Appendix J

Odour Impact Assessment prepared by Benbow Environmental

REPORT FOR
ODOUR IMPACT ASSESSMENT
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EXECUTIVE SUMMARY

Benbow Environmental was commissioned by E.G. Property Group (on behalf of Mary Camilleri) to conduct an Odour Impact Assessment (OIA) for the existing operations of the Wollondilly Abattoir located at 48-70 Koorana Rd, Picton NSW. The study was focused on determining the extent of potential odour impacts from the abattoir, and its effect on the proposed subdivision areas to be located south of the subject abattoir. Given that the recommendations provided by Benbow Environmental are established, it has been concluded that the odour impacts of the abattoir towards the subject land are apparent and can be used to provide decision-making inputs with respect to odour.

The abattoir site consists of a main building, and office building near the entrance to the site, aerobic and anaerobic ponds for waste treatment, and a small-sized stockpile area for waste. The abattoir site operates with an anticipated production capacity of more than 30,000 tonnes per annum of livestock processed material. Livestock processed on site includes (and may not be limited to) cattle, sheep and pigs. Discussions with the operations manager on site indicate that there were intentions to implement vegetation controls along the boundaries of the subject site, but were not established due to changes in site operation priorities and other factors. The Environment Protection Licence (EPL) of the subject abattoir was also examined, which shows no requirements or conditions relating to odour emissions from the subject site.

The OIA was conducted in accordance with the guidelines "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW", "Technical Framework – Assessment and Management of Stationary Sources of Odour in NSW", and its associated "Technical Notes", which are all published by the Office of Environment & Heritage (OEH). These are referred to as the (OEH) odour modelling guidelines.

This OIA report provides a summary of the methodology used (in detail as prescribed by the OEH odour modelling guidelines) and the outcomes of the assessment, along with (if necessary) any recommendations to help achieve compliance with the OEH-based odour criterion.

Gridded receptors were selected for this assessment, which were used to provide the detailed ground level odour concentration isopleth diagrams.

Outcomes from the assessment and its modelling component only show exceedances at two of the discrete receptors located within the proposed subdivision, selected by Benbow Environmental. These two receptors were determined to be not part of the development footprint, allowing to achieve compliance with the OEH odour guidelines.

Benbow Environmental recommends the construction of the heavily vegetated earth berms, not only to eliminate the line of sight (which would then eliminate possible perception of odour being present at the subdivision areas), but would also further reduce the odour impacts from the abattoir.

Compliance to the OEH guidelines is achieved either by removing the two identified receptors from the development footprint, or by establishing heavily vegetated earth berms to futher reduce the odour impacts toward the subdivision.

where - on or off site?

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1. INTRODUCTION

Benbow Environmental was commissioned to prepare an odour impact assessment for an existing abattoir at 48-70 Koorana Road, Picton NSW. The site is located in a rural area, currently surrounded with clusters of residential areas to the north, and bounded by the proposed subdivided land to the south (which is subject to a subdivision project managed by E.G. Property Group).

The objective of this study is to determine whether there will be any adverse odour impacts on the proposed land subdivision to the south of the abattoir, described by the following lot and DP details:

- Lots 46 to 52, DP 26282

Figure 1-1 shows the location of the subject abattoir and its relative location to the proposed subdivision. Figure 1-2 has been provided to show the preliminary concepts masterplan for the proposed subdivided land.

1.1 SCOPE

This odour assessment has been limited to the following:

- A review of the odour source of concern (i.e. the subject abattoir) and its operation;
- Collection of odour samples from the odour source to determine the odour intensity of the source of odour;
- Air dispersion modelling of the abattoir emissions and determine the predicted odour impacts at the nearest affected sensitive receptors;
- Assessment of the odour impact from the abattoir; and
- The compilation of a report which summarises the methodology, findings, and (if any) recommendations required to minimise the extent of odour impacts from the existing abattoir.

Figure 1-1: Location of the Subject Abattoir and the Proposed Subdivided Land

Source: © Department of Lands Spatial Information eXchange Viewer 2008

Figure 1-2: Preliminary Masterplan for the Proposed Subdivision

Source: © E.G. Property Group 2011

2. SITE IDENTIFICATION

2.1 SITE LOCATION

The subject abattoir is located at 48-70 Koorana Road, Picton NSW, which are Lots 46 to 52 of DP 26282. The abattoir occupies the south-west portion of the two consolidated lots, and is surrounded by native vegetation which borders along the site's boundary (as shown in Figure 1-1).

The land is located within the Local Government Area of Wollondilly Shire Council.

2.2 SITE DESCRIPTION AND LAND USE

The subject abattoir is bounded by Koorana Road to the north, 44 Koorana Road to the west, 80 Koorana Road to the east, and Myrtle Creek paralleled with vegetation to the south. Further south is the proposed subdivision that is being examined for odour affectation as part of this assessment report. The land currently holds 2 aerated ponds and an abattoir building, with some vacant lands on the eastern portion of the abattoir site. The only entrance to the abattoir site is via Koorana Road.

The proposed subdivision located south of the abattoir site is bounded by Myrtle Creek to the north, 140 Myrtle Creek Avenue to the west and south, and the Nepean River to the east. The land adjacent to the west and south is seen to be a greenfield and is undeveloped. Entrance to this land is only via River Road.

One of the authors of the report visited the abattoir on 27 July 2011 and has detected odour within the working areas of the abattoir. These working areas include temporary shelters for livestock delivered to the site pending for processing. Waste stockpiles are also kept within proximity to the abattoir building. Certain odour patterns were observed by one of the authors of the report at the entrance of the Koorana Road site, which will assist in validating the results from the model (which shall be discussed at the latter section of this report).

2.3 TERRAIN OF THE LOCAL REGION

The abattoir site is located within the area of Picton / Tahmoor, with undulating terrain given the locations of the Nepean River and its tributaries around the subject region. Terrain is generally seen to gradually decrease towards the Nepean River and Myrtle Creek, with an increase in elevation towards the north-west direction of the abattoir site.

Figure 2-1 and Figure 2-2 illustrates the terrain within the region of the subject abattoir and its surroundings in a three-dimensional view.

Figure 2-1: Three-Dimensional View of Terrain of the Region with an Exaggerated Z-Axis (Z-Axis Increased by Factor of 4)

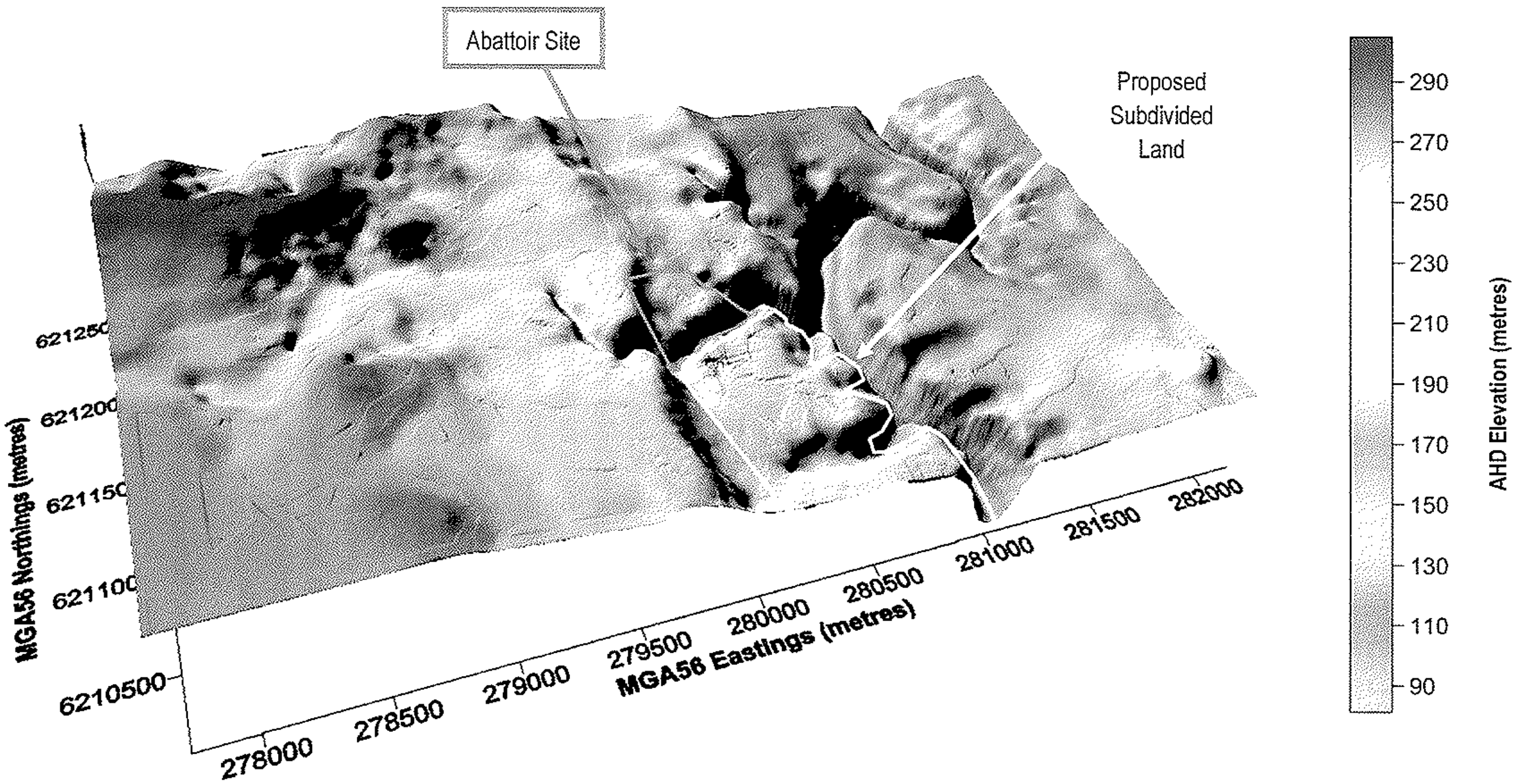
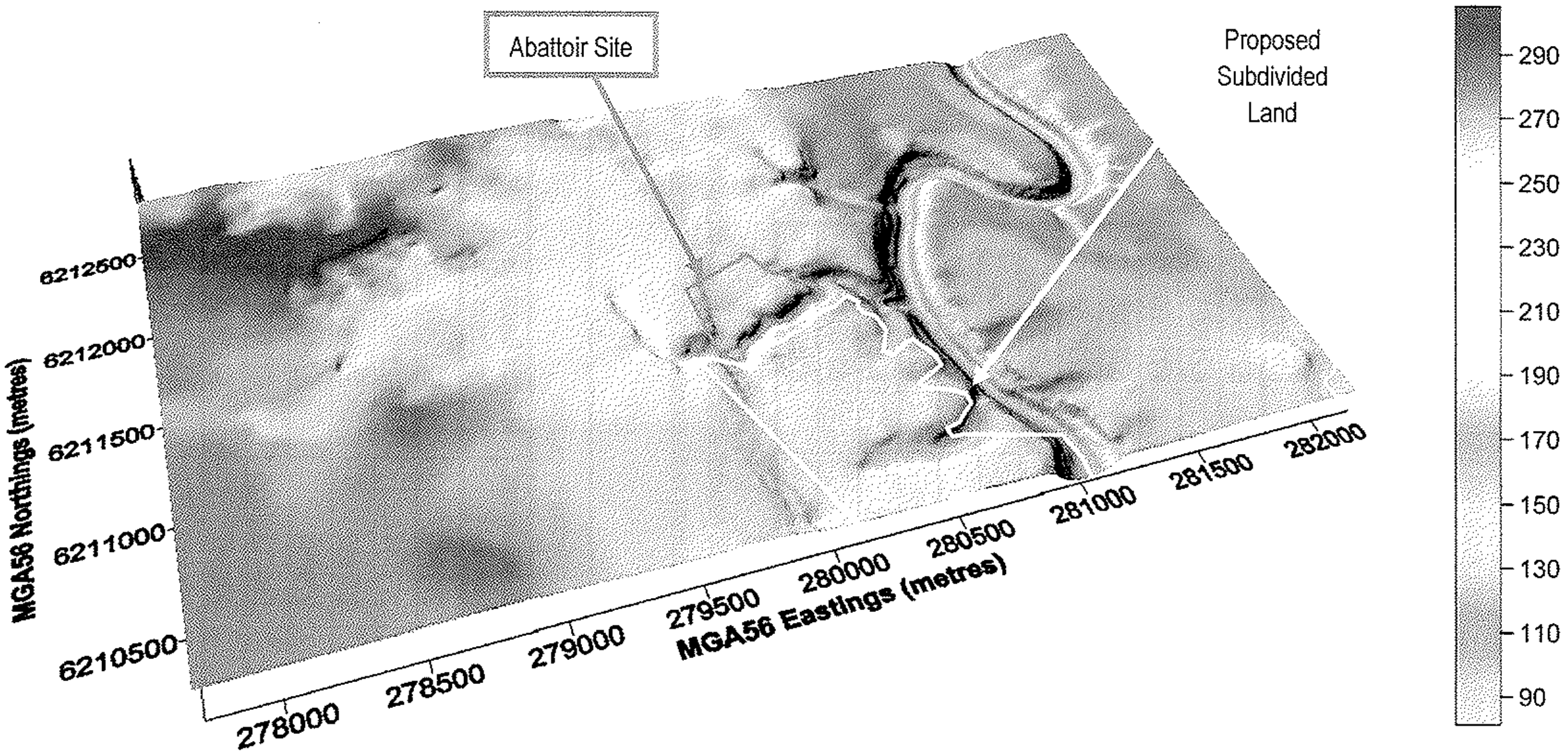


Figure 2-2: Three-Dimensional View of Terrain of the Region with all Axes Equally Scaled



2.4 Receptor Locations

Discrete receptors were selected for this assessment and placed at specially designated sites within the area of the future subdivision. Discrete receptors are locations that are relatively close to the odour emission sources being examined – these receptors would be assessed by determining the ground level concentration results through the use of an air dispersion modelling program. The receptors are listed below.

Table 2-1: List of Selected Discrete Receptors

Receptor ID	MGA56 Northings (metres)	MGA56 Eastings (metres)
R1	280404	6210984
R2	280402	6211061
R3	280331	6211090
R4	280253	6211028
R5	280191	6210981
R6	280102	6210984
R7	280075	6210955
R8	279928	6210970
R9	279957	6210941
R10	279980	6210906
R11	280006	6210870
R12	279955	6210846

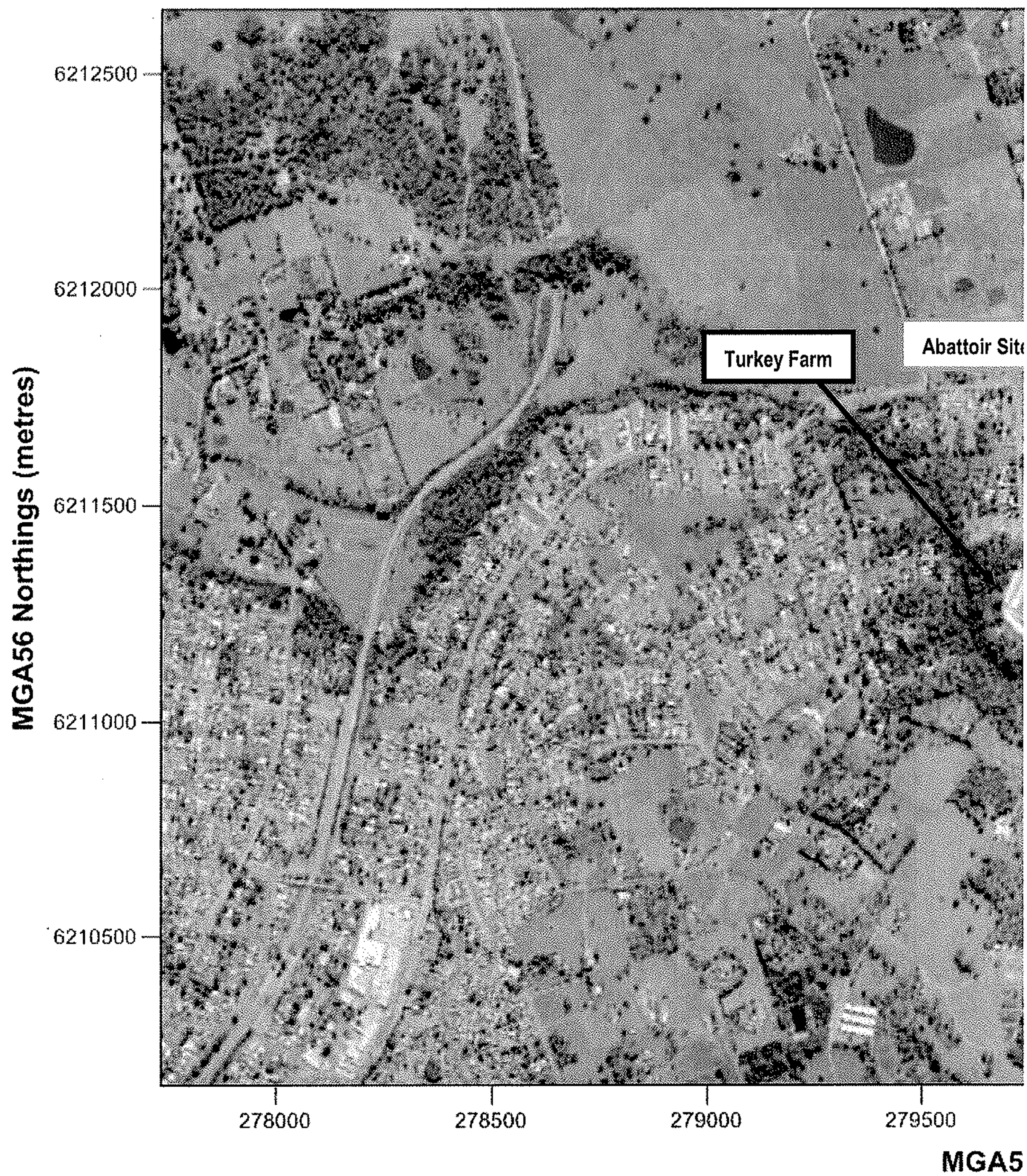
In addition to discrete receptors, the nearest affected residential receptors were also selected. The selected residential receptors, which are current residences located within proximity to the abattoir site, are listed in Table 2-2.

Table 2-2: List of Selected Residential Receptors

Receptor ID	MGA56 Northings (metres)	MGA56 Eastings (metres)	Address
R13	279775	6211476	35 Koorana Road, Picton 2571
R14	279714	621 1442	30 Koorana Road, Picton 2571
R15	279882	6211616	12 Kent Road, Picton 2571
R16	279984	6211681	24 Kent Road, Picton 2571
R17	280072	6211787	34 Kent Road, Picton 2571
R18	280367	6211690	74 Kent Road, Picton 2571
R19	280507	6211621	90 Kent Road, Picton 2571
R20	279523	6211376	12 Suffolk Place, Tahmoor 2573
R21	279466	6211205	41 River Road, Tahmoor 2573

Locations of these identified receptors have been shown in Figure 2-3, Figure 2-4, and Figure 2-5.

Figure 2-3: Sensitive Receptor Locations on an Aerial Photograph



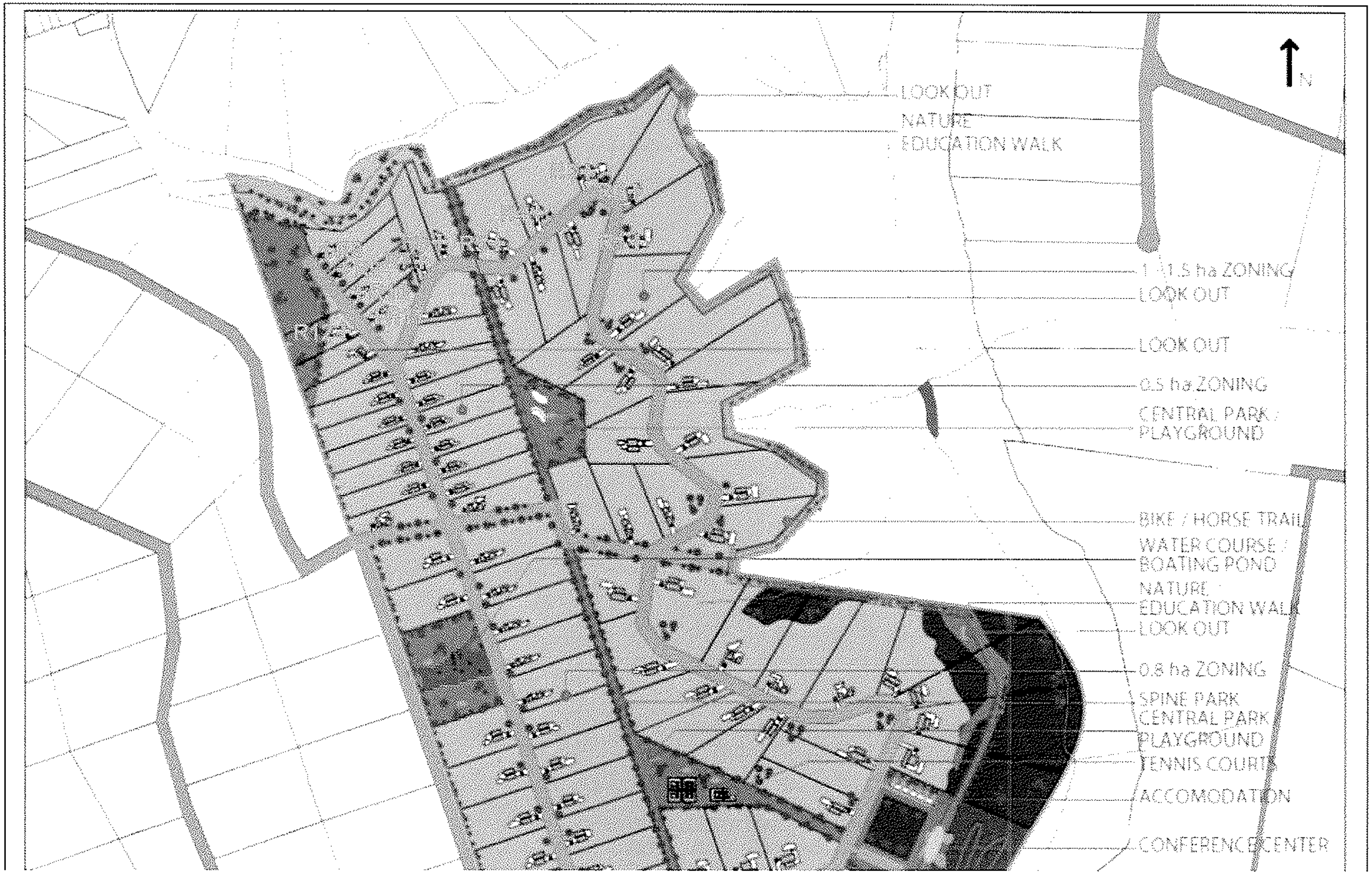
Legend:
Receptor Locations

Figure 2-4: Sensitive Receptor Locations (Zoom In View)

Legend:	**Source:**
Receptor Locations	© Department of

Note: The aerial map above is not to scale.

