

**Boundary Creek, Big
Swamp and surrounding
environment
Remediation and
Environmental
Protection Plan**

Quarterly Update

1 October to 31 December 2020

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Introduction

In June 2017, Barwon Water acknowledged that historic management of groundwater pumping had an environmentally significant impact in the Boundary Creek catchment. Reductions in flows caused by groundwater extraction coupled with a drier climate and supplementary flows not reaching the intended area, all contributed to the drying out of Big Swamp. This resulted in the activation of acid sulfate soils and ongoing release of acidic water to the lower reach of Boundary Creek.

In May 2018, Barwon Water established a community and stakeholder working group to participate in the design of a remediation plan for Boundary Creek and Big Swamp. As part of this process, Barwon Water invited the working group to nominate their own technical experts to help support them in their discussions to shape the remediation plan.

Barwon Water's commitment to undertake remedial works was legally strengthened through the issuing of a Ministerial Notice under section 78 of the *Water Act, 1989*. This notice mandated the development and implementation of the Boundary Creek, Big Swamp and Surrounding Environment – Remediation and Environmental Protection Plan (REPP) by 01 March 2020.

The section 78 notice defined remediation to be the controls and actions that could be practicably carried out to achieve improved environmental outcomes. In order to align this with an accepted scientific definition for remediation, the REPP further expanded the definition to be *"the controls and actions that could be practicably carried out to improve the ecological condition and function of areas confirmed to have been impacted by historical management of groundwater pumping at Barwon Downs, noting that this is likely to be different to the original condition due to the extent of change since European settlement."*

In late February 2020, Southern Rural Water (SRW) accepted Barwon Water's REPP, which will be delivered under two parallel work packages:

- The **Boundary Creek and Big Swamp Remediation Plan** to address remediation of confirmed impact in the Boundary Creek catchment resulting from historical management of groundwater extraction.
- The **Surrounding Environment Investigation** to investigate whether other areas within the regional groundwater system have been impacted by historical management of groundwater extraction.

Key requirements of the section 78 notice and the REPP is the provision of quarterly updates to Southern Rural Water to report on progress with implementation of the plan, as well as an Annual Report. The Annual Report is required to be submitted to SRW and made publicly available by 30 September each year.

This quarterly update is the third since implementation of the REPP commenced on 01 March, 2020 and provides a high-level update on progress to date with implementation of the REPP.

In addition to the information contained in the quarterly updates, the Annual Report, released on the 30th September each year, provides more detail on technical investigations, monitoring, data collected, and tracking against the REPP success targets.

Quarterly update - Implementation of the REPP

Quarterly Updates outline actions completed during the reporting period and highlight any major milestones to be achieved in the following quarter. Stakeholder engagement and feedback is also covered in these updates.

Remediation of Boundary Creek and Big Swamp

The REPP outlined the below plan for remediation (refer Figure 1). This quarter, Barwon Water has been working to complete the updated groundwater-surface water model for Boundary Creek & Big Swamp and begin works to further geochemical analysis and modelling. The updated modelling utilised the additional 12 months of data that has been collected and will inform the detailed design for the Remediation of Boundary Creek and Big Swamp. The first round of baseline vegetation monitoring has been undertaken in Big Swamp under the REPP, with the next round scheduled for November 2022. The 2020 spring macro-invertebrate survey in Boundary Creek and the Barwon River has also been completed, with the next survey scheduled for Autumn 2021.

