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HYDRO REMEDIATION PROJECT IRRIGATION MANAGEMENT PLAN

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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.**

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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
<p>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:</p>	
<p>(a) A plan showing the area to be irrigated by treated effluent from the TWTP;</p>	<p>Figure 2-1</p>
<p>(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));</p>	<p>Section 4.1 and TWTP Management Plan</p>
<p>(c) Details of ongoing treated effluent quality monitoring, including sample take location and frequency;</p>	<p>Section 3.1.1 and TWTP Management Plan</p>
<p>(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.</p>	<p>TWTP Management Plan</p>
<p>Triggers and associated responses must be provided for, but not limited to, the following:</p>	
<p>i. excessive saturation of the soil profile (waterlogging);</p>	<p>Section 4.3</p>
<p>ii. any surface water runoff of treated effluent from the North Dam; and</p>	<p>Section 4.3</p>
<p>iii. any water quality impacts to the downstream receiving environment.</p>	<p>Section 4.3</p>
<p>(e) Operating rules to ensure the North Dam maintains a 1 in 5-year rainfall event or 20% AEP design storm capacity;</p>	<p>Section 4.2.1</p>
<p>(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:</p>	
<p>i. additional treatment of leachate through the TWTP;</p>	<p>Section 3.1.2 and TWTP Management Plan</p>
<p>ii. treatment of the North Dam water quality through the TWTP; and</p>	<p>Not applicable (refer to Section 3.1.2)</p>
<p>iii. offsite removal by tanker for disposal at a licensed facility.</p>	<p>Section 3.1.2 and TWTP Management Plan</p>

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.



RAMBOLL AUSTRALIA - GIS MAP file : 318000737_GIS_P003_WaterManagement | E001_ExistingWaterMgmtSys_V01 | 23/02/2022

Aerial photography by Nearmap, flown 15.12.2021

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

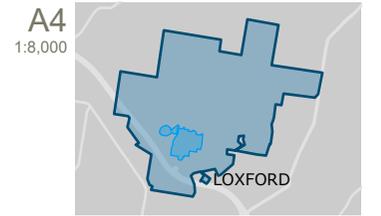


Figure 2-1 | Existing Smelter Water Management System



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 m³ 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 m³ to 8,580 m³

- West Surge Pond: Approximately 5,800 m³ 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 m³ to 14,833 m³
- 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.



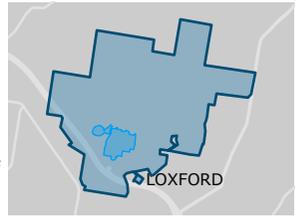
RAMBOLL AUSTRALIA - GIS MAP file : 318900737_GIS_P001_RemediationMod1 | F001_LeachateMgmt/V02_V01 | 30/06/2021

Aerial photography by Nearmap, flown 15.06.2020

Legend

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

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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.
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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

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