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## **Coal & Allied Industries Limited**

### **Report for Lower Hunter Lands Project**

**Black Hill and Tank Paddock: Air Quality  
Assessment**

**January 2011**



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# 1. Introduction

## 1.1 Background

It is proposed that the entire Coal & Allied Industries Limited (Coal & Allied) owned Black Hill and Tank Paddock sites be rezoned/listed as a 'State Significant Site' (SSS) in Schedule 3 of State Environmental Planning Policy (Major Development). A draft Schedule 3 listing will be prepared with the Concept Plan Application.

The Concept Plan will apply to the entire 183ha Black Hill, the 147ha Tank Paddock site and 398ha of the Stockrington site. The key parameters for the future development of the sites are as follows:

- » Dedication of 545ha of conservation land to the New South Wales Government (NSWG) that is identified in the Lower Hunter Regional Strategy and Lower Hunter Regional Conservation Plan, comprising 100% of the 147ha Tank Paddock site and 398ha of the Stockrington site.
- » Use of the 183ha Black Hill site as 'employment lands' for a range of employment generating activities.
- » Indicative development staging - The number of lots and extent of staging for release areas will be largely dictated by the service infrastructure requirements as well as responding to market forces.
- » The provision of associated infrastructure.

Approval will not be sought under the Concept Plan for a specific lot or road layout. An indicative super-lot layout will be prepared, which will indicate how subdivision could be achieved that will enable a range of industrial and ancillary activities to be undertaken.

An existing mining consent under the Black Hill site will defer development on the site until post June 2013. Accordingly, a detailed built form layout has not been prepared at this stage. Approval is not sought under the Concept Plan for subdivision or for individual buildings on the site. Urban Design Guidelines have been prepared to inform the Concept Plan in respect of urban form, built form, open space and landscape, access and movement and visual impact for the site.

It is proposed to dedicate land for conservation purposes as part of the Major Development Application via a Voluntary Planning Agreement (VPA) between Coal & Allied and the NSWG in accordance with s.93F of the Environmental Planning & Assessment Act, 1979 (EP&A Act).

GHD was engaged to provide an assessment of air quality impact upon the proposed employment land development at Black Hill, hereafter referred to as the Black Hill site.

The Director General's Requirements (DGR) for the air quality component of the environmental assessment of the Black Hill site is as follows (subject to review on issue of new DGR's):

*"Assess the odour and air quality impacts of the nearby existing development including the adjoining poultry farm, any proposed sewage treatment plant on the site and in light of potential coal mining and coal-bed methane extraction on the subject land."*



The adjoining poultry farm is no longer operating. Therefore, the scope of work of the air quality assessment was to:

- » Characterise the local meteorology and ambient air quality at the Black Hill site;
- » Assess the potential air quality impact to the Black Hill site from adjacent industrial/commercial facilities, including, in particular, the Donaldson Open-Cut Mine and the proposed Abel Underground Mine;
- » Assess air quality impacts from potential coal mining and coal-bed methane extraction on the Black Hill site; and
- » As a future industrial estate, assess the potential air quality impacts from future activities, including sewage treatment plants, likely to occur within the site on existing or likely future sensitive receptors.

The scope of work was conducted with consideration to the to the Department of Environment Climate Change and Water (DECCW) *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2005) and *Assessment and Management of Odour from Stationary Sources in NSW* (2006), as appropriate.