Specific actions undertaken are outlined in Table 1

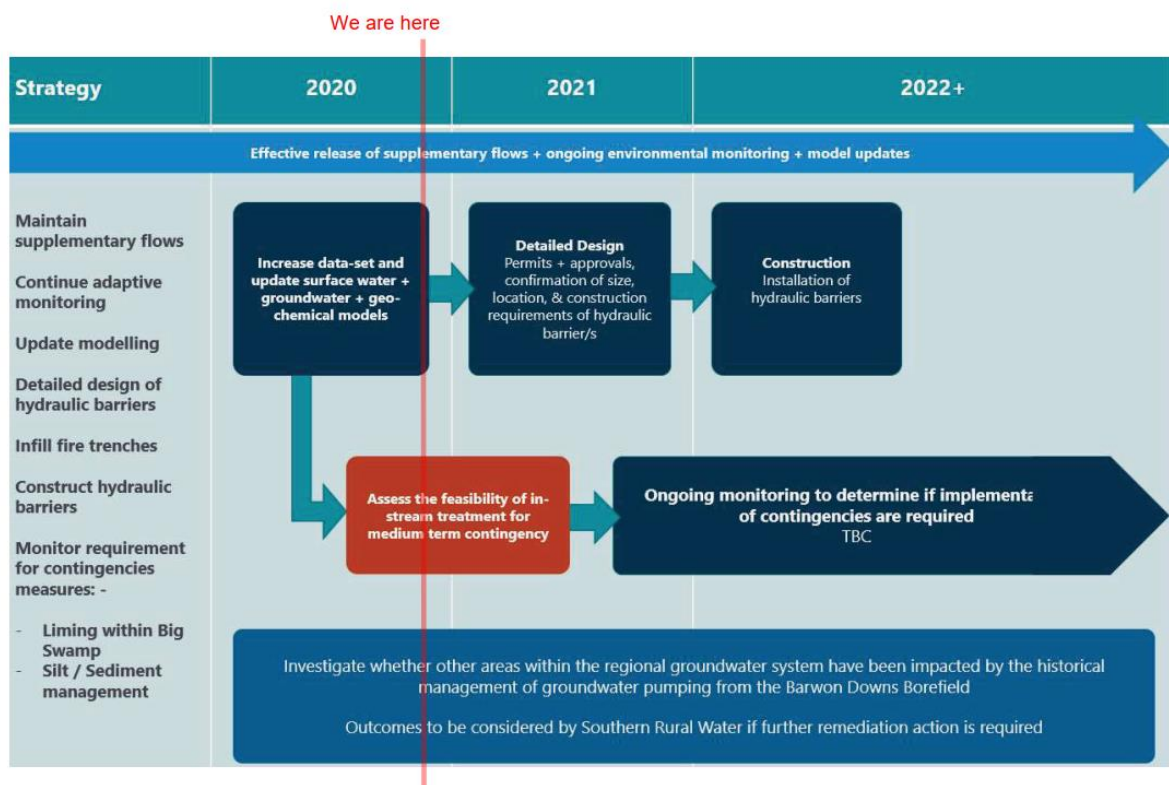


Figure 1: Timeframes for implementation of the REPP

Quarterly update on completed actions for the Boundary Creek and Big Swamp Remediation Plan – Q2 2020/21 (1 October to 31 December 2020)

Table 1: Completed actions – Q2 2020/21 (1 October – 31 December 2020) – Boundary Creek and Big Swamp Remediation Plan