Figure 2-5: Sensitive Receptors on the Preliminary Concept Plan



3. DESIGN AND OPERATION OF THE ABATTOIR

The abattoir site consists of a main building, and office building near the entrance to the site, aerobic and anaerobic ponds for waste treatment, and a small-sized stockpile area for waste. The abattoir site operates with an anticipated production capacity of more than 30,000 tonnes per annum of livestock processed material according to their Environment Protection Licence (EPL). According to recent processing data provided by administration on site, the current approximate production capacity of the site is 37 tonnes per week, which equates to approximately 2,000 tonnes per annum. Livestock processed on site includes (but may not be limited to) cattle, sheep and pigs.

Discussions with the operations manager on site indicate that there were intentions to implement thicker and taller vegetation along the boundaries of the subject site as improved odour emission controls. The subject abattoir EPL was examined, showing no requirements or conditions relating to odour emissions from the subject site.

Except for the native vegetation that has been kept scattered throughout the site and along the boundaries, no other odour controls are employed on site.

3.1 VENTILATION UTILISED

Natural ventilation is generally employed in all building structures on site reflecting traditional methods of processing livestock. Hence, emissions from the subject site are anticipated to be prone to buoyancy dispersion effects during summer and would promote worst-case impacts during still atmospheric conditions.

3.2 ENVIRONMENTAL MANAGEMENT SYSTEMS

To manage off-site odour impacts, Benbow Environmental encourages sites with significant odour emission sources to establish an Environmental Management System and strive for best industry practices.

No management practices on site were seen to mitigate the odour emissions from the subject site. However, based upon findings from the site visit, current vegetation and terrain that surrounds the abattoir favours the dispersion of odour emissions in such a way that ambient air quality at the nearest potentially affected receptors have been deemed acceptable.

4. DISPERSION METEOROLOGY

4.1 DISPERSION METEOROLOGY – SITE REPRESENTATIVE DATA

The nearest weather monitoring station within proximity to the subject farm is the Camden Airport AWS monitoring station operated by the Bureau of Meteorology. This monitoring station is located 20.7 kilometres away north-east of the subject site. Weather conditions at this monitoring station are logged hourly, though it was considered that the data provided from this monitoring station is insufficient for use and was considered unrepresentative (due to distance) to be utilised as input into the selected modelling program. The computer simulation program TAPM (The Air Pollution Model) was subsequently used to generate synthetic meteorological data files (e.g. surface and upper air files) specific for the subject area.

TAPM is a three-dimensional meteorological and air pollution model developed by the CSIRO Division of Atmospheric Research. TAPM uses databases of terrain, vegetation, soil type, sea surface temperature and synoptic-scale meteorological analyses for Australia. The OEH guidelines "The Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales (2005)" recommends the use of prognostic meteorological models such as TAPM for generating meteorological data for areas where neither site-specific nor site-representative meteorological data are available.

A site-representative meteorological data file was generated for the local area with TAPM. The latest annual information that could be obtained from TAPM was for the year 2007, which was then utilised for the assessment. The TAPM file dataset contained a total number of 8,760 values which includes parameters such as temperature, wind speed, wind direction, mixing height, stability class and standard wind deviation.

Comparison between the wind rose plots of the year specific, TAPM generated meteorological dataset, is made against the long term wind rose plots from an extract of the Richmond RAAF observed meteorological data.

Seasonal wind rose plots for the site-representative meteorological file have been included in the following section as Figure 4-1 and Figure 4-2.

4.1.1 Atmospheric Stability

The "stability" of the atmosphere is a classification used to describe the structure of the atmosphere in terms of temperature, specifically, how temperature changes in the atmosphere with altitude. Classification is often done according to the Pasquill-Gifford classification system that consists of six stability class groups, shown in Table 4-1. The class "A" describes an atmosphere where the air is well-mixed and there is little hindrance of dispersion into the atmosphere. At the other end of the scale is class "F", which describes conditions under which temperature inversions would occur, where winds are calm or absent and air close to the earth's surface cannot rise into the atmosphere due to the presence of warmer air layers above. The classes in between A and F indicate changing degrees of stability due to variations in temperature in the atmosphere.

Table 4-1: Pasquill-Gifford Stability Class System	
Stability Class	**Description**
A	Extremely Unstable
B	Unstable
C	Slightly Unstable
D	Neutral
E	Slightly Stable
F	Very Stable

Worst case dispersion conditions from the site would be best associated with F-class stability conditions – generally associated with still / light winds and clear skies during the night time or early morning period (stable conditions). Analysis of the referenced site-specific meteorological data indicates the F-class dispersion conditions were present for approximately 16.6% of the time for the Tahmoor 2007 file, suggesting a moderate-to-high risk of enhanced impacts from farm emissions due to this weather condition.

Looking at Table 4-3, it can be seen that stability class frequencies in the meteorological file have not been biased by TAPM towards giving enhanced dispersive conditions. Stability class D is the most frequent, with an occurrence of 51.7%. Stability classes A, B, C, which offered the best dispersion conditions; occur with frequencies of 0.2%, 5.8% and 14.6% respectively.

Table 4-2: Wind Direction / Stability Class Frequency Distribution (Count) for Referenced Meteorological Data Input File – Tahmoor 2007 (by TAPM)

Frequency Distribution (Count)							
Direction (Blowing From)	**Stability Class**						
	A	**B**	**C**	**D**	**E**	**F**	**Total**
N	2	78	137	169	3	5	394
NE	5	202	279	339	19	26	870
E	1	72	152	524	33	22	804
SE	0	52	155	728	48	10	993
S	2	20	111	851	228	94	1306
SW	5	27	172	953	426	958	2541
W	3	37	209	843	210	324	1626
NW	1	18	64	120	9	14	226
Total	19	506	1279	4527	976	1453	**8760**

Table 4-3: Wind Direction / Stability Class Frequency Distribution (Percentage) for Referenced Meteorological Data Input File – Tahmoor 2007(by TAPM)

Frequency Distribution (Percentage %)							
Direction (Blowing From)	Stability Class						
	A	B	C	D	E	F	Total
N	0.02	0.89	1.56	1.93	0.03	0.06	4.50
NE	0.06	2.31	3.18	3.87	0.22	0.30	9.93
E	0.01	0.82	1.74	5.98	0.38	0.25	9.18
SE	0.00	0.59	1.77	8.31	0.55	0.11	11.34
S	0.02	0.23	1.27	9.71	2.60	1.07	14.91
SW	0.06	0.31	1.96	10.88	4.86	10.94	29.01
W	0.03	0.42	2.39	9.62	2.40	3.70	18.56
NW	0.01	0.21	0.73	1.37	0.10	0.16	2.58
Total	0.22	5.78	14.60	51.68	11.14	16.59	**100.00**

4.1.2 Wind Rose Plots

Wind rose plots show the direction from which the wind is coming using triangles known as "petals". The petals of the plots in the figure summarise wind direction data into 8 compass directions i.e. north, north-east, east, south-east, etc.

The length of the triangles, or "petals", indicates the frequency with which wind blows from the direction presented. Longer petals for a given direction indicate a higher frequency of wind from that direction. Each petal is divided into segments, with each segment representing one of the six wind speed classes.

The proportion of time for which wind speed is less than speeds in the first class (i.e. 0.5 m/s), when speed is negligible, is referred to as calm hours or "calms". Calms are not shown on a wind rose as they have no direction, but the proportion of calms for the period under consideration is noted under each wind rose.

The concentric circles in each wind rose are the axes that denote wind frequencies. In comparing the plots it should be noted that the axes varies between wind roses, although all wind roses are the same size. The frequencies shown in the first quadrant (top-left quarter) of each wind rose are stated beneath the diagram.

4.1.3 Local Wind Trends

Figure 4-1 shows that the Tahmoor regional area is predominantly affected by south-western and western winds, with frequencies of 29% and 18% respectively. Most of the south-western winds are at the lower end of the windspeed spectrum, whilst western winds have moderate windspeeds in average. On the other hand (see Figure 4-2), Camden experiences a wide range of wind directions, with majority coming from the east, south, and south-west and are all moderately average in terms of windspeeds.

In summer, Tahmoor experiences weak strength winds that are predominantly observed from north-east, east and south-east with a frequency figure close to 20%. Camden experiences winds from north to south (in a clockwise direction) with eastern winds being the most dominant at 18%.

Autumn winds in Tahmoor mainly come from the south-west, with low windspeeds and a frequency of close to 39%. On the other hand, majority of the autumn winds in Camden (again) are from more than 4 wind directions with a similar trend to the Camden annual average wind rose plot.

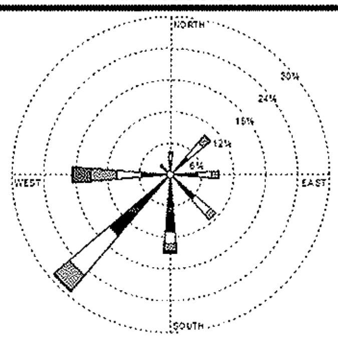
South-western (38%) and western (32%) winds are predominant in Tahmoor during winter, which are mainly composed of moderate strength winds. Camden on the other hand is exposed to south-west (16%), west (13%) and south (11%), with all being moderate in windspeeds.

Spring in Tahmoor remains to show dominance of south-western (26%) and western (16%) winds, with the south-western winds being weak in strength and western winds being moderate in windspeed. Camden spring winds are similar to what is observed during autumn with an increase in frequency of approximately 3% for all directions.

Comparison between the two meteorological wind rose plots show the differences in wind patterns for the two respective locations, which further highlight the need to use the TAPM meteorological file. Utilising site-specific meteorological file allows the assessment to realistically determine the extent of odour impacts from the subject site, which is an approach that has been considered in this assessment.

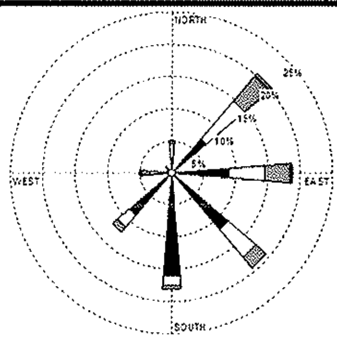
Figure 4-1: Wind Rose Plots for the Synthetic Meteorological Station – TAPM Tahmoor (2007)

All Seasons



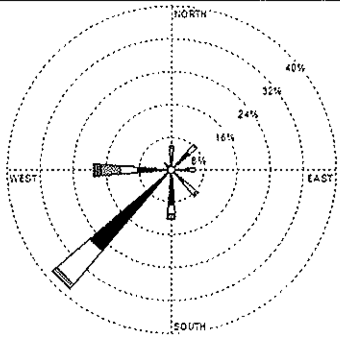
Average Wind Speed: 2.47 m/s
Calms Frequency: 5.27 %
Axis Frequencies: 6%, 12%, 18%, 24%, 30%

Summer (December – February)



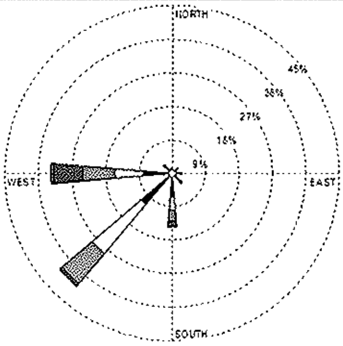
Average Wind Speed: 2.16 m/s
Calms Frequency: 8.01 %
Axis Frequencies: 5%, 10%, 15%, 20%, 25%

Autumn (March – May)



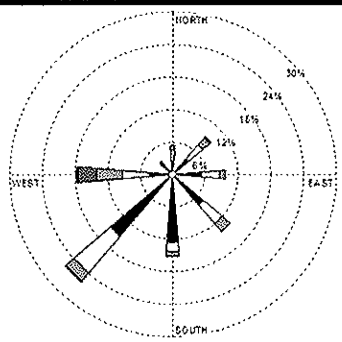
Average Wind Speed: 2.09 m/s
Calms Frequency: 6.57 %
Axis Frequencies: 8%, 16%, 24%, 32%, 40%

Winter (June – August)



Average Wind Speed: 3.20 m/s
Calms Frequency: 2.08 %
Axis Frequencies: 9%, 18%, 27%, 36%, 45%

Spring (September – November)



Average Wind Speed: 2.44 m/s
Calms Frequency: 4.49 %
Axis Frequencies: 6%, 12%, 18%, 24%, 30%

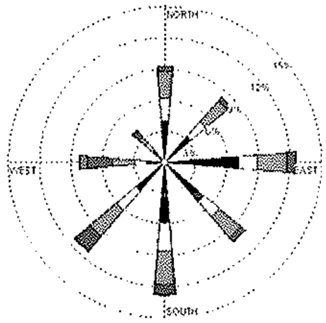
Legend

WIND SPEED (m/s)

- >= 11.1
- 8.8 - 11.1
- 5.7 - 8.8
- 3.6 - 5.7
- 2.1 - 3.6
- 0.5 - 2.1

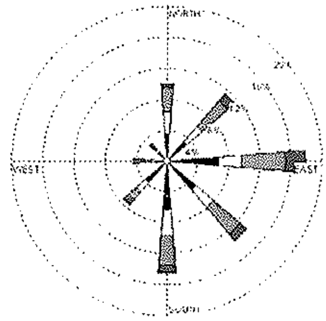
Figure 4-2: Wind Rose Plots for the Referenced Meteorological Station - Bureau of Meteorology Camden Airport (2004-2008)

All Seasons



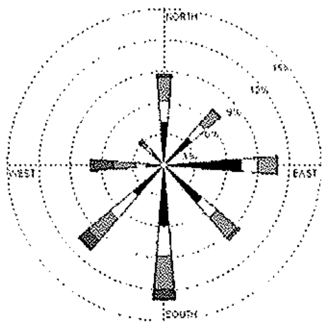
Average Wind Speed: 2.48 m/s
Calms Frequency: 23.26 %
Axis Frequencies: 3%, 6%, 9%, 12%, 15%

Summer (December – February)



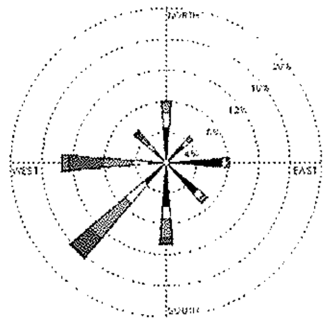
Average Wind Speed: 2.71 m/s
Calms Frequency: 17.69 %
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Autumn (March – May)



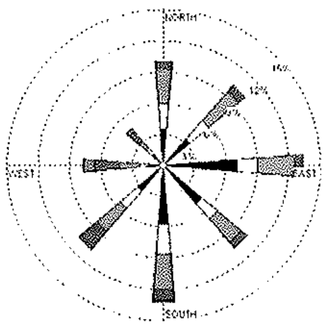
Average Wind Speed: 2.05 m/s
Calms Frequency: 29.60 %
Axis Frequencies: 3%, 6%, 9%, 12%, 15%

Winter (June – August)



Average Wind Speed: 2.40 m/s
Calms Frequency: 25.90 %
Axis Frequencies: 4%, 8%, 12%, 16%, 20%

Spring (September – November)



Average Wind Speed: 2.77 m/s
Calms Frequency: 19.69 %
Axis Frequencies: 3%, 6%, 9%, 12%, 15%

Legend

WIND SPEED (m/s)

- >= 11.1
- 8.8 - 11.1
- 5.7 - 8.8
- 3.6 - 5.7
- 2.1 - 3.6
- 0.5 - 2.1

5. ODOUR IMPACT ASSESSMENT

The following sections provide details of the quantitative assessment used to determine the extent of odour impacts from the subject abattoir.

5.1 ADOPTED CRITERIA AND GUIDELINES

The following documents published by the Office of Environment and Heritage (OEH) were referenced for the assessment methodology and guidelines used in this study.

- "Technical Framework – Assessment and Management of Odour from Stationery Sources in New South Wales" (November 2006) and the associated "Technical Notes" (November 2006); and
- "Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales" (August 2005).

The above listed guidelines are often referred to as the OEH odour modelling guidelines. Table 5-1 provides the selection of the assessment criteria used in this study, as recommended by these guidelines.

Table 5-1: OEH Odour Performance Criteria – Selection Based on Population

Size of Affected Community	Odour Performance Criteria (Odour Units) (to be complied for 99.0% of the time)
Urban (Population ≥ ≈ 2000)	2.0 OU
Population ≈ 500	**3.0 OU**
Population ≈ 125	4.0 OU
Population ≈ 30	5.0 OU
Population ≈ 10	6.0 OU
Single residence (≤ ≈ 2)	7.0 OU

OU or Odour Units provide the units of identifying the strength of odour in an odour impact perspective. One (1) OU is considered to be the threshold of when 50% of the panel (or observers, in a practical situation) can detect the odour.

Given the size of the population as a result of the proposed subdivision, an odour assessment criterion of 3 OU (99.0th Percentile) would be the appropriate limit to adopt for the nearest identified receptors according to the OEH modelling guidelines, since the total population affected would most likely be close to 500 people. However, given the definition of 1 OU and the nature of odour observed from the abattoir, Benbow Environmental would recommend to consider the possibility that detection of the odour unique from the abattoir may result in an odour complaint at any of the identified sensitive receptors located within the proposed subdivision. This refers to paying particular attention to environmental performance by taking a proactive approach in odour emission reduction.

However, it is common in rural residential areas that a limit of 5 OU would be considered acceptable, given the range of odours observed in a region dominated by agricultural activities associated with reasonable amount of odour emissions. This has also been noted in this assessment for discussion purposes.

The OEH odour modelling guidelines also set 7 OU as a design criterion for the maximum odour level an individual should be exposed to.

The rural nature of the land use would be accompanied by a range of odours associated with agricultural activities that could be conducted due to land use and would need to be considered when assessing the source of impacts towards affected receptors.

It is important to note that the detection of poultry, abattoir or livestock-related odour alone does not indicate that the odour assessment criterion of 3 OU is being exceeded.

5.2 Odour Impact Modelling

5.2.1 Dispersion Model

The CALPUFF PRO (Version 7.3 Plus) Gaussian plume dispersion model was used for the prediction of potential off-site impacts from the proposed development. CALPUFF modelling package is the preferred software to be used to predict the potential off-site impacts and is recommended in the OEH modelling guidelines.

A year of meteorological data, described in Section 4 of this report, was obtained as the appropriate input for CALPUFF. The data has been considered to be representative of the wind climate at the subject site and its regional location in general. A total number of 8,760 individual temperature, wind speed and wind direction events were obtained for the meteorological input data. This was to ensure that sufficient meteorological data was available so as to guarantee that worst-case conditions were adequately included in the model predictions.

5.2.2 Terrain

The terrain data utilised as an input into the dispersion model was provided by the 3-dimensional meteorological and air pollution program, TAPM. Data obtained from TAPM was then compared and adjusted against the digital information of the terrain data obtained for the regional area of the subject farm. The digital terrain information was constructed using the current topographic maps for Tahmoor provided by the Department of Lands and Infrastructure. This was to ensure that proper terrain elevation heights were incorporated into the dispersion model.

The terrain elevation between the sources and the receptors of odour did not change so significantly that the dispersion model could not account for the influence of these changes.

5.2.3 Terrain Effects on Odour Impacts through Katabatic Air Drainage

The meteorological condition known as katabatic flow (or katabatic drift) is simply the movement of cold air down a slope, generally under stable atmospheric conditions. Under such circumstances, dispersion of airborne pollutants, including odour, is generally slow and the associated impacts can potentially reach its peak concentration.

Based on the terrain elevation of the regional area, only minimal katabatic flow effects are likely to impact the movement of odour emissions from the site. These effects were accurately accounted for using CALPUFF.

5.2.4 Calculation of Odour Emission Rate (OER) Inputs

Odour emission rates for the egg-laying farm were calculated based on the following formula:

$$OER = OC \times A_{TOTAL} \times Vel \times PMR \qquad \text{(Equation 1)}$$

where *OER* - Shed Odour Emission Rate, OU/s
OC - Odour Concentration measured from Source, OU
A_{TOTAL} -Total Area of the Openings of the Source
Vel - Wind Velocity through the Area of the Openings
PMR - Peak-to-Mean Ratio factors (see Section 5.2.4.3)

Multiplying the parameters A_{TOTAL} and *Vel* gives the air exchange rate through the source.

The following sections provide details of each of the factors above.

5.2.4.1 Odour Concentration

Measurements of the site-representative odour concentration were taken during the site visit on the 27 July 2011. A total of 8 samples were collected: 4 samples collected from the aerobic and anaerobic ponds, and 4 samples collected from the main abattoir building and its surrounding ancillary working areas.

Odour samples were collected in a bag, made from Tedlar or Nalophane, fitted inside a plastic drum. The drum was evacuated permitting sampled air stream to be drawn into the bag without making contact with the internal workings of the sampling pump. Tedlar and Nalophane are relatively stable mediums, being essentially non-absorbing and impermeable materials. Approximately 25 litres of odorous air was drawn into the bag through a Tedlar hose.

A basic schematic of the equipment used is shown in Figure 5-1.

Odour samples that were collected in bags were sent to a NATA-accredited olfactometry laboratory to determine the concentration of odour in the samples.

