10 Air Quality

10.1 Introduction

The Project activities have the potential to generate air emissions that may impact on nearby sensitive receivers. The potential air quality impacts from the Project have been assessed by:

- reviewing legislative requirements and ambient air quality goals;
- describing existing air quality and dispersion meteorology within the Project Site;
- identifying the nearest sensitive receivers;
- air dispersion modelling to predict concentrations of particulate matter at nearest sensitive receivers;
- determining the likelihood for potential air quality impacts through comparison with air quality goals; and
- identifying mitigation measures to assist with the management of the air quality impacts from the Project.

The operation of equipment during construction and operation will also generate combustion products however the quantities of these emissions are expected to be low, and will not result in an exceedance of ambient air quality goals. Accordingly these emissions have not been estimated or modelled as part of this assessment.

10.2 Air Quality Guidelines

The *Environmental Protection Act 1994* provides for the management of the air environment in Queensland. Air quality guidelines are specified by the Environment Protection Agency (EPA) in the Queensland *Environment Protection (Air) Policy 1997* (EPP (Air)).

The current goals for criteria pollutants considered relevant to the assessment of air quality impacts from the Project, as shown in Schedule 1 of the EPP (Air), are as follows:

- PM_{10} maximum 24-hourly average – 150 µg/m^3;
- PM_{10} annual average – 50 µg/m^3; and
- Total Suspended Particulates (TSP) annual average – 90 µg/m^3.

The National Environment Protection Measure (NEPM) for Ambient Air Quality was released by the National Environment Protection Council (NEPC, 2003). The relevant standard for PM_{10} in the NEPM is a PM_{10} maximum 24-hourly average of 50 µg/m^3 (with five allowable exceedances per year). The NEPM has established an advisory reporting standard for $PM_{2.5}$ of 25 µg/m^3 (24-hour averaging period). Although the NEPM is not considered strictly applicable to mining operations, it is recognised that projects should work towards achieving the NEPM goals.

Deposited dust, if present at sufficiently high levels, can reduce the amenity of an area. No formal criteria for dust deposition exist within Queensland, however, the EPA (2003) recommends a nuisance guideline of 120 mg/m^2/day averaged over one month.

The air quality goals for the assessment of impacts from the Project have been based upon the EPP (Air) and NEPM and are presented in **Table 10-1**.

Table 10-1 Air Quality Goals for the Project

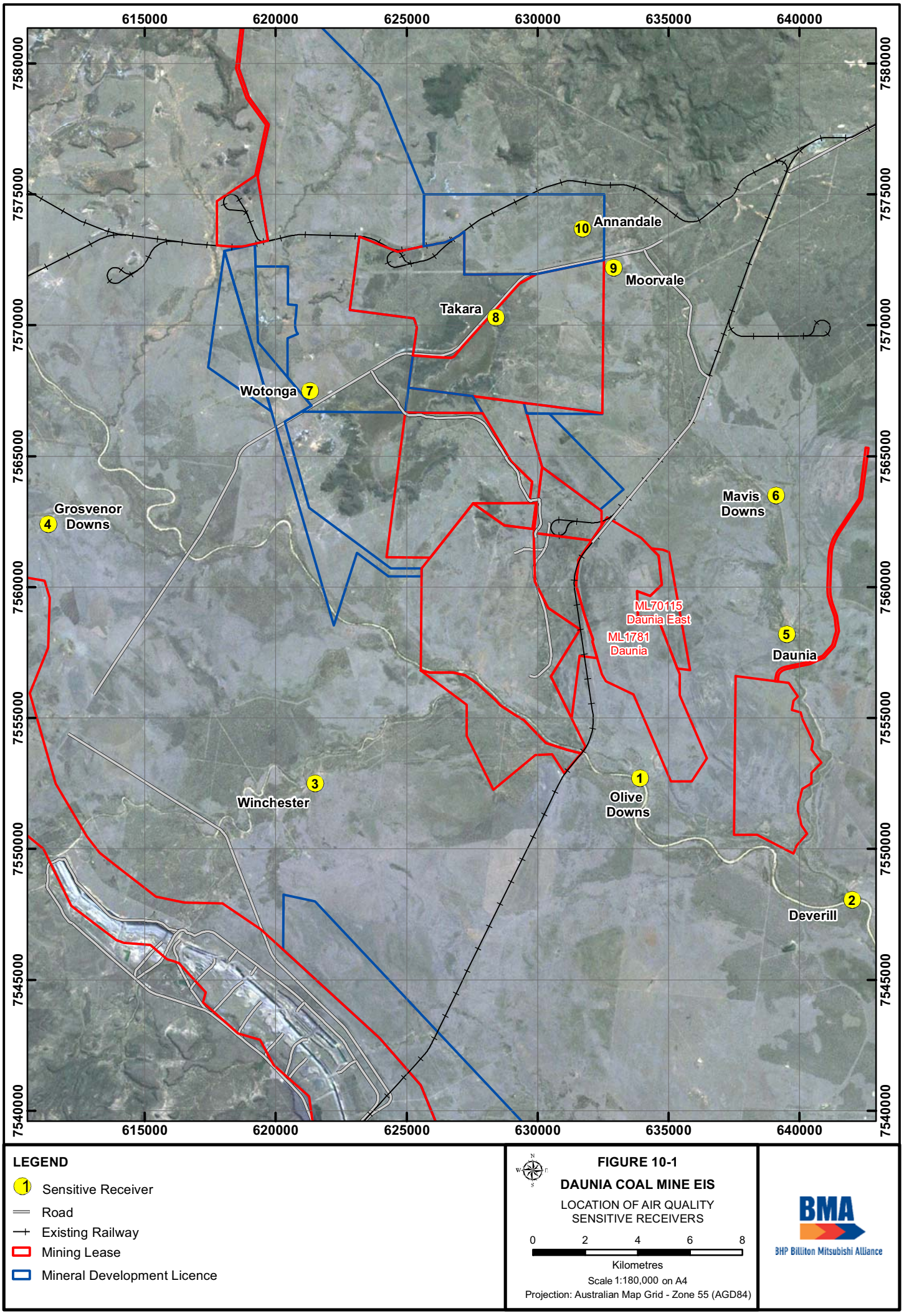
Air Quality Indicator	Aim to achieve	Not to be exceeded
Particles as PM_{10}	50 µg/m^3 (24 hr average)	150 µg/m^3 (24 hr average)
		50 µg/m^3 (annual average)
Total Suspended Particulates (TSP)	-	90 µg/m^3 (annual average)
Dust Deposition	120 mg/m^2/day (30 day average)	-

10.3 Existing Environment

10.3.1 Local Setting and Sensitive Receivers

The Project Site is located in the Bowen Basin approximately 25 km east-southeast of Moranbah and 170 km southwest of Mackay. The land use in the vicinity of the Project Site includes pastoral uses, coal mining and native vegetation. Terrain near the Project Site is relatively flat, with general elevations at the Site sloping from approximately 240 m AHD in the north to approximately 190 m AHD the south.

