13 AIR QUALITY

13.1 INTRODUCTION

This chapter examines ambient air quality, potential impacts to air quality, and mitigation and management measures. A detailed air quality technical report is presented in TR 13-V1.4 Air Quality Assessment of the Wandoan Coal Project (the Project). Note that figures/documents with numbering ending in V1.4 refer to figures/documents contained in Volume 1, Book 4 of the EIS.

13.2 METHODOLOGY OF ASSESSMENT

13.2.1 LEGISLATION AND GUIDELINES

Environmental Protection (Air) Policy

The Environmental Protection (Air) Policy 1997 (EPP(Air)) nominates certain air quality goals that are located near industrial sites and extractive industries. The EPP(Air) goals are therefore applicable to the Project.

National Environment Protection (Ambient air quality) measure

The National Environment Protection Council defines national ambient air quality standards and goals in consultation, and with agreement from, all state governments. These were first published in 1997 in the National Environment Protection (Ambient Air Quality) Measure (NEPM(Air)). The NEPM(Air) standards are used to assess the exposure of large residential populations in urban centres and are, therefore, not applicable to the Wandoan Coal Project.

Guideline - Odour impact assessment from developments

The EPA's odour guideline is contained in a document titled: Guideline Odour Impact Assessment from Developments (EPA 2004) (Odour Guideline).

The Odour Guideline aims to protect odour sensitive places from odour nuisance, and define criteria for assessing odour annoyance

13.2.2 ASSESSMENT CRITERIA

Schedule 1 of the EPP(Air) specifies air quality indicators and goals for Queensland. Indicators and goals that are relevant for this Project are shown in Table 13-1.

Table 13-1 also shows the dust deposition guideline commonly used in Queensland as a benchmark for avoiding amenity impacts due to dust. The dust deposition guideline is not defined in the EPP(Air) and is therefore not enforceable by legislation, but is recommended by the EPA as a design goal and has been adopted for this project.

The criteria for assessing odour annoyance has been selected as the odour annoyance threshold (concentration) for ground level sources from the EPA's odour guideline, as shown in Table 13-1.

Table 13-1: Impact assessment criteria for pollutants

Pollutant	Averaging period	Concentration	Units
Nitrogen dioxide	1-hour	320	µg/m^3
	Annual	62	µg/m^3
Carbon monoxide	8-hour	10,000	µg/m^3
Particulate matter (diameter <10 µm) (PM_{10})	24-hour	150	µg/m^3
	Annual	50	µg/m^3
Total suspended particulates (TSP)	Annual	90	µg/m^3
Dust deposition rate	Annual	120	mg/m^2/day
Odour annoyance threshold	1-hour	1.5	ou

Power station

There are no regulatory air quality limits for gas dual fuel engines in Queensland. The EPA commonly refers to the NSW Clean Air Regulations 2002 which has a stated emission limit of 450 mg/Nm^3 (3% O_2) for a stationary reciprocating internal combustion engine.

13.2.3 BACKGROUND AIR MONITORING

The Wandoan Joint Venture (WJV) commenced monitoring of PM_{10} levels, using a tapered element oscillating microbalance (TEOM), in March 2008 to measure the existing levels of PM10 at the Wandoan Township (TEOM 1 located at Short Street) and on the mine site (TEOM 2 located at Jondale Property) (refer Figure 13-1-V1.3). Dust deposition rates were also measured at both of these locations.

13.2.4 AIR QUALITY MODELLING METHODOLOGY

The air quality assessment was conducted in accordance with leading industry practice techniques for dispersion modelling and emission estimation. Details of the modelling methodology are provided in TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine, with a summary provided below.

- the prognostic model TAPM (developed by CSIRO, version 3) and the diagnostic meteorological model CALMET (developed by EarthTec, version 6) were used in conjunction with site specific meteorological data to develop a 3-dimensional windfield representing wind flows in the region. (Refer Attachment C of TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine for model details)
- the dispersion model CALPUFF (developed by EarthTec, version 6) and the regulatory dispersion model Ausplume (developed by the Victorian EPA) were used in the assessment of ground-level concentrations of pollutants and odour due to the mine, power station and the upgraded Wastewater Treatment Plant
- emission factors for dust emissions from the mine were calculated based on emission factors published by the USEPA in their AP-42 documents and in the National Pollutant Inventory Handbooks

- emission rates of air pollutants from the power station were calculated from manufacturer specifications and supplementary information supplied by Parsons Brinckerhoff
- mining activities, such as extraction rates of coal and overburden, location of equipment and mining schedule were based on information supplied by Xenith Consulting Pty. Ltd, as detailed in Tables A1 to A5 of TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine
- emission rates of odour from the upgraded Wastewater Treatment Plant (WWTP) were based on sampling of emissions from the existing WWTP and discussions with wastewater treatment plant operations personnel from the Dalby Regional Council.

Background levels

Background levels used are those discussed in Section 13.3.

Mine operations

Air quality impacts were modelled to reflect the dust generating activities from mining activities and disturbed surfaces within the mine lease application area boundaries and gas pipeline construction.

Various scenarios were assessed in terms of potential impacts of dust due to the Project, based on representative years of mine operations over the life of the mine.

The CALMET/CALPUFF meteorological and dispersion modelling system was used to project the average ground level concentrations of 24 hour PM_{10}, and annual PM_{10}, TSP, and dust deposition. Twelve months of modeled meteorological data was used as input for the dispersion model. This encompasses all weather conditions likely to be experienced in the region during a typical year, including worst case scenarios.

Power station

Air quality impacts for two dual fuel gas engine power station scenarios (80MW and 30MW plants as discussed in Section 13-4-1) were modelled. The CALMET/CALPUFF meteorological and dispersion modelling system was used to project the hourly and annual average ground level concentration of nitrogen oxides (NO_x) and carbon monoxide (CO).

For the purpose of this assessment a worst case scenario was applied in relation to the operation of the power station.

Sewage treatment plant

Odour impacts for existing and proposed WWTP scenarios were modelled to reflect the current baseline and the proposed upgrade of the Plant.

The AUSPLUME dispersion model is used to project downwind ground-level concentrations of air contaminants by taking into consideration:

- odour emissions data – odour emission rate and source dimensions
- site specific meteorology
- building wake effects.

For this assessment the air contaminant was odour and ground-level concentrations in odour units (ou) have been projected. While terrain elevation information can be incorporated into the AUSPLUME model and is used for calculating dispersion characteristics from point sources, the model ignores the influence of terrain for area and volume source emissions.

All of the sources input to this model were area sources.

Gas pipeline

A qualitative assessment of the air quality impacts was undertaken in relation to the construction of a gas supply pipeline between the gas fired power station and the Peat-Scotia lateral gas pipeline.

The air quality assessment followed the framework set out in the Environmental Protection (Air) Policy 1997 to achieve the objectives of the *Environmental Protection Act 1994* (EP Act) with regard to Queensland's air environment.

13.3 EXISTING ENVIRONMENT

13.3.1 CLIMATIC CONDITIONS

General details of the climatic conditions were provided in Chapter 7 Climate. Additional meteorological information specifically required for the air quality impact assessment is provided in TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine.

Development of meteorological windfield for dispersion modelling

Whilst there is site specific meteorological data available for the assessment, a three dimensional wind field was required for inclusion in the dispersion modelling of potential impacts from the Project. A coupled approach using the meteorological models TAPM (CSIRO, version 3) and CALMET (Earthtech, version 6) in conjunction with the on-site measurements has been used. Details of this modelling approach are provided in Attachment C of TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine.

13.3.2 AMBIENT AIR QUALITY

The region of Wandoan is primarily rural. There are approximately 380 people living in Wandoan. The Leichhardt Highway is the main transport corridor in the region that links Wandoan with Taroom in the north and Miles in the south. Within the township of Wandoan there is a wastewater treatment plant, a landfill, a saw mill and sale yards. Due to the rural nature of the site the region is likely to experience relatively low levels of nitrogen oxides NOx, carbon monoxide CO, and PM_{10}.

PM_{10}

Figure 13-2-V1.3 presents the 24-hour average concentrations of PM_{10} measured at the Jondale site and at the Wandoan Township for the period March to October. It is noted that on two occasions, 28 April 2008 and 19 September 2008, the levels of PM_{10} were elevated, above 100 µg/m^3. This can be attributed to two dust storms that covered much of the state following the passage of frontal systems. To ascertain a mean 24 hour background PM_{10} statistical characteristics of the data measured at the two monitoring sites was compared with the EPA's Toowoomba monitoring station at Willowburn Oval (refer Table 13-2 and Figure 13-3-V1.3). As the monitoring locations have only been operating for eight months the 95th percentile was chosen as a conservative background value. Therefore this assessment has used a 24 hour PM_{10} concentration of 30 µg/m^3 as a background for the modeling.