Figure 5-1: Odour Sampling Apparatus

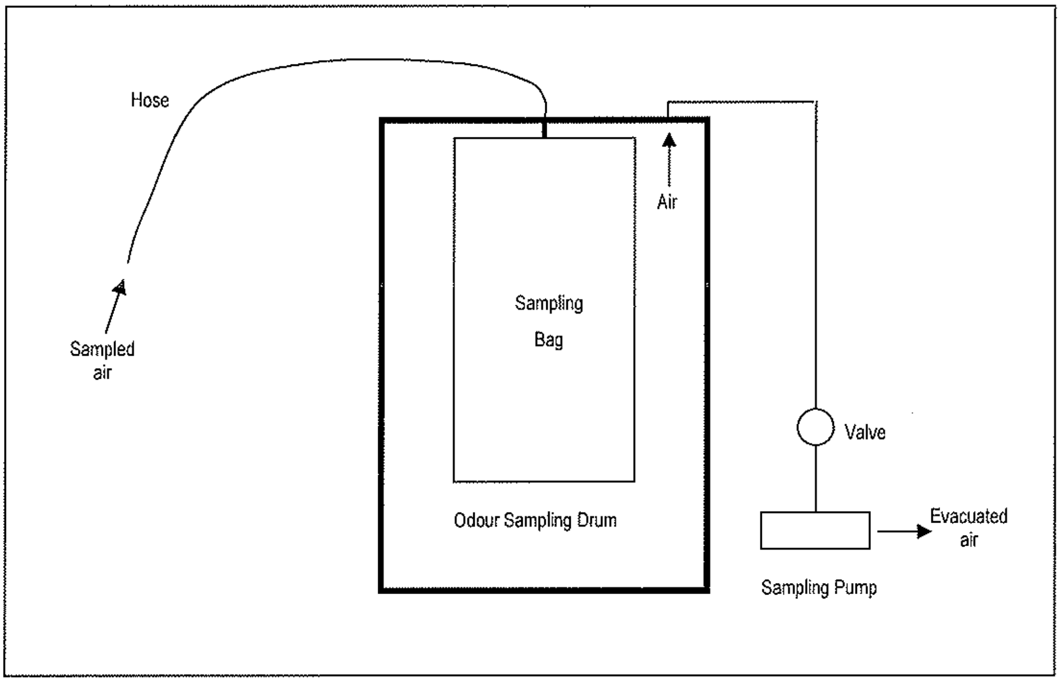


Table 5-2 provides a summary of the results obtained from the olfactometry laboratory. The olfactometry test report has been provided in the Attachments.

Table 5-2: Olfactometry Laboratory Results

Sample ID	Location	Odour Concentration (OU)
Sample No. 1	West of Main Building	25
Sample No. 2	South-West of Main Building	13
Sample No. 3	South-East of Main Building	35
Sample No. 4	East of Main Building	25
Sample No. 5	Anaerobic Pond, First Sample	130
Sample No. 6	Anaerobic Pond, Second Sample	1,349
Sample No. 7	Aerobic Pond, First Sample	285
Sample No. 8	Aerobic Pond, Second Sample	794

Note: 1 OU is defined by the OEH guidelines as the threshold of where 50% of a panel of observers can detect the odour.

The main building is divided into two sections: north and south sections. It has been noted that processing operations were only conducted in the southern part of the main building. Hence, samples were only collected across four points around the perimeter of the southern section of the building.

It was ensured that the samples collected were representative of the average odour concentrations from various openings on each side of the southern perimeter.

Duplicates were collected for aerobic and anaerobic ponds, given that these ponds have been identified to provide a variety of odour concentration results across their respective surface areas.

5.2.4.2 Wind Velocity Measurements

Quick flow measurement tests were carried out by one of the authors to determine the wind velocities from the main building. Tests have only shown a velocity reading close to 0.1 m/s at the 4 different areas where samples were collected from the building.

Measurements for the aerobic and anaerobic ponds were made using a Fluxhood Chamber. Wind velocities that would be measured during Fluxhood measurements would be less than 0.1 m/s, which would be the appropriate velocities to use. It is fair and conservative to assume, in this instance, that the wind velocities that could be applied for aerobic and anaerobic ponds would be 0.1 m/s.

In order to calculate the appropriate emission rates for each of the identified source, it was then generally assumed that a wind velocity of 0.1 m/s would be the most applicable wind velocity to use for all the sources on site.

5.2.4.3 Peak-to-Mean Ratios

One of the important parameters that need to be set in running the dispersion model is the averaging time. The OEH modelling guidelines stipulate that odour modelling be assessed on a 1-hour average basis.

However, the odour modelling in this method would face a serious limitation in that human noses generally can detect odour over a period of one second or less. The relatively long one hour model averaging times could mean that the peak odour concentrations of modelled odour emissions, at levels that would cause annoyance, would effectively be averaged in the calculations to a point of being non-offensive, and thus could potentially represent the odour source as less of a nuisance than it really is.

To account for these potential peaks, a parameter called a "peak-to-mean ratio" is used in the calculation of odour emission rates. Peak-mean-ratios relate the long-term modelled averages to the short-term averages. Peak-to-mean ratios are dependent on the distance of the receptor to the source, the stability of weather during the transport of the odour through the air, the type of source, and length of the averaging time used in the model.

OEH recommends the peak-to-mean ratio factors developed by Katestone Scientific, as shown in Table 5-3.

Table 5-3: Factors for Estimating Peak Concentrations in Flat Terrain (Katestone Scientific 1995 and 1998)

Source Type	Pasquill-Gifford Stability Class	Near-field P/M60*	Far-field P/M60*
Area	A, B, C, D	2.5	2.3
	E, F	2.3	1.9
Line	A – F	6	6
Surface wake-free point	A, B, C	12	4
	D, E, F	25	7
Tall wake-free point	A, B, C	17	3
	D, E, F	35	6
Wake-affected point	A – F	2.3	2.3
Volume	A – F	2.3	2.3

Note: * Ratio of peak 1-second average concentrations to mean 1-hour average concentrations.

The ratios for a wake-affected point were applied to the calculation of odour emission rates.

Near-Field is defined as *"The zone where source structure directly affects plume dispersion. It is typically 10 times the largest source dimension, either height or width"* where Far-Field is defined as *"The zone where plume rise and meandering have fully occurred and the plume is well mixed in the vertical plane from the ground level to the base of the first temperature inversion."*

5.2.5 Building-Wake Effects

Building-wake effects occur when emissions from a source are hindered as they move from winds "washing" the emissions down to the nearest building structure. This phenomenon can enhance off-site odour impacts (depending on the location of the building structure, wind direction and the source) due to the effect of bringing the emissions down to a height where insufficient dispersion would occur. Insufficient dispersion leads to "still" movement of concentrated odour emissions, which would migrate towards the nearest receptor and cause high odour impacts.

Building-wake effects were considered in the modelling by representing all buildings on site as rectangular and/or cubic solid structures in the model. Dimensions of these structures are entered into the model, based on dimensions of the buildings and sheds on site (with particular attention to the main abattoir building and other ancillary sheds on site).

5.2.6 Modelling Techniques

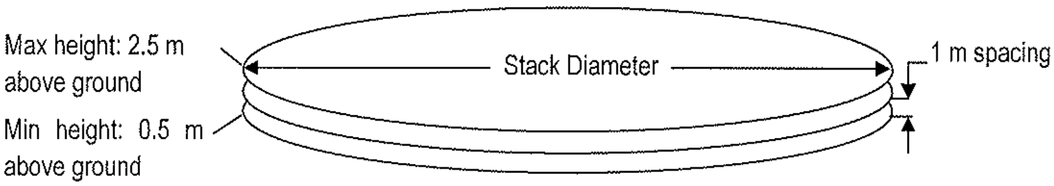
Poultry sheds have traditionally been modelled as volume sources. One drawback to this approach is that it does not allow for the thermal buoyancy of the emissions to be considered.

In 2003, Ormerod et al showed that neglecting even minute differences in temperature between shed-exhausted air and the surrounding external air could result in significant differences in the resulting odour impact on receptors close to the source (Ormerod et al, 2003).

In recent times it has subsequently become more common to model buoyant volume sources as "point (or stack) sources". This method introduces a problem that stacks vent vertically and so can represent an unrealistic vertical component to the emissions. To account for this, the diameter of the stacks is then made wide enough to produce a negligible vertical exit velocity. This creates an additional problem, as a wider source places emissions closer to receptors and unrealistically distributes the sources of the odour. To counter this problem, multiple stacks are positioned co-linearly (i.e. their centre-points are aligned) and placed above each other, so to adequately represent the volume source-nature of the source.

In conducting the odour modelling, the diameter of the stacks was calculated from the predicted air volumetric flowrate and a maximum exit velocity of 0.1 m/s. Three co-linear stacks, equally spaced between ground level height and 2.5 metres above the ground, were used to represent the odorous volume source from each side of the main building's south perimeter. Figure 5-1 illustrates this method.

Figure 5-2: An Example of Modelling of Buoyant Volume Sources as Three Vertical Stacks



5.2.7 Scenarios

Only 1 scenario was considered in this assessment, which is to simulate the current operations on site. A list of assumptions were utilised in the dispersion model, which have been summarised in Section 5.2.8. A few of the assumptions used were based on the information collected from the site visit.

As indicated previously, odour measurements taken using the approved olfactometry sampling and test method were utilised as the appropriate inputs into the air dispersion model. The site specificity of the inputs used in the model provides a realistic predicted impact result.

5.2.8 Summary of Modelling Assumptions

The following modelling assumptions were incorporated into the CALPUFF model:

- The site operates 24 hours per day and 7 days per week, without any consideration to public holidays and operation breaks throughout the year. This means that emissions from the main abattoir building and the ponds are constant;

- Seven (7) incoming trucks to the site per day, which delivers livestock to be processed (information obtained from staff on site);

- Five (5) outgoing trucks from the site per day, which delivers processed material off-site (information obtained from staff on site);

- Movement of trucks from the main abattoir building to and from the entrance/exit of the site takes approximately 15 minutes;

- Trucks (incoming and outgoing) are assumed to be stationed on site for approximately 1 hour;

- Processed material are not kept on site;

- Source odour levels from the skin shed was assumed to be similar to the level of odour measured at the waste stockpile area;

- Source odour levels at the western end of the building (where most livestock is kept on site) is assumed to be the level of odour observed from trucks carrying livestock;

- Source odour levels after the first aerobic pond were conservatively estimated to have a reduction in odour emissions by 10% and have been incorporated into the model, whereas the results shown as reduction between the two tested ponds provided a reduction in odour concentration of approximately 27%;

- Odorous emission sources from the abattoir were only incorporated into the model. No other odour sources such as the neighbouring turkey farm were not incorporated into the model; and

- A constant air velocity of 0.1 m/s throughout all openings of the odorous building sources on site. Aerobic and anaerobic ponds on site have been measured to have a maximum surface velocity of 0.01 m/s and was utilised in the modelling.

5.2.9 Odour Emissions Inventory

The odour emissions inventory has been provided in Table 5-4 below.

Results obtained from the olfactometry laboratory have been provided in Attachment 1. Attachment 2 has been provided to show the CALPUFF input file utilised in the model.

Table 5-4: Odour Emissions Inventory

Source ID	Type (Point, Area, Volume)	Source Velocity (m/s)	Temp (K)	Source Height (m)	Diameter (m)	MGA56 Eastings (m)	MGA56 Northings (m)	Elevation (m)	Odour Emission Rate (OU/s)
W1	Point	0.1	298.15	0.5	7.695	279909	6211214	215	39.21
W2	Point	0.1	298.15	1.5	7.695	279909	6211214	215	39.21
W3	Point	0.1	298.15	2.5	7.695	279909	6211214	215	39.21
SW1	Point	0.1	298.15	0.5	8.486	279916	6211205	213	22.49
SW2	Point	0.1	298.15	1.5	8.486	279916	6211205	213	22.49
SW3	Point	0.1	298.15	2.5	8.486	279916	6211205	213	22.49
SE1	Point	0.1	298.15	0.1	5.893	279943	6211211	211	42.04
SE2	Point	0.1	298.15	0.25	5.893	279943	6211211	211	42.04
SE3	Point	0.1	298.15	0.4	5.893	279943	6211211	211	42.04
E1	Point	0.1	298.15	1	10.678	279942	6211233	211	54.41
E2	Point	0.1	298.15	2.5	10.678	279942	6211233	211	54.41
E3	Point	0.1	298.15	4	10.678	279942	6211233	211	54.41
AEP1	Point	0.01	298.15	0.1	39.818	279987	6211300	203	15451.17
ANP1	Point	0.01	298.15	0.1	31.634	279986	6211257	206	21179.13
AEP2	Point	0.01	298.15	0.1	20.733	280006	6211348	201	14046.52
AEP3	Point	0.01	298.15	0.1	14.325	279994	6211387	205	12769.56
SHD1	Point	0.1	298.15	0.5	17.076	279935	6211316	212	42.04
SHD2	Point	0.1	298.15	1.5	17.076	279935	6211316	212	42.04
SHD3	Point	0.1	298.15	2.5	17.076	279935	6211316	212	42.04

Table 5-4: Odour Emissions Inventory

Source ID	Type (Point, Area, Volume)	Source Velocity (m/s)	Temp (K)	Source Height (m)	Diameter (m)	MGA56 Eastings (m)	MGA56 Northings (m)	Elevation (m)	Odour Emission Rate (OU/s)
SHD4	Point	0.1	298.15	0.5	17.076	279906	6211194	214	39.21
SHD5	Point	0.1	298.15	1.5	17.076	279906	6211194	214	39.21
SHD6	Point	0.1	298.15	2.5	17.076	279906	6211194	214	39.21
TRK1	Point	0.1	298.15	0.5	15.506	279955	6211247	211	54.41
TRK2	Point	0.1	298.15	1.5	15.506	279955	6211247	211	54.41
TRK3	Point	0.1	298.15	2.5	15.506	279955	6211247	211	54.41
PTH1	Point	0.1	298.15	0.5	15.506	279883	6211436	212	54.41
PTH2	Point	0.1	298.15	1.5	15.506	279883	6211436	212	54.41
PTH3	Point	0.1	298.15	2.5	15.506	279883	6211436	212	54.41
PTH4	Point	0.1	298.15	0.5	15.506	279889	6211396	222	54.41
PTH5	Point	0.1	298.15	1.5	15.506	279889	6211396	222	54.41
PTH6	Point	0.1	298.15	2.5	15.506	279889	6211396	222	54.41
PTH7	Point	0.1	298.15	0.5	15.506	279903	6211343	231	54.41
PTH8	Point	0.1	298.15	1.5	15.506	279903	6211343	231	54.41
PTH9	Point	0.1	298.15	2.5	15.506	279903	6211343	231	54.41
PTH10	Point	0.1	298.15	0.5	15.506	279932	6211291	232	54.41
PTH11	Point	0.1	298.15	1.5	15.506	279932	6211291	232	54.41
PTH12	Point	0.1	298.15	2.5	15.506	279932	6211291	232	54.41
TRK4	Point	0.1	298.15	0.5	15.506	279918	6211198	212	39.21
TRK5	Point	0.1	298.15	1.5	15.506	279918	6211198	212	39.21

Table 5-4: Odour Emissions Inventory

Source ID	Type (Point, Area, Volume)	Source Velocity (m/s)	Temp (K)	Source Height (m)	Diameter (m)	MGA56 Eastings (m)	MGA56 Northings (m)	Elevation (m)	Odour Emission Rate (OU/s)
TRK6	Point	0.1	298.15	2.5	15.506	279918	6211198	212	39.2098211
PTH13	Point	0.1	298.15	0.5	15.506	279912	6211245	215	39.2098211
PTH14	Point	0.1	298.15	1.5	15.506	279912	6211245	215	39.2098211
PTH15	Point	0.1	298.15	2.5	15.506	279912	6211245	215	39.2098211
PTH16	Point	0.1	298.15	0.5	15.506	279909	6211304	217	39.2098211
PTH17	Point	0.1	298.15	1.5	15.506	279909	6211304	217	39.2098211
PTH18	Point	0.1	298.15	2.5	15.506	279909	6211304	217	39.2098211
PTH19	Point	0.1	298.15	0.5	15.506	279896	6211369	226	39.2098211
PTH20	Point	0.1	298.15	1.5	15.506	279896	6211369	226	39.2098211
PTH21	Point	0.1	298.15	2.5	15.506	279896	6211369	226	39.2098211
PTH22	Point	0.1	298.15	0.5	15.506	279884	6211421	232	39.2098211
PTH23	Point	0.1	298.15	1.5	15.506	279884	6211421	232	39.2098211
PTH24	Point	0.1	298.15	2.5	15.506	279884	6211421	232	39.2098211

5.2.10 Modelling Results

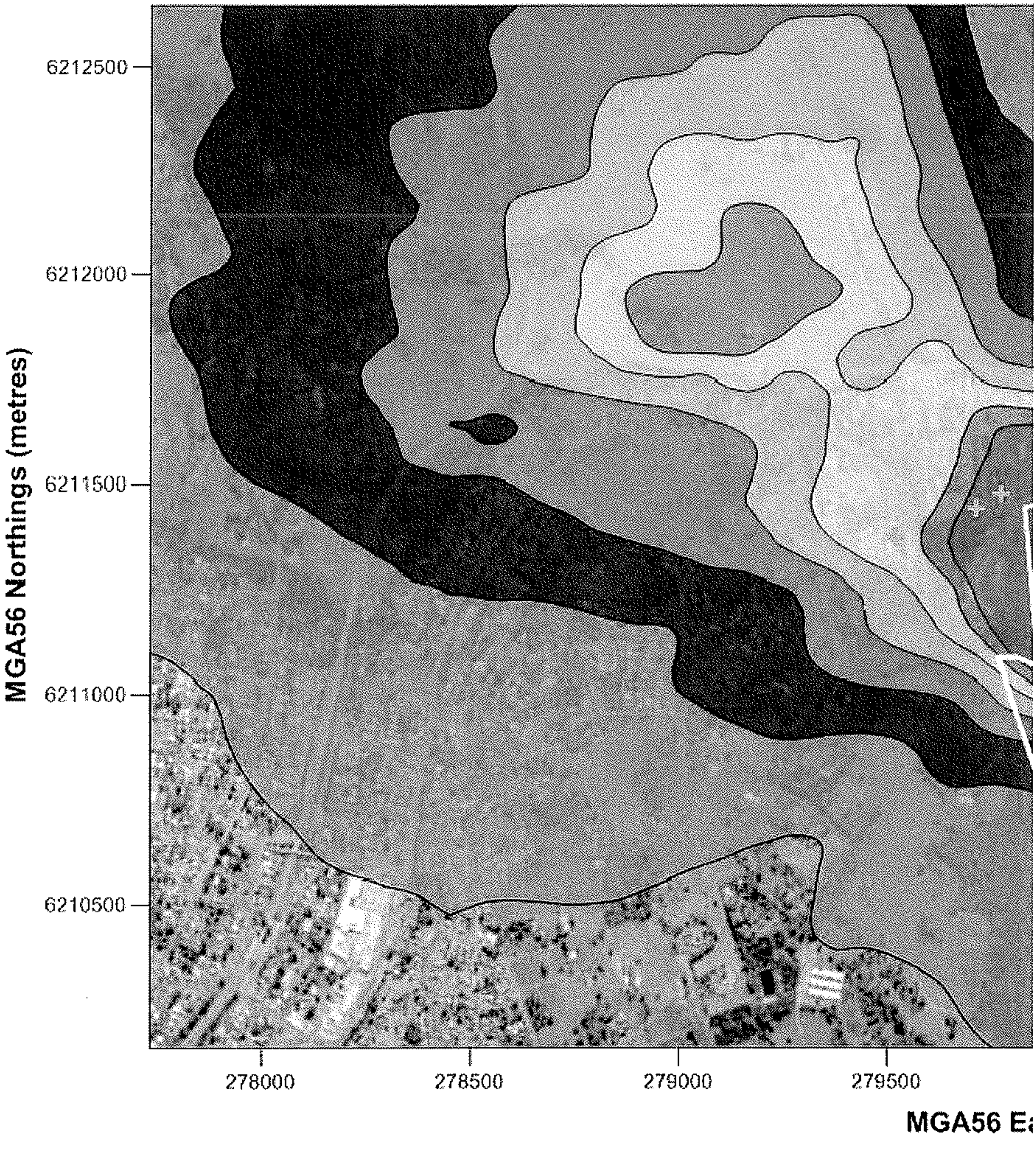
Modelling results for all identified discrete and sensitive receptors have been provided in Table 5-5. An odour concentration isopleth diagram has been provided as Figure 5-3.

Table 5-5: Odour Modelling Results

Receptor	Predicted Odour Concentration (OU)	Assessment Criteria (OU)	Pass (Yes/No)
R1	1.34	3.0 (5.0 for Rural)	Yes
R2	1.85		Yes
R3	2.43		Yes
R4	1.91		Yes
R5	1.59		Yes
R6	2.22		Yes
R7	2.24		Yes
R8	4.88		Yes
R9	3.95		Yes
R10	3.00		Yes
R11	2.35		Yes
R12	2.46		Yes
R13	5.35		Yes (Rural & Existing)
R14	4.69		Yes (Rural & Existing)
R15	4.84		Yes (Rural & Existing)
R16	3.34		Yes (Rural & Existing)
R17	1.74		Yes (Rural & Existing)
R18	1.57		Yes (Rural & Existing)
R19	1.50		Yes (Rural & Existing)
R20	3.41		Yes (Rural & Existing)
R21	2.49		Yes (Rural & Existing)

Note: Receptors R1 to R12 are potential discrete receptors located within the proposed subdivision.
Receptors R13 to R21 are existing residential receptors exposed to the existing level of odour from the abattoir.
The OEH guidelines provide an odour assessment criteria of 3 OU.
Results for Receptors R13 to R21 include odour reduction effects from the existing heavy vegetation surrounding these receptors and located north of the abattoir.

Figure 5-3: Odour Concentration Isopleth Diagram



5.2.11 Discussion of Results

Results (as shown in Figure 5-3 and Table 5-5) show exceedances to the odour impact assessment criterion at some of the selected discrete receptors located within the proposed subdivided land, located south of the abattoir. A maximum of 4.9 OU was detected at these selected discrete receptors.

As indicated in Table 5-5, potential receptors R8 and R9 have exceeded the OEH criteria of 3 OU. However, it has been identified that these two receptors will not be part of the development footprint.

