Telstra Corporation Ltd
Network Integrity.
N.S.W.

Tahmoor Coal Pty Ltd.
Tahmoor Colliery.

MANAGEMENT PLAN

LONGWALL MINING (LW 29 & LW30) BENEATH TELSTRA PLANT @ TAHMOOR & PICTON N.S.W.

Authorised on behalf of
Telstra Corporation Ltd

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TABLE OF CONTENTS

1.0 Introduction

Tahmoor Coal Proprietary Limited at Tahmoor Colliery proposes to extend longwall mining activities to the north of Tahmoor and towards the south-western side of Picton in NSW. Tahmoor Colliery has previously mined Longwalls 22-27 in the current series and has currently just completed extraction of LW28 and about to commence extraction of LW29.
As part of the planning for mining Longwalls LW29 & LW30, Tahmoor Colliery has identified surface assets which may be affected by the mining operation in Tahmoor north area. Some of these assets belong to Telstra and are part of Telstraôs infrastructure in the area. This management plan will consider the impact of the ground surface movements, contributed by longwalls LW29 & LW30 on these assets owned by Telstra. The new longwall LW29 is planned to commence in June 2015 with LW30 to commence approximately 12 months later after completion of LW29. The new longwalls are approximately 2500 metres in length and are generally located between Remembrance Drive in the south and extending approximately 500 metres to the north-west beyond the main Southern Railway. Longwalls LW29 and 30 will be mined in the same direction as previous longwalls from south-east to north-west. See Plate 1.

Tahmoor Coal commissioned a report by Mine Subsidence Engineering Consultants Pty Ltd (MSEC) in support of the Subsidence Management Plan (SMP) for longwalls LW27 to 30. The Report MSEC 355, Reference No 1, is titled ñThe Prediction of Subsidence Parameters and the Assessment of Mine Subsidence Impacts on Natural Features and Items of Surface Infrastructure due to Mining Longwalls 27-30 at Tahmoor Colliery in Support of the SMP Applicationò. This report identifies an area, to be considered for mine subsidence impacts, bounded by the 20mm subsidence contour line for LW27 to 30 which are shown in MSEC drawing MSEC355-01 attached as Appendix A, Sheet 1. The layout of the Telstra optical fibre and copper cable networks in the area under consideration is shown in Appendix A, Sheets 2 MSEC Drawing numbers MSEC647-07-01.

Telstraôs Tahmoor telephone exchange is located on the north east corner of Thirlmere Way and Denmead Streets. All of Telstraôs main cable network into and out of Tahmoor exchange feeds along Thirlmere Way, north east and south west and to the south along Denmead Street. During the extraction of previous longwalls LW22 to LW28 the mining impacts from mine subsidence on the Telstra network that have occurred have been managed satisfactorily. As mining has continued north of the telephone exchange the potential for impacts on the major network cable infrastructure has changed as now the longwalls are commencing to impact on the Picton exchange area and the optical fibre cables and copper network to the south of Picton. The commencing ends of LW29 and LW30 are at Remembrance Drive where there are main Trunk cables and local cables present from Tahmoor exchange and the north western ends of the longwalls are affecting cables from Picton exchange. The current optical fibre cables potentially impacted by these new longwalls cross LW29 & LW30 and in the north along Bridge Street both originate from Picton exchange rather than Tahmoor. Therefore the Telstra cable network potentially impacted by LW29 & LW30, determined by the 20mm subsidence zone, are located in the following areas :-

a) Copper junction cable from Thirlmere Way north along Remembrance Drive and continuing north east through to Picton.
b) The distribution cable network to individual customers within the 20mm subsidence zone located in the south along Remembrance Drive feeding to Stilton Lane and Koorana Road and the distribution network along Bridge Street at the north-east edge of LW30. This cable network is distributed across the entire 20mm subsidence zone and in general these cables are 100 pair or less and are non-pressurised polyethylene insulated copper cables. This network crosses LW29 and is at the eastern edge of LW30 along both Bridge Street and Stilton Lane.
c) The manhole and pit installations supporting the cable network.
d) Mobile Telephone Transmission Tower & Hut above Redbank Tunnel located on the eastern goaf edge of LW28.
    i) Optical Fibre Cable F PCTN 3002 Section A) installed from Picton exchange along Henry Street and Stilton Lane to the Mobile Telecommunications tower above Redbank Tunnel and
    ii) Optical Fibre Cable F PCTN 3002 Section B) installed from Picton exchange along Bridge Street feeding to the industrial area located on the north eastern edge of LW30

The items of plant affected by ground surface movement therefore include optical fibre and copper junction cable between the exchanges and the associated subscriber cable distribution network in the Tahmoor / Picton area, the manhole, pit and conduit network that supports the entire cable distribution network and the Transmission Tower & Equipment Hut.

Refer to Plate 1 on the following page showing the general layout of the new longwalls.

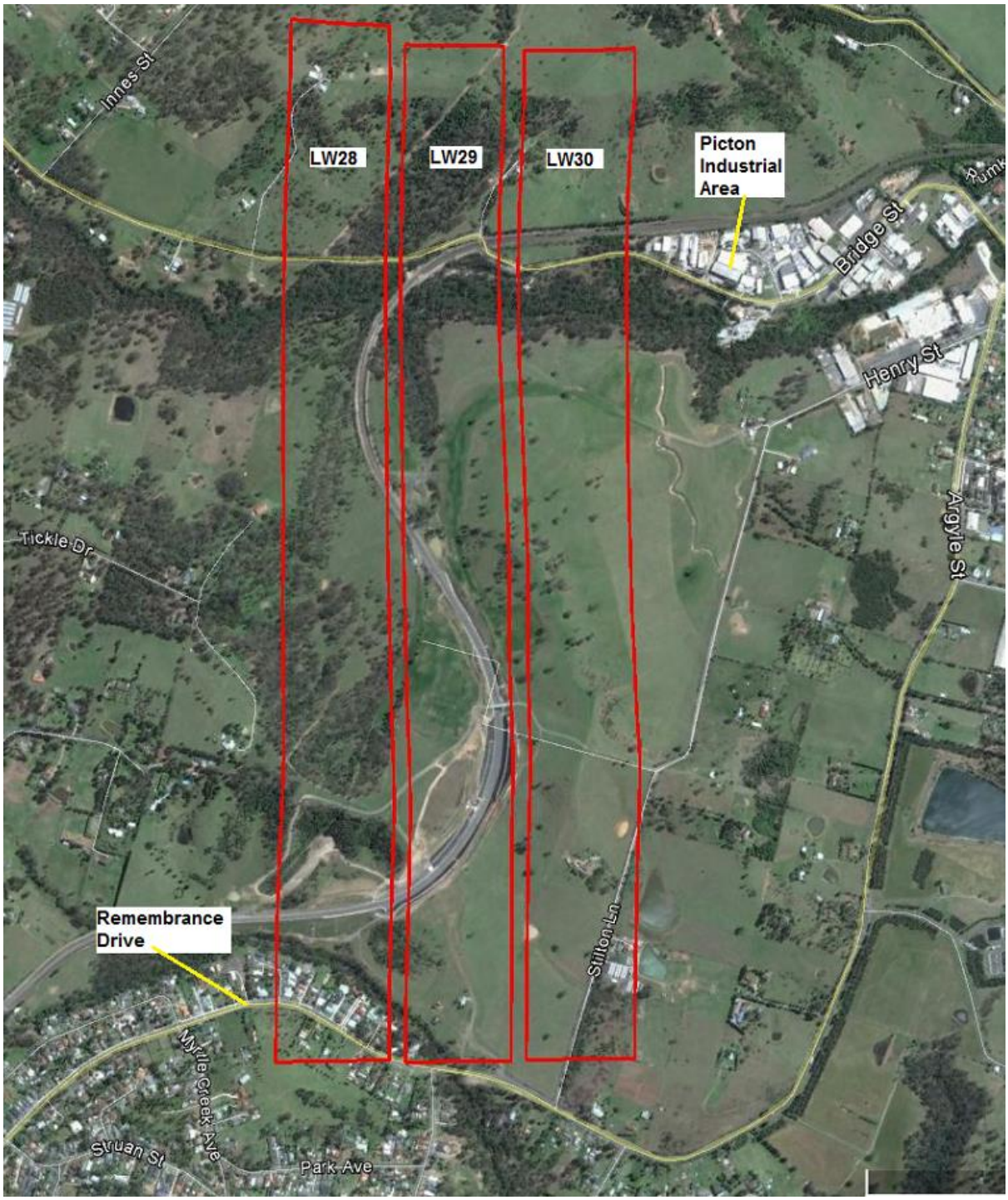

Plate 1:
Google Earth aerial view of three longwalls LW28 just completed and proposed new longwalls LW29 & LW30 extending from Remembrance Drive at Tahmoor in the south and crossing the Main Southern Railway in the north on the western side of Picton.

