Appendix 7

AIR QUALITY ASSESSMENT

RHA REPORT 10-3785-R1
Draft 2

Whitehaven Coal Mine
Canyon Extension
Air Quality Impact Assessment

Prepared for

Whitehaven Coal Mining Ltd
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17 December 2004

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Whitehaven Coal Mine
Canyon Extension
Air Quality Impact Assessment

Quality System
Quality Endorsed Company
ISO 9001 Lic 3236
Standards Australia

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This document has been prepared in accordance with the requirements of that System.

Richard Heggie Associates Pty Ltd is a Member Firm of the Association of Australian Acoustical Consultants.

Reference	Status	Date	Prepared	Checked	Authorised
10-3785-R1	Draft 2	17 December 2004	Debbie Peel	Jason Watson	Jason Watson
10-3785-R1	Draft 1	10 December 2004	Debbie Peel	Jason Watson	Jason Watson

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1 INTRODUCTION

Richard Heggie Associates Pty Ltd (Heggies) has been commissioned by Whitehaven Coal Mining Ltd (WCML) to undertake an Air Quality Impact Assessment for the proposed extension of the existing Whitehaven Coal Mine (referenced herein as "Canyon Extension site").

The Whitehaven Coal Mine (WCM) located some 16 km east-southeast of Boggabri NSW, commenced operations in 2000 and has an approved production rate of 1.25 Mtpa. Most open-cut mining activities are approved to occur between 7.00 am to 10.00 pm Monday to Saturday and are generally undertaken from 7.00 am to 6.00 pm. Limited activities are permitted between 10.00 pm to about 2.00 am. The approved mine has a projected remaining life of approximately 1 year.

This letter report assesses the air quality impacts associated with the Canyon Extension of the Whitehaven Coal Mine only, and does not consider the current mining activities at the site.

2 EXISTING AIR QUALITY ENVIRONMENT

For the purposes of assessing the potential air quality impacts of the Canyon Extension site, an estimate of background particulate levels is required. For each criteria pollutant, the maximum background concentration has been selected, for each relevant averaging period. **Table 1** outlines the background air quality concentrations relevant to this project.

Table 1 Background Air Quality Environment for Assessment Purposes

Air Quality Parameter	Averaging Period	Assumed Background Ambient Level
PM_{10}	24-hour	Varies[1]
	Annual	14 $\mu g/m^3$
Dust	Annual	1.5 g/m^2/month[2]

Note 1 *Daily-varying 24-hour average PM_{10} concentrations sourced from the Tamworth DEC air quality monitoring site (2001) have been used within the PM_{10} modelling.*

Note 2 *Dust deposition values have been sourced from monitoring undertaken by Whitehaven Coal Mining Ltd, between January 2001 and December 2001, around the existing Whitehaven Coal Mine, NSW.*

3 AIR QUALITY CRITERIA

The air quality goals adopted in this report are those specified in the NSW DEC document "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*".

In summary, the specific goals being applied to the Canyon Extension site, which conform to current DEC air quality targets, are as follows:

PM_{10}: A 24-hour maximum of 50 $\mu g/m^3$
An annual average of 30 $\mu g/m^3$

$PM_{2.5}$: A 24-hour maximum of 25 $\mu g/m^3$
An annual average of 8 $\mu g/m^3$

Dust: Nuisance expected to impact on residential areas when annual average dust deposition levels exceed 3.5 g/m^2/month.

4 DISPERSION MODELLING

4.1 Methodology

The pollutant dispersion modelling carried out in the present assessment utilises the Ausplume Gaussian Plume Dispersion Model software developed by EPA (Victoria).

Ausplume is the approved dispersion model for use in the majority of applications in New South Wales. Default options specified in the Technical Users Manual (EPA Victoria, 2000) have been used, as per "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*".

4.2 Dispersion Meteorology

Meteorological data for the year 2001, from the on-site Whitehaven monitoring station, has been used for this assessment.

A summary of the 2001 annual wind behaviour for the Canyon Extension site is presented as a wind rose is included in **Appendix A**. This wind rose is representative of the meteorological input file used in the assessment, and displays occurrences of winds from all quadrants.

The seasonal variation in wind behaviour at the Canyon Extension site is also presented in **Appendix A**. The seasonal wind roses indicate that:

- In spring, south-easterly and west-north-west winds dominate.
- In winter, winds originate from all quadrants.
- In summer, the predominant wind direction is south-easterly.
- In autumn, the predominant wind direction is south-easterly.

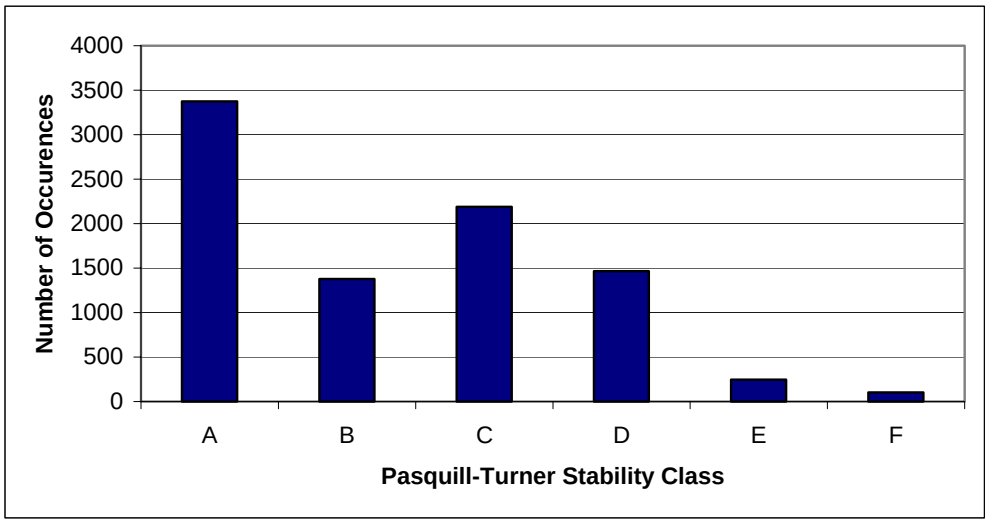
Atmospheric stability refers to the tendency of the atmosphere to resist or enhance vertical motion. The Pasquill-Gifford-Turner assignment scheme identifies six (6) Stability Classes, "A" to "F", to categorise the degree of atmospheric stability. These classes indicate the characteristics of the prevailing meteorological conditions.