As indicated in Section 5.1, Benbow Environmental encourages agricultural industries to be proactive in reducing their odour emissions as a strategic precautionary measure to ensure that no impacts at any of future receptors are caused. However, it is acknowledged that results predicted from CALPUFF can sometimes be conservative (when compared to results after establishing the development) and it is impossible to determine as to how conservative the CALPUFF model during the period of conducting this assessment. These variations have been often identified to be due to the increased effectiveness of the odour reduction of natural vegetation that exists (or proposed to be implemented as a result of future developments), and has been determined to be too difficult to quantify in practice. Poultry CRC and the Rural Industries Research and Development Corporation (RIRDC) are currently exploring these issues.

Hence (as an alternative, which is to reduce impacts at Receptors R8 and R9), Benbow Environmental recommends the construction of heavily-vegetated earth berms to be located along the northern boundary of the subdivision (or between receptor locations and the odour source) to further reduce the odour impacts toward the subdivision.

As indicated in literature studies published and released by U.S. research institutes, thick vegetation has heavy influence in reducing the odour emissions, particularly odour emissions from livestock and agricultural activities. Eliminating the line of sight between the proposed subdivision and the abattoir would not only reduce the visual impacts (existing and future) but would also (at the same time) eliminate the odour impacts due to windbreak effects, assimilation of the odour by vegetation (since odorous substances from livestock and agricultural activities are essentially vegetative nutrients), and achieving the perception of odour being absent when eliminating the line of sight to the odour source.

Utilising an odour assessment criteria of 3 OU in accordance with the OEH guidelines, either by discounting potential receptors R8 and R9 from the development footprint or by constructing heavily vegetated earth berms north of the subdivision receptors, this assessment report concludes that there will not be any adverse odour impacts toward the potential receptors located within the proposed subdivision.

6. STATEMENT OF POTENTIAL ODOUR IMPACTS

The Office of Environment and Heritage (OEH) modelling guidelines, "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW", "Technical Framework – Assessment and Management of Odour from Stationery Sources in New South Wales" (November 2006) and the associated "Technical Notes" (November 2006) were followed in the preparation of this odour impact assessment.

Examination of the potential impacts toward the future receptors located within the proposed subdivision indicates that the predicted impacts are within the OEH odour assessment criteria. The assessment report concludes that under the OEH guidelines, either of the following can be established to ensure that no adverse odour impacts are caused as a result of the subdivision:

- Discounting potential receptors R8 and R9 from the development footprint; or
- Constructing heavily vegetated earth berms along the northern boundary of the subdivided land.

Benbow Environmental recommends the construction of the heavily vegetated earth berms, as it has the capacity to increase the quality of land and the potential residential receptors located on the north portion of the subdivision.

This concludes the report.

Prepared by:

Duke Ismael	R T Benbow
Team Leader (Air Group)	Principal Consultant

7. REFERENCES & BIBLIOGRAPHY

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8. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use by Mary Camilleri, as per our agreement for providing environmental assessment services. Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that required by law) in relation to the information contained within this document.

Mary Camilleri is entitled to rely upon the findings in the report within the scope of work described in this report. No responsibility is accepted for the use of any part of the report in any other context or for any other purpose.

Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

ATTACHMENTS

Attachment 1: Olfactometry Laboratory Results – Stephenson Environmental

Odour Research Laboratories Australia

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Olfactometry Test Report

The measurement was commissioned by SEMA on behalf of:

Client	Organisation:	Benbow Environmental
	Address:	PO Box 687 Parramatta NSW 2124
	Contact:	Duke Ismael
	Sampling Site:	48-70 Koorana Rd, Picton
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	Email:	dismael@benbowenviro.com.au
Project	ORLA Report Number:	4879/ORLA/01
	Project Manager:	Peter Stephenson
	Testing operator:	Ali Naghizadeh
	ORLA Sample number(s):	3079 to 3086 inclusive
	SEMA Sample number(s):	720409 to 720416 inclusive
Order	Analysis Requested:	Odour Analysis
	Order requested by:	SEMA on behalf of Benbow
	Date of order:	25 July 2011
	Order number:	3261
	Telephone:	02 9737 9991
	Signed by:	Ali Naghizadeh
	Order accepted by:	Ali Naghizadeh

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Investigated Item	Odour concentration in odour units 'ou' determined by Sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Analysis Method	The samples were analysed in accordance with AS/NZS4323.3:2001.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification) sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian Standard 'Determination of Odour Concentration by Dynamic Olfactometry AS/NZS4323.3:2001. The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for n-butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Instrument Used	The Olfactometer used during this testing session was: AC'SCENT International Olfactometer
Measuring Range	The measuring range of the AC'SCENT International olfactometer is $13 \leq \chi \leq 61{,}660$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained between ± 3°C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.05$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $r = 0.0201$ (May 2011) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.20$ in accordance with the Australian Standard AS/NZS4323.3:2001. AC'SCENT International Olfactometer: $A = 0.108$ (May 2011) Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the AC'SCENT International Olfactometer has been determined to be 13 ou
Traceability	The measurements have been performed using standards for which the traceability to the national standard has been demonstrated. The assessors are individually selected to comply with fixed criteria and are monitored every session to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen.

01 August 2011

Peter Stephenson
Approved Signature

Odour Olfactometry Results – 4879/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou)[1]	Sample Odour Concentration (ou)[2]	Odour Character & Hedonic Tone^ +
Sample ID: Anaerobic Pond -Outlet	720409	27/7/11 1539-1553	3079	28/7/11 0935-1000	4	8	Nil	130	130	Chicken manure, dead fish, raw meat, oak barrel filled with mixed waste and peanut shells (-2.75)^
Sample ID: Anaerobic Pond - Inlet	720410	27/7/2011 1645-1700	3080	28/7/2011 1005-1039	4	8	Nil	1349	1349	Sewerage, rotten eggs, tip (-4.25)^
Sample ID: Aerobic Pond - 10m East of Inlet	720411	27/7/11 1539-1553	3081	28/7/2011 1148-1218	4	8	Nil	285	285	Mixed waste tip, septic, sewerage, soiled nappies (-3.00)^
Sample ID: Aerobic Pond - Inlet	720412	27/7/2011 1625-1638	3082	28/7/2011 1406-1436	4	8	Nil	794	794	Sewerage, rotten eggs, soiled nappies (-3.25)^
Sample ID: BEO1	720413	27/7/11 1500	3083	28/7/2011 1045-1115	6	8	Nil	25	25	All panellists found it difficult to describe the odour (0.00)^
Sample ID: BEO2	720414	27/7/2011 1505	3084	28/7/2011 1120-1143	6	2	Nil	< 13	< 13	Panellist found it difficult to describe (-0.17)^

Odour Olfactometry Results – 4879/ORLA/01

Sample Location	Sample ID No.	Sampling Date & Time	ORLA Sample No.	Analysis Date & Time (Completed)	Panel Size	Valid ITEs	Sample Pre-Dilution	Sample Odour Concentration (ou) [1]	Sample Odour Concentration (ou) [2]	Odour Character & Hedonic Tone^ +
Sample ID: BEO3	720415	27/7/11 1512	3085	28/7/2011 1310-1339	6	8	Nil	35	35	Septic, mixed waste, old socks, sewerage (-2.00)^
Sample ID: BEO4	720416	27/7/11 1520	3086	28/7/2011 1342-1404	6	8	Nil	25	25	Faint septic, faint garbage, faint sewerage smell, some panellists found it difficult to describe (-1.25)^

Odour Panel Calibration Results - 4879/ORLA/01

Reference Odorant	ORLA Sample No.	Concentration of Reference Gas (ppm)	Reference Gas Measured Concentration (ou)	Panel Average Measured Concentration (ppb) [3]	Does this panel calibration measurement comply with AS/NZS4323.3:P2001 (Yes/No) [4]
n-butanol	3078	50.2	1008	49.8	Yes

Comments: Samples 3079 to 3082 (inclusive) were collected by Stephenson Environmental Management Australia and samples 3083 to 3086 (inclusive) were collected by Benbow environmental. All samples were analysed by Odour Research Laboratories Australia at their Sydney Laboratory.

Notes from Odour Olfactometry Results:

[1] Sample Odour Concentration: as received in the bag

[2] Sample Odour Concentration: allowing for pre-dilution

[3] Panel Average Measured Concentration: indicates the sensitivity of the panel for the session completed

[4] Target Range for reference gas n-butanol is $20 \leq \chi \leq 80$ ppb and compliance with AS/NZ4323.3:2001 is based on the individuals rolling average and not on the panel average measured concentration. Panellist Rolling Average: BG = 35.6, SR = 47.7, MR = 41.4, CS = 47.7, PR = 52.5, TL = 48.9

^ denotes the Average Hedonic Tone: describes the pleasantness of the odour being presented where (+5) represents Very Pleasant, (0) represents Neutral and (-5) represents Very Unpleasant and has been derived from the panellist responses at the recognition threshold.

