msec mine subsidence ENGINEERING CONSULTANTS

TAHMOOR UNDERGROUND GLENCORE

GLENCORE:

Tahmoor Colliery – Longwall 31

Management Plan for Potential Impacts to Built Structures

 | REPORT NUMBER: MSEC862-12 | REVISION A

AUTHORISATION OF MANAGEMENT PLAN

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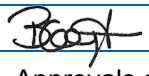
Signature:	
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Date:	28/06/2017

DOCUMENT REGISTER

Date	Report No.	Rev	Comments
Mar-06	MSEC286-10	A	Draft for SMP Application
Aug-06	MSEC286-10	B	Complete for LW24B
May-08	MSEC286-10	C	Amended to include additional management measures for LW24A
Sep-08	MSEC286-10	D	Amended to include additional management measures for LW25 and LW26 Combined with public amenities and commercial establishments
Feb-11	MSEC446-12	A	Updated for LW26
Sep-12	MSEC567-12	A	Updated for LW27
Nov-12	MSEC567-12	B	Updated to include farm dams
Nov-12	MSEC567-12	C	Updated draft following feedback from MSO
Nov-12	MSEC567-12	D	Final for Longwall 27
Mar-14	MSEC646-12	A	Updated for Longwalls 28 to 30
Jun-17	MSEC862-12	A	Updated for Longwall 31

References:-

AS/NZS 4360:1999 Risk Management

Tahmoor Colliery Longwalls 31 to 37 - Subsidence Predictions and Impact Assessments for Natural and Built Features in support of the SMP Application. (Report MSEC647, Revision A, December 2014), prepared by Mine Subsidence Engineering Consultants.

JMA (2017). Site specific pre-mining investigation reports for Longwall 31. April 2017.

JMA (2014). Review of LW28-LW30 Subsidence Management. John Matheson & Associates, Report No. R0234, Rev 1, March 2014.

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LIST OF TABLES, FIGURES AND DRAWINGS

Tables

Tables are prefaced by the number of the chapter in which they are presented.

Figures

Figures are prefaced by the number of the chapter or the letter of the appendix in which they are presented.

Drawings

Drawings referred to in this report are included in Appendix B at the end of this report.

Drawing No.	*Description*	*Revision*
MSEC862-00-01	Monitoring over LW31	B
MSEC646-12-01	Structures	A

1.1. Introduction

Tahmoor Colliery is located approximately 80 km south-west of Sydney in the township of Tahmoor NSW. It is managed and operated by Glencore. Tahmoor Colliery has previously mined 30 longwalls to the north and west of the mine's current location.

Longwall 31 is a continuation of a series of longwalls that extend into the Tahmoor North Lease area, which began with Longwall 22. The longwall panels are located between the Bargo River in the south-east, the township of Thirlmere in the west and Picton in the north. Longwall 31 is located beneath the rural area of Tahmoor and part of the South Picton industrial area.

A small number of structures are located directly above Longwall 31.

The location of Longwall 31 relative to structures is shown in Drawing No. MSEC862-12-01. A summary of the dimensions of these longwalls is provided in Table 1.1.

Table 1.1 Longwall Dimensions

Longwall	Overall Void Length Including Installation Heading (m)	Overall Void Width Including First Workings (m)	Overall Tailgate Chain Pillar Width (m)
Longwall 31	2448	283	39

As at May 2017, a total of 1955 houses, public amenities and commercial and business establishments have experienced subsidence movements during the mining of Longwalls 22 to 30. While impacts have been observed to some structures, mine subsidence has not directly exposed residents to any immediate or sudden safety hazards.

This Management Plan provides detailed information about how the risks associated with the mining beneath structures will be managed by Tahmoor Colliery.

Separate management plans have been or will be developed for the following structures:

- Structures owned by owners of services infrastructure, such as bridges, culverts and sewage pumping stations and Picton Water Recycling Plant.
- Commercial and business establishments along Bridge Street, Redbank Place, Bollard Place and Henry Street in South Picton.
- Commercial establishment on Stilton Lane, which is located adjacent to the commencing end of Longwall 31.
- Structures located at RSL LifeCare Queen Victoria Gardens.
- Heritage structures

This Management Plan is an update of previous management plans, taking into account experiences gained during the mining of Longwalls 22 to 30.

The Management Plan is a live document that can be amended at any stage of mining.

1.2. Objectives

The objectives of this Management Plan are to establish procedures to measure, control, mitigate and repair potential impacts that might occur to structures.

The objectives of the Management Plan have been developed to:-

- Ensure the safety and serviceability of all structures. Public safety is paramount. Ensure that the health and safety of people who may be present in structures are not put at risk due to mine subsidence.
- Disruption and inconvenience should be kept to minimal levels.
- Monitor ground movements and the condition of structures during mining.
- Initiate or coordinate action with the Mine Subsidence Board to mitigate or remedy potential significant impacts that are expected to occur to structures.
- Provide a plan of action in the event that the impacts of mine subsidence are greater than those that are predicted.
- Establish a clearly defined decision making process to ensure timely implementation of risk control measures for high consequence but low likelihood mine subsidence induced hazards that involve potential serious injury or illness to a person or persons at the properties that may require emergency evacuation, entry restriction or suspension of work activities.
- Provide a forum to report, discuss and record impacts to the surface. This will involve Tahmoor Colliery, the affected landowner and/or resident, relevant government agencies, and consultants as required.
- Establish lines of communication and emergency contacts.

1.3. Scope

The Management Plan is to be used to protect and monitor the condition of the items of infrastructure identified such that the health and safety of people who may be present at structures are not put at risk due to mine subsidence. The major items at risk are:-

- Residential Establishments
- Public Amenities
- Commercial and Business Establishments

The Management Plan describes measures that will be undertaken as a result of mining Longwall 31 only.

Separate management plans have been or will be developed for the following structures:

- Structures owned by owners of services infrastructure, such as bridges, culverts and sewage pumping stations.
- Commercial and business establishments along Bridge Street, Redbank Place, Bollard Place and Henry Street in South Picton.
- Commercial establishment on Stilton Lane, which is located adjacent to the commencing end of Longwall 31.
- Structures associated with the Picton Water Recycling Plant near the commencing end of Longwall 31.
- Structures located at RSL LifeCare Queen Victoria Gardens.
- Heritage structures

1.4. Proposed Mining Schedule

It is planned that each Longwall 31 will extract coal working northwest from the south eastern end. This Management Plan covers longwall mining until completion of mining in Longwall 31 and for sufficient time thereafter to allow for completion of subsidence effects. The current schedule of mining is shown in Table 1.2.

Table 1.2 Schedule of Mining

Longwall	Start Date	Completion Date
Longwall 31	June 2017	July 2018

1.5. Definition of Active Subsidence Zone

As a longwall progresses, subsidence begins to develop at a point in front of the longwall face and continues to develop after the longwall passes. The majority of subsidence movement typically occurs within an area 150 metres in front of the longwall face to an area 450 metres behind the longwall face.

This is termed the “active subsidence zone” for the purposes of this Management Plan, where surface monitoring is generally conducted. The active subsidence zone for each longwall is defined by the area bounded by the predicted 20 mm subsidence contour for the active longwall and a distance of 150 metres in front and 450 metres behind the active longwall face, as shown by Fig. 1.1.

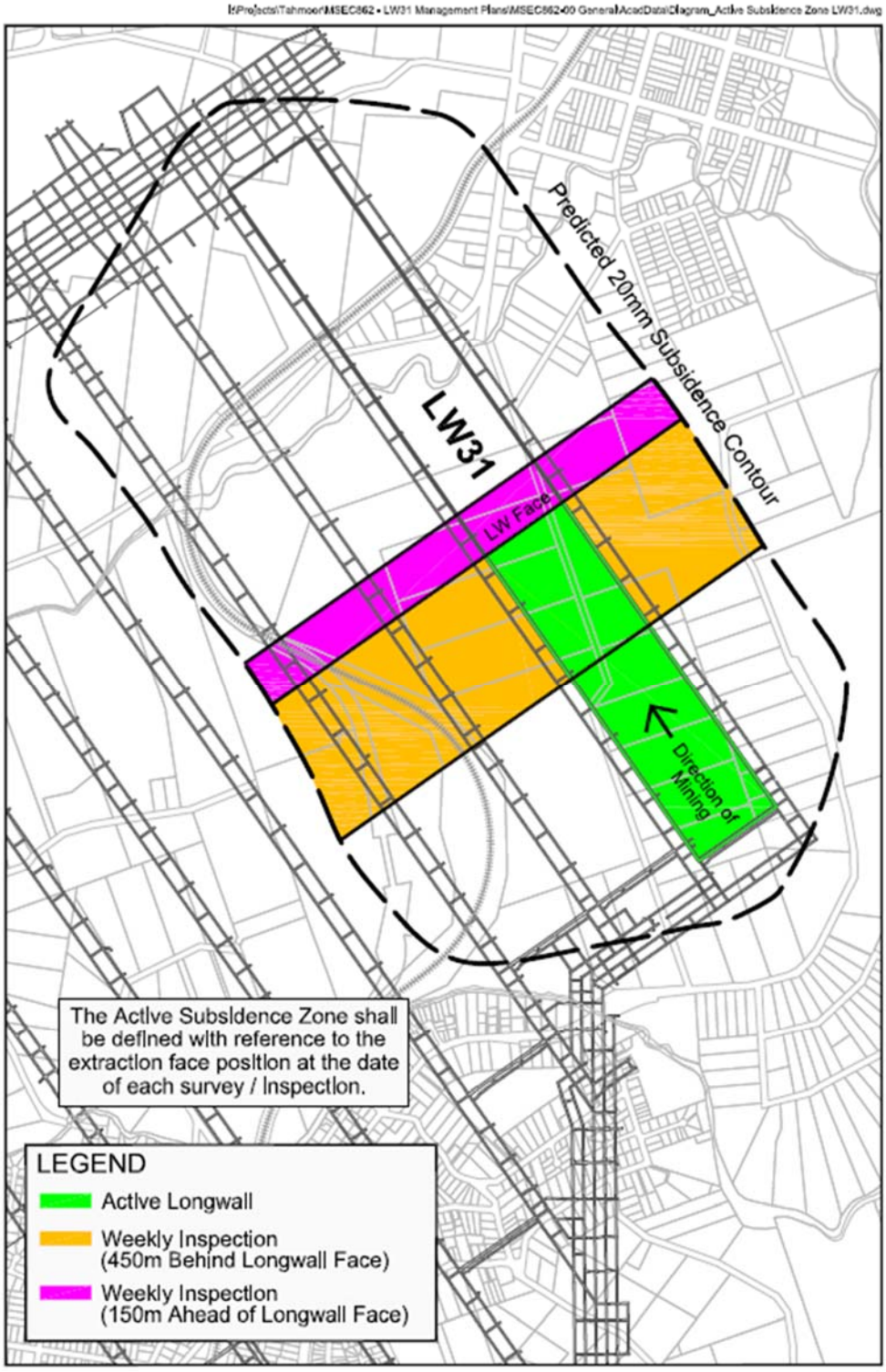


Fig. 1.1 Diagrammatic Representation of Active Subsidence Zone

2.1. Maximum Predicted Systematic Parameters

Predicted mining-induced systematic subsidence movements were provided in Report No. MSEC647, which was prepared in support of Tahmoor Colliery's SMP Application for Longwalls 31 to 37.

