

Appendix C

Air quality and
noise and vibration reports

Keepit Dam Upgrade Air Quality Impact Assessment

September, 2008

State Water



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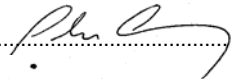
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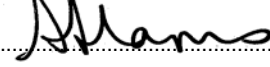
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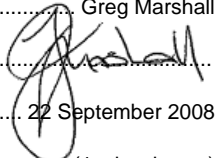
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Glossary

Term	Definition
$\mu\text{g}/\text{m}^3$	Micrograms per cubic metre
$\text{mg}/\text{m}^2/\text{day}$	Milligrams per metre squared per day
BOM	Bureau of Meteorology
CO	Carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CO_{2-e}	Carbon dioxide equivalent
C_xH_x	Non-combustible hydrocarbons
Deposited matter	Any particulate matter that falls out from suspension in the atmosphere. This measurement is expressed in units of mass per area over time (e.g. $\text{mg}/\text{m}^2/\text{day}$).
EPA	Environmental Protection Authority
Fugitive dust	Dust derived from a mixture of sources (non-point source) or not easily defined sources. Examples of fugitive dust include dust from vehicular traffic on unpaved roads, materials transport and handling and un-vegetated soils and surfaces.
Gradient wind flow	Gradient wind is flow created by high and low pressures centres.
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Ambient Air Quality) Measure. National Environment Protection Measures are broad framework-setting statutory instruments defined under the <i>National Environment Protection Council Act 1994</i> . They outline agreed national objectives for protecting or managing particular aspects of the environment. NEPMs are similar to environmental protection policies and may consist of any combination of goals, standards, protocols, and guidelines.
NHMRC	National Health and Medical Research Council
NO_x	Oxides of nitrogen
PB	Parsons Brinckerhoff
PM_{10}	Particulate matter less than or equal to 10 micrometres in aerodynamic diameter
$\text{PM}_{2.5}$	Particulate matter less than or equal to 2.5 micrometres in aerodynamic diameter
SO_x	Oxides of sulphur
t	Tonnes
TAPM	CSIRO's 'The Air Pollution Model'
TSP	Total suspended particulates less than or equal to 30micrometres in aerodynamic diameter.
US EPA	United States Environmental Protection Agency. Its mission is to protect human health and the environment.

Executive summary

This report was prepared by Parsons Brinckerhoff (PB) on behalf of State Water Corporation to assess the potential air quality impacts of the proposed Keepit Dam upgrade (the Project) on the receiving environment. This technical assessment has focussed primarily on the construction stage emissions and associated impact potential. Operational emissions are not expected to change significantly as a result of the upgrade.

The preferred option for the Project (Option B1) includes the raising of the main and subsidiary dam walls by 3.4 metres, constructing two additional spillways, and installing three saddle dams. Concrete for the Project will be provided from on site concrete batching and crushing plants.

The assessment has been undertaken in accordance with the guidelines presented in the *Approved Methods and Guidance for the Modelling of Air Pollutants in New South Wales* (DEC 2005a) and other relevant guidelines.

Ambient air quality-data was not measured at the Project site. Data for particulate matter less than or equal to 10 micrometres in aerodynamic diameter (PM₁₀) from 2001 was obtained from the Department of Environment and Climate Change (DECC) air quality monitoring station at Tamworth. Total suspended particulates less than or equal to 30 micrometres in aerodynamic diameter (TSP) and dust deposition levels were extrapolated from the available PM₁₀ data. There were no exceedances of the PM₁₀ DECC goal of 50 micrograms per cubic metre (µg/m³) at the Tamworth air quality station in 2001.

Dispersion modelling was undertaken to predict the impact of dust emissions from the Project on the receiving environment during the construction phase. The construction activities were considered to comprise generally two stages. Stage 1 would include simultaneous construction works on the subsidiary dam wall, saddle dams and at the right-hand abutment. Stage 2 would primarily involve construction activities associated with raising the main dam wall which are not expected to result in substantial changes in ambient air quality. Modelling was therefore undertaken on two scenarios associated with the Stage 1 works only.

Maximum predicted levels modelled for PM₁₀, TSP and dust deposition for Stage 1 works indicated:

- Scenario 1 — no blasting: Compliance with adopted air quality goals at all modelled receptors with the exception of the peak cumulative 24-hour PM₁₀ levels at 1521 Bulga Road.
- Scenario 2 —blasting: Compliance with adopted air quality goals at all modelled receptors with the exception of the peak cumulative 24-hour PM₁₀ levels at 1521 Bulga Road. The second highest 24-hour PM₁₀ cumulative concentration of 45.0ug/m³ was predicted to be below the air quality goal and represents an 18% reduction of the highest predicted cumulative concentration of 55.4ug/m³. Therefore, concentrations exceeding the 24-hour PM₁₀ air quality goal were predicted to occur once over the entire year i.e. less than 1% of the year.

Within the Gums and Lakeside caravan parks, 24-hour PM₁₀ levels are expected at approximately 20 to 50 µg/m³ which is below the 24-hour PM₁₀ goal.

There is little difference in the predicted results for Scenario 1 (no blasting) and Scenario 2 (blasting events) indicating that the blasting events are not predicted to have a substantial adverse impact on predicted dust levels during construction.

Mitigation measures for the construction phase are proposed to ensure that predicted impacts at the modelled sensitive receptors are minimised. Specific emphasis on particulate matter management during blasting events have been included.

The mitigation measures proposed are outlined in Section 8 of this report and would be further detailed in the Project CEMP. They have also been included in the revised Statement of Commitments of the submissions report.

State Water has contacted the landowner at 1521 Bulga Road and have provided a draft copy of this report for comment. It is understood that this landowner does not live full-time at this location. Further and ongoing consultation with potentially affected landowners including 1521 Bulga Road and monitoring of any actual impacts would be conducted during the construction works.

1. Introduction

This technical report has been prepared to assess the potential air quality impacts associated with the proposed construction and operation of the Keepit Dam upgrade (the Project) on the receiving environment.

1.1 Background

State Water Corporation (State Water) is the owner and operator of Keepit Dam (a Project locality plan is provided in Figure 1-1) and is responsible for ensuring that the dam meets the current requirements of the NSW Dams Safety Committee. The NSW Dams Safety Committee requires the upgrade of the dam to withstand extreme natural events.

An Environmental Assessment Report, '*Keepit Dam Upgrade Environmental Assessment – Volumes 1 and 2*' was exhibited by the Department of Planning commencing in December 2007. This report addressed the environmental assessment requirements for the Project issued by the Director-General of the Department of Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In its submission to the exhibition of the Environmental Assessment, the Department of Environment and Climate Change (DECC) requested a detailed assessment of air quality impacts on key sensitive receptors.

This report has been completed in accordance with the guidelines presented in the *Approved Methods and Guidelines for the Modelling of Air Pollutants in New South Wales* (Department of Environment and Conservation (DEC) 2005a) and other relevant guidelines. The report considers the air quality impacts associated with the Project based on predictive air quality modelling. The air quality assessment focuses on potential ground level contaminant generation during construction of the Project. Operational emissions are not expected to be significant and have been included as a qualitative assessment in this report.

1.2 Scope

The scope of work for this study was to undertake an air quality impact assessment for the construction and operational phases of the Project, including the following tasks:

- review of proposed works and construction program
- review of existing meteorological conditions and air quality monitoring data
- determine potential air emissions sources for both the construction and operational stages of the project
- assess air quality impacts for the construction (quantitative) and operational (qualitative) phases, with comparison to relevant legislation and guidelines
- compile a concise statement of potential impact, including development mitigation and management measures, where required.

Supporting documentation is included in the appendices of this report. Limitations to the scope and use of this assessment are provided in Chapter 11.

2. Project description

2.1 Overview

The proposed Project involves the construction and operation of a combination of additional spillways and raising of the main dam wall and other associated works to safely accommodate extreme flood and earthquake events.

Three dam safety options were examined in the Environmental Assessment, including a combination of raising the main and subsidiary dam walls, provision of additional saddle dams, strengthening the main dam wall and providing additional spillway capacity. A clay borrow pit will be excavated to provide clay material for earth dam construction. Concrete would be provided from an on-site concrete batching plant. Option B1 is the preferred option and is specifically addressed in this assessment.

The construction of the Project is anticipated to occur over a two and half year period.

2.2 Location and topographic setting

Keepit Dam is located off the Oxley Highway approximately 38 kilometres east of Gunnedah and 54 kilometres west of Tamworth in north-west NSW. The dam is situated on the Namoi River, 13 kilometres upstream of its confluence with the Peel River.

The landscape character is a mixture of undulating hills and expansive plains as the landform gradually falls to the west into the upper reaches of the Darling/Barwon system river basin. The Great Dividing Range is accompanied by two primary ridge systems running west from the range. To the north the Nandewar Range runs west from Armidale toward Bringara, to the south the Liverpool Range commences at Murrurrundi, runs west to Coonabarabran and terminates in the Warrumbungle National Park. Between these two ranges is a gently undulating area known as the Liverpool Plains. The Namoi River runs west draining the Liverpool Plains. The main land use comprises grazing, irrigation and cotton plantations.

2.3 Sensitive receptors

Existing residential properties are located in the vicinity of Keepit Dam, with the nearest receptor located approximately 600 metres south-east of the subsidiary dam wall.

The nearest potentially affected receptors are listed in Table 2-1 and shown on Figure 2-1.

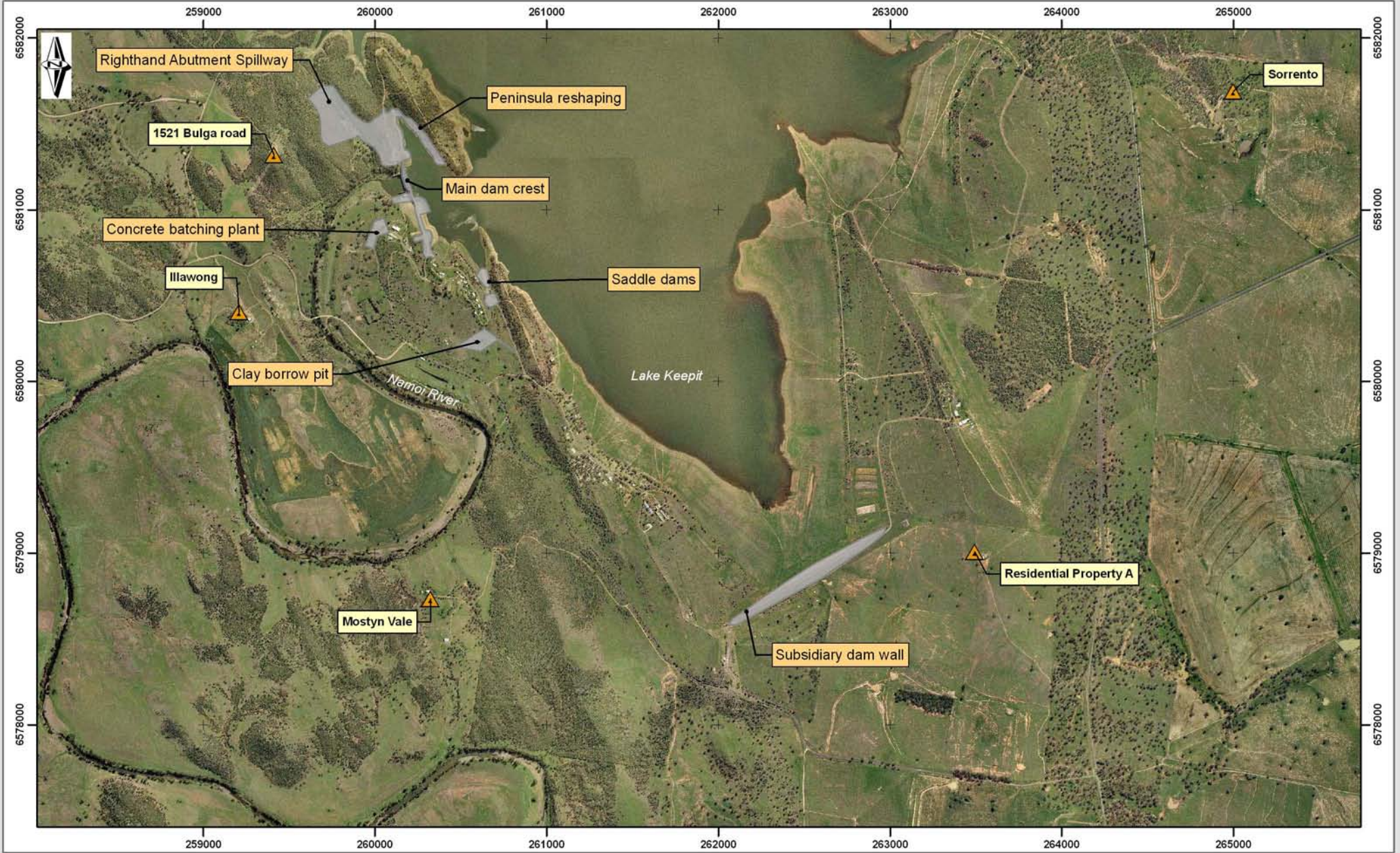
Table 2-1 Adopted sensitive receptor locations

Receptor location	Property name	Vector	Approximate distance (metres) centre point of project site	Coordinates (AMG)
1	1521 Bulga Road	West of main dam	1,000	259413, 6581320
2	Illawong	South-west of main dam	1,300	259209, 6580406
3	Mostyn Vale	West of subsidiary dam wall	2,100	260323, 6578734
4	Residential Property A	South-east of subsidiary dam wall	600	263493, 6579009
5	Sorrento	North-east of main dam	3,400	265000, 6581690

Existing commercial receivers located in the vicinity of the Project include:

- The Gums Caravan Park
- Lakeside Caravan Park
- Lake Keepit Sport and Recreational Centre
- sailing club
- golf course
- kiosk
- gliding club hangar.

State Water employee housing is located approximately 350 metres south-east of the main dam wall. For the purposes of this assessment, it is not considered to be a sensitive receptor, however statements of potential impact, and contour impact isopleths, are provided which address the selected sensitive receptors and others. State Water offices are the nearest commercial receptor, located approximately 670 metres to the excavation works adjacent to the right hand abutment spillway.





-  Sensitive receptors
-  Construction areas

Figure 2-1: Adopted nearest potentially affected receptors



3. Existing air quality and meteorology

Air quality data and meteorological conditions were referenced from a combination of Bureau of Meteorology (BoM) and DECC monitoring data as follows:

- BoM Tamworth station meteorological data for 2001 (site number 55054)
- DECC Tamworth station PM₁₀ background concentrations (2001).

The data set is considered suitable for the purposes of this assessment.

3.1 Ambient air quality

Based on a review of existing land uses in the vicinity of the Project area, the existing air quality area is considered to be characteristic of a rural environment with key air emission sources expected to include a combination of general rural/residential activities and the use of local roads. No known major pollutant generating facilities are located in the immediate vicinity of Keepit Dam. Particulate matter, carbon monoxide (CO), hydrocarbons and the oxides of nitrogen (NO_x) and sulphur (SO_x) are all expected to fall within acceptable ranges.

Ambient air quality data is not currently available for the Project site and no site-specific monitoring was undertaken. Measured PM₁₀ profiles (2001) from the DECC controlled Tamworth air quality monitoring site were adopted to provide a conservative estimate of background conditions. This station is located approximately 40 kilometres north-east of Keepit Dam, in a rural/urban area. This approach was considered the best available for this assessment and is consistent with the NSW policy document.

Annual PM₁₀ concentrations

An annual average PM₁₀ background concentration level of 13.5 µg/m³ was calculated from the 2001 Tamworth data. This background value was adopted and added to the calculated incremental impacts, where available.

24-Hour PM₁₀ concentrations

The five highest 24-hour average background measurements for each month at Tamworth in 2001 are presented in Table 3-1.

Table 3-1 Adopted background 24-hour PM₁₀ concentration data

Rank	Highest values for each month (µg/m ³)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Avg.
1st Highest	24.3	19.9	14.5	16.7	22.9	21.8	23.3	23.7	23.6	27.0	34.6	24.3	23.1
2nd Highest	22.9	19.4	14.5	16.6	21.2	20.7	21.9	21.1	21.5	25.5	30.5	22.6	21.5
3rd Highest	22.7	19.3	13.7	16.5	18.2	20.6	21.4	20.2	21.2	23.9	27.4	20.8	20.5
4th Highest	22.5	19.3	13.4	15.5	18.1	18.7	19.2	19.7	19.4	22.9	25.2	20.6	19.5
5th Highest	19.2	18.7	13.0	14.6	17.6	18.6	17.3	18.2	17.9	19.6	23.3	20.5	18.2

Source: DECC (Tamworth) 2001.

Measured 24-hour averaged PM₁₀ data for the Tamworth air monitoring station was adopted for the assessment of particulate matter impacts.

Annual TSP concentrations

No annual average background TSP data for the Tamworth or Gunnedah area was available. It is considered good practice to assume a TSP concentration of at least double the annual PM₁₀ concentration. As such, an annual TSP background concentration of 27 µg/m³ was adopted and added to the predicted incremental impacts, where applicable.

Dust deposition

No existing background dust deposition levels were available. An existing background dust deposition level of 0.7 g/m²/month was assumed — approximately one third the DECC recommended level of 2 g/m²/month for maximum increase in deposited dust levels. The cumulative criterion established ensures that significant increases in off-site deposited dust are unlikely to occur.

3.2 Meteorology

Air quality impacts are influenced by regional meteorological conditions, primarily in the form of gradient wind flow regimes, and by local conditions, generally driven by topographical features in the form of drainage flows. Topography, wind speed and wind direction all affect the potential dispersion and transport of dust plumes. Regional and local dispersion meteorology for the Project site was estimated based on the data available for regional and local conditions.

A site-representative regional meteorological data file was configured for the Project site. The data was based on 2001 conditions for temperature, wind speed and wind direction. Stability classes were based on cloud cover data and the Turner Method. Mixing height was determined using Powell and Venkatram. Eight thousand six hundred and eighty-eight valid hours of data (99% of 200) were present.

The 2001 wind frequency data and the stability classes for Tamworth are included in Attachment A. Directional wind patterns indicate predominant wind flows from the north or south through to the south-east. The noted flow regimes were generally present throughout all seasons. Review of the annual wind rose data indicates that winds from a south-south-easterly direction are predominant.

Annually, the proportion of light winds (less than 1.5 metres per second (m/s)) was 5.2% for 2001. A higher frequency of light wind conditions occurs during the winter season.

Regional gradient wind flow conditions over the life of the BoM Tamworth Station (9 am and 3 pm) are provided in Attachment B. These long-term wind rose plots are consistent with the compiled 2001 data set.

Annual and seasonal wind rose plots for this file are included in Attachment B. An annual average wind speed of 4.4 m/s was calculated for 2001, with the primary wind direction from the south-south-east. Seasonal wind roses were in close agreement with the annual wind rose, with the exception of spring when northerly winds were predominant.

Worst-case dispersion conditions from the site (least dispersion) would normally be associated with F-class stability conditions — still/light winds and clear skies during the early morning period (stable conditions). Analysis of the referenced site-specific meteorological data indicates that F-class dispersion conditions were present for approximately 14.5% of the time during 2001. This is consistent with the north-westerly tablelands and is not considered excessive.

3.3 Topography

When assessing the impact potential from a ground level source of air pollutants, it is important to consider local drainage flows. The movement of cold air down a slope (generally under stable atmospheric conditions) is referred to as katabatic drift and can result in plume entrapment and poor dispersion of air borne pollutants and the potential to cause greater off-site impacts. Katabatic drift would follow the topography of the site.

Based on topographical information available for the Project site, there is expected to be minimal potential for the formation of a localised catchment towards each of the nearest potentially affected receptors. Plume entrapment and minimal horizontal or vertical diffusion are not expected to readily occur as a result of the intermittent ground-level based construction works.

4. Adopted standards and guidelines

Air quality reporting standards and regional goals are established to protect the health of local communities and minimise potential annoyance.

The identified national goals are based on the recommendations of the National Health and Medical Research Council (NHMRC, 1995) and the National Environmental Protection (Ambient Air Quality) Measure (NEPM, 1998) prepared by the National Environmental Protection Council (NEPC). The NEPM is a long-term reporting descriptor.

NSW ambient air quality goals are provided in the Department of Environment and Conservation (DEC, now DECC) document entitled '*Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*' (DEC 2005a). The standards/goals for a range of pollutants are presented in Table 4-1.

Table 4-1 Ambient air quality goals

Pollutant	Averaging period	Goal ¹	Source ²
TSP ³	Annual mean	90 µg/m ³	NHMRC, DECC
PM ₁₀ ⁴	24-hour	50 µg/m ³	NEPC, NEPM, DECC
	Annual	30 µg/m ³	EPA, DECC
Dust deposition	Annual average (monthly)	2 g/m ² /month ⁵	NERDCC ⁷ , DECC
		4 g/m ² /month ⁶	

Notes:

- 1 ug/m³ = micrograms per cubic metre, mg/m³ = milligrams per cubic metre.
- 2 NEPM allows for no more than five exceedances in a given year (PM₁₀).
- 3 TSP = total suspended particulates less than or equal to 30 µm in aerodynamic diameter.
- 4 PM₁₀ = particulate matter less than or equal to 10 µm in aerodynamic diameter.
- 5 Maximum increase in deposited dust level.
- 6 Maximum total deposited dust level.
- 7 National Energy Research, Development and Demonstration Council.

An NEPM 'advisory' standard has been established for 24-hour and annual PM_{2.5} concentration levels. (PM_{2.5} is defined as particulate matter less than or equal to 2.5 µm in diameter). A 24-hour goal of 25 µg/m³ and annual goal of 8 µg/m³ has been recommended. However, given the existing advisory status of the PM_{2.5} criterion, detailed assessment of impact potential was not undertaken.

5. Air dispersion modelling characteristics

5.1 Industrial Source Complex Short Term No. 3 model

The computer-based pollutant dispersion modelling program identified as the Industrial Source Complex Short Term No. 3 (ISCST3) Version #00101 was used to undertake the air impact assessment. ISCST3 uses industry-accepted dispersion modelling algorithms that predict ground-level dust concentrations as a function of distance from the emission source. The model takes into account the source characteristics in terms of relative location, elevation, dust emission rate and the particle size mass distribution of the dust plume from the source.

The ISCST3 modelling program implemented in this assessment uses consecutive meteorological data records to define the conditions for plume rise, transport, diffusion and deposition. The model was used to estimate the concentration and deposition values for each source and receptor combination for each hour of input meteorology and calculated using selected short-term or period average predictions. Atmospheric dispersion curves and surface roughness heights were selected that represented the conditions present.

The basis of the model used is the straight line, steady state Gaussian Plume Equation (consistent with current air dispersion theory). Fugitive dust emissions from the proposed site are considered to have been adequately represented using ISCST3.