+ This value is not part of our NATA Scope of Accreditation and AS4323.3

Attachment 2: Extract of a CALPUFF Input File

```
---------------- Run title (3 lines) ------------------------------------------

                    CALPUFF MODEL CONTROL FILE
                    --------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names

--------------
Default Name  Type          File Name
------------  ----          ---------
CALMET.DAT    input    ! METDAT =C:\ACTIVE~1\111098\CALMET\CALMET.DAT   !
    or
ISCMET.DAT    input    * ISCDAT =                  *
    or
PLMMET.DAT    input    * PLMDAT =                  *
    or
PROFILE.DAT   input    * PRFDAT =                  *
SURFACE.DAT   input    * SFCDAT =                  *
RESTARTB.DAT  input    * RSTARTB=                  *
--------------------------------------------------------------------------------
CALPUFF.LST   output   ! PUFLST =c:\active~1\111098\calpuff\CALPUFF.lst  !
CONC.DAT      output   ! CONDAT =c:\active~1\111098\calpuff\CONC.DAT        !
DFLX.DAT      output   * DFDAT  =                  *
WFLX.DAT      output   * WFDAT  =                  *

VISB.DAT      output   * VISDAT =                  *
TK2D.DAT      output   * T2DDAT =                  *
RHO2D.DAT     output   * RHODAT =                  *
RESTARTE.DAT  output   * RSTARTE=                  *
--------------------------------------------------------------------------------
Emission Files
--------------
PTEMARB.DAT   input    * PTDAT  =                  *
VOLEMARB.DAT  input    * VOLDAT =                  *
BAEMARB.DAT   input    * ARDAT  =                  *
LNEMARB.DAT   input    * LNDAT  =                  *
--------------------------------------------------------------------------------
Other Files
-----------
OZONE.DAT     input    * OZDAT  =                  *
VD.DAT        input    * VDDAT  =                  *
CHEM.DAT      input    * CHEMDAT=                  *
H2O2.DAT      input    * H2O2DAT=                  *
HILL.DAT      input    * HILDAT=                  *
HILLRCT.DAT   input    * RCTDAT=                  *
COASTLN.DAT   input    * CSTDAT=                  *
FLUXBDY.DAT   input    * BDYDAT=                  *
BCON.DAT      input    * BCNDAT=                  *
DEBUG.DAT     output   * DEBUG =                  *
MASSFLX.DAT   output   * FLXDAT=                  *
MASSBAL.DAT   output   * BALDAT=                  *
FOG.DAT       output   * FOGDAT=                  *
RISE.DAT      output   * RISDAT=                  *
--------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = F !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 70 characters in length


Provision for multiple input files
----------------------------------

     Number of CALMET.DAT files for run (NMETDAT)
                                Default: 1       ! NMETDAT =   1   !

     Number of PTEMARB.DAT files for run (NPTDAT)
                                Default: 0       ! NPTDAT =  0  !

     Number of BAEMARB.DAT files for run (NARDAT)
                                Default: 0       ! NARDAT =  0  !

     Number of VOLEMARB.DAT files for run (NVOLDAT)
                                Default: 0       ! NVOLDAT =  0  !
```

```
!END!

-------------
Subgroup (0a)
-------------

  The following CALMET.DAT filenames are processed in sequence if NMETDAT>1

Default Name  Type          File Name
------------  ----          ---------
 none         input    * METDAT=     *    *END*

--------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

    Option to run all periods found
    in the met. file     (METRUN)   Default: 0       ! METRUN =   1  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in met. file

     Starting date:    Year   (IBYR)  --    No default   ! IBYR  =  2007  !
                       Month  (IBMO)  --    No default   ! IBMO  =  0  !
                       Day    (IBDY)  --    No default   ! IBDY  =  0  !
     Starting time:    Hour   (IBHR)  --    No default   ! IBHR  =  0  !
                       Minute (IBMIN) --    No default   ! IBMIN =  0  !
                       Second (IBSEC) --    No default   ! IBSEC =  0  !

     Ending date:      Year   (IEYR)  --    No default   ! IEYR  =  0  !
                       Month  (IEMO)  --    No default   ! IEMO  =  0  !
                       Day    (IEDY)  --    No default   ! IEDY  =  0  !
     Ending time:      Hour   (IEHR)  --    No default   ! IEHR  =  0  !
                       Minute (IEMIN) --    No default   ! IEMIN =  0  !
                       Second (IESEC) --    No default   ! IESEC =  0  !

     (These are only used if METRUN = 0)

     Base time zone        (XBTZ) -- No default       ! XBTZ= -10.0  !
     The zone is the number of hours that must be
     ADDED to the time to obtain UTC (or GMT)
     Examples: PST = 8., MST = 7.
               CST = 6., EST = 5.

     Length of modeling time-step (seconds)
     Equal to update period in the primary
     meteorological data files, or an
     integer fraction of it (1/2, 1/3 ...)
     Must be no larger than 1 hour
     (NSECDT)                         Default:3600     ! NSECDT =  3600  !
                                      Units: seconds

     Number of chemical species (NSPEC)
                                      Default: 5       ! NSPEC =  1   !

     Number of chemical species
     to be emitted  (NSE)             Default: 3       ! NSE =  1   !

     Flag to stop run after
     SETUP phase (ITEST)              Default: 2       ! ITEST =  2   !
     (Used to allow checking
     of the model inputs, files, etc.)
           ITEST = 1 - STOPS program after SETUP phase
           ITEST = 2 - Continues with execution of program
                       after SETUP

     Restart Configuration:

        Control flag (MRESTART)       Default: 0       ! MRESTART =  0   !

           0 = Do not read or write a restart file
           1 = Read a restart file at the beginning of
               the run
           2 = Write a restart file during run
           3 = Read a restart file at beginning of run
               and write a restart file during run

        Number of periods in Restart
        output cycle (NRESPD)         Default: 0       ! NRESPD =  0   !
```

```
           0 = File written only at last period
          >0 = File updated every NRESPD periods

     Meteorological Data Format (METFM)
                                      Default: 1        ! METFM =  1   !

          METFM = 1 - CALMET binary file (CALMET.MET)
          METFM = 2 - ISC ASCII file (ISCMET.MET)
          METFM = 3 - AUSPLUME ASCII file (PLMMET.MET)
          METFM = 4 - CTDM plus tower file (PROFILE.DAT) and
                      surface parameters file (SURFACE.DAT)
          METFM = 5 - AERMET tower file (PROFILE.DAT) and
                      surface parameters file (SURFACE.DAT)

     Meteorological Profile Data Format (MPRFFM)
            (used only for METFM = 1, 2, 3)
                                      Default: 1        ! MPRFFM =  1   !

          MPRFFM = 1 - CTDM plus tower file (PROFILE.DAT)
          MPRFFM = 2 - AERMET tower file (PROFILE.DAT)

     PG sigma-y is adjusted by the factor (AVET/PGTIME)**0.2
     Averaging Time (minutes) (AVET)
                                      Default: 60.0     ! AVET = 60. !
     PG Averaging Time (minutes) (PGTIME)
                                      Default: 60.0     ! PGTIME = 60. !


!END!


-------------------------------------------------------------------------------

INPUT GROUP: 2 -- Technical options
--------------


     Vertical distribution used in the
     near field (MGAUSS)                    Default: 1     ! MGAUSS =  1   !
        0 = uniform
        1 = Gaussian

     Terrain adjustment method
     (MCTADJ)                               Default: 3     ! MCTADJ =  3   !
        0 = no adjustment
        1 = ISC-type of terrain adjustment
        2 = simple, CALPUFF-type of terrain
            adjustment
        3 = partial plume path adjustment

     Subgrid-scale complex terrain
     flag (MCTSG)                           Default: 0     ! MCTSG =  0   !
        0 = not modeled
        1 = modeled

     Near-field puffs modeled as
     elongated slugs? (MSLUG)               Default: 0     ! MSLUG =  0   !
        0 = no
        1 = yes (slug model used)

     Transitional plume rise modeled?
     (MTRANS)                               Default: 1     ! MTRANS =  1   !
        0 = no  (i.e., final rise only)
        1 = yes (i.e., transitional rise computed)

     Stack tip downwash? (MTIP)             Default: 1     ! MTIP =  1  !
        0 = no  (i.e., no stack tip downwash)
        1 = yes (i.e., use stack tip downwash)

     Method used to compute plume rise for
     point sources not subject to building
     downwash? (MRISE)                      Default: 1     ! MRISE =  1  !
        1 = Briggs plume rise
        2 = Numerical plume rise

     Method used to simulate building
     downwash? (MBDW)                       Default: 1     ! MBDW =   2  !
        1 = ISC method
        2 = PRIME method
```

```
Vertical wind shear modeled above
stack top (modified Briggs plume rise)?
(MSHEAR)                              Default: 0     ! MSHEAR =  0  !
   0 = no  (i.e., vertical wind shear not modeled)
   1 = yes (i.e., vertical wind shear modeled)

Puff splitting allowed? (MSPLIT)      Default: 0     ! MSPLIT =  0  !
   0 = no (i.e., puffs not split)
   1 = yes (i.e., puffs are split)

Chemical mechanism flag (MCHEM)       Default: 1     ! MCHEM =  0   !
   0 = chemical transformation not
       modeled
   1 = transformation rates computed
       internally (MESOPUFF II scheme)
   2 = user-specified transformation
       rates used
   3 = transformation rates computed
       internally (RIVAD/ARM3 scheme)
   4 = secondary organic aerosol formation
       computed (MESOPUFF II scheme for OH)
   5 = user-specified half-life with or
       without transfer to child species

Aqueous phase transformation flag (MAQCHEM)
(Used only if MCHEM = 1, or 3)        Default: 0     ! MAQCHEM =  0   !
   0 = aqueous phase transformation
       not modeled
   1 = transformation rates adjusted
       for aqueous phase reactions

Wet removal modeled ? (MWET)          Default: 1     ! MWET =  0   !
   0 = no
   1 = yes

Dry deposition modeled ? (MDRY)       Default: 1     ! MDRY =  0   !
   0 = no
   1 = yes
   (dry deposition method specified
    for each species in Input Group 3)


Gravitational settling (plume tilt)
modeled ? (MTILT)                     Default: 0     ! MTILT =  0   !
   0 = no
   1 = yes
   (puff center falls at the gravitational
    settling velocity for 1 particle species)

Restrictions:
    - MDRY  = 1
    - NSPEC = 1  (must be particle species as well)
    - sg    = 0  GEOMETRIC STANDARD DEVIATION in Group 8 is
                 set to zero for a single particle diameter

Method used to compute dispersion
coefficients (MDISP)                  Default: 3     ! MDISP =  3   !

   1 = dispersion coefficients computed from measured values
       of turbulence, sigma v, sigma w
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.
   5 = CTDM sigmas used for stable and neutral conditions.
       For unstable conditions, sigmas are computed as in
       MDISP = 3, described above.  MDISP = 5 assumes that
       measured values are read

Sigma-v/sigma-theta, sigma-w measurements used? (MTURBVW)
(Used only if MDISP = 1 or 5)         Default: 3     ! MTURBVW =  3  !
   1 = use sigma-v or sigma-theta measurements
       from PROFILE.DAT to compute sigma-y
       (valid for METFM = 1, 2, 3, 4, 5)
   2 = use sigma-w measurements
       from PROFILE.DAT to compute sigma-z
       (valid for METFM = 1, 2, 3, 4, 5)
```

```
   3 = use both sigma-(v/theta) and sigma-w
       from PROFILE.DAT to compute sigma-y and sigma-z
       (valid for METFM = 1, 2, 3, 4, 5)
   4 = use sigma-theta measurements
       from PLMMET.DAT to compute sigma-y
       (valid only if METFM = 3)

Back-up method used to compute dispersion
when measured turbulence data are
missing (MDISP2)                       Default: 3     ! MDISP2 =  3  !
(used only if MDISP = 1 or 5)
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
       (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
       the ISCST multi-segment approximation) and MP coefficients in
       urban areas
   4 = same as 3 except PG coefficients computed using
       the MESOPUFF II eqns.

[DIAGNOSTIC FEATURE]
Method used for Lagrangian timescale for Sigma-y
(used only if MDISP=1,2 or MDISP2=1,2)
(MTAULY)                               Default: 0     ! MTAULY =  0  !
   0 = Draxler default 617.284 (s)
   1 = Computed as Lag. Length / (.75 q) -- after SCIPUFF
  10 < Direct user input (s)              -- e.g., 306.9


[DIAGNOSTIC FEATURE]
Method used for Advective-Decay timescale for Turbulence
(used only if MDISP=2 or MDISP2=2)
(MTAUADV)                              Default: 0     ! MTAUADV =  0  !
   0 = No turbulence advection
   1 = Computed (OPTION NOT IMPLEMENTED)
  10 < Direct user input (s)   -- e.g., 800


Method used to compute turbulence sigma-v &
sigma-w using micrometeorological variables
(Used only if MDISP = 2 or MDISP2 = 2)
(MCTURB)                               Default: 1     ! MCTURB =  1  !
   1 = Standard CALPUFF subroutines
   2 = AERMOD subroutines

PG sigma-y,z adj. for roughness?       Default: 0     ! MROUGH =  0  !
(MROUGH)
   0 = no
   1 = yes

Partial plume penetration of           Default: 1     ! MPARTL =  1  !
elevated inversion modeled for
point sources?
(MPARTL)
   0 = no
   1 = yes

Partial plume penetration of           Default: 1     ! MPARTLBA =  1  !
elevated inversion modeled for
buoyant area sources?
(MPARTLBA)
   0 = no
   1 = yes

Strength of temperature inversion      Default: 0     ! MTINV =  0  !
provided in PROFILE.DAT extended records?
(MTINV)
   0 = no (computed from measured/default gradients)
   1 = yes

PDF used for dispersion under convective conditions?
                                       Default: 0     ! MPDF =  0  !
(MPDF)
   0 = no
   1 = yes

Sub-Grid TIBL module used for shore line?
                                       Default: 0     ! MSGTIBL = 0  !
(MSGTIBL)
   0 = no
   1 = yes
```

```
     Boundary conditions (concentration) modeled?
                                          Default: 0     ! MBCON = 0   !
     (MBCON)
        0 = no
        1 = yes, using formatted BCON.DAT file
        2 = yes, using unformatted CONC.DAT file

     Note:  MBCON > 0 requires that the last species modeled
            be 'BCON'.  Mass is placed in species BCON when
            generating boundary condition puffs so that clean
            air entering the modeling domain can be simulated
            in the same way as polluted air.  Specify zero
            emission of species BCON for all regular sources.

     Individual source contributions saved?
                                          Default: 0     ! MSOURCE = 0   !
     (MSOURCE)
        0 = no
        1 = yes


     Analyses of fogging and icing impacts due to emissions from
     arrays of mechanically-forced cooling towers can be performed
     using CALPUFF in conjunction with a cooling tower emissions
     processor (CTEMISS) and its associated postprocessors.  Hourly
     emissions of water vapor and temperature from each cooling tower
     cell are computed for the current cell configuration and ambient
     conditions by CTEMISS. CALPUFF models the dispersion of these
     emissions and provides cloud information in a specialized format
     for further analysis. Output to FOG.DAT is provided in either
     'plume mode' or 'receptor mode' format.

     Configure for FOG Model output?
                                          Default: 0     ! MFOG =   0   !
     (MFOG)
        0 = no
        1 = yes  - report results in PLUME Mode format
        2 = yes  - report results in RECEPTOR Mode format


     Test options specified to see if
     they conform to regulatory
     values? (MREG)                       Default: 1     ! MREG =   0   !

        0 = NO checks are made
        1 = Technical options must conform to USEPA
            Long Range Transport (LRT) guidance
                       METFM    1 or 2
                       AVET     60. (min)
                       PGTIME   60. (min)
                       MGAUSS   1
                       MCTADJ   3
                       MTRANS   1
                       MTIP     1
                       MRISE    1
                       MCHEM    1 or 3 (if modeling SOx, NOx)
                       MWET     1
                       MDRY     1
                       MDISP    2 or 3
                       MPDF     0 if MDISP=3
                                1 if MDISP=2
                       MROUGH   0
                       MPARTL   1
                       MPARTLBA 0
                       SYTDEP   550. (m)
                       MHFTSZ   0
                       SVMIN    0.5 (m/s)


!END!


-------------------------------------------------------------------------------

INPUT GROUP: 3a, 3b -- Species list
-------------------

------------
Subgroup (3a)
------------
```

```
  The following species are modeled:

! CSPEC =          ODOR !          !END!

                                                                    Dry                  OUTPUT GROUP
    SPECIES          MODELED            EMITTED            DEPOSITED                     NUMBER
     NAME          (0=NO, 1=YES)      (0=NO, 1=YES)        (0=NO,                        (0=NONE,
   (Limit: 12                                               1=COMPUTED-GAS               1=1st CGRUP,
    Characters                                              2=COMPUTED-PARTICLE          2=2nd CGRUP,
    in length)                                              3=USER-SPECIFIED)            3= etc.)

!         ODOR  =           1,               1,             0,                       0   !

!END!

  Note:  The last species in (3a) must be 'BCON' when using the
         boundary condition option (MBCON > 0).  Species BCON should
         typically be modeled as inert (no chem transformation or
         removal).


-------------
Subgroup (3b)
-------------
  The following names are used for Species-Groups in which results
  for certain species are combined (added) prior to output.  The
  CGRUP name will be used as the species name in output files.
  Use this feature to model specific particle-size distributions
  by treating each size-range as a separate species.
  Order must be consistent with 3(a) above.



-------------------------------------------------------------------------------


INPUT GROUP: 4 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                     Default: UTM     ! PMAP = UTM  !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                    Default=0.0      ! FEAST  = 0.000  !
     (FNORTH)                   Default=0.0      ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                   No Default       ! IUTMZN =  56   !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                   Default: N       ! UTMHEM = S  !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                    No Default       ! RLAT0 =  0N  !
     (RLON0)                    No Default       ! RLON0 =  0E  !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
                RLAT0 selected for convenience
         EM  :  RLON0 identifies central meridian of projection
                RLAT0 is REPLACED by 0.0N (Equator)
```

```
        LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
               RLAT0 identifies latitude of tangent-point of mapping plane

    Matching parallel(s) of latitude (decimal degrees) for projection
    (Used only if PMAP= LCC or PS)
    (XLAT1)                    No Default      ! XLAT1 =  0N  !
    (XLAT2)                    No Default      ! XLAT2 =  0N  !

        LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
        PS  :  Projection plane slices through Earth at XLAT1
               (XLAT2 is not used)

    ----------
    Note:  Latitudes and longitudes should be positive, and include a
           letter N,S,E, or W indicating north or south latitude, and
           east or west longitude.  For example,
           35.9  N Latitude  =  35.9N
           118.7 E Longitude = 118.7E


    Datum-region
    ------------

    The Datum-Region for the coordinates is identified by a character
    string.  Many mapping products currently available use the model of the
    Earth known as the World Geodetic System 1984 (WGS-84).  Other local
    models may be in use, and their selection in CALMET will make its output
    consistent with local mapping products.  The list of Datum-Regions with
    official transformation parameters is provided by the National Imagery and
    Mapping Agency (NIMA).

    NIMA Datum - Regions(Examples)
    ------------------------------------------------------------------------------
    WGS-84    WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
    NAS-C     NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
    NAR-C     NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
    NWS-84    NWS 6370KM Radius, Sphere
    ESR-S     ESRI REFERENCE 6371KM Radius, Sphere

    Datum-region for output coordinates
    (DATUM)                    Default: WGS-84    ! DATUM = WGS-84  !

METEOROLOGICAL Grid:

    Rectangular grid defined for projection PMAP,
    with X the Easting and Y the Northing coordinate

           No. X grid cells (NX)       No default     ! NX =  40   !
           No. Y grid cells (NY)       No default     ! NY =  40   !
        No. vertical layers (NZ)       No default     ! NZ =  6   !

          Grid spacing (DGRIDKM)       No default     ! DGRIDKM = .3 !
                                       Units: km

               Cell face heights
                   (ZFACE(nz+1))       No defaults
                                       Units: m
  ! ZFACE = .0, 20.0, 50.0, 100.0, 500.0, 2000.0, 2500.0 !

           Reference Coordinates
          of SOUTHWEST corner of
                grid cell(1, 1):

           X coordinate (XORIGKM)      No default     ! XORIGKM = 273.908 !
           Y coordinate (YORIGKM)      No default     ! YORIGKM = 6205.203 !
                                      Units: km


COMPUTATIONAL Grid:

    The computational grid is identical to or a subset of the MET. grid.
    The lower left (LL) corner of the computational grid is at grid point
    (IBCOMP, JBCOMP) of the MET. grid.  The upper right (UR) corner of the
    computational grid is at grid point (IECOMP, JECOMP) of the MET. grid.
    The grid spacing of the computational grid is the same as the MET. grid.

       X index of LL corner (IBCOMP)      No default     ! IBCOMP =  1   !
               (1 <= IBCOMP <= NX)

       Y index of LL corner (JBCOMP)      No default     ! JBCOMP =  1   !
```

```
                (1 <= JBCOMP <= NY)


       X index of UR corner (IECOMP)      No default      ! IECOMP =  40    !
                (1 <= IECOMP <= NX)

       Y index of UR corner (JECOMP)      No default      ! JECOMP =  40    !
                (1 <= JECOMP <= NY)


SAMPLING Grid (GRIDDED RECEPTORS):

     The lower left (LL) corner of the sampling grid is at grid point
     (IBSAMP, JBSAMP) of the MET. grid.  The upper right (UR) corner of the
     sampling grid is at grid point (IESAMP, JESAMP) of the MET. grid.
     The sampling grid must be identical to or a subset of the computational
     grid.  It may be a nested grid inside the computational grid.
     The grid spacing of the sampling grid is DGRIDKM/MESHDN.

        Logical flag indicating if gridded
        receptors are used (LSAMP)         Default: T      ! LSAMP = T !
        (T=yes, F=no)

        X index of LL corner (IBSAMP)      No default      ! IBSAMP =  1    !
         (IBCOMP <= IBSAMP <= IECOMP)

        Y index of LL corner (JBSAMP)      No default      ! JBSAMP =  1    !
         (JBCOMP <= JBSAMP <= JECOMP)


        X index of UR corner (IESAMP)      No default      ! IESAMP =  40    !
         (IBCOMP <= IESAMP <= IECOMP)

        Y index of UR corner (JESAMP)      No default      ! JESAMP =  40    !
         (JBCOMP <= JESAMP <= JECOMP)


       Nesting factor of the sampling
        grid (MESHDN)                      Default: 1      ! MESHDN =  3  !
        (MESHDN is an integer >= 1)

!END!

--------------------------------------------------------------------------------


INPUT GROUP: 5 -- Output Options
--------------
                                                *                          *
     FILE                          DEFAULT VALUE             VALUE THIS RUN
     ----                          -------------             --------------

   Concentrations (ICON)                 1                   !  ICON =  1    !
   Dry Fluxes (IDRY)                     1                   !  IDRY =  0    !
   Wet Fluxes (IWET)                     1                   !  IWET =  0    !
   2D Temperature (IT2D)                 0                   !  IT2D =  0    !
   2D Density (IRHO)                     0                   !  IRHO =  0    !
   Relative Humidity (IVIS)              1                   !  IVIS =  0    !
    (relative humidity file is
     required for visibility
     analysis)
   Use data compression option in output file?
   (LCOMPRS)                           Default: T            ! LCOMPRS = T !

   *
    0 = Do not create file, 1 = create file


    QA PLOT FILE OUTPUT OPTION:

       Create a standard series of output files (e.g.
       locations of sources, receptors, grids ...)
       suitable for plotting?
       (IQAPLOT)                       Default: 1            !  IQAPLOT =  1    !
         0 = no
         1 = yes

    DIAGNOSTIC MASS FLUX OUTPUT OPTIONS:
```

```
      Mass flux across specified boundaries
      for selected species reported?
      (IMFLX)                        Default: 0          ! IMFLX =  0  !
        0 = no
        1 = yes (FLUXBDY.DAT and MASSFLX.DAT filenames
                 are specified in Input Group 0)

      Mass balance for each species
      reported?
      (IMBAL)                        Default: 0          ! IMBAL =  0  !
        0 = no
        1 = yes (MASSBAL.DAT filename is
             specified in Input Group 0)


   NUMERICAL RISE OUTPUT OPTION:

      Create a file with plume properties for each rise
      increment, for each model timestep?
      This applies to sources modeled with numerical rise
      and is limited to ONE source in the run.
      (INRISE)                       Default: 0          ! INRISE =  0  !
        0 = no
        1 = yes (RISE.DAT filename is
                 specified in Input Group 0)


   LINE PRINTER OUTPUT OPTIONS:

      Print concentrations (ICPRT)   Default: 0          ! ICPRT =  0   !
      Print dry fluxes (IDPRT)       Default: 0          ! IDPRT =  0   !
      Print wet fluxes (IWPRT)       Default: 0          ! IWPRT =  0   !
      (0 = Do not print, 1 = Print)

      Concentration print interval
      (ICFRQ) in timesteps           Default: 1          ! ICFRQ =  1   !
      Dry flux print interval
      (IDFRQ) in timesteps           Default: 1          ! IDFRQ =  1   !
      Wet flux print interval
      (IWFRQ) in timesteps           Default: 1          ! IWFRQ =  1   !

      Units for Line Printer Output
      (IPRTU)                        Default: 1          ! IPRTU =  5   !
                        for              for
                   Concentration     Deposition
          1 =        g/m**3           g/m**2/s
          2 =       mg/m**3          mg/m**2/s
          3 =       ug/m**3          ug/m**2/s
          4 =       ng/m**3          ng/m**2/s
          5 =      Odour Units

      Messages tracking progress of run
      written to the screen ?
      (IMESG)                        Default: 2          ! IMESG =  2   !
        0 = no
        1 = yes (advection step, puff ID)
        2 = yes (YYYYJJJHH, # old puffs, # emitted puffs)


    SPECIES (or GROUP for combined species) LIST FOR OUTPUT OPTIONS

                 ---- CONCENTRATIONS ----    ------ DRY FLUXES ------    ------ WET FLUXES --
----   -- MASS FLUX --
   SPECIES
   /GROUP          PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON
DISK?   SAVED ON DISK?
   -------       ------------------------    ------------------------    --------------------
----   ---------------
!         ODOR =      0,           1,           0,           0,           0,           0,
0   !

  Note:  Species BCON (for MBCON > 0) does not need to be saved on disk.


    OPTIONS FOR PRINTING "DEBUG" QUANTITIES (much output)

      Logical for debug output
      (LDEBUG)                                Default: F     ! LDEBUG = F !

      First puff to track
      (IPFDEB)                                Default: 1     ! IPFDEB =  1   !
```

```
       Number of puffs to track
       (NPFDEB)                               Default: 1      ! NPFDEB =  1  !

       Met. period to start output
       (NN1)                                  Default: 1      ! NN1 =  1   !

       Met. period to end output
       (NN2)                                  Default: 10     ! NN2 =  10  !

!END!

-------------------------------------------------------------------------------

INPUT GROUP: 6a, 6b, & 6c -- Subgrid scale complex terrain inputs
-------------------------

---------------
Subgroup (6a)
---------------
       Number of terrain features (NHILL)     Default: 0      ! NHILL =  0   !

       Number of special complex terrain
       receptors  (NCTREC)                    Default: 0      ! NCTREC =  0   !

       Terrain and CTSG Receptor data for
       CTSG hills input in CTDM format ?
       (MHILL)                                No Default      ! MHILL =  2   !
       1 = Hill and Receptor data created
           by CTDM processors & read from
           HILL.DAT and HILLRCT.DAT files
       2 = Hill data created by OPTHILL &
           input below in Subgroup (6b);
           Receptor data in Subgroup (6c)

       Factor to convert horizontal dimensions  Default: 1.0   ! XHILL2M = 1.0 !
       to meters (MHILL=1)

       Factor to convert vertical dimensions    Default: 1.0   ! ZHILL2M = 1.0 !
       to meters (MHILL=1)

       X-origin of CTDM system relative to      No Default     ! XCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

       Y-origin of CTDM system relative to      No Default     ! YCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

! END !

---------------
Subgroup (6b)
---------------

                      1 **
     HILL information


HILL           XC          YC        THETAH  ZGRID  RELIEF    EXPO 1    EXPO 2   SCALE 1
SCALE 2    AMAX1     AMAX2
 NO.          (km)        (km)       (deg.)   (m)      (m)       (m)       (m)       (m)
(m)        (m)       (m)
----          ----        ----       ------  ------  ------    ------    ------   -------   --
-----      -----     -----

---------------
Subgroup (6c)
---------------

    COMPLEX TERRAIN RECEPTOR INFORMATION

                      XRCT         YRCT        ZRCT          XHH
                      (km)         (km)         (m)
                     ------       -----       ------         ----


-------------------
1
     Description of Complex Terrain Variables:
          XC, YC  = Coordinates of center of hill
```

```
        THETAH  = Orientation of major axis of hill (clockwise from
                  North)
        ZGRID   = Height of the  0  of the grid above mean sea
                  level
        RELIEF  = Height of the crest of the hill above the grid elevation
        EXPO 1  = Hill-shape exponent for the major axis
        EXPO 2  = Hill-shape exponent for the major axis
        SCALE 1 = Horizontal length scale along the major axis
        SCALE 2 = Horizontal length scale along the minor axis
        AMAX    = Maximum allowed axis length for the major axis
        BMAX    = Maximum allowed axis length for the major axis