Q2 2020/21 Update (1 October – 31 December 2020) Completed Actions	Comment / Link
Monitoring of groundwater levels and groundwater quality in Big Swamp, surface water flows and surface water quality in Boundary Creek and Big Swamp to provide a full seasonal cycle of data (i.e. minimum of 12 months of data) and surface water flows at Ten Mile Creek and Yahoo Creek.	Monitoring of groundwater levels and quality as well as surface water levels, flows and quality will continue throughout remediation
Proposed REPP Ammendments to address Southern Rural Water's feedback on the REPP – Submitted to Southern Rural Water	Proposed changes submitted to Southern Rural Water by 30 September. Proposed changes were also discussed with the Remediation Reference Group (RRG) and the feedback provided will inform finalisation of the proposed changes, along with feedback received from SRW.
Completion of the Groundwater-Surface Water modelling. Feedback to be sought from SRW ITRP.	Modelling and draft report completed. Input/feedback provided by SRW's ITRP and considered during modelling and drafting of the report. Final report to be completed January 2021.
Confirm constructability of additional bore within Big Swamp to further assist with determining interaction between Lower Tertiary Aquifer (LTA) and swamp at the west end of the swamp.	Contractor engaged, site visit planned for January 2021 to confirm accessibility to allow construction.
Hydrogeochemical analysis and modelling update Request for Quote (RFQ) released	The RFQ has been released to market, proposals due back in mid-January
Completion of the Spring macro-invertebrates survey of the Barwon River & Boundary Creek	The report will be available in January on our Your Say platform
Establish vegetation baseline monitoring for Boundary Creek and Big Swamp Remediation Plan	The report will be available in January on our Your Say platform
Remediation Reference Group meeting held on 2 December 2020	The meeting was hosted online via Zoom with the majority of members in attendance. The discussion focused on the work completed since the acceptance of the REPP and the focus for the coming quarter. Meetings will be hosted quarterly with the next meeting scheduled in March 2021.
Submit quarterly update for the period 1 October to 31 December 2020 to SRW and publish to website	Once submitted the report will be available on our Your Say platform. https://www.yoursay.barwonwater.vic.gov.au/boundary-creek

Next quarter - Upcoming actions for the Boundary Creek and Big Swamp Remediation Plan - Q3 2020/21 – 1 January to 31 March 2021

Table 2: Upcoming actions – Q3 2020/21 (1 January – 31 March 2021) – Boundary Creek and Big Swamp Remediation Plan

Upcoming tasks – Remediation of Boundary Creek and Big Swamp	Due (if applicable)
Hydrogeochemical analysis and modelling update to commence with completion in April 2021	
Initiate Detailed Design contract - specification to confirm size, location and construction requirements for hydraulic barriers and any other contingency requirements SRW & ITRP feedback to be sought (as a part of detailed design consultation)	
Finalisation of REPP amendment to address SRW feedback	
Develop a scope of works to analyse the rate of aquifer recovery including new information from groundwater monitoring and the Groundwater-Surfacewater modelling undertaken for Boundary Creek & Big Swamp	
Q3 Remediation Reference Group Meeting	March 2021
Submit quarterly update to SRW for the period 1 January to 31 March 2021 and publish to website	31/03/2021

Surrounding Environment Investigation

We have also begun work on the Surrounding Environment Investigation (refer Figure 2). Completed actions are outlined below in Table 3.