To establish a mean annual PM_{10} background the average of the eight months of data was compared with the Willowburn site (refer Table 13-2) The annual average ground-level concentrations of PM_{10}. was determined to be 15 µg/m^3.

Table 13-2: Comparison of measured PM_{10} for Toowoomba, Jondale and Wandoan

Monitoring site	Mean (µg/m^3)	Standard Deviation	Maximum (µg/m^3)	Minimum (µg/m^3)	95th percentile
Toowoomba	15	7	59	4	28
TEOM1 Town	15	11	100	5	25
TEOM2 Jondale	12	12	108	5	28

TSP and dust deposition rate

There are no known measurements of TSP in the region. Previous assessments by Katestone Environmental and standard conversion ratios detailed in the US EPA's Compilation of Air Pollution Emission Factors Volume 1 (AP-42) and in the National Pollutant Inventory (NPI) Handbooks, have found that PM_{10} is usually 50% of the TSP concentration. In accordance with standard industry practice, this ratio has been employed here giving an annual background level of 30µg/m^3 for TSP.

Dust deposition gauges were co-located with the the TEOM's (refer Figure 13-4-V1.3), to provide a baseline from which the estimation of dust deposition was possible. The results of total insoluble solids (mg/m^2/day) for five months of monitoring are presented in Figure 13-4-V1.3. The amounts of deposited dust recorded for the month of July appear quite low, while May is quite high at the Jondale site due to region wide dust storms reported during this month. No statistical analysis is available on the frequency of dust storms in the region other than that they are associated with passage of cold front.

Previous studies conducted in Australia have estimated a background dust deposition level of between 45 and 60 mg/m^2/day for rural areas with existing open cut mining activities and urban areas adjacent to existing coal terminals. Neither of which are comparable to the present situation in Wandoan. The statistical breakdown of the monitoring data is shown in Table 13-3. A maximum daily deposition rate of 42 mg/m^2/day was recorded at the Jondale site in May. The average dust deposition rate was 15 mg/m^2/day and 22 mg/m^2/day for the Town and Jondale site respectively. To determine an annual average daily background deposition rate the second highest record Jondale and the highest Town value were used. Therefore, based on the available data a dust deposition rate of 30 mg/m^2/day has been chosen as a conservative background level of natural dust deposition.

Table 13-3: Dust deposition statistics for the Town and Jondale monitoring sites in mg/m^2/day

Monitoring site	Mean	StDev	Max	Min	95th
TEOM1 Town	15	10	30	6	18
TEOM2 Jondale	22	14	42	3	27

Nitrogen dioxide and carbon monoxide

There are no known measurements of nitrogen dioxide and carbon monoxide at Wandoan. In instances when there are no local measurements, background levels may be inferred from other locations, similar in nature, such as the Willowburn Oval monitoring station in Toowoomba. This monitoring station has been operated by the EPA since July 2003 and measures concentrations of nitrogen dioxide and carbon monoxide as well as other pollutants.

A summary of the background monitoring data at this site is presented in Table 13-4. These data show that the existing concentrations of nitrogen dioxide and carbon monoxide are well below the EPP (Air) goals. The main sources of air pollutants in Toowoomba are industries, motor vehicles and domestic activities such as wood fires that are used for heating and are representative of an urban area. The 1-hour, 95th percentile concentration of nitrogen dioxide is expected to be dominated by emissions from motor vehicles. The area surrounding the subject site is rural and sparsely populated with few industries and consequently levels of air pollutants will be much lower than the Toowoomba measurements. Therefore the background levels used in this assessment will be conservative.

Table 13-4: Measured concentrations of nitrogen dioxide and carbon monoxide from the EPA's monitoring station at Toowoomba

Air pollutant	Averaging period	Concentration (µg/m^3)		Goal/standard
		Maximum	95th percentile	
Nitrogen dioxide	1-hour Annual	116 11	36 —	320 30
Carbon monoxide	8-hour	2,625	758	10,000

Note: Data period September 2005 to July 2007

13.3.3 WASTE WATER TREATMENT PLANT

The Dalby Regional Council operates and maintains the Wandoan WWTP on Golden Street, Wandoan. The WWTP is designed for a treatment capacity of 550 kilolitres per day (kL/d), although the flow rate has diminished in recent years to approximately 104 kL/d corresponding to the reduced local population served of 380 people.

The existing odour emissions at the Wandoan WWPT, measured in odour emission rates (OER) are presented in Table 13-5.

Table 13-5: Wandoan WWTP baseline modelling odour scenario

Source	OER (ou.m^3 m^{-2} s^{-1})
Imhoff tank	339
Sludge drying beds	47
Channel between Imhoff Tank and Oxidation pond 1	14
Oxidation pond 1 – Inlet end, 20% of pond	1,350
Oxidation pond 1 – Remaining 80% of pond	360
Oxidation pond 2 – 100% of pond	450
Oxidation pond 3 – 100% of pond	450
Rear holding pond – 100% of pond	120
Total	3,131

13.3.4 SENSITIVE RECEPTORS

The term 'sensitive receptors' is used to describe places surrounding the MLAs at which acceptable air quality levels must be met, and range from residential areas, isolated dwellings, industrial developments and community centres.

Figure 13-5-V1.3 shows the general locations of sensitive receptors located around the MLA and gas pipeline areas, as well as the area defined as the Wandoan Township, the Wandoan cemetery and the abattoir. Table 13-6 shows the corresponding receptor labels and their Lot numbers. Dwellings that have been purchased by the Proponent have not been treated as sensitive receptors and are not shown in the figures. Similarly, the accommodation facility has not been treated as a sensitive receptor as it is part of the mine development.

Table 13-6: Sensitive receptors and their Lot location

Receptor	Lot	Plan	Type
Town Centre	—	—	Residential
MLA-740 and MLA741 and MLA708 Abattoir	—	—	Rural
Cemetery	—	—	Rural
MLA-116	5	FT1004	Residence
MLA-134	34	SP106737	Residence
MLA-141	41	FT603	Residence
MLA-150	44	FT328	Residence
MLA-158	44	FT507	Residence
MLA-159	30	FT835701	Residence
MLA-162	40	FT329	Residence
MLA-168	29	SP167183	Residence
MLA-175	42	FT505	Residence

Receptor	Lot	Plan	Type
MLA-178	99	FT815	Residence
MLA-183	61	FT515	Residence
MLA-188	32	FT444	Residence
MLA-190	38	FT440	Residence
MLA-196	6	FT801	Residence
MLA-199	43	FT506	Residence
MLA-201	1	FT740	Residence
MLA-205	10	FT486	Residence
MLA-208	66	FT517	Residence
MLA-213	31	FT715	Residence
MLA-218	63	FT960	Residence
MLA-228	60	FT904	Residence
MLA-229	63	FT960	Residence
MLA-230	67	FT518	Residence
MLA-235	59	FT820	Residence
MLA-239	47	FT466	Residence
MLA-244	45	FT507	Residence
MLA-247	27	FT36	Residence
MLA-254	62	FT815	Residence
MLA-271	37	FT494	Residence
MLA-274	37	FT494	Residence
MLA-277	50	FT508	Residence
MLA-284	64	FT516	Residence
MLA-291	65	FT518	Residence
MLA-297	64	FT525	Residence
MLA-300	15	FT161	Residence
MLA-304	48	FT815	Residence
MLA-305	29	FT467	Residence
MLA-307	48	FT871	Residence
MLA-308	20	FT101	Residence
MLA-309	45	FT497	Residence
MLA-310	49	FT453	Residence
MLA-312	65	FT518	Residence
MLA-318	66	FT521	Residence
MLA-320	62	FT833	Residence
MLA-321	4	FT835681	Residence
MLA-329	77	FT565	Residence
MLA-331	2	SP177963	Residence
MLA-339	37	FT440	Residence
MLA-340	361	SP143626	Residence