        XRCT, YRCT = Coordinates of the complex terrain receptors
        ZRCT    = Height of the ground (MSL) at the complex terrain
                  Receptor
        XHH     = Hill number associated with each complex terrain receptor
                  (NOTE: MUST BE ENTERED AS A REAL NUMBER)

   **
     NOTE: DATA for each hill and CTSG receptor are treated as a separate
           input subgroup and therefore must end with an input group terminator.

-------------------------------------------------------------------------------


INPUT GROUP: 7 -- Chemical parameters for dry deposition of gases
--------------

      SPECIES      DIFFUSIVITY        ALPHA STAR        REACTIVITY     MESOPHYLL RESISTANCE
HENRY'S LAW COEFFICIENT
       NAME          (cm**2/s)                                                          (s/cm)
(dimensionless)
      -------     -----------      ----------      ----------     --------------------    -
----------------------


!END!


-------------------------------------------------------------------------------


INPUT GROUP: 8 -- Size parameters for dry deposition of particles
--------------

     For SINGLE SPECIES, the mean and standard deviation are used to
     compute a deposition velocity for NINT (see group 9) size-ranges,
     and these are then averaged to obtain a mean deposition velocity.

     For GROUPED SPECIES, the size distribution should be explicitly
     specified (by the 'species' in the group), and the standard deviation
     for each should be entered as 0.  The model will then use the
     deposition velocity for the stated mean diameter.

      SPECIES      GEOMETRIC MASS MEAN        GEOMETRIC STANDARD
       NAME             DIAMETER                   DEVIATION
                        (microns)                  (microns)
      -------      -------------------        ------------------

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 9 -- Miscellaneous dry deposition parameters
--------------

     Reference cuticle resistance (s/cm)
     (RCUTR)                           Default: 30     !  RCUTR = 30.0 !
     Reference ground resistance  (s/cm)
     (RGR)                             Default: 10     !    RGR = 10.0 !
     Reference pollutant reactivity
     (REACTR)                          Default: 8      ! REACTR = 8.0 !

     Number of particle-size intervals used to
     evaluate effective particle deposition velocity
     (NINT)                            Default: 9      !   NINT =  9   !

     Vegetation state in unirrigated areas
     (IVEG)                            Default: 1      !   IVEG =  1   !
```

```
        IVEG=1 for active and unstressed vegetation
        IVEG=2 for active and stressed vegetation
        IVEG=3 for inactive vegetation

!END!

--------------------------------------------------------------------------------


INPUT GROUP: 10 -- Wet Deposition Parameters
---------------


                      Scavenging Coefficient -- Units: (sec)**(-1)

       Pollutant      Liquid Precip.       Frozen Precip.
       ---------      --------------       --------------

!END!

--------------------------------------------------------------------------------


INPUT GROUP: 11a, 11b -- Chemistry Parameters
---------------------

---------------
Subgroup (11a)
---------------

     Ozone data input option (MOZ)     Default: 1            ! MOZ =  0   !
     (Used only if MCHEM = 1, 3, or 4)
        0 = use a monthly background ozone value
        1 = read hourly ozone concentrations from
            the OZONE.DAT data file

     Monthly ozone concentrations
     (Used only if MCHEM = 1, 3, or 4 and
      MOZ = 0 or MOZ = 1 and all hourly O3 data missing)
     (BCKO3) in ppb                    Default: 12*80.
     !   BCKO3 = 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00, 80.00,
80.00, 80.00 !

     Monthly ammonia concentrations
     (Used only if MCHEM = 1, or 3)
     (BCKNH3) in ppb                   Default: 12*10.
     !   BCKNH3 = 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00,
10.00, 10.00 !

     Nighttime SO2 loss rate (RNITE1)
     in percent/hour                   Default: 0.2          ! RNITE1 = .2 !

     Nighttime NOx loss rate (RNITE2)
     in percent/hour                   Default: 2.0          ! RNITE2 = 2.0 !

     Nighttime HNO3 formation rate (RNITE3)
     in percent/hour                   Default: 2.0          ! RNITE3 = 2.0 !

     H2O2 data input option (MH2O2)    Default: 1            ! MH2O2 =  1   !
     (Used only if MAQCHEM = 1)
        0 = use a monthly background H2O2 value
        1 = read hourly H2O2 concentrations from
            the H2O2.DAT data file

     Monthly H2O2 concentrations
     (Used only if MQACHEM = 1 and
      MH2O2 = 0 or MH2O2 = 1 and all hourly H2O2 data missing)
     (BCKH2O2) in ppb                  Default: 12*1.
     !  BCKH2O2 = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !


 --- Data for SECONDARY ORGANIC AEROSOL (SOA) Option
     (used only if MCHEM = 4)

     The SOA module uses monthly values of:
          Fine particulate concentration in ug/m^3 (BCKPMF)
          Organic fraction of fine particulate     (OFRAC)
          VOC / NOX ratio (after reaction)         (VCNX)
     to characterize the air mass when computing
```

```
     the formation of SOA from VOC emissions.
     Typical values for several distinct air mass types are:

        Month    1    2    3    4    5    6    7    8    9   10   11   12
                Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

     Clean Continental
        BCKPMF   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.
        OFRAC  .15  .15  .20  .20  .20  .20  .20  .20  .20  .20  .20  .15
        VCNX   50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

     Clean Marine (surface)
        BCKPMF  .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5
        OFRAC  .25  .25  .30  .30  .30  .30  .30  .30  .30  .30  .30  .25
        VCNX   50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

     Urban - low biogenic (controls present)
        BCKPMF 30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.
        OFRAC  .20  .20  .25  .25  .25  .25  .25  .25  .20  .20  .20  .20
        VCNX    4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.

     Urban - high biogenic (controls present)
        BCKPMF 60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.
        OFRAC  .25  .25  .30  .30  .30  .55  .55  .55  .35  .35  .35  .25
        VCNX   15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

     Regional Plume
        BCKPMF 20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.
        OFRAC  .20  .20  .25  .35  .25  .40  .40  .40  .30  .30  .30  .20
        VCNX   15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

     Urban - no controls present
        BCKPMF 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100.
        OFRAC  .30  .30  .35  .35  .35  .55  .55  .55  .35  .35  .35  .30
        VCNX    2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.

     Default: Clean Continental
     !  BCKPMF = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !
     !  OFRAC  = 0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15 !
     !   VCNX    = 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00,
50.00, 50.00 !

 --- End Data for SECONDARY ORGANIC AEROSOL (SOA) Option


     Number of half-life decay specification blocks provided in Subgroup 11b
     (Used only if MCHEM = 5)
     (NDECAY)                                    Default: 0      ! NDECAY =  0    !

!END!


--------------
Subgroup (11b)
--------------

     Each species modeled may be assigned a decay half-life (sec), and the associated
     mass lost may be assigned to one or more other modeled species using a mass yield
     factor. This information is used only for MCHEM=5.

     Provide NDECAY blocks assigning the half-life for a parent species and mass yield
     factors for each child species (if any) produced by the decay.
     Set HALF_LIFE=0.0 for NO decay (infinite half-life).


                                  a            b
        SPECIES        Half-Life    Mass Yield
         NAME            (sec)        Factor
        -------        ---------    ----------

     *   SPEC1    =     3600.,          -1.0     *      (Parent)*
     *   SPEC2    =      -1.0,           0.0     *      (Child)*
   *END*

--------
    a
     Specify a half life that is greater than or equal to zero for 1 parent species
     in each block, and set the yield factor for this species to -1
    b
     Specify a yield factor that is greater than or equal to zero for 1 or more child
     species in each block, and set the half-life for each of these species to -1
```

```
     NOTE: Assignments in each block are treated as a separate input
           subgroup and therefore must end with an input group terminator.
           If NDECAY=0, no assignments and input group terminators should appear.

--------------------------------------------------------------------------------

INPUT GROUP: 12 -- Misc. Dispersion and Computational Parameters
---------------

     Horizontal size of puff (m) beyond which
     time-dependent dispersion equations (Heffter)
     are used to determine sigma-y and
     sigma-z (SYTDEP)                           Default: 550.   ! SYTDEP = 5.5E02 !

     Switch for using Heffter equation for sigma z
     as above (0 = Not use Heffter; 1 = use Heffter
     (MHFTSZ)                                   Default: 0      ! MHFTSZ =  0   !

     Stability class used to determine plume
     growth rates for puffs above the boundary
     layer (JSUP)                               Default: 5      ! JSUP =  5   !

     Vertical dispersion constant for stable
     conditions (k1 in Eqn. 2.7-3)  (CONK1)     Default: 0.01   ! CONK1 = .01 !

     Vertical dispersion constant for neutral/
     unstable conditions (k2 in Eqn. 2.7-4)
     (CONK2)                                    Default: 0.1    ! CONK2 = .1 !

     Factor for determining Transition-point from
     Schulman-Scire to Huber-Snyder Building Downwash
     scheme (SS used for Hs < Hb + TBD * HL)
     (TBD)                                      Default: 0.5    ! TBD = .5 !
        TBD < 0   ==> always use Huber-Snyder
        TBD = 1.5 ==> always use Schulman-Scire
        TBD = 0.5 ==> ISC Transition-point

     Range of land use categories for which
     urban dispersion is assumed
     (IURB1, IURB2)                             Default: 10     ! IURB1 =  10  !
                                                         19     ! IURB2 =  19  !

     Site characterization parameters for single-point Met data files ---------
     (needed for METFM = 2,3,4,5)

        Land use category for modeling domain
        (ILANDUIN)                              Default: 20     ! ILANDUIN =  20  !

        Roughness length (m) for modeling domain
        (Z0IN)                                  Default: 0.25   ! Z0IN = .25 !

        Leaf area index for modeling domain
        (XLAIIN)                                Default: 3.0    ! XLAIIN = 3.0 !

        Elevation above sea level (m)
        (ELEVIN)                                Default: 0.0    ! ELEVIN = .0 !

        Latitude (degrees) for met location
        (XLATIN)                                Default: -999.  ! XLATIN = -999.0 !

        Longitude (degrees) for met location
        (XLONIN)                                Default: -999.  ! XLONIN = -999.0 !

     Specialized information for interpreting single-point Met data files -----

        Anemometer height (m) (Used only if METFM = 2,3)
        (ANEMHT)                                Default: 10.    ! ANEMHT = 10.0 !

        Form of lateral turbulance data in PROFILE.DAT file
        (Used only if METFM = 4,5 or MTURBVW = 1 or 3)
        (ISIGMAV)                               Default: 1      ! ISIGMAV =  1  !
            0 = read sigma-theta
            1 = read sigma-v

        Choice of mixing heights (Used only if METFM = 4)
        (IMIXCTDM)                              Default: 0      ! IMIXCTDM =  0  !
            0 = read PREDICTED mixing heights
            1 = read OBSERVED mixing heights
```

```
Maximum length of a slug (met. grid units)
(XMXLEN)                                      Default: 1.0    ! XMXLEN = 1.0 !

Maximum travel distance of a puff/slug (in
grid units) during one sampling step
(XSAMLEN)                                     Default: 1.0    ! XSAMLEN = 1.0 !

Maximum Number of slugs/puffs release from
one source during one time step
(MXNEW)                                       Default: 99     ! MXNEW =  99   !

Maximum Number of sampling steps for
one puff/slug during one time step
(MXSAM)                                       Default: 99     ! MXSAM =  99   !

Number of iterations used when computing
the transport wind for a sampling step
that includes gradual rise (for CALMET
and PROFILE winds)
(NCOUNT)                                      Default: 2      ! NCOUNT =  2   !

Minimum sigma y for a new puff/slug (m)
(SYMIN)                                       Default: 1.0    ! SYMIN = 1.0  !

Minimum sigma z for a new puff/slug (m)
(SZMIN)                                       Default: 1.0    ! SZMIN = 1.0  !

Maximum sigma z (m) allowed to avoid
numerical problem in calculating virtual
time or distance.  Cap should be large
enough to have no influence on normal events.
Enter a negative cap to disable.
(SZCAP_M)                                     Default: 5.0e06 ! SZCAP_M = 5.0E06 !

Default minimum turbulence velocities sigma-v and sigma-w
for each stability class over land and over water (m/s)
(SVMIN(12) and SWMIN(12))

                ---------- LAND ----------       --------- WATER ----------
   Stab Class :  A    B    C    D    E    F         A    B    C    D    E    F
                ---  ---  ---  ---  ---  ---       ---  ---  ---  ---  ---  ---
Default SVMIN : .50, .50, .50, .50, .50, .50,      .37, .37, .37, .37, .37, .37
Default SWMIN : .20, .12, .08, .06, .03, .016,     .20, .12, .08, .06, .03, .016

        ! SVMIN = 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.370, 0.370, 0.370, 0.370,
0.370, 0.370!
        ! SWMIN = 0.200, 0.120, 0.080, 0.060, 0.030, 0.016, 0.200, 0.120, 0.080, 0.060,
0.030, 0.016!

Divergence criterion for dw/dz across puff
used to initiate adjustment for horizontal
convergence (1/s)
Partial adjustment starts at CDIV(1), and
full adjustment is reached at CDIV(2)
(CDIV(2))                                     Default: 0.0,0.0  ! CDIV = .0, .0 !

Search radius (number of cells) for nearest
land and water cells used in the subgrid
TIBL module
(NLUTIBL)                                     Default: 4      ! NLUTIBL =  4  !

Minimum wind speed (m/s) allowed for
non-calm conditions. Also used as minimum
speed returned when using power-law
extrapolation toward surface
(WSCALM)                                      Default: 0.5    ! WSCALM = .5 !

Maximum mixing height (m)
(XMAXZI)                                      Default: 3000.  ! XMAXZI = 3000.0 !

Minimum mixing height (m)
(XMINZI)                                      Default: 50.    ! XMINZI = 50.0 !

Default wind speed classes --
5 upper bounds (m/s) are entered;
the 6th class has no upper limit
(WSCAT(5))                          Default     :
                                    ISC RURAL : 1.54, 3.09, 5.14, 8.23, 10.8 (10.8+)

                        Wind Speed Class :  1     2     3     4     5
                                           ---   ---   ---   ---   ---
```

```
                                         ! WSCAT = 1.54, 3.09, 5.14, 8.23, 10.80 !

Default wind speed profile power-law
exponents for stabilities 1-6
(PLX0(6))                        Default    : ISC RURAL values
                                 ISC RURAL : .07, .07, .10, .15, .35, .55
                                 ISC URBAN : .15, .15, .20, .25, .30, .30

                           Stability Class :  A     B     C     D     E     F
                                             ---   ---   ---   ---   ---   ---
                                    ! PLX0 = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55 !

Default potential temperature gradient
for stable classes E, F (degK/m)
(PTG0(2))                        Default: 0.020, 0.035
                                    ! PTG0 = 0.020,   0.035 !

Default plume path coefficients for
each stability class (used when option
for partial plume height terrain adjustment
is selected -- MCTADJ=3)
(PPC(6))                   Stability Class :  A     B     C     D     E     F
                              Default  PPC : .50,  .50,  .50,  .50,  .35,  .35
                                             ---   ---   ---   ---   ---   ---
                                    !  PPC = 0.50, 0.50, 0.50, 0.50, 0.35, 0.35 !

Slug-to-puff transition criterion factor
equal to sigma-y/length of slug
(SL2PF)                               Default: 10.       ! SL2PF = 10.0 !

Puff-splitting control variables ------------------------

  VERTICAL SPLIT
  --------------

  Number of puffs that result every time a puff
  is split - nsplit=2 means that 1 puff splits
  into 2
  (NSPLIT)                            Default:   3       ! NSPLIT =  3  !

  Time(s) of a day when split puffs are eligible to
  be split once again; this is typically set once
  per day, around sunset before nocturnal shear develops.
  24 values: 0 is midnight (00:00) and 23 is 11 PM (23:00)
  0=do not re-split    1=eligible for re-split
  (IRESPLIT(24))                      Default:  Hour 17 = 1
  !  IRESPLIT = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0 !

  Split is allowed only if last hour's mixing
  height (m) exceeds a minimum value
  (ZISPLIT)                           Default: 100.      ! ZISPLIT = 100.0 !

  Split is allowed only if ratio of last hour's
  mixing ht to the maximum mixing ht experienced
  by the puff is less than a maximum value (this
  postpones a split until a nocturnal layer develops)
  (ROLDMAX)                           Default: 0.25      ! ROLDMAX = 0.25 !


  HORIZONTAL SPLIT
  ----------------

  Number of puffs that result every time a puff
  is split - nsplith=5 means that 1 puff splits
  into 5
  (NSPLITH)                           Default:   5       ! NSPLITH =  5  !

  Minimum sigma-y (Grid Cells Units) of puff
  before it may be split
  (SYSPLITH)                          Default:  1.0      ! SYSPLITH = 1.0 !

  Minimum puff elongation rate (SYSPLITH/hr) due to
  wind shear, before it may be split
  (SHSPLITH)                          Default:  2.       ! SHSPLITH = 2.0 !

  Minimum concentration (g/m^3) of each
  species in puff before it may be split
  Enter array of NSPEC values; if a single value is
  entered, it will be used for ALL species
  (CNSPLITH)                          Default:  1.0E-07  ! CNSPLITH = 1.0E-07 !
```

```
     Integration control variables ------------------------

       Fractional convergence criterion for numerical SLUG
       sampling integration
       (EPSSLUG)                          Default:   1.0e-04  ! EPSSLUG = 1.0E-04 !

       Fractional convergence criterion for numerical AREA
       source integration
       (EPSAREA)                          Default:   1.0e-06  ! EPSAREA = 1.0E-06 !

       Trajectory step-length (m) used for numerical rise
       integration
       (DSRISE)                           Default:   1.0      ! DSRISE = 1.0 !

       Boundary Condition (BC) Puff control variables ------------------------

       Minimum height (m) to which BC puffs are mixed as they are emitted
       (MBCON=2 ONLY).  Actual height is reset to the current mixing height
       at the release point if greater than this minimum.
       (HTMINBC)                          Default:   500.     ! HTMINBC = 500.0 !

       Search radius (km) about a receptor for sampling nearest BC puff.
       BC puffs are typically emitted with a spacing of one grid cell
       length, so the search radius should be greater than DGRIDKM.
       (RSAMPBC)                          Default:   10.      ! RSAMPBC = 10.0 !

       Near-Surface depletion adjustment to concentration profile used when
       sampling BC puffs?
       (MDEPBC)                           Default:   1        ! MDEPBC =  1  !
          0 = Concentration is NOT adjusted for depletion
          1 = Adjust Concentration for depletion

!END!

--------------------------------------------------------------------------------

INPUT GROUPS: 13a, 13b, 13c, 13d -- Point source parameters
--------------------------------

---------------
Subgroup (13a)
---------------

     Number of point sources with
     parameters provided below      (NPT1)  No default  !  NPT1 =  52  !

     Units used for point source
     emissions below                (IPTU)  Default: 1  !  IPTU =   5  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (13d)        (NSPT1) Default: 0  !  NSPT1 =  30  !

     Number of point sources with
     variable emission parameters
     provided in external file      (NPT2)  No default  !  NPT2 =  0  !

     (If NPT2 > 0, these point
     source emissions are read from
     the file: PTEMARB.DAT)

!END!

---------------
Subgroup (13b)
---------------
                                         a
          POINT SOURCE: CONSTANT DATA
          -----------------------------
                                                                              b         c
  Source        X          Y        Stack     Base      Stack     Exit  Exit     Bldg.  Emission
```

```
No.      Coordinate Coordinate Height Elevation Diameter  Vel.  Temp.   Dwash   Rates
            (km)       (km)     (m)       (m)        (m)  (m/s) (deg. K)
------   ---------- ---------- ------  ------    --------- ----- -------- ----- --------
 1 ! SRCNAM = W1 !
 1 ! X =279.90855,6211.2144,      .5, 215.0,       .314,     .1, 298.15,  1.0,39.21 !
 1 ! ZPLTFM  =        .0 !
 1 ! FMFAC   =      1.0 !   !END!
 2 ! SRCNAM = W2 !
 2 ! X =279.90855,6211.2144,     1.5, 215.0,       .314,     .1, 298.15,  1.0,39.21 !
 2 ! ZPLTFM  =        .0 !
 2 ! FMFAC   =      1.0 !   !END!
 3 ! SRCNAM = W3 !
 3 ! X =279.90855,6211.2144,     2.5, 215.0,       .314,     .1, 298.15,  1.0,39.21 !
 3 ! ZPLTFM  =        .0 !
 3 ! FMFAC   =      1.0 !   !END!
 4 ! SRCNAM = SW1 !
 4 ! X =279.91587,6211.2053,      .5, 213.0,       .346,     .1, 298.15,  1.0,22.49 !
 4 ! ZPLTFM  =        .0 !
 4 ! FMFAC   =      1.0 !   !END!
 5 ! SRCNAM = SW2 !
 5 ! X =279.91587,6211.2053,     1.5, 213.0,       .346,     .1, 298.15,  1.0,22.49 !
 5 ! ZPLTFM  =        .0 !
 5 ! FMFAC   =      1.0 !   !END!
 6 ! SRCNAM = SW3 !
 6 ! X =279.91587,6211.2053,     2.5, 213.0,       .346,     .1, 298.15,  1.0,22.49 !
 6 ! ZPLTFM  =        .0 !
 6 ! FMFAC   =      1.0 !   !END!
 7 ! SRCNAM = SE1 !
 7 ! X =279.94309,6211.2112,      .1, 211.0,       .241,     .1, 298.15,  1.0,42.04 !
 7 ! ZPLTFM  =        .0 !
 7 ! FMFAC   =      1.0 !   !END!
 8 ! SRCNAM = SE2 !
 8 ! X =279.94309,6211.2112,     .25, 211.0,       .241,     .1, 298.15,  1.0,42.04 !
 8 ! ZPLTFM  =        .0 !
 8 ! FMFAC   =      1.0 !   !END!
 9 ! SRCNAM = SE3 !
 9 ! X =279.94309,6211.2112,      .4, 211.0,       .241,     .1, 298.15,  1.0,42.04 !
 9 ! ZPLTFM  =        .0 !
 9 ! FMFAC   =      1.0 !   !END!
10 ! SRCNAM = E1 !
10 ! X =279.94221,6211.2334,     1.0, 211.0,       .436,     .1, 298.15,  1.0,54.41 !
10 ! ZPLTFM  =        .0 !
10 ! FMFAC   =      1.0 !   !END!
11 ! SRCNAM = E2 !
11 ! X =279.94221,6211.2334,     2.5, 211.0,       .436,     .1, 298.15,  1.0,54.41 !
11 ! ZPLTFM  =        .0 !
11 ! FMFAC   =      1.0 !   !END!
12 ! SRCNAM = E3 !
12 ! X =279.94221,6211.2334,     4.0, 211.0,       .436,     .1, 298.15,  1.0,54.41 !
12 ! ZPLTFM  =        .0 !
12 ! FMFAC   =      1.0 !   !END!
13 ! SRCNAM = ANP1 !
13 ! X =279.98647,6211.2574,      .1, 206.0,     1.291,     .1, 298.15,   .0,21179.13 !
13 ! ZPLTFM  =        .0 !
13 ! FMFAC   =      1.0 !   !END!
14 ! SRCNAM = AEP1 !
14 ! X =279.98712,6211.3003,      .1, 203.0,     1.626,     .1, 298.15,   .0,15451.17 !
14 ! ZPLTFM  =        .0 !
14 ! FMFAC   =      1.0 !   !END!
15 ! SRCNAM = AEP2 !
15 ! X =280.00597,6211.3484,      .1, 201.0,       .846,     .1, 298.15,   .0,14046.52 !
15 ! ZPLTFM  =        .0 !
15 ! FMFAC   =      1.0 !   !END!
16 ! SRCNAM = AEP3 !
16 ! X =279.99362,6211.3868,      .1, 205.0,       .585,     .1, 298.15,   .0,12769.56 !
16 ! ZPLTFM  =        .0 !
16 ! FMFAC   =      1.0 !   !END!
17 ! SRCNAM = SHD1 !
17 ! X =279.93509,6211.3159,      .5, 212.0,       .697,     .1, 298.15,   .0,42.04 !
17 ! ZPLTFM  =        .0 !
17 ! FMFAC   =      1.0 !   !END!
18 ! SRCNAM = SHD2 !
18 ! X =279.93509,6211.3159,     1.5, 212.0,       .697,     .1, 298.15,   .0,42.04 !
18 ! ZPLTFM  =        .0 !
18 ! FMFAC   =      1.0 !   !END!
19 ! SRCNAM = SHD3 !
19 ! X =279.93509,6211.3159,     2.5, 212.0,       .697,     .1, 298.15,   .0,42.04 !
19 ! ZPLTFM  =        .0 !
19 ! FMFAC   =      1.0 !   !END!
20 ! SRCNAM = SHD4 !
20 ! X =279.90648,6211.1937,      .5, 214.0,       .697,     .1, 298.15,   .0,39.21 !
```

```
20 ! ZPLTFM  =        .0 !
20 ! FMFAC  =      1.0 !   !END!
21 ! SRCNAM = SHD5 !
21 ! X =279.90648,6211.1937,      1.5, 214.0,       .697,     .1, 298.15,   .0,39.21 !
21 ! ZPLTFM  =        .0 !
21 ! FMFAC  =      1.0 !   !END!
22 ! SRCNAM = SHD6 !
22 ! X =279.90648,6211.1937,      2.5, 214.0,       .697,     .1, 298.15,   .0,39.21 !
22 ! ZPLTFM  =        .0 !
22 ! FMFAC  =      1.0 !   !END!
23 ! SRCNAM = TRK1 !
23 ! X = 279.9546, 6211.247,       .5, 211.0,       .633,     .1, 298.15,   .0,54.41 !
23 ! ZPLTFM  =        .0 !
23 ! FMFAC  =      1.0 !   !END!
24 ! SRCNAM = TRK2 !
24 ! X = 279.9546, 6211.247,      1.5, 211.0,       .633,     .1, 298.15,   .0,54.41 !
24 ! ZPLTFM  =        .0 !
24 ! FMFAC  =      1.0 !   !END!
25 ! SRCNAM = TRK3 !
25 ! X = 279.9546, 6211.247,      2.5, 211.0,       .633,     .1, 298.15,   .0,54.41 !
25 ! ZPLTFM  =        .0 !
25 ! FMFAC  =      1.0 !   !END!
26 ! SRCNAM = PTH1 !
26 ! X =279.88307,6211.4362,       .5, 212.0,       .633,     .1, 298.15,   .0,54.41 !
26 ! ZPLTFM  =        .0 !
26 ! FMFAC  =      1.0 !   !END!
27 ! SRCNAM = PTH2 !
27 ! X =279.88307,6211.4362,      1.5, 212.0,       .633,     .1, 298.15,   .0,54.41 !
27 ! ZPLTFM  =        .0 !
27 ! FMFAC  =      1.0 !   !END!
28 ! SRCNAM = PTH3 !
28 ! X =279.88307,6211.4362,      2.5, 212.0,       .633,     .1, 298.15,   .0,54.41 !
28 ! ZPLTFM  =        .0 !
28 ! FMFAC  =      1.0 !   !END!
29 ! SRCNAM = PTH4 !
29 ! X =279.88892,6211.3959,       .5, 222.0,       .633,     .1, 298.15,   .0,54.41 !
29 ! ZPLTFM  =        .0 !
29 ! FMFAC  =      1.0 !   !END!
30 ! SRCNAM = PTH5 !
30 ! X =279.88892,6211.3959,      1.5, 222.0,       .633,     .1, 298.15,   .0,54.41 !
30 ! ZPLTFM  =        .0 !
30 ! FMFAC  =      1.0 !   !END!
31 ! SRCNAM = PTH6 !
31 ! X = 279.8889,6211.3959,      2.5, 222.0,       .633,     .1, 298.15,   .0,54.41 !
31 ! ZPLTFM  =        .0 !
31 ! FMFAC  =      1.0 !   !END!
32 ! SRCNAM = PTH7 !
32 ! X =279.90323,6211.3432,       .5, 231.0,       .633,     .1, 298.15,   .0,54.41 !
32 ! ZPLTFM  =        .0 !
32 ! FMFAC  =      1.0 !   !END!
33 ! SRCNAM = PTH8 !
33 ! X =279.90323,6211.3432,      1.5, 231.0,       .633,     .1, 298.15,   .0,54.41 !
33 ! ZPLTFM  =        .0 !
33 ! FMFAC  =      1.0 !   !END!
34 ! SRCNAM = PTH9 !
34 ! X =279.90323,6211.3432,      2.5, 231.0,       .633,     .1, 298.15,   .0,54.41 !
34 ! ZPLTFM  =        .0 !
34 ! FMFAC  =      1.0 !   !END!
35 ! SRCNAM = PTH10 !
35 ! X =279.93184,6211.2906,       .5, 232.0,       .633,     .1, 298.15,   .0,54.41 !
35 ! ZPLTFM  =        .0 !
35 ! FMFAC  =      1.0 !   !END!
36 ! SRCNAM = PTH11 !
36 ! X =279.93184,6211.2906,      1.5, 232.0,       .633,     .1, 298.15,   .0,54.41 !
36 ! ZPLTFM  =        .0 !
36 ! FMFAC  =      1.0 !   !END!
37 ! SRCNAM = PTH12 !
37 ! X =279.93184,6211.2906,      2.5, 232.0,       .633,     .1, 298.15,   .0,54.41 !
37 ! ZPLTFM  =        .0 !
37 ! FMFAC  =      1.0 !   !END!
38 ! SRCNAM = TRK4 !
38 ! X =279.91754,6211.1982,       .5, 212.0,       .633,     .1, 298.15,   .0,39.21 !
38 ! ZPLTFM  =        .0 !
38 ! FMFAC  =      1.0 !   !END!
39 ! SRCNAM = TRK5 !
39 ! X =279.91754,6211.1982,      1.5, 212.0,       .633,     .1, 298.15,   .0,39.21 !
39 ! ZPLTFM  =        .0 !
39 ! FMFAC  =      1.0 !   !END!
40 ! SRCNAM = TRK6 !
40 ! X =279.91754,6211.1982,      2.5, 212.0,       .633,     .1, 298.15,   .0,39.21 !
40 ! ZPLTFM  =        .0 !
```

```
40 ! FMFAC  =      1.0 !   !END!
41 ! SRCNAM = PTH13 !
41 ! X =279.91168, 6211.245,      .5, 215.0,       .633,     .1, 298.15,    .0,39.21 !
41 ! ZPLTFM  =        .0 !
41 ! FMFAC  =      1.0 !   !END!
42 ! SRCNAM = PTH14 !
42 ! X =279.91168, 6211.245,     1.5, 215.0,       .633,     .1, 298.15,    .0,39.21 !
42 ! ZPLTFM  =        .0 !
42 ! FMFAC  =      1.0 !   !END!
43 ! SRCNAM = PTH15 !
43 ! X =279.91168, 6211.245,     2.5, 215.0,       .633,     .1, 298.15,    .0,39.21 !
43 ! ZPLTFM  =        .0 !
43 ! FMFAC  =      1.0 !   !END!
44 ! SRCNAM = PTH16 !
44 ! X =279.90908,6211.3036,      .5, 217.0,       .633,     .1, 298.15,    .0,39.21 !
44 ! ZPLTFM  =        .0 !
44 ! FMFAC  =      1.0 !   !END!
45 ! SRCNAM = PTH17 !
45 ! X =279.90908,6211.3036,     1.5, 217.0,       .633,     .1, 298.15,    .0,39.21 !
45 ! ZPLTFM  =        .0 !
45 ! FMFAC  =      1.0 !   !END!
46 ! SRCNAM = PTH18 !
46 ! X =279.90908,6211.3036,     2.5, 217.0,       .633,     .1, 298.15,    .0,39.21 !
46 ! ZPLTFM  =        .0 !
46 ! FMFAC  =      1.0 !   !END!
47 ! SRCNAM = PTH19 !
47 ! X =279.89608,6211.3692,      .5, 226.0,       .633,     .1, 298.15,    .0,39.21 !
47 ! ZPLTFM  =        .0 !
47 ! FMFAC  =      1.0 !   !END!
48 ! SRCNAM = PTH20 !
48 ! X =279.89608,6211.3692,     1.5, 226.0,       .633,     .1, 298.15,    .0,39.21 !
48 ! ZPLTFM  =        .0 !
48 ! FMFAC  =      1.0 !   !END!
49 ! SRCNAM = PTH21 !
49 ! X =279.89608,6211.3692,     2.5, 226.0,       .633,     .1, 298.15,    .0,39.21 !
49 ! ZPLTFM  =        .0 !
49 ! FMFAC  =      1.0 !   !END!
50 ! SRCNAM = PTH22 !
50 ! X =279.88437,6211.4213,      .5, 232.0,       .633,     .1, 298.15,    .0,39.21 !
50 ! ZPLTFM  =        .0 !
50 ! FMFAC  =      1.0 !   !END!
51 ! SRCNAM = PTH23 !
51 ! X =279.88437,6211.4213,     1.5, 232.0,       .633,     .1, 298.15,    .0,39.21 !
51 ! ZPLTFM  =        .0 !
51 ! FMFAC  =      1.0 !   !END!
52 ! SRCNAM = PTH24 !
52 ! X =279.88437,6211.4213,     2.5, 232.0,       .633,     .1, 298.15,    .0,39.21 !
52 ! ZPLTFM  =        .0 !
52 ! FMFAC  =      1.0 !   !END!

--------

    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

     SRCNAM  is a 12-character name for a source
             (No default)
     X       is an array holding the source data listed by the column headings
             (No default)
     SIGYZI  is an array holding the initial sigma-y and sigma-z (m)
             (Default: 0.,0.)
     FMFAC   is a vertical momentum flux factor (0. or 1.0) used to represent
             the effect of rain-caps or other physical configurations that
             reduce momentum rise associated with the actual exit velocity.
             (Default: 1.0  -- full momentum used)
     ZPLTFM  is the platform height (m) for sources influenced by an isolated
             structure that has a significant open area between the surface
             and the bulk of the structure, such as an offshore oil platform.
             The Base Elevation is that of the surface (ground or ocean),
             and the Stack Height is the release height above the Base (not
             above the platform).  Building heights entered in Subgroup 13c
             must be those of the buildings on the platform, measured from
             the platform deck.  ZPLTFM is used only with MBDW=1 (ISC
             downwash method) for sources with building downwash.
             (Default: 0.0)

    b
     0. = No building downwash modeled
     1. = Downwash modeled for buildings resting on the surface
     2. = Downwash modeled for buildings raised above the surface (ZPLTFM > 0.)
```

