

Comms Network Solutions

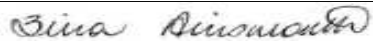
TAHMOOR COAL – LONGWALLS LW S1A to LW S6A

**MANAGEMENT PLAN FOR POTENTIAL IMPACTS TO
NBN INFRASTRUCTURE**

Prepared for Tahmoor Coal Pty Ltd

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AUTHORISATION OF TELECOMMUNICATIONS MANAGEMENT PLAN

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1.0 Introduction

1.1 Background

The Tahmoor Coking Coal Mine (Tahmoor Coal) is an underground coal mine located approximately 80 kilometres (km) south-west of Sydney between the towns of Tahmoor and Bargo, New South Wales (NSW). Tahmoor Mine produces up to three million tonnes of Run of Mine (ROM) coal per annum from the Bulli Coal Seam. Tahmoor Mine produces a primary hard coking coal product and a secondary higher ash coking coal product that are used predominantly for coke manufacture for steel production. Product coal is transported via rail to Port Kembla and Newcastle for Australian domestic customers and export customers. Tahmoor Coal, trading as Tahmoor Coking Coal Operations, is owned and operated by SIMEC Mining a member of the GFG Alliance (GFG).

Currently the existing mining operation area in the Western Domain is due to cease in 2022 and Tahmoor Coal has made provision to extend the life of the mine by a further 10 years inside an existing leasehold that has been held for the past 30 years. The new mining area will extend south from the current mine operations centre at Tahmoor towards the town of Bargo. The new area to be developed will be known as Tahmoor South Project Area and the initial longwalls in the mining area within Tahmoor South are LW S1A to LW S6A which are located just north of Bargo and centred along Remembrance Drive. The location of the longwalls LW S1A to LW S6A is shown in Plates 1 and 2 below.

As part of the planning for mining of LW S1A to LW S6A, Tahmoor Coal has identified surface assets which may be affected by the mining operation in the Tahmoor South area. Some of these assets belong to NBN and are part of NBN's infrastructure in the area. There are current changes underway to the ownership of the external cable and conduit distribution network in this area. Some of the existing communications infrastructure in the area is proposed to be transferred to NBN ownership as NBN establish their new network throughout the area of Tahmoor -Bargo. Currently NBN have only installed their Main cable network between Tahmoor and Bargo exchanges and the majority of the Local and Main cable network in the LW S1A to LW S6A area still remains in Telstra ownership. The one exception is that NBN now own the Local cable distribution network at the intersection of Charlies Point Road and Great Southern Road at the southern corner of LW S4A-LW S5A. Telstra however, still retains ownership of the pits and conduits in this area. NBN currently provides customer internet, telephone and data services, in the Tahmoor South mining area, through Fixed Wireless connection from the NBN transmission tower off Yarran Road

During the extraction of previous longwalls LW W1 to LW W3 in the Western Division the mining impacts from mine subsidence on the NBN network was considered and cable testing of the co-located NBN and Telstra optical fibre cables has proved effective in managing subsidence issues. Additionally, NBN have installed remote OTDR monitoring on their Picton to Lakesland and Picton to Tahmoor Main IEN optical fibre cables to monitor the cables during mine operations.

Tahmoor Coal had presented previous longwall mining application details for LW W1–W4 to both Telstra and NBN and each company has independently determined their own preferred management plan and monitoring regime for their own networks. This management plan is to consider the monitoring actions to be determined by NBN for their network, allowing for some minor overlap and feedback being provided from the concurrent Telstra network monitoring exercise, since this process has been established over the past 22 years, for the telecommunications networks.

In the Southern Project Area, there is a NBN Main IEN optical fibre cable present installed along Remembrance Drive which links the communications network between Bargo and Tahmoor telephone exchanges as well as the NBN Fixed Wireless distribution network as mentioned above. Refer to location details of the proposed Tahmoor South Project area longwalls LW S1A to LW S6A in Plate 1 and the details of the NBN network identified in the Study Area as shown in Plates 2 below.

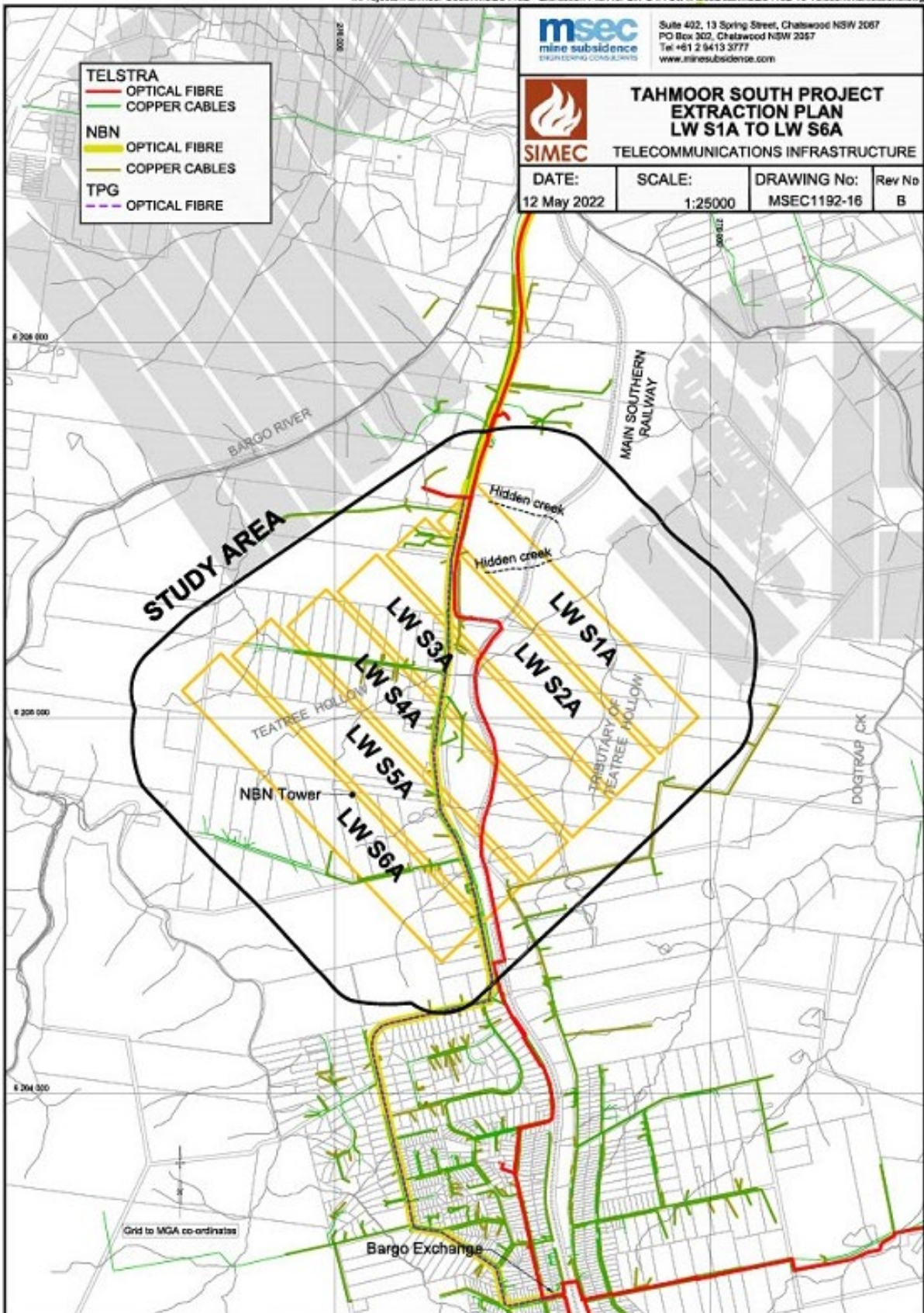


Plate 1: MSEC Drawing 1192-16 Showing Study Area for LW S1A-LW S6A and Telecommunications Services crossing the Study Area. Shows Bargo telephone exchange to the south.