Receptor	Lot	Plan	Type
MLA-345	76	RP895260	Residence
MLA-352	23	RP835697	Residence
MLA-353	58	FT520	Residence
MLA-354	84	FT673	Residence
MLA-355	38	CP899702	Residence
MLA-356	68	SP137906	Residence
MLA-359	22	FT553	Residence
MLA-361	38	CP899702	Residence
MLA-362	21	FT552	Residence
MLA-364	1	RP144130	Residence
MLA-365	87	CP905099	Residence
MLA-366	21	FT552	Residence
MLA-368	56	FT941	Residence
MLA-369	80	FT616	Residence
MLA-373	88	FT894	Residence
MLA-374	111	FT487	Residence
MLA-375	58	FT520	Residence
MLA-378	1	RP144130	Residence
MLA-379	20	FT436	Residence
MLA-388	88	FT894	Residence
MLA-390	30	FT491	Residence
MLA-397	67	FT873	Residence
MLA-402	1	RP204781	Residence
MLA-404	15	SP180948	Residence
MLA-415	13	FT667	Residence
MLA-420	2	FT1019	Residence
MLA-427	88	FT911	Residence
MLA-428	88	FT911	Residence
MLA-442	28	FT672	Residence
MLA-443	39	FT576	Residence
MLA-453	30	FT468	Residence
MLA-459	28	FT467	Residence
MLA-484	1	RP110817	Residence
MLA-49	14	FT165	Residence
MLA-494	28	FT913	Residence
MLA-50	1	SP210618	Residence
MLA-505	6	FT788	Residence
MLA-506	14	RP807808	Residence

Receptor	Lot	Plan	Type
MLA-51	43	FT348	Residence
MLA-520	36	FT981	Residence
MLA-533	23	FT938	Residence
MLA-547	18	FT739	Residence
MLA-552	16	FT1012	Residence
MLA-556	5	RP900597	Residence
MLA-557	3	FT695	Residence
MLA-565	12	FT99	Residence
MLA-567	14	FT100	Residence
MLA-570	7	FT912	Residence
MLA-574	5	RP900597	Residence
MLA-576	3	RP900597	Residence
MLA-579	29	FT130	Residence
MLA-587	12	FT99	Residence
MLA-591	59	FT105	Residence
MLA-592	21	FT191	Residence
MLA-595	38	AB188	Residence
MLA-601	22	FT746	Residence
MLA-603	69	SP137906	Residence
MLA-624	42	AB241	Residence
MLA-626	41	AB241	Residence
MLA-639	48	SP127252	Residence
MLA-640	2	SP106043	Residence
MLA-642	154	FT884	Residence
MLA-651	41	AB241	Residence
MLA-652	4	FT105	Residence
MLA-658	913	W6416	Residence
MLA-659	2	RP123884	Residence
MLA-66	418	W6412	Residence
MLA-663	913	W6416	Residence
MLA-670	17	FT99	Residence
MLA-672	18	FT739	Residence
MLA-678	131	SP121742	Residence
MLA-679	24	FT41	Residence
MLA-680	74	FT563	Residence
MLA-687	28	FT563	Residence
MLA-690	39	W6416	Residence
MLA-692	70	FT590	Residence
MLA-693	41	CP857459	Residence
MLA-694	71	FT590	Residence

Receptor	Lot	Plan	Type
MLA-695	70	FT590	Residence
MLA-697	40	FT503	Residence
MLA-698	46	FT64	Residence
MLA-699	36	W6416	Residence
MLA-708	18	FT739	Residence
MLA-712	39	FT503	Residence
MLA-720	72	FT590	Residence
MLA-721	132	SP121742	Residence
MLA-725	132	SP121742	Residence
MLA-728	131	SP121742	Residence
MLA-731	16	FT101	Residence

13.4 DESCRIPTION OF PROPOSED DEVELOPMENT

The Project is proposed to be producing 30 million tonnes per annum (Mt/a) of ROM coal by year three of the operation. Approximately fifteen distinct mining pits will be developed across the MLAs with some pits being adjacent to the MLA boundaries and potentially generating air quality impacts to nearby sensitive receptors. The mine's operation will include Frank Creek Pit which is in close proximity to the Wandoan township, being approximately 500 m from the Leichhardt Highway at its closest location.

13.4.1 POWER SUPPLY

The four power supply options under consideration for the Project are:

- Option 1: total supply via a new 132 kV or 275 kV electricity transmission line, from a new substation adjacent to the 275 kV Callide to Tarong line, near Auburn River, east of Wandoan, to a substation at or adjacent to the MLAs
- Option 2: total supply via a new 132 kV electricity transmission line from the Columboola Switchyard east of Miles, which is currently under construction, to a substation at or adjacent to the MLAs
- Option 3: an on-site 80 MW gas fired power station likely to be located on MLA 50231 comprising of twelve gas dual fuel engines, each with 8 MW of electrical output. Ten units will operate at a time and two will be on standby
- Option 4: partial supply from a new 132 kV electricity transmission line, and balance of supply from on-site 30 MW on-site gas fired power station likely to be located on MLA 50231. The power station will comprise of six dual fuel gas engines, each with 8 MW of electrical output. Four units are expected to operate at a time with two units on standby mode

- Option 3 is considered the worst case from a localised air emission perspective. Compliance with Option 3 would ensure compliance with Option 4, therefore only Option 3 has been considered in the air quality assessment.

Options 1 and 2 would not be a source of air quality impacts (other than during construction) and has not been considered further in this assessment.

For the purpose of this assessment a worst case scenario was applied and twelve engines were modelled as operating in Option 3.

The engines will burn natural gas, with gas supplied by a new pipeline connecting into the existing Peat-Scotia lateral gas pipeline. The main air pollutants from the engines will be oxides of nitrogen and carbon monoxide. Emissions of particulate matter, volatile organic compounds, unburnt hydrocarbons and oxides of sulphur will also occur, however, these emissions are generally below detection limits and will have a negligible risk of causing an adverse or cumulative impact and therefore have not been considered further in this study.

Location and layout

The proposed power station will be located to the west of the rail spur loop and approximately 1.5 km to the southwest of the accommodation facilities (refer Figure 6-3-V1.3) and approximately 8.5 km northwest of the town of Wandoan.

The plant layouts for the two potential configurations of plant are presented in Figure 6-39-V1.3 and 6-41-V1.3.

The stack characteristics for the two plant operations are shown in Table 13-7.

Table 13-7: Stack characteristics

Parameter	Units	Stack characteristics
Number of engines	—	12
Number of stacks	—	4
Stack height	m	21
Effective stack diameter	m	2.08
Building height (engine hall)	m	9

Emission characteristics

The emission characteristics for the plant operating at full load are presented in Table 13-8. Those emissions are based on engine specifications from manufacturer Wartsila and the design team.

Table 13-8: Emission characteristics for each 8 MW unit

Parameter	Units	Emission characteristics per unit
		8 MW
Volume flow	m^3/s	28
	Nm^3/s	12.1
Exit velocity	m/s	25.5
Temperature	°C K	375 648.15

Parameter	Units	Emission characteristics per unit
		8 MW
Concentration		
Oxides of nitrogen	mg/Nm^3	250
Carbon monoxide	mg/Nm^3	250
Emission rate		
Oxides of nitrogen	g/s	3.23
Carbon monoxide	g/s	2.93

The proposed gas engines will meet emission limits for oxides of nitrogen and carbon monoxide of 250 mg/Nm^3 (5% O_2). Whilst there are no regulatory limits for gas dual fuel engines in Queensland, the EPA commonly refers to the NSW Clean Air Regulations 2002, The proposed engines will comply with the NSW Clean Air Regulations (2002) of an emission limit of 450 mg/Nm^3 (3% O_2) for a stationary reciprocating internal combustion engine. The engine specification supplied emission rates of oxides of nitrogen and carbon monoxide from each engine type. The total emission rates of oxides of nitrogen and carbon monoxide are 38.7 g/s and 35.1 g/s, respectively.

13.4.2 WASTEWATER TREATMENT PLANT

The development of the Wandoan Coal Project is estimated to increase the total treatment demand on the existing WWTP. Design guidelines require the capacity of the WWTP to treat three times the average dry weather flow (ADWF). Consequently the plant must be upgraded.

Detail on current design and proposed upgrade are detailed in Attachment D of TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine.

Location

The Wandoan WWTP is proposed to remain in its existing location on Golden St, Wandoan, as previously discussed in Section 13.3.3.

Emission characteristics

The inventory for the WWTP upgrade scenario includes an additional three Imhoff Tanks for primary treatment and two additional sludge drying bed areas. The additional inlet channels, bypass channels, flow combination chambers and overflow weirs are likely to comprise only 1-2% of WWTP odour emissions. These sources are likely to be small areas sources or covered, resulting in minimal odour emissions. Consequently, these small sources have not been included in the modelling. Table 13-9 presents the odour emissions inventory for the proposed upgrade scenario.