Stability Class "A" represents highly unstable conditions that are typically found during summer, categorised by strong winds and convective conditions. Conversely, Stability Class "F" relates to highly stable conditions, typically associated with clear skies, light winds and the presence of a temperature inversion. Classes "B" through to "E" represent conditions intermediate to these extremes.

The frequency of occurrence of each Stability Class for 2001 are presented in **Figure 1**. The results indicate a high frequency (39%) of conditions typical to Stability Class "A" throughout the year at the project site. This is indicative of highly unstable conditions, conducive to a high level of pollutant dispersion due to mechanical mixing.

It is noted that the Noise Impact Assessment undertaken by Richard Heggie Associates Pty Ltd (Heggies) for the Canyon Extension Site used stability class data for the period January 2001 to December 2002, only analysing stability class for 6pm to 7am in accordance with the Industrial Noise Policy (INP). The stability class used in this assessment presents both the annual and seasonal averages for 2001, as outlined in *"Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales"*.

Figure 1 Annual Stability Class Distribution for the Canyon Extension site



Appendix B illustrates the seasonal variation in atmospheric stability class at the subject site. The frequency distribution of stability class varies relatively little with season, with Stability Class "A" dominating in all seasons.

4.3 Nearest Sensitive Receptors

The details of the four closest (non project related) sensitive air quality receptors (residential) are presented in **Table 2**.

Table 2 Details of Representative Sensitive Air Quality Receptors

Property Name	Easting	Northing
"Willgai"	224822	167688
"Broadwater"	219398	164326
"Woodlands"	225884	168241
"Gundawarra"	224564	169543

4.4 Modelling Scenarios

For this air quality impact assessment, the worst case scenario (Scenario 2, illustrated in **Appendix C**) has been modelled. This scenario corresponds (as reported in the "Heggies" report 10-1863R4D2 *"Whitehaven Coal Mine, Canyon Extension, Noise Impact Assessment"*) to mining operations that are proposed to occur during the period February 2007 to November 2007. This scenario has been selected for modelling considering the following factors:

- The quantity of waste (overburden) and run-of-mine (ROM) coal that is set to be extracted and processed during this time. To simulate this worst case scenario, the waste and ROM coal quantities that have been established for the period February 2007 to November 2007 have been used, these being 7,333,705 bank cubic metres (bcm) and 1,000,500 tonnes, respectively.
- Location of coal extraction and emplacement activities.
- The area of the mine exposed to open cut activities (approximately 0.4 km^2).
- Location of major particulate generating plant.
- The proximity of the proposed mining operations in this scenario to the closest non-mine related residential receivers, particularly Willgai and Broadwater.

Most open-cut mining activities are approved to occur between 7.00 am to 10.00 pm Monday to Saturday and are generally undertaken from 7.00 am to 6.00 pm at the Canyon Extension site. Limited activities are permitted between 10.00 pm to about 2.00 am. This is explored further in **Section 4.6** of the report.

4.5 Emission Factors

A review has been carried out of particulate generating activities expected at the Canyon Extension site. For the chosen worst case scenario, the following activities (where applicable) have been included in the particulate emissions inventory.

- Mining activities (excavators, dozers, scraper and grader).
- Blasting activities (including the use of a drill rig).
- Dumping of materials within the project site (overburden / coal).

- Coal Processing Area activities (crushing, front end loader).
- Wind erosion of open pit and stockpiles.
- Load-out facility activities (front end loader, handling, transfer, conveyor, loading to trucks).
- General movement of heavy vehicles on unsealed roads within the site (haul truck wheel dust).

General movement of heavy vehicles on unsealed roads between the processing area and the site boundary (semi-trailer wheel dust).**Table 3** presents the emission factors used for the key atmospheric pollutants used in the dispersion modelling carried out for this report. These relate to emissions expected under normal operating conditions. The ratio of the PM_{10} fraction of the TSP ranges from 50% (eg wind erosion) down to 25% (eg wheel generated dust). The proportion of the PM_{10} fraction for each activity was derived primarily from Environment Australia (2001), *"Emission Estimation Technique Manual for Mining"* (EETM for mining).

Table 3 Particulate Emission Factors for Air Quality Dispersion Modelling

Activity	Dust Deposition Emission Factor	PM_{10} Emission Factor	Emission Factor Units
Blasting	311.55	162.01	kg/blast
Excavator (on overburden)	0.0003	0.0001	kg/t
Excavator / Front End Loader (on coal)	0.0273	0.0131	kg/t
Bulldozer (on overburden)	0.5739	1.4054	kg/hr
Bulldozer (on coal)	10.72	2.27	kg/hr
Grader	0.5238	0.1913	kg/VKT
Scraper	0.0108	0.0026	kg/VKT
Stockpile and Open Pit Wind Erosion	0.4000	0.2000	kg/ha/hr
Drilling	0.5900	0.3100	kg/hole
Coal Dumping	0.0100	0.0042	kg/t
Overburden Dumping	0.0120	0.0043	kg/t
Haul Truck Movement (on overburden)	0.4740	0.1388	kg/VKT
Haul Truck Movement (on coal)	0.4351	0.1288	kg/VKT
Crusher	0.0100	0.0040	kg/t
Handling, transfer and conveying	0.0050	0.0020	kg/t
Loading to Trucks	0.0050	0.0020	kg/t

In general, default emission factors have been used as contained in Table 1 of the EETM for Mining, or in some instances such as crushing operations and handling, transferring and conveying activities, default emission factors have been used as contained in Table 2 of the EETM for Mining.

However, in some instances, the moisture content of materials at the site is not adequately reflected within the default emission factors contained in the EETM for Mining, and the equations given in Table 1 of the document were therefore used to derive representative emission factors. The following emission factors were derived using this method:

- Excavator on overburden / coal
- Dozer on overburden / coal
- Grader
- Scraper
- Front end loader
- Handling, transfer and conveying
- Blasting
- Haul truck generated wheel dust from movement both within and out of the site

The following parameters, which were utilised for a previous Heggies assessment of a similar open-cut coal mine, the Werris Creek Coal Mine (found in "Heggies" report 30-1307R2D4 *"The Proposed Werris Creek Coal Mine, Air Quality Impact Assessment"*), were used in deriving the above emission factors:

- A mean average of 3.9% moisture content of coal
- A mean average of 5.5% moisture content of overburden
- 1.8% silt content

A summary of the calculations made in deriving these emission factors is given in **Appendix D**.

4.6 Emission Inventory for the Proposed Operation

Appendix D provides details of the emission inventory associated with the chosen model scenario for the Canyon Extension site using the emission factors given in Table 3.