The nearest sensitive receivers to the Project Site were identified from aerial photography and a site visit. There are a number of homesteads located within 10 km of the Project Site, as presented in **Figure 10-1**.



LEGEND

- 1 Sensitive Receiver
- Road
- Existing Railway
- Mining Lease
- Mineral Development Licence

FIGURE 10-1

DAUNIA COAL MINE EIS

LOCATION OF AIR QUALITY SENSITIVE RECEIVERS

0 2 4 6 8

Kilometres

Scale 1:180,000 on A4

Projection: Australian Map Grid - Zone 55 (AGD84)

BMA BHP Billiton Mitsubishi Alliance

I:\QENV\Projects\QE06520\1800 Spatial\Arc_MXD\Figures\Fig_10-1_Sensitive_Receptors_v4.mxd Produced: 10/10/2008 This figure should be read in conjunction with the data disclaimer at the front of this report.

10.3.2 Climate and Dispersion Meteorology

Meteorological data recorded by the Bureau of Meteorology (BoM) at Moranbah have been reviewed to describe the existing meteorological and climatological influences in the vicinity of the Project Site. **Table 10-2** provides a summary of the temperature, humidity and rainfall data for the Moranbah meteorological station. Graphs of climatic data are presented in **Appendix K.1**.

Moranbah typically has warm days during summer with average maximum daytime temperatures around 34 °C falling to 24 °C during the winter months. Overnight temperatures are generally cool throughout the year and cold during the winter months, with average minimum daily temperatures of 11 °C in July, rising to greater than 21 °C between December and February.

Mean 9 am relative humidity is generally greatest from February to June and lowest from September to December. Mean 3 pm relative humidity is lower than 9 am relative humidity throughout the year, ranging from 30 per cent in September up to 45 per cent in February. The lowest 3 pm relative humidity is from August to November.

Highest rainfall is generally recorded during summer months with monthly rain averaging above 85 mm/month from December to February. Mean monthly rainfall generally drops off in late autumn and winter with average monthly rainfalls less than 40 mm from April till October.

Table 10-2 Climatic Summary for Moranbah (BoM site 034038)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean daily maximum temperature (°C)	34.1	33.3	32.4	29.6	26.6	23.6	23.7	25.4	29.2	32.4	33.2	34.0	29.8
Mean daily minimum temperature (°C)	22.0	21.8	20.3	17.7	14.6	11.2	9.8	11.0	14.0	17.7	19.5	21.1	16.7
Mean 9am air temp (°C)	26.5	25.8	24.8	22.2	19.0	15.4	14.6	16.5	20.5	24.0	25.2	26.3	21.7
Mean 9am relative humidity (%)	69	73	70	72	73	73	69	66	59	59	61	64	67
Mean 3pm air temp (°C)	32.9	32.2	31.4	28.6	25.7	22.7	22.8	24.4	28.2	31.3	32.1	32.8	28.8
Mean 3pm relative humidity (%)	41	45	41	43	44	44	39	36	30	31	34	39	39
Mean monthly rainfall (mm)	95.2	86.8	49.9	38.5	37.8	23.5	16.9	23.7	8.1	37.8	68.9	99.2	583.9
Mean no. of rain days	6.3	5.7	3.6	3.0	2.8	2.1	1.8	1.6	1.3	3.1	4.8	5.7	41.8
Mean no. of clear days	5.5	4.1	7.7	9.9	11.6	13.8	17.0	16.9	17.4	14.4	10.5	7.4	136.2
Mean no. of cloudy days	9.6	10.0	8.0	7.5	7.7	6.6	4.6	4.1	2.3	4.8	6.4	8.5	80.1

Dispersion modelling requires an hourly breakdown of wind speed and direction, and other meteorological parameters such as mixing height and Pasquill-Gifford stability class. The BoM meteorological data for Moranbah, where wind speed and direction are recorded three times daily, are not sufficient for dispersion modelling purposes. Therefore, TAPM version 3 was used to generate a meteorological file for the Project Site for 2004 to input into the Ausplume air dispersion model. TAPM is a three-dimensional prognostic meteorological and air pollution model that produces detailed fields of hourly estimated temperature, winds,

pressure, turbulence, cloud cover and humidity at various levels in the atmosphere as well as surface solar radiation and rainfall.

The all hours windrose of the TAPM generated meteorological file for Daunia in 2004 is presented in **Figure 10-2.** Windroses for Daunia by time of day and by season are presented in **Appendix K.2**. The general features of the wind environment in the vicinity of the Project Site are:

- wind directions vary from all directions but are predominantly from the east and northeast;
- wind speeds are fairly light, generally less than 5 m/s;
- winds in the morning are generally light from the southeast transitioning to stronger easterlies during the day;
- winds at night are light from the north-eastern quadrant;
- during summer and spring, winds are predominantly from the northeast; and
- during autumn winds are from the east, and during winter winds vary between southerlies and easterlies.

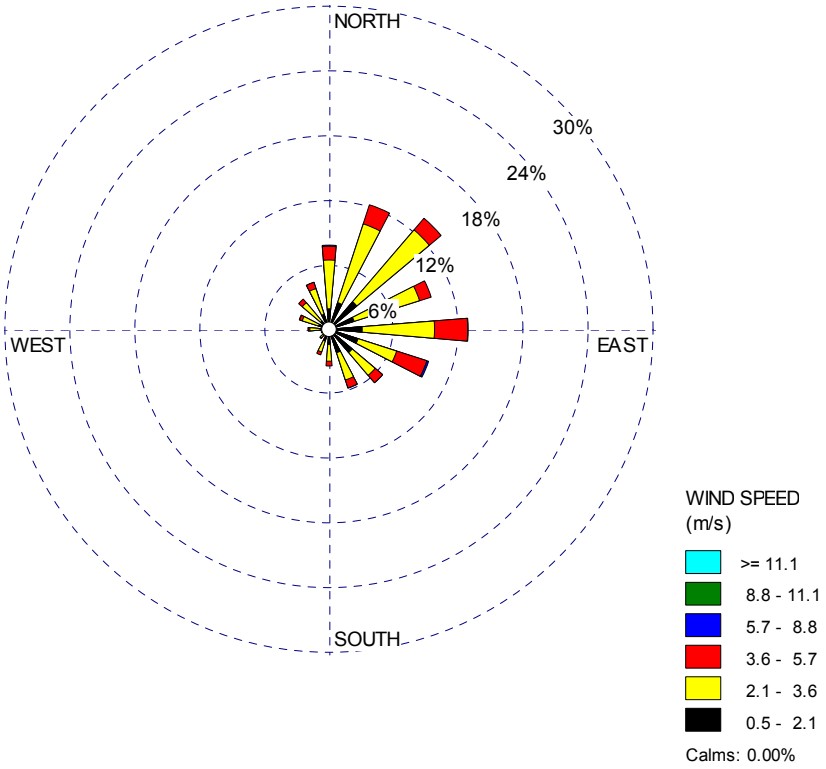


Figure 10-2 All Hours Windrose for Daunia (generated with TAPM)