Table 13-9: Wandoan WWTP upgrade modelling scenario inventory

Odour source	OER (ou.m^3 m^{-2} s^{-1})
Imhoff tank – total of four tanks	1,356
Sludge drying beds – total of three beds	141
Channel between Imhoff Tank and Oxidation pond 1	14
Oxidation pond 1 – Inlet end, 20% of pond	1,350
Oxidation pond 1 – Remaining 80% of pond	360
Oxidation pond 2 – 100% of pond	450
Oxidation pond 3 – 100% of pond	450
Rear holding pond – 100% of pond	120
Total	4,242

13.4.3 GAS SUPPLY PIPELINE

Preconstruction activities will include the use of machinery to prepare the area along the pipeline route (and access tracks, if necessary) by clearing vegetation and grading. The use of existing access tracks would be given first preference to avoid any unnecessary clearing.

Trenching would be used to construct the majority of the pipeline route and would be prepared ahead of construction using a wheel trencher and excavator for the majority of the route. In some areas, harder rock may be encountered and hydraulic rock breaking equipment may be required.

Multiple tractors fitted with side cranes and counterweights would be used to lift and move the pipe string over the trench and lower the pipe into position.

Once the pipe is strung, a line-up crew would position the pipe using side boom tractors and internal line-up clamps. The specialist welding crew would then follow, joining the pipes into a continuous string. It is expected that for this size of pipe, welding would be undertaken using an automatic welding machine.

13.4.4 AIRSTRIP

An airstrip may be located on or adjacent to the MLA areas. The location is yet to be determined and will be assessed during the detailed design phase. The airstrip is therefore not considered any further from an impact perspective in this chapter.

13.4.5 ROAD TRAFFIC

The main pollutants of concern from vehicular exhaust are nitrogen dioxide, particulate matter, carbon monoxide and sulphur dioxide. The Leichhardt Highway runs north-south on the eastern edge of the Project and connects Taroom, Wandoan and Miles. Vehicles hauling construction material will use this road to access the Project site. During the operation of the mine, haul trucks and other diesel-fuelled vehicles will be a source of air pollutants.

Detail of traffic numbers annual average daily traffic (AADT) currently and proposed are presented in the traffic report. Current traffic numbers for the Leichhardt Highway for 2008 are reproduced in Table 13-10.

Table 13-10: Background traffic for 2008

Road / section	AADT	Daily CVs*	Daily ESAs**
Leichhardt Highway (26A) 1.62 km south of Fitzroy Developmental Road	537	190	666
Leichhardt Highway (26B)			
Taroom – Jackson-Wandoan Road intersection	654	189	661
Jackson-Wandoan Road intersection – Miles	638	203	711
Jackson-Wandoan Road (4302)			
Jackson – chainage 68.5 km	66	14	50
Chainage 68.5 km – Wandoan	132	27	95
Warrego Highway (18C)			
Main Roads district boundary – Miles	1,846	428	1,500
Warrego Highway (18B)			
Dalby – Road 325 intersection	5,639	861	3,012
Road 325 intersection – chainage 27.0 km	4,433	964	3,375
Chainage 27.0 km – chainage 10.5 km	11,482	1,372	4,802
Chainage 10.5 km – intersection McDougall Street, Toowoomba	13,068	1,112	3,892
Dawson Highway (46B)			
1 km east of Banana	1,384	234	818
900 m west of Burnett Highway (41E)	1,832	285	996
700 m west of Burnett Highway (41D)	6,091	639	2,236

* CVs = commercial vehicles
** ESAs = equivalent standard axles

As discussed in Chapter 12 Transportation, the maximum number of additional vehicles during construction will be 13,251 vehicles per year, during the first two years of construction before reducing to half of this for the remainder of the construction phase. This equates to an increase of 29 vehicles per day and an increase in the AADT of 4.2% expected on the Leichhardt Highway (26B) on the Taroom – Jackson-Wandoan Road intersection link. For the Jackson-Wandoan Road intersection – Miles link this equates to an increase of 12 vehicles per day and an increase in the AADT of 1.8%.

During the operations phase of the mine, the maximum number of additional vehicles due to the ongoing development and operation of the mine is expected to be 6,447 per year, with 45% of these vehicles being B-Double trucks and 30% of these vehicles being buses transporting the workers. This equates to an increase of 5 vehicles per day and an increase in the AADT of 0.6% expected on the Leichhardt Highway (26B) on the Taroom–Jackson-Wandoan Road intersection link. For the Jackson-Wandoan Road intersection – Miles link this equates to increase of 13 vehicles per day and an increase in the AADT of 1.6%.

On the mine site, at any one time, there is expected to be six shovels, 30 dump trucks and 17 dozers operating.

13.4.6 MINE OPERATIONS

MLA associated infrastructure

The overall air assessment examines five distinct scenarios taking into account various years of operation. Scenario 3 is broken into two subsets to take into consideration mining techniques for Frank Creek Pit. Each scenario takes into account a "snap shot" which shows the number, type and disposition of all operating equipment based on the mining operation scenario during this time. Table 13-11 provides a summary of each operating scenario.

Table 13-11: Operational scenarios

Operational scenario	Description
1	This 'Do Nothing' Scenario assumes that the coal mine is not constructed the for first year (Year 1) of coal mining, assuming this year to be 2012
2	Assumes construction and operation of the coal mine, examining the first year (Year 1) of coal mining, assuming this year to be 2012
3	Assumes construction and operation of the coal mine, examining Year 5 of coal mining, assuming this year to be 2016 For Frank Creek Pit: a/b. These scenarios took into account the operation of the dragline located in the southern end of the Frank Creek pit. As discussed in TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine, exceedances of air quality goals at sensitive receptors may limit the operation of draglines in the Frank Creek Pit. The assessment indicates that Dragline operations in Frank Creek Pit within 2 km of the town can only occur if the real time air quality monitoring indicates that the objectives and performance criteria in the environmental authority will be met. c. operations are examined using blasting of partial bench height of approximately 10 m and trucks and shovels to remove overburden, operating 24 hours a day, seven days a week
4	Assumes construction and operation of the coal mine, examining Year 10 of coal mining, assuming this year to be 2021
5	Assumes construction and operation of the coal mine, examining Year 20 of coal mining, assuming this year to be 2031
6	Assumes construction and operation of the coal mine, examining the final year (assumed Year 30) of coal mining, assuming this year to be 2041

It is important to highlight that each scenario does not reflect the equipment designation throughout that whole year, rather during the specific time in that operational year that has been modelled. Due to the mobile nature of the mining equipment, the area of operation for each piece of mining equipment will vary in between the Scenario years modelled in accordance with mining schedule for every year of operation.

All scenarios utilise worst case meteorological conditions as defined in previous sections.

Regardless, all scenarios are defined as 'worst case' in that the highest dust generating equipment (i.e. dragline) is positioned within its operating pit as close possible to a sensitive receptor. The dispersion model then simulates that activity every hour for a 12 month period, encompassing all meteorological scenarios.

Scenario 1

The 'Do Nothing' scenario does not introduce any new air quality impacting sources into the rural area, therefore the existing ambient air quality environment will remain unaffected if the Project does not proceed.

Scenario 2 - Year 1

The output during the first year of operation will be approximately 10 Mt of ROM coal due to the ongoing establishment of equipment and processes on site. Mining activities will be carried out in the Austinvale North Pit with the utilisation of only one dragline and three excavators. Table 13-12 shows the proposed schedule of operating equipment for this scenario.

Table 13-12: Schedule of operating equipment for Scenario 2

Equipment designation	Mining pit	Haulage road
	Austinvale	
Dragline	1	—
Dozer	5	1
Dump Truck	6	7
Excavator (Medium)	2	—
Excavator (Small)	1	—
Front End Loader	1	—
Grader	—	1
Overburden Drill	3	—
Water Truck	—	1

Scenario 3c - Year 5 with truck and shovel mining of Frank Creek Pit

This scenario provides an alternative method for mining the Frank Creek Pit through the use of a truck and shovel arrangement, instead of a dragline to remove overburden. Table 13-13 outlines the applicable equipment schedule that will in operation during year 5.

Table 13-13: Schedule of operating equipment for scenario 3c/d operations with truck and shovel in Frank Creek Pit

Equipment designation	Mining pit			Haulage roads
	Frank Creek	Woleebee	Austinvale	
Dragline	—	1	1	—
Dozer	3	5	5	1
Dump Truck	4	3	3	10
Excavator (Medium)	2	—	1	—
Excavator (Small)	—	1	1	—
Front End Loader	1	1	—	—
Grader	1	—	—	2
Overburden Drill	1	2	1	—
Water Truck	—	—	—	3

Scenario 4 – Year 10

Scenario 4 consists of equipment spread out across all MLA areas, reaching the western boundary of the development with the operation of the initial mining strips at the Turkey Hill Pit. Table 13-14 shows the proposed schedule of operating equipment for year 10.