5.2 Model justification

There are a number of circumstances where the use of ISCST3 may not prove suitable. These circumstances and their relevance to the Project area include:

- Complex terrain, non steady-state conditions. Terrain induced deflection or channelling (to nearest potentially affected receivers) would be unlikely to significantly influence the fate and transport of pollutants towards the nearest potentially affected receptors at the Project site. Potential drainage flow catchments (katabatic flow) would not be expected to be significant.
- High frequency of stable calm night-time conditions. The assessment of F-class stability conditions (see Section 4) demonstrated that the influence of a stable atmosphere, and accumulation of pollutants, would be of little relevance.
- High frequency of calm conditions. ISCST3 does not simulate calm conditions. Review of the meteorological data file indicated that calm conditions (0.5 m/s within the modelled input file) occurred for less than 0.5% of the 2001 hourly data set.
- Buoyant line plumes. No sources with buoyant line plume characteristics are present within the proposed Keepit Dam construction site.
- Coastal effects such as fumigation. Large changes in meteorological conditions over short distances would be unlikely to either occur or influence the fate and transport of pollutants at the subject site, which is not a coastal location.

Based on the above, the use of the ISCST3 model (including the steady-state assumptions and associated technical parameterisations) is considered appropriate.

5.3 Modelling characteristics

5.3.1 Meteorological input data

The meteorological input file is considered representative of the wind climate and wind direction events at the Project site, and in the study region in general. Over 8,000 wind speed and wind direction events were obtained, ensuring that worst-case conditions were adequately represented in the model predictions.

5.3.2 Terrain effects

The ISCST3 modelling package does not effectively account for terrain effects from low level volume or area emission sources — consistent with those likely to be present throughout the Project site. Experience has also shown that terrain effects have minimal affect on the predicted air quality impacts for sites similar to the Project site. Terrain effects have, therefore, not been included as part of this assessment.

5.3.3 Cartesian grid and site plan

A grid size of seven kilometres by five kilometres was constructed, with grid receptors placed at 100 metre intervals and south-west corner coordinates of E258000 N6577000. The grid was used to assess the extent of dispersion of emissions during construction. Five discrete (sensitive) receptors were also included in the grid. A site layout map was used as the template for the source locations on which all isopleths have been superimposed.

6. Air emission sources

The Project will have two phases with potential to affect air quality:

- construction
- operation

The main sources of emissions during operation are not anticipated to change as a result of the dam upgrade and include:

- employee vehicles entering/leaving the site
- vans/trucks deliveries entering/leaving the site
- visitor vehicles entering/leaving the site.

This report therefore focuses only on the construction air quality emissions.

The main air emission sources during the construction phase are detailed below. Further information regarding these sources and the derivation of emission factors is presented in Attachment C.

6.1 Mobile vehicular emissions

The operation of on-site machinery during construction works and general site operations will generate CO, carbon dioxide (CO₂), oxides of nitrogen (NO_x), sulphur dioxide (SO₂), and trace amounts of non-combustible hydrocarbons (C_xH_x) emissions. Emission rates and impact potential depend on the number and power output of the combustion engines, quality of the fuel and condition of the combustion engine.

Slight odours may be detectable close to the emission source(s). However, based on the setting of the Project site, the likely ambient air quality characteristics, low population density, and transient nature of odorous emissions, odours are not considered a key issue for this Project. They have, therefore, not been considered further in this study.

6.2 Particulate matter emissions

Particulate emissions are caused by two basic physical phenomena: pulverisation and abrasion of surface materials by mechanical force (e.g. wheels, blades); and entrainment of dust particles by the action of turbulent air currents (e.g. wind).

The impact of a fugitive dust source (i.e. dust not discharged to the atmosphere in a confined flow stream) on air quality primarily depends on the quantity and drift potential of the dust particles injected into the atmosphere. Drift potential is governed by the initial injection height, terminal settling velocity, reflection co-efficient and specific gravity of the particle, and the degree of atmospheric turbulence, with larger particles dispersed over much greater distances. A discussion of the primary sources of particulate emissions follows.

6.2.1 Aggregate handling on storage piles

Total dust emissions from aggregate storage piles result from four distinct source activities in the storage cycle: loading of aggregate onto storage piles; equipment traffic in storage areas; wind erosion of pile surface and ground areas around piles; and load out of aggregate for shipment or return to the process stream. The quantity of dust emitted varies with the volume of aggregate passing through the storage cycle. Emissions also depend on the condition of a storage pile — pile age, moisture content, and proportion of aggregate fines.

6.2.2 Industrial wind erosion

Industrial wind erosion is typically characterised by non-homogenous surfaces impregnated with non-erodible elements. Mean atmospheric wind speed alone is sufficient to sustain wind erosion from most flat surfaces. Emissions generated by wind erosion are dependent on the frequency or disturbance of the erodible surface — any natural crusting of the surface binds the erodible material, reducing the erosion potential. Each time a surface is disturbed, its erosion potential is restored.

6.2.3 Heavy construction operations

The quantity of these emissions is proportional to the area of land being worked and the level of construction activity, and is also affected by the speed and weight of the average vehicle. The temporary nature of the construction differentiates it from other fugitive sources, as emissions can be expected to have a definable beginning and end and will vary substantially over different stages of the Project. A large portion of these emissions will result from equipment traffic over temporary access roads at the site. Emissions from heavy construction operations are correlated with the silt content of the soil. Higher levels of soil moisture reduce emission potential.

6.2.4 Blasting

While not a sustained event, blasting has the potential to result in significant short-term particulate matter emissions. The quantity of particulate matter injected into the atmosphere is a function of blast patterns, horizontal area, quantity of charge and associated items.

The total amount of rock to be excavated is approximately 670,000m³ over a 40 week period. During this period it is anticipated there would be approximately one to two blasts per day (or up to approximately 7 per week) Monday to Saturday using small charges (less than 250 kilograms) and resulting in small blasts. This will therefore result in a much lower dust impact at the nearest sensitive receptors.

6.2.5 Unpaved roads

The force of wheels on unpaved roads, such as haul roads or roads under construction, causes pulverisation of surface material, whereby particles are lifted and dropped, exposing the surface to strong air currents, and the turbulent wake behind a vehicle. The quantity of emissions varies linearly with the volume of traffic, speed and the parameters that characterise the condition of the road.

6.2.6 Paved roads

Particulate emissions from paved roads are associated with direct exhaust from vehicles and re-suspension of loose material on the road surface. As the surface loading is moved or removed, it is continuously replenished by other sources. Dust emissions from this source have been found to vary with the 'silt loading' present on the road surface as well as the average weight of vehicles travelling the road. Particulate emissions may be associated with the Project as a result of increased numbers of vehicles on the road network during construction.

6.2.7 Material processing

Processing of materials is expected to involve the use of various combinations of washers, screens and classifiers to segregate particle sizes; crushers to reduce oversized material; and storage and loading facilities, which all have the potential to cause emissions.

Generally, sand, gravel and clay at the site will be extracted in a moist or wet condition, which would reduce emissions. Furthermore, a substantial portion of these emissions may consist of heavy particles that settle out in the immediate vicinity of the plant.

6.2.8 Concrete batching plant

Concrete batching plants store, convey, measure and discharge constituents for transport to the relevant work area. Particulate matter, consisting primarily of cement dust and including some aggregate and sand component emissions, are the major pollutant of concern. Sources of emissions are expected to occur in the transfer of cement to the silo and of sand and coarse aggregate to elevated bins. Batching plant operations for the construction phase were characterised into the following main dust producing activities:

- truck and front end loader (FEL) delivery of aggregate to storage
- aggregate transfer to conveyor
- conveyor transfer of aggregate to elevated storage
- truck and FEL delivery of sand to storage
- sand transfer to conveyor
- conveyor transfer of sand to elevated storage
- cement unloading to elevated storage silo
- cement supplement (fly ash) unloading to elevated storage silo
- weigh hopper loading
- truck loading (central mix)
- wheel generated dust
- wind erosion from stockpiles and exposed areas
- emissions from cars and trucks.

6.3 Emission factors and rates

Particulate matter emissions will depend on the final construction program. In modelling emissions, all sources were conservatively assumed to be emitting dust at their maximum rate for all active periods of the day. Ancillary sources (e.g. mulchers and generators) were not considered in detail, as they would not be expected to be significant contributors to the emission inventory.

6.4 Modelling scenarios

Based on the anticipated construction activities and draft construction program, the following stages of construction works were considered:

- Stage 1, with the main activities including simultaneous works on the subsidiary wall, right-hand abutment and saddle dams. The majority of blasting activities (approximately 95%) would take place at the right-hand abutment during this stage
- Stage 2, with the main activities including raising the main dam wall. No blasting would be required for this work however some overlap with the Stage 1 works is anticipated to occur.

The following modelling scenarios were assessed:

- Scenario 1 – Stage 1 construction works with no blasting
- Scenario 2 – Stage 1 construction works with blasting

For each Scenario, four model runs for particulate matter were undertaken, consistent with the air quality guidelines provided in Chapter 3 (Table 6-1).

Table 6-1 Modelling runs and parameters modelled

Modelling run	Parameter	Averaging period
Run 1	PM ₁₀	24-hour
Run 2		Annual
Run 3	TSP	Annual
Run 4	Dust (TSP) deposition	Annual average (daily)

Predictive impact models allow for variations in particulate matter emissions potential by applying corrections for release properties and expected work conditions. This approach provides an adequate representation of 'likely' year-round emissions and dust impact potential. A review of maps and aerial photographs of the study area determined the position of the site specific dust sources.

6.4.1 Emission estimation

For each identified source, emission factors were obtained from the following sources:

- the United States Environment Protection Agency's (US EPA), 1995; AP-42
- National Pollution Inventory (NPI) Emission Estimation Technique Manual for Concrete Batching
- Concrete Product Manufacturing (Environment Australia 1999).

Emission rates for each source were determined using the adopted emission factors. Adopted emission rates, including the number of sources and key assumptions made are outlined in Table 6-2. An emission inventory is included in Attachment C.

Table 6-2 Particulate matter emission factors and rates adopted

Dust emission source	Number of sources	Emission factor			Emission rates			Assumptions
		TSP	PM ₁₀	Units	TSP	PM ₁₀	Units	
Fugitive area sources								
Paved roads ¹	30	49.3	9.4	g/VKT	2.49e-6	4.75e-7	g/m ² /s	40 km/hr over 3 km road
Internal unpaved haul roads ²	10	105.6	33.6	g/VKT	3.20e-6	1.02e-6	g/m ² /s	40 km/hr over 1 km road
Wind erosion (stockpile) ³	2	1.61	0.66	kg/hectare/ hour	3.73e-5	1.53e-5	g/m ² /s	500 m ² area
Wind erosion (exposed area) ⁴	6	3839	1920	g/m ²	2.61e-7	1.31e-7	g/m ² /s	17,000 m ² total exposed area
Blasting ³ - (short-term release)	1	3.23	1.68	Kg/blast	9.98e-3	5.19e-3	g/m ² /s	600 m ² area over 1 hour
Mobile sources								
Drill rigs ³	2	0.59	0.35	kg/hole	6.83e-5	4.10e-5	g/m ² /s	-
Bulldozer (FEL) handling material ³	2	26.98	20.24	kg/hour	0.02	0.01	g/m ² /s	-
Bulldozer FEL overburden ³	2	2.26	1.70	kg/hour	1.10e-3	8.58e-4	g/m ² /s	-
Scrapers ³	2	0.029	0.0174	g/kg	0.37	0.22	g/s	500 tonnes/day
Graders ³	2	1.075	0.65	g/VKT	1.30e-6	7.88e-7	g/m ² /s	
Handling, transfer and storage of aggregate ⁵	3	0.001	5.26e-4	g/kg	1.11e-3	1.21e-3	g/m ² /s	1,000 tonnes/day
Truck with aggregate material (loading/dumping) ³	3	0.11	0.08	g/kg	0.11	0.08	g/m ² /s	1,000 tonnes/day
Compactor ³	2	2.26	1.70	kg/hour	1.14e-3	8.58e-4	g/m ² /s	-

Table 6-2 (cont'd) Particulate matter emission factors and rates adopted

Dust emission source	Number of sources	Emission factor			Emission rates			Assumptions
		TSP	PM ₁₀	Units	TSP	PM ₁₀	Units	
Stationary sources								
Crusher ⁶	1	3.5e-4	2.1e-4	g/kg	8.84e-3	5.30e-3	g/s	1,000 tonnes/day
Screening operations (controlled) ⁷	2	1.1e-3	3.7e-5	g/kg	0.03	9.34e-3	g/s	1,000 tonnes/day
Conveyor transfer points ⁷	2	7.0e-5	2.3e-5	g/kg	1.77e-3	5.81e-4	g/s	1,000 tonnes/day
Concrete batch plant (CBP) – truck delivery of aggregate to ground storage ⁸	1	1.1	0.52	kg/day	1.11e-3	5.25e-4	g/m ² /s	600 tonnes/day
CBP – FEL delivery of aggregate to ground storage ⁸	1	1.1	0.52	kg/day	1.11e-3	5.25e-4	g/m ² /s	600 tonnes/day
CBP – Aggregate transfer to conveyor ⁸	1	1.1	0.52	kg/day	1.11e-3	5.25e-4	g/m ² /s	600 tonnes/day
CBP – conveyor transfer of aggregate to elevated storage ⁸	1	0.55	0.26	kg/day	1.39e-3	3.94e-4	g/m ² /s	600 tonnes/day
CBP – truck delivery of fine aggregate to ground storage ⁸	1	0.179	0.085	kg/day	5.02e-4	2.38e-4	g/m ² /s	~300 tonnes/day
CBP – FEL delivery of fine aggregate to ground storage ⁸	1	0.179	0.085	kg/day	5.02e-4	2.38e-4	g/m ² /s	~300 tonnes/day
CBP – fine aggregate transfer to conveyor ⁸	1	0.179	0.085	kg/day	5.02e-4	2.38e-4	g/m ² /s	~300 tonnes/day
CBP – conveyor transfer of fine aggregate to elevated storage ⁸	1	0.089	0.042	kg/day	2.25e-4	1.06e-4	g/m ² /s	~300 tonnes/day
CBP – cement unloading to elevated storage silo ⁸	1	0.082	0.052	kg/day	2.07e-3	1.31e-3	g/s	1,200 tonnes/day
CBP – weigh hopper loading ⁸	1	0.003	0.002	kg/day	7.58e-5	5.05e-5	g/m ² /s	1,200 tonnes/day
CBP – truck loading (central mix) ⁸	1	0.372	0.09	kg/day	9.39e-3	2.27e-3	g/m ² /s	1,200 tonnes/day

Note 1: sourced from AP-42 (5th Edition), Chapter 13.2.1; Note 2: AP-42, Chapter 13.2, Note .3; AP-42, Chapter 11.9; Note 4: AP-42, Chapter 13.2.5, Note 5: AP-42, Chapter 13.2.4, Note 6: AP-42, Chapter 11.19.2, 1/95, Note 7: 11.19.2, 8/04, Note 8: AP-42, Chapter 11.12

6.5 Modelling assumptions

The following assumptions were made regarding the construction activities and concrete batching plants:

- concrete batching plant: operating for a period of approximately 2 years and 3 months
- design of the concrete batching plant based on details provided in AP-42 Section 11.12
- height of silos and storage bins set at 10 metres
- concrete throughput of 1,200 tonnes per day (peak demand)
- coarse aggregate throughput of 600 tonnes per day (peak demand)
- fine aggregate throughput of 324 tonnes per day (peak demand).

General assumptions:

- hours of operation between 7 am and 6 pm Monday to Friday, and between 7 am and 1 pm on Saturdays
- controls for each identified source, where appropriate
- fully enclosed conveyor
- blasting modelled over a 1-hour period, with an active blast area of 600 square metres
- three kilometres of paved haul road and one kilometre of internal (unsealed) haul road
- numbers of mobile plant for each stage as listed in Table 6-2.

Blasting assumptions:

- based on an estimate of 600m² horizontal blast area and 250kg MIC
- drilling depth of up to 21 metres
- Maximum emission factors used. Mitigation measures not incorporated
- Blasting is assumed to occur continuously over a 1-hour period. This is an overestimation but is limited by the constraints of the model.
- Model based on up to 2 blasts per day or approximately 7 blasts per week

6.6 Operation phase

The main sources of emissions to air during the operation of the Project are not anticipated to change to any significant degree to the existing scenario, and include:

- employee vehicles entering/leaving the site
- vans/trucks deliveries entering/leaving the site
- visitor vehicles entering/leaving the site.

7. Potential air quality impacts

7.1 Prediction method

Dust impacts were assessed quantitatively using the ISCST3 modelling software package. Background data presented in Section 3.1 was adopted consistent with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005). This data was used to determine the contemporaneous or cumulative impact of particulate matter concentrations at the nearest sensitive receptors and to compare the results to air quality standards. Calculations are presented in Attachment D.

7.2 Modelling results

The predicted incremental and cumulative levels of PM₁₀, TSP and dust deposition are presented in Table 7-1. The shaded results indicate potential non-compliance with adopted ambient air quality goals.

Figure 7-1 to Figure 7-4 present the contour plots for Scenario 2, (with blasting) only. The contour plots do not represent particular dispersion patterns, but rather the extent of maximum potential impact of construction activities on the receptors considered.

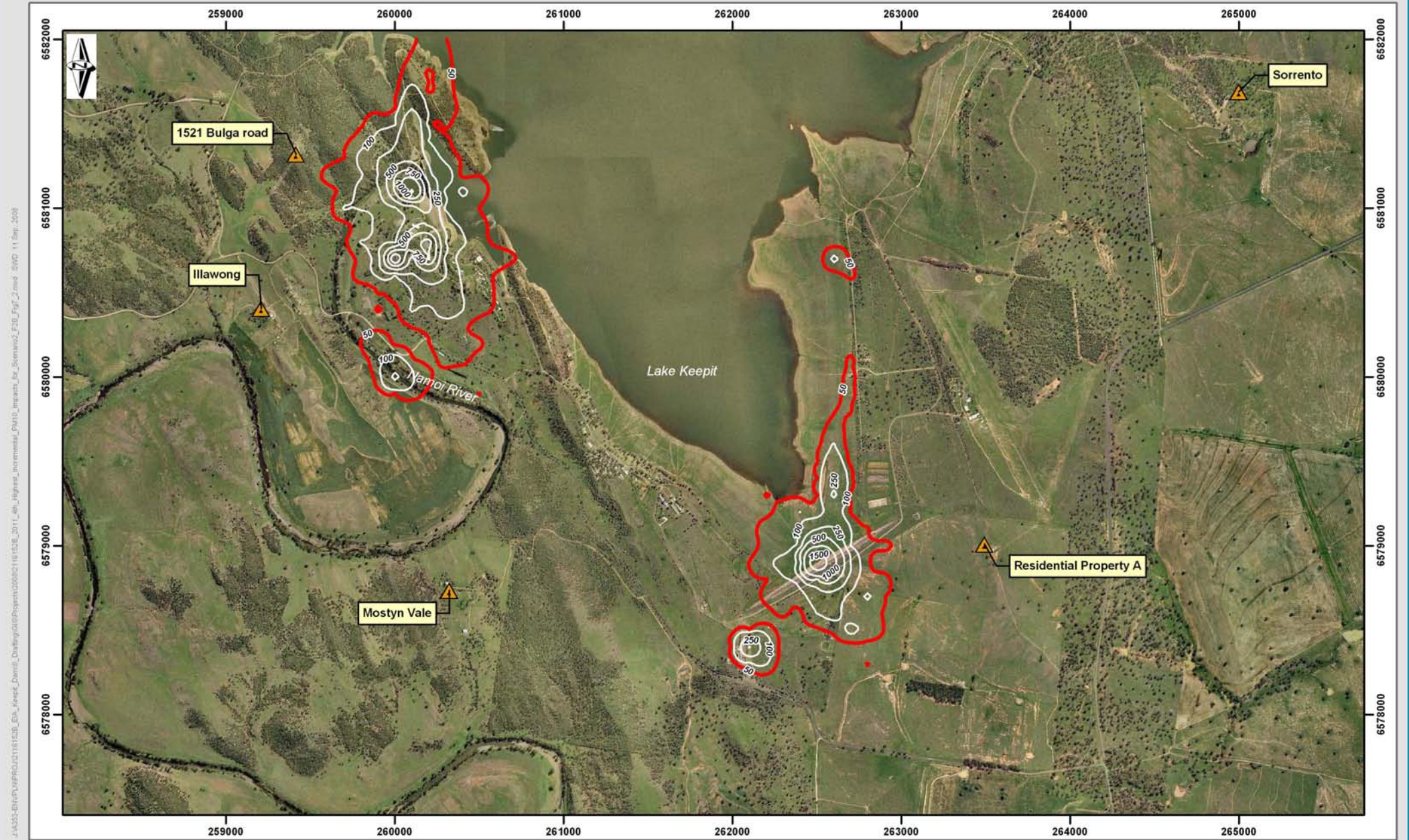
A sample ISCST3 model output file is included in Attachment E for further reference.

Table 7-1 Predicted incremental and cumulative particulate matter impacts

	Receptor 1 1521 Bulga Road		Receptor 2 Illawong		Receptor 3 Mostyn Vale		Receptor 4 'Residential Property A'		Receptor 5 Sorrento	
	A ¹	B ²	A ¹	B ²	A ¹	B ²	A ¹	B ²	A ¹	B ²
Scenario 1: no blasting										
PM ₁₀ (annual, µg/m ³) ³	2.91	16.4	1.87	15.4	1.68	15.2	1.09	14.6	0.16	13.7
PM ₁₀ (24 hour, µg/m ³) ⁴	39.9	55.1	18.3	39.0	14.9	34.6	18.0	34.9	2.23	34.6
TSP (annual, µg/m ³) ³	4.30	31.3	2.81	29.8	2.79	29.8	1.64	28.6	0.24	27.2
Dust (g/m ² /month) ³	0.48	1.18	0.32	1.02	0.27	0.97	0.18	0.88	0.03	0.73
Scenario 2: blasting										
PM ₁₀ (annual, µg/m ³)	3.32	16.8	1.89	15.4	1.68	15.2	1.09	14.6	0.16	13.7
PM ₁₀ (24 hour, µg/m ³)	40.2	55.4	18.3	39.0	14.9	34.6	18.0	34.9	2.23	34.6
TSP (annual, µg/m ³)	5.09	32.1	2.85	29.9	2.80	29.8	1.64	28.6	0.24	27.2
Dust (g/m ² /month)	0.58	1.28	0.32	1.02	0.27	0.97	0.18	0.88	0.03	0.73

Notes:

1. A = incremental, predicted increments expressed as ug/m³.
2. B = cumulative, calculated cumulative level expressed as g/m²/month.
3. Cumulative impacts presented (existing annual PM₁₀ = 13.5 ug/m³, existing annual TSP = 27 ug/m³ and existing daily TSP deposition = 0.7 g/m²/month).
4. Contemporaneous assessment of 24-hour PM₁₀ concentration impact presented in Attachment D – note that the maximum predicted increments do not necessarily correspond with the predicted maximum cumulative levels.
5. Impacts identified in Table 7-1 are expected to occur for less than 1% of the year.



