NSW GOVERNMENT

NSW Resources Regulator

COMPLIANCE AUDIT PROGRAM – SUBSIDENCE MANAGEMENT

METROPOLITAN COLLIERY

Metropolitan Collieries Pty Ltd

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Contents

1. Introduction

1.1. Background

Metropolitan Colliery operates in Consolidated Coal Lease 703 (CCL703) and Mining Lease 1610 (ML1610) in the southern coalfield of NSW. Both leases are held by Metropolitan Collieries Pty Ltd.

Longwall panel 23 (LW23) was one of a series of panels (LW20 – LW27) that has been progressively mined at Metropolitan over the last 15 years. LW23 was split into two sections – LW23A and LW23B. Waratah Rivulet flowed in the unmined area between the two panel sections.

LW23A was commenced in May 2014 and was completed in March 2015. Although not directly undermining Waratah Rivulet, LW23A did undermine a section of Tributary B. Potential impacts resulting from the underground mining in LW23-LW27 included:

- surface cracking
- changes to pool water levels
- leakage through rock bars.

A subsidence monitoring program was established to collect and analyse data for these impacts. Data analysis included a comparison between the actual observed impacts and the predicted impacts. This information has been used to refine subsidence modelling for future panels.

As part of the compliance audit program undertaken by the NSW Resources Regulator, an audit of subsidence management activities associated with the Metropolitan Colliery was undertaken on 26 February 2020.

1.2. Audit objectives

The objectives of the audit were to:

- undertake a compliance audit of the Metropolitan Colliery, operated by Metropolitan Collieries Pty Ltd, against the requirements of the *Mining Act 1992*, the conditions of the mining leases and associated subsidence management approvals issued pursuant to that Act, in relation to the management of subsidence impacts

- assess the operational performance of the mining operations in relation to subsidence management and the ability of the title holder and/or operator to implement adaptive management and controls to provide for sustainable management of the operations.

1.3. Audit scope

The scope of the audit included:

- The Metropolitan Colliery mining operations and the areas above the longwall panels, focussing on longwall panel 23A (LW23A).
- A review of documents and records pertaining to the mining, subsidence management and rehabilitation activities associated with LW23A.

1.4. Audit criteria

The audit criteria against which compliance was assessed included:

- relevant conditions related to subsidence management attached to ML1610, granted on 12 February 2009
- relevant conditions related to subsidence management attached to CCL703, renewal dated 1 April 2004
- conditions attached to Subsidence Management Plan approval for Metropolitan Mine LW23A within ML1610, issued by the (then) Department of Trade and Investment, Regional Infrastructure and Services, dated 11 April 2014, specifically Conditions 6, 9, 12, 13, 16 and 18
- conditions attached to Metropolitan Colliery Longwall Panels 23A, 23B and 24 within CCL703, approval of Subsidence Monitoring Program, issued by the (then) Trade and Investment Mine Safety, dated 27 May 2014 including:
  - commitments made in the Metropolitan Coal Longwalls 23 – 27 Subsidence Monitoring Program, Revision SMP-R01-B, dated April 2014.
- conditions attached to the approval for the Metropolitan Colliery, Longwall 23A Environmental Management Plan and associated subplans, issued by the (then) Division of Resources and Energy, dated 15 April 2014 including:

- commitments made in Metropolitan Coal Land Management Plan Longwalls 23 to 27, dated September 2013 (LMP-R01-B)
- commitments made in Metropolitan Coal Water Management Plan Longwalls 23 to 27, dated September 2013 (WMP-R01-B).

1.5. Publishing and disclosure of information

This audit report will be published on the NSW Resources Regulator's website consistent with Section 365 of the *Mining Act 1992*.

This audit report may be publicly disclosed consistent with the *Government Information (Public Access) Act 2009*.

2. Audit methods

The audit process involved the interview of site personnel, a review of documentation and samples of records provided by the title holder and/or operator and a site inspection of the operations to determine the level of compliance of the operations and assess the status of the operational performance. The audit process and methodology are described in more detail in the sections below.