Table 13-14: Schedule of operating equipment for Scenario 4

Equipment designation	Mining pit					Haulage roads
	Turkey Hill	Summer Hill	Mud Creek	Woleebee	Austinvale	
Dragline	1	1	—	1	—	—
Dozer	5	5	—	5	1	2
Dump Truck	6	2	—	4	1	14
Excavator (Medium)	1	1	—	—	—	—
Excavator (Small)	—	1	—	1	—	—
Front End Loader	1	—	—	1	—	—
Grader	—	1	—	—	—	2
Overburden Drill	2	1	1	1	—	—
Water Truck	—	—	—	—	—	3

Scenario 5 – Year 20

Scenario 5 will see the mine operate the scheduled equipment across seven mining pits, including five draglines. The equipment will be spread quite evenly across the MLA areas. Table 13-15 shows the proposed schedule of operating equipment that will operated for this scenario.

Table 13-15: Schedule of operating equipment for Scenario 5

Equipment designation	Mining pit							Haulage roads
	Turkey Hill	Summer Hill	Mud Creek	Woleebee North	Woleebee Creek	Austinvale	Leichhardt	
Dragline	1	1	—	2	—	—	1	—
Dozer	4	3	2	5	3	1	3	3
Dump Truck	3	3	3	2	—	1	1	14
Excavator (Medium)	—	—	1	—	—	—	1	—
Excavator (Small)	—	1	—	—	1	—	—	—
Front End Loader	1	—	—	1	—	—	—	—
Grader	—	—	1	—	—	—	—	2
Overburden Drill	1	1	1	2	1	—	1	—
Water Truck	—	—	—	—	—	—	—	3

Scenario 6 – Year 30

Scenario 6 will see the mine operate predominantly in the Woleebee Pits as well as completing mining in pits located at the western end of MLA 50229. Table 13-16 shows the proposed schedule of equipment that will be operating for this scenario.

Table 13-16: Schedule of operating equipment for Scenario 6

Equipment designation	Mining pit						Haulage roads
	Summer Hill North	Mud Creek	Woleebee North	Woleebee Creek	Woleebee South	Austinvale	
Dragline	1	1	1	1	1	—	—
Dozer	3	3	3	5	4	1	3
Dump Truck	1	4	1	3	1	1	16

Equipment designation	Mining pit						Haulage roads
	Summer Hill North	Mud Creek	Woleebee North	Woleebee Creek	Woleebee South	Austinvale	
Excavator (Medium)	—	1	—	1	—	—	—
Excavator (Small)	1	—	—	1	—	—	—
Front End Loader	1	—	1	—	1	—	—
Grader	—	1	—	—	—	—	2
Overburden Drill	1	1	1	2	2	—	—
Water Truck	1	—	—	—	—	—	2

13.5 POTENTIAL IMPACTS

Activities for this Project that are associated with the most significant dust emissions are draglines, coal conveyors, coal stockpiles, truck and shovel operations, blasting and wheel generated dust on haul roads. Minor amounts of wind-blown dust are also associated with wind erosion of dust from bare ground and stockpiles.

13.5.1 EARLY WORKS

As discussed in Chapter 5 Project Construction, subject to agreement with Dalby Regional Council and the necessary approvals, the proposed upgrade of the Wandoan WWTP and potable water treatment plant may commence as part of the early works of the Project.

The upgrade of the existing WWTP and potable water treatment plant will include some light construction, land clearing and trenching. The air quality impacts of these activities are expected to be minimal and short term. Due to the transient and relatively small nature of the activity air quality, impacts are expected to be low.

13.5.2 CONSTRUCTION

Mine infrastructure

Construction of mine infrastructure, including the gas fired power station, will include land clearing, civil works, structural installations and road constructions. The air quality impacts of these activities are expected to be minimal and short lived. As the construction site will be well within the mine lease application areas, the closest receptors will be more than 5 km away.

A large portion of fugitive dust emissions will result from mobile equipment traffic driving over temporary unsealed roads. As the majority of the construction activity will be located within the MLA areas and the relatively small number of vehicles required for the operation these impacts are considered to be negligible.

Gas supply pipeline

Emissions during construction of the pipeline will be associated with land clearing, ground excavation and back filling.

The excavation of the pipeline trench and subsequent refilling once the pipe has been laid will be a relatively small source of fugitive dust emissions. This is due to the small surface area of worked land (approximately 10 m in width) as dust emissions are proportional to the area of land being disturbed (US EPA AP-42, 1995). It was determined that exceedances of the EPP (Air) goals from fugitive emissions would not extend beyond the pipeline corridor.

A large portion of fugitive dust emissions results from equipment traffic over temporary unsealed roads. As the majority of the construction activity will be co-located with the proposed Surat Basin Rail Line, and the relatively small number of vehicles required for the operation, the impacts are considered to be negligible.

13.5.3 MINE OPERATION

The following assessment of air quality impacts is based on the combined air quality impacts of the CHPP, rail spur, power supply as well as the operation of mining equipment.

Scenario 2 – Year 1

Modelling of air quality impacts at the Wandoan township, and at the sensitive receptor outside the Wandoan township with the highest predicted levels (Receptors MLA-520 and MLA-356), found predicted ground-level concentrations of PM_{10}, total suspended particulates and dust deposition complied with the relevant EPP(Air) and EPA guideline goals, being generally less than half the goal concentrations. Receptors MLA-356 and MLA-520 had slightly higher 24 hour PM_{10} concentrations, being 59% of the goal respectively, as shown in Table 13-17.

Table 13-17: Maximum predicted ground-level concentrations of PM_{10}, TSP and dust deposition rate, due to the mine operating in Year 1

Pollutant	Averaging period	Predicted ground-level concentrations[1]				Goal / standard
		Wandoan township		Highest at a sensitive receptor[2,3] not in Wandoan township		
		µg / m^3	% of goal	µg / m^3	% of goal	
PM_{10}	24-hour	74.8	50	87.9	59[2]	150 g/m^3
	Annual	16.7	33	20.5	41[3]	50 g/m^3
TSP	Annual	32.1	36	38.7	43[3]	90 g/m^3
Dust deposition	Annual	31.3	26	40.4	34[3]	120 mg/m^2/day

[1] including background concentration [2] Receptor MLA-520 [3]Receptor MLA-356

Figure 13-6-V1.3 and Figure 13-7-V1.3 present the maximum 24-hour and annual average ground-level concentrations of PM_{10}.

The annual average ground-level concentrations of TSP are presented in Figure 13-8-V1.3. The annual average dust deposition rate due to the mine are presented in Figure 13-9-V1.3.

As seen in Table 13-18, no exceedences are predicted for Year 1.

Table 13-18: EPP (Air) goal exceedances during Year 1

Receptor	Type	No. of days EPP(Air) 24 Hr PM_{10} goal was exceeded	No. of days within 80% of EPP(Air) 24 Hr PM_{10} goal
Nil	—	—	—

Scenario 3b – Year 5 with truck and excavator mining of Frank Creek Pit

Preliminary assessments of the potential impacts of mining activities within the Frank Creek area in Year 5 (Year 5 dragline) illustrated that the EPP(Air) goal for 24-hour average concentrations of PM_{10} could be exceeded at the Wandoan township. An extensive sensitivity analysis was undertaken to determine the maximum rate of activity that would result in adherence to EPP(Air) goals relevant for the town of Wandoan (Refer to Section 4.5.3.1 of TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine. for the modelling results). The resulting maximum 24-hour average and annual average ground-level concentrations of PM_{10}, total suspended particulates and dust deposition predicted to occur at the township of Wandoan and at a sensitive receptor not located in the town (Receptor No MLA-505) are presented in Table 13-19.

Table 13-19: Maximum predicted ground-level concentrations of PM_{10}, TSP and dust deposition rate, due to the mine operating in Year 5

Pollutant	Averaging period	Predicted ground-level concentrations[1]				Goal / standard
		Wandoan township		Highest at a sensitive receptor[2] not in Wandoan township		
		$\mu g/m^3$	% of goal	$\mu g/m^3$	% of goal	
PM_{10}	24-hour	127.4	85	156	104	150 g/m^3
	Annual	17.3	35	20.2	40	50 g/m^3
TSP	Annual	34.4	38	38.2	42	90 g/m^3
Dust deposition	Annual	30.1	25	39.4	33	120 mg/m^2/day

[1] including background concentration [2] MLA-505

Figure 13-10-V1.3 and Figure 13-11-V1.3 present the maximum 24-hour and annual average ground-level concentrations of PM_{10}.

