

Comms Network Solutions

TAHMOOR COAL – LONGWALLS LW W3 AND LW W4

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

Prepared for Tahmoor Coal Pty Ltd

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AUTHORISATION OF TELECOMMUNICATIONS MANAGEMENT PLAN

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1. Introduction

1.1. Background

The Tahmoor 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 a wholly owned subsidiary within the SIMEC Mining Division (SIMEC) of the GFG Alliance (GFG).

Tahmoor Coal has previously mined 34 longwalls to the north and west of the Tahmoor Mine's current pit top location. In November 2019 Tahmoor Coal commenced longwall mining in the new Western Domain area consisting of four longwalls LW W1 to LW W4. The area is located north of previous mining in LW28-LW32 and to the north of Thirlmere Way and south of Barkers Lodge Road. In this newer development area LW W1 completed extraction in November 2019 and LW W2 completed extraction in June 21. Currently mining is planned to continue in this area and commence mining in LW W3 in September 2021 followed on completion by LW W4. The location of the longwalls LW W1 to LW W4 is shown in Plate 1.

As part of the planning for mining of LW W3–W4, Tahmoor Coal has identified surface assets which may be affected by the mining operation in the Picton west area. Some of these assets belong to NBNC Co and are part of NBNC Co's infrastructure in the area. There are current changes underway to ownership of the Telecommunications network in Australia with Telstra transferring part of their external plant network to NBNC Co. Telstra will retain ownership of their existing Main copper and optical fibre cable as well as all the manhole, pit and conduit distribution network while NBNC Co will have ownership over their newly installed cable network to the Node or Pillar and the existing and new Local cable network to the customer's premises. Generally, within the Western Domain the existing Local cable telecommunications infrastructure has been transferred to NBNC Co from Telstra plus NBNC Co also have ownership of new network installed as part of the transfer process.

During the extraction of previous longwalls LW W1 to LW W2 monitoring of the NBNC Co network was completed with no recorded impacts on the network. Within the Western Domain, the southern area of the longwalls will influence network along Thirlmere Way and Stonequarry Creek Road and the northern area will potentially influence network along Barkers Lodge Road. The two areas present very similar telecommunications infrastructure for subsidence and ground movement consideration. Main IEN optical fibre cables are present in the south and north as well as Customer Access Network (CAN) optical fibre cables to the Nodes in Stonequarry Creek Road and Barkers Lodge Road. Note that although the Local cable distribution is now owned by NBNC Co in the south and north areas the manhole pit and conduit network remains in Telstra's ownership. Therefore, primarily the NBNC Co cable networks potentially impacted by LW W3-W4 are determined geographically in the northern and southern areas within the 20mm subsidence zone as shown in Plate 1.

Tahmoor Coal has presented this longwall mining application for LW W3–W4 to both Telstra and NBNC Co, and each company have independently determined that they will present their own preferred management plan and monitoring regime for their own networks to Tahmoor Coal for implementation. This management plan is to consider the monitoring actions determined by NBNC Co for their network, allowing for some minor overlap and feedback being provided from the Telstra monitoring exercise since this process has been established over the past 20 years.

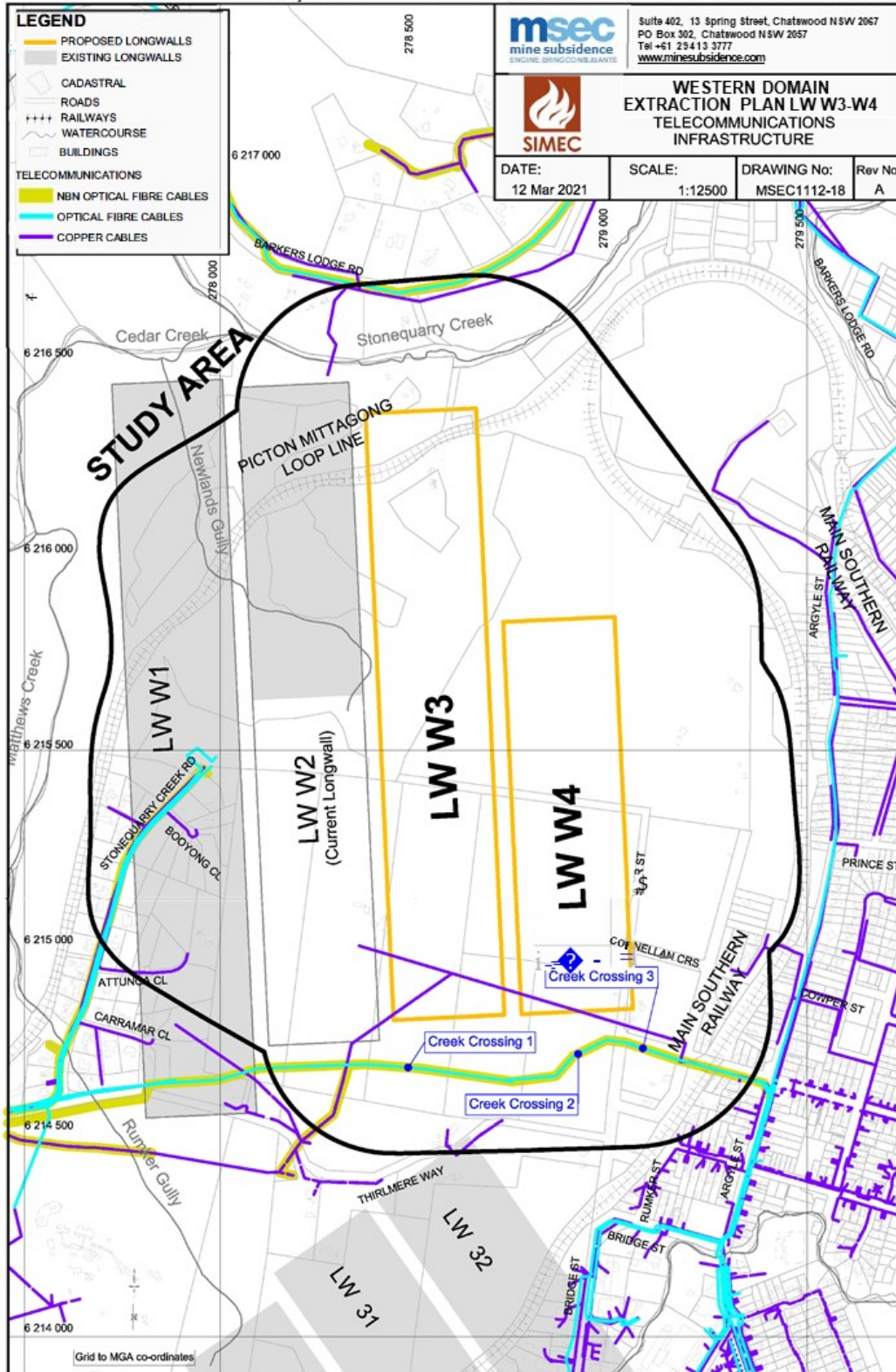


Plate 1:
Telecommunications Infrastructure in Study Area of LW W1-W4 Extraction Plan (MSEC Dwg MSEC1112-18)



Plate 1:

Google Earth aerial view of two longwalls LW W3 & LW W4 showing Thirlmere Way in the south and Barkers Lodge Road in the north. The green lines indicate NBNC Co optical fibre cables, south between Picton and Tahmoor exchanges and along Stonequarry Creek Road and north along Barkers Lodge Road between from Picton and west. The blue lines are the NBNC Co local copper customer cables and the yellow lines are the Telstra IEN optical fibre cables.