2.1. Opening meeting

The opening meeting was held onsite at the Metropolitan Colliery office on 26 February 2020. The audit team was introduced and the scope of their responsibilities was conveyed to the auditees. The objectives and scope of the audit were outlined. The methods to be used by the team to conduct the audit were explained, including interview of personnel, review of documentation, examination of records and a site inspection to assess specific compliance requirements.

2.2. Site interviews and inspections

2.2.1. Data collection and verification

Where possible, documents and data collected during the audit process were reviewed on site. All information obtained during the audit process was verified by the audit team, where possible. For example, statements made by site personnel were verified by viewing documentation and/or site inspections where possible. Where suitable verification could not be provided, this has been identified in the audit findings as not determined.

2.2.2. Site inspections

A site inspection was undertaken of the following impact sites over LW23A and associated panels:

- Waratah Rivulet – Pool F rock bar remediation
- Waratah Rivulet – reaches between Pool F and Pool N
- Tributary B Pool RTP2
- Swamp 16/17, including shallow groundwater monitoring well.

An inspection of cliffs and overhangs 3/4 could not be completed due to high water levels in the rivulet which prevented access.

2.3. Closing meeting

The closing meeting was held onsite at the Metropolitan Colliery office on 26 February 2020. The objectives of this meeting were to discuss any outstanding matters, present preliminary findings and outline the process for finalising the audit report.

2.4. Compliance assessment definitions

The reporting of results from the compliance audit was determined based on the definitions presented below in Table 1.

Table 1 Audit assessment categories

ASSESSMENT	CRITERIA
Compliance	Sufficient and appropriate evidence is available to demonstrate the particular requirement has been complied with.
Non-compliance	Clear evidence has been collected to demonstrate the particular requirement has not been complied with. There are three subcategories of non-compliance reflecting the severity and level of risk associated with the non-compliance: **NC1** – the absence of planning or implementation of a required operational element which has the potential to result in a significant risk. **NC2** – an isolated lapse or absence of control in the implementation of an operational element which is unlikely to result in a significant risk.

ASSESSMENT	CRITERIA
	NC3 – an administrative or reporting non-compliance which does not have a direct environmental or safety significance. Note: The identification of a non-compliance in this audit may or may not constitute a breach of, or offence under, the Mining Act 1992. Non-compliances identified in this audit report may be further investigated by the Regulator and regulatory actions may be undertaken.
Observation of concern	Where an auditee may be compliant at the time of the audit, but there are issues that exist that could result in the potential for future non-compliance if not addressed. Observation of concern was also used where an issue may not have particular compliance requirements, but which was not conducive to good management or best practice.
Suggestion for improvement	Where changes in processes or activities inspected or evaluated at the time of the audit could deliver improvement in relation to risk minimisation, sustainable outcomes and management practices.
Not determined	The necessary evidence has not been collected to enable an assessment of compliance to be made within the scope of the audit. Reasons why the audit team could not collect the required information include: ■ insufficient information on the file relating to the period covered by the audit or insufficient evidence collected to reach a conclusion ■ the wording on the criteria (approval condition) meant that no evidence could be gathered, or it was too difficult to gather the evidence. A 'not determined' assessment was also made where the condition was outside of the scope of the audit.
Not applicable	The circumstances of the authorisation or title holder have changed and are no longer relevant (e.g. no longer mining, mining equipment and plant have been removed). An invoking element in the criteria was not activated within the scope of the audit.

2.5. Reporting

Following completion of the site audit, the audit checklists were completed and audit notes were reviewed to compile a list of outstanding matters to be noted in the audit report. This report was prepared to provide an overview of the operational performance of the site in relation to the mining operations and identify any non-compliances or observations of concern noted by the auditors during the site inspections and interviews.

The draft audit findings were forwarded to Metropolitan Collieries for comment. Consideration was given to the representations made during the finalisation of the audit report, as discussed in the audit findings.

3. Audit findings

3.1. Subsidence management plan

Metropolitan Collieries submitted a subsidence management plan (SMP) application for LW23A on 16 September 2013 in accordance with Condition 8 of ML1610 and Condition 61 of CCL703. The SMP application was approved by the (then) Department of Trade and Investment, Regional Infrastructure and Services – Resources and Energy on 11 April 2014. The approved plan was DRG No. M130910/1 titled 'Metropolitan Mine Approved LW23A Proposed Extraction in accordance with (ML1610)'.

