation cable earthing			Yes / No	
	Visually inspect accessible cables to		AS3000	Yes / No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
	confirm insulation integrity and that the cable route and separation between power and control cables are in accordance with the wiring rules		AS3012		
	Perform the following for field wiring: a. Check the field wiring for proper conductor size selection b. Verify all incoming and outgoing power wiring is secure, well supported, and braced to withstand the effects of a fault current Check the terminations/connections at field junction boxes		Conductor Size _____	Yes / No	
Check uninterrupted power supply (UPS)/Battery	The area around the UPS/battery is clean and dust free			Yes / No	
	A main earth conductor is installed			Yes / No	
	Check proper cable terminations according to wiring diagrams and UPS/battery installation manual			Yes / No	
	Check polarity of the batteries connected externally			Yes / No	
Check the earthing system	The earthing system checked to ensure that all parts of steel structures, motor frames, switchgear, trays, conduits and other electrical equipment are earthed in accordance with the drawings and the relevant standards		AS3000 AS3012	Yes / No	
	Check that all connections to the main earth are clearly identified			Yes / No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
	Check that the Control and instrument earthing systems are adequate and effectively separated			Yes / No	
	Check the earthing connection of the UPS/battery system			Yes / No	
	Check for proper sealing of conduit connections, cable glands and other penetrations			Yes / No	
	Check that all spare conductors are identified and insulated, and/or laced back with sufficient length in the duct			Yes / No	
	Check spare components and /or drawings that are required to be left in the enclosures			Yes / No	
	Make sure that enclosures are equipped with drain and breather fittings if required, and inspect all boxes for any moisture collection			Yes / No	
	Check for the correct settings of switchgears and other protection schemes (MCCB, MPCB, ELR etc.)			Yes / No	
Check each starter module in MCC	Check alignment and operation of main isolating switches and correct adjustment where necessary			Yes / No	
	Check thermal overloads and fuses, if used, for size and rating		Size / Rating _____	Yes / No	
	Check tightness of all connections and particularly connections to the thermal overloads			Yes / No	
	Check motor overload rating and thermistor operating resistance. Set all protection relays in accordance with drawings. Set motor overload to motor full load current, set MPCB, MCCB settings appropriately			Yes / No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
	Check continuity of control system wiring and check tripping functions			Yes / No	
	Open the DC fuse holders and check the 24v supply is correct prior to energizing instruments			Yes / No	
	Carry out continuity and IR test on all motor starters			Yes / No	
	Operate the starter for proper operation from the HMI			Yes / No	
	Confirm all loads are connected to the correct starter			Yes / No	
	Ensure that the screen of cables run from a VSD to a motor is positively earthed at both the motor and the VSD to prevent radiation of electromagnetic energy			Yes / No	
	Hold Point	Ready for Operation?		Yes / No	

COMMENTS

Action Required

Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project

Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion

ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed

Commissioning Manager Sign Off:	Date:

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-03
Dry Commissioning Motors (Direct Online Starters)

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev: A**	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item		Reference	Confirmation (Y/N/NA)	Initial/Sign
1.0	Check the motor terminal boxes for proper sealing and gland tightness					
2.0	Check the wiring with the wiring diagram and terminations at the starter; ensure cable size is correct					
3.0	Check the incoming voltage, started and overload					
4.0	Check the direction of rotation					
5.0	Check the overload relay is set for the motor rated current and coil voltage is correct					

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-03
Dry Commissioning Motors (Direct Online Starters)

Step	Action	Item		Reference	Confirmation (Y/N/NA)	Initial/Sign
6.0	Check the motor operation locally and remotely from the PLC					
7.0	Check current and vibration of each motor					
	Hold Point	Ready for Operation?				

COMMENTS

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-03
Dry Commissioning Motors (Direct Online Starters)

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Drive/Pump/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC SERVICES PTY LTD
INSPECTION AND TEST REPORT 03-04
Dry Commissioning Drive Motors (Variable Speed Drives)

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurii Kurri, NSW		**ITR Rev:** A	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item		Reference	Confirm. (Y/N/NA)	Initial /Sign
Check the motor terminal boxes for proper sealing	Check and confirm the sealing of motor terminal boxes and availability and tightness of cable glands					
Check VSD's and cabling	Check the VSD's and motors have been correctly installed and meet the wiring and safety standards			Standard		
	Check the power and motor cables are correctly sized, installed and terminated as per specifications and wiring diagram			Drawing		
Check cabling of all motors	All power cable shields have been correctly earthed at both ends, to the protective					

Step	Action	Item		Reference	Confirm. (Y/N/NA)	Initial /Sign
	earthing terminal at the inverter, at the motor and at the MCC					
	All control cable shields have been correctly earthed at one end only, preferably at the process control system end	Cable shields earthed correctly?				
		Any not connected to process control system end? Comment				
	The control cables have been installed according to the control system design			Drawing		
Check VSD quick set-up parameters	Check Quick Setup Parameters for all VSD's as per **Table 1** below					
	Check the connections to the cooling fan to ensure that the correct tap on the transformer has been selected in all VSD's					

Step	Action	Item		Reference	Confirm. (Y/N/NA)	Initial /Sign
Motor rotation and acceptance test	Check equipment manuals before doing rotation tests. Start each VSD to check the correct direction of rotation if possible, otherwise jog the motor to confirm the direction of rotation			Direction of Rotation		
	Follow the motor identification and auto tuning routines in VSD to get the maximum control and performance of the motor			**Table 1**		
	Check Speed, current (no load starting) and vibration of each motor as per the above sequence at different speeds according to the number of poles			**Table 1**		
	Check motor operation locally (from operator panel of VSD) and remotely (from PLC)					

Step	Action	Item		Reference	Confirm. (Y/N/NA)	Initial /Sign
	Scale the analog input/speed reference and scale analog outputs to get the values of properly assigned parameters correctly (ex: current, speed)			**Table 1**		
	Hold Point	Ready for Operation?				

TABLE 1					
Parameter	**Setting**				
Motor Power	[kW]				
Motor Voltage	[V]				
Motor Frequency	[Hz]				
Motor Current	[A]				
Motor Nominal Speed	[rpm]				
Minimum Reference	% of rpm				
Maximum Reference	% of rpm				
Ramp 1Ramp up Time	[sec]				
Ramp 1Ramp Down Time	[sec]				

TABLE 1 cont…					
Parameter	**Setting**				
Motor Power	[kW]				
Motor Voltage	[V]				
Motor Frequency	[Hz]				
Motor Current	[A]				
Motor Nominal Speed	[rpm]				
Minimum Reference	% of rpm				
Maximum Reference	% of rpm				
Ramp 1Ramp up Time	[sec]				
Ramp 1Ramp Down Time	[sec]				

ENVIROPACIFIC SERVICES PTY LTD
INSPECTION AND TEST REPORT 03-04
Dry Commissioning Drive Motors (Variable Speed Drives)

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-05
Dry Commissioning Plant Control System

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev: A**	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Check the P&ID and I/O schedule	Check all I/O's with I/O address schedule, control schematics and P&ID's to verify the loops and control cabling		Electrical schematics	Yes / No	
Conduct point to point checks from Remote MCC's to main MCC (terminal bar) and up to PLC	Check point to point while identifying the cables and ensure that they are labelled properly according to control schematics		Electrical schematics	Yes / No	
Visual inspection of PLC	Check to confirm all modules are fitted according to the reference diagrams and control schematic diagrams		Electrical schematics	Yes / No	
	Ensure that all Dual In-line Pin (DIP) mode select switches and configuration links on the chassis are correct			Yes / No	
	Ensure that all analogue modules are configured to operate on the designed protocol.		Electrical schematics	Yes / No	
	Check that all I/O modules have the correct part number as per the drawings			Yes / No	
	Confirm that any remote termination cable accessories are correctly fitted		Electrical schematics	Yes / No	
I/O checks on field devices	Check that all I/O cabling to field devices and the field devices themselves are installed and comply with the reference documents.		Electrical schematics	Yes / No	
	Verify that the supply to all field devices and I/O is isolated if required			Yes / No	
	Ensure adequate segregation of power and instrumentation cabling			Yes / No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
	Open all 24VDC fuses			Yes / No	
Power up PLC and I/O to verify output voltage	Switch on the AC power supply to the processor and I/O power supply modules and verify that the DC output voltages are correct.			Yes / No	
	Check that all power status indicators are correctly illuminated.			Yes / No	
	Check that the processor back up battery is fitted, healthy and that the battery age is within acceptable limits		Age and limits _____	Yes / No	
Load Program into PLC and check I/O s	(Re-confirm that there is no risk of accidental start-ups of equipment during program upload) Load the program into the processor and verify that all I/O can be correctly addressed and that no fault indicators are illuminated			Yes / No	
	Switch on the DC supply for digital output interposing relays. Force each output on individually and verify that: a. The indicating LED on the output module illuminates. b. The corresponding interposing relay is energised			Yes / No	
Check on communication links (TCP/IP)	Verify all communications between PLC and Computer, PLC and motor controller and PLC and operator interfaces			Yes / No	
	Switch on the DC supply to the input field devices and prove that each field device when operated: a. Illuminates the LED on the relevant digital input card b. Indicates the relevant state in the PLC data tables			Yes / No	
	Switch on the power supplies to the analog input devices and check the readings obtained			Yes / No	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-05
Dry Commissioning Plant Control System

Step	Action	Item	Reference	Confirmation	Initial/Sign
Calibration checks	Checks on calibration in both upscale and downscale directions are done (Check for analog channel scaling-lower and upper)			Yes / No	
Loop testing	Loop testing are carried out on each loop to ensure that all instrumentation components (as per P&ID) in the Loop are in full operational order when connected and are in a state ready for plant commissioning		Electrical schematics	Yes / No	
Interlock Testing	Check interlock testing with respect to the P&ID, Trip and Interlock List and Design Criteria (FAT)		WTP Functional Description	Yes / No	
Check for Emergency Safety Stops	Check for all Safety Emergency Stops			Yes / No	
Check for Machine Safety	Check process interlocks			Yes / No	
Alarm Management-testing	Check all alarm functions against the alarms list			Yes / No	
Check CPU Performance	Check the load level of the CPU of PLC			Yes / No	
Test Backups	Keep a backup of PLC program and the HMI		Backup Location _____	Yes / No	
Trend / Archiving	Check analogue signal trending / archiving with correct scaling, view history functions			Yes / No	
Check for OEM Licences	Check for OEM licences			Yes / No	
	Hold Point	Ready for Operation?		Yes / No	

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-06
Dry Commissioning Tanks

ENVIROPACIFIC

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev: A**	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Tank I.D. (✓, ×, N/A)			
Tanks - General	Piping and installation complete according to the P&ID (Walk through- highlight P&ID/as built)	Drawing No. _____	Drawing No. _____	Drawing No. _____	Drawing No. _____
	No damage or leaks				
	Check correct tank capacity (record capacity)	Capacity _____	Capacity _____	Capacity _____	Capacity _____
	Tank can be manually drained				
	All instruments/analysers are appropriately fitted and functioning?				
	Adjoining valves fitted and functioning				
	Overflow sufficient in size comparative to inlet pipework (Record size)	Size _____	Size _____	Size _____	Size _____
	Outlet piping allows for free-draining gravity flow without blockage				
	Tank is Vented or fitted with appropriate overpressure protection.				
	Inspection hatch is fitted and accessible				
	Sufficient room for maintenance activities				
Chemical Tanks	Bunding and separation distances are appropriate for the chemicals selected				

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-06
Dry Commissioning Tanks

Step	Action	Tank I.D. (✓, ×, N/A)			
Reaction/ Mixed Tanks	Check mixer nameplate against data sheets	Data Sheet _____	Data Sheet _____	Data Sheet _____	Data Sheet _____
	Mixer impellers located at correct height as per design specification and securely fastenned				
Polymer Make-down Unit	Protected against condensation and water Ingress into neat polymer / powder				
	Rotameter installed is of correct capacity	Capacity _____	Capacity _____	Capacity _____	Capacity _____
Additional					
	Hold Point				

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-07
Dry Commissioning Pumps

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev: A**	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	**Action**	**Pump I.D. (✓, ✗, N/A)**			
Pumps - General	Piping and installation complete according to the P&ID (Walk through- highlight P&ID/as built)	Drawing No. _____	Drawing No. _____	Drawing No. _____	Drawing No. _____
	Check each valve operation & handle access/path				
	Fasteners are tight and supports are adequate				
	Pressure rating of pipe/equipment is adequate for this duty				
	No damage or leaks				
	Check nameplate against data sheets	Data Sheet _____	Data Sheet _____	Data Sheet _____	Data Sheet _____
	Motor/pump is level and secure				
	Adequate free air circulation for motor cooling				
	Suction strainer adequate and maintainable				
	Pressure switch/transmitters appropriately fitted and functioning. (Record PIT-XXXX)				
	Flow switch/rotameters appropriately fitted and functioning. (Record FIT-XXXX)				
	Direction of check valves is correct				
	PRV set at _____kPa				