The Mine Subsidence Engineering Consultants Pty Ltd Report, Reference 1, Section 5.18 Telecommunications Services makes the statement that:-

Based on experience during the mining of Longwalls 22 to 25, it is considered that the mining of the proposed longwalls is unlikely to result in any significant impact to the telecommunications infrastructure within the SMP Area. The range of subsidence movements is predicted to be similar to those experienced during the mining of Longwalls 22 to 25. The nature of infrastructure within the SMP Area is similar to that located above Longwalls 22 to 25. It is likely, however, that a small number of adjustments to overhead services connections to houses will be required and it is possible that impacts may occur to the main lead cable along Remembrance Drive.

The main copper cable and some local copper cables cross beneath Myrtle Creek near Remembrance Drive Bridge. The creek crossing is located near the end of Longwall 29. Predictions of closure and upsidence at the Remembrance Drive Bridge due to the extraction of Longwalls 22 to 30 are shown in Table 5.30.

Table 5.30 Predictions of Upsidence and Closure at Remembrance Drive Bridge over Myrtle Creek

Stage of Mining	Subsidence (mm)	Maximum Tilt (mm/m)	Hogging Curvature (1/km)	Sagging Curvature (1/km)	Upsidence (mm)	Closure (mm)
After LW26	< 20	< 0.2	< 0.01	< 0.01	< 5	< 5
After LW27	< 20	< 0.2	< 0.01	< 0.01	15	10
After LW28	25	< 0.2	< 0.01	< 0.01	25	25
After LW29	100	0.9	0.01	0.01	80	45
After LW30	145	1.3	0.02	0.01	125	55

The predictions for the Telstra network for LW29 & LW30 are summarised MSEC Fig E.01(Optical Fibre Cable near Prediction Line 1 and also Appendix A sheet 7), Fig E.07 (Remembrance Drive Copper Cables), Fig E.08 which are attached as Appendix A sheets 3, 4 & 5. A summary of the Subsidence Tilts and Curvature (Strain) are shown below in Table 1 below.

TABLE 1

Maximum Predicted Cumulative Subsidence Parameters for LW 29 & LW30

Location of Network	Subsidence mm	Tilt mm/m	Curvature (1/km)	Transverse Strain (Applying a factor of 10 to curvature)
Optical fibre cable LW29	1075	5.5	+0.075, -0.10	0.75mm/m tension 1.0mm/m compression
Optical fibre cable LW30	800	5.75	+0.06, -0.11	0.6mm/m tension 1.1mm/m compression
Remembrance Drive	150	0.5	+0.01, -0.01	0.1 mm/m tension 0.1mm/m compression
Bridge Street	1100	6.0	+0.8, -0.12	0.8mm/m tension 1.2mm/m compression

(Above predictions extracted from Prediction Line 1 for the Optical Fibre Cable and from Remembrance Drive and Bridge Street Predictions for Copper Cable Network – Appendix A Sheets 3, 4 & 5)

The Telstra Mobile Telecommunications tower is located towards the northern goaf edge of LW28, as shown in MSEC Drawing MSEC567-07-01 attached as Appendix A Sheet 2. The predicted subsidence parameters for the tower are included in the table below which is an extract from MSEC documentò*Notes on Subsidence Predictions, Observations and Proposed Management Measures for the Telstra Mobile Phone Tower at Site No. 28124, Stilton Road, Tahmoor Above Redbank Tunnel", By Daryl Kay, Mine Subsidence Engineering Consultants, 14 September 2012 & updated 20th March 2014 following LW27 mining.*

Maximum Predicted Cumulative Systematic Subsidence, Tilt and Curvature at the Telstra Tower during the Extraction of Longwalls 22 to 30 (Reference No 2)

Longwall	Maximum Predicted Subsidence (mm)	Maximum Predicted Tilt (mm/m)	Maximum Predicted Hogging Curvature (1/km)	Maximum Predicted Sagging Curvature (1/km)
After LW26	< 20	< 0.2	< 0.01	< 0.01
After LW27	65	0.3	< 0.01	< 0.01
After LW28	600	5.2	0.04	0.06
After LW29	950	4.8	0.05	0.06
After LW30	1060	3.8	0.05	0.06

As can be seen above the maximum tilt is predicted to occur after LW28 with subsequent mining of LW29 & LW30 predicted to marginally reduce maximum tilt operating on the tower. Refer also to MSEC Predictions for the Tower " Tahmoor Colliery – Longwalls 29 & 30, Predicted Subsidence and Tilt during mining" extract from MSEC Report 567 attached as Appendix A Sheets 8 & 9.

The prediction for tilt following extraction of LW28 was for south and west orientations to have tilt levels of 0.18 south and 0.22 degrees west. From the data recorded by the tiltmetres at the base of the tower during LW28 subsidence, the actual recorded tilts were of the order of 0.22 south 0.12 degrees west. Therefore the major tower tilt predicted to the south of 0.18 degrees is very close to the recorded tilt of 0.22 degrees in that direction. There is slightly more variation in the tilt west with the actual tilt recorded of 0.12 compared to predicted of 0.24. Additionally the predicted subsidence for LW28 in the area around the tower was 600mm as shown above and the observed cumulative subsidence from LW27 & LW28 was recorded as 725mm (Sept 14) following LW28 extraction, indicating slightly higher than predicted subsidence but of the same order of magnitude.

Therefore the accuracy of the predictions for tower tilt were reasonably verified for LW28 and from Appendix A Sheet 8 the tilt predictions following LW29 extraction are predicted to reduce in the south & west directions to 0.12 degrees (south) and 0.19 degrees (west) once the longwall has moved between 400 to 500 metres past the tower. The maximum predicted tilt for LW29 is for the transmitters oriented to a bearing of 200 degrees which will experience a predicted maximum tilt of just under 0.3 degrees reducing to 0.2 degrees south with the passage of the longwall. The accepted trigger for realignment of the transmitters is approximately 1 degree change in tilt and the comparison of actual tilts with the predictions verifies that the tilt is anticipated to be well within this accepted limit. The predictions for LW30 are similar to LW29 as discussed above but of lesser impact as the longwall is further east of the tower.

It should be noted from Appendix A sheet 3 that the maximum subsidence predicted near the centre of LW29 near the chain pillars of the longwall is 700mm taking into account the cumulative subsidence from previous longwalls. However the total cumulative subsidence following future mining of LW30 will increase the LW29 subsidence to approximately 1100mm. Therefore it is anticipated that approximately 65% of subsidence (700mm) will occur over LW29 area initially following mining of LW29 with subsidence increasing to 100% (1100mm) following future mining of LW30. The gathering of data during the subsidence impacts from LW24 to LW28 has been a valuable guide for assessing the impacts from LW29 and LW30 accepting that the levels of subsidence strain and tilt will be similar for LW29. Hence it is important to continue to monitor the performance of the Telstra network during the subsidence events from LW29 & LW30 and continue to review the management plan in the future to account for the past performance of the network.

Reference 1 Section 5.18) Telecommunications Services also states that:-

Tahmoor Colliery and Telstra have developed and acted in accordance with an agreed risk management plan to manage potential impacts to telecommunications infrastructure during the mining of Longwalls 22 to 25. The management plan provides for ground and visual monitoring, which include detailed inspections of pits and cables prior to, during and after mining, and recording of cable pressures for main copper cables.

The management plan also provides for planned responses if triggered by observations of impacts. If impacts occur to the network, Telstra is able to quickly make adjustments and restore communications, if required.

This management plan will continue the agreement between Telstra and Tahmoor Coal to effectively manage and address the monitoring issues related to the associated risk for the various elements of the Telstra network exposed to mine subsidence during LW29 and LW30.