Information contained in the 2015 annual environmental management report indicates that LW23A was generally carried out in accordance with the SMP approval and approved plan. No evidence was sighted during the site inspection to indicate that LW23A was not carried out generally in accordance with the approval.

3.2. Environmental management plan and associated subplans

Condition 13 of the SMP approval required the lease holder to prepare and submit for approval an environmental management plan to address the management of subsidence impacts on a range of natural features. Metropolitan Coal prepared and submitted an environmental management strategy and a range of subplans that comprised the Environmental Management Plan for the purposes of this condition:

- water management plan, Revision WMP-R01-B September 2013
- land management plan, Revision LMP-R01-B September 2013

- biodiversity management plan, Revision BMP-R01-B September 2013
- heritage management plan, Revision HMP-R01-B August 2013.

The plans comprising the Environmental Management Plan were approved by the (then) Department of Trade and Investment, Regional Infrastructure and Services – Resources and Energy on 15 April 2014. The scope of the audit only included assessment of the implementation of the Water Management Plan and the Land Management Plan for LW23A.

Each of the water and land management plans included a trigger action response plan (TARP) which provides actions where subsidence monitoring indicators are exceeded.

Although there were no formal systems in place for monitoring the implementation of the management plans, there was no evidence sighted during the site inspection to indicate that the plans had not been implemented. Inspection records and monitoring data reviewed during the audit, generally confirmed that monitoring was conducted during the extraction of LW23A to determine whether impacts were generally in accordance with the subsidence predictions.

3.3. Subsidence monitoring program

Condition 12 of the SMP approval required the lease holder to submit to the principal subsidence engineer for approval a subsidence monitoring program for the panels to be extracted. Metropolitan Collieries prepared and submitted Metropolitan Coal Longwalls 23 to 27 - Subsidence Monitoring Program, Revision B, dated April 2014. This monitoring program was approved by the principal subsidence engineer on 30 April 2014. The program was subsequently modified by Metropolitan with the modification approved the principal subsidence engineer on 27 May 2014.

Subsidence monitoring was also documented in the Water Management Plan and Land Management Plan in relation to impacts on cliffs and overhangs, steep land, surface and groundwater, and swamps.

Generally, evidence was available in the form of surveys and monitoring data to indicate that the subsidence monitoring program was substantially implemented. For example:

- Water management plan section 7.2 – visual inspections and photographic surveys were conducted monthly along Waratah Rivulet, Eastern Tributary, Tributary A and Tributary B. These inspections were undertaken by a contractor to the mine (Brienan Environment & Safety). Results of the visual inspection and photographic survey were documented in a spreadsheet provided by the contractor. Examples of reporting spreadsheets were reviewed by the audit team (i.e. report dated 17 January 2017).
- Three months after the completion of each longwall panel, detailed surveys and photographic records were completed of each stream. The stream mapping completed at the

end of LW23A was available for review. Stream mapping following completion of earlier and later panels was also available for review, providing a comprehensive inventory of the streams and impacts.

- Water management plan section 7.3.2 – continuous water level sensors and loggers were observed in several of the pools inspected between Pool F and Pool O in Waratah Rivulet, and at site RTP2 in Tributary B. Water level data from these loggers was available and was noted to be included in the Annual Environmental Management Report (AEMR) each year.
- Water management plan sections 7.5.2 and 7.5.3 - A network of shallow and deep groundwater monitoring piezometers had been installed, including a series of swamp groundwater level sites. For example, the shallow groundwater monitoring piezometer at Swamp 16/17 was inspected during the site inspection.
- Subsidence monitoring program section 6.2 - Survey marks along Waratah Rivulet were sighted during the audit site inspection. Survey data was available.

It should be noted that the scope of the audit only focussed on the environmental subsidence monitoring and did not review monitoring data for infrastructure or public safety.