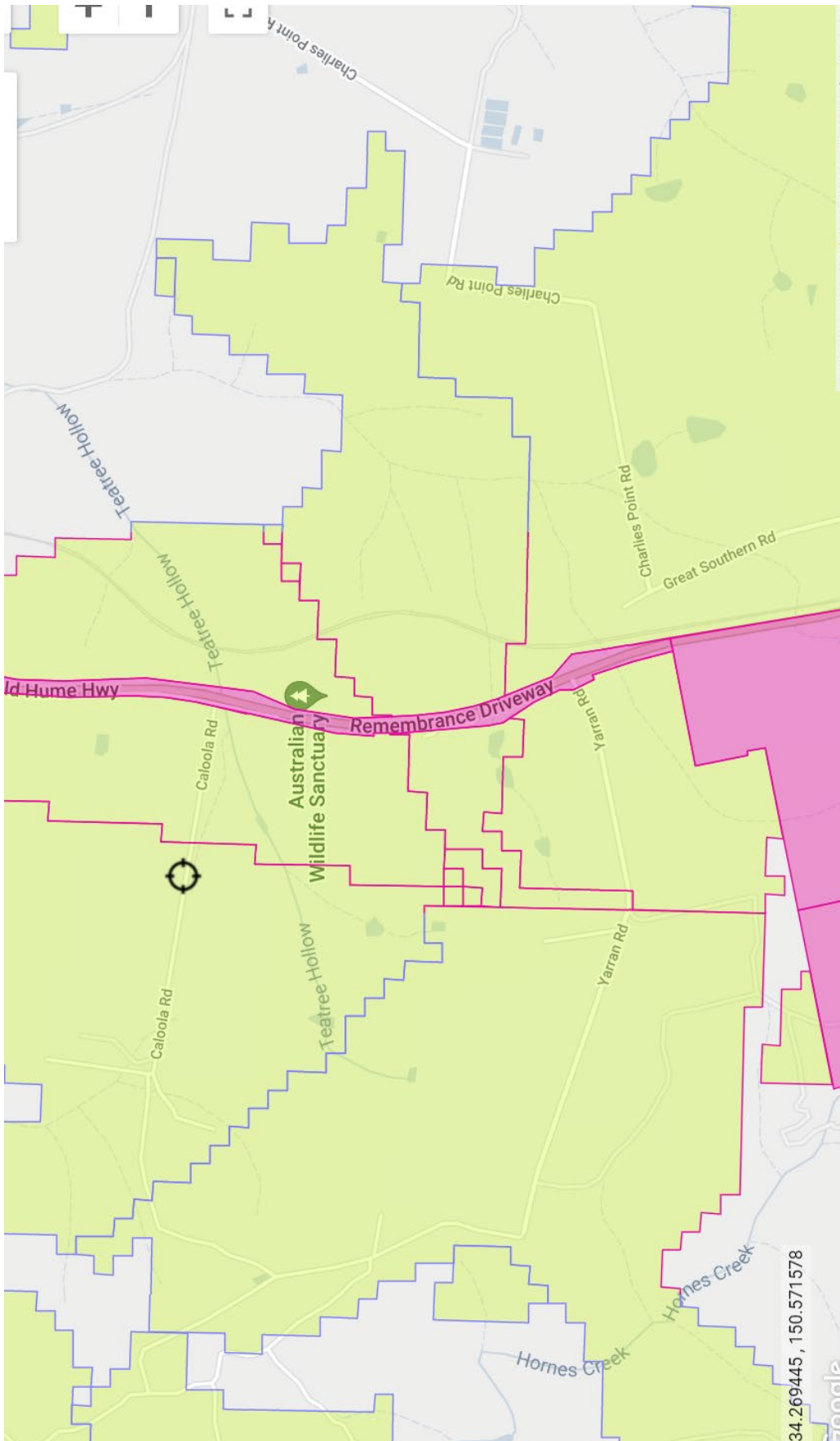


Plate 2: Tahmoor South Project Area showing NBN Fixed Wireless connection area provided from transmission tower to the north of Yarran Road (yellow area highlighted). Also shows (pink line) along Remembrance Drive indicating the line of the Main optical fibre cable between Tahmoor and Bargo. The other pink area at the southern end of the mining area indicates NBN Local copper cable customers in Bargo, south of Wellers Road

1.2 Purpose & Objectives

This NBN Management Plan (NBN MP) will consider the impact of the ground surface movements, contributed by LW S1A to LW S6A on the assets owned by NBN. Additionally, there is some comment in this management plan regarding potential impacts on the co-located Telstra network. The comments relate to planned monitoring of the Telstra network by Comms Network Solutions Pty Ltd (CNS) who have been involved with previous longwall monitoring, where the entire communications network was owned by Telstra. The commitment by CNS to NBN in regard to existing monitoring regimes, as previously adopted and now applied to LW S1A to LW S6A, is to immediately provide any relevant information gained by monitoring the performance of the Telstra network to NBN. This provides the advantage to NBN that CNS field staff engaged by Tahmoor Coal can immediately advise NBN of current ground surface impacts, affecting the co-located Telstra network, which may have implications for the NBN network.

It is recognised that NBN will be responsible for managing potential impacts on their network but this can be augmented by CNS providing current mining status, potential anomalous ground movements and any changes noted within the adjacent Telstra network which may prove to be of assistance to the monitoring regime established for NBN. The objectives of this NBN MP in relation to NBN plant are to put in place procedures to be followed:

- To ensure the safe and serviceable operation of all surface infrastructure. Public and workplace safety is paramount. Ensure that the health and safety of people who may be present in the vicinity are not put at risk due to mine subsidence;
- To avoid disruption and inconvenience or, if unavoidable, kept to minimal levels;
- To audit and assess the relative risk, for each section of the NBN networks exposed to mine subsidence;
- To monitor the impact of mine subsidence and initiate action to mitigate potential damage to the network infrastructure by recording visible changes or changes in transmission characteristics which may affect plant performance;
- To provide a plan of action, should subsidence effects impact on the serviceability or performance of plant;
- To 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 for serious injury or illness to a person or persons that may require emergency evacuation, entry restriction to an area or suspension of work activities.
- To establish an NBN Response Group (NBN RG) to report, discuss and record impacts on NBN plant and transmission performance (Refer to Section 6.0).

1.3 Scope

Tahmoor Coal commissioned a report by Mine Subsidence Engineering Consultants Pty Ltd (MSEC) in support of the Extraction Plan for LW S1A to LW S6A. Reference No1 – “SIMEC Mining: Tahmoor South Project – Extraction Plan for Longwalls S1A to S6A, Subsidence Ground Movement Predictions and Subsidence Impact Assessments for Natural Features & Surface Infrastructure”, MSEC Report MSEC1192 Revision A, dated March 2022.

This report identifies a Study Area for LW S1A through to LW S6A that considers mine subsidence impacts bounded by the 20 mm subsidence contour line and 35° Angle of Draw for the longwalls. This Study Area has been identified for LW S1A–LW S6A in MSEC Drawing MSEC1112-18, as shown in Plate 1 and shows the general geographical area proposed for the longwalls.

As mentioned, the new Study Area under consideration, is to the north of Bargo and just south of the current Tahmoor Colliery Operations Area on Remembrance Drive.

For consideration in the management plan the following NBN major assets or shared assets are identified:

- NBN main optical fibre cable between Bargo and Tahmoor telephone exchanges, generally along the western side of Remembrance Drive, (Telstra Main IEN copper and optical fibre cable over S1A and S2A are in the same Telstra conduit as NBN main cable);
- NBN transmission tower supporting Fixed Wireless internet, data and telephone services throughout the Study Area and associated Transmission Cabinets.
- NBN Local cable distribution in the area of Great Southern Road and Charlies Point Road on the southern corner of LW S4A-LW S5A. This area is shown on the Telstra plans as Local cable distribution being owned by NBN but is not shown on NBN plan in Plate 2
- Telstra Manhole, Pit and Pipe networks supporting some of the above NBN cable networks through the mining area.

During the extraction of previous longwalls LW22 to LW32 and LW W1 to W3, the mining impacts from mine subsidence on the Telstra owned network, that had occurred have been managed satisfactorily from Telstra's perspective. As mining continues in LW S1A-LW S6A the potential for impacts on the NBN network infrastructure will vary with regards to the different types of telecommunications plant that is exposed to mining as outlined above.

This NBN MP is to be used to assess and protect the performance of the items in the NBN network identified to be most at risk, due to mine subsidence impacts and to ensure that the health and safety of people who may be present on public property or around NBN property, are not put at risk due to mine subsidence. The major items of NBN plant are considered, relative to their location and risk assessed from subsidence impacts from LW S1A to LW S6A. (See Section 4.2 -4.3).

Reference 1, Section 6.10.6 states:-

Tahmoor Coal has developed Subsidence Management Plans in consultation with Telstra for the existing longwalls at Tahmoor Mine to manage potential impacts on telecommunications infrastructure.

It is recommended that similar Subsidence Management Plans be developed in consultation with Telstra and NBN Co Limited to manage potential impacts on the telecommunications infrastructure within the Subsidence Study Area.