## 2. Local Environment

### 2.1 Site Description

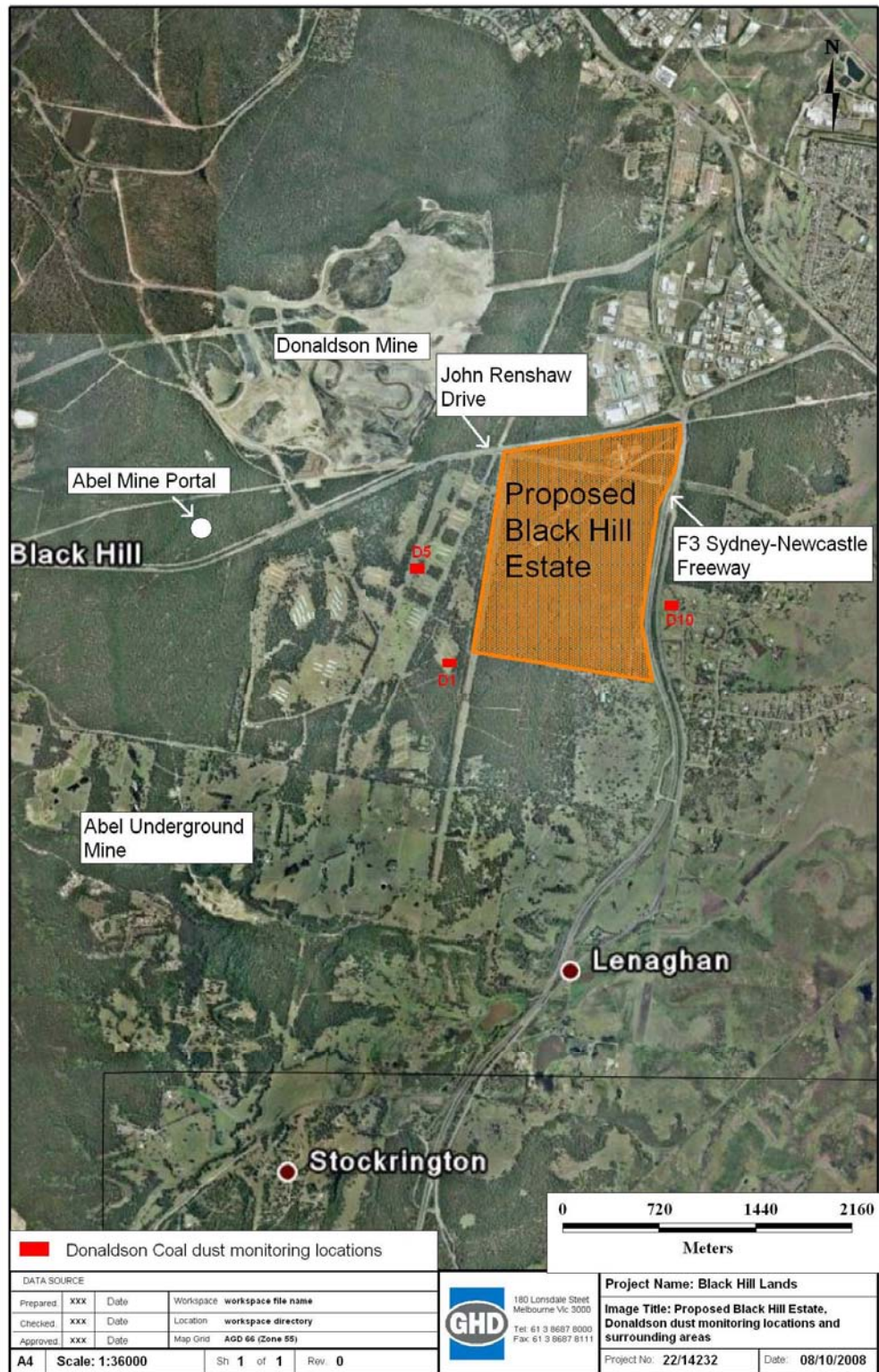
The Black Hill site is bound by John Renshaw Drive to the north and the F3 Sydney-Newcastle Freeway to the east. On the eastern side of the Freeway, there is rural-residential land and on the northern side of John Renshaw Drive there is an existing industrial business park. The land adjacent to the west of the site was formerly a poultry farm, however, future planning details are unknown and is identified in the Lower Hunter Regional Strategy as future employment lands. The land adjacent to the south of the site is rural.

Further afield the Donaldson Open-Cut mine is located approximately 700 metres to the north-west of the site. The ventilation shaft for the proposed Abel Underground Mine is located to the west of the site. Future mining by Abel coal mining operations is proposed below the site, which may affect the timing and urban design of the proposed development. Development of the site will not occur until the mining and associated subsidence is complete, which is required to be completed by mid 2013.

In the north-east corner of the site there is an old quarry that is currently operated as an asphalt plant by Boral Asphalt. It is understood that this facility will not be operational at the time that the site is developed, therefore, it is not considered in this assessment.

