Mt Piper Power Station
Ash Placement Project

ENVIRONMENTAL ASSESSMENT

CHAPTER 5 – AIR QUALITY

August 2010

Contents

5. Air Quality

The Director-General's requirements for air quality are:

Air quality impacts for the Neubecks Creek and Ivanhoe 4 sites (concept plan application only) include an analysis of potential air quality impacts and constraints to the development of these sites including available mitigation and/or management options that may be applied to achieve acceptable environmental outcomes (such as low dust generation ash disposal options), with consideration of cumulative impacts from the project and other existing or proposed activities in close proximity to the project site. Key air quality risk factors and/or design criteria that would require further detailed investigation prior to the development of these sites must be identified.

For the Lamberts North and Lamberts South Sites (project application), include an assessment of the air quality impacts of the proposed development in accordance with the Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005) (Approved Methods) considering worst case operating scenarios and meteorological conditions, representative monitoring and receiver locations and cumulative impacts from nearby activities (e.g. Mount Piper and Wallerawang Power Stations). The assessment must focus on potential point source emissions, odour impacts, and particulate impacts during construction and operation as well as contaminants in the ash. Detailed information for the proposed mitigation and management measures proposed to minimise identified impacts relevant to the project application must be provided.

5.1. Introduction

This chapter provides a qualitative air quality assessment of the Neubecks Creek and Ivanhoe sites and a quantitative air quality assessment for the Lamberts North and Lamberts South sites. The assessment follows the procedures outlined by the NSW Department of Environment and Climate Change and Water (DECCW) in their document titled *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. Full details of the study are provided in **Appendix B.**

5.1.1. Assessment Criteria

The Department of Environment, Climate Change and Water (DECCW) has set criteria to assess the air quality impacts of existing or proposed facilities. Of particular relevance to the proposed activities are criteria for particulate matter. There are various classifications of particulate matter, with the DECCW providing assessment criteria for the following:

- Total suspended particulates (TSP);
- Particulate matter with equivalent aerodynamic diameter less than or equal to 10 microns (PM_{10}); and

- Deposited dust.

Table 5-1 summarises the current air quality assessment criteria for particulate matter, as noted by the DECCW. In general, these criteria relate to the total burden of dust in the air and not just the dust from project-specific sources. Therefore, some consideration of background levels needs to be made when using these criteria to assess impacts.

Table 5-1 DECCW assessment criteria for particulate matter

Pollutant	Averaging time	Criterion	Application
TSP	Annual average	90 µg/m^3	Cumulative
PM_{10}	Annual average	30 µg/m^3	Cumulative
	Maximum 24-hour average	50 µg/m^3	Cumulative
Deposited dust	Annual average (maximum increase)	2 g/m^2/month	Cumulative
	Annual average (maximum total)	4 g/m^2/month	Cumulative

The DECCW's criteria for TSP and deposited dust have been set to protect against nuisance impacts, while the PM_{10} criteria have been set to protect against adverse health effects.

There is an increasing body of evidence to suggest that criteria for finer particulate matter (for example, $PM_{2.5}$) may be more important for protecting against adverse health impacts, however, at this stage the DECCW has not set criteria for $PM_{2.5}$ that can be applied on a project-specific basis.

5.1.2. Existing Environment

The proposed areas for ash placement and the location of sensitive receivers are shown in **Figure 5-1**. Details on locations of sensitive receptors are provided in **Table 5-2.**

Available data from the area of the project allowed an assessment of the existing air quality environment at residential locations. These data showed that:

- Annual average PM_{10} and TSP concentrations are in compliance with the DECCW's air quality assessment criteria;
- Short-term (that is, 24-hour average) PM_{10} concentrations are highly variable and are likely to have exceeded the 50 µg/m^3 criterion on occasions; and
- Average dust deposition levels are in compliance with the DECCW's air quality assessment criteria.

