HEGGIES

AUSTRALIA

REPORT 10-4912R1

Revision 3

# Concept Plan for the Redevelopment of Lot 11 DP 558723, Lot 1 DP 200697 and Lot 2 DP 262213

# Eastern Creek, NSW

# Air Quality Impact Assessment

PREPARED FOR

Hanson Construction Materials Pty Ltd

15 NOVEMBER 2006

# Concept Plan for the Redevelopment of Lot 11 DP 558723, Lot 1 DP 200697 and Lot 2 DP 262213

# Eastern Creek, NSW

# Air Quality Impact Assessment


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## EXECUTIVE SUMMARY

Hanson Construction Materials Pty Ltd (Hanson) has historically operated quarrying, concrete and asphalt production, transport logics and associated activities from its Eastern Creek site. The site is located within the Eastern Creek Precinct, in the Central Western Sydney Employment Area, approximately 35 km from the Sydney CBD.

Hanson proposes to consolidate its operations to a subdivided section of the site by relocating existing activities plus the addition of a masonry plant while ceasing extractive quarry uses. Heggies Australia Pty Ltd (Heggies) has been engaged by Planning Workshop Australia (PWA) on behalf of Hanson to evaluate and assess potential air quality impacts associated with the site consolidation (the Project).

An estimation of background air quality has been made, primarily by referencing data from the Department of Environment and Conservation (DEC) air quality monitoring station at St Marys, located approximately 5 km to the west-northwest of the Hanson Site, and continuous dust deposition data surrounding the quarry provided by Hanson.

Based on the available data, site-specific ambient air quality levels adopted for assessment purposes are as follows.

- Dust: An annual average ambient dust deposition rate of the order of 1.6 g/m$^2$/month.
- TSP: An annual average of the order of 34 µg/m$^3$.
- $PM_{10}$: A daily varying 24-hour average concentration and an annual average of the order of 17 µg/m$^3$.
- Individual Odorous Pollutants: Negligible.

The NSW DEC has established ground level air quality criteria for key pollutants to achieve appropriate environmental outcomes and to minimise associated risks to human health. The criteria specified by DEC, as expressed in their document "*Approved Methods and Guidance for Modelling and Assessment of Air Pollutants in New South Wales*" 2005, have been adopted as the ambient air quality goals for this assessment.

The following project-specific air quality goals have been established for assessment of the Project.

- A 24-hour maximum of $PM_{10}$ of 50 µg/m$^3$.
- An annual average of $PM_{10}$ of 30 µg/m$^3$.
- A 24-hour maximum of $PM_{2.5}$ of 25 µg/m$^3$.
- An annual average of $PM_{2.5}$ of 8 µg/m$^3$.
- An annual average incremental dust deposition rate of 2.0 g/m$^2$/month.
- A 1 hour maximum of Acetaldehyde of 0.042 mg/m$^3$
- A 1 hour maximum of Toluene of 0.36 mg/m$^3$
- A 1 hour maximum of Xylene of 0.19 mg/m$^3$

The Air Pollution Model (TAPM) software was used to simulate the meteorology of the Project Site. TAPM is a prognostic model which may be used to predict three-dimensional meteorological data.

## EXECUTIVE SUMMARY

To provide concurrent observations with the daily varying background $PM_{10}$ data used in the assessment, TAPM was used to generate a 2004 meteorological data set, using the data assimilation option to incorporate observations from the Bureau of Meteorology's Horsley Park Automatic Weather Station.

Inspection of the 2004 meteorology revealed occurrences of wind directions from all quadrants, with the annual wind rose indicating that winds tend to be experienced from the southwest quadrant dominate at the project site. The strongest winds originate from the west to southeast.

A high frequency of conditions typical of Atmospheric Stability Class "D" was predicted throughout the year at the Project Site. This is indicative of neutral atmospheric conditions, which neither enhance nor diminish atmospheric dispersion due to mechanical mixing. There is also a strong occurrence of Stability Class "F", which represents more stable conditions less conducive to pollutant dispersion.

Following an inspection of the immediate topography surrounding the Project Site, the topography of the area within, and surrounding, the Project Site has not been considered in the atmospheric dispersion model. This is since significant impacts on modelled concentrations at the nearest residences would not be seen with the inclusion of such uncomplicated near-field topography.

A review has been carried out of the potentially particulate-generating activities attributable to the Project. The following activities have been included in the particulate emissions inventory.

- Handling and conveying of raw and processed materials at the various key areas about the Site.
- Pneumatic loading of cement storage silos from trucks.
- Loading of trucks at the concrete batching and asphalt and emulsion plants.
- Unloading of trucks at concrete recycling plant.
- Wind erosion of exposed ground areas and various material stockpiles.
- Combustion and production process emissions associated with the asphalt and emulsion plant.

Computer predictions of fugitive emissions ($PM_{10}$, dust deposition, individual toxic / odorous pollutants) from the Project Site were undertaken using the Ausplume Gaussian Plume Dispersion Model (version 6.0) software developed by EPA (Victoria) to determine the resulting air quality impacts of the proposed operation.

All modelling predictions indicate that, provided that specific design and operational safeguards are implemented, particulate matter, dust deposition and individual odours pollutants attributable to the Project would be within the current DEC (and NEPM) air quality goals at all surrounding residences.

Specifically, it is noted that should the emulsion plant intend to produce polymer modified bitumen, particularly using scrap rubber as an input, then potential odour issues will require to be engineered out through the use of an afterburner or other appropriate technology.

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Appendix B Annual and Seasonal Stability Class Distributions for the Project Site.
Appendix C Project Site Atmospheric Emissions Inventory

# 1 INTRODUCTION

Heggies Australia Pty Ltd (Heggies) has been commissioned by Planning Workshop Australia (PWA) on behalf of Hanson Construction Materials Pty Ltd (Hanson) to carry out an Air Quality Impact Assessment for the proposed redevelopment of the existing Hanson operations conducted within the Eastern Creek Precinct, located centrally within the Greater Sydney Basin, NSW. This document assesses the anticipated impacts of the onsite operations on local air quality

# 2 PROJECT OVERVIEW

## 2.1 Project Site Description

The site is legally known as Lot 11 DP 558723, Lot 1 DP 200697 and Lot 2 DP 262213 within Blacktown Local Government Area, Parish of Melville and County of Cumberland, New South Wales.

The application includes a boundary adjustment to Lot 11 DP 558723 to include the relevant parts of the adjoining allotments (Lot 1 in DP 200697 and Lot 2 in DP 262213). The new proposed Lot is irregular in shape and has an area of approximately 27 hectares.

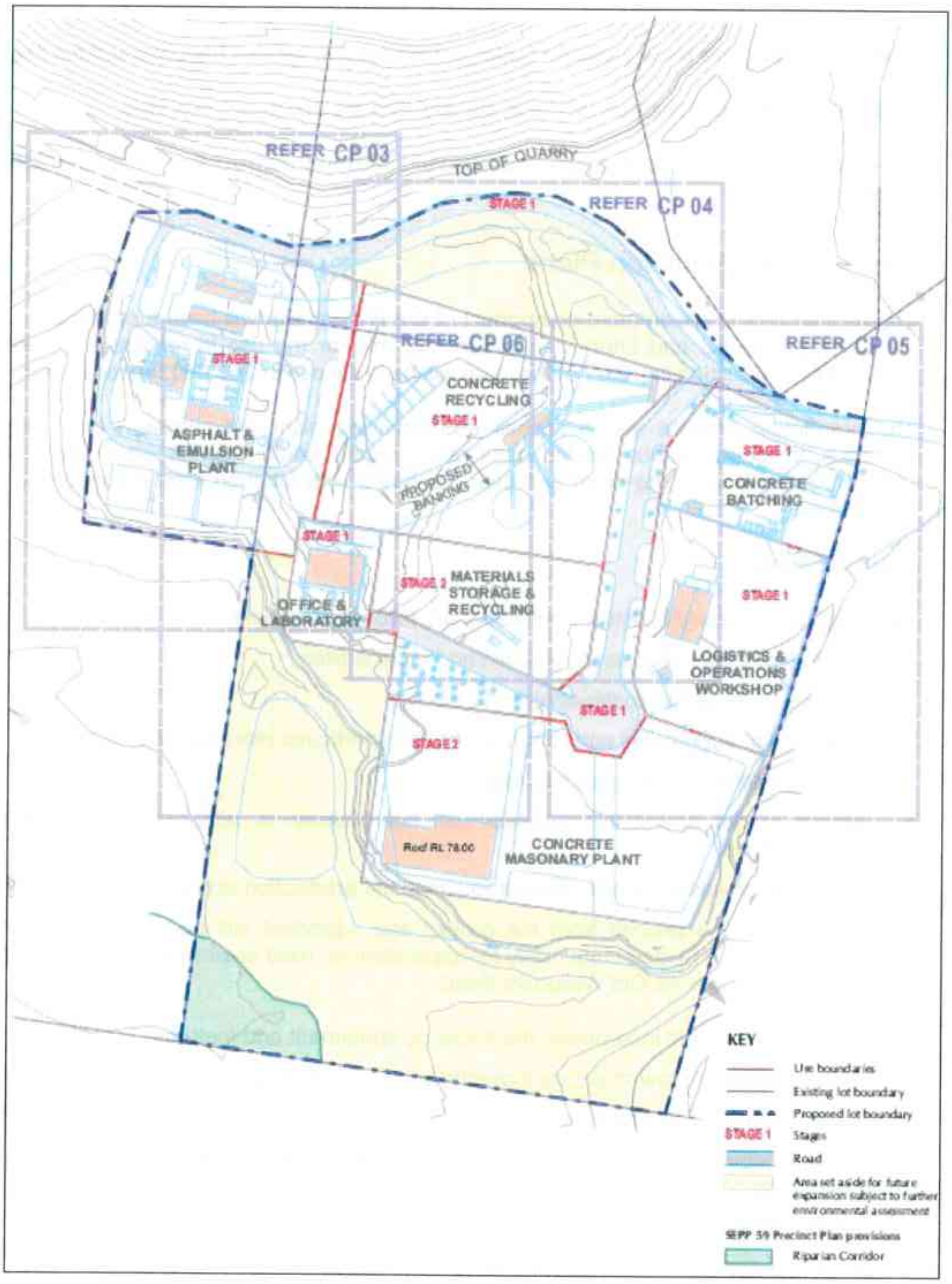
The subject site has one point of access with a right of carriageway at the north-eastern part of the site, and an easement for services (10.85 metres wide) to Old Wallgrove Road.

The site is conveniently located with regard to major traffic routes. The site is situated approximately 900 metres to the north of Old Wallgrove Road and with access to M7 forming part of the Orbital as defined in the 1998 NSW Government Report 'Action for Transport 2010' . The proximity of the M4 motorway serves the site well for both incoming and, particularly, outgoing traffic.

The site is zoned Employment Lands pursuant to the State Environmental Planning Policy No. 59 - Central Western Sydney Employment Area.

The proposed conceptual site layout including all plant is presented in **Figure 1**. Additional detail on plant operations over and above the summary information below is contained within the main body of the concept plan application.

## Figure 1 Proposed Conceptual Site Layout




## 2.2 Project Site Construction

The site requires minimal clearing and earthworks; construction of hardstand; and the delivery and erection of some equipment, offices and laboratories. Construction would be expected to be completed within six months and would be carried out during normal construction hours in accordance with DEC guidelines.

The screening plant, associated bin structures, stockpile stacker conveyors, fuel storage tank and laboratory will be demolished. The primary jaw crusher, conveyor, electrical substation yard and control room and secondary crusher will be relocated.

Some excavation will be required for footings, foundations, service trenches and the like.

Sediment and Erosion controls will be in place during the construction period.

Air quality impacts and management associated with the construction phase are discussed in **Section 7.1**.

## 2.3 Asphalt and Emulsion Plant

The asphalt and emulsion plant component of the Project Site will have a productive capacity to meet current market and future demand for hot mix for the use in road and related surfacing works. The production capacity of the plant will be in excess of 360,000 tonnes annum.

The production process at the asphalt and emulsion plant will comprise of a range of raw materials, including various graded sizes of aggregate, waste asphalt, sand and mineral filler, mixed together in a drying drum and then combined with bitumen from the emulsion plant in a mixing tower.