3.4. Impact analysis and remediation

At the completion of each longwall, detailed analysis of monitoring data was compiled and reported in the AEMR. For example, section 6.1 of the 2015 AEMR provided an analysis of surface water flows and pool water levels, water quality, groundwater levels, upland swamp vegetation monitoring, and riparian vegetation monitoring. Section 6.1.8 provided an assessment of environmental performance against the performance indicators and the performance measures.

Remediation works to address subsidence related impacts in Waratah Rivulet had been undertaken. Given the passage of time since the completion of LW23A and others in that series, the audit provided an opportunity to review the longer-term success of the remediation measures. Inspection of a stretch of Waratah Rivulet between Pool F and Pool O was undertaken during the audit with the following observations made:

- Remediation of the rock bar at Pool F had been completed and appeared to be effective in holding water within the pool, with water flowing over the rock bar at the time of inspection. (refer to Figure 1 and Figure 2). A completion report for the rock bar remediation works was prepared and available for review during the audit.

- Remediation of the rock bar at Pool G had been completed. Pool G was holding water at the time of the inspection, but a review of monitoring data showed that it had dropped below cease-to-flow levels on occasion since the remediation works, indicating that further remediation may be required.
- Pool I was observed to have some surface cracking, but water was flowing freely with no remediation having been required (refer to Figure 3 and Figure 4).
- Water was observed to be flowing through Pool J (refer to Figure 5). Rock ledges adjacent to Pool J appeared stable with limited signs of rock fall (refer to Figure 6).
- Monitoring data and interviews with Metropolitan staff showed that Pool N had drained during extraction of longwalls but has since recharged following a significant rainfall event some years ago and has held water since (refer to Figure 7). This may indicate that the pool had settled into its new regime following subsidence, however, further monitoring would be required to determine whether remediation work was required. Water was flowing freely over the small waterfall between Pool N and Pool O (refer to Figure 8).