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-07
Dry Commissioning Pumps

Step	Action	Pump I.D. (✓, ✗, N/A)			
	Suction piping/tank is adequate				
	Upstream/downstream valves are open and pump IOM manual start procedures followed				
	Suction/Discharge pressure gauge range is appropriate. (Record Range).	Range _____	Range _____	Range _____	Range _____
	Sufficient room for maintenance activities.				
	Piping connections will provide adequate NPSH to prevent cavitation				
	Motor bearings are lubricated-if need be				
	Coupling guard in place and secured				
	All wiring is labelled and can be identified				
	Pump has been primed / air removed.				
	Check all components with the O&M manual				
	Pressure tank is appropriately charged	Pressure _____	Pressure _____	Pressure _____	Pressure _____
	Flow/Pressure on nameplate match design intent				
	Pump protection provided (Comment)				
	Pump rotation check performed.				
Sump Pumps	Method of lifting the pump out of the sump is provided. (comment)				
	Minimum water level/setpoint is set such that the motor is always submerged for cooling. (Record Setpoint)	Setpoint _____	Setpoint _____	Setpoint _____	Setpoint _____
	Cable is supported and not under stress or tension				

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-07
Dry Commissioning Pumps

Step	Action	Pump I.D. (✓, ✗, N/A)			
	Pump high and low level switches move freely without getting stuck				
Chemical Pumps	Hose is not kinked				
	Seals used appropriate for the chemical				
	Flow switch direction correct				
	Valves allow for isolation, flushing, filling, calibration and discharge				
	Tank is filled with water and pump is primed				
	Pump flow rate checked at 100% and 25% of rated flow. Record	Flow rate 25% _____ 100% _____	Flow rate 25% _____ 100% _____	Flow rate 25% _____ 100% _____	Flow rate 25% _____ 100% _____
	MFV settings adjusted (~1bar backpressure and ~6bar relief)				
Sludge Pumps	Protection Device installed and set (Temp / Flow / Pressure)	Setting _____	Setting _____	Setting _____	Setting _____
Additional					
	Hold Point				

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-09
Dry Commissioning Chemical Storage and Dosing System

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev: A**	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	**Action**	**Chemical Sytem I.D. (✓, ×, N/A)**			
General	Piping and installation complete according to the P&ID (Walk through- highlight P&ID/as built)	Drawing No. _____	Drawing No. _____	Drawing No. _____	Drawing No. _____
	Chemicals tanks, pipes and equipment are identifiable (at least temporary signage acceptable until final labels procured)				
	Check each valve operation & handle access/path				
	Fasteners are tight and supports are adequate				
	Pressure rating of pipe/equipment is adequate for this duty				
	No damage or leaks				
Tanks	Check correct tank capacity (Record capacity)				
	Fill the float with water, check level “empty” is correct & mark the indicator.				
	Scale and calibrate tank level transmitter. Perform “empty” mapping.				
	Fill the Dosing Tank with water Check the security bund remained empty				
	Scale and calibrate tank level transmitter. Check mapping was ok until “full”				
	Level transmitter reads >100% at least 5% before reaching the tank overflow level.				
	Adjoining valves fitted and functioning				

Step	Action	Chemical Sytem I.D. (✓, ✗, N/A)			
	Overflow sufficient in size comparative to inlet pipework				
	Inspection hatch / vent is fitted and functioning, vermin protection is fitted.				
	Check material compatibility of all seals, O-rings, pumps, valves etc… **Adhere to or seek advice:** Sulphuric Acid 51% – Viton Hypochlorite 12.5% – Viton Sodium Hydroxide 30% – EPDM Aluminium Chlorhydrate 23% – EPDM Soda Ash 5% – EPDM Sodium Metabisulphite – EPDM Polymers – EPDM (Viton if >2 year duty)				
Pumps	Check nameplate against data sheets	1- Tag: 2- Tag: 3- Tag: 4- Tag: 5- Tag:	1- Tag: 2- Tag: 3- Tag: 4- Tag: 5- Tag:	1- Tag: 2- Tag: 3- Tag: 4- Tag: 5- Tag:	1- Tag: 2- Tag: 3- Tag: 4- Tag: 5- Tag:
	Motors/pumps are level and secure				
	Adequate free air circulation for motor cooling				
	Suction strainers adequate and maintainable				
	Pressure switch/transmitters appropriately fitted and functioning. (Record PIT-XXXX)				

Step	Action	Chemical Sytem I.D. (✓, ✗, N/A)			
	Flow switch/rotameters appropriately fitted and functioning. (Record FIT-XXXX)				
	Direction of check valves are correct				
	PRV set at _____kPa	1- 2- 3- 4- 5-			
	Suction piping/tank is adequate. Connections will provide adequate NPSH to prevent cavitation.				
	Upstream/downstream valves are open and pump IOM manual start procedures followed				
	Suction/Discharge pressure gauge range is appropriate. (Record Range).	1- 2- 3- 4- 5-	1- 2- 3- 4- 5-	1- 2- 3- 4- 5-	1- 2- 3- 4- 5-
	Sufficient room for maintenance activities.				
	Motor bearings are lubricated-if need be. Oil plugs are vented if need be.				
	All wiring is labelled and can be identified. If GPO's are used, cables and GPO's are both labelled uniquely and matching.				
	Pump has been primed / air removed.				
	Pressure tank / Pulsation dampener is appropriately charged (Record Pressure)	1- 2- 3- 4- 5-	1- 2- 3- 4- 5-	1- 2- 3- 4- 5-	1- 2- 3- 4- 5-
	Pump flow rate checked at 100% and 25% of rated flow (Record Result)	100/25% ____/____	100/25% ____/____	100/25% ____/____	100/25% ____/____

Step	Action	Chemical Sytem I.D. (✓, ✗, N/A)			
	Sufficient room for maintenance activities				
Discharge Pipework	Hose is not kinked				
	Double containment is sufficient (Corrosive chemicals only)				
	Dosing points are secure, splash guards in place (Corrosive chemicals only).				
	Clear tubing is not used if exposed to UV light				
Additional					
	Hold Point				

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 03-12
Dry Commissioning Ancillary Water and Air Manifolds

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev:** A	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item I.D. (✓, ✕, N/A)			
	Potable Water Manifold:				
Potable Water	RPZ or Registered 100mm air gap is fitted and functioning (Comment)				
	Safety showers come off before the RPZ. Hoses and other process come off after the RPZ. (or air gap)				
	Potable water flow is sufficient for the duty required				
	Additional notes:				
	Eyewash/ Safety Showers:				
Eyewash/ Safety Showers	Check that the units are connected to a potable water supply in accordance with AS-4775				
	Check units are identified with a highly visible sign complying with AS 1319 and that the signs are in good condition				
	Units are clearly visible and are well illuminated				
	Path of travel shall be free of obstructions that may inhibit the immediate use of the equipment. Ensure area near units are kept clear at all times. <7m from Chemical Hazards/filling points				
	Check that all parts are in place and are in good condition. Replace or repair broken, worn or missing parts				
	Shower is either a) shaded b) lagged c) has a thermal relief valveinstalled				
	Additional notes:				

Step	Action	Item I.D. (✓, ✗, N/A)			
	Sumps:				
Sumps	Check correct bund capacity	Capacity (kL) _____	Capacity (kL) _____	Capacity (kL) _____	Capacity (kL) _____
	Grate is flush with floor				
	General area slopes to the sump without pooling elsewhere				
	Easy access for cleaning /pump maintenance. Method of lifting pump is safe.				
	Sump high level alarm switch appropriately fitted and set at correct level (Record LS-XXXX)				
	Level transmitters appropriately fitted and functioning. (Record LIT-XXXX)				
	Sufficient room for maintenance activities				
	Additional notes:				
	Compressed Air Systems:				
Air Manifold	Compressor Pressure and Free Air Delivery is adequate	Pressure: FAD:	Pressure: FAD:	Pressure: FAD:	Pressure: FAD:
	Air receiver volume adequate	Volume:	Volume:	Volume:	Volume:
	Dryer fitted, installed correctly and functioning				
	PRV is fitted and set to (record setting)				
	Low air pressure switch/transmitter is fitted and set to (record setting)				
	Filter is supplied and fitted (record details)				
	Direction of air through the manifold is correct.				

Step	Action	Item I.D. (✓, ✗, N/A)			
	Air Compressor cut in pressure: (record setting)				
	Air Compressor cut out pressure: (record setting)				
Additional					
	Hold Point				

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 04-01
Wet Commissioning

ENVIROPACIFIC

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri,		**ITR Rev:** A	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item	Reference	Confirmation	Initial/Sign
HMI Set and Test	Set all equipment to OFF	Begin with all equipment OFF on the HMI		Yes / No	
		Field isolators in the OFF position		Yes / No	
	Insert process and alarm set points	Manually enter appropriate values on HMI		Yes / No	
	Eliminate all alarms	Work through errors and alarms such that the majority are cleared; The aim is not yet to have the system running, but in a state ready to test individual components and alarms.		Yes / No	
Check Digital Inputs/ Outputs	Check soft signals correctly correlate to field actions by manually toggling them ON & OFF or triggering signals in the field.	Tick on P&ID all Level/ pressure/ flow **switch status changes:** e.g. LSH / LSL Record any failures below:	P&ID attached	Yes / No	
		Tick on P&ID all switch **alarms triggered:** Record any errors below:	P&ID attached	Yes / No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Check Digital Inputs/ Outputs	Check soft signals correctly correlate to field actions by manually toggling them ON & OFF or triggering signals in the field.	Tick on P&ID all actuated valve **status changes:** O / C. Record any failures below:	P&ID attached	Yes / No	
		Tick on P&ID all actuated valve **alarms triggered:** Fail O/ Fail C Record any errors below:	P&ID attached	Yes / No	
		Tick on P&ID all motor operation **Manual on / Manual off:** Record any failures below:	P&ID attached	Yes / No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Check Digital Inputs/ Outputs	Check soft signals correctly correlate to field actions by manually toggling them ON & OFF or triggering signals in the field.	Tick on P&ID all motor operation **Alarms triggered:** Motor fault Record any errors below:	P&ID attached	Yes / No	

Step	Action	Description Tag No Range/Units	Simulated mA input	Measured Current (mA)	Scaled Reading	HMI Reading	Initial/Sign
Check analogue inputs/ outputs	For each analogue item on the P&ID, tick off a scaling check: Simulate 4 – 20 mA analogue instrument inputs using instrument calibration mode (if available) Check analogue signals match the correct field transmitters. Scale field instruments if required. Scale PLC input if required.		4				
			20				
			Comment				
			4				
			20				
			Comment				
			4				
			20				
			Comment				
			4				
			20				
			Comment				

Step	Action	Description Tag No Range/Units	Simulated mA input	Measured Current (mA)	Scaled Reading	HMI Reading	Initial/Sign
Check analogue inputs/ outputs	For each analogue item on the P&ID, tick off a scaling check: Simulate 4 – 20 mA analogue instrument inputs using instrument calibration mode (if available) Check analogue signals match the correct field transmitters. Scale field instruments if required. Scale PLC input if required.		4				
			20				
			Comment				
			4				
			20				
			Comment				
			4				
			20				
			Comment				
			4				
			20				
			Comment				
			4				
			20				
			Comment				
			4				
			20				
			Comment				
			4				
			20				
			Comment				

Step	Action	Item	Reference	Confirmation	Initial/Sign
Test Faults and interlocks	Manipulate settings or field parameters to check faults are successfully triggered & correlate to correct WTP actions.	Refer to Functional Description/Trip and Interlock List/Set Point Register and confirm all faults and interlocks. Ensure delays and functionality are suitable. See attachment.		Yes / No	
Check SMS/email alert system functionality	Verify	SMS/email alerts received at correct critical faults. Importantly:		Yes / No	
		General system fault		Yes / No	
		High and low tank level alarms		Yes / No	
		High and low analysis alarms		Yes / No	
		Motor/Sensor fail alarms		Yes / No	
		Inlet Valve Closed alarm		Yes / No	
Simulate start up after power failure	Verify	UPS maintains control system online sufficient time to send a power failure SMS		Yes / No	
		All setpoints are retentive on regaining power		Yes / No	
		System can be easily started again: list steps		Yes / No	
	Hold Point	Ready for Operation?		Yes / No	

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 05-01
Process Commissioning

