Planning, Industry & Environment

Richard Sheehan
Environmental Manager
NRE NO. 1 Colliery 7
Princes Highway
Corrimal, NSW, 2518

09/02/2021

Dear Mr Sheehan

Russell Vale Underground Expansion (MP09_0013)
Extraction Plan

I refer to your request (MP09_0013-PA-3) for the Planning Secretary's approval of suitably qualified persons to prepare the Extraction Plan for the Russell Vale Underground Expansion (MP09_0013).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Planning Secretary approves the appointment of the experts to prepare the Extraction Plan.

Accordingly, the following experts are approved as authors for the Extraction Plan.

Consent Condition	Extraction Plan Requirement	Expert/Author
Schedule C Condition 10	Extraction Plan	Warwick Lidbury – RVC Mine Manager Luke Bettridge – Umwelt David Holmes – Umwelt
Schedule C Condition 10 (g)(i)	Subsidence Monitoring Plan	Dr Ken Mills – SCT Stephen Wilson - SCT
Schedule C Condition 10 (g)(ii)	Built Features Management Plan	Dr Ken Mills – SCT Stephen Wilson - SCT
Schedule C Condition 10 (g)(iii)	Water Management Plan	Susan Shield – Engeny Clare Stephenson - Umwelt
Schedule C Condition 10 (g)(iv)	Biodiversity Management Plan	Paul Price - Biosis
Schedule C Condition 10 (g)(v)	Swamp Monitoring Plan	Luke Stone - Biosis
Schedule C Condition 10 (g)(vi)	Land Management Plan	Luke Bettridge – Umwelt David Holmes – Umwelt
Schedule C Condition 10 (g)(vi)	Heritage Management Plan	Dr Amanda Markham - Biosis
Schedule C Condition 10 (g)(vii)	Public Safety Management Plan	Warwick Lidbury – RVC Mine Manager
Schedule C Condition 10 (g)(viii)	Trigger Action Response Plan/s	Warwick Lidbury – RVC Mine Manager Luke Bettridge – Umwelt David Holmes – Umwelt
Schedule C Condition 10 (g)(ix)	Contingency Plan	Warwick Lidbury – RVC Mine Manager Luke Bettridge – Umwelt David Holmes – Umwelt

If you wish to discuss the matter further, please contact Daniel Martin at daniel.martin@dpie.nsw.gov.au

Yours sincerely

Stephen O'Donoghue
Director
Resource Assessments
As nominee of the Planning Secretary

Planning, Industry & Environment

Mr Richard Sheehan
Group Environment Manager
Wollongong Coal Limited

Via email: richard.sheehan@wcl.net.au

20/01/2022

Dear Mr Sheehan

Russell Vale Underground Expansion (MP 09_0013)
Endorsement of Experts - Stage 2 Extraction Plan

I refer to your request (undated) for the Secretary's approval of suitably qualified persons to prepare the Stage 2 Extraction Plan for the Russell Vale Underground Expansion Project (MP 09_0013).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Secretary approves the appointment of the following team to prepare the Stage 2 Extraction Plan.

Team member	Role
Luke Bettridge - Principal Environmental Consultant, Umwelt David Holmes - Principal Environmental Consultant, Umwelt	Author - Extraction Plan main document
	Author - Land Management Plan
	Author - Public Safety Management Plan
Dr Ken Mills - Principal Subsidence Engineer, SCT Operations Stephen Wilson - Mine Planner, SCT Operations	Technical Specialist - Subsidence Monitoring Plan
	Technical Specialist - Built Features Management Plan
Chris Bonomini - Principal Engineer, Umwelt Claire Stephenson - Principal Hydrogeologist, Umwelt	Technical Specialist - Water Management Plan
Jane Taithby-Veall - Associate Director (Ecology), Biosis Dr Caragh Heenan - Project Zoologist, Biosis Zoe Goold - Project Zoologist, Biosis	Technical Specialist - Biodiversity Management Plan
	Technical Specialist - Swamp Monitoring Program

Team member	Role
Taryn Gooley - Manager Heritage (NSW), Biosis Samantha Keats - Senior Archaeologist, Biosis Matthew Smith - Consultant Archaeologist, Biosis	Technical Specialist - Heritage Management Plan

If you wish to discuss the matter further, please contact Gabrielle Allan on 02 9585 6078 or gabrielle.allan@dpie.nsw.gov.au.

Yours sincerely

Jessie Evans
Director

As nominee of the Secretary

DOC22/309095-3

Mr Nick Robinson
Umwelt (Australia) Pty Ltd
Suite 1101, Level 11
213 Miller Street
NORTH SYDNEY NSW 2060

Email: nrobinson@umwelt.com.au

Dear Mr Robinson

Russel Vale Colliery Underground Expansion Project Stage 1 and 2 Extraction Plan

The EPA refers to Unwelt's email dated 12 April 2021 requesting comment on the Water Management Plan which is part of the Extraction Plan for the revised Russell Vale Mine Underground Expansion Project. The Water Management Plan includes the Groundwater Management Plan.

The EPA is responsible for administering Environment Protection Licences that govern environmental impacts from surface infrastructure such as pit tops & vent shafts. The licences typically contain limit & monitoring conditions relating to air, noise, water emissions & waste management.

The EPA does not generally assess subsidence impacts from underground coal mines because they are outside the EPA's licensing framework and regulated under Development Approvals issued by the Department of Planning and Environment (Planning and Assessment).

The EPA appreciates the opportunity to review on the Extraction Plan but has no input to provide.

If you have questions regarding the above, please phone Andrew Couldridge on (02) 4224 4100.

Yours sincerely

26/4/2022

GREG NEWMAN
Unit Head Regulation

Phone 131 555
Phone 02 4224 4100
(from outside NSW)

Fax 02 4224 4110
TTY 131 677
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www.epa.nsw.gov.au

Department of Planning and Environment

Our ref: OUT22/6132

Simon Pigozzo

Email: simon.pigozzo@wcl.net.au

23 May 2022

Subject: **Russell Vale Underground Expansion - Extraction Plan, Water Management Plan (incorporating Groundwater Management Plan) & Swamp Monitoring Program**

Dear Mr Pigozzo,

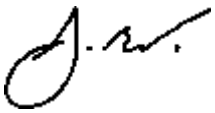
I refer to your email of 13 April 2022 to the Department of Planning and Environment (DPE) Water about the above matter.

The Department of Planning and Environment- Water has reviewed the Extraction Plan, Water Management Plan (incorporating Groundwater Management Plan) & Swamp Monitoring Program and requests further information regarding:

- Performance criteria
- environmental tracers
- accountability of an impact change
- dispute resolution.

Should you have any further queries in relation to this submission please do not hesitate to contact DPE Water Assessments at water.assessments@dpie.nsw.gov.au

Yours sincerely,



Luke McIver

Acting Manager, Assessments, Knowledge Division
Department of Planning and Environment: Water

Attachment A

Detailed advice regarding the Russell Vale Underground Expansion - Extraction Plan, Water Management Plan (incorporating Groundwater Management Plan) & Swamp Monitoring Program

1.0 Performance Criteria

1.1 Recommendation

Define the water level trigger action thresholds for the nested monitoring bores including the deeper sandstone aquifer.

1.2 Explanation

This is required for assessing and taking action against issues relating to the hydraulic connection between swamps and associated aquifers, as specified under condition C10(g)(v).

2.0 Environmental Tracers

2.1 Recommendation

Incorporate environmental tracers within the suite of water quality analytes.

2.2 Explanation

Environmental tracers are a specific requirement under condition C10(g)(v) and will assist in objective evaluation in the event performance criteria exceeds trigger levels 2 or 3.

3.0 Accountability of an Impact Change

3.1 Recommendation

Provide a supplementary statement to the existing “Statement of Commitment “ that requires the proponent to identify the cause (natural or mining related) of any identified level 2 or 3 exceedances, and not arrive at an open finding due to insufficient monitoring evidence.

3.2 Explanation

Section 7.3 of the WMP refers the reader to Appendix D which objectively should be modified to reflect the emphasis is on the proponent to demonstrate Level 2 or Level 3 change in the performance criteria is not due to mining, as opposed to if the change is due to mining operations. The implication is to ensure the responsibility of proof sits with the proponent to collect appropriate data sufficient to rule out an impact from mining activities, as opposed to stating that there is no evidence of a mining related impact potentially as a consequence due to in-effective baseline dataset(s) and inability to draw a scientifically robust conclusion. A Statement of Commitment should be provided that the monitoring program is sufficiently designed to differentiate between mining and natural impacts.

4.0 Dispute Resolution

4.1 Recommendation

Consider including a dispute resolution step in the TARP for instances where there may be differing opinions in relation to the cause of any exceedance. Additionally, Figure 15 – Flow

chart box should consider a process for dispute resolution in the event there is conflicting opinion between agency and stakeholder as to whether the impact is/isn't mining related.

End Attachment A

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www.waternsw.com.au
ABN 21 147 934 787

27 April 2022

Contact: Ravi Sundaram
Telephone: 0428226152
Our ref: *D2022/31435*

Jessie Evans, Director Resource Assessments, DPE
Email: Jessie Evans@DPIE.nsw.gov.au

Dear Jessie

Russell Vale Colliery Underground Expansion Project – Stage 2 (PC27-PC34) Extraction Plan

WaterNSW appreciates the opportunity to review the updated extraction plan (EP) which now include Stage 2 (PC27-34) of underground mining expansion project. WaterNSW has previously provided feedback on the Stage 1 (PC07-08 and 21 -25) (our reference - D2021/116712). Both Stage 1 and Stage 2 mining areas are located within the Metropolitan Special Area and the Upper Nepean Catchment (specifically within the upper catchment of the Cataract Reservoir).

WaterNSW has an important statutory role "*to protect and enhance the quality and quantity of water in declared catchment areas*". It also has a set of 'Mining Principles' which underpin WaterNSW decision making in relation to managing mining impacts in the declared Sydney catchment area and on catchment infrastructure.

Wollongong Coal Limited (WCL) has consulted with WaterNSW in preparing several key management plans required under the approval including Water Management Plan, Land Management Plan, Swamp Monitoring Program, and the Public Safety Management Plan. The EP has addressed feedback provided by WaterNSW to these plans.

Proposed mining in the Wongawilli seam in the Stage 2 area underlie parts of the previously mined Bulli and Balgownie seam workings area. The subsidence assessment has comprehensively addressed the pillar stability and pillar failure issues, and the potential risk of 'pillar run' for proposed extraction in a multi-seam area where overlying seams have been extracted previously.

Subsidence assessment predicts:

- vertical subsidence to be less than 100mm and generally imperceptible over most of the area, and
- the impacts, and consequences to natural, surface, and sub-surface features to be negligible and imperceptible in the undeveloped bushland setting over most of the Stage 2 extraction area.

WaterNSW considers that:

- The mining method and mine design adopted by WCL to the proposed mining in Stage 2 is likely to result in negligible impacts on water resources, biodiversity, and catchment environmental values.
- The proposed monitoring and management measures are appropriate for the planned mining method and subsidence predictions.
- The underground mine water balance monitoring system is expected to be effective as a guide to any unexpected inflows and inrush events from previously mined overlying seams and from Cataract Reservoir.
- The Trigger Action Response Plans (TARPs) for water and swamp monitoring including stream and swamp triggers developed based on baseline monitoring of performance indicators and anticipated subsidence effects are reasonable and appropriate.

WaterNSW does not have any concerns to the approval of the updated EP as:

- It has taken into consideration WaterNSW Mining Principles;
- Poses low risk to overlying catchment values and water resources; and
- Is likely to meet the performance measures set in the development consent.

Please contact Dr. Ravi Sundaram if you would like to discuss any of theabove matters further.

Yours sincerely

Daryl Gilchrist
Manager, Catchment Protection

RVF22/403#40
MAAG0013970

Mr Simon Pigozzo

Via: Major Project Portal / Email

Dear Mr Pigozzo

Re. Extraction Plan - Russell Vale Underground Expansion - RVC Revised UEP Extraction Plan

I refer to your request of 20 April 2022 for advice regarding the Russell Vale Underground Expansion - RVC Revised UEP Extraction Plan. The Resources Regulator has reviewed the request.

Limitations
The Extraction Plan is assessed and determined by DPIE under the conditions of the development consent. The Resources Regulator provides advice to DPIE to assist in the determination. In view of the high-level uncertainties in relation to the magnitude, nature, location, timing and duration of subsidence development due to the highly complicated conditions at the subject site as well as the existence of the Key Public Infrastructure located above the proposed extraction panels PC07 and PC08, we suggest that the Approving Authority consider and enforce relevant Conditions of Approval to ensure that the proposed mining of PC07 and PC08 be subject to:

1. The Proponent's undertaking of a specific review of the subsidence monitoring and any other relevant data collected during the mining of extraction panels PC21 to PC25 and PC27 to PC34. The objectives of the review are to up-date the Proponent's understanding of risks to the Key Public Infrastructure located above the proposed extraction panels PC07 and PC08 and, if warranted as a result of the review, to up-date the Proponent's risk management plans for the Key Public Infrastructure. The aforementioned review must include the representatives of the infrastructure operators, and

2. The infrastructure operators' endorsement of the Proponent's proposed risk management plans for the Key Public Infrastructure following the above-mentioned review.

Please note:
- The Key Public Infrastructure mentioned above is identified in Condition C7 of the Development Consent (i.e. MP09_0013, dated 8 December 2020);

- The aforementioned review may take place towards the end or after the completion of mining of extraction panels PC21 to PC25 and PC27 to PC34, and

- In discussing the Sequencing of Mining, the Proponent states that "Stage 2 second workings (PC27-PC34) may be undertaken concurrently with Stage 1a (PC21- PC25) and Stage 1b (PC07-PC08) second workings." In this case, it is critical to mine extraction panels PC21 to PC25 and PC27 to PC34 prior to the review as recommended above, considering the potentially severe consequences and any resulting community outrages if the Key Public Infrastructure is adversely affected by subsidence.

In addition, the holder of relevant mining leases is required to ensure that the rehabilitation commitments outlined in any approved Extraction Plan are included in the Mining Operations Plan / Rehabilitation Management Plan regulated by the Resources Regulator pursuant to the conditions of the mining leases under the Mining Act 1992. The holder of the mining leases must ensure the Mining Operations Plan / Rehabilitation Management Plan for the area covered by this 'RUSSELL VALE COLLIERY REVISED UNDERGROUND EXPANSION PROJECT, EXTRACTION PLAN, STAGES ONE and TWO - PC07, PC08 & PC21 to PC25 and PC27 to PC34 , RVE EC PLN 010 (dated 30 November 2021) ' is updated where necessary.