1.1) Limitations

The mechanism of mine subsidence and its impact on the Telstra network has now been considered over a large number of longwall mining events in different geographic locations with different types of Telecommunications networks present. The impacts range from undermining of direct buried major interstate optical fibre cables to undermining two pair copper cables servicing one customer. It is known that longwall mining can impact on the transmission characteristics of optical fibre cables, older more brittle copper sheathed cables and aerial cables. In this case since there is one optical fibre cable located across both longwalls to the Mobile Telephone transmission tower there is maximum exposure of this cable and accompanying risk to the mobile telephone network since the cable is the critical link for connection of all mobile calls into the network. Also as mentioned above there are both older copper junction, local copper and aerial cables which are more vulnerable to sheath damage due to their age and size and installation methods. Since monitoring has been performed on the network during LW24 and LW28 subsidence there is now some basis for assessing the performance of the Telstra network from past experience. Generally it has been found that the older lead paper insulated main and junction cables are more vulnerable to ground movement along with the local aerial copper cable distribution network, where that network is exposed to ground tilting.

Once the mine subsidence is initiated there is no method of halting the subsidence event and hence if the degree of ground movement begins to damage Telstra plant, then the impact is irreversible and repair work is required. This has been done in the past where, through continuous monitoring, vulnerable plant has been identified to be at risk during the event and action has been taken to minimise the risk of any continuing damage to the network. A management plan for Telstraôs assets will not necessarily prevent damage but will limit its impact and put in place actions to be taken, should evidence of significant ground movement indicate the potential for damage to occur.

1.2) Objectives

The objectives of this management plan in relation to Telstraôs plant are to put in place procedures to be followed :-

a) To audit and assess the relative risk, for each section of the Telstra network, exposed to mine subsidence.
b) To monitor the impact of mine subsidence and initiate action to mitigate potential damage to the Telstra infrastructure by recording visible changes or changes in transmission characteristics which may affect plant performance.
c) To provide a plan of action, should the subsidence effects impact on the serviceability or performance of plant.
d) Provide a forum, *Plan Review Meeting*, to report, discuss and record impacts on Telstra plant and transmission performance. The Plan *Review Meeting* will involve representatives from Tahmoor Colliery, Telstra Network Integrity, The Mine Subsidence Board, Mine Subsidence Engineering Consultants Pty Ltd, and other consultants as required.

1.3) Scope

This management plan is to be used to assess and protect the performance of the items of Telstraôs network identified to be most at risk, due to mine subsidence impacts. The major items of plant are considered, according to their location relative to subsidence impacts from LW29 & LW30. The items of Telstra plant are listed below as items a) to d) and are referred to in the management plan by these reference numbers.

Trunk and Local Copper Cables

a) Lead Junction cables C PICT 444 Z01 J1-100 and Cable 101 Z01 J1-50 (Both designated T444, 1-100 & 1-50). Installed east along Thirlmere Way from Tahmoor to Picton telephone exchange. This cable is jointed at York Street and Thirlmere Way changing configuration into the northern cable along Remembrance Drive to Picton, designated as C PCTN T444 Z01, J1-150/0.90. Current advice from Telstraôs Planning Group is that this cable is not carrying traffic north of Thirlmere Way but is still capable of carrying customer services to the rural area between Tahmoor and Picton along Remembrance Drive should additional services be required.

b) Copper customer distribution cable on the customer side of the pillar providing connection to each customerôs premises. This network covers the area inside the 20mm subsidence zone along Remembrance Drive, Stilton Lane and Bridge Street. The network consists of cable directly buried, in conduit and aerial distribution cable. This network is the most extensive throughout the zone yet potentially mining should have the lowest impact on this network in terms of possible subsidence impacts and number of services potentially affected.

Distribution Cable and Pit, Manhole & Pipe Network Supporting Cable Infrastructure

c) Conduit, manhole and pit network across the entire area of the 20mm subsidence zone, impacts are possible in the areas where maximum ground movement is predicted due to the age and brittle nature of some of the older asbestos cement pits and conduit components of this network.

Telstra Mobile Telephone Tower and Optical Fibre Cable F PICT 3002 sections A) & B)

d) i) The Telstra Mobile Telephone Tower is located over the old Redbank Railway Tunnel inside the northern goaf edge of LW28 at the end of the optical fibre cable as shown in Appendix A sheet 2. MSEC have completed predictions for the tower for LW27 to LW30 which will be considered in Sections 2.0) & 3.0) on the following pages.
ii) Optical Fibre Cable F PICT 3002 ï Section A). This cable is installed from Picton exchange to the Telstra Mobile Telephone Tower located above LW28. The cable is vulnerable to subsidence impacts over LW29 and LW30 where it crosses the full subsidence profile of LW29 and LW30.
iii) Optical Fibre Cable F PICT 3002 ï Section B). This cable enters the subsidence zone on the eastern edge of LW30 along Bridge Street providing services to the industrial area. The cable is not fully undermined but there may be some subsidence impacts around this cable.

1.4) Timing

Longwall LW28 has just been completed in May 2015 and LW29 is anticipated to commence in June 2015. The longwall will then take approximately 12 months to mine, working to the north west from the south eastern end of the longwall. It is anticipated that LW30 will also take approximately 12 months for completion. Therefore this management plan covering the longwall mining under Telstra plant at Tahmoor / Picton will continue in operation until completion of mining of longwall LW30 and for sufficient period of time thereafter to allow for completion of subsidence effects.

1.5) Definitions

CAN - Customer Access Network, the cable distribution network which provides communications services direct to customers premises.
Junction Cable –Inter exchange copper cable installed between two major telephone exchanges carrying inter-exchange telephone and data traffic, in this case the cable is between Tahmoor and Picton
Main Cable ï Subscriber main copper cable providing pairs of copper conductors between the exchange and the distribution point or cross connect point generally a pillar location, ie Pillar P8.
Local Cable ï Subscriber local copper cable providing pairs of copper conductors between the Pillar distribution point and the customerôs premises. This cable may be directly buried, installed in conduit or use aerial distribution to the individual premises.
NI :- Telstra Network Integrity responsible for the protection of the Telstra external plant network.
OTDR :- Optical Time Domain Reflectometer, used to determine loss characteristics for transmission systems on optical fibre cables. General used for testing quality of optical fibre with testing at 1625nm at higher frequency than transmission systems to provide early warning of possible loss in the system.
Pillar ï Is the interconnection point between the local cable leading to the customerôs premises and the main cable from the exchange. It provides flexibility within the Customer Access Network to connect new and disconnect cancelled services. The main telephone exchange distribution area is broken up into smaller distribution areas where the individual pillar provides the connection between the exchange and the customer, ie Pillars 1 to 10, P1 to P10.
Plan Review Meeting: Regularly convened forum to be meet (teleconference) to implement this management plan. Participants from Tahmoor Colliery, Telstra, NDCG, Mine Subsidence Engineering Consultants Pty Ltd, Mine Subsidence Board and consultants as required.

2.0) Principal Risks Identified

In relation to the assets identified in 1.3) item a) to d) above, the following are the assessed relative risks associated with existing Telstra plant within the 20mm mine subsidence contour area. The items of plant have been assessed according to the probability of damage and the consequences resulting from that damage, associated with that general category of plant. The Risk Factors Low to High are shown in the attached Table 2.

Table 2
Relative Risk Factor for Telstra Plant

Risk Assessment Matrix		**Consequence**				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Almost Certain	Significant	Significant	High	High	High
	Likely	Moderate	Significant	Significant	High	High
	Moderate	Low	Moderate	Significant	High	High
	Unlikely	Low	Low	Moderate	Significant	High
	Rare	Low	Low	Moderate	Significant	Significant

a) Lead Junction cable C PCTN 444 M1-150, Installed north along Remembrance Drive.

NOTE: Advice from Telstra Planning Group that cable does not carry inter-exchange services. However the cable is in reasonable condition and may be used to provide customer services to the rural area between Picton and Tahmoor.

