AIR MONITORING REPORT 2009

COMPLIANCE WITH THE NATIONAL ENVIRONMENT PROTECTION MEASURE (AMBIENT AIR QUALITY)

BY TASMANIA

JULY 2010

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INTRODUCTION

Under Clause 18 of the National Environmental Protection (Ambient Air Quality) Measure (AAQ NEPM), jurisdictions are required to submit an annual report on their compliance with the measure in an approved form. Content and format requirements for the annual report are detailed in the AAQ NEPM Technical Paper No. 8 which is available at www.ephc.gov.au .

This report documents compliance information for Tasmania for 2009 in accordance with the requirements of Technical Paper No. 8. The report is divided into the following sections:

Section A: Overview of the AAQ NEPM monitoring network and related activities for 2009.

Section B: Assessment of compliance with the AAQ NEPM standards and goals.

Section C: Assessment of monitoring data against the standards.

Section D: Analysis of monitoring data and trends.

This report is available on the EPA Division website at www.environment.tas.gov.au.

SECTION A – OVERVIEW OF THE AAQ NEPM MONITORING NETWORK AND RELATED ACTIVITIES FOR 2009.

MONITORING SUMMARY

The Environment Division of the Tasmanian Department of Primary Industries, Parks, Water and the Environment (DPIPWE) continues to monitor air quality at its NEPM measuring stations in Launceston (Ti Tree Bend) and Hobart (New Town), as summarised in the Table below. Ambient air quality at these stations is monitored using Low Volume Air Samplers (LVAS) and Tapered Element Oscillating Microbalance (TEOM) instrumentation for PM_{10}, and LVAS for $PM_{2.5}$.

Region Performance monitoring station	**Location category**	**Site type**					
		CO	NO_2	O_3	SO_2	$PM_{2.5}$	PM_{10}
Launceston Ti Tree Bend	Light Industry					G & T	G & T
Hobart New Town	Residential					G & T	G & T

G = Generally Representative Upper Bound **T** = Trend station

The planned installation of the Devonport ambient air monitoring station did not take place in 2009 due to logistical and resource issues associated with negotiating access to a suitable site as discussed in section 3.4. Progress has been made in these negotiations and it is intended the station will be commissioned in Devonport during in late 2010.

Plans to monitor CO concentrations at a peak site within the Hobart CBD are well advanced, and it is expected that this station will be commissioned in 2010.

The following air quality monitoring programmes, not for NEPM reporting, are also being conducted in Tasmania.

(i) The George Town Air Monitoring Station (GAMS), which was established in July 2007 in partnership with the local heavy industries, has been monitoring PM_{10}, $PM_{2.5}$ using Low Volume Air Samplers and levels of SO_2 and NO_x using gas analysers. Continuous particle monitoring is also provided by means of an optical Dust Monitor (*GRIMM Aerosol Technik*), which uses the optical scattering properties of the particles to estimate concentrations in the PM_{10}, $PM_{2.5}$ and PM_1 size fractions.

(ii) The EPA Division has continued to operate the Level 2 monitoring station at Rowella in the central Tamar Valley, established in 2006 by the Tasmanian Regional Planning and Development Council (RPDC), as part of the baseline environmental studies required prior to the construction and operation of the proposed pulp mill at Longreach. During 2009, this station has continued to monitor $PM_{2.5}$ and PM_{10} particles using TEOM instruments and the levels of sulphur dioxide, oxides of nitrogen and Total Reduced Sulphur (TRS) using gas analysers. The remaining five Level 1 stations located in the Tamar Valley at Beauty Point, Deviot, Riverside, Tippogorrie Hills and Rowella, continue to monitor PM_{10} levels using Microvol^{TM} air samplers and hydrogen sulphide with passive adsorption samplers.