The emission inventory has been derived to reflect the worst-case scenario for airborne emissions over a 24-hour period, and mean average operational conditions for annual assessments. As such, all equipment stated in the proposed equipment list provided by Whitehaven Coal Mining Ltd is assumed to be operational for their respective hours of operation.

The following assumptions have been made in deriving the emission inventory for the model:

- The working days available is based on six and a half (6 ½) days a week, for 50 weeks per annum.
- Blasting activities are proposed to occur once a week, for 50 weeks per annum.

- Most open-cut mining activities are approved to occur between 7.00 am to 10.00 pm Monday to Saturday and are generally undertaken from 7.00 am to 6.00 pm. Limited activities are permitted between 10.00 pm to about 2.00 am which includes the following; mining activities (the use of the Hitachi 3600 excavator, dozers, grader), dumping of overburden materials within the project site and wheel generated dust from unpaved roads within the project site on overburden.
- Haul Trucks have been represented as simulated line sources using the 'volume source' Ausplume input. Each volume source is located along the centreline of the real line source with separations less than one quarter of the distance to the nearest residential receptor (in this case, at 500 m intervals). The above is in accordance with Section 2.5.3 of the Ausplume Technical User Manual. Hauling on unpaved roads will employ water spraying, and as such, a 50% emission reduction has been applied to this activity.
- A 'Pit retention' control factor has been applied to emission rates / fluxes corresponding to activities occurring within the limit of mining, based on 50% control for TSP and 5% for PM_{10}, as per Table 3 of the EETM for Mining.
- One (1) blasting event is assumed to occur in the middle of the working day. The average area of blast, the moisture content, and the depth of the blast hole are used to determine the blasting Emission Factor. This has been assumed to be 6000 m^2, 3.9% and 15 m respectively based on information supplied by Whitehaven Coal Mining Ltd.
- Stockpiles are to be watered as required. Accordingly, a 50% reduction to the stockpile wind erosion emission factor due to water spraying has been applied, as per Table 3 of EETM for Mining.
- Average wind speeds are used for conveying and excavator/front end loader emission factors. This has been calculated using the site specific meteorological file as 2 m/s.
- In the absence of an emission factor corresponding to the loading of the coal hopper, an emission factor equivalent to the loading of the stockpiles has been assumed.
- Percentage silt content is used to derive an emission factor for the scraper. This has been assumed to be 1.8% based on an assessment conducted at a similar open-cut coal mine, Werris Creek.
- Mean vehicle speed is used to derive an emission factor for the grader. This is assumed to be 7.5 km/h based on an assessment conducted at a similar open-cut coal mine, Werris Creek.
- In the absence of a specific emission factor, the truck loading coal bin located at the processing plant is assumed to have a similar emission factor to the handling, transferring and conveying of coal.
- The front end loader is assumed to be working in the processing area for a 15 hour period daily.
- For modelling of annual emissions, emission rates have been adjusted to reflect six and a half (6 ½) days of operation per week.

5 EMISSIONS ASSESSMENT

5.1 Dust Deposition

Table 4 shows the results of the Ausplume predictions for dust deposition using the emission rates calculated in **Appendix D**, at the sensitive air quality receptors adopted in **Section 4.3**.

The results show the mean average monthly deposition experienced by the receptors surrounding the site over a one-year time frame. It has been assumed that background levels of dust deposition are of the order of 1.5 g/m^2/month for the nearest receptors. The background values were sourced from monitoring undertaken by Whitehaven Coal Mining Ltd between January 2001 and December 2001 around the existing Whitehaven Coal Mine. A contour plot of the modelled dust deposition values obtained around the Canyon Extension site is presented in **Appendix E**.

Table 4 Background and Incremental Dust Deposition at Nearest Sensitive Receptors

Receptor	Dust – Annual Average g/m^2/ month		
	Background	**Increment**	**Background + Increment**
"Willgai"	1.5	0.1	1.6
"Broadwater"	1.5	0.1	1.6
"Woodlands"	1.5	0.1	1.6
"Gundawarra"	1.5	0.1	1.6

At all of the nearest sensitive receptors, total mean monthly dust deposition (background plus increment) rates associated with the Canyon Extension site operation are predicted to be:

- Less than 1.7 g/m^2/month at all nearest residential receptors.

As such, levels of dust deposition are expected to satisfy the dust deposition criterion (3.5 g/m^2/month).

5.2 PM_{10} (24-Hour Average)

Table 7 shows the results of the Ausplume predictions for 24-hour PM_{10} using the emission rates calculated in **Appendix D**, at the sensitive air quality receptors adopted in **Section 4.3**.

The results show the maximum 24-hour average concentration of PM_{10} experienced by the receptors surrounding the site applying the analysis over a one-year time frame. It has been assumed that background levels of PM_{10} vary on a daily basis. These background levels, sourced from the Tamworth DEC air quality monitoring site, have been incorporated into the model and associated contour plots. A contour plot of the modelled 24-hour PM_{10} values obtained around the Canyon Extension site is presented in **Appendix F**.

Table 5 Background and Incremental PM_{10} Concentrations at Nearest Sensitive Receptors

Receptor	PM_{10} – 24-hour Average $\mu g/m^3$		
	Background	Increment	Background + Increment
"Willgai"	20.6	15.1	35.7
"Broadwater"	18.3	22.2	40.5
"Woodlands"	34.6	0.1	34.7
"Gundawarra"	34.6	0.1	34.7

At the nearest residential receptors, the maximum annual 24-hour average concentration of PM_{10} for the modelled year (background plus increment) associated with the Canyon Extension site is predicted to be:

- Less than 40.6 $\mu g/m^3$ at all nearest residential receptors.

As such, concentrations of 24-hour PM_{10} are expected to satisfy the project goal (50 $\mu g/m^3$).

5.3 PM_{10} (Annual Average)

Table 6 shows the results of the Ausplume predictions for annual average PM_{10} using the emission rates calculated in **Appendix D**, at the sensitive air quality receptors adopted in **Section 4.3**.

It has been assumed that background annual average levels of PM_{10} are of the order of 14 $\mu g/m^3$ for the nearest receptors.

Table 6 Background and Incremental Annual PM_{10} Concentrations at Nearest Sensitive Receptors

Table 6 Receptor	PM_{10} – Annual Average $\mu g/m^3$		
	Background	Increment	Background + Increment
"Willgai"	14	1.7	15.7
"Broadwater"	14	0.9	14.9
"Woodlands"	14	0.9	14.9
"Gundawarra"	14	0.6	14.6

At all of the nearest residential receptors, total annual average PM_{10} concentrations (background plus increment) associated with the Canyon Extension site are predicted to be:

- Less than 15.8 $\mu g/m^3$ at all nearest residential receptors for all scenario stages modelled.