Figure 2-1 shows the key features of the existing study area.

Figure 2-1 Study Area







## 2.2 Ambient Air Quality

Ambient air quality data was obtained for the years 2002 -2006 from the Beresfield and Wallsend air quality monitoring stations, which are the closest monitoring stations to the site. Beresfield and Wallsend are considered to be good representations of the ambient air quality at the Black Hill site.

Table 2-1 presents a summary of the ambient air quality at Beresfield and Wallsend from 2002 to 2006. Note that sulphur dioxide (SO<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>) are not recorded at Beresfield and so data from Wallsend have been adopted.

The highest 1-hour average value of NO<sub>2</sub> was 0.05 parts-per-million (ppm), which is less than half of the 0.12 ppm criterion. The highest annual average was 0.009 ppm, which is less than a third of the 0.03 ppm annual average criterion.

The highest 1-hour average value of SO<sub>2</sub> was 0.067 ppm, which is a third of the 0.2 ppm criterion. The highest 24-hour average was 0.014 ppm, which is well below the criterion of 0.08 ppm. The highest annual average was 0.002 ppm, which is an order of magnitude below the 0.02 ppm annual average criterion.

The highest 24-hour average fine particulate matter (referred to as PM<sub>10</sub>)<sup>1</sup> concentration was 166 µg/m<sup>3</sup> in 2002, which is well over the 50 µg/m<sup>3</sup> criterion. The highest annual average PM<sub>10</sub> value was 26 µg/m<sup>3</sup> in 2002, which is below the 30 µg/m<sup>3</sup> criterion. The elevated PM<sub>10</sub> concentrations were typically influenced by bushfire smoke and drought conditions.

Note that site-specific PM<sub>10</sub> measurements are also discussed in Section 3.1.3.

**Table 2-1 Ambient Air Quality – Beresfield and Wallsend, NSW for years 2002 - 2006**

Pollutant	NO <sub>2</sub> (ppm) <sup>(1)</sup>		SO <sub>2</sub> (ppm) <sup>(1)</sup>			PM <sub>10</sub> (µg/m <sup>3</sup> ) <sup>(2)</sup>	
Averaging Period	Maximum 1-Hour Average	Annual Average	Maximum 1-Hour Average	Maximum 24-Hour Average	Annual Average	Maximum 24-Hour Average	Annual Average
2002	0.043	0.009	0.045	0.011	0.002	166	26
2003	0.050	0.008	0.047	0.010	0.002	88	16
2004	0.041	0.008	0.067	0.014	0.002	56	21
2005	0.038	0.008	0.048	0.007	0.001	53	18
2006	0.037	0.009	0.058	0.009	0.001	52	21
<b>DECCW Criteria</b>	<b>0.12</b>	<b>0.03</b>	<b>0.2</b>	<b>0.08</b>	<b>0.02</b>	<b>50</b>	<b>30</b>

(1) Data taken from Wallsend monitoring station.

(2) Data taken from Beresfield monitoring station.

## 2.3 Local Meteorology

The transport and dispersion of air pollution in the vicinity of the proposed development will be influenced by prevailing synoptic flows, local sea breezes, and vertical temperature profiles that



