



Avoca - Tigroney 850 Adit
Ground Support Rehabilitation
Follow up visit
August 2025

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Introduction

Lisheen Technical Mining Services (LTMS) was requested by MKO to assess the stability of the ground and support of the Tigroney 850 Adit at the now closed Avoca mines.

The scope of works was to examine the effectiveness of the rehabilitation works of the first 85m of the adit carried out in June 2020 and examine the remaining 620m of the adit for ground stability, deteriorating supports or additional water inflows. The scope of works was to examine the effectiveness of the rehabilitation works of the first 85m of the adit carried out in June 2020 and examine the remaining 620m of the adit for ground stability, deteriorating supports and/or additional water inflows.

The assessment was carried out on the 19th of August, accompanied underground by Colin Fitzgerald (MKO), with Jon Hunt (MKO) providing oversight and safety watch in overcast and humid weather conditions.

The adit was examined with the excavation divided into zones as identified in the rehabilitation works program.

Prior to carrying out the task the revised and updated risk assessment was discussed, reviewed and agreed by all parties taking part in the examination.

Zone 1 (0 – 11m)

This zone was rehabilitated by a cut and cover method with filling behind untreated timber lagging, supported by a steel frame. The steel arch feet were placed in concrete plinths to negate the corrosive effects of the low pH water outflow.

The water flow was diverted into an underfloor drain via a pipe to the Deep Adit below with no running water on the floor of this zone.

The bulging of some of the steel arches with offsets and displacements of the timber lagging in sections of the north sidewall continues, photo 1.

The leaking water and suspected overflow from the adit itself are causing severe corrosion of the steel footings particularly the retaining nuts, photo 2.



The grill allowing the piped water flow to the Deep adit level is significantly reduced in area by an encrusted ochre covering, photo 3.

This restriction causes the acid rich water to overflow at times contributing to the corrosion of the steel arches.

It is suspected that water pressure is building up during periods of heavy precipitation and exerting pressure on the timbers and steel frame. This action will continue with failure of the lagging and steel frame displacement as saturation of the backfilled area occurs.



Photo 3: Grill restricted by Ochre

As an immediate measure It is recommended that

- 1. The grill be cleaned to allow the full flow into the lower Deep Adit.*
- 2. A sandbag barricade (0.5m high) be constructed before the timbered area to prevent overflow into the front Zone 1.*
- 3. A series of small diameter holes be drilled into the lower sidewalls to allow drainage and relieve any hydrostatic pressures.*

Longer term it would be advisable to insert drainage pipes in the backfill to channel the water to the outside on the north side and construct an impervious wall behind the steel arches.

Zone 2 (11m – 33m)

The original timber supports are in a very poor condition and were mainly left in place and supplemented with regular spaced steel sets. The supports are encased behind a grout filled shutter with the roof cross beams sprayed in shotcrete.

There has been a significant increase in wet conditions in this zone with the entire roof and walls now damp and covered in small stalactites, photo 4.

The steelwork where exposed had some small local iron staining on the cross beams but now shows severe corrosion, photo 5.

The floor previously almost dry is now under 5-10cm of water that will erode away the gravel floor and deteriorate the lower surface concrete with time.

It is unlikely that this change over the last 14 months was a one off event and is likely to persist and will require remedial measures in the near future.



Photo 4: Zone 2 – Water ingress

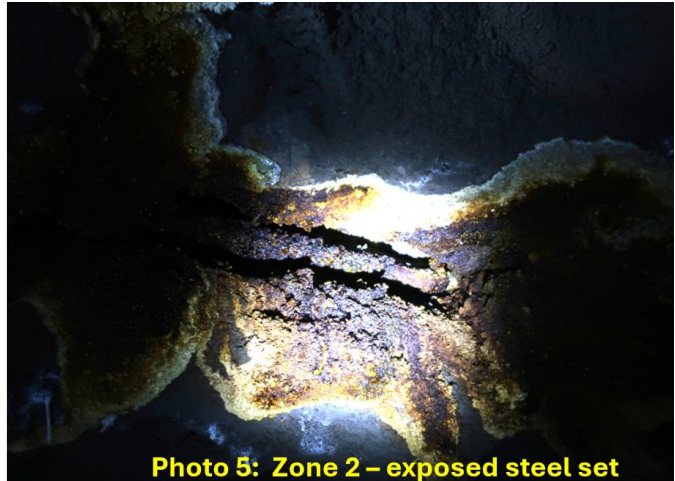


Photo 5: Zone 2 – exposed steel set

Zone 3 (33m – 44m)

