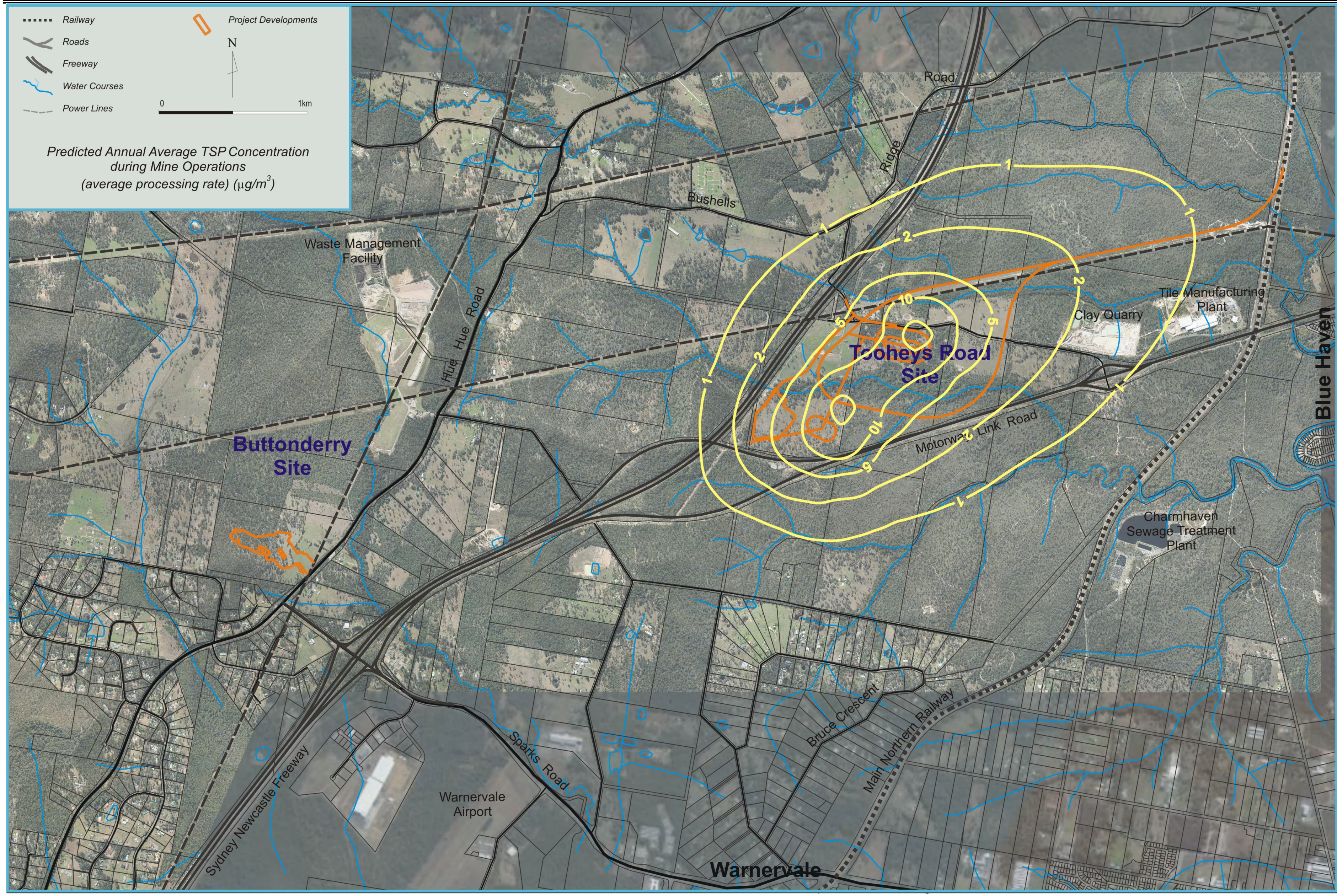


**Figure 12.13** **Predicted Annual Average TSP Concentration During Mine Operations, Average Processing Rate**

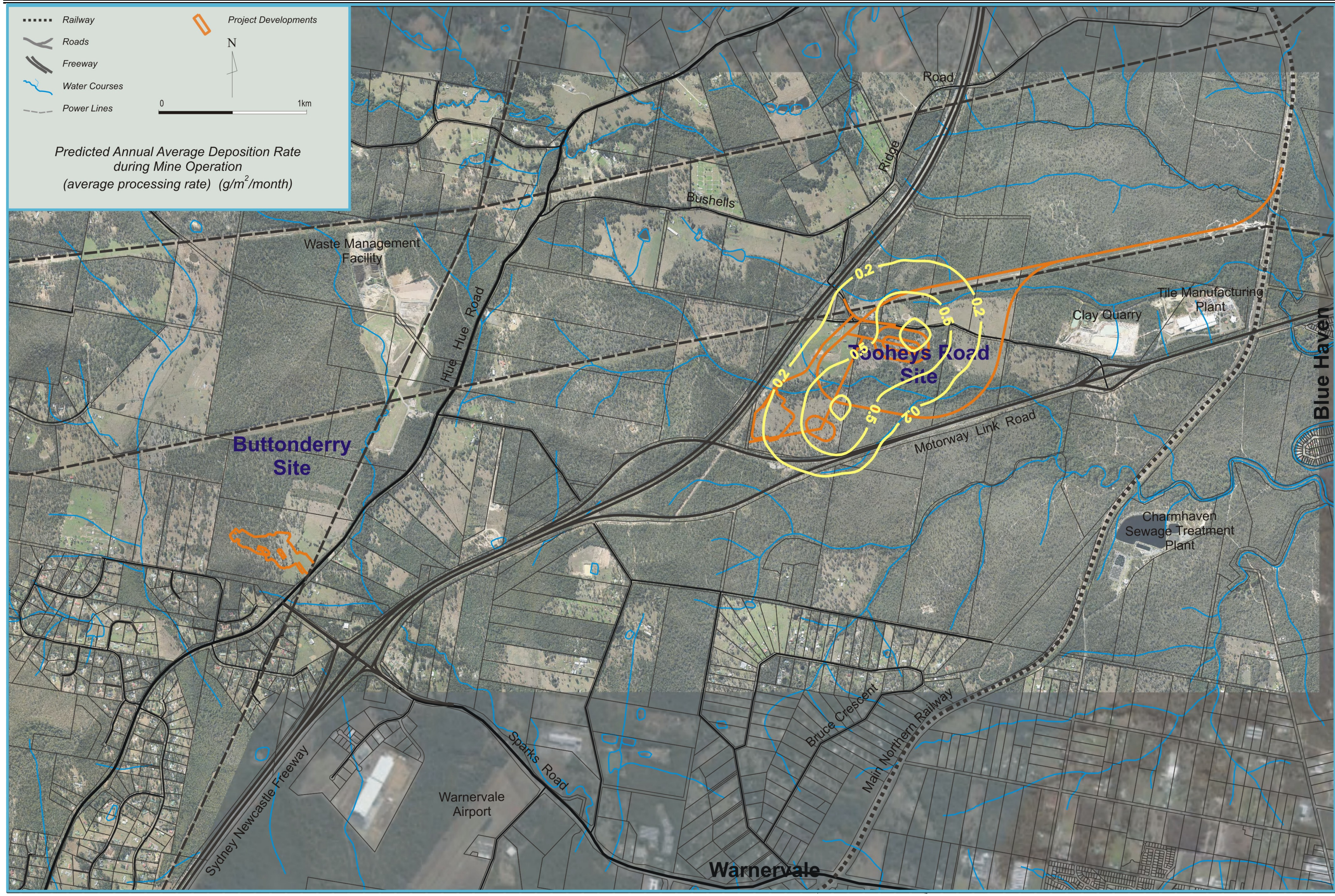


**Figure 12.14 Predicted Annual Average Deposition Rate During Mine Operations, Average Processing Rate**

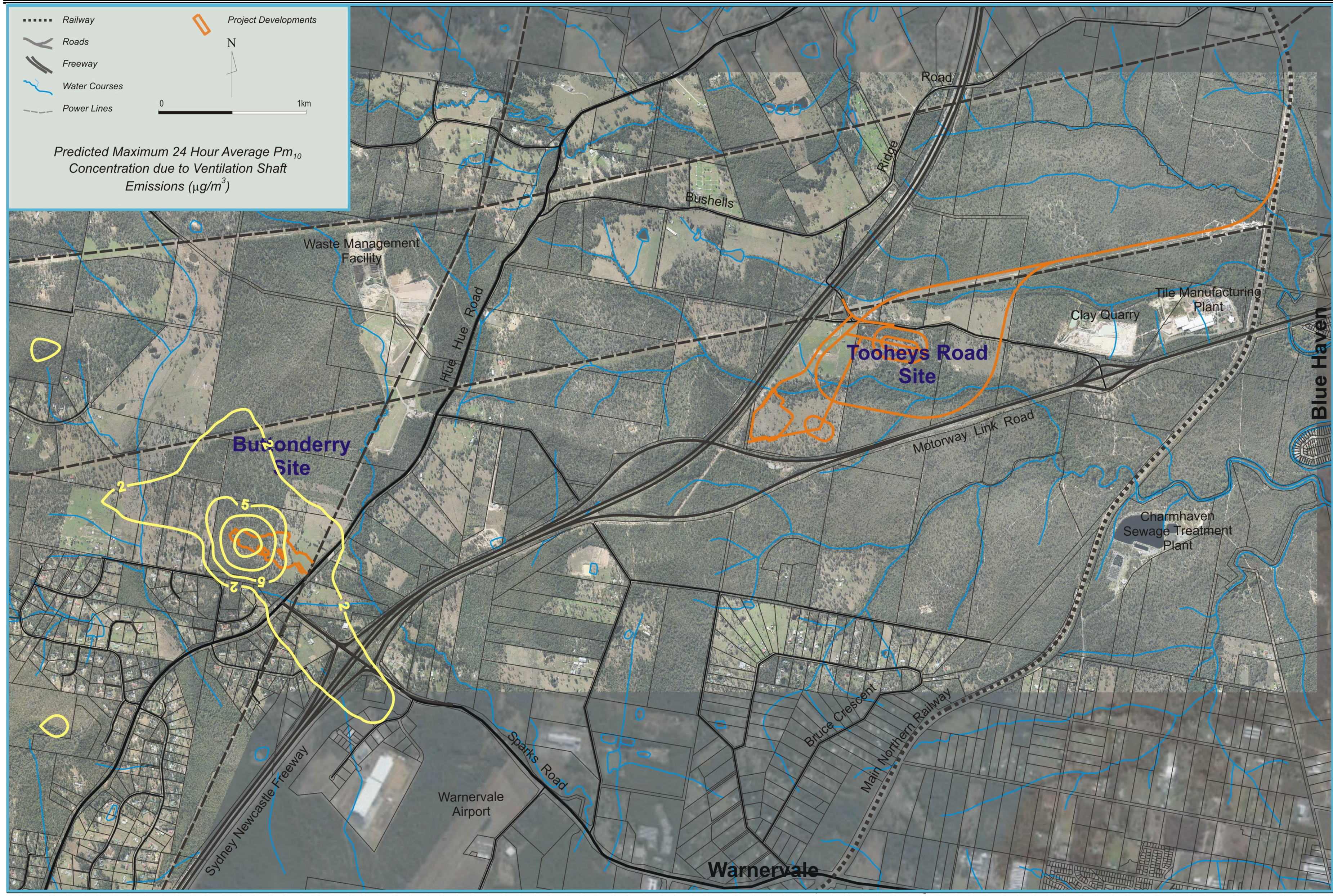


**Figure 12.15 Predicted Maximum 24 Hour Average $PM_{10}$ Concentration Due to Ventilation Shaft Emissions**


**Figure 12.16 Predicted Annual Average $PM_{10}$ Concentration Due to Ventilation Shaft Emissions**


**Figure 12.17 Predicted Maximum 24 Hour Average PM$_{10}$ Concentration Due to Ventilation Shaft Emissions, including Background**

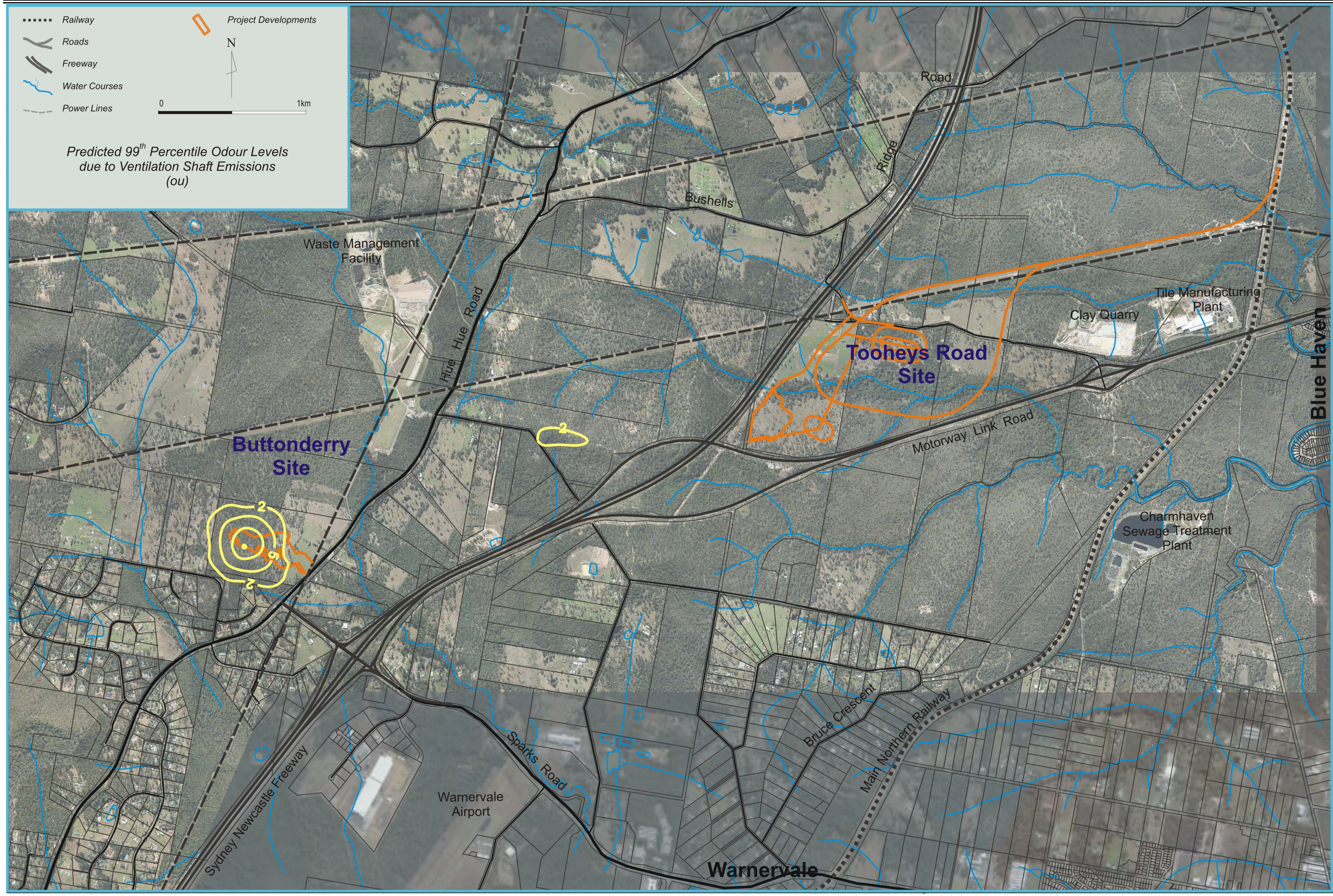


**Figure 12.18 Predicted 99th Percentile Odour Levels due to Ventilation Shaft Emissions**

### 12.5.3 Particulate Matter Impacts from the Ventilation Shaft

Figure 12.15 and Figure 12.16 present the predicted maximum 24-hour and annual average $PM_{10}$ concentrations due to the ventilation shaft emissions. It has been assumed that all particulate emissions are $PM_{10}$. The 24-hour $PM_{10}$ concentrations including contemporaneous background are also presented, using the continuous hourly data from Beresfield collected by the DECCW over the same time period as the meteorological data. There are no exceedances of the goal. The annual $PM_{10}$ measured at Beresfield was 16.5 $\mu g/m^3$ for that period. The more conservative value of 21 $\mu g/m^3$ was used as the background in this case.