With an appropriate management plan in place, it is considered that potential impacts on the telecommunications infrastructure can be managed during the extraction of the proposed longwalls, even if al subsidence movements are greater than the predictions or substantial non-conventional movements occur.

Therefore, this management plan for the NBN network will take into consideration the subsidence predictions for longwall LW S1A to LW S6A as well as utilising the experience gained from the management of the Telstra infrastructure from previous subsidence events due to LW22 to LW32 and LW W1-W3 at Tahmoor Mine.

1.4 Timeframe

Mining is anticipated to commence in October 2022 commencing with LW S1A. Each longwall is around 1800m in length and is anticipated to take around 12 months for full extraction leading to completion of LW S6A in late 2026. Therefore, this management plan covering the longwall mining under NBN network at Bargo north will continue in operation until completion of mining of LW S6A and for sufficient period of time thereafter to allow for completion of subsidence effects from all longwalls.

1.5 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 lead sheathed cables and aerial cables. In this case there is an NBN IEN optical fibre cable located above LW S1A-LW S5A. This cable carries major NBN internet services, data, mobile and telephone traffic between Bargo and Tahmoor Exchanges, and forms a critical link to maintain all services in the Bargo – Picton area and further north to provide services into Campbelltown exchange area.

Also, as mentioned above there is some, Local copper cable in conduit at the southern end of LW S4A and LW S3A which may be vulnerable to damage from subsidence related ground movement. Since monitoring has been performed on the Telstra network during LW22 through to LW32 and LW W1 and LW W3 subsidence events, there is now some basis for assessing the performance of these networks from past experience. Generally, as mentioned above telecommunications networks are not homogenous in nature and some parts of the network are more vulnerable to mining induced ground movement. The diverse telecommunications network consists of varying types of technology, differing both in age and sensitivity to the surrounding environment, providing differing responses to mining events.

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 communications plant, then the impact is generally irreversible and repair

work is required. This has been done in the past where, through continuous monitoring of optical fibre cables, 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 NBN's assets will not necessarily prevent damage but will plan to limit its impact and put in place actions to be taken, should evidence of significant ground movement indicate the potential for damage to occur.

1.6 Definitions.

CAN - Customer Access Network, the cable distribution network which provides communications services direct to customers premises.

Main Cable – Main copper cable providing pairs of copper conductors between the exchange and the distribution point or cross connect point generally a pillar location. This cable network is being superseded as NBN roll out FTTN.

NBN FTTN - System of providing telecommunications services to the customer. NBN install above ground Micro Node or VDSL (Very High Bit Rate Subscriber Line) Cabinets generally adjacent to the Telstra Pillar with optical fibre cable feeds to the Node location. Copper services are then generally used customer's side of the Node to provide data, phone and internet services to customer's premises. The Node will be fed by optical fibre cable from the exchange and the distribution from the node to the customer will be by NBN Local copper cable network.

NBN Fixed Wireless Network - System of providing data and telecommunications services to the customer using radio signal link from local transmission tower transmitting to outdoor aerials fitted to the customer premises The NBN Fixed Wireless Network is installed at the customer's premises by the phone and internet service provider using an approved NBN installer.

Local Cable – NBN customer local copper cable providing pairs of copper conductors between the Node distribution point and the customer's premises. This cable may be directly buried or installed in conduit or use aerial distribution to the individual premises.

OTDR :- Optical Time Domain Reflectometer, used to determine loss characteristics for transmission systems on optical fibre cables. Generally used for testing transmission quality of individual optical fibres with testing at 1625nm, at higher frequency than transmission systems, to provide early warning of possible transmission loss on the system.

Pillar – Is the Telstra interconnection point between the local cable leading to the customer's 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. Note that with the rollout of NBN this section of the Telstra cable network will be divested from Telstra to NBN as NBN establish Nodes in areas such as along Yarran and Caloola Roads.

NBN Response Group: (NBN RG) Forum proposed to be convened as necessary (teleconference preferred) to facilitate the implementation and discussions around the operation of this NBN MP. Participants to be from NBN, Tahmoor Coal, MSEC, communications consultants as required and other Tahmoor Coal technical consultants as necessary. The NBN RG will arrange discussions and meetings as required and where necessary involve Subsidence Advisory NSW and the NSW Resources Regulator.

NBN Node – This is an external cabinet located generally in the road reserve as a stand-alone cross connect unit which allows improved transmission systems in telephone, internet and data traffic to be provided to locations remote from a telephone exchange. The transmission system into the Node is provided by optical fibre cable and the customer feed from the Node is then generally by traditional Local copper cable distribution to the customer's premises.

2.0 Consultation

2.1 Consultation with NBN

Colin Dove from CNS has requested details of the NBN Network which have been provided as shown in Plate 2 for Tahmoor South and for NBN to consider the implications of subsidence ground movement on the NBN Network.

It is planned to provide this management plan to NBN Technology Group where the Network Operations and Service Delivery Sections of NBN can then determine their planned methods to monitor the major parts of the existing NBN network throughout the Study Area.

The principal items of NBN network exposed to ground subsidence impacts area:-

- The 432f SMOF cable, 2TAH 0300 DSS 005 currently crossing to the south over LW S1A and LW S5A in the centre zone of the Study Area
- NBN Transmission Tower & Transmission Cabinets located at 3166 Remembrance Drive Bargo
- Local cable distribution in Great Southern Road and Charlies Point Road

Tahmoor Coal will consult with NBN in relation to mine subsidence effects from mining as required and contact can also be supplemented through CNS who are in the field, monitoring the Telstra network.

Tahmoor Coal and/or CNS will consult with NBN during the extraction of LW S1A through to LW S6A in relation to progress of longwalls, presentation of survey data and potential mine subsidence impacts that may appear to be developing as longwall extraction continues.

3.0 Subsidence Predictions

3.1 Subsidence Predictions (Reference No 1)

This NBN MP will take into consideration the incremental subsidence predictions for LW S1A through LW S6A, as well as drawing on the experience gained from the management of the Telstra infrastructure from previous subsidence events due to LW22 to LW32 and LW W1 to LW W3 more recently at Tahmoor Mine.

It is recognised from past experience gained at Tahmoor Mine in monitoring the Telstra network that optical fibre cable is more vulnerable to ground movement predominantly due to the nature of the cable in that it is only able to sustain relatively low ground compressive and tensile strains before the external sheath transfers the strain to the individual fibres within the cable. When this occurs, the individual fibres have limited capacity to tolerate tensile or compressive strains before they cause interruption to or failure of transmission systems. The other concern with optical fibre cables is that these cables have much larger capacity to carry telephone, data and internet services such that any minor interruption to traffic, can cause serious impacts on the overall telecommunications network.

Generally the more extensive Local copper cable network is more robust and able to tolerate reasonable levels of mining induced ground strain. The interaction is complex since the network comprises of very small copper cables in this instance of 4mm diameter up to larger 18 mm diameter, spread along Great Southern Road and Charlies Point Road in the southern sections of the Study Area.

Therefore, the cable types to be considered are:

- a) NBN Main 432f optical fibre cable network between Bargo and Tahmoor telephone exchanges along the western side of Remembrance Drive, (Telstra Main IEN cable in same Telstra conduit as NBN main cable);
- b) NBN Transmission Tower and infrastructure supporting Fixed Wireless internet, data and telephone services throughout the Study Area. Tower & Transmission Equipment Cabinets located at 3166 Remembrance Drive Bargo.
- c) NBN Local cable distribution in the area of Great Southern Road and Charlies Point Road on the southern corner of LW S4A-LW S5A. This area is shown on the Telstra plans as Local cable distribution being owned by NBN but is not shown on NBN controlled area plan in Plate 2
- d) Telstra Pit and Pipe networks supporting some of the above NBN cable networks in the mining area. Note this network is also considered in the Telstra management plan for LW S1A to LW S6A.