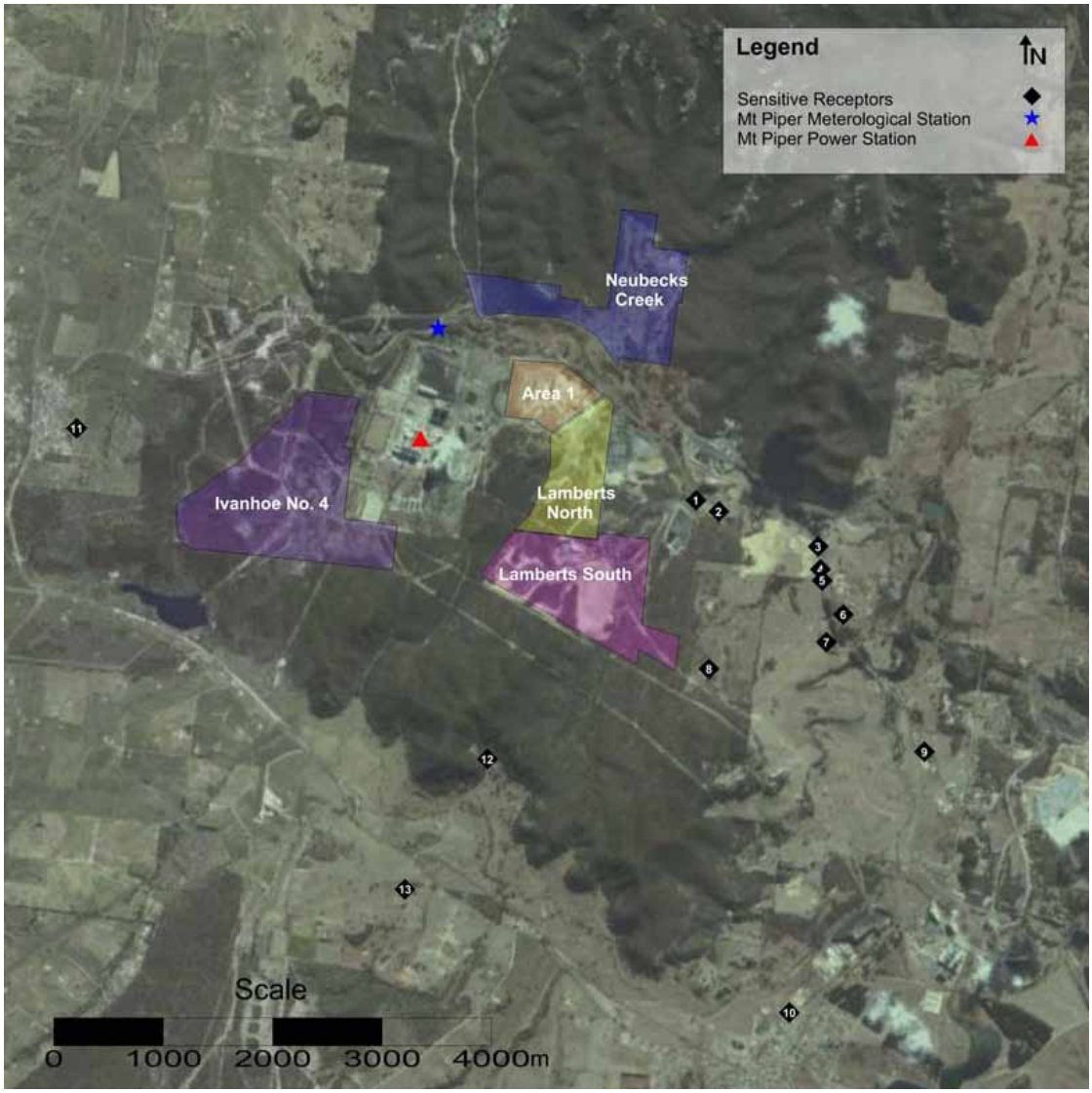

Figure 5-1 Site Location and Sensitive Receivers

For this assessment the following background levels were assumed to apply at the nearest sensitive receptors:

- Annual average TSP of 32µg/m^3;
- Annual average PM_{10} of 16µg/m^3; and
- Annual average dust deposition of 1.2g/m^2/month.