NOTE: must be entered as a REAL number (i.e., with decimal point)

c
An emission rate must be entered for every pollutant modeled.
Enter emission rate of zero for secondary pollutants that are
modeled, but not emitted. Units are specified by IPTU
(e.g. 1 for g/s).

Subgroup (13c)

BUILDING DIMENSION DATA FOR SOURCES SUBJECT TO DOWNWASH

```
Source                                                                    a
 No.       Effective building height, width, length and X/Y offset (in meters)
           every 10 degrees.  LENGTH, XBADJ, and YBADJ are only needed for
           MBDW=2 (PRIME downwash option)
------     --------------------------------------------------------------------

 1     ! SRCNAM  =   W1 !
 1     ! HEIGHT  =  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    .0,     .0,
                    .0,     .0,     .0,     .0,     .0,     .0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    .0,     .0,
                    .0,     .0,     .0,     .0,     .0,     .0!
 1     ! WIDTH   =  34.75,   42.5,   49.0,   54.0,   57.0,   60.5,
                    62.0,   61.0,   59.0,   61.0,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    34.81,   42.5,   49.0,   54.0,   57.5,   60.5,
                    62.0,   61.5,   59.0,   61.0,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0!
 1     ! LENGTH =   61.5,   61.5,   61.0,   59.0,   56.0,   50.75,
                    44.25,   36.25,   30.0,   34.81,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    61.0,   61.5,   61.5,   59.5,   56.0,   50.75,
                    44.25,   36.13,   30.0,   34.81,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0!
 1     ! XBADJ   =  -.5,    2.5,    4.0,    5.0,    5.0,    5.75,
                    6.0,    6.0,    6.0,    .12,    .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    -61.0,   -64.0,   -65.0,   -64.0,   -61.0,   -56.5,
                    -50.25,   -42.25,   -36.0,   -34.94,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0!
 1     ! YBADJ   =  -17.5,   -11.5,   -5.0,   1.25,   8.0,   13.25,
                    18.5,   22.5,   26.5,   30.0,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    17.53,   11.5,   5.25,   -1.25,   -7.75,   -13.25,
                    -18.0,   -22.75,   -26.5,   -30.5,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0!
!END!
 2     ! SRCNAM  =   W2 !
 2     ! HEIGHT  =  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    .0,     .0,
                    .0,     .0,     .0,     .0,     .0,     .0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    .0,     .0,
                    .0,     .0,     .0,     .0,     .0,     .0!
 2     ! WIDTH   =  34.75,   42.5,   49.0,   54.0,   57.0,   60.5,
                    62.0,   61.0,   59.0,   61.0,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    34.81,   42.5,   49.0,   54.0,   57.5,   60.5,
                    62.0,   61.5,   59.0,   61.0,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0!
 2     ! LENGTH =   61.5,   61.5,   61.0,   59.0,   56.0,   50.75,
                    44.25,   36.25,   30.0,   34.81,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    61.0,   61.5,   61.5,   59.5,   56.0,   50.75,
                    44.25,   36.13,   30.0,   34.81,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0!
 2     ! XBADJ   =  -.5,    2.5,    4.0,    5.0,    5.0,    5.75,
                    6.0,    6.0,    6.0,    .12,    .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    -61.0,   -64.0,   -65.0,   -64.0,   -61.0,   -56.5,
                    -50.25,   -42.25,   -36.0,   -34.94,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0!
 2     ! YBADJ   =  -17.5,   -11.5,   -5.0,   1.25,   8.0,   13.25,
                    18.5,   22.5,   26.5,   30.0,   .0,    .0,
                    .0,     .0,     .0,     .0,     .0,    .0,
                    17.53,   11.5,   5.25,   -1.25,   -7.75,   -13.25,
```

```
                  -18.0,    -22.75,    -26.5,    -30.5,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0!
!END!
 3     ! SRCNAM  =   W3 !
 3     ! HEIGHT  =  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                  3.0,    3.0,    3.0,    3.0,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0,
                  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                  3.0,    3.0,    3.0,    3.0,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0!
 3     ! WIDTH   =  34.75,    42.5,    49.0,    54.0,    57.0,    60.5,
                  62.0,    61.0,    59.0,    61.0,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0,
                  34.81,    42.5,    49.0,    54.0,    57.5,    60.5,
                  62.0,    61.5,    59.0,    61.0,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0!
 3     ! LENGTH =  61.5,    61.5,    61.0,    59.0,    56.0,    50.75,
                  44.25,    36.25,    30.0,    34.81,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0,
                  61.0,    61.5,    61.5,    59.5,    56.0,    50.75,
                  44.25,    36.13,    30.0,    34.81,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0!
 3     ! XBADJ   =  -.5,    2.5,    4.0,    5.0,    5.0,    5.75,
                  6.0,    6.0,    6.0,    .12,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0,
                  -61.0,    -64.0,    -65.0,    -64.0,    -61.0,    -56.5,
                  -50.25,    -42.25,    -36.0,    -34.94,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0!
 3     ! YBADJ   =  -17.5,    -11.5,    -5.0,    1.25,    8.0,    13.25,
                  18.5,    22.5,    26.5,    30.0,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0,
                  17.53,    11.5,    5.25,    -1.25,    -7.75,    -13.25,
                  -18.0,    -22.75,    -26.5,    -30.5,    .0,    .0,
                  .0,    .0,    .0,    .0,    .0,    .0!
!END!
 4     ! SRCNAM  =   SW1 !
 4     ! HEIGHT  =  .0,    .0,    .0,    .0,    3.0,    3.0,
                  3.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    3.0,    3.0,
                  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                  3.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    3.0,    3.0!
 4     ! WIDTH   =  .0,    .0,    .0,    .0,    57.0,    60.5,
                  62.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    36.13,    30.0,
                  34.81,    42.5,    49.0,    54.0,    57.5,    60.5,
                  62.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    36.13,    30.0!
 4     ! LENGTH =  .0,    .0,    .0,    .0,    56.0,    50.75,
                  44.25,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    61.5,    59.0,
                  61.0,    61.5,    61.5,    59.5,    56.0,    50.75,
                  44.25,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    61.5,    59.0!
 4     ! XBADJ   =  .0,    .0,    .0,    .0,    5.5,    4.25,
                  2.5,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    -63.5,    -65.0,
                  -68.5,    -70.0,    -69.5,    -66.5,    -61.5,    -55.0,
                  -46.75,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    2.0,    6.0!
 4     ! YBADJ   =  .0,    .0,    .0,    .0,    19.0,    24.25,
                  29.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    18.94,    14.0,
                  9.03,    1.88,    -5.25,    -12.5,    -19.25,    -24.25,
                  -29.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    -18.81,    -14.0!
!END!
 5     ! SRCNAM  =   SW2 !
 5     ! HEIGHT  =  .0,    .0,    .0,    .0,    3.0,    3.0,
                  3.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    3.0,    3.0,
                  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                  3.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    3.0,    3.0!
 5     ! WIDTH   =  .0,    .0,    .0,    .0,    57.0,    60.5,
                  62.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    36.13,    30.0,
                  34.81,    42.5,    49.0,    54.0,    57.5,    60.5,
                  62.0,    .0,    .0,    .0,    .0,    .0,
                  .0,    .0,    .0,    .0,    36.13,    30.0!
 5     ! LENGTH =  .0,    .0,    .0,    .0,    56.0,    50.75,
```

```
                  44.25,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   61.5,   59.0,
                  61.0,   61.5,   61.5,   59.5,   56.0,   50.75,
                  44.25,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   61.5,   59.0!
 5   ! XBADJ  =   .0,   .0,   .0,   .0,   5.5,   4.25,
                  2.5,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   -63.5,   -65.0,
                  -68.5,   -70.0,   -69.5,   -66.5,   -61.5,   -55.0,
                  -46.75,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   2.0,   6.0!
 5   ! YBADJ  =   .0,   .0,   .0,   .0,   19.0,   24.25,
                  29.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   18.94,   14.0,
                  9.03,   1.88,   -5.25,   -12.5,   -19.25,   -24.25,
                  -29.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   -18.81,   -14.0!
!END!
 6   ! SRCNAM =    SW3 !
 6   ! HEIGHT =   .0,   .0,   .0,   .0,   3.0,   3.0,
                  3.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   3.0,   3.0,
                  3.0,   3.0,   3.0,   3.0,   3.0,   3.0,
                  3.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   3.0,   3.0!
 6   ! WIDTH  =   .0,   .0,   .0,   .0,   57.0,   60.5,
                  62.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   36.13,   30.0,
                  34.81,   42.5,   49.0,   54.0,   57.5,   60.5,
                  62.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   36.13,   30.0!
 6   ! LENGTH =   .0,   .0,   .0,   .0,   56.0,   50.75,
                  44.25,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   61.5,   59.0,
                  61.0,   61.5,   61.5,   59.5,   56.0,   50.75,
                  44.25,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   61.5,   59.0!
 6   ! XBADJ  =   .0,   .0,   .0,   .0,   5.5,   4.25,
                  2.5,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   -63.5,   -65.0,
                  -68.5,   -70.0,   -69.5,   -66.5,   -61.5,   -55.0,
                  -46.75,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   2.0,   6.0!
 6   ! YBADJ  =   .0,   .0,   .0,   .0,   19.0,   24.25,
                  29.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   18.94,   14.0,
                  9.03,   1.88,   -5.25,   -12.5,   -19.25,   -24.25,
                  -29.0,   .0,   .0,   .0,   .0,   .0,
                  .0,   .0,   .0,   .0,   -18.81,   -14.0!
!END!
 7   ! SRCNAM =    SE1 !
 7   ! HEIGHT =   3.0,   3.0,   3.0,   .0,   .0,   .0,
                  3.0,   3.0,   3.0,   3.0,   3.0,   3.0,
                  3.0,   3.0,   3.0,   3.0,   3.0,   3.0,
                  3.0,   3.0,   3.0,   .0,   .0,   .0,
                  3.0,   3.0,   3.0,   3.0,   3.0,   3.0,
                  3.0,   3.0,   3.0,   3.0,   3.0,   3.0!
 7   ! WIDTH  =   34.75,   42.5,   49.0,   .0,   .0,   .0,
                  62.0,   61.0,   59.0,   61.0,   61.5,   61.5,
                  59.5,   56.0,   51.0,   44.0,   36.13,   30.0,
                  34.81,   42.5,   49.0,   .0,   .0,   .0,
                  62.0,   61.5,   59.0,   61.0,   61.0,   61.0,
                  59.5,   56.0,   51.0,   44.25,   36.13,   30.0!
 7   ! LENGTH =   61.5,   61.5,   61.0,   .0,   .0,   .0,
                  44.25,   36.25,   30.0,   34.81,   42.5,   49.0,
                  54.0,   57.5,   61.0,   62.0,   61.5,   59.0,
                  61.0,   61.5,   61.5,   .0,   .0,   .0,
                  44.25,   36.13,   30.0,   34.81,   42.5,   49.0,
                  54.0,   57.0,   60.5,   62.0,   61.5,   59.0!
 7   ! XBADJ  =   -3.5,   -6.0,   -10.5,   .0,   .0,   .0,
                  -25.0,   -26.88,   -28.0,   -33.88,   -42.75,   -50.25,
                  -56.25,   -61.0,   -63.5,   -63.5,   -62.5,   -59.0,
                  -58.0,   -55.0,   -51.0,   .0,   .0,   .0,
                  -19.25,   -9.25,   -2.0,   -.94,   .25,   1.5,
                  2.25,   3.5,   2.5,   2.0,   1.0,   .0!
 7   ! YBADJ  =   16.5,   21.38,   25.75,   .0,   .0,   .0,
                  32.5,   31.5,   29.5,   27.5,   24.25,   20.25,
                  14.75,   9.5,   3.25,   -3.0,   -8.81,   -13.0,
                  -16.47,   -21.5,   -25.75,   .0,   .0,   .0,
                  -32.5,   -31.25,   -29.5,   -27.5,   -24.5,   -20.0,
                  -15.25,   -9.5,   -3.25,   2.88,   8.81,   13.0!
```

```
!END!
 8     ! SRCNAM  =   SE2 !
 8     ! HEIGHT  =  3.0,    3.0,    3.0,    .0,    .0,    .0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    .0,    .0,    .0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0!
 8     ! WIDTH   =  34.75,   42.5,   49.0,   .0,    .0,    .0,
                    62.0,   61.0,   59.0,   61.0,   61.5,   61.5,
                    59.5,   56.0,   51.0,   44.0,   36.13,   30.0,
                    34.81,   42.5,   49.0,   .0,    .0,    .0,
                    62.0,   61.5,   59.0,   61.0,   61.0,   61.0,
                    59.5,   56.0,   51.0,   44.25,   36.13,   30.0!
 8     ! LENGTH =   61.5,   61.5,   61.0,   .0,    .0,    .0,
                    44.25,   36.25,   30.0,   34.81,   42.5,   49.0,
                    54.0,   57.5,   61.0,   62.0,   61.5,   59.0,
                    61.0,   61.5,   61.5,   .0,    .0,    .0,
                    44.25,   36.13,   30.0,   34.81,   42.5,   49.0,
                    54.0,   57.0,   60.5,   62.0,   61.5,   59.0!
 8     ! XBADJ   =  -3.5,   -6.0,   -10.5,   .0,    .0,    .0,
                    -25.0,   -26.88,   -28.0,   -33.88,   -42.75,   -50.25,
                    -56.25,   -61.0,   -63.5,   -63.5,   -62.5,   -59.0,
                    -58.0,   -55.0,   -51.0,   .0,    .0,    .0,
                    -19.25,   -9.25,   -2.0,   -.94,   .25,   1.5,
                    2.25,   3.5,   2.5,   2.0,   1.0,   .0!
 8     ! YBADJ   =  16.5,   21.38,   25.75,   .0,    .0,    .0,
                    32.5,   31.5,   29.5,   27.5,   24.25,   20.25,
                    14.75,   9.5,   3.25,   -3.0,   -8.81,   -13.0,
                    -16.47,   -21.5,   -25.75,   .0,    .0,    .0,
                    -32.5,   -31.25,   -29.5,   -27.5,   -24.5,   -20.0,
                    -15.25,   -9.5,   -3.25,   2.88,   8.81,   13.0!
!END!
 9     ! SRCNAM  =   SE3 !
 9     ! HEIGHT  =  3.0,    3.0,    3.0,    .0,    .0,    .0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    .0,    .0,    .0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0!
 9     ! WIDTH   =  34.75,   42.5,   49.0,   .0,    .0,    .0,
                    62.0,   61.0,   59.0,   61.0,   61.5,   61.5,
                    59.5,   56.0,   51.0,   44.0,   36.13,   30.0,
                    34.81,   42.5,   49.0,   .0,    .0,    .0,
                    62.0,   61.5,   59.0,   61.0,   61.0,   61.0,
                    59.5,   56.0,   51.0,   44.25,   36.13,   30.0!
 9     ! LENGTH =   61.5,   61.5,   61.0,   .0,    .0,    .0,
                    44.25,   36.25,   30.0,   34.81,   42.5,   49.0,
                    54.0,   57.5,   61.0,   62.0,   61.5,   59.0,
                    61.0,   61.5,   61.5,   .0,    .0,    .0,
                    44.25,   36.13,   30.0,   34.81,   42.5,   49.0,
                    54.0,   57.0,   60.5,   62.0,   61.5,   59.0!
 9     ! XBADJ   =  -3.5,   -6.0,   -10.5,   .0,    .0,    .0,
                    -25.0,   -26.88,   -28.0,   -33.88,   -42.75,   -50.25,
                    -56.25,   -61.0,   -63.5,   -63.5,   -62.5,   -59.0,
                    -58.0,   -55.0,   -51.0,   .0,    .0,    .0,
                    -19.25,   -9.25,   -2.0,   -.94,   .25,   1.5,
                    2.25,   3.5,   2.5,   2.0,   1.0,   .0!
 9     ! YBADJ   =  16.5,   21.38,   25.75,   .0,    .0,    .0,
                    32.5,   31.5,   29.5,   27.5,   24.25,   20.25,
                    14.75,   9.5,   3.25,   -3.0,   -8.81,   -13.0,
                    -16.47,   -21.5,   -25.75,   .0,    .0,    .0,
                    -32.5,   -31.25,   -29.5,   -27.5,   -24.5,   -20.0,
                    -15.25,   -9.5,   -3.25,   2.88,   8.81,   13.0!
!END!
 10     ! SRCNAM  =   E1 !
 10     ! HEIGHT  =  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                    3.0,    3.0,    3.0,    3.0,    3.0,    3.0!
 10     ! WIDTH   =  34.75,   42.5,   49.0,   54.0,   57.0,   60.5,
                    62.0,   61.0,   59.0,   61.0,   61.5,   61.5,
                    59.5,   56.0,   51.0,   44.0,   36.13,   30.0,
                    34.81,   42.5,   49.0,   54.0,   57.5,   60.5,
                    62.0,   61.5,   59.0,   61.0,   61.0,   61.0,
                    59.5,   56.0,   51.0,   44.25,   36.13,   30.0!
 10     ! LENGTH =   61.5,   61.5,   61.0,   59.0,   56.0,   50.75,
                    44.25,   36.25,   30.0,   34.81,   42.5,   49.0,
                    54.0,   57.5,   61.0,   62.0,   61.5,   59.0,
```

```
                 61.0,    61.5,    61.5,    59.5,    56.0,    50.75,
                 44.25,   36.13,    30.0,    34.81,    42.5,    49.0,
                 54.0,    57.0,    60.5,    62.0,    61.5,    59.0!
 10    ! XBADJ  =  -25.0,    -26.5,    -29.0,    -31.0,    -32.5,    -32.25,
                 -31.5,    -29.75,    -27.0,    -29.13,    -34.25,    -38.5,
                 -41.25,    -43.5,    -44.0,    -42.5,    -40.5,    -37.0,
                 -36.5,    -35.0,    -32.0,    -28.5,    -23.5,    -18.5,
                 -12.75,    -6.5,    -3.0,    -5.75,    -8.25,    -10.5,
                 -12.5,    -14.0,    -17.0,    -19.0,    -21.0,    -22.0!
 10    ! YBADJ  =  11.69,    13.0,    14.0,    14.5,    14.5,    13.25,
                 11.5,    9.5,    7.5,    6.0,    4.25,    1.75,
                 -1.75,    -4.0,    -7.0,    -9.5,    -11.56,    -12.0,
                 -11.66,    -13.0,    -13.75,    -14.25,    -14.25,    -13.25,
                 -11.5,    -9.75,    -7.5,    -6.0,    -4.0,    -1.5,
                 1.25,    4.0,    7.0,    9.38,    11.56,    12.0!
!END!
 11    ! SRCNAM  =   E2 !
 11    ! HEIGHT  =  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0!
 11    ! WIDTH  =  34.75,    42.5,    49.0,    54.0,    57.0,    60.5,
                 62.0,    61.0,    59.0,    61.0,    61.5,    61.5,
                 59.5,    56.0,    51.0,    44.0,    36.13,    30.0,
                 34.81,    42.5,    49.0,    54.0,    57.5,    60.5,
                 62.0,    61.5,    59.0,    61.0,    61.0,    61.0,
                 59.5,    56.0,    51.0,    44.25,    36.13,    30.0!
 11    ! LENGTH =  61.5,    61.5,    61.0,    59.0,    56.0,    50.75,
                 44.25,    36.25,    30.0,    34.81,    42.5,    49.0,
                 54.0,    57.5,    61.0,    62.0,    61.5,    59.0,
                 61.0,    61.5,    61.5,    59.5,    56.0,    50.75,
                 44.25,    36.13,    30.0,    34.81,    42.5,    49.0,
                 54.0,    57.0,    60.5,    62.0,    61.5,    59.0!
 11    ! XBADJ  =  -25.0,    -26.5,    -29.0,    -31.0,    -32.5,    -32.25,
                 -31.5,    -29.75,    -27.0,    -29.13,    -34.25,    -38.5,
                 -41.25,    -43.5,    -44.0,    -42.5,    -40.5,    -37.0,
                 -36.5,    -35.0,    -32.0,    -28.5,    -23.5,    -18.5,
                 -12.75,    -6.5,    -3.0,    -5.75,    -8.25,    -10.5,
                 -12.5,    -14.0,    -17.0,    -19.0,    -21.0,    -22.0!
 11    ! YBADJ  =  11.69,    13.0,    14.0,    14.5,    14.5,    13.25,
                 11.5,    9.5,    7.5,    6.0,    4.25,    1.75,
                 -1.75,    -4.0,    -7.0,    -9.5,    -11.56,    -12.0,
                 -11.66,    -13.0,    -13.75,    -14.25,    -14.25,    -13.25,
                 -11.5,    -9.75,    -7.5,    -6.0,    -4.0,    -1.5,
                 1.25,    4.0,    7.0,    9.38,    11.56,    12.0!
!END!
 12    ! SRCNAM  =   E3 !
 12    ! HEIGHT  =  3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0,
                 3.0,    3.0,    3.0,    3.0,    3.0,    3.0!
 12    ! WIDTH  =  34.75,    42.5,    49.0,    54.0,    57.0,    60.5,
                 62.0,    61.0,    59.0,    61.0,    61.5,    61.5,
                 59.5,    56.0,    51.0,    44.0,    36.13,    30.0,
                 34.81,    42.5,    49.0,    54.0,    57.5,    60.5,
                 62.0,    61.5,    59.0,    61.0,    61.0,    61.0,
                 59.5,    56.0,    51.0,    44.25,    36.13,    30.0!
 12    ! LENGTH =  61.5,    61.5,    61.0,    59.0,    56.0,    50.75,
                 44.25,    36.25,    30.0,    34.81,    42.5,    49.0,
                 54.0,    57.5,    61.0,    62.0,    61.5,    59.0,
                 61.0,    61.5,    61.5,    59.5,    56.0,    50.75,
                 44.25,    36.13,    30.0,    34.81,    42.5,    49.0,
                 54.0,    57.0,    60.5,    62.0,    61.5,    59.0!
 12    ! XBADJ  =  -25.0,    -26.5,    -29.0,    -31.0,    -32.5,    -32.25,
                 -31.5,    -29.75,    -27.0,    -29.13,    -34.25,    -38.5,
                 -41.25,    -43.5,    -44.0,    -42.5,    -40.5,    -37.0,
                 -36.5,    -35.0,    -32.0,    -28.5,    -23.5,    -18.5,
                 -12.75,    -6.5,    -3.0,    -5.75,    -8.25,    -10.5,
                 -12.5,    -14.0,    -17.0,    -19.0,    -21.0,    -22.0!
 12    ! YBADJ  =  11.69,    13.0,    14.0,    14.5,    14.5,    13.25,
                 11.5,    9.5,    7.5,    6.0,    4.25,    1.75,
                 -1.75,    -4.0,    -7.0,    -9.5,    -11.56,    -12.0,
                 -11.66,    -13.0,    -13.75,    -14.25,    -14.25,    -13.25,
                 -11.5,    -9.75,    -7.5,    -6.0,    -4.0,    -1.5,
                 1.25,    4.0,    7.0,    9.38,    11.56,    12.0!
!END!
```