(iii) In the Autumn of 2008 large areas of Tasmania were affected on several occasions by smoke from planned burns, conducted largely by the forestry industry, and also from agricultural, fuel reduction and environmental management burns. These smoke events have also occurred in previous years. As a response to the autumn smoke, in 2009 the Environment Division of the Department of Environment, Parks, Heritage and the Arts (DEPHA) commenced the establishment of a regional network of air monitoring stations to determine the effects of forestry and agricultural burning and other smoke-generating activities on air pollution levels over a representative sample of the state. This network – called the *Base-Line Air Network of EPA Tasmania* (BLANkET) will consist 15 stations, equipped with nephelometric and meteorological instruments, located near communities that are likely to be affected by smoke from planned burn operations. Eight stations of the BLANkET network were commissioned in 2009, five in the north-east of the state in May, and three in the Huon region southern Tasmania in November. These stations have significantly improved the spatial coverage of air monitoring in Tasmania. Several instances of bushfire smoke moving across the state have been well observed by BLANkET. Valuable insights into winter woodsmoke levels (from domestic heating) in several of the smaller Tasmanian communities has also been obtained from this network.

The full BLANkET network is planned to be in operation before the 2010 autumn burning season. Further information and real-time PM data are available on the EPA Division's website at http://www.environment.tas.gov.au/?base=7747

OVERVIEW OF REGIONS

A-1 HOBART

1.1 REGION BOUNDARIES

The extent to which pollutants emitted in a given area can impact on air quality elsewhere depends on a number of factors, including topography, meteorology and the chemical and physical properties of the pollutants. The term airshed is commonly used to refer to an area that is defined by natural or topographic features affecting air quality.

In the case of a secondary pollutant (i.e. one that is formed by chemical reactions in the atmosphere, rather than being directly emitted, e.g. O_3), the airshed may extend relatively large distances from the city centre. However, for a pollutant such as PM_{10} in winter, the extent of influence may be more localised and perhaps confined to areas sharing common nocturnal-drainage airflows.

For the purpose of the Measure, the Hobart Region boundaries are defined as presented in Figure 1. Although there is no functional purpose served in exactly defining the boundary MGA co-ordinates, these may be taken to be defined by the south-west corner (Easting 500,000; Northing 521,000) and the north-east corner (Easting 550,000; Northing 5290,000).

1.2 POPULATION AND TOPOGRAPHY

The population density and topography for the Hobart Region is presented in Figure 1. The city of Hobart is located on the narrow coastal plain of the Derwent Estuary, which lies in a well-defined valley flanked by a complex terrain of hills and mountain ranges. The majority of the region's population of 205,500 (ABS, 2006), reside within a 10 kilometre radius of the Central Business District (CBD), as illustrated in Figure 1, with significant satellite urban centres at Kingston-Blackmans Bay to the south (pop 29,000), Bridgewater-Gagebrook (pop. 14,000) and New Norfolk (pop. 6,800) to the north.

1.3 METEOROLOGY

The prevailing wind direction for Tasmania is northwest, which is strongly modified by the complex mountainous terrain surrounding the Derwent Estuary. While the city experiences periods of strong winds during winter storms and the equinox, the city also experiences relatively calm anti-cyclonic conditions for much of the year. During these periods, the wind flows are dominated by the katabatic drainage winds flowing down the Derwent Valley during the night and early mornings, and a south-easterly sea breeze on warm afternoons. In clear, calm autumn and winter weather, relatively high levels of locally generated air pollution can be trapped in hollows and basins.

1.4 HOBART, PERFORMANCE AND TREND MONITORING STATION

The Performance and Trend air monitoring station for Hobart was established in June 2000 at the Prince of Wales Bay sports fields, approximately 6km WNW of the Hobart CBD in the northern suburb of Glenorchy. In May 2006, following the review of the Tasmanian Air Monitoring Plan in 2005, a new Performance and Trend air monitoring station was established 2.5 km closer to the CBD at a more representative site in New Town (Figure 1).