Table 5-2 Location of Sensitive receivers

ID No.	Address
1	Noon Street, Blackmans Flat
2	Castlereagh Highway, Blackmans Flat
3	Castlereagh Highway, Blackmans Flat
4	View Street, Black Blackmans Flat
5	Castlereagh Highway, Blackmans Flat
6	Castlereagh Highway, Lidsdale
7	Ian Holt Drive, Lidsdale
8	Castlereagh Highway, Wallerawang
9	Ian Holt Drive, Lidsdale
10	Commercial Hotel, Main Street, Wallerawang
11	Main Street, Portland
12	Portland Road, Wallerawang
13	Pipers Flat Road, Wallerawang

5.1.3. Existing Dust Emissions

Proposed ash handling activities were combined with emissions factors developed both locally and by the US EPA to determine total dust emissions.

The following emission factor equations discussed in this section relate to:

- The quantity of TSP generated by a particular operation to the type of operation;
- Intensity of the operation (e.g. the quantity of material handled per unit of time); and
- The properties of the materials being handled (e.g. silt content and moisture level).

Sources of dust on the site would include:

- Loading and unloading ash including:
  - Loading ash to trucks;
  - Emplacement of ash into the repository;
- Vehicles hauling ash to emplace from conveyor while travelling on unpaved areas;
- Shaping the emplaced ash using dozers;
- Wind erosion from the emplacement of ash; and
- Emplacement of topsoil on top of the ash.

Operational hours for ash placement will be 6am to 8pm, Monday to Friday and 6am to 5pm Saturday and Sunday. It has been assumed for modelling purposes that onsite operations would only occur between the hours of 6am and 8pm.

A discussion of the emission factors and operational data used for this assessment is included in **Appendix B**.

A summary of estimated annual TSP emissions, including with the proposed Mt Piper Extension scenario is shown in **Table 5-3**.

Table 5-3 Summary of Dust Emissions

ACTIVITY	Estimated annual TSP emissions (kg/y)	
	Proposed Placement Area (with existing Mt Piper operations)	Proposed Placement Area (with Mt Piper Extension)
Loading ash to trucks	80	220
Emplacement of ash into the repository	80	220
Vehicles carrying ash on unpaved roads	166,000	443,520
Shaping the emplaced ash using dozers	4,000	4,000
Wind erosion from the emplacement of ash	182,630	182,630
Emplacement of topsoil on top of the ash	400	830
TOTAL	**353,200**	**631,600**

All numbers are rounded to the nearest 10

It should be noted that the above TSP emissions have been calculated without dust emission control measures, and as such may be considered as worst case.

5.2. Methodology

This section describes the assessment methodology for dispersion modelling of the Lamberts North and Lamberts South sites. Specifically this involves a Level 2 air quality assessment conducted in accordance with the "*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*". The Level 2 assessment uses site-specific input data, such as detailed meteorological information.

The AUSPLUME (version 6.0) model was used to predict dust concentrations within the vicinity of the proposed disposal area. AUSPLUME was developed by the Victorian EPA, and is an approved model for conducting site-specific air quality assessments in NSW.

Inputs required by the AUPLUME model include:

- Emission source locations;
- Emission rates;

- Topographical data;
- Locations of sensitive receptors; and
- Meteorological conditions.

The dispersion modelling was based on meteorological information and the dust emission estimates to predict dust concentrations and deposition levels in the vicinity of the project.

5.3. Predicted Operational Impacts from Project

This section outlines the results of modelling using AUSPLUME.