1.2. Purpose and Objectives

This NBNC Co Management Plan (NBN MP) will consider the impact of the ground surface movements, contributed by LW W3–W4 on the assets owned by NBNC Co. Additionally, there is some comment in this management plan regarding potential impacts on the adjacent Telstra network. The comments relate to planned monitoring of the Telstra network by Comms Network Solutions Pty Ltd (CNS) who has been involved with previous longwall monitoring where the entire communications network was owned by Telstra. The commitment by CNS to NBNC Co in regard to existing monitoring regimes, as previously adopted and now applied to LW W3-W4, is to immediately provide any relevant information gained by monitoring the performance of the Telstra network to NBNC Co. This provides the advantage to NBNC Co that CNS field staff engaged by Tahmoor Coal can immediately advise NBNC Co of current ground surface impacts, affecting the co-located Telstra network, which may have implications for the adjacent NBNC Co network.

It is recognised that NBNC Co 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 NBNC Co.

The objectives of this NBN MP in relation to NBNC Co 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 NBNC Co 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 NBNC Co 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 W3-W4. The Report by MSEC 1112, Revision A, Reference No 1, is titled “*Subsidence Predictions and Impact Assessments for Tahmoor LW W3-W4*” This report identifies a Study Area for LW W1 through to LW W4 that considers mine subsidence impacts bounded by the 20 mm subsidence contour line and 35° Angle of Draw for LW W1-W4. This Study Area has been identified for LW W1–W4 in MSEC Drawing MSEC1112-18, as shown in Plate 1 and shows the layout of the telecommunications infrastructure including Telstra and NBNC Co optical fibre and copper cable networks.

As mentioned, the Study Area under consideration is to the west of Picton and includes the subsidence impacts to date from LW W1 & LW W2, noting that there will be incremental ground movement from these two longwalls during LW W3-W4 extraction. For consideration in the management plan the following NBNC Co major assets or shared assets are identified:

- NBNC Co main optical fibre cable network between Picton and Tahmoor telephone exchanges along Thirlmere Way, (Telstra IEN cable direct buried adjacent to NBNC Co main cable);

- NBNC Co main optical fibre cable installed west from Picton along Barkers Lodge Road, (Telstra IEN cable direct buried adjacent to NBNC Co of cable). It is noted that Barkers Lodge Road is on the northern perimeter of the Study Area with no associated subsidence predictions made for this area in the MSEC Report. However due to the importance of the Telstra and NBNC Co Inter-Exchange cables passing through this area this management plan will consider monitoring of these cables. The consideration being that should any anomalous of far-field impacts occur around these cables, there is the potential to isolate the entire Lakesland telecommunications district from regional interconnection of all services.
- NBNC Co Nodes in Stonequarry Creek Road providing interconnection from NBNC Co optical fibre cable to copper distribution cable network in this area;
- Telstra Pit and Pipe networks supporting some of the above NBNC Co cable networks throughout the mining area.

During the extraction of previous longwalls LW22 to LW32 and LW W1 to W2, 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 W3-W4 the potential for impacts on the major network cable infrastructure will vary with regards to the different types of telecommunications infrastructure exposed to mining. With this new mining area LW W3-W4, the southern section of the Study Area will be associated with network in the Thirlmere Way and Stonequarry Creek Road area and the northern section of the Study Area will be associated with Barkers Lodge Road as explained above.

The two areas present very similar telecommunications infrastructure for subsidence and ground movement considerations. Main IEN optical fibre cables are present in the south and north. In the south however, there is also NBNC Co optical fibre cable to the Nodes and the Local cable distribution is also present in the south to customers along Stonequarry Creek Road. The Telstra manhole, pit and conduit installations support both the Telstra and NBNC Co cable networks and also cover both south and north sections of the Study Area. Therefore, the NBNC Co cable networks potentially impacted by LW W3-W4 are located in the north along Barkers Lodge Road and in the south along Thirlmere Way and Stonequarry Creek Road.

This NBN MP is to be used to assess and protect the performance of the items in the NBNC Co 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 NBNC Co property, are not put at risk due to mine subsidence. The major items of NBNC Co plant are considered, relative to their location and risk assessed from subsidence impacts from LW W3-W4. (See Section 4.2 -4.3).

1.4. Timeframe

As mentioned above longwall LW W2 was completed 18 June 2021 and LW W3 is anticipated to commence in September 2021. The longwall LW W3 will then take approximately seven months to mine, working to the south from the northern extent of the longwall. It is anticipated that LW W4 extraction will follow, commencing in May 2022 with completion around September 2022. Therefore, this management plan covering the longwall mining under Telstra plant at Picton West will continue in operation until completion of mining of LW W4, anticipated towards the last quarter of 2022 and for sufficient period of time thereafter to allow for completion of subsidence effects.

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 as identified above. 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 since there are direct buried optical fibre cables located just south of LW W3 and LW W4, significant exposure of these two NBNC Co and Telstra cables is associated with accompanying risk to the Inter Exchange Network. This network carries major internet services, data and telephone traffic between Picton and Tahmoor Exchanges, and the cables are the critical link for maintenance of all services in the Tahmoor – Picton area and beyond through to Bargo and Campbelltown Exchanges.

Also, as mentioned above there are both, Local copper direct buried cables and cables in conduit which are potentially vulnerable to sheath damage or high tensile loads respectively. Since monitoring has been performed on the communications network during LW24 through to LW32 and LW W1 and LW W2 subsidence events, there is now some basis for assessing the performance of these networks from past experience. Generally, as mentioned it has been found that the older lead sheathed Main, Junction, some Local copper cables, and local aerial copper cable distribution networks are vulnerable to ground movement, particularly, the latter, during exposure to ground tilting. However, within the subsidence zone for LW W3-W4 there are no older lead Junction or Local copper cables but NBNC Co does have Local aerial copper cables installed in the south and east areas of the Study Area.

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 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 NBNC Co's 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.

1.6. 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 NBNC Co roll out FTTN.

NBNC Co FTTN - System of providing telecommunications services to the customer. NBNC Co 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 NBNC Co Local copper cable network.