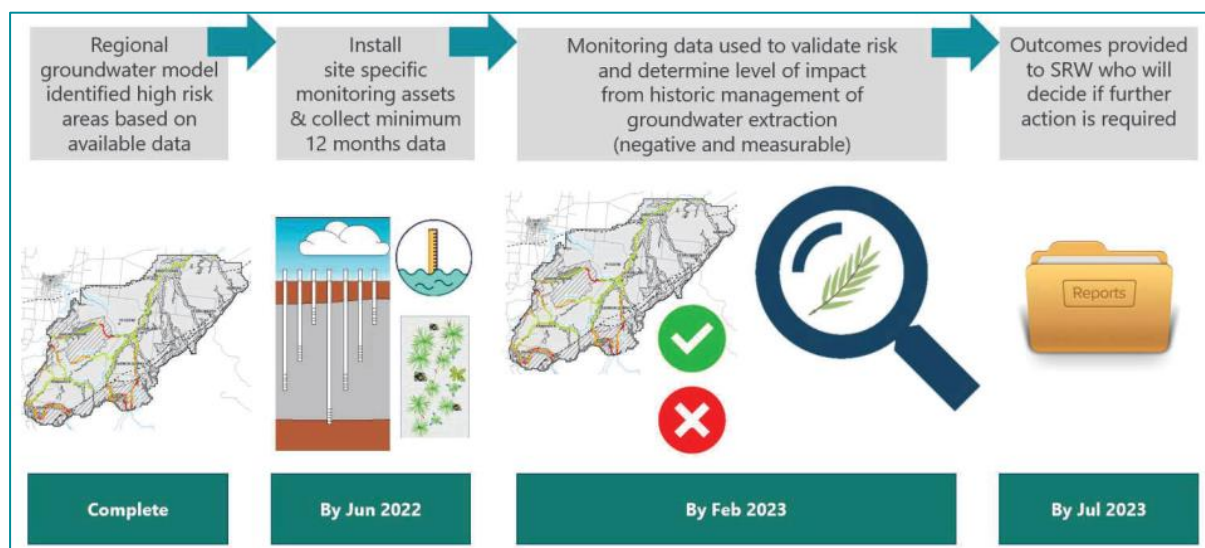


Figure 2: Process overview for the Surrounding Environment Investigation

Quarterly update on completed actions for the Surrounding Environment Investigation – Q2 2020/21 (1 October to 31 December 2020)

Table 3: Completed actions – Q2 2020/21 (1 October – 31 December 2020) – Surrounding Environment Investigation

Completed actions – Surrounding Environment Investigation	Comment / Link
Collection of streamflow data for Yahoo and Ten Mile Creeks (tributaries of Loves Creek)	Data collection continues
Design complete for 22 monitoring bores to be constructed in the Surrounding Environment	Design completed
Contract awarded to for the construction of 22 new monitoring bores in the Surrounding Environment. Construction to commence in January 2021	Contract awarded
Stream gauge construction is complete for the East Barwon River. Construction at the West Barwon River has begun (17/12) Barwon River downstream confluence with Boundary Creek, Gellibrand River and Barongarook Creek stream gauges have been designed, with construction planned early in 2021	Construction undertaken by Barwon Asset Solutions with installation of instrumentation and ongoing monitoring undertaken through the Regional Water Monitoring Partnership
Implementation of vegetation baseline monitoring program at six proposed bore sites outside Big Swamp.	Completed by Ecological Australia
First Remediation Reference Group meeting held on 2 December 2020*	The meeting was hosted online via Zoom with the majority of members in attendance. The discussion focused on the work completed since the acceptance of the REPP and the focus for the coming quarter. Meetings will be hosted quarterly with the next meeting scheduled in March 2021.
Submit quarterly update to SRW for the period 1 October to 31 December 2020 and publish to website*	Once submitted the report will be available on our Your Say platform https://www.yoursay.barwonwater.vic.gov.au/boundary-creek

* Also shown in Table 1 Remediation of Boundary Creek and Big Swamp.

Next quarter - Upcoming actions for the Surrounding Environment Investigation - Q3 2020/21 – 1 January to 31 March 2021

Table 4: Upcoming actions – Q3 2020/21 (1 January – 31 March 2021) – Surrounding Environment Investigation

Upcoming tasks – Surrounding Environment Investigation	Due (if applicable)
Construction of 22 new monitoring bores in the Surrounding Environment	31/07/2021
Stream gauge construction at: <ul style="list-style-type: none"> - West Barwon River (construction commenced 17/12) - Barwon River downstream confluence with Boundary Creek - Gellibrand River - Barongarook Creek 	31/07/2021
Development of a process/framework for consideration of local knowledge in the surrounding environment investigations	
Q3 Remediation Reference Group Meeting*	March 2021
Submit quarterly update to SRW for the period 1 January to 31 March 2021 and publish to website*	31/03/2021

* Also shown in Table 2 Remediation of Boundary Creek and Big Swamp.

Issues register

This section outlines any issues that have been identified during implementation of the REPP that may impact future implementation activities.