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- ▲ Sensitive receptors
- 50 µg/m³ annual air quality goal

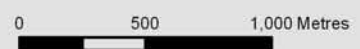
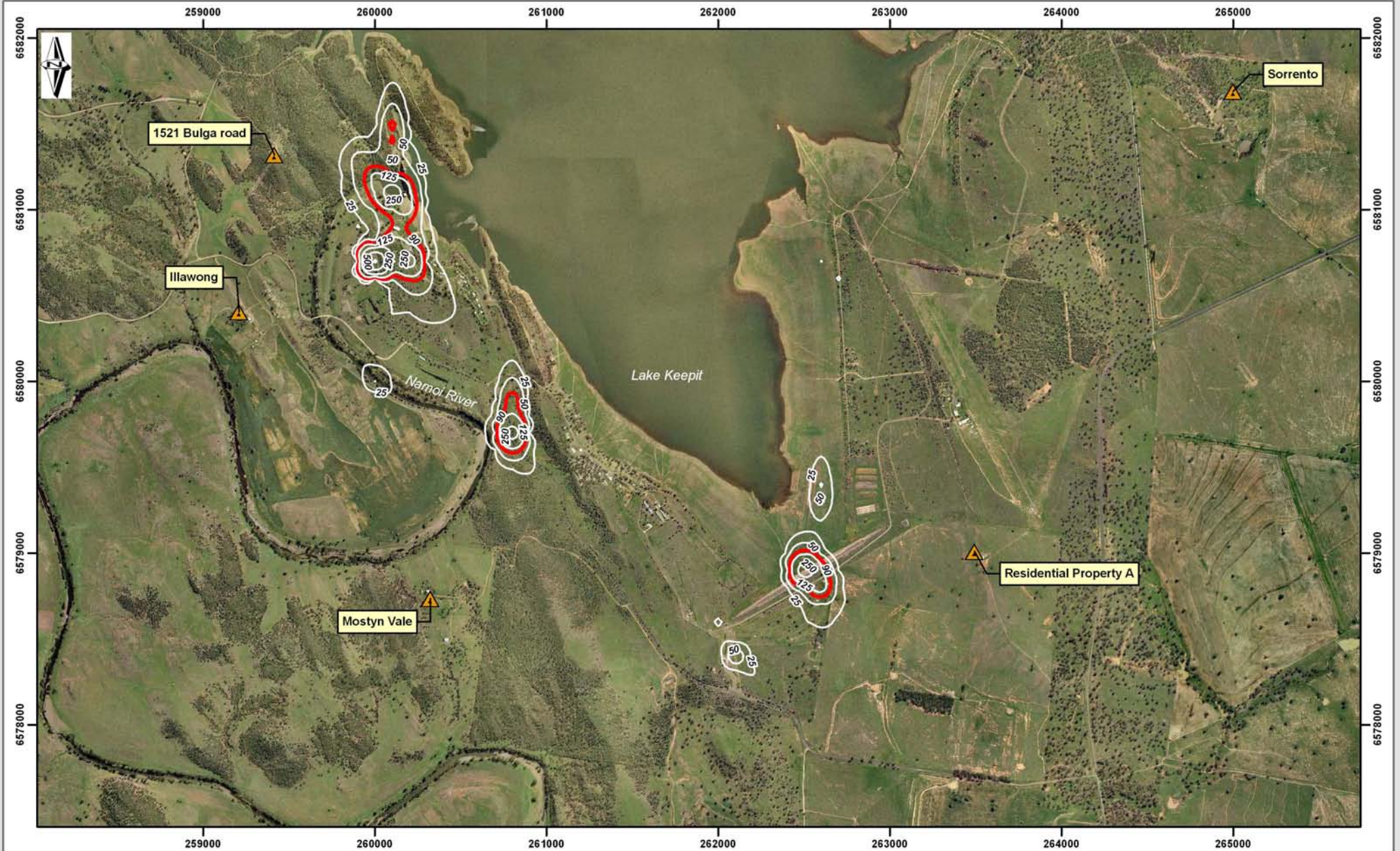


Figure 7-2: 4th highest incremental PM₁₀ impacts for Scenario 2

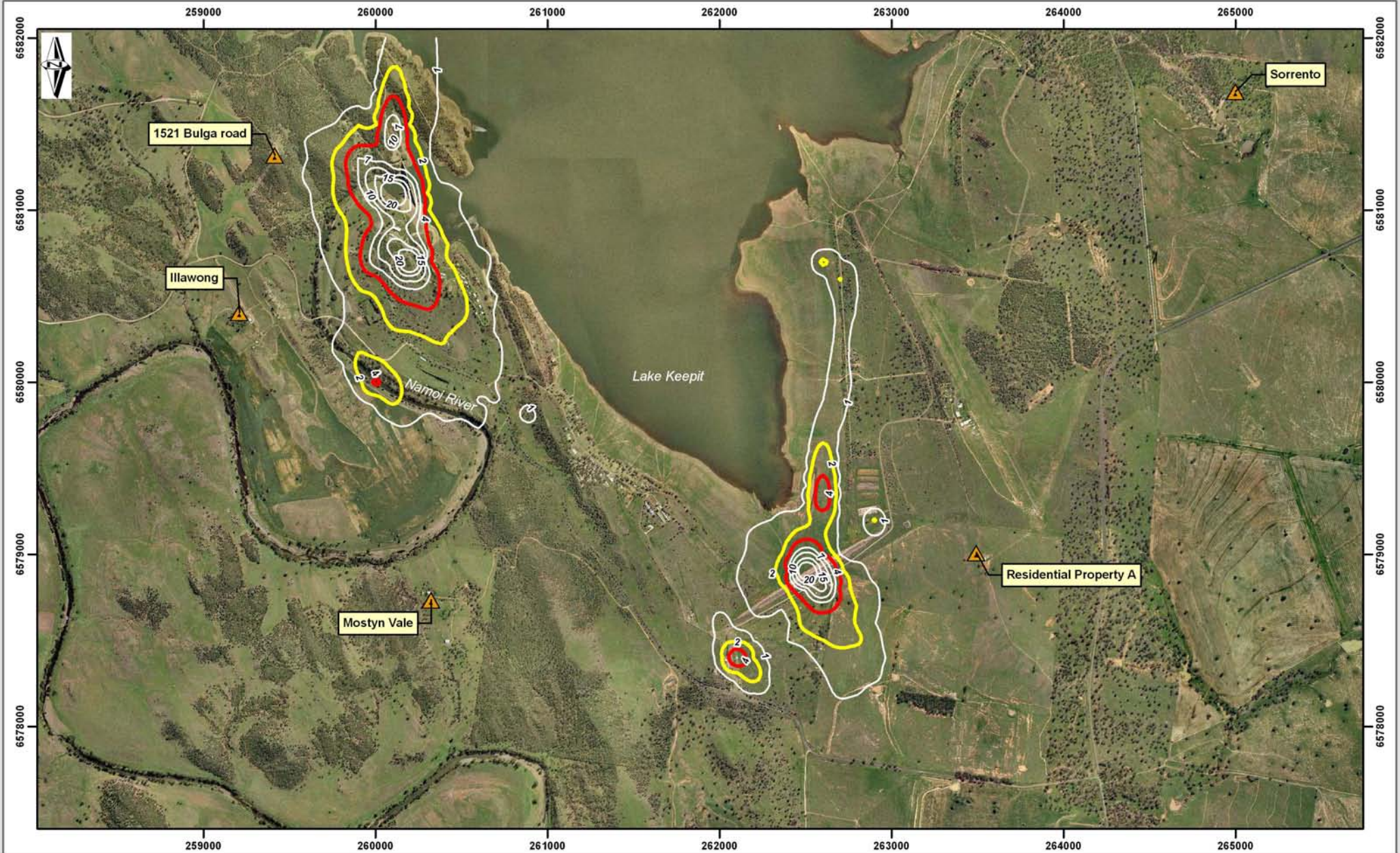


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

▲ Sensitive receptors
— 90µg/m³, TSP air quality goal

0 500 1,000 Metres

Figure 7-3: Incremental annual TSP impacts for Scenario 2



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-  Sensitive receptors
-  2 mg/ m² / day, incremental deposition air quality goal
-  4 mg/ m² / day, maximum deposition air quality goal

0 500 1,000 Metres

Figure 7-4: Incremental daily TSP deposition impacts for Scenario 2

7.3 Discussion of results

The result of the dispersion modelling is discussed briefly below. In summary, there are unlikely to be exceedances of the specified air quality standards, with the exception of one receiver for cumulative PM₁₀ 24-hour concentrations. In this case, the conditions giving rise to the exceedance are expected to occur for approximately less than 1% of the modelling year and therefore given the conservatism built in to other modelling elements, are unlikely to occur.

7.3.1 PM₁₀ (annual)

Compliance with the adopted annual PM₁₀ concentration goal of 30 µg/m³ was predicted for both scenarios considered at each receptor assessed. The highest cumulative concentration was predicted at 1521 Bulga Road (16.8 µg/m³) located approximately 1,000 metres west of the main dam wall during blasting activities.

Based on assessment of modelled levels, and consideration of adopted background values, no adverse annual incremental (construction activities only) and cumulative (construction activities plus existing background) PM₁₀ impacts are anticipated.

7.3.2 PM₁₀ (24-hour)

Compliance with the adopted 24-hour PM₁₀ DECC goal of 50 µg/m³ was predicted for all construction works where no blasting took place at each receptor, with the exception of cumulative impacts at 1521 Bulga Road (Scenario 1). The highest cumulative concentration of 55.1 µg/m³ was predicted at 1521 Bulga Road for during standard construction activities (Scenario 1).

With the exception of cumulative impacts at 1521 Bulga Road, compliance with the 24-hour PM₁₀ limit value was predicted during blasting episodes (Scenario 2). The highest cumulative concentration of 55.4 µg/m³ was predicted at 1521 Bulga Road. This occurred with a wind speed range of 0.7 - 5.6 m/s with more than half of the hourly data exhibiting Stability Class F conditions. Stability Class F represents stable conditions with light wind speeds (<1 m/s up to 3m/s) and less than 50% nighttime cloud cover. The second highest 24-hour PM₁₀ cumulative concentration of 45.0 µg/m³ was predicted to be below the air quality goal and represents an 18% reduction of the highest predicted cumulative concentration of 55.4 µg/m³. Therefore, concentrations exceeding the 24-hour PM₁₀ air quality goal were predicted to occur once over the entire year i.e. less than 1% of the year.

The similar 24-hour PM₁₀ results for both scenarios indicates that the blasting events are not predicted to significantly impact on standard construction activities at all modelled sensitive receptors.

Within the Gums and Lakeside caravan parks, 24-hour PM₁₀ levels would be expected at approximately 20 to 50 µg/m³ (cumulative) and adverse impacts are not expected.

7.3.3 TSP (annual)

Compliance with the adopted annual TSP concentration goal of 90 µg/m³ was predicted for both scenarios considered at each sensitive receptor assessed. No adverse annual incremental or cumulative TSP impacts are anticipated at any of these receptors.

7.3.4 Dust deposition (monthly)

Compliance with the adopted monthly deposition goal of the 2 g/m²/month (maximum increase in deposited dust) and the 4 g/m²/month (maximum total deposited dust) was predicted for both scenarios considered at each sensitive receptor assessed.

7.3.5 PM_{2.5} impacts

An outline of anticipated fine (PM_{2.5}) particulate matter impact, based on expected constituent size fractions and source apportionment was carried out. Combustion sources produce finer particles than emissions caused by mechanical abrasion.

Typically fugitive PM₁₀ dust emissions contain the following proportion of PM_{2.5} particulates:

- 20% from road and soil dust (Watson et al, 2000)
- 17% from construction sources (Watson et al, 2000)
- 12% from a typical extractive industry operation (NSW Minerals Council, 2000).

The ratios would be expected to change as the distance from the source to the measurement point increases. For the purposes of providing a qualitative statement of potential impact, a 15% proportion of PM_{2.5} to PM₁₀ emissions for the incremental air quality impacts from the Project construction works and 20% ratio of PM_{2.5} to PM₁₀ levels for existing ambient background levels were adopted.

Adopting a maximum 24-hour PM₁₀ incremental impact level of 39.9 µg/m³ (Table 7-1, Scenario 1: no blasting [1521 Bulga Road]) and a 24 hour background PM₁₀ level of 34.6 µg/m³ (Section 3.1), a 24-hour PM_{2.5} impact of 12.9 µg/m³ (PM₁₀ incremental of 15% plus a PM₁₀ background of 20%) has been conservatively calculated.

This level of cumulative 24-hour PM_{2.5} impact complies with the NEPM intervention level of 25 µg/m³.

Adopting a maximum annual PM₁₀ incremental impact level of 2.9 µg/m³ (Table 7-1, Scenario 1: no blasting [1521 Bulga Road]) and an annual background PM₁₀ level of 13.5 µg/m³ (Section 3.1), an annual PM_{2.5} impact of 3.1 µg/m³ (PM₁₀ incremental of 15% plus a PM₁₀ background of 20%) has been conservatively calculated.

This level of cumulative annual PM_{2.5} impact complies with the NEPM intervention level of 8 µg/m³.

7.4 Operational air quality impacts

No adverse impacts are expected during the operational stage.

8. Mitigation and management measures

Dust and vehicle emissions typically contribute the greatest proportion to potential air quality impacts. Dust suppression would be implemented in accordance with the Construction Environmental Management Plan (CEMP) to reduce impacts throughout the local air shed.

8.1 Blasting impact management

To minimise the level of potential impact during blasting events, the following measures should be incorporated into the CEMP:

- fine material arising from drilling would not be used for blast stemming
- nearest potentially affected receptors would be notified prior to each blast event
- PM₁₀ 24-hour concentration would be monitored (TEOM) at 1521 Bulga Road (refer below); the duration of monitoring would be outlined in the CEMP and should be periodically reviewed
- the horizontal blast area and quantity of charge used would be minimised, where possible
- smaller mass charges i.e. less than 1250 kg may be required to limit the potential for structural damage at the main dam wall. The limiting vibration criteria and relevant mass charges should be determined by an appropriately qualified person
- Meteorological monitoring should be conducted at the worksite for association with the monitoring results (refer below)

8.2 General dust and emission control measures

The implementation of effective mitigation and management practices would minimise the potential for adverse impact. The following mitigation measures and safeguards, which would be detailed in the project CEMP, would be implemented during the construction phase of the project:

- measures to minimise dust would be developed in consultation with/with agreement of relevant parties prior to commencement of construction
- a consultation plan with all potentially affected receivers would be put in place which would include discussion of the applied mitigation measures, monitoring and a complaints register for the duration of construction
- dampening with water would be applied to internal unsealed access roadways and work areas (application rates would be determined based on atmospheric conditions and the intensity of construction operations). At the joining of unsealed and sealed roads, the area would be swept routinely to remove deposited material that could generate dust. The application of a chemical stabilising agent to unsealed haul roads and stockpile areas may be required where water application rates prove insufficient or there is a limited supply of water. To reduce potable water consumption, recycled water should be used where practicable
- site rehabilitation would be undertaken as soon as practicable

- disturbed areas would be stabilised immediately to prevent or minimise wind-blown dust
- on-site speed limits would be enforced for all construction vehicles at the site
- vehicle and machinery movements during construction would be restricted to designated areas
- rumble grids and/or wheel wash facilities may be provided at the site exit onto sealed roads to remove mud and dust from vehicles. Alternatively, roads would be swept to remove dirt and mud
- vehicles transporting spoil and materials with the potential to generate dust to and from the site would be covered immediately after loading to prevent wind blown dust emissions and spillages; tailgates of road transport trucks would be securely fixed prior to loading and immediately after unloading
- construction plant and equipment would be well maintained and regularly serviced so that vehicular emissions remain within relevant air quality guidelines and standards
- all site vehicles and machinery would be switched off or throttled down to a minimum when not in use
- excess or unnecessary revving of engines should not be permitted
- all chemicals and fuels should be stored in sealed containers or sealed buildings
- unloading of diesel should be vented via return hoses that recirculate vapours from delivery to receiver.

8.3 Particulate matter monitoring

A monitoring program for dust deposition levels would be undertaken at specific areas (with reference to AS 3580.10.1-1991 *Particulates – deposited matter – gravimetric method*), and 24-hour concentration levels (with reference to AS 3580.9.8-2001: *Method for sampling and analysis of ambient air – Determination of suspended particulate matter – PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser, Homebush, NSW*). Meteorological conditions during dust monitoring would be measured to allow correlation of all reported results.

The requirements for particulate matter monitoring would be outlined within the site specific CEMP prepared for the Project.

Pre-construction baseline levels should be measured to establish the existing ambient air profiles and evaluate the effectiveness of the site-specific ameliorative measures.

Where unacceptable levels of air quality are measured, on-site activities may need to be reviewed, with additional control measures and/or varied site operations being required.

A meteorological station would be installed at a representative location during the construction phase period to monitor parameters such as wind speed, wind direction, and temperature as a minimum.

8.4 Operational phase

As no adverse air quality impacts are expected during the operational phase of the Project, mitigation measures are not considered necessary.

9. Conclusion

The modelling results predicted compliance with annual PM₁₀, TSP, PM_{2.5} and monthly dust deposition goals at all of the sensitive receptors included in the assessment.

Incremental 24-hour PM₁₀ concentrations were below the 50µg/m³ air quality goal. However cumulative impacts were predicted to exceed this goal at 1521 Bulga Road by approximately 10% and for less than 1% of the year. State Water has contacted this landowner and has provided a draft copy of this report for comment. It is understood that this landowner does not live full-time at this location. Further and ongoing consultation with potentially affected landowners and monitoring of actual impacts would be conducted during construction.

Within the Gums and Lakeside caravan parks, 24-hour PM₁₀ impacts would be expected at an approximate cumulative level of 20 to 50 µg/m³, and in general, adverse impacts are not expected at these receptors.

The quantity of particulate matter injected into the atmosphere is a function of blast patterns, horizontal area, and quantity of charge. Impacts are also dependent on meteorological conditions and other construction practices. To minimise potential impacts, mitigation measures have been prescribed and would be implemented.

Monitoring of dust levels at the nearest sensitive receptor locations would assist with assessing the impact of construction works.

10. References

Department of Environment and Climate Change (NSW), 2007, *Approved methods for the Sampling and Analysis of Air Pollutants in New South Wales*

Department of Environment and Conservation (NSW) 2005, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*

National Environment Protection Council 1998, *National Environmental Protection (Ambient Air Quality) Measure*

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National Environment Protection Authority Council 1998, *National Environmental Protection (Ambient Air Quality) Measure (1998)*

NSW Minerals Council 2000, *Particulate Matter and Mining Interim Report*

United States Environment Protection Authority 1995, *AP-42 Compilation of Air Pollutant Emission Factors*

Watson, J. Chow, J. Pace, T. 2004, *Air quality engineering manual*

11. Limitations

Scope of services and reliance of data

This air impact study ('the study') has been prepared in accordance with the scope of work/services set out in the contract, or as otherwise agreed, between Parsons Brinckerhoff (PB) and the Client. In preparing this air impact study, PB has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the air impact study ('the data'). Except as otherwise stated in the air impact study, PB has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this air impact study ('conclusions') are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. PB will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to PB.

Study for benefit of client

This air impact study has been prepared for the exclusive benefit of the Client and no other party. PB assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt within this air impact study, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in this air impact study (including without limitation matters arising from any negligent act or omission of PB or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in this air impact study). Other parties should not rely upon the air impact study or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

Other limitations

To the best of PB's knowledge, the project presented and the facts and matters described in this air impact study reasonably represent the Client's intentions at the time of printing of the air impact study. However, the passage of time, the manifestation of latent conditions or the impact of future events (including a change in applicable law) may have resulted in a variation of the project and of its possible air impact. PB will not be liable to update or revise the air impact study to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the air impact study.

Attachment A

Wind frequency data (Tamworth
2001)

MONTHS: All
HOURS : All
OPTION: Frequency

ALL PASQUILL STABILITY CLASSES

Wind Speed Class (m/s)

WIND SECTOR	0.50 TO 1.50	1.50 TO 3.00	3.00 TO 4.50	4.50 TO 6.00	6.00 TO 7.50	7.50 TO 9.00	9.00 TO 10.50	GREATER THAN 10.50	TOTAL
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NNE	0.000921	0.012431	0.006331	0.001727	0.000806	0.000230	0.000115	0.000230	0.022790
NE	0.001381	0.009899	0.004834	0.000115	0.000576	0.000000	0.000576	0.000115	0.017495
ENE	0.000460	0.008633	0.005180	0.002878	0.000345	0.000345	0.000115	0.000000	0.017956
E	0.001151	0.013812	0.008287	0.005755	0.001842	0.001727	0.000691	0.000691	0.033955
ESE	0.001151	0.015424	0.016920	0.011165	0.005525	0.001957	0.001496	0.001036	0.054673
SE	0.001957	0.022330	0.043278	0.029236	0.016575	0.008402	0.004144	0.002072	0.127993
SSE	0.003108	0.029811	0.063306	0.059968	0.014503	0.003798	0.002072	0.001266	0.177831
S	0.001496	0.021869	0.029351	0.024171	0.008402	0.004489	0.000921	0.000460	0.091160
SSW	0.000691	0.011971	0.016690	0.005640	0.002072	0.001611	0.000576	0.000000	0.039250
SW	0.000921	0.010474	0.016344	0.004834	0.001611	0.000345	0.000230	0.000000	0.034761
WSW	0.001036	0.009093	0.017035	0.008633	0.003453	0.001727	0.000806	0.000115	0.041897
W	0.000921	0.008517	0.015884	0.012431	0.007021	0.004489	0.002072	0.001036	0.052371
WNW	0.001266	0.006791	0.015308	0.011280	0.007136	0.004374	0.004834	0.002302	0.053292
NW	0.000691	0.010935	0.018877	0.014273	0.007482	0.006906	0.003453	0.001957	0.064572
NNW	0.001036	0.015769	0.022790	0.011740	0.005295	0.003453	0.000691	0.001151	0.061924
N	0.030272	0.020028	0.023366	0.011280	0.007251	0.005525	0.003798	0.002762	0.104282

CALM 0.003798

TOTAL 0.048458 0.227785 0.323780 0.215124 0.089894 0.049378 0.026588 0.015193 1.000000

MEAN WIND SPEED (m/s) = 4.42
NUMBER OF OBSERVATIONS = 8688

FREQUENCY OF OCCURENCE OF STABILITY CLASSES

A : 1.3%
B : 10.0%
C : 13.1%
D : 47.0%
E : 14.2%
F : 14.5%

PASQUILL STABILITY CLASS 'A'

Wind Speed Class (m/s)

WIND SECTOR	0.50	1.50	3.00	4.50	6.00	7.50	9.00	GREATER	TOTAL
	TO 1.50	TO 3.00	TO 4.50	TO 6.00	TO 7.50	TO 9.00	TO 10.50	THAN 10.50	

NNE	0.000000	0.000921	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000921
NE	0.000115	0.001266	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001381
ENE	0.000000	0.001036	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001036
E	0.000000	0.000806	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000806
ESE	0.000000	0.001381	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001381
SE	0.000000	0.001151	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001151
SSE	0.000000	0.000115	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000115
S	0.000000	0.000345	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000345
SSW	0.000000	0.000115	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000115
SW	0.000000	0.000576	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000576
WSW	0.000000	0.000345	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000345
W	0.000000	0.000691	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000691
WNW	0.000000	0.000230	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000230
NW	0.000000	0.000460	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000460
NNW	0.000000	0.001151	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001151
N	0.000115	0.001957	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.002072

CALM 0.000115

TOTAL 0.000230 0.012546 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.012891