As such, annual concentrations of PM_{10} are expected to satisfy the project goal (30 $\mu g/m^3$).

5.4 $PM_{2.5}$

Generalised particle size distributions are available in Appendix B.2 of the USEPA AP-42 document. Size distributions from industries covering material handling and processing of aggregate and unprocessed ore (typical of particulate generating activities likely to contribute to the air quality surrounding the study area) are quoted as the following:

- Approximately 30% of the PM_{10} particle size fraction will constitute $PM_{2.5}$.

A simple calculation based on the above assumption, combined with the highest predicted PM_{10} concentrations in **Table 5** and **Table 6** above, indicates that:

- Worst case 24-hour average $PM_{2.5}$ may be expected to be of the order of 12.2 $\mu g/m^3$.
- Annual average $PM_{2.5}$ may be expected to be of the order of 4.7 $\mu g/m^2$.

Therefore the 24-hour average $PM_{2.5}$ criterion of 25 $\mu g/m^3$ will be satisfied when the 24-hour average PM_{10} criterion of 50 $\mu g/m^3$ is achieved.

Additionally, the annual average criterion of 8 $\mu g/m^3$ $PM_{2.5}$ is also anticipated to be achieved.

6 CONCLUSION

Richard Heggie Associates (Heggies) has been commissioned by Whitehaven Coal Mining Ltd (WCML) to assess the operation of the proposed Canyon Extension phase of the existing Whitehaven Coal Mine on local air quality.

Modelling of fugitive dust emissions and an assessment of combustion emissions was undertaken to determine the resulting air quality impacts of the proposed operation.

Computer predictions of fugitive emissions from the site were undertaken using the Ausplume Gaussian Plume Dispersion Model software developed by EPA (Victoria).

These predictions indicate that particulate matter emissions and dust deposition attributable to the proposed operation will be within current NSW DEC (and NEPM) air quality goals at all surrounding residences.

7 REFERENCES

The following documents and resources have been used in the production of this report:

Regarding Air Quality Standards

- National Environmental Protection Council (NEPC), "*National Environmental Protection Measure for Ambient Air Quality*", 1998.
- National Health and Medical Research Council, 92nd Session, 1981.
- NSW Department of Environment and Conservation (DEC), "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*", August 2001.

Regarding Existing Air Quality

- Background dust deposition monitoring undertaken by Whitehaven Coal Mining Ltd, between January 2001 and December 2001, around the existing Whitehaven Coal Mine, NSW.
- NSW DEC, PM_{10} data as measured by TEOM at the DEC's Tamworth monitoring site, 2001.
- USEPA, "*AP-42: Compilation of Air Pollutant Emission Factors, Fifth Edition*", 2001.

Regarding Site Meteorology

- Site specific meteorology file (hourly observations for the year 2001) for the existing Whitehaven Coal Mine site.

Regarding Site Emission Factors

- Environment Australia, "*Emission Estimation Technique Manual for Mining Version 2.3*", National Pollutant Inventory, December 2001.
- Environment Australia, "*Emission Estimation Technique Manual for Mining and Processing of Non-Metallic Minerals Version 2.0*", National Pollutant Inventory, August 2000.
- RHA Draft Report No. 10-1863R4D2 "*Whitehaven Coal Mine, Canyon Extension, Noise Impact Assessment*", December 2004.
- RHA Draft Report No. 30-1307R2D4 "Proposed Werris Creek Coal Mine, Air Quality Impact Assessment", July 2004.

APPENDICES

Appendix A **Annual and Seasonal Wind Roses for Whitehaven Coal Mine, Canyon Extension**

Appendix B **Seasonal Stability Classes for Whitehaven Coal Mine, Canyon Extension**

Appendix C **Site Plan of Scenario 2 – Whitehaven Coal Mine, Canyon Extension**

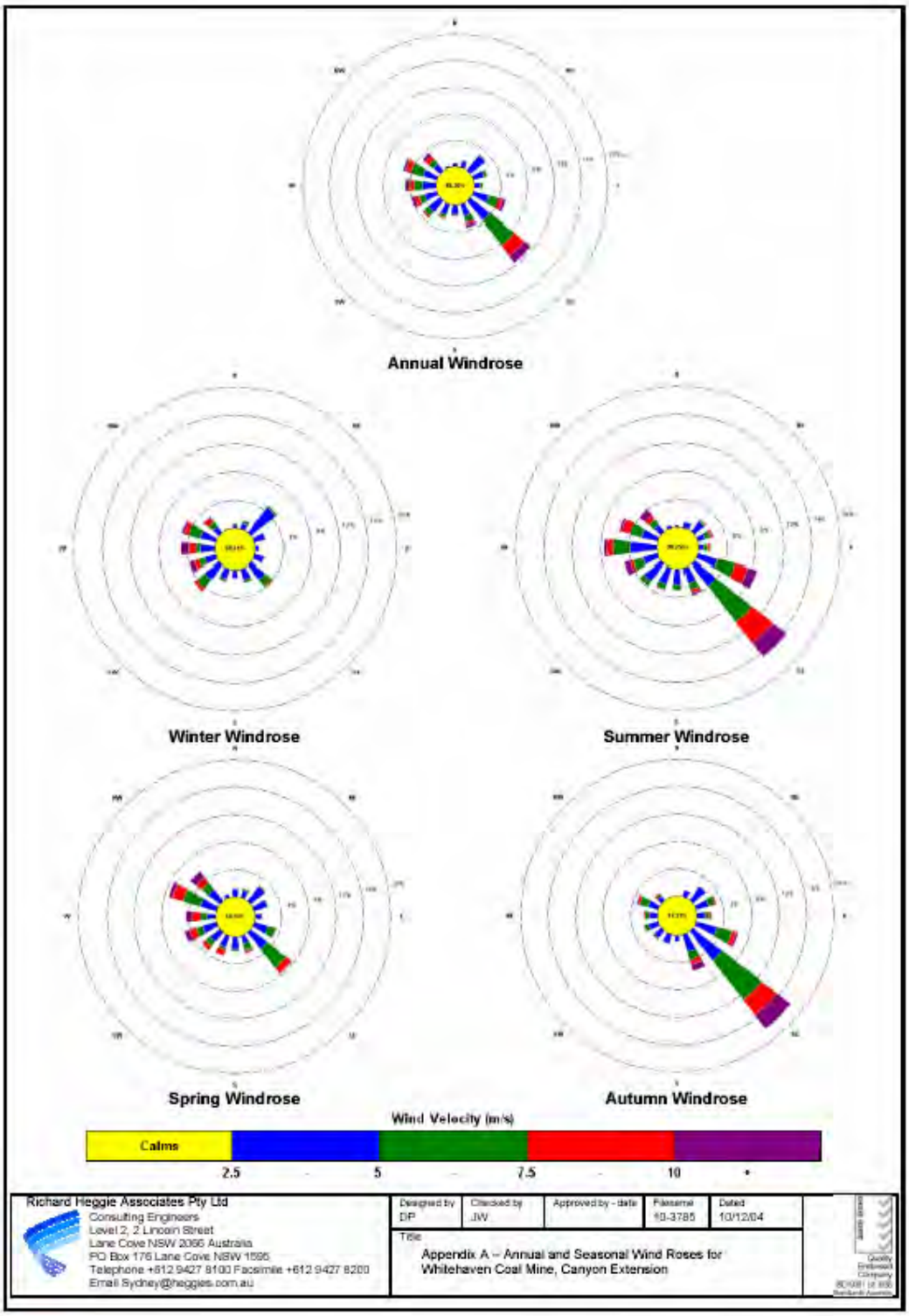
Appendix D **Atmospheric Emissions Inventory**