5.3.1. Total Suspended Particulates

Predicted annual average TSP concentrations show that the annual 90µg/m^3 criterion contour does not extend beyond the site boundary for the proposal. All sensitive receivers are predicted to experience an incremental increase in the annual TSP concentration of less than 6µg/m^3, with the highest TSP concentration (5.3µg/m^3) occurring at sensitive receptor one (1). These results are well below DECCW criterion of 90µg/m^3, even when added to the assumed annual average background TSP concentration of 32µg/m^3. The model predictions suggest that there will be no adverse impacts, in terms of TSP concentrations, on the nearest sensitive receivers.

5.3.2. Particulate Matter (PM_{10})

Predicted maximum 24-hour average concentrations show that the 50µg/m^3 criterion contour may extend beyond the site boundary for the proposed expansion at Lamberts South. Sensitive Receiver 1 is predicted to experience the highest maximum 24-hour average concentration of 15.6µg/m^3 which is well below the criterion.

The measurement data showed that background PM_{10} concentrations are highly variable and it is likely that the DECCW's 50 µg/m^3 criterion is exceeded in the region on a number of occasions each year. For assessment of cumulative 24-hour average PM_{10} concentrations, the approach of adding maximum measured to maximum predicted would not demonstrate compliance with the 50 µg/m^3 criterion. This is because the historical maximum measured values (over100 µg/m^3) would not permit any project contribution before 50 µg/m^3 is exceeded.

Existing PM_{10} concentrations vary from day to day but if it were assumed that the existing annual average PM_{10} concentration (16 µg/m^3) occurred every day of the year then the assessment would be very much simplified as a maximum project contribution of 34 µg/m^3 or more would be the point at which potential air quality impacts would be observed - assuming 50 µg/m^3 is the level at which potential impacts occur. No sensitive receivers are predicted to exceed 34 µg/m^3, taking this

conservative approach. It should also be emphasised that the model results present the "worst-day" at each location in terms of potential impacts from the project.

Predicted annual average PM10 concentrations indicate that the 30µg/m3 criterion contour slightly exceeds the Lamberts North boundary. All sensitive receivers are predicted to experience an annual PM10 concentration of less than 30µg/m3 with the highest incremental increase predicted to be 4.5µg/m3 at sensitive receiver 1. These results demonstrate compliance with the DECCW's criterion of 30µg/m3, even when assumed background concentrations of 16µg/m3 are added to the predictions.

For the purpose of this assessment a "worst case" condition has been assumed in which no controls have been put in place to reduce onsite dust emissions. It is noted that existing dust control measures used in Area 1 such as application of sprays to exposed surfaces within the placement area and use of water trucks on unpaved haul roads would also be applied to the proposed expansion areas. Therefore, it is likely that the maximum 24-hour and annual PM10 concentrations would be lower than predicted.

Further, the assessment has not removed any existing contribution from current ash emplacement activities within Area 1, and thus cumulative impacts discussed in this assessment are likely to be lower than predicted.

5.3.3. Deposited Dust

Predicted annual average dust deposition results indicate that the 2g/m^2/month contour (maximum increase) extends slightly beyond the site boundary, east of Lamberts North and Lamberts South. All sensitive receivers are predicted to experience less 2g/m^2/month of deposited dust due to the proposal.

The 4g/m^2/month (maximum total) criterion contour is within the site boundary. When the assumed background concentration of 1.2g/m^2/month is added to the predicted concentration at the sensitive receivers it can be seen that all sensitive receivers experience a deposited dust concentration well below the 4g/m^2/month (maximum total).

These model predictions suggest that there will be no adverse impacts on sensitive receivers, in terms of dust deposition.

5.3.4. Predicted Impacts from Project plus Mt Piper Extension

Should project approval be obtained to develop a new 2,000 MW coal-fired plant this would result in the generation of an additional 1,314,000 m^3 of ash requiring placement at the proposed ash site. Cumulative impacts of on residences during the operation of the proposed ash placement site and the proposed Mt Piper Extension are assessed in this section.