10.3.3 Existing Air Quality

The following existing sources contribute to particulate emissions in the vicinity of the Project Site:

- nearby coal mines including Poitrel, Millennium, Carborough Downs and Moorvale;
- dust generated from agricultural activities including cropping;
- smoke from bushfires and controlled burns; and
- motor vehicle emissions from roads.

BMA monitored PM_{10} concentrations in the vicinity of the Project Site at Olive Downs and Winchester Downs from April 2007 to August 2008. The location of these monitoring sites is shown on **Figure 10-1**. Daily PM_{10} concentrations at each site are presented in **Figure 10-3**, excluding anomalous data recorded during periods of high rainfall and flooding when monitoring equipment could not be serviced or calibrated. The maximum 24 hour average PM_{10} concentrations recorded were 69 µg/m^3 at Winchester Downs and 94 µg/m^3 at Olive Downs. These PM_{10} concentrations are below the ambient air quality goal in the EPP (Air) (150 µg/m^3) but exceed the NEPM (50 µg/m^3). The average PM_{10} concentration for the monitoring period was 10 µg/m^3 for both Olive Downs and Winchester Downs, well below the EPP (Air) goal of 50 µg/m^3. The 95th percentile PM_{10} concentration recorded was 20 µg/m^3 at Winchester Downs and 19 µg/m^3 at Olive Downs. For the purposes of this assessment, the 95th percentile and average PM_{10} concentration recorded at Winchester Downs have been selected as the background 24 hour and annual average PM_{10} concentrations at the nearest sensitive receiver locations.

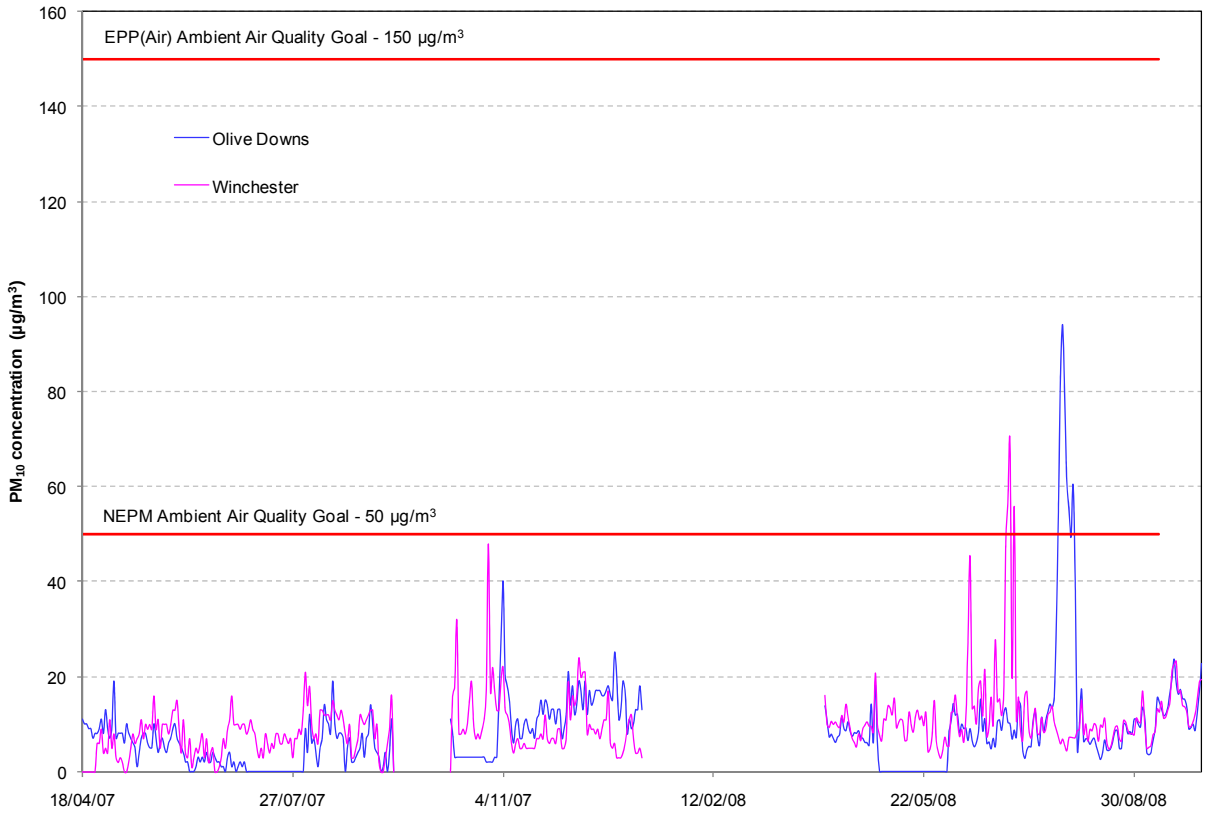


Figure 10-3 PM10 concentrations (24 hour average) recorded at Olive Downs and Winchester Downs

BMA has recorded dust deposition rates at Olive Downs and Winchester Downs from May 2007 to the present (April 2008). This period was after operations at the nearby Poitrel Mine had commenced. The dust depositions recorded from May 2007 to April 2008 at Olive Downs and Winchester Downs are presented in **Table 10-3**. The average dust deposition rates recorded were 153 mg/m^2/day at Olive Downs and 138 mg/m^2/day at Winchester Downs. The high deposition rate of 353 mg/m^2/day recorded at Olive Downs in September 2007 and 403 mg/m^2/day recorded at Winchester Downs in March 2008, may be due to localised sources. The high deposition rates recorded in May 2007 and January 2008 at both Olive Downs and Winchester Downs may be the result of a regional source. The average dust deposition rate recorded was less than the nuisance guideline of 120 mg/m^2/day, but the guideline was exceeded on a number of occasions at both monitoring sites. Given the prevailing winds at the Project Site (refer to **Figure 10-2**), operations at the Poitrel Mine are unlikely to be contributing to the dust deposition rates recorded at Olive Downs. Typically, the background dust deposition rates recorded in the Bowen Basin are often more than the nuisance guideline due to regional sources such as dust storms and localised sources such as agricultural activities. For the purposes of this assessment, a background dust deposition rate of 145 mg/m^2/day has been assumed to apply at all nearest sensitive locations.