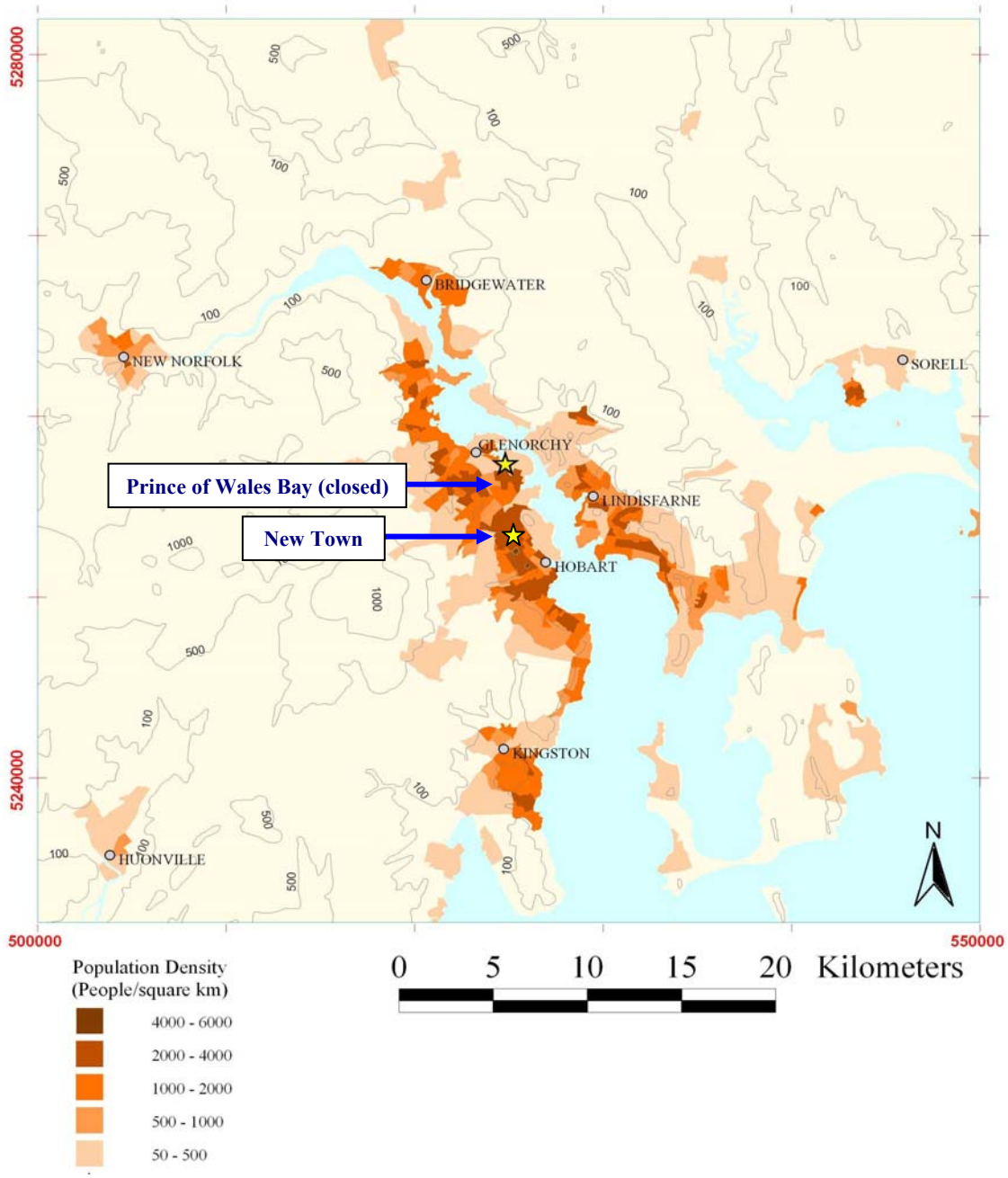

Figure 1. Map of the Hobart Region, showing the Population Density, Topography and the location of the NEPM Air Monitoring Stations. The Prince of Wales Bay Air Station was closed in mid 2006 when the New Town station commenced operation.