### 2.3.1 Asphalt Plant

Operation of the asphalt plant will consist of the following activities:

- Delivery of aggregate, sand , bitumen and mineral filler;
- Storage of these raw materials prior to mixing;
- Selection of aggregates and sand according to particular mix specifications;
- Heating and drying of aggregate materials;
- Mixing of the aggregate materials with hot bitumen in accordance with particular job specifications;
- Recycling of waste asphalt, as appropriate in the production schedules; and
- Dispatch of the asphalt from the project site - product will be dropped into trucks and dispatched in a heated state ready for application on road or similar surfaces. Loaded trucks will leave the site via Old Wallgrove Road.

The asphalt plant would incorporate the following equipment and features:

- Stockpile bins for raw materials including sand and aggregate;
- An electronic weigh hopper to dispatch finished product (hot/cold mix asphalt) into trucks;
- Miscellaneous water and other storage tanks, basins and containers, including a truck wash down bay;
- An asphalt plant operations office, Workers Crib sheds, and Ablutions block;
- A crusher for Recycled Asphalt Product.

On-site mobile plant associated with the asphalt plant includes:

- One front-end loader (FEL) to transfer material from the stockpile to the aggregate feed bins.

### 2.3.2 Emulsion Plant

Operation of the emulsion plant will consist of the following activities:

- The bitumen is pumped hot from the storage tanks to the colloid mill where it is broken up into micron-sized particles and dispersed in the water-phase.
- If solvent is included, it is dosed in-line and blended into the bitumen stream through a static mixer.

### 2.3.3 Air Pollutant Emission Sources and Controls

Air quality elements of interest in this study are:

- Emissions of odorous compounds originating from the stack;
- Fugitive atmospheric (including odorous) emissions;
- Process particulate emissions;
- Fugitive particulate emissions.

The majority of the site is to be paved, and therefore dust generation from vehicle movement on site has not been considered as a significant pollutant source.

Pollution abatement techniques anticipated to be employed at the proposed asphalt facility include

- A Bag house or Fabric filter;
- Three-sided binned stockpile areas; and
- Partially enclosed collecting conveyor.
- Afterburner or other appropriate technology for the limitation of odour associated with the use of scrap rubber addition in the production of polymer modified bitumen. The use of such technology is discussed further in **Section 7.2**.

## 2.4 Concrete Recycling Plant

The Concrete Recycling Plant collects both solid and liquid waste product from concrete pours and demolition sites and puts the waste through a crushing machine, often along with asphalt, bricks, dirt, and rocks. The Concrete Recycling plant will process approximately 100,000 tonnes of material per annum.

The Concrete Recycling Facility involves the sorting, screening, crushing and stockpiling of materials for on-selling as recycled products. Solid, inert, building and demolition wastes are received and sorted in recoverable and non-recoverable products.

Recoverable or recyclable material are temporarily stockpiled before being processed by sorting, screening, crushing and shredding to separate and recoverable end products. Recoverable products include various grades of aggregate, road base and sub base, bedding sand and grey sand and bitubase.

For modelling purposes, the concrete batching plant is assumed to comprise of the following plant and equipment:

- 1 x Primary Crusher
- 1 x Secondary Crusher
- 1 x Screen
- 1 x Dump Truck

- 1 x Front end loader.

### 2.4.1 Air Pollutant Emission Sources and Controls

Air quality elements of interest in this study include the following sources of fugitive particulate emissions:

- Crushing activities;
- Material handling and conveying activities; and
- Wind erosion from stockpiles.

The majority of the site is to be paved, and therefore dust generation from vehicle movement on site has not been considered as a significant pollutant source.

Pollution abatement techniques anticipated to be employed at the proposed asphalt facility include

- A sprinkler system to keep the concrete dust to a minimum; and
- Partial enclosure of the crushing plant.

## 2.5 Concrete Batching Plant

The Concrete Batching Plant is responsible for the production of concrete or concrete products that are manufactured by mixing cement, sand, rock (metal), aggregate or similar materials.

The operation of the plant involves the following activities:

- Aggregate material will be delivered to the site in a damp condition and dumped into ground storage bins.
- Course and fine aggregates will be taken from the ground level storage bins/bunkers by front end loader to an aggregate weigh hopper.
- The aggregate is then added to an agitator.
- Cement and fly ash are weighed in a separate hopper and transferred to the agitator.
- The appropriate proportion of water is added to the agitator.
- The concrete is mixed, ready for final slumping, inspection and transportation to the customer.

For modelling purposes, the concrete batching plant is assumed to comprise of the following plant and equipment:

- 1 x Front end loader;
- Ground bins for raw materials;
- Cement silo;
- Aggregate weigh bins; and
- Conveyor system.

### 2.5.1 Air Pollutant Emission Sources and Controls

Air quality elements of interest in this study include the following sources of fugitive particulate emissions:

- Material handling and conveying activities;
- Pneumatic loading of cement storage silos from trucks;

- Loading of concrete product trucks; and
- Wind erosion from stockpiles.

The majority of the site is to be paved, and therefore dust generation from vehicle movement on site has not been considered as a significant pollutant source.

Pollution abatement techniques anticipated to be employed at the proposed asphalt facility include

- Cement storage silos will be fitted with appropriate bag filtration and will be loaded pneumatically via a closed, inter-locked system.
- Bins and conveyors will be sited in a leeward position to minimise the effects of the wind;
- Water sprays or a dust suppression agent will be applied to the aggregate material when required to reduce dust emissions and minimise water usage;
- Sand and aggregates will be stored in in-ground bunkers which will shield the materials from wind. The bunker will be fitted with water sprays for the purposes of dust mitigation.

## 2.6 Masonry Plant

The plant is a front end loader type design whereby the raw material components of the concrete are stored in ground bins and recovered by front-end loader and loaded into the aggregate weigh hopper. Oversized material is removed using a single deck vibrating (scalping) screen. These raw materials are transferred by conveyor to the concrete mixing plant. The concrete mixing process consists of the mixing of coarse and fine aggregates with water in strict proportion with cement from four (4) 100 tonne cement silos.

The concrete mix is then conveyed into the block machine where the product is made using a combination of pressure and vibration. The blocks or bricks are then conveyed to a curing chamber. Once the blocks are cured they are then stacked on pallets and stored on site for despatch by truck.

The proposed masonry plant will have an annual production rate of up to 150,000 tonnes per annum.

The plant and equipment assumed for operation at the site includes the following:

- 1 x Front End Loader;
- 2 x Forklift;
- Cement silo; and
- 1 x enclosed concrete block plant including internal crane.

### 2.6.1 Air Pollutant Emission Sources and Controls

Air quality elements of interest in this study include the following sources of fugitive particulate emissions:

- Materials handling associated with the use of the front end loader;
- Pneumatic loading of cement storage silos from trucks; and
- Wind erosion from stockpiles.

The majority of the site is to be paved, and therefore dust generation from vehicle movement on site has not been considered as a significant pollutant source.

Pollution abatement techniques anticipated to be employed at the proposed asphalt facility include

- Cement storage silos will be fitted with appropriate bag filtration and will be loaded pneumatically via a closed, inter-locked system; and
- Raw materials will be stored in in-ground bunkers which will shield the materials from wind.

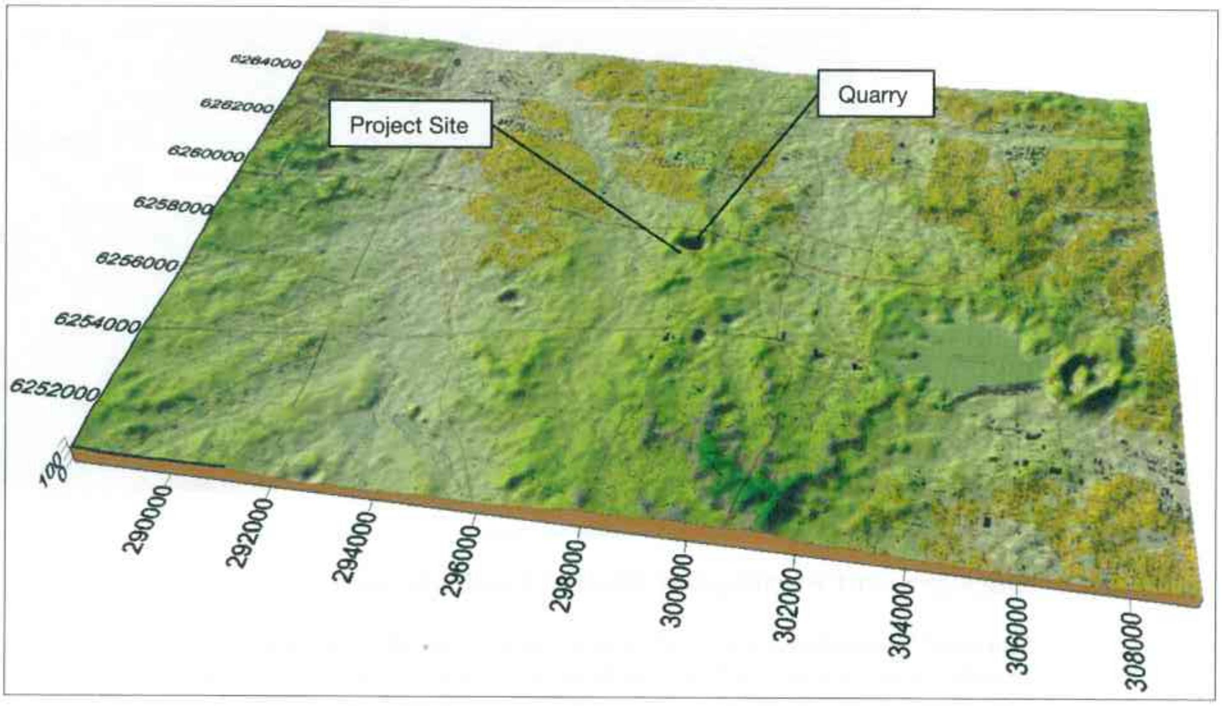
## 3 EXISTING ENVIRONMENT

### 3.1 Regional and Project Site Topography

Local topography plays an important role in atmospheric dispersion of pollutants by allowing or obstructing free movement of air masses.

The project site is located within the Sydney Basin in moderately flat terrain. The topography of the site and surrounding region is illustrated in **Figure 2**.

**Figure 2 Topography of the Project Site and Surrounding Area (Vertical Exaggeration = 4)**




As depicted in **Figure 2**, the project site is situated at an altitude of approximately 80 m AHD. The local topography reaches a maximum height of 154 m AHD approximately 6 kilometres south of the project site. The land then slopes gently downwards from this point and the region surrounding the project site ranging predominately between 60 and 80 m AHD.

In view of the foregoing, as the topography of the area surrounding the Project Site is characterised by flat terrain, it is unlikely to significantly influence the dispersion of atmospheric pollutants. Accordingly a terrain file has not been incorporated into the dispersion model used for this assessment.

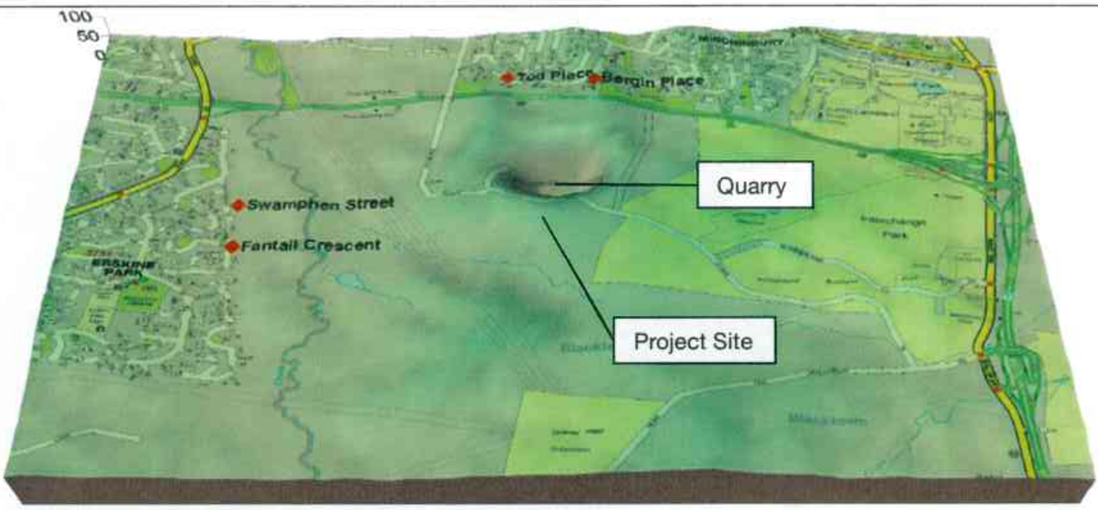
### 3.2 Nearest Residences

Residential areas exist to the west and north of the Project Site. The two closest streets to the west and north of the Project Site have been chosen to select two sensitive residential locations representative of each of these two areas. **Table 1** details the location of the nearest four residential receptors and their approximate distances from the asphalt plant (closest plant within the Project Site to residential area).