MEAN WIND SPEED (m/s) = 2.42

NUMBER OF OBSERVATIONS = 112

PASQUILL STABILITY CLASS 'B'

Wind Speed Class (m/s)

WIND SECTOR	0.50	1.50	3.00	4.50	6.00	7.50	9.00	GREATER	TOTAL
	TO 1.50	TO 3.00	TO 4.50	TO 6.00	TO 7.50	TO 9.00	TO 10.50	THAN 10.50	

NNE	0.000460	0.002417	0.001151	0.000115	0.000000	0.000000	0.000000	0.000000	0.004144
NE	0.000230	0.001381	0.001266	0.000000	0.000000	0.000000	0.000000	0.000000	0.002878
ENE	0.000115	0.002187	0.001036	0.000115	0.000000	0.000000	0.000000	0.000000	0.003453
E	0.000460	0.002993	0.000921	0.000115	0.000000	0.000000	0.000000	0.000000	0.004489
ESE	0.000230	0.005064	0.002647	0.000230	0.000000	0.000000	0.000000	0.000000	0.008172
SE	0.000230	0.003223	0.004144	0.000806	0.000000	0.000000	0.000000	0.000000	0.008402
SSE	0.000460	0.002302	0.003913	0.000115	0.000000	0.000000	0.000000	0.000000	0.006791
S	0.000576	0.001957	0.003338	0.000345	0.000000	0.000000	0.000000	0.000000	0.006215
SSW	0.000345	0.001381	0.003223	0.000345	0.000000	0.000000	0.000000	0.000000	0.005295
SW	0.000115	0.001266	0.003223	0.000115	0.000000	0.000000	0.000000	0.000000	0.004719
WSW	0.000115	0.000806	0.002993	0.000230	0.000000	0.000000	0.000000	0.000000	0.004144
W	0.000000	0.000460	0.003453	0.000576	0.000000	0.000000	0.000000	0.000000	0.004489
WNW	0.000000	0.001151	0.004144	0.000806	0.000000	0.000000	0.000000	0.000000	0.006100
NW	0.000115	0.002187	0.006446	0.000691	0.000000	0.000000	0.000000	0.000000	0.009438
NNW	0.000115	0.002532	0.005755	0.000576	0.000000	0.000000	0.000000	0.000000	0.008978
N	0.002187	0.003453	0.006215	0.000345	0.000000	0.000000	0.000000	0.000000	0.012201

CALM 0.000230

TOTAL 0.005755 0.034761 0.053867 0.005525 0.000000 0.000000 0.000000 0.000000 0.000000 0.100138

MEAN WIND SPEED (m/s) = 3.15

NUMBER OF OBSERVATIONS = 870

PASQUILL STABILITY CLASS 'C'

Wind Speed Class (m/s)

WIND SECTOR	0.50	1.50	3.00	4.50	6.00	7.50	9.00	GREATER	TOTAL
	TO 1.50	TO 3.00	TO 4.50	TO 6.00	TO 7.50	TO 9.00	TO 10.50	THAN 10.50	
NNE	0.000000	0.001266	0.001496	0.000460	0.000000	0.000000	0.000000	0.000000	0.003223
NE	0.000000	0.000921	0.000806	0.000000	0.000115	0.000000	0.000000	0.000000	0.001842
ENE	0.000000	0.000345	0.000115	0.000806	0.000000	0.000000	0.000000	0.000000	0.001266
E	0.000115	0.001727	0.000460	0.000921	0.000115	0.000115	0.000000	0.000000	0.003453
ESE	0.000000	0.001957	0.002878	0.002187	0.000230	0.000230	0.000000	0.000000	0.007482
SE	0.000345	0.003453	0.007597	0.005180	0.000921	0.000000	0.000000	0.000230	0.017726
SSE	0.000230	0.004144	0.008287	0.004144	0.000000	0.000115	0.000000	0.000000	0.016920
S	0.000115	0.001381	0.004489	0.001496	0.000115	0.000000	0.000115	0.000000	0.007712
SSW	0.000115	0.001266	0.001957	0.001036	0.000000	0.000000	0.000000	0.000000	0.004374
SW	0.000115	0.001151	0.002302	0.001496	0.000000	0.000000	0.000000	0.000000	0.005064
WSW	0.000000	0.000921	0.003568	0.001727	0.000345	0.000115	0.000000	0.000000	0.006676
W	0.000000	0.000576	0.003683	0.002878	0.001036	0.000576	0.000345	0.000000	0.009093
WNW	0.000115	0.000691	0.003223	0.004949	0.001151	0.000460	0.000345	0.000115	0.011050
NW	0.000115	0.000691	0.003108	0.005064	0.001496	0.000921	0.000576	0.000230	0.012201
NNW	0.000000	0.001496	0.003338	0.003683	0.000230	0.000460	0.000000	0.000000	0.009208
N	0.003568	0.001266	0.003913	0.003453	0.000691	0.000115	0.000345	0.000115	0.013467
CALM									0.000230
TOTAL	0.004834	0.023250	0.051220	0.039480	0.006446	0.003108	0.001727	0.000691	0.130985

MEAN WIND SPEED (m/s) = 4.28
NUMBER OF OBSERVATIONS = 1138

PASQUILL STABILITY CLASS 'D'

Wind Speed Class (m/s)

WIND SECTOR	0.50	1.50	3.00	4.50	6.00	7.50	9.00	GREATER	TOTAL
	TO 1.50	TO 3.00	TO 4.50	TO 6.00	TO 7.50	TO 9.00	TO 10.50	THAN 10.50	
NNE	0.000115	0.002187	0.001611	0.001036	0.000806	0.000230	0.000115	0.000230	0.006331
NE	0.000345	0.002072	0.001727	0.000115	0.000460	0.000000	0.000576	0.000115	0.005410
ENE	0.000000	0.000806	0.002647	0.001611	0.000345	0.000345	0.000115	0.000000	0.005870
E	0.000115	0.001957	0.002878	0.003798	0.001727	0.001611	0.000691	0.000691	0.013467
ESE	0.000115	0.001381	0.004719	0.006791	0.005295	0.001727	0.001496	0.001036	0.022560
SE	0.000230	0.004259	0.014388	0.016459	0.015654	0.008402	0.004144	0.001842	0.065378
SSE	0.000460	0.008057	0.026013	0.037638	0.014503	0.003683	0.002072	0.001266	0.093692
S	0.000230	0.007021	0.010014	0.017495	0.008287	0.004489	0.000806	0.000460	0.048803
SSW	0.000115	0.003108	0.006561	0.004029	0.002072	0.001611	0.000576	0.000000	0.018071
SW	0.000345	0.003108	0.005295	0.002647	0.001611	0.000345	0.000230	0.000000	0.013582
WSW	0.000230	0.001381	0.005064	0.004949	0.003108	0.001611	0.000806	0.000115	0.017265
W	0.000345	0.001496	0.004949	0.007366	0.005985	0.003913	0.001727	0.001036	0.026819
WNW	0.000345	0.001266	0.004949	0.005180	0.005985	0.003913	0.004489	0.002187	0.028315
NW	0.000115	0.001842	0.006906	0.007712	0.005985	0.005985	0.002878	0.001727	0.033149
NNW	0.000345	0.003683	0.007827	0.006446	0.005064	0.002993	0.000691	0.001151	0.028200
N	0.004834	0.004834	0.008172	0.006100	0.006561	0.005410	0.003453	0.002647	0.042012
CALM									0.000691
TOTAL	0.008287	0.048458	0.113720	0.129374	0.083448	0.046271	0.024862	0.014503	0.469613

MEAN WIND SPEED (m/s) = 5.58
NUMBER OF OBSERVATIONS = 4080

PASQUILL STABILITY CLASS 'E'

Wind Speed Class (m/s)

WIND SECTOR	0.50	1.50	3.00	4.50	6.00	7.50	9.00	GREATER	TOTAL
	TO 1.50	TO 3.00	TO 4.50	TO 6.00	TO 7.50	TO 9.00	TO 10.50	THAN 10.50	
NNE	0.000000	0.001496	0.001381	0.000115	0.000000	0.000000	0.000000	0.000000	0.002993
NE	0.000000	0.001151	0.000576	0.000000	0.000000	0.000000	0.000000	0.000000	0.001727
ENE	0.000000	0.000921	0.001036	0.000345	0.000000	0.000000	0.000000	0.000000	0.002302
E	0.000000	0.000460	0.003108	0.000921	0.000000	0.000000	0.000000	0.000000	0.004489
ESE	0.000000	0.000806	0.004719	0.001957	0.000000	0.000000	0.000000	0.000000	0.007482
SE	0.000000	0.001496	0.013237	0.006791	0.000000	0.000000	0.000000	0.000000	0.021524
SSE	0.000000	0.002993	0.020718	0.018071	0.000000	0.000000	0.000000	0.000000	0.041782
S	0.000000	0.001611	0.009093	0.004834	0.000000	0.000000	0.000000	0.000000	0.015539
SSW	0.000000	0.001496	0.004029	0.000230	0.000000	0.000000	0.000000	0.000000	0.005755
SW	0.000000	0.000691	0.005180	0.000576	0.000000	0.000000	0.000000	0.000000	0.006446
WSW	0.000000	0.000806	0.004489	0.001727	0.000000	0.000000	0.000000	0.000000	0.007021
W	0.000000	0.000691	0.002762	0.001611	0.000000	0.000000	0.000000	0.000000	0.005064
WNW	0.000000	0.000576	0.002532	0.000345	0.000000	0.000000	0.000000	0.000000	0.003453
NW	0.000000	0.001036	0.001842	0.000806	0.000000	0.000000	0.000000	0.000000	0.003683
NNW	0.000000	0.000460	0.004489	0.001036	0.000000	0.000000	0.000000	0.000000	0.005985
N	0.000000	0.001842	0.003338	0.001381	0.000000	0.000000	0.000000	0.000000	0.006561
CALM									0.000000
TOTAL	0.000000	0.018531	0.082528	0.040746	0.000000	0.000000	0.000000	0.000000	0.141805

MEAN WIND SPEED (m/s) = 4.01

NUMBER OF OBSERVATIONS = 1232

PASQUILL STABILITY CLASS 'F'

Wind Speed Class (m/s)

WIND SECTOR	0.50	1.50	3.00	4.50	6.00	7.50	9.00	GREATER	TOTAL
	TO 1.50	TO 3.00	TO 4.50	TO 6.00	TO 7.50	TO 9.00	TO 10.50	THAN 10.50	
NNE	0.000345	0.004144	0.000691	0.000000	0.000000	0.000000	0.000000	0.000000	0.005180
NE	0.000691	0.003108	0.000460	0.000000	0.000000	0.000000	0.000000	0.000000	0.004259
ENE	0.000345	0.003338	0.000345	0.000000	0.000000	0.000000	0.000000	0.000000	0.004029
E	0.000460	0.005870	0.000921	0.000000	0.000000	0.000000	0.000000	0.000000	0.007251
ESE	0.000806	0.004834	0.001957	0.000000	0.000000	0.000000	0.000000	0.000000	0.007597
SE	0.001151	0.008748	0.003913	0.000000	0.000000	0.000000	0.000000	0.000000	0.013812
SSE	0.001957	0.012201	0.004374	0.000000	0.000000	0.000000	0.000000	0.000000	0.018531
S	0.000576	0.009553	0.002417	0.000000	0.000000	0.000000	0.000000	0.000000	0.012546
SSW	0.000115	0.004604	0.000921	0.000000	0.000000	0.000000	0.000000	0.000000	0.005640
SW	0.000345	0.003683	0.000345	0.000000	0.000000	0.000000	0.000000	0.000000	0.004374
WSW	0.000691	0.004834	0.000921	0.000000	0.000000	0.000000	0.000000	0.000000	0.006446
W	0.000576	0.004604	0.001036	0.000000	0.000000	0.000000	0.000000	0.000000	0.006215
WNW	0.000806	0.002878	0.000460	0.000000	0.000000	0.000000	0.000000	0.000000	0.004144
NW	0.000345	0.004719	0.000576	0.000000	0.000000	0.000000	0.000000	0.000000	0.005640
NNW	0.000576	0.006446	0.001381	0.000000	0.000000	0.000000	0.000000	0.000000	0.008402
N	0.019567	0.006676	0.001727	0.000000	0.000000	0.000000	0.000000	0.000000	0.027970
CALM									0.002532
TOTAL	0.029351	0.090239	0.022445	0.000000	0.000000	0.000000	0.000000	0.000000	0.144567

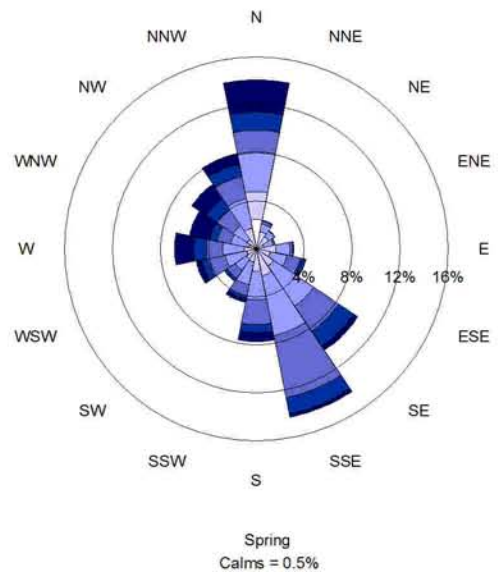
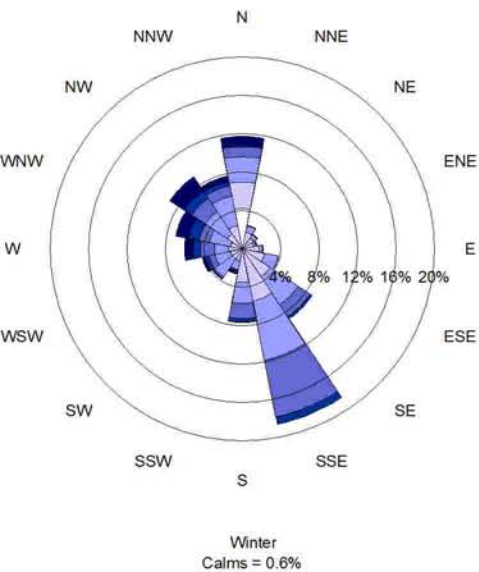
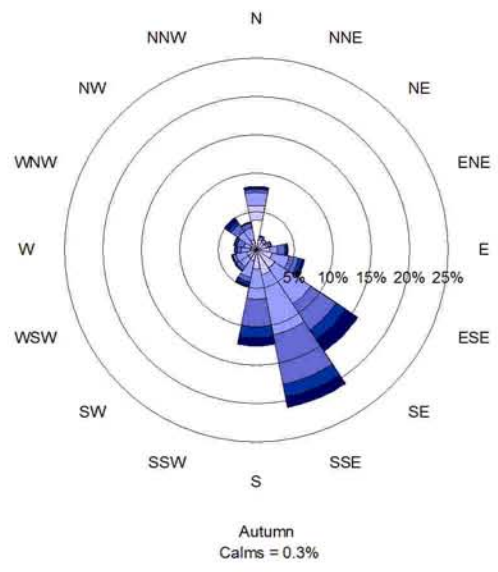
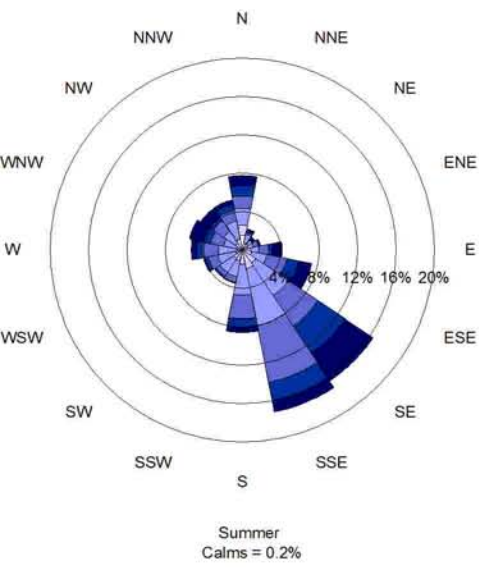
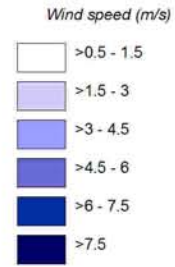
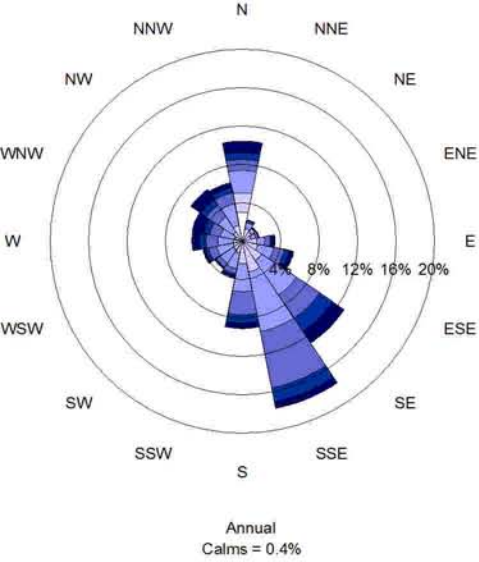
MEAN WIND SPEED (m/s) = 2.24

NUMBER OF OBSERVATIONS = 1256

Attachment B

Wind-rose plots (Tamworth 2001)

Annual and Seasonal Windroses for Tamworth Airport (BoM, 2001)



Attachment C

Site-specific particulate matter
emission calculations

Dust Emissions Source

Dust Emissions Source	Emission Factor		Units	Notes	Type of Source	
	TSP	PM ₁₀				
Wind Erosion						
Paved Roads	49.3	9.4	g/VKT		Area (g/m ² /s)	*
Internal Unpaved Haul Roads	105.6	33.6	g/VKT		Area (g/m ² /s)	1
(60 rain days considered and 80 percent reduction due to road watering assumed)						2
Wind Erosion & Maintenance of stockpiles	1.61	0.66	kg/hectare/hr	PM ₁₀ 60% of TSP	Area (g/m ² /s)	3
(emissions of active stockpile with reference made to average wind speeds and 80 percent reduction due to watering assumed)						4
Wind erosion of exposed surfaces	3839	1920	g/m ²		Area (g/m ² /s)	5
Material Extraction						
Blasting	3.233	1.681	kg/blast	600m ² horizontal blast area	Area (g/m ² /s)	#
Drilling	0.59	0.354	kg/hole	PM ₁₀ 60% of TSP	Area (g/m ² /s)	
Bulldozer /Front End Loader Handling Material	26.98	20.24	kg/hr		Area (g/m ² /s)	
Bulldozer/Front End Loader Overburden	2.26	1.698	kg/hr		Area (g/m ² /s)	
Topsail removal by scraper	0.029	0.0174	kg/Mg		Point (g/s)	
Material Handling Works						
Grader	1.075	0.65	g/VKT		Area (g/m ² /s)	
Handling, transfer & storage of aggregate	0.0011	0.000526	g/Kg		Area (g/m ² /s)	
Truck with aggregate material (loading/dumping)	0.1099	0.082	g/Kg		Area (g/m ² /s)	
Compactor	2.26	1.698	kg/hr		Area (g/m ² /s)	
Preparation Plant						
Primary crusher	0.00035	0.00021	g/kg	AP-42, 11.19.2-1, 1/95	Point (g/s)	
Screening operations (controlled)	0.0011	0.00037	kg/Mg	11.19.2, 8/04	Point (g/s)	
Conveyor Transfer Point	0.00007	0.000023	g/kg	11.19.2, 8/04	Point (g/s)	
Concrete Batching						
Truck delivery of agg. to ground storage	1.1	0.52	kg/day		Area (g/m ² /s)	
FEL delivery of aggr top ground storage	1.1	0.52	kg/day		Area (g/m ² /s)	
Aggregate transfer to conveyor	1.1	0.52	kg/day		Area (g/m ² /s)	
Conveyor transfer of aggr. to elevated storage	0.55	0.26	kg/day		Volume (g/sec)	
Truck delivery of fine agg. to ground storage	0.179	0.085	kg/day		Area (g/m ² /s)	
FEL delivery of fine aggr to ground storage	0.179	0.085	kg/day		Area (g/m ² /s)	
Fine aggr. Transfer to conveyor	0.179	0.085	kg/day		Area (g/m ² /s)	
Conveyor transfer of fine aggr. to elevated storage	0.089	0.042	kg/day		Volume (g/sec)	
Cement unloading to elevated storage silo	0.082	0.052	kg/day		Point (g/s)	
weigh hopper loading	0.003	0.002	kg/day		Area (g/m ² /s)	
Truck loading (central mix)	0.372	0.09	kg/day		Area (g/m ² /s)	