A summary of the maximum predicted incremental systematic subsidence parameters, due to the extraction of each of the proposed longwalls, is provided in Table 2.1. A summary of the maximum predicted total systematic subsidence parameters, after the extraction of each of the proposed longwalls, is provided in Table 2.2.

Table 2.1 Maximum Predicted Incremental Systematic Subsidence Parameters due to the Extraction of Longwall 31

Longwall	Maximum Predicted Incremental Subsidence (mm)	Maximum Predicted Incremental Tilt (mm/m)	Maximum Predicted Incremental Hogging Curvature (1/km)	Maximum Predicted Incremental Sagging Curvature (1/km)
Due to LW31	725	5.5	0.06	0.10

Table 2.2 Maximum Predicted Total Systematic Subsidence Parameters after the Extraction of Longwall 31

Longwall	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (1/km)	Maximum Predicted Total Sagging Curvature (1/km)
After LW31	1250	6.0	0.10	0.15

The values provided in the above table are the maximum predicted total systematic subsidence parameters which occur within the general longwall mining area, including the predicted movements resulting from the extraction of Longwalls 22 to 31.

2.2. Observed Subsidence during the mining of Longwalls 22 to 30

The extraction of longwalls at Tahmoor Colliery has generally resulted in mine subsidence movements that were typical of those observed above other collieries in the Southern Coalfield of NSW at comparable depths of cover.

However, observed subsidence was greater than the predicted values over Longwalls 24A and the southern parts of Longwalls 25 to 27. Please refer to details provided in the LW29 Subsidence Monitoring Programme (Report No. MSEC746-00, Revision D).

Monitoring during the mining of Longwalls 28 to 30 has found that subsidence behaviour has returned to normal levels.

Ground surveys will continue to be undertaken above Longwall 31. The survey results will be checked against predictions to confirm whether subsidence continues to develop in a normal manner during the mining of Longwall 31.

2.3. Predicted Strain

The prediction of strain is more difficult than the predictions of subsidence, tilt and curvature. The reason for this is that strain is affected by many factors, including curvature and horizontal movement, as well as local variations in the near surface geology, the locations of pre-existing natural joints at bedrock, and the depth of bedrock. Survey tolerance can also represent a substantial portion of the measured strain, in cases where the strains are of a low order of magnitude. The profiles of observed strain, therefore, can be irregular even when the profiles of observed subsidence, tilt and curvature are relatively smooth.

In previous MSEC subsidence reports, predictions of conventional strain were provided based on the best estimate of the average relationship between curvature and strain. Similar relationships have been proposed by other authors. The reliability of the strain predictions was highlighted in these reports, where it was stated that measured strains can vary considerably from the predicted conventional values.

Adopting a linear relationship between curvature and strain provides a reasonable prediction for the conventional tensile and compressive strains. The locations that are predicted to experience hogging or convex curvature are expected to be net tensile strain zones and locations that are predicted to experience sagging or concave curvature are expected to be net compressive strain zones. In the Southern Coalfield, it has been found that a factor of 15 provides a reasonable relationship between the maximum predicted curvatures and the maximum predicted conventional strains.

At a point, however, there can be considerable variation from the linear relationship, resulting from non-conventional movements or from the normal scatters which are observed in strain profiles. When expressed as a percentage, observed strains can be many times greater than the predicted conventional strain for low magnitudes of curvature. In this report, therefore, we have provided a statistical approach to account for the variability, instead of just providing a single predicted conventional strain.

The data used in an analysis of observed strains included those resulting from both conventional and non-conventional anomalous movements, but did not include those resulting from valley related movements, which are addressed separately in this report. The strains resulting from damaged or disturbed survey marks have also been excluded.

A number of probability distribution functions were fitted to the empirical data. It was found that a *Generalised Pareto Distribution (GPD)* provided a good fit to the raw strain data. Confidence levels have been determined from the empirical strain data using the fitted GPDs. In the cases where survey bays were measured multiple times during a longwall extraction, the maximum tensile strain and the maximum compressive strain were used in the analysis (i.e. single tensile strain and single compressive strain measurement per survey bay).

2.3.1. Analysis of strains measured in survey bays

For features that are in discrete locations, such as building structures, farm dams and archaeological sites, it is appropriate to assess the frequency of the observed maximum strains for individual survey bays.

Predictions of strain above goaf

The survey database has been analysed to extract the maximum tensile and compressive strains that have been measured at any time during the extraction of Longwalls 22 to 28 at Tahmoor Colliery, for survey bays that were located directly above goaf or the chain pillars that are located between the extracted longwalls, which has been referred to as "*above goaf*".

The histogram of the maximum observed total tensile and compressive strains measured in survey bays above goaf at Tahmoor Colliery is provided in Fig. 2.1. The probability distribution functions, based on the fitted GPDs, have also been shown in this figure.

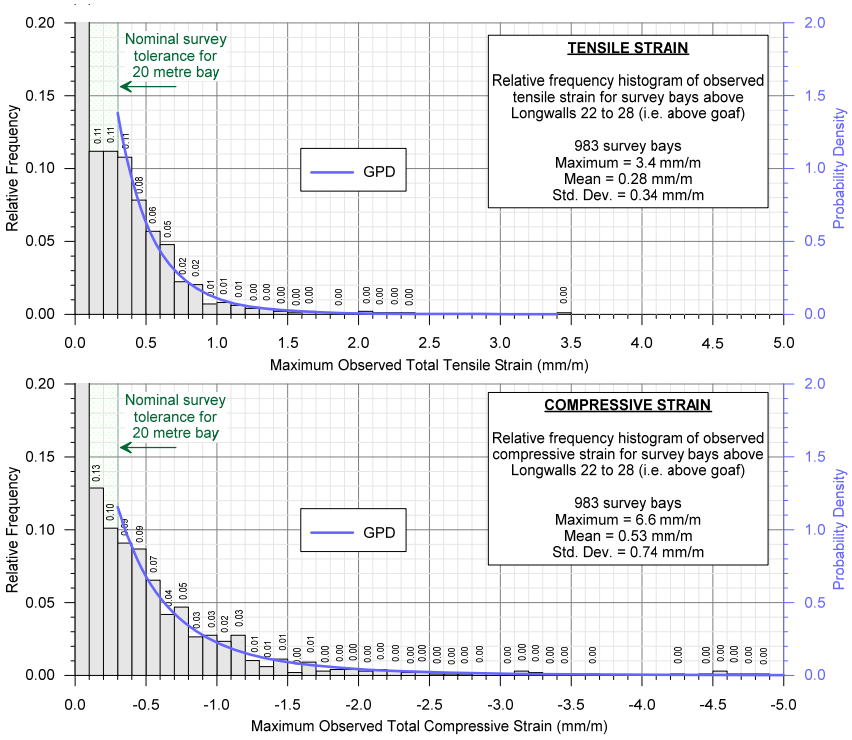


Fig. 2.1 Distributions of the measured maximum tensile and compressive strains for surveys bays located above goaf

The 95 % confidence levels for the maximum total strains that the individual survey bays *above goaf* experienced at any time during mining are 0.9 mm/m tensile and 1.8 mm/m compressive. The 99 % confidence levels for the maximum total strains that the individual survey bays *above goaf* experienced at any time during mining are 1.5 mm/m tensile and 3.5 mm/m compressive.

Predictions of strain above solid coal

The survey database has also been analysed to extract the maximum tensile and compressive strains that have been measured at any time during the extraction of Longwalls 22 to 28 at Tahmoor Colliery, for survey bays that were located outside and within 200 metres of the nearest longwall goaf edge, which has been referred to as "*above solid coal*".

The histogram of the maximum observed tensile and compressive strains measured in survey bays above solid coal at Tahmoor Colliery is provided in Fig. 2.2. The probability distribution functions, based on the fitted GPDs, have also been shown in this figure.

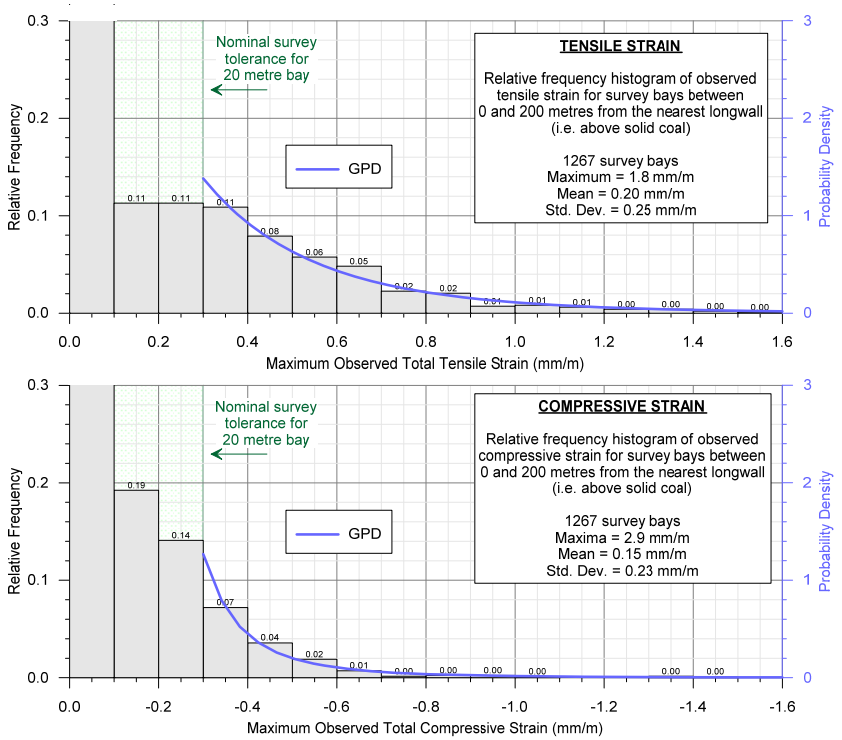


Fig. 2.2 Distributions of the measured maximum tensile and compressive strains for survey bays located above solid coal

The 95 % confidence levels for the maximum total strains that the individual survey bays *above solid coal* experienced at any time during mining are 0.6 mm/m tensile and 0.5 mm/m compressive. The 99 % confidence levels for the maximum total strains that the individual survey bays *above solid coal* experienced at any time during mining are 1.1 mm/m tensile and 0.9 mm/m compressive.

3.1. NSW Work Health & Safety Legislation

All persons conducting a business or undertaking (PCBUs), including mine operators and contractors, have a primary duty of care to ensure the health and safety of workers they engage, or whose work activities they influence or direct. The responsibilities are legislated in *Work Health and Safety Act 2011* and the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated Regulations (collectively referred to as the 'WHS laws').

The *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* commenced on 1 February 2015 and contains specific regulations in relation to mine subsidence.

As outlined in the Guide by the NSW Department of Trade & Investment Mine Safety:

"a PCBU must manage risks to health and safety associated with mining operations at the mine by:

- *complying with any specific requirements under the WHS laws*
- *identifying reasonably foreseeable hazards that could give rise to health and safety risks*
- *ensuring that a competent person assesses the risk*
- *eliminating risks to health and safety so far as is reasonably practicable*
- *minimising risks so far as is reasonably practicable by applying the hierarchy of control measures, any risks that it is are not reasonably practical to eliminate*
- *maintaining control measures*
- *reviewing control measures.*

The mine operator's responsibilities include developing and implementing a safety management system that is used as the primary means of ensuring, so far as is reasonably practicable:

- *the health and safety of workers at the mine, and*
- *that the health and safety of other people is not put at risk from the mine or work carried out as part of mining operations."*

This Management Plan documents the risk control measures that are planned to manage risks to health and safety associated with the mining of Longwall 31 directly beneath or adjacent to structures in accordance with the WHS laws.

