4. SITE CONDITIONS

(SMP GUIDELINES section 6.4)

4.1. GEOMORPHOLOGY AND SOILS

4.1.1. Geomorphology

The study area is situated south of Sydney and is within the southern part of the Sydney Basin. The surface geology of the SMP Area is dominated by Wianamatta Shale and Hawkesbury Sandstone, with small isolated areas of quaternary soils.

The surface of the land within the SMP Area varies from gently undulating to hilly refer **Figure 4.1**.

4.1.2. Soil Landscapes

Near-surface geology of the SMP Area is dominated by weathered Wianamatta Shale outcrop, with Hawkesbury Sandstone occurring as outcropping in gullies and river valleys. The soil landscapes of the area have been mapped by Hazelton and Tille (1990) at a scale of 1:100,000. They identified three main soil types in the area:

- *Blacktown*; described as a residual soil landscape occurring on gently undulating landscape on Wianamatta Group Shale
- *Hawkesbury*; described as a colluvial soil landscape occurring on rugged, rolling to very steep hills on Hawkesbury Sandstone
- *Luddenham*; described as an erosional soil landscape occurring on undulating to rolling hills on Wianamatta Shale, often associated with Minchinbury Sandstone.

Refer **Appendix A** for a figure of surface geology.

4.2. COVER DEPTHS

The depth of cover to the Bulli Seam within the general SMP Area varies between a minimum of 440 metres, in the base of the Nepean River valley, and a maximum of 620 metres, near the western end of Longwall 708. The depth of cover directly above the proposed longwalls varies between 470 metres, at the eastern end of Longwall 707, to 620 metres, near the western end of Longwall 708.

For figures relating to depth of cover refer **Appendix A**.

4.3. OVERBURDEN STRATIGRAPHY

Appin Colliery lies in the southern part of the Permo-Triassic Sydney Basin, within which the main coal bearing sequence is the Illawarra Coal Measures, of Late Permian age. The Illawarra Coal Measures contain a number of workable seams throughout the area, the uppermost of which is the Bulli Seam (refer **Figure 4.2**).

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ILLAWARRA COAL

APPIN COLLIERY

SURFACE LEVEL CONTOURS

DATE:	SCALE:	Figure 4.1	Rev No
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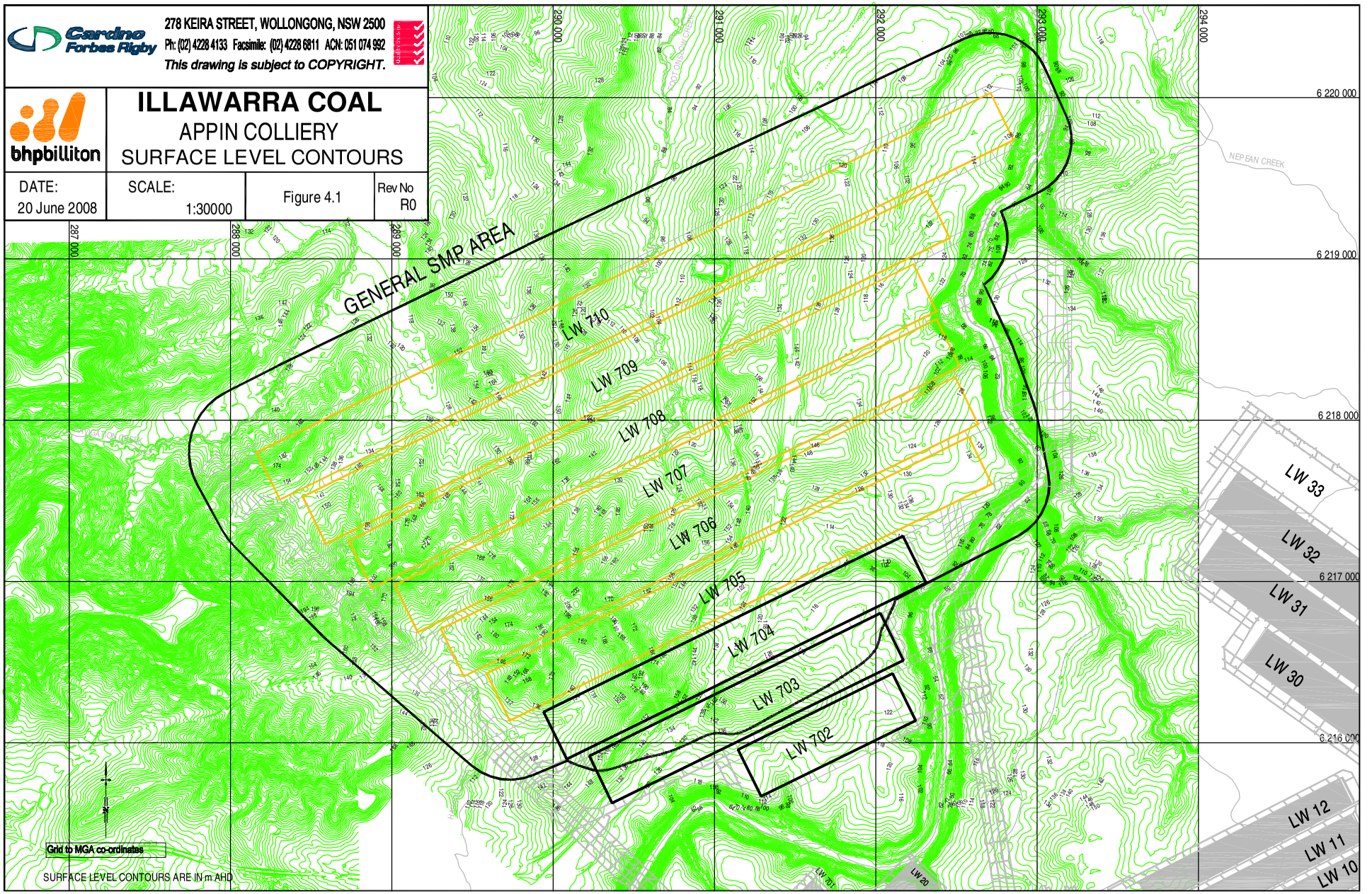