Regulatory requirements if approved

The authorisation holder is required to ensure that the rehabilitation commitments outlined in any approved Extraction Plan are included in the Mining Operations Plan / Rehabilitation Management Plan regulated by the Resources Regulator under the conditions of the mining lease and the *Mining Act 1992*. The authorisation holder must ensure the Mining Operations Plan / Rehabilitation Management Plan for the area covered by this Extraction Plan is updated where necessary.

The Resources Regulator may undertake assessments of the mine operators' proposed mining activities under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulation as well as other WHS regulatory obligations.

Subsidence associated with the proposed Extraction Plan will be regulated by under relevant provisions of WHS laws in particular Clause 33 and Clause 67 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* relating to High Risk Activities and Subsidence.

Background

The NSW Resources Regulator is responsible for compliance and enforcement of the Extraction Plan is so far as it relates to requirements under the Mining Act 1992 and Work Health and Safety legislation. This role principally relates to rehabilitation, workplace safety and public safety.

The Mining Act Inspectorate within the Resources Regulator undertake risk-based compliance and enforcement activities in relation to obligations under the *Mining Act 1992*. This includes undertaking assessment and compliance activities in relation to mine rehabilitation activities and determination of security deposits.

The Mine Safety Inspectorate within the Resources Regulator is responsible for ensuring the mine operators' compliance with the Work Health and Safety (WHS) legislation, in particular the effective management of risks associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Contact

Should you require any further information or clarification, please contact the Office of the Executive Director (ED.ResourcesRegulator@planning.nsw.gov.au)

Yours sincerely,

Peter Day
Executive Director
Resources Regulator
13 May 2022

Inspired People.
Dedicated Team.
Quality Outcomes.

Our Ref: 21174_Peter Day re NSWRR submission_V1.0

31 May 2022

Peter Day
Executive Director
NSW Resources Regulator

E| ED.ResourcesRegulator@planning.nsw.gov.au

Dear Peter

RE: NSW Resources Regulator Comments on Russell Vale Colliery Revised UEP Extraction Plan (RVF22/403#40, MAAG0013970)

I refer to your letter to Simon Pigozzo dated 13 May 2022 regarding the Russell Vale Colliery (RVC) revised Extraction Plan for the approved Russell Vale East mining area.

Thank you for providing a response, as requested by Wollongong Coal Limited (WCL) on 20 April 2022, for the revised Extraction Plan.

The extraction plan was revised to include extraction of the 'Stage 2' area, panels PC27–34. Based on the comments in the letter, we have assumed that the Resources Regulator has no specific concerns regarding the draft Extraction Plan insofar as it relates to the 'Stage 2' mining area (panels PC27–34).

As detailed in the current conditional approval of the 'Stage 1' Extraction Plan, mining is currently only approved in panel PC21 with further mining in PC22–25 and in PC07 and PC08 being subject to a review of subsidence monitoring in PC21 to confirm impact predictions. A minimum of 12 months groundwater monitoring within CCUS1 and the endorsement of the extraction plan by relevant infrastructure owners in the vicinity of PC07–08 is also required before mining can commence in PC07 and PC08.

A detailed submission to the Department of Planning and Environment is currently being prepared regarding the proposed approach to satisfying the subsidence monitoring requirements of this conditional approval.

Please do not hesitate to contact the undersigned on 1300 793 267 should you require clarification or further information.

Yours sincerely

David Holmes
Principal Environmental Consultant

E| dholmes@umwelt.com.au

cc Department of Planning and Environment

Umwelt (Australia) Pty Limited

ABN 18 059 519 041

T| 1300 793 267
E| info@umwelt.com.au

www.umwelt.com.au

Department of Planning and Environment

Our ref: MP09_0013-PA-45

Tom McMahon

NRE No.1 Colliery 7

Princes Highway

Corrimal NSW 2518

24 August 2022

Subject: Russell Vale Underground Coal Mine Stage 2 Extraction Plan – Request for Information

Dear Tom

I refer to the Russell Vale Underground Expansion Stage 2 Extraction Plan submitted to the Department of Planning and Environment (the department) as required under the conditions of consent for the Russell Vale Underground Expansion. After careful consideration, the department is requesting that you provide additional information.

You are requested to submit the additional information detailed in **Attachment A**.

You are requested to provide the information, or notification that the information will not be provided, to the department by 7 September 2022. If you are unable to provide the requested information within this timeframe, you are requested to provide, and commit to, a timeframe detailing the provision of this information.

If you have any questions, please contact Allison Sharp on 4345 4403 or via email at Allison.Sharp@planning.nsw.gov.au.

Yours sincerely,

JEvans

Jessie Evans

Director
Energy and Resources Assessments

Attachment A – Request for information

Russell Vale Underground Coal Mine – Stage 1 and 2 Extraction Plan

Biodiversity Management Plan

Giant Burrowing Frog Monitoring

The Biodiversity Management Plan (BMP) describes 13 surveys undertaken along a 245 m section of a tributary of Cataract River below swamp CRUS2. The BMP states that detailed surveys indicate that other tributaries are unlikely to support the species, and the species is not present within the Stage 2 extraction area.

BCD has provided the attached advice. The department has reviewed WCL's response to similar advice in Appendix E – Attachment 4 of the Biodiversity Management Plan. Appendix B of the 2022 BMP details the year of the most recent record, the number of records, and the distance of the records from the Study Area. The data included in Appendix B does not sufficiently justify the exclusion of the Giant Burrowing Frog from baseline data collection surveys prior to mining in the Stage 2 EP area.

The preferred project report biodiversity assessment (Umwelt, 2019) draws a conclusion regarding the potential for impact on the Giant Burrowing Frog stating:

"Although often associated with upland swamps, this association is not direct, rather that upland swamps are associated with minor drainage lines that provide suitable breeding pools and burrowing habitat for this species (DECC 2007). SCT (2018) predicts that the imperceptible levels of subsidence resulting from the revised UEP mine plan will not result in perceptible impacts to creeks. As such, the Giant Burrowing Frog is considered at negligible risk of impact."

The department acknowledges to low risk of impact. However, conditions C4-C6 of MP09_0013 provide for biodiversity impact offsetting if WCL exceeds the performance measures. If required, offsets must be undertaken in accordance with the Biodiversity Offsets Scheme (BOS). The BOS requires a suitable baseline dataset collected in accordance with the Biodiversity Assessment Method. To justify the exclusion of the Giant Burrowing Frog from the baseline dataset, the department requires the following:

- maps demonstrating the survey effort conducted for the Giant Burrowing Frog other than at CRUS2
- survey data associated with the mapped survey effort
- detailed outline of any other criteria used for each swamp to justify the exclusion of the species from further survey

Frog Species Monitoring

Threatened frog monitoring listed in Appendix B-Attachment 1 of the Biodiversity Monitoring Plan includes:

- two transects for *Litoria littlejohni* and *Heleioporus australiacus*, and
- four transects for *Mixophyes balbus*

The department requests more information including:

- maps of the transect locations references in Appendix B-Attachment 1 and any other survey transects completed for threatened frog species
- details of survey effort at the monitoring transect locations, and any other locations including date, number of days/hours
- detailed outline of any other criteria used for each swamp to justify the exclusion of the above species from further survey

Subsidence Monitoring

Explanation of GNSS monitoring locations

The proposed GNSS locations are mapped on Figure 11a of the Upland Swamp Monitoring Plan (USMP). Table 13 of the USMP details the subsidence monitoring relevant to Coastal Upland Swamps. The relevance/purpose of GNSS units is described as:

- located over second workings to provide information about subsidence occurring within that panel
- located within or at the edge of swamps provide an indication of subsidence levels within the swamp
- where possible, located at a point within the swamp or at a point between the swamp and the second workings

The department requests WCL identify which GNSS units are intended for one or more of the purposes outlined in Table 13 of the USMP.

Subsidence baseline monitoring

All GNSS units require a baseline monitoring period of 12 months prior to mining. The Subsidence Monitoring Plan (SMP) provides baseline monitoring results for GNSS units #1 - #17. The department does not consider GNSS units #1 - #17 provide a representative baseline data set for GNSS units within the Stage 2 extraction plan area.

The SMP and Master TARP must define the timeframe for baseline subsidence data collected ‘prior to mining’.

The department requests confirmation from WCL that subsidence monitoring by GNSS units will be conducted for a minimum of 12 months prior to undermining.

LiDAR

The Stage 2 Subsidence Assessment (SCT, July 2022) states "Broad-area remote monitoring (LiDAR) across the entire area is to check for unexpected movements, particularly any that may be associated with instability of remnant pillars in or in the vicinity of Bulli Seam goaf areas." The subsidence monitoring plan (Section 4.1) re-states this and details that the planned LiDAR surveys have an accuracy of +/- 200mm over the majority of the survey area. The accuracy and purpose of LiDAR is also detailed in Table 5 of the SMP.

The Master Trigger Action Response Plan (Master TARP) is inconsistent with the proposed subsidence monitoring outlined in Table 5 of the SMP. The Master TARP lists a LiDAR survey trigger level of >100mm of subsidence. The TARPs of >100mm of subsidence appear to be inconsistent with the Subsidence Assessment (SCT, July 2022) and the SMP.

The department requires clarification of how LiDAR can be used for subsidence levels <200mm, or alternatively, align TARPs measured by LiDAR with the limitations of the method.

GNSS Units #31 and #32

Please clarify the locations of GNSS Units 31 and 32

Groundwater Monitoring

The department requires an outline of groundwater monitoring undertaken at control sites. The outline must include the location name, month, and year of data collection and whether monitoring is ongoing or has ceased.

Wollongong Resources Pty Ltd

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ABN 28 111 244 896

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9 September 2022

Jessie Evans
Director, Energy and Resource Assessments
Department of Planning and Environment
jessie.evans@dpie.nsw.gov.au

Dear Jessie

RE: Russell Vale Underground Coal Mine Stage 2 Extraction Plan

We refer to your correspondence dated 24 August 2022 (your ref: MP09_0013-PA-45), requesting additional information in relation to the Russell Vale Underground Coal Mine Stage 2 Extraction Plan.

Please refer to the table below where detailed responses to your queries have been provided. We trust this information meets with your current requirements.

Please do not hesitate to contact the undersigned or David Holmes (Umwelt, 0411 363 417, Dholmes@umwelt.com.au) should you require clarification or further information.

Yours sincerely
WOLLONGONG RESOURCES PTY LTD

Tom McMahon
Group Approvals Manager
04 2229 5127

Table 1 Response to Request for Information

Request for Information	Response
Biodiversity Management Plan	
Giant Burrowing Frog Monitoring The Biodiversity Management Plan (BMP) describes 13 surveys undertaken along a 245 m section of a tributary of Cataract River below swamp CRUS2. The BMP states that detailed surveys indicate that other tributaries are unlikely to support the species, and the species is not present within the Stage 2 extraction area. BCD has provided the attached advice. The department has reviewed WCL's response to similar advice in Appendix E – Attachment 4 of the Biodiversity Management Plan. Appendix B of the 2022 BMP details the year of the most recent record, the number of records, and the distance of the records from the Study Area. The data included in Appendix B does not sufficiently justify the exclusion of the Giant Burrowing Frog from baseline data collection surveys prior to mining in the Stage 2 EP area. The preferred project report biodiversity assessment (Umwelt, 2019) draws a conclusion regarding the potential for impact on the Giant Burrowing Frog stating: *"Although often associated with upland swamps, this association is not direct, rather that upland swamps are associated with minor drainage lines that provide suitable breeding pools and burrowing habitat for this species (DECC 2007). SCT (2018) predicts that the imperceptible levels of subsidence resulting from the revised UEP mine plan will not result in perceptible impacts to creeks. As such, the Giant Burrowing Frog is considered at negligible risk of impact."* The department acknowledges to low risk of impact. However, conditions C4-C6 of MP09_0013 provide for biodiversity impact offsetting if WCL exceeds the performance measures. If required, offsets must be undertaken in accordance with the Biodiversity Offsets Scheme (BOS). The BOS requires a suitable baseline dataset collected in accordance with the Biodiversity Assessment Method. To justify the exclusion of the Giant Burrowing Frog from the baseline dataset, the department requires the following: • maps demonstrating the survey effort conducted for the Giant Burrowing Frog other than at CRUS2 • survey data associated with the mapped survey effort • detailed outline of any other criteria used for each swamp to justify the exclusion of the species from further survey	Please refer to attached report prepared by Biosis to address these queries.

Request for Information	Response
Frog Species Monitoring Threatened frog monitoring listed in Appendix B-Attachment 1 of the Biodiversity Monitoring Plan includes: • two transects for *Litoria littlejohni* and *Heleioporus australiacus*, and • four transects for *Mixophyes balbus* The department requests more information including: • maps of the transect locations references in Appendix B-Attachment 1 and any other survey transects completed for threatened frog species • details of survey effort at the monitoring transect locations, and any other locations including date, number of days/hours • detailed outline of any other criteria used for each swamp to justify the exclusion of the above species from further survey	Please refer to attached report prepared by Biosis to address these queries.
Subsidence Monitoring	
Explanation of GNSS monitoring locations The proposed GNSS locations are mapped on Figure 11a of the Upland Swamp Monitoring Plan (USMP). Table 13 of the USMP details the subsidence monitoring relevant to Coastal Upland Swamps. The relevance/purpose of GNSS units is described as: • located over second workings to provide information about subsidence occurring within that panel • located within or at the edge of swamps provide an indication of subsidence levels within the swamp • where possible, located at a point within the swamp or at a point between the swamp and the second workings The department requests WCL identify which GNSS units are intended for one or more of the purposes outlined in Table 13 of the USMP.	The GNSS units are used to measure subsidence for a range of purposes/features, and some GNSS units are applied to multiple purposes/features. Please refer to Table 2 below for a summary of the purposes that each GNSS unit is used for.

Request for Information	Response
Subsidence baseline monitoring All GNSS units require a baseline monitoring period of 12 months prior to mining. The Subsidence Monitoring Plan (SMP) provides baseline monitoring results for GNSS units #1 - #17. The department does not consider GNSS units #1 - #17 provide a representative baseline data set for GNSS units within the Stage 2 extraction plan area. The SMP and Master TARP must define the timeframe for baseline subsidence data collected 'prior to mining'. The department requests confirmation from WCL that subsidence monitoring by GNSS units will be conducted for a minimum of 12 months prior to undermining.	There is no need for an extended period of baseline monitoring of ground movement prior to potential mining impacts and the requirement for 12 months baseline monitoring using GNSS units prior to any impacts is not warranted. Unlike water and vegetation impacts, natural variability in ground movement is of limited magnitude as confirmed by the near real-time monitoring installed across the RVE area. The 'baseline' need only be established by a single point of measurement before mining reaches a point where potential impacts from that mining could be experienced and accepted principles of angle of draw can be used to define this. Installation of a GNSS unit prior to mining within 350m horizontal distance from the point of measurement is considered adequate to provide a baseline level against which future impacts can be measured. The above approach is consistent with conventional subsidence monitoring programs which rely on physical subsidence monitoring lines that would be surveyed once prior to mining, regularly during mining and once or twice after mining. As with conventional survey line monitoring, an extended pre-mining monitoring period using the GNSS monitors is not needed to establish an accurate baseline.