The total subsidence predictions for these various cable locations is shown below in Table 1, extracted from data in Table 4.2, Table 6.18 & Table 6.20 provided in the MSEC Report 1192 Revision A, March 2022, Reference No 1

Table 1
Maximum Predicted Total Conventional Subsidence, Tilt & Curvature after the Extraction of each of the Proposed Longwalls as Potentially Impacting NBN Network

Location of Network	Subsidence mm	Tilt mm/m	Curvature (1/km)	Transverse Strain (Applying a factor of 15 to curvature)
IEN Optical fibre cable installed along Remembrance Drive	325 to 1300 (S1A to S5A)	2.5 to 8.5	+0.06to +0.14 -0.06 to -0.20	0.09 to 2.1mm/m tension 0.09 to 3.0mm/m comp
i) NBN Transmission Tower & Hut located @ 3166 Remembrance Dr. East Goaf Edge of LW S6A	850-900	2.5 Tower 3.0 Cabinets	+0.04 to -0.04	0.6mm/m tension 0.6mm/m comp
++ ii) Power supply diagonal crossing LW S6A	1100	4.5	+0.1 to -0.022	1.5mm/m tension 3.3mm/m comp
Local copper cable Great Southern & Charlies Pt Roads S4A & S5A	300 to 900	+4 to -4	+0.14 to -0.22	2.1mm/m tension 3.3mm/m comp
Telstra Manhole Conduit and Pit Network – Considered in Telstra Management Plan	N/A	N/A	N/A	N/A

++ Additional Predictions along Power Supply Confirmed by MSEC

See extract below from Reference No1 MSEC Report 1192 S

Extract below from Section 6.10.5 regarding the impact assessment for the NBN telecommunications tower at 3166 Remembrance Drive.

6.10.5. Impact assessments for NBN telecommunications tower

The NBN telecommunications tower is expected to experience subsidence during the extraction of proposed LWs S5A and S6A. The tower is a single pole structure and its structural integrity is unlikely to be adversely affected by the extraction of the proposed longwalls. The predicted tilts of 2.5 mm/m, while small, may affect the operation of the antennae on the structure.

The tilts can be readily adjusted by either releveling the pole or the individual antennae, if required.

It is recommended that Tahmoor Coal consult with NBN regarding the tower to manage potential impacts on the tower and its operations.

It is proposed that this NBN MP will initiate a broad agreement between NBN and Tahmoor Coal to assist in effectively managing and addressing the monitoring issues, related to the degree of risk, assessed during mining, for the various elements of the NBN network exposed to mine subsidence from LW W3-W4 extraction.

4.0 Risk Assessment

4.1 NSW Work Health and 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 and 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; and*
- *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."*

Detailed guidelines have also been released by the NSW Department of Planning and Environment, Resources Regulator, Mine Safety Operations (MSO, 2017).

The risk management process has been carried out in accordance with guidelines published by the NSW Department of Planning and Environment, Resources Regulator, Mine Safety Operations (MSO, 2017). The following main steps of subsidence risk management have been and will be undertaken, in accordance with the guidelines:

- Identification and understanding of subsidence hazards;
- Assessment of risks of subsidence;
- Development and selection of risk control measures;
- Implementation and maintenance of risk control measures, and
- Continual improvement and change management.
- Each of the above steps have been or will be conducted together with the following processes.
- Consultation, co-operation and co-ordination; and
- Monitoring and review.

This management plan documents the risk control measures that are planned to manage risks to health and safety associated with the mining of LW W3-W4 in accordance with the WHS laws.

4.2 Risk Assessment Methodology

The following are the assessed relative risks associated with existing NBN plant within the Study Area as shown in Plates 1 and 2. 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 (from Low to High) are shown in the attached Table 2. A summary of all risks as identified below is included in Table 3.

Table 2 Relative Risk Factor for NBN 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

4.3 Risk Assessments for NBN Infrastructure

- a) NBN Main 432f, optical fibre cable between Bargo and Tahmoor telephone exchanges generally along the western side of Remembrance Drive, (Telstra Main IEN copper in same Telstra conduit as NBN Main cable);



Plate 3:
Telstra pit on north side of Yarran Road over LW S5A, showing route of NBN IEN cable 2-TAH-0300-DSS-005 along western side of Remembrance Drive and crossing LW S5A north to LW S1A



Plate 4:

Telstra pit on west side of Remembrance Drive over north end of LW S1A, showing coil on NBN 432f cable 2-TAH-0300-DSS-005 installed in Telstra conduit south between Tahmoor & Bargo.

As discussed above this optical fibre cable is of a more recent design and at 22mm diameter is reasonably robust and able to sustain hauling tensions of around 2.0kN. Additionally for the entire route across the longwalls the cable is installed in 100mm diameter Telstra conduit. The presence of the cable in the conduit isolates the cable from the ground movement impacts predicted to be 2.1mm/m tension and 3.0mm/m compression along Remembrance Drive.

There is no Telstra optical fibre cable co-located continuously with the NBN cable in the Telstra conduit across longwalls LW S5A to LW S3A. However, in the initial stages of mining of LW S1A and LW S2A over a distance of around 800m there is a direct buried Telstra optical fibre cable F BRGO 101 installed parallel with the conduit route. This Telstra cable will be subject to regular 1625nm OTDR monitoring from Bargo exchange across these two initial longwalls. Therefore, in the initial say 18months of mining there will be very close OTDR monitoring data on the older direct buried cable alongside the NBN optical fibre cable installed in protective conduit. Any transmission loss detected on F BRGO 101 can be immediately advised to NBN for any action that may be required and will provide a general indication of possible impacts on a much more vulnerable optical fibre cable.

Additionally, withing the conduit section of the NBN cable installation over all five longwalls, there will be survey data recorded along Remembrance Drive to provide early indication of any anomalous ground movement that may be occurring. This survey will be combined with physical inspections by Telstra or their conduit route and the more vulnerable lead sheathed cable during critical subsidence events from each of the six longwalls

Hence the risk factor for this cable TAH-0300-DSS-005 is assessed to be a rare event with major consequence due to transmission traffic it supports an overall **Significant** risk.

- b) i) NBN Transmission Tower supporting Fixed Wireless internet, data and telephone services throughout the Study Area. Tower & Transmission Equipment Cabinets @ 3166 Remembrance Drive, Bargo.
- ii) Power Supply, located on access road from Yarran Road @ Bargo.

Reference 1, Section 6.10.5 states:-

It is recommended that Tahmoor Coal consult with NBN regarding the tower to manage potential impacts on the tower and its operations”

It was not possible to access the tower location due to locked gate and the distance it is located from public roads. The monopole tower is located at 3166 Remembrance Drive Bargo and has access from Yarran Road and from observations appears to be around 35m high. From aerial photos of the tower site, it appears there is a reinforced concrete mass base slab, approximately 6.0m square. This site is of similar design to the Telstra monopole site undermined by LW705 by Illawarra Coal in 2013 /2014.

The Telstra site consisted of a mass concrete footing 6m x 6m with a 35m monopole tower and two transmission equipment huts. The LW705 site was subject to significant predicted tilt of 4.4mm/m and around 1000mm subsidence and following the passage of LW705 and the adjacent LW706 there were no impact issues recorded on the footings, tower or associated Telstra and Optus transmission huts. See further discussion below. The data recorded from survey of the base footing and tilt-meters in place on the footing, recorded total tilt of around 2mm/m, which corresponded to an angular tilt of +0.12 degrees in the north south direction, towards the goaf edge. This was well below the 1.0 degree trigger limit accepted by Telstra at the time for re-set of the dishes and consideration of the structural integrity of tower and base. Additionally, there was no impact recorded on the Transmission Huts, waveguides and support framing including the optical fibre cable F DGPK 3001, providing line systems to the tower.



Plate 5:
NBN Fixed Wireless
Transmission Tower at 3166
Remembrance Drive with access
off Yarran Road

In relation to the new LW S6A longwall the tower is located very close to the chain pillar between LW S5A and LW S6A near the eastern edge of LW S6A. The tower location near the edge of the longwall has predicted tilt for LW S6A of 2.5mm/m, whereas near the centre of the longwall much higher ground tilt is predicted to occur. The predicted tilt would indicate movement at the top of the tower of around 90mm combined with 850-900mm subsidence and ground strains of the order of + or - 2.5mm/m as ground subsidence occurs.

The NBN tower is vulnerable in two aspects as a result of the potential mining impacts:-

- a) Structural integrity due to both subsidence and tilting, although the fact that it is a monopole structure with what appears to be a mass concrete footing relieves the concern of differential settlement occurring of tower legs, since the base footings is constructed in one piece.
- b) Transmission viability of the tower due primarily to tilt that may operate on the tower causing misalignment of the parabolic dish receivers mounted on the tower.

These issues can be dealt with by contacting the specialist consultants within NBN who are responsible for maintaining structural and transmission serviceability of the Fixed Wireless Tower network. It is anticipated that limits can be set on the degree of movement which can be tolerated before intervention is required to counteract the

subsidence and tilt impacts. These limits should be set at trigger levels for the proposed monitoring on the tower site.

From the field audit and from NBN plans shown in Plate 2 there does not appear to be any direct optical fibre or copper cable connection to the tower to support transmission systems. It appears that the transmission links for the tower are by microwave links from adjacent towers at Menangle and Couridjah. Therefore, it would appear to maintain existing links that the existing microwave dishes may need fine adjustment to maintain full signal strength dependent on the degree of tilt on the tower. Adjustments could be made at the two head frames of each dish.