3.2. General

The Australian/New Zealand standard for Risk Management defines the terms used in the risk management process, which includes the identification, analysis, assessment, treatment and monitoring of risk. In this context:-

3.2.1. Consequence

'The outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. There may be a range of possible outcomes associated with an event.'[1] The consequences of a hazard are rated from very slight to very severe.

3.2.2. Likelihood

'Used as a qualitative description of probability or frequency.'[2] The likelihood can range from very rare to almost certain.

3.2.3. Hazard

'A source of potential harm or a situation with a potential to cause loss.'[3]

[1] AS/NZS 4360:1999 – Risk Management pp2
[2] AS/NZS 4360:1999 – Risk Management pp2
[3] AS/NZS 4360:1999 – Risk Management pp2

3.2.4. Method of assessment of potential mine subsidence impacts

The method of assessing potential mine subsidence impacts combines the likelihood of an impact occurring with the consequence of the impact occurring. In this Management Plan, the likelihood and consequence are combined via the Glencore Coal Assets Australia Risk Matrix to determine an estimated level of risk for particular events or situations. A copy of the Risk Matrix is included in the Appendix of this Management Plan.

4.1. Experience of mining beneath structures during the mining of Longwalls 22 to 30

As at May 2017, a total of 1955 houses, public amenities and commercial and business establishments have experienced subsidence movements during the mining of Longwalls 22 to 30. The following observations are made:

- Mine subsidence has not directly exposed residents to any immediate or sudden safety hazards.
- Subsidence Advisory NSW (formerly Mine Subsidence Board) has received a total of 547 claims from individual properties (not including refused claims) of which 489 claims include impacts to main structures. The remaining 58 claims from properties relate solely to claims of damage to small improvements such as swimming pools, sheds and pavements.
- This represents an overall claim rate of 489 out of 1955 main structures, or 25%. In other words, no impacts have been reported for 75% of main structures.
- The rate of impact is understandably greater for structures located directly above extracted mining domains. A total of 1190 houses, public amenities and commercial and business establishments are located directly above the extracted Longwalls 22 to 27 (or pillars between them). A total of 385 claims have been made from this subset, which represents a claim rate of 32% for structures above goaf.
- The claim rate for structures within the predicted limit of subsidence but not located directly above extracted coal (that is, structures on 'solid coal') is 48 claims out of a total of 352 structures, or 14%.
- The majority of impacts are considered very slight to slight and consist of sticky doors and minor impacts to internal walls, ceilings or floor finishes. However, 2.5% of impacts are considered to be moderate or greater. In ten of these cases (i.e: 0.5 % of all building structures), the impacts were substantial and the costs to repair these structures were deemed to be greater than the costs to rebuild.

4.2. Impact Assessment on Structures

The methods for predicting and assessing impacts on building structures have developed over time as knowledge and experience has grown. MSEC has provided predictions and assessments for structures potentially affected by mining at Tahmoor Colliery using the latest methods available at the time.

The information collected during the mining of Longwalls 22 to 24A has been reviewed in two parallel studies: one as part of a funded ACARP Research Project C12015 and one at the request of the Department of Primary Industries (DPI).

The outcomes of the studies include:

- Review of the performance of the previous method
- Recommendations for improving the current method of Impact Classification
- Recommendations for improving the current method of Impact Assessment

A summary is provided in Report No. MSEC647 (2014).

The predictions of subsidence, tilt and curvature for each structure due to the extraction of Longwalls 22 to 37 are provided in Table F.02 of Report No. MSEC647 (2014).

The probability of impacts for each house has been assessed based on the parameters of predicted ground curvature and type of construction, in accordance with the revised method of assessing impacts on structures. The results are provided in Report No. MSEC647 (2014).

4.3. Managing Public Safety

The primary risk associated with mining beneath structures is public safety. Tahmoor Colliery has previously directly mined beneath or adjacent to more than 1900 houses and civil structures, commercial and retail properties, the Main Southern Railway and local roads and bridges. It has implemented extensive measures prior to, during and after mining to ensure that the health and safety of people have not been put at risk due to mine subsidence. People have not been exposed to immediate and sudden safety hazards as a result of impacts that have occurred due to mine subsidence movements.

Emphasis is placed on the words “immediate and sudden” as in rare cases, some structures have experienced severe impacts, but the impacts did not present an immediate risk to public safety as they developed gradually with ample time to repair the structure.

The potential for impacts on public safety have been assessed on a case by case basis. The assessments include an inspection by a structural engineer. The findings of the assessments are described in this Management Plan in the sections below.

4.3.1. Subsidence Impact Management Process

Tahmoor Colliery has developed and acted in accordance with a risk management plan to manage potential impacts on structures during the mining of Longwalls 22 to 30. The management strategy has been reviewed and updated based on experiences gained during the mining of Longwalls 22 and 30 and the strategy for Longwall 31 includes the following process:

1. Regular consultation, cooperation and coordination with the community before, during and after mining as described in Section 5.3. This includes letters and door knocking to all residents of structures that will soon be affected by subsidence. The letters invite the residents to contact Tahmoor Colliery should they have any concerns with their structure, or alternatively contact Subsidence Advisory NSW (formerly the Mine Subsidence Board) for a pre-mining inspection.
2. Site-specific investigations, where they are necessary and appropriate, into the conditions of buildings and associated structures and their surrounding environment (where access is allowed). The site-specific investigations will be undertaken early so that there is adequate time, if required, to arrange additional inspections and/or surveys and implement any mitigation measures before mining-induced impacts are experienced.

   As a general rule, site-specific investigations are undertaken before the longwall face approaches to within 300 metres of travel prior to directly mining beneath each property. For properties located directly above the first 300 metres of the commencing end of a longwall, the investigations are targeted to be undertaken prior to extraction or at the latest, they will be undertaken prior to the first 200 metres of extraction of the longwall.

   The site-specific investigations include the following:
   a) At the time of preparing Report No. MSEC647 (2014) in support of Tahmoor Colliery’s SMP Application, structures were identified from aerial photographs, with structure types identified from kerbside inspections.
   b) Additional front of house inspections by Tahmoor Colliery in company with a structural engineer for all properties that are located directly above Longwall 31. The purpose of the inspections is to identify potentially unstable structures that may warrant a structural inspection, subject to approval by the landowner.
   c) Pre-mining geotechnical inspections of structures located on or immediately adjacent to steep slopes (refer Section 4.4.1)
   d) Pre-mining structural inspections of the following structures
      i) Public amenities and commercial and business establishments that are located directly above longwalls. (refer Section 4.10 and Section 4.11)
      ii) Structures on or immediately adjacent to steep slopes that have been recommended for structural inspection by the geotechnical engineer.
      iii) Structures that have been identified as being potentially unstable or unsafe by landowners (Item 1), or front of house inspections (Item 2b), or if an issue is raised by the Subsidence Advisory NSW during the course of undertaking its pre-mining inspections.
      iv) Structures of heritage significance (refer separate Heritage Management Plan).
      v) Houses and units located above hidden creeks (refer Section 4.4.2).
      vi) Houses and units located outside any Mine Subsidence District that are predicted to experience more than 150 mm of subsidence (refer Section 4.4.4).
      vii) Houses estimated to have been constructed prior to the declaration of the Mine Subsidence District (1975) that are predicted to experience more than 150 mm of subsidence (refer Section 4.4.5).

3. Implementation of mitigation measures following inspections by geotechnical and/or structural engineer. These will be implemented before the longwall face approaches to within 100 metres of travel prior to directly mining beneath each property
4. Surveys and inspections during mining within the active subsidence area (refer Table 5.1 for timing and frequencies):
   - Detailed visual inspections and vehicle based inspections along the streets
   - Ground surveys along streets
   - Visual inspections of public amenities and industrial, commercial and business establishments
   - Visual inspections of structures that have already reported impacts, where recommended by the Structures Management Group
   - Visual inspections of pool fences and gates
   - Specific ground surveys and visual inspections for selected properties, where recommended by a geotechnical or structural engineer due to their proximity to steep slopes or pre-existing condition.

The Subsidence Impact Management Process has been developed in consideration of the following facts and observations:

1. Australian standards have been available for use in the design of structures since 1948.The great majority of structures at Tahmoor and Thirlmere (approximately 80%) have been constructed after the declaration of the Bargo Mine Subsidence District in November 1975.
2. There is sufficient redundancy in structural design such that ductile deformation will develop and be noticeable to residents before structural failure occurs (JMA, 2014).
3. Subsidence movements develop gradually over time at Tahmoor Colliery as they have above other previously extracted longwalls at similar depths of cover.
4. Experiences during the mining of Longwalls 22 to 30 have found that the most effective method of managing potential impacts on the safety and serviceability of structures are by way of community consultation. Residents living within the active subsidence zone have often provided early feedback to Tahmoor Colliery and/or Subsidence Advisory NSW (formerly the Mine Subsidence Board) about impacts developing at their houses or along their local roads. Contact is made well before impacts develop to a level of severity sufficient to become a safety hazard.
5. On the basis of the above, there is sufficient time for residents to notify Tahmoor Colliery or the Subsidence Advisory NSW of significant displacement or deflection well before structural failure will occur.
6. The conclusions are supported by the observation that residents have not been exposed to immediate and sudden safety hazards as a result of impacts that occur due to mine subsidence movements at Tahmoor Colliery and above other previously extracted longwalls at similar depths of cover. This includes the recent experience at Tahmoor Colliery during the mining of Longwalls 22 to 30, which have affected more than 1900 houses and civil structures.

   While severe impacts have developed during the mining of Longwalls 22 to 30, there is sufficient redundancy in structural design such that when structures have experienced severe impacts, they have developed gradually with ample time for residents to notify Tahmoor Colliery or Subsidence Advisory NSW to repair the structure and/or relocate residents before structural failure occurs. This conclusion is supported by structural engineer, John Matheson & Associates (JMA, 2014).

While the three most important factors in managing risks to public safety are redundancy in structural design, gradual development of subsidence movements and an effective community consultation program, a number of additional management measures have been or will be undertaken, including site specific investigations, regular surveys and inspections during mining and triggered response measures as detailed in this Management Plan.

A flowchart illustrating the Subsidence Impact Management Process prior to each structure potentially experiencing impacts is shown in Fig. 4.1.