The annual average ground-level concentrations of TSP are presented in Figure 13-12-V1.3. The annual average dust deposition rates are presented in Figure 13-13-V1.3.

All goals were complied with at the township of Wandoan, except at sensitive receptors MLA-297,MLA-300, MLA-402 and MLA-505, where the EPP(Air) 24-hour average goal of 150 g/m^3 for PM_{10} is exceeded as shown in Table 13-20.

Table 13-20: EPP (Air) goal exceedances during Year 5

Receptor	Type	No. of days EPP(Air) 24 Hr PM_{10} goal was exceeded	No. of days within 80% of EPP(Air) 24 Hr PM_{10} goal
MLA- 297	Residence	1	1
MLA -300	Residence	1	1
MLA- 402	Residence	1	1
MLA- 505	Residence	1	4

Scenario 4 - Year 10

The maximum 24-hour average and annual average ground-level concentrations of PM_{10}, total suspended particulates and dust deposition predicted to occur at the township of Wandoan and at a sensitive receptor not located in the town (MLA-595) are presented in Table 13-21. Figure 13-14-V1.3 and Figure 13-15-V1.3 present the maximum24-hour and annual average ground-level concentrations of PM_{10}.

The annual average ground-level concentrations of TSP with a background is presented in Figure 13-16-V1.3. The annual average dust deposition rate due is presented in Figure 13-17-V1.3. All goals were complied with at the township of Wandoan and sensitive receptor MLA-505, but the 24-hour average PM_{10} concentration is 83% of the EPP(Air) 24-hour average goal of 150 g/m^3 for PM_{10}. This would activate a trigger response plan (TARP) within the mine operations do keep 24 hour PM_{10} levels below this threshold. No other receptors approach this limit during this year of operation (refer Table 13-22).

Table 13-21: Maximum predicted ground-level concentrations of PM_{10}, TSP and dust deposition rate, due to the mine operating in Year 10

Pollutant	Averaging period	Predicted ground-level concentrations[1]				Goal / standard
		Wandoan township		Highest at a sensitive receptor[2] not in Wandoan township		
		μg / m^3	% of goal	μg / m^3	% of goal	
PM_{10}	24-hour	57.1	38	123.8	83	150 g/m^3
	Annual	15.5	31	22.3	45	50 g/m^3
TSP	Annual	30.6	34	44.0	49	90 g/m^3
Dust deposition	Annual	30.0	25	50.4	42	120 mg/m^2/day

[1] including background concentration [2] (MLA-595)

Table 13-22: EPP (Air) goal exceedances during Year 10

Receptor	Type	No. of days EPP(Air) 24 Hr PM_{10} goal was exceeded	No. of days within 80% of EPP(Air) 24 Hr PM_{10} goal
MLA-595	Residence	0	1

Scenario 5 - Year 20

The maximum 24-hour average and annual average ground-level concentrations of PM_{10}, total suspended particulates and dust deposition predicted to occur at the township of Wandoan and Receptor No MLA-552 are presented in Table 13-23. All 24 hour and annual goals are complied with at the township of Wandoan, and annual goals at MLA-552. The trigger response limit of 120µm/m^3 for dust deposition is exceeded at receptors MLA-50, MLA-300, MLA-404, MLA-459,MLA-484, MLA-505, MLA-520, MLA-552, MLA-595, MLA-687, and MLA-693 (refer Table 13-24).

Table 13-23: Maximum predicted ground-level concentrations of PM_{10}, TSP and dust deposition rate, due to the mine operating in Year 20

Pollutant	Averaging period	Predicted ground-level concentrations[1]				Goal / standard
		Wandoan township		Highest at a sensitive receptor[2] not in Wandoan township		
		µg / m^3	% of goal	µg / m^3	% of goal	
PM_{10}	24-hour	111.3	74	195.0	130	150 g/m^3
	Annual	16.7	33	24.1	48	50 g/m^3
TSP	Annual	32.6	36	45.8	51	90 g/m^3
Dust deposition	Annual	30.0	25	48.7	41	120 mg/m^2/day

[1] including background concentration [2] MLA-552

Figure 13-18-V1.3 and Figure 13-19-V1.3 present the maximum 24-hour and annual average ground-level concentrations of PM_{10}.

The annual average ground-level concentrations of TSP are presented in Figure 13-20-V1.3. The annual average dust deposition rates, are presented in Figure 13-21-V1.3.

Table 13-24: EPP (Air) goal exceedances during Year 20

Receptor	Type	No. of days EPP(Air) 24 Hr PM_{10} goal was exceeded	No. of days greater than 80% of EPP(Air) 24 Hr PM_{10} goal
MLA-50	Residence	2	4
MLA-300	Residence	3	6
MLA-404	Residence	3	7

Receptor	Type	No. of days EPP(Air) 24 Hr PM_{10} goal was exceeded	No. of days greater than 80% of EPP(Air) 24 Hr PM_{10} goal
MLA-459	Residence	1	8
MLA-484	Residence	1	1
MLA-505	Residence	1	3
MLA-520	Residence	—	1
MLA-552	Residence	3	9
MLA-595	Residence	2	6
MLA-687	Residence	1	3
MLA-693	Residence	1	4

The modelling results for Year 20 operations indicate that the 24-hour average ground-level concentrations of PM_{10} would exceed the EPP(Air) goal at several locations to the north, west and south of Turkey Hill, the south of Mud Creek, the west and south of Woleebee Creek and the east of Leichhardt Pit on the northern extent of the Wandoan township.

The predicted PM_{10} concentrations to the north of Turkey Hill are due to wind erosion of the ROM stockpiles. Two receptors are located within 1 km of the Summer Hill ROM pad and Turkey Hill haul route (MLA-687 and MLA-693) (refer Table 13-23). Figure 13-28-V1.3 shows that the predicted concentrations at the receptors exceed the EPP(Air) goal once and approach the goal on several occasions.

The predicted PM_{10} exceedances to the south and west of Turkey Hill, Mud Creek and Wolleebee Creek are due to the proximity of the dragline operations to sensitive receptors. The exceedance to the north of the township of Wandoan did not occur at any specific receptor but appear as an isolated contour extending across the Leichhardt Highway. This contour is mentioned here due to its proximity to the township. Figure 13-34-V1.3 shows the predicted 24-hour average concentration of PM_{10} at the closest receptor (MLA-520) (refer Table 13-23). Although no exceedances are predicted at these residences, ambient PM_{10} levels do reach within 80% of the EPP(Air) goal.

Scenario 6 - Year 30

The modelling results for Year 30 operations indicated that the24-hour average ground-level concentrations of PM_{10} would be exceeded to the south and west as per the Year 20 exceedances outlined above, with the addition of five more receptors located approximately 6 km to the south and west of the Wolleebee Creek MLA boundary (MLA 420, MLA-443, MLA-557, MLA-659 and MLA-679). The maximum 24-hour average and annual average ground-level concentrations of PM_{10}, predicted to occur at the township of Wandoan and MLA-552 are presented in Table 13-25. All 24 hour and annual goals are complied with at the township of Wandoan and annual goals at MLA-552, but the EPP(Air) 24-hour average goal of 150 g/m^3 for PM_{10} is exceeded at MLA-300, MLA-420, MLA-443, MLA-484, MLA-505, MLA-552, MLA-557, MLA-659, MLA-679 and MLA-693 (refer Table 13-26).

Table 13-25: Maximum predicted ground-level concentrations of PM_{10}, TSP and dust deposition rate, due to the mine operating in Year 30

Pollutant	Averaging period	Predicted ground-level concentrations[1]				Goal / Standard
		Wandoan township		Highest at a sensitive receptor[2] not in Wandoan township		
		$\mu g/m^3$	% of goal	$\mu g/m^3$	% of goal	
PM_{10}	24-hour	96.8	65	320	213	150 g/m^3
	Annual	16.3	33	28.7	57	50 g/m^3
TSP	Annual	31.7	35	54.1	60	90 g/m^3
Dust deposition	Annual	31.1	26	64.2	53	120 mg/m^2/day

[1] including background concentration [2] MLA-552

Table 13-26: EPP (Air) goal exceedances during Year 30

Receptor	Type	No. of days EPP(Air) 24 Hr PM_{10} goal was exceeded	No. of days greater than 80% of EPP(Air) 24 Hr PM_{10} goal
MLA-300	Residence	9	19
MLA-420	Residence	2	2
MLA-443	Residence	3	3
MLA-484	Residence	1	3
MLA-505	Residence	11	31
MLA-552	Residence	13	27
MLA-557	Residence	1	2
MLA-659	Residence	2	5
MLA-679	Residence	1	1
MLA-693	Residence	1	1

Figure 13-22-V1.3 and Figure 13-23-V1.3 present the maximum 24-hour and annual average ground-level concentrations of PM_{10}.