Appendix E **Predicted Annual Average Dust Deposition Contours, Scenario 2, Whitehaven Coal Mine, Canyon Extension**

Appendix F **Predicted 24-Hour Average PM10 Contours, Scenario 2, Whitehaven Coal Mine, Canyon Extension**

APPENDIX A

Annual and Seasonal Wind Roses for Whitehaven Coal Mine, Canyon Extension


Annual Windrose
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Summer Windrose
Spring Windrose
Autumn Windrose
Wind Velocity (m/s)
Calms
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5
7.5
10
Richard Heggie Associates Pty Ltd
Consulting Engineers
Level 2, 2 Lincoln Street
Lane Cove NSW 2066 Australia
PO Box 176 Lane Cove NSW 1595
Telephone +612 9427 8100 Facsimile +612 9427 8200
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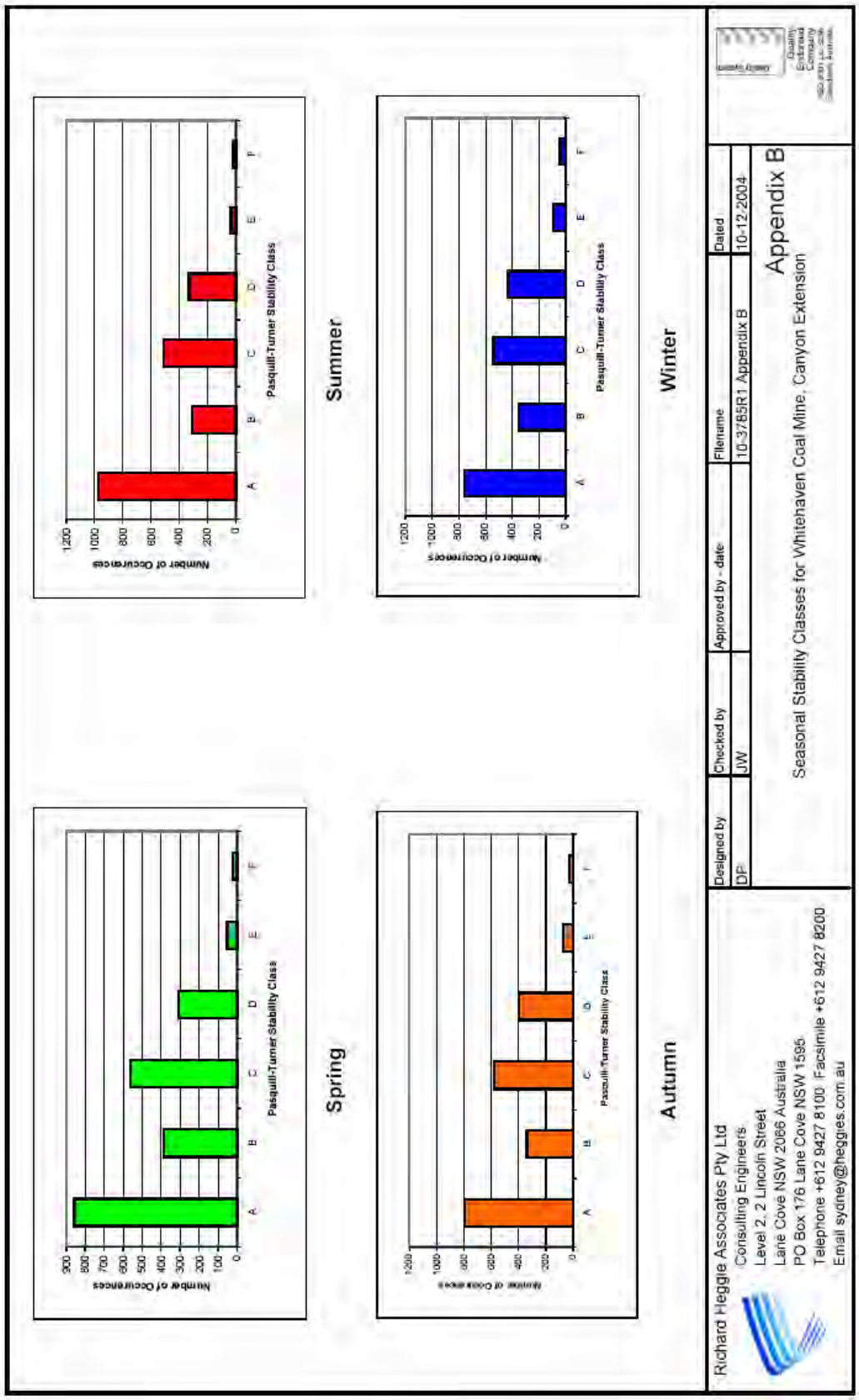
Designed by DP
Checked by JW
Approved by - date
Filename 10-3785
Dated 10/12/04
Title
Appendix A – Annual and Seasonal Wind Roses for Whitehaven Coal Mine, Canyon Extension