Request for Information	Response
LiDAR The Stage 2 Subsidence Assessment (SCT, July 2022) states "*Broad-area remote monitoring (LiDAR) across the entire area is to check for unexpected movements, particularly any that may be associated with instability of remnant pillars in or in the vicinity of Bulli Seam goaf areas.*" The subsidence monitoring plan (Section 4.1) re-states this and details that the planned LiDAR surveys have an accuracy of +/- 200mm over the majority of the survey area. The accuracy and purpose of LiDAR is also detailed in Table 5 of the SMP. The Master Trigger Action Response Plan (Master TARP) is inconsistent with the proposed subsidence monitoring outlined in Table 5 of the SMP. The Master TARP lists a LiDAR survey trigger level of >100mm of subsidence. The TARPs of >100mm of subsidence appear to be inconsistent with the Subsidence Assessment (SCT, July 2022) and the SMP. The department requires clarification of how LiDAR can be used for subsidence levels <200mm, or alternatively, align TARPs measured by LiDAR with the limitations of the method.	While a movement of 100 mm may be a result of inaccuracies associated with the limitations of LiDAR, if this were to occur and trigger the TARP, it would function as an indicator that subsidence in excess of predictions may have occurred and should therefore be investigated further (e.g. compared to surrounding LiDAR values, nearby GNSS results, field survey, comparison with underground monitoring etc.). In line with this reasoning, the TARPs can be adjusted such that LiDAR detecting a change of greater than 100 mm and less than 300 mm is a Level 2 trigger, and LiDAR detecting a change of greater than 300 mm is a Level 3 trigger, with appropriate actions associated with each trigger. It is envisaged that these updates may result in changes being carried through to the following plans: • Subsidence Monitoring Program. • Main Text (including Appendix A Master TARP). • Upland Swamp Monitoring Program. Subject to the concurrence of DPE, the above plans would be updated and resubmitted for approval. Given the level of accuracy in the LiDAR data, an exceedance of the 300 mm Level 3 trigger alone does not constitute a breach of the subsidence performance measure. Additional investigations into whether the subsidence indicated by the LiDAR is 'real' will be required as set out in the SMP. Monitoring against the 100 mm subsidence limit for coastal upland swamps (as required by DCCEEW) is met through a combination of GNSS and underground monitoring.

Request for Information	Response
GNSS Units #31 and #32 Please clarify the locations of GNSS Units 31 and 32	Please refer to Table 2 below for coordinates of GNSS #31 and #32. While these sites were shown in the Main Text figures, it appears that the SMP included an old figure. Figure 3 in the SMP will be updated to include GNSS #31 and #32 (situated along the 132 kV powerline). The correct figure is provided below for ease of reference.
Groundwater Monitoring The department requires an outline of groundwater monitoring undertaken at control sites. The outline must include the location name, month, and year of data collection and whether monitoring is ongoing or has ceased.	Please refer to Table 3 below for a summary of all groundwater monitoring undertaken at Russell Vale Colliery. In relation to swamps, monitoring at CCUS10 and CCUS12 currently act as reference sites of current soil moisture conditions for site swamps unaffected by initial workings under the RVE UEP. As mining progresses into the Stage 2 area, alternative soil moisture/swamp water level reference sites will be adopted, such as any swamps that have been unaffected by operations (i.e. greater than 350 m from 'second workings' approved under an EP).

Table 2 – Clarification of GNSS Monitoring Program

GNSS Unit	Easting	Northing	Purpose(s)	Comment[1]
CC1	302619	6197430	• Valley closure	Monitoring across Cataract Creek.
CC2	303076	6197426	• Valley closure	Monitoring across Cataract Creek.
CC3	303698	6197109	• Valley closure	Monitoring across Cataract Creek.
CC4	303397	6197261	• Valley closure	Monitoring across Cataract Creek.
GNSS #1	303687	6196669	• Valley closure	-
			• Mt Ousley Road	Pavement monitoring.
			• PC8	Immediately adjacent.
			• CCUS1	Located near to swamp. GNSS unit will be undermined by PC08 prior to CCUS1 being undermined.
			• CCUS21	Located between second workings and swamp. Subsidence from PC8 will be lower at CCUS21 than observations at GNSS #1.
GNSS #2	303520	6196371	• PC8	Directly overlying.
			• Mt Ousley Road	Pavement monitoring.
			• CCUS1	Adjacent/within.
			• CCUS20	Located over nearby second workings (PC8). Subsidence levels at CCUS20 will be lower than observations at GNSS #2. Potential for impacts is also informed by under-ground and road monitoring observations.
GNSS #3	303661	6196275	• PC7	Directly overlying.
			• CCUS1	Located over nearby second workings. Located adjacent/within CCUS 1.
			• CCUS2	Located over nearby second workings. Subsidence from PC7 will be lower at CCUS2 than observations at GNSS #3.
GNSS #5	303936	6196166	• PC5	Directly overlying.
			• Powerlines	Directly adjacent to 330 kV powerline and tower.
			• CCUS2	Located over nearby second workings. Subsidence from PC5 will be lower at CCUS2 than observations at GNSS #5.
GNSS #6	304291	6196713	• General subsidence	Located between panels and main headings.
			• Powerlines	Directly adjacent to 330 kV powerline and tower.
GNSS #7	303796	6195899	• PC5	Directly overlying.
			• Powerlines	Directly adjacent to 330 kV powerline and tower.
			• CCUS2	Located over nearby second workings. Subsidence from PC5 will be lower at CCUS2 than observations at GNSS #7. Potential for impacts also informed by under-ground observations.

GNSS Unit	Easting	Northing	Purpose(s)	Comment[1]
GNSS #8	304184	6197480	• General subsidence	Located to the north of main headings.
			• Valley closure	-
GNSS #9	302349	6197089	• PC21	Directly overlying.
			• CCUS4	Located over nearby workings. Subsidence from PC21 will be lower at CCUS4 than observations at GNSS #9.
			• CCUS5	Located over nearby workings. GNSS unit will be undermined by PC21 prior to CCUS1 being undermined.
GNSS #10	301879	6197250	• PC23	Directly overlying.
			• CCUS5	Located over nearby workings. Subsidence from PC23 will be lower at CCUS5 than observations at GNSS #10.
GNSS #11	302235	6197053	• PC21	Directly overlying.
			• CCUS5	Adjacent/within.
GNSS #12	302217	6196907	• Previous mining (LW6)	Directly overlying.
			• PC21	Adjacent.
			• CRUS1	Adjacent/within.
GNSS #13	302542	6196985	• Previous mining (LW6)	Adjacent to Longwall 6.
			• PC21	Adjacent.
			• CCUS4	Adjacent/within.
			• CCUS3	Located between second workings and swamp. Subsidence from PC21 will be lower at CCUS3 than observations at GNSS #13.
			• CCUS6	Located between second workings and swamp. Subsidence from PC21 will be lower at CCUS6 than observations at GNSS #13.
			• CCUS23	Located between second workings and swamp. Subsidence from PC21 will be lower at CCUS23 than observations at GNSS #13.
GNSS #14	303209	6196193	• General subsidence	Near PC8.
			• CCUS15	Located between second workings and swamp. Subsidence from PC8 will be lower at CCUS15 than observations at GNSS #14.
			• CCUS17	Located between second workings and swamp. Subsidence from PC8 will be lower at CCUS17 than observations at GNSS #14.
			• CCUS18	Located between second workings and swamp. Subsidence from PC8 will be lower at CCUS18 than observations at GNSS #14.

GNSS Unit	Easting	Northing	Purpose(s)	Comment[1]
			• CCUS19	Located between second workings and swamp. Subsidence from PC8 will be lower at CCUS19 than observations at GNSS #14.
			• CRUS3	Located between second workings and swamp. Subsidence from PC8 will be lower at CRUS3 than observations at GNSS #14.
GNSS #15	303537	6196027	• PC7	Directly overlying.
			• CCUS2	Overlying nearby workings. Subsidence from PC7 will be lower at CCUS2 than observations at GNSS #15.
			• CRUS3	Overlying nearby workings. Subsidence from PC7 will be lower at CCUS2 than observations at GNSS #15.
GNSS #16	303095	6195591	• General subsidence	Located south of workings.
			• RMS infrastructure at Picton Road inter-change.	Located adjacent to road infrastructure.
GNSS #17	303695	6195763	• General subsidence	Located south of workings.
			• Powerlines	Located between workings and 330 kV powerline and tower.
GNSS #18	301743	6198587	• PC34	Directly overlying.
			• CRUS7	Adjacent/within.
			• BCUS15	Overlying nearby workings. Subsidence from PC34 will be lower at BCUS15 than observations at GNSS #18.
			• BCUS16	Overlying nearby workings. Subsidence from PC34 will be lower at BCUS16 than observations at GNSS #18.
GNSS #19	301761	6198371	• PC34	Directly overlying.
			• CCUS13	Adjacent/within.
			• CCUS16	Located over nearby workings. Subsidence from PC34 will be lower at CCUS16 than observations at GNSS #19.
			• CCUS22	Located over nearby workings. Subsidence from PC34 will be lower at CCUS22 than observations at GNSS #19.
GNSS #20	301916	6198492	• PC33	Directly overlying.
			• BCUS7	Adjacent/within.
			• BCUS8	Located over nearby workings. Subsidence from PC33 will be lower at BCUS8 than observations at GNSS #20.

GNSS Unit	Easting	Northing	Purpose(s)	Comment[1]
			• BCUS9	Located over nearby workings. Subsidence from PC33 will be lower at BCUS9 than observations at GNSS #20.
			• BCUS10	Located over nearby workings. Subsidence from PC33 will be lower at BCUS10 than observations at GNSS #20.
GNSS #21	302223	6198335	• General subsidence	Located nearby PC31 and PC32.
			• BCUS5	Located between swamp and workings. Subsidence from PC32 will be lower at BCUS5 than observations at GNSS #21.
			• BCUS6	Adjacent/within. Located between swamp and workings. Subsidence from PC32 will be lower at BCUS6 than observations at GNSS #21.
			• BCUS14	Located between swamp and workings. Subsidence from PC32 will be lower at BCUS14 than observations at GNSS #21.
GNSS #22	301956	6198109	• PC33	Directly overlying.
			• CRUS6	Adjacent/within.
GNSS #23	301915	6197956	• PC33	Directly overlying.
			• CCUS12	Adjacent/within.
GNSS #24	302273	6197979	• PC31	Directly overlying.
			• BCUS4	Overlying nearby workings. GNSS unit will be undermined by PC31 prior to BCUS4 being undermined.
			• BCUS11	Adjacent/within.
GNSS #25	302521	6197972	• PC30	Directly overlying.
			• BCUS4	Adjacent/within. GNSS unit will be undermined by PC30 prior to BCUS4 being undermined.
			• BCUS3	Overlying nearby workings. Subsidence from PC30 will be lower at BCUS3 than observations at GNSS #25.
			• BCUS2	Overlying nearby workings. Subsidence from PC30 will be lower at BCUS2 than observations at GNSS #25.
			• BCUS5	Overlying nearby workings. Subsidence from PC30 will be lower at BCUS5 than observations at GNSS #25.
			• BCUS14	Overlying nearby workings. Subsidence from PC30 will be lower at BCUS14 than observations at GNSS #25.
GNSS #26	302613	6197694	• PC28	Directly overlying.

GNSS Unit	Easting	Northing	Purpose(s)	Comment[1]
			• CCUS10	Adjacent/within.
			• CCUS11	Adjacent/within.
GNSS #27	302141	6197825	• PC29	Directly overlying.
			• CCUS24	Adjacent/within.
			• BCUS11	Overlying nearby workings. Subsidence from PC29 will be lower at BCUS11 than observations at GNSS #27.
			• CCUS12	Overlying nearby workings. Subsidence from PC29 will be lower at CCUS12 than observations at GNSS #27.
GNSS #28	302975	6197821	• General subsidence	Overlying main headings and north-east of workings.
			• CCUS9	Adjacent/within.
			• BCUS2	Adjacent/within.
			• BCUS3	Between swamp and nearby workings. Subsidence will be lower at BCUS3 than observations at GNSS #28.
GNSS #30	302469	6197127	• PC21	Directly overlying.
			• CCUS5	Overlying nearby workings. GNSS unit will be undermined by PC21 prior to CCUS5 being undermined.
			• CCUS4	Overlying nearby workings. Subsidence will be lower at CCUS4 than observations at GNSS #30.
GNSS #31	304747	6196958	• General subsidence	Located north of main headings.
			• Powerline	Located adjacent to 132 kV powerline, at change in line direction.
GNSS #32	303865	6095127	• General subsidence	Located south of workings.
			• Powerline	Located adjacent to 132 kV powerline, at change in line direction.

[1] "nearby workings" are within 350 m.