Table 5: Issues register

Issue	Likelihood	Consequence	Comment
COVID-19 pandemic limits/delays engagement with stakeholders and the community	Low	Low	Coronavirus (COVID-19) has seen face to face stakeholder and community engagement with a Remediation Working Group move to an online setting. During 2020 email updates were provided in lieu of a face-to-face meeting. The likelihood and consequence have now been scored low as the December meeting of the Remediation Reference Group was run online on Zoom with positive feedback from group members. Future meetings may be hosted in-person depending on the latest Government advice.
COVID-19 pandemic impacts availability of appropriate consultants or contractors to undertake required work for implementation of the REPP	Low	Low	To date Barwon Water has experienced little to no impact on availability of consultants and contractors to complete work during the coronavirus (COVID-19) pandemic.

Community engagement

The first Remediation Reference Group meeting was held on 2 December 2020. This group comprised mostly of existing members from the Remediation Working Group who were involved in the development of the REPP. This meeting was held online via Zoom.

Topics discussed included:

- 2019/20 REPP Annual Report update
- Feedback from Southern Rural Water, addressing feedback and amendments to the REPP
- Surrounding Area Investigation update
- Upcoming quarterly report
- Upcoming hydraulic barrier detailed design

An open forum was also held for group members to raise any topics that we not discussed above. It was noted that members were pleased that these meetings were continuing and there has been some great work already done with a long way to go.

Future meetings for 2021 have been scheduled, with one meeting planned each quarter, noting further meetings by exception could be required. Depending on the latest Government advice, face-to-face meetings may be able to resume in 2021.

Key items of feedback that has been received from the community and agency stakeholders through the Remediation Reference Group and how Barwon Water is responding is outlined in Table 6 below.

Table 6: Community Feedback

Community Feedback Received	How we are responding
Wording in the REPP around emergency access to groundwater from the Barwon Downs Borefield needs to better reflect that it is an absolute last resort after all other avenues have been explored. It should also make mention of how the water supply system is to be managed to prevent a water shortage from eventuating	Barwon Water (BW) will incorporate additional and strengthened wording in the REPP updates currently being reviewed by SRW to address this feedback
Members of the Remediation Reference Group indicated that they would like to see any technical reports and data/information from field surveys made available to the community.	In order to continue our commitment to transparency for the REPP Barwon Water will continue to make reports and information available to the community.
<p>Full aquifer recovery in the LTA should still be considered as a key component of remediation. Full recovery does not need to be to pre-european levels, but pre-pumping levels e.g. 1982 Groundwater levels. Even if these levels cannot be achieved due to climate, just leave the aquifer alone.</p> <p>The rate of aquifer recovery should also be revisited to determine if the rate has changed and when groundwater levels may return to pre-pumping levels</p>	Barwon Water will re-assess the rates of aquifer recovery and what may be achievable for recovery of groundwater levels in the LTA to inform success targets for aquifer recovery.

<p>The remediation reference group would like to see a process outlined for incorporating local knowledge and information into the surrounding environment investigation, particularly where specific sites have been identified and are believed to have been impacted by management of historical groundwater extraction from Barwon Downs.</p> <p>The RRG nominated experts advised that there would be existing frameworks that could be readily adopted for considering both local knowledge and scientific measures of assessment.</p>	<p>Barwon Water will request information on specific sites for follow up and will work with the RRG and their nominated experts to develop a process for inclusion of local knowledge in the surrounding environment investigation</p>
<p>There is insufficient assessment of ecology in the Barwon River and the impacts of acid events on the ecology. While macroinvertebrate sampling is being conducted, it is well after the previous acid event and therefore not representative of the impact.</p>	<p>Barwon Water is committed to continuing the macroinvertebrate surveys as an indicator of ecological health in Boundary Creek and the Barwon River over time. We are also working with local environmental groups to support eDNA surveys for platypus in the Barwon River. We will also continue to re-assess the appropriateness of our current monitoring programs for assessing ecological health of Boundary Creek and the Barwon River.</p>

Success targets

The REPP provided 12 success targets for remediation of Boundary Creek and Big Swamp. An update on progress towards each of these targets will be provided in the Annual Report. Monitoring data, which informs many of the success targets, will also be provided with the Annual Report.