**Table 1 Representative Sensitive Residential Receptor Locations**

| Receptor Identification | Suburb | Street Name | Location (AMG) | | Distance from Asphalt Plant (km) |
|---|---|---|---|---|---|
| | | | Easting | Northing | |
| R1 | Erskine Park | Fantail Crescent | 297290 | 6257596 | 1.5 (West) |
| R2 | Erskine Park | Swamphen Street | 297283 | 6257906 | 1.5 (West) |
| R3 | Minchinbury | Tod Place | 298660 | 6258956 | 1.1 (North) |
| R4 | Minchinbury | Bergin Place | 299142 | 6258911 | 1.1 (North) |

**Figure 3 Representative Sensitive Residential Receptor Locations**




## 3.3 Background Particulate Matter Environment

The term *"particulate matter"* refers to a category of airborne particles typically less than 50µm in aerodynamic diameter and ranging down to 0.1µm in size. Particles less than 10µm and 2.5µm are referred to in this report as $PM_{10}$ and $PM_{2.5}$ particles respectively.

The closest site monitoring particulate matter is maintained by the NSW Department of Environment and Conservation (DEC) in St Marys, approximately 5 km to the west-northwest of the Project Site. The site was commissioned in October 1992 and is located on a residential property on Mamre Road, St Marys.

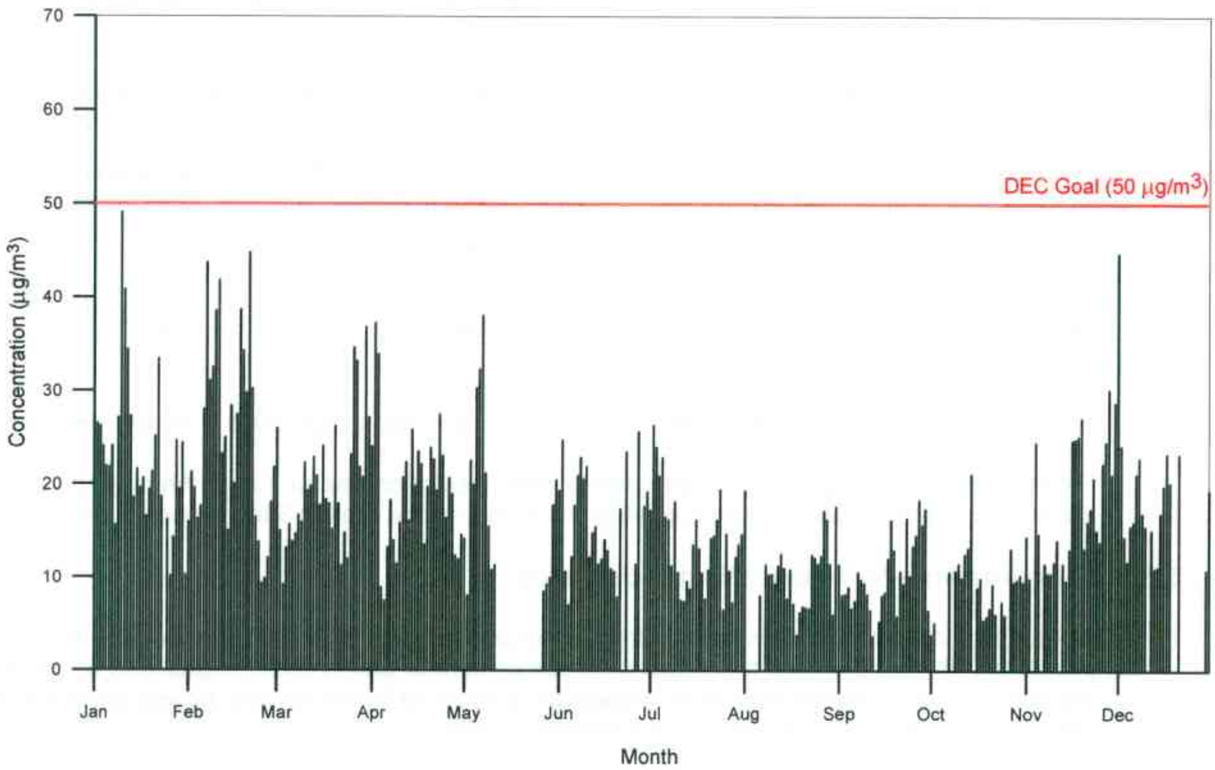
The following air pollutants are measured at the St Marys monitoring station:

- Ozone ($O_3$);
- Oxides of Nitrogen (NO, $NO_2$ & $NO_x$);
- Sulphur Dioxide ($SO_2$); and
- Fine particles ($PM_{10}$).

Ambient concentrations of $PM_{10}$ were assessed using the DEC air quality monitoring data recorded by a Tapered Element Oscillating Microbalance (TEOM) instrument. This instrument gives real-time recordings of ambient particulate matter, detected by observing changes to the loading on a filter mounted within the unit.

The verified data for 2004 showing 24-hour average $PM_{10}$ concentrations at the St Marys monitoring site has been obtained from the NSW DEC and is presented in **Figure 4**.

**Figure 4 DEC $PM_{10}$ (24-hour average) Monitoring Results for St Marys, 2004**




The data for 2004 displayed in **Figure 4** indicate that the highest 24-hour average $PM_{10}$ concentration at the St Marys monitoring site was 49 µg/m³, recorded on 10 January 2004.

However, it is noted that in Sydney elevated concentrations of $PM_{10}$ were observed during the period 9-10 January 2004, caused by fires on the outskirts of Sydney, particularly southwest of Sydney at Wilton (over 550 ha burnt) and north of Sydney in the Ku-ring-gai National Park (over 800 ha burnt).

Accordingly, to discount this anomalous event, the elevated $PM_{10}$ concentration observed on 10 January 2004 has been excluded from the daily varying data set for dispersion modelling. The annual average $PM_{10}$ concentration for the entire data set (17 µg/m³) has been used in lieu of this value.

It is noted that the $PM_{10}$ sub-set is typically approximately 50% of total suspended particulates (TSP) in the ambient air in regions where road traffic is not the dominant particulate source, such as rural areas (USEPA, 2001). In the absence of monitoring data for TSP, the annual average TSP concentration for the region may therefore be derived by multiplying the annual average $PM_{10}$ concentration by a factor of two.

To estimate a background concentration of annual TSP, this report has taken the annual average $PM_{10}$ records at St Marys for 2004 (17 µg/m³), and used the above multiplier to derive the annual average TSP concentration. This corresponds to a background TSP concentration of 34 µg/m³.

## 3.4 Background Dust Deposition Environment

Two separate dust deposition gauges have been established and maintained by Pioneer Construction Materials about the Quarry pit to monitor the levels of dust deposition generated by the Quarry operations. The dust deposition results obtained from the monitoring period January 2004 to July 2006 are listed in **Table 2**.

**Table 2 Dust Deposition Monitoring Data - Project Site - Mean Average Monthly Deposition**

| Location | Monitoring Period | Total Insoluble Solids ($g/m^2/month$) | Ash Content ($g/m^2/month$) |
|---|---|---|---|
| D1 - Wonderland | Jan 04 – Jul 06 | 2.4 | 1.6 |
| D2 - Freeway | Jan 04 – Jul 06 | 0.9 | 0.5 |
| **Average** | | **1.6** | **1.0** |

The average for all sites for the monitoring period January 2004 to July 2006 is 1.6 $g/m^2/month$.

For the purposes of modelling, a background dust deposition rate of 1.6 $g/m^2/month$, based on the dust deposition monitoring conducted in the vicinity of the Project Site, has been assumed.

## 3.5 Surrounding NPI-reporting Industries

In Australia, industrial facilities are required to report emissions to the National Polution Inventory (hereafter, "NPI") if they use more than a certain amount of one or more substances on the NPI reporting list, or consume more than a specified amount of fuel or electric power, or emit more than a certain amount of nitrogen or phosphorus to water.

In the suburbs surrounding the Project Site, including Eastern Creek, Horsley Park and Huntingwood, there are 13 NPI-reporting industrial facilities present. These include the current Hanson operations at the Eastern Creek Quarry, the Eastern Creek Waste and Recycling Centre and the Austral Brick Plants at Horsley Park.

## 3.6 Background Odorous Pollutant Environment

As detailed in **Section 3.5**, there are a number of NPI-reporting industrial facilities surrounding the Project Site that may contribute to the existing air quality environment of the region. A number of these facilities, including the Eastern Creek Waste and Recycling Centre and the George Borg Piggery at Horsley Park, are noted as emitting odour.

It is noted however that the odorous emissions from these existing facilities are anticipated to differ from the pollutant compounds emitted from operations at the Project Site (detailed in **Section 4.5**) as they would represent a complex mixture of odorous compounds from diffuse sources.

As the Project Site is anticipated to be dominated by point source emissions of readily identifiable compounds from the asphalt and emulsion plant, negligible existing concentrations of these specific odorous pollutants have been assumed for assessment purposes.

# 4 AIR QUALITY GOALS

## 4.1 Goals Applicable to Particulate Matter Less than 10 Microns ($PM_{10}$)

Emissions of $PM_{10}$ and $PM_{2.5}$ are considered important pollutants in terms of impact due to their ability to penetrate into the respiratory system. In the case of the $PM_{2.5}$ category, recent health research has shown that this penetration can occur deep into the lungs (NSW DEC, 1998). Potential adverse health impacts associated with exposure to $PM_{10}$ and $PM_{2.5}$ include increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and heart disease, and reduced lung capacity in asthmatic children.

One of the difficulties in dealing with air quality goals governing fine particles such as $PM_{10}$ and $PM_{2.5}$ is that the medical community has not been able to establish a threshold value (for either $PM_{10}$ or $PM_{2.5}$) below which there are no adverse health impacts.

The NSW DEC $PM_{10}$ assessment goals as expressed in their document *"Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales"* (2005) (hereafter, "AMMAAP") are:

- A 24-hour maximum of 50 $\mu g/m^3$; and
- An annual average of 30 $\mu g/m^3$.

The 24-hour $PM_{10}$ reporting standard of 50$\mu g/m^3$ is numerically identical to the equivalent National Environment Protection Measure (or NEPM) reporting standard except that the NEPM reporting standard allows for five exceedances per year. These NEPM goals were developed by the National Environmental Protection Council (NEPC) in 1998 to be achieved within 10 years of commencement.

## 4.2 Goal Applicable to Total Suspended Particulates (TSP)

The annual goal for Total Suspended Particulates (or TSP) is given as 90 $\mu g/m^3$, as recommended by the National Health and Medical Research Council (NHMRC) at their 92nd session in October 1981. It was developed before the more recent results of epidemiological studies suggested a relationship between health impacts and exposure to $PM_{10}$ concentrations.

It is noted that the $PM_{10}$ sub-set is typically 50% of total suspended particulate (TSP) mass in regions where road traffic is not the dominant particulate source (USEPA, 2001). This would be consistent with an annual average $PM_{10}$ goal of approximately 45 $\mu g/m^3$ (derived from 50% of the annual NHMRC goal of 90 $\mu g/m^3$). Thus, the historical NHMRC goal may be regarded as not as stringent as the newer $PM_{10}$ goal of 30 $\mu g/m^3$ expressed as an annual average.

Where road traffic is the dominant source of particulate pollution, (as may be the case at Eastern Creek), the $PM_{10}$ sub-set of TSP may be even higher (up to 96% for diesel vehicle emissions (Watson et al, 2000).