This junction cable is a very old lead sheathed paper insulated cable, jointed along Thirlmere Way east of the exchange through to York Street and then jointed into a Pillar (SAH2) at York Street. At the York Street Pillar the cable splits and there is a PCM regenerator which feeds cable pairs in both the Picton section to the north and the Bargo section to the south. Then from York Street north the cable is a 150/0.90 cable to Picton and is installed as a direct buried heavy wire armoured lead cable north along Remembrance Drive.
This cable is direct buried north along northern side of Remembrance Drive and it is just within the 20mm subsidence zone at the ends of Longwalls LW29 & LW30. Since these two longwalls do not undermine Remembrance Drive the Total cumulative strains after LW30 are much less than occurred over LW28. The predicted strains for LW28 are around 0.25mm/m tension and 0.5mm/m compression and then reducing tensile & compressive strain of around + and - 0.1mm/m. for LW29 & LW30. From previous experience with larger lead sheathed cables the predictions are up to a factor of 10 below the level of subsidence and strain which may impact on this cable. There will be some upsidence and closure increasing the compressive strain at Myrtle Creek and this will be principally over LW29 which will require some monitoring. Refer to Appendix A Sheet 4 showing subsidence predictions for Remembrance Drive. Because of the age of this cable and exposure to movement at pit and manhole locations where the armouring is stripped away there is some vulnerability to subsidence. **As mentioned in the note above the junction cable between Tahmoor and Picton is not currently carrying inter-exchange services however Telstra may bring this cable back into service for rural customers.** Since the cable is not currently carrying services the consequence of any damage is Low and the likelihood Unlikely, hence the risk factor is **Low.**

Plate 1:
View of manhole in private property on east side of Myrtle Creek along Remembrance Drive showing lead joint in C PCTN 444 Z01, J1-150/0.90. Cable still has air pressure and joints across LW29-30 generally are in good condition.

b) Copper Local cable distribution on the customer side of the Pillar, providing connection to each customerôs premises, installed within the subsidence zone for LW29 & LW30.

The distribution of telephone services from the pillars are by different methods, generally these cables are installed in conduit however they can be directly buried as in Stilton Lane or use aerial distribution networks as along Bridge Street. The sections of distribution cable impacted from predicted subsidence are along Remembrance Drive at the southern ends of LW29 & LW30, Stilton Lane at the eastern end of LW30 and along Bridge Street over LW30.

In past experience with subscriber distribution cable at Appin and Tahmoor/Thirlmere there has been no damage reported or observed with the subscriber distribution network with the exception of an old lead cable used to feed the distribution network at Appin and a main lead sheathed cable in Thirlmere Way. The plastic distribution grease filled cables with either polyethylene or cellular polyethylene insulation over copper conductors are of much smaller size than main cables discussed above and are able to tolerate a greater degree of movement due to their smaller size and more flexible nature than the main copper cable. Unlike the main cable they do not generally use rigid lead joints which can fracture when moved, but use openable, in-line or elevated type joints. These joints are able to tolerate significant movement as they are lifted out of pits for jointing and maintenance work. Hence the entire distribution network is generally able to tolerate some degree of ground movement, see Plate 2.

The distribution cable network is installed using different techniques within the subsidence zone as follows:-

i) Local Distribution cable

This distribution cable is installed in various sized conduit and is directly buried entering pits of varying size and vulnerability. However since the longwalls are away from the more densely populated urban residential areas they cross few rural cables. These cables are located along Stilton Lane and at the western end of Bridge Street. It is suggested that in the higher order subsidence zones, say above 500mm that there may be some degree of risk to these cables dependant on how the subsidence develops. Hence accepting that there is this mix of direct buried cables, joints, pits and conduit types within the area, the risk to these cables is assessed to be Unlikely/Minor **LOW.** The consequence is assessed as minor, since these cables feed a small number of customers and it is unlikely that these smaller distribution cables will be impacted since they have performed without damage during past subsidence events**.**

Plate 2:
View into No 4 Pit showing relatively flexible Local cable openable joints. The two cables shown are 50/0.64 and 10/0.64 cables entering the openable joint.

ii) Aerial Cable.

The aerial distribution network is in a limited area along Bridge Street just within the 20mm subsidence zone and as a result it is not anticipated that there will be any impact on tilt at poles which may impact on the cables.

The experience with previous longwalls however did produced some anomalous movements in the areas of Lintina, Courtland, Pandora, Abelia and Janice Drive which did impact on the aerial cable network requiring adjustment of the cable catenery between poles and from poles to individual premises. On the basis of aerial cable exposure from LW29 & LW30 the Likelihood is Rare and the consequence is Minor producing a risk assessment of **LOW.**

c) Conduit, Manhole and Pit network.

The conduit, manhole and pit network is the critical factor in the performance of the cable network during mine subsidence. Although the possibility of differential movement between the components of this network, due to mine subsidence is low, due to the large geographical extent of the network, its lack of homogeneity and its differing age, it is considered to be an important factor in the performance of the entire cable network. The conduit and pits provide the primary isolation of the cable network from ground movement and strain. In addition because of the variation in the components of this network it is also the most difficult item of plant to assess for potential risk of damage. The main concern in this network is the performance of the older asbestos cement 100mm conduits (A100) and the older asbestos cement pits, which typically perform poorly, in areas where ground movement occurs, such as expansive soils.
However in the audit of this section of the network apart from one road crossing there was no evidence of asbestos pits or long sections of asbestos conduit. Most of the cable is installed in polyethylene plastic pits, using some small sized PVC conduit (12-50mm dia.) and it is not considered to be, at the same level of risk, as the larger 100mmm diameter asbestos conduit and pit network generally carrying the larger main cables.
The risk assessment for the Local copper distribution network is considered to be Unlikely/Minor **LOW.**

d) Telstra Mobile Telephone Tower and Optical Fibre Cable F PICT 3002 sections A) & B)

i) Telstra Mobile Telephone Tower

The Telstra Mobile Telephone Tower located above the Redbank Railway Tunnel is a 35 metre steel monopole and as mentioned above the tower is located at the northern goaf edge of LW28. Consequently the tower was predicted to have a higher level of tilt from LW28 than from the adjacent northern longwalls. It is noted as discussed in Section 1.0) above that the maximum tilt predicted during LW28 is for the transmitters oriented at 60 degrees was 0.3 degrees away from the transmitters i.e. @ a bearing of 240 degrees. MSEC has consulted with Telstra regarding the levels of predicted tilt in September 2012 and Telstra Networks and Access Technologies Group have accepted the predicted impacts on the tower from the current series of longwalls, principally from LW28 which was predicted to impose a maximum tilt on the tower of 5.2mm/m or 0.3 degrees.

This current Telstra management plan is to consider LW29 & LW30 impacts on the tower however since the analysis has been completed by MSEC for LW28-LW30 the predicted impacts from LW28 to LW30 are included in the general discussion Section 3 d). Monitoring data has been gathered for the tower from LW28 indicating the maximum tilt after the longwall had passed the tower of 0.22 degrees to the south. See the extract below from MSEC Report MSEC688 dated 10-11-14:-

MSEC688 – LW28 Subsidence Monitoring Report R23 10/11/14

Telstra Tower

The Telstra Tower is located above the former Redbank Railway Tunnel. Longwall 28 face has mined directly beneath the tower. It has passed the tower by approximately 740 metres and is moving away.

Tiltmeters have been installed on the Tower and only very small changes have been observed to date, as shown in Figure C. The tiltmeters were re-calibrated on 22 May 2013 and a small step change can be observed at this point in time. The daily oscillations are due to the effects of changes in temperatures on the sensors. Tilts are substantially less than the tolerance level of 1 degree. Rates of change have reduced to very low levels as the longwall face moves further away.