Table 10-3 Dust deposition rates (mg/m^2/day) at Olive Downs and Winchester Downs

Month	Monthly Dust Deposition Rates	
	Olive Downs	Winchester Downs
May 2007	147	213
June 2007	67	120
July 2007	-	-
August 2007	47	77
September 2007	353	43
October 2007	93	83
January 2008	187	183
February 2008	257	40
March 2008	77	403
April 2008	253	77

The annual average TSP concentration has been assumed to be double the annual average PM_{10} concentration. The background particulate levels adopted for the purposes of this assessment are presented in **Table 10-4**.

Table 10-4 Adopted background particulate levels

Air Quality Indicator	Averaging Time	Value
Particles as PM_{10}	24 hour	20 µg/m^3
	Annual	10 µg/m^3
Total Suspended Particulates (TSP)	Annual	20 µg/m^3
Dust deposition	Monthly	145 mg/m^2/day

10.4 Potential Impacts

The air quality impact assessment investigated the potential impacts of concentrations of PM_{10} and TSP and the dust deposition rates for one operating scenario. One scenario was selected as a representative worst case for construction and operation of the Project, based on the rates of ROM coal and overburden removal, haul distances and proximity to sensitive receivers. The assessed operating scenario was selected from five operating scenarios, which are presented in **Table 10-5**. The year 20 operating scenario was selected as it was considered to have the highest potential for air quality impacts as the mining operations will be closest to sensitive receivers, and the haul distances from the pit to the coal handling and processing plant (CHPP) will be greatest.

Table 10-5 Mining Rates and Haul Distances for Five Operating Scenarios

Mining Operations	Year 1	Year 5	Year 10	Year 15	Year 20
Overburden removal (10^6 bcm/yr)	9.5	38.1	38.4	37.2	38.7
Run-of-mine (ROM) coal (Mt/yr)	0.8	5.8	5.9	4.3	5.9
Return haul distance to CHPP(km)	8	8	12	8	16

10.4.1 Sources of Air Emissions

The sources of particulate emissions from the Project will occur where material is moved in significant quantities, such as the following operations typical of open-cut coal mines: drilling and blasting, extraction by shovel-and-truck operations, bulldozing, loading to trucks, dumping to stockpiles, loading from stockpiles, and wind erosion of stockpiles and exposed areas. Wheel generated dust from the transport of coal and overburden around the site is also a significant source of dust. Detailed estimates of the particulate emissions from the mining activities specific to the Project are shown in **Section 10.4.2**.

Particles with equivalent diameters less than 2.5 µm ($PM_{2.5}$) will also be generated from activities associated with the Project however, at this stage, there is no ambient air quality goal for PM2.5 which is applies on a project specific basis. Dust monitoring around open cut coal mining activities, has shown that coarse particles (those greater than 2.5 µm) dominate the particulate size distribution. Specifically, measurement data (Smith 2004) has shown approximately 40 per cent of TSP is less than 10 µm and approximately 4per cent of TSP is less than 2.5 µm thus the emission of $PM_{2.5}$ from the Project will be significantly less than the emission of PM_{10}. Due to the low emission rate, the concentrations of $PM_{2.5}$ at the nearest sensitive receivers are not expected to be significant and have not been modelled for this assessment.

10.4.2 Emissions Estimation

The main dust generating activities were identified and dust emissions from these sources were estimated. The operational information which has been used as the basis for the estimations is presented in **Table 10-6.**

Table 10-6 Mine information for year 20 operations of the Project

Parameter		Value
Production rates	Coal production rate	4 Mt/y
	Run-of-mine (ROM) coal rate	5.6 Mt/y
	Overburden removed by shovel-and-truck operations	27 Mbcm/y
Blasting Overburden	Area	20,000 m^2
	Depth	18 m
	Blasting frequency	1 per week
Return haul distances	Overburden	3 km
	Coal from pit to CHPP	16 km
Exposed areas	Dump 1	25 ha
	Dump 2	25 ha
	Coal stockpile	10 ha

Dust emissions were estimated on an annual basis using emission factors in the Emission Estimation Technique Manual for Mining version 2.3 (NPI, 2001) and the AP-42 Compilation of Air Pollutant Emission Factors (US EPA, 1998). The emission rates (in grams per second) from the main dust generating activities are presented in **Table 10-7**.

A proportion of particulate emissions from sources in the open pit remains in the pit as a result of gravitational settling. The escape fraction (in per cent) for each particle size category is calculated, as in the US EPA Industrial Source Complex model, from the equation:

$$\varepsilon_i = 1 / (1 + v_g / (\alpha.U_r))$$

where:

- v_g is the gravitational settling velocity of particle fraction i (m/s);
- U_r is the approach wind speed at 10 m (m/s); and
- α is an experimentally-derived proportionality constant (Thompson, 1994).

The escape fractions for TSP and PM_{10} are 58 per cent and 92 per cent respectively. The escape fractions have been included in the estimated emissions presented in **Table 10-7**.

Table 10-7 Summary of Dust Emissions for Mining Operations in Year 20

Mine Operation	TSP (g/s)	PM_{10} (g/s)	Dust Control
Topsoil removal, transport, dumping	1.17	0.38	Assumes no control
Excavator/ truck loading overburden	0.413	00.313	Assumes no control
Dozer on overburden	2.0	0.73	Assumes no control
Hauling overburden	58.9	13.7	75% control, watering haul roads
Trucks dumping overburden	35.1	12.6	Assumes no control
Drilling	0.075	0.039	70% control, water injection
Blasting	0.62	0.32	Assumes no control
Excavator on coal	1.997	1.517	Assumes no control
Dozers on coal	8.8	4.5	Assumes no control
Hauling coal	21.2	5.0	75% control, watering haul roads
Trucks dumping coal	1.9	0.8	Assumes no control
Conveying coal	0.062	0.029	Assumes no control
Crushing coal	2.239	0.298	95% control with enclosure
Reclaiming coal	3.8	1.65	Assumes no control
Rail loading	0.015	0.006	30% control with enclosure and spray bars
Road grading	0.3	0.2	25% control with watering haul roads
Wind erosion	6.7	3.3	Assumes no control
TOTAL	**145.2**	**45.3**	

10.4.3 Modelling Methodology

The Ausplume version 6.0 dispersion model has been used to predict ground level concentrations of PM_{10}, and TSP, and dust deposition rates, within a 15 km x 16.5 km receptor grid surrounding the Project Site. The grid receptor spacing is 300 m. Particulate concentrations and dust deposition rates have been predicted for ten discrete receivers to assess air quality impacts at residences close to the mine. The TAPM generated meteorological data file described previously (refer **Section 10.3.2**), was used. Impacts at sensitive receivers are compared to the goals for ambient air quality shown in **Table 10-1**.