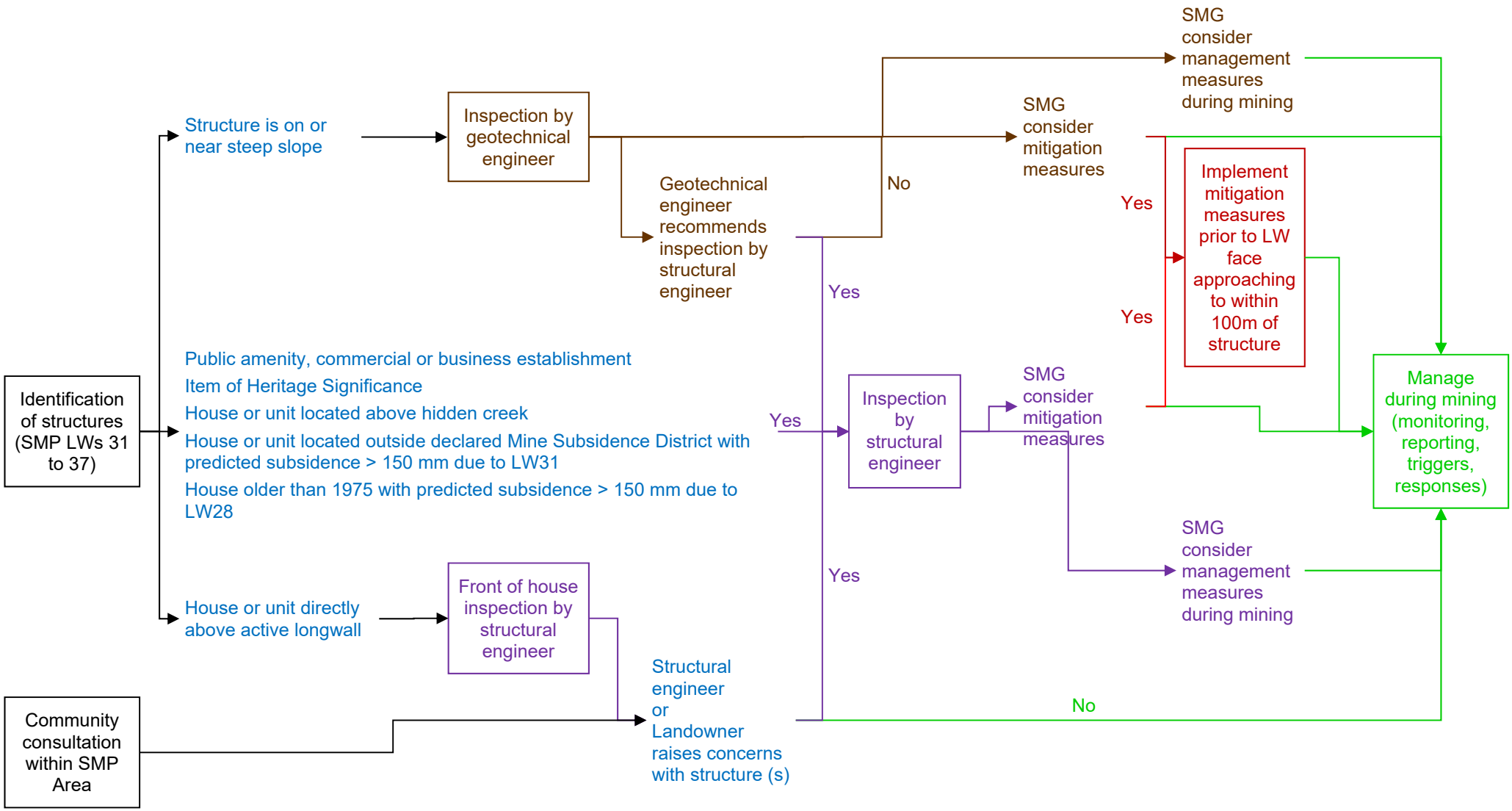


Fig. 4.1 Flowchart for Subsidence Impact Management Process prior to each structure potentially experiencing impacts

4.4. Residential Structures

This section describes observations and management measures for specific types of residential structures that have been identified as being potentially more vulnerable to subsidence movements.

4.4.1. Structures on Steep Slopes

A total of 59 structures above Longwalls 22 to 30 have been inspected by geotechnical engineer, GHD Geotechnics. Structures and dams on these properties were assessed to have been located on or immediately adjacent to steep slopes, which are conservatively defined as a slope greater than 1 in 3. There are no structures located near cliffs. It is possible, though unlikely, that tension cracks may form at the top of the slope and these may coincide with some houses and cause additional impacts to them. It is considered extremely unlikely that the houses would be severely damaged due to large-scale slope failure. No impacts have been observed to steep slopes during the mining of Longwalls 22 to 30, including steep slopes on the banks of Myrtle Creek and along the Redbank Range.

Structural inspections by John Matheson & Associates (JMA) have also been undertaken where recommended by the geotechnical engineer.

Structures on a total of thirteen properties have been identified on or near steep slopes directly above or near Longwall 31.

The properties have been inspected by GHD Geotechnics prior to the commencement of Longwall 31. No issues have been identified.

4.4.2. Structures above 'Hidden' Creeks

Hidden creeks are defined as natural watercourses that appear to have been covered during development of a property or road. Hidden creeks have been identified from surface contours and historical aerial photographs.

These houses are considered to have a greater chance of experiencing non-systematic upsidence and closure movements during mining. When tested against observations during the mining of Longwalls 22 to 30, however, no clear increase in frequency of impact is observed.

A total of 52 houses above hidden creeks have experienced subsidence during the mining of Longwalls 22 to 27 and 22 houses have experienced impacts, including five houses directly above Longwall 27. The impacted houses include some on Oxley Grove, where a creek had been infilled, and houses on York Street and Remembrance Drive where a small tributary to Myrtle Creek had been infilled. The claim rate is higher than the overall claim rate of 42% and may represent a trend, though the impacts to these houses have been generally very minor (less than Category 1) and the sample size is small.

The observations of very minor impacts may be explained by the fact that the valleys in which the houses are located are very small and may not be sufficiently incised to generate significant upsidence and closure movements. If any movements do occur, it is also possible that they may not be completely transferred from the bedrock to the house through the constructed fill, depending on the design of the building foundations.

There is a hidden creek located adjacent to Longwall 31 at Redbank Place within the Picton Industrial Area. Separate PSMPs have been developed for these properties.

4.4.3. Houses Prone to Flooding or Inundation

Potential flood prone areas have been identified along Redbank Creek. None are located directly above Longwall 31.

4.4.4. Houses outside any Mine Subsidence District

There are over houses that have or may experience subsidence during the mining of Longwall 31 but are not located within any Mine Subsidence District. The houses are located near the township of Picton.

The hazard associated with these houses is that they may be less tolerant to mine subsidence movements as their designs have not been checked and approved by the Mine Subsidence Board. As discussed in Report No. MSEC647, the majority of the houses are single-storey buildings that are less than 30 metres long and less than 30 years old.

Tahmoor Colliery has conducted a structural inspection on the houses that are located outside a Mine Subsidence District and are predicted to experience more than 150 mm of subsidence during the mining of Longwall 31.

4.4.5. Older Houses

Approximately 20% of houses are estimated to have been constructed prior to the proclamation of the Bargo Mine Subsidence District in 1975. The hazard associated with these houses is that these houses may be less tolerant to mine subsidence movements as their designs have not been checked and approved by the Mine Subsidence Board. Some old houses may also be in poor condition. Many of the houses are constructed with timber frames and weatherboard panels or fibro sheets.

Analysis of impacts to structures during the mining of Longwalls 22 to 25 in December 2008 did not find any significant trend between the rate of impacts and structure age.

Tahmoor Colliery will conduct a structural inspection on all houses that were constructed prior to 1975 that are predicted to experience more than 150 mm of subsidence during the mining of Longwall 31.

4.4.6. Future House Construction

Longwall 31 will extract within a semi-rural area. It is therefore possible that new houses could be constructed since the houses were identified by Tahmoor Colliery, though the number of new houses will be small. No large scale developments are currently under construction in this area.

The hazard associated with new houses is considered to be generally low for the following reasons.

- The design for new houses will be approved by the Mine Subsidence Board (unless they are located outside any Mine Subsidence District),
- The condition of the houses will generally be high as they are newly constructed.

As described in Section 5.3, Tahmoor Colliery attempts to notify landowners at multiple stages during the mining process. New landowners may be contacted in this manner.

In addition to the above process, new houses have been identified from an aerial photograph commissioned by Tahmoor Colliery in 2013. The houses have been mapped and included in Drawing No. MSEC646-12-01.

If it is discovered that a new house has been constructed, Tahmoor Colliery will offer a pre-mining inspection by Subsidence Advisory NSW and offer to conduct and provide an impact assessment and risk analysis to the landowner upon request.

Standard risk control procedures will be applied to these houses, which are provided in this Management Plan.

4.5. Flats or Units

There are no flats or units affected by the extraction f Longwall 31.

4.6. Pools

4.6.1. Pool Damage

As of May 2017, a total of 157 pools have experienced mine subsidence movements during the mining of Longwalls 22 to 30. A total of 36 pools have reported impacts, which represents an impact rate of approximately 23%. A higher proportion of impacts have been observed for in-ground pools, particularly fibreglass pools.

The majority of the impacts related to tilt or cracking, though in a small number of cases the impacts are limited to damage to skimmer boxes or the edge coping.

Mining-induced tilts are more noticeable in pools than other structures due to the presence of the water line and small gap to the edge coping, particularly when the pool lining has been tiled. Skimmer boxes are also susceptible of being lifted above the water line due to mining tilt. The Australian Standard AS2783-1992 (Use of reinforced concrete for small swimming pools) requires that pools be constructed level within ± 15 mm. This represents a tilt of approximately 3.3 mm/m for pools that are 10 metres in length. Australian Standard AS/NZS 1839:1994 (Swimming pools – Premoulded fibre-reinforced plastics – Installation) also requires that pools be constructed with a tilt not exceeding 3 mm/m.

4.6.2. Pool Gates

The hazard to pool gates is that they may not close due to mine subsidence impacts, even if they are spring-loaded.

A number of pool gates have been impacted by mine subsidence during the mining of Longwall 22 to 30. While the gates can be easily repaired, the consequence of breaching pool fence integrity is considered to be severe.

While consultation with the pool owners is considered to be the most effective method of managing potential impacts on pool gates, Tahmoor Colliery will inspect pool fences on a weekly basis during the active subsidence period. Any damage to pool fences and gates caused by mine subsidence will be repaired immediately.

4.7. Septic Tanks

The risk to septic tanks is that they could be damaged and/or rendered unserviceable from mine subsidence impacts. There are two types of potential damage to septic tanks.

- Compressive ground strains could cause cracking and leaking of tanks.
- Shearing could also occur at the joint connecting the sewer pipes to the septic tank, as sewer pipes are generally able to slide as the ground moves horizontally beneath them, while the septic tanks are fixed and unable to slide relative to the sewer pipes.

Given that tanks are quite small (usually less than three (3) metres in diameter), constructed of reinforced concrete, and are usually bedded in sand and backfilled, the likelihood of cracking to septic tanks is assessed as very rare. It is noted that no impacts to septic tanks have been reported during the mining of Longwalls 22 to 30.

Pipe joints are usually flexible and consist of relatively short lengths, due to the proximity of the septic tank to the house. However, given that both the house and septic tank are effective ground anchors, it is possible that pipe joints can pull out or shear as a result of subsidence. Subsidence Advisory NSW (SANSW) reports that this has been observed in a small number of cases during the mining of Longwalls 22 to 30. This impact is relatively easy to repair.

Subsidence Advisory NSW also report that on two occasions during the mining of Longwalls 22 to 26, the grade of the sewer pipe to the septic tank has been reversed. The impacts are considered to have been partially due to very low pre-mining grades. In both cases, the repairs have been straight-forward, where the pipes were re-laid at an improved fall, entering the septic tank at a slightly lower level.

4.8. Sheds and Other Domestic Structures

The risk to sheds and other domestic structures is that they could be damaged and/or rendered unserviceable from mine subsidence impacts. These include garages, sheds, carport, tanks, greenhouses, hothouses, playhouses and shade structures.

These structures are able to withstand greater subsidence impacts than houses as they are generally lighter, more flexible in construction, and smaller in size. The risk of damage to sheds and other domestic structures is therefore considerably less when compared to houses.

Impacts have been reported to a small number of sheds and other domestic structures during the mining of Longwalls 22 to 30, all of which are considered to be relatively minor and easy to repair.