Dust Emission Source	# sources	Emission Factor			avg speed	duration	dist trvl	m ²	material handled	correction	Emission Rate				TSP (Kg/day)	PM ₁₀ (Kg/day)	TSP (Kg/yr)	PM ₁₀ (Kg/yr)		
		TSP	PM ₁₀	Units							TSP	PM ₁₀	Units	Notes						
Wind Erosion																				
Paved Roads	20	49.3	9.4	g/VKT	40	11	39600	120	60000	20	2.4899E-06	4.74747E-07	Area (g/m2/s)	3km	approx 20m wide	20 x 20 tonne trucks assumption	118.32	22.56	43186.8	8234.4
Internal Unpaved Haul Roads	10	105.6	33.6	g/VKT	40	11	39600	12	10000	6	0.0000032	1.01818E-06	Area (g/m2/s)	1km	approx 10m wide	6 x 20 tonne trucks assumption	12.67	4.032	4625.28	1471.68
Wind Erosion & Maintenance of stockpiles	2	1.61	0.66	kg/hectare/hr	24	24	86400	500		1000	3.72685E-05	1.52778E-05	Area (g/m2/s)		area of stockpile 50m x 10m assumed		3.22	1.32	1175.3	481.8
Wind erosion of exposed surfaces	6	3839	1920	g/m2	24	24	86400	170000		1000	2.6137E-07	1.30719E-07	Area (g/m2/s)		17000m2 in total		23.034	11.52	8407.41	4204.8
Material Extraction																				
Blasting (single blast events)	1	3.233	1.681	kg/blast		0.15	540	2000		1000	0.002993519	0.001556481	Area (g/m2/s)				3.2	1.681	1180.045	613.565
Drilling	2	0.59	0.354	kg/hole			86400	100		1000	6.8287E-05	4.09722E-05	Area (g/m2/s)				1.18	0.708	430.7	258.42
Bulldozer /Front End Loader Handling Material	2	26.98	20.24	kg/hr		11	39600	50		1000	0.013626263	0.010222222	Area (g/m2/s)				53.96	40.48	19695.4	14775.2
Bulldozer/Front End Loader Overburden	2	2.26	1.698	kg/hr		11	39600	50		1000	0.001141414	0.000857576	Area (g/m2/s)				4.52	3.396	1649.8	1239.54
Topsail removal by scraper	2	0.029	0.0174	g/Kg		11	39600		500	1000	0.366161616	0.21969697	Point (g/s)		500 tonnes per day assumption		29	17.4	10585	6351
Material Handling Works																				
Grader	2	1.075	0.65	g/VKT		10	11	39600	120	2500	1.30303E-06	7.87879E-07	Area (g/m2/s)		Assume 25m x 100m		0.3	0.156	94.17	56.94
Handling, transfer & storage of aggregate	3	0.0011	0.000526	g/Kg		11	39600	25	1000	1000	0.001111111	0.00120753	Area (g/m2/s)				3.3	3.59	1204.5	1309.02
Truck with aggregate material (loading/dumping)	3	0.1099	0.082	g/Kg		11	39600	25	1000	1000	0.111010101	0.082828283	Area (g/m2/s)				329.7	246	120340.5	89790
Compactor	2	2.26	1.698	kg/hr		11	39600	50		1000	0.001141414	0.000857576	Area (g/m2/s)				4.5	3.396	1649.8	1239.54
Preparation Plant																				
Primary crusher	1	0.00035	0.00021	g/kg		11	39600	20	1000	1000	0.008838384	0.00530303	Point (g/s)		1000 tonnes per day assumed		0.35	0.21	127.75	76.65
Screening operations (controlled)	2	0.0011	0.00037	g/Kg		11	39600		1000	1000	0.027777778	0.009343434	Point (g/s)		1000 tonnes per day assumed		2.2	0.74	803	270.1
Conveyor Transfer Point	2	0.00007	0.000023	g/kg		11	39600		1000	1000	0.001767677	0.000580808	Point (g/s)				0.14	0.046	51.1	16.79
Concrete Batching																				
Truck delivery of agg. to ground storage	1	1.1	0.52	kg/day		11	39600	25	600	1000	0.001111111	0.000525253	Area (g/m2/s)		Storage area 5m x 5m		1.1	0.52	401.5	189.8
FEL delivery of aggr to ground storage	1	1.1	0.52	kg/day		11	39600	25	600	1000	0.001111111	0.000525253	Area (g/m2/s)		Storage area 5m x 5m		1.1	0.52	401.5	189.8
Aggregate transfer to conveyor	1	1.1	0.52	kg/day		11	39600	25	600	1000	0.001111111	0.000525253	Area (g/m2/s)		Storage area 5m x 5m		1.1	0.52	401.5	189.8
Conveyor transfer of aggr. to elevated storage	1	0.55	0.26	kg/day		11	39600	10	600	1000	0.001388889	0.000333339	Area (g/m2/sec)		Conveyor: 1m x 10m		0.6	0.156	200.75	56.94
Truck delivery of fine agg. to ground storage	1	0.179	0.085	kg/day		11	39600	9	325	1000	0.000502245	0.000238496	Area (g/m2/s)		Storage area 3m x 3m		0.2	0.085	65.335	31.025
FEL delivery of fine aggr to ground storage	1	0.179	0.085	kg/day		11	39600	9	325	1000	0.000502245	0.000238496	Area (g/m2/s)		Storage area 3m x 3m		0.2	0.085	65.335	31.025
Fine aggr. Transfer to conveyor	1	0.179	0.085	kg/day		11	39600	9	325	1000	0.000502245	0.000238496	Area (g/m2/s)		Storage area 3m x 3m		0.2	0.085	65.335	31.025
Conveyor transfer of fine aggr. to elevated storage	1	0.089	0.042	kg/day		11	39600	10	325	1000	0.000224747	0.000106061	AREA (g/m2/sec)		Conveyor: 1m x 10m		0.1	0.042	32.485	15.33
Cement unloading to elevated storage silo	1	0.082	0.052	kg/day		11	39600	0.03	230	1000	0.002070707	0.001313131	Point (g/s)		0.2m outlet (0.1mx0.1mx3.14)		0.082	0.05	29.93	18.98
weigh hopper loading	1	0.003	0.002	kg/day		11	39600	1	1150	1000	7.57576E-05	5.06051E-05	Area (g/m2/s)		Area of hopper 1m x 1m		0.0	0.002	1.095	0.73
Truck loading (central mix)	1	0.372	0.09	kg/day		11	39600	1	230	1000	0.009393939	0.002727272	Area (g/m2/s)		Area of truck opening 1m x 1m		0.4	0.09	135.78	32.85
Σ															594.5	359.4	217007.1	131176.8		

Attachment D

Contemporaneous 24-hour PM₁₀
impacts

Date	Incremental 24-Hour PM ₁₀ Data					Adopted Background 24-Hour PM ₁₀ Data	Contemporaneous 24-Hour PM ₁₀ Data				
	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Tamworth 2001	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5
1/01/2001	0.05714	0.75652	0.00048	1.12293	0.16928	8.66	8.71714	9.41652	8.66048	9.78293	8.82928
2/01/2001	3.03767	0.01033	0	4.82298	0.04036	9.28	12.31767	9.29033	9.28	14.10298	9.32036
3/01/2001	0.46353	2.27578	0.00268	3.08944	0.22553	13.87	14.33353	16.14578	13.87268	16.95944	14.09553
4/01/2001	1.46795	0.34785	0.00003	1.60528	0.11287	16.6	18.06795	16.94785	16.60003	18.20528	16.71287
5/01/2001	0.48556	0.2687	0.09565	1.38551	1.03638	17.57	18.05556	17.8387	17.66565	18.95551	18.60638
6/01/2001	2.53777	0.24312	0.13291	1.38038	1.80911	15.45	17.98777	15.69312	15.58291	16.83038	17.25911
7/01/2001	0	0.01083	0.01187	0.65386	0.77691		0	0.01083	0.01187	0.65386	0.77691
8/01/2001	0.59671	0.23366	0.04478	0.62107	0.13586		0.59671	0.23366	0.04478	0.62107	0.13586
9/01/2001	0	0	0	1.99972	0.37713	14.32	14.32	14.32	14.32	16.31972	14.69713
10/01/2001	0	0	0.03074	1.22901	0.88747	11.1	11.1	11.1	11.13074	12.32901	11.98747
11/01/2001	0.1814	5.93784	0.01957	0.48963	1.53065	15.99	16.1714	21.92784	16.00957	16.47963	17.52065
12/01/2001	0.65757	3.73101	0.33497	3.26895	5.31995	17.1	17.75757	20.83101	17.43497	20.36895	22.41995
13/01/2001	2.92965	0.90048	0.03261	2.28515	0.24616	22.93	25.85965	23.83048	22.96261	25.21515	23.17616
14/01/2001	3.83513	1.38413	0.06032	0.56239	1.00404	16.64	20.47513	18.02413	16.70032	17.20239	17.64404
15/01/2001	2.28843	9.33275	0.01813	1.88981	0.03485	22.66	24.94843	31.99275	22.67813	24.54981	22.69485
16/01/2001	0.0002	0	0.00013	1.37468	0.50228	14.65	14.6502	14.65	14.65013	16.02468	15.15228
17/01/2001	5.15808	0.68271	0.63903	1.05567	0.74527		5.15808	0.68271	0.63903	1.05567	0.74527
18/01/2001	0	0	0	0.79577	1.18283	11.74	11.74	11.74	11.74	12.53577	12.92283
19/01/2001	0	0	0	0.02927	0.74403	9.55	9.55	9.55	9.55	9.57927	10.29403
20/01/2001	0	0	0.17791	0.84834	1.02416	10.59	10.59	10.59	10.76791	11.43834	11.61416
21/01/2001	0.00629	2.74955	0.35886	1.3129	5.53223	11.12	11.12629	13.86955	11.47886	12.4329	16.65223
22/01/2001	15.07967	2.9655	1.90812	1.84844	4.73423	15.16	30.23967	18.1255	17.06812	17.00844	19.89423
23/01/2001	2.43226	0.28645	0.02706	1.89821	1.08488	17.92	20.35226	18.20645	17.94706	19.81821	19.00488
24/01/2001	0.25222	0.0284	0.64926	1.65788	1.78059	19.2	19.45222	19.2284	19.84926	20.85788	20.98059
25/01/2001	3.19619	3.28931	0.36282	1.8837	0.08796	16.37	19.56619	19.65931	16.73282	18.2537	16.45796
26/01/2001	6.3647	2.46074	1.43105	0.1085	3.9551	24.27	30.6347	26.73074	25.70105	24.3785	28.2251
27/01/2001	0.24973	5.15365	0.00343	2.48466	0.08987	22.45	22.69973	27.60365	22.45343	24.93466	22.53987
28/01/2001	0	0.04088	0.00001	2.08449	0.45142	13.89	13.89	13.93088	13.89001	15.97449	14.34142
29/01/2001	2.25315	0.05757	0.00044	1.11007	0.21314	8.02	10.27315	8.07757	8.02044	9.13007	8.23314
30/01/2001	0.0992	1.8933	0.0381	0.06878	1.04687	9.6	9.6992	11.4933	9.6381	9.66878	10.64687

31/01/2001	0	0	0	2.34269	0.07282	3.56	3.56	3.56	3.56	5.90269	3.63282
1/02/2001	0	0	0	0.01138	0.35298	4.39	4.39	4.39	4.39	4.40138	4.74298
2/02/2001	0	0	0.32065	0	3.52471	6.74	6.74	6.74	7.06065	6.74	10.26471
3/02/2001	0	0	0.46699	0.00038	3.66789	5.01	5.01	5.01	5.47699	5.01038	8.67789
4/02/2001	0.51238	0.67227	0.04828	0.06684	0.90748	6.17	6.68238	6.84227	6.21828	6.23684	7.07748
5/02/2001	7.2544	3.90409	0	0.10071	0.05567	12.41	19.6644	16.31409	12.41	12.51071	12.46567
6/02/2001	0	0	0.09985	2.6205	1.02992	5.8	5.8	5.8	5.89985	8.4205	6.82992
7/02/2001	0	0	0	1.05561	0.93114	6.28	6.28	6.28	6.28	7.33561	7.21114
8/02/2001	0.19872	7.17953	0.00017	0.44022	0.32544	11.19	11.38872	18.36953	11.19017	11.63022	11.51544
9/02/2001	8.18983	3.24502	0	1.44674	0.02692	14.72	22.90983	17.96502	14.72	16.16674	14.74692
10/02/2001	4.23698	5.19485	0.10137	0.74793	0.62681	16.65	20.88698	21.84485	16.75137	17.39793	17.27681
11/02/2001	0	0.00241	0.057	2.45617	1.55215	9.56	9.56	9.56241	9.617	12.01617	11.11215
12/02/2001	3.0799	0.07719	0.42717	0.50147	1.26842	10.98	14.0599	11.05719	11.40717	11.48147	12.24842
13/02/2001	3.21219	9.1097	0.02587	0.55151	1.90432	14.09	17.30219	23.1997	14.11587	14.64151	15.99432
14/02/2001	1.27285	3.17845	0.03368	0.9313	0.08186	16.37	17.64285	19.54845	16.40368	17.3013	16.45186
15/02/2001	0.41155	0.06196	0.21916	2.90004	1.40074	10.51	10.92155	10.57196	10.72916	13.41004	11.91074
16/02/2001	0	0	0	1.36852	0.77755	7.51	7.51	7.51	7.51	8.87852	8.28755
17/02/2001	0	0	0	1.10961	0.98259	7.43	7.43	7.43	7.43	8.53961	8.41259
18/02/2001	0.17103	0	0.0439	3.61118	0.95054	9.23	9.40103	9.23	9.2739	12.84118	10.18054
19/02/2001	0	0.01999	0.02983	0.76845	1.08332	8.56	8.56	8.57999	8.58983	9.32845	9.64332
20/02/2001	0	0	0	1.36032	0.56367	9.91	9.91	9.91	9.91	11.27032	10.47367
21/02/2001	1.92213	9.23936	0.03504	0.41002	2.52363	8.36	10.28213	17.59936	8.39504	8.77002	10.88363
22/02/2001	3.17748	1.69624	0	1.56824	0.10133	13.78	16.95748	15.47624	13.78	15.34824	13.88133
23/02/2001	0.00306	0.06966	0.00099	2.87386	0.76654	12.37	12.37306	12.43966	12.37099	15.24386	13.13654
24/02/2001	2.37581	3.39924	0	1.73612	0.1127	19.3	21.67581	22.69924	19.3	21.03612	19.4127
25/02/2001	4.83123	0.27803	0.00514	0.55167	0.24331	19.44	24.27123	19.71803	19.44514	19.99167	19.68331
26/02/2001	1.79144	0.74221	0.00588	0.99138	0.08344	19.32	21.11144	20.06221	19.32588	20.31138	19.40344
27/02/2001	2.96368	0.99116	0.22201	1.86613	2.82616	19.91	22.87368	20.90116	20.13201	21.77613	22.73616
28/02/2001	0.02807	0.58728	1.49328	0.03112	9.10775	18.71	18.73807	19.29728	20.20328	18.74112	27.81775
1/03/2001	0	0	0.0002	0.44576	1.8591	8.41	8.41	8.41	8.4102	8.85576	10.2691
2/03/2001	1.81177	1.21188	0.12538	0.43963	0.84438	10.55	12.36177	11.76188	10.67538	10.98963	11.39438
3/03/2001	0	0	0.00045	0.03026	0.87384	8	8	8	8.00045	8.03026	8.87384
4/03/2001	0	0.07604	0	1.08683	0.64773	10.08	10.08	10.15604	10.08	11.16683	10.72773
5/03/2001	0	0	0	3.27184	0.10942	10.69	10.69	10.69	10.69	13.96184	10.79942
6/03/2001	0	0	0	2.09568	0.16596	10.1	10.1	10.1	10.1	12.19568	10.26596
7/03/2001	0	0	0	2.62674	0.06414	8.1	8.1	8.1	8.1	10.72674	8.16414

8/03/2001	0	0	0	3.21006	0.05908	8.06	8.06	8.06	8.06	11.27006	8.11908
9/03/2001	0	0	0	1.73844	0.14108	6.92	6.92	6.92	6.92	8.65844	7.06108
10/03/2001	0.99421	0.99976	0.11758	0.33444	1.61641	5.81	6.80421	6.80976	5.92758	6.14444	7.42641
11/03/2001	1.13538	0.43189	0.07847	0.3906	0.35951	6.32	7.45538	6.75189	6.39847	6.7106	6.67951
12/03/2001	0.93565	1.45133	0.7006	0.18715	0.65138	8.34	9.27565	9.79133	9.0406	8.52715	8.99138
13/03/2001	2.49707	4.48676	0	1.1089	0.83627	11.58	14.07707	16.06676	11.58	12.6889	12.41627
14/03/2001	0.00042	1.25029	0.15047	0.02703	3.84358	11.35	11.35042	12.60029	11.50047	11.37703	15.19358
15/03/2001	0.12326	0	0.08168	0.03231	2.08244	11.45	11.57326	11.45	11.53168	11.48231	13.53244
16/03/2001	0.8339	0.91531	0.20843	0.03736	4.50717	9.45	10.2839	10.36531	9.65843	9.48736	13.95717
17/03/2001	6.44444	8.4436	0	1.39417	0	11.65	18.09444	20.0936	11.65	13.04417	11.65
18/03/2001	4.02326	4.80606	0.00715	0.10557	0	9.19	13.21326	13.99606	9.19715	9.29557	9.19
19/03/2001	2.85996	4.46039	0.16588	0.98698	3.63332	12.54	15.39996	17.00039	12.70588	13.52698	16.17332
20/03/2001	6.12026	0.75771	0.333	2.47035	2.31691	13.39	19.51026	14.14771	13.723	15.86035	15.70691
21/03/2001	0.03428	0.05613	0.34333	0.89465	4.72341	12.99	13.02428	13.04613	13.33333	13.88465	17.71341
22/03/2001	7.59378	3.19768	0.10099	0.53673	0.53167	14.45	22.04378	17.64768	14.55099	14.98673	14.98167
23/03/2001	1.81586	0.05126	0.78603	1.52409	0.06322	11.61	13.42586	11.66126	12.39603	13.13409	11.67322
24/03/2001	0.47609	0.46237	0.08444	2.29235	0.5247	14.49	14.96609	14.95237	14.57444	16.78235	15.0147
25/03/2001	3.58714	0.91205	0	0.89258	0.05132	10.34	13.92714	11.25205	10.34	11.23258	10.39132
26/03/2001	11.73529	5.44642	0.06513	0.05214	3.74382	10.37	22.10529	15.81642	10.43513	10.42214	14.11382
27/03/2001	0.02937	5.70961	0.11336	3.79126	3.2636	13.66	13.68937	19.36961	13.77336	17.45126	16.9236
28/03/2001	0.00008	0.22722	0	0.6848	0.1315	11.55	11.55008	11.77722	11.55	12.2348	11.6815
29/03/2001	1.97713	0.01747	0	0.74594	0.17159	11.27	13.24713	11.28747	11.27	12.01594	11.44159
30/03/2001	0	0	0.00192	2.34574	0.73459	9.13	9.13	9.13	9.13192	11.47574	9.86459
31/03/2001	0.01742	0.00031	0.01941	1.48793	1.21102	6.99	7.00742	6.99031	7.00941	8.47793	8.20102
1/04/2001	0.00106	0.21645	0.00884	3.84647	0.22034	8.84	8.84106	9.05645	8.84884	12.68647	9.06034
2/04/2001	0.21413	0.00386	0	0.33156	0.68634	12.53	12.74413	12.53386	12.53	12.86156	13.21634
3/04/2001	0	0	0	3.62219	0.50143	14.58	14.58	14.58	14.58	18.20219	15.08143
4/04/2001	0.99817	2.0912	0.92499	0.50575	0.43308	16.49	17.48817	18.5812	17.41499	16.99575	16.92308
5/04/2001	0	0.053	0.01002	1.52827	0.45235	16.66	16.66	16.713	16.67002	18.18827	17.11235
6/04/2001	0	0	0.72924	0.64943	8.49888	11.05	11.05	11.05	11.77924	11.69943	19.54888
7/04/2001	0	0	0.50055	1.36054	3.72222	11.11	11.11	11.11	11.61055	12.47054	14.83222
8/04/2001	1.33837	0.0362	0.72198	0.85075	6.66345	8.73	10.06837	8.7662	9.45198	9.58075	15.39345
9/04/2001	0.46472	0.46045	0.1437	0.13047	1.44248	12.88	13.34472	13.34045	13.0237	13.01047	14.32248
10/04/2001	0	0	0.00046	1.43901	1.00307	9.12	9.12	9.12	9.12046	10.55901	10.12307
11/04/2001	1.91832	1.87793	0.14091	0.81938	1.09151	10.32	12.23832	12.19793	10.46091	11.13938	11.41151
12/04/2001	0	2.68797	0	2.21251	0.41823	15.54	15.54	18.22797	15.54	17.75251	15.95823

13/04/2001	0	0	0.06948	1.51314	1.02818	9.07	9.07	9.07	9.13948	10.58314	10.09818
14/04/2001	0	0.00005	0.85301	1.58917	1.72089	9.43	9.43	9.43005	10.28301	11.01917	11.15089
15/04/2001	0	0.83501	0.00026	3.18594	0.19992	10.05	10.05	10.88501	10.05026	13.23594	10.24992
16/04/2001	17.74649	0.96714	0.06052	6.70577	0.43409	14.14	31.88649	15.10714	14.20052	20.84577	14.57409
17/04/2001	0.33953	0.48635	0	4.94681	0.02751	16.56	16.89953	17.04635	16.56	21.50681	16.58751
18/04/2001	1.64919	8.23516	0.13771	3.51945	1.51199		1.64919	8.23516	0.13771	3.51945	1.51199
19/04/2001	1.97954	1.61694	0	1.6122	0.2145		1.97954	1.61694	0	1.6122	0.2145
20/04/2001	0.93303	2.3459	1.25469	1.31273	2.47987	13.13	14.06303	15.4759	14.38469	14.44273	15.60987
21/04/2001	0.00098	5.41593	0.37313	0.23985	0.38731	12.34	12.34098	17.75593	12.71313	12.57985	12.72731
22/04/2001	19.0707	0.80642	0.07052	1.10275	0.17768	5.25	24.3207	6.05642	5.32052	6.35275	5.42768
23/04/2001	12.9585	9.47965	0.00321	0.061	0.04678	13.45	26.4085	22.92965	13.45321	13.511	13.49678
24/04/2001	3.13586	1.06416	0.01754	0.8797	3.09585	11.35	14.48586	12.41416	11.36754	12.2297	14.44585
25/04/2001	2.58987	6.01444	0.11478	4.34758	0.21362	9.55	12.13987	15.56444	9.66478	13.89758	9.76362
26/04/2001	0.9353	0.1121	0.02312	6.46897	0.70452	13.28	14.2153	13.3921	13.30312	19.74897	13.98452
27/04/2001	0.01478	0.0335	1.37258	5.68271	0.94846	11.37	11.38478	11.4035	12.74258	17.05271	12.31846
28/04/2001	0.03662	0.58676	0.00022	2.20793	0.10722	13.13	13.16662	13.71676	13.13022	15.33793	13.23722
29/04/2001	0	0	0.07132	0.79125	0.84352	9.49	9.49	9.49	9.56132	10.28125	10.33352
30/04/2001	0	1.53819	0	1.55216	0.13895	9.38	9.38	10.91819	9.38	10.93216	9.51895
1/05/2001	1.8729	0.30652	0.35929	2.14883	0.33828	7.36	9.2329	7.66652	7.71929	9.50883	7.69828
2/05/2001	0.06374	0.13718	0	1.80799	0.4508	5.52	5.58374	5.65718	5.52	7.32799	5.9708
3/05/2001	0.23398	1.1605	0.0086	1.44917	0.19827	8.22	8.45398	9.3805	8.2286	9.66917	8.41827
4/05/2001	0.41262	0.93669	0.00001	1.63172	0.26232	9.54	9.95262	10.47669	9.54001	11.17172	9.80232
5/05/2001	7.35129	0.07757	0.19718	0.40232	0.25458	8.57	15.92129	8.64757	8.76718	8.97232	8.82458
6/05/2001	0	4.67862	0	0.38647	0.46628	6.63	6.63	11.30862	6.63	7.01647	7.09628
7/05/2001	0	0.03321	0	0.58527	0.00033	4.94	4.94	4.97321	4.94	5.52527	4.94033
8/05/2001	0	1.08378	0	1.85452	0.00123	5.86	5.86	6.94378	5.86	7.71452	5.86123
9/05/2001	0	0.10134	0.21191	0.76711	0.04511	9.46	9.46	9.56134	9.67191	10.22711	9.50511
10/05/2001	0.00998	2.48672	1.26035	2.93145	1.30767	7.89	7.89998	10.37672	9.15035	10.82145	9.19767
11/05/2001	1.27613	5.43139	0.00052	1.97135	1.14471	12.9	14.17613	18.33139	12.90052	14.87135	14.04471
12/05/2001	0.77032	0.89427	0.39159	1.86813	0.34325	18.06	18.83032	18.95427	18.45159	19.92813	18.40325
13/05/2001	0.02734	0.29129	0.04326	5.07012	0.42786	18.19	18.21734	18.48129	18.23326	23.26012	18.61786
14/05/2001	0	0.0005	0.00091	1.89194	0.25165	13.87	13.87	13.8705	13.87091	15.76194	14.12165
15/05/2001	0.2474	10.45999	0.00124	1.72346	0.52654	13.6	13.8474	24.05999	13.60124	15.32346	14.12654
16/05/2001	0.3427	1.26853	0.0422	0.74294	0.71678	15.33	15.6727	16.59853	15.3722	16.07294	16.04678
17/05/2001	5.88282	0.68998	0	2.87789	0.44919	17.61	23.49282	18.29998	17.61	20.48789	18.05919
18/05/2001	7.19627	1.77575	0.00358	2.26833	0.19219	16.5	23.69627	18.27575	16.50358	18.76833	16.69219