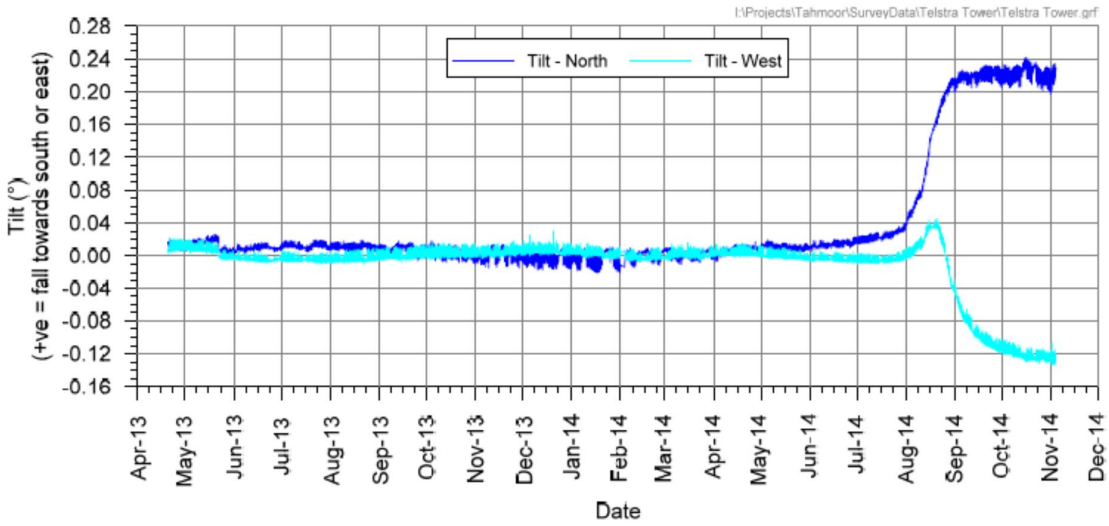

Figure C Tilt at Telstra Tower

See also the following Table from MSEC Report ôMSEC646-07ô showing the predicted tower tilts following mining of longwalls LW29 and LW30.

Extract MSEC Report ôMSEC646-07ô

Subsidence predictions

The following predictions were provided in Report No. MSEC355, which was prepared for Tahmoor Colliery in support of its application to extract Longwalls 27 to 30.

Maximum Predicted Cumulative Systematic Subsidence, Tilt and Curvature at the Telstra Tower during the Extraction of Longwalls 22 to 30

Longwall	*Maximum Predicted Subsidence (mm)*	*Maximum Predicted Tilt (mm/m)*	*Maximum Predicted Hogging Curvature (1/km)*	*Maximum Predicted Sagging Curvature (1/km)*
After LW26	*< 20*	*< 0.2*	*< 0.01*	*< 0.01*
After LW27	*65*	*0.3*	*< 0.01*	*< 0.01*
After LW28	*600*	*5.2*	*0.04*	*0.06*
After LW29	*950*	*4.8*	*0.05*	*0.06*
After LW30	*1060*	*3.8*	*0.05*	*0.06*

The values provided in the above table are the maximum predicted parameters within a 20 metre radius of the Tower. The predicted tilts and strains are the values which occur after the extraction of the proposed longwalls.

Longwall LW28 was predicted to impose a minor tilt of 5.2mm/m on the tower which relates to a 0.3 degree change in tilt angle. Referring to Section 1 and Figure C above the actual tilts recorded as in Figure C are of the order of 0.22 south 0.12 degrees west. Therefore the major tower tilt predicted to the south of 0.18 degrees is very close to the recorded tilt of 0.22 degrees in that direction. There is slightly more variation in the tilt west with the actual tilt recorded of 0.12 compared to predicted of 0.24.

It is understood that the operating tolerances of the tower antennae is approximately 1 degree so that the prediction is well inside the tolerance limit of the antennae. Additionally Telstra technicians are able to remotely adjust the Antennae on the tower if signal strength is affected by tower movement below 1 degree and in the instance of greater tower movement for both direction and projection of signal manual adjustment of the antennae frames is also possible.

These predictions above show that it is anticipated that the tower tilt will reduce following passage of LW29 & LW30 combined with a slight increase in ground tension around the tower which may have some impact on the optical fibre cable feed to the tower.

Therefore accepting that the predicted tilt will reduce from the level induced for LW28 it is considered that the Risk Factor is **LOW**, minor consequence, unlikely event.

Plate 3:
View west showing the 30 metre steel Telstra tower located above the Redbank Railway Tunnel with optical cable feed to tower from Picton telephone exchange.

ii) Optical Fibre Cable F PCTN 3002 Section A) -Tower

The tower and mobile service interface to the Telstra network is via the optical fibre cable F PCTN 3002 12f Section A) which is installed along Henry Street to Stilton Lane and then running approximately 1400 metres from Stilton Lane across LW30 and the new rail alignment and then crossing over LW29 to the old tunnel and to the tower. Although the old tunnel was filled with excavated material from the new tunnel and there has been packing of rock material between brick tunnel lining and the tunnel void there does exist the remote possibility of anomalous ground behaviour in the area over the old tunnel. This was possible during LW28 extraction and also possible for LW29 and LW30 as extraction of these two longwalls will directly impact on the old tunnel alignment. Hence the risk factor will increase with the mining of LW29 and LW30 due to exposure to the old tunnel structure. The predictions along the cable line over the two longwalls are for tensile strains of around 0.8mm/m and compressive strains of around 1mm/m. Refer to Appendix A Sheet 3 and the recorded data for the Optical Fibre Line for LW28 Appendix A Sheet 7. Even though this level of strain is below the accepted maximum strain for this type of cable of around + or ï 2mm/m there is the potential for anomalous ground movement to impact on the cable. Accordingly the risk factor for the cable is assessed as a Moderate Likelihood with Major Consequence since transmission capacity to the tower could be affected by ground movement along the cable, Risk Factor **SIGNIFICANT.**

ii) Optical Fibre Cable F PCTN 3002 Section B) - Bridge Street

The industrial area of Picton along the western end of Bridge Street on the eastern side of the railway is fed from the same cable F PICT 3002 as feeds the tower. There is a joint in Argyle Street Picton where the cable splits with one Section A) continuing south to the tower and the other Section B) continuing west into the industrial area. There are major Telstra customers who rely on the large high capacity transmission systems that the fibres on this cable are able to deliver to the industrial area.

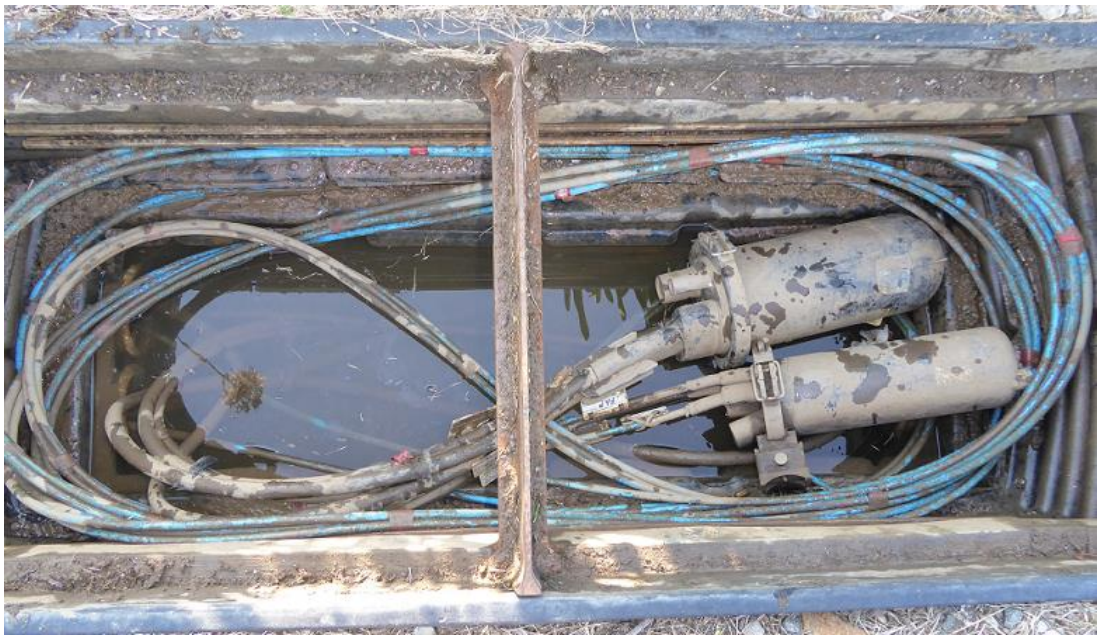

Plate 4;
View of Optical Fibre Cable joint on the northern corner of Redbank Place. One section of this cable feeds into Redbank Place and the other continues west along Bridge Street.

The cable enters the 20mm subsidence zone to the west of Redbank Place but does not enter into the northern goaf edge of LW30. With reference to Appendix A Sheet 5 the predictions for the western end of the cable along Bridge Street are relatively low with 100mm subsidence and minor tensile strain of 0.1mm/m. As a result of the limited impact from LW30 on this cable the Liklihood of impact is Unlikely /Rare but the consequence would be Major resulting in a **Significant** Risk Factor.