Updated Subsidence Monitoring Program Figure

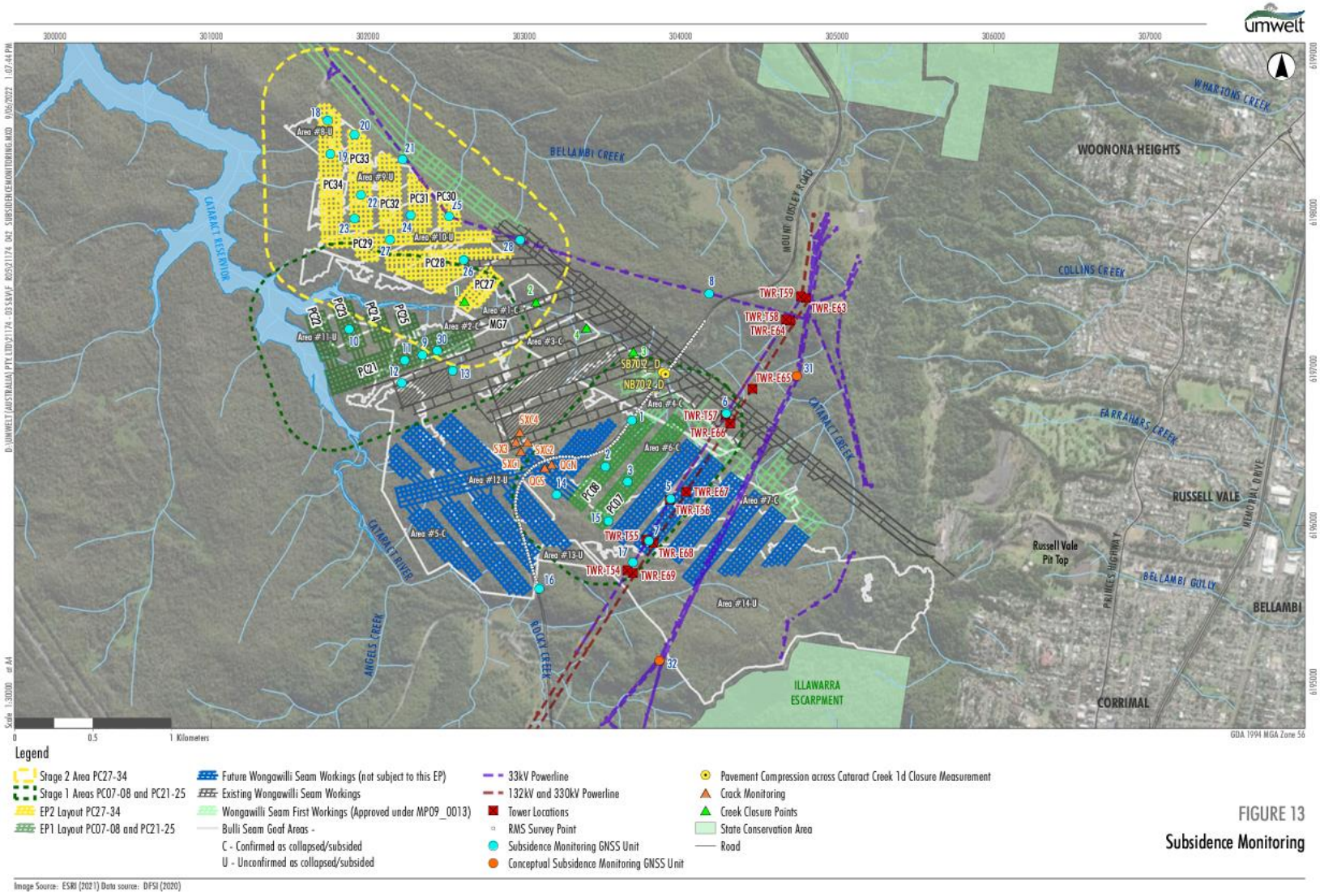

FIGURE 13
Subsidence Monitoring

Table 3 – Summary of Groundwater Monitoring Undertaken

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
Swamp Monitoring Sites						
PB4A	BCUS4	Nov-14	302382	6198016	SM and PZ	Monitoring ongoing
PB4B	BCUS4	Nov-14	302431	6198020	SM and PZ	Monitoring ongoing
PB4C	BCUS4	May-12	302460	6198060	PZ	Monitoring ongoing
PB4D	BCUS4	Nov-14	302526	6198018	SM and PZ	Monitoring ongoing
PCc10A	CCUS10	Nov-14	302625	6197639	SM and PZ	Monitoring ongoing
PCc10B	CCUS10	Nov-14	302691	6197672	SM and PZ	Monitoring ongoing
PCc12A	CCUS12	Nov-14	302047	6197858	SM and PZ	Monitoring ongoing
PCc12B	CCUS12	Nov-14	302038	6197964	SM and PZ	Monitoring ongoing
PCc2	CCUS2	May-12	303745	6196080	PZ	Monitoring ongoing
PCc3	CCUS3	May-12	302820	6196810	PZ	Monitoring ongoing
PCc4A	CCUS4	Oct-14	302678	6196900	PZ	Monitoring ongoing
PCc4B	CCUS4	Oct-14	302604	6196877	SM and PZ	Monitoring ongoing
PCc4C	CCUS4	Oct-14	302579	6196931	SM and PZ	Monitoring ongoing
PCc4D	CCUS4	Mar-12	302615	6196925	SM and PZ	Monitoring ongoing
PCc5A	CCUS5	May-12	302110	6197150	SM and PZ	Monitoring ongoing
PCc5B	CCUS5	May-12	302245	6197250	SM and PZ	Monitoring ongoing
PCc5C	CCUS5	Oct-14	302234	6197073	PZ	Monitoring ongoing
PCc5D	CCUS5	Oct-14	302295	6197172	SM and PZ	Monitoring ongoing
PCc6	CCUS6	Mar-12	303165	6196790	PZ	Monitoring ongoing
PCr1A	CRUS1	Mar-12	302330	6196625	SM and PZ	Monitoring ongoing
PCr1B	CRUS1	Oct-14	302247	6196655	SM and PZ	Monitoring ongoing
PCr1C	CRUS1	Oct-14	302229	6196762	SM and PZ	Monitoring ongoing

[1] GDA94 Z56

[2] SM – soil moisture, PZ – piezometer, OSP = Open Standpipe, VWP = Vibrating Wire Piezometer

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
PCr1D	CRUS1	Oct-14	302263	6196879	PZ	Monitoring ongoing
SP1	Near CCUS6	Mar-12	303245	6196955	PZ	Monitoring ongoing
SP2	Near CCUS3 and CCUS4	Mar-12	302830	6196905	PZ	Monitoring ongoing
PCc1A[3]	CCUS1	Jul-21	303382	6196263	SM and PZ	Monitoring ongoing
PCc1B[3]	CCUS1	Jul-21	303512	6196355	SM	Monitoring ongoing
PCc1C[3]	CCUS1	Jul-21	303609	6196292	SM and PZ	Monitoring ongoing
PCc11[3]	CCUS11	Jul-21	302531	6197700	SM	Monitoring ongoing
PCc6B[3]	CCUS6	Jul-21	303020	6196609	SM and PZ	Monitoring ongoing
PCc14A[3]	CCUS14	Jul-21	304311	6195771	SM and PZ	Monitoring ongoing
PCc14B[3]	CCUS14	Jul-21	304276	6195820	SM	Monitoring ongoing
PCc20[3]	CCUS20	Jul-21	303513	6196568	SM and PZ	Monitoring ongoing
PCc21[3]	CCUS21	Jul-21	303481	6196772	SM	Monitoring ongoing
PCr2[3]	CRUS2	Jul-21	302784	6196158	SM	Monitoring ongoing
PCr3[3]	CRUS3	Jul-21	303177	6195925	SM	Monitoring ongoing
PCr6[3]	CRUS6	Jul-21	301928	6198123	SM	Monitoring ongoing
PB11[3]	BCUS11	Jul-21	302220	6197915	SM	Monitoring ongoing
BCUS2	BCUS2	Jun-22	302965	6197914	SM	Monitoring ongoing
BCUS3	BCUS3	Aug-22	302916	6198133	SM	Monitoring ongoing
BCUS5	BCUS5	Jun-22	302668	6198369	SM	Monitoring ongoing
BCUS6	BCUS6	Jun-22	302169	6198359	SM	Monitoring ongoing
BCUS7	BCUS7	Jun-22	301988	6198479	SM	Monitoring ongoing
BCUS8	BCUS8	Jun-22	302211	6198634	SM	Monitoring ongoing
BCUS9	BCUS9	Jun-22	302282	6198702	SM	Monitoring ongoing
BCUS12	BCUS12	Jun-22	303890	6200475	SM	Monitoring ongoing
BCUS13	BCUS13	Jun-22	303799	6199148	SM	Monitoring ongoing

[3] Locations are indicative. Surveyed details still to be provided.

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
BCUS14	BCUS14	Jun-22	302458	6198185	SM	Monitoring ongoing
BCUS15	BCUS15	Jun-22	301907	6198976	SM	Monitoring ongoing
BCUS16	BCUS16	Jun-22	301628	6198916	SM	Monitoring ongoing
CCUS3	CCUS3	Jun-22	302820	6196810	SM	Monitoring ongoing
CCUS7	CCUS7	Jun-22	303747	6197498	SM	Monitoring ongoing
CCUS8	CCUS8	Jun-22	303552	6197414	SM	Monitoring ongoing
CCUS9	CCUS9	Jun-22	302971	6197735	SM	Monitoring ongoing
CCUS13	CCUS13	Jun-22	301715	6198322	SM	Monitoring ongoing
CCUS15	CCUS15	Jun-22	303093	6196358	SM	Monitoring ongoing
CCUS16	CCUS16	Jun-22	301381	6197979	SM	Monitoring ongoing
CCUS17	CCUS17	Jun-22	303156	6196291	SM	Monitoring ongoing
CCUS18	CCUS18	Jun-22	303167	6196215	SM	Monitoring ongoing
CCUS19	CCUS19	Jun-22	303227	6196149	SM	Monitoring ongoing
CCUS22	CCUS22	Jun-22	301612	6198426	SM	Monitoring ongoing
CCUS23	CCUS23	Jun-22	302730	6196747	SM	Monitoring ongoing
CCUS24	CCUS24	Jun-22	302190	6197796	SM	Monitoring ongoing
CRUS4	CRUS4	Aug-22	304427	6195667	SM	Monitoring ongoing
CRUS5	CRUS5	Aug-22	304216	6195606	SM	Monitoring ongoing
CRUS7	CRUS7	Jun-22	301693	6198563	SM	Monitoring ongoing
PB4A	BCUS4	Jun-22	302381	6198016	SM	Monitoring ongoing
PCc10a	CCUS10	Jun-22	302624	6197639	SM	Monitoring ongoing
PCc12A	CCUS12	Jun-22	302042	6197860	SM	Monitoring ongoing
PCc4c	CCUS4	Jun-22	302579	6196931	SM	Monitoring ongoing
PCc5B	CCUS5	Jun-22	302243	6197252	SM	Monitoring ongoing
PCr1B	CRUS1	Jun-22	302247	6196655	SM	Monitoring ongoing
Groundwater Monitoring Sites						
GW1 A	N/A	2012	303742	6196983	OSP	Monitoring ongoing

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
NRE A	N/A	2009	303692	6196033	OSP	Monitoring ongoing
NRE C	N/A	2009	303233	6198797	OSP	Monitoring ongoing
NRE D	N/A	2009	301870	6198509	OSP	Monitoring ongoing
NRE E	N/A	2009	296727	6202286	OSP	Monitoring ongoing
NRE F (NE 3)	N/A	2009	294803	6201954	OSP	Monitoring ongoing
NRE G	N/A	2009	296949	6201954	OSP	Monitoring ongoing
RV18	N/A	2014	302041	6196884	OSP	Monitoring ongoing
RV19	N/A	2014	301867	6196787	OSP	Monitoring ongoing
RV21	N/A	2014	302633	6197894	OSP	Monitoring ongoing
RV22A	N/A	2014	303026	6197634	OSP	Monitoring ongoing
RV23A	N/A	2014	301370	6198233	OSP	Monitoring ongoing
RV39	N/A	2021	302936	6196635	OSP	Monitoring ongoing
RV40	N/A	2021	302920	6196297	OSP	Monitoring ongoing
RV41	N/A	2021	303540	6196564	OSP	Monitoring ongoing
RV42	N/A	2021	303373	6196264	OSP	Monitoring ongoing
RV44	N/A	2021	303666	6195790	OSP	Monitoring ongoing
RV45	N/A	2021	303930	6195965	OSP	Monitoring ongoing
RV46	N/A	2021	304277	6195733	OSP	Monitoring ongoing
RV47	N/A	2021	304526	6195665	OSP	Monitoring ongoing
PB1	N/A	2021	306358	6196133	OSP	Monitoring ongoing
PB2	N/A	2021	306778	6195779	OSP	Monitoring ongoing
PB3	N/A	2021	306405	6195559	OSP	Monitoring ongoing
GW1 (NRE1 GW01)	N/A	2012	303693	6196913	VWP	Monitoring ongoing
		2012				
		2012				
		2012				
		2012				

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
		2012				
		2012				
		2012				
NRE 3 (905)	N/A	2009	294803	6201954	VWP	Monitoring ongoing
		2009				
		2009				
		2009				
NRE1A	N/A	2009	303680	6196034	VWP	NRE1A VWP failed in 2017 and was repaired in 2021. Monitoring ongoing.
		2009				
		2009				
		2009				
NRE1B	N/A	2009	303939	6197567	VWP	Monitoring ongoing
		2009				
		2009				
		2009				
NRE1D (939)	N/A	2009	301870	6198509	VWP	Monitoring ongoing
		2009				
		2009				
		2009				
RV16	N/A	2014	303567	6196288	VWP	Monitoring ongoing
		2014				
		2014				
		2014				
		2014				
		2014				
		2014				
RV17	N/A	2014	301979	6196818	VWP	Monitoring ongoing

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
		2014				
		2014				
		2014				
RV20	N/A	2014	302944	6196635	VWP	Monitoring ongoing
		2014				
		2014				
		2014				
		2014				
RV22	N/A	2014	303026	6197634	VWP	Monitoring ongoing
		2014				
		2014				
		2014				
		2014				
		2014				
		2014				
RV23	N/A	2014	301370	6198233	VWP	Monitoring ongoing
		2014				
		2014				
		2014				
		2014				
		2014				
		2014				
		2014				
RV24	N/A	2018	301004.6	6201932	VWP	Monitoring ongoing
		2018				
		2018				
		2018				

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
		2018				
		2018				
		2018				
RV25	N/A	2018	301367	6201056	VWP	Monitoring ongoing
		2018				
		2018				
		2018				
		2018				
		2018				
		2018				
		2018				
RV27	N/A	2020	298743	6201421	VWP	Monitoring ongoing
		2020				
		2020				
		2020				
		2020				
		2020				
		2020				
RV29	N/A	2018	300533	6200938	VWP	Monitoring ongoing
		2018				
		2018				
		2018				
		2018				
		2018				
		2018				
RV35	N/A	2020	291578	6205739	VWP	Monitoring ongoing
		2020				

Site ID	Swamp site	Installed	Easting[1]	Northing[1]	Type[2]	Monitoring Status
		2020				
		2020				
		2020				
		2020				
		2020				
		2020				
RV36	N/A	2020	291880	6203229	VWP	Monitoring ongoing
		2020				
		2020				
		2020				
		2020				
		2020				
		2020				
		2020				

Russell Vale East Stage 2 Extraction Plan

Biodiversity Management Plan Response to Request for Information

FINAL REPORT

Prepared for Umwelt on behalf of Wollongong Resources Pty Ltd

9 September 2022

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Document information

Report to:	Umwelt on behalf of Wollongong Resources Pty Ltd
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Biosis project no.:	36746
File name:	36746.Stage2.BMP.DPE.RFI.Response.FIN01.20220909
Citation:	Biosis 2022. Russell Vale East Stage 2 Extraction Plan Biodiversity Management Plan Request for Information. Report for Umwelt on behalf of Wollongong Resources Pty Ltd. Heenan. C, Gray. R, Biosis Pty Ltd., Wollongong, NSW. Project no. 36746

Document control

Version	Internal reviewer	Date issued
Draft version 01	Jane Raithby-Veall	7/9/2022
Final version 01	Caragh Heenan	9/9/2022

Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- Wollongong Resources Pty Ltd.
- Umwelt: Matthew Copeland, David Holmes.