Local Cable – NBNC Co 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 NBNC Co this section of the Telstra cable network will be divested from Telstra to NBNC Co as NBNC Co establish Nodes in areas such as in Stonequarry Creek Road.

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 NBNC Co, 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 Consultation

2.1 Consultation with NBNC Co

Colin Dove from CNS attended a meeting with NBNC Co Network Deployment NSW / ACT at their Pennant Hills Office in August 2019 to discuss the planned Western Domain longwalls LW W1-W2 to be commenced by Tahmoor Coal and for NBNC Co to consider the implications on the NBNC Co Network.

As a result of the initial meeting there was follow up phone and email contact with NBNC Co Technology Group where the Network Operations and Service Delivery Sections of NBNC Co decided to introduce Remote OTDR monitoring on their two optical fibre cables:

- a) The 144f SMOF cable, 2OAK 00 00 TSS 010 currently crossing to the south of LW W3 and LW W4 in the southern zone of the Study Area
- b) The 144f SMOF cable, 2OAK-00-00-TSS-007 installed north of LW W3 and LW W4 just within the perimeter of the northern Study Area.

Tahmoor Coal will consult with NBNC Co 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 NBNC Co during the extraction of LW W3-W4 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 Subsidence Predictions

3.1 Subsidence Predictions (Reference No 1)

The Mine Subsidence Engineering Consultants Pty Ltd Report MSEC1112 Revision A, Reference 1, Section 6.11.4 Telecommunications Services makes the statement that:

The Mine Subsidence Engineering Consultants Pty Ltd Report MSEC1112 Revision A, Reference 1, Section 6.11.4 Telecommunications Services makes the statement that:

“TC 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 LW22 to LW32, and LW W1-W2. TC has also developed a risk management plan for NBNC Co to manage potential impacts to NBNC Co infrastructure during the mining of LW W1-W2

*.....
It is recommended that these management plans are reviewed and updated to incorporate LW W3-W4”*

This NBN MP will take into consideration the incremental subsidence predictions for LW W1-W2 and the new predictions for LW W3-W4, as well as drawing on the experience gained from the management of the Telstra infrastructure from previous subsidence events due to LW22 to LW32 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 cable of 5mm diameter up to larger and generally more fragile 12-25 mm diameter optical fibre cables, spread diversly in the northern and southern sections of the Study Area. As a result the cable types will be considered within their general groupings of similar cable types:

- a NBNC Co Local copper aerial cable distribution along Thirlmere Way and at the western end of Connellan Crescent.
- b NBNC Co optical fibre cables: (including consideration of Telstra optical fibre cables co-located)
 - i) NBNC Co and Telstra direct buried IEN optical fibre cables crossing south of the southern end of LW W3 and LW W4;
 - ii) NBNC Co and Telstra optical fibre cables in conduit to the north of LW W3-W4 along Barkers Lodge Road just inside the Study Area as also noted in iii) above. Note, the major impacts from mining on this cable have occurred over the last 18 months from LW W1 and LW W2 and it is possible there may be some slight incremental impacts on this cable from LW W3 and W4. It is noted however, that the area along Barkers Lodge Road and cable lines are just on the northern perimeter of the Study Area. Hence, there is unlikely to be any recordable ground movement in this area and it is intended to allow for one month of OTDR cable testing on the direct buried Telstra cable principally since it is an IEN cable and any anomalous impact has the potential to isolate Lakesland telephone exchange from the local area network. As a result, the NBNC Co cable installed in conduit is much less vulnerable than the Telstra cable and feedback will be provided to NBNC Co should any anomaly present on the Telstra cable from testing in the initial stages of each longwall.

NOTE: The NBNC Co CAN optical fibre cable along Stonequarry Creek Road is installed to the south of the Study Area and provides connection to the node located south of Attunga Close. The cable is in Telstra conduit and the co-located Telstra cable which does cross into the western side of the Study Area of LW W1. Note, also the major impacts from mining on this cable have occurred over the last 18 months from LW W1 and LW W2 and it is considered that there is no or very minimal risk to this cable

accepting that the Telstra cable alongside will be monitored. This cable is not considered in this risk analysis.

- c Cable distribution network consisting of manholes, pits and conduit over the Extraction Plan Study Area supporting both the Telstra and NBNCo cable networks. Note this network is considered in the Telstra management plan for LW W3 W4.

The total subsidence predictions for these various cable types is as shown below in Table 1 extracted from data provided in the MSEC Report 1112 Revision A, March 2021, Reference No 1

Table 1 Maximum Predicted Cumulative Subsidence Parameters for LW W3-W4 on optical fibre and copper telecommunications cables

Location of Network	Subsidence mm	Tilt mm/m	Curvature (1/km)	Transverse Strain (Applying a factor of 10 to curvature)
IEN Optical fibre & Local direct buried copper cable Crossing south of LW W3 & LW W4	950 (W3) 1025 (W4)	5.0	+0.06, -0.10	0.6mm/m tension 1.0mm/m comp Creek Closure strain approx. + or - 0.1mm/m [#]
CAN Optical fibre & Local copper cable Stonequarry Creek Road After LW W4	Total 775	Total 3.0	+0.03, -0.05	0.3mm/m tension 0.05mm/m comp
Local copper cable Thirlmere Way After LW W4	100	< 0.5	+0.01, <-0.01	0.2mm/m tension < 0.1mm/m comp
Local copper cable Connellan Crescent After LW W4	175	1.0	+0.02, <-0.01	0.2mm/m tension < 0.1mm/m comp

[#] See extract below from MSEC Report 1112 Table 6.7 and the related discussion regarding the Telstra and NBNCo cable lines south of LW W3 and LW W4 and the additional predicted ground strain from upsidence and closure at the three Creek Crossings. Refer to Plate 1 for Creek Crossing locations south of LW W3 and W4.

Extract MSEC Report 1112 Section 6.11.2 and Table 6.7.

The Telstra and NBN cables at the southern end of LW W3-W4 cross a small tributary to Redbank Creek at two locations. Their locations are shown in Drawing No, MSEC1112-18, Creek crossing 1 is located approximately 110 metres to the south of LW W3. Creek crossing 2 is located approximately 110 metres to the south of the centreline of LW W4. Creek crossing 3 is located approximately 100 metres to the south of the maingate edge of LW W4,

A summary of the maximum predicted conventional subsidence and valley-related effects for the creek crossings is provided in Table 6.20. The table provides the maximum total values within a 20 m radius of each culvert due to the extraction of LW W1-W4.