The Illawarra Coal Measures are overlain by sandstone, shales and mudstones of the Narrabeen Group, which are in turn, overlain by Hawkesbury Sandstone. In much of the SMP Area, the Hawkesbury Sandstone is overlain by the Wianamatta Shale. The coal measures contain numerous seams, the uppermost of which is the Bulli Seam.

All of the sediments that form the overburden to the Bulli Seam belong to the Hawkesbury Tectonic Stage, which comprises three stratigraphic divisions. The lowest division is the Narrabeen Group, which is subdivided into a series of interbedded sandstone and claystone units. It ranges in age from Lower to Middle Triassic and varies in thickness up to 310 m. Overlying the Narrabeen Group is the Hawkesbury Sandstone Group, which is a series of bedded sandstone units which dates from the Middle Triassic and has a thickness of up to 185 m. Above the Hawkesbury is the Wianamatta Group, which consists of shales and siltstones and is poorly represented in this region, having a thickness of only a few tens of metres. A typical stratigraphic section for the Appin Colliery area is shown in **Plan 6**.

The major sandstone units are interbedded with other rocks and, though shales and claystones are quite extensive in places, the sandstone predominates. The major sandstone units are the Scarborough, the Bulgo and the Hawkesbury Sandstones and these units vary in thickness from a few metres to as much as 200 m. The rocks exposed in the river alignments belong to the Hawkesbury Sandstone.

The other rocks generally exist in discreet but thinner beds of less than fifteen metres thickness, or are interbedded as thin bands within the sandstone.

The major claystone unit is the Bald Hill Claystone, which lies above the Bulgo Sandstone at the base of the Hawkesbury Sandstone. This claystone varies in thickness and is, in some places, more than 25 metres thick. Due to the nature of the clay, which swells when it is wetted, it tends to act as an aquiclude or aquitard. Significant claystone units exist lower in the overburden, the Stanwell Park Claystone and Wombarra Shale.

The known geological structures shown in **Figure 4.3** and **Plan 3B** are at the Bulli seam level, at a depth of approximately 500 metres underground. The geological features identified at seam level within the SMP Area include the series of dykes which cross the western parts of the proposed longwalls and two faults which cross the eastern parts of the proposed longwalls. The likelihood of irregular subsidence profiles resulting from near surface geological features is discussed in **Appendix A**.