APPENDIX B

Seasonal Stability Classes for Whitehaven Coal Mine, Canyon Extension


Summer
Winter
Spring
Autumn
Pasquill-Turner Stability Class
Number of Occurrences
A
B
C
D
E
F
Richard Heggie Associates Pty Ltd
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Filename
10-3765R1 Appendix B
Dated
10-12-2004
Appendix B
Seasonal Stability Classes for Whitehaven Coal Mine, Canyon Extension

APPENDIX C

Site Plan of Scenario 2 – Whitehaven Coal Mine, Canyon Extension

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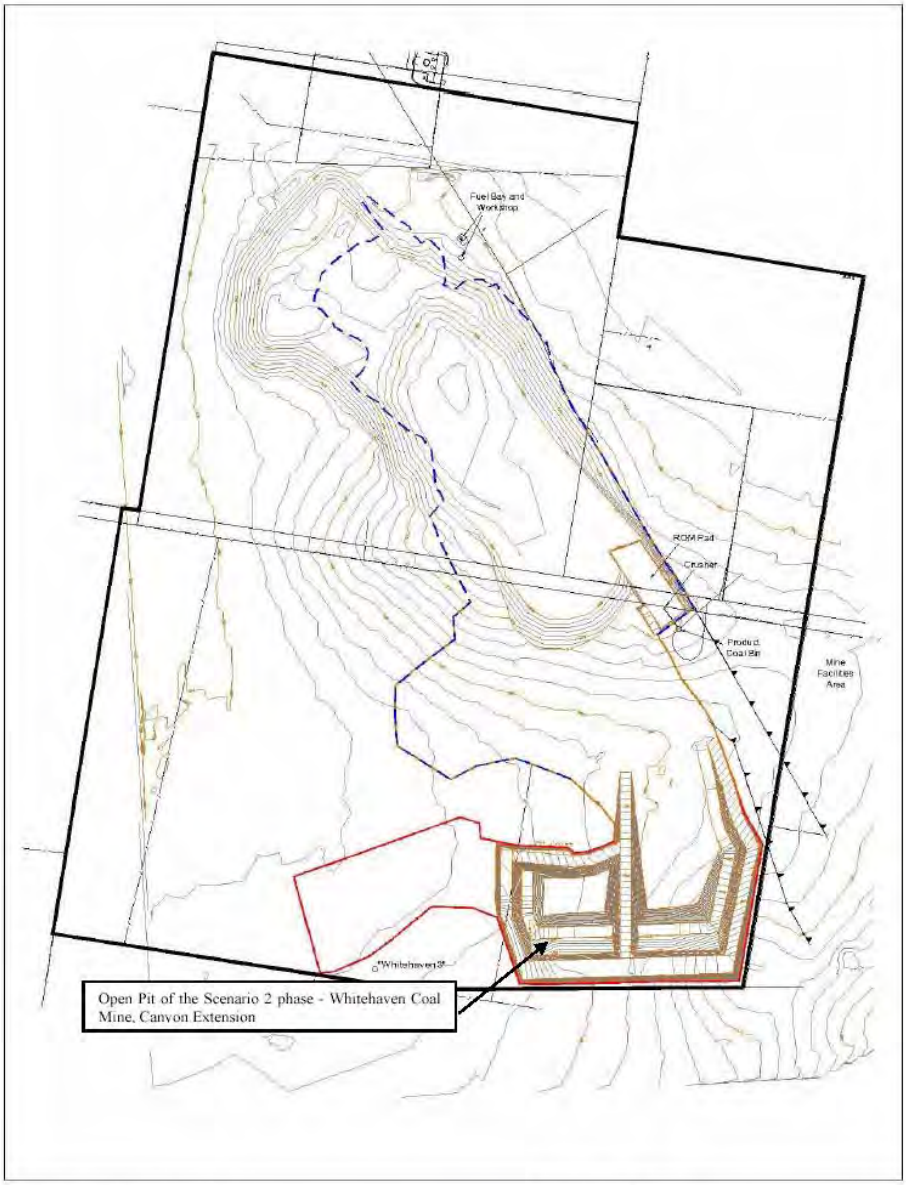
Site Plan of Scenario 2 – Whitehaven Coal Mine, Canyon Extension



SCALE 1:20 000

0 200 400 600 800 1000 m

REFERENCE
Mining Lease Boundary
Limit of Previous Open Cut Development
Limit of Proposed Canyon Development

Richard Heggie Associates Pty Ltd
(10-3785R1D2.doc) 17 December 2004

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APPENDIX D

Atmospheric Emissions Inventory

	TSP Emission Factor	PM_{10} Emission Factor	Emission Factor Units	Throughput (tonnes per hour)	Number of Hectares of stockpile	Average number of kilometres per return trip	Working days available	Working Hours Per Day	TSP Emission Rate (mg/s)	PM_{10} Emission Rate (mg/s)	TSP Emission Flux (mg/s/m²)	PM_{10} Emission Flux (mg/s/m²)	x-coord	y-coord	width	length	height
1. Extraction																	
Blasting	311.55	162.01	kg/blast	N/A	N/A	N/A	50	1	5927.5	42751.8	0.9879	7.1253	222609	166482	50	120	12
Excavator A - Hitachi 3600	0.0003	0.0001	kg/t	501.00	N/A	N/A	300	24	14.5	15.9	N/A	N/A	223032	166333	3	5	4
Excavator B - Komatsu PC 1250	0.0273	0.0131	kg/t	136.70	N/A	N/A	300	15	426.3	473.7	N/A	N/A	222559	166326	3	5	4
Bulldozer A - CAT D11	10.7223	2.2742	kg/hr	N/A	N/A	N/A	300	24	1224.0	600.1	N/A	N/A	222576	166491	4	4	2
Bulldozer B - CAT D10	10.7223	2.2742	kg/hr	N/A	N/A	N/A	300	24	1224.0	600.1	N/A	N/A	222592	166330	4	4	2
Carry Dozer - CAT D11	0.5739	1.4054	kg/hr	N/A	N/A	N/A	300	24	65.5	370.9	N/A	N/A	222917	166396	4	4	2
Grader - CAT 14G	0.5238	0.1913	kg/VKT	N/A	N/A	0.68	300	9	40.7	34.3	N/A	N/A	223086	166521	3	10	1
Scraper (topsoil, elevated)	0.0108	0.0026	kg/VKT	N/A	N/A	0.30	300	15	0.4	0.2	N/A	N/A	222394	166530	6	10	1
Truck Overburden Dumping (day)	0.0120	0.0043	kg/t	501.00	N/A	N/A	300	15	205.9	170.6	N/A	N/A	222888	166484	2	4	4
Truck Overburden Dumping (night)	0.0120	0.0043	kg/t	501.00	N/A	N/A	300	9	205.9	170.6	N/A	N/A	223098	166668	2	4	4
Haul Truck Movement - CAT 785 (day)	0.4740	0.1388	kg/VKT	N/A	N/A	2.20	300	15	121.2	82.1	N/A	N/A	223003	166919	2	4	4
Haul Truck Movement - CAT 785 (day)	0.4740	0.1388	kg/VKT	N/A	N/A	2.20	300	15	121.2	82.1	N/A	N/A	223066	166451	2	4	4
Haul Truck Movement - CAT 785 (night)	0.4740	0.1388	kg/VKT	N/A	N/A	0.68	300	9	74.9	50.7	N/A	N/A	223108	166660	2	4	4
Haul Truck Movement - CAT 777 (day)	0.4351	0.1288	kg/VKT	N/A	N/A	2.76	300	15	38.1	26.1	N/A	N/A	222625	166618	2	4	4
Haul Truck Movement - CAT 777 (day)	0.4351	0.1288	kg/VKT	N/A	N/A	2.76	300	15	38.1	26.1	N/A	N/A	222800	166988	2	4	4
Open Pit Wind Erosion	0.4000	0.2000	kg/ha/hr	N/A	49.27	N/A	N/A	N/A	N/A	N/A	0.0001	0.0001	222394	166530	679	725	-30
Drill Rig (Ingersoll Rand DM45)	0.5900	0.3100	kg/hole	N/A	N/A	N/A	50	2	11.2	81.8	N/A	N/A	222400	166599	2	4	2