3.0) Control Procedure

3.1) General

As discussed in Item 1.1) above there is now information available on the performance of Telstra plant due to ground subsidence caused by longwall mining operations. The current information available is from, experience gained at Appin, Thirlmere, West Wallsend, Camberwell and Broke in NSW. The longwall mining operation at Thirlmere / Tahmoor provides a continuing opportunity to gather information on the performance of the network, needed to understand the interaction between ground movement and the Telstra plant, comprising both robust and also relatively sensitive elements of the network.

The general control procedure considered in this management plan is to look at each item of plant described in Section 2.0) Items a) to d) and determine the practical level of monitoring that can be performed according to the assessed risk factor applied. The monitoring described for the plant identified should be completed during the ground subsidence events occurring at the particular location as the longwall progresses. In addition Table 3, is a summary of recommendations for monitoring procedures and basic actions to be taken during mining, should the potential for damage be indicated by surface impacts, cable testing or from survey data.

The primary control procedure for monitoring copper cables under air pressure is to visually inspect cables and record the pressure in these cables on a regular basis. The pressure can then be monitored during mine subsidence, to detect any loss of pressure and resultant impact on the pressurised cable network, due to ground movement.

Since there are similar types of cable involved and the proposed monitoring methods for each cable type are similar, they have been grouped together below and in Table 3 to simplify the discussion and management of the network during ground subsidence.

a) Junction Cable. C PCTN 444 Z01, J1-150/0.90 north along Remembrance Drive .(Risk Factor Unlikely/Low- **Low**)

The lead Junction cables C PCTN 444 Z01, J1-150/0.90, as mentioned in Section 2.0) is an old lead sheathed paper insulated junction cable installed between Tahmoor and Picton. The cable is a direct buried, heavy wire armoured cable and the age and condition of the lead sheathing on this cable is the main concern. However as mentioned in 1.3) a) above this cable no longer carries any inter-exchange transmission services so it is not considered an important component of the cable network. The cable currently does not carry any local services out of Tahmoor exchange however the fact that it is not in current use does not preclude Telstra from installing services on the cable in the future to supply customers between Tahmoor and Picton. The cable appears in pits and manholes along Remembrance Drive and these should be inspected regularly to ensure no damage to the cable or joints is visible within the larger pits or manholes. Provided Telstra maintains the air flow on the cable this can also be recorded to indicate the condition of the cable.

b) Copper Local distribution cable on the customer side of the Pillar, providing connection to each customerôs premises, covering the LW29 & LW30 subsidence zone

i) Local Distribution Cable (Risk Factor. -Unlikely/Minor- **Low**)
This distribution cable is located along Remembrance Drive, Stilton Lane and Bridge Street as mentioned above at the southern end of the longwalls at Stilton Lane and entering into the subsidence zone along Bridge Street. These services in the rural area of Tahmoor-Picton only service around 12 houses and the western end of the industrial area. This network has been audited and over LW29 & LW30 and there is no old lead cable present which is located further south in the exchange area. However the cable present should be monitored during subsidence to ensure there is no risk of cable damage from the conduit and pit network. Within the distribution network located in conduit it is anticipated that there will be minor impact on the cables with the slight risk that anomalous ground movement may cause movement of both plastic and asbestos pits, relative to surrounding ground levels. Should this type of ground movement become evident at the surface, (ie cracking of road pavements, footpath movement, kerb movement or house damage) then the cable network in the area should be investigated, to determine if there are any observable impacts on the network. Close liaison should be maintained with the Telstra line maintenance staff to ensure that any abnormal fault incidence in the Tahmoor / Picton area is investigated concurrent with the fault clearance, to ensure there is not a component of ground movement responsible.

ii) Aerial Cable. (Risk Factor (Risk Factor - Rare / Minor **Low**)
This distribution cable is assessed as having a Low risk factor based on location and exposure to significant ground movement. This assessment is based on previous experience with aerial distribution cable in the Tahmoor/Thirlmere area. It is recommended for the aerial cable along Bridge Street and the small area along Remembrance Drive over the end of LW28 that regular inspections be undertaken during periods of maximum tilt, associated with the commencement of mining in LW29 and LW30.

The above cables will be inspected during subsidence events as the longwall progresses and any apparent visible strain on the cables reported to Telstra and the plan review meeting for further action to relieve strain on the cable where necessary.

c) Conduit, manhole and pit network. (Risk Factor -Unlikely/Minor **Low**)

The cable distribution network is obviously subject to the greatest risk of damage in the areas of maximum subsidence, however in this case for LW29 & LW30 there is only a small amount of the network in Stilton Lane that is directly undermined. The remainder of the network in Remembrance Drive and Bridge Street will be subject to some limited influence from mining impacts.

For all areas of cable exposure to potential mining impacts it is recommended that the cable routes and pit network be inspected regularly during critical subsidence impacts from both longwalls. This will include inspections along Remembrance Drive, Stilton Lane and Bridge Street at varying times during mine. Additionally the surface area above the conduit will be ñwalked overò, to note any changes in road pavement or in the footpath area, which may indicate excessive ground strains potentially impacting on the conduit and cable network.

d) i) Telstra Mobile Telephone Tower (Risk Factor Unlikely/Minor ï **Low)**,
ii) Optical Fibre Cable F PCTN 3002 Section A) - (Risk Factor - Moderate / Major - **Significant**)
iii) Optical Fibre Cable F PCTN 3002 Section B) - (Risk Factor - Unlikely / Major - **Significant)**

i) Telstra Mobile Telephone Tower (**Low**)
As mentioned above MSECôs Daryl Kay has co-ordinated discussions between MSEC, Tahmoor Colliery and Telstra and has also produced predictions for Subsidence and Tilt on the tower for the series of longwalls LW27-LW30 which are shown on Page 13 and the details are discussed in Sections 1.0) & 2) d) above.

For LW27 tiltmeters were installed around April 2013 at the base of the tower to continuously record movement of the tower as LW27 & LW28 progressed past the tower. See Plate 5 below showing the installation of the two tiltmeters at the base of the tower.

Referring to Figure C page 12 which shows details of the live monitoring data from the tiltmetres installed on the base slab of the tower for LW27 & LW28 the maximum tilt recorded to the south was 0.22 degrees and 0.12 degrees to the west. The resolution of the tilt would be 0.28 degrees to the south-south-west. As discussed above the predicted maximum tilt of the tower from LW28 was 0.3 degrees of rotation of the top of the tower at a bearing of 240 degrees. Therefore the predicted tilt is verified by the tiltmeter data. Hence from the predictions for LW29 & LW30 from Page 13, it is anticipated that the tower tilt will actually reduce by approximately 30% following completion of LW30. As indicated by Telstra engineers the trigger for intervention or concern for the transmit and receive signals from the tower is at a tilt of 1.0 degree which is much greater than actual recorded tilt from LW28 and the predicted tilt after LW30.

Plate 5:
View of base of tower showing installation of tiltmeters on the base slab of the tower. Live data from the tower for tilt is recorded at 15 minute intervals and graphed on the Lynton Survey website.

With the tiltmeters already installed, the readings from the tiltmeters are uploaded regularly onto the web hosting computer server for immediate display on the Lynton Surveys website. The Telstra login details for 24 hour access to the website are as follows:

Web:	monitoring.lyntonsurveys.com.au
User:	Telstra
Password:	tower2013

Additional to the tiltmeter continuous monitoring the following actions will be undertaken:-
i) Ground survey by Tahmoor Colliery of the Main Southern Railway and the extension of Hilton Park monitoring lines across the top of the tunnel at the base of the tower to record subsidence tilt and strain.
ii) Survey of tower tilt by referencing a survey point at the base of the tower to a point near the top of the tower.

iii) Visual inspections as and when required determined by feedback from survey and tiltmeter data.
iv) Monthly survey along the optical fibre cable line during LW29 & LW30
v) Weekly monitoring reports at critical times by MSEC commenting on active subsidence and presenting latest survey and ground monitoring data.