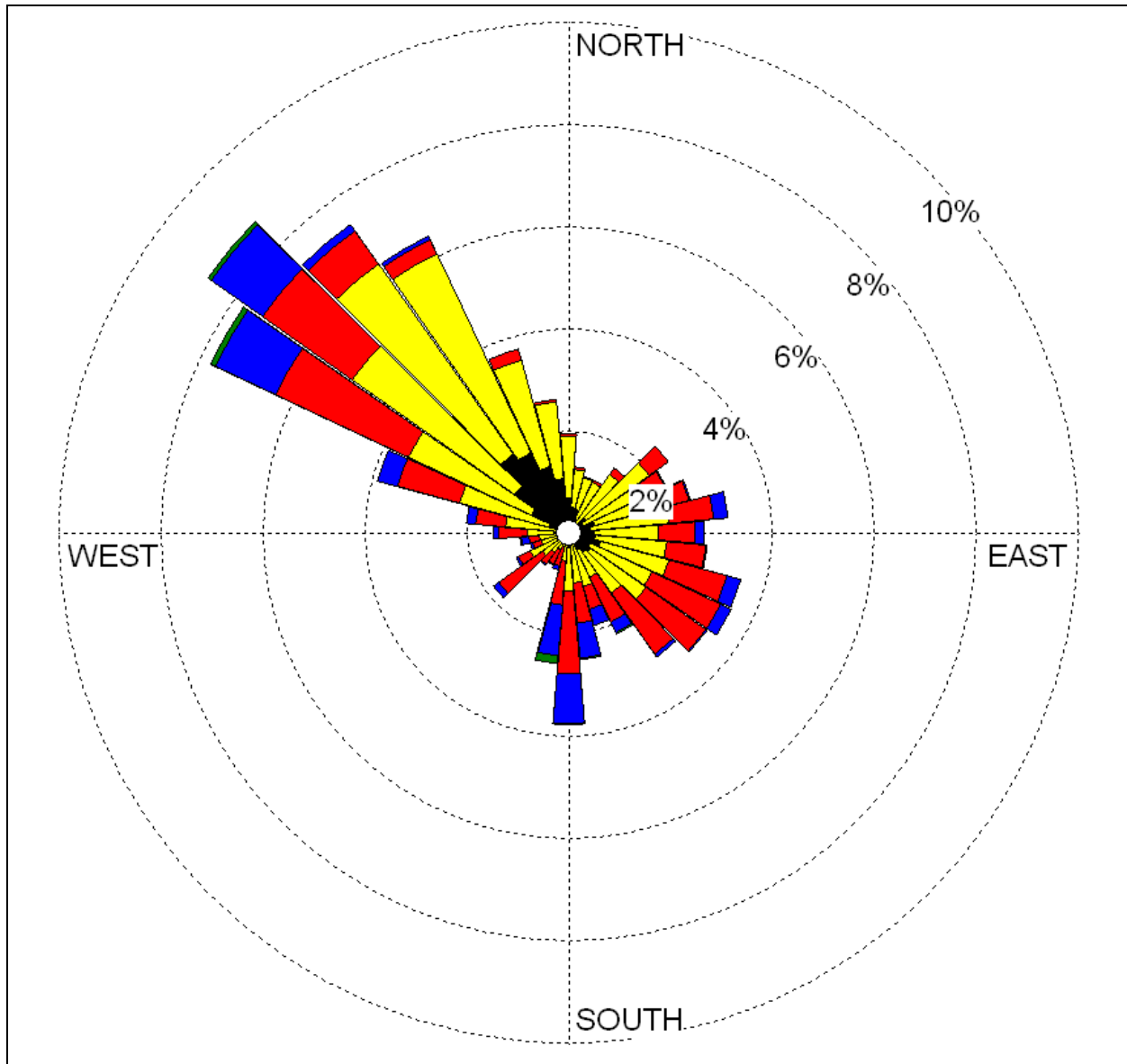
will alter both diurnally and with wind direction, depending on whether flows are coming off the land or water.

GHD holds meteorological data from a previous air quality assessment at Tomago (located approximately 7 km to the east-north-east of Black Hill), which is considered to be representative of the wind climate at Black Hill. GHD note that wind patterns are likely to be slightly different at Black Hill because it is in a more sheltered location than the Tomago location, but the prevailing wind patterns are considered to be sufficiently representative for the purposes of this qualitative assessment.

Figure 2-2 shows a wind rose that illustrates the distribution of wind speed and direction at Tomago. On an annual basis the prevailing winds are from the north-west and to a lesser extent from the south-east. Higher speed winds are typically associated with north-westerly winds. The highest frequency of light winds also occurs from the north-west, which corresponds with the regional scale cool air drainage flows down the Hunter Valley from the north-west under stable atmospheric conditions. At the Black Hill site, to a lesser extent, local drainage flows from the elevated terrain to the north and west of the site would also be prevalent.

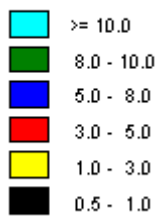
Figure 2-3 shows the seasonal variation in wind climate, and it can be seen that south-easterly winds occur more frequently during summer (sea-breeze), while a north-westerly dominates during the other seasons, in particular during winter.