This zone is highly jointed and fractured but is competent and supported with fibre bolts and shotcrete. A large 2m wide gouge fault was intersected in the south sidewall that required draining, profiling and shotcreting to prevent plastic deformations. A large 2m wide gouge fault was intersected in the south sidewall that required draining, profiling and shotcreting to prevent plastic deformations and this was completed during the geotechnical rehabilitation.

There is no evidence of additional water ingress from either the sidewalls or roof.

The drain holes installed show no flows and have dried out with only occasional damp patches showing, photo 6.

The floor is now under water due to overflow from the dam site.

The shotcrete shows no indications of deterioration, and the bolt/ bearing plates show no signs of movement.

The zone remains unchanged well supported and stable.



Zone 4 (44m – 53m)

This zone traverses a series of geological faults running oblique to the trend of the adit and required extensive systematic supporting with steel sets and blocking of overhead voids. This zone traverses a series of geological faults running oblique to the trend of the adit and required extensive systematic supporting with steel sets and blocking of overhead voids, all of which was completed during the rehabilitation.

There has been no deterioration in the installed support and no indications of running water, but the floor is now wet with overflow from the dam.

Several sections of the roof are damp causing the widespread growth of stalactites.

It would be possible to completely seal these voids and secure the steel and timber arches in this section by scaling and cleaned back the affected area and pressure grout fill the voids. A series of short drainpipes would need to be installed to prevent possible water buildup.

Zone 5 (53m – 78m)

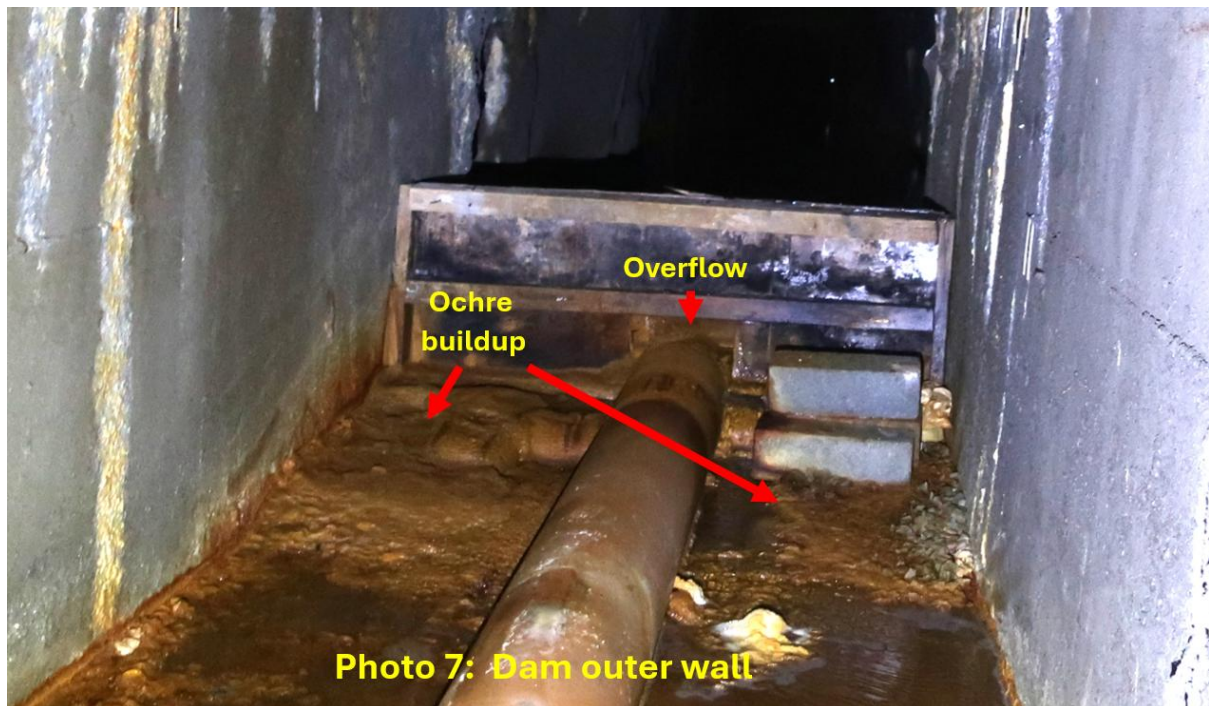
This area is in competent but jointed ground and supported by timber sets that are in moderate condition.