19/05/2001	0	0	0.23306	3.36396	0.27451	8.9	8.9	8.9	9.13306	12.26396	9.17451
20/05/2001	0.00105	0	0.52231	5.09219	0.77788	7.58	7.58105	7.58	8.10231	12.67219	8.35788
21/05/2001	0.42051	1.47648	0.00012	2.9955	0.13588	8.97	9.39051	10.44648	8.97012	11.9655	9.10588
22/05/2001	0	0	0	2.78456	0.48114	9.07	9.07	9.07	9.07	11.85456	9.55114
23/05/2001	11.82687	0.3167	0.34558	0.42708	0.55352	9.11	20.93687	9.4267	9.45558	9.53708	9.66352
24/05/2001	10.63648	1.23366	0.43395	0.36399	0.00101	22.93	33.56648	24.16366	23.36395	23.29399	22.93101
25/05/2001	0.6518	10.59829	0.0082	0.73903	4.08085	21.16	21.8118	31.75829	21.1682	21.89903	25.24085
26/05/2001	3.31245	6.49457	0.00363	7.2624	1.58824	17.29	20.60245	23.78457	17.29363	24.5524	18.87824
27/05/2001	2.40555	0.37371	0.05357	0.05114	0.19609	12.9	15.30555	13.27371	12.95357	12.95114	13.09609
28/05/2001	6.08654	0.56801	0.10677	0	0.01706	8.38	14.46654	8.94801	8.48677	8.38	8.39706
29/05/2001	0.31042	0.01697	0.16455	0.86493	0.43411	11.62	11.93042	11.63697	11.78455	12.48493	12.05411
30/05/2001	0.16141	0.12217	0.46062	1.33986	2.73331	13.32	13.48141	13.44217	13.78062	14.65986	16.05331
31/05/2001	0.6061	0.14295	0.01124	0.25871	0.25899	13.89	14.4961	14.03295	13.90124	14.14871	14.14899
1/06/2001	8.42685	0.47862	0.20007	2.15334	1.03291	20.86	29.28685	21.33862	21.06007	23.01334	21.89291
2/06/2001	0.4381	0.08738	0.15587	1.16845	3.99103	15.66	16.0981	15.74738	15.81587	16.82845	19.65103
3/06/2001	3.33161	0.45864	0.00004	2.40691	0.25409	15.42	18.75161	15.87864	15.42004	17.82691	15.67409
4/06/2001	3.13837	1.14501	0	2.76275	0.10123	18.26	21.39837	19.40501	18.26	21.02275	18.36123
5/06/2001	0	0.24392	0.4581	4.66296	2.09296	15.03	15.03	15.27392	15.4881	19.69296	17.12296
6/06/2001	0.17193	0.01417	0.43535	8.42665	1.93676	9.17	9.34193	9.18417	9.60535	17.59665	11.10676
7/06/2001	6.26686	0.5361	0.05067	0.0628	0.42359	14.01	20.27686	14.5461	14.06067	14.0728	14.43359
8/06/2001	6.2066	0.41688	0.12782	0.33953	0.01923	11.37	17.5766	11.78688	11.49782	11.70953	11.38923
9/06/2001	3.55085	2.90913	0	3.9083	0.55172	7.69	11.24085	10.59913	7.69	11.5983	8.24172
10/06/2001	0.23871	6.66858	0	8.29758	0.18295	13.39	13.62871	20.05858	13.39	21.68758	13.57295
11/06/2001	0.57818	0.6339	0.64897	1.68708	8.21826	12.75	13.32818	13.3839	13.39897	14.43708	20.96826
12/06/2001	1.0796	0.032	0.02139	0.11315	1.85446	18.15	19.2296	18.182	18.17139	18.26315	20.00446
13/06/2001	4.40783	2.34177	0	0.21481	0.01573	14.02	18.42783	16.36177	14.02	14.23481	14.03573
14/06/2001	4.11371	3.65595	0	2.15102	0	6.65	10.76371	10.30595	6.65	8.80102	6.65
15/06/2001	16.17035	9.71741	0.20751	0.82438	0	11.4	27.57035	21.11741	11.60751	12.22438	11.4
16/06/2001	0.29803	2.14028	0.55989	3.74765	7.15599	15.15	15.44803	17.29028	15.70989	18.89765	22.30599
17/06/2001	0.4047	0.00673	0.01983	0.37514	0.65203	18.31	18.7147	18.31673	18.32983	18.68514	18.96203
18/06/2001	0.01901	0.00009	0.01279	4.52399	0.70776	14.5	14.51901	14.50009	14.51279	19.02399	15.20776
19/06/2001	1.76528	1.82743	0.10564	2.11727	0.27087	17.03	18.79528	18.85743	17.13564	19.14727	17.30087
20/06/2001	3.13072	0.1686	0.00539	0.66397	4.36085	20.71	23.84072	20.8786	20.71539	21.37397	25.07085
21/06/2001	2.27998	0.27109	2.23315	2.39688	1.32644	17.08	19.35998	17.35109	19.31315	19.47688	18.40644
22/06/2001	1.30466	14.26921	0.08121	0.90522	0.52956	15.89	17.19466	30.15921	15.97121	16.79522	16.41956
23/06/2001	2.58684	0.29343	0.02871	14.92394	0.29668	15.71	18.29684	16.00343	15.73871	30.63394	16.00668

24/06/2001	0.41012	0.00227	0.01196	4.81959	0.26248	15.38	15.79012	15.38227	15.39196	20.19959	15.64248
25/06/2001	0.50598	0.10918	0.04172	5.60595	1.88167	20.59	21.09598	20.69918	20.63172	26.19595	22.47167
26/06/2001	1.84754	7.49134	0.0036	5.07488	1.32561	21.84	23.68754	29.33134	21.8436	26.91488	23.16561
27/06/2001	0	0	0.87015	2.67782	3.96025	11.45	11.45	11.45	12.32015	14.12782	15.41025
28/06/2001	0.24819	4.44967	0.00008	1.38137	0.17017	15.98	16.22819	20.42967	15.98008	17.36137	16.15017
29/06/2001	0.02	5.06271	0.1869	1.45501	0.84197	18.72	18.74	23.78271	18.9069	20.17501	19.56197
30/06/2001	0	0.10771	0.01243	0.95473	0.43491	13.36	13.36	13.46771	13.37243	14.31473	13.79491
1/07/2001	1.14754	3.29231	0.70138	0.9335	0.9726	15.13	16.27754	18.42231	15.83138	16.0635	16.1026
2/07/2001	11.04574	0.67424	0	0.32716	0.23282	19.2	30.24574	19.87424	19.2	19.52716	19.43282
3/07/2001	0.76939	0.79259	0.0102	0.61341	0.70181	21.94	22.70939	22.73259	21.9502	22.55341	22.64181
4/07/2001	0.47462	15.71693	0.01442	1.46451	0.14334	23.28	23.75462	38.99693	23.29442	24.74451	23.42334
5/07/2001	13.6993	0.81999	0.01691	3.85095	0.16409	21.37	35.0693	22.18999	21.38691	25.22095	21.53409
6/07/2001	5.67317	1.9404	0.03068	0.76177	0.13562	10.28	15.95317	12.2204	10.31068	11.04177	10.41562
7/07/2001	5.30469	0.21293	0	0	0	5.52	10.82469	5.73293	5.52	5.52	5.52
8/07/2001	8.13048	1.07862	0	0.0152	0	6.88	15.01048	7.95862	6.88	6.8952	6.88
9/07/2001	4.83181	3.26069	0.24467	1.51865	0.14503	11.91	16.74181	15.17069	12.15467	13.42865	12.05503
10/07/2001	2.14904	0.04209	0.09039	8.33024	0.17056	12.82	14.96904	12.86209	12.91039	21.15024	12.99056
11/07/2001	0.90897	1.34613	0.23293	2.7155	0.63504	14.33	15.23897	15.67613	14.56293	17.0455	14.96504
12/07/2001	0.13848	1.14598	0	8.8536	1.70137	15.62	15.75848	16.76598	15.62	24.4736	17.32137
13/07/2001	19.26719	0.80983	0.13883	0.51981	0.11311	16.96	36.22719	17.76983	17.09883	17.47981	17.07311
14/07/2001	16.46756	0.30092	0.0266	3.04787	1.61813	16.05	32.51756	16.35092	16.0766	19.09787	17.66813
15/07/2001	13.27651	1.11986	0	1.26066	0.94222	14.49	27.76651	15.60986	14.49	15.75066	15.43222
16/07/2001	4.73249	2.56505	0.04056	0.31358	1.06919	12.86	17.59249	15.42505	12.90056	13.17358	13.92919
17/07/2001	2.88442	18.31924	0.00003	0.1863	0.65927	15.97	18.85442	34.28924	15.97003	16.1563	16.62927
18/07/2001	9.11337	1.87969	0	0.20379	0.71891	17.12	26.23337	18.99969	17.12	17.32379	17.83891
19/07/2001	0.07334	0.9221	0.781	2.63106	9.67788	15.95	16.02334	16.8721	16.731	18.58106	25.62788
20/07/2001	0.00005	9.69142	0.96314	7.67415	17.97099	15.09	15.09005	24.78142	16.05314	22.76415	33.06099
21/07/2001	0.19852	0.59273	0.0165	10.17157	0.45628	14.27	14.46852	14.86273	14.2865	24.44157	14.72628
22/07/2001	1.03644	0.43793	0.00734	1.47015	0.20507	14.4	15.43644	14.83793	14.40734	15.87015	14.60507
23/07/2001	0.9701	0.08935	0.02788	1.14309	0.13032	17.31	18.2801	17.39935	17.33788	18.45309	17.44032
24/07/2001	0.00002	0.2867	0.04382	0.68925	1.22206	12.09	12.09002	12.3767	12.13382	12.77925	13.31206
25/07/2001	0.05364	0	0	1.26778	0.16408	9.78	9.83364	9.78	9.78	11.04778	9.94408
26/07/2001	2.01524	2.2945	0.45057	1.11961	2.75415	7.19	9.20524	9.4845	7.64057	8.30961	9.94415
27/07/2001	9.59266	0.8119	0	1.04869	0	5.1	14.69266	5.9119	5.1	6.14869	5.1
28/07/2001	7.56952	8.15528	0	0.60319	0	6.18	13.74952	14.33528	6.18	6.78319	6.18
29/07/2001	5.88233	0.94475	0.00077	1.42746	0.00186	9.57	15.45233	10.51475	9.57077	10.99746	9.57186

30/07/2001	0	0.0002	0.00005	2.9301	0.60341	12.65	12.65	12.6502	12.65005	15.5801	13.25341
31/07/2001	3.26251	0.37861	0.28216	2.06348	3.5155	14.48	17.74251	14.85861	14.76216	16.54348	17.9955
1/08/2001	3.1208	1.07502	0.0196	2.72428	0.18449	9.19	12.3108	10.26502	9.2096	11.91428	9.37449
2/08/2001	0	1.7113	0.14897	1.65239	3.82691	12.76	12.76	14.4713	12.90897	14.41239	16.58691
3/08/2001	0.46873	4.87283	0.04494	3.72848	0.30933	16.18	16.64873	21.05283	16.22494	19.90848	16.48933
4/08/2001	3.85378	0.3005	0	1.54225	0.03093	14.19	18.04378	14.4905	14.19	15.73225	14.22093
5/08/2001	4.61274	5.86183	0.0054	0.05692	1.77276	10.36	14.97274	16.22183	10.3654	10.41692	12.13276
6/08/2001	13.26456	3.32803	0.00259	1.1848	0	11.85	25.11456	15.17803	11.85259	13.0348	11.85
7/08/2001	40.21948	14.36261	0.03148	0.40208	1.32224	15.15	55.36948	29.51261	15.18148	15.55208	16.47224
8/08/2001	7.72506	0.98214	0	4.26345	0.12406	14.21	21.93506	15.19214	14.21	18.47345	14.33406
9/08/2001	2.21755	0.1365	0.00037	0.37935	0.12005	20.18	22.39755	20.3165	20.18037	20.55935	20.30005
10/08/2001	0.84495	0.234	0.07801	2.04202	0.47092	17.64	18.48495	17.874	17.71801	19.68202	18.11092
11/08/2001	2.10032	0.53051	0.01569	8.11306	0.09423	17.46	19.56032	17.99051	17.47569	25.57306	17.55423
12/08/2001	0.69242	1.06722	0	0.2705	0.15637	23.7	24.39242	24.76722	23.7	23.9705	23.85637
13/08/2001	0	0.79245	0.01656	0.57803	0.15983	18.24	18.24	19.03245	18.25656	18.81803	18.39983
14/08/2001	0	0	0.00025	0.83114	0.3197	11.04	11.04	11.04	11.04025	11.87114	11.3597
15/08/2001	2.61967	0.14333	0.3388	0.585	0.14393	16.99	19.60967	17.13333	17.3288	17.575	17.13393
16/08/2001	1.61511	0.13739	0.05347	2.99663	0.35525	15.97	17.58511	16.10739	16.02347	18.96663	16.32525
17/08/2001	11.04281	1.70831	0	0.85804	0	14.94	25.98281	16.64831	14.94	15.79804	14.94
18/08/2001	4.2959	1.17275	0	4.45244	0	13.03	17.3259	14.20275	13.03	17.48244	13.03
19/08/2001	12.9879	6.17311	0.16743	0.71582	0.48257	14.96	27.9479	21.13311	15.12743	15.67582	15.44257
20/08/2001	4.77263	0.06831	0	0	0.01049	16.88	21.65263	16.94831	16.88	16.88	16.89049
21/08/2001	11.59179	17.77373	0	1.09192	0	11.14	22.73179	28.91373	11.14	12.23192	11.14
22/08/2001	6.76038	0.88329	0.00005	0.40565	0	14.46	21.22038	15.34329	14.46005	14.86565	14.46
23/08/2001	2.01035	17.88234	0	0.16591	0.29645	16.42	18.43035	34.30234	16.42	16.58591	16.71645
24/08/2001	0.45207	2.02445	0	0.32282	0.10377	19.73	20.18207	21.75445	19.73	20.05282	19.83377
25/08/2001	0.0736	0.10069	0.56686	2.89098	0.09029	21.09	21.1636	21.19069	21.65686	23.98098	21.18029
26/08/2001	0.89477	4.97451	0	0.07847	0.04324	8.98	9.87477	13.95451	8.98	9.05847	9.02324
27/08/2001	5.33111	0.63466	0	0	0	6.47	11.80111	7.10466	6.47	6.47	6.47
28/08/2001	19.76844	2.08162	0	0.54133	0	8.87	28.63844	10.95162	8.87	9.41133	8.87
29/08/2001	18.17319	2.44437	0.16177	1.08796	0	10.58	28.75319	13.02437	10.74177	11.66796	10.58
30/08/2001	0.1434	7.63386	0.25614	0.81069	0.03992	10.99	11.1334	18.62386	11.24614	11.80069	11.02992
31/08/2001	1.60452	0.54882	1.40908	1.4132	0.11924	12.45	14.05452	12.99882	13.85908	13.8632	12.56924
1/09/2001	7.9951	2.11871	0.00002	0.57366	0.07077	17.3	25.2951	19.41871	17.30002	17.87366	17.37077
2/09/2001	3.97619	0.63921	1.39807	0.1702	0	13.33	17.30619	13.96921	14.72807	13.5002	13.33
3/09/2001	8.27728	1.992	0.37914	0.28828	0	10.5	18.77728	12.492	10.87914	10.78828	10.5

4/09/2001	11.84239	2.08964	0.40984	2.94821	2.97113	13.35	25.19239	15.43964	13.75984	16.29821	16.32113
5/09/2001	4.09828	0.5687	0.01777	2.05146	0.74281	10.55	14.64828	11.1187	10.56777	12.60146	11.29281
6/09/2001	0.00071	8.21363	0.04156	1.01096	0.24879	10.19	10.19071	18.40363	10.23156	11.20096	10.43879
7/09/2001	1.57922	1.64947	0.02306	2.37755	0.1952	13.79	15.36922	15.43947	13.81306	16.16755	13.9852
8/09/2001	1.78667	0.01152	0	0.06027	0	12.21	13.99667	12.22152	12.21	12.27027	12.21
9/09/2001	7.30422	1.87604	0	0.47916	0	21.49	28.79422	23.36604	21.49	21.96916	21.49
10/09/2001	5.6815	0.95901	0.07703	3.23488	0.84033	12.16	17.8415	13.11901	12.23703	15.39488	13.00033
11/09/2001	2.96828	0.9284	0.90163	0.82578	3.85878	19.36	22.32828	20.2884	20.26163	20.18578	23.21878
12/09/2001	6.48909	0.9153	0.02422	0.11346	0.4985	11.89	18.37909	12.8053	11.91422	12.00346	12.3885
13/09/2001	10.48385	0.6644	0	0.17111	0.41971	10.78	21.26385	11.4444	10.78	10.95111	11.19971
14/09/2001	10.14813	1.00402	0.00769	0.44732	0.49053	10.13	20.27813	11.13402	10.13769	10.57732	10.62053
15/09/2001	0	2.71255	0.20867	0.31806	2.291	10.28	10.28	12.99255	10.48867	10.59806	12.571
16/09/2001	2.38182	0.23268	0.00598	2.82434	0.08612	13.47	15.85182	13.70268	13.47598	16.29434	13.55612
17/09/2001	0.00004	0.0811	0.02541	2.2272	0.61788	14.15	14.15004	14.2311	14.17541	16.3772	14.76788
18/09/2001	0	0	0.98304	0.09877	1.86511	16.44	16.44	16.44	17.42304	16.53877	18.30511
19/09/2001	0.00243	0.00077	0.76464	0.08207	5.38849	14.51	14.51243	14.51077	15.27464	14.59207	19.89849
20/09/2001	0.02042	0.28087	0.03439	1.89022	4.4551	17.41	17.43042	17.69087	17.44439	19.30022	21.8651
21/09/2001	0	0.0763	0	1.84313	0.2251	21.24	21.24	21.3163	21.24	23.08313	21.4651
22/09/2001	0	0	0.1559	0.41224	4.23649	13.83	13.83	13.83	13.9859	14.24224	18.06649
23/09/2001	0.05135	0.00105	0	3.82047	0.82029	13.86	13.91135	13.86105	13.86	17.68047	14.68029
24/09/2001	1.00605	1.41341	0.05387	2.06461	0.04525	16.5	17.50605	17.91341	16.55387	18.56461	16.54525
25/09/2001	4.06636	4.62096	0.02593	0.14229	0.14903	23.6	27.66636	28.22096	23.62593	23.74229	23.74903
26/09/2001	2.28461	1.11172	0.30387	0.72715	5.61853	9.2	11.48461	10.31172	9.50387	9.92715	14.81853
27/09/2001	0	0	0.30045	3.25213	0.43138	10.98	10.98	10.98	11.28045	14.23213	11.41138
28/09/2001	0	0.00177	0	1.53627	0.42973	8.96	8.96	8.96177	8.96	10.49627	9.38973
29/09/2001	1.49023	0.19424	0	3.60461	0.06951	14.55	16.04023	14.74424	14.55	18.15461	14.61951
30/09/2001	0.34784	6.23729	0	1.98449	1.18949	17.93	18.27784	24.16729	17.93	19.91449	19.11949
1/10/2001	1.16554	1.01118	0	3.52136	0.95361	23.43	24.59554	24.44118	23.43	26.95136	24.38361
2/10/2001	1.26147	0.34354	0.00381	2.87286	0.52879	22.92	24.18147	23.26354	22.92381	25.79286	23.44879
3/10/2001	4.51254	0.81512	0.23866	1.26704	0.00008	13.95	18.46254	14.76512	14.18866	15.21704	13.95008
4/10/2001	0.42155	4.92781	1.08213	0.18737	0.70787	9.97	10.39155	14.89781	11.05213	10.15737	10.67787
5/10/2001	3.92636	0.62281	0.00011	0.35567	0.35469	11.1	15.02636	11.72281	11.10011	11.45567	11.45469
6/10/2001	3.05516	1.5565	0	0.30871	0.12715	8.98	12.03516	10.5365	8.98	9.28871	9.10715
7/10/2001	15.88637	1.74788	0	0.8965	0	10.57	26.45637	12.31788	10.57	11.4665	10.57
8/10/2001	1.05407	11.36916	0.00849	0.44037	0.4699	9.83	10.88407	21.19916	9.83849	10.27037	10.2999
9/10/2001	0	0.6445	0	0.59831	0.23064	14.91	14.91	15.5545	14.91	15.50831	15.14064

10/10/2001	1.28933	0.25298	0.36909	0.99973	1.05137	25.51	26.79933	25.76298	25.87909	26.50973	26.56137
11/10/2001	0.20901	2.7322	0.30712	0.50889	3.47474	23.93	24.13901	26.6622	24.23712	24.43889	27.40474
12/10/2001	4.57261	4.61942	0.00175	1.76704	0	7.4	11.97261	12.01942	7.40175	9.16704	7.4
13/10/2001	0.39459	0.00007	0.07349	1.35335	0.43206	13.13	13.52459	13.13007	13.20349	14.48335	13.56206
14/10/2001	10.46038	2.31745	0	0.50764	0	5.6	16.06038	7.91745	5.6	6.10764	5.6
15/10/2001	3.51038	2.1874	0.42749	1.27428	7.026	8.19	11.70038	10.3774	8.61749	9.46428	15.216
16/10/2001	0.11259	1.00738	0.47309	2.6256	3.87052	9.88	9.99259	10.88738	10.35309	12.5056	13.75052
17/10/2001	0.02124	0.89499	0.03735	0.01228	0.48763	12.02	12.04124	12.91499	12.05735	12.03228	12.50763
18/10/2001	3.0074	1.37699	0.49601	0.66086	8.05188	12.47	15.4774	13.84699	12.96601	13.13086	20.52188
19/10/2001	0.73203	1.43265	0	2.9488	0.00071	12.25	12.98203	13.68265	12.25	15.1988	12.25071
20/10/2001	0	1.12765	0	0.76508	0.88737	10.57	10.57	11.69765	10.57	11.33508	11.45737
21/10/2001	0	1.26012	0.04576	1.59278	1.36403	17.09	17.09	18.35012	17.13576	18.68278	18.45403
22/10/2001	0.94053	0.02692	0.03912	3.37034	0.08035	19.63	20.57053	19.65692	19.66912	23.00034	19.71035
23/10/2001	0.80893	0.96998	0	2.50039	0.01043	27.4	28.20893	28.36998	27.4	29.90039	27.41043
24/10/2001	0.0333	2.11127	0	0.40085	0		0.0333	2.11127	0	0.40085	0
25/10/2001	3.44088	0.19004	0	3.10884	0.02968	9.98	13.42088	10.17004	9.98	13.08884	10.00968
26/10/2001	11.10817	0.44243	0	0.12554	0.00203	7.31	18.41817	7.75243	7.31	7.43554	7.31203
27/10/2001	16.43676	3.5081	0.16027	0.68002	2.22419	7.16	23.59676	10.6681	7.32027	7.84002	9.38419
28/10/2001	3.03089	0.38649	0.31586	3.91223	3.02416	9.22	12.25089	9.60649	9.53586	13.13223	12.24416
29/10/2001	18.81133	3.23646	0.09191	1.00261	0.33179	11.19	30.00133	14.42646	11.28191	12.19261	11.52179
30/10/2001	14.32718	13.42367	1.42701	0.33667	0.50034	12.42	26.74718	25.84367	13.84701	12.75667	12.92034
31/10/2001	23.66717	1.64021	0.21817	1.17414	0	13.96	37.62717	15.60021	14.17817	15.13414	13.96
1/11/2001	7.65609	3.15577	0.03012	0.34276	0.33144	9.65	17.30609	12.80577	9.68012	9.99276	9.98144
2/11/2001	0.41093	1.51321	0.50917	0.38887	3.84248	23.26	23.67093	24.77321	23.76917	23.64887	27.10248
3/11/2001	0	0	0.0002	0.01866	0.33446	34.58	34.58	34.58	34.5802	34.59866	34.91446
4/11/2001	0.00068	0.02714	0.05686	0.0005	1.84222	16.68	16.68068	16.70714	16.73686	16.6805	18.52222
5/11/2001	0.62018	0.21837	0.053	4.79351	1.45152	25.19	25.81018	25.40837	25.243	29.98351	26.64152
6/11/2001	14.52722	3.19335	0.1066	0.13341	1.45528	30.48	45.00722	33.67335	30.5866	30.61341	31.93528
7/11/2001	9.73417	2.45005	0.0811	0.89776	0.01247	14.76	24.49417	17.21005	14.8411	15.65776	14.77247
8/11/2001	0.4397	1.09906	0	3.90251	0.11079		0.4397	1.09906	0	3.90251	0.11079
9/11/2001	2.30921	0.01029	0	1.16358	0.08091	10.32	12.62921	10.33029	10.32	11.48358	10.40091
10/11/2001	0.37682	0.01341	0	7.96727	0.10941	11.06	11.43682	11.07341	11.06	19.02727	11.16941
11/11/2001	7.00336	3.04978	0	0.67178	0.41977	8.17	15.17336	11.21978	8.17	8.84178	8.58977
12/11/2001	7.99513	0.64156	0.22308	0.42179	2.68166		7.99513	0.64156	0.22308	0.42179	2.68166
13/11/2001	23.98097	1.72467	0	2.36271	3.34952		23.98097	1.72467	0	2.36271	3.34952
14/11/2001	0	0.00001	0.13972	1.56208	0.95101		0	0.00001	0.13972	1.56208	0.95101