Table 6.37 Maximum Predicted total vertical subsidence, curvature, upsidence and closure for the Telstra IEN creek crossings

Label	Maximum predicted total vertical subsidence (mm)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)	Maximum predicted total upsidence (mm)	Maximum predicted total closure (mm)
Creek crossing 1	< 20	< 0.01	< 0.01	80	60
Creek crossing 2	40	< 0.01	< 0.01	120	80
Creek crossing 2	< 20	< 0.01	< 0.01	40	25

The optical fibre and copper telecommunications cables within Stonequarry Estate cross small tributaries directly above LW W1-W2 and, therefore, they could experience valley-related effects. The maximum predicted valley-related effects for these telecommunications cables are 25 mm upsidence and 50 mm closure.

Therefore, in addition to the predicted ground strain acting on the Telstra and NBNC Co IEN cables, south of LW W3 and LW W4, at Creeks 1 to 3, there will be additional ground strain resulting from upsidence and closure at the creek crossings. The creek crossing locations are shown in Plate 1. The additional predicted strain impacts generated due to upsidence and closure at the cable lines based on the standard factor of 10 applying to predicted curvature in the southern coal-fields would be a maximum of + or - 0.1mm/m.

It is proposed that this NBN MP will initiate a broad agreement between NBNC Co 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 NBNC Co network exposed to mine subsidence from LW W3-W4 extraction.

4 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 NBNC Co 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 is identified in Table 3.

Table 2 Relative Risk Factor for NBNC Co 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 each Infrastructure Group

4.3.1 NBNC Co Local Copper Cables

4.3.1 i) NBNC Co Local Copper Customer Distribution Cable in Conduit

This cable provides connection to each customer's premises along Thirlmere Way & Stonequarry Creek Road and Connellan Crescent. The section of network cable in Stonequarry Creek Road and intersecting roads of Carramar Close, Attunga Close and Booyong Close is all in conduit and are exposed to limited subsidence impact since the conduit isolates the cable from the ground movement. Hence the risk factor for these cables is assessed to be associated with an unlikely likelihood, minor consequence, and overall **Low** risk.

4.3.1 ii) NBNC Co Local Copper Customer Distribution Cable Direct Buried

There is also cable in the southern section of the Study Area crossing into LW W3 and LW W4 to the north of Thirlmere Way as shown in Plates 1 & 2 and Plate 4 on the following page. The direct buried cables 30/0.64 cable shown is more exposed to ground movement than the cables in the conduit network. As shown the only Local direct buried copper cable located inside the Study Area is the 30/0.64 cable west from Rumker Street and Thirlmere Way across the south end of LW W3 and W4 then south west to the area where the cable crosses Thirlmere Way as shown in Plate 4. Hence accepting that this cable is within the southern ends of the longwalls and accepting that it is a nylon jacketed, larger conductor size resilient grease filled cable the risk factor is assessed to be associated with a moderate likelihood, minor consequence an overall **Moderate** risk.



Plate 3:
View into typical Telstra plastic pit showing Telstra P100 conduit and pit and NBNSCo Local copper distribution cables along Stonequarry Creek Road. Note blue cable is Telstra optical fibre cable



Plate 4:
View of Telstra No5 Pit in private property on north side of Thirlmere Way outside the Study Area. Photo shows line of NBNSCo cable 30/0.64 from across LW W3 W4 inside Study Area, north-west 10/0.64 to two properties outside the Study Area and 20/0.64 crossing Thirlmere Way to the south outside the Study Area. See Plate 1 showing crossing Thirlmere Way outside the Study Area. Cables are grease filled hard jacket resilient cables.

4.3.1 iii) NBNC Co Local Copper Aerial Distribution Cables

These Local distribution cables are located along Thirlmere Way on the southern perimeter of the Study Area and at the western end of Connellan Crescent in the eastern and southern edges of the Study Area as shown below.



Plate 5: View of NBNC Co Local aerial cable along Thirlmere Way crossing the road to property north side of Thirlmere Way on the southern edge of the Study Area



Plate 6: View of NBNC Co Local aerial cable west at western end of Connellan Crescent near the intersection with Rumker St.

The prediction of tilt in the area of Thirlmere Way is $<0.5\text{mm/m}$ and for Connellan Crescent 1.0mm/m . These are not high tilt predictions as both areas shown above are just within the south and east edges of the Study Area. Therefore, the risk factor is assessed as unlikely, minor consequence an overall **Low risk**.

4.3.2 NBNC Co Optical Fibre Cables

4.3.2 i) NBNC Co Cable in Conduit crossing to the south of LW W3 and LW W4 (Co-located with Telstra Direct Buried IEN optical fibre cable)

The Telstra cable F PCTN 103 12f SMOF cable is a small diameter standard construction direct buried cable crossing to the south of LW W3 and W4 alongside the NBNC Co cable. The NBNC Co cable, 2 OAK 00 00 TSS 010, is a 144f SMOF cable is more recent design and of more robust construction than the Telstra cable directly buried alongside. Therefore, since the two cables are installed within 3-5m of each other it is considered that the Telstra cable being the more vulnerable of the two cables present south of LW W3-W4, it can be monitored to provide early advice of any potential impacts to the NBNC Co cable. The risk factor for the NBNC Co cable installed in conduit is assessed as an unlikely event with major consequence, and an overall **Significant** risk.



Plate 7: View west from Thirlmere Way & Rumker St where Telstra & NBNC Co cables enter rural land south of LW W3 and LW W4

4.3.2 ii) NBNC Co Crossing the Northern Perimeter of the Study Area along Barkers Lodge Road (Co-located with Telstra direct buried cable)

As noted in Section 1.3 above, accepting that these optical fibre cables are on the northern perimeter of the Study Area and no predictions are made in Reference 1 for ground movements, due to the importance of the Telstra and NBNC Co Inter-Exchange cables passing through this area this management plan will consider monitoring of these cables. The consideration being that should any anomalous far-field impacts occur around these cables, there is the potential to isolate the entire Lakesland telecommunications district from regional interconnection of all services.

It is acknowledged that the risk has is an unlikely event with major consequence, an overall **Significant** risk.

