Briefing Note

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Date: 21 February 2017
Subject: Comparison of Flood Impacts

Purpose

Umwelt (Australia) Pty Limited (Umwelt) routinely prepares flood studies for Centennial Mandalong Pty Ltd (Centennial) as a part of the subsidence management planning process. A Flood Assessment Study prepared for Longwalls (LW) 22 to 23 was adapted for submission to the NSW Department of Planning and Environment (DPE) as part of the Modification 4 to State Significant Development SSD-5144. The modification is for the extension of existing Longwall panels 22 and 23 within the current SSD-5144 consent boundary.

Longwall panels 22 to 24 were originally shortened as a conservative measure due to uncertainty associated with the extent of an igneous sill within the mining area. Geological exploration has resulted in the proposed extension of Longwall panels 22 and 23. The extension to approved Longwall panels 22 and 23 will optimise the mining of the coal resource within the existing development consent boundary associated with SSD-5144 which would have otherwise sterilised approximately 1.42 Mt of saleable coal.

A query has been raised by DPE regarding incremental changes in flooding impacts as a result of the proposed modification. This includes changes in flood hazard, freeboard, depth and grade of the four drainage channels listed in Table 4.5 of the Flood Assessment, and impacts on properties 73 and 207.

This briefing note will form an addendum to a response to submissions for the proposed modification prepared by Centennial for extension of Longwalls 22 to 23 for submission to DPE.

1.0 Introduction

Umwelt has previously completed flood assessments within the Mandalong Valley on behalf of Centennial (Umwelt 2007, 2008, 2009, 2012, 2013, and 2016) for the purpose of identifying and quantifying possible changes to the nature of flooding as a result of mining activities. In these assessments, a two-dimensional hydrodynamic flood model (RMA-2) was applied due to its capacity to represent the land surface in great detail and be readily modified to reflect land surface changes due to subsidence. A flood assessment was completed for a proposed modification for extension of Longwalls 22 and 23 (Umwelt, 2016). The flood model was used to assess the flood impacts associated with Longwalls 22 to 23, including the cumulative impacts associated with previous mining stages. Where possible, post mining land forms are used in the modelling process. As a result, the incremental changes

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reported in the flood assessment of Longwalls 22 and 23 represent anticipated changes from the current landform, due to mining in Longwalls 22 and 23.

It is noted that the Flood Assessment Study for Longwalls 22 to 23 submitted as a part of the Modification 4 application did not included information on Longwall 24 as currently approved. Prior to completing the Flood Assessment Study for Longwalls 22 to 23 Umwelt prepared a similar flood assessment for the proposed extension of Longwall 24 and the addition of Longwall 24a (Umwelt, 2016) using the same methodology as outlined in the flood assessment of Longwalls 22 and 23.

In the absence of available subsidence data for the original approved mine plan incorporating Longwalls 22 to 24, a comparative analysis of the flood modelling results for the following two scenarios was undertaken to determine the potential impacts the proposed modification (extension of Longwall 22 and 23) may have when incorporating the mining of Longwall 24:

- Scenario 1 - the flood model completed as a part of the subsidence management process for the proposed mine plan of Longwalls 22 to 24a, as shown in **Figure 1.1**; and

- Scenario 2 - the model completed for the proposed extension to LW22 and LW23 as shown in **Figure 1.2**.

2.0 Comparison of Results

2.1 Dwelling Floor Levels

The modelled impact of a 100 year ARI storm event on the freeboard levels for the dwellings affected by the two mining scenarios are listed in **Table 1**.

Table 1 Predicted Freeboard, 100 year ARI storm event

Property No.	Structure	Pre-Mining Freeboard (m)	Predicted Freeboard (m)		Change between Scenario 1 and 2
			Scenario 1 LW22-24a	Scenario 2 LW22-23	
73	Residence	0.87	0.87	0.87	No change
207	Residence	4.35	4.35	4.35	No change

The results in **Table 1** indicate there is no difference in the predicted freeboard between the two mining scenarios at properties 73 and 207.

2.2 Flood Hazards

Flood hazards are classified by the *Floodplain Development Manual* (NSW Government, 2005) as follows:

- Level one flood hazard (L1) - vehicles are considered to be stable and wading safe.

- Level two flood hazard (L2) - vehicles are considered to be unstable but wading is considered to be safe.