ENVIROPACIFIC

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev:** A	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Prepare chemical tanks for filling	Drain & Fill	All chemical tanks (currently filled with water from hydrotesting) should be drained to empty **Ensure bunds are emptied first to prevent 'floating' internal tanks**		Yes / No	
		Follow SWMS chemical fill procedures ensuring: Correct PPE is worn: Safety showers are tested: Hazchem spill kit is available: Tightness of fittings is checked: Capacity in the tank is sufficient: The correct chemical is decanted: Area is washed down afterwards:		 Yes / No Yes / No Yes / No Yes / No Yes / No Yes / No Yes / No	
Fill chemical tanks	- Ensure piping is connected in a way to avoid leaking of chemicals - Tanks filled with Chemicals - Hazardous Materials spill kit on hand in case of spill.			Yes / No	
				Yes / No	
Provide raw water feed to WTP	Sample, test, observe, refine	- Samples taken, tested and analysis attached.		Yes / No	
Determine the inlet dosing control settings to target pH	Dosing for pH control Adjust and refine	- pH target is reached - pH target is not significantly overshot - pH within the feed line within ±0.5pH of the target setpoint - Lag has been observed and causes no process issues - Record setpoints in the summary at the end of this ITR	pH target _____	Yes / No	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Determine the dose rates for primary settling	Sample	Take a sample of influent and determine the correct COAGULANT dosing rate	Rate (mg/L) _____	Yes / No	
	Sample	Take a sample of influent and determine the correct POLYMER dosing rate	Rate (mg/L) _____	Yes / No	
	Comments:				

Step	Action	Item	Reference	Confirmation	Initial/Sign
Determine the break point chlorination dosing settings	Adjust and refine Sodium Hypochlorite dosing	-Free Cl is reached -Free Cl target is not significantly overshot -Free Cl within TK-0401 is within ±0.1mg/L of target setpoint -Lag has been observed and causes no process issues -Record setpoints in the summary at the end of this ITR	Cl target _____ mg/L	Yes / No	
Determine the SMBS dosing settings	Adjust and refine SMBS dosing	-Target ORP is reached -Target ORP is not significantly overshot -Control loop results in ORP that does not exceed the target any more than 5% of the time it is in operation -Lag has been observed and causes no process issues -Record setpoints in the summary at the end of this ITR	ORP target _____ mV	Yes / No	
Determine desludging settings	Test, monitor and record	-Target sludge discharge times greater than 30 sec -Confirm correct sequencing		Yes / No	
		Target discharge times less than 300 sec to capture mainly settled sludge		Yes / No	
		Target interval times and net discharge do not overcome sumps, sludge holding tanks or other downstream processes?		Yes / No	
		Determine discharge frequency to prevent sludge build up		Yes / No	
		Set sludge pump speed to assist with above volumes and times and record		Yes / No	
		Confirm clarifier performance and low overflow solids loading		Yes / No	
		Confirm ISR performance and low overflow solids loading		Yes / No	
Determine Filters Backwash Settings	Filter 1	DP warning:			
		DP alarm:			
		Backwash flow target:			
		Backwash timer:			
	Filter 2	DP warning:			
		DP alarm:			
		Backwash flow target:			

Step	Action	Item	Reference	Confirmation	Initial/Sign
		Backwash timer:			
Determine Filters Backwash Settings	Perform a full backwash sequence of train 1	Tank level settings appropriate? Raw start: Raw stop: TW start: TW stop:		Yes/No	
		Logic allows plant to initiate backwash and won't be held up by feed tank level?		Yes/No	
		Sequence of automatic valve/pump operation is correct?			
		Backwash sequence can be run for approx. 10 min or longer?		Yes/No	
	Observe backwash effect on influent from flow balance tank and comment on:	Influent pH:			
		Influent turbidity:			
		Clarifier performance:			
		Any recommendations/alterations required to correct for backwashing impact on influent		Yes/No	
Determine polymer make down system settings	Pipe Flocculator make polymer down system Adjust and refine:	-Aim for 0.1-1% dilution range -Satisfy that dilute polymer pump is within its pumping range -Record setpoints in the summary at the end of this ITR	Conc. Set _____	Yes/No	
	Screw press polymer make down system Adjust and refine:	-Aim for 0.1-1% dilution range -Satisfy that dilute polymer pump is within its pumping range -Record setpoints in the summary at the end of this ITR	Conc. Set _____	Yes/No	
Determine discharge system setpoints	Sample, test, observe, refine	-Discharge ITP/ITR process is manageable -Treated water to site discharge point tested -Recirculation/reuse system tested -No undue alarms create process issues during discharging (i.e. low-level alarms).			
		Samples taken, tested for all Treated Leachate Target contaminants			

Step	Action	Item	Reference	Confirmation	Initial/Sign
		Analyse sample results to determine if all Target criteria have been met and share the analysis report with the client.		Yes/No	
		Client sign off for discharge of Treated Leachate		Yes/No	
Record all commissioning setpoints (after system has operated consistently for a few days)					

COMMENTS

Action Required					
Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project					
Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion					
ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed

Commissioning Manager Sign Off:				Date:	

ENVIROPACIFIC PTY LTD
INSPECTION AND TEST REPORT 06-01
Operation of TWTP – Discharge of Treated Leachate

Project Title: HAKK TWTP		**Project No:** 105079	
Location: Kurri Kurri, NSW		**ITR Rev:** A	**Lot No.:**
Prepared By: Fahad Saleem	**Approved By:** Patrick Puddefoot	**Date:**	
Reviewed By:	Patrick Puddefoot	**Date:**	
Completed By:	**Signed:**	**Date:**	

Step	Action	Item	Reference	Confirmation	Initial/Sign
Provide raw leachate to the TWTP	Start up TWTP	TWTP is operational and transferring leachate from the Leachate Holding Pond to the TWTP		Yes / No	
Sample the raw feed to the TWTP	Sample the raw leachate entering the Flow Balance Tank prior to pH correction	- Samples taken, tested and analysis attached.		Yes / No	
General operation of the TWTP	Operate and optimise the TWTP operation	Comment any process or plant issues experienced during operation		Yes / No	
Sample the Treated Leachate	When one of the Treated Water Tanks is full, sample the tank water for analysis	Samples taken, tested and analysis attached.		Yes / No	
Report results to client	Collate raw and treated analysis	Analyse the Raw and treated leachate results to check if Target Criteria has been met and issue to client to review		Yes / No	
Client sign off for discharge	Seek approval to discharge	Client sign off for discharge of Treated Leachate		Yes / No	

COMMENTS

Action Required

Action on: M = Mechanical, E = Electrical, I = Instrumental, P = Project

Priority: 1 = Complete before start-up, 2 = Complete after start-up, 3 = For discussion

ID	Description (Air-bleed/Valve/)	Action Required	Action on	Priority	Completed/Date/Signed
Commissioning Manager Sign Off:				Date:	

DOC22/33303-1

Ramboll Australia Pty Ltd.
PO Box 435
THE JUNCTION NSW 2291

Email: staylor@ramboll.com

Attention: Mr Shaun Taylor

20 January 2022

Dear Mr Taylor,

HYDRO ALUMINIUM REMEDIATION PROJECT – DRAFT MANAGEMENT PLANS

I refer to your email to the Environment Protection Authority (EPA), received on 18 January 2022, inviting the EPA to comment on the draft Temporary Water Treatment Plant Management Plan, draft Irrigation Management Plan and draft Water Quality Monitoring Program being prepared in respect of the Hydro Aluminium Remediation Project.

The EPA encourages the development of such plans to ensure that proponents and licensees have determined how they will meet their statutory obligations and designated environmental objectives.

Being a regulatory authority, the EPA's role is to administer and regulate statutes for environmental management and protection. As such the EPA does not directly get involved in the development of strategies to achieve those objectives and does not review or comment on such plans. Accordingly, the EPA has not reviewed and offers no comments on the above management plans.

If you have any questions about this matter, please contact Hamish Rutherford on (02) 4908 6824 or email info@epa.nsw.gov.au.

Yours sincerely

CLAIRE MILES
Acting Manager Metro North
Environment Protection Authority

cc. Mr Richard Brown
Hydro Aluminium Kurri Kurri Pty Ltd
Email: richard.brown@hydro.com

APPENDIX 2
IRRIGATION MANAGEMENT PLAN

Intended for
Hydro Aluminium Kurri Kurri Pty Ltd

Document type
Report

Date
November 2022

HYDRO REMEDIATION PROJECT
IRRIGATION MANAGEMENT PLAN

RAMBOLL Bright ideas. Sustainable change.

HYDRO REMEDIATION PROJECT
IRRIGATION MANAGEMENT PLAN

Project name	**Hydro Remediation Project**
Project no.	**318000737**
Recipient	**Hydro Aluminium Kurri Kurri Pty Ltd**
Document type	**Final**
Version	**Rev 2**
Date	**14/11/2022**
Prepared by	**S Taylor**
Checked by	**F Robinson**
Approved by	**F Robinson**
Description	**Ramboll was commissioned to prepare an Irrigation Management Plan in accordance with condition B19C of Modification 1 to the development consent for the Hydro Remediation Project, which is State Significant Development (SSD) 6666.**

Ramboll
Level 2, Suite 18 Eastpoint
50 Glebe Road
PO Box 435
The Junction
NSW 2291
Australia

T +61 2 4962 5444
https://ramboll.com

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

CONTENTS

APPENDICES

1. INTRODUCTION

1.1 Background

Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) own and manage the former Aluminium Smelter (the Smelter) located at Hart Road, Loxford. The Smelter comprises approximately 80 hectares, and is surrounded by approximately 1,940 hectares of buffer zone land (known as Hydro Land) that is currently owned and managed by Hydro.

The Smelter is in the post-operational phase of decommissioning, demolition and remediation prior to the land being divested and developed for future employment, residential, rural and biodiversity conservation purposes. Demolition was approved by Cessnock City Council and is largely complete, and the remediation activities were approved as State Significant Development No. 6666 (SSD 6666) by the Department of Planning, Industry and Environment (the Department). Remediation activities are currently underway.

Hydro is committed to completing the demolition and remediation of the Hydro owned land in a manner that: conforms to relevant regulatory and legislative requirements; and minimises the potential environmental impacts on human health and the environment.

A key element of managing any potential environmental impact from the Project site is the existing Smelter water management system, including the irrigation of water from the North East Dam to the Irrigation Area (which is regulated by the Environment Protection Authority (EPA) under the Environment Protection Licence (EPL) No. 1548). The adequate management of this system will play a major role in minimising the potential off-site environmental impacts from the demolition and remediation activities.

On 13 September 2021 the Department approved a modification to the development consent for SSD 6666 that includes the construction and operation of a Temporary Water Treatment Plant (TWTP) as part of the Project. The TWTP system includes the discharge of treated effluent to the Smelter water management system.

1.2 Purpose of the Plan

The Irrigation Management Plan (IMP) documents the management and monitoring requirements for irrigation of stormwater at the Hydro site, as required by Modification 1 to the development consent for SSD 6666.

The IMP will allow Hydro to continue to operate the irrigation area and associated infrastructure in a way that minimises impacts on downstream water quality and aquatic environments.

Plans supplementary to the IMP which should be read in conjunction with the IMP are:

- Temporary Water Treatment Plant Water Management Plan (EPS, 2022) (the **TWTP Management Plan**). The TWTP MP outlines the operational and monitoring requirements for the treatment of leachate and the condition requirements for the discharge of leachate from the TWTP to the North East Dam in accordance with condition B19A of the development consent for SSD 6666
- Temporary Water Treatment Plant Water Quality Monitoring Program, (Ramboll, 2022) (the **TWTP WQMP**). The TWTP WQMP outlines the monitoring requirements applicable during the operation of the TWTP for the North East Dam and the receiving environment in accordance with condition B19D of the development consent for SSD 6666

1.3 Plan Requirements

Table 1-1 lists the requirements of Condition 19C from Modification 1 to the development consent for SSD 6666, and where they are addressed in this plan, or in other related management plans.

As required by Condition 19C Hydro consulted with the Environment Protection Authority (EPA) during preparation of the Irrigation Management Plan. As noted in the correspondence provided in Appendix 1 the EPA had no comments on specific content for the plan.