### Legend

WIND SPEED  
(m/s)



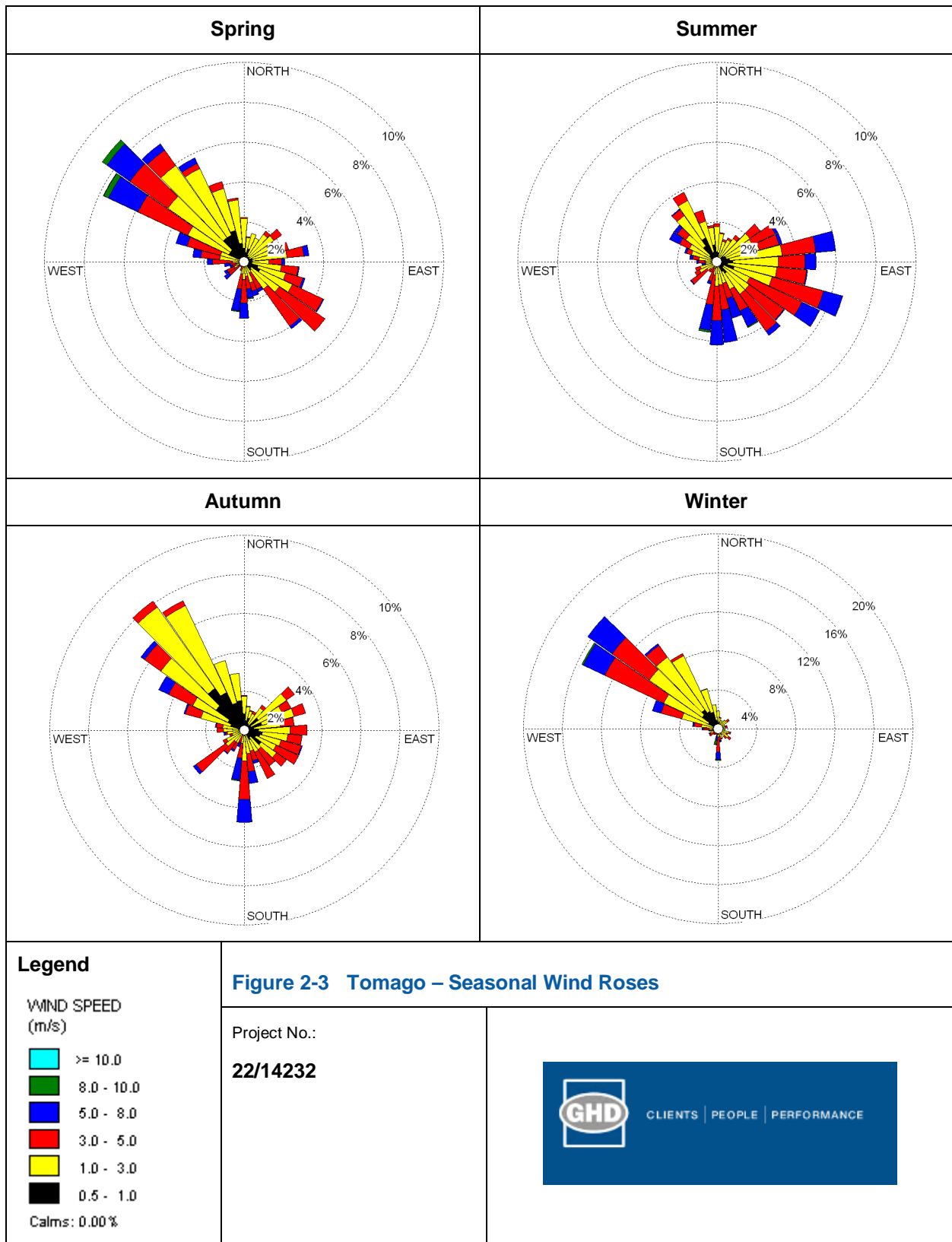
Calms: 0.00 %

**Figure 2-2 Tomago – Annual Wind Rose**

Project No.:

**22/14232**







### 3. Air Quality Assessment

A desktop review of aerial photography, the National Pollutant Inventory (NPI) database<sup>1</sup> and information provided by Coal & Allied lead to the following significant sources being identified as contributing to the air emissions inventory:

- » Odour and dust emissions from the existing Donaldson Open-Cut Mine;
- » Odour and dust emissions from the proposed Abel Underground Mine; and
- » Fugitive dust and methane emissions from Coal-bed methane extraction at existing bore sites on Coal & Allied land.