Therefore, as the annual TSP goal is seen to be achieved if the annual $PM_{10}$ goal is satisfied, TSP has not been considered further in this report.

## 4.3 Goals Applicable to Particulate Matter Less than 2.5 Microns ($PM_{2.5}$)

In December 2000, the NEPC initiated a review to determine whether a new ambient air quality goal for particulates of 2.5microns or less in aerodynamic diameter ($PM_{2.5}$) was needed in Australia, and the feasibility of developing such a goal. The review found that:

- there are health effects associated with fine particles;
- the health effects observed overseas are supported by Australian studies; and

- fine particle standards have been set in Canada and the USA, and an interim goal proposed for New Zealand.

The review concluded that there is sufficient community concern regarding $PM_{2.5}$ to consider it an entity separate from $PM_{10}$.

As such, in July 2003 a variation to the Ambient Air Quality NEPM was made to extend its coverage to $PM_{2.5}$. This document references the following goals for $PM_{2.5}$.

- A 24-hour maximum of 25µg/m$^3$.
- An annual average of 8µg/m$^3$.

Historical quantitative assessment of air quality impacts of particulate matter generating projects undertaken by Heggies has indicated that providing maximum predicted $PM_{10}$ concentrations satisfy project air quality goals, goals applicable to $PM_{2.5}$ are similarly met. In view of the foregoing, it is assumed that providing adequate mitigation of $PM_{10}$ is achieved, goals applicable to $PM_{2.5}$ would be satisfied. Potential impacts of $PM_{2.5}$ have thus not been considered further in this report.

## 4.4 Nuisance Impacts of Fugitive Emissions

The preceding sections are concerned in large part with the health impacts of particulate matter. Nuisance impacts also need to be considered, mainly in relation to dust. In NSW, accepted practice regarding the nuisance impact of dust is that dust-related nuisance can be expected to impact on residential areas when annual average dust deposition levels exceed 4 g/m$^2$/month.

To avoid dust nuisance the DEC has developed assessment goals for dust fallout. **Table 3** presents the allowable increase in dust deposition relative to the ambient levels.

**Table 3 DEC Goals for Allowable Dust Deposition**

| Averaging Period | Maximum Increase in Deposited Dust Level | Maximum Total Deposited Dust Level |
|---|---|---|
| Annual | 2 g/m$^2$/month | 4 g/m$^2$/month |

Source: AMMAAP, 2005

As the ambient dust deposition level has been assumed to be <2g/m$^2$/month (refer **Section 3.4**), the maximum increase in deposited dust level will be the governing goal for the project.

## 4.5 Individual Odorous and Toxic Air Pollutants

Ground level concentration (glc) criteria for individual odorous and toxic air pollutants are detailed in both the AMMAAP and the *"Technical Notes, Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW"* (2001), produced by the NSW DEC. The latter document indicates that the use of ground level concentration criteria should be applied to bitumen pre-mix or hot-mix industries, as opposed to employing odour performance criteria.

A summary of the ground level concentration criteria applicable to emissions from bitumen premix plants, as detailed in the National Pollutant Inventory document, "*Emission Estimation Technique Manual for Hot Mix Asphalt Manufacturing*", (EETMHMAM) (Environment Australia, 1999), are detailed in **Table 4**.

**Table 4 Criteria for Individual Odorous and Toxic Air Pollutants applicable to Asphalt Plants**

| Air pollutant | Ground Level Concentration [1, 3] ($mg/m^3$) | Ground Level Concentration [2, 3] ($mg/m^3$) |
|---|---|---|
| | 1-Hour Average | 3-Minute Average |
| Acetaldehyde | 0.042 | 0.076 |
| Toluene | 0.36 | 0.65 |
| Xylene | 0.19 | 0.35 |

Note 1: Source: NSW DEC *AMMAAP*

Note 2: Source: NSW DEC *"Technical Notes, Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW"* (2001)

Note 3 Gas volumes are expressed at 25°C and at an absolute pressure of one atmosphere (101.325 kPa).

# 5 DISPERSION MODELLING

## 5.1 Methodology

The pollutant dispersion modelling carried out in the present assessment utilises the Ausplume Gaussian Plume Dispersion Model software developed by EPA Victoria, Windows Version 6.0.

Ausplume is the approved dispersion model for use in the majority of applications in NSW. Default options specified in the Technical Users Manual (EPA Victoria, 2000) have been used, as per the AMMAAP.

## 5.2 Dispersion Meteorology

The Air Pollution Model (TAPM) software, developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) was used to simulate the meteorology of the area. TAPM is a prognostic model which may be used to predict three-dimensional meteorological data, with no local data inputs required.

The model predicts wind speed and direction, temperature, pressure, water vapour, cloud, rain water and turbulence. The program allows the user to generate synthetic observations by referencing databases (covering terrain, vegetation and soil type, sea surface temperature and synoptic scale meteorological analyses) which are subsequently used in the model input to generate site-specific hourly meteorological observations. TAPM is often used to drive the regulatory Ausplume model where insufficient on-site meteorological data is available, and as such is considered suitable for use in this assessment.

The TAPM model also allows for the assimilation of wind observations to be optionally included in a model simulation. The wind speed and direction observations are used to "nudge" the predicted solution towards the observation values.

For this assessment, TAPM was used to generate a complete 2004 meteorological data set for the project site, incorporating hourly observations recorded at the Bureau of Meteorology (BoM) weather station in Horsley Park. The 2004 data set is consistent with the daily-varying background $PM_{10}$ data to be utilised in the atmospheric dispersion modelling.

A summary of the 2004 annual wind behaviour for the project site presented as a wind rose is included in **Appendix A**. This wind rose is representative of the meteorological input file used in the assessment, and displays occurrences of winds from all quadrants. Wind roses produced using TAPM-generated site specific meteorology were validated against wind roses prepared using data from the BoM weather monitoring site at Horsley Park for 2001 - 2004. These wind roses for the Horsley Park weather station are included for comparative purposes within **Appendix A**.

The annual wind rose indicates that winds from the southwest quadrant dominate at the project site. The strongest winds originate from the west to southeast.

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

- In spring the prevailing wind directions are from the southwest, the west southwest, the southeast.
- In summer the prevailing wind directions are from the southeast quadrant.
- In autumn the prevailing wind direction is from the southwest, west southwest and the west.
- In winter the prevailing wind direction is from the southwest and northwest quadrants.

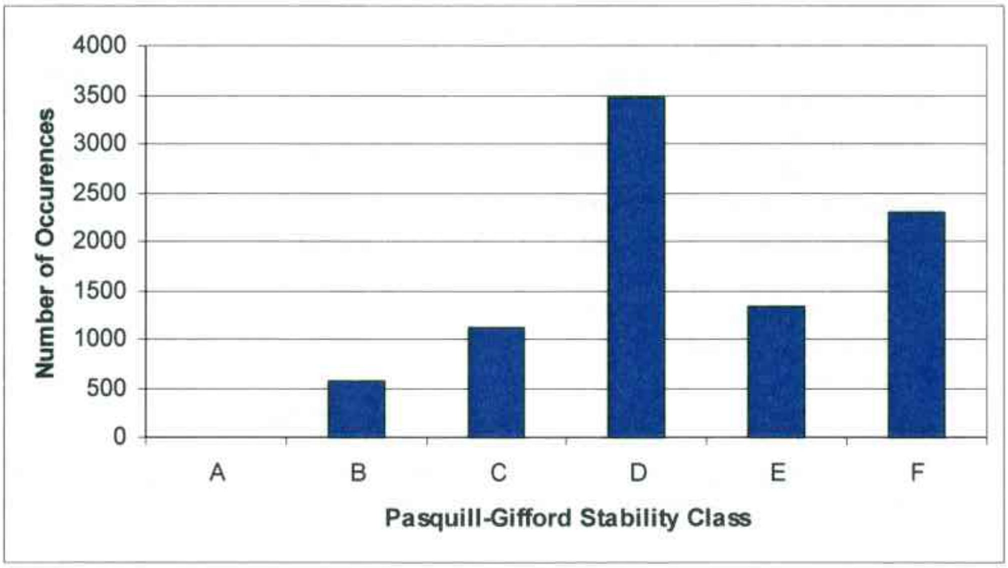
- The strongest winds occur in the winter and summer months and prevail from the west-southwest to southwest and the southeast respectively.

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

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

The frequency of occurrence of each Stability Class for 2004 is presented in **Figure 5**. The seasonal stability class distributions are included in **Appendix B**. The results indicate a high frequency of conditions typical to Stability Class "D" throughout the year at the project site. This is indicative of neutral conditions, which neither enhance nor inhibit plume dispersion. There is also a strong occurrence of Stability Class "F", which represents more stable conditions less conducive to pollutant dispersion.

**Figure 5 Annual Stability Class Distribution for the Project Site**




## 5.3 Modelling Scenario

A review has been carried out of the potentially particulate-generating activities attributable to the Project. The following activities have been included in the particulate emissions inventory.

- Handling and conveying of raw and processed materials at the various key areas about the Site.
- Pneumatic loading of cement storage silos from trucks.
- Loading of dispatch trucks at the concrete batching and asphalt and emulsion plants.
- Unloading of trucks at concrete recycling plant.
- Wind erosion of exposed ground areas and various material stockpiles.

- Combustion and production process emissions associated with the asphalt and emulsion plant.

**Table 5** presents the emission factors used for the key particulate generating activities used in the dispersion modelling carried out for this report.

**Table 5 Particulate Emission Factors for Atmospheric Dispersion Modelling**

| Activity | Total Particulate Emission Factor[1] | $PM_{10}$ Emission Factor | Emission Factor Units |
|---|---|---|---|
| Aggregate Transfer | 0.0035 | 0.0017 | kg/t |
| Sand Transfer | 0.0011 | 0.00051 | kg/t |
| Pneumatic Loading of Cement to Silos | 0.0005 | 0.00017 | kg/t |
| Pneumatic Loading of Cement Supplement to Silos | 0.0045 | 0.0024 | kg/t |
| Aggregate Delivery To Ground Storage | 0.0058 | 0.0028 | kg/t |
| Sand Delivery to Ground Storage | 0.0014 | 0.00067 | kg/t |
| Haul Truck Loading (by Excavator) | 0.0012 | 0.0006 | kg/t |
| Delivery Truck Loading from Silos (Concrete Batching Plant) | 0.049 | 0.0132 | kg/t |
| Delivery Truck Loading from Silos (Asphalt Plant) | 0.00026 | 0.00026 | kg/t |
| Asphalt Plant Silo Filling | 0.00035 | 0.00035 | kg/t |
| Crusher Operations | 0.0054 | 0.0024 | kg/t |
| Transfer and Conveying of Recycled Materials | 0.003 | 0.001 | kg/t |
| Stockpile / Bare Ground Wind Erosion | 0.4 | 0.2 | kg/ha/hr |

Note 1: Total Particulate emission factor is used to derive the rate of dust deposition

For Asphalt Plant operations listed in **Table 5**, default emission factors have been used as contained in US EPA document *Chapter 11: Mineral Products Industry: Hot-Mix Asphalt Plants* (AP42a).

For Concrete Batching operations listed in **Table 5**, default emission factors have been used as contained in Table 11.12-1 of the US EPA document *"AP-42 Compilation of Air Pollutant Emission Factors, Fifth Edition, Chapter 11.12 Concrete Batching"* (AP42). It is noted that the emission factors were derived from the latest Draft Revision of the *AP-42* document dated 29 November 2005.

Emission factors for operation of the front end loader, crushing and sand and aggregate stockpile wind erosion were derived from Table 1 of the National Pollutant Inventory (NPI) document "*Emissions Estimation Technique Manual for Mining*, Version 2.3" (EETMM).

A summary of the calculations made in deriving these emission factors is given in **Appendix C**, as is the emission inventory associated with the proposed operation. The emission inventory has been derived to reflect the worst-case scenario for the airborne emissions over a working day.

### 5.3.1 Asphalt Plant Stack Emissions

Pollutant emission rates for dispersion modeling were derived from site specific stack testing data from the existing PRS asphalt plant at the Project Site (TSP) and the US EPA AP-42 document (hydrocarbons). **Table 6** details the emission rates used in this modeling assessment.