Generally, transmission huts associated with towers are transportable buildings set on block footings. Over the past 20 years' experience with this type of structure, at ten diverse locations around NSW subject to longwall mining, no damage has been recorded by mining to this type of transportable building. However, from aerial photos, it appears that NBN are using smaller individual cabinets, set on a concrete slab to contain transmission equipment for the tower. Due to the degree of ground strain and tilt, based on past experience, it is not considered that the cabinets are vulnerable to damage from mining.

ii) Power Supply to the Transmission Tower

From field investigation there is an underground pit and conduit system from Yarran Road into the tower site. The route at around 450m crosses diagonally 90% of the width of LW S6A from Yarran Road north.



Plate 6:
View north from Yarran Road entry to tower site. Shows approx. location of buried underground power supply to the site from pole in Yarran Road. Note the Power Line also crosses a shallow creek line along the access track and above the centerline of LW S6A.

Due to the length of cable and conduit route across almost the full width of LW S6A it is recommended that for subsidence from LW S6A a survey route be established along the road access corridor to monitor potential impacts that may occur along the power route. The survey should also be supplemented by physical inspection along the route after LW S6A has progressed around 1,000m.

Therefore, as recommended in Reference No1 specific discussions should be initiated with NBN tower specialists to outline any concerns they may have with predicted mining impacts on the Tower site. As a minimum recommendation it is suggested that :-

- Survey prisms be established on all corners of reinforced concrete footings on site and base line survey detail be recorded, so that any changes can be identified. This is to ensure that there is no anomalous ground movement occurring around the site. A general trigger for review of the structures would be 1mm/m strain & tilt levels recorded from survey data and a subsidence of say 300mm.
- Install tilt-metres on the base slab of the tower oriented in the north-south and east-west directions with real time data provision.
- All data to be referred to NBN or their consultants during critical impact times from LW S5A and LW S6A.
- NBN to assess the provision of power supply to the site for any vulnerabilities from ground subsidence or tilt.
- Establish survey monitoring line for power supply along access road corridor from Yarran Road to be supplemented by physical inspections during subsidence impacts from LW S6A

Hence the risk factor for the Tower site is assessed to be an unlikely event with major consequence for NBN Fixed Wireless customers it supports, an overall **Significant** risk.

c) NBN Local cable distribution in the area of Great Southern Road and Charlies Point Road.

This area at the southern corner of LW S4A-LW S5A.is identified on Telstra plans as now being managed by NBN as the “Other Carrier” but as mentioned above is not shown on the NBN plan in Plate 2. The cable to the corner of Great Southern Road is in P35 conduit but the 20/0.64 grease filled cable east along Charlies Point Road is direct buried out past the Sewerage Treatment Works.



Plate 7:
View north along Great Southern Rd towards Charlies Point Rd showing Telstra P35 conduit route containing NBN cable



Plate 8
View west along Charlies Point Rd towards Great Southern Rd showing NBN direct buried 20/0.64 HJ cable

With the exception of anomalous ground movement, the NBN cable in conduit in Great Southern Road is protected to a large degree by the conduit which isolates the cable from ground strain. The exposure length of the direct buried 20/0.64 copper cable in Great Southern Road is unlikely to be impacted due to mining in LW S4A and LW S5A since:-

- There is relatively short cable exposure length of around 150m and only around 100m of direct buried cable where potential impacts are more likely to occur than for the cable in conduit
- The direct buried 20/0.64 cable is reasonably robust cable and has a good performance history throughout previous mine subsidence areas.
- The potential impact is adjacent to the finishing end of the two longwalls where the total subsidence impacts do not fully develop to the south of the finishing end

Hence the risk factor for these cables is assessed to a rare event with minor consequence an overall **Low** risk.

d) Manhole, Conduit & Pit Network.

As noted above the management of this network is considered in the Telstra management plan for LW S1A to LW S6A.

It is considered that the conduit, manhole & pit network is a 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 overall performance of the entire cable network. The conduit, manhole & pits provide the primary isolation of the cable network from ground movement and strain. In addition, because of the variation in the components and geographic distribution of this network it is also the most difficult item of plant to assess for potential risk of damage.

Within the Study Area these components of the network are located throughout the entire Study Area and consequently are subject to all predicted levels of ground movement. The main concern in this network is the performance of the older larger asbestos and cellulose fibre pits, however, these are only present outside of the direct mining areas along Remembrance Drive as all larger pits in the Study Area are HDPE pits. All of the conduit network utilises varying sized PVC conduit (20-100 mm dia.) which is considered to be at a low level of risk of damage from ground movement or strain. The risk assessment from past experience for the manhole, conduit & pit network is considered to be associated with an unlikely likelihood, minor consequence, and an overall **Low** risk.

4.4 Identification of Subsidence Hazards

Clause 34 of the *Work Health and Safety Regulation (2017)* requires that the duty holder (in this case Tahmoor Coal), in managing risks to health and safety, must identify reasonably foreseeable hazards that could give rise to risks to health and safety.

This section of the management plan summarises hazards that have been identified in the mining operation which could raise risks to health and safety of people in the vicinity of NBN and Telstra infrastructure.

Mine subsidence hazards have been identified, investigated and analysed in a systematic manner by examining each aspect of the infrastructure, as described in Section 4.3.1 to 4.3.5 above of this management plan. Each of the infrastructure groups discussed above could potentially experience mine subsidence movements that give rise to risks to the health and safety of people.

The following mine subsidence hazards were identified that could give rise to risks to health and safety due to the extraction of LW S1A to LW S6A:

- Temporary loss of telecommunication Main IEN services between Tahmoor and Bargo;
- Tensile or compressive ground strain acting on direct buried cables; and
- Disruption of telecommunication services into and out from the NBN Fixed Wireless Tower.

The identification and risk assessment process took into account the location of infrastructure relative to LW S1A to LW S6A and the associated timing and duration of the subsidence event, as described in this management plan. Whilst mine subsidence predictions and extensive past experiences from previous mining at Tahmoor Coal were taken into account, the identification and risk assessment process recognised that there are uncertainties in relation to predicting subsidence movements, and uncertainties in how mine subsidence movements may adversely impact NBN infrastructure. In this case, creeks have been mapped that intersect the NBN and Telstra infrastructure where higher ground strains may occur but in general along Remembrance Drive and south of LW S4A and LW S5A there are no deep creek ravines or valleys likely to significantly increase compressive strain levels. The main area of influence for creek crossings is on the Telstra direct buried optical fibre cable installed along the rail corridor to the east of Remembrance Drive.

Tahmoor Coal has considered the outcomes of the hazard identification and risk assessment process when developing measures to manage potential impacts on the health and safety of people, and potential impacts on NBN and Telstra infrastructure in general. These details are described in Section 5 of this management plan.

In addition to the risk assessment process outlined in this NBN MP, a Risk Assessment was completed by Tahmoor Coal for LW S1A to LWS6A which included the identification of potential risks to NBN infrastructure (refer to Appendix B).

5.0 Control Procedure

5.1 Overview of Control Procedures

Tahmoor Coal has developed and selected risk control measures in consultation, co-ordination and co-operation with the infrastructure owner in accordance with WHS legislation. In accordance with Clauses 35 and 36 in Part 3.1 of the *Work Health and Safety Regulation 2017* and the guidelines (MSO, 2017), a hierarchy of control measures has been considered and selected where reasonably practicable, using the following process:

1. Eliminate risks to health and safety so far as is reasonably practicable;
2. If it is not reasonably practicable to eliminate risks to health and safety – minimise those risks so far as is reasonably practicable, by doing one or more of the following:
 - a. Substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk;
 - b. Isolating the hazard from any person exposed to it;
 - c. Implementing engineering controls;
3. If a risk then remains, minimise the remaining risk, so far as is reasonably practicable, by implementing administrative controls; and
4. If a risk then remains, the duty holder must minimise the remaining risk, so far as is reasonably practicable, by ensuring the provision and use of suitable personal protective equipment.
5. A combination of the controls set out in this clause may be used to minimise risks, so far as is reasonably practicable, if a single control is not sufficient for the purpose.

There are primarily two different methods to control the risks of subsidence, namely:

- Method A – Selection of risk control measures to be implemented prior to the development of subsidence, (Items 1 and 2 above), and
- Method B – Selection of risk control measures to be implemented during the development of subsidence (Items 3 and 4 above).