Success targets for the Surrounding Environment Investigation will be developed if impacts are confirmed and remediation determined to be practicable in accordance with the Section 78 Notice.

Technical reports and investigation

Reports for technical work and investigations that have been completed can be accessed from the dedicated Boundary Creek Remediation webpage via the following link:

<https://www.yoursay.barwonwater.vic.gov.au/boundary-creek>

Contingency measures

Table 7 will outline any contingency measures confirmed to be required during the detailed design or implementation of the REPP, contingency measures are being developed as a part of the Hydro-Geochemical Modelling and Detailed Design.

Table 7: Contingency measures to be implemented

Contingency measure	Status
No contingency measures to be implemented currently	

REPP amendments

Table 8 outlines REPP amendments current as of the time of this report.

Table 8: Amendments to the REPP

No.	REPP amendments	Status
1	REPP updated 27 th February 2020 to include new section capturing SRW feedback on the REPP	Complete
2	Amendments to the REPP to address SRW feedback	Drafted - Pending Consultation and Comments

Progress report

Table 9 presents actions that have been completed, are currently in progress, or are yet to commence as part of implementation of the REPP. It is important to note that additional tasks may be added as they are identified during implementation of the REPP.

Table 9: Action register

#	Activity	Due Date	Status	Health Indicator	Comments
5.0	Scoping of SW-GW technical work packages required to inform detailed design and address feedback register	30-Nov-20	Complete	Complete	Complete
6.0	Complete installation of additional monitoring assets for the following sites identified as 'high risk' in the Surrounding Environment Investigation	31-May-21	In progress	On track	Installation of first 2 stream gauges in December, remaining 3 to be installed in 2021
7.0	Conclusion of monitoring period enabling the capture of a full seasonal cycle of data to inform updates to the groundwater-surface water model and geochemical model.	31-Jul-20	Complete	Complete	1 year of monitoring completed. Monitoring of GW levels, stream flows and water quality continues in Big Swamp and Boundary Creek.
8.0	REPP Feedback Work plan - Submission and Acceptance	31-Jul-20	Complete	Complete	Complete
9.0	Governance Framework - Submission and Acceptance	31-Jul-20	Complete	Complete	Complete
10.0	Barwon Water Comms and Engagement Plan	Ongoing	In progress	On track	First Remediation Reference Group held on the 2 December. Ways of Working was discussed with group members
11.0	Submit updated REPP to capture the work plan for addressing the feedback register. SRW to accept the updated REPP.	TBA	In progress	On track	Barwon Water submitted changes to SRW on 30th September. SRW to provide feedback to BW post discussions with their CLG and ITRP. Feedback from the Remediation Reference Group will also be factored into the finalisation of the REPP updates
12.0	Submit annual report to SRW and publish to website	30-Sep-20	Complete	Complete	Complete

#	Activity	Due Date	Status	Health Indicator	Comments
13.0	Remediation Reference Group Meeting	2-Dec-20	Complete	Complete	Very positive first meeting. Most members could attend. BW received positive feedback for the work being completed so far, noting there is still a lot of work to be done. Suggestions for surrounding environment investigations were provided as well as comments on proposed REPP changes to address feedback
14.0	Establish vegetation baseline monitoring for Boundary Creek and Big Swamp Remediation Plan:	31-Dec-20	Complete	Complete	Baseline monitoring begun on the 25th of November and is now complete - ELA completed this work.
15.0	Update groundwater-surface water model	31-Dec-20	Complete	Complete	Feedback from SRW on methodology was received on 18/11 and 18/12 which assisted the modelling process Model calibration is complete and hydraulic barrier locations and configurations tested.
16.0	Update geochemical model:	Apr-21	In progress	Rescheduled	RFQ released in December Will be delivered later than initially scheduled, no impact on critical path for detailed design at this stage
17.0	Complete stage 1 detailed design for Boundary Creek and Big Swamp Remediation Plan: - obtain / progress permits		In progress	On track	RFQ currently being developed.
18.0	Submit quarterly report to SRW and publish to website	31-Dec-20	Complete	On track	
19.0	Remediation Reference Group Meeting	Mar-21	Not started		
20.0	Submit quarterly report to SRW and publish to website	31-Mar-21	Not started		
21.0	Infill the existing fire trenches and the agricultural drain at the eastern end of the swamp to allow the swamp to retain more water over the winter months: - obtain necessary permits and approvals - engage contractor - undertake works	30-Apr-21	Not started		Infilling of the fire trenches likely to be undertaken in conjunction with installation of hydraulic barriers
22.0	Remediation Reference Group Meeting	Jun-21	Not started		