Biosis staff involved in this project were:

- Astrid Mackegard (mapping).

Contents

Tables

Figures

1. Introduction

Biosis was engaged by Umwelt on behalf of Wollongong Resources Pty Ltd (WRPL, formerly Wollongong Coal Limited) to prepare a Biodiversity Management Plan (BMP) (Wollongong Coal 2021) to inform the Russell Vale East (RVE) Underground Expansion Project (UEP) Extraction Plan (EP).

Biosis has received a request for information from the NSW Department of Planning and Environment (DPE) regarding survey methodology and results for threatened frogs in the RVE area, as undertaken by Biosis. The request for information is detailed in Table 1 below.

Table 1 Request for information from DPE

Consultation	Biosis' response
Giant Burrowing Frog Monitoring	
The BMP describes 13 surveys undertaken along a 245 m section of a tributary of Cataract River below swamp CRUS2. The BMP states that detailed surveys indicate that other tributaries are unlikely to support the species, and the species is not present within the Stage 2 extraction area. **NSW Biodiversity Conservation Division (BCD) has provided the attached advice. The department has reviewed WRPLs response to similar advice in Appendix E – Attachment 4 of the Biodiversity Management Plan. Appendix B of the 2022 BMP details the year of the most recent record, the number of records, and the distance of the records from the Study Area. The data included in Appendix B does not sufficiently justify the exclusion of the Giant Burrowing Frog from baseline data collection surveys prior to mining in the Stage 2 EP area.** **The preferred project report biodiversity assessment (Umwelt 2019) draws a conclusion regarding the potential for impact on the Giant Burrowing Frog stating:** **"Although often associated with upland swamps, this association is not direct, rather that upland swamps are associated with minor drainage lines that provide suitable breeding pools and burrowing habitat for this species (DECC 2007). SCT (2018) predicts that the imperceptible levels of subsidence resulting from the revised UEP mine plan will not result in perceptible impacts to creeks. As such, the Giant Burrowing Frog is considered at negligible risk of impact."**	Noted. Refer to discussion below regarding adequacy of survey effort.
The department acknowledges to low risk of impact. However, conditions C4-C6 of MP09_0013 provide for biodiversity impact offsetting if WCL exceeds the performance measures. If required, offsets must be undertaken in accordance with the Biodiversity Offsets	Noted. The Biodiversity Assessment Method (BAM) was originally released in 2017 (OEH 2017) and has since been updated in 2020 (DPIE 2020a). Threatened frog surveys undertaken prior to the

Consultation	Biosis' response
Scheme (BOS). The BOS requires a suitable baseline dataset collected in accordance with the Biodiversity Assessment Method.	initial BAM release (OEH 2017) were not undertaken in line with the BAM, however methodology had been designed to meet the requirements of *Threatened species survey and assessment guidelines: field survey methods for fauna - Amphibians* (DECC 2009). Giant Burrowing Frog Surveys undertaken in 2021 were conducted in line with the BAM (DPIE 2020a), including: • *NSW Survey Guide for Threatened Frogs: A Guide for the Survey of Threatened Frogs and their Habitats for the Biodiversity Assessment Method* (DPIE 2020b). • *Survey guidelines for Australia's threatened frogs* (DEWHA 2010). • *Threatened species survey and assessment guidelines - Field survey methods for fauna - Amphibians 2009* (DECC 2009). • *Environmental Impact Assessment Guideline: Giant Burrowing Frog* (NPWS 2001a). • *Environmental Impact Assessment Guideline: Red-crowned Toadlet* (NPWS 2001b). All future threatened frog surveys will also be undertaken in line with BAM and relevant survey guidelines.
To justify the exclusion of the Giant Burrowing Frog from the baseline dataset, the department requires the following:	Refer to individual items below.
• **Maps demonstrating the survey effort conducted for the Giant Burrowing Frog other than at CRUS2.**	Map detailing survey type and sites for each species is provided in Figure 1.
• **Survey data associated with the mapped survey effort.**	Survey data from prior reports provided herein.
• **Detailed outline of any other criteria used for each swamp to justify the exclusion of the species from further survey.**	An assessment of habitat suitability for the species is provided in Section 2.1 below, as per the BMP. There is a long period of monitoring within the UEP area, commencing largely in 2012, that has been used to assess the likelihood of occurrence for threatened species. The monitoring within Cataract Creek and Bellambi Creek and downstream of BCUS2 and BCUS3 (refer to Figure 1 and Section 2.1 below) support the assessment that suitable habitat for the Giant Burrowing Frog does not occur within Stage 2. Similarly, the monitoring within CCUS1, CCUS2, CCUS4, CCUS23, CRUS1 and CRUS3 support the conclusion that the Giant Burrowing Frog is not present in the areas potentially impacted by Stage 1. As an additional commitment by WRPL since the preparation of the Stage 2 BMP, an additional round

Consultation	Biosis' response
	of Giant Burrowing Frog monitoring will be undertaken at CRUS2 to confirm presence in spring 2022 and autumn 2023. Mining in Stages 1 and 2 will not impact on CRUS2 or the tributary where Giant Burrowing Frog has been observed.
Frog Species Monitoring	
Threatened frog monitoring listed in Appendix B-Attachment 1 of the Biodiversity Monitoring Plan includes: • **Two transects for *Litoria littlejohni* and *Heleioporus australiacus.*** • **Four transects for *Mixophyes balbus.***	Appendix E of the BMP includes the prior BCD EES Response regarding the BMP, which includes a letter dated 19 November 2021 from Wollongong Resources Pty Ltd, to Department of Planning and Environment, as well as Appendix B *DPIE NSW – RFI Attachment B Request for clarifications,* Attachment 1. Attachment 1 states that Biosis has undertaken: • 2 x Giant Burrowing Frog transects. • 2 x Littlejohn's Tree Frog transects. • 4 x Stuttering Frog transects. The above threatened frogs, as well as Red-crowned Toadlet were surveyed for in 2012 (Biosis 2012), 2013 (Biosis 2013, Biosis 2014b), 2014-2015 (Biosis 2016). Red-crowned Toadlet has also been surveyed for in 2016 (2017) and Giant Borrowing Frog in 2021 (2022). More information is provided below on these and other surveys undertaken to date.
The department requests more information including:	Refer to individual items below.
• **Maps of the transect locations referenced and any other survey transects completed for threatened frog species.**	Map detailing survey type and sites for each species is provided in Figure 1.
• **Details of survey effort at the monitoring transect locations, and any other locations including date, number of days/hours.**	Survey data from prior reports provided herein.
• **Detailed outline of any other criteria used for each swamp to justify the exclusion of the above species from further survey.**	An assessment of habitat suitability for the species is provided in Section 2.1 below, as per the BMP. The Russell Vale Colliery – Underground Expansion Project: Preferred Project Report – Biodiversity (Biosis 2014a) report identified 13 fauna species listed under the EPBC Act and/or BC Act, that have the potential to occur or are known to occur in the EP area, of which nine fauna species are considered susceptible to subsidence impacts. An assessment of the likelihood of occurrence of these species, based on additional monitoring data collected since 2011, and the risk of impact from mining was provided in Table 11 of the Stage 2 BMP. There is a long period of monitoring within the UEP area that

Consultation	Biosis' response
	has been used to assess the likelihood of occurrence for threatened species. Species with a low likelihood of occurrence are not represented on Figure 6 and are not addressed further in the BMP. This includes Littlejohn's Tree Frog and Stuttering Frog, which are now considered a low likelihood of occurrence based on the results of additional monitoring (reported herein). No monitoring for Red-crowned Toadlet has been included in the BMP as habitat for this species within the study area is considered to be widespread and potential indirect impacts from subsidence are unlikely to affect the species. There is a negligible risk of any impact to threatened frogs within the UEP area from the bord and pillar mining method. Potential indirect impacts are limited to subsidence (such as surface cracking) and hydrological changes affecting surface water regimes or near-surface groundwater, which are in turn considered to have a low likelihood of occurring under the bord and pillar mining method. Potential remediation options for threatened species with a low likelihood of occurrence would only be investigated in the unlikely event that habitat for the species is detected and impacts to habitat (Coastal Upland Swamps / aquatic environments) associated with mining are higher than anticipated (i.e. subsidence TARPs level 3 are triggered, greater than 100 mm of subsidence at Coastal Upland Swamps).

2. Project background

2.1. Threatened frogs

Threatened frogs identified previously as having a moderate or greater likelihood of presence within the RVE locality and potentially susceptible to subsidence include:

- Giant Burrowing Frog *Heleioporus australiacus*.
- Littlejohn's Tree Frog *Litoria littlejohni*.
- Stuttering Frog *Mixophyes balbus*.
- Red-crowned Toadlet *Pseudophryne australis*.

Giant Burrowing Frog is known to inhabit ephemeral and intermittent streams in the locality. Habitat for the Giant Burrowing Frog within the study area consists of small sections of upper tributaries above the Stage 1 and future stages workings. Despite extensive survey across the RVE area, GBF has only been identified along a 245 metre section of a tributary of Cataract River below swamp CRUS2 only. This area is outside the Stage 1 and Stage 2 mining areas and potential impacts from mining in these two areas do not have a feasible causal pathway to have any impact on CRUS2 and the downstream catchment where the Giant Burrowing Frog has been observed. Additional baseline survey within the Stage 1 and Stage 2 mining areas is therefore not considered to be warranted. As the Giant Burrowing Frog has not been observed in the Stage 1 and Stage 2 mining areas or in catchments immediately downstream of these areas, the absence of this species in any post-mining monitoring in these areas would not be indicative of any adverse impacts on this species from mining. Other than below CRUS2, this species is assumed **not** to be present for the purposes of offsetting requirements in the unlikely event that the proposed mining does impact on swamps or creeks.

Littlejohn's Tree Frog is known to inhabit ephemeral and intermittent streams in the locality. The species is however considered a low likelihood of occurrence in the Stage 1 and Stage 2 mining areas based on the results of additional monitoring (detailed herein) since the Preferred Project Report (Biosis 2014a). Suitable habitat is limited in the study area and targeted surveys undertaken have not detected the species. This species is assumed **not** to be present for the purposes of offsetting requirements in the unlikely event that the proposed mining does impact on swamps or creeks.

Stuttering Frog is known to inhabit streams in the locality. The species is rare in the locality. Stuttering Frog is considered a negligible likelihood of occurrence based on the results of additional monitoring (detailed herein) since the Preferred Project Report (Biosis 2014a). Targeted surveys undertaken between August 2013 and February 2016 did not detect the species in the study area. The Stuttering Frog is not known from localities with disturbed riparian vegetation or significant human impacts upstream, which may indicate that the species is highly sensitive to perturbations in the environment (Mahony, Knowles, & Pattinson 1997). Identified habitat in Cataract Creek shows it was found to exhibit levels of pollution due to run-off from Mount Ousley Road, as well as high levels of iron flocculent from past mining. Although the habitat is suitable, these impacts result in sub-optimal conditions for the species which occur irrespective of the proposed mining. This species is assumed **not** to be present for the purposes of offsetting requirements in the unlikely event that the proposed mining does impact on swamps or creeks.

The Red-crowned Toadlet is fairly common in preferred ridgetop habitat and first order ephemeral creeks below ridges (DECC 2007) and has been recorded, using drainage lines, sheltering under bushrock on ridgetops and in depressions along fire trails (Biosis pers. obs.). Habitat for this species within the study area

has not been mapped, as it is widely distributed and common. Targeted surveys for the Red-crowned Toadlet have been undertaken by Biosis as a part of the ecological monitoring program for Wonga East (Biosis 2013) and the species was recorded. This species is therefore assumed to be present for the purposes of offsetting requirements in the unlikely event that the proposed mining does impact on swamps or creeks. However, given the wide diversity in habitat of this species and the nature of subsidence impacts that may (unlikely) occur, this species is not predicted to be adversely impacted even if higher than predicted levels of subsidence were to occur.

2.2. Threatened frog surveys of relevance

A summary of Biosis' projects involving threatened frog surveys at RVE is detailed in Table 2 below.

Table 2 Current and prior projects in relation to threatened frog surveys or habitat assessment

Matter	Notes	Project mentions or includes survey of threatened frogs of relevance			
		Giant Burrowing Frog	Littlejohn's Tree Frog	Stuttering Frog	Red-crowned Toadlet
Wonga East Lease Area Ecological Monitoring Program Annual Monitoring Report Year 1 (2011) **(Biosis 2012); Project no. 11853**	Terrestrial flora and fauna monitoring for RVE in 2011, including targeted threatened frog survey.	✓	✓	✓	✓
Wonga East and V-Mains Ecological Monitoring Program. Autumn 2011 through to autumn 2013 **(Biosis 2013); Project no. 14511**	Terrestrial flora and fauna monitoring for RVE in 2012, including targeted threatened frog survey.	✓	✓	✓	✓
Russell Vale East and V Mains 2013 Ecological Monitoring Program **(Biosis 2014b); Project no. 16940**	Terrestrial flora and fauna monitoring for RVE in 2013-2014, including targeted threatened frog survey. Non-breeding Habitat: • Auditory and quadrat survey: Auditory surveys at fixed points throughout each swamp identified as suitable habitat. This will be followed by a Visual Encounter exhaustively checked and all frog species will be recorded. • In addition, non-standardised transect surveys will be undertaken. Call recognition surveys conducted	✓	✓	✓	✓

Matter	Notes	Project mentions or includes survey of threatened frogs of relevance			
		Giant Burrowing Frog	Littlejohn's Tree Frog	Stuttering Frog	Red-crowned Toadlet
	simultaneously to detect those species that are hard to see. Breeding Habitat: • Standardised transects in breeding habitat conducted in areas considered to be suitable breeding habitat for the various frog species. • Tadpole counts undertaken as part of the breeding habitat monitoring transects. Acoustic Surveys: • Use of Song meters to collect auditory data during favourable breeding conditions.				
***Russell Vale East terrestrial ecological monitoring program: Annual Report 2015* (Biosis 2016); Project no. 20492**	Terrestrial flora and fauna monitoring for RVE in 2015-2016, including targeted threatened frog survey. Breeding Habitat Monitoring: • Standardised transects conducted in areas considered to be suitable breeding habitat for the various frog species. • Tadpole counts. Acoustic Surveys: • Use of Song Meters to collect auditory data during favourable breeding conditions.	✓	✓	✓	✓
***Russell Vale East Terrestrial ecological monitoring program Annual report for 2016* (Biosis 2017); Project no. 23086**	Terrestrial flora and fauna monitoring for RVE in 2016-2017, including targeted threatened frog survey. Acoustic Surveys: • Use of Song Meters to collect auditory data during favourable breeding conditions. • The results of these surveys were assessed by comparing impact and control sites with a presence/absence approach.	X	X	X	✓
Russell Vale East	Terrestrial flora and fauna	✓	X	X	X

Matter	Notes	Project mentions or includes survey of threatened frogs of relevance			
		Giant Burrowing Frog	Littlejohn's Tree Frog	Stuttering Frog	Red-crowned Toadlet
***Terrestrial Ecological Monitoring Program 2021* (Biosis 2022); Project no. 34919**	monitoring for RVE in 2021-2022, including targeted threatened frog survey. Giant Burrowing Frog survey included searches along a tributary below swamp CRUS2.				