1.4.1 New Town Station

In May 2006, the Environment Division moved the primary *Hobart Performance and Trend Monitoring Station* to a property in New Town leased by the Hockey Association of Tasmania, some 2.5 km SSE from the original station. The new station incorporates a PM_{10} TEOM, plus an Andersen RAAS low volume sampler for each of PM_{10} and $PM_{2.5}$, as well as a *DustTrak*™ particle counter for continuous indicative monitoring of fine particle concentrations. The choice of this site was supported by TAPM modelling of the greater Hobart airshed, which predicts elevated smoke concentrations in the areas illustrated in Figure 2.

The following indicators were measured at the New Town station in 2009:

- $PM_{2.5}$ measured by Andersen RAAS™ low volume air sampler (LVAS), according to AS 3580.9.10-2006, sampled every day.
- PM_{10} measured by Andersen RAAS™ low volume air sampler (LVAS), according to AS 3580.9.9-2006, sampled every day.
- A collocated TEOM direct-reading instrument with a PM_{10} head.
- A second TEOM with a $PM_{2.5}$ Size Selective Inlet is planned to be installed in 2010.

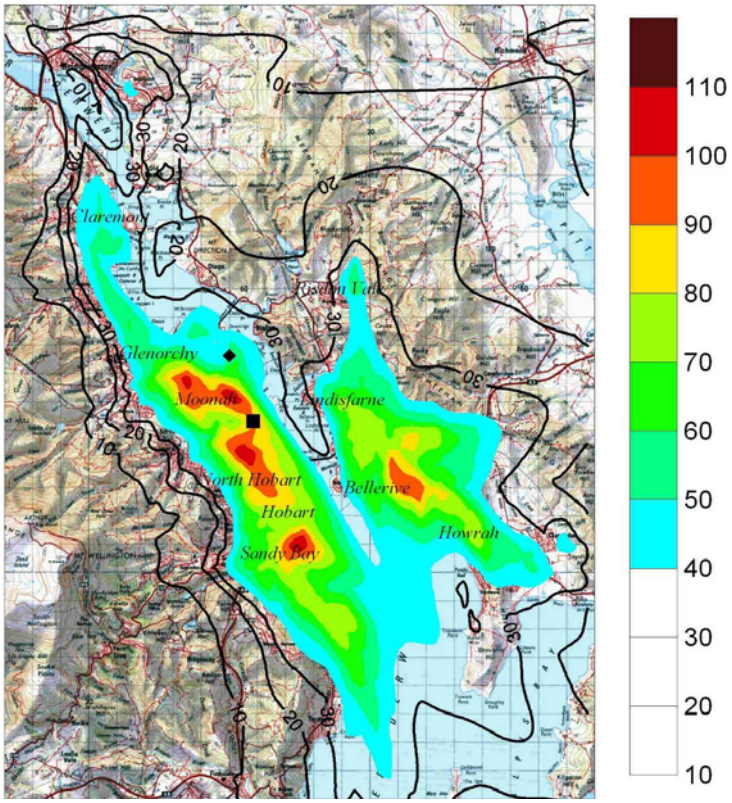

Figure 2. Results of preliminary modelling of maximum 24 hr average PM10 concentrations in the Hobart region, showing indicative "hot-spots" (in red) for particles. The black square and diamond symbols respectively represent the locations of the current Newtown and former Prince of Wales Bay air monitoring station.

A-2 LAUNCESTON

2.1 REGION BOUNDARIES

Launceston and the Tamar Valley as a whole have been well studied in terms of the meteorology and atmospheric dispersion of the region. Results of three-dimensional atmospheric dispersion modelling have indicated that emissions from heavy industry at Bell Bay, some 40 kilometres north-west of Launceston, may occasionally have a minor impact on air quality in Launceston under unfavourable weather conditions (DELM, 1995).