4.9. Private Roads and Walking Trails in close proximity of steep slopes

There are a small number of private driveways that are located on steep slopes.

It is possible that tension cracks may form at the tops of the slopes, and compression ridges may form at the bottoms of the slopes, and that these may coincide with private driveways. If the tension cracks are left untreated, these may cause erosion to occur, which may further damage driveways. It is unlikely that large-scale slope failure will occur.

Small ripples were observed at locations along the private driveway of a house on Tickle Drive during the mining of Longwall 26.

4.10. Public Amenities

A number of public amenities have experienced subsidence movements during the mining of Longwalls 22 to 30.

Structures at RSL LifeCare Queen Victoria Gardens may experience small mining-induced movements during the mining of Longwalls 28 to 30. A separate management plan will be developed by Tahmoor Colliery and Queen Victoria Gardens

There are no other public amenities predicted to experience more than 20 mm of additional subsidence during the mining of Longwalls 28 to 30.

4.11. Commercial and Business Establishments

The commercial and business establishments within the SMP Area have been identified and are described in Report No. MSEC647.

A number of commercial and business establishments will experience minor subsidence movements during the mining of Longwall 31.

- Commercial, industrial and business establishments along Bridge Street and Redbank Place in South Picton.
- Commercial establishment on Stilton Lane, which is located directly above the commencing end of Longwall 31.

Separate management plans have been or will be developed for these establishments prior to the influence of mining of Longwall 31.

4.12. Risks associated with Existing Structural Condition

The existing structural condition of structures varies within the general mining area. This is a function of age, structural design, construction workmanship and maintenance. Pre-mining inspections undertaken by Tahmoor Colliery have identified elements of structures that did not appear to comply fully with Australian Standards, in regard to design and construction. In a small number of cases, the existing structural condition has been considered unsafe and Tahmoor Colliery has undertaken measures to repair the defect, or has informed the landowner of the hazard.

There is a remote possibility that the comparatively small additional contribution of mine subsidence movements could be sufficient to result in the structures that do not meet Australian Standards to become potentially unsafe. While the warnings appear dire, it should be noted that the likelihood of structural failure is still considered to be remote as no structures have collapsed as a result of mine subsidence movements in the Southern Coalfield.

The experience from the mining of Longwalls 22 to 30, affecting more than 1900 structures shows that residents have not been exposed to immediate and sudden safety hazards as a result of impacts that occur due to mine subsidence movements. In rare cases, some structures have experienced severe impacts, but the impacts did not present an immediate risk to public safety as they developed gradually with ample time to relocate residents.

The management strategy described in Section 4.3 includes measures to identify potentially ‘unstable structures:

A total of 910 pre-mining inspections, 226 pre-mining checks and 153 front of house inspections have been undertaken by Subsidence Advisory NSW and Tahmoor Colliery to date. Tahmoor Colliery has undertaken thousands of visual inspections of structures during the mining of Longwalls 22 to 30. A reduced amount of inspections is expected to be undertaken during the mining of Longwall 31 as there are fewer structures above these longwalls.

Tahmoor Colliery will undertake a structural inspection of any structures that have been identified from front of house inspections as being potentially unstable. Further management measures may be implemented following the findings of the inspection.

4.13. Farm dams

A total 63 dams have been directly mined beneath by Longwalls 22 to 30 with one impact having been reported to a dam located directly above the extracted Longwall 27. This represents an impact rate of less than 0.5%. The dataset includes some large water treatment dams above Longwall 24A. A similar experience is found at dams located above other extracted longwalls at Appin and West Cliff Collieries, where the depth of cover is similar. While no impacts have been reported to dam walls, seepage was observed at the base of one dam wall that is located above Longwall 702 at Appin Colliery.

The dams are typically constructed from cohesive soils with reasonably high clay contents. The walls of the farm dams should be capable of withstanding tensile strains of up to 3 mm/m without significant impacts, because of their inherent plasticity.

The likelihood of leakage of the dam wall or floor due to subsidence is considered to be very rare. If impacts occur to the dams, Tahmoor Colliery will supply water to the landowner on a temporary basis until the dam is repaired.

As undertaken during the mining of Longwalls 22 to 30, Tahmoor Colliery will visually inspect the dams immediately prior to and immediately after active subsidence of the dam. If impacts occur to the dams, Tahmoor Colliery will supply water to the landowner on a temporary basis until the dam is repaired.

From a public safety point of view, there are no structures or driveways located immediately downstream of the dams directly above Longwall 31.

5.1. Structures Management Group (SMG)

The SMG is responsible for taking the necessary actions required to manage the risks that are identified from monitoring of structures. The SMG's key members are:

- Tahmoor Colliery
- John Matheson and Associates
- Mine Subsidence Engineering Consultants

The Mine Subsidence Board also participates at SMG meetings as observers when available. The SMG may invite other specialist consultants from time to time, including GHD Geotechnics where issues relate to slope stability.

5.2. Mitigation Measures

Mitigation measures have been undertaken to strengthen a small number of structures prior to the influence of mine subsidence movements prior to the mining of Longwalls 24A and 25. No additional structures have been identified for strengthening prior to the mining of Longwalls 28 to 31 at the writing this management plan.

5.3. Community Consultation, Co-operation and Co-ordination

Experiences during the mining of Longwalls 22 to 30 have found that the most effective method of managing potential impacts on the safety and serviceability of structures are by way of community consultation. Residents living within the active subsidence zone have often provided early feedback about impacts developing at their houses or along their local roads. Contact is made well before impacts develop to a level of severity sufficient to become a safety hazard.

The initial community consultation commenced when the Colliery applied for development consent to mine. A commission of inquiry was undertaken as part of this process. Tahmoor Colliery continued to develop their mine plans after development approval was received. These plans were discussed with the Tahmoor Colliery Community Consultative Committee (TCCCC), which was set up in accordance with the conditions of development consent. Prior to mining the first longwall beneath Tahmoor, the Colliery increased the level of communication with the community.

The approaches adopted by Tahmoor Colliery are listed below.

- *Undertake conservative predictions and impact assessments*
  Tahmoor Colliery and MSEC have adopted a conservative approach to predicting subsidence and assessing impacts. This reduces the likelihood of under-stating the predicted impacts. For example, predictions for each structure have been made by predicting the maximum subsidence, tilt and strain within a 20 metre radius around each structure.
- *Undertake detailed predictions and impact assessments*
  By undertaking detailed subsidence predictions, the Colliery is able to provide residents with predictions for their own structures. Individual assessments provide some comfort to concerned residents. This is particularly helpful for residents that live beyond the extent of mining and are expected to experience only small movements.
- *Community Information Days*
  A number of advertised information days are held by the Colliery through the year. The Information Days allow members of the community to directly meet Colliery representatives and its consultants. Subsidence Advisory NSW is also present on Information Days to answer questions.
  The information exchanged at Information Days also assist the Colliery, as members of the community sometimes provide information about particular surface features or impacts that the Colliery might not have been aware of.

- *Tahmoor Colliery Community Consultative Committee*
  This committee meets at regular (bi-monthly to quarterly) intervals. It allows the Colliery to present information to the committee and receive feedback. The committee is committed to ensuring that the concerns of the community are well understood by the Colliery. Many of the members have been part of the committee for several years, and this allows for informed discussion to take place.
- *Letters and door knocking to residents*
  The Colliery sends many letters to community advising of imminent longwall mining in their area. By continuing to engage with residents at each stage of mining, the Colliery is able to find new residents who might not have been aware that mining was taking place. The letters include:
    - Notification of preparation of SMP application for LWs 31 to 37 and notification of lodgement of SMP application. The notification letter attached a Subsidence Information Pack, which included information on longwall mining and mine subsidence, claims process with Subsidence Advisory NSW, recommendation to undertake pre-mining inspections with Subsidence Advisory NSW (or the Colliery if preferred), a list of emergency contact numbers and point of contact at Tahmoor Colliery.
    - Notification to all landowners within the application area of SMP approval for LW31. These were within 30 days of the date of approval in accordance with Clause 7 of the SMP approval. The Subsidence Information Pack was resent as part of this notification.
    - Notification of imminent commencement of each longwall. The letter is sent to all landowners whose properties are located directly above the active longwall panel plus landowners whose properties are located directly above the next longwall panel. The letter encourages the landowners to undertake pre-mining inspections with the Subsidence Advisory NSW.
    - For properties where pre-mining inspections or checks have been or will be undertaken in accordance with this Management Plan, Tahmoor Colliery have r will make direct contact to arrange access with the landowner by mail, letterbox drop, phone and/or door knocking.
    - Door knocking of houses located directly above the active longwall
        - This exercise is an attempt to directly engage with residents and is undertaken in conjunction with Front of House inspections (refer Section 5.4.1).
        - This exercise will be undertaken before the longwall face approaches within 300 metres of each property, so that there is adequate time, if required, to arrange additional inspections and/or surveys and implement any mitigation measures if required before mining-induced impacts are experienced.
- *Individual meetings with residents*
  Many members of the community prefer to meet with Colliery representatives face to face. The Colliery has held many individual meetings with concerned residents to explain how mine subsidence develops and what the impacts might be. This is a time consuming but rewarding process for residents and the Colliery.
- *Newspaper advertisements*
  The Colliery places advertisements in the newspaper from time to time to advise the community at large about community consultation opportunities, including community information days.
- *Monthly reporting*
  The Colliery provides regular updates on the progress of mining in the area. This is conducted mainly by community newsletter by mail, email, website and notice boards for any member of the community who wishes to be regularly informed. The updates advise the current position of the longwall and what impacts have been observed during the past week.
- *Prompt response to reported impacts*
  Tahmoor Colliery responds quickly to impacts that are reported by the community. If a severe impact is reported, the Colliery checks neighbouring properties to see whether the incident is localised or part of a larger potential issue.
- *Ongoing monitoring if impacts occur*
  Where impacts have been reported, the Colliery offers to continue monitoring the property for further impacts.

The Subsidence Advisory NSW.also plays a very important role in managing the expectations of the community. The SANSW's concerted efforts to quickly respond to residents' concerns, particularly where they relate to emergency repairs to doors, gates or service pipes, have greatly assisted the community in coping with any inconvenience that may have occurred as a result of mine subsidence.

5.4. Site-Specific Structure Inspection Plan

5.4.1. Pre-mining Front of House inspections

At the time of preparing Report No. MSEC647 (2014) in support of Tahmoor Colliery's SMP Application, structures were identified from aerial photographs, with structure types identified from kerbside inspections. A number of newly constructed structures have been identified from an aerial photograph in 2013.

Front of house inspections have been undertaken by Tahmoor Colliery in company with a structural engineer to identify potentially unstable structures that may warrant a structural inspection, subject to approval by the landowner. The inspections include houses located directly above Longwall 31. An internal inspection will be recommended if a potential structural deficiency is perceived.

The results of the pre-mining inspections are attached to this Management Plan in the Appendix.

5.4.2. Pre-mining Geotechnical Inspections of Steep Slopes

A qualified geotechnical engineer (GHD Geotechnics) has inspected steep slopes on which structures are located to determine whether there is any potential for slope instability prior to, during or after mining. The inspection findings are detailed in Section 4.4.1.

5.4.3. Pre-mining Structural Inspections

Structural inspections will be undertaken for structures as defined in Section 4.3.1.

Structural inspections will be undertaken before the longwall face approaches to within 300 metres of travel prior to directly mining beneath each property.