Table 1-1 Modification 1 Irrigation Management Plan Requirements

Condition	Where addressed
B19C. Prior to operation of the TWTP, the Applicant must prepare, to the satisfaction of the Planning Secretary, an Irrigation Management Plan in consultation with the EPA. The Irrigation Management Plan must include, but is not limited to:	
(a) A plan showing the area to be irrigated by treated effluent from the TWTP;	Figure 2-1
(b) Irrigation rules to ensure that irrigation water quality meets the North East Dam Target Values prior to irrigation (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1);	Section 4.1 and TWTP Management Plan
(c) Details of ongoing treated effluent quality monitoring, including sample take location and frequency;	Section 3.1.1 and TWTP Management Plan
(d) Identification of operational triggers (such as 'trigger action response plans') to ensure that the treatment process is functioning correctly and to prevent unacceptable impacts to the irrigated area.	TWTP Management Plan
Triggers and associated responses must be provided for, but not limited to, the following:	
i. excessive saturation of the soil profile (waterlogging);	Section 4.3
ii. any surface water runoff of treated effluent from the North Dam; and	Section 4.3
iii. any water quality impacts to the downstream receiving environment.	Section 4.3
(e) Operating rules to ensure the North Dam maintains a 1 in 5-year rainfall event or 20% AEP design storm capacity;	Section 4.2.1
(f) Develops a Trigger Action Response Plan (TARP) which includes contingencies to identify and manage any unpredicted impacts (such as poor water quality within the North Dam) and ensure corrective actions are implemented. Contingency measures could include, but are not limited to:	
i. additional treatment of leachate through the TWTP;	Section 3.1.2 and TWTP Management Plan
ii. treatment of the North Dam water quality through the TWTP; and	Not applicable (refer to Section 3.1.2)
iii. offsite removal by tanker for disposal at a licensed facility.	Section 3.1.2 and TWTP Management Plan

2. EXISTING ENVIRONMENT

The following documents were reviewed to provide an understanding of the existing system including infrastructure, water management and monitoring procedures and emergency response procedures:

- *Former Hydro Aluminium Kurri Kurri Smelter Demolition and Remediation Environmental Impact Statement* (Ramboll Environ, 2017a) (the Remediation EIS)
- *Hydro Aluminium Kurri Kurri: Stormwater Management Report - Flood Modelling and Hydrology Review* (Pulver, Cooper and Blakely (PCB), 2018) (the Flood Modelling and Hydrology Review)
- *Hydro Aluminium Kurri Kurri Smelter Decommissioning, Demolition and Remediation: Remediation Works Environmental Management Plan* (Ramboll, 2021) (RWEMP)
- *Hydro Aluminium Kurri Kurri Smelter Decommissioning, Demolition and Remediation: Soil and Water Management Plan* (Ramboll, 2021) (SWMP)
- *Statement of Environmental Effects: Modification 1 to SSD 6666 – Temporary Water Treatment System* (Ramboll, 2021)
- *Water Treatment Plant Management Plan: HAKK Temporary Water Treatment Plant (TWTP)* (Enviropacific Services, 2022) (TWTPMP)
- *Temporary Water Treatment Plant: Water Quality Monitoring Program* (Ramboll, 2022)

2.1 Smelter Water Management System

The existing surface water infrastructure is depicted in **Figure 2-1** and includes:

- Subsurface and open surface water drainage throughout the Smelter.
- Three surge ponds: one surge pond in the west of the Smelter (Western Surge Pond), one in the east of the Smelter (Eastern Surge Pond) and one in the south of the Smelter (Southern Surge Pond). These are the initial collection and treatment points for the water.
- Two ponds located to the north of the Smelter. The northern surge ponds are collectively known as the North Dam however it is comprised of two dams, the Northern Stilling Pond to the west and the Northern Surge Pond to the east (herewith described as the North East Dam). The North Dam has previously been, and continues to be, used as the major element of the water collection and treatment system for the Smelter.
- Irrigation area. To the north east of the Smelter is an irrigation area that receives water from the North East Dam. The irrigation area is operated in accordance with the requirements of the EPL (refer to **Section 2.3.1**).

The open and subsurface water drainage system facilitates the collection of surface water within the surge ponds. Water from the surge ponds is then transferred from the Southern Surge Pond (via pumping) to the Eastern Surge Pond to the Northern Stilling Dam (herewith described as the North West Dam) prior to discharge to the irrigation area from the Northern Surge Pond (herewith described as the North East Dam). Hydro aims to maintain the Southern Surge Pond at 5 to 10% of its capacity.

Table 2-1 details the characteristic of each surge pond including capacity and surrounding catchment.

Aerial photography by Nearmap, flown 15.12.2021

RAMBOLL AUSTRALIA - GIS MAP file : 318000737_GIS_P003_WaterManagement | F001_ExistingWaterMgtSys_V01 | 23/02/2022

Legend

- Project site
- Waterway (NSW Spatial Services)
- Berm
- Underground pipe
- Pond

A4
1:8,000

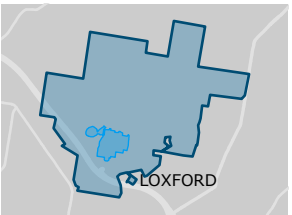


Figure 2-1 | Existing Smelter Water Management System

RAMBOLL

Table 2-1 Smelter Water Management Infrastructure and Capacities

Water Management Infrastructure	Existing Storage Capacity (m^3)	Catchment Area (ha)
West Surge Pond	14,833	15.59
South Surge Pond	1,500	7.47
Southern Bypass (channel)	2,280	-
East Surge Pond	8,580	10.66
North Stilling Pond	9,700	32.31
North Surge Pond	23,400	8.56
TOTAL	**60,293**	**74.58**

Source: PCB, 2018

The water levels of the individual surge ponds is recorded by Hydro on a weekly basis in the Water Management Spreadsheet. These recorded levels are compared against the target levels (where applicable).

Water levels are managed via a combination of gravity flows and pumped flows to maintain adequate storage capacity for a storm event in accordance with **Table 2-3**. The pumps are manually operated by Hydro personnel. The water level (as a percentage of capacity) is measured on a weekly basis. This information is recorded in the Water Management Spreadsheet.

Table 2-2 Water Level Management

Pond/Pump Location	Discharge to:	Overflow To:	Pump On Trigger (%)	Pump Off Trigger (%)
South Surge Pond	East Surge Pond	East Surge Pond	50	10
East Surge Pond	North East Dam	North East Dam	N/A (gravity flow)	N/A
West Surge Pond	Unnamed creek	Unnamed creek	N/A (gravity flow)	N/A
North Dams	Irrigation Area	Black Waterholes Creek and to Wentworth Swamp	70	50

Source: PBC, 2018

Protection of water quality during the Smelter operation was the primary purpose for the management of water levels in the surge ponds, and the controlled discharge to the irrigation area. The water was retained on the Smelter in the surge ponds for as long as possible to facilitate treatment of water (primarily by reducing fluoride levels). Controlled discharge from the North East Dam (which had the best quality water within the Smelter management system) was undertaken to provide sufficient capacity within the water management system so as to retain water requiring treatment, as well as water received during rainfall.

In 2021 the following improvements to the Smelter water management system were undertaken:

- East Surge Pond: Approximately 5,161 m^3 of sediment and other materials were removed from the East Surge Pond and drainage line. A survey of the pond following the works showed that the capacity of the pond has increased from 5,900 m^3 to 8,580 m^3

- West Surge Pond: Approximately 5,800 m^3 of sediment and other materials were removed from the West Surge Pond. In addition, the West Surge Pond overflow height has been increased by 600 mm. As a result, the capacity of the West Surge Pond has increased from 11,300 m^3 to 14,833 m^3
- South Surge Pond – No remediation required, therefore no change in capacity
- North East and North West Dams – No remediation required, therefore no change in capacity

2.2 Irrigation Area

As shown in **Figure 2-1** the Irrigation Area is located to the north of the Project site, adjacent to Swamp Creek.

The trigger to discharge from the North East Dam to the irrigation area is 50% capacity with discharge ceasing (pumps turned off) when the water level is reduced to 10% capacity, or prior to the generation of surface water runoff at the irrigation area in accordance with Condition O4.1 of Hydro's Environment Protection Licence (EPL) No. 1548 (detailed in **Table 2-3**).

The Hydro Environment Officer monitors the Irrigation Area to confirm irrigation is occurring in accordance with the EPL. This is through visual inspections to identify if any water runoff is occurring, including any observations of runoff into Swamp Creek. Historical water quality monitoring downstream of the Irrigation Area has not identified significant adverse environmental impacts.

2.2.1 Irrigation Regulatory Requirements

Hydro has an existing EPL No. 1548 under the *Protection of the Environment Operations Act 1997* (POEO Act) applied to the Smelter premises. The EPL was amended on 30 July 2018 to align the licence with the post operational activities occurring at the Smelter. The EPL specifically permits the chemical storage and specifies licensed discharges to air and water and applications to land; limit, operating, monitoring and recording, and reporting conditions.

Specific to surface water, the EPL provides approval for Hydro to discharge water from the site, the manner in which it is to be discharged and monitoring of the discharge event. The licensee of the EPL must comply with Section 120 of the POEO Act which prohibits the pollution of waters, unless specifically conditioned within the licence.

Condition P1.2 of EPL 1548 allows for one '*discharge to utilisation area*' which is the irrigation area depicted in **Figure 2-1**. Operating conditions O4.1 to O4.4 regulate the application of the surplus water on the irrigation area (the irrigation area), refer **Table 2-4**.

Table 2-3 Operating Conditions for Irrigation Area

Condition Reference	Operating Condition
O4.1	Effluent application must not occur in a manner that causes surface runoff
O4.2	Spray from the effluent application must not drift beyond the boundary of the premises
O4.3	Livestock access to any effluent application area must be denied during effluent application and until the applied effluent area has dried
O4.4	The quantity of effluent/solids applied to the utilisation area must not exceed the capacity of the area to effectively utilise the effluent/solids

2.3 Water quality monitoring

Water quality monitoring completed during the operation of the TWTP is outlined in the TWTP WQMP.

3. EFFLUENT AND WATER QUALITY MONITORING AND MANAGEMENT

The purpose of this section is to address the following requirements of Condition 19C:

- Irrigation rules to ensure that irrigation water quality meets the North East Dam Target Values prior to irrigation (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1)
- Details of ongoing treated effluent quality monitoring, including sample take location and frequency
- Identification of operational triggers (such as 'trigger action response plans') to ensure that the treatment process is functioning correctly and to prevent unacceptable impacts to the irrigated area, including any water quality impacts to the downstream receiving environment.
- Develops a Trigger Action Response Plan (TARP) which includes contingencies to identify and manage any unpredicted impacts (such as poor water quality within the North East Dam) and ensure corrective actions are implemented. Contingency measures could include, but are not limited to:
  - Additional treatment of leachate through the TWTP
  - Treatment of the North East Dam water quality through the TWTP
  - Offsite removal by tanker for disposal at a licensed facility

3.1 Irrigation Rules

3.1.1 Temporary Water Treatment Plant Discharge Controls and Monitoring

Rules for the discharge of treated effluent to the North East Dam are documented in the TWTP Management Plan. Treated effluent not meeting the North East Dam Target values will not be discharged to the North East Dam.

Water quality monitoring requirements applicable to the North Dams and the surrounding environment are outlined in the TWTP WQMP.

Water quality monitoring requirements for treated effluent are outlined in the TWTP Management Plan.

Continuous monitoring of the water throughout the TWTP (located as shown in **Figure 3-1**) is done with built-in instrumentation and alarm systems. If the water is measured to be out of the specification within the process, the automated system will interlock the necessary steps of the process. The system may automatically recover (such as by pH correction dosing) and recommence operation or may require the water to be returned to the head of the system for re-treating. This can be facilitated by manually running pumps and opening/closing actuated valves.

pH, turbidity and electrical conductivity (EC) will be monitored at the TWTP so that the water remains within the Discharge Criteria. pH and oxidation reduction potential (ORP) are measured throughout the process so that the treatment processes are operating at their optimum design requirements to remove the target contaminants.

RAMBOLL AUSTRALIA - GIS MAP file - 318000737_GIS_P001_RemediationMod1 | F001_LeachateMgtInfV02_V01 | 30/06/2021

Aerial photography by Nearmap, flown 15.06.2020

Legend

- Project site
- Leachate management infrastructure
  - Leachate storage dam
  - Temporary water treatment plant
  - Leachate transfer pipeline
  - Clean water discharge

A4
1:8,000

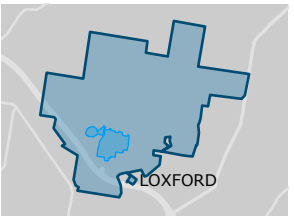


Figure 3-1 | Temporary Water Treatment Plant Infrastructure

Alarms and emails are also sent out to operators and managers to notify them of plant issues. If the operator is onsite, they will investigate the cause of the alarm immediately. If the operator is not present at site or the incident occurs outside of normal operation hours, then the operator will attempt to fix the problem remotely. If this is not possible the operator will assess the urgency of the situation and attend site if necessary to rectify the issue. The TWTP operator, Enviropacific, maintains a team with personnel on-call for these requirements.

If treated water sample results indicate a failure Enviropacific will notify Daracon and Hydro via email and phone call and follow the steps of ITR-06-01 Operation of the TWTP – Discharge of Treated Leachate so that normal processes are followed, and relevant documentation is available for record keeping.

By implementing the batch treatment process, the likelihood of a treated water environmental breach is significantly reduced.

3.1.2 Trigger Action Response Protocols

This section outlines a trigger action response plan which includes contingencies to identify and manage any unpredicted impacts and ensure corrective actions are implemented.

Trigger: Water quality monitoring of the treated effluent identifies effluent does not meet the North East Dam Target Values and cannot be discharged.

Response: Water would be re-treated through the TWTP until the North East Dam Target Values are achieved.

Trigger: Water quality monitoring identifies and exceedance of the North East Dam Target Values comprising either

- Five consecutive exceedances of the historical 80th percentile value, or
- Three exceedances of the historical 95th percentile value.