For the purpose of the Measure, the Launceston Region boundaries are defined as presented in Figure 3 and cover an area approximately 40 kilometres wide and 60 kilometres long. This area has been selected for consistency with the Tamar Valley Airshed Study (DELM, 1995). Although there is no functional purpose served in exactly defining the boundary MGA co-ordinates, these may be taken to be defined by the south-most corner (Easting 501,250; Northing 5,389,750) and the north-most corner (Easting 498,750; Northing 5,467,250).

2.2 POPULATION AND TOPOGRAPHY

The population density and topography of the Launceston Region is presented in Figure 3.

The total population of the Launceston Region as defined in the *Air Monitoring Plan for Tasmania*, and illustrated in Figure 3, is approximately 108,000 (ABS, 2006). The city of Launceston is located on the upper reaches of the Tamar River, in a well defined valley that extends some 50 kilometres to Bass Strait. The valley axis is mostly aligned in a north-west to south-east orientation and is flanked by hills that reach heights of up to 400 m.

Most of Launceston's urban population of 64,000 is located within approximately 5 kilometres of the city centre, with the highest densities located south-east of the city centre and significant densities on the banks of the Tamar River to the north and north-west of the city.

George Town, near the mouth of the Tamar river, is the second largest urban centre in the region with a population of 6,700. While the population of George Town is below the threshold for the installation of an ambient air monitoring station under the *National Environment Protection (Ambient Air Quality) Measure (2003 – hereafter "Air NEPM")*, an industry-government funded air monitoring station has been operating on the southern edge of George Town since July 2007.

The $PM_{2.5}$ and PM_{10} levels in the Launceston region are also monitored by two TEOMs at the Rowella station in the central Tamar Estuary. An additional five Level 1 stations equipped with PM_{10} *microvol*™ air samplers are located at Rowella, Beauty Point, Deviot, Tippogorree Hills and Riverside-Trevallyn, as shown in Figure 3.

The data from these non-NEPM stations are not included in this report.

2.3 METEOROLOGY

The prevailing winds tend to be northerly all year round in Launceston, with atmospheric calm conditions reported to be most frequent in the winter and autumn months (Power, 2000).

Available data for the Launceston region clearly indicate that high concentrations of particles are frequently associated with light winds and highly stable atmospheric conditions. Moreover, because of night-time ground cooling and the formation of drainage flows, relatively high pollutant concentrations are likely to be found in topographic hollows and basins, and on low-lying land.