Figure 1 Waratah Rivulet Pool F

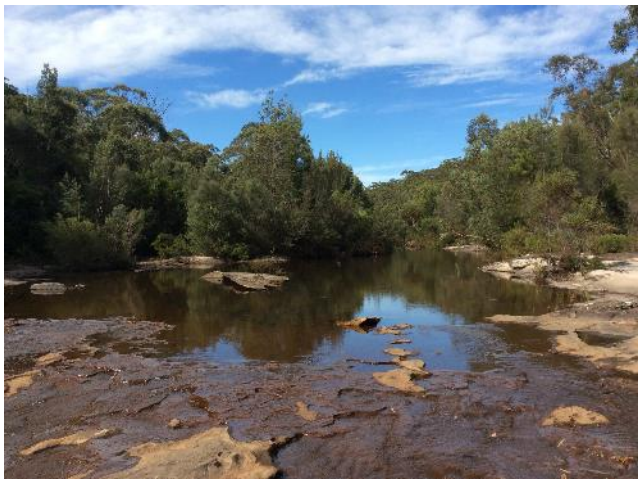


Figure 2 Water flowing over Pool F rock bar

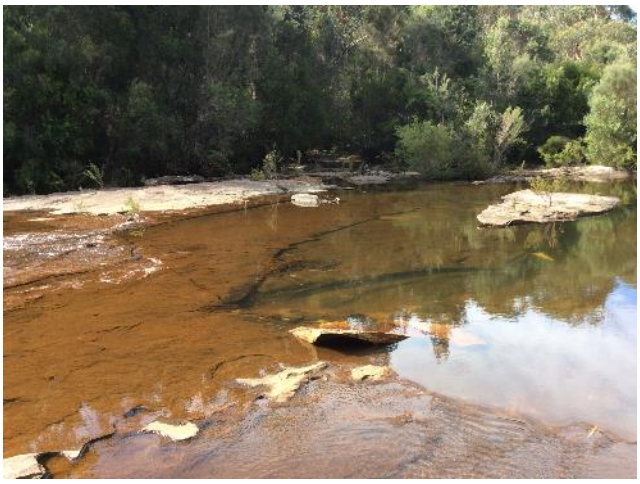


Figure 3 Waratah Rivulet Pool I

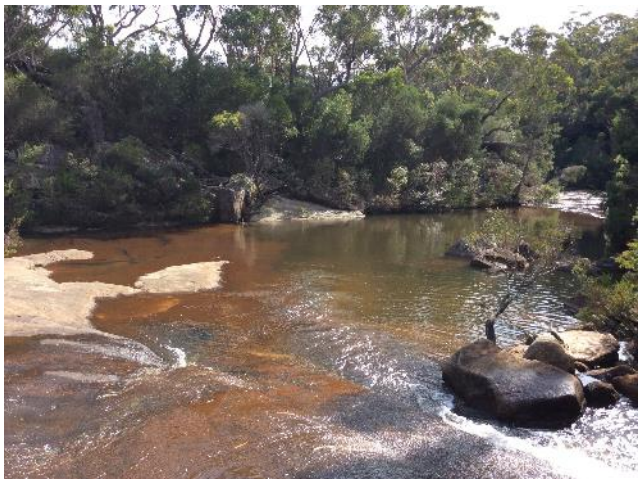


Figure 4 Example of surface cracking in Pool I rock bar

Figure 5 Waratah Rivulet Pool J

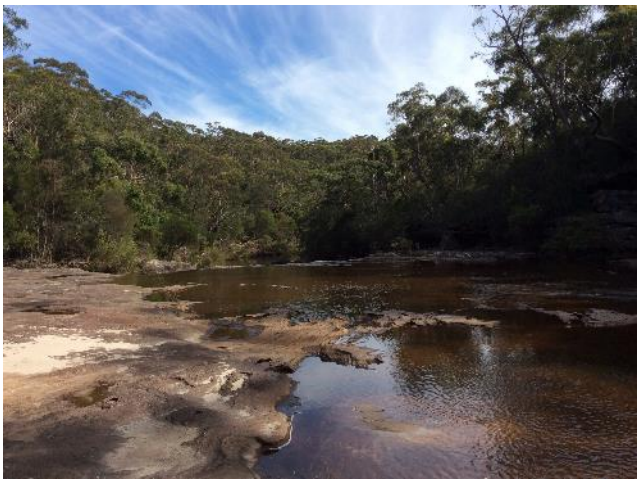


Figure 6 Rock ledges adjacent to Pool J

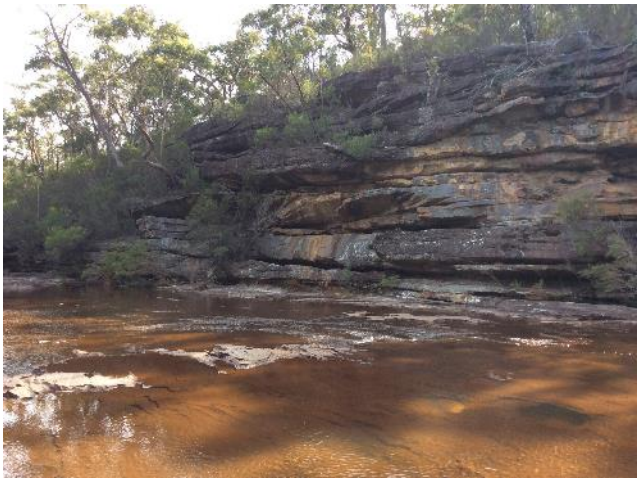


Figure 7 Waratah Rivulet Pool N

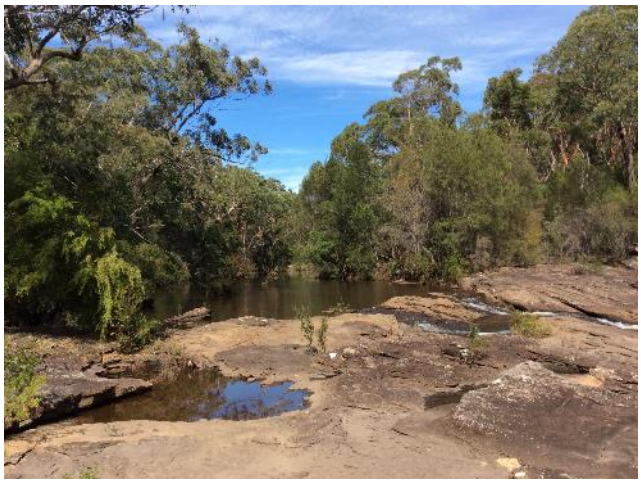
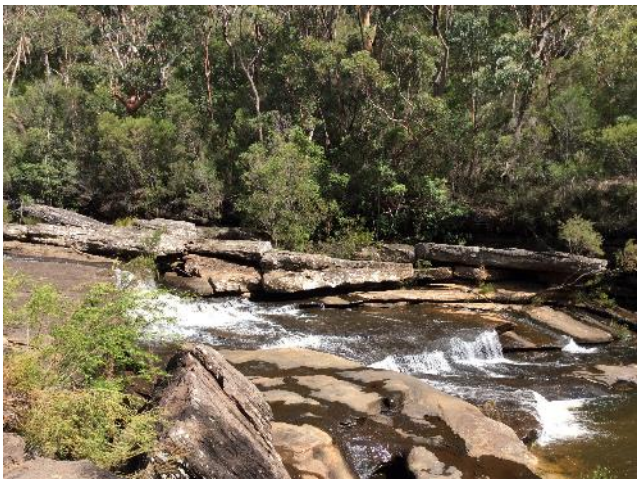


Figure 8 Small waterfall between Pool N and Pool O



Tributary B was dry at the time of the audit (refer to Figure 9 and Figure 10), but Metropolitan staff advised that this stream was intermittent and generally only flowed after a significant rainfall event. No specific remediation was proposed for site RTP2.

Figure 9 Tributary B Pool RTP2 looking downstream