The Ausplume dispersion modelling options assumed as part of this air quality assessment include:

- Irwin rural wind profile exponents;
- average roughness length of 0.2 m;
- terrain of the study area has been assumed to be flat;
- emissions were modelled as 13 volume sources across the Project site;
- emissions were assumed to be emitted 24 hours per day for the whole year;
- annual average dust deposition rates were divided by 366 to determine average daily dust deposition rates;
- windblown dust was assumed to be a source of emissions 24 hours per day;
- dry depletion options with particle size distribution information based on estimated TSP and PM_{10} emissions; and
- particle density of 2.39 g/cm^3, particle size for TSP and PM_{10} is 20 µm and 10 µm respectively and mass fraction of TSP and PM_{10} is 64 per cent and 36 per cent respectively.

10.4.4 Modelling Results

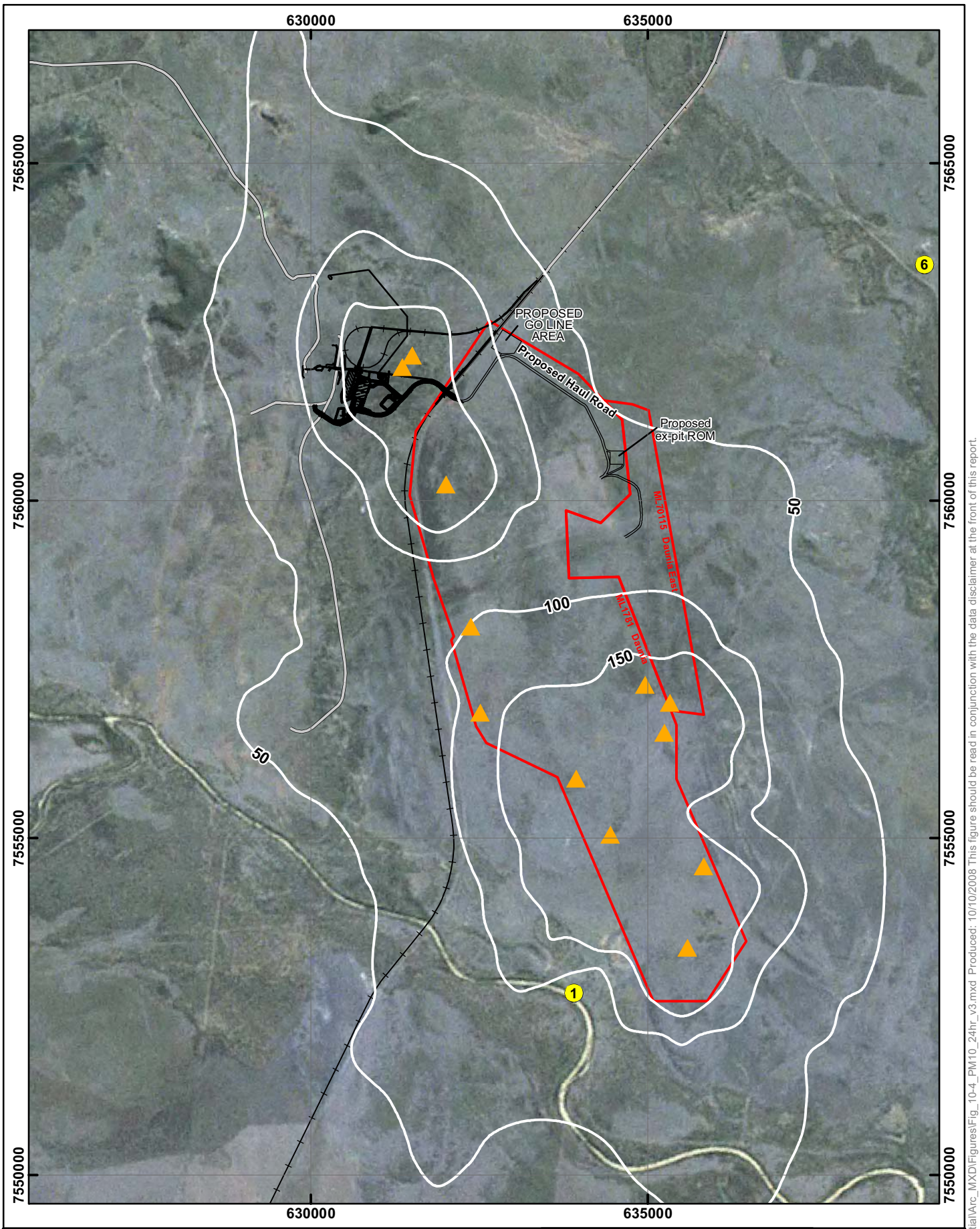
This section outlines the predicted concentrations of particulate matter and dust deposition rates for Year 20 operation from the Project. The predicted increase in concentrations as a result of the Project and the cumulative impact (including background concentration) is presented in the tables below. Contour plots presented below indicate the particulate matter concentrations and dust deposition rates due to dust emissions from the proposed mining activities.

10.4.4.1 Maximum PM_{10} Concentrations (24 hours average)

The maximum predicted 24 hour PM_{10} concentrations at nearest sensitive receivers for Year 20 operations of the Project are presented in **Table 10-8**. The cumulative concentrations (including an assumed background of 20 µg/m^3) are also presented in **Table 10-8**. All concentrations at sensitive receivers are below the ambient air quality goal of 150 µg/m^3 specified in the EPP (Air). Contour plots of maximum PM_{10} concentrations (24 hour average) from mining operations in Year 20 are presented in **Figure 10-4**.