#	Activity	Due Date	Status	Health Indicator	Comments
23.0	Submit quarterly report to SRW and publish to website	30-Jun-21	Not started		
24.0	Complete feasibility assessment for in-stream contingency measures	31-May-21	Not started		
25.0	Complete stage 2 detailed design: - specification to confirm size, location and construction requirements for hydraulic barriers	31-May-21	Not started		
26.0	Submission of detailed design of the hydraulic barriers outlining proposed controls or actions and any revisions to success measures/targets. SRW to accept the detailed design, including proposed actions, controls, and success measures/targets.	31-Jul-21	Not started		
27.0	Remediation Reference Group Meeting	Sep-21	Not started		
28.0	Submit annual report to SRW and publish to website	30-Sep-21	Not started		
29.0	Remediation Reference Group Meeting	Dec-21	Not started		
30.0	Submit quarterly report to SRW and publish to website	31-Dec-21	Not started		
31.0	Construction of hydraulic barriers: - engage consultants and contractors - undertake construction	31-Mar-22	Not started		
32.0	Remediation Reference Group Meeting	March 2022	Not started		
33.0	Submit quarterly report to SRW and publish to website	31-Mar-22	Not started		
34.0	Remediation Reference Group Meeting	June 2022	Not started		
35.0	Submit quarterly report to SRW and publish to website	30-Jun-22	Not started		
36.0	Conclusion of monitoring period for Surrounding Area Investigation enabling the capture of a full seasonal cycle of data (12 month minimum) to inform updates to the groundwater-surface water model and geochemical model.	31-Jul-22	Not started		
37.0	Remediation Reference Group Meeting	Sept 2022	Not started		

#	Activity	Due Date	Status	Health Indicator	Comments
38.0	Submit quarterly report to SRW and publish to website	30-Sep-22	Not started		
39.0	Update regional groundwater model or build new local scale groundwater models for the Surrounding Investigation Area 'high' risk sites to assess magnitude of impact as a result of historic groundwater management.	31-Oct-22	Not started		
40.0	Remediation Reference Group Meeting	Dec-2022	Not started		
41.0	Submit quarterly report to SRW and publish to website	31-Dec-22	Not started		
42.0	Review risk assessment for 'high' risk areas for the Surrounding Area Investigation to confirm risk rankings based on updated groundwater model/s		Not started		
43.0	Remediation Reference Group Meeting	March 2023	Not started		
44.0	Submit quarterly report to SRW and publish to website	31-Mar-23	Not started		
45.0	Remediation Reference Group Meeting	June 2023	Not started		
46.0	Submit quarterly report to SRW and publish to website	30-Jun-23	Not started		
47.0	Outcomes of the Surrounding Area Investigation to be provided to Southern Rural Water to determine if further remedial works is required. SRW to decide if further action is required.	31-Jul-23	Not started		
48.0	Remediation Reference Group Meeting	Sept 2023	Not started		
49.0	Submit annual report to SRW and publish to website	30-Sep-23	Not started		
50.0	Remediation Reference Group Meeting	Dec 2023	Not started		
51.0	Submit quarterly report to SRW and publish to website	31-Dec-23	Not started		