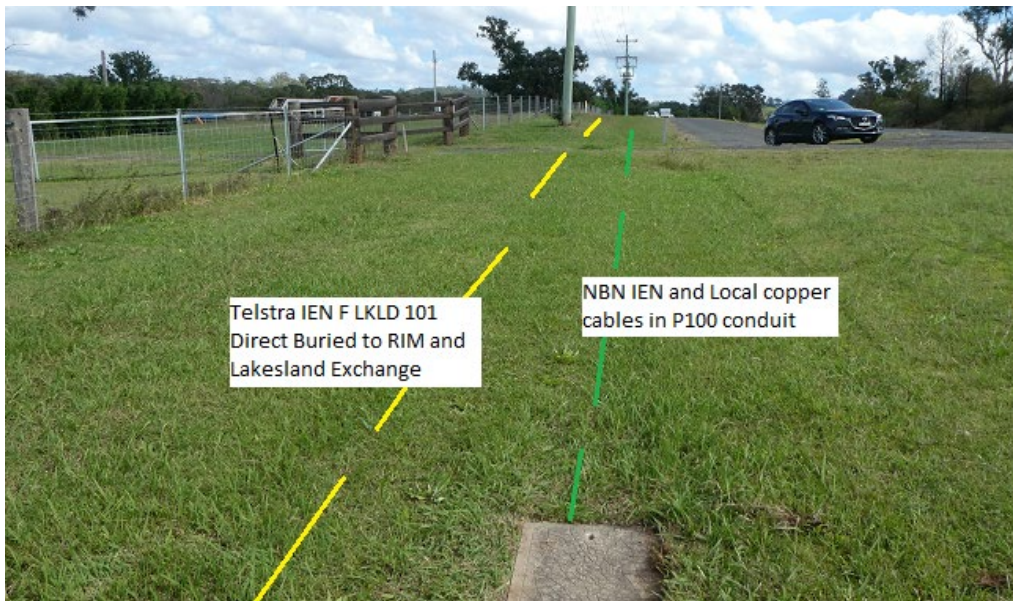


Plate 9: View of No 6 Pit in Barkers Lodge Road looking west towards Telstra's RIM showing alignment of direct buried Telstra optical fibre cable F LKLD 101 18f installed parallel with NBNCo IEN optical fibre and Telstra local copper cables both installed in conduit.

4.3.3 Manhole, Conduit, Pit and Pole Network

The conduit, manhole, pit and pole 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 performance of the entire cable network. The conduit, manhole, pit and poles 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.

Within the Study Area these components of the network are located on the very outer east, south and western edges of the Study Area and consequently are subject to predicted low 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 east along Thirlmere Way. The large pits along Stonequarry Creek Road are all HDPE (polyethylene) construction making them far less vulnerable to ground movement impacts than the heavier asbestos or concrete pits located outside the Study Area. 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 for the manhole, conduit pit and pole 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 NBNCo 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 W3-W4:

- Temporary loss of telecommunication IEN or CAN services;
- Tensile or compressive ground strain acting on direct buried cables; and
- Disruption of telecommunication services into or out of Nodes.

The identification and risk assessment process took into account the location of infrastructure relative to LW W3-W4 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 NBNC Co infrastructure. In this case, creeks have been mapped that intersect the NBNC Co and Telstra infrastructure where higher ground strains may occur.

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 NBNC Co 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 W3-W4 which included the identification of potential risks to NBNC Co infrastructure (refer to Appendix B).

5. 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:

- Eliminate risks to health and safety so far as is reasonably practicable;
- 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:
 - Substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk;
 - Isolating the hazard from any person exposed to it;
 - Implementing engineering controls;
- If a risk then remains, minimise the remaining risk, so far as is reasonably practicable, by implementing administrative controls; and
- 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.
- 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 NBNCo infrastructure due to the extraction of LW W3-W4.

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 NBNCo 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 NBNCo infrastructure.

Tahmoor Coal and NBNCo 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 NBNCo 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 W1-W4, 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 line services could possibly 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 NBNCo.

Tahmoor Coal and NBNCo 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 focussed 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 NBNCo 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 NBNCo 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 NBNCo 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 NBNCo networks, comprising both robust and also relatively sensitive elements of the network. This information is provided in this NBN MP for the benefit of NBNCo through the experience gained by CNS in over 20 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 4.3.1 to 4.3.3 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 NBNC Co Local Copper Cables

5.3.1 NBNC Co Local Copper Customer Distribution Cable in Conduit

(Risk Factor, **Low**)

The NBNC Co local copper customer cables located in Stonequarry Creek Road and intersecting roads of Carramar Close, Attunga Close and Booyong Close are all in conduit and are exposed to limited subsidence impacts since the conduit isolates the cable from the ground movement and the primary subsidence has already occurred from LW W1 and W W2. The proposed monitoring of these cables is by OTDR monitoring of the Telstra CAN optical fibre cable located in the same conduit as the Local copper cable and by regular checking of the Stonequarry Creek Road survey data to ensure there is no anomalous ground movement occurring along the conduit route.

5.3.2 NBNC Co Local Copper Customer Distribution Cable Direct Buried

(Risk Factor, **Moderate**)

The Local 30/0.64 NBNC Co copper cable at the south ends of LW3 and LW4 was not able to be inspected at the time of preparation of this NBN MP. It is advised by Tahmoor Coal that the two rural properties which part of the cable feeds to, are currently unoccupied and that this area is identified for future development. This cable needs to be surveyed to identify the type of cable and the location of the cable relative to LW W3 and LW W4. The cable is plotted reasonably accurately from the old Telstra plans and it appears that the cable just crosses the south-west corner of LW W4 and is just inside the finishing end of LW W3, see Plate 2.

The subsidence predictions for the LW W1-W2 Cross Line due to LW W3-W4 near the centre of the longwalls LW W3 and W4 are as shown below. However, the 30/0.64 cable crossing, located at the southern end of the two longwalls, is likely to sustain significantly lower subsidence and ground strain to the predicted levels as shown below.

- Subsidence of around 550mm
- Ground Strain + 0.75mm/m and – 0.5mm/m

Accordingly provided there is no significant anomalous ground movements that may occur along the cable line the cable will be able to sustain the ground movements predicted.

However, specific monitoring actions are required to monitor impacts on this cable, prior to potential impacts occurring in January 2022. This should involve survey of the cable line and establish the exact location of the cable relative to LW W3 and LW W4, identification of condition of pits and joints present and discussions with the property owners to determine if services are 'in-use'. With current accurate information available re-check predicted subsidence impacts on the cable.

5.3.3 NBNC Co Local Copper Aerial Distribution Cables

(Risk Factor, **Low**)

As described above these cables are on the edges of the Study area and the predicted levels of tilt at the poles is relatively low being around 1mm/m. Accordingly the only monitoring required is physical inspection of these cable during potential impact periods for subsidence from LW W3 and W4. The inspection should be completed along Thirlmere Way during the final one month of extraction of LW W3 and W4 and concurrently for Connellan Crescent during the final one month of extraction of LW W4.

5.4 NBNC Co Optical Fibre Cables

5.4.1 NBNC Co (2 OAK 00 00 TSS 010) optical fibre cables crossing south of the southern end of LW W3 & LW W4 (Telstra F PCTN 103 direct buried IEN co-located)

(Risk Factor, **Significant**).