The annual average ground-level concentrations of TSP are presented in Figure 13-24-V1.3. The annual average dust deposition rates are presented in Figure 13-25-V1.3.

Health impacts from mine dust

Under normal conditions a human respiratory tract in good health is able to deal with inhaled particles without undue stress or long-term effects. In sensitive individuals, or when high levels of particles are present, particulate matter may contribute to increased rates of respiratory illnesses and symptoms.

Studies indicate that such adverse effects are dependent on a number of factors (Neale 2005), including:

- particle size (whether particles can penetrate the lower airways)
- the intensity of the exposure
- the chemical nature of the particles and their interaction with human tissue
- the presence or absence of pre-existing conditions (especially diseases of the respiratory tract)
- meteorological factors such as winds, humidity, a temperature inversion, rain or thunderstorms.

Power station

The maximum predicted 1-hour average ground-level concentrations of nitrogen dioxide and 8-hour average ground-level concentrations of carbon monoxide at any location are presented in Table 13-27. The predicted 1-hour average ground-level concentrations of nitrogen dioxide and 8-hour average ground-level concentrations of carbon monoxide at the Wandoan Township are presented in Table 13-28.

Table 13-27: Maximum ground-level concentrations of nitrogen dioxide and carbon monoxide at any location predicted for the power station

Pollutant	Averaging period	Predicted ground-level concentrations[1]		Goal / standard
		$\mu g/m^3$	% of goal	
Nitrogen dioxide	1-hour	223	69.7	320
	Annual	16.5	55.0	30
Carbon monoxide	8-hour	1,784	17.8	10,000

1 including background concentration

Table 13-28: Maximum ground-level concentrations of nitrogen dioxide and carbon monoxide (at the Wandoan township) predicted for the power station

Pollutant	Averaging period	Predicted ground-level concentrations[1]		Goal / standard
		$\mu g/m^3$	% of goal	
Nitrogen dioxide	1-hour	58.8	18.4	320
	Annual	13.03	43.4	30
Carbon monoxide	8-hour	1493.4	14.9	10,000

1 including background concentration

The results show:

- the maximum 1-hour average ground-level concentration of nitrogen dioxide predicted to occur at any location is less than 70% of the EPP(Air) goal
- the maximum 1-hour average ground-level concentration of nitrogen dioxide predicted to occur at Wandoan is less than 19% of the EPP(Air) goal
- the highest predicted annual average ground-level concentration of nitrogen dioxide is less than 55% of the EPP(Air) goal
- the highest predicted 8-hour average ground-level concentration of carbon monoxide is less than 18% of the EPP(Air).

Figure 13-38-V1.3 presents the maximum 1-hour average ground-level concentrations of nitrogen dioxide (Background included).

Figure 13-39-V1.3 presents the maximum annual average ground-level concentrations of nitrogen dioxide (Background included).

Figure 13-40-V1.3 presents the maximum 8-hour average ground-level concentrations of carbon monoxide (background included).

Waste water treatment plant

Odour sensitive places for this project include:

- the Wandoan Health Care Centre
- Cultural Centre
- community pool
- show grounds
- shotgun club
- sports facilities
- shops and business premises
- residences.

The odour contour plots for the baseline and upgrade scenarios are presented in Figure 13-41-V1.3, Figure 13-42-V1.3 and Figure 13-43-V1.34 respectively. The predicted highest 1-hour average odour concentration for the 99.5th percentile across the modelling domain and at each of the nearest sensitive receptors is presented in Table 13-29.

Table 13-29: Predicted highest 1-hour average ground-level odour concentrations for the 99.5th percentile, in the modelling domain and at sensitive receptor locations

Location	Baseline scenario (ou)	Upgrade scenario (ou)	Upgrade scenario with odour control (ou)	EPA Guideline level (ou)
MLA-107 – 1.2 km WSW of STP	0.26	0.35	0.24	2.5
MLA-36 – 1.1 km SW of STP	0.29	0.40	0.27	2.5
MLA-536 – 1.0 km SW of STP	0.31	0.42	0.28	2.5
MLA-88 – 1.0 km SSW of STP	0.35	0.48	0.34	2.5
MLA-63 – 0.9 km SSW of STP	0.33	0.43	0.30	2.5

Location	Baseline scenario (ou)	Upgrade scenario (ou)	Upgrade scenario with odour control (ou)	EPA Guideline level (ou)
MLA-451 – 0.9 km SSW of STP	0.36	0.46	0.33	2.5
MLA-429 – 1.1 km SE of STP	0.13	0.18	0.12	2.5

The modelling results are summarised as follows:

- there are no exceedances of the EPA odour guideline of 2.5 ou (99.5th percentile, 1-hour average) predicted from the WWTP for the upgrade scenarios
- the predicted maximum odour impact at a sensitive receptor for the baseline scenario is 0.36 ou (99.5th percentile, 1-hour average) at R10
- the predicted maximum odour impact at a sensitive receptor for the upgrade scenario is 0.48 ou (99.5th percentile, 1-hour average) at R8
- the predicted maximum odour impact at a sensitive receptor for the upgrade with odour control scenario is 0.34 ou (99.5th percentile, 1-hour average) at R8
- the inclusion of odour control results in the reduction of ground level concentrations of odour at all sensitive receptors.

Gas supply pipeline

Fugitive air emissions may potentially be produced by the operation of the pipeline.

Road traffic

Given the relatively small change in traffic numbers and the relatively small number of vehicles that use the Leichhardt Highway, ground-level concentrations of all air pollutants from vehicle exhausts will be below the EPP(Air) goals within and outside of the road corridor. Similarly, given the relatively small number of haul vehicles travelling along the haul roads of the mine-site, ground-level concentrations of air pollutants are unlikely to exceed the EPP(Air) goals within or outside the haul road corridor.

13.6 MITIGATION MEASURES

13.6.1 CONSTRUCTION

Dust management measures will be applied to the construction of all aspects of the Project, and will include the following:

- development of an air quality management plan will be prepared prior to the commencement of construction
- regular watering of roads and exposed areas to reduce wheel-generated dust
- where practicable, limit dust-generating activities such as earthworks that could potentially affect residents during high wind conditions
- stockpiles kept in appropriate locations to prevent vegetation stockpiles wind erosion from the prevailing easterly wind direction

- following wet conditions, a regime will be implemented to dislodge mud from vehicles before they travel on public roads
- burning of cleared vegetation or other waste materials will only be carried out on site when all other preferred options (e.g. storage or reuse) are unfeasible, and will be carried out in compliance with local fire authority
- minimising speed of on-site traffic, to minimise wheel generated dust
- watering high use unsealed roads to minimise dust lift-off from the road surface
- limiting vegetation and soil clearing to approved areas, so as to minimise exposed ground
- rehabilitate disturbed land as soon as practicable
- investigate any complaints received and monitor feedback through the community reference group
- ensuring all vehicles are suitably fitted with exhaust systems that minimise gaseous and particulate emissions to meet vehicle design standards.

If on-site concrete batching plants, bitumen or asphalt plants are required, these may be a source of dust and odour. These activities will be located away from sensitive receptors.

13.6.2 OPERATIONS

Given the extent of this Project and the scattered distribution of receptors, the most effective strategy for mitigating air quality impacts is to implement a combined approach to air quality management which will include management of the activities on site along with the use of a real time monitoring and forecasting system. Such a strategy will provide the most effective mitigation of impacts as well as the efficient method of mining.

Triggers for management actions

The EPP (Air) policy establishes the criteria for acceptable levels of ambient air quality. The main pollutant criteria of issue are particulate matter less than 10 µm (PM_{10}), total suspended particulates (TSP) and dust deposition. Extensive air quality modelling has indicated that annual PM_{10}, TSP and daily dust deposition will not impact on any sensitive receptors outside of the MLA areas. The results for the 24 hour average PM_{10} indicate that some isolated residences within 2 to 5 km of the MLA will exceed the EPP (Air) goal under certain meteorological conditions. Therefore a coupled weather forecasting and dust monitoring system that will initiate the application of management and mitigation strategies prior to the onset of an air quality exceedance will be developed.