Response: In the event that pre-irrigation monitoring identifies an exceedance of the North East Dam Target Values, irrigation would not commence until monitoring shows that water quality is acceptable to discharge. Alternate evaporation measures may be required such as increased use in dust suppression or water cannon in order to reduce volumes.

An investigation of the cause of increased values would be undertaken and an appropriate response identified and implemented in order to provide an overall reduction in the North East Dam.

4. IRRIGATION AREA AND NORTH EAST DAM MANAGEMENT

The purpose of this section is to address the following requirements of Condition 19C:

- Operational triggers (such as 'trigger action response plans') to ensure that the treatment process is functioning correctly and to prevent unacceptable impacts to the irrigated area. Triggers and associated responses must be provided for, but not limited to, the following:
  - excessive saturation of the soil profile (waterlogging)
  - any surface water runoff of treated effluent from the North East Dam
  - any water quality impacts to the downstream receiving environment
- Operating rules to ensure the North East Dam maintains a 1 in 5-year rainfall event or 20% AEP design storm capacity

4.1 Irrigation Area Operations and Monitoring

Operation and monitoring of the irrigation area would continue in accordance with existing procedures (as described in Section 2.2). These procedures have successfully protected water quality in the downstream watercourses for more than 25 years.

4.2 North East Dam Operating Rules

4.2.1 North East Dam Discharge and Storage Capacity Protocols

Discharges to the irrigation area is the controlled discharge method from the North East Dam. The procedures described in Section 2.2 and Section 4.1 would manage these discharges. It is also the primary management measure for maintaining capacity in the North East Dam and the Smelter water management system. Water from the North East Dam is also sprayed and used for dust suppression within the Project site, further helping to manage capacity in the North East Dam.

Overflow could occur from the North East Dam during and/ or immediately following periods of heavy rainfall (typically greater than a 1 in 5-year rainfall event). In such events any overflow would be diluted from the rainfall within the catchment and in the North East Dam itself. The downstream watercourses would also have additional inflows, and so the overflow from the North East Dam into Black Waterholes Creek and Wentworth Swamp would be further diluted. The WQMP requires water sampling to be undertaken in response to rainfall events of >30 mm in a 24-hour period, with sampling to be completed within 24 hours of the cessation of rain, where it is safe to access the sampling locations. This monitoring would determine the extent of dilution from rainfall during an overflow event.

As described in the Response to Submissions Report (Ramboll, 2018) and the Modification 1 SEE (Ramboll, 2021) noted that a water balance model was produced which found that the Smelter site is capable of containing and controlling stormwater runoff for up to a 1 in 5-year, 3-hour storm event (PCB 2019). The improvements to the Smelter water management system described in Section 2.1 further increased the capacity of the Smelter water management system, and reduced the quantity of water that is directed to the North East Dam.

4.3 Trigger Action Response Protocol

The following describes trigger action response protocols for possible occurrences during the use of the TWTP and the irrigation area.

Trigger: Surface water run off or water logging is observed during the inspections of the irrigation area during irrigation activities.

Response: Cease use of the irrigation area and assess options for additional forms of water consumption such as water carts or water cannon evaporators.

Trigger: Water quality monitoring of the downstream environment identifies an adverse impact from use of the irrigation area as defined in the TWTP WQMP.

Responses:

- Discharges to the irrigation area would be suspended until water quality analysis confirms that it acceptable to resume
- TWTP treated effluent testing results would be reviewed to confirm compliance with the Target Values
- An investigation would be undertaken to determine the source of the adverse water quality.
- An investigation of the significance of the adverse water quality on the downstream environment.

5. LIMITATIONS

Ramboll Australia Pty Ltd (Ramboll) prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 3 May 2019 and in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

5.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without Ramboll's express written permission.

APPENDIX 1
EPA CONSULTATION

DOC22/33303-1

Ramboll Australia Pty Ltd.
PO Box 435
THE JUNCTION NSW 2291

Email: staylor@ramboll.com

Attention: Mr Shaun Taylor

20 January 2022

Dear Mr Taylor,

HYDRO ALUMINIUM REMEDIATION PROJECT – DRAFT MANAGEMENT PLANS

I refer to your email to the Environment Protection Authority (EPA), received on 18 January 2022, inviting the EPA to comment on the draft Temporary Water Treatment Plant Management Plan, draft Irrigation Management Plan and draft Water Quality Monitoring Program being prepared in respect of the Hydro Aluminium Remediation Project.

The EPA encourages the development of such plans to ensure that proponents and licensees have determined how they will meet their statutory obligations and designated environmental objectives.

Being a regulatory authority, the EPA's role is to administer and regulate statutes for environmental management and protection. As such the EPA does not directly get involved in the development of strategies to achieve those objectives and does not review or comment on such plans. Accordingly, the EPA has not reviewed and offers no comments on the above management plans.

If you have any questions about this matter, please contact Hamish Rutherford on (02) 4908 6824 or email info@epa.nsw.gov.au.

Yours sincerely

CLAIRE MILES
Acting Manager Metro North
Environment Protection Authority

cc. Mr Richard Brown
Hydro Aluminium Kurri Kurri Pty Ltd
Email: richard.brown@hydro.com

APPENDIX 3
TEMPORARY WATER TREATMENT PLANT WATER QUALITY MONITORING PROGRAM

Intended for
Hydro Aluminium Kurri Kurri Pty Ltd

Document type
Final V1

Date
November 2022

TEMPORARY WATER TREATMENT PLANT WATER QUALITY MONITORING PROGRAM

RAMBOLL Bright ideas. Sustainable change.

TEMPORARY WATER TREATMENT PLANT
WATER QUALITY MONITORING PROGRAM

Project name	**Temporary Water Treatment Plant Water Quality Monitoring Program**
Project no.	**318000344-001**
Recipient	**Hydro Aluminium Kurri Kurri Pty Ltd**
Document type	**Report**
Version	**Final V1**
Date	**14/11/2022**
Prepared by	**Jillian Cowburn**
Checked by	**Kirsty Greenfield CEnvP Site Contamination Specialist No. SC40104**
Approved by	**Fiona Robinson CEnvP Site Contamination Specialist No. SC40100**
Description	**This report provides a program for monitoring of water quality while treated leachate is discharged into the existing surface water management and irrigation system at the former Hydro Aluminium Kurri Kurri Smelter in Loxford, NSW. Discharge of treated leachate will occur during the operation of a Temporary Water Treatment Plant as part of the Engineered Containment Cell and Remediation Project, to be undertaken between 2021 and 2023.**

Ramboll
Level 2, Suite 18 Eastpoint
50 Glebe Road
PO Box 435
The Junction
NSW 2291
Australia

T +61 2 4962 5444
https://ramboll.com

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

CONTENTS

TABLE OF TABLES

APPENDICES

Measures	Description
%	per cent
µg/L	Micrograms per Litre
ha	Hectare
km	Kilometres
m	Metre
mg/L	Milligrams per Litre
AEP	Annual Exceedance Probability
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
COC	Chain of Custody
CWS	Capped Waste Stockpile
DQI	Data Quality Indicator
DQO	Data Quality Objective
ECC	Engineered Containment Cell
EEC	Endangered Ecological Community
EPA	Environment Protection Authority (NSW)
GHD	GHD Pty Ltd
LCS	Laboratory Control Sample
LOR	Limit of Reporting
MS	Matrix Spike
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
n	Number of Samples
pH	A measure of acidity, hydrogen ion activity
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RWEMP	Remediation Works Environmental Management Plan
SAQP	Sampling Analysis and Quality Plan
SEE	Statement of Environmental Effects
SWMP	Soil and Water Management Plan
TWTP	Temporary Water Treatment Plant
TV	Trigger Value
USEPA	United States Environmental Protection Agency
WQMP	Water Quality Monitoring Program
-	On tables is "not calculated", "no criteria" or "not applicable"

1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was engaged by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to prepare and implement a Water Quality Monitoring Program (WQMP) to fulfil regulatory requirements for discharging treated leachate into the existing surface water management system at the former Hydro Aluminium Kurri Kurri Smelter on Hart Road, Loxford, New South Wales (NSW).

The existing surface water management system comprises a series of holding dams at the former Smelter before water is applied to land by irrigation within the Buffer Zone. The former Smelter, herein referred to as the 'Smelter Site', and the surrounding Buffer Zone owned by Hydro occupy an area of approximately 2,000 ha as shown in **Figure 1, Appendix 1**.

1.1 Context

The Smelter commenced operations in 1969 and smelting activities ceased in September 2012. Closure of the Smelter was announced in May 2014 following a two-year period of care and maintenance. Remediation of the Smelter Site has commenced and will be undertaken between 2021 and 2023. Remediation is outlined in the Smelter Site Remedial Action Plan (Smelter RAP) (Ramboll, 2018) and broadly comprises construction of an Engineered Containment Cell (ECC) and excavation and placement of contaminated materials within the ECC.

A component of the remediation is relocation of a mixed waste stockpile in the eastern portion of the Smelter Site to the ECC. During past operations at the Smelter, mixed smelter materials were stockpiled on site and ultimately capped with clay. The stockpile is referred to as the Capped Waste Stockpile (CWS). Past exposure of these waste materials to surface water and groundwater has resulted in the generation of leachate characterised by elevated fluoride, cyanide and sodium concentrations and a high pH. During relocation of the CWS, leachate within the materials including leachate generated from rainfall occurring during the relocation process requires capture and treatment.

The on-site treatment methodology is detailed in Ramboll (2021) Statement of Environmental Effects (SEE) which was submitted as an amendment to the existing development consent for off-site treatment and disposal of CWS leachate. The amendment was approved after GHD (2018) was able to demonstrate through modelling that the proposed modification could effectively and cost efficiently treat the leachate on-site.

The methodology for on-site treatment of CWS leachate comprises a Temporary Water Treatment Plant (TWTP) specifically designed by GHD (2018) to treat the leachate, which was sampled and characterised by Ramboll (2021). The treated leachate will then be discharged to the existing water management system and subsequently applied to land through irrigation in the Buffer Zone Irrigation Area.

Approval conditions for on-site leachate treatment require Hydro or a representative to prepare and implement a Water Quality Monitoring Program (WQMP) for the duration of leachate treatment. Hydro has nominated Ramboll as the representative to prepare and implement WQMP.

1.2 Objective of the WQMP

The objectives of this WQMP are to:

- Prepare a program outlining surface water monitoring locations, timing and frequency of surface water sampling of the existing water management system and downstream receiving environments to assess changes to water quality while treated leachate is discharged to the existing water management system
- Document reporting requirements associated with the WQMP

The WQMP relates to the management of treated leachate once it is discharged from the TWTP to the onsite stormwater management system. An Operational Management Plan (Enviropacific Services (September 2021) Water Treatment Plant Management Plan) will be separately developed that details the operations of the TWTP and the discharge criteria to be met by the treatment process.

1.1 Program requirements

Table 1-1 lists the requirements of Condition B19D from Modification 1 to the development consent for SSD 6666, and where they are addressed in this plan.

As required by Condition B19D Hydro consulted with the Environment Protection Authority (EPA) during preparation of this WQMP. NSW EPA had no comments on specific content for the WQMP. Agency consultation is included in **Appendix 2**.

Table 1-1 Modification 1 Irrigation Management Plan Requirements

Condition	Where addressed
B19C. Prior to operation of the TWTP, the applicant must prepare a Water Quality Monitoring Program in consultation with the EPA that informs the Irrigation Management Plan and Trigger Action Response Plans. The monitoring program should include, at a minimum:	
(a) water quality monitoring locations (including but not limited to the North Dam and downstream receiving environment)	
(b) analyte list for all pollutants with the potential to cause non-trivial harm (including all the 'Treated Leachate Target Values' (Document: Hydro Kurri Kurri Aluminium Smelter Remediation-Mod-1 (SSD-6666-Mod-1).	Section 5.3 and Section 5.4
(c) sampling method for each location	Section 5.2

2. BACKGROUND

2.1 Capped Waste Stockpile

The CWS is an on-site stockpile comprising mixed smelter wastes that were capped in 1995. The stockpile originated during early site operations between 1969 and 1992, when smelter wastes were stored within onsite storage facilities situated along the eastern smelter boundary.

In the mid-1980s changes to legislation regarding the storage of aluminium smelter wastes resulted in the improvement of storage and waste management on the Smelter Site. These improvements resulted in the consolidation of wastes into one stockpile and the capping of that stockpile, now referred to as the CWS. The capping of the CWS in 1995 was designed to reduce ongoing leachate generation.