The cable NBNC Co 144f SMOF cable, 2 OAK 00 00 TSS 010 is believed to be installed in conduit alongside the direct buried Telstra 12f SMOF cable F PCTN 103 both located approximately 80m to 140 m to the south of both longwalls. The two cables for the majority of this section of the route are installed within three to five metres of each other. The NBNC Co cable at 144f and as a more recent design is a much more robust hard jacketed cable at more than twice the diameter of the standard construction Telstra cable. The route of both cables across the longwalls is to the north by an average of around 150 m from Thirlmere Way through undulating rural land as shown in Plates 1, 2, 4.3.2 & 5.2.2

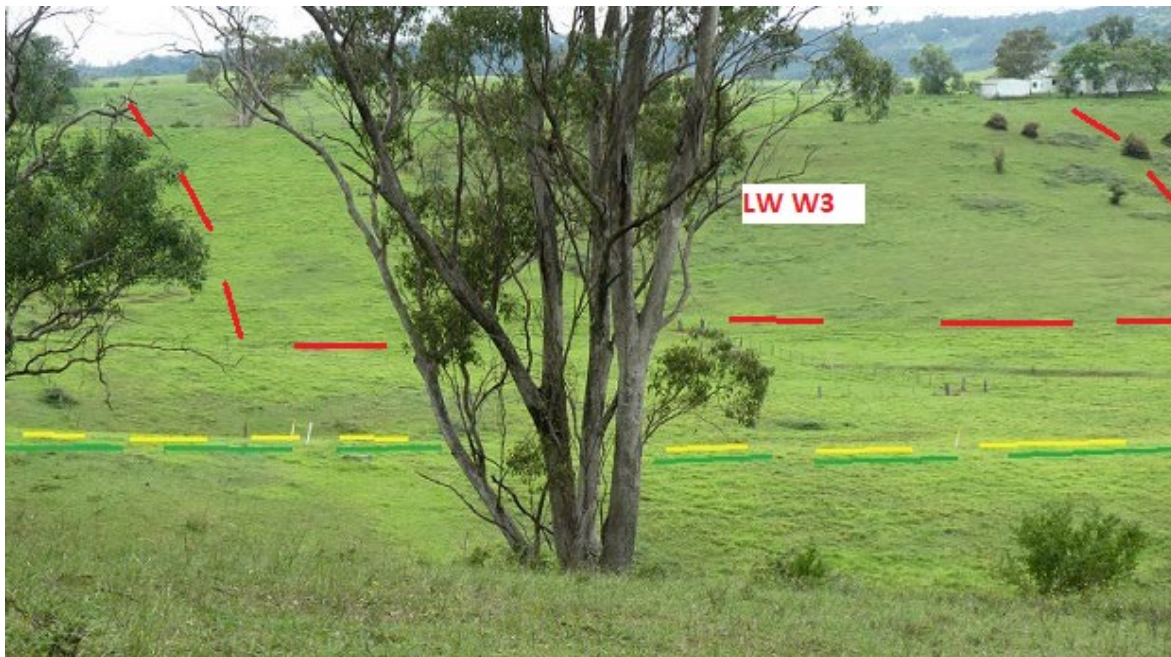


Plate 10:- View of NBNC Co & Telstra IEN cable to the south of LW W3. Cable is running east west to the north of Thirlmere Way around 80m to 140m south of the finishing ends of LW W3 and LW W4 respectively.

In this case there is little value in physical inspection of the cable lines during mining since it is heavily grassed rural grazing land. Therefore, it is proposed by both NBNC Co and Telstra to remotely monitor by OTDR their cables using their own Network Operations Centres for their cables across LW W3 W4.

Due to the importance of these two IEN cables an additional monitoring regime will be maintained on these cables consisting of:

- Analysis of survey data by Tahmoor Coal surveyors for Thirlmere Way; and
- Close in 1625nm OTDR testing on spare fibres in the Telstra cable F PCTN 103 from Tahmoor 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 NBNC Co so that a close in test can be arranged on their cable.

This OTDR fibre testing on the Telstra cable across the longwalls will be carried out by CNS from Picton or Tahmoor exchange 'looking' through the mining area. This specialized individual fibre testing can confirm that there are no or very low levels of transmission loss present 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.

With interruption cable installed and secured discussions with Tahmoor Coal and Subsidence Advisory NSW will be initiated through the NBN RG for the permanent reinstatement of the cable - Like for Like replacement.

Survey data for the centre line and the cross line of LW W3 and W4 should also be provided to NBNC Co and Telstra at regular intervals to determine the degree of subsidence and the indication of any anomalous ground movement present.

5.4.2 NBNC Co Cable (2 OAK 00 00 TSS 0007) in Conduit Crossing the Northern Perimeter of the Study Area (Barkers Lodge Road) – (Telstra direct buried IEN cable also present)

(Risk Factor -**Significant**)

As noted in Section 1.3 & 4.3.2 above, accepting that these optical fibre cables are on the northern perimeter of the Study Area and no predictions are made in Reference 1 for ground movements, due to the importance of the NBNC Co and Telstra Inter-Exchange cables passing through this area this management plan will consider monitoring of these cables.

As in Part i) above the two cables are installed along the same route. The NBNC Co 144f SMOF cable, 2 OAK 00 00 TSS 007 is installed in Telstra conduit and pits and is alongside the direct buried standard construction Telstra cable F LKLD 18f. Both cables are installed along the southern side of Barkers Lodge Road, just on the northern perimeter of the Study Area. As already noted above there is no ground subsidence predictions made in Reference No1 that apply to this area so it is predominantly the critical nature of these cables and the remote possibility of far-field impact from mining occurring. Since 2 OAK 00 00 TSS 0007 is in conduit and ground movement is below predictable levels there is in fact some greater risk to the Telstra direct buried cable.

Also as described in Part i) above the NBNC Co cable will be Remotely OTDR monitored by NBNC Co Network Operations Centre while the Telstra cable will be close-in monitored along Barkers Lodge Road for the initial 350m of mine extraction on LW W3 and W4 from Picton exchange by CNS. As above the Telstra fibre monitoring will be at 1625nm along Barkers Lodge Rd north of LW W3 W4 utilising the same trigger levels as above 0.1dB to 1.0dB, as above, with any minor loss detected at 0.1dB trigger level to be immediately advised to NBNC Co so that a close in test can be arranged on their cable.

5.5 Manhole, Conduit, Pit and Pole Network

(Risk Factor **Low**).

The cable distribution network is obviously subject to a degree of risk of damage in the areas of maximum subsidence, however in this case for LW W3-W4, there is a relatively small amount of the network exposed to significant subsidence impacts mainly in the eastern and southern sectors where the network is near the perimeter of the Study Area. The network present generally consists of aerial cable and more recent plastic jointing pits and relatively newer uPVC conduit installation.

During active times of subsidence from LW W3-W4 it is proposed, in association with cable testing outlined above, to carry out regular physical inspections of the network. The inspection regime will be supplemented by an examination of the survey data provided by Tahmoor Coal, so that inspections can be targeted to areas of any abnormal ground movement identified in the survey data.