In the unlikely event should Telstra require intervention on the tower to maintain signal direction and strength then Telstra at cost to Tahmoor Colliery will undertake the following actions to secure the transmission capability from the tower:-
i) Complete remote controlled adjustment of the antennae system by rotating supports attaching the antennae to the tower.
ii) Manually adjust the antennae frame by packing the bolting assembly if remote controlled adjustment in i) above cannot restore signal capacity and direction.
iii) Manually adjust the tilt of the tower by adjusting the bolt cage assembly at the base of the tower.

ii) Optical Fibre Cable F PCTN 3002 Section A) (**Significant**).

The optical fibre cable F PCTN 3002 12f Section A) is installed from Stilton Road for approximately 1400 metres across and along LW29 & LW30 as shown below. The cable route follows the access track and railway boundary, crosses the railway and then is installed south above the old rail tunnel alignment crossing the chain pillar between LW28 and LW29 to the tower. Due to subsidence impacts from LW29 & LW30 there is a risk to the transmission capacity into and out of the tower thus isolating the tower and the mobile network from the switching network at Picton Exchange. The predictions from Table 1 Prediction Line 1 used for the Optical Fibre Cable (which have a factor of 10 applied for conversion from Curvature to Strain) indicate for Longwalls 22-30, that strains are likely to be approximately 0.8mm/m tension and 1.2mm/m compression. This data can be compared to the subsidence data collected for LW28 for the Optical Fibre Survey line which recorded strains of + & - 1.2mm/m in November 2014. Additionally towards the eastern end of the Hilton Park survey line compressive strains of around 1.4mm/m were recorded in the general vicinity of the tower and cable entry to the tower. Therefore using this data there is moderate level of risk involved to the optical fibre cable with strains being recorded below the maximum level of strain acceptable of + & - 2mm/m. Hence it is considered essential to monitor the cable during the passage of LW29 & LW30 approaching and passing under the cable line. This work will be arranged by Comms Network Solutions Pty Ltd to carry out OTDR testing from Picton Exchange @ 1650nm with particular emphasis on the condition of the last 1500 metres of cable to the termination in the Transmission Hut. Testing will initially be monthly as the longwall progresses and then reduced to fortnightly and weekly as the cable is undermined.

Plate 6:
Google Earth view of optical fibre cable route from Stilton Lane across LW30, LW29 and LW28 to the termination in the tower equipment hut.

ii) Optical Fibre Cable F PCTN 3002 Section B) (**Significant**).
As indicated this cable just enters the 20mm subsidence zone to the east of LW30 at Bridge Street Picton. The cable provides service to the Industrial Area along Bridge Street. Although the potential impact on the cable is low should there be any anomalous ground movement there is the remote possibility that services to the Industrial Area could be significantly impacted.

Since Section A) of the cable is vulnerable to mine impacts and is being tested from Picton Exchange it will require little additional effort to also monitor fibres in this Section B) of the same cable to the Industrial Area. OTDR testing of the cable will also provide baseline data for subsequent mining in LW31 & LW32 when this section of the cable is actually undermined. The cable testing will also be supplemented by survey data provided by Tahmoor Coal along this section of Bridge Street.

3.2) Surface Subsidence Survey
The control procedure for the Telstra plant should be supplemented by ground surveys carried out by Tahmoor Coal at agreed time intervals along agreed base lines of Remembrance Drive, Stilton Lane, Bridge Street, Hilton Park Road Extension Line and the Optical Fibre Line indicating the :-

- Initial RL of the surface prior to mining commencing.
- Incremental subsidence over the agreed period.
- Incremental ground strain over the agreed period.
- Incremental ground tilt over the agreed period.

In addition the frequency of the survey and the reporting of the results, to the *Plan Review Meeting,* are to be agreed by the members of the *Plan Review Meeting,* at each regular meeting of the group. The initial meeting should agree on the limits of the survey lines and set the initial frequency of the survey work.

Refer to the following table, Table 3, which presents a Summary of the Telstra Plant, Risk Factor, Monitoring and Actions required for items of plant, which may be impacted by mine subsidence. Note that in the Table 3 items of plant have been grouped according to the monitoring technique outlined above and identified by the item numbers previously assigned, items a) to d).

Table 3 - Summary of Monitoring Procedures and Actions

ITEM OF PLANT	Risk Factor	Monitoring Method Levels	Detail	Frequency	Trigger	Actions & Responsibilities
a) Lead junction Cable C PICT 444, J1-150	Low	Record Cable Pressure, Physically Monitor	Record initial cable pressure on cables C1 at pillar manhole and through subsidence zone at regular intervals during periods of ground subsidence.	Record cable pressures prior to mining then as required by Plan Review Meeting,	Variation in cable pressure of 5-10Kpa.	C Dove to advise Mark Schneider of loss of pressure on cable. Mark Schneider to advise Plan Review Meeting of proposed action in relation to repair / maintenance on cables.
b)Copper Distribution **i) Local Copper Cable** **ii) Aerial**	Low Low	Regular physical checks of cables particularly on aerial cables & general condition of distribution cables.	Carry out physical check of cables related to any subsidence damage reported and any anomalous ground movement occurring in the subsidence zone. Complete regular physical inspections of network during critical subsidence events for that particular location. Check available survey data to indicate areas of anomalous subsidence behaviour.	Monitor as required by Plan Review Meeting dependant on survey results provided along roads within the subsidence zone.	Investigate any anomalous subsidence variations from predicted subsidence profile. Carry out regular physical checks on the network.	If problems identified in a) above with cable performance C Dove to re-inspect subscriber cables (conduit & aerial) and advise Mark Schneider of results. Mark Schneider to advise Plan Review Meeting & arrange repair / maintenance as required. C Dove to complete regular inspections of network during periods of maximum subsidence at particular locations.
c) Copper Conduit, Manhole & Pit Network	Low	Monitor conduit & cable movement in pits and manholes .	Monitor conduit & cable movement in Remembrance Drive, Stilton Lane & Bridge St during subsidence period from LW29 & LW30 impacting on the particular area.	Prior to mining then as determined by Plan Review Meeting.	Visual check of section being monitored. If significant surface movement evident check distribution cables.	Should surface damage occur or survey data indicate anomalous movement check conduit pit and manhole network in this area. C Dove to advise Mark Schneider of any damage evident & Mark Schneider to advise Plan Review Meeting of maintenance / repair work proposed.

ITEM OF PLANT	Risk Factor	Monitoring				Actions & Responsibilities
		Method Levels	Detail	Frequency	Trigger	
d) i) Telstra Tower **ii) Optical Fibre Cable F PCTN 3002 Sect A)** **iii) Optical Fibre Cable F PCTN 3002 Sect A)**	Low Significant Significant	Survey base slab & monitor tower tilt with installed tiltmeters. Survey cable line Base line OTDR Testing.	Tahmoor Coal (TC) to carry out detail survey of Hilton Park Rd Extension and Base Slab survey of tower. TC to maintain continuously recording bi-directional tiltmeters on Tower base TC to survey cable line. OTDR Testing @ 1625nm of F PCTN 3002 A) & B) by Comms Network Solutions P/L (CNS).	Initial survey & weekly during critical subsidence events. Tiltmeter continuous recording, data available to Telstra via website Initial survey & OTDR test then fortnightly / weekly during critical subsidence events.	Tilt 0.5 degrees by survey or tiltmeter. Ground Strain > 1mm/m, OTDR loss on fibre <0.3dB.	TC to advise Telstra Mark Schneider and Rhadhika Anandamohan of trigger on Tower and report to Plan Review Meeting for decision on action to be taken as considered necessary by Telstra representatives to protect the transmission network. TC or CNS P/L (Colin Dove) to report trigger levels to plan Review Meeting for decision on action to be taken as considered necessary by Telstra representatives to protect the cables.
Survey Line	Not Applicable	Establish permanent marks at approx. 20 metre intervals along roads, cable line and tower base where Telstra network installed.	TC to carry out detail survey, (subsidence, strain and tilt recorded) along Remembrance Drive, Bridge Street, Stilton Lane, Hilton Park Rd Extension & along Optical Fibre cable line and tower base. Provide survey results to Telstra representatives.	To be determined by Plan Review Meeting dependant on degree of subsidence occurring and potential hazard to Telstra plant	Ground strain above 1mm/m and tilt in areas of aerial cable above 2mm/m.	TC to make survey results available to Telstra following each regular survey.