Table 10-8 Predicted maximum PM_{10} concentrations (24 hour average) at nearest residences

Location	Description	PM_{10} Concentration ($\mu g/m^3$)	
		Predicted increase	Including background
1	Olive Downs	59	79
2	Deverill	6	26
3	Winchester Downs	4	24
4	Grosvenor Downs	2	22
5	Daunia	12	32
6	Mavis Downs	7	27
7	Wotonga	4	24
8	Takara	14	34
9	Moorvale	5	25
10	Annandale	3	23



LEGEND

- 1 Sensitive Receiver
- Dust Sources
- Proposed Mine Infrastructure
- Road
- Existing Railway
- Mining Lease

FIGURE 10-4

DAUNIA COAL MINE EIS

MAXIMUM 24 HOUR PM_{10} CONCENTRATIONS ($\mu g/m^3$)

0 1 2 3

Kilometres

Scale 1:75,000 on A4

Projection: Australian Map Grid - Zone 55 (AGD84)

BMA

BHP Billiton Mitsubishi Alliance

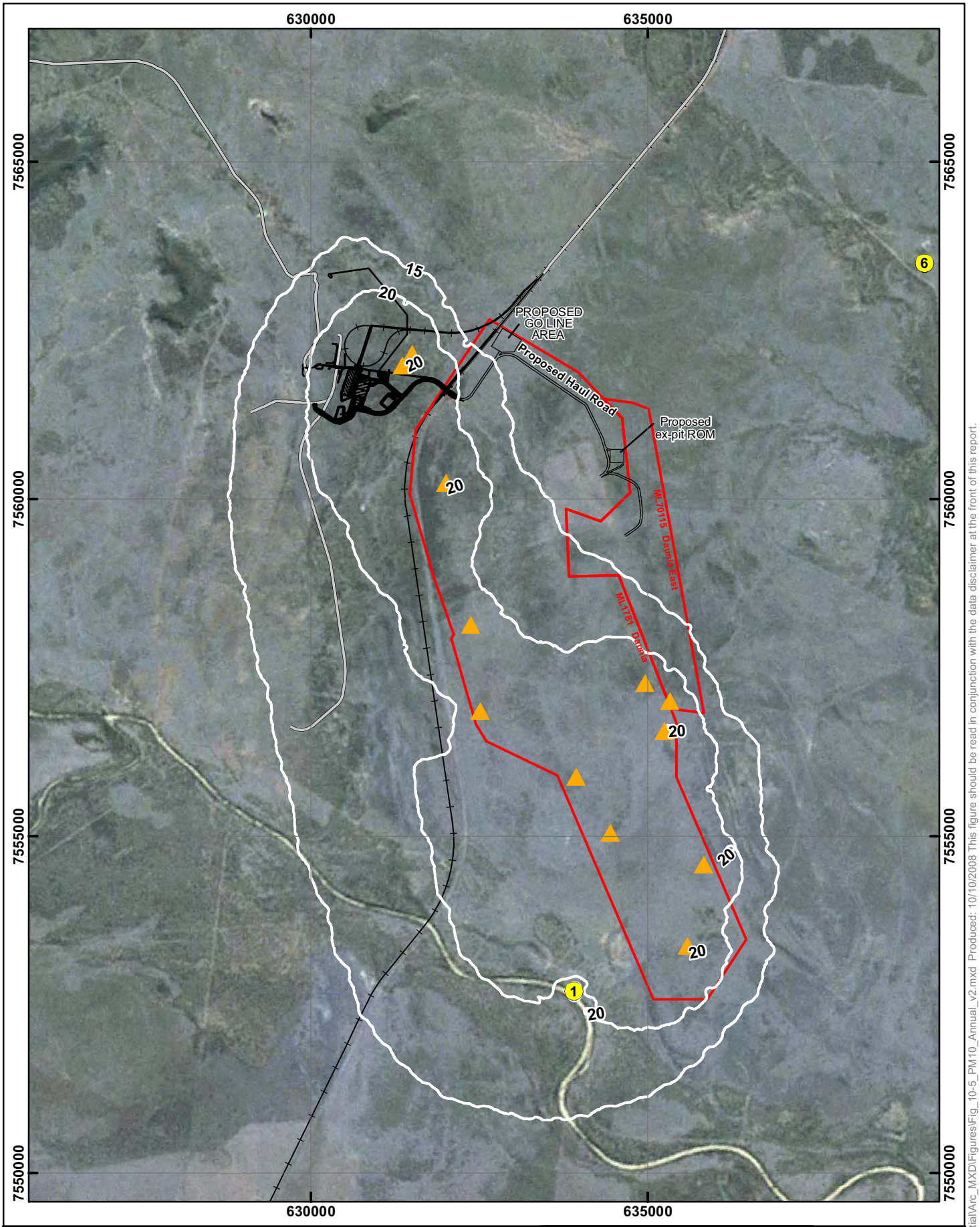
I:\QENV\Projects\QE06520\1800 Spatial\Arc_MXD\Figures\Fig_10-4_PM10_24hr_v3.mxd Produced: 10/10/2008 This figure should be read in conjunction with the data disclaimer at the front of this report.

10.4.4.2 PM_{10} Concentrations (annual average)

The annual average PM_{10} concentrations at nearest sensitive receivers for Year 20 operations of the Project are presented in **Table 10-9**. The cumulative concentrations (including a background of 10 µg/m^3) are also presented in **Table 10-9**. All concentrations at sensitive receivers are well below the ambient air quality goal of 50 µg/m^3 in the EPP (Air). A contour plot of PM_{10} concentrations (annual average) from mining operations in Year 20 are presented in **Figure 10-5**.

Table 10-9 Predicted PM_{10} concentrations (annual average) at sensitive receivers

Location	Description	PM_{10} Concentration (µg/m^3)	
		Predicted increase	Including background
1	Olive Downs	11	21
2	Deverill	0.3	10.3
3	Winchester Downs	1	11
4	Grosvenor Downs	0.2	10.2
5	Daunia	0.5	10.5
6	Mavis Downs	0.3	10.3
7	Wotonga	0.3	10.3
8	Takara	0.5	10.5
9	Moorvale	0.2	10.2
10	Annandale	0.1	10.1



LEGEND

- 1 Sensitive Receiver
- Dust Sources
- Proposed Mine Infrastructure
- Road
- Existing Railway
- Mining Lease

FIGURE 10-5
DAUNIA COAL MINE EIS
ANNUAL AVERAGE PM_{10} CONCENTRATIONS ($\mu g/m^3$) for YEAR 20 OPERATIONS

0 1 2 3
Kilometres
Scale 1:75,000 on A4
Projection: Australian Map Grid - Zone 55 (AGD84)