5.6 Surface Subsidence Survey

The control procedure for the NBNC Co & Telstra plant identified above will be supplemented by ground surveys carried out by Tahmoor Coal at agreed time intervals along agreed base lines of Stonequarry Creek Road, Thirlmere Way and cross and longitudinal lines for LW W3 and LW W4 recording:

Initial RL of the surface prior to mining commencing:

- 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 NBNC Co, 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 have been grouped as discussed in the four groupings identified above. i.e., Local Copper Cables, Main Optical Fibre Cables, Local (CAN) Optical Fibre Cables and Manholes, Conduit, Pits and Poles.

Table 3 Monitoring for NBNC Co Telecommunications Infrastructure

Location of Network	Risk Factor	Method Levels	Monitoring Details	Frequency	Trigger	Actions and Responsibilities
1) i) NBNC Co Local copper cables installed in Conduit	Low	Physically Monitor. & Survey	CNS to complete Physical inspections along cable lines during LW W3 extraction. Tahmoor Coal to provide regular survey data for current survey lines.	Weekly during active subsidence Dependant also on anomalous survey data recorded along survey lines.	Ground Strain > + or -1mm/m, Observed ground tension or compression over cable line	Tahmoor Coal or CNS to report ground strains approaching + or – 1mm/m to NBN RG for decision on action to be taken as considered necessary by NBNC Co representatives to check condition of local cable
1) ii) NBNC Co Local copper cable Direct buried cable	Moderate	Type and cable location unable to be verified at time of preparation of NBN MP.	CNS to locate cable with Tahmoor Coal surveyors to establish cable type and exact location of direct buried cable relative to the southern edges of LW W3 & W4 Survey detail of cross & longitudinal lines for LW W3 & W4	Establish cable details prior to impacts from LW W3 in Jan 2022. Survey weekly during active subsidence	Customer advice of loss or degradation of service advised to Tahmoor Coal Ground Strain > 1mm/m	Dependant on cable identified from field inspection. Tahmoor Coal to immediately report any change identified by customer in their Local service to NBNC Co for investigation
1) iii) NBNC Co Local copper cable Aerial cable	Low	Physical Inspection & Survey	Inspect for any change pole tilt or change of cable catenary in aerial cables Tahmoor Coal to provide regular survey data for Thirlmere Way & Connellan.	Weekly during final one month of extraction of LW3 & LW4 Survey weekly during active subsidence	Significant ground movement observed Tilt levels exceeding 2mm/m	Tahmoor Coal or CNS to report ground tilt recorded of 2mm/m to NBN RG for decision on action to be taken as considered necessary by NBNC Co representatives to check condition of local cable

Location of Network	Risk Factor	Method Levels	Monitoring Details	Frequency	Trigger	Actions and Responsibilities
2) NBNCof Cables i) 2 OAK 00 00 TSS 010 ii) 2 OAK 00 00 TSS 007	Significant Significant	Base line OTDR Testing.	Remote OTDR Testing by NBNCof Network Operations on both cables over LW W3 & W4	Continuous OTDR testing with alarms	Minor transmission loss <0.1db sustained in the area of LW W3 & W4 mining	NBNCof Service Delivery to investigate and advise Tahmoor Coal of proposed action. Additional localised OTDR testing of Telstra cables alongside both cables. Any loss detected by CNS immediately referred to NBNCof for consideration
3) Conduit, Manhole Pit & Pole Network	Low	Monitor conduit & cable movement in pits and manholes concurrent with cable testing as outlined in Part 3) above.	Monitor conduit & cable movement in Stonequarry Creek Rd, Carramar, Attunga & Booyong Close during LW W3 and Thirlmere Way & Connellan Cresc finishing ends of LW W3 & W4	Prior to mining then as determined by LW W3 & W4 progress	Visual check of active section being monitored. If significant surface movement impacting on network check distribution cables in conduit network.	Should surface damage occur or survey data indicate anomalous movement CNS to check conduit pit and manhole network in this area. CNS to advise NBNCof of any observation or damage evident and maintenance or repair work considered necessary on conduit, pits or manholes.
4) Survey Lines	Not Applicable	Establish permanent marks at approx. 20 metre intervals along roads, cable lines where network is installed. Additional cross & longitudinal lines for LW W3 & W4	Tahmoor Coal to carry out detail survey, (subsidence, strain and tilt recorded) along Stonequarry Creek Road Thirlmere Way Connellan Cresc for LW W3 & W4. Also cross & longitudinal lines for LW W3 & W4. Provide survey results to NBNCof representatives.	To be determined by NBN RG dependant on degree of subsidence occurring and potential hazard to NBNCof plant	Ground Strain > + or -1mm/m, to be reported immediately to NBN RG	Tahmoor Coal to make survey results available to NBNCof and CNS following each regular survey of active mining area for LW W3 and W4.

6 Implementation

6.1 NBN Response Group – 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 around and over LW W3-W4 to determine incremental and total subsidence, strain and tilt during mine subsidence from the longwalls. The additional survey required is to follow on from LW W2 survey and the frequency of the survey work is to be reviewed as required by the NBN Response Group (NBN RG).

Prior to commencing any proposed rectification work the NBNC Co 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, NBNC Co and Subsidence Advisory NSW as to the responsibility for the costs of the proposed work. For emergency work involving work to immediately secure NBNC Co's network, where loss of service to customers or line systems outage is involved, the work will be carried out by NBNC Co 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 NBNC Co infrastructure to ensure the continued effective consultation, co-operation and co-ordination of action with respect to subsidence between Tahmoor Coal and NBNC Co and Subsidence Advisory NSW.

The monitoring of the NBNC Co's network in accordance with this management plan is to be carried out by Tahmoor Coal, NBNC Co or their representatives and 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 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 NBNC Co or Telstra network. Any anomalous ground movement resulting from subsidence over LW W3-W4 and any risk perceived by Tahmoor Coal to the network, due to mining is to be used as a trigger for an initial 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 Fitzgerald** – 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 NBNC Co stakeholders are:

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

When required 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 reviews is to:

- Assess monitoring data, including the early detection of potential impacts on health and safety and impacts to NBNC Co infrastructure;

- Verify the risk assessments previously conducted;
- Ensuring the effectiveness and reliability of risk control measures; and
- Supporting continual improvement and change management.

At the NBN RG meetings, NBNC Co are to report incidents recorded in relation to the performance of their network plant and a detailed log is to be maintained of each 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 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 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 NBNC Co during the operation of this management plan:

Tahmoor Coal will provide to NBNC Co 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 NBNC Co, i.e. inspection of Telstra conduit and pit network carrying NBNC Co cables
- CNS- OTDR reports of any transmission loss identified on adjacent Telstra cables
- Monitoring reports of what has been monitored (as above)
- Direct notification to NBNC Co if any potential adverse changes on surrounding infrastructure is observed such as roads, drainage structures, buildings or on other underground or above ground services

NBNC Co 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 NBNC Co plant in regard to mine subsidence, such as interruption or loss of services;
- Any trigger levels being reached or exceeded;
- Favourable performance of the NBNC Co 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 NBNC Co Management Plan be required during that period then a representative is to be appointed by NBNC Co, 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, 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 NBNC Co 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 2022.