**Table 12.8 Predicted Dust Concentrations at Sensitive Receptors due to the Ventilation Shaft**

| | 24-hour maximum $PM_{10}$ ($\mu g/m^3$) | | Annual average $PM_{10}$ ($\mu g/m^3$) | |
|---|---|---|---|---|
| | 50 $\mu g/m^3$ | | 30 $\mu g/m^3$ | |
| **Background** | **Contemporaneous** | | **21 $\mu g/m^3$** | |
| **Receptor** | **Vent alone** | **Vent plus background** | **Vent alone** | **Vent plus background** |
| P1 | 0.6 | 39.1 | 0.15 | 21.15 |
| P2 | 0.8 | 39.1 | 0.20 | 21.20 |
| P3 | 0.8 | 39.2 | 0.20 | 21.20 |
| P4 | 1.4 | 39.4 | 0.35 | 21.35 |
| P5 | 1.0 | 39.1 | 0.20 | 21.20 |
| P6 | 0.7 | 39.0 | 0.07 | 21.07 |
| P7 | 0.7 | 39.0 | 0.08 | 21.08 |
| P8 | 0.7 | 39.0 | 0.08 | 21.08 |
| P9 | 0.6 | 39.0 | 0.07 | 21.07 |
| P10 | 0.4 | 39.0 | 0.05 | 21.05 |
| R1 | 2.1 | 40.4 | 0.25 | 21.25 |
| R2 | 2.9 | 39.2 | 0.44 | 21.44 |
| R3 | 0.8 | 38.9 | 0.18 | 21.18 |
| R4 | 0.6 | 38.9 | 0.09 | 21.09 |
| R5 (Blue Haven) | 0.4 | 39.0 | 0.09 | 21.09 |

Figure 12.17 presents the predicted maximum 24-hour $PM_{10}$ concentrations including background concentrations. The predictions are dominated by the background contributions and do not exceed the 24-hour goal of 50 $\mu g/m^3$. All predicted levels due to the vent alone are low.

The cumulative impacts of the dust emissions from the ventilation shaft and the dust emissions from the Tooheys Road surface facilities would also not result in any exceedances of the goals.

### 12.5.4 Odour

The predicted 99-percentile 1-hour average odour levels due to emissions of odour from the ventilation shaft are shown in Figure 12.18**.**

Predicted 99$^{th}$ percentile odour levels at specific receptors are summarised in Table 12.9**.** The modelling predicts generally low levels of odour with compliance with the most stringent two odour unit 99$^{th}$ percentile goal at all receptors. In practice the levels are likely to be lower than this for the assumed emission rate as the modelling cannot fully take into account the initial dispersion of the emissions. It is proposed to direct the vent away from the residences to the south and to shield it behind terrain.

It is also possible that the odour levels in the vent and total emission rates could be higher than that assumed in the modelling. The total odour emission rate of 22,940 is approximately half the average measured for the Dartbook Underground Coal Mine which is 49,300 ou.$m^3$/s (Holmes Air Sciences, 2003). However for most residences, a doubling of the odour emission rate would not cause any exceedance of the most stringent goal and would not result in exceedances of the three odour unit goal which would be appropriate for the population density in the area.

**Table 12.9 Predicted 99th Percentile Odour Levels at Sensitive Receptors**

| Receptor | 99th percentile odour level |
|---|---|
| P1 | 0.5 |
| P2 | 0.8 |
| P3 | 0.7 |
| P4 | 1.4 |
| P5 | 1.2 |
| P6 | 0.7 |
| P7 | 0.7 |
| P8 | 0.7 |
| P9 | 0.6 |
| P10 | 0.4 |
| R1 | 0.7 |
| R2 | 1.2 |
| R3 | 0.4 |
| R4 | 0.3 |
| R5 (Blue Haven) | 0.3 |

## 12.6 Climate Change

For some time now, there has been growing global awareness of, and agreement within the Australian and international scientific communities, that human activities resulted in substantial global warming from the mid-20th century, and that continued growth in greenhouse gas concentrations caused by human-induced emissions would generate high risks of dangerous climate change.

It is believed that if global emissions of greenhouse gases, of which Australia is a major contributor, are left unmitigated, there is a high risk of detrimental changes to the climate. In Australia, these changes are predicted to include considerable drying in southern Australia, accompanied by much higher temperatures and greater variability in weather patterns.

Relative to other OECD countries, Australia's high emissions are mainly the result of the high emissions intensity of energy use, through the burning of coal for electricity generation.

Australia is committed to the reduction of greenhouse gas emissions with the development of policies and framework to facilitate the changes required. The proposed method of policy intervention by the Australian government is the implementation of an emissions trading scheme.