It is noted that to represent the worst-case emission scenario, it has been assumed that 100 percent of particulate matter associated with the stack will be emitted in the $PM_{10}$ size fraction.

**Table 6 Asphalt Plant Emission Rates**

| Pollutant | Emission Rate (g/s) |
|---|---|
| TSP | 0.112 |
| Acetaldehyde | 0.004 |
| Toluene | 0.010 |
| Xylene | 0.024 |

### 5.3.2 Modelling Assumptions

**Appendix C** provides details of the emission inventory associated with the operation of the key areas of the Project Site using the emission factors given in **Table 5**.

The emission inventory has been derived to reflect the worst-case scenario for airborne emissions over a 24 hour period. Locations of materials processing activities and related mobile sources have been chosen so as to present the highest potential for impact, that is, at the closest distances to nearby residences.

The following assumptions were made in creating the emissions inventory for the dispersion modelling:

- Operation of all plant is assumed to occur 24-hours a day, 7 days a week.
- It is assumed that, excluding an approximate area of 3 hectares within the site boundary, the surface of the Project Site will be hardstand and will therefore have no emission associated with wind erosion.
- A total annual tonnage of production materials for the key areas of the Project Site are assumed as follows:
  - Asphalt Plant – 360,000 t
  - Concrete Batching Plant – 144,000 t
  - Concrete Recycling Plant – 100,000 t.
  - Masonry Plant – 150,000 t
- Hourly throughput values for operations have been calculated from the annual working hours and the annual production tonnage.
- The existence of multiple-stockpile areas within the Project Site at the Asphalt Plant and the Concrete Recycling Plant have been accounted for by modelling one aggregated area source at each area. This conservative assumption will assist in predicting worst-case emissions.
- The emission factors for the excavator and loading of trucks were derived from Table 1 of EETMM. The equation corresponding to Excavators/Front-end Loaders on overburden was used.

- Pneumatic unloading of cement and cement supplement is assumed to occur once every day, during a one hour period in the middle of the day. The quantity of cement / supplement unloaded is anticipated to be 30 tonnes per delivery.
- The Asphalt Plant stack is assumed to have the following parameters (as per PRS stack testing result from the existing, operational plant):
  - Stack Height – 20 m.
  - Stack Diameter – 0.95 m
  - Exit Velocity – 17.8 m/s.
  - Exit Temperature – 98 °C.
- As summarised in **Section 2**, various emission control measures have been scheduled for employment about the Project Site. However, for the purpose of predicting worst case emissions, no controls have been accounted for within the modelling process. As such, all atmospheric dispersion model predictions should be regarded as conservatively high.

# 6 EMISSIONS ASSESSMENT

## 6.1 Dust Deposition

**Table 7** shows the results of the Ausplume predictions for dust deposition using the emission rates calculated in **Appendix D**, at the receptors nominated in **Section 3.2**

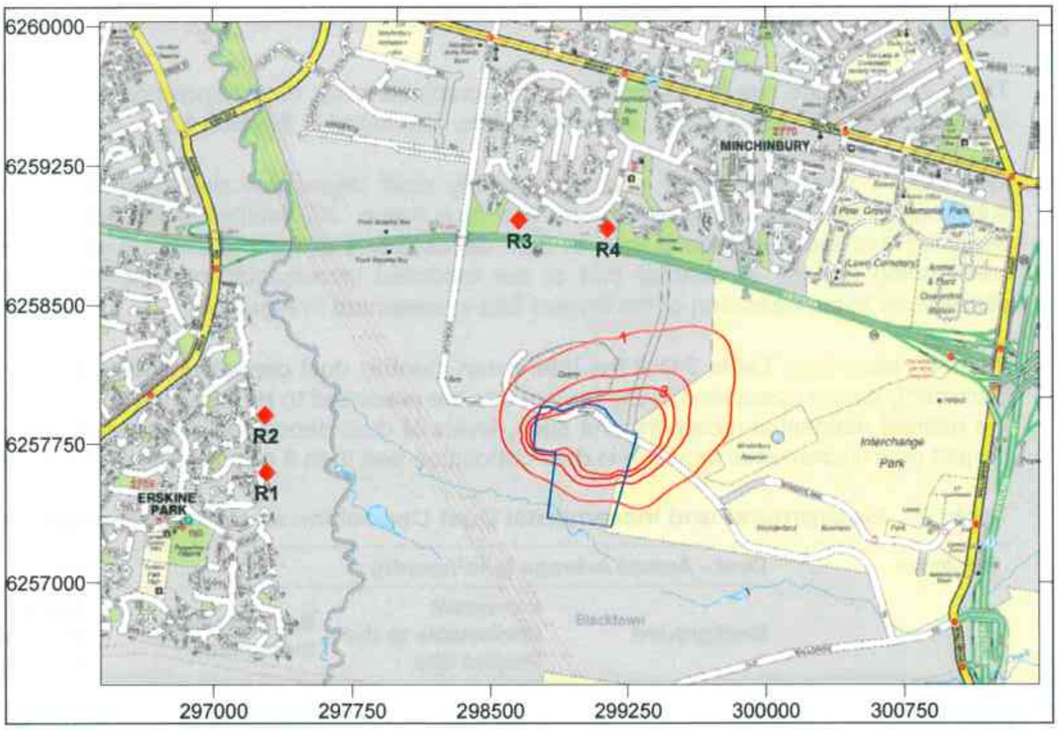
The results show the mean average monthly dust deposition predicted at the residences surrounding the Project Site over a one-year time frame. As detailed in **Section 3.4**, it has been assumed that the background level of dust deposition is of the order of 1.6 g/m²/month for the surrounding region. A contour plot of the modelled incremental increase in dust deposition attributable to the operation of the Project Site is presented in **Figure 6**.

It can be seen from **Table 7** that the total mean monthly dust deposition levels (background plus increment) during operations at the Project Site are predicted to be less than 1.9 g/m²/month at all the nearest residential receptors. As such, levels of dust deposition are predicted to satisfy the project goal (incremental increase in dust deposition less than 2 g/m²/month at all receptors).

**Table 7 Background and Incremental Dust Deposition at Nearest Receptors**

| Receptor | Dust - Annual Average (g/m²/month) | | | |
|---|---|---|---|---|
| | Background | Increment attributable to the Project Site | Background + Increment | Project Goal (Incremental Increase) |
| R1 | 1.6 | 0.1 | 1.7 | 2 |
| R2 | 1.6 | 0.1 | 1.7 | 2 |
| R3 | 1.6 | 0.3 | 1.9 | 2 |
| R4 | 1.6 | 0.3 | 1.9 | 2 |

Figure 6 Predicted Annual Average Incremental Dust Deposition (g/m²/month)




## 6.2 $PM_{10}$ (24-Hour Average)

**Table 8** presents the results of the Ausplume predictions for 24-hour $PM_{10}$ concentrations using the emission rates calculated in **Appendix C**, at the residences nominated in **Section 3.2**.

The results in **Table 8** present the maximum (background plus increment) 24-hour average concentration of $PM_{10}$ predicted at the residences surrounding the site applying the analysis over a one-year time frame. As detailed in **Section 3.3**, it has been assumed that background levels of $PM_{10}$ vary on a daily basis. These background levels have been incorporated into the model.

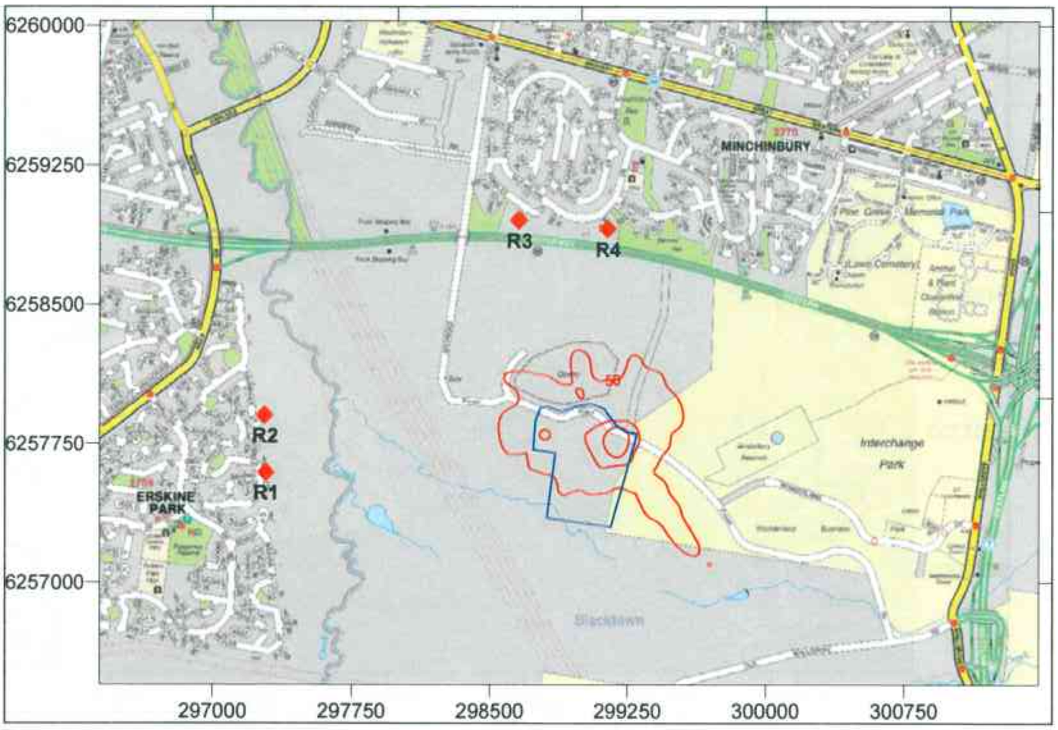
It can be seen from **Table 8** that the maximum 24-hour average $PM_{10}$ concentrations (background plus increment) associated with operations at the Project Site are predicted to be less than 46.8 µg/m³ at all the nearest non-project related receptors.

Table 8 Maximum $PM_{10}$ Concentrations at Nearest Receptors

| Receptor | $PM_{10}$ - 24-Hour Average (µg/m³) | | | |
|---|---|---|---|---|
| | Background | Increment attributable to the Project Site | Background + Increment | Project Goal |
| R1 | 44.8 | 0.0 | 44.8 | 50 |
| R2 | 44.8 | 0.0 | 44.8 | 50 |
| R3 | 44.7 | 2.1 | 46.8 | 50 |
| R4 | 44.7 | 1.8 | 46.5 | 50 |

A contour plot of the 24-hour $PM_{10}$ values (background plus increment) attributable to the operation of the Project Site is illustrated in **Figure 7**.

Figure 7 Predicted Maximum 24-hour Ground Level Concentrations of $PM_{10}$ (µg/m³)




## 6.3 $PM_{10}$ (Annual Average)

**Table 9** presents the results of the Ausplume predictions for annual average $PM_{10}$ using the emission rates calculated in **Appendix C**, at the residences nominated in **Section 3.2**. As detailed in **Section 3.3**, it has been assumed that the annual average background concentration of $PM_{10}$ is 17 µg/m³ for the surrounding region. This background level has been incorporated into the model.