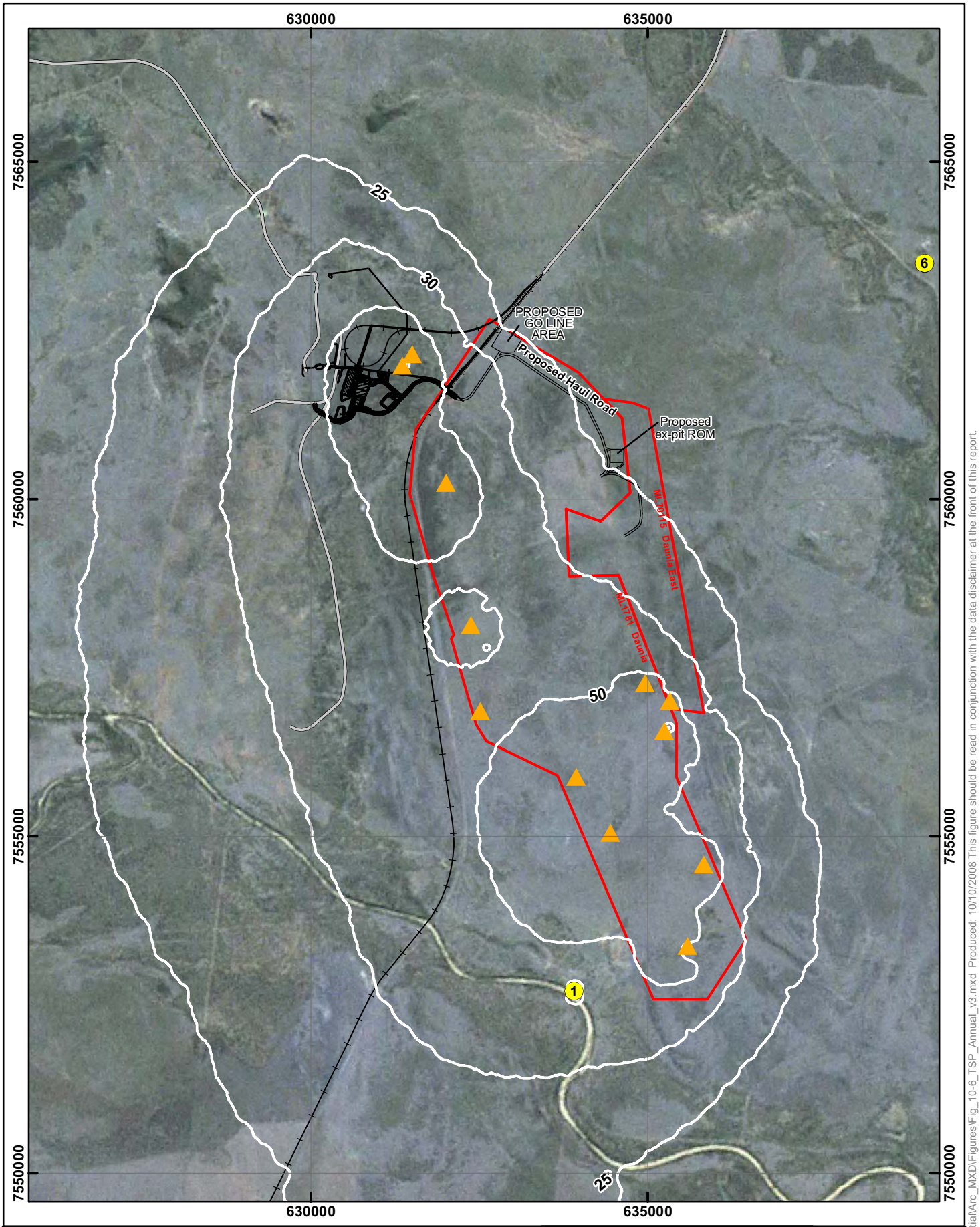
BMA
BHP Billiton Mitsubishi Alliance

10.4.4.3 TSP Concentrations (annual average)

The average annual TSP concentrations at nearest sensitive receivers for Year 20 operations of the Project are presented in **Table 10-10**. The cumulative concentrations (including a background of 20 µg/m^3) are also presented in **Table 10-10**. All concentrations at sensitive receivers are below the ambient air quality goal of 90 µg/m^3 in the EPP (Air). A contour plot of TSP concentrations (annual average) from mining operations in Year 20 is presented in **Figure 10-6**.

Table 10-10 Predicted TSP concentrations (annual average) at sensitive receivers

Location	Description	TSP Concentration (µg/m^3)	
		Predicted increase	Including background
1	Olive Downs	18	38
2	Deverill	1	21
3	Winchester Downs	2	22
4	Grosvenor Downs	0.5	20.5
5	Daunia	1	21
6	Mavis Downs	1	21
7	Wotonga	1	21
8	Takara	1	21
9	Moorvale	0.5	20.5
10	Annandale	0.4	20.4



LEGEND

- 1 Sensitive Receiver
- Dust Sources
- Proposed Mine Infrastructure
- Road
- Existing Railway
- Mining Lease

FIGURE 10-6
DAUNIA COAL MINE EIS
ANNUAL AVERAGE TSP
CONCENTRATIONS ($\mu g/m^3$) FOR
YEAR 20 OPERATIONS

0 1 2 3
Kilometres
Scale 1:75,000 on A4
Projection: Australian Map Grid - Zone 55 (AGD84)

BMA
BHP Billiton Mitsubishi Alliance

I:\QENV\Projects\QE06520\1800 SpatialArc_MXD\Figures\Fig_10-6_TSP_Annual_v3.mxd Produced: 10/10/2008 This figure should be read in conjunction with the data disclaimer at the front of this report.