### 12.6.1 The Garnaut Review

A review of the current and predicted climate change trend, its impact on Australia and the countries global position, and the impact of mitigation strategies was undertaken through the Garnaut Climate Change Review, with the final report released in September 2008.

The key findings of the Garnaut Review, as set out in its final report, were:

- A fair and effective global agreement delivering deep cuts in emissions consistent with stabilising concentrations of greenhouse gases at around 450 parts per million or lower would be in Australia's interests;
- Achieving global commitment to emissions reduction of this order appears unlikely in the next commitment period; and
- The most prospective pathway to this goal is to embark on global action that reduces the risks of dangerous climate change and builds confidence that deep cuts in emissions are compatible with continuing economic growth and improved living standards.

The Garnaut Review recognises and acknowledges the impact and cost of greenhouse gas reduction on households and industry. Of particular reference is how the national and international pressure to reduce the use of coal in power generation will affect the coal industry. Coal is the primary source of electricity generation in Australia at present, and it is Australia's largest export commodity.

The Garnaut Review, while highlighting the significant contribution that the coal industry makes to greenhouse gas emissions, does not idealistically demand that the mining and burning of coal cease. Instead, the report acknowledges the ongoing future of the coal industry, and that it will be possible to counteract the negative impact of mining and burning coal through geosequestration or biosequestration.

Through development of technologies and the capture of greenhouse gases, the review in fact foresees an expansion in the coal industry:

> *"Any large negative impacts in the coal regions are many years away. With effective application of known technologies to reduce emissions in the immediate future, and commercially successful carbon capture and storage after that, the future prospects are for continued expansion."*

### 12.6.2 Carbon Pollution Reduction Scheme

The Commonwealth Government is proposing the Carbon Pollution Reduction Scheme (CPRS) aimed at reducing carbon pollution while sustaining strong economic growth and securing our future prosperity. The CPRS will cap the amount of carbon that can be emitted, and affected businesses will need to purchase a "permit" for each tonne of carbon emitted to the atmosphere. Direct obligations would apply to entities with a facility that has direct (Scope 1) emissions of 25,000 t of $CO_2$-e per year, or more.

The CPRS is described in Section 4.11 and has been taken into account in the benefit cost analysis (refer to Section 3.8.5 and Appendix H).

## 12.7 Greenhouse Gas Emissions

Australia signed the Kyoto protocol on April 29, 1998. However, it was on 11 March 2008 that Australia's ratification of the Kyoto Protocol came into force, officially making Australia a full party to the Kyoto Protocol. Under the Kyoto Protocol, Australia is obliged to limit its greenhouse gas emissions in 2008-2012 to 108 percent of its emissions in 1990.

The current primary shareholder in the WACJV, Kores, is owned by the South Korean Government which announced its commitment to reducing greenhouse gas emissions by signing the Kyoto Protocol on the 25 September 1998, and ratifying the Protocol on 8 November 2002.

The development of the W2CP and the subsequent domestic use of its product coal in Korea forms part of project owner's commitment to reduce greenhouse gas emissions and assist in meeting its targets under the Kyoto Protocol.

### 12.7.1 Greenhouse Gas Assessment

PAE Holmes was employed to undertake an assessment of the potential impact of the W2CP on greenhouse gas emissions and global warming resulting from the project. The report is contained in Appendix L and summarised in the following sections.

### 12.7.2 Methodology

The estimation and reporting of greenhouse gas emissions are calculated via a number of different methods. The procedures specified under the Kyoto Protocol United Nations Framework Convention on Climate Change are the most common.

The protocol identifies greenhouse gases as follows:

- Carbon dioxide ($CO_2$);
- Methane ($CH_4$);
- Nitrous oxide ($N_2O$);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Sulfur hexafluoride ($SF_6$).

From the point of view of the W2CP, only $CO_2$, $CH_4$ and $N_2O$ are relevant. $CO_2$ and $N_2O$ are formed and released during the combustion of gaseous, liquid and solid fuels. They are liberated when fuels are burnt in diesel powered equipment and in the generation of the electrical energy that will be used by the Project. Fugitive emissions from underground mines involve the release of $CH_4$ and $CO_2$. during the mining process when coal seams are fractured. Residual gases are also release from post mining activities. Offsite transport and the final end use of the coal will also be sources of GHG emissions.

Inventories of greenhouse gas emissions can be calculated using published emission factors. Different gases have different greenhouse warming effects (potentials) and emission factors take into account the global warming potentials of the gases created during combustion.

The global warming potentials assumed in the Department of Climate Change (DCC, 2009a) emission factors are as follows.

- $CO_2$ – 1;
- $CH_4$ – 21;
- $N_2O$ – 310;
- $NO_2$ – not included.

When the global warming potentials are applied to the estimated emissions then the resulting estimate is referred to as a "$CO_2$-equivalent emission".

### 12.7.3 Emission Factors

The National Greenhouse Accounts (NGA) Factors published by the Department of Climate Change (DCC, 2009a) have been used to convert fuel usage and electricity consumption into $CO_2$-equivalent emissions. The relevant emission factors are summarised in Table 12.10.