The sub-sections below discuss the air emission inventory and provide a screening assessment to gauge the potential for air quality impacts on the proposed Black Hill site.

The last sub-section discusses the air emission inventory for future activities within the site and provides a screening assessment to gauge the potential for air quality impacts from these activities on surrounding land uses.

#### 3.1 Donaldson Open-Cut Mine

The Donaldson Open-Cut Mine (DOCM) is located approximately 700 metres to the north-west of the Black Hill site.

It is understood that the current Mining Operations Plan expires in the year 2012. The development of the Black Hill site is not expected until the year 2013, therefore, air quality impacts from the DOCM might not be of concern.

This screening level assessment gauges the potential for air quality impact by examining the following aspects:

- » Emission inventory;
- » Local wind climate patterns; and
- » Dust monitoring.

#### 3.2 Emission Inventory

Air quality impacts generated from the operation of DOCM would primarily arise due to dust emissions. The major potential dust sources during quarrying activity are expected to include:

- » Land clearing and removal of topsoil;
- » Drilling and blasting operations;
- » Operation of crushing and screening equipment;
- » Loading and unloading of material on-site and subsequent transport off-site;

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<sup>1</sup> Search limited to facilities located in the area bound by the postal code 2322 and within a 2 km radius of the Black Hill site.



- » Transport by vehicles on access roads and haul roads; and
- » Wind action affecting stockpiles and exposed areas of the site.

A range of measures are employed by the DOCM operators to control airborne dust, which include<sup>2</sup>:

- » Maintenance of adequate separation distance between the mine and residents;
- » Minimisation of disturbed land;
- » Minimisation of distance travelled by hauling overburden over the shortest distance possible;
- » Utilisation of mine water for dust suppression on roads, stockpiles and work areas; and
- » Cessation of dusty operations when dust becomes difficult to control.

### **3.3 Wind Climate**

The local wind climate indicates a higher occurrence of wind from the north-west, which means sensitive receptors at the Black Hill site will have a higher frequency of exposure to dust potentially emitted from the DOCM.

Furthermore, wind erosion or dust lift-off from unconsolidated surfaces within the DOCM site can become significant under strong winds (greater than 5 m/s). These stronger prevailing winds also predominantly occur from the north-west.

### **3.4 Dust Monitoring**

Environmental effects of airborne particulate matter (dust) are generally related to the size of the particle size range of the dust. Health effects are often associated with fine particles less than 10 micrometres in equivalent aerodynamic diameter (PM<sub>10</sub>), whereas coarser particles (generally 10 to say 100 micrometres) are associated with effects on amenity (eg visible dust plumes or deposition on surfaces). As a dust plume is transported downwind from a source, the coarser particulates progressively drop-out of the air column to deposit on surfaces (land, water, cars etc) downwind of the source, while the finer particulate fractions will be retained in the air column longer by turbulent mixing. Generally, a high proportion of the coarse particulate matter emissions are likely to be deposited within 500 metres of the dust source.

The DOCM undertakes dust deposition monitoring at locations on and off the mine site as part of its licence requirements. The results of dust deposition monitoring, at selected stations near the site, conducted over the 12 month period from November 2006 to October 2007 are shown in Table 3-1. The locations of each monitoring location are shown in Figure 2-1.

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<sup>2</sup> Donaldson Coal Annual Environmental Management Report 2006-2007



**Table 3-1 Dust Deposition Results for Donaldson Open-Cut Mine**

Period	Annual Average Dust Deposition - Insoluble Solids (g/m <sup>2</sup> /month)		
	Monitoring Location D1	Monitoring Location D5	Monitoring Location D10
1 November 2006 to 31 October 2007	1.5	1.4	1.4

Source: Donaldson Coal Annual Environmental Management Report 2006-2007.