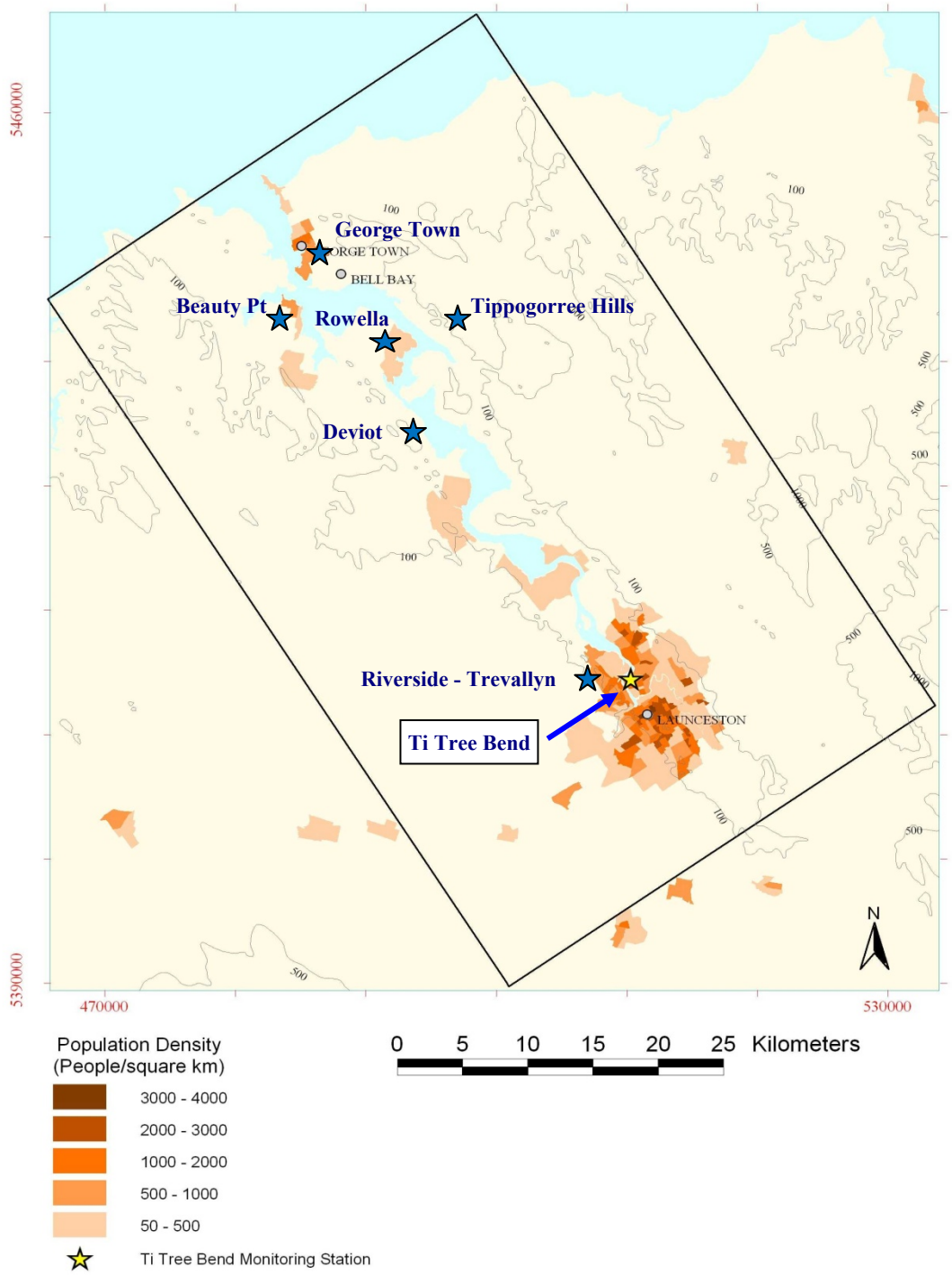

Figure 3. Map of Launceston Region showing the Population Density, Topography and the location of Air Monitoring Stations, including the Air NEPM monitoring station at Ti Tree Bend.

2.4 LAUNCESTON, TI TREE BEND PERFORMANCE AND TREND MONITORING STATION.

Seasonal PM_{10} measurements using a High Volume Air Sampler have been collected at Ti Tree Bend since 1992, with year round sampling commencing in 1997. The station was established in the grounds of the Launceston Council Waste Water Treatment Plant, on the banks of the Tamar River, some 170 metres from the Launceston Weather Station operated by the Bureau of Meteorology, as illustrated in Figure 4. This station was upgraded in March 2002 with the installation of a PM_{10} TEOM, a permanent station building in 2004, and the

installation of Andersen RAAS™ Low Volume Air Samplers (LVAS) for $PM_{2.5}$ and PM_{10} in August 2005, as part of the *Tasmanian Air Quality Monitoring System Development Project, 2004-2008*.

Figure 4. Satellite image of the Ti Tree Bend Waste Water plant showing the old and new positions of the Air NEPM monitoring station. (Image from Google Earth.)