**Table 12.10 Summary of Greenhouse Gas Emission Factors**

| Type of Fuel and Electricity | Emission Factor | | Scope | Source |
|---|---|---|---|---|
| ***Mining and Extraction*** | | | | |
| Diesel - on-site transport activities[(a)] | 2.7 | t $CO_2$-e/kL | 1 | Table 4 (DCC, 2009a) |
| | 0.2 | t $CO_2$-e/kL | 3 | Table 38 (DCC, 2009a) |
| Electricity[(b)] | 0.89 | kg $CO_2$-e/kWh | 2 | Table 39 (DCC, 2009a) |
| | 0.18 | kg $CO_2$-e/kWh | 3 | |
| Extraction of coal (gassy underground mine) | 305 | kg $CO_2$-e/tonne ROM | 1 | Table 6 (DCC 2009a) |
| Fugitive emissions from post mining activities | 14 | kg $CO_2$-e/tonne ROM | 1 | Table 7 (DCC 2009a) |
| ***Transport of Product Coal*** | | | | |
| Rail transport | 12.3 | g $CO_2$-e/t-km | 3 | QR Network Access (2002) |
| Fuel oil (ship transport) | 73.1 | kg $CO_2$-e/GJ | 1 | Table 4 (DCC, 2009a) |
| | 5.3 | kg $CO_2$-e/GJ | 3 | Table 38 (DCC, 2009a) |
| ***Usage of Product Coal*** | | | | |
| Burning coal in a power station | 88.43 | kg $CO_2$-e/GJ | 3 | Table 1 (DCC, 2009a) |

Notes:
(a) The emission factors for diesel usage include Scope 1 emissions which are associated with burning the fuel and Scope 3 emissions which are associated with producing the diesel.
(b) The emission factors for electrical energy include Scope 2 emissions (i.e. those associated with generating the electricity) and Scope 3 emissions (those associated with producing the fuel for the power station and the distribution losses involved in delivering electricity to the mine).

### 12.7.4 Diesel Use

The mine will consume quantities of diesel in mining the panel. It is estimated that 0.19 litres of diesel will be consumed per tonne of ROM coal mined. For 151 Mt (nominal total mined tonnage) this would equate to 28,690,000 litres [151 x $10^6$ t x 0.19 t/l]. Each litre of diesel fuel burnt is assumed to result in the release of 2.9 kg of $CO_2$-e. Total $CO_2$-e emissions are therefore 83,201 t [28,690,000 l x 2.9 kg/l x 1/1000 kg/t].

### 12.7.5 Electricity Consumption

Typically underground coal mining requires approximately 11 kWh/t of coal. The production from the panels is estimated to be 151 Mt. This would result in the use of 1,661,000,000 kWh of electrical energy, which in turn would result in the emission of 1,777,270 t $CO_2$-e [1.07 kg $CO_2$-e/kWh x1,661,000,000 kWh x 1/1000 kg/t]. This includes the emission for the full fuel cycle in generating the electricity. The Scope 2 and 3 components would be 1,478,290 and 298,980 t of $CO_2$-e respectively.

### 12.7.6 Extraction of Coal

The DCC (2009) publication (Table 6 in the report) suggests values for gassy underground mines in NSW of 305 kg $CO_2$-e per tonne of raw coal during mining and 14 kg $CO_2$-e per tonne of raw coal post mining (Table 7). The production from the panels is estimated to be 151 Mt, making total emissions of 48,169,000 t $CO_2$-e [(305 + 14) kg $CO_2$-e/t x 151 x $10^6$ t x 1/1000 kg/t].

### 12.7.7 Transport of the Coal

The round trip to transport coal by rail to the port is estimated to 123.6 km. According to a study commissioned by QR Network Access (2002) the Australian average $CO_2$-e rate for rail transport is 0.0123 kg/net tonne-km. For transporting 151 Mt, the $CO_2$-e emission would be 114,781 t [151 x $10^6$ x 123.6/2 km x 0.0123 kg/tonne-km x 1/1000 kg/t].

Most of the coal will be exported to North Asia with a one-way shipping distance of approximately 8400 km. Emissions were estimated as follows:

- Average ship capacity of 89,000 t (Boyle, 2009)
- Freight shipping energy efficiency is equal to 4.16 t.km/MJ (The Allen Consulting Group, 2001)
- Ships are assumed to burn heavy fuel oil.

Total emission for the transportation of 151 Mt are therefore 23,904,461 t [151 x $10^6$ t x 8400 km x 1/4.16 MJ/t.km x (73.1 + 5.8) kg/GJ x 1/1000 MJ/GJ x 1/1000 kg/t].

## 12.8 End Use of the Coal

Data from W2CP indicates that average specific energy of the coal from W2CP will be 26.21 MJ/kg and according to the DCC (2009a) the Scope 1 emission factor for power stations burning black coal is 88.43 kg $CO_2$-e/GJ. Thus if a nominal 151 Mt of ROM coal is burnt in a NSW Power Station and assuming that the dry ash-free carbon content is 82% then the $CO_2$-e emission would be 287,631,757 t [151 x $10^6$ t x 26.21 GJ/t x 88.43 kg/GJ x 0.82 x 1/1000 kg/t]. This accounting for the final combustion of the coal would cover any oxidation or spontaneous combustion which could occur.

## 12.9 Summary

The total greenhouse gas emissions in tonnes of $CO_2$-e, from each of the sources discussed above are summarised in Table 12.11. These are the emissions for the life of the project. The emissions from the end use of the coal are approximately 86% of the total emissions.