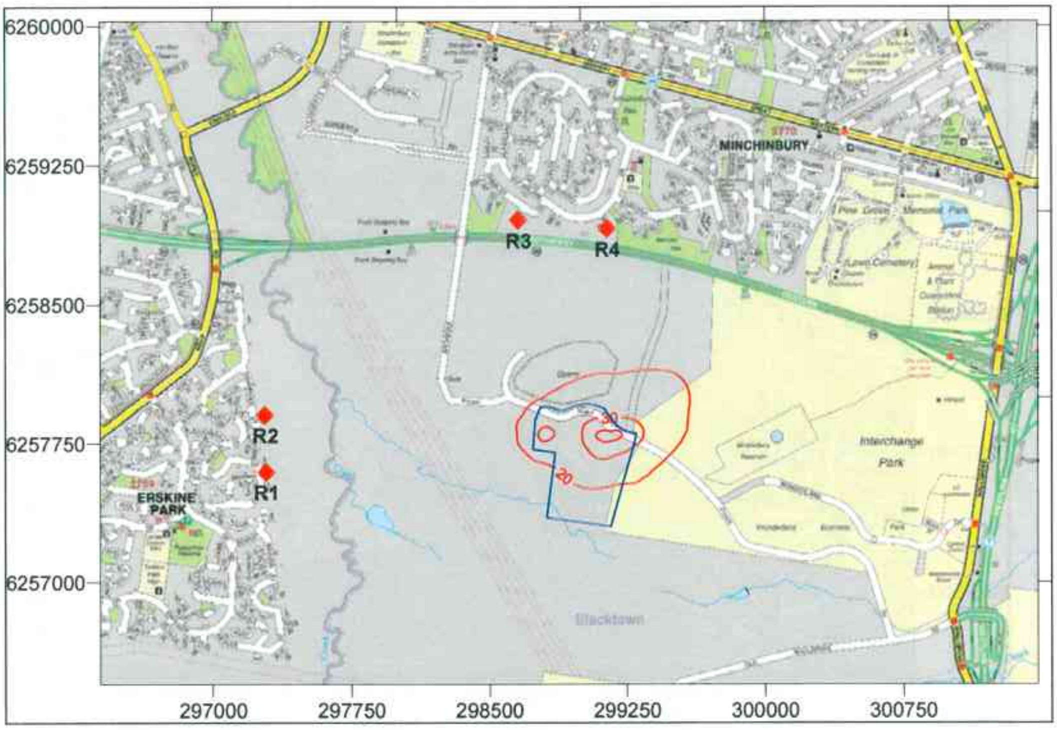
A contour plot of the modelled annual average $PM_{10}$ concentrations (background plus increment) attributable to the operation of the Project Site is presented in **Figure 8**.

Total annual average $PM_{10}$ concentrations (background plus increment) associated with the operation of the Project Site are predicted to be less than 17.5 µg/m³ at all nearest non-project related receptors. As such, annual concentrations of $PM_{10}$ are predicted to satisfy the project goal of 30 µg/m³.

Table 9 Background and Incremental Annual $PM_{10}$ Concentrations at Nearest Receptors

| Receptor | $PM_{10}$ - Annual Average (µg/m³) | | | |
|---|---|---|---|---|
| | Background | Increment attributable to the Project Site | Background + Increment | Project Goal |
| R1 | 17.0 | 0.3 | 17.3 | 30 |
| R2 | 17.0 | 0.3 | 17.3 | 30 |
| R3 | 17.0 | 0.5 | 17.5 | 30 |
| R4 | 17.0 | 0.5 | 17.5 | 30 |

Figure 8 Predicted Maximum Ground Level Concentrations of Annual $PM_{10}$ ($\mu g/m^3$)




## 6.4 Individual Odorous and Toxic Air Pollutants

**Table 10** presents the maximum predicted concentrations of individual odorous and toxic air pollutants experienced at the nearest receptors.

**Table 10 Maximum Predicted Concentrations (Individual Odorous and Toxic Air Pollutants) at Nearest Receptors**

| Air pollutant | Averaging Period | Ground Level Concentration Criteria ($mg/m^3$) | Highest Recorded Concentration ($mg/m^3$) |
|---|---|---|---|
| Acetaldehyde | 1 hour | 0.042 | $1.1 \times 10^{-04}$ |
| | 3 minute | 0.076 | $2.0 \times 10^{-04}$ |
| Toulene | 1 hour | 0.36 | $2.8 \times 10^{-04}$ |
| | 3 minute | 0.65 | $4.9 \times 10^{-04}$ |
| Xylene | 1 hour | 0.19 | $6.8 \times 10^{-04}$ |
| | 3 minute | 0.35 | $1.2 \times 10^{-03}$ |

Results presented in **Table 10** demonstrate that predicted concentrations of individual odorous and toxic air pollutants are anticipated to satisfy the air quality assessment criteria at all receptors for all averaging times.

# 7 DESIGN AND OPERATIONAL SAFEGUARDS

## 7.1 Construction Phase

During dry conditions, the following construction related site activities have the potential to generate dust:

- Earthworks;
- Loading trucks;
- Wheel generated dust from construction traffic; and
- Wind Erosion from disturbed stockpiles / earth mounds.

In addition, diesel emissions from construction vehicles including excavators, front end loaders and trucks are expected during construction.

The construction phase of the proposed development is expected expected to be completed within six months and would be carried out during normal construction hours in accordance with DEC guidelines.

Any potential atmospheric emissions during construction are anticipated to be largely controllable through technical means including good site management / housekeeping, vehicle maintenance and applying appropriate dust mitigation measures where required.

Mitigation measures that can be implemented during the construction phase should dust become an issue include:

- Reducing the idling time of diesel vehicles on site;
- Ensuring trucks are maintained in accordance with manufacturer's specifications;
- Minimisation of exposed surfaces on soil and road base mounds;
- Regular watering of exposed surfaces;
- Any dirt tracked onto access routes should be cleaned as soon as practical;
- Ensure truck loads are covered and tailgates effectively sealed;
- Silt and other material should be removed from around erosion control structures to ensure deposits do not become a dust source; and
- Amending of dust-generating construction activities during adverse wind conditions.

Provided the mitigation measures detailed above are adhered to when required, air quality impacts associated with the construction activities are not considered to be significant.

## 7.2 Operational Phase

Air pollutant emission controls associated with the respective plants are documented individually within **Section 2**.

Following discussions with the site manager of Hanson's existing emulsion plant at Windsor, NSW (Pers. Comm. Mr Mark Wheatley) it has been established that production of polymer modified bitumen is an odorous activity, particularly if scrap rubber is used as an input.

No data is available concerning quantitative odour emission rates from such a process, and as such this source has not been explicitly accounted for within the atmospheric dispersion modelling exercise.

However, it is noted that it is Hanson's intention that should the emulsion plant produce polymer modified bitumen, particularly using scrap rubber as an input, then an engineered solution, whether an afterburner or other appropriate technology, would be fitted to the plant to mitigate odour generation and meet required DEC standards. It is anticipated that such a mitigation measure will be employed at the emulsion plant. This will be incorporated as part of subsequent construction certification and detailed engineering design process.

In order to ensure that odour from the operation of the emulsion plant will not have an impact on the surrounding region; Hanson will adhere to the following Statements of Commitments:

- As per the requirements of Section 129 of the Protection of the Environment and Operations Act 1997 ("POEO" Act), Hanson commits to not cause or permit the emission of offensive odour beyond the boundary of the premises.
- To demonstrate the above, prior to commissioning of the emulsion plant, the proponent will provide a technical report and/or manufacture's performance guarantees for all odour mitigation plant and equipment utilised within the emulsion plant process demonstrating to the satisfaction of the DEC that emissions of odour from this source will comply with Section 129 of the POEO Act.

# 8 GREENHOUSE GAS ASSESSMENT

Operations at all of the Project Site facilities have the potential to generate greenhouse gas emissions from a number of sources, including:

- The combustion of fuel by onsite equipment and vehicles, including haul trucks, front end loaders, crushers, screens and conveyors;
- The use of electricity to power all the plants; and
- The combustion of Natural Gas at the Asphalt Plant.

Carbon dioxide ($CO_2$) is produced during fuel combustion as a result of the oxidation of the fuel carbon content. $CO_2$ is likely to make the largest contribution to greenhouse gas emissions from fuel combustion as approximately 99% of automotive diesel oil (ADO) fuel is oxidised during the combustion process (AGO, 2002).

Other greenhouse gases emitted as a result of operations at the site may include carbon monoxide (CO), methane ($CH_4$), oxides of nitrogen ($NO_X$) and non-methane volatile organic compounds (NMVOCs). These are produced by incomplete fuel combustion, reactions between air and fuel constituents during fuel combustion, and post-combustion reactions. Fugitive emissions of NMVOCs may also be expected due to fuel evaporation.

For comparative purposes, non-$CO_2$ greenhouse gases are awarded a "$CO_2$-equivalence" based on their contribution to the enhancement of the greenhouse effect. The $CO_2$-equivalence of a gas is calculated using an index called the Global Warming Potential (GWP). The GWPs for a variety of non-$CO_2$ greenhouse gases are contained within the Intergovernmental Panel on Climate Change (IPCC) document *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*.

The GWPs of relevance to this assessment are:

- **Methane ($CH_4$)**: GWP of 21 (21 times more effective as a greenhouse gas than $CO_2$); and
- **Nitrous Oxide ($N_2O$)**: GWP of 310 (310 times more effective as a greenhouse gas than $CO_2$).

The short-lived gases such as CO, $NO_2$, and NMVOCs vary spatially and it is consequently difficult to quantify their global radiative forcing impacts. For this reason, GWP values are generally not attributed to these gases nor have they been considered further as part of this assessment.

An assessment of the predicted greenhouse gas emissions from the operation of entire facility has been undertaken for each of the aforementioned sources and is outlined below.

## 8.1 Diesel Combustion

The primary fuel source for the vehicles operating on site would be Automotive Diesel Oil (ADO). Data is available on the diesel consumption for all mobile and fixed equipment servicing the site, and is estimated as 1,200 L/day.

It is noted that this excludes the Asphalt Plant which will have also use a dedicated Front End Loader (FEL). To conservatively account for this additional FEL, an additional 50 L/day has been used.

This equates to a total approximate diesel consumption rate of 456 kL per annum.

The annual emissions of $CO_2$ and other greenhouse gases from this source have been estimated using the Australian Greenhouse Office (AGO) document *"Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002 - Energy (Stationary Sources)"*. It has been assumed that the energy content of ADO is 38.6 MJ/L (ABARE, 2004).

A summary of the worst case predicted emissions is provided in **Table 11**.

**Table 11 Predicted Annual Greenhouse Gas Emissions from Diesel Fuel Combustion**

| | $CO_2$ | $N_2O$ | $CH_4$ |
|---|---|---|---|
| Predicted Emissions (tpa) | 1,215 | 0.01 | 0.06 |
| $CO_2$-Equivalent (tpa) | 1,215 | 3.3 | 1.4 |

## 8.2 Electricity

Electricity will be used to power facilities including components of the asphalt plant, concrete batching / recycling plants, masonry plant and ancillary site facilities.

The annual electricity consumption at the asphalt plant is estimated to be of the order of 1 GWh/annum. No electricity consumption data is currently available for other operations occurring at the site. In the absence of additional electricity consumption data, it is assumed that the other plants within the Project Site will consume an equivalent quantity of electricity annually.

An estimate of the annual emissions of carbon dioxide from the consumption of electricity at the Asphalt Plant has been derived using the Australian Building Greenhouse Rating (ABGR) Performance Calculator emission factor of 940 kg $CO_2$-equivalent/MWh.

Based on these assumptions, it is predicted that the use of electricity associated with Project Site activities will result in the emission of approximately 3,760 tonnes of $CO_2$-equivalent per annum.

## 8.3 Natural Gas Consumption

Natural Gas will be burnt in the rotary dryer as part of the asphalt production process. Based on information supplied by the proponent, the annual gas usage will be 65 Terajoules (TJ) per annum.

The annual emissions of $CO_2$ and other greenhouse gases from this source have been estimated using the Australian Greenhouse Office (AGO) document *"Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002 - Energy (Stationary Sources)"*.

**Table 12 Predicted Annual Greenhouse Gas Emissions from Natural Gas Combustion**

| | $CO_2$ | $N_2O$ | $CH_4$ |
|---|---|---|---|
| Predicted Emissions (tpa) | 128 | 0.002 | 0.003 |
| $CO_2$-Equivalent (tpa) | 128 | 0.5 | 0.05 |

## 8.4 Total Greenhouse Gas Emissions

A summary of the predicted greenhouse gas emissions resulting from all operations at the site are presented in **Table 13**.

Table 13 Predicted Annual Greenhouse Gas Emissions from operations at the site

| Source | Predicted Emissions (tpa) | | | Total $CO_2$-Equivalent (tpa) |
|---|---|---|---|---|
| | $CO_2$ | $N_2O$ | $CH_4$ | |
| Diesel | 1,215 | 3.3 | 1.4 | 1,220 |
| Electricity | 3,760 | NA | NA | 3,760 |
| Gas | 128 | 0.5 | 0.05 | 129 |
| **TOTAL** | | | | **5,109** |

As shown in **Table 13** the total estimated annual emissions of $CO_2$-Equivalent as a result of operations at the site are likely to be of the order of 5,109 t of $CO_2$-Equivalent per annum.