- Level three flood hazard (L3) - vehicles and wading are considered to be unsafe.

- Level four flood hazard (L4) - damage to light structures is possible.

Comparisons between the two mining scenarios indicate that there are changes in the flood hazard categories for some of the dwellings and some dwelling access routes due to differences in the predicted peak flood depths and peak velocities in the subsided areas (refer to **Table 2** to **4**).

The results in **Table 2** to **4** indicate there is no difference in the predicted flood hazard between the two mining scenarios at properties 73 and 207.

2.3 Channel Stability

The longwalls studied in this comparative analysis are located in the upper reaches of the Mandalong Valley floodplain, and have the potential to impact on four separate drainage channels:

- Sawpit Creek
- Tobins Creek
- Morans Creek; and
- An unnamed tributary of Morans Creek.

The average and maximum predicted grade changes due to the subsidence for each of these channels are summarised in **Table 5**.

In all four creeks the differences in average and maximum predicted grade changes from Scenario 1 to Scenario 2 are predicted to all be less than 1%.

3.0 Conclusion

A comparative analysis was undertaken for the two modelling scenarios that incorporate changes to Longwalls 22, 23 and 24. The comparison included changes in flood hazard, freeboard, depth and grade of four drainage channels, and impacts on properties 73 and 207 for both the 1 year and 100 year ARI events compared to pre-mining. The analysis indicated there will be no changes in the flooding impact on properties 73 and 207, and minimal change in the flow conveyance capacity of the existing channels.

Table 2 Flood Hazard Categories – Structures (100 year ARI storm event)

Dwelling ID	Structure	Flood Hazard Category			Change in Flood Hazard Category Scenario 1 to Scenario 2
		Pre-Mining	Scenario 1 – LW22-24a	Scenario 2 – LW22-23	
73	Houses, buildings	No flooding	No flooding	No flooding	No change
207	Houses, buildings	No flooding	No flooding	No flooding	No change

Table 3 Flood Hazard Categories – Access Routes (100 year ARI storm event)

Property No.	Structure	Flood Hazard Category			Change in Flood Hazard Category Scenario 1 to Scenario 2
		Pre-Mining	Scenario 1 – LW22-24a	Scenario 2 – LW22-23	
73	Houses, buildings	No flooding	No flooding	No flooding	No change
207	Houses, buildings	No flooding	No flooding	No flooding	No change

Table 4 Flood Hazard Categories – Access Routes (1 year ARI storm event)

Property No.	Structure	Flood Hazard Category			Change in Flood Hazard Category Scenario 1 to Scenario 2
		Pre-Mining	Scenario 1 – LW22-24a	Scenario 2 – LW22-23	
73	Houses, buildings	No flooding	No flooding	No flooding	No change
207	Houses, buildings	No flooding	No flooding	No flooding	No change

Table 5 Predicted Grade Changes for Undermined Drainage Channels

Drainage Channel	Channel Length (m)	Average Predicted Grade Change (%) (pre-mining and subsidence)			Max. Predicted Grade Change (%) (pre-mining and subsidence) and Location		
		Scenario 1	Scenario 2	Difference	Scenario 1	Scenario 2	Difference
Channel 1, Sawpit Ck	749	0.01% (0.26% to 0.27%)	-0.02% (0.26% to 0.24%)	-0.03%	4.07% (2.28% to 6.35%) (Longwall 18)	4.06% (2.28% to 6.33%) (Longwall 18)	-0.01%
Channel 2, Tobins Ck	2,094	-0.05% (0.38% to 0.33%)	-0.02% (0.38% to 0.36%)	+0.03%	3.02% (0.04% to 3.06%) (Longwall 21)	3.14% (0.04% to 3.18%) (Longwall 21)	+0.12%
Channel 3, Morans Ck	1,527	0.06% (0.23% to 0.29%)	0.05% (0.23% to 0.28%)	-0.01%	2.07% (2.65% to 4.72%) (Longwall 18)	1.41% (0.92% to 2.33%) (Longwall 19)	-0.66%
Channel 4, unnamed tributary of Morans Ck	1,570	-0.01% (0.35% to 0.34%)	0.03% (0.35% to 0.38%)	+0.04%	1.34% (1.92% to 3.25%) (Longwall 21)	1.57% (0.10% to 1.60%) (Longwall 21)	+0.23%