15/11/2001	15.59602	3.40281	0.11113	1.44799	1.64923	20.1	35.69602	23.50281	20.21113	21.54799	21.74923
16/11/2001	0.0403	2.21178	0.00014	0.63709	0.28524	9.12	9.1603	11.33178	9.12014	9.75709	9.40524
17/11/2001	4.09943	0.21699	0.07229	0.04161	0.32137	11.09	15.18943	11.30699	11.16229	11.13161	11.41137
18/11/2001	1.13085	0.56022	0.00166	0.16947	0	17.48	18.61085	18.04022	17.48166	17.64947	17.48
19/11/2001	2.83692	0.9945	0	1.07433	0.00064	13.91	16.74692	14.9045	13.91	14.98433	13.91064
20/11/2001	0	0.00079	0	0.98928	0.01171	7.95	7.95	7.95079	7.95	8.93928	7.96171
21/11/2001	0.03517	0.27714	0	2.13406	0.148	8.77	8.80517	9.04714	8.77	10.90406	8.918
22/11/2001	0.00875	0.45524	0.00003	2.2329	0.30837	11.91	11.91875	12.36524	11.91003	14.1429	12.21837
23/11/2001	0.08244	0	0.0418	1.73619	0.62422	21.39	21.47244	21.39	21.4318	23.12619	22.01422
24/11/2001	2.71003	0.3425	0.02176	0.70174	1.58878	27.36	30.07003	27.7025	27.38176	28.06174	28.94878
25/11/2001						10.16	10.16	10.16	10.16	10.16	10.16
26/11/2001						10.47	10.47	10.47	10.47	10.47	10.47
27/11/2001	0	0	0	0.26571	0.92489	8.47	8.47	8.47	8.47	8.73571	9.39489
28/11/2001	0.19384	0.86897	0.36145	0.81076	0.47579	9.31	9.50384	10.17897	9.67145	10.12076	9.78579
29/11/2001	0.00809	0.87275	0.02151	1.5572	0.05162	12.33	12.33809	13.20275	12.35151	13.8872	12.38162
30/11/2001	4.13312	2.55485	0.11053	0.06267	1.09864	16	20.13312	18.55485	16.11053	16.06267	17.09864
1/12/2001	2.73826	0.48033	0.00054	2.1555	0.33141	16.18	18.91826	16.66033	16.18054	18.3355	16.51141
2/12/2001	0.85098	0.23165	0	0.89632	0.05145	20.82	21.67098	21.05165	20.82	21.71632	20.87145
3/12/2001	5.62836	0.75737	0.01363	1.17977	0.00011	22.6	28.22836	23.35737	22.61363	23.77977	22.60011
4/12/2001	0	0.44448	0	2.68835	0.45179	16.32	16.32	16.76448	16.32	19.00835	16.77179
5/12/2001	3.17407	0.04262	0	2.03938	0.01951	12.01	15.18407	12.05262	12.01	14.04938	12.02951
6/12/2001	2.37884	1.28378	0.3378	0.60986	1.03029	11.79	14.16884	13.07378	12.1278	12.39986	12.82029
7/12/2001	10.65844	3.17612	0.22285	1.04359	2.23725	12.36	23.01844	15.53612	12.58285	13.40359	14.59725
8/12/2001	2.3905	0.04558	0	0.80948	0.14779	8.47	10.8605	8.51558	8.47	9.27948	8.61779
9/12/2001	9.80867	4.44052	0	0.86086	0.00002	8.09	17.89867	12.53052	8.09	8.95086	8.09002
10/12/2001	19.13038	12.25149	0.00613	5.87912	0.01969	11.77	30.90038	24.02149	11.77613	17.64912	11.78969
11/12/2001	4.88576	0.50339	0.5281	0.65925	8.36262	18.36	23.24576	18.86339	18.8881	19.01925	26.72262
12/12/2001	5.84132	0.75165	0.00334	0.26062	0.7503	19.15	24.99132	19.90165	19.15334	19.41062	19.9003
13/12/2001	4.70672	0.88149	0.10146	0.03288	0.00345	17.05	21.75672	17.93149	17.15146	17.08288	17.05345
14/12/2001	0.59865	5.55863	0	3.15568	0.11144	19	19.59865	24.55863	19	22.15568	19.11144
15/12/2001	0	0.09391	0.06956	4.17867	0.3115	11.13	11.13	11.22391	11.19956	15.30867	11.4415
16/12/2001	0.85763	0.4905	0.02085	2.52381	0.33648	11.96	12.81763	12.4505	11.98085	14.48381	12.29648
17/12/2001	0.75473	2.25409	0.16807	0.45609	2.41021	13.88	14.63473	16.13409	14.04807	14.33609	16.29021
18/12/2001	0.97638	0.13814	0.30339	1.84744	3.00472	17.11	18.08638	17.24814	17.41339	18.95744	20.11472
19/12/2001	0.23678	0.01249	0.0227	0.80858	0.03139	12.3	12.53678	12.31249	12.3227	13.10858	12.33139
20/12/2001	8.0535	0.86465	0.39925	0.14923	0.02923	16.88	24.9335	17.74465	17.27925	17.02923	16.90923

21/12/2001	2.067	2.67547	0.07847	0.779	0.11892	18.83	20.897	21.50547	18.90847	19.609	18.94892
22/12/2001	19.51892	3.43785	0.16643	1.41531	0.07074	13.87	33.38892	17.30785	14.03643	15.28531	13.94074
23/12/2001	10.9536	1.03058	0	1.07964	0.00057	17.22	28.1736	18.25058	17.22	18.29964	17.22057
24/12/2001	9.73825	1.19318	0	0.63199	0	20.48	30.21825	21.67318	20.48	21.11199	20.48
25/12/2001	7.88529	3.30763	0	0.15351	0	17.78	25.66529	21.08763	17.78	17.93351	17.78
26/12/2001	5.13374	8.05489	0.00005	1.00664	0.0005	20.56	25.69374	28.61489	20.56005	21.56664	20.5605
27/12/2001	15.63706	0.0875	0.4885	0.16258	1.50457	18.42	34.05706	18.5075	18.9085	18.58258	19.92457
28/12/2001	3.43452	2.86476	0.01134	0.68726	0.08025	16.34	19.77452	19.20476	16.35134	17.02726	16.42025
29/12/2001	0.01676	1.47945	0.0005	1.61475	0.14837	17.6	17.61676	19.07945	17.6005	19.21475	17.74837
30/12/2001	4.10138	0.01471	0	1.48398	0.03935	24.23	28.33138	24.24471	24.23	25.71398	24.26935
31/12/2001	19.76844	15.71693	1.43105	8.42665	8.49888	13.96	33.72844	29.67693	15.39105	22.38665	22.45888
Maximum	40.21948	18.31924	2.23315	14.92394	17.97099	34.58	55.36948	38.99693	34.5802	34.59866	34.91446

Attachment E

Sample ISCST3 model output file

RES2A.OUT

co starting

titleone Keepit Dam
titletwo Scenario 2a. PM10 annual - concentration
modelopt rural conc nocalm
avertime annual
pollutid PM10
flagpole 0.0
runornot run

co finished

so starting

** Wind Erosion and Maintenance Stockpiles

LOCATION	Pile1	AREA	259850	6581188					
SRCPARAM	Pile1	1.53e-5	1.0	10	50	90			
EMISFACT	Pile1	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	
LOCATION	Pile2	AREA	262892	6579215					
SRCPARAM	Pile2	1.53e-5	1.0	10	50	90			
EMISFACT	Pile2	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	

** exposed surfaces

LOCATION	Area1	AREA	262452	6578532					
SRCPARAM	Area1	1.31e-7	0.1	28	100				
EMISFACT	Area1	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	

LOCATI ON	Area2	AREA	262937	RES2A. OUT	6579139				
SRCPARAM	Area2		1.31e-7	0.1	28	100			
EMI SFACT	Area2	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	

LOCATI ON	Area3	AREA	259810	6581152					
SRCPARAM	Area3		1.31e-7	0.1	28	100			
EMI SFACT	Area3	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	

LOCATI ON	Area4	AREA	259937	6580608					
SRCPARAM	Area4		1.31e-7	0.1	28	100			
EMI SFACT	Area4	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	

LOCATI ON	Area5	AREA	260760	6579658					
SRCPARAM	Area5		1.31e-7	0.1	28	100			
EMI SFACT	Area5	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	

LOCATI ON	Area6	AREA	260304	6580253					
SRCPARAM	Area6		1.31e-7	0.1	28	100			
EMI SFACT	Area6	STAR	6*0.0	6*0.0	6*0.25	6*0.5	6*1.0	6*1.0	

** bl asti ng

LOCATI ON	bl ast	AREA	259920	6581228					
SRCPARAM	bl ast		5.19e-3	2	20	30			
EMI SFACT	bl ast	HROFDY	12*0.0	1*1.0	11*0.0				

** dri lli ng

LOCATI ON	dri l l 1	AREA	259930	6581200					
SRCPARAM	dri l l 1		4.10e-5	3	1	1			

LOCATI ON	dri l l 2	AREA	262506	6578608					
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RES2A. OUT

SRCPARAM drill2 4.10e-5 3 1 1

** Bulldozer - handling material

LOCATION DOZHNDL1 AREA 262127 6578405

SRCPARAM DOZHNDL1 1.02e-2 0.5 5 2

LOCATION DOZHNDL2 AREA 260025 6580025

SRCPARAM DOZHNDL2 1.02e-2 0.5 5 2

** Bulldozer - overburden

LOCATION DOZBURD1 AREA 262810 6578861

SRCPARAM DOZBURD1 8.58e-4 0.5 5 2

LOCATION DOZBURD2 AREA 260076 6580861

SRCPARAM DOZBURD2 8.58e-4 0.5 5 2

** scraper - topsoil removal

LOCATION scraper1 POINT 262506 6578709

SRCPARAM scraper1 2.20e-1 1 293 5 10

LOCATION scraper2 POINT 259987 6581101

SRCPARAM scraper2 2.20e-1 1 293 5 10

** Grader

LOCATION grader1 AREA 262500 6578700

SRCPARAM grader1 7.88e-7 0.5 5 2

RES2A. OUT

LOCATI ON grader2 AREA 259990 6581115
SRCPARAM grader2 7.88e-7 0.5 5 2

** dump truck with aggregate material (loading / dumping)

LOCATI ON TRUCK1 AREA 260152 6580760
SRCPARAM TRUCK1 8.28e-2 0.5 5 2

LOCATI ON TRUCK2 AREA 260051 6581152
SRCPARAM TRUCK2 8.28e-2 0.5 5 2

LOCATI ON TRUCK3 AREA 262532 6578912
SRCPARAM TRUCK3 8.28e-2 0.5 5 2

** handling transfer and storage of material

LOCATI ON LOAD1 AREA 259908 6581127
SRCPARAM LOAD1 1.21e-3 0.5 5 2

LOCATI ON LOAD2 AREA 259950 6581140
SRCPARAM LOAD2 1.21e-3 0.5 5 2

LOCATI ON LOAD3 AREA 262836 6578912
SRCPARAM LOAD3 1.21e-3 0.5 5 2

** paved roads

LOCATI ON PvRd1 AREA 262000 6578377
SRCPARAM PvRd1 4.75e-7 0.1 20 100 45

LOCATI ON PvRd2 AREA 261955 6578452

RES2A. OUT

SRCPARAM	PvRd2	4.75e-7	0.1	20	100	45
LOCATI ON	PvRd3	AREA	261955	6578628		
SRCPARAM	PvRd3	4.75e-7	0.1	20	100	110
LOCATI ON	PvRd4	AREA	261892	6578716		
SRCPARAM	PvRd4	4.75e-7	0.1	20	100	110
LOCATI ON	PvRd5	AREA	261716	6578904		
SRCPARAM	PvRd5	4.75e-7	0.1	20	100	20
LOCATI ON	PvRd6	AREA	261540	6579101		
SRCPARAM	PvRd6	4.75e-7	0.1	20	100	120
LOCATI ON	PvRd7	AREA	261452	6579176		
SRCPARAM	PvRd7	4.75e-7	0.1	20	100	100
LOCATI ON	PvRd8	AREA	261339	6579226		
SRCPARAM	PvRd8	4.75e-7	0.1	20	100	-5
LOCATI ON	PvRd9	AREA	261214	6579327		
SRCPARAM	PvRd9	4.75e-7	0.1	20	100	120
LOCATI ON	PvRd10	AREA	261113	6579402		
SRCPARAM	PvRd10	4.75e-7	0.1	20	100	120
LOCATI ON	PvRd11	AREA	261163	6579625		
SRCPARAM	PvRd11	4.75e-7	0.1	20	100	120
LOCATI ON	PvRd12	AREA	262880	6579050		
SRCPARAM	PvRd12	4.75e-7	0.1	20	100	-5
LOCATI ON	PvRd13	AREA	262804	6579503		
SRCPARAM	PvRd13	4.75e-7	0.1	20	100	-5

RES2A. OUT

LOCATI ON	PvRd14	AREA	262729	6579980				
SRCPARAM	PvRd14	4.75e-7	0.1	50	100	-5		
LOCATI ON	PvRd15	AREA	262704	6580553				
SRCPARAM	PvRd15	4.75e-7	0.1	20	100	-5		
LOCATI ON	PvRd16	AREA	263301	6580553				
SRCPARAM	PvRd16	4.75e-7	0.1	20	100	-5		
LOCATI ON	PvRd17	AREA	260930	6579792				
SRCPARAM	PvRd17	4.75e-7	0.1	20	100	-5		
LOCATI ON	PvRd18	AREA	260553	6579792				
SRCPARAM	PvRd18	4.75e-7	0.1	20	100	-5		
LOCATI ON	PvRd19	AREA	260836	6579817				
SRCPARAM	PvRd19	4.75e-7	0.1	20	100	70		
LOCATI ON	PvRd20	AREA	260403	6579874				
SRCPARAM	PvRd20	4.75e-7	0.1	20	100	70		
LOCATI ON	PvRd21	AREA	260203	6579962				
SRCPARAM	PvRd21	4.75e-7	0.1	20	100	70		
LOCATI ON	PvRd22	AREA	260076	6580051				
SRCPARAM	PvRd22	4.75e-7	0.1	20	100	70		
LOCATI ON	PvRd23	AREA	260000	6580226				
SRCPARAM	PvRd23	4.75e-7	0.1	20	100	70		
LOCATI ON	PvRd24	AREA	260000	6580477				
SRCPARAM	PvRd24	4.75e-7	0.1	20	100	135		
LOCATI ON	PvRd25	AREA	259820	6580666				

RES2A. OUT

SRCPARAM	PvRd25	4.75e-7	0.1	20	100	135
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LOCATI ON	PvRd26	AREA	260503	6580266		
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SRCPARAM	PvRd26	4.75e-7	0.1	20	100	95
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LOCATI ON	PvRd27	AREA	260380	6580440		
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SRCPARAM	PvRd27	4.75e-7	0.1	20	100	85
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LOCATI ON	PvRd28	AREA	260212	6580553		
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SRCPARAM	PvRd28	4.75e-7	0.1	20	100	80
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LOCATI ON	PvRd29	AREA	260177	6580691		
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SRCPARAM	PvRd29	4.75e-7	0.1	20	100	80
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LOCATI ON	PvRd30	AREA	259937	6581127		
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SRCPARAM	PvRd30	4.75e-7	0.1	20	100	80
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** unpaved roads

LOCATI ON	UnPvRd1	AREA	260165	6581291		
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SRCPARAM	UnPvRd1	1.02e-6	0.1	10	100	45
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LOCATI ON	UnPvRd2	AREA	260025	6581430		
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SRCPARAM	UnPvRd2	1.02e-6	0.1	10	100	45
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LOCATI ON	UnPvRd3	AREA	259899	6581367		
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SRCPARAM	UnPvRd3	1.02e-6	0.1	10	100	110
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LOCATI ON	UnPvRd4	AREA	259925	6581327		
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SRCPARAM	UnPvRd4	1.02e-6	0.1	10	100	110
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LOCATI ON	UnPvRd5	AREA	259950	6581076		
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SRCPARAM	UnPvRd5	1.02e-6	0.1	10	100	110
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RES2A. OUT

LOCATI ON UnPvRd6 AREA 260241 6581152
SRCPARAM UnPvRd6 1.02e-6 0.1 10 100 20

LOCATI ON UnPvRd7 AREA 260249 6581160
SRCPARAM UnPvRd7 1.02e-6 0.1 10 100 120

LOCATI ON UnPvRd8 AREA 259850 6581400
SRCPARAM UnPvRd8 1.02e-6 0.1 10 100 110

LOCATI ON UnPvRd9 AREA 259900 6581300
SRCPARAM UnPvRd9 1.02e-6 0.1 10 100 20

LOCATI ON UnPvRd10 AREA 259950 6581200
SRCPARAM UnPvRd10 1.02e-6 0.1 10 100 120

** primary crusher

LOCATI ON PCru1 POINT 260785 6580810
SRCPARAM PCru1 5.30e-3 2.0 293 2.0 10

** Compactor

LOCATI ON Cmpct1 AREA 259860 6580203
SRCPARAM Cmpct1 8.58e-4 0.1 5 10 180

LOCATI ON Cmpct2 AREA 262633 6580684
SRCPARAM Cmpct2 8.58e-4 0.1 5 10 180

** Screener

LOCATI ON Scrn1 POINT 259857 6581127
SRCPARAM Scrn1 9.34e-3 1.0 293 0.5 1.0

LOCATI ON Scrn2 POINT 262506 6578633

SRCPARAM Scrn2 9.34e-3 1.0 293 0.5 1.0

** Conveyor Transfer Point

LOCATION Cnvr1 POINT 259958 6581127

SRCPARAM Cnvr1 5.81e-4 1.0 293 0.5 1.0

LOCATION Cnvr2 POINT 260506 6580962

SRCPARAM Cnvr2 5.81e-4 1.0 293 0.5 1.0

** Truck Delivery of Aggregate

LOCATION TruAggr1 AREA 260038 6580785

SRCPARAM TruAggr1 5.25e-4 0.1 5.0 5.0 180

** FEL delivery of Aggregate

LOCATION FEL1 AREA 260036 6580778

SRCPARAM FEL1 5.25e-4 0.1 5.0 5.0 180

** Aggregate Conveyor Transfer

LOCATION Act1 AREA 260035 6580769

SRCPARAM Act1 5.25e-4 0.1 5.0 5.0 180

** Agg transfer to elevated storage

LOCATION AEIev1 AREA 260034 6580765

SRCPARAM AEIev1 3.94e-4 5.0 1.0 10.0 45

** Truck delivery of fine aggregate

LOCATION TruFAggr1 AREA 260032 6580758

SRCPARAM TruFAggr1 2.38E-4 0.1 3.0 3.0 180

** FEL delivery of fine aggregate

LOCATION FELF1 AREA 260030 6580745
SRCPARAM FELF1 2.38E-4 0.1 3.0 3.0 180

** Fine aggregate conveyor transfer

LOCATION FAct1 AREA 260026 6580728
SRCPARAM FAct1 2.38E-4 0.1 3.0 3.0 180

** Fine Agg transfer to elevated storage

LOCATION FAel ev1 AREA 260021 6580720
SRCPARAM FAel ev1 1.10E-4 5.0 1.0 10.0 45

** Cement unloading to silo

LOCATION Silo1 POINT 260012 6580706
SRCPARAM Silo1 1.31e-3 0.1 293 0.1 0.1

** Weigh Hopper Loading

LOCATION WHL1 AREA 260005 6580700
SRCPARAM WHL1 5.05e-5 0.1 1.0 1.0 180

** Truck Loading

LOCATION Tru1 AREA 260000 6580696
SRCPARAM Tru1 2.27e-3 0.1 1.0 1.0 180

srcgroup all

so finished

RES2A. OUT

re starting

el evunit meters

** 1 Receptotr 1

di sccart 259413 6581320 1.2

** 2 Receptotr 2

di sccart 259209 6580406 1.2

** 3 Receptor

di sccart 260323 6578734 1.2

** 4 Receptor 4

di sccart 263493 6579009 1.2

** 5 Receptor

di sccart 265000 6581690 1.2

** GRIDCART NETWORK STA

** XYINC 259000 61 6000 6578000 41 4000

** GRIDCART NETWORK END

** grid off 6000m x 4000m (origin 259000, 6578000)

re finished

me starting

i nputfil tam01.prn

anemhght 10 METERS

surfdata 00000 2001 tam

uai rdata 00000 2001 tam

** wdrotate 180

me finished

RES2A. OUT

**Misc. Inputs: Anem. Hgt. (m) = 10.00 ; Decay Coef. = 0.000 ;
 Rot. Angle = 0.0
 Emission Units = GRAMS/SEC ;
 Emission Rate Unit Factor = 0.10000E+07
 Output Units = MICROGRAMS/M**3