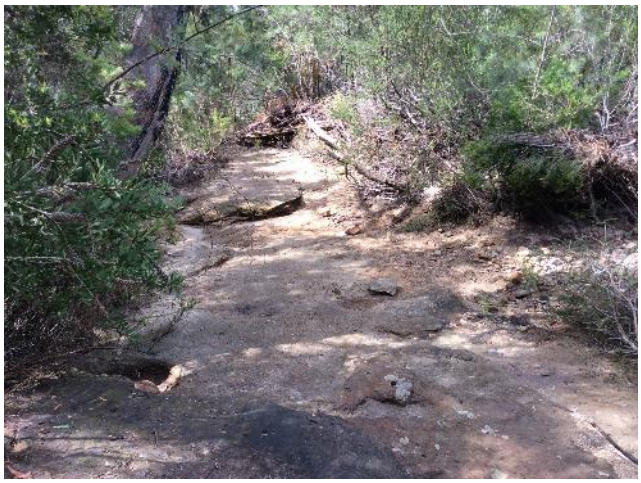
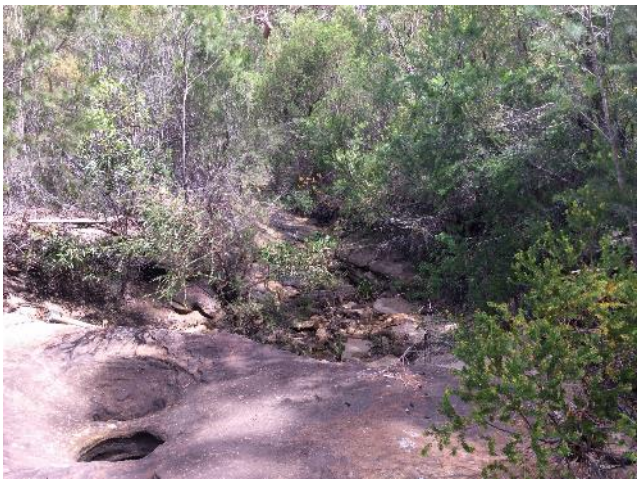


Figure 10 Tributary B Pool RTP2 looking upstream



3.5. Adaptive management

Interviews with Metropolitan staff indicated a good adaptive management approach for the management of environmental impacts associated with longwall extraction. Data gained during the extraction of previous panels was used to refine the modelling and prediction of impacts for future panels. Evidence was available to demonstrate that mining operations have been modified as a result of the refined modelling and monitoring to reduce the potential for impacts. For example, as a result of the impacts to Eastern Tributary, subsequent panels have included the requirement for a standoff of 450 metres from the lower end of Eastern Tributary. Similarly, one longwall was pulled up 100 metres short of the intended finish to prevent further impacts to Eastern Tributary and avoid exceeding the performance criteria.