Greenhouse gas estimates are assessed relative to 1990 baseline levels for reporting purposes. The *1990 National Greenhouse Gas Inventory* (AGO, 1990) provides estimates of greenhouse emissions in Australia. In 1990, total Australian emissions were estimated to be 392,061 kt $CO_2$-equivalent.

A comparison of the predicted emissions with the 1990 estimate demonstrates that operations would represent an annual increase of approximately 0.001% on the total baseline Australian emissions.

# 9 CONCLUSION

Heggies Australia Pty Ltd (Heggies) has been commissioned by Planning Workshop Australia (PWA) on behalf of Hanson Construction Materials Pty Ltd (Hanson) to carry out an Air Quality Impact Assessment for the proposed redevelopment of the existing Hanson operations conducted within the Eastern Creek Precinct, located centrally within the Greater Sydney Basin, NSW. This document assesses the anticipated impacts of the onsite operations on local air quality.

Computer predictions of fugitive emissions ($PM_{10}$, dust deposition, individual toxic / odorous pollutants) from the Project Site were undertaken using the Ausplume Gaussian Plume Dispersion Model (version 6.0) software developed by EPA (Victoria) to determine the resulting air quality impacts of the proposed operation.

All modelling predictions indicate that, provided that specific design and operational safeguards are implemented, particulate matter, dust deposition, and individual odours pollutants attributable to the Project would be within the current DEC (and NEPM) air quality goals at all surrounding residences.

Specifically, it is noted that should the emulsion plant intend to produce polymer modified bitumen, particularly using scrap rubber as an input, then potential odour issues will require to be engineered out through the use of an afterburner or other appropriate technology.

An estimate of greenhouse gas generation associated with operation of the Project Site has been undertaken. A comparison of the predicted emissions with benchmark 1990 emission estimates for Australian industry as a whole demonstrates that operations would represent an annual increase of approximately 0.001% on the total baseline Australian emissions.

# 10 REFERENCES

This Air Quality Assessment has utilised the following references.


**Regarding Existing Air Quality**

- NSW DEC $PM_{10}$ data as measured by TEOM at the DEC's St Marys monitoring site, January 2004 – December 2004.

**Regarding Air Quality Goals**

- National Environmental Protection Council (NEPC), "*National Environmental Protection Measure for Ambient Air Quality*", 1998.
- National Health and Medical Research Council, 92nd Session, 1981.
- NSW Department of Environment and Conservation (DEC), "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*", 2005.
- Watson, J. G., Chow, J. C. & Pace, T. G., Chapter 4: *Fugitive Dust Emissions* in Buonicore A. J. & Davis, W. T. (ed.), *Air Quality Engineering Manual*, 2000.

**Regarding Meteorology**

- Bureau of Meteorology Automatic Weather Station data for 2001 to 2005 at Horsley Park.

**Regarding Particulate Emission Factors**

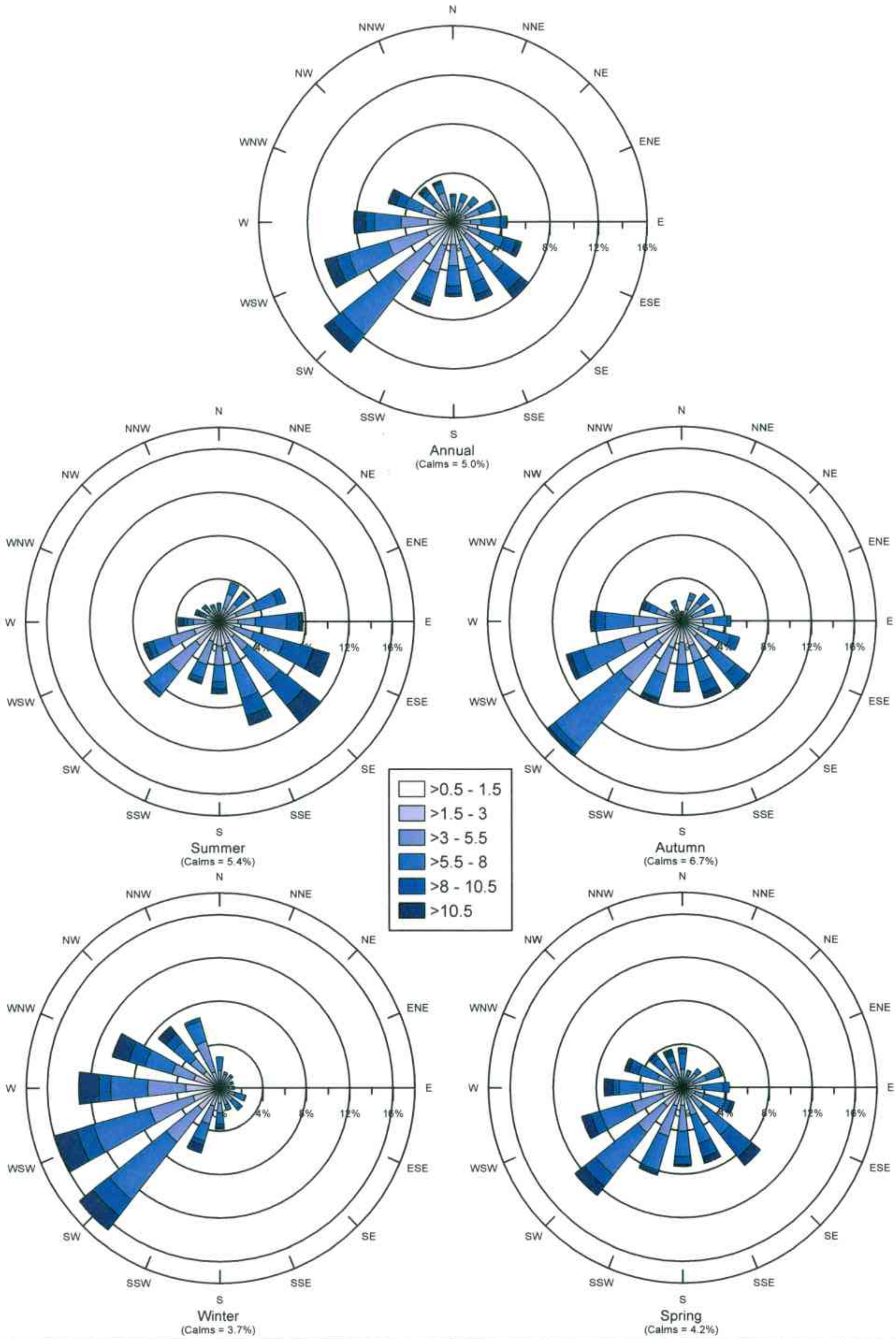
- Department of Environment and Heritage (DEH) "*Emission Estimation Technique Manual for Mining Version 2.3*", December 2001.
- NZ MFE (2001) New Zealand Ministry for the Environment "*Good practice guide for assessment and managing the environmental effects of dust emissions*"
- USEPA (1985) "*Compilation of Air Pollutant Emission Factors AP-42*" Fourth Edition United States Environmental Protection Authority.
- USEPA (1988) "*Compilation of Air Pollutant Emission Factors AP-42*" Fourth Edition United States Environmental Protection Authority.

**Regarding Greenhouse Gas Assessment**

- Australian Bureau of Agricultural and Resource Economics (ABARE) (2004). "*Energy Abbreviations and Definitions*". http://www.abareconomics.com/research/energy/ENERGYDEFINITIONS.pdf
- Australian Greenhouse Office (2002) *"Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002 – Energy (Stationary Sources)"*
- Australian Greenhouse Office (2002) *"Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002 – Transport"*
- Australian Greenhouse Office (2002) *"Factors and Methods Workbook, August 2004"*
- Intergovernmental Panel on Climate Change (IPCC) (1996) *"Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories"*.
- Australian Building Greenhouse Rating (ABGR) Performance Calculator http://www.abgr.com.au.
- Australian Greenhouse Office (1990) *"1990 National Greenhouse Gas Inventory"*.

## 11 GLOSSARY OF ACRONYMS AND SYMBOLS

| | |
|---|---|
| AMMAAP | NSW Department of Environment and Conservation (DEC), "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*", 2005. |
| AS | Australian Standard |
| AWS | Automatic Weather Station |
| BoM | Bureau of Meteorology |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DEC | NSW Department of the Environment and Conservation |
| glc | Ground level concentration |
| mg | Milligram (g x $10^{-3}$) |
| µg | Microgram (g x $10^{-6}$) |
| µm | Micrometre or micron (metre x $10^{-6}$) |
| $m^3$ | Cubic metre |
| NEPC | National Environment Protection Council |
| NHMRC | National Health and Medical Research Council |
| $PM_{10}$ | Particulate matter less than 10 microns in aerodynamic diameter |
| $PM_{2.5}$ | Particulate matter less than 2.5 microns in aerodynamic diameter |
| TAPM | "The Air Pollution Model" |
| TEOM | Tapered Element Oscillating Microbalance |
| TSP | Total Suspended Particulate |
| USEPA | United States Environmental Protection Agency |
| WHO | World Health Organisation |





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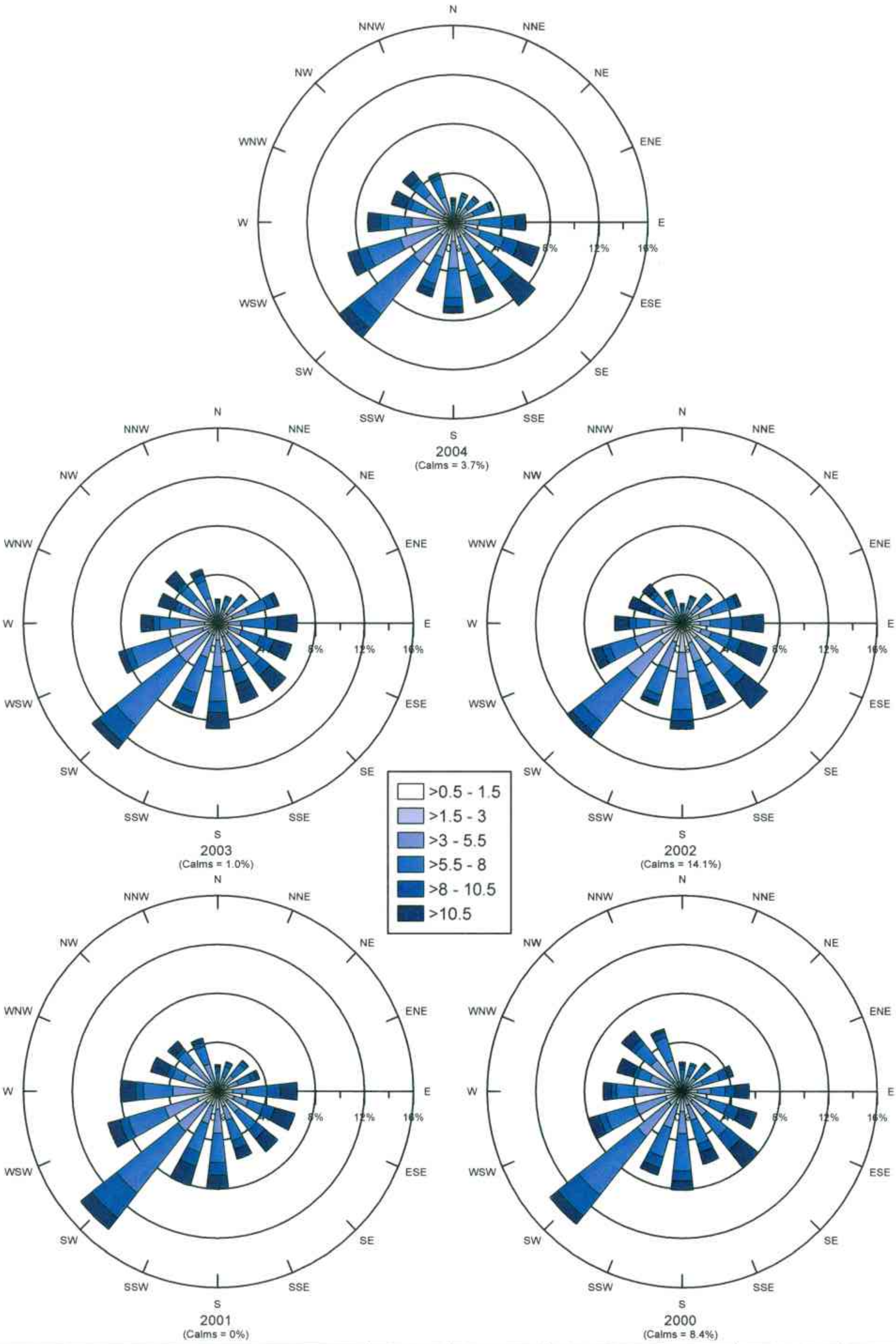
|---|---|---|---|---|
| SF | RK | 03/10/2006 | 10-4912 | 03/10/2006 |