### Table 12.11 Greenhouse Gas Emissions Summary for Life of the Mine

| Source | Emissions (t of $CO_2$-e) | | | |
|---|---|---|---|---|
| | **Scope 1** | **Scope 2** | **Scope 3** | **Total** |
| Diesel usage | 77,463 | | 5,738 | 83,201 |
| Electricity usage | | 1,478,290 | 298,980 | 1,767,270 |
| Coal extraction | 48,169,000 | | | 48,169,000 |
| Transport by rail | | 114,781 | | 114,781 |
| Transport by sea | | 23,904,461 | | 23,904,461 |
| End use of the coal | | | 287,631,757 | 287,631,757 |
| **TOTAL** | **48,246,463** | **313,434,007** | | **361,670,470** |

## 12.10 Effect of Greenhouse Gas Emissions

In November 2006, the NSW Land and Environment Court handed down a landmark decision (the judgement of Justice Pain in the matter of *Gray v The Minister for Planning and ors* (2006) 152 LGERA 258) which held that the principles of ESD should be taken into account by the approval authority, and in that case, in respect of the contribution of the coal mine's GHG emissions (including downstream emissions) to climate change.

The principles of ESD have been defined and discussed in Section 3.7 of this EA.

To assess the effects of the greenhouse gas emissions associated with the Project, it is useful to consider the contribution of total emissions from both mining and burning of the coal to global warming. For these purposes, it is assumed that all the coal in W2CP is mined in forty years.

As the relationship between global warming and greenhouse gas concentrations is not linear there is no accepted method to determine the contribution that a given emission of greenhouse gases might make to global warming.

To understand this point it is useful to consider the discussion from Section 1.3.1 of the Second Assessment Report prepared by the IPCC (IPCC, 1996), which explains the relationship between the concentration of greenhouse gases and global temperature.

At any period in time, it would be reasonable simply to compare the estimated total emission of $CO_2$-equivalent from the various activities for the year when W2CP is mined (9.025 = 361/40 Mtpa), with the estimated equivalent global emission of 27 Gtpa. On this basis, the emission of 9 Mtpa from the mining and burning of coal from the Project is estimated to be 0.031% of global $CO_2$-equivalent annual emissions (based on estimated global emissions for 2003). Thus, the Project could be considered to contribute 0.031% to the increase in global temperatures caused by the increase in greenhouse gas emissions as they are currently. This invites the question as to what temperature rise might be attributed to the greenhouse gases arising from the Project.

It is also relevant to note that the Project's annual Scope 1, 2 and 3 emissions of 9.025 Mt are approximately 1.6% of the 553 Mt that was estimated to be Australia's net greenhouse gas emissions for 2008 and 2.2% of the 416 Mt that was estimated to be the Australian energy sector's emissions for 2008 (DCC 2009b). It should also be noted that the estimates for Australia's emissions do not include off shore end-use Scope 3 emissions which make up approximately 86% of the W2CP emissions. If these are excluded from the W2CP estimate, the Project emissions are approximately 0.2% of the 2008 net Australian greenhouse emissions and approximately 0.3% of the 2008 energy sector emissions.

Based on the IPPC estimate, a doubling of the $CO_2$-equivalent concentration in the atmosphere would lead to a 2.5 $^oC$ increase in global average temperature, and that the current global $CO_2$ load is 2,750 Gt, we can estimate that the total emissions from the Project would lead to an increase in global temperature of 0.000328 $^oC$ [$(361 \times 10^6/2{,}750 \times 10^9) \times 2.5\ ^oC$].

There will clearly be no measurable environmental effect due to the emissions of greenhouse gases from the Project even when the customer's use of the coal is taken into account. Any environmental assessment would conclude that the effects of the emissions from the Project are unmeasurable.

In practice of course, the effects of global warming and associated climate change are the cumulative effect of many thousands of such sources and it is the cumulative effects that pose a threat to ESD principles.

### 12.10.1 Conclusions

The Project has been assessed to identify potential impacts due to emissions of dust, odour and greenhouse gases as a result of underground mining.

Concentrations of dust and deposition rates of dust from the construction phase of the project are predicted to be well within DECCW air quality criteria.

During the operational phase of the project, air quality impacts for particulate matter are in compliance with long-term goals when background is taken into account, and in compliance with the short-term 24-hour $PM_{10}$ goal when the project is considered on its own.

Further mitigation measures, such as dust suppression spray watering of the stockpiles will reduce the short-term impacts further.

The modelled vent configuration was at an angle of 30 degrees to the horizontal. This would result in acceptable air quality impacts of both particulate matter and odour, based on the emission assumptions.

There will be emissions of greenhouse gas emissions as a result of the W2CP and as a result of burning the coal that will be produced. These emissions will not by themselves have any significant impact on global warming. However the project will use all practicable means to reduce greenhouse gas emissions through efficient use of fuel and electricity.

### 12.10.2 Implications from Strategic Inquiry

The findings of the expert Panel involved in the Strategic Inquiry recognises that failing to allow the mining of coal through the W2CP will not prevent the release of greenhouse gases and the relevant implications for climate change …

*"Further, it is very unlikely that, if the coal at Wallarah 2 coal was left in the ground, that total GHG* [Greenhouse Gases] *emissions would reduce, either in NSW,*

*nationally or globally. Any shortfall in supply would be readily addressed by some other coal producer, perhaps located elsewhere in NSW."*

### 12.10.3 Greenhouse Strategies

There are several opportunities available for the mitigation of greenhouse gases for the W2CP. The project involves longterm strategies to beneficially utilise the methane gas resource which will be extracted as part of the project. The collected gas could be fed directly into the existing gas distribution systems for use by others. Alternatively, if any electricity was to be generated from the captured methane, it could be fed into the State's high voltage distribution system.