**Approximate Storage Requirements of Model = 1.3 MB of RAM.

**Input Runstream File: 6152_2a.inp

**Output Print File: res2a.out

□ *** ISCST3 - VERSION 02035 *** Keepit Dam
 *** 09/03/08
 *** Scenario 2a. PM10 annual - concentration
 *** 21:05:21

**MODELOPTs:

CONC RURAL FLAT FLGPOL PAGE 2 NOCALM

*** POINT SOURCE DATA ***

STACK SOURCE ID (M/SEC)	STACK PART. DIAMETER CATS. (METERS)	NUMBER BUILDING EXISTS	EMISSION RATE (GRAMS/SEC)	EMISSION RATE X SCALAR VARY (METERS) BY	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG. K)	
SCRAPER1	5.00	10.00	0	0.22000E+00	262506.0	6578709.0	0.0	1.00	293.00
SCRAPER2	5.00	10.00	0	0.22000E+00	259987.0	6581101.0	0.0	1.00	293.00
PCRU1	2.00	10.00	0	0.53000E-02	260785.0	6580810.0	0.0	2.00	293.00
SCRN1	0.50	1.00	0	0.93400E-02	259857.0	6581127.0	0.0	1.00	293.00
SCRN2	0.50	1.00	0	0.93400E-02	262506.0	6578633.0	0.0	1.00	293.00
CNVR1	0.50	1.00	0	0.58100E-03	259958.0	6581127.0	0.0	1.00	293.00
CNVR2	0.50	1.00	0	0.58100E-03	260506.0	6580962.0	0.0	1.00	293.00
SIL01	0.10	0.10	0	0.13100E-02	260012.0	6580706.0	0.0	0.10	293.00

□ *** ISCST3 - VERSION 02035 *** Keepit Dam
 *** 09/03/08
 *** Scenario 2a. PM10 annual - concentration
 *** 21:05:21

**MODELOPTs:

CONC RURAL FLAT FLGPOL PAGE 3 NOCALM

*** AREA SOURCE DATA ***

Y-DIM SOURCE OF AREA	ORIENT. OF AREA	NUMBER PART. OF AREA	EMISSION RATE (GRAMS/SEC) SZ	EMISSION RATE X SCALAR VARY	COORD (SW CORNER) X Y	BASE ELEV.	RELEASE HEIGHT	X-DIM OF AREA
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ID (METERS)	CATS. (DEG.)	/METER**2) (METERS)	RES2A. OUT				
			BY	(METERS)	(METERS)	(METERS)	(METERS)
PILE1	0	0.15300E-04	259850.0	6581188.0	0.0	1.00	10.00
50.00	90.00	0.00	STAR				
PILE2	0	0.15300E-04	262892.0	6579215.0	0.0	1.00	10.00
50.00	90.00	0.00	STAR				
AREA1	0	0.13100E-06	262452.0	6578532.0	0.0	0.10	28.00
100.00	0.00	0.00	STAR				
AREA2	0	0.13100E-06	262937.0	6579139.0	0.0	0.10	28.00
100.00	0.00	0.00	STAR				
AREA3	0	0.13100E-06	259810.0	6581152.0	0.0	0.10	28.00
100.00	0.00	0.00	STAR				
AREA4	0	0.13100E-06	259937.0	6580608.0	0.0	0.10	28.00
100.00	0.00	0.00	STAR				
AREA5	0	0.13100E-06	260760.0	6579658.0	0.0	0.10	28.00
100.00	0.00	0.00	STAR				
AREA6	0	0.13100E-06	260304.0	6580253.0	0.0	0.10	28.00
100.00	0.00	0.00	STAR				
BLAST	0	0.51900E-02	259920.0	6581228.0	0.0	2.00	20.00
30.00	0.00	0.00	HROFDY				
DRI LL1	0	0.41000E-04	259930.0	6581200.0	0.0	3.00	1.00
1.00	0.00	0.00					
DRI LL2	0	0.41000E-04	262506.0	6578608.0	0.0	3.00	1.00
1.00	0.00	0.00					
DOZHNDL1	0	0.10200E-01	262127.0	6578405.0	0.0	0.50	5.00
2.00	0.00	0.00					
DOZHNDL2	0	0.10200E-01	260025.0	6580025.0	0.0	0.50	5.00
2.00	0.00	0.00					
DOZBURD1	0	0.85800E-03	262810.0	6578861.0	0.0	0.50	5.00
2.00	0.00	0.00					
DOZBURD2	0	0.85800E-03	260076.0	6580861.0	0.0	0.50	5.00
2.00	0.00	0.00					
GRADER1	0	0.78800E-06	262500.0	6578700.0	0.0	0.50	5.00
2.00	0.00	0.00					
GRADER2	0	0.78800E-06	259990.0	6581115.0	0.0	0.50	5.00
2.00	0.00	0.00					
TRUCK1	0	0.82800E-01	260152.0	6580760.0	0.0	0.50	5.00
2.00	0.00	0.00					
TRUCK2	0	0.82800E-01	260051.0	6581152.0	0.0	0.50	5.00
2.00	0.00	0.00					
TRUCK3	0	0.82800E-01	262532.0	6578912.0	0.0	0.50	5.00
2.00	0.00	0.00					
LOAD1	0	0.12100E-02	259908.0	6581127.0	0.0	0.50	5.00
2.00	0.00	0.00					
LOAD2	0	0.12100E-02	259950.0	6581140.0	0.0	0.50	5.00
2.00	0.00	0.00					
LOAD3	0	0.12100E-02	262836.0	6578912.0	0.0	0.50	5.00
2.00	0.00	0.00					
PVRD1	0	0.47500E-06	262000.0	6578377.0	0.0	0.10	20.00
100.00	45.00	0.00					
PVRD2	0	0.47500E-06	261955.0	6578452.0	0.0	0.10	20.00
100.00	45.00	0.00					
PVRD3	0	0.47500E-06	261955.0	6578628.0	0.0	0.10	20.00
100.00	110.00	0.00					
PVRD4	0	0.47500E-06	261892.0	6578716.0	0.0	0.10	20.00
100.00	110.00	0.00					
PVRD5	0	0.47500E-06	261716.0	6578904.0	0.0	0.10	20.00
100.00	20.00	0.00					
PVRD6	0	0.47500E-06	261540.0	6579101.0	0.0	0.10	20.00
100.00	120.00	0.00					
PVRD7	0	0.47500E-06	261452.0	6579176.0	0.0	0.10	20.00
100.00	100.00	0.00					
PVRD8	0	0.47500E-06	261339.0	6579226.0	0.0	0.10	20.00
100.00	-5.00	0.00					
PVRD9	0	0.47500E-06	261214.0	6579327.0	0.0	0.10	20.00
100.00	120.00	0.00					

RES2A. OUT

PVRD10	0	0.47500E-06	261113.0	6579402.0	0.0	0.10	20.00
100.00	120.00	0.00					
PVRD11	0	0.47500E-06	261163.0	6579625.0	0.0	0.10	20.00
100.00	120.00	0.00					
PVRD12	0	0.47500E-06	262880.0	6579050.0	0.0	0.10	20.00
100.00	-5.00	0.00					
PVRD13	0	0.47500E-06	262804.0	6579503.0	0.0	0.10	20.00
100.00	-5.00	0.00					
PVRD14	0	0.47500E-06	262729.0	6579980.0	0.0	0.10	50.00
100.00	-5.00	0.00					
PVRD15	0	0.47500E-06	262704.0	6580553.0	0.0	0.10	20.00
100.00	-5.00	0.00					
PVRD16	0	0.47500E-06	263301.0	6580553.0	0.0	0.10	20.00
100.00	-5.00	0.00					
PVRD17	0	0.47500E-06	260930.0	6579792.0	0.0	0.10	20.00
100.00	-5.00	0.00					

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**MODELOPTS:

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 RURAL FLAT FLGPNL NOCALM

*** AREA SOURCE DATA ***

Y-DIM SOURCE OF AREA ID (METERS)	ORIENT. PART. OF AREA CATS. (DEG.)	EMISSION RATE INIT. (GRAMS/SEC SZ /METER**2)	EMISSION RATE SCALAR VARY BY	COORD (SW CORNER) X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	X-DIM OF AREA (METERS)
PVRD18	0	0.47500E-06		260553.0	6579792.0	0.0	0.10	20.00
100.00	-5.00	0.00						
PVRD19	0	0.47500E-06		260836.0	6579817.0	0.0	0.10	20.00
100.00	70.00	0.00						
PVRD20	0	0.47500E-06		260403.0	6579874.0	0.0	0.10	20.00
100.00	70.00	0.00						
PVRD21	0	0.47500E-06		260203.0	6579962.0	0.0	0.10	20.00
100.00	70.00	0.00						
PVRD22	0	0.47500E-06		260076.0	6580051.0	0.0	0.10	20.00
100.00	70.00	0.00						
PVRD23	0	0.47500E-06		260000.0	6580226.0	0.0	0.10	20.00
100.00	70.00	0.00						
PVRD24	0	0.47500E-06		260000.0	6580477.0	0.0	0.10	20.00
100.00	135.00	0.00						
PVRD25	0	0.47500E-06		259820.0	6580666.0	0.0	0.10	20.00
100.00	135.00	0.00						
PVRD26	0	0.47500E-06		260503.0	6580266.0	0.0	0.10	20.00
100.00	95.00	0.00						
PVRD27	0	0.47500E-06		260380.0	6580440.0	0.0	0.10	20.00
100.00	85.00	0.00						
PVRD28	0	0.47500E-06		260212.0	6580553.0	0.0	0.10	20.00
100.00	80.00	0.00						
PVRD29	0	0.47500E-06		260177.0	6580691.0	0.0	0.10	20.00
100.00	80.00	0.00						
PVRD30	0	0.47500E-06		259937.0	6581127.0	0.0	0.10	20.00
100.00	80.00	0.00						
UNPVRD1	0	0.10200E-05		260165.0	6581291.0	0.0	0.10	10.00
100.00	45.00	0.00						
UNPVRD2	0	0.10200E-05		260025.0	6581430.0	0.0	0.10	10.00
100.00	45.00	0.00						
UNPVRD3	0	0.10200E-05		259899.0	6581367.0	0.0	0.10	10.00
100.00	45.00	0.00						

RES2A. OUT

UNPVRD1 , PVRD24 , PVRD25 , PVRD26 , PVRD27 , PVRD28 , PVRD29 , PVRD30 ,
UNPVRD2 , UNPVRD3 , UNPVRD4 , UNPVRD5 ,

CMPCT2 , UNPVRD6 , UNPVRD7 , UNPVRD8 , UNPVRD9 , UNPVRD10, PCRU1 , CMPCT1 ,
SCRN1 , SCRN2 , CNVR1 , CNVR2 ,

FAELEV1 , SILO1 , WHL1 , TRU1 , ACT1 , AELEV1 , TRUFAGGR, FELF1 , FACT1 ,
TRUAGGR1, FEL1 , ACT1 , AELEV1 , TRUFAGGR, FELF1 , FACT1 ,

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**MODELOPTS:

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FLGPOL NOCALM

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH
HOUR OF THE DAY *

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00
5	.00000E+00	6	.00000E+00	7	.00000E+00	8	.00000E+00
9	.00000E+00	10	.00000E+00	11	.00000E+00	12	.00000E+00
13	.10000E+01	14	.00000E+00	15	.00000E+00	16	.00000E+00
17	.00000E+00	18	.00000E+00	19	.00000E+00	20	.00000E+00
21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

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**MODELOPTS:

CONC RURAL FLAT PAGE 7
FLGPOL NOCALM

* SOURCE EMISSION RATE SCALARS WHICH VARY WITH STABILITY AND
WIND SPEED (STAR) *

SOURCE ID = PILE1 ; SOURCE TYPE = AREA :

WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
CATEGORY 5	CATEGORY 6	CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
STABILITY CATEGORY A	STABILITY CATEGORY B	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
STABILITY CATEGORY C	STABILITY CATEGORY D	0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00
STABILITY CATEGORY E		0.50000E+00	0.50000E+00	0.50000E+00	0.50000E+00
		0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01

RES2A. OUT

0.10000E+01 0.10000E+01
STABILITY CATEGORY F 0.10000E+01 0.10000E+01 0.10000E+01 0.10000E+01
0.10000E+01 0.10000E+01

SOURCE ID = PILE2 ; SOURCE TYPE = AREA :

WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
CATEGORY 5	CATEGORY 6	CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00
0.50000E+00	0.50000E+00	0.50000E+00	0.50000E+00	0.50000E+00	0.50000E+00
0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01
0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01

SOURCE ID = AREA1 ; SOURCE TYPE = AREA :

WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
CATEGORY 5	CATEGORY 6	CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00
0.50000E+00	0.50000E+00	0.50000E+00	0.50000E+00	0.50000E+00	0.50000E+00
0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01
0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01	0.10000E+01

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**MODELOPTS:

CONC RURAL FLAT FLGPOL PAGE 8 NOCALM

WIND SPEED (STAR) * SOURCE EMISSION RATE SCALARS WHICH VARY WITH STABILITY AND

SOURCE ID = AREA2 ; SOURCE TYPE = AREA :

WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
CATEGORY 5	CATEGORY 6	CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00	0.25000E+00

RES2A. OUT

0. 25000E+00	0. 25000E+00				
STABILITY CATEGORY D		0. 50000E+00	0. 50000E+00	0. 50000E+00	0. 50000E+00
0. 50000E+00	0. 50000E+00				
STABILITY CATEGORY E		0. 10000E+01	0. 10000E+01	0. 10000E+01	0. 10000E+01
0. 10000E+01	0. 10000E+01				
STABILITY CATEGORY F		0. 10000E+01	0. 10000E+01	0. 10000E+01	0. 10000E+01
0. 10000E+01	0. 10000E+01				

SOURCE ID = AREA3 ; SOURCE TYPE = AREA :

WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
		CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
CATEGORY 5	CATEGORY 6				
STABILITY CATEGORY A		0. 00000E+00	0. 00000E+00	0. 00000E+00	0. 00000E+00
0. 00000E+00	0. 00000E+00				
STABILITY CATEGORY B		0. 00000E+00	0. 00000E+00	0. 00000E+00	0. 00000E+00
0. 00000E+00	0. 00000E+00				
STABILITY CATEGORY C		0. 25000E+00	0. 25000E+00	0. 25000E+00	0. 25000E+00
0. 25000E+00	0. 25000E+00				
STABILITY CATEGORY D		0. 50000E+00	0. 50000E+00	0. 50000E+00	0. 50000E+00
0. 50000E+00	0. 50000E+00				
STABILITY CATEGORY E		0. 10000E+01	0. 10000E+01	0. 10000E+01	0. 10000E+01
0. 10000E+01	0. 10000E+01				
STABILITY CATEGORY F		0. 10000E+01	0. 10000E+01	0. 10000E+01	0. 10000E+01
0. 10000E+01	0. 10000E+01				

SOURCE ID = AREA4 ; SOURCE TYPE = AREA :

WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
		CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
CATEGORY 5	CATEGORY 6				
STABILITY CATEGORY A		0. 00000E+00	0. 00000E+00	0. 00000E+00	0. 00000E+00
0. 00000E+00	0. 00000E+00				
STABILITY CATEGORY B		0. 00000E+00	0. 00000E+00	0. 00000E+00	0. 00000E+00
0. 00000E+00	0. 00000E+00				
STABILITY CATEGORY C		0. 25000E+00	0. 25000E+00	0. 25000E+00	0. 25000E+00
0. 25000E+00	0. 25000E+00				
STABILITY CATEGORY D		0. 50000E+00	0. 50000E+00	0. 50000E+00	0. 50000E+00
0. 50000E+00	0. 50000E+00				
STABILITY CATEGORY E		0. 10000E+01	0. 10000E+01	0. 10000E+01	0. 10000E+01
0. 10000E+01	0. 10000E+01				
STABILITY CATEGORY F		0. 10000E+01	0. 10000E+01	0. 10000E+01	0. 10000E+01
0. 10000E+01	0. 10000E+01				

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**MODELOPTS:

CONC RURAL FLAT FLGPOL PAGE 9 NOCALM

WIND SPEED (STAR) * SOURCE EMISSION RATE SCALARS WHICH VARY WITH STABILITY AND *

SOURCE ID = AREA5 ; SOURCE TYPE = AREA :

WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED	WIND SPEED
		CATEGORY 1	CATEGORY 2	CATEGORY 3	CATEGORY 4
CATEGORY 5	CATEGORY 6				
STABILITY CATEGORY A		0. 00000E+00	0. 00000E+00	0. 00000E+00	0. 00000E+00

CONC

RURAL FLAT FLGPOL

NOCALM

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: tam01.prn

FORMAT: (4I 2, 2F9. 4, F6. 1, I 2, 2F7. 1, f9. 4, f10. 1, f8. 4, i 4, f7. 2)

0 SURFACE STATION NO. : 0 UPPER AIR STATION NO. :
 NAME: TAM NAME: TAM
 YEAR: 2001 YEAR:

Z-0	IPCODE	FLOW PRATE	SPEED	TEMP	STAB	MIXING HEIGHT (M)	USTAR	M-0 LENGTH
YR MN DY HR	VECTOR	(M/S)	(K)	CLASS	RURAL	URBAN	(M/S)	(M)
(M)	(mm/HR)							
01 01 01 01	209.0	5.60	290.0	4	2029.0	2029.0	0.0000	0.0
01 01 01 02	219.0	6.70	290.0	4	2029.0	2029.0	0.0000	0.0
01 01 01 03	167.0	7.10	290.0	4	2152.0	2152.0	0.0000	0.0
01 01 01 04	230.0	6.90	289.0	4	2081.0	2081.0	0.0000	0.0
01 01 01 05	137.0	4.60	286.0	4	50.0	50.0	0.0000	0.0
01 01 01 06	189.0	6.00	286.0	4	244.0	244.0	0.0000	0.0
01 01 01 07	166.0	6.00	290.0	4	473.0	473.0	0.0000	0.0
01 01 01 08	176.0	6.50	292.0	4	689.0	689.0	0.0000	0.0
01 01 01 09	183.0	7.10	295.0	4	889.0	889.0	0.0000	0.0
01 01 01 10	349.0	7.40	296.0	4	1067.0	1067.0	0.0000	0.0
01 01 01 11	355.0	7.00	297.0	4	1219.0	1219.0	0.0000	0.0
01 01 01 12	6.0	6.90	299.0	4	1341.0	1341.0	0.0000	0.0
01 01 01 13	326.0	5.80	299.0	4	1429.0	1429.0	0.0000	0.0
01 01 01 14	349.0	5.50	300.0	4	1483.0	1483.0	0.0000	0.0
01 01 01 15	320.0	3.70	301.0	4	1500.0	1500.0	0.0000	0.0
01 01 01 16	107.0	5.50	302.0	4	1480.0	1480.0	0.0000	0.0
01 01 01 17	114.0	5.40	301.0	4	1424.0	1424.0	0.0000	0.0
01 01 01 18	95.0	5.40	300.0	4	1333.0	1333.0	0.0000	0.0
01 01 01 19	160.0	5.10	299.0	4	1561.0	1561.0	0.0000	0.0
01 01 01 20	157.0	5.50	297.0	4	1674.0	1674.0	0.0000	0.0
01 01 01 21	136.0	5.40	296.0	4	1651.0	1651.0	0.0000	0.0
01 01 01 22	138.0	5.60	295.0	4	1691.0	1691.0	0.0000	0.0

RES2A. OUT
 01 01 01 23 188.0 5.40 294.0 4 1641.0 1641.0 0.0000 0.0
 0.0000 0 0.00
 01 01 01 24 167.0 4.30 293.0 5 202.0 202.0 0.0000 0.0
 0.0000 0 0.00

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
 FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

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**MODELOPTS:

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*** THE ANNUAL (1 YRS) AVERAGE CONCENTRATION
 VALUES FOR SOURCE GROUP: ALL ***
 INCLUDING SOURCE(S): PILE1 , PILE2 ,
 AREA1 , AREA2 , AREA3 , AREA4 , AREA5 ,
 AREA6 , BLAST , DRI LL1 , DRI LL2 , DOZHNDL1, DOZHNDL2, DOZBURD1,
 DOZBURD2, SCRAPER1, SCRAPER2, GRADER1 , GRADER2 ,
 TRUCK1 , TRUCK2 , TRUCK3 , LOAD1 , LOAD2 , LOAD3 , PVRD1 ,
 PVRD2 , PVRD3 , PVRD4 , PVRD5 , . . . ,

*** DISCRETE CARTESIAN RECEPTOR
 POINTS ***

** CONC OF PM10 IN MICROGRAMS/M**3
 **
 X-COORD (M) Y-COORD (M) CONC X-COORD (M)
 Y-COORD (M) CONC

 259413.00 6581320.00 3.31515 259209.00
 6580406.00 1.89151
 260323.00 6578734.00 1.68254 263493.00
 6579009.00 1.09279
 265000.00 6581690.00 0.15671

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**MODELOPTS:

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*** THE SUMMARY OF MAXIMUM ANNUAL (1 YRS) RESULTS ***

** CONC OF PM10 IN MICROGRAMS/M**3
 **

NETWORK
 GROUP ID AVERAGE CONC RECEPTOR (XR, YR,
 ZELEV, ZFLAG) OF TYPE GRID-ID

 ALL 1ST HIGHEST VALUE IS 3.31515 AT (259413.00, 6581320.00,
 0.00, 1.20) DC NA
 2ND HIGHEST VALUE IS 1.89151 AT (259209.00, 6580406.00,

RES2A. OUT

0.00,	1.20)	DC	NA			
	3RD HI	GHEST	VALUE IS	1.68254	AT (260323.00, 6578734.00,
0.00,	1.20)	DC	NA			
	4TH HI	GHEST	VALUE IS	1.09279	AT (263493.00, 6579009.00,
0.00,	1.20)	DC	NA			
	5TH HI	GHEST	VALUE IS	0.15671	AT (265000.00, 6581690.00,
0.00,	1.20)	DC	NA			
	6TH HI	GHEST	VALUE IS	0.00000	AT (0.00, 0.00,
0.00,	0.00)					
	7TH HI	GHEST	VALUE IS	0.00000	AT (0.00, 0.00,
0.00,	0.00)					
	8TH HI	GHEST	VALUE IS	0.00000	AT (0.00, 0.00,
0.00,	0.00)					
	9TH HI	GHEST	VALUE IS	0.00000	AT (0.00, 0.00,
0.00,	0.00)					
	10TH HI	GHEST	VALUE IS	0.00000	AT (0.00, 0.00,
0.00,	0.00)					

*** RECEPTOR TYPES: GC = GRIDCART
 GP = GRIDPOLR
 DC = DISCCART
 DP = DISCPOLR
 BD = BOUNDARY

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**MODELOPTs:

CONC RURAL FLAT FLGPOL PAGE 15 NOCALM

*** Message Summary : ISCST3 Model Execution ***

----- Summary of Total Messages -----

A Total of 0 Fatal Error Message(s)
 A Total of 0 Warning Message(s)
 A Total of 0 Informational Message(s)

***** FATAL ERROR MESSAGES *****
 *** NONE ***

***** WARNING MESSAGES *****
 *** NONE ***

 *** ISCST3 Finishes Successfully ***