A minimum criteria level for the implementation of a trigger action response protocol (TARP) has been set to 80% of the 24 hour PM_{10} goal. Where once ambient levels of PM_{10} exceed 120 µg/m^3 the TARP is activated, the source is identified and appropriate mitigation and management steps are taken until levels return to below the trigger criteria.

To further the ability to manage these challenges, three mitigation zones have been developed defined as:

- Mitigation Zone 1. Dwellings indentified in the air quality report (refer Table 15 of TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine) as having more than five exceedances of the 24 hour PM_{10} goal or located within 500 m of the MLA boundary (Receptors MLA-505 and MLA-552)

- Mitigation Zone 2. Dwellings indentified in the air quality report (refer Table 15 of TR 13-V1.4 Air Quality Assessment of the Proposed Wandoan Coal Mine) as having at least one exceedance of the 24 hour PM_{10} goal or located within 2 km of the MLA boundary (Receptors MLA-297, MLA-300, MLA-595, MLA-50, MLA-404, MLA-459, MLA-484, MLA-520, MLA-687, MLA-693, MLA484, MLA-557, MLA-693)
- Mitigation Zone 3. Involvement and communication with the community of the greater Wandoan region that feels it is impacted by the mines operations.

Operational controls

The following operational and design measures will be applied:

- restricting the use of the dragline, and optionally changing to truck and excavator operations where monitoring of dust levels indicates that the objectives and performance measures described in the Environmental Authority will not be met
- continuous review of mining schedules and activity rates will be conducted based on forecasting, monitoring and community reference feedback for operations that directly impact on, or nearby, the township of Wandoan
- implementation of road dust management such as water sprays or the application of a dust suppressant
- install continuous real time PM_{10} and meteorological monitoring stations at representative sites prior to the commencement of operations in Turkey Hill, Mud Creek and Woleebee Creek, and review the required management actions closer to the time of mining these pits
- a wind break (such as planting) will be constructed around the tailings storage facility.

Air quality monitoring

The following monitoring will be implemented:

- maintain continuous real time monitoring of PM_{10} in Wandoan at the town site already established
- establish continuous real time monitoring of PM_{10} at representative sites of potential high dust occurrences as described in Section 13-5-3 and detailed in Figure 13-37-V1.3 and Table 13-30
- meteorological monitoring to form the basis of a high dust potential forecasting system coupled with the dust monitoring program, meteorological conditions will inform the implementation of the reactive management plan
- the forecasting system will be designed to a trigger response criteria, i.e. when PM_{10} levels exceed 80% of the EPP (Air) goal (120 µg/m^3) the reactive management plan is activated.

Table 13-30: Monitoring requirements for mining operations

Lot / plan	Receptor	TSP	PM_{10}	Dust deposition	Meteorological variables
47 FT466	MLA-239	Y	Y	Y	Y
4 FT758	MLA-526	Y	Y	Y	Y
132 SP121742	MLA721 or MLA725	Y	Y	Y	Y
Short Street	Town Centre	Y	Y	Y	Y
6 FT788	MLA-505	Y	Y	Y	Y
28 FT563	MLA-687	Y	Y	Y	Y
1 RP204781	MLA-402	Y	Y	Y	Y

Proactive / predictive air quality management

The establishment a forecasting and monitoring system will provide real time information on PM_{10} concentrations outside of the MLA boundaries and the meteorological conditions which gave rise these conditions.

The system will allow management to make informed and accurate decisions on mine operations, equipment locations and extraction rates to mitigate any adverse impact on the surrounding sensitive receptors, before any impact actually occurs. The real time monitoring will be linked to the TARP which will be activated once the 24 hour PM_{10}-ground level concentrations exceed 80% (120 µg/m^3) of the EPP (Air) goal (150 µg/m^3). Measures to minimise the potential impact of fugitive dust emissions must recognise all potential sources of dust emissions and have strategies in place to mitigate any unnecessary emissions and adverse impacts that the proposed activities may have on the health and amenity of the surrounding community. Therefore the air quality management plan will have both proactive and reactive measures.

The proactive management plan includes, as necessary:

- formulation of mitigation measures based on dust forecast
- grading and watering haul roads and if necessary use of surface treatments
- water sprays, covers and closed in chutes on conveyors
- progressive rehabilitation of disturbed areas as mining operations progresses
- minimisation of the drop height for dragline operations
- the surface of coal in wagons will be profiled to a flat “garden bed” shape and a surface treatment will be applied to minimise coal dust emissions during transit
- laboratory work has been completed to investigate the relationship between dustiness and moisture of the Wandoan coal to assist in the management of coal dust emissions (refer TR 13-V1.4)
- laboratory work has been conducted to investigate the dustiness of the washery rejects to assist in the management of dust emissions from the reject emplacement (refer TR 13-V1.4).

The reactive management plan will include:

- implementation of additional mitigation measures when wind conditions become adverse, such ceasing operations, reducing activity rates or covering equipment
- a complaints management system as discussed later in this chapter.

Power station

No specific mitigation measures are required during operation of the power station.

Waste Water Treatment Plant

No specific mitigation measures are required during operation of the WWTP, however, odour engineering controls to achieve the odour levels as shown in Table 13-28 will be initially implemented.

Gas supply pipeline

A dust management plan will be developed for the construction of the gas supply pipeline as part of the pipeline's Environmental Management Plan (Construction). This plan will include:

- use of water sprays during excavation when sensitive receptors are located within 500 m of the pipeline corridor
- revegetation of disturbed area as soon as possible following backfilling of the pipe trench.

Complaints management

To manage any complaints, a site hot line will be established for residents who wish to report air quality related incidents associated with the operation of the Project. In addition the following commitments are made:

- all air quality complaints will be investigated
- strategies and targets based on the regular review of air quality monitoring results and review of air quality complaints will be undertaken as part of the sites Environmental Management System requirements.

Air Quality Management Plan

Construction and operations Air Quality Management Plans will be prepared in accordance with Environmental Protection Agency Guideline – Preparing environmental management plans (March 2003). The Plans will detail performance objectives, actions and procedures and be prepared prior to the respective phases of the Project and incorporate the above measures. The plan will be reviewed based on monitoring results.

13.7 RESIDUAL IMPACTS

Following mitigation, the residual impacts are anticipated to be as follows:

- no significant impacts are predicted at sensitive receptors
- dust deposition impacts to crops and plant photosynthesis outside of the MLA are predicted to be insignificant
- dust deposition levels outside of the MLA will not impact water bores.

No residual impacts are expected to occur for the construction and operation of the gas pipeline.

13.8 REFERENCES

Bofinger, N.D., Best, P.R., Cliff, D.I., and Stumer, L.J., 1986. The oxidation of nitric oxide to nitrogen dioxide in power station plumes. *Proceedings of the Seventh World Clean Air Congress*, Sydney, 384-392.

TAPM (2006) Version 3.0.7 developed by the CSIRO (http://www.cmar.csiro.au/research/tapm/).

Earth Tech Inc, Concord, MA, USA. CALMET – Version 6.211 – April 14. 2006 http://www.src.com/verio/download/download.htm#MOD6_VERSION

Earth Tech Inc, Concord, MA, USA. CALPUFF – Version 6.112 – April 12, 2006 CALMET – Version 6.211 – April 14. 2006 http://www.src.com/verio/download/download.htm#MOD6_VERSION

Environmental Protection Agency 1997. Environmental Protection (Air) Policy, Subordinate Legislation 1997 No. 468 and amendments. *Office of the Queensland Parliamentary Counsel, Queensland.*

Environmental Protection Agency, 2004 Guideline – Odour Impact Assessment from Developments.

Gutteridge Haskins & Davey (GHD)/Oceanics 1975. *Hay Point Environmental Planning Study.*

National Environment Protection Council (NEPC) 1998. National Environment Protection (Ambient Air Quality) Measure, as amended July 2003.

Neale, D. 2005 Ambient air quality in Queensland 2005 annual summary and trend report. Environmental Protection Agency, Technical Report: ISSN 1037-4671.

NSW DECC 2007, Factsheet: Mine dust and you.

Park C.W. & Lee S.J. 2001, "Verification of the shelter effect of a windbreak on coal piles in the POSCO open storage yards at the Kwang-Yang works" *Atmospheric Environment.*

Queensland Environmental Protection Act (1994), Reprinted as in force on 6 June 1996 (includes amendments up to Act No. 10 of 1996).

Sturman, A.P. and Tapper, N.J., 1996, Weather and Climate of Australia and New Zealand. Melbourne Oxford University Press.

Tapper, N. and Hurry, L. 1993, Australia's Weather Patterns – An Introductory Guide, Dellasta Pty Ltd, Mt. Waverly, Victoria.