Predicted dust concentrations and deposition levels due to ash placement from the new power plant show slightly higher impacts than for the existing Mt Piper Power Station ash placement, and the annual average PM_{10}, TSP and dust deposition levels are unlikely to be exceeded. Again, the maximum 24-hour average PM_{10} concentrations are below the criterion (50 µg/m^3).

For the purpose of this assessment a worst case condition has been assumed in which no controls have been put in place to reduce on-site dust emissions. It is also assumed that existing dust control measures used in Area 1 would also be applied to the proposed ash placement areas. When taking into account the use of dust control measures and that the assumed background concentration would include the existing operational activities undertaken within Area 1, it is likely that the maximum 24-hour and annual PM_{10} concentrations would be lower than predicted.

5.4. Construction Impacts

Preparation of the proposed ash placement areas may require bulk earthworks which have the potential to result in nuisance dust emissions. Dust emissions will arise primarily from the following activities:

- Clearing of vegetation and topsoil;
- Loading and unloading of material from trucks;
- Trucks travelling over unsealed roads; and
- Wind erosion from unsealed surfaces and stockpiles.

Appropriate safeguards would be required to minimise potential air quality impacts during construction including watering of exposed soils when necessary, particularly during dry and windy conditions, stabilising work areas and minimising areas of surface disturbance.

5.5. Ivanhoe No. 4 and Neubecks Creek Sites

Placement of ash at the proposed Ivanhoe No. 4 and Neubecks Creek sites has the potential to generate dust if not managed properly. These areas would require further assessment in accordance with the DECC *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in* NSW, should project approval be sought. A qualitative assessment has been undertaken in the current study which identifies the key dust-generating sources and suitable measures to minimise emissions.

Ash within the placement area can be exposed for a considerable time before capping, which can lead to the generation of dust emissions particularly during dry and windy conditions. A number of activities associated with the emplacement of ash would also generate ash emissions including:

- Loading and unloading ash including:
  - Loading ash to trucks;
  - Emplacement of ash into the placement area;

- Vehicles hauling ash to area from conveyor while travelling on unpaved areas; and
- Shaping the ash using dozers.

It is assumed that the same dust control methods currently used within the existing ash site (Area 1) would be applied to the proposed sites including:

- Conditioning of fly ash with water or brine, ensuring that the moisture content sits at approximately 15%;
- Application of sprays to wet the ash surface and prevent dusting, with any runoff from the ash placement area contained within onsite ponds;
- Application of molasses in areas of exposed ash, where application of sprays is not practical; and
- Use of water trucks on unpaved haul roads.

In accordance with the proposed placement strategy, once the capacity is reached the entire area would be capped. Emplacement of topsoil on top of the ash used for capping would also result in dust emissions from wind erosion and vehicle activities. Once an area is capped it would be re-vegetated, thereby avoiding the any further risk of dust generation.

5.6. Cumulative Impacts with other Projects

In addition to the proposed Mt Piper Extension, Delta has obtained approval to extend the existing Kerosene Vale ash storage area (approximately 4km southeast of the study area) to enable storage of ash from Wallerawang Power Station. Predicted TSP, PM_{10} and deposited dust emissions for the Kerosene Vale project is set out in an air quality assessment prepared by Holmes Air Sciences. The predicted cumulative TSP, PM_{10} and deposited dust levels provided in **Table 5-4**.

These results add the predictions for the most affected sensitive receptor location due to Mt Piper (that is, Receiver 1) to the predictions for the most affected sensitive receptor location due to proposed Kerosene Vale activities. Maximum 24-hour average PM_{10} concentrations are not included as the maximum impacts from the Mt Piper ash area will not occur at the same time as maximum impacts from the Kerosene Vale ash area. In **Table 5-4** it can be seen that the cumulative impact for annual TSP and PM_{10} of the Mt Piper Extension (and associated ash placement site) and the Kerosene Vale ash storage area extension do not exceed the DECCW criteria of 90 and 30µg/m^3. Predicted annual average deposited dust is also within the DECCW criterion of 4g/m^2/month. It follows that the cumulative impacts of the Project will be at acceptable levels.