4.0) Geological Structures:

Refer to Section 1.8) Reference No 1 and the discussion indicating that there have been extensive drilling investigations to identify geological structures at coal seam level. *"The only known fault is the Nepean Fault, which is located to the east of the proposed longwalls"* However while there is little or no evidence of geological structures related to LW29 & LW30 the experience gained from longwalls LW24 to LW28 east of the Main Southern Railway indicates anomalous subsidence behaviour is possible in this area. It has been suggested this excessive ground movement could possibly be related to the presence of the Bargo River Valley or the Nepean Fault. The existing known geological structures are shown on MSEC Drawing MSEC355-09 ñTahmoor Colliery Longwalls 27 to 30 Geological Structuresò attached as Appendix A - Sheet 10. Should any evidence of unpredicted movement or location of geological structures become apparent during mining of LW29 & LW30 this should be reported immediately to Telstra. Also during future mining development works or should ñRegional or Far Field Horizontal Ground Movementsò be recorded, this information should also be immediately reported to the *Plan Review Meeting* for Telstra to consider the impact on their network.

5.0) Resources

Technical resources required to carry out the monitoring as identified In Table 3 are to be provided by Telstra or consultants as required. The costs associated with the monitoring work required for the network are to be reported to the *Plan Review Meeting* and agreement reached as to the responsibility for individual costs. Tahmoor Colliery will provide the survey resources required for the line surveys established on the roads around the tower and along the optical fibre cable line within the subsidence zone to determine incremental and total subsidence, strain and tilt during mine subsidence from LW29 & LW30. The initial survey is to follow on from LW28 survey and the frequency of the survey work is to be reviewed at the regular *Plan Review Meeting*s.

Prior to commencing any proposed rectification work the Telstra representatives will detail the extent of the work and the associated costs, to the *Plan Review Meeting*. At that meeting agreement will be reached between Tahmoor Colliery, Telstra and the Mine Subsidence Board as to the responsibility for the costs of the proposed work. In the event of a dispute as to responsibility for the costs, involving work to secure Telstraôs network, where loss of service to customers or line systems outage is involved, the work will be carried out by Telstra and the dispute referred to the next meeting of the *Plan Review Meeting* for further discussion and agreement.

6.0) Roles and Responsibilities

The monitoring of the Telstra network in accordance with this management plan is to be carried out by Telstra with the ground survey component of the monitoring work completed by Tahmoor Colliery. The Management ***Plan Review Meeting*** is to be the forum for discussion and resolution of issues raised in the operation of the Management Plan and impacts on the Telstra network. This meeting need only be convened in the event of trigger levels being reached, mining induced faults or damage occurring within the Telstra network. Any anomalous ground movement resulting from subsidence over LW29 & LW30 and any risk perceived by Tahmoor Colliery to the Telstra network due to mining is to be used to prompt an initial *Plan Review Meeting*.

The representatives invited to attend the *Plan Review Meeting* are:-
Belinda Treverrow ï Approvals & Community Coordinator, Tahmoor Coal Pty Ltd, Tahmoor Coal.
Mark Schneider, Team Leader Telstra Network Integrity.
Radhika Anandamohan Technology Specialist Telstra Mobile Coverage Delivery NSW & ACT.
District Supervisor, Southern Coalfields, Mine Subsidence Board.
Daryl Kay, Mine Subsidence Engineering Consultants Pty Ltd.
Colin Dove, Consultant Telecommunications Engineer.

When required the *Plan Review Meeting* is to appoint a minutes secretary responsible for maintaining all documentation presented to the meeting and responsible for circulating minutes and advising participants of future meetings.
At the *Plan Review Meeting* meetings, Telstra is to report incidents recorded in relation to the performance of the Telstra plant and a detailed log is to be maintained of each incident reported to the *Plan Review Meeting*. Full details are to be reported of significant events observed or events which have an impact on the Telstra Network or the provision of Telstra services in the area. Tahmoor Colliery are to report on the degree of subsidence that has occurred at that time and how closely subsidence is following the predictions made in References Nos 1 & 2.

It is the responsibility of this meeting to determine if the events recorded are due to the impact of mine subsidence and then determine the degree of responsibility each party has, for those events.
Should significant risk be identified then either party may call an emergency *Plan Review Meeting*, with one dayôs notice, to discuss proposed action and to keep other parties informed of developments in the monitoring or maintenance of the Telstra network.

7.0) Audit and Review

It is anticipated that this plan will be in place for approximately 24-30 months from the commencement of mining of LW29 through to completion of LW30 or for a minimum period of three months following final ground settlement after extraction of LW30. Should an audit of the Management Plan be required during that period then a representative is to be appointed by Telstra, Tahmoor Collieries and the Mine Subsidence Board to review the operation of the plan and report amendments to the next scheduled meeting of the *Plan Review Meeting*.

Other factors which may require the management plan to be reviewed are:-

- Poor performance of the Telstra plant in regard to mine subsidence, such as interruption or loss of services.
- Any trigger levels being reached or exceeded.
- Favourable performance of the Telstra plant in regard to mine subsidence, no observe red or recorded impacts.
- Significant variations between actual and predicted subsidence occurring including variations in ground strain observed from survey data.
- Evidence of significant geological faults or evidence suggesting major ñFar field effectsò may develop.

8.0) Record Keeping

As required when meeting is initiated the minutes secretary of the *Plan Review Meeting* shall keep minutes from the meetings called and advise participants of any future or emergency meetings to be held. The minutes are to include details as reported on the condition of the individual items of Telstra plant, the assessment of the degree of ground subsidence that has occurred, any agreements reached and a log of any incidents/damage reported to the meeting involving the Telstra network.

9.0) Associated Documents and References

9.1) Appendices

Appendix A (Drawings from References 1 & 2 & MSEC Tahmoor LW28 Monitoring Report R23 10/11/14)

Tahmoor Colliery,
Longwalls 27 to 30
General Layout,
Drawing No MSEC 355-01 Sheet 1 of 10

Tahmoor Colliery,
Tahmoor North, LW28 to LW30
Drawing No MSEC 646-07-01
Telstra Infrastructure Sheet 2 of 10

Tahmoor Colliery, Longwall s 22 to 30,
MSEC Fig. E.01
Predicted Profiles of Systematic Subsidence, Tilt and Curvature
Along Prediction Line 1, Resulting from the
Extraction of Longwall 22-30 Sheet 3 of 10

Tahmoor Colliery, Longwall s 22 to 30, MSEC Fig. E.07 Predicted Profiles of Systematic Subsidence, Tilt and Curvature Along Remembrance Drive Resulting from the Extraction of Longwall 22-30	Sheet 4 of 10
Tahmoor Colliery, Longwall s 22 to 30, MSEC Fig. E.08 Predicted Profiles of Systematic Subsidence, Tilt and Curvature Along Bridge Street Resulting from the Extraction of Longwall 22-30	Sheet 5 of 10
Tahmoor Colliery, Total subsidence Profiles Along Hilton Park Road MSEC Fig. 14-R23 10th November 2014	Sheet 6 of 10
Tahmoor Colliery, Total subsidence Profiles Along The Optical Fibre Line MSEC Fig. 15-R23 10th November 2014	Sheet 7 of 10
Tahmoor Colliery, Longwall 29, MSEC 567-07 Predicted Subsidence and Tilt during Mining (Telstra Tower)	Sheet 8 of 10
Tahmoor Colliery, Longwall 30, MSEC 567-07 Predicted Subsidence and Tilt during Mining (Telstra Tower)	Sheet 9 of 10
Tahmoor Colliery, Longwalls 27-30, Drawing No MSEC 355-09 Geological Structures	Sheet 10 of 10

9.2) References

Reference No 1- MSEC Report No MSEC355 ñThe Prediction of Subsidence Parameters and the Assessment of Mine Subsidence Impacts on Natural Features and Items of Surface Infrastructure due to Mining Longwalls 27-30 at Tahmoor Colliery in Support of the SMP Applicationò, Reference No 1.

Reference No 2 - òNotes on Subsidence Predictions, Observations and Proposed Management Measures for the Telstra Mobile Phone Tower at Site No. 28124, Stilton Road, Tahmoor Above Redbank Tunnelò, By Daryl Kay, Mine Subsidence Engineering Consultants, 14 September 2012 & Updated 20 March 2014.

10.0) Contact List.

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