5.4.4. Pre-Mining Inspections by Subsidence Advisory NSW

Subsidence Advisory NSW has undertaken a number of pre-mining inspections above Longwalls 22 to 30. These are shown in Fig. 5.1. Further inspections may be conducted by Subsidence Advisory NSW in the future if requested by a landowner. Tahmoor Colliery will undertake a structural inspection of a property if a potential structural deficiency is perceived by Subsidence Advisory NSW.as a result of its pre-mining inspections.

5.4.5. Visual kerbside inspections during mining

Detailed visual inspections will be undertaken along streets on a weekly basis within the active subsidence area during the mining of Longwall 31, commencing after 200 metres of extraction.

A second, vehicle based inspection will also be undertaken once a week within the active subsidence area during the mining of Longwall 31, commencing after 200 metres of extraction.

The frequency of inspections can be increased, if required, based on actual observations.

5.4.6. Visual Inspections of Structures during mining

Weekly visual inspections will be conducted for the following structures or slopes when they are located within the active subsidence zone:

- Public amenities and commercial and business establishments
- Houses and units that have experienced impacts as a result of mining previous longwalls
- Pool gates
- Structures and driveways located on steep slopes, where recommended by the geotechnical engineer or structural engineer.
- Farm dams immediately prior to and after the period of active subsidence for each dam.

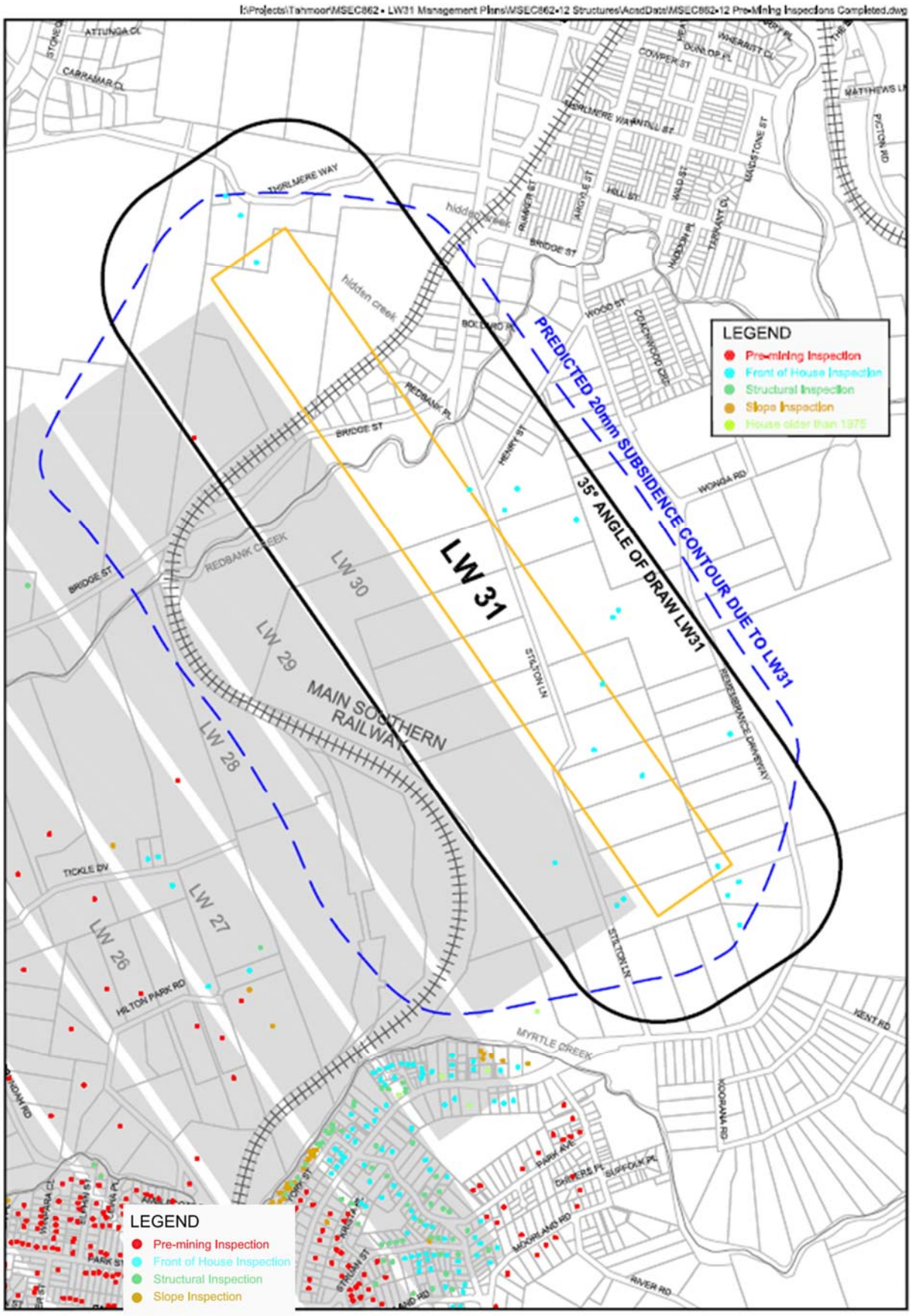


Fig. 5.1 Properties for which Pre-Mining Inspections or Front of House Inspections have been completed

5.5. Ground and Structure Monitoring Plan

5.5.1. Ground Surveys along Streets

Monitoring lines have been installed along streets within the urban area above Longwall 31, as shown in Drawing No. MSEC862-00-01. The monitoring lines have been initially surveyed to provide a baseline reference. Monitoring of street survey lines will be conducted for every 200 metres of longwall travel as a minimum for pegs located within the active subsidence zone.

5.5.2. Specific Structure Surveys

Tahmoor Colliery will undertake building surveys where recommended by a geotechnical or structural engineer.

Ground surveys around structures are used as a baseline monitoring tool. Surveys are undertaken following completion of each longwall unless impacts or high tilts are observed. Tahmoor Colliery will place permanent ground survey pegs around each subject building. The Colliery will endeavour to place pegs at each external and internal corner of the building, and one peg at the centre of each external side of reasonable length (this will depend on the overall size of the building, but is approximately 10 metres).

The Colliery will record the reduced levels of each peg, as well as the horizontal distance between each peg around the perimeter of the building. The survey information will provide subsidence, tilt, curvature and strain information on the ground around the building. This general surveying scheme is illustrated in Fig. 5.2. It is recognised that in some cases, it will not be possible to gain access and suitable lines of sight to the entire perimeter of the building, and in some cases, the number of survey pegs may be reduced. However, as a minimum, survey marks will be placed at every corner of the building.

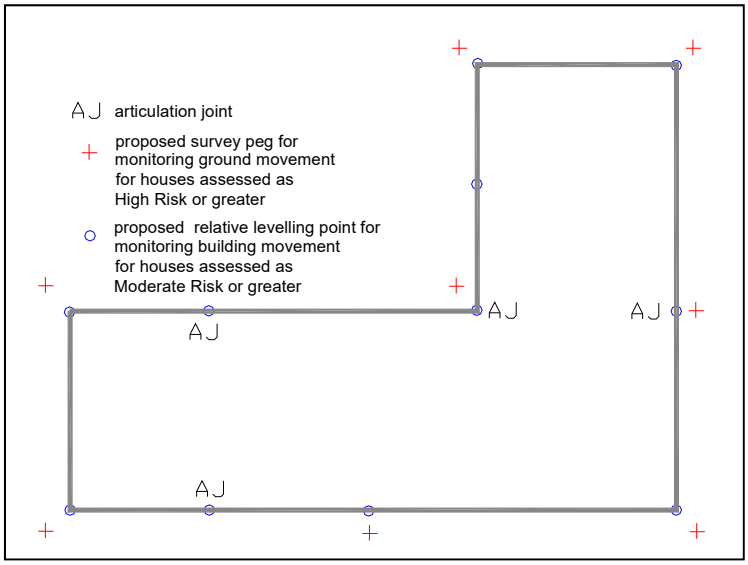


Fig. 5.2 Schematic layout for ground movement and building level surveys around a typical building

5.6. Schedule of Inspections and Surveys

A schedule of inspections and surveys is maintained by Tahmoor Colliery.

5.7. Inspection and Survey Register

A register will be kept by Tahmoor Colliery, recording when inspections and surveys are conducted. Tahmoor Colliery can, at any time, provide a copy of the register to MSO.

5.8. Triggers and Responses

Trigger levels have been developed by Tahmoor Colliery based on observed ground movements or impacts. Trigger levels for each monitoring parameter are described in the risk control procedures in Table 5.1.

Structural inspections will be undertaken for any structure where ground tilt is observed to exceed 7 mm/m or curvature is observed to exceed 0.2 km^{-1}.

Tahmoor Colliery will coordinate and ensure that building contractors are on standby for immediate call out and service in the event of impacts occurring. Temporary alternative accommodation will also be arranged by Tahmoor Colliery in the unlikely event that a residence becomes unsafe as a result of mine subsidence impacts.

Immediate responses will be undertaken by Tahmoor Colliery for the following impacts:

- Impacts that create a serious public safety hazard
- Impacts to all entry and exit doors, and all other doors that must remain operational for security and fire egress reasons, even if further impacts are anticipated.
- Impacts that impair any essential services.
- Impacts to sensitive equipment, even if further impacts are anticipated.

5.9. Risk Control Procedures for Longwall 31

The risk control procedures for the management of potential impacts to residential, public amenities and commercial or business establishments are provided in Table 5.1.

Table 5.1 Risk Control Procedures for Residential Establishments for Longwall 31

Infrastructure	Hazard / Impact	Risk	Trigger	Control Procedure/s	Timing and Frequency	By Whom?
Residential Establishments that will experience mine subsidence movements due to the mining of Longwall 31	Impacts occur	Low to Moderate	Baseline monitoring for LW31	Kerbside inspection to identify any potentially unstable structures	Completed	Tahmoor Colliery (JMA)
				Front of house inspection to identify any potentially unstable structures, for properties located directly above the active longwall	*For properties located directly above LW31:* Complete *For other structures:* Prior to longwall face approaching to within 300 m of each property	Tahmoor Colliery & JMA
			Prior to mining	Contact residents to inform them of commencement of mine subsidence. Request owners for information on any potential issues with existing structures	Prior to subsidence occurring	Tahmoor Colliery
				Conduct geotechnical assessment of steep slopes in vicinity of structure to check whether there is any potential for slope instability prior to, during or after mining.	Complete	Tahmoor Colliery (GHD Geotechnics)
				Conduct pre-mining structural inspection and assessment of: • Structures that have been recommended for structural inspection by the geotechnical engineer • Structures that have been identified as being potentially unstable • Houses built outside Mine Subsidence District which are predicted to experience more than 150 mm of subsidence • Houses built prior to declaration of the Mine Subsidence District (1975) and predicted to experience more than 150 mm of subsidence • Houses above potential hidden creeks	Prior to longwall face approaching to within 300 m of each property.	Tahmoor Colliery (JMA)
				Installation of additional monitoring measures or mitigation/strengthening measures as recommended by structural engineer	None recommended for LW31	Tahmoor Colliery
				Install survey lines on all streets above Longwall 31 and survey initial levels and strain distances (as shown in Drawing No. MSEC862-00-01).	Complete	Tahmoor Colliery (SMEC)
			Discovery of potential structural issue prior to mining	Conduct structural pre-mining inspection and assessment and consider: - any mitigation / strengthening measures to improve the existing structural condition - any management measures that should be undertaken prior to or during mining - any monitoring and inspection measures, triggers and responses during mining	Within 1 week of discovery	SMG
				Advise property owner, Subsidence Advisory NSW (SANSW) and MSO of findings of structural engineer	Within 1 week of inspection	Tahmoor Colliery
				Undertake mitigation / strengthening measures if decided by SMG	Prior to longwall face approaching to within 100 m of structure	Tahmoor Colliery