**Appendix A: TAPM Generated Seasonal Wind Roses for the Subject Site (2004)**

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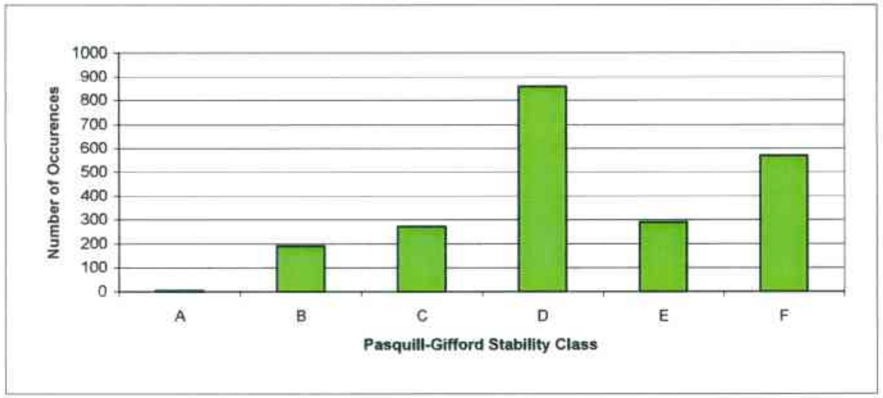
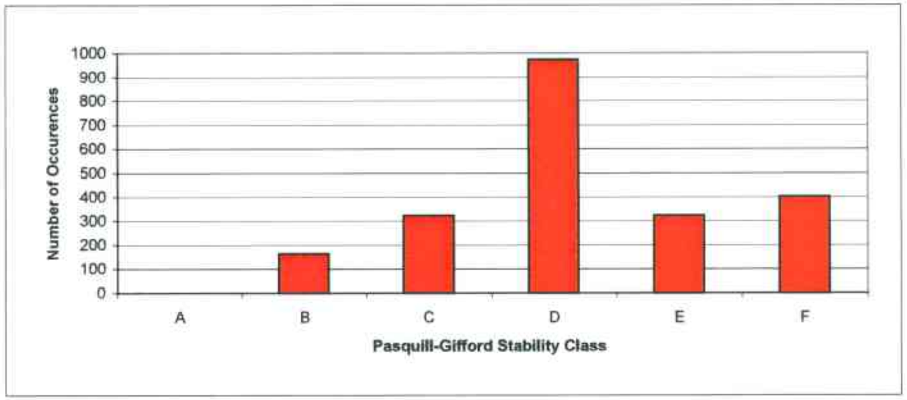
|---|---|---|---|---|
| SF | RK | 03/10/2006 | 10-4912 | 03/10/2006 |

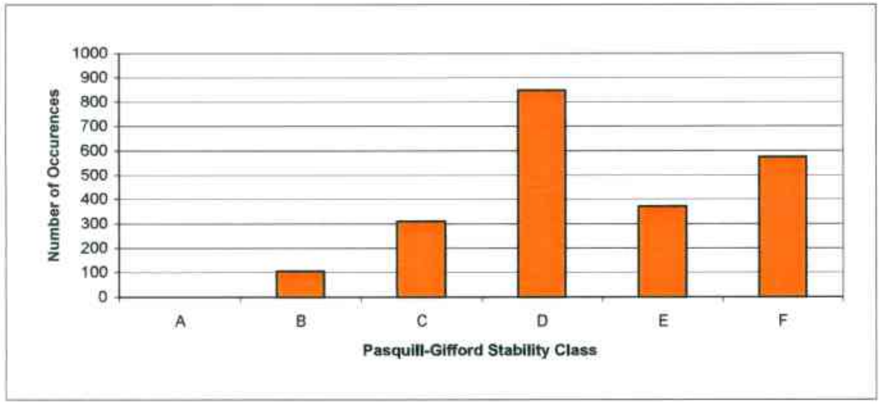
**Appendix A: Annual Wind Roses for Horsley Park BoM AWS (2000 - 2004)**



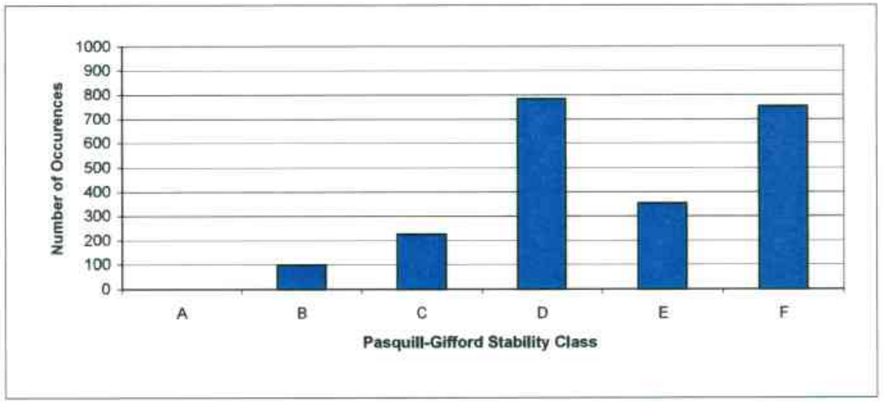

**Spring**




**Summer**




**Autumn**




**Winter**

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|---|---|---|---|---|
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Seasonal Stability Class Frequency Distribution for Subject Site - 2004

Project Site Emissions Inventory

| | Total PM Emission Factor | $PM_{10}$ Emission Factor | Emission Factor Units | Throughput (t/hour) | Number of hectares of stockpile | Working days available | Working hours per day | Total PM Emission Rate (mg/s) | $PM_{10}$ Emission Rate (mg/s) | TSP Emission Flux (mg/s/m$^2$) | $PM_{10}$ Emission Flux (mg/s/m$^2$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Masonry Plant*** | | | | | | | | | | | |
| Crushed Slag Aggregate Transfer | 0.003500 | 0.001700 | kg/t | 17.1 | N/A | 365 | 24 | 16.648 | 8.086 | N/A | N/A |
| Cement Unloading to Elevated Storage Silo (Pneumatic) | 0.000500 | 0.000170 | kg/t | 30.0 | N/A | 365 | 24 | 4.167 | 1.417 | N/A | N/A |
| ***Batching Plant*** | | | | | | | | | | | |
| Aggregate delivery to ground storage | 0.005779 | 0.002799 | kg/t | 8.2 | N/A | 365 | 24 | 13.194 | 6.391 | N/A | N/A |
| Sand delivery to ground storage | 0.001426 | 0.000665 | kg/t | 8.2 | N/A | 365 | 24 | 3.255 | 1.519 | N/A | N/A |
| Sand transfer to weigh bins by FEL | 0.001100 | 0.000510 | kg/t | 7.6 | N/A | 365 | 24 | 2.328 | 1.080 | N/A | N/A |
| Aggregate transfer to weigh bins by FEL | 0.003500 | 0.001700 | kg/t | 5.8 | N/A | 365 | 24 | 5.675 | 2.756 | N/A | N/A |
| Sand transfer to elevated storage (by conveyor) | 0.001100 | 0.000510 | kg/t | 7.6 | N/A | 365 | 24 | 1.630 | 0.756 | N/A | N/A |
| Aggregate transfer to elevated storage (by conveyor) | 0.003500 | 0.001700 | kg/t | 5.8 | N/A | 365 | 24 | 3.972 | 1.929 | N/A | N/A |
| Cement Unloading to Elevated Storage Silo (Pneumatic) | 0.000500 | 0.000170 | kg/t | 30.0 | N/A | 365 | 1 | 4.167 | 1.417 | N/A | N/A |
| Cement (supplement) Unloading to Elevated Storage Silo (Pneumatic) | 0.004500 | 0.002400 | kg/t | 30.0 | N/A | 365 | 1 | 37.500 | 20.000 | N/A | N/A |
| Truck loading (truck mix) | 0.049050 | 0.013150 | kg/t | 30.0 | N/A | 365 | 24 | 408.750 | 109.583 | N/A | N/A |
| ***Recycling Plant*** | | | | | | | | | | | |
| Crusher Loading | 0.003000 | 0.001000 | kg/t | 11.4 | n/a | 365 | 24 | 9.513 | 3.171 | n/a | n/a |
| Crusher | 0.005400 | 0.002400 | kg/t | 11.4 | n/a | 365 | 24 | 17.123 | 7.610 | n/a | n/a |
| FEL Transfer | 0.003500 | 0.001700 | kg/t | 11.4 | N/A | 365 | 24 | 11.098 | 5.391 | N/A | N/A |
| FEL Bin Loading | 0.003500 | 0.001700 | kg/t | 11.4 | N/A | 365 | 24 | 11.098 | 5.391 | N/A | N/A |
| Storage Bin WE | 0.400000 | 0.200000 | kg/ha/hr | N/A | 467 | N/A | N/A | N/A | N/A | 0.011 | 0.006 |
| Haul Truck Dumping | 0.003000 | 0.001000 | kg/t | 11.4 | n/a | 365 | 24 | 9.513 | 3.171 | n/a | n/a |
| Conveying to screening plant | 0.003000 | 0.001000 | kg/t | 11.4 | n/a | 365 | 24 | 9.513 | 3.171 | n/a | n/a |
| Conveying to silos | 0.003000 | 0.001000 | kg/t | 11.4 | n/a | 365 | 24 | 9.513 | 3.171 | n/a | n/a |
| Stockpile WE | 0.400000 | 0.200000 | kg/ha/hr | N/A | 467 | N/A | N/A | N/A | N/A | 0.011 | 0.006 |
| Conveying to Stockpile | 0.003000 | 0.001000 | kg/t | 11.4 | n/a | 365 | 24 | 9.513 | 3.171 | n/a | n/a |
| Bare Ground | 0.400000 | 0.200000 | kg/ha/hr | N/A | 467 | N/A | N/A | N/A | N/A | 0.011 | 0.006 |
| ***Asphalt Plant*** | | | | | | | | | | | |
| Plant Load Out | 0.000261 | 0.000261 | kg/t | 41.1 | n/a | 365 | 24 | 2.979 | 2.979 | n/a | n/a |
| Silo Filling | 0.000347 | 0.000347 | kg/t | 41.1 | n/a | 365 | 24 | 3.965 | 3.965 | n/a | n/a |
| Recycled Crusher | 0.005400 | 0.002400 | kg/t | 10.3 | n/a | 365 | 24 | 15.411 | 6.849 | n/a | n/a |
| Recycled Storage | 0.400000 | 0.200000 | kg/ha/hr | N/A | 467 | N/A | N/A | N/A | N/A | 0.011 | 0.006 |
| Aggregate Storage | 0.400000 | 0.200000 | kg/ha/hr | N/A | 467 | N/A | N/A | N/A | N/A | 0.011 | 0.006 |
| Crusher Loading | 0.003000 | 0.001000 | kg/t | 10.0 | n/a | 365 | 24 | 8.333 | 2.778 | n/a | n/a |
| FEL Transfer | 0.003500 | 0.001700 | kg/t | 41.1 | N/A | 365 | 24 | 39.954 | 19.406 | N/A | N/A |
| Raw material Storage 1 | 0.400000 | 0.200000 | kg/ha/hr | N/A | 467 | N/A | N/A | N/A | N/A | 0.011 | 0.006 |
| Raw material Storage 2 | 0.400000 | 0.200000 | kg/ha/hr | N/A | 467 | N/A | N/A | N/A | N/A | 0.011 | 0.006 |
| Aggregate transfer to elevated storage (by conveyor) | 0.003500 | 0.001700 | kg/t | 41.1 | N/A | 365 | 24 | 27.968 | 13.584 | N/A | N/A |