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Appendix D. Atmospheric Emissions Inventory

	TSP Emission Factor	PM_{10} Emission Factor	Emission Factor Units	Throughput (tonnes per hour)	Number of Hectares of stockpile	Average number of kilometres per return trip	Working days available	Working Hours Per Day	TSP Emission Rate (mg/s)	PM_{10} Emission Rate (mg/s)	TSP Emission Flux (mg/s/m²)	PM_{10} Emission Flux (mg/s/m²)	x-coord	y-coord	width	length	height
2. Crushing/Processing																	
Crusher	0.0100	0.0040	kg/t	136.70	N/A	N/A	300	15	312.1	151.9	N/A	N/A	222877	167298	3	6	3
Unloading from trucks in ROM area (day)	0.0100	0.0042	kg/t	136.70	N/A	N/A	300	15	312.1	159.5	N/A	N/A	222852	167340	2	4	4
Handling, transfer and conveying	0.0050	0.0020	kg/t	136.70	N/A	N/A	300	15	156.1	75.9	N/A	N/A	222896	167271	2	58	4
Enclosed Conveyor Belt	0.0050	0.0020	kg/t	136.70	N/A	N/A	300	15	46.8	22.8	N/A	N/A	222895	167272	2	2	4
Loading to Trucks	0.0050	0.0020	kg/t	136.70	N/A	N/A	300	15	156.1	75.9	N/A	N/A	222916	167243	5	10	5
Coal Stockpile Wind Erosion	0.4000	0.2000	kg/ha/hr	136.70	0.11	N/A	N/A	N/A	N/A	N/A	0.0222	0.0111	222852	167340	40	125	-8
Front End Loader (CAT 988G)	0.0273	0.0131	kg/t	136.70	N/A	N/A	300	15	852.5	498.7	N/A	N/A	222875	167301	30	30	25
3. Hauling Offsite																	
Haul Truck Movement - CAT 777 (day)	0.4351	0.1288	kg/VKT	N/A	N/A	0.55	300	15	15.2	10.4	N/A	N/A	223047	167170	2	4	4

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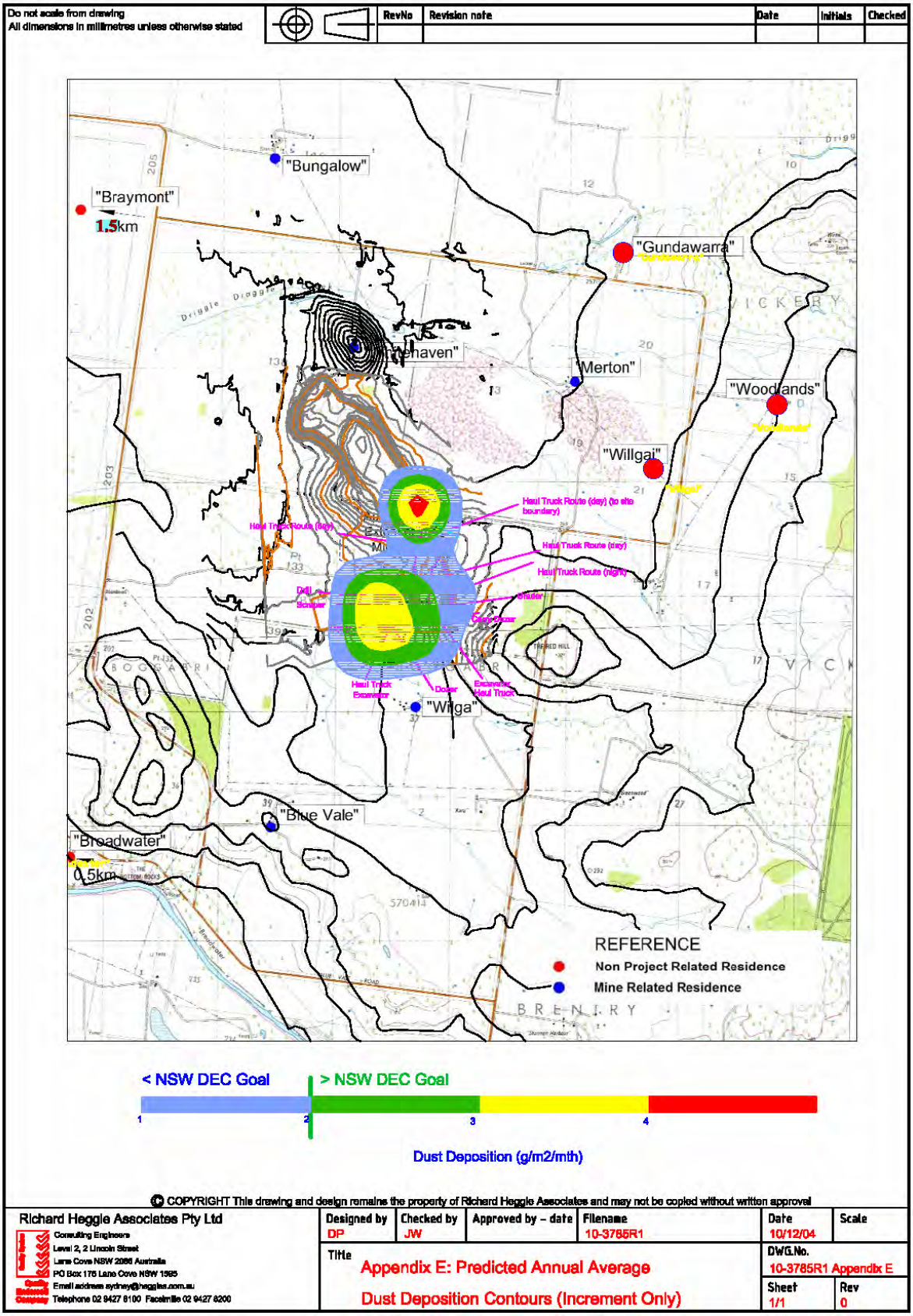
Appendix D. Atmospheric Emissions Inventory