Infrastructure	Hazard / Impact	Risk	Trigger	Control Procedure/s	Timing and Frequency	By Whom?
Residential Establishments that will experience mine subsidence movements due to the mining of Longwall 31	Impacts occur	Low to Moderate	During mining of Longwall 31	Survey levels of street survey lines within active subsidence area	Every 200 metres of longwall face movement	Tahmoor Colliery (SMEC)
				Conduct kerbside visual inspection of streets and structures	Detailed inspection once a week Vehicle based inspection once a week within active subsidence area	Tahmoor Colliery (Colin Dove)
				Assess subsidence results and project likely ground movements for structures. Provide subsidence monitoring report and commentary.	Weekly after 200 m of extraction of LW31	Tahmoor Colliery (MSEC)
				Confirm arrangements for building contractors to remain on standby for immediate call out and service in the event of impacts affecting safety or serviceability.	Prior to subsidence occurring	Tahmoor Colliery
				Conduct inspections during mining for following structures: a) Public amenities and commercial business establishments b) Structures that have previously experienced mine subsidence impacts, where recommended by the SMG c) Pool gates d) Any other structures recommended for regular inspections and/or structure surveys by geotechnical or structural engineer due to their proximity to steep slopes or pre-existing condition	Weekly within active subsidence zone, or as required by geotechnical or structural engineer	Tahmoor Colliery
			Observed tilts are greater than 7 mm/m or observed curvatures are greater than 0.2 km^{-1} near structure	Conduct inspection of building and provide photographic survey and impact report	Within one week	Tahmoor Colliery
				Consider structural inspection/additional monitoring and/or mitigation/strengthening measures	Immediately after building inspection.	Tahmoor Colliery (JMA)

Infrastructure	Hazard / Impact	Risk	Trigger	Control Procedure/s	Timing and Frequency	By Whom?
Residential Establishments that will experience mine subsidence movements due to the mining of Longwall 31	Impacts occur	Low to Moderate	Significant non-systematic movement occurs or Impacts observed to any surface infrastructure (not just structures) or Slope slippage observed	Consider whether any additional management measures are required in light of observations, including additional geotechnical or structural inspections, increase frequency of surveys and inspections, additional community consultation	As required by SMG	SMG
				Notify landowner, Tahmoor Colliery, Subsidence Advisory NSW (SANSW), MSO	Within one week	Tahmoor Colliery
			Any impact occurs to structure	As information can come from many possible sources: If not already done, notify landowner, Tahmoor Colliery, Subsidence Advisory NSW (SANSW)	Within 24 hours	Tahmoor Colliery
				Inspect impact of subsidence on building	As soon as possible	Tahmoor Colliery
				Inspect condition of building, where recommended by the SMG based on feedback from Subsidence Advisory NSW (SANSW) or TC	As recommended by SMG with active subsidence area or as agreed with owner	Tahmoor Colliery
				Rectify any adverse impacts that impair upon: - the safety, access and mobility, security or fire egress - any essential services - sensitive equipment used for commercial and business establishments	As soon as possible at any stage during mining	Tahmoor Colliery and/or Subsidence Advisory NSW
				Repair damage to structure	When subsidence impacts cease	Tahmoor Colliery and/or Subsidence Advisory NSW
			Observed impacts are greater than predicted impacts	Investigate cause(s) for greater impacts, including possibility of non-systematic or anomalous movements, type of structure. Investigate spatial trends in data to identify any pattern.	Within one week of observation	Tahmoor Colliery
			Observed impact is AS2870 Category 3 or greater	Notify landowner, Tahmoor Colliery, Subsidence Advisory NSW (SANSW), MSO	Within 24 hours	Tahmoor Colliery
				Inspect structural condition of building.	Within two days and then as recommended by structural engineer	Tahmoor Colliery
				Reassess final level of damage based upon likelihood of further damage and structural condition.	Immediately after structural re-inspection.	SMG
				Consider additional monitoring and/or mitigation/strengthening measures	Immediately after structural re-inspection.	SMG
			A hazard has been identified that involves potential serious injury or illness to a person or persons at the property, and cannot be controlled	Coordinate with Subsidence Advisory NSW (SANSW) and provide temporary accommodation for residents.	Immediately	Tahmoor Colliery
				Utilise acquisition and compensation procedure from DA67/98-1999 Development Consent Conditions 18-26 and Subsidence Advisory NSW (SANSW) procedures	Immediately	Tahmoor Colliery
			Property owner does not accept acquisition	Temporarily relocate residents until building is repaired	Immediately	Tahmoor Colliery and/or Subsidence Advisory NSW

Infrastructure	Hazard / Impact	Risk	Trigger	Control Procedure/s	Timing and Frequency	By Whom?
Houses	House subsides below 100 year ARI flood level	Moderate	Prior to Mining	Assess potential for houses to subside below 100 year ARI flood level, including transverse ground surveys of Myrtle and Redbank Creeks.	Complete	Tahmoor Colliery
			Completion of Mining	Conduct transverse ground surveys of Myrtle and Redbank Creeks	Complete for Myrtle Creek Completion of mining when subsidence movements along Redbank Creeks cease	Tahmoor Colliery (SMEC)
				Assess whether any houses has subsided below 100 year ARI flood level	Complete for Myrtle Creek Completion of mining when subsidence movements along Redbank Creeks cease	Tahmoor Colliery
			House(s) subside below 100 year ARI flood level	Raise house so that floor level is above 100 year ARI flood level	As required	Tahmoor Colliery
Houses	Impacts to future houses	Low to Moderate	Prior to mining	Contact residents to inform them of commencement of mine subsidence. Request owners for information on whether any new houses have been constructed since 2014.	Prior to subsidence occurring	Tahmoor Colliery
			Owner notifies of new house	Conduct pre-mining inspection by Subsidence Advisory NSW, if requested	Prior to subsidence occurring	Subsidence Advisory NSW
				Conduct impact assessment and risk analysis, if requested	Prior to subsidence occurring	Tahmoor Colliery (MSEC)
			New house has maximum plan dimension greater than 30 m	Conduct subsidence predictions, impact assessment and risk analysis	Prior to subsidence occurring	Tahmoor Colliery (MSEC)
				Follow risk control procedures, as for other houses	Immediately	Tahmoor Colliery
Swimming pools and pool gates	Damage to pool	Low	None	Notify owner of potential impacts to pool	Before mine subsidence impacts occur	Tahmoor Colliery
	Pool gate – won't shut	High	None	Notify owner of potential impact to pool gate and fence	Before mine subsidence impacts occur	Tahmoor Colliery
				Visually inspect pool gate to check that it is operating properly	Weekly when each pool is within active subsidence zone, and at completion of each longwall	Tahmoor Colliery
			Pool gate won't close	Contact Subsidence Advisory NSW to repair gate	Immediately	Tahmoor Colliery
				Repair gate	As soon as possible	Tahmoor Colliery or Subsidence Advisory NSW
Farm dams	Loss of water storage due to leakage of dam wall or floor	Low	During mining	Visual inspection of dam	Immediately prior to and after period of active subsidence at each dam	Tahmoor Colliery (GeoTerra)
			Cracks observed in dam	Repair cracks	As required	Subsidence Advisory NSW
			Loss of water supply due to leakage of dam wall or floor	Supply water to landowner	As required	Tahmoor Colliery

6.0 SMG REVIEW MEETINGS

SMG meetings will be held between for discussion and resolution of issues raised in the operation of the Management Plan. The frequency of meetings shall be as agreed by the parties.

SMG meetings will discuss any incidents reported in relation to the relevant surface feature, the progress of mining, the degree of mine subsidence that has occurred, and comparisons between observed and predicted ground movements.

It will be the responsibility of the meeting representatives to determine whether the incidents reported are due to the impacts of mine subsidence, and what action will be taken in response.

In the event that a significant risk is identified for a particular surface feature, any member of the SMG may call an emergency SMG Meeting, with one day's notice, to discuss proposed actions and to keep other parties informed of developments in the monitoring of the surface feature.

7.0 AUDIT AND REVIEW

All Management Plans within this document have been agreed between parties. The Management Plan will be reviewed following extraction of each longwall.

Should an audit of the Management Plan be required during that period, an auditor shall be appointed by the Tahmoor Colliery to review the operation of the Management Plan and report at the next scheduled Plan Review Meeting.

Other factors that may require a review of the Management Plan are:-

- Observation of greater impacts on surface features due to mine subsidence than was previously expected.
- Observation of fewer impacts or no impacts on surface features due to mine subsidence than was previously expected.
- Observation of significant variation between observed and predicted subsidence.

8.0 RECORD KEEPING

Tahmoor Colliery will keep and distribute minutes of any SMG Meeting.

9.0 CONTACT LIST

Organisation	Contact (* SMG Member)	Phone	Email / Mail	Fax
NSW Department of Industry – Division of Resources and Energy (DRE)	Gang Li	(02) 4931 6644 0409 227 986	gang.li@ industry.gov.au	(02) 4931 6790
	Phil Steuart	(02) 4931 6648	phil.steuart@industry.gov.au	(02) 4931 6790
	Ray Ramage	(02) 4931 6645 0402 477 620	ray.ramage@ industry.gov.au	(02) 4931 6790
John Matheson & Associates (JMA)	John Matheson*	(02) 9979 6618	jma.eng@bigpond.net.au	(02) 9999 0121
Subsidence Advisory NSW (Mine Subsidence Board)	Matthew Montgomery	(02) 4677 1967 0425 275 564	matthew.montgomery@finance.nsw.gov.au	(02) 4677 2040
Mine Subsidence Engineering Consultants (MSEC)	Daryl Kay*	(02) 9413 3777 0416 191 304	daryl@minesubsidence.com	(02) 8412 0222
Glencore Tahmoor Coal – Approvals and Community Coordinator	Belinda Treverrow*	(02) 4640 0133 0458 627 752	Belinda.L.Treverrow@glencore.com.au	(02) 4640 0140
Tahmoor Colliery 24 hour contact	Tahmoor Colliery Control	1800 154 415	-	-

* denotes member of Structures Management Group

APPENDIX A.

Please refer to the following documents:

- Drawings
- JMA (2017). Site specific pre-mining investigation reports for Longwall 31. April 2017.