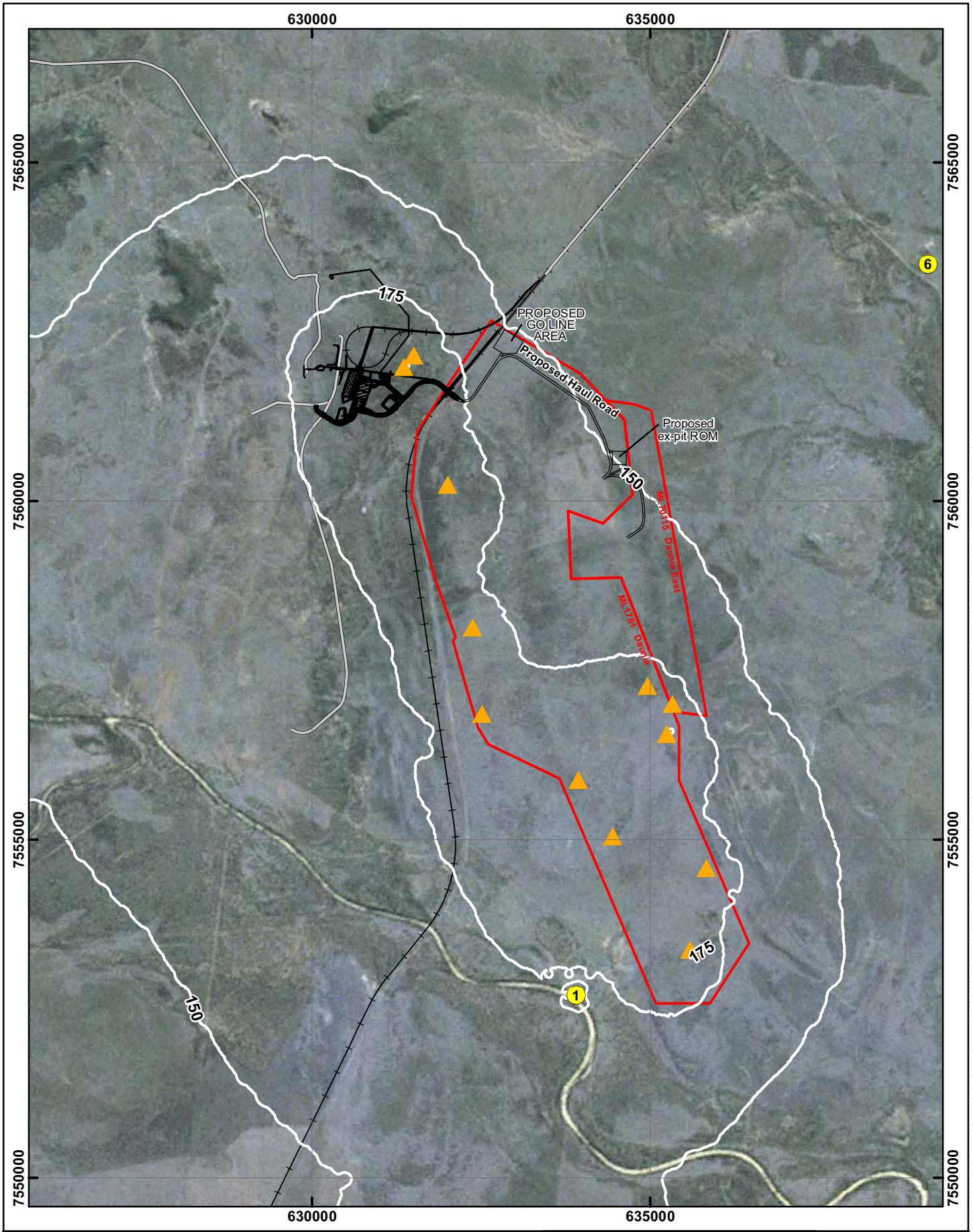
10.4.4.4 Dust Deposition Rates (annual average)

The average dust deposition rates at nearest sensitive receivers for Year 20 operations of the Project are presented in **Table 10-11**. A contour plot of average dust deposition rates from mining operations in Year 20 is presented in **Figure 10-7**.

The predicted dust deposition rate at Olive Downs of 171 mg/m^2/day is more than the guideline of 120 mg/m^2/day. The average background dust deposition rate (145 mg/m^2/day) is already above the guideline level. The predicted increase dust deposition rate due to mining is less than a quarter of the existing average background level.

Table 10-11 Predicted dust deposition rate (annual average) at sensitive receivers

Location	Description	Dust Deposition Rates (mg/m^2/day)	
		Predicted increase	Including background
1	Olive Downs	26	171
2	Deverill	1	146
3	Winchester Downs	2	147
4	Grosvenor Downs	1	146
5	Daunia	1	146
6	Mavis Downs	1	146
7	Wotonga	1	146
8	Takara	1	146
9	Moorvale	1	146
10	Annandale	0.4	145.4



LEGEND

- 1 Sensitive Receiver
- Dust Sources
- Proposed Mine Infrastructure
- Road
- Existing Railway
- Mining Lease

FIGURE 10-7
DAUNIA COAL MINE EIS
ANNUAL AVERAGE DUST DEPOSITION RATES (mg/m^2/day) FOR YEAR 20 OPERATIONS

0 1 2 3
Kilometres
Scale 1:75,000 on A4
Projection: Australian Map Grid - Zone 55 (AGD84)

BMA
BHP Billiton Mitsubishi Alliance

I:\QENV\Projects\QE06520\1800 Spatial\Arc_MXD\Figures\Fig_10-7_Dust-DepositionYr20_v2.mxd Produced: 10/10/2008 This figure should be read in conjunction with the data disclaimer at the front of this report.

10.4.5 Discussion

All mathematical models of airborne pollutant dispersion are simplifications of reality. Ausplume is a Gaussian plume model that is accepted by the EPA for the majority of regulatory applications.

The following factors should be considered when interpreting the air quality assessment:

- the mining scenario assessed is a snapshot of typical activities that could be expected to occur for Year 20 operations which is the anticipated worst case scenario;
- actual emission rates may differ from the estimates in **Table 10-7**;
- emission factors are generally long-term averages, whereas actual emissions will vary on a short-term time scale;
- estimated dust emission rates are based on an assumption that dust emission controls have been utilised on many of the dust emitting processes as outlined in **Table 10-7**; and
- dispersion models are based on a number of assumptions about regional homogeneity of winds and surface conditions.

10.4.6 Mitigation Measures

The following dust mitigation measures will be implemented to reduce the potential for air quality impacts:

- exposed areas (particularly haul roads) will be watered during operations as required;
- provide dust suppression sprays at locations in coal handling facilities that produce excessive dust (e.g. crushers);
- speed limits for light vehicles on unsealed roads will be limited to a maximum speed of 80 km/hr;
- supervisors and operators will pay particular attention to the management of topsoil stripping such that dust does not become a safety hazard or severe nuisance;
- land disturbance will be restricted to that necessary for the works;
- progressive rehabilitation of disturbed areas will occur including disused roads, overburden dumps and topsoil to reduce the potential for dust generation;
- avoid burning cleared vegetation when wind is blowing towards sensitive receivers;
- all exposed coal faces in the final voids will be covered during final rehabilitation to prevent spontaneous combustion;
- any spontaneous combustion of coal material anywhere on the Project Site will be extinguished or prevented through rehabilitation;
- all complaints about dust will be investigated promptly and appropriate action taken to reduce dust nuisance; and
- a register of dust complaints will be maintained.

Ongoing dust deposition monitoring will be undertaken at Olive Downs to detect if the mine is generating potential nuisance impacts. Consultation with the landholder and implementing dust mitigation measures should assist in reducing the potential for dust nuisance.

10.5 Summary

This section has assessed the air quality impacts of the Project. Ausplume was used to predict PM_{10} and TSP concentrations and dust deposition rates at sensitive receivers for Year 20 of mining operations. The predicted PM_{10} and TSP concentrations were below ambient air quality goals in EPP (Air). Deposited dust has the potential to generate some nuisance impacts at Olive Downs. Ongoing dust deposition monitoring will be undertaken to detect if the mine is generating potential nuisance impacts. Mitigation measures will be implemented to reduce the potential for air quality impacts at nearest sensitive receivers.