3. Survey method and effort

The survey methodology to identify and/or discount habitat for these species is detailed below and in Figure 1.

3.1. Biosis (2012) – Project no. 11853 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

Threatened frog auditory and habitat survey

Creekline surveys consisted of 50 metre nocturnal stream searches for 30 person-minutes at fixed locations. Upland swamp surveys consist of area and stream searches at fixed locations. Each site had three replicates.

Sites surveyed within RVE (Figure 1) include; CC-F1, CC-F2, CC-F3, CRS-F1, CRS-F2, CRS-F3, CRS-F1 and CRS-F2, and CRS-F3.

Threatened frog breeding habitat assessment

A diurnal assessment of threatened frog habitat in the Cataract River tributaries was completed in winter 2011. This area was mapped as potential habitat by ERM (2011). Those areas considered to contain suitable Littlejohn's Tree Frog or Giant Burrowing Frog breeding pools were mapped.

One day of threatened frog habitat assessment was conducted by two zoologists in the Cataract River Tributaries down-swamp from Cataract River Swamp (CRHS1). A total of three tributaries were walked and areas containing suitable breeding pools for Littlejohn's Tree Frog, Giant Burrowing Frog, Red-crowed Toadlet and Stuttering Frog were mapped. The sites assessed are identified in Table 3 below.

Table 3 Threatened frog habitat assessment sites

Location Description	Coordinates
Walked down from CRS-F3 monitoring point down towards Cataract River (245 m transect)	CRWP-7 – CRWP-8
Second western tributary at Cataract River Swamp	CRWP-6 – CRWP-5
Walked down from CRS-F1 monitoring point down towards Cataract River	CRWP-1 – half way between CRWP-3 and CRWP-3
Upstream from fire road 7C/Bellambi Creek crossing	BCWP1 – BCWP2

3.2. Biosis (2013) – Project no. 14511 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

Surveys were undertaken between 25-28 February 2013.

Threatened frog auditory monitoring

Auditory monitoring surveys for the Red-crowned Toadlet have been undertaken at two locations within RVE, where locations were chosen based on suitable breeding habitat along two ephemeral creeks located

below ridgelines above Longwalls (Figure 1). Two control sites were also established in the Cordeaux catchment where the species has previously been observed or heard. Surveys were undertaken at two fixed-point locations for four hours across four nights (equal to 32 hours of survey).

Surveys were undertaken using a passive acoustic monitoring device (SM2+ Song Meter (Wildlife Acoustics)), to monitor the presence of Red-crowned Toadlet breeding males calling within the area above Longwall 4 and Longwall 5 at RVE and at control sites. Data was then analysed using Audacity by scanning the spectrogram for the characteristic signature of the Red-crowned Toadlet.

The survey methodology has been designed to meet the requirements of the guidelines outlined in the *Threatened species survey and assessment guidelines: field survey methods for fauna - Amphibians* (DECC 2009).

Audio strip transects (and quadrats) have also been incorporated into both the threatened frog breeding and non-breeding habitat monitoring (targeting Giant Burrowing Frog, Littlejohn's Tree Frog and Stuttering Frog) which can be particularly effective for species that are hard to see, either because they blend in with their habitat, or because their habitat may be inaccessible (for example in the thick vegetation of upland swamps). This technique used a combination of both call-playback of the male advertisement call and set listening periods to estimate relative abundances of calling males, species composition, breeding habitat and microhabitat use.

Sites surveyed within RVE (Figure 1) include LW5A-F1 and LW5A-F2.

Threatened frog breeding habitat monitoring

An initial diurnal habitat assessment was undertaken across RVE. All areas of potential habitat were mapped and used to inform the location and extent of future monitoring. Potential habitat identified by topography maps and aerials along streams was ground-truthed and all suitable breeding pools were marked using a GPS.

Following diurnal habitat assessments, locations considered to be suitable habitat of varying quality for the Stuttering Frog, Littlejohn's Tree Frog and Giant Burrowing Frog were then incorporated into the ongoing monitoring program through a transect sampling survey technique.

Transects are surveyed by zoologists familiar with the target species, counting all amphibians seen and/or heard along the transect. The timing of surveys has taken into consideration the seasonal movements of each species, with monitoring undertaken in both the breeding season, to detect calling males and higher period of activity for adult frogs and following the breeding season to target tadpoles and metamorphs.

Active Visual Encounter Surveys (VES) for adults, tadpoles and egg mass were completed in peak breeding times for each species to allow for a higher probability of detecting adult frogs. Spotlighting and call detection was undertaken along transects in those areas assessed to contain suitable habitat for each of the species.

The location of any individuals detected during the targeted nocturnal surveys, or any other significant incidentals is recorded using a GPS.

Sites surveyed that are within RVE (Figure 1) that were considered controls for this survey include the following transects; CC(1)-T, CC(2)-T, CCUS4-T, CRUS1(1)-T, CRUS1(2)-T, CRUS2-T.

Control sites (not mapped) include WAC-T and WACT-T.

Sites surveyed that are not within RVE (not mapped) include; DC13, LA4, LC7, NDC, ND2, ND1, SC7(1), SC7(2), SC7A (rep 1), SC7A, SC8, WC11, WC15 and WC10.

Threatened frog non-breeding habitat monitoring

A combination of both randomised transects and permanent quadrat survey techniques have been established within the non-breeding habitat of upland swamps throughout RVE.

Quadrat surveys for threatened frogs in upland swamps are conducted within a 25 metre by 25 metre (625 metre square area centralised around a fixed point. An initial listening period is followed by active searching by zoologists familiar with the target species of all natural features including rocks, vegetation and leaf litter within the transect for 25 person minutes. The length of the initial listening period varies depending on the target species. Five minutes is allocated to those habitats suitable for Littlejohn's Tree Frog, whereas a 30 minute listening period is allocated for those sites containing habitat for the Giant Burrowing Frog given the time it can take for the species to re-commence calling following disruption.

The presence and abundance of threatened species within each quadrat is recorded. An inventory of incidental species, namely non-threatened frogs, is also recorded.

Between fixed quadrat survey points, randomised transects are surveyed by walking a specific distance through a randomly chosen route. This design allows for detection of threatened and non-threatened species across habitat gradients of RVE.

Sites surveyed within RVE (Figure 1) include; CCUS1, CCUS2, CCUS3, CCUS4, CRUS1, CRUS2, and CRUS3; which are associated with quadrats; CCHS1-V2-S, CCHS1-V3-S, CRHS3-V1-S, CRHS3-V3-S, CRHS2-V2, CRHS2-V3, CCHS3-V1, CCHS3-V2, CCHS4-V2, CCHS4-V3, and CCHS2-V2.

Control sites (not mapped) include; 33 and 15A(1).

3.3. Biosis (2014b) – Project no. 16940 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

Surveys were undertaken 9-18 December 2013, 24 January-2 February 2014.

Threatened frog auditory monitoring

See Biosis (2013) above (Section 3.2).

In addition to the above methodology, data was then analysed using a call recogniser built in Song Scope bioacoustics software (Wildlife Acoustics). Confirmed Red-crowned Toadlet calls were sourced from previous Biosis recordings combine with David Stewarts Nature Sounds (2002) and were annotated into a call library to be used in the recogniser. The final recogniser had a total training value of 71.5 +-6.36 %, which indicates an adequate power of detection for the species. Recordings from the field were then run through the recogniser to detect potential Red-crowned Toadlet calls. An ecologist then reviewed these calls to confirm their identity.

Sites surveyed within RVE (Figure 1) that differ to Biosis (2013) include LW6A-F1 instead of LW5A-F2.

Control sites (not mapped) include FT6FA and WC11.

Threatened frog breeding habitat monitoring

See Biosis (2013) above (Section 3.2).

Threatened frog non-breeding habitat monitoring

See Biosis (2013) above (Section 3.2).

3.4. Biosis (2016) – Project no. 20492 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

Monitoring for Stuttering Frog along Cataract Creek was completed between 2012 and the summer of 2014/2015. Given that no individuals were detected over three years of monitoring, this component of the threatened frog program ceased during the 2015/2016 monitoring.

Threatened frog auditory monitoring

See Biosis (2013) (Section 3.2) and Biosis (2014b) (Section 3.3) methods above.

Threatened frog breeding habitat monitoring

See Biosis (2013) above (Section 3.2).

Sites surveyed within RVE (Figure 1) that differ to Biosis (2013) include; BCUS2(1), BCUS2(2), CCUS4, CRUS1(1), CRUS1(2) and CRUS2.

3.5. Biosis (2017) – Project no. 23086 (Red-crowned Toadlet)

Threatened frog auditory monitoring

See Biosis (2013) (Section 3.2) and Biosis (2014b) (Section 3.3) methods above.

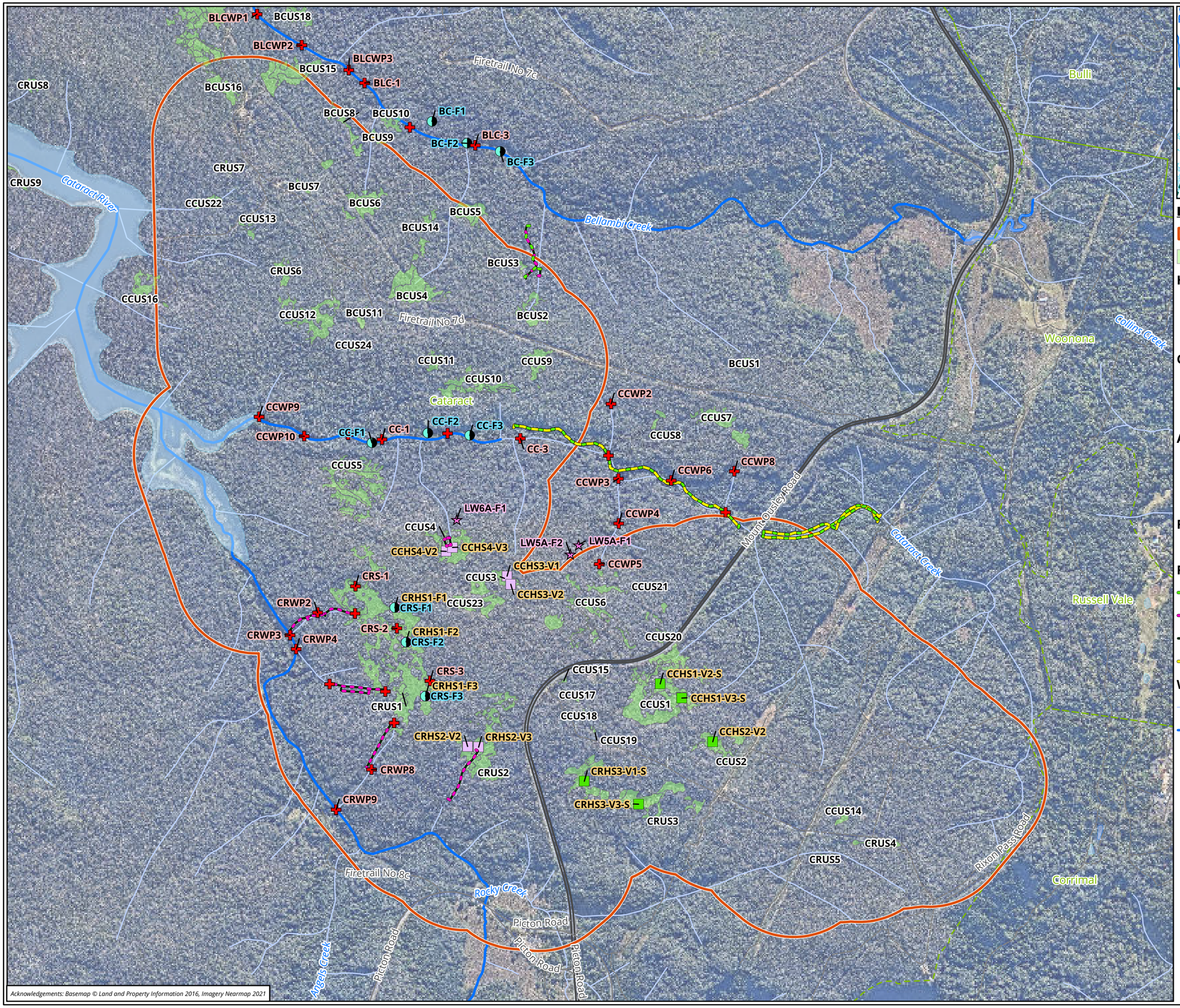
As per the recommendations outlined in the *Russell Vale East Terrestrial Ecological Monitoring Program Annual Report for 2015* (Biosis 2016), two additional sites were established downstream from the existing impact sites within RVE, in an attempt to identify whether or individuals were still present along the ephemeral drainage lines (Figure 1).

Sites surveyed within RVE (Figure 1) that differ to Biosis (2013) and Biosis (2014b) include LW5A-F1 and LW6A-F1 additional sites.

3.6. Biosis (2022) – Project no. 34919 (Giant Burrowing Frog)

Targeted surveys for Giant Burrowing Frog tadpoles were undertaken over two days along a tributary below swamp CRUS2 (Figure 1). The initial survey was undertaken in line with the previous survey methodology undertaken in the area to detect the species, see Biosis (2013) above and according to the methodology outlined in the BMP (Wollongong Coal 2021), developed following consultation with the NSW BCD.

The 2021 surveys were undertaken by Luke Stone (Senior Aquatic Ecologist), assisted by Zoe Goold (Project Zoologist) and Rosie Gray (Research Assistant) on 13 and 21 October 2021. Active VES for adults, tadpoles and egg mass were undertaken using spotlighting and call detection along a set transect identified as containing suitable habitat the species.