As noted in the 2008 NEPM Annual Report on Ambient Air Quality for Tasmania, the Ti Tree Bend air monitoring station was moved on the 16th of December 2008 to a more suitable site in the NE corner of the waste water treatment plant away from the very localised dust contamination problems associated with sludge transfer operations. Several existing trees at the new station site were removed to comply with the requirements of **AS2923** (*Ambient air - Guide for the measurement of horizontal wind for air quality applications*) and **AS3580** (*Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment*).

The following indicators were measured at the Ti Tree Bend station in 2009.

- $PM_{2.5}$ measured by Andersen RAAS low volume air sampler (LVAS), according to AS 3580.9.10-2006, sampled every day.
- PM_{10} measured by Andersen RAAS low volume air sampler (LVAS), according to AS 3580.9.9-2006, sampled every day.
- A collocated TEOM direct-reading instrument with a PM_{10} head.
- A second TEOM with a $PM_{2.5}$ Size Selective Inlet has been purchased and is scheduled for installation during the second half of 2010.

A-3 DEVONPORT

3.1 REGION BOUNDARIES

For Devonport, the availability of meteorological data tends to be relatively low. Moreover, comprehensive atmospheric dispersion models have not been developed for the Region. For these reasons, the extent of the Devonport airshed is unclear.

For the purpose of the Measure, the Devonport Region boundaries are defined as presented in Figure 6. Although there is no functional purpose served in exactly defining the boundary MGA co-ordinates, these may be taken to be defined by the south-west corner (Easting 441,000; Northing 5430,000) and the north-east corner (Easting 454,000; Northing 5444,000).

3.2 POPULATION AND TOPOGRAPHY

The population density and topography for the Devonport Region is presented in Figure 6. The majority of the population resides within approximately a 5 km radius of the CBD. In total, the population of the Devonport Region as defined in the *Air Monitoring Plan for Tasmania* is approximately 33,500 (ABS 2006).

Devonport is located in a shallow coastal plain on the banks of the Mersey River. The Mersey connects the town of Latrobe with Devonport.

3.3 METEOROLOGY

Westerly winds tend to prevail in the Devonport Region, with atmospheric calm conditions most frequent in winter and autumn.

Strongly stable atmospheric conditions in Devonport are normally associated with southerly, south-easterly or easterly winds draining out of the Valley. This is especially evident in winter.

3.4 DEVONPORT PERFORMANCE AND TREND MONITORING STATION

Campaign monitoring of particles was completed at the Devonport High School in 2003, to assess the need for a permanent station in Devonport. The results of this survey confirmed that central Devonport experienced elevated levels of PM_{10} air pollution during the winter months, which could exceed the 50 $\mu g\ m^{-3}$ NEPM 24-hr standard under calm atmospheric conditions. Initial plans to install a permanent monitoring station in the grounds of the Devonport High School in 2007 could not proceed due to limited resources, together with engineering and administrative difficulties relating to student safety and site access.

Negotiations are continuing with owners of alternative sites in the south west of the Devonport CBD, with the aim of commissioning a Devonport station in late 2010.

A transportable station building and suitable monitoring instruments have been acquired to measure the following air quality indicators at the Devonport site:

- $PM_{2.5}$ measured by sequential Low Volume Air Sampler (LVAS), according to AS 3580.9.10:2006, sampled every day.
- PM_{10} measured by sequential Low Volume Air Sampler (LVAS), according to AS 3580.9.9 :2006, sampled every day.
- A collocated dichotomous TEOM direct-reading instrument for $PM_{2.5}$ and PM_{10}. (PM_{10} according to AS3580.9.8:2008.)