Additional steel sets were installed and the timber/steel shotcreted in place. Additional steel sets were installed and the timber/steel shotcreted in place during the rehabilitation.

There has been no deterioration of ground conditions or the support. The floor is now wet with the water covering the pipe along the floor.

The outer dam wall consisting of a timber frame wedged to a shuttered section of the wall is now partly under water.

The overflow exits through the hole cut for the outflow pipe, photo 7. A large amount of ochre is building up indicating a regular overflow of the pipe.



Over time it is likely that the timber frame will deteriorate with a buildup of ochre between the sandbag dam and timber wall rotting the structure as it becomes the principal means of restraining a rising head of water behind.

Consideration should be given to replacing the timber frame with a designed wall anchored to the sidewalls.

Zone 6 (78m – 85m)

This zone comprises strongly foliated moderately altered rock and is supported with fibre bolts and shotcrete.

No deterioration of either the ground or support system has occurred.

The dam wall is now under pressure with overflowing water from the sandbag dam.

The outflow pipe is now submerged having been at approximately 55% of the pipe diameter capacity in June 2024, up from 40% capacity in 2023 (photos 8 & 9).

There has been a very noticeable increase in ochre buildup on floors behind the dam and in the pipe itself.

There has been an increase in timber beams being washed down from further up the adit that are obstructing the outflow.

There is no indication that these timbers are from the adit support system with the conclusion that they are from the flooded stopes and moved by rises in water levels following heavy rains or perhaps washed down from the shafts at the back end of the adit.



Photo 8: Outflow pipe – JUNE 2024



Photo 9: Outflow pipe – AUGUST 2025

It is suggested that maintenance work be carried out on the sandbag dam and outflow pipe, principally to remove the debris, clean out the ochre build-up and install a mesh screen to prevent smaller loose timbers blocking the pipe.

Due to an increase in water levels (unsure if this is seasonal) the sandbag dam should be raised to prevent the overflow on the adit floor.

Conclusions on Sections 1 to 6

There has been no ground deterioration and the rehabilitation support works undertaken by QME in the adit in 2020 are performing well. However, a significant increase in dampness in Zone 2 will have a detrimental effect on the long-term stability of this section.

A maintenance program to manage the grill and dams is necessary to control the water flow and maintain access to the adit.

Adit Assessment (from 85m onwards)

There has been no major deterioration in either ground conditions or the timber supports in the remaining length of the adit.

The water level appears to be slightly higher and is now at almost at the limits of the protection provided by the waders.

The condition of the timber supports (ca. 115m in total) is good with the posts and cross beams in good condition.

The blocking between the posts both in the sidewalls and roof is either softwood planking or poles. However, these have been largely submerged in water for several years as the adit was submerged to the roof.

As the timber support remain dry, they will further weaken, particularly the untreated poles with fungi causing a noticeable deterioration in conditions, eventually failure. In many areas these timbers are already rotten and with time will fail causing the loose/ broken ground

being retained to collapse into the adit. This could possibly block certain sections of the adit and restrict the water outflow.