Legend

- UEP area
- Swamp extent

Habitat assessment sites

- Giant Burrowing Frog, Stuttering frog, Red-crowned Toadlet, Littlejohn's Tree Frog

Call playback

- Giant Burrowing Frog, Stuttering frog, Red-crowned Toadlet, Littlejohn's Tree Frog

Area search

- Giant Burrowing Frog
- Giant Burrowing Frog and Littlejohn's Tree Frog

Frog auditory monitoring

- Red-crowned Toadlet

Frog survey transects

- Stuttering Frog
- Littlejohn's Tree Frog
- Giant Burrowing Frog
- Red-crowned Toadlet

Waterways

- Non-perennial
- Perennial

Figure 1 Threatened frog targeted survey effort in the RVE UEP

0 100 200 300 400 500

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

Acknowledgements: Basemap © Land and Property Information 2016, Imagery Nearmap 2021

Matter: 36746,
Date: 09 September 2022 ,
Prepared for: CBH, Prepared by: AM, Last edited by: amackegard
Layout: 36746_F1_TFM
Project: P:\36700s\36746\Mapping\
36746_WCL_Stage2_BMP.aprx

4. Timing of survey

Recommended survey periods for threatened frogs surveyed at RVE are outlined in Table 4.

Table 4 Recommended survey periods for threatened frogs surveyed at RVE

Species	EPBC Act	BC Act	Recommended survey period
Heleioporus australiacus **Giant Burrowing Frog**	VU	VU	September-May
Litoria littlejohni **Littlejohn's Tree Frog**	VU	VU	July-November
Mixophyes balbus **Stuttering Frog**	VU	EN	September-March
Pseudophryne australis **Red-crowned Toadlet**	-	VU	Year-round

Surveys were conducted with the following timing:

- Biosis (2012) – Project no. 11853 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet):
  - Frog surveys were conducted in creeklines and upland swamps in autumn and spring. The remaining surveys were undertaken in winter 2011 during the active period for frogs (Table 4).
- Biosis (2013) – Project no. 14511 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet):
  - Surveys were undertaken during optimal conditions for each of the targeted species and during the active period for most species (Table 4) between 25-28 February 2013.
  - The survey period is not within the recommended survey period for Littlejohn's Tree Frog, however the species was consistently detected at control sites during this period (see Section 5.2, Table 8).
- Biosis (2014b) – Project no. 16940 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet):
  - Surveys were undertaken during optimal conditions for each of the targeted species and during the active period of most species (Table 4) between the 9-18 December 2013 above Longwall 5, and 24 January to 2 February 2014 above Longwall 6.
  - The survey period is not within the recommended survey period for Littlejohn's Tree Frog, however the species was consistently detected at control sites during this period (see Section 5.3).
- Biosis (2016) – Project no. 20492 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet):
  - Monitoring along Cataract Creek was completed between 2012 and the summer of 2014/2015 (see Section 5.4), during optimal conditions for each of the targeted species and during the active period of the species (Table 4).

- Biosis (2017) – Project no. 23086 (Red-crowned Toadlet):
  - Surveys were undertaken during optimal conditions for the targeted species and during the active period of the species (Year-round, Table 4) between February to April 2017.
- Biosis (2022) – Project no. 34919 (Giant Burrowing Frog):
  - Surveys were undertaken in CRUS2 during optimal conditions for each of the targeted species and during the active period of the species (September – March, Table 4) on 13 and 21 October 2021.
  - As the species was detected during the initial nocturnal survey, the second survey was undertaken under diurnal conditions, focusing on describing pools where the species was detected, to better record detailed habitat descriptions. Species observations were also collected during this survey, although water surface visibility was hampered due to tannin staining and glare. As the primary focus of the surveys are to determine the ongoing presence of the species within the previously identified area of habitat this is not considered a major limitation. Diurnal survey was required to ensure the most appropriate recording of habitat conditions could be collected, including the collection of photographs of the pools occupied by the species.

5. Results

5.1. Biosis (2012) – Project no. 11853 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

The results of this survey are shown in Table 5 and Table 6 below.

Table 5 Species detected at newly established sites during the autumn and spring surveys 2011

Location	Common Name	Scientific Name	Total Count over 3 Replicates
Impact Creekline			
Cataract Creek	Lesueur's Tree Frog	*Litoria lesueuri*	1
	Leaf Green Tree Frog	*Litoria nudidigita/Litoria phyllochroa*	35
	Leaf Green Tree Frog	*Litoria phyllochroa*	33
Reference Creeklines			
Bellambi Creek	Lesueur's Tree Frog	*Litoria lesueuri*	-
	Leaf Green Tree Frog	*Litoria nudidigita/Litoria phyllochroa*	37
	Leaf Green Tree Frog	*Litoria phyllochroa*	17
Flying Fox Creek #3	Common Eastern Froglet	*Crinia signifera*	32
	Jervis Bay Tree Frog	*Litoria jervisiensis*	1
	Leaf Green Tree Frog	*Litoria nudidigita/Litoria phyllochroa*	10
	Peron's Tree Frog	*Litoria peronii*	1

Table 6 Results of diurnal threatened frog habitat assessment

Location Description	Habitat Notes
Walked down from CRS-F3 monitoring point down towards Cataract River (245 m transect)	Width: 0 – 1.5 metres Depth: 0 – 0.25 metres Defined creekline with very little water present. Only one suitable breeding pool present however, the surrounding terrain is steep. Around CRWP-8, creekline vegetation consists of mesic species with bare ground. **No tadpoles observed in diurnal surveys.**
Second western tributary at Cataract River Swamp	Width: 0 – 2 metres Depth: 0 – 0.2 metres Slow flowing rocky stream. Several sections stagnant with no water flow apparent for some time. Mossy/rainforest environment. **Possible Stuttering Frog habitat. Not considered to be potential Littlejohn's Tree Frog or Giant Burrowing Frog habitat. No tadpoles observed in diurnal surveys.**

Location Description	Habitat Notes
Walked down from CRS-F1 monitoring point down towards Cataract River	Width: 0 – 5 metres Depth: 0 – 0.25 metres Fast flowing rocky stream with few breeding pools present. Stream widens and becomes slightly deeper toward CRWP-2. Although there are a few breeding pools present, the terrain is very steep and minimal overhanging vegetation. **Considered to be sub-optimal habitat for Littlejohn's Tree Frog. No tadpoles observed in diurnal surveys. Red-crowned Toadlet may be heard from adjacent ephemeral drainage lines.**
Upstream from fire road 7C/ Bellambi Creek crossing	Width: 1.5 – 6 metres Depth: 0.1 – 2 metres Fast Flowing rocky stream. From BCWP1 and upstream, vegetation turns into Moist Gully Gum Forest. **Not ideal vegetation type for Littlejohn's Tree Frog however structurally suitable with flat slope, deep permanent pools present and fringing vegetation. No tadpoles observed in diurnal surveys.**

5.2. Biosis (2013) – Project no. 14511 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

Threatened frog auditory monitoring

The Red-crowned Toadlet was recorded calling at Site F1 on 25-27 of February 2013 and at Site 2 on 25 of February 2012.

Table 7 Summary of Red-crowned Toadlet auditory monitoring, including numbers of calls and calling time for each site

Site	Date	Calls (24 hour time)
LW5A-F1	25 February 2013	1 adult calling at 19:54
	26 February 2013	3 adults calling between 18:08 and 19:35
	27 February 2013	3 adults calling between 17:23 and 19:04
	28 February 2013	Nil - Heavy rain precluded analysis of calls
LW5A-F2	25 February 2013	5 adults calling between 16:14 and 17:54
	26 February 2013	-
	27 February 2013	-
	28 February 2013	Nil - Heavy rain precluded analysis of calls

Threatened frog breeding habitat monitoring

Following the commencement of the threatened frog breeding habitat monitoring program in winter 2012, no adult Littlejohn's Tree Frog, Giant Burrowing Frog or Stuttering Frog adults have been detected at RVE.

Despite no records of Littlejohn's Tree Frog located in suitable habitats at RVE, the species was recorded at 12 of the 14 control sites surveyed within the same seasons. All three lifecycle stages (adult, tadpole and egg

mass) were recorded at four sites; adults and tadpoles at six sites; and adults only at an additional two sites. A summary of the results is provided in Table 8 below.

The Giant Burrowing Frog was recorded, as tadpoles only, at only one site (CRUS2 transect) during the winter and summer targeted surveys. A total of 17 tadpoles were observed over three breeding pools located along the 245 metre long transect.

Of the transects surveyed as part of the breeding habitat monitoring program at RVE, the CRUS2 transect is considered to be of highest habitat value for both the Giant Burrowing Frog and Littlejohn's Tree Frog and was ranked "good" in habitat assessments (although Littlejohn's Tree Frog has not been recorded).

Finally, no records of the Stuttering Frog have been recorded following the spring and summer targeted surveys for this species along two transects of Cataract Creek.

Threatened frog non-breeding habitat monitoring

Seven swamps potentially impacted by mining in RVE and two control sites were also monitored for non-breeding individuals in seasons where each frog is most active, and therefore easiest to detect. No threatened frog presence was recorded at any of the non-breeding habitat monitoring survey sites within RVE.

Table 8 Summary of results of threatened frog species surveys 2012-2013 (maximum number of recorded individuals is displayed)

Species	Control														Pre-impact and impact sites															
	SC8	SC7(1)	SC7(2)	SC7A (rep 1)	SC7A	NDC	ND2	ND1	LA4	DC13	WC11	WC15	LC7	WC10	CC(1)-T	CC(2)-T	CCUS2	CRUS1	CRUS1(1)-T	CRUS1(2)-T	CRUS2	CRUS2-T	CRUS3	WAC-T	WACT-T	CCUS1	CCUS3	CCUS4	CCUS4-T
Littlejohn's Tree Frog																														
Adults	4	9	14	8	15	4	3	1	-	9	6	2	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tadpoles	4	-	70	86	185	7	-	2	-	19	2	4	-	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Egg Mass	4	-	4	-	-	-	-	-	-	4	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Breeding Pools	3	4	6	-	10	7	2	2	-	4	1	2	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Giant Burrowing Frog																														
Adults	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tadpoles	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-
Egg Mass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Breeding Pools	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-
Stuttering Frog																														
Adults	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tadpoles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Egg Mass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pools	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

5.3. Biosis (2014b) – Project no. 16940 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

Threatened frog auditory monitoring

The Red-crowned Toadlet was recorded calling at LW5A-F1 on 13 and 16 December 2013, however there were no records detected at LW5A-F2. This is the second season that the threatened species has been recorded calling in this ephemeral drainage line, following data collected at the same point in February 2013 (specific details provided in Biosis (2013). There has been no indication of a change in habitat at LW5A-F2 and the lack of calls is likely to be a result of environmental factors rather than longwall mining.

Song Meter data collected at LW6A did not detect the species this season despite being recorded at the control site (WC11A) within this same timeframe. This is the first season of monitoring at this site collecting pre-mining data. Data collected from the summer 2013/2014 auditory monitoring program are provided in Table 9 below.

Table 9 Summary of Red-crowned Toadlet auditory monitoring, including numbers of calls and calling time for each site

Site	Date	Calls (24 hour time)
LW5A-F1	9/12/2013	-
	10/12/2013	-
	11/12/2013	-
	12/12/2013	-
	13/12/2013	1 adult calling at 19:54
	14/12/2013	-
	15/12/2013	-
	16/12/2013	1 adult calling within 0:50:52 and 1:15:44
	17/12/2013	-
	18/12/2013	-
LW5A-F2	9/12/2013	-
	10/12/2013	-
	11/12/2013	-
	12/12/2013	-
	13/12/2013	-
	14/12/2013	-
	15/12/2013	-
	16/12/2013	-
	17/12/2013	-
	18/12/2013	-

Site	Date	Calls (24 hour time)
LW6A-F1	24/1/2014	-
	25/1/2014	-
	26/1/2014	-
	27/1/2014	-
	28/1/2014	-
	29/1/2014	-
	30/1/2014	-
	31/1/2014	-
	1/2/2014	-
	2/2/2014	-

Threatened frog breeding habitat monitoring

Following the commencement of the threatened frog breeding habitat monitoring program in winter 2012, no adult Littlejohn's Tree Frog or Stuttering Frog adults have been detected at RVE.

Despite no records of Littlejohn's Tree Frog located in suitable habitats at Russell Vale East, the species was recorded at 12 of the 14 control sites surveyed within winter 2013. All three lifecycle stages (adult, tadpole and egg mass) were recorded at four sites; adults and tadpoles at six sites; and adults only at an additional two sites.

No records of the Stuttering Frog have been recorded following the spring 2013 and summer 2013/2014 targeted surveys along two transects of Cataract Creek.

The Giant Burrowing Frog was recorded, as adults, metamorphs and tadpoles at only one monitoring site (CRUS2 Tributary) during the summer 2013/2014 targeted surveys. A total of 17 tadpoles (including 11 metamorphs) were observed within one breeding pool located along the 245 metre long transect on the first replicate conducted for the season on 13 January 2014. The second replicate completed on the 21 January 2014 detected nine tadpoles (including 3 metamorphs) within the same breeding pool. One adult was also identified to be calling from a burrow upstream of the known breeding pools. This is the first time an adult and metamorphs have been detected within this monitoring transect. The species was first detected as tadpoles in winter 2012 when ecological monitoring commenced.

Table 10 Summary of Giant Burrowing Frog observations at CRUS2-Trib in summer 2013/2014 monitoring season

Date recorded	Life Stage	Habitat	Number recorded
13/1/2014	Tadpoles	In water	8
	Metamorphs	In water	8
	Metamorphs	On Ground	1
21/1/2014	Tadpoles	In water	6
	Metamorphs	In water	3
	Adult	Calling	1

Of the transects surveyed CRUS2 is considered to be of highest habitat value for both the Giant Burrowing Frog and Littlejohn's Tree Frog and was ranked "good" in habitat assessments (although Littlejohn's Tree Frog has not been recorded).

Threatened frog non-breeding habitat monitoring

A total of seven sites were also monitored for non-breeding individuals in seasons where each frog is most active, and therefore easiest to detect. No threatened frog presence was recorded at any of the survey sites.

5.4. Biosis (2016) – Project no. 20492 (Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Red-crowned Toadlet)

Threatened frog auditory monitoring

The Red-crowned Toadlet was again not recorded at either of the two impact sites (LW5A-F1 and LW6A-F1) during summer 2015/2016 auditory monitoring despite having been detected at the control sites. The site inspection again confirmed that the surface fracture intersecting the LW5A drainage line, first detected in 2014, is still present. The fracture is located approximately 30 meters upstream of the monitoring point and remains to be approximately eight meters long, two meters wide and one and a half meters deep. For the second consecutive year, no Red-crowed Toadlet were detected at LW5A-F1 downstream which may be a result of disrupted surface flows down the drainage line.

Data for the 2015 monitoring period is summarised in Table 11.