The DECCW impact assessment criterion to prevent dust nuisance is 4 g/m<sup>2</sup>/month of total deposited dust over an annual average period. Based on this information, it is unlikely that dust levels within the proposed Black Hill site would exceed nuisance dust levels as a result of the DOCM activities.

The DOCM also undertakes monitoring for fine particulate matter (PM<sub>10</sub>) and total suspended particulates (TSP) at a station to the west of the Black Hill site (near dust monitoring station D5 on Figure 2-1). The annual average TSP (34 µg/m<sup>3</sup>) and PM<sub>10</sub> (17 µg/m<sup>3</sup>) concentrations were well below the DECCW criteria of 90 µg/m<sup>3</sup> and 30 µg/m<sup>3</sup>, respectively. The maximum 24-hour average PM<sub>10</sub> concentration at this site was 44 µg/m<sup>3</sup>, which was below the DECCW criterion of 50 µg/m<sup>3</sup>.

The results presented above indicate a low dust impact from mining operations on the proposed Black Hill site. The absence of dust complaints made against the DOCM during the 2007 reporting period supports this.

### 3.5 Abel Underground Mine

Donaldson holds consent for and has commenced operation of an underground coal mine (Abel Underground Mine) that will access coal reserves south of the DOCM. Facilities for the Abel Underground Mine (AUM) will be located within the DOCM final void and the mine ventilation shaft would be located near the mine entry portal, approximately 100 metres north of John Renshaw Drive.

This screening level assessment gauges the potential for air quality impact by examining the following aspects:

- » Emission inventory; and
- » Previous dust and odour impact modelling conducted for the proposed AUM.

The primary pollutants emitted to air during the coal extraction process are dust and gaseous (e.g. various odorous volatile organic compounds, methane) emissions. These emissions would be emitted to atmosphere via the mine ventilation shaft. Other sources of dust emissions include; loading coal to the raw coal stockpile; wind erosion from stockpiles; and dust loss from the conveyor system.

The air quality impact assessment prepared as part of the Environment Assessment for the AUM indicates that air emissions from the AUM operations will be minor compared with an open cut mine of a similar production level. Atmospheric dispersion modelling indicates no residences are likely to experience any exceedances of the DECCW's long-term assessment



criteria for particulate matter (PM<sub>10</sub>), total suspended particulates (TSP) or dust (insoluble solids) deposition. The report also states that the most affected sensitive receptor is located at the site of the decommissioned poultry farm immediately west of the Black Hill site<sup>3</sup>.

Investigations into the potential impact of odour in the mine ventilation air indicate that the potential for odour impact is not likely to extend beyond 500 metres from the ventilation shaft<sup>4</sup>, which is well clear of the Black Hill site.

### 3.6 Coal-Bed Methane Extraction

Future coal mining by the AUM is proposed below the site, which may affect the timing and urban design of the proposed development. Development of the site would not occur until the mining and associated subsidence is complete, which is required to be by mid 2013

It is understood that all wells on the Black Hill site would be capped, and as such, residual emissions of methane from the wells should be negligible.

### 3.7 Black Hill Industrial Estate

It is understood that future land uses could include distribution and logistics centres; a range of manufacturing and warehouse facilities; show rooms and bulky good storerooms. A small local centre would also include; food outlets, service station, day care facility and a motel/hotel<sup>5</sup>. It is also understood that package sewage treatment plant options are being considered for the development area. However, the infrastructure strategy for the site will include an option to provide for connection to the existing sewer network or for provision of an on site treatment system to meet HWC's requirements. Any application to include an onsite sewerage treatment will include an air quality assessment as part of the application for approval.

Without detailed information on the proposed facilities, it is not possible to determine the potential level of air emissions from the site or its potential impact on nearby sensitive receptors (e.g. residences, motel, day care).

In the interim, it is recommended that consideration be given to available separation distance guidelines to guide development within the site.

Separation (or buffer) distances are commonly used as a planning tool to ensure that there is adequate separation between the pollution source and sensitive uses in the vicinity – where typically the sensitive use is a residence. The separation distance is taken as the distance between the activity boundary within a facility and the property boundary of a sensitive land use nearest to the emission source.