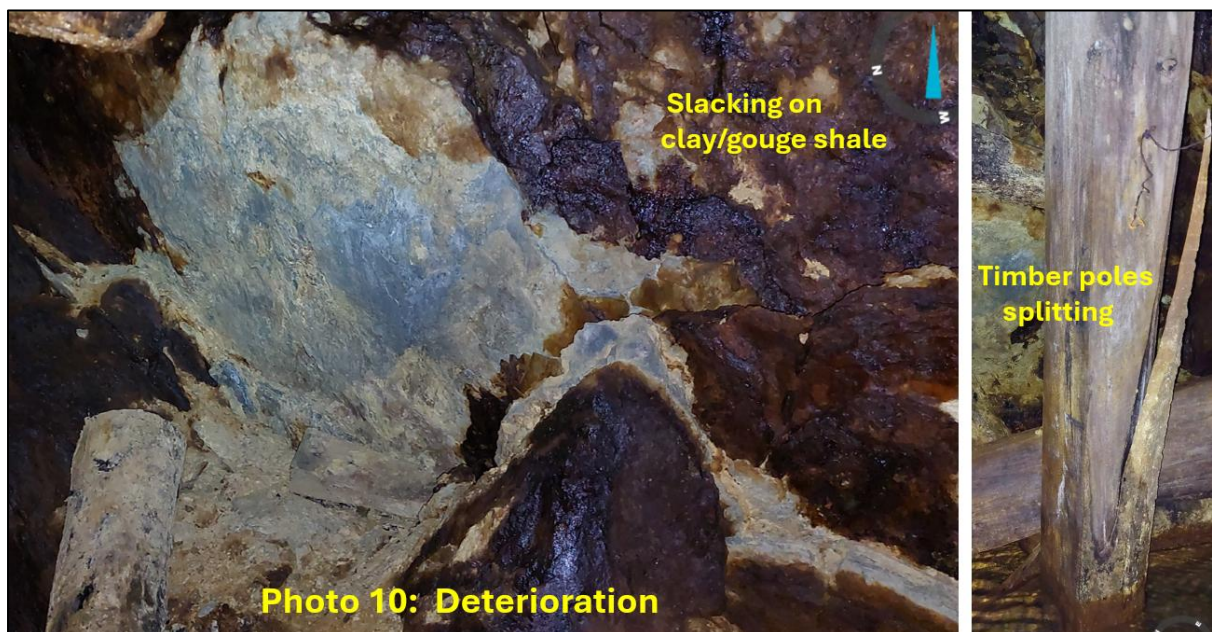
It would be sufficient to encase the legs in concrete and seal the timber with shotcrete to ensure the long-term stability of these areas.

Some sections of lagging, where under constant water inflow, should be repaired by replacing with either steel beams shotcreted in place or galvanised sheet cover and replaced lagging. Water control measures in the form of drainage pipes will also be necessary.

The area between station 210 and 350 passes alongside extensive mined out stopes with very small pillars separating the open voids from the adit.

The nearby mining and small pillars have caused moderate rock damage with loosening of the rock and formation of wedges.

There is evidence of slackening of the shale rock pillars along clay/gauge filled contacts with some small-scale failures and pole cracking, photo 10.



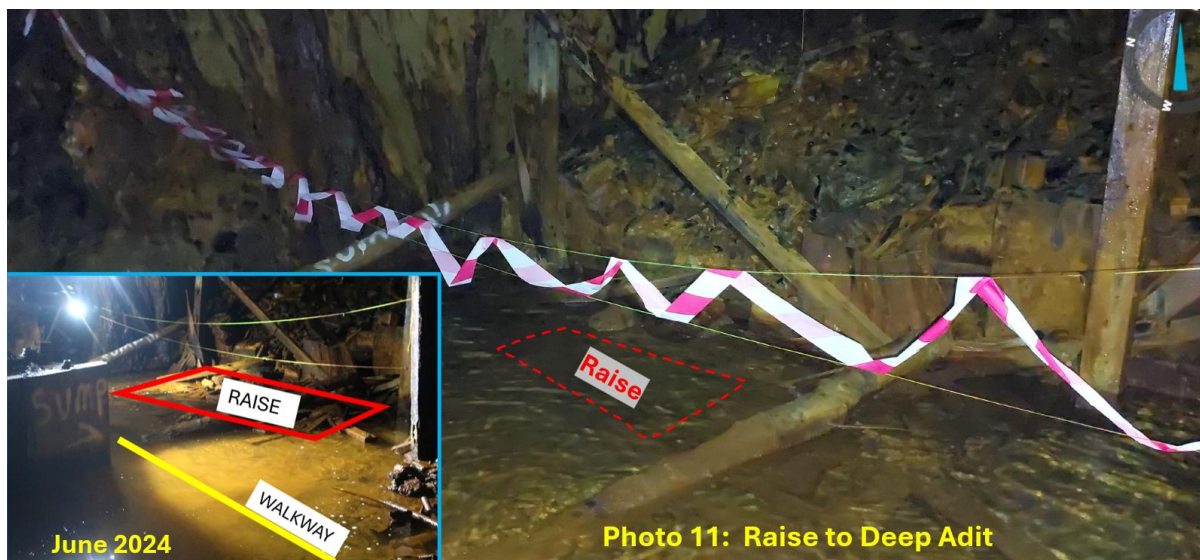
In some areas the loose rock is supported by bolts that must now be considered ineffective. Although the area is currently accessible it should be considered unstable and traversed quickly.