I:\Projects\Tahmoor\MSEC862 - LW31 Management Plans\MSEC862-00 General\AcadData\MSEC862-00-01 Monitoring LW31 Rev B.dwg

msec mine subsidence ENGINEERING CONSULTANTS
Suite 402, 13 Spring Street, Chatswood NSW 2067
PO Box 302, Chatswood NSW 2057
Tel +61 2 9413 3777
www.minesubsidence.com

TAHMOOR COLLIERY

TAHMOOR NORTH - LW31

MONITORING OVER LW31

TAHMOOR UNDERGROUND GLENCORE

DATE:	SCALE:	DRAWING No:	Rev No
26 June 2017	as shown	MSEC862-00-01	B

277 500 278 000 278 500 279 000

6 214 500 6 214 000 6 213 500 6 213 000 6 212 500 6 212 000 6 211 500 6 211 000

Grid to MGA co-ordinates

Refer Queen Victoria Memorial Home for details (MSEC815-17)

Refer Embankment 89.80km diagram for details (MSEC863-11)

Refer Embankment 90.252km diagram for details (MSEC863-10)

Refer individual diagrams for details of Commercial area (MSEC862-19)

Refer Embankment 90.676km diagram for details (MSEC863-09)

Refer Bridge St Cutting & Overbridge 91.00km diagram for details (MSEC863-08)

Refer Redbank Creek Culvert diagram for details (MSEC863-07)

Refer Railway diagram for details (MSEC863-03)

Refer ATS diagram for details (MSEC863, Fig. 4.6)

Refer Embankment diagram for details (MSEC863-05)

Refer Picton Water Recycling diagram for details (MSEC862-18)

Refer Deviation Overbridge 92.41km diagram for details (MSEC863-06)

Refer Deviation Cutting diagram for details (MSEC863-06)

Refer No155 Stilton Lane diagram for details (MSEC862-15-02)

Dam removed 2016

Myrtle Creek Bridge

THIRLMERE WAY

RUMKER ST

ARGYLE ST

BRIDGE ST

REDBANK CREEK

HENRY ST

STILTON LN

REMEMBRANCE DRIVEWAY

MAIN SOUTHERN RAILWAY

MYRTLE CREEK

LW 28 LW 29 LW 30 LW 31 LW 27 LW 26

35° ANGLE OF DRAW LW31

PREDICTED 20mm SUBSIDENCE CONTOUR DUE TO LW31

628485 628623 628632 628565 628338 623346 623341 805778 798027

LEGEND

- Existing Monitoring Lines
- Future Monitoring Lines
- Future Monitoring Lines Prior to LW31
- Monitoring Lines Before & End of LW30
- Surveys During LW31
- Critical Power Poles
- Specific Structure Inspections

Refer to Management Plans for Timing & Frequencies

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 10 Stilton LA, PICTON

MSEC Structure Reference: GG11a

Age of structure (date in which structure first visible in aerial photograph): 1961

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Image 5400 depicts a single storey structure. Metal and tiled portions of roofing. Timber roof framing. Timber wall framing with portions of full masonry. Suspended timber floor.

Image 5401 depicts a single storey garage with tiled roof. Timber roof framing with full masonry walls on a concrete raft slab.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5400

Image 5401

Image 5402

Image 5403

Image 5404

Image 5405

Image 5406

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 10 Stilton LA, PICTON

MSEC Structure Reference: GG29a GG30a

Age of structure (date in which structure first visible in aerial photograph): 2002

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Image 5408 depicts a single storey house with metal colour bond roofing. Timber roof framing, brick veneer walls on a concrete raft slab.

Image 5409 depicts a single storey shed with metal roof. Steel roof framing with metal clad walls on a concrete raft slab.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5408

Image 5409

Image 5410

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 35 Stilton LA, PICTON

MSEC Structure Reference: GG31

Age of structure (date in which structure first visible in aerial photograph): 1961

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with metal roofing. Timber roof framing with full masonry walls on a suspended timber floor.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

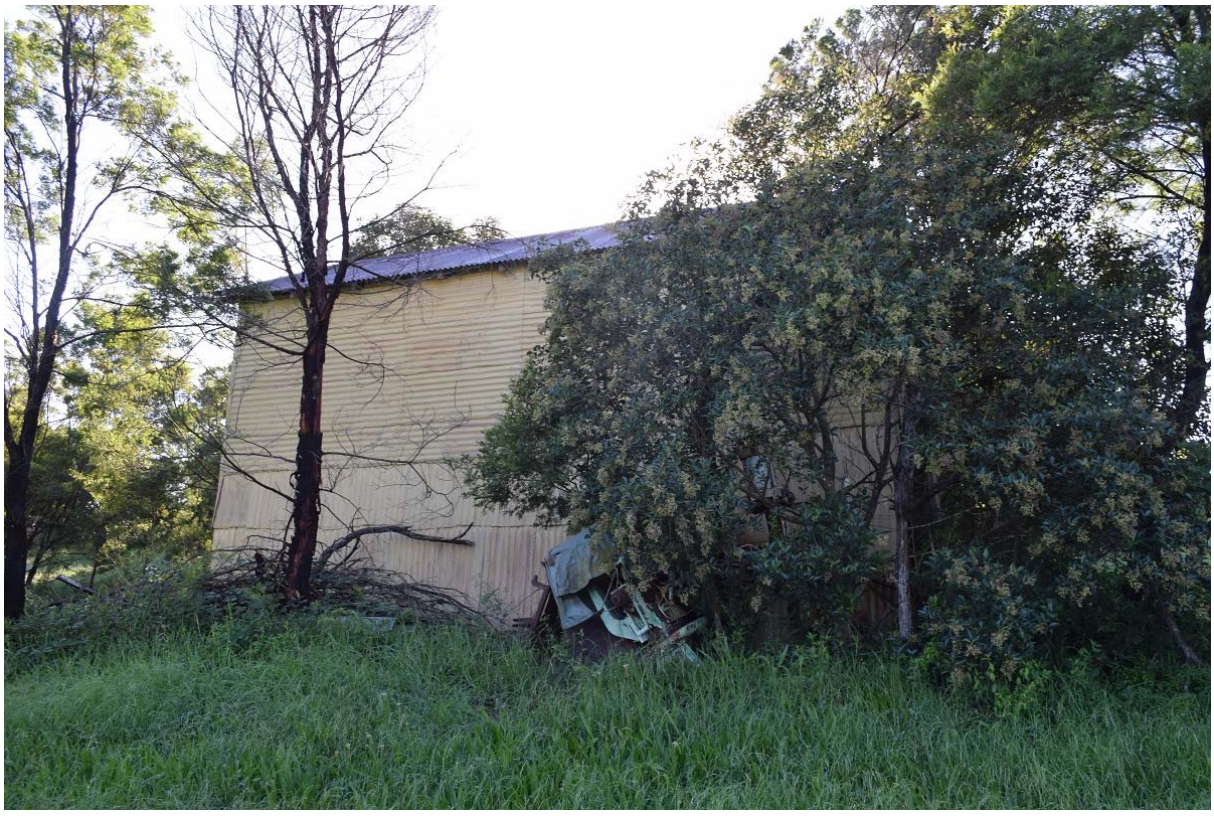
Image 5411

Image 5412

Image 5413

Image 5414

Image 5415



TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 130 Stilton LA, PICTON

MSEC Structure Reference: GG05a, GG05b

Age of structure (date in which structure first visible in aerial photograph): 1983

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with tiled roof. Timber roof framing with brick veneer walls on a concrete raft slab.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5433

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 75 Stilton LA, PICTON

MSEC Structure Reference: GG34a, GG34b, GG35a, GG35b

Age of structure (date in which structure first visible in aerial photograph): 1983

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Image 5416 depicts a single storey house with metal roofing. Steel roof framing, metal clad wall framing on a suspended timber floor.

Image 5417 and 5418 depicts a single storey house with tiled roof. Timber roof framing with brick veneer walls on a suspended timber floor.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5416

Image 5417

Image 5418

Image 5419

Image 5420

Image 5421

Image 5422

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 85 Stilton LA, PICTON

MSEC Structure Reference: GG35/1a, GG35/1b

Age of structure (date in which structure first visible in aerial photograph): 2008

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with metal roofing. Timber roof framing with clad timber wall frames on a suspended timber floor.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5423

Image 5424

Image 5425

Image 5426

Image 5427

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 95 Stilton LA, PICTON

MSEC Structure Reference: GG36a, GG36b, GG36c

Age of structure (date in which structure first visible in aerial photograph): 1983

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with tiled roof. Timber roof framing with brick veneer walls on a concrete raft slab.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5428

Image 5429

Image 5430

Image 5431

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 2240 Remembrance DRWY, PICTON

MSEC Structure Reference: GG33, GG32

Age of structure (date in which structure first visible in aerial photograph): 1961

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with metal roof. Timber roof framing with full masonry walls on a suspended timber floor.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Main House:

Dairy Shed:

Caretakers Cottage:

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 2247 Remembrance DRWY, PICTON

MSEC Structure Reference: PRE_015_h02

Age of structure (date in which structure first visible in aerial photograph): 1975

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Main house is a single storey house with tiled roof. Timber roof framing with clad timber walls on a suspended timber floor.

Image 5448 depicts a single storey garage with tiled roof, timber roof framing, clad timber walls on a concrete raft slab.

Image 5450 depicts single storey shed with metal roof, steel roof framing, metal clad walls on a concrete raft slab.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5447:

Image 5448:

Image 5449:

Image 5450:

TAHMOOR
UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 2290 Remembrance DRWY (Lot 29)

MSEC Structure Reference: GG51a

Age of structure (date in which structure first visible in aerial photograph): 1994

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with tiled roof. Timber roof framing with brick veneer walls on a concrete raft slab.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5446:

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 2326 Remembrance DRWY, PICTON

MSEC Structure Reference: GG44a

Age of structure (date in which structure first visible in aerial photograph): 1994

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Image 5443 depicts single storey house with tiled roof. Timber roof framing with brick veneer walls on a suspended timber floor.

Image 5444 depicts single storey shed with metal roofing. Steel roof framing, metal clad walls on a concrete raft slab

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5443:

Image 5444:

TAHMOOR
UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 2330 Remembrance DRWY, PICTON

MSEC Structure Reference: GG43/1a, GG43/1d

Age of structure (date in which structure first visible in aerial photograph): 2008

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Image 5435 depicts a single storey house with metal roof. Timber roof framing with clad timber walls on a suspended timber floor.

Image 5436 depicts a single storey stables with metal roofing. Timber roof framing with timber clad walls on a concrete raft slab.

Image 5442 same as main house.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5435:

Image 5436:

Image 5437:

Image 5438:

Image 5439:

Image 5441:

Image 5442:

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 2360 Remembrance DRWY, PICTON

MSEC Structure Reference: GG43b

Age of structure (date in which structure first visible in aerial photograph): 1961

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with metal roof. Timber roof framing with full masonry walls on a suspended timber floor.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Resident refused photographs to be taken on site.

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 673 Thirlmere WY, PICTON

MSEC Structure Reference: V05c

Age of structure (date in which structure first visible in aerial photograph): 2002

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Split level house with tiled roofing. Timber roof framing with brick veneer walls on a suspended timber floor.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5459

Image 5460

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 675 Thirlmere WY, PICTON

MSEC Structure Reference: V06a

Age of structure (date in which structure first visible in aerial photograph): 1966

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with metal roof. Timber roof framing with clad timber walls on a suspended timber floor.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Images:

Pool:

Timber Shed:

Steel Shed:

TAHMOOR UNDERGROUND
GLENCORE

SITE SPECIFIC PRE-MINING INVESTIGATIONS PRIOR TO MINING OF LONGWALL 31

Address: 695 Thirlmere WY, PICTON

MSEC Structure Reference: V07a, V07b

Age of structure (date in which structure first visible in aerial photograph): 1994

Type of Inspection undertaken: Front of House Inspection

Date of Inspection: 19th April 2017

Comments arising from inspection:

Single storey house with tiled roof. Timber roof framing with brick veneer walls on a concrete raft slab.

Are any additional inspections recommended?

No

Are any additional management or monitoring measures recommended in addition to the standard measures described in *Tahmoor Colliery Longwall 31 – Management Plan for Potential Impacts to Built Structures, Report No. MSEC862-12, Revision A?*

Selected photographs during inspection:

Image 5457

Image 5453