Table 11 Summary of Red-crowned Toadlet auditory monitoring, including numbers of calling adults and calling time for each site

Site status	Site	Date	Calls (24 hour time)
Impact	LW5A-F1	4/02/2016	-
		5/02/2016	-
		6/02/2016	-
		7/02/2016	-
		8/02/2016	-
	LW6A-F1	4/02/2016	-
		5/02/2016	-
		6/02/2016	-
		7/02/2016	-
		8/02/2016	-
Control	FT6FA	4/02/2016	2 adults calling between 18:43 and 22:00
		5/02/2016	2 adults calling between 18:05 - 22:00
		6/02/2016	1 adult calling between 18:01 - 22:00
		7/02/2016	1 adult calling between 19:07 - 21:42
	WC11	4/02/2016	1 adult calling between 20:25 – 21:42
		5/02/2016	1 adult calling between 20:22 - 21:40

Site status	Site	Date	Calls (24 hour time)
		6/02/2016	1 adult calling between 20:17 - 22:00
		7/02/2016	-

Threatened frog breeding habitat monitoring

During 2015, no Littlejohn's Tree Frogs were detected in RVE. Since the commencement of the program in winter 2012 this species has not yet been detected at any of monitoring sites at RVE. The species was however recorded at seven control sites surveyed within winter 2015. All three lifecycle stages (adult, tadpole and egg mass) were recorded at each site.

The Giant Burrowing Frog was again recorded as adult, metamorphs and tadpoles at the CRUS2 tributary monitoring site during 2015. Throughout the monitoring year of 2015 Giant Burrowing Frog tadpoles were recorded in three breeding pools in CRUS2. Giant Burrowing Frog tadpoles were recorded across all three monitoring seasons during 2015, with the largest numbers of tadpoles being observed during autumn (117) and at the end of winter/early spring (119). Metamorphs were only recorded during the two monitoring seasons completed in summer 2015/2016. Three adults were detected along the transect during the December 2015 monitoring survey, observed on the warmest evening of the month (minimum temperature of 20.4˚C) the night before a rainstorm. This is the third year where metamorphs and adult frogs have been detected at CRUS2. Data for the 2015 monitoring period is summarised in Table 12, Table 13 and Table 14.

Table 12 Summary of Giant Burrowing Frog observations at CRUS2-Trib in 2015 monitoring program (autumn 2015 – summer 2015/2016)

Date recorded	Life stage	Habitat	Number recorded	Breeding pool
09/04/2015	Tadpoles	In water	3	Pool 12
	Tadpoles	In water	19	Pool 13
	Tadpoles	In water	49	Pool 14
21/05/2015	Tadpoles	In water	4	Pool 12
	Tadpoles	In water	16	Pool 13
	Tadpoles	In water	26	Pool 14
21/12/2015	Adult	On Ground	1	On banks of transect
	Adult	On Ground	1	Pool 14
	Adult	On Ground	1	Pool 16
	Metamorphs	In water	2	Pool 12
	Tadpoles	In water	2	Pool 12
	Tadpoles	In water	11	Pool 13
	Tadpoles	In water	16	Pool 14
18/02/2016	Tadpoles	In water	2	Pool 13
	Tadpoles	In water	57	Pool 14
	Metamorphs	In water	1	Pool 12
	Metamorphs	In water	2	Pool 14

Table 13 RVE threatened frog breeding habitat 2015 data

Species	Life Stage	BCUS2(1) (07/05/2015)	BCUS2(1) (14/05/2015)	BCUS2(1) (20/08/2015)	BCUS2(1) (11/08/2015)	BCUS2(2) (07/05/2015)	BCUS2(2) (14/05/2015)	BCUS2(2) (20/08/2015)	BCUS2(2) (11/08/2015)	CCUS4 (09/04/2015)	CCUS4 (21/05/2015)	CCUS4 (19/08/2015)	CCUS4 (09/09/2015)	CRUS1(1) (09/04/2015)	CRUS1(1) (21/05/2015)	CRUS1(1) (19/08/2015)	CRUS1(1) (09/09/2015)	CRUS1(2) (09/04/2015)	CRUS1(2) (21/05/2015)	CRUS1(2) (19/06/2015)	CRUS1(2) (09/09/2015)	CRUS2 (09/04/2015)	CRUS2 (21/05/2015)	CRUS2 (19/08/2015)	CRUS2 (09/09/2015)	CRUS2 (21/12/2015)	CRUS2 (18/02/2016)
Giant Burrowing Frog	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
	Eggmass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tadpoles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	71	46	59	60	29	59
	Metamorph	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
	Number of Breeding pools	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	3	5	3
Littlejohn's Tree Frog	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Eggmass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tadpoles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Metamorph	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Number of Breeding pools	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stuttering Frog	Adult	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Eggmass	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Tadpoles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Metamorph	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Number of Breeding pools	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 14 Control threatened frog breeding habitat 2015 data

Species	Life Stage	SC6	SC7A	SC7(1)	SC7(2)	SC8	NDC	ND1	ND2	WC10	WC11
		10/08/2015	10/08/2015	10/08/2015	28/07/2015	5/08/2015	3/08/2015	8/09/2015	3/08/2015	4/08/2015	12/08/2015
Giant Burrowing Frog	Adult	-	-	-	-	-	-	-	-	-	-
	Eggmass	-	-	-	-	-	-	-	-	-	-
	Tadpoles	11	-	-	-	-	-	-	-	-	7
	Metamorph	-	-	-	-	-	-	-	-	-	-
	# Breeding pools	10	-	-	-	-	-	-	-	-	4
Littlejohn's Tree Frog	Adult	7	19	6	14	1	8	7	-	11	4
	Eggmass	7	18	9	7	4	-	11	-	13	2
	Tadpoles	5	5	-	5	3	3	4	-	1	2
	Metamorph	-	-	-	-	-	-	-	-	-	-
	# Breeding pools	12	16	8	9	4	6	10	-	12	4

The species was first detected as tadpoles in winter 2012 when ecological monitoring commenced with the first adult frog and metamorphs detected in the summer surveys of 2013/2014. During the period of monitoring, adults continue to be detected on warm nights following or prior to thunderstorms during the summer and autumn months. Following this the highest numbers of tadpoles also continue to be observed during the autumn and winter months. As tadpole abundance declines in summer, metamorph abundance increases with peak metamorph abundances during summer. Metamorph detection was comparably low in 2015 when compared to 2014 (Figure 2).

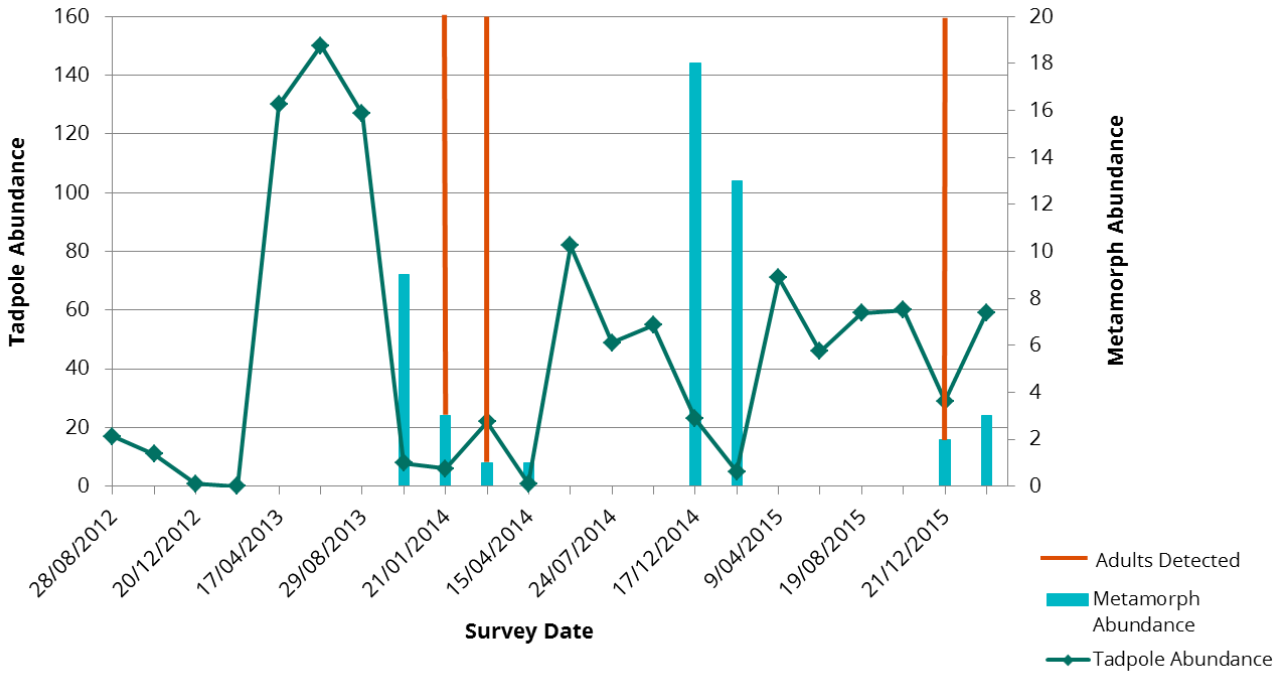


Figure 2 **Giant Burrowing Frog observations at CRUS2-Trib across time since monitoring commenced (spring 2012 – summer 2015/2016)**

Of the seven transects surveyed at RVE as part of the breeding habitat monitoring program, the CRUS2 transect is considered to be of highest habitat value for both the Giant Burrowing Frog and Littlejohn's Tree Frog. However, Littlejohn's Tree Frog has not been recorded at this site to date.

5.5. Biosis (2017) – Project no. 23086 (Red-crowned Toadlet)

Threatened frog auditory monitoring

Due to the two previous years of auditory monitoring resulting in the apparent absence of the Red-crowned Toadlet from the impact sites (LW5A-F1 and LW6A-F1), additional monitoring sites were established for the 2016/2017 monitoring period. These sites were located within the impact area of Longwalls 5 and 6 in an attempt to determine if the species may have relocated to more suitable habitat downstream of the initial monitoring sites. Analysis of the recordings resulted in the presence of the Red-crowned Toadlet at the additional site downstream from LW6A-F1, where habitat was thought to be more suitable. In addition to this, during the setup of the original monitoring site at LW5A-F1, a qualified zoologist identified the presence of the Red-crowned Toadlet, as the species is known to call back to clapping and ambient noises created from using tools during installation of the songmeter.

Data collected from the summer 2013/2014 auditory monitoring program are provided in Table 15 below. Trends in call activity at these sites from the beginning of monitoring are represented in Table 16.

Table 15 Summary of Red-crowned Toadlet auditory monitoring, including numbers of calling adults and calling time for each site

Site	Site status	Date	Calls (24 hour time)
LW5A-F1	Impact	23/02/2017 - 03/03/2017	One individual recorded during the installation of the Songmeter
LW6A-F1	Impact	23/02/2017 - 09/04/2017	-
LW5A-F1 Additional Site	Impact	24/02/2017 - 5/03/2017	-
LW6A-F1 Additional Site	Impact	24/02/2017 - 09/04/2017	At least two individuals calling between 16:18 – 16:21
FT6FA	Control	23/02/2017 - 14/05/2017	At least two individuals calling between 19:36 – 19:39
WC11	Control	23/02/2017 - 01/03/2017	At least two individuals calling between 16:59 – 17:46

Table 16 Summary of Red-crowned Toadlet auditory monitoring, including all monitoring years

Treatment	Site	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
RVE	LW5A-F1	Present	Present	Absent	Absent	Present
	LW6A-F1	Absent	Absent	Absent	Absent	Absent
	LW5A-F1 - Additional	-	-	-	-	Absent
	LW6A-F1- Additional	-	-	-	-	Present
Control	FT6FA	Present	Present	Present	Present	Present
	WC11	Present	Present	Present	Present	Present

5.6. Biosis (2022) – Project no. 34919 (Giant Burrowing Frog)

The spring 2021 surveys have focussed on identifying the continued presence of the species within mapped habitat along the CRUS2 transect. Giant Burrowing Frog tadpoles were identified at pools 12 and 13 along transect CRUS2 during the spring surveys.

A summary of the Giant Burrowing Frog tadpoles recorded from transect CRUS2 since monitoring commenced in 2012 is summarised in Table 17 (Biosis 2022). While the spring surveys cannot be directly compared to any previous surveys during spring, the 2021 results broadly align with results of previous surveys which show greatest detection during winter and lowest levels of detection during summer and demonstrate the ongoing presence of this species in this waterway.

Table 17 Giant Burrowing Frog records summary from CRUS2 transect

Survey date	Round	Adults	Metamorphs	Tadpoles
28/08/2012	Winter	-	-	17
30/08/2012	Winter	-	-	11
17/04/2013	Autumn	-	-	130
27/05/2013	Autumn	-	-	50
27/08/2013	Winter	-	-	100
29/08/2013	Winter	-	-	127
20/12/2013	Summer	-	-	1
13/01/2014	Summer	-	9	8
21/01/2014	Summer	1	3	6
19/03/2014	Autumn	1	1	22
15/04/2014	Autumn	-	1	82
24/07/2014	Winter	-	-	49
29/07/2014	Winter	-	-	55
17/12/2014	Summer	-	18	23
13/01/2015	Summer	-	13	5
9/04/2015	Autumn	-	-	71
21/05/2015	Autumn	-	-	46
19/08/2015	Winter	-	-	59
9/09/2015	Winter	-	-	60
21/12/2015	Summer	3	2	29
18/02/2016	Summer	-	3	59
13/10/2021	Spring	-	-	21
21/10/2021	Spring*	-	-	18

**diurnal habitat survey*

Previous monitoring has been undertaken in winter, autumn and summer and has predominantly encountered tadpoles at pools 12, 13 and 14. A detailed breakdown of detection per pool is provided in Table 18. The monitoring data indicate that pools 12 and 13 represent the most permanent habitat for Giant Burrowing Frog tadpoles. Pool 14 has also reliably recorded relatively high number of tadpoles, although there is a greater number of zero counts for this pool. Indicating that habitat conditions are less permanent or utilisation is less frequent, but that abundances tend to be greater when tadpoles are present. The 2021 results are consistent with these findings.

Table 18 Giant Burrowing Frog tadpole detection in identified pools along the CRUS2 transect

Year	Season	CRUS2-P10	CRUS2-P11	CRUS2-P12	CRUS2-P13	CRUS2-P14	CRUS2-P15	CRUS2-P16
2012	Winter	-	-	15	8	5	-	-
2013	Autumn	-	-	130	20	30	-	-
2013	Summer	-	-	1	-	-	-	-
2013	Winter	-	2	102	50	73	-	-
2014	Autumn	1	-	22	59	-	12	10
2014	Summer	-	-	-	37	-	-	-
2014	Winter	-	-	-	104	-	-	-
2015	Autumn	-	-	7	35	75	-	-
2015	Summer	-	-	2	16	16	-	-
2015	Winter	-	-	16	34	69	-	-
2016	Summer	-	-	-	2	57	-	-
2021	Spring	-	-	19	20	-	-	-

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