Tahmoor Coal considered Method A and Method B risk control measures in relation to managing potential impacts on NBN infrastructure due to the extraction of LW S1A through to LW S6A.

The following considerations have been made by Tahmoor Coal with regards to impact to telecommunication infrastructure:

- Elimination - In this instance, no reasonably practicable controls could be identified that would eliminate the identified risks;
- Substitution - In this instance, no reasonably practicable controls could be identified that will change the environment so the hazards could be substituted for hazards with a lesser risk;
- Isolation - In this instance, no reasonably practicable controls could be identified to isolate a hazard from any person exposed to it;
- Engineering Controls - In this instance, no reasonably practicable controls could be identified to put in place a structure or item that prevents or minimises risks; and
- Administrative Controls - Tahmoor Coal and NBN have developed and implemented Administrative Controls that will put in place procedures to minimise the potential of impacts on the health and safety of people associated with damage to NBN infrastructure.

Tahmoor Coal and NBN have developed a management strategy of detecting early the development of potential adverse subsidence movements in the ground, so that contingency response measures can be implemented before impacts on the safety and serviceability develop. See Table 3 of this NBN MP.

The risk control measures described in this NBN MP have been developed to ensure that the health and safety of people on NBN infrastructure are not put at risk due to mine subsidence. It is also an objective to avoid disruption to services, or if unavoidable, keep disruption and inconvenience to minimal levels.

With respect to the extraction of LW S1A through to LW S6A, no potential hazards have been identified that could reasonably give rise to the need for an emergency response. Of the potential hazards identified, only a complete loss of mobile and fixed wireless and line services connections could give rise to the need for an emergency response. The likelihood is considered remote and would require substantial differential subsidence movements at multiple locations to develop before such an event occurs.

Mine subsidence movements will develop gradually and there will be ample time to identify the development of potentially adverse differential subsidence movements early, consider whether any additional management measures are required and repair or adjust affected surface features, in close consultation with NBN.

Tahmoor Coal and NBN will review and assess monitoring reports and consider whether any additional management measures are required on a weekly basis. If potentially adverse differential subsidence movements are detected, it is anticipated that a focused inspection will be undertaken in the affected area, and a decision will likely be made to increase the frequency of surveys and/or inspections. Additional management measures may also be implemented. It is therefore expected that, if a potential adverse situation escalates, Tahmoor Coal will be present on site on a more frequent basis to survey or inspect the affected site, and that NBN will be consulted on a more frequent basis.

Notwithstanding the above, if a hazard has been identified that involves potential serious injury or illness to a person or persons on public property or in the vicinity of NBN infrastructure, and cannot be controlled, the immediate response is to remove people from the hazard. If such a situation is observed or is forecast to occur by either Tahmoor Coal or by people on public property, Tahmoor Coal and NBN will immediately meet and implement emergency procedures through the NBN RG.

5.2 Control for each Infrastructure Groups

There is now information available on the general performance of Telstra telecommunications plant due to ground subsidence caused by longwall mining operations in the past. The current information available is from experience gained at Appin, Tahmoor, Helensburgh, West Wallsend, Camberwell and Broke in NSW. The longwall mining operation at 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 and NBN networks, comprising both robust and also relatively sensitive elements of the network. This information is provided in this NBN MP for the benefit of NBN through the experience gained by CNS in over 22 years of ‘in the field’ monitoring of Telstra’s extensive telecommunications network throughout the large geographic areas identified above.

The general control procedure considered in this NBN MP is to look at each item of plant described in Section 4.3 parts 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.

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 proposed management of the network during ground subsidence.

5.3 NBN Infrastructure

a) NBN Optical Fibre Cable

NBN Optical fibre cable TAH-0300-DSS-005 installed in Telstra conduit crossing LW S1A to LWS5A along the western side of Remembrance Drive.
(Risk Factor, **Significant**).

The cable NBN 432f SMOF Main cable is installed in conduit with Telstra Main cables between Tahmoor and Bargo. At the northern end of the Study Area this cable is installed in conduit parallel to the direct buried Telstra cable F BRGO 101 12f for around 800m across LW S1A to LWS2A. The two cables for the majority of this section of the route are installed within five metres of each other. The NBN cable is a more recent design suitable for cable hauling and is a much more robust hard jacketed cable at more than twice the diameter of the standard construction Telstra direct buried cable.

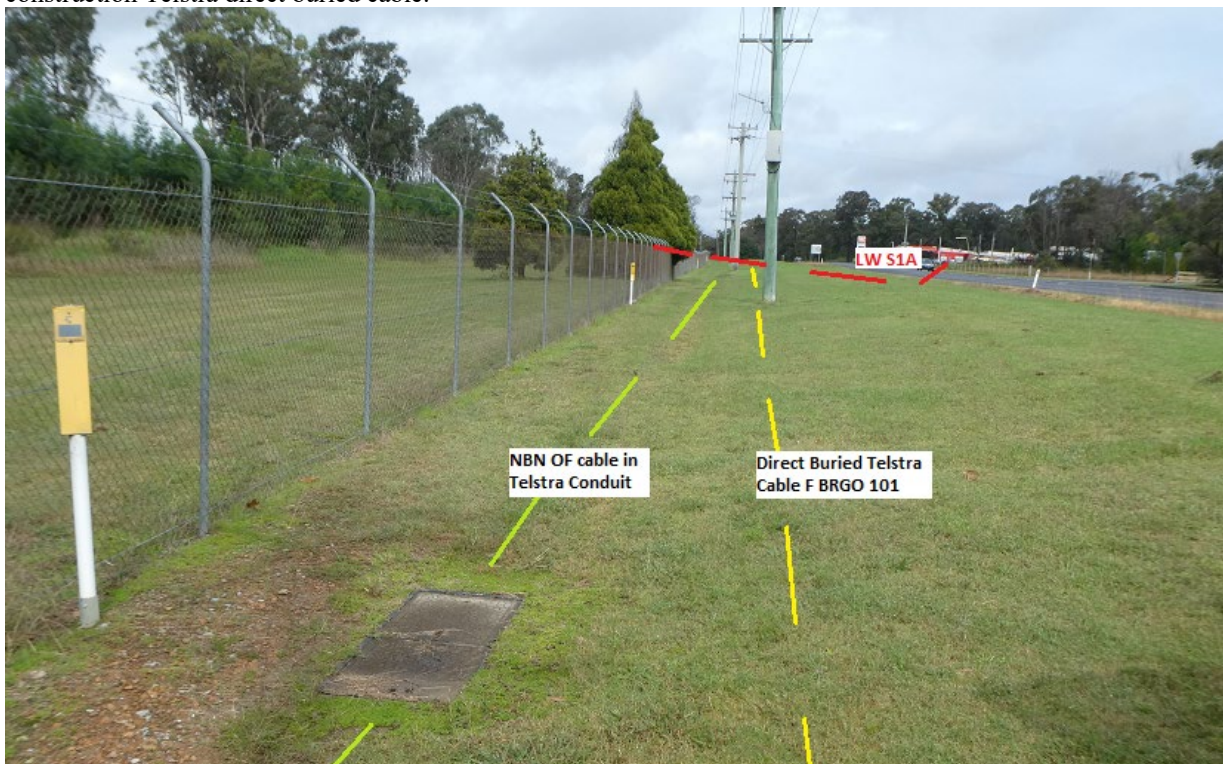


Plate 9:- View south to north end of LW S1A showing NBN OF cable in Telstra conduit and direct buried Telstra IEN cable installed parallel and around 3-5m. to the west.

Physical inspection of the cable lines during mining will be maintained in this northern area as well as OTDR monitoring from Bargo exchange on the Telstra direct buried cable to provide early warning of any anomalous ground movement around the cable line to NBN.

NBN Network Operations Centre may consider utilising remote OTDR monitoring on this cable to supplement the OTDR detail to be provided from cable testing on the Telstra cable. Due to the importance of the IEN cables an additional monitoring regime will be maintained on these cables consisting of:

- Analysis of survey data by Tahmoor Coal surveyors for Remembrance Drive; and
- Close in 1625nm OTDR testing on spare fibres in the Telstra cable F BRGO 101 from Bargo exchange, to closely monitor any minor loss that may develop on the more vulnerable Telstra cable. Any minor loss detected at 0.1dB trigger level will be immediately advised to NBN so that a close in testing can be arranged on their cable.