From comprehensive site records and site knowledge, the CWS is known to contain:

- Spent pot lining
- Carbon Plant shot blast refuse, including grit and dust
- Carbon Plant dust collector product
- Collar mix (coke, pitch) spillage
- Carbon Plant floor sweepings
- Packing coke oversize
- Contaminated bath
- Rotary breaker oversize
- Pot lining mix (hot ramming paste)
- Rodding mix (coke, graphite, pitch and anthracene oil)
- Consumable gaskets and insulation material (synthetic mineral fibre and asbestos)
- Pitch spills/ pencil pitch
- Aluminium swarf
- Scrap aluminium billets
- Anode cover material
- Butt from spent anodes
- Ahead of schedule anodes
- Dross
- Pot bottom aluminium
- Stud joining mix
- General rubbish, including plastic, wood and steel

Ramboll undertook an intrusive (core drilling) investigation in October/November 2015 at the CWS. The objective of the investigation was to provide an assessment on the composition of the waste material, the underlying soil, and the groundwater conditions beneath the CWS. A total of six boreholes were drilled and subsequently developed with groundwater monitoring wells. Waste, soil, and groundwater were collected and analysed in a laboratory for a wide range of Contaminants of Concern. The results of the untreated leachate sample analysis showed high concentrations of benzo(a)pyrene, Total Polyaromatic Hydrocarbons (PAHs), arsenic, lead, cyanide and fluoride among detectable concentrations of other contaminants.

Following the approval of the proposed modification to SSD 6666, leachate will be treated on-site as opposed to being transported to an off-site facility for treatment. The TWTP has been designed based on the physico-chemical parameters of the leachate in order to reduce contaminants to acceptable concentrations before being discharged into the existing water management system at the Smelter Site.

The location of the CWS and the proposed TWTP is shown in **Figure 2, Appendix 1**.

2.2 Existing Water Management System

Existing surface water infrastructure includes:

- Subsurface and open surface water drainage throughout the Smelter Site
- Three surge ponds: one surge pond in the west of the Smelter (West Surge Pond), one in the east of the Smelter (East Surge Pond) and one in the south of the Smelter (South Surge Pond). These are the initial collection and treatment points for the water.
- Two ponds located to the north of the Smelter: The northern surge dams are collectively known as the North Dam however it is comprised of two dams, the North West Dam and North East Dam. The North Dam has previously been, and continues to be, used as the major element of the water collection and treatment system for the Smelter Site.
- Irrigation Area: To the north east of the Smelter in the Buffer Zone is an irrigation area that receives water from the North Dam. The Irrigation Area is operated in accordance with the requirements of Environmental Protection License (EPL) 1548.

A water quality monitoring schedule is in place for weekly and monthly monitoring of water quality at on-site and off-site locations to fulfil regulatory requirements of the EPL associated with the application of collected surface water to land at the irrigation site. Water quality parameters recorded include pH, Electrical Conductivity (EC), Total dissolved Solids (TDS), Total Suspended Solids (TSS), free cyanide, and fluoride.

The Smelter Site is permitted to apply water to land as per EPL 1548. Irrigation rates ensure that the rate of irrigation will not cause visible pooling of water or runoff.

3. ENVIRONMENTAL SETTING

3.1 Topography

Review of Google Earth satellite imagery identified regional topography characterised by low residual hills to the west (20 – 30 m Australian Height Datum (AHD)) and low-lying swampy land to the north and east (8 –14 m AHD). The Site appears to have been filled to create a flat, elevated platform at 14 – 17 m AHD.

The Irrigation Area is located approximately 300 m north-east of the North East Dam. The Irrigation Area slopes gently down from north-west to south-east towards Swamp Creek and is within approximately 30 m of Swamp Creek at the south-eastern corner. The location of the Irrigation Area is shown in **Figure 2, Appendix 1**.

3.2 Direction of Surface Water Runoff

Surface runoff at the Smelter Site is generally directed to one of two dams – either the West Surge Pond or East Surge Pond. The TWTP will discharge treated leachate to the East Surge Pond which is connected in series to the North East Dam and North West Dam. Water is held at the North East Dam and North West Dam until it can be applied to land by irrigation. Irrigation is undertaken at a grassed paddock located north east of the North Dam known as the Irrigation Area.

The nearest surface water receptor to the Irrigation Area is Swamp Creek, located approximately 175 m east of the Irrigation Area. Swamp Creek generally runs south to north from the point at which it rises in the Broken Back Range and travelling down through suburbs such as Kearsley and Neath, towards the township of Abermain where it is joined with Deep Creek. From Abermain, Swamp Creek continues to Kurri Kurri where it passes by the Site before draining into Wentworth Swamp. The Wentworth Swamp is an EEC under the Biodiversity Conservation Act (2016) meeting the definition of EEC *Freshwater Wetland on Coastal Floodplains of New South Wales North Coast, Sydney Basin and South East Corner Bioregions*.

In the event that the North Dam overtops due to a significant rainfall event, surface water flows north into Wentworth Swamp via Black Waterholes Creek. Black Waterholes Creek is located approximately 360 m north of the North Dam. Black Waterholes Creek flows into Wentworth Swamp in the west, while Swamp Creek flows into Wentworth Swamp in the east.

A review of a management plan developed by the Department of Environment and Climate Change (2007) for the middle Hunter River catchment describes Swamp Creek, Black Waterholes Creek and Wentworth Swamp as disturbed ecosystems. The introduction of pest species has diminished native vegetation cover however is still listed as an Endangered Ecological Community (EEC). Sections of Swamp Creek preserve remnants of several other EECs while other sections, namely 5 kms between Abermain and Loxford are highly disturbed and have been channelised. In addition, two wastewater treatment works are known to discharge treated effluent into Wentworth Swamp which contribute to elevated phosphorus in the water body.

3.3 Flood Potential

The majority of the Smelter Site is located on low lying swampy ground that has been filled. Low lying areas of the Smelter Site remain susceptible to flooding.

Swamp Creek has a history of significant flooding, notably the February 1990, June 2007 (“the Pasha Bulker storm”), June 2011, February-March and November 2013, April 2015, and January 2016 (WMA Water, 2019). A study found that upstream of the Hunter Expressway, flows were likely to break out of the channel in a 20% Annual Exceedance Probability (AEP) event (38.9mm rainfall/hr) and inundate urban areas in a 10% AEP event (47.2mm rainfall/hr). However,

downstream of the Hunter Expressway where the Site is located, is swamp area and water levels remain fairly constant (WMA Water, 2019).

Risks associated with contaminated runoff and additional leachate generated during peak rainfall at the CWS will be mitigated by containing runoff and leachate in two 1 Mega Litre (ML) storage ponds. In addition, the ECC and CWS each have 1 ML capacity equalling a total of 4 ML of contaminant runoff and leachate storage capacity (GHD, 2018).

4. SAMPLING AND ANALYSIS QUALITY PLAN

4.1 Data Quality Objectives

Ramboll developed Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) for the WQMP using the US EPA seven-step DQO process, endorsed in Schedule B2 of NEPM (2013). The DQOs set quality assurance and quality control parameters for the field and laboratory program to ensure data of appropriate reliability will be used to assess surface water quality at on- and off-site locations.

Table 4-1 Data Quality Objectives

DQO	Outcome
State the Problem	During the decommissioning and decontamination of the CWS, leachate from the CWS will be treated through a TWTP to meet set criteria outlined in the TWTP Management Plan (Enviropacific Services (September 2021) Water Treatment Plant Management Plan). Once achieved, treated leachate will be discharged into the existing water management system via an open drain that flows into the East Surge Pond. Water quality monitoring of the North Dam is required to ensure North East Dam Target Values are being met before water is applied to land at the Irrigation Area. Monitoring at off-site locations in the down-gradient surface water receptors of Swamp Creek and Wentworth Swamp is also required to ensure the irrigation of water to the Irrigation Area is not impacting the down-gradient receiving environment.
Identify the Decision	Decision that are required as part of the WQMP are as follows: 1. Are sampling locations adequate for monitoring on-site and off-site water quality impacts? 2. Is the data collected of sufficient quality to identify impacts to meet the project objectives? 3. Does the on-site water quality data comply with the North East Dam Target Values? 4. Is there an impact to water quality in the down-gradient receiving environment?
Identify Inputs to the Decision	The following inputs are required: 1. Physico-chemical properties at on-site and off-site sampling locations per sampling round 2. Analytical results for each on-site and off-site sampling location per sampling round 3. Quality assurance/ quality control (QA/QC) data review 4. Comparison of on-site data against historical observations and North East Dam Target Values outlined in **Section 6** 5. Comparison of downstream data against background/upstream locations to identify impacts to downstream receiving environments 6. All sample analyses are to be conducted using National Association of Testing Authorities (NATA) registered methods in accordance with ANZECC (1996) and NEPC (1999) guidelines 7. All samples are to be appropriately preserved and handled in accordance with the sampling methodology outlined in **Table 5-3.** 8. PQLs are to be less that the adopted assessment criteria 9. Duplicates, spikes, blanks and control samples are to meet the DQIs presented in **Section 4.2**
Define the Study Boundaries	Spatial boundaries are shown in **Figure 1, Appendix 1** and include: 1. North Dams – North East Dam and North West Dam 2. Down-gradient Swamp Creek 3. Down-gradient Wentworth Swamp 4. Down-gradient Black Waterholes Creek 5. Up-gradient Swamp Creek Vertical boundaries: Vertical boundaries are limited to surface waters. Temporal boundaries: The temporal boundary is limited to data to be collected under this WQMP which is to include (at a minimum) monthly sampling, and post heavy rainfall sampling for the duration of operation of the TWTP.
Develop a Decision Rule	The decision rules for this investigation are as follows:

DQO	Outcome
	1. If it is determined that the data generated is reliable, complete, comparable, accurate and representative then this information will be used to address the WQMP objectives. 2. If it is determined that the data generated is not suitable, comprehensive or reliable for use in achieving the goals of the EMP, then further works may be recommended to reduce uncertainties. 3. If it is determined that insufficient information is available to make conclusions on the effects of treated leachate of the existing water management system and downstream receiving environments, then further information may be required.
Specify Limits on Decision Errors	To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs in relation to precision, accuracy, representativeness, comparability and completeness. The DQIs and data assessment criteria are outlined in **Table 4-2**.
Optimise the Design for Obtaining Data	The overall design of the WQMP is to assess water quality in the North Dams and off site water quality monitoring during the operation of the TWTP. Further detail is provided in the field and laboratory methodologies in **Section 5**.

4.2 Data Quality Indicators

DQIs have been established to set acceptance limits on field and laboratory data collected as part of the surface water program. The DQIs are outlined **Table 4-2**.

Table 4-2 Data Quality Indicators

DQI	Field	Laboratory
Completeness – a measure of the amount of useable data from a data collection activity	All critical locations sampled Experienced sampler Documentation is correct and complete	All critical samples analysed All analysis completed according to standard operating procedures. Appropriate methods
Comparability – the confidence that data may be considered to be equivalent for each sampling and analytical event	Experienced sampler Climatic conditions noted during sampling Same types of samples collected using approved sampling methods Samples collected into laboratory-supplied sample bottles	Same analytical methods used Same sample PQLs Same NATA accredited laboratories used Same units
Representativeness – the confidence that data are representative of each medium present onsite.	Appropriate media sampled	All samples analysed according to standard operating procedures
Precision – a quantitative measure of the variability of the data.	Collection of intra-laboratory duplicates at a rate of 1 in 20 primary samples Collection of inter-laboratory duplicate samples at a rate of 1 in 20 primary samples Collection of 1 field blank per sampling round	Analysis of field duplicate samples, relative percent difference (RPDs) to be $\leq$30% Laboratory duplicates analysed, RPDs to be $\leq$ 30%
Accuracy – a quantitative measure of the closeness of the reported data to the “true” value.	Sampling methodologies appropriate and complied with Collection of one field blank sample each day of sampling.	Analysis of: • Method blanks. • Matrix spikes. • Surrogate spikes. • Laboratory control samples. • Results for blank samples to be non-detect. • Results for spike samples to be between 70% and 130%
Sensitivity - is a measure of the suitability of the laboratory results against the adopted assessment criteria.	Collection of sufficient sample volume	Appropriate Practical Quantitation Limits (PQLs) Appropriate units

5. SAMPLING PROGRAM – FIELD AND LABORATORY METHODOLOGY

5.1 WQMP Sampling Program

Hydro continues to implement a long-term surface water sampling program in accordance with its Soil and Water Management Plan (SWMP), which forms part of its Remediation Works Environmental Management Plan (RWEMP). This includes the North East Dam, other dams within the Smelter Site, and upstream and downstream locations in adjoining waterbodies (including adjacent to the Irrigation Area) in the Buffer Zone. Hydro's current monitoring program includes the following:

- Monthly monitoring of East Surge Pond, West Surge Pond, South Surge Pond, North Dams, Swamp Creek and Wentworth Swamp for pH, electrical conductivity, fluoride, free cyanide, TSS and TDS

This surface water monitoring is the continuation of monitoring that has been undertaken for more than 25 years, which has not identified significant adverse impacts from this historical use of the Irrigation Area.

Supplementary water quality monitoring required in relation to the discharge of treated leachate from the TWTP is outlined in **Table 5-1**.