----

a
Building height, width, length, and X/Y offset from the source are treated as a separate input subgroup for each source and therefore must end with an input group terminator. The X/Y offset is the position, relative to the stack, of the center of the upwind face of the projected building, with the x-axis pointing along the flow direction.

```
---------------
Subgroup (13d)
---------------
                                                 a
          POINT SOURCE: VARIABLE EMISSIONS DATA
          ---------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 13b.  Factors entered multiply the rates in 13b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use PTEMARB.DAT and NPT2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                    where first group is DEC-JAN-FEB)
           4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
           5 =       Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)


 23  ! SRCNAM = TRK1 !
 23  ! IVARY  =  1  !    (24 Hours)
 23  ! ODOR          = 0,0,0,1,0,0,
                     0,0,1,0,0,0,
                     0,1,0,0,0,0,
                     1,0,0,0,0,1       !
!END!
 24  ! SRCNAM = TRK2 !
 24  ! IVARY  =  1  !    (24 Hours)
 24  ! ODOR          = 0,0,0,1,0,0,
                     0,0,1,0,0,0,
                     0,1,0,0,0,0,
                     1,0,0,0,0,1       !
!END!
 25  ! SRCNAM = TRK3 !
 25  ! IVARY  =  1  !    (24 Hours)
 25  ! ODOR          = 0,0,0,1,0,0,
                     0,0,1,0,0,0,
                     0,1,0,0,0,0,
                     1,0,0,0,0,1       !
!END!
 26  ! SRCNAM = PTH1 !
 26  ! IVARY  =  1  !    (24 Hours)
 26  ! ODOR          = 0,0,0,1,0,0,
                     0,0,1,0,0,0,
                     0,1,0,0,0,0,
                     1,0,0,0,0,1       !
!END!
 27  ! SRCNAM = PTH2 !
 27  ! IVARY  =  1  !    (24 Hours)
 27  ! ODOR          = 0,0,0,1,0,0,
                     0,0,1,0,0,0,
                     0,1,0,0,0,0,
                     1,0,0,0,0,1       !
!END!
 28  ! SRCNAM = PTH3 !
 28  ! IVARY  =  1  !    (24 Hours)
 28  ! ODOR          = 0,0,0,1,0,0,
                     0,0,1,0,0,0,
                     0,1,0,0,0,0,
                     1,0,0,0,0,1       !
!END!
 29  ! SRCNAM = PTH4 !
```

```
 29  ! IVARY  =  1  !    (24 Hours)
 29  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 30  ! SRCNAM = PTH5 !
 30  ! IVARY  =  1  !    (24 Hours)
 30  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 31  ! SRCNAM = PTH6 !
 31  ! IVARY  =  1  !    (24 Hours)
 31  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 32  ! SRCNAM = PTH7 !
 32  ! IVARY  =  1  !    (24 Hours)
 32  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 33  ! SRCNAM = PTH8 !
 33  ! IVARY  =  1  !    (24 Hours)
 33  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 34  ! SRCNAM = PTH9 !
 34  ! IVARY  =  1  !    (24 Hours)
 34  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 35  ! SRCNAM = PTH10 !
 35  ! IVARY  =  1  !    (24 Hours)
 35  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 36  ! SRCNAM = PTH11 !
 36  ! IVARY  =  1  !    (24 Hours)
 36  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 37  ! SRCNAM = PTH12 !
 37  ! IVARY  =  1  !    (24 Hours)
 37  ! ODOR            = 0,0,0,1,0,0,
                    0,0,1,0,0,0,
                    0,1,0,0,0,0,
                    1,0,0,0,0,1       !
!END!
 38  ! SRCNAM = TRK4 !
 38  ! IVARY  =  1  !    (24 Hours)
 38  ! ODOR            = 1,0,0,0,1,0,
                    0,0,1,0,0,1,
                    0,0,1,0,0,0,
                    1,0,0,0,1,0       !
!END!
 39  ! SRCNAM = TRK5 !
 39  ! IVARY  =  1  !    (24 Hours)
 39  ! ODOR            = 1,0,0,0,1,0,
                    0,0,1,0,0,1,
                    0,0,1,0,0,0,
                    1,0,0,0,1,0       !
!END!
 40  ! SRCNAM = TRK6 !
 40  ! IVARY  =  1  !    (24 Hours)
 40  ! ODOR            = 1,0,0,0,1,0,
                    0,0,1,0,0,1,
                    0,0,1,0,0,0,
```

```
                  1,0,0,0,1,0         !
!END!
 41  ! SRCNAM = PTH13 !
 41  ! IVARY  =  1  !    (24 Hours)
 41  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 42  ! SRCNAM = PTH14 !
 42  ! IVARY  =  1  !    (24 Hours)
 42  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 43  ! SRCNAM = PTH15 !
 43  ! IVARY  =  1  !    (24 Hours)
 43  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 44  ! SRCNAM = PTH16 !
 44  ! IVARY  =  1  !    (24 Hours)
 44  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 45  ! SRCNAM = PTH17 !
 45  ! IVARY  =  1  !    (24 Hours)
 45  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 46  ! SRCNAM = PTH18 !
 46  ! IVARY  =  1  !    (24 Hours)
 46  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 47  ! SRCNAM = PTH19 !
 47  ! IVARY  =  1  !    (24 Hours)
 47  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 48  ! SRCNAM = PTH20 !
 48  ! IVARY  =  1  !    (24 Hours)
 48  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 49  ! SRCNAM = PTH21 !
 49  ! IVARY  =  1  !    (24 Hours)
 49  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 50  ! SRCNAM = PTH22 !
 50  ! IVARY  =  1  !    (24 Hours)
 50  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 51  ! SRCNAM = PTH23 !
 51  ! IVARY  =  1  !    (24 Hours)
 51  ! ODOR          = 1,0,0,0,1,0,
                  0,0,1,0,0,1,
                  0,0,1,0,0,0,
                  1,0,0,0,1,0         !
!END!
 52  ! SRCNAM = PTH24 !
 52  ! IVARY  =  1  !    (24 Hours)
```

```
 52  ! ODOR          = 1,0,0,0,1,0,
                       0,0,1,0,0,1,
                       0,0,1,0,0,0,
                       1,0,0,0,1,0       !
!END!

--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.

-------------------------------------------------------------------------------

INPUT GROUPS: 14a, 14b, 14c, 14d -- Area source parameters
--------------------------------

---------------
Subgroup (14a)
---------------

     Number of polygon area sources with
     parameters specified below (NAR1)       No default  !  NAR1 =  0   !

     Units used for area source
     emissions below            (IARU)       Default: 1  !  IARU =   1  !
           1 =        g/m**2/s
           2 =       kg/m**2/hr
           3 =       lb/m**2/hr
           4 =     tons/m**2/yr
           5 =     Odour Unit * m/s  (vol. flux/m**2 of odour compound)
           6 =     Odour Unit * m/min
           7 =     metric tons/m**2/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (14d)        (NSAR1) Default: 0  !  NSAR1 =  0  !

     Number of buoyant polygon area sources
     with variable location and emission
     parameters (NAR2)                       No default  !  NAR2 =  0    !
     (If NAR2 > 0, ALL parameter data for
     these sources are read from the file: BAEMARB.DAT)

!END!

---------------
Subgroup (14b)
---------------
                                                       a
          AREA SOURCE: CONSTANT DATA
          ----------------------------
                                                                              b
Source            Effect.   Base      Initial    Emission
 No.              Height  Elevation   Sigma z     Rates
                    (m)      (m)        (m)
-------           ------   ------     --------   ---------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IARU
     (e.g. 1 for g/m**2/s).

---------------
Subgroup (14c)
---------------

           COORDINATES (km) FOR EACH VERTEX(4) OF EACH POLYGON
           --------------------------------------------------------
Source                                                                a
 No.       Ordered list of X followed by list of Y, grouped by source
------     ------------------------------------------------------------
```

```
--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.


---------------
Subgroup (14d)
---------------
                                                 a
          AREA SOURCE: VARIABLE EMISSIONS DATA
          --------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 14b.  Factors entered multiply the rates in 14b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use BAEMARB.DAT and NAR2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                             Default: 0
           0 =        Constant
           1 =        Diurnal cycle (24 scaling factors: hours 1-24)
           2 =        Monthly cycle (12 scaling factors: months 1-12)
           3 =        Hour & Season (4 groups of 24 hourly scaling factors,
                                     where first group is DEC-JAN-FEB)
           4 =        Speed & Stab. (6 groups of 6 scaling factors, where
                                     first group is Stability Class A,
                                     and the speed classes have upper
                                     bounds (m/s) defined in Group 12
           5 =        Temperature   (12 scaling factors, where temperature
                                     classes have upper bounds (C) of:
                                     0, 5, 10, 15, 20, 25, 30, 35, 40,
                                     45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


-------------------------------------------------------------------------------

INPUT GROUPS: 15a, 15b, 15c -- Line source parameters
---------------------------

---------------
Subgroup (15a)
---------------

     Number of buoyant line sources
     with variable location and emission
     parameters (NLN2)                                  No default  !  NLN2 =  0   !

     (If NLN2 > 0, ALL parameter data for
      these sources are read from the file: LNEMARB.DAT)

     Number of buoyant line sources (NLINES)            No default   ! NLINES =  0  !

     Units used for line source
     emissions below              (ILNU)                Default: 1  !  ILNU =   1  !
           1 =         g/s
           2 =         kg/hr
           3 =         lb/hr
           4 =       tons/yr
           5 =       Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =       Odour Unit * m**3/min
           7 =       metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (15c)        (NSLN1) Default: 0  !  NSLN1 =  0  !

     Maximum number of segments used to model
     each line (MXNSEG)                                 Default: 7   ! MXNSEG =  7  !

     The following variables are required only if NLINES > 0.  They are
     used in the buoyant line source plume rise calculations.
```

```
Number of distances at which               Default: 6   ! NLRISE =  6  !
transitional rise is computed

Average building length (XL)               No default   ! XL = .0 !
                                           (in meters)

Average building height (HBL)              No default   ! HBL = .0 !
                                           (in meters)

Average building width (WBL)               No default   ! WBL = .0 !
                                           (in meters)

Average line source width (WML)            No default   ! WML = .0 !
                                           (in meters)

Average separation between buildings (DXL) No default   ! DXL = .0 !
                                           (in meters)

Average buoyancy parameter (FPRIMEL)       No default   ! FPRIMEL = .0 !
                                           (in m**4/s**3)
```

!END!

Subgroup (15b)

BUOYANT LINE SOURCE: CONSTANT DATA

Source No.	Beg. X Coordinate (km)	Beg. Y Coordinate (km)	End. X Coordinate (km)	End. Y Coordinate (km)	Release Height (m)	Base Elevation (m)	Emission Rates [a]

----

[a] Data for each source are treated as a separate input subgroup and therefore must end with an input group terminator.

[b] An emission rate must be entered for every pollutant modeled. Enter emission rate of zero for secondary pollutants that are modeled, but not emitted. Units are specified by ILNTU (e.g. 1 for g/s).

Subgroup (15c)

BUOYANT LINE SOURCE: VARIABLE EMISSIONS DATA [a]

Use this subgroup to describe temporal variations in the emission rates given in 15b. Factors entered multiply the rates in 15b. Skip sources here that have constant emissions.

```
IVARY determines the type of variation, and is source-specific:
(IVARY)                                Default: 0
      0 =      Constant
      1 =      Diurnal cycle (24 scaling factors: hours 1-24)
      2 =      Monthly cycle (12 scaling factors: months 1-12)
      3 =      Hour & Season (4 groups of 24 hourly scaling factors,
                             where first group is DEC-JAN-FEB)
      4 =      Speed & Stab. (6 groups of 6 scaling factors, where
                             first group is Stability Class A,
                             and the speed classes have upper
                             bounds (m/s) defined in Group 12
      5 =      Temperature   (12 scaling factors, where temperature
                             classes have upper bounds (C) of:
                             0, 5, 10, 15, 20, 25, 30, 35, 40,
                             45, 50, 50+)
```

----

[a] Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

```
-------------------------------------------------------------------------------

INPUT GROUPS: 16a, 16b, 16c -- Volume source parameters
---------------------------

---------------
Subgroup (16a)
---------------

     Number of volume sources with
     parameters provided in 16b,c (NVL1)     No default  !  NVL1 =  0   !

     Units used for volume source
     emissions below in 16b       (IVLU)     Default: 1  !  IVLU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (16c)      (NSVL1)    Default: 0  !  NSVL1 =  0  !

     Number of volume sources with
     variable location and emission
     parameters                   (NVL2)     No default  !  NVL2 =   0   !

     (If NVL2 > 0, ALL parameter data for
      these sources are read from the VOLEMARB.DAT file(s) )

!END!

---------------
Subgroup (16b)
---------------
                                                  a
           VOLUME SOURCE: CONSTANT DATA
           ------------------------------
                                                                                b
         X          Y        Effect.   Base     Initial     Initial    Emission
     Coordinate Coordinate   Height  Elevation  Sigma y     Sigma z     Rates
        (km)       (km)        (m)      (m)       (m)         (m)
     ---------- ----------   ------   ------   --------    ---------   --------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IVLU
     (e.g. 1 for g/s).

---------------
Subgroup (16c)
---------------
                                                           a
          VOLUME SOURCE: VARIABLE EMISSIONS DATA
          ---------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 16b.  Factors entered multiply the rates in 16b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use VOLEMARB.DAT and NVL2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                               Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
```

```
                                    where first group is DEC-JAN-FEB)
          4 =        Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
          5 =        Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)
```

----

a

Data for each species are treated as a separate input subgroup and therefore must end with an input group terminator.

INPUT GROUPS: 17a & 17b -- Non-gridded (discrete) receptor information

----
Subgroup (17a)

Number of non-gridded receptors (NREC) No default ! NREC = 21 !

!END!

Subgroup (17b)

NON-GRIDDED (DISCRETE) RECEPTOR DATA[a]

Receptor No.		X Coordinate (km)	Y Coordinate (km)	Ground Elevation (m)	Height Above Ground (m)[b]	
1	! X =	280.404,	6210.984,	199.000,	0.000!	!END!
2	! X =	280.402,	6211.061,	201.000,	0.000!	!END!
3	! X =	280.331,	6211.09,	202.000,	0.000!	!END!
4	! X =	280.253,	6211.028,	202.000,	0.000!	!END!
5	! X =	280.191,	6210.981,	201.000,	0.000!	!END!
6	! X =	280.102,	6210.984,	200.000,	0.000!	!END!
7	! X =	280.075,	6210.955,	203.000,	0.000!	!END!
8	! X =	279.928,	6210.97,	198.000,	0.000!	!END!
9	! X =	279.957,	6210.941,	199.000,	0.000!	!END!
10	! X =	279.98,	6210.906,	200.000,	0.000!	!END!
11	! X =	280.006,	6210.87,	205.000,	0.000!	!END!
12	! X =	279.955,	6210.846,	206.000,	0.000!	!END!
13	! X =	279.775,	6211.476,	240.000,	0.000!	!END!
14	! X =	279.714,	6211.442,	240.000,	0.000!	!END!
15	! X =	279.882,	6211.616,	233.000,	0.000!	!END!
16	! X =	279.984,	6211.681,	219.000,	0.000!	!END!
17	! X =	280.072,	6211.787,	217.000,	0.000!	!END!
18	! X =	280.367,	6211.69,	205.000,	0.000!	!END!
19	! X =	280.507,	6211.621,	203.000,	0.000!	!END!
20	! X =	279.523,	6211.376,	232.000,	0.000!	!END!
21	! X =	279.466,	6211.205,	236.000,	0.000!	!END!

----

a

Data for each receptor are treated as a separate input subgroup and therefore must end with an input group terminator.

b

Receptor height above ground is optional. If no value is entered, the receptor is placed on the ground.