- **Table 5-4 Potential cumulative impacts with Kerosene Vale ash project**

Pollutant	Criterion	Proposed Mt Piper Ash Placement (786,500m^2)*	Proposed Mt Piper Ash Placement (with Mt Piper Ext) (2,110,000m^2)*	Kerosene Vale Ash Repository	Maximum cumulative Impact
Annual PM_{10} (µg/m^3)	30	20.5	25.9	3	28.9
Annual TSP(µg/m^3)	90	37.3	43.4	4	47.4
Deposited Dust (g/m^2/month)	4	1.6	1.9	0.5	2.4

*Includes assumed background concentrations

It has been assumed that existing dust control measures used in Area 1 would also be applied to the proposed new ash placement areas, and that existing background concentrations used in this assessment (which include ash emplacement activities within Area 1) has resulted in an over prediction of cumulative impacts. Therefore, PM_{10} and TSP levels are likely to be lower than predicted.

5.7. Odour and Ash Contaminants

The fly ash produced from the burning of pulverised coal in a coal-fired boiler is a fine-grained, powdery particulate material that is generally odourless. Odour problems associated with fly ash generally only occur when ammonia-based NO_x (oxides of nitrogen) reduction systems are used at the power station. Such ammonia based NO_x reduction systems convert flue gas NO_x into elemental nitrogen through both high temperature use of ammonia (selective non-catalytic reduction [SNCR]) and the use of ammonia with a catalyst (selective catalytic reduction). Both these processes can result in deposition of ammonia on fly ash, and as a result detectable odours may be experienced from the fly ash.

Given that a NH_3 based NO_x reduction system is currently not used at MPPS, and that no odour issues have arisen within the current ash disposal area it is unlikely that the proposed ash placement activities would cause odour impacts.

Trace elements are found within the ash, naturally and due to the conditioning of ash with brine. Dust emissions from the emplacement of ash are unlikely to contain high enough concentrations of these trace elements to cause exceedances of air quality criteria at all ground level locations.

5.8. Conclusions

This chapter provides an assessment of potential dust, odour and ash contaminants associated with the proposed Mt Piper Ash Placement Project. Computer-based dust dispersion modelling was undertaken for the Lamberts North and Lamberts South ash placement areas and used to assess the impacts of the proposal. A qualitative assessment was undertaken for odour and ash contaminants, and for the proposed Ivanhoe No. 4 and Neubecks Creek sites.

Meteorological data from the Mt Piper Power Station site were combined with estimated dust emissions from proposed activities to predict off-site TSP, PM_{10} and deposited dust levels.

An additional scenario was also developed which took into account ash requiring placement from the proposed Mt Piper Extension Project.

The results from the assessment indicated that the project is unlikely to cause exceedances of annual PM_{10}, TSP and dust deposition criteria at the nearest sensitive receptor locations. There is potential for the maximum 24-hour average PM_{10} criteria to be exceeded from time to time, although it is unlikely that the project would be the cause of such exceedances. It should also be noted that the model results present the "worst-day" at each location in terms of potential impacts from the project.

The assessment was based on a worst case scenario, in which no controls have been put in place to reduce onsite dust emissions. As indicated in Chapter 3 the existing dust control measures used in Area 1, such as application of sprays and molasses to exposed surfaces and water trucks on unpaved haul roads, would also be applied to the proposed placement areas. Consequently, dust concentrations and deposition levels should be lower than predicted. Background levels would also be lower as there would no longer be ash placement at Area 1 once Lamberts North is operational.

Assessment of the Ivanhoe No. 4 and Neubecks Creek found that ash placement at these sites would have the potential to generate dust and would require further detailed assessment in accordance with the DECC *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in* NSW, whenever project approval was sought for these two areas.

The project emissions are unlikely to cause exceedances of air quality criteria for ash contaminant and odour at all ground-level locations.