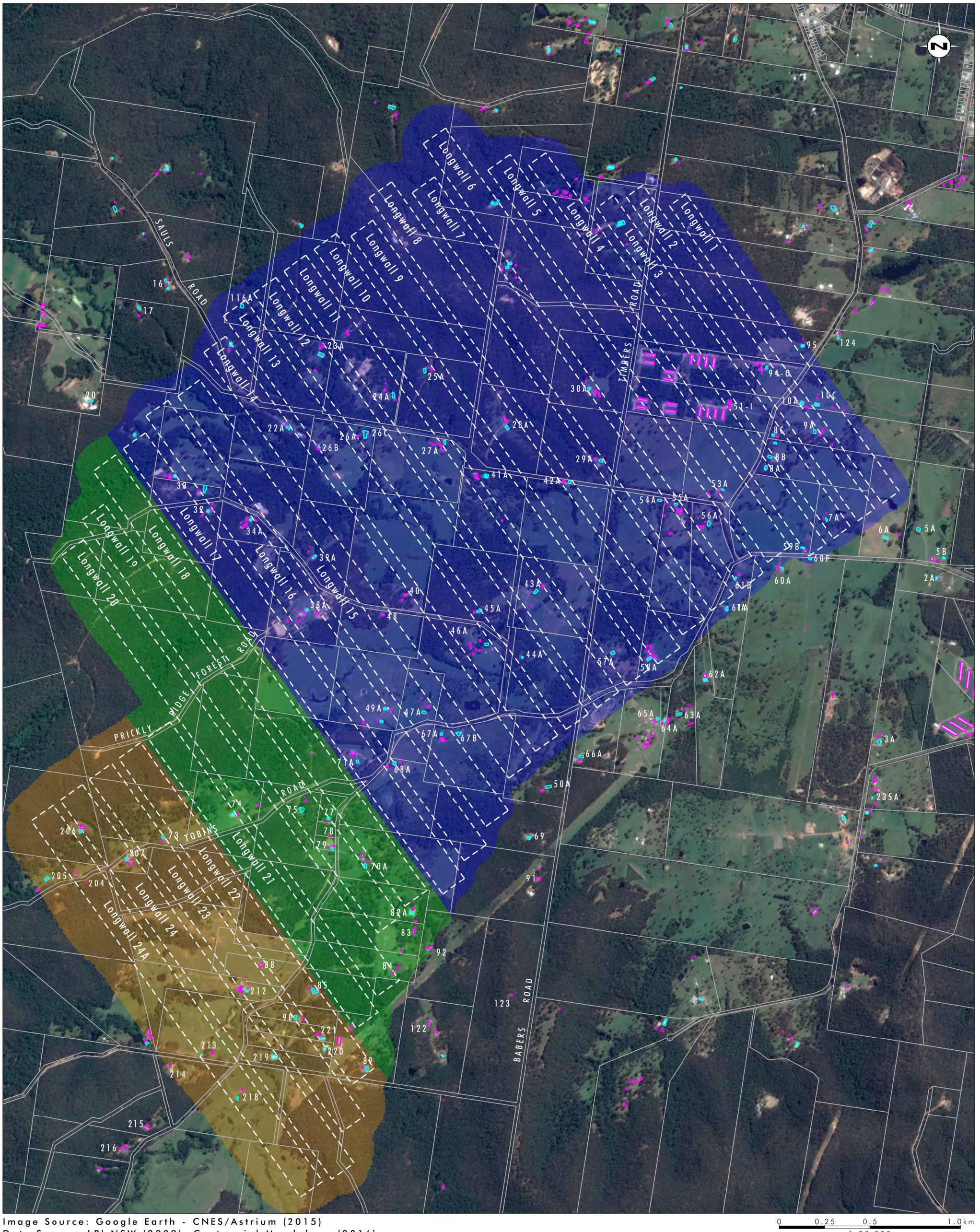

Image Source: Google Earth - CNES/Astrium (2015)
Data Source: LPI NSW (2009), Centennial Mandalong (2016)