7 Associated Documents and References

7.1 Appendices

Appendix A (Drawings Extracted from Reference No1)

Tahmoor Coal,
Western Domain, Extraction Plan LWW1-W2, Monitoring,
MSEC Drawing MSEC 1112-30

Sheet 1 of 1

Appendix B

Tahmoor Coal Pty Ltd, Risk Assessment Report,
Tahmoor North – Western Domain
Longwalls West 3 & West 4, October 2020

Pages 1 to 50

7.2 References

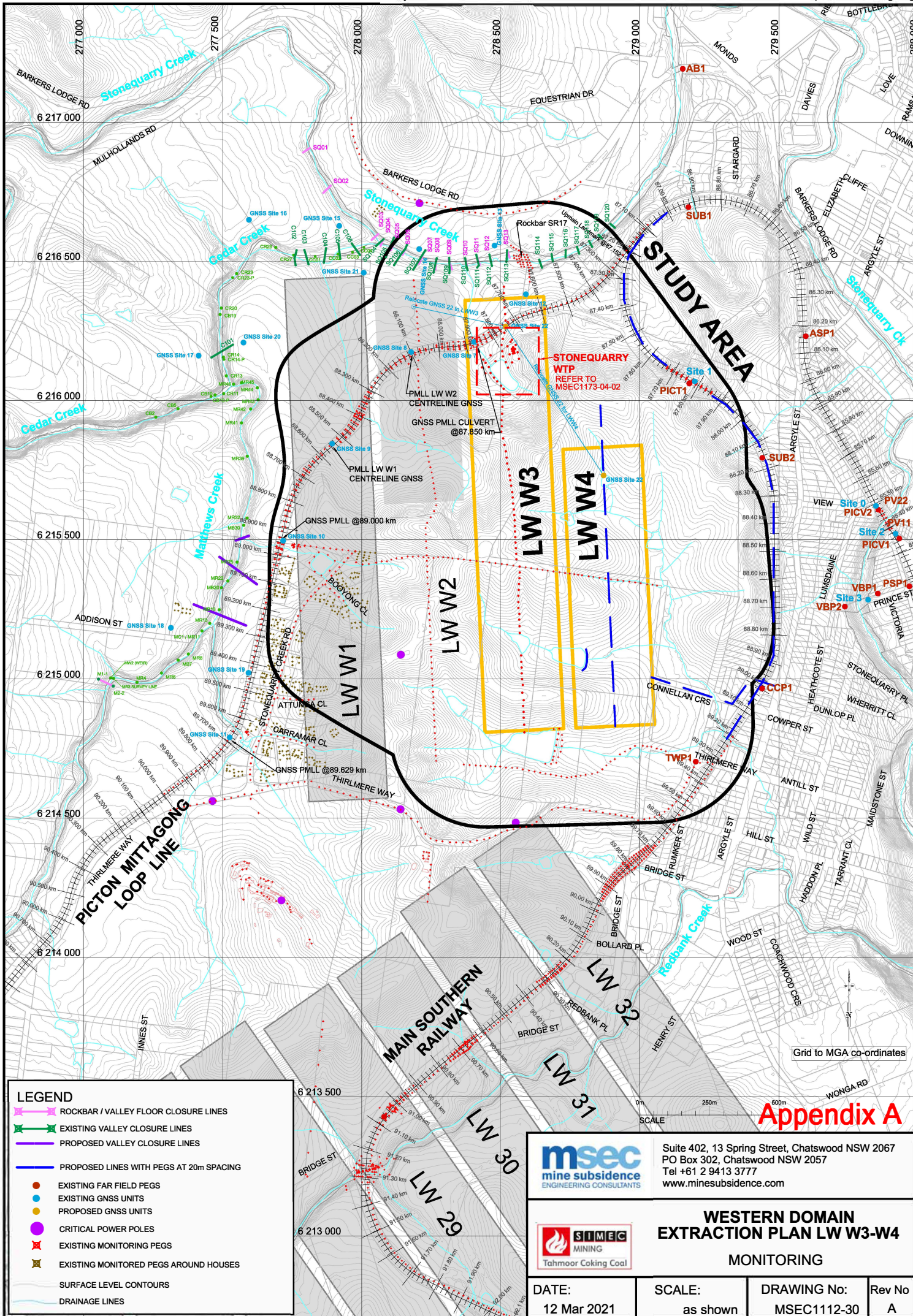
Reference No 1

The Report MSEC 1112, Revision A, March 2021, titled “Subsidence Predictions and Impact Assessments for Tahmoor LW W3-W4”

8 Contact List

Contacts of participants involved in the NBN Response Group:

Organisation	Contact Name	Title	Postal Address	Telephone / Mobile	Email
Mine Subsidence Engineering Consultants Pty Ltd	Daryl Kay	Director	PO Box 302 Chatswood, NSW, 2057	9413 3777	daryl@minesubsidence.com
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Tahmoor Coal	Amanda Fitzgerald	Environment and Community Coordinator	PO Box 100 Tahmoor NSW	4640 0025, 0414 848 213	Amanda.Fitzgerald@simecgfg.com
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NBNCo	Colin Chapman	Services Delivery Manager			ColinChapman@nbnco.com.au
Comms Network Solutions Pty Ltd	Colin Dove	Telecomms Consultant	20 Bowden Cresc Connells Point, 2221	0428 970 826	cdove@commsnet.net.au
Subsidence Advisory NSW	Matthew Montgomery	Infrastructure Manager, Southern Coalfields	PO Box 40 Picton NSW, 2571	4677 1967, 0425 275 567	matthew.montgomery@finance.nsw.gov.au



- LEGEND**
- ROCKBAR / VALLEY FLOOR CLOSURE LINES
 - EXISTING VALLEY CLOSURE LINES
 - PROPOSED VALLEY CLOSURE LINES
 - PROPOSED LINES WITH PEGS AT 20m SPACING
 - EXISTING FAR FIELD PEGS
 - EXISTING GNS UNITS
 - PROPOSED GNS UNITS
 - CRITICAL POWER POLES
 - EXISTING MONITORING PEGS
 - EXISTING MONITORED PEGS AROUND HOUSES
 - SURFACE LEVEL CONTOURS
 - DRAINAGE LINES

Grid to MGA co-ordinates

Appendix A



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WESTERN DOMAIN EXTRACTION PLAN LW W3-W4 MONITORING

DATE: 12 Mar 2021	SCALE: as shown	DRAWING No: MSEC1112-30	Rev No A
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