Current and previous longwalls have used a 163-metre panel width with 50-metre pillars. Based on the refined modelling and predictions, Metropolitan Coal will proceed with narrower longwall panels (138 metre) and wider pillars (70 metre) for the mining under Woronora Reservoir. Use of the narrower panels and wider pillars should reduce the maximum subsidence at the surface to 400 millimetres or less.

3.6. Reporting

3.6.1. Status reports

Condition 17 of the SMP approval required the lease holder to prepare and maintain a subsidence management status report. This report was not required to be submitted to the Regulator but was required to be provided upon request. Interview with Metropolitan staff indicated that subsidence status reports have not been requested to be provided. A search of the Regulator's records also confirmed that no subsidence status reports had been requested by the principal subsidence engineer.

In relation to the environmental impacts of subsidence, it was noted that catchment status reports, which provide a similar level of detail to the status reports required under Condition 17, have been maintained and submitted by Metropolitan:

- Metropolitan Coal Environmental Management Status Report Catchment Area May to June 2014 (INW14/33945)
- Metropolitan Coal Environmental Management Status Report Catchment Area July to August 2014 (INW14/41482)

- Metropolitan Coal Environmental Management Status Report Catchment Area September to October 2014 (INW14/52850).

Interviews with Metropolitan staff confirmed that subsidence monitoring surveys were uploaded to the Regulator's subsidence portal within 48 hours of completion.

3.6.2. Incident reporting

Metropolitan did not advise of any subsidence-related incidents for the environmental management aspects related to the Land Management Plan or the Water Management Plan during the extraction of LW23A. Data reviewed showed that while a small section of cliff or overhang did collapse as a result of the extraction of LW23A, it did not exceed the performance measure of less than 3% of the total length of cliffs within the mining area experiencing mining induced rockfall.

To avoid exceedances of the performance measures, Metropolitan established a series of subsidence impact performance indicators as an early warning trigger for further investigation and/or management action for each of the subsidence impact performance measures specified in the management plans. As documented in Table 8 of the 2015 AEMR, the performance indicator for water quality reaching Woronora Reservoir was triggered during the mining of LW23 to LW27. However, further investigation by Hydro Engineering and Consulting Pty Ltd indicated that the performance measure had not been exceeded.

3.6.3. End of panel report

End of panel reporting was not a specific requirement of the SMP approval for LW23A. However, it was noted that end of panel reports had been prepared.

3.6.4. End of year report

Metropolitan Coal has not prepared a separate standalone end of year report, but has included a detailed section on subsidence assessment and monitoring in the annual environmental management report (AEMR). For example, Section 6.1 of the 2015 AEMR includes results from subsidence monitoring including surface water flows and pool water level monitoring, water quality data, groundwater levels, swamp vegetation monitoring and land management. Section 6.1.8 provides a discussion on the assessment of environmental performance against the subsidence impact performance measures.

3.7. Title holder response to draft audit findings

Metropolitan Collieries was provided with a copy of the draft audit report and invited to submit a response to the draft audit findings. In an email received by the Regulator, Metropolitan Collieries advised that it had no specific comments on the draft report.

4. Audit conclusions

From the evidence reviewed during the audit, and observations made on site during the audit site inspections, it was concluded that Metropolitan Collieries Pty Ltd has achieved a high level of compliance with the requirements of the SMP approval and environmental management plans associated with the management of subsidence impacts at the Metropolitan Colliery.

Evidence was available to confirm the implementation of the subsidence monitoring program, including survey data, inspection reports, monitoring data and detailed stream mapping at the completion of each panel. Evidence was also available to demonstrate assessment of cumulative impacts associated with a series of panels, and an adaptive management approach that was founded on an analysis of monitoring data from previous panels and refinement of subsidence models.

No non-compliances were identified for the subsidence management activities subject to audit.