Table 5-1 Supplementary Water Quality Monitoring Program

WQMP Sampling Program	Requirements
Sampling Locations	Surface water receptors are: • East Surge Pond • North East Dam • Swamp Creek down-gradient of the Irrigation Area • Wentworth Swamp Suitable sampling locations have been identified at the down-gradient receptors, as outlined in **Table 5-2.** A background sampling location has also been identified at an upgradient location in Swamp Creek, as outlined in **Table 5-2**.
Sampling Frequency – Routine Sampling	Routine sampling is to be completed monthly, in the third week of the month. Routine sampling is to commence in October 2021 and continue until cessation of leachate treatment through the TWTP.
Sampling Frequency – Event-Based Sampling	Event-based sampling is to be completed at the following times: • Following rainfall events of >30 mm in a 24-hour period, with sampling to be completed within 24 hours of the cessation of rain, where it is safe to access the sampling locations.
Contaminants of Concern – Field Parameters	Samples collected during routine and event-based sampling events are to be tested in the field for the following parameters: • pH • Electrical conductivity • Visual observation of oil and grease

WQMP Sampling Program	Requirements
Contaminants of Concern – Laboratory Analysis	Samples collected during routine and event-based sampling events are to be analysed for Contaminants of Concern within the leachate that require treatment through the TWTP, including: • Fluoride • Cyanide • Total Recoverable Hydrocarbons (TRH) • Polycyclic Aromatic Hydrocarbons (PAH) • Per- and Polyfluoroalkyl Substances (PFAS) • Heavy metals – total and dissolved (full list shown in **Table 6-1**) • Total dissolved solids • Total suspended solids

Table 5-2 Surface Water Sampling Locations

Location	Sample ID	Easting	Northing
Onsite			
East Surge Pond	E Dam 1	358202.6658	6371193.557
North East Dam	NE Dam 2	357936.4993	6371485.385
Offsite			
Swamp Creek – Upgradient	Swamp Creek 4	357869.0028	6370020.893
Swamp Creek – down gradient	Swamp Creek 5	359039.3505	6371944.736
Wentworth Swamp	62	360405.7194	6373845.988
Unnamed Creek	9	358083.6073	6372217.735

5.2 Field Sampling Methodology

Sampling methodology for the collection of surface water samples is outlined in **Table 5-3**. For health and safety reasons, all sampling should be completed by a two-person field team following a Health and Safety Plan and Safe Work Method Statement prepared specifically for the tasks to be undertaken.

Table 5-3 Sampling Methodology

Sampling Methodology	Assessment
Sample Depths	Surface water samples are to be collected from 100 mm beneath the surface as far away from the embankment as is practicable. A sampling arm may be used where appropriate however, every effort should be made to avoid disturbing sediments.
Field Records	Each sample shall be labelled with a unique identification or sample ID, as presented in **Table 5-2.** Water quality parameters including pH, temperature, EC, dissolved oxygen, redox potential, turbidity and total dissolved solids (TDS) are to be measured and recorded for each of the sampling locations. Visual observations of surface water and photographic records shall be collected during each sampling event.
Sample Collection Method	Surface water samples are to be collected directly into laboratory-supplied sample bottles with appropriate preservatives. Disposable nitrile gloves shall be worn by the sampler and offsider. Gloves are to be changed between sampling locations. One set of samples for heavy metals are to be filtered in the field using a 0.45µm filter.

Sampling Methodology	Assessment
Decontamination Procedures	Non disposable sampling equipment i.e. water quality meter and sampling arm, shall be decontaminated between sampling locations using a decontamination solution (i.e. Decon90®) and laboratory supplied rinsate water.
Sample Collection and Storage	Surface water samples are to be collected directly into laboratory-supplied sample bottles. The bottles are to be stored in a chilled Esky in the field and during transit to the laboratory.
Chain of Custody	Samples are to be promptly submitted to a NATA accredited laboratory under Chain of Custody conditions.
Calibration of Field Equipment	The water quality meter may be rented from an equipment hire company or provided by Ramboll. Where supplied by Ramboll, the water quality meter will be calibrated prior to use and calibration records will be provided as proof of calibration. The water quality meter will be calibrated prior to hire and the calibration certificate shall be retained for proof of calibration.

5.3 Field Parameters

The following field parameters are to be recorded at each sampling location using a calibrated water quality meter:

- pH
- EC
- Redox
- Dissolved oxygen
- Turbidity
- Temperature

5.4 Laboratory Analytical Methodology

Surface water samples are to be analysed at a laboratory NATA accredited for the analysis required. From a previous Ramboll investigation described in **Section 2.1**, Contaminants of Concern associated with the CWS that are at non-trivial concentrations:

- Fluoride
- Cyanide
- PAHs
- TRH/BTEX
- PFAS
- Heavy Metals – total and dissolved

To ensure DQIs are met for laboratory analysis, **Table 5-4** shows the analytical method corresponding practical quantitation limit (PQL) for each assessment criteria listed in **Table 6-1** and **Table 6-3**. As per the DQIs, the PQL must be less than the assessment criteria.

Table 5-4 Analytical Methods and PQLs for water samples

Analyte	Method Code	PQL
Heavy Metals		
Aluminium	ICP-MS	0.01 mg/L
Arsenic	ICP-AES	0.01 mg/L
Beryllium	ICP-AES	0.1 mg/L
Boron	ICP-AES	0.1 mg/L
Cadmium	ICP-MS	0.1 mg/L

Analyte	Method Code	PQL
Chromium	Ultra Trace ICP-AES	0.01 mg/L
Cobalt	ICP-MS	0.001 mg/L
Copper	ICP-MS	0.001 mg/L
Iron	ICP-AES	0.05 mg/L
Lead	ICP-MS	0.001 mg/L
Lithium	ICP-MS	0.001 mg/L
Manganese	ICP-AES	0.01 mg/L
Mercury	ICP-MS	0.0001 mg/L
Nickel	ICP-MS	0.001 mg/L
Selenium	ICP-AES	0.01 mg/L
Uranium	Ultra Trace ICP-AES	0.05 mg/L
Vanadium	Ultra Trace ICP-AES	0.2 mg/L
Zinc	ICP-MS	0.005 mg/L
Petroleum Hydrocarbons		
TRH >C10 – C40 Sum	Capillary GC/FID[1]	100 µg/L
Benzene	Capillary GC/FID[1]	1 µg/L
Toluene	Capillary GC/FID[1]	2 µg/L
Ethyl benzene	Capillary GC/FID[1]	2 µg/L
o-xylene	Capillary GC/FID[1]	2 µg/L
m-xylene	Capillary GC/FID[1]	2 µg/L
p-xylene	Capillary GC/FID[1]	2 µg/L
PAHs		
Naphthalene	Capillary GC/MS[1]	0.005
PAHs	Capillary GC/MS[1]	0.001 [2]
PFAS		
PFAS - Trace	LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level	0.005 µg/L[3]
Fluoride		
Fluoride	Ion Selective Electrode (ISE)	0.01 mg/L
Cyanide		
Free Cyanide	Segmented Flow Analyser	0.004 mg/L

Analyte	Method Code	PQL
Total Cyanide	Segmented Flow Analyser	0.004 mg/L

[1] Compliant with NEPM Schedule B(3)

[2] Highest PQL of all PAH analytes is 1 µg/L

[3] Highest PQL for all PFAS analytes is 0.005 µg/L

6. ASSESSMENT CRITERIA

6.1 North East Dam

North East Dam Target Values were developed as part of Ramboll (2021) Statement of Environmental Effects, Modification 1 to SSD 6666 Temporary Water Treatment System. Comparison of analytical results from monthly surface water monitoring events to North East Dam Target Values will be used to assess suitability of surface water for irrigation during the operation of the TWTP and discharge of treated leachate. North East Dam Target Values are shown in **Table 6-1**.

Table 6-1 North East Dam Target Values

Parameter	Units	Limit
Conductivity	µS/cm	4,000 [1]
pH	-	6.5-8 [2]
Fluoride	mg/L	15 [2]
Free cyanide	mg/L	<0.005
Total oils and grease	-	No visual sheen [3]
Total Dissolved Solids (TDS)	mg/L	None specified
Total Suspended Solids (TSS)	mg/L	<50 [3]
Total polyaromatic hydrocarbons (PAHs)	µg/L	LOR (<1)
Total Recoverable Hydrocarbons (TRH)	µg/L	LOR (<100)
Perfluorooctane sulfonate (PFOS)	µg/L	0.21 [2]
Heavy metals		
Aluminium	mg/L	5 [4]
Arsenic	mg/L	0.1 [4]
Beryllium	mg/L	0.1 [4]
Boron	mg/L	0.5 [4]
Cadmium	mg/L	0.01 [4]
Chromium	mg/L	0.1 [4]
Cobalt	mg/L	0.05 [4]
Copper	mg/L	0.2 [4]
Iron	mg/L	0.2 [4]
Lead	mg/L	2 [4]
Lithium	mg/L	2.5 [4]
Manganese	mg/L	0.2 [4]
Mercury	mg/L	0.002 [4]
Molybdenum	mg/L	0.01 [4]
Nickel	mg/L	0.2 [4]
Selenium	mg/L	0.02 [4]
Uranium	mg/L	0.01 [4]
Vanadium	mg/L	0.1 [4]
Zinc	mg/L	2 [4]

[1] Use Of Effluent By Irrigation, Department of Local Government, 1998

[2] Historical value in North Dams

[3] Managing Urban Stormwater: Soils and Construction, 2004

[4] Long-term trigger values for heavy metals and metalloids in irrigation sourced from ANZECC, 2000.

6.2 Off-Site Receiving Waters

In the absence of sufficient background data for Swamp Creek and Wentworth Swamp, default trigger values for physical and chemical stressors, and toxicants have been adopted from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ARMCANZ & ANZECC , 2000) and will be used as a guideline for the assessment of off-site water quality.

Additionally, an upstream (background) location will be sampled to compare against downstream receiving environment water quality. Upstream water quality monitoring will be used to supplement the default trigger values in order to provide context to any discrepancies in the downstream receiving environment when compared to the adopted default trigger values.

Based on the contaminants associated with the CWS leachate, default trigger values for physical and chemical stressors for lowland rivers in South-East Australia (ARMCANZ & ANZECC , 2000) have been selected and are summarised in **Table 6-2** for off-site receiving waters.

Table 6-2 Default Trigger Values for Physico-Chemical Parameters

		Slightly Disturbed Lowland Rivers in South-East Australia	
Parameter	**Units**	**Lower Limit**	**Upper Limit**
pH		6.5	7.5
DO	%	85	110
Salinity	µS/cm	125	2200
Turbidity	NTU	6	50

Based on the contaminants associated with the CWS leachate, default trigger values for toxicants for 95% level of species protection in freshwater ecosystems (ARMCANZ & ANZECC , 2000) have been selected and are summarised in **Table 6-3** for off-site receiving waters.

Table 6-3 Default Toxicant Trigger Values

Analyte	Units	Freshwater Aquatic Ecosystem 95% Species Protection
Aluminium	mg/L	0.055
Arsenic (III)	mg/L	0.024
Arsenic (V)	mg/L	0.013
Beryllium	mg/L	*0.00013* [2]
Boron	mg/L	0.370 [1]
Cadmium	mg/L	0.002
Chromium (III)	mg/L	*0.0033*
Chromium (VI)	mg/L	0.001 [1]
Cobalt	mg/L	*0.0028*
Copper	mg/L	0.0014

Analyte	Units	Freshwater Aquatic Ecosystem 95% Species Protection
Iron	mg/L	*0.300* [2]
Lead	mg/L	0.0034
Manganese	mg/L	1.9 [1]
Mercury (inorganic)	mg/L	0.0006
Mercury (methyl)		ID
Molybdenum	mg/L	*0.034*
Nickel	mg/L	0.011
Selenium (Total)	mg/L	0.011
Uranium	mg/L	*0.0005*
Vanadium	mg/L	*0.006*
Zinc	mg/L	0.008
Cyanide	mg/L	0.007
Benzene	mg/L	0.950
o-xylene	mg/L	0.350
Naphthalene	mg/L	0.016

ID - Insufficient data to derive a reliable trigger value and no low reliability trigger value available
Italics - indicate low reliability value
[1] may not protect key test species from acute toxicity (and chronic)
[2] Interim working value used in the absence of low or moderate reliability value

7. REPORTING

7.1 Monthly Reporting

Reporting is to be completed on a monthly basis following monthly sampling. Each report must contain the following components:

- Updated cumulative monitoring data summary table
- Details of additional monthly monitoring i.e. monitoring prior to irrigation or after rainfall
- Assessment of monitoring results against criteria
- Comment on the concentrations of contaminants observed
- Identification of any exceedance of the contaminants observed and identification if further investigation or action is required.

7.2 Final Report

Following the cessation of the TWTP, a report will be prepared documenting the completed sampling, trend analysis, quality assurance / quality control and monthly reports.