These options, along with other initiatives to offset the emission of greenhouse gases, have been included in an overall energy and Greenhouse Strategy for the project. The package also covers other offsets and measures such as ecological, social and economic initiatives and is described in more detail in Chapter 16. These commitments include:

- ❒ Use of minimum 5% bio-diesel or similar in the mining fleet;
- ❒ Use of low-sulphur diesel fuel for underground mobile equipment;
- ❒ Conduct an options study for coal mine methane capture and utilisation within 3 years of the commencement of longwall coal mining production;
- ❒ Monitor greenhouse gas emissions and mitigation actions from the commencement of mining operations;
- ❒ Prior to the development and implementation of a long term methane utilisation strategy, W2CP will commit to flaring the initial production of methane, if required by the terms of project approval, to ensure a significant reduction in greenhouse emissions;
- ❒ Conduct of an energy efficiency audit each three years after the commencement of mining; and
- ❒ Installation of energy efficient appliances, lighting and hot water system (such as gas boosted solar hot water system).

W2CP will continue to assess and implement energy and greenhouse management initiatives during the project design, operation and decommissioning. The Greenhouse Strategy developed for the W2CP will be consistent with the aims of the NSW Government Greenhouse Plan (DECC, 2005), as described in Section 4.8.12.

In addition, the Republic of South Korea pledged $10 million to contribute to the construction and operation of the world's first near zero emissions coal-fired power plant. The U.S. Department of Energy (DOE) which administers this project advised that South Korea was the second nation, after India, to participate in the FutureGen International Partnership.

In January 2008, the FutureGen project was restructured from a single project focus to encourage a number of slightly larger clean coal electricity generation plants and to increase the amount of carbon dioxide that will be collected and permanently stored underground rather than emitted to the atmosphere.

South Korea joined the Asia-Pacific Partnership for Clean Development and Climate which was formed in July 2005, along with the US, Australia, China and Japan. The 'vision' for the Asia-Pacific Partnership is to develop and implement new technologies which will allow the economies of these nations to grow, while mitigating the environmental degradation that has always accompanied such rapid economic growth. Central to this economic strategy is a suite of new technologies that will allow the utilisation of coal with relatively low emissions of pollutants, including greenhouse gases such as carbon dioxide ($CO_2$).

South Korea is also a member country of the Carbon Sequestration Leadership Forum (CSLF), as is Australia. CSLF is an international climate change initiative that is focused on development of improved cost-effective technologies for the separation and capture of carbon dioxide for its transport and long-term safe storage. The purpose of the CSLF is to make these technologies broadly available internationally, and to identify and address wider issues relating to carbon capture and storage. This could include promoting the appropriate technical, political, and regulatory environments for the development of such technology. The CSLF is currently comprised of 22 members, including 21 countries and the European Commission. Membership is open to national governmental entities that are significant producers or users of fossil fuel and that have a commitment to invest resources in research, development and demonstration activities in carbon dioxide capture and storage technologies.

In addition, South Korea – like Australia - is also a partner in the International Energy Agency's (IEA) Greenhouse Research and Development Program. It is also a partner, as is Australia, in the international program administered by the US Environmental Protection Authority known as the Methane to Markets collaborative program which includes exploring opportunities for, and best practices, in management and use of coal mine methane for beneficial greenhouse outcomes.

South Korean research agencies are also involved in international collaborative research related to greenhouse management. For example, the Korean Institute of Geology, Mining and Materials (KIGAM) is a participant in the Australian Co-operative Research Centre for Greenhouse Gas Technologies (CO2CRC), as is the NSW Department of Industry and Investment – Minerals and Energy. The CO2CRC undertakes practical research on greenhouse gas management associated with energy production, especially carbon capture and storage (CCS), and is closely involved in Australian and international CCS demonstration projects such as Otway Project in Victoria.

## 12.11 Conclusion

The Project has been assessed to identify potential impacts due to emissions of dust, odour and greenhouse gases as a result of underground mining.

Concentrations of dust and deposition rates of dust from the construction phase of the project are predicted to be well within DECCW air quality criteria.

During the operational phase of the project, air quality impacts for dust (particulate matter) are predicted to remain in compliance with long-term goals when background is taken into account, and in compliance with the short-term 24-hour $PM_{10}$ goal when the project is considered on its own.

Further mitigation measures, such as dust suppression spray watering of the stockpiles and revegetation and landscape planting of disturbed areas, will reduce the short-term impacts further.

The proposed mine ventilation will result in acceptable air quality impacts of both particulate matter and odour, based on the emission assumptions. The proposed angled vent outlet provided the best option from both noise mitigation and atmospheric dispersion, however there will be a contingency incorporated into the vent design to retrofit with a vertical stack if required.

There will be emissions of greenhouse gas emissions as a result of the project and as a result of burning the coal that will be produced by the project (i.e. the coal from W2CP). These emissions will not by themselves have any significant impact on global warming. However, the project will use all practicable means to reduce greenhouse gas emissions though efficient use of fuel and electricity and management of coal mine methane.