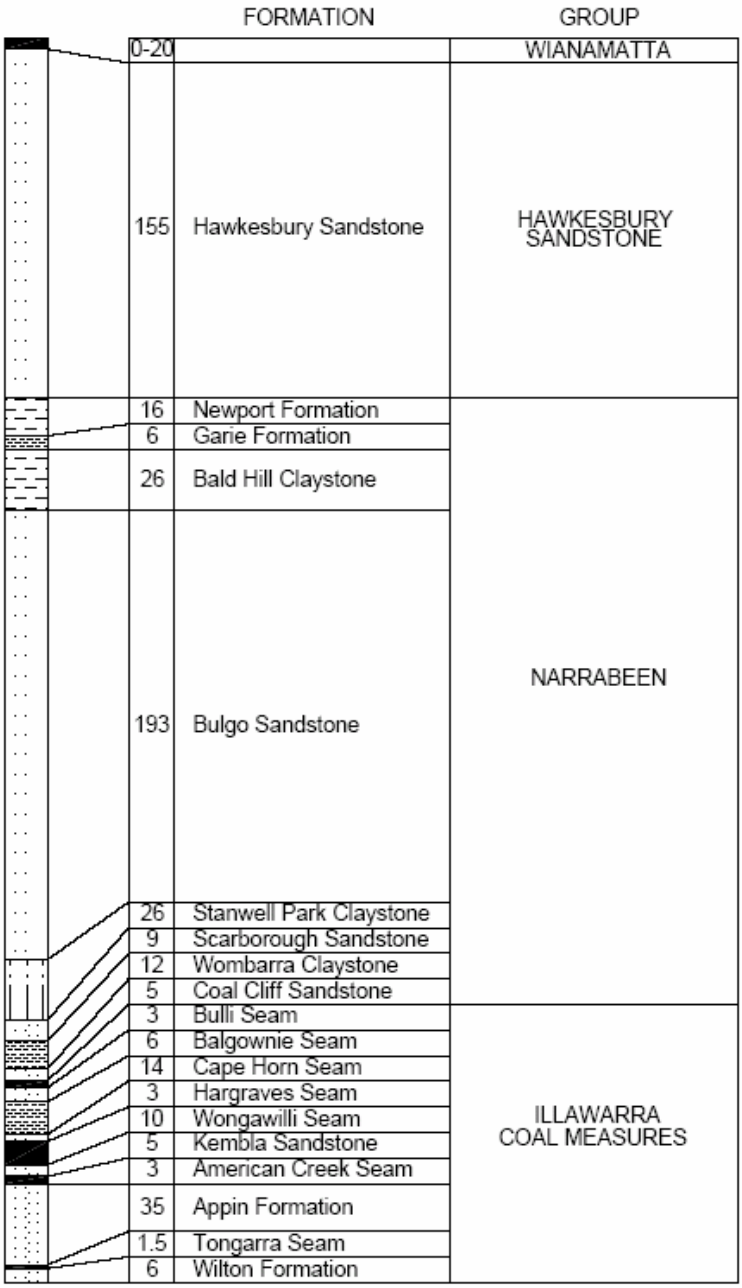

Figure 4.2 – Typical Stratigraphic Section – Southern Coalfield

4.4. LOCATION OF EXISTING AND FUTURE WORKINGS

The areas to the south of Longwalls 705 to 710 have recently been successfully mined. Longwall 701 has recently been completed with mining of Longwall 702 in progress.