The report shall include the following:

- Executive summary
- Introduction
- Objectives and scope of work
- Summary of WQPP monthly reports
- Summary of completed field sampling and laboratory analysis
- QA/QC review
- Results
- Conclusion
- Monthly reports are to be included as an appendix

8. REFERENCES

ARMCANZ & ANZECC . (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality

Biodiversity Conservation Act No. 63. (2016). NSW: https://legislation.nsw.gov.au/view/html/inforce/current/act-2016-063#statusinformation

Department of Environment and Climate Change NSW. (2007). Management Plan for the Green and Golden Bell Frog Key Population in the Middle Hunter

GHD (2018) *Hydro Aluminium Kurri Kurri Pty Ltd Containment Cell Design Report.*

Landcom (2004) Managing Urban Stormwater: Soils and Construction

National Environment Protection Council (NEPC) (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999

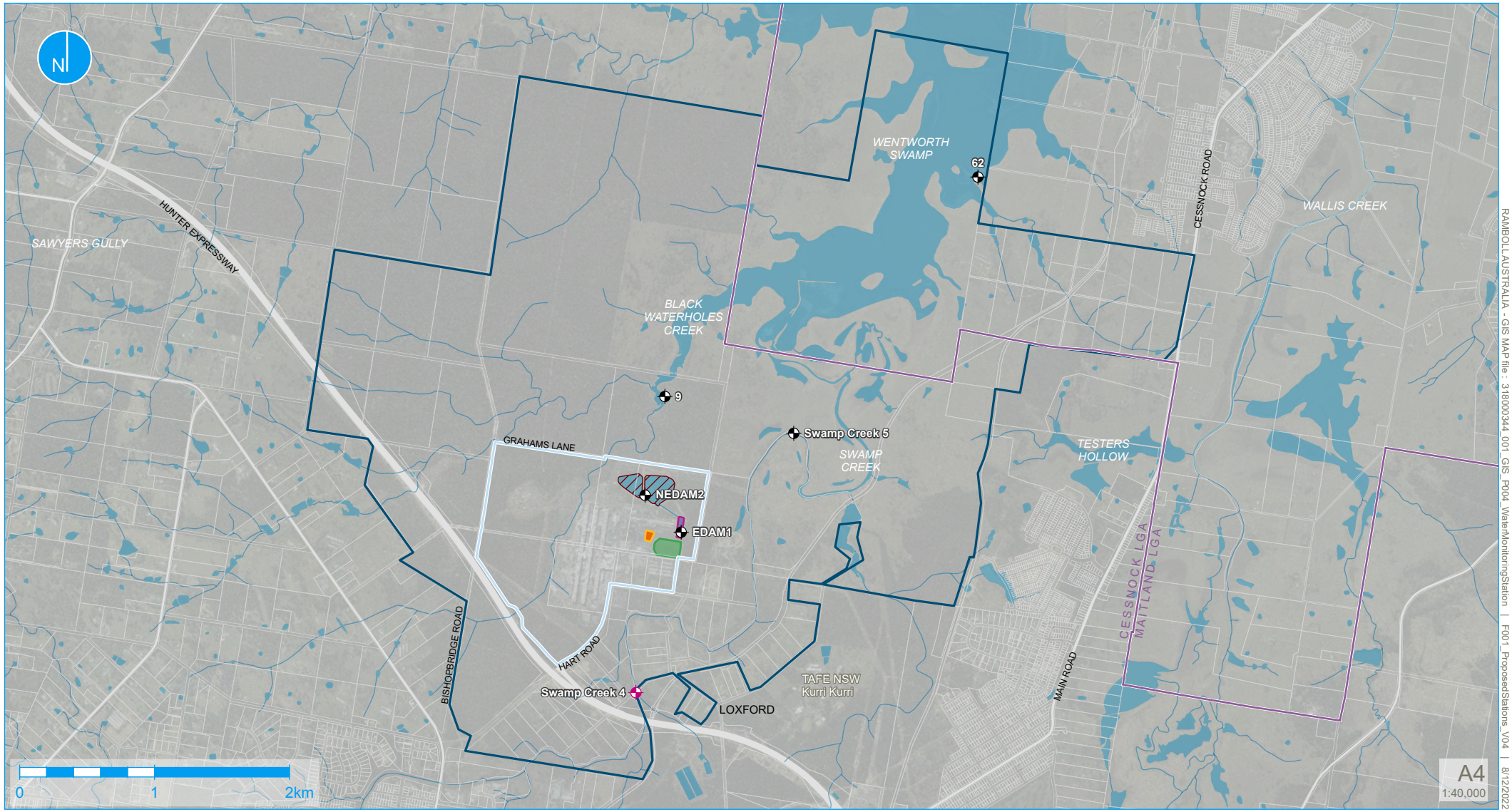
NSW EPA (2004) *Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales*

Ramboll (2018) *Remedial Action Plan, Hydro Aluminium Kurri Kurri*

Ramboll (2021) *Statement of Environmental Effects: Modification 1 to SSD 6666 - Temporary Water Treatment System*

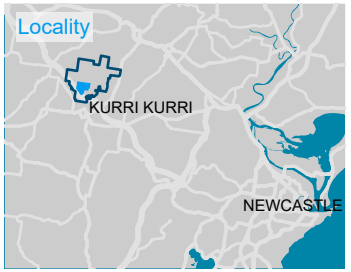
WMA Water (2019) Wallis and Swamp Fishery Creek Flood Study

APPENDIX 1
FIGURES



RAMBOLL AUSTRALIA - GIS MAP file - 318000344_001_GIS_P004_WaterMonitoringStation | F001_ProposedStations_V04 | 8/12/2022

Imagery © Department of Customer Service 2020



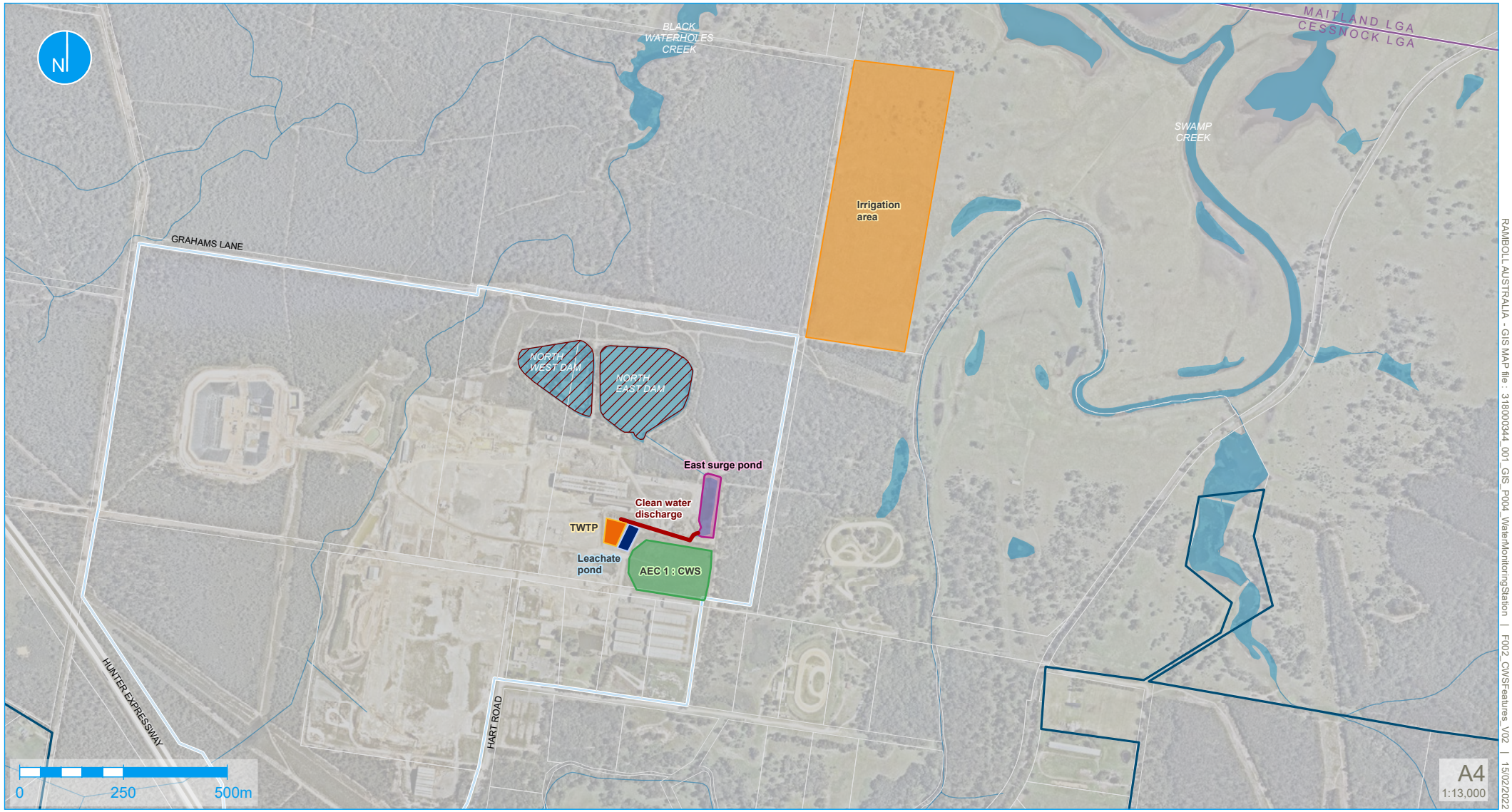
Legend

- Hydro owned land
- Smelter site
- LGA boundary
- AEC 1 : Capped waste stockpile (CWS)
- Temporary water treatment plant (TWTP)
- East Surge pond
- North dams
- Water body (NSW Spatial Serivce, 2021)

Sample locations

- Downstream sample location
- Upstream sample location

Figure 1 | Proposed Water Quality Monitoring Sampling Locations



RAMBOLL AUSTRALIA - GIS MAP file : 318000344_001_GIS_P004_WaterMonitoringStation | F002_CWSFeatures_V02 | 15/02/2022

Aerial imagery from Nearmap 15.12.2021

Legend

- Hydro owned land
- Smelter site
- LGA boundary
- AEC 1 : Capped waste stockpile (CWS)
- Temporary water treatment plant (TWTP)
- East surge pond
- North dams
- Irrigation area
- Clean water discharge
- Leachate pond
- Water body (NSW Spatial Serivce, 2021)

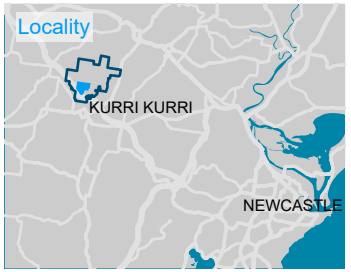


Figure 2 | Location of Capped Waste Stockpile (CWS), Treated Leachate Discharge Point and Irrigation Area

APPENDIX 2
AGENCY CONSULTATION

DOC22/33303-1

Ramboll Australia Pty Ltd.
PO Box 435
THE JUNCTION NSW 2291

Email: staylor@ramboll.com

Attention: Mr Shaun Taylor

20 January 2022

Dear Mr Taylor,

HYDRO ALUMINIUM REMEDIATION PROJECT – DRAFT MANAGEMENT PLANS

I refer to your email to the Environment Protection Authority (EPA), received on 18 January 2022, inviting the EPA to comment on the draft Temporary Water Treatment Plant Management Plan, draft Irrigation Management Plan and draft Water Quality Monitoring Program being prepared in respect of the Hydro Aluminium Remediation Project.

The EPA encourages the development of such plans to ensure that proponents and licensees have determined how they will meet their statutory obligations and designated environmental objectives.

Being a regulatory authority, the EPA's role is to administer and regulate statutes for environmental management and protection. As such the EPA does not directly get involved in the development of strategies to achieve those objectives and does not review or comment on such plans. Accordingly, the EPA has not reviewed and offers no comments on the above management plans.

If you have any questions about this matter, please contact Hamish Rutherford on (02) 4908 6824 or email info@epa.nsw.gov.au.

Yours sincerely

CLAIRE MILES
Acting Manager Metro North
Environment Protection Authority

cc. Mr Richard Brown
Hydro Aluminium Kurri Kurri Pty Ltd
Email: richard.brown@hydro.com

Department of Planning and Environment

Mr Richard Brown
Director
Hydro Aluminium Kurri Kurri Pty Ltd
PO Box 1
Kurri Kurri NSW 2327

22/03/2022

Dear Mr Brown

Hydro Kurri Kurri Aluminium Smelter Remediation (SSD-6666)
Temporary Water Treatment Plant Water Quality Monitoring Program

I refer to the **Temporary Water Treatment Plant Water Quality Monitoring Program** which was prepared to satisfy Condition B19D of Schedule 2 of the consent for SSD-6666 and submitted to the Department on 24 February 2022.

The Department acknowledges the receipt of this document, noting that it does not require approval from the Planning Secretary.

If you wish to discuss the matter further, please contact Zoe Halpin on (02) 9995 6430 or via zoe.halpin@planning.nsw.gov.au.

Yours sincerely

Sheelagh Laguna
Principal Planning Officer
Industry Assessments

As nominee of the Secretary