This OTDR fibre testing on the Telstra cable across the longwalls will be carried out by CNS from Bargo exchange ‘looking’ north through the mining area for LW S5A to LW S1A. This specialized individual fibre testing can confirm that there are no or new very low levels of transmission loss developing on the cable. The trigger levels and actions for the cable monitoring which will be at 1625nm on individual fibres will be set as follows:

- Loss of 0.1dB - The point loss or area of loss should be recorded and an investigation carried out of the direct buried cable line at that location to determine if any ground movement is evident, i.e., ground compression tension over the cable line and analysis of any relevant survey data;
- Loss of 0.5dB -The loss event identified should continue to be continuously monitored and should the loss progress to (+/-) 0.5 dB then the cable should be exposed at the recorded location to attempt to relieve pressure or tension/compression on the cable due to ground strain; and
- Loss on 1dB - In the event of the loss on the cable continuing, excepting that cable exposure has not relieved or reduced the transmission loss and that loss continues and exceeds 1 dB an interruption cable should be laid and pits installed in preparation for cable cutover of the cable as considered necessary.

In the event an interruption cable is installed and secured, discussions with Tahmoor Coal and Subsidence Advisory NSW would be initiated prior to this event occurring, through the NBN RG for the permanent reinstatement of the cable - Like for Like replacement.

b) NBN Transmission Tower

i) The Tower located off Yarran Road supports Fixed Wireless internet, data and telephone services throughout the Study Area. Tower & Transmission Equipment Cabinets address is 3166 Remembrance Drive Bargo.

(Risk factor for the Tower is assessed to be **Significant**)

Therefore, as recommended in Reference No1 and in 4.3 b) above discussions should be initiated with NBN tower specialists to outline any concerns they may have with predicted mining impacts on the Tower infrastructure.

As a minimum recommendation for monitoring during ground subsidence it is suggested that :-

- Survey prisms be established on all corners of reinforced concrete footings on site and base line survey detail be recorded, so that any changes can be identified. This is to ensure that there is no anomalous ground movement occurring around the site. A general trigger for review of the structures would be 1mm/m strain & tilt recorded and a subsidence of say 300mm.
- Install tilt-metres on the base slab of the tower oriented in the north-south and east-west direction with real time data provision.
- All data be referred to NBN or their consultants as required.
- NBN to assess the provision of power to the site for any vulnerabilities for ground subsidence or tilt.

ii) Power Supply to NBN Tower

(Risk factor for the Tower is assessed to be **Significant**)

In addition to the recommendations above it is considered there is some risk to the power supply in the diagonal crossing of LW S6A and it is recommended that a survey monitoring line be established for LW S6A. Additionally, for the period of maximum predicted impacts from LW S6A in this area, the cable and conduit route should be subject to physical inspection.

c) NBN Local cable distribution in the area of Great Southern Road and Charlies Point Road on the southern corner of LW S4A-LW S5A.

(Risk Factor **Low**).

Planned monitoring for this cable area is to review survey data along the northern end of Great Southern Road and western end of Charlies Point Road, to check for unpredicted ground movement, along the cable lines. The survey data to be provided by Tahmoor Coal towards the finishing end of each of the longwall panels LW S4A and LW S5A and should be supplemented by physical inspection along this section of the cable route.

d) Manhole, Conduit & Pit Network

(Risk Factor **Low**).

The cable distribution network is obviously subject to a degree of risk of damage in the areas of maximum subsidence which is principally along Remembrance Drive and Caloola Road and the eastern part of Yarran Road. The aim of the monitoring is to combine physical inspections of the conduit route with road survey data at the critical impact times for each longwall. For example, to monitor;-

- The first 200m of LW S1A along Remembrance Drive
- Chainage 200 to 600m of LW S2A along Remembrance Drive
- Chainage 300 to 900m of LW S3A along Remembrance Drive & Caloola Road

- Chainage 0.0 to 600m of LW S4A along Caloola Road and Chainage 900 to 1500 along Remembrance Drive and at end of panel along Charlies Point Road
- Chainage 0.0 to 200m of LW S5A along Caloola Road and Chainage 1200 to 1500 along Yarran Road and Remembrance Drive and at end of Panel along Great Southern Road
- Chainage 1200 to 1600m of LW S6A along Yarran Road

The NBN network present only consists of more recent plastic jointing pits and relatively newer uPVC conduit installation. Additionally, advice from Tahmoor Coal should be provided to NBN on any infrastructure, road or building damage which is observed or reported to the mine, as a result of independent inspections completed for Tahmoor Coal by other mine engineering consultants

5.4 Surface Subsidence Survey

The additional control procedure for the NBN & Telstra plant identified above will be supplemented by ground surveys carried out by Tahmoor Coal at agreed time intervals along agreed base lines of Remembrance Drive, Caloola Road, Yarran Road, Great Southern Road and Charlies Point Road as shown in Appendix A Sheet 2.

The survey data will record the initial RL of the surface prior to mining commencing and then:-

- Incremental subsidence over the agreed period;
- Incremental ground strain over the agreed period; and
- Incremental ground tilt over the agreed period.

The frequency of the survey and the reporting of the results, to the NBN RG are to be agreed by the members of the Group as the longwalls commence and advance into the different areas. The NBN RG should consult and agree on the limits of the survey lines and set the frequency of the survey work.

Refer to the following table – Table 3, which presents a Summary of the NBN, Risk Factors, Monitoring and Actions required for items of plant, which may be impacted by mine subsidence. Note that in Table 3 items of plant are identified as discussed earlier. i.e., a) Main Optical Fibre Cables, b) NBN Tower Infrastructure, c) Local Copper Cables and d) Manholes, Conduit & Pit network.

Table 3 - Summary of Monitoring Procedures and Actions for NBN Infrastructure

Item of Plant	Risk Factor	Method Levels	Monitoring Details	Frequency	Trigger	Actions and Responsibilities
a) NBN OF Cable 2 TAH 0300 DSS 005	Significant	Base line OTDR Testing. Remembrance Drive survey detail available to NBN	OTDR Monitoring of adjacent direct buried Telstra Cable F BRGO 101 from Bargo Exchange. Loss details to NBN If Required by NBN, Remote OTDR Testing by NBN Network Operations on cable over LW S1A to LW S5A	Test Telstra cable @ critical times for each LW Continuous OTDR testing as necessary by NBN Road survey data weekly at critical times	Minor transmission loss on FBRGO 101 <0.1db advise NBN Anomalous ground m'vmnt from survey data or reports of damage	NBN Service Delivery to investigate and advise Tahmoor Coal of any proposed remote OTDR monitoring. Localised OTDR testing of Telstra F BRGO 101 alongside NBN cable. Any loss detected by CNS immediately referred to NBN for consideration and action NBN RG maintain check on survey data
b) i) NBN Fixed Wireless Tower Infrastructure	Significant	Survey prisms or marks on slabs Real -Time Tilt-meter installed on Tower Base Slab & cabinet slab	Tahmoor Coal to survey prisms or marks for localised subsidence tilt and strain Continuous Tilt meter data recorded and provided to NBN for base slab tilt in two directions	Fortnightly / weekly during critical subsidence event for LW S5A & LW S6A	Ground Strain > 1mm/m and or anomalous ground movement from survey. Tilt 1.0 degree, detail to be agreed	Tahmoor Coal to report tilt data at min of weekly to NBN. Trigger levels to be agreed by NBN RG for decision on action to be taken as considered necessary by NBN representatives to protect the Tower Infrastructure.
b) ii) Power Supply to Tower Infrastructure	Significant	Survey & Physical Inspections	Tahmoor Coal establish Survey Line along access corridor from Yarran Rd for LW S6A Qualified & experienced consultant to inspect cable & conduit route	Survey and inspect weekly during major impacts from LW S6A	Ground Strain > 1mm/m and or anomalous ground movement from survey or inspection	Tahmoor Coal to report strain data at min of weekly to NBN. Trigger levels to be agreed by NBN RG for decision on action to be taken as considered necessary by NBN representatives to protect the Power Supply.