0 0.25 0.5 1.0km
1:20 000

Legend

- Longwall Locations
- Dwelling
- Other Structure
- Cadastral Boundary
- Observed Subsidence Longwalls 1 to 17
- Predicted Subsidence Longwalls 18 to 21
- Predicted and Sensitivity Subsidence Longwalls 22 to 24a

FIGURE 1.1

Subsidence Data - Longwalls 1-24a

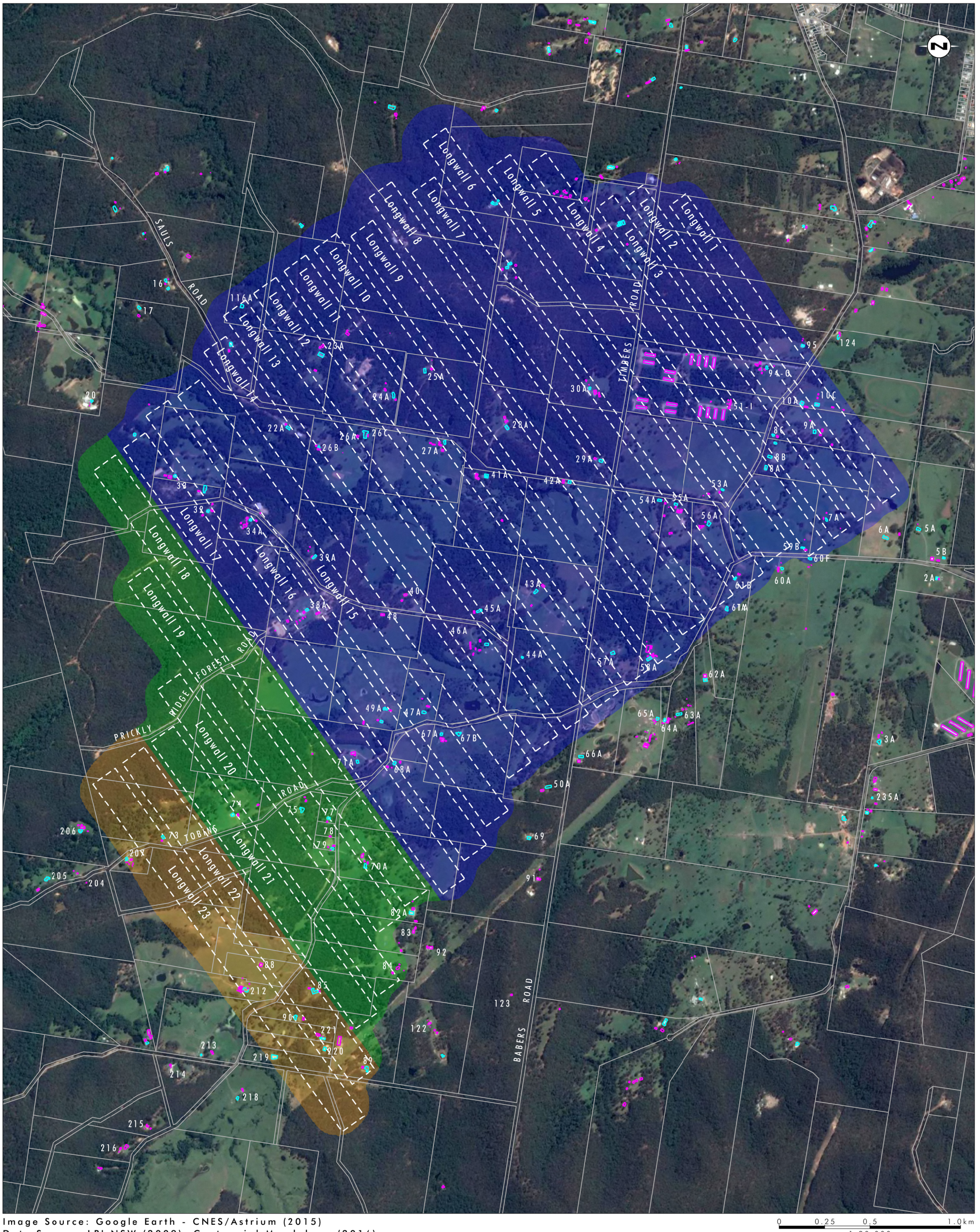

FIGURE 1.2

Subsidence Data - Longwalls 1-23

File Name (A3): R04/3685_527.dgn
20170221 10.17