APPENDIX E

Predicted Annual Average Dust Deposition Contours, Scenario 2, Whitehaven Coal Mine, Canyon Extension


Do not scale from drawing
All dimensions in millimetres unless otherwise stated
RevNo
Revision note
Date
Initials
Checked
"Bungalow"
"Braymont"
1.5km
"Gundawarra"
"Merton"
"Woodlands"
"Willgai"
"Wilga"
"Blue Vale"
"Broadwater"
0.5km
Haul Truck Route (day) (to site boundary)
Haul Truck Route (day)
Haul Truck Route (night)
Haul Truck Route (day)
Dozer
Excavator
Haul Truck
REFERENCE
Non Project Related Residence
Mine Related Residence
< NSW DEC Goal
> NSW DEC Goal
1
2
3
4
Dust Deposition (g/m2/mth)
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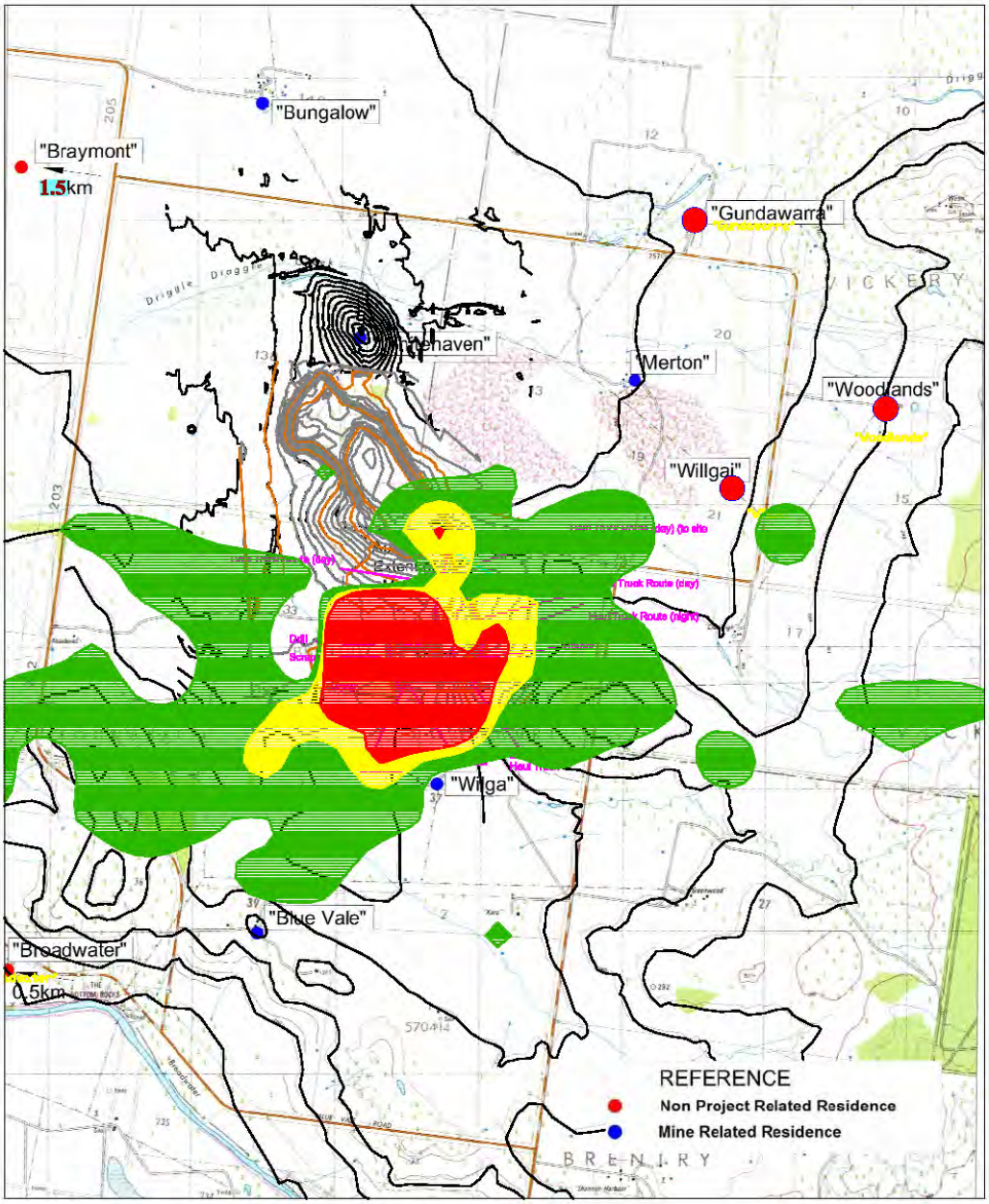
Designed by DP
Checked by JW
Approved by – date
Filename 10-3785R1
Date 10/12/04
Scale
Title
Appendix E: Predicted Annual Average
Dust Deposition Contours (Increment Only)
DWG.No. 10-3785R1 Appendix E
Sheet 1/1
Rev 0

APPENDIX F

Predicted 24-Hour Average PM10 Contours, Scenario 2, Whitehaven Coal Mine, Canyon Extension

Do not scale from drawing
All dimensions in millimetres unless otherwise stated

RevNo	Revision note	Date	Initials	Checked



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Designed by	Checked by	Approved by – date	Filename	Date	Scale
DP	JW		10-3785R1	10/12/04	

Title: Appendix F: Predicted 24-Hour Average PM10 Contours (Background + Increment)

DWG.No. 10-3785R1 Appendix F
Sheet 1/1 Rev 0