Item of Plant	Risk Factor	Method Levels	Monitoring Details	Frequency	Trigger	Actions and Responsibilities
c) NBN Local cable distribution in Great Southern and Charlies Point Roads	Low	Road survey data	Agreed survey lines along Great Southern and Charlies Point Roads	Fortnightly / weekly during critical subsidence events at End of Panels LW S4A and LW S5A.	Ground strain exceeding 1mm/m	Tahmoor Coal to report trigger levels to NBN RG for decision on action to be taken as considered necessary by NBN representatives to protect their cables.
<u>d) Conduit, Manhole Pit & Pole Network</u>	Low	Telstra to inspect conduit m/hole & pits concurrent with cable inspections Road Survey data for Remembrance Drive as mining progresses.	Monitor conduit, manholes & pits along Remembrance Drive during subsidence period from respective longwalls active at the time on Remembrance Drive.	Prior to mining then as determined by each longwall's progress and as required by NBN RG.	Visual check of active section being monitored. If survey details show anomalous movement around conduit network check NBN cable	Should surface damage occur or reports of damage, check survey data and check conduit pit and manhole network in particular area. Tahmoor Coal to advise Telstra & NBN RG of any damage evident and maintenance or repair work considered necessary on other infrastructure.
<u>Survey Line</u>	Not Applicable	Permanent marks at approx. 20m intervals along roads & cable lines where network is installed. Additional Survey Line installed along driveway along Power Line to NBN Tower from Yarran Rd	Tahmoor Coal to carry out detail survey, (subsidence, strain and tilt recorded) along Remembrance Drive, Caloola Road, Yarran Road, Great Southern Road and Charlies Point Road. Also survey along power access track for LW S6A. Tahmoor Coal to provide survey results to NBN RG and NBN representatives concurrent with mine progress.	To be determined by NBN RG dependent on degree of subsidence occurring and potential hazard to NBN network. Nominal weekly surveys through active subsidence areas	Surveyed ground strain compression or tension above 1mm/m. Ground tilt above 3mm/m	Tahmoor Coal to make survey results available to NBN or their representative & NBN RG following each regular survey of active mining area.

6.0 Implementation

6.1 NBN Response Group (NBN RG) – Roles and Responsibility

Technical resources required to carry out the monitoring as identified In Table 3 are to be provided by Tahmoor Coal or their consultants as required. Tahmoor Coal will provide the survey resources required for the line surveys established on the roads and power access track around and over LW S1A to LW S6A to determine incremental and total subsidence, strain and tilt during mine subsidence from the longwalls. The survey frequency and reporting is to be reviewed as required by the NBN Response Group (NBN RG).

Prior to commencing any proposed rectification work the NBN representatives will detail the extent of the work and the associated costs to the NBN RG. At that meeting agreement will be reached between Tahmoor Coal, NBN and Subsidence Advisory NSW as to the responsibility for the costs of the proposed work. For emergency work involving work to immediately secure the NBN network, where loss of service to customers or line systems outage is involved, the work will be carried out by NBN as necessary and the discussions regarding costs associated with the emergency repair work resolved at a special meeting of the NBN RG.

The following procedures will be implemented during and after active subsidence of the NBN infrastructure to ensure the continued effective consultation, co-operation and co-ordination of action with respect to subsidence between Tahmoor Coal and NBN and Subsidence Advisory NSW. The monitoring of the NBN network in accordance with this management plan is to be carried out by Tahmoor Coal, NBN or their representatives and if required CNS for ‘in field’ monitoring. The NBN RG is to be the forum for discussion and resolution of issues raised in the operation of the management plan and discussions on impacts on the telecommunication network. Meetings or teleconferences preferred, to be arranged as necessary and the NBN RG need only be convened in the event of trigger levels being reached as set out in Table 3, unpredicted ground movement detected by survey or cable faults or damage being recorded within the NBN or Telstra network. Any anomalous ground movement resulting from subsidence over LW S1A to LW S6A and any risk perceived by Tahmoor Coal to the network, due to mining is to be used as a trigger for a meeting of the NBN RG.

The representatives proposed to be involved in the NBN Response Group are (contact details are provided in Section 8):

- **Zina Ainsworth** – Environment and Community Manager, Tahmoor Coal.
- **April Hudson** – Approvals Specialist, Tahmoor Coal.
- **Amanda Bateman** – Environment & Community Officer, Tahmoor Coal
- **Daryl Kay** – Mine Subsidence Engineering Consultants Pty Ltd.
- **Colin Dove** – Consultant Telecommunications Engineer.
- **Matthew Montgomery** – Infrastructure Manager Subsidence Advisory NSW.

The NBN stakeholders are:

- **Todd Williams** – NBN Deployment Manager – Augmentation Network.
- **Senthil Manikandan** – NBN Technology Manager.
- **Chinmay Kumar** – NBN Networks Operations Manager.
- **Colin Chapman** – NBN Service Delivery Manager.

When impacts on the NBN network determine, the NBN RG 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.

The purpose of the NBN Response Group is to:

- a) Assess monitoring data, including the early detection of potential impacts on health and safety and impacts to NBN infrastructure;
- b) Verify the risk assessments previously conducted;
- c) Ensure the effectiveness and reliability of risk control measures; and
- d) Support the continual improvement and change management.

At any necessary meeting of the NBN RG, NBN are to report incidents recorded in relation to the performance of their network plant and a detailed log is to be maintained of any incident reported to the NBN RG. Full details are to be reported of significant events observed or events which have an impact on the communications networks or the provision of telecommunication services in the area. Tahmoor Coal 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 No 1.

It is the responsibility of NBN RG 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 NBN RG meeting, with one day's notice, to discuss proposed action and to keep other parties informed of developments in the monitoring or maintenance of the NBN and/or Telstra network.

6.2 Communication Plan

The communications plan outlines the feedback to be provided between Tahmoor Coal and NBN during the operation of this management plan:

Tahmoor Coal will provide to NBN details of:

- Summary of ground surveys along monitoring lines as identified in Appendix A
- Exception reporting of impacts observed from visual inspections of telecommunications plant which has relevance to NBN, i.e. inspection of Telstra manhole, conduit and pit network carrying NBN cables
- CNS- OTDR reports of any transmission loss identified on adjacent Telstra cables
- CNS inspections of Telstra network of relevance to NBN
- Monitoring reports of what has been monitored (as above)
- Direct notification to NBN if any potential adverse changes on surrounding infrastructure is observed such as roads, drainage structures, buildings or on other underground or above ground services

NBN will communicate to Tahmoor Coal:

- Any impact identified on NBN assets during mining.
- Planned new NBN infrastructure to be constructed within the Study Area.

6.3 Audit and Review

This management plan as agreed between parties and can be reviewed and updated to continually improve the risk management systems based on audit, review and learnings from the development of subsidence during mining and manage changes in the nature, likelihood and consequence of subsidence hazards.

The review process will be conducted to achieve the following outcomes:

- Gain an improved understanding of subsidence hazards based on ongoing subsidence monitoring and reviews, additional investigations and assessments as necessary, ongoing verification of risk assessments previously conducted, ongoing verification of assumptions used during the subsidence hazard identification and risk assessment process, ongoing understanding of subsidence movements and identified geological structures at the mine;
- Revise risk control measures in response to an improved understanding of subsidence hazards;

- Gain feedback from stakeholders in relation to managing risks, including regular input from business or property owners;
- Ensure on-going detection of early warnings of changes from the results of risk assessments to facilitate corrective or proactive management actions or the commencement of emergency procedures in a timely manner; and
- Ensure timely implementation of a contingency plan in the event that the implemented risk control measures are not effective.

Some examples where review may be applied include:

- Poor performance of the NBN plant in regard to mine subsidence, such as interruption or loss of services;
- Any trigger levels being reached or exceeded;
- Favourable performance of the NBN 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; and
- Evidence of significant geological faults or evidence suggesting major “Far field effects” may develop.

Should an audit of the NBN Management Plan be required during that period then a representative is to be appointed by NBN, Tahmoor Coal and Subsidence Advisory NSW to review the operation of the plan and report amendments to the next scheduled meeting of the NBN RG.

6.4 Record Keeping

As and when required preferably by teleconference, if a meeting is initiated of the NBN RG, a minutes secretary shall be appointed to 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 NBN 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 telecommunications network.

It is anticipated that the NBN RG will remain active as required until late 2026.

7.0 Associated Documents and References

7.1) Appendices

Appendix A (Drawings Extracted from Reference No 1)

Appendix A Sheet 1 - MSEC Dwg No 1192-19 Revision A, "Public Amenities & Commercial Premises" (NBN Tower Location).

Appendix A Sheet 2 - MSEC Dwg No 1192-23 Revision A, "Tahmoor South Project Extraction Plan LW S1A to LW S6A, Proposed Monitoring

Appendix B -
Tahmoor Coal (2021), Risk Assessment Report,
Infrastructure Tahmoor South
Extraction Plan
Longwalls 101A to 106A, November 2021

7.2) References

Reference No 1
The Report MSEC 1192, Revision A, March 2022, titled
"SIMEC Tahmoor South Project
Extraction Plan for Longwalls S1A to S6A,
Subsidence Ground Movement Predictions and Subsidence Impact Assessments for Natural Features &
Surface Infrastructure"

8.0 Contact List.

Contacts of participants involved in NBN Response Group:

Organisation	Contact Name	Title	Postal Address	Telephone / Mobile	Email
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