To ensure safe and continuous access a support regime should be installed including scaling to solid rock, shotcrete to close joints and give surface bonding and bolting to secure wedges and large blocks of loose.

A 3-4m long timber launder in the centre of the adit at approximately 390m forces people to walk a narrow path on the south side of the drive.

This exposes them to a submerged and uncovered raise to the lower levels with the risk of falling into a deep void.

As a temporary measure the area was marked off with reflective tape, photo 11.



The marking of the area with painting 'SUMP' or tape is not sufficient to prevent unintentional access.

It is strongly recommended that the launder be removed and placed in front of the void and a timber barricade be constructed and marked to restrict any access.

In the remaining unsupported sections of the adit (~500m) the exposed ground shows no signs of deterioration, however, small areas would need careful minor scaling due to partings along foliations with steep dips that intersect the adit.

There is a small number of additional dressed timbers in the adit before the Boundary shaft and likely to have come from either the shaft or Copse shaft further along the adit.

An application of a 50mm layer of shotcrete and/or spot bolting in a few selected areas would be sufficient to ensure the stability of the remainder of the adit.

The water inflow down Copse Shaft remains constant as does the airflow.

Summary

1. The displacements occurring in the cut and cover section of the adit, (0 -11m) have accelerated and the recommendations given for Zone 1 should be actioned as soon as possible.
2. The rehabilitation zone 2 shows significant damp conditions and accelerated deterioration of exposed steel arches.
The area is stable but needs to be dried out and the steelwork sealed.
3. The outflow pipe is being blocked with ochre buildup and loose timbers causing an overflow of the sandbag dam and placing the timber frame at risk of deterioration and failure.

A cleanup of the dam area is necessary with longer term measures to strengthening the sandbag dam and construct a robust retaining dam is to be considered.

4. An assessment of the remainder of the adit shows no immediate areas of concern or instability. However, it is advised to rehabilitate soon to ensure long-term stability as deterioration of the timber sets will continue with possible sudden and large-scale failure.
5. The flooded raise at 390 (shaft to Deep Adit) must be sealed off with a constructed barricade as it presents a safety hazard to travelling in unfavourable conditions.
6. Access to the adit should be minimized and strictly controlled.
 - a) It is recommended that timber supports should not be touched, even if they seem very stable.
 - b) The rock in many areas is unstable or poorly held by anchors and should not be touched.
 - c) Stopes should not be entered for any reason.
 - d) Some areas especially from 210 to 350 should be travelled through at a fast pace and are not suitable for breaks or discussions.
 - e) The adit airflow depends on the outside temperature and time of day and results in some instances of poor or no air circulation particularly from 500 to the adit end.
 - f) At least two people should be together while in the adit and within visual distance of one another.
 - g) A responsible person must be left outside with an agreed safety response if people inside fail to return in a stipulated time period.

Disclaimer

The recommendations contained within this report are based on the experience and qualifications of Avoca Geotec Ltd. (AGL) staff combined with the visual observations recorded on the site visit to the Tigroney 850 Adit on Tuesday 19th August 2025.

AGL or any of its staff are not responsible for any accidents, injuries, fatalities, loss of production or loss of income that may arise out of the implementation or failure of implementation of the recommendations contained within this report or any unforeseen circumstances which may arise out of the geotechnical assessment conducted at Tigroney 850 Adit in August 2025.

Signed:



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