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APPIN COLLIERY

GEOLOGICAL STRUCTURES

DATE:	SCALE:	Figure 4.3	Rev No
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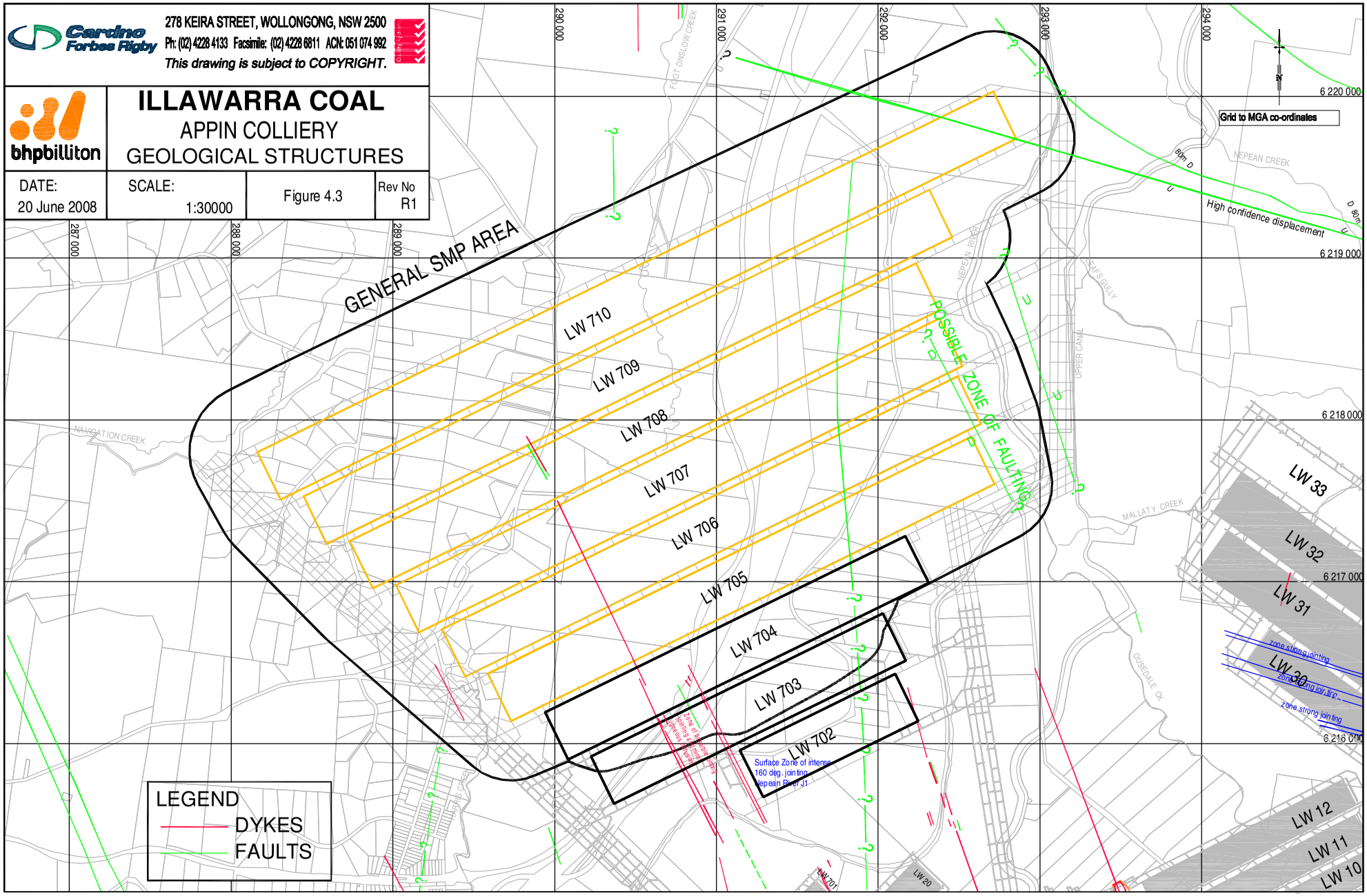

4.5. LITHOLOGICAL AND GEOTECHNICAL CHARACTERISTICS OF THE ROOF AND FLOOR

The stratum around the Bulli Seam provides good longwall conditions and in particular the floor is hard and competent. The immediate roof is a combination of bedded mudstone, interbedded siltstone and sandstone. It caves readily and is strong enough to stand in front of the supports, unless affected by geological features or poor face management.

Support of all development roadways is rigorously applied in accordance with the mine's Strata Management Plan. This provides for both primary support in all roadways (principally using roofbolts and mesh) and secondary support (principally with cable-bolts) in more critical areas such as at intersections, and in some beltroads. Confirmation of stratigraphy and monitoring of rock properties is accomplished by the periodic coring of the immediate eight metres of roof strata. Roof dilation is routinely monitored with extensometers at defined locations. In addition, the Plan provides for certain actions in response to triggers defined in terms of the measured and observed strata behaviour. The Strata Management Plan is part of Appin Colliery's statutory management system, is approved by the DPIM and has provided a formalised and effective means of managing these issues and will be extended to apply to Longwalls 705 to 710.

Appin Area 7 Longwalls operate under a face management plan, which aims to maintain strata integrity in and around the operating face. There is provision for the use of specialised bolting, the use of recovery equipment and access to experienced contractors for processes such as polyurethane injection, when required.

4.6. UNCONTROLLED COLLAPSE OF ROOF (FOR SHALLOW WORKINGS)

Given that the depth of cover over the proposed longwalls typically is around 500 metres, the consideration for uncontrolled collapse due to shallow (<30 metres) overburden effects is not applicable and is not considered further for this application.

5. STABILITY OF UNDERGROUND WORKINGS

(SMP GUIDELINES section 6.5)

Illawarra Coal Geotechnical Engineers have designed the underground workings to be stable. The design considers the stability of the roadways for secondary extraction via longwall mining methods. In addition, the Appin Colliery Strata Management Plan will be used to manage the ongoing stability of the workings.