The Department of Urban Affairs and Planning's (DUAP) Circular E3 *Guidelines for buffer areas around sewage treatment plants* (STPs) recommends buffer zones of at least 400 metres surrounding treatment plants<sup>6</sup>. Note that this guideline does not provide a buffer distance for a

<sup>3</sup> Abel Underground Mine – Part 3A Environmental Assessment, Donaldson Coal Pty Ltd, 22/09/2006; and

<sup>4</sup> Abel Underground Mine – Part 3A Environmental Assessment: Response to Submissions, Donaldson Coal Pty Ltd, 19 January 2007.

<sup>5</sup> Site description based on information presented in the report "Lower Hunter Lands Development Black Hill – Phase 2 Acoustic Study" prepared by Renzo Tonin & Associates, dated 26 March 2008.

<sup>6</sup> Small Town Sewerage Systems – EIS Guideline, NSW Department of Urban Affairs and Planning, February 1998.





specific plant, rather they only provide a generic buffer distance applicable to all STPs. The DECCW Technical Framework for *Assessment and Management of odour from stationary sources in NSW* (DECCW, 2006) does not specify separation distances for any of the development types listed above for the Black Hill site. Therefore, GHD has relied on the use of a range of separation distance guidelines from other regulatory jurisdictions. The relevant separation distance guidelines are summarised in Table 3-2 below.

**Table 3-2 Separation Distances**

Industry Type <sup>3</sup>	Separation Distance
Industrial Dry Cleaners <sup>1,2</sup>	100 m
Service Stations (operating 7 a.m. to 7 p.m.) <sup>1</sup>	50 m
Service Stations (operating 24-hours) <sup>1</sup>	200 m
Small goods manufacturing <sup>1,2</sup>	100 m
Sewage Treatment Plant <sup>4</sup>	400 m

1. EPA Western Australia: Guidance for the Assessment of Environmental Factors – Separation distances between industrial and sensitive land uses, No. 3, June 2005;

2. EPA Victoria: AQ 2/86 : Recommended Buffer Distances for Industrial Residual Air Emissions; and

3. Industry types shown were selected from a wide range of industries types on the basis of the likely future land uses.

4. Small Town Sewerage Systems – EIS Guideline, NSW Department of Urban Affairs and Planning, February 1998



## 4. Conclusions

The key findings of the air quality assessment for the proposed Black Hill site are:

- » Air emissions from the existing DOCM are not expected to impact on the Black Hill site based on current information for the following reasons:
  - Standard mitigation measures are applied to key emissions sources; and
  - Measured total deposited dust levels and airborne particulate concentrations at a monitoring station adjacent to the site are below the DECCW air quality criteria for nuisance dust and health impacts.
- » Air emissions from the proposed AUM are not expected to impact on the Black Hill site based on current information for the following reasons:
  - Standard mitigation measures are applied to key emissions sources; and
  - Predicted total deposited dust levels and airborne particulate concentrations at a location near the site are below the DECCW air quality criteria for nuisance dust and health impacts.
- » Coal mining and coal-bed methane extraction conducted on the Black Hill site land, as part of the AUM operations, would be complete before the development of the Black Hill site; and
- » At this stage, it is not possible to assess the potential impact of air emissions from the site on sensitive receptors located inside and outside of the site boundary. Therefore, in the interim, it is recommended that consideration be given to the use of the separation distances provided in Table 3-2 to guide the development planning within the site.

The conclusions given above are subject to the limitations described in Section 5.



## 5. Limitations

This report has been prepared for Coal & Allied in order to comply with local regulatory requirements. The purpose of the report is to provide an independent review of the Project and assess the potential impact of local air quality on the Project.

It is not the intention of the assessment to cover every element of the ambient environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the air quality assessment represent the findings apparent at the date and time of the monitoring and the conditions of the area at that time. It is the nature of environmental monitoring that not all variations in environmental conditions can be accessed and all uncertainty concerning the conditions of the ambient air environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

The air quality mitigation measures recommended in this report are in-principle only. The assistance of an air quality consultant is recommended at the detailed design phase of the project or when there is more detailed information available to provide more accurate recommendations.

In conducting this assessment and preparing the report, current guidelines for air quality were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.



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**Document Status**

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