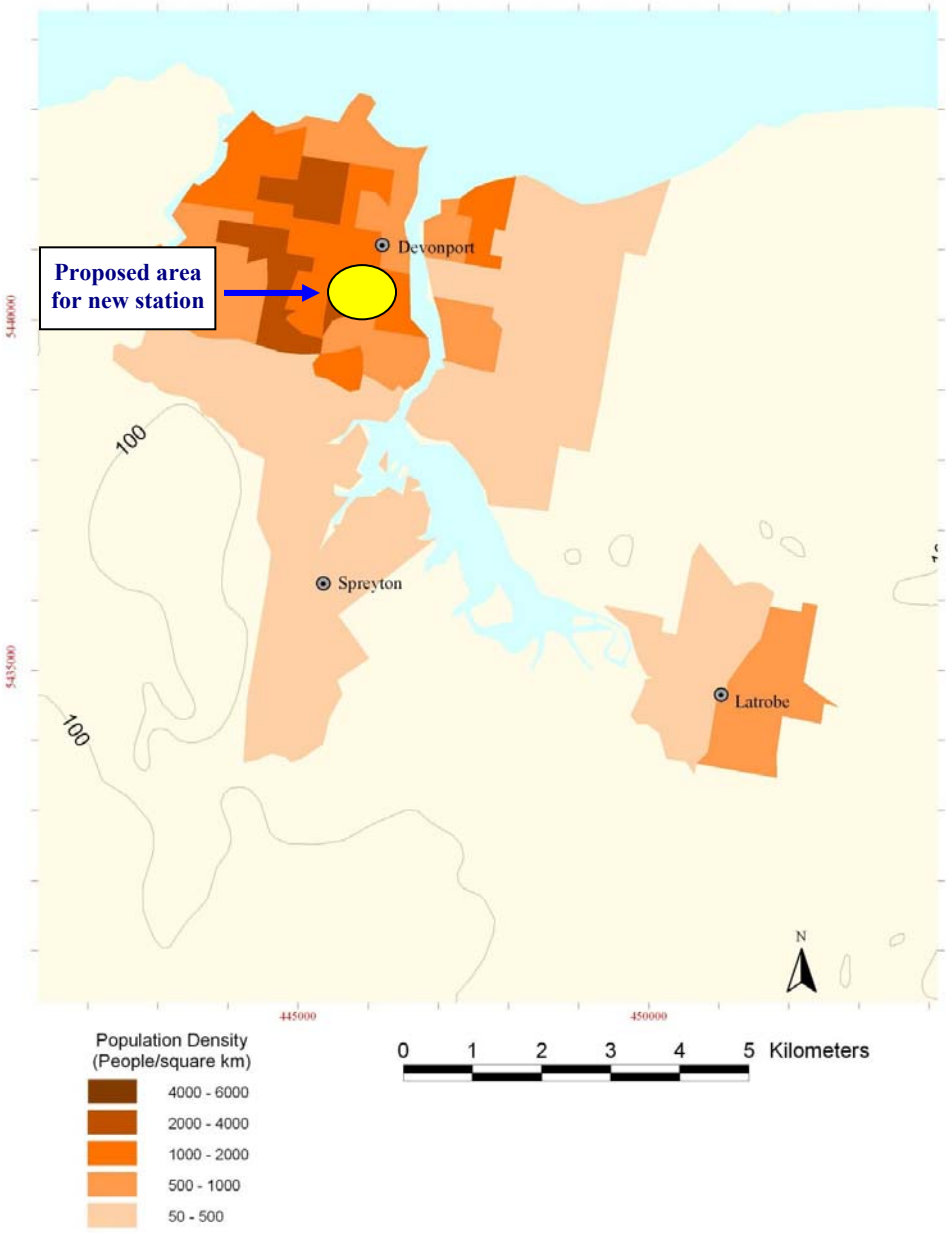

Figure 5. Map of Devonport Region Including Population Density and Topography. The region identified as suitable for the proposed Devonport air station is indicated.

A-4. REFERENCE METHODS

The reference methods specified in Schedule 3 of the *Air NEPM* for determining PM_{10} particulate concentration in ambient air are:

AS3580.9.6–1990	Determination of Suspended Particulate Matter – PM_{10} High Volume Sampler with Size Selective Inlet – Gravimetric Method.
AS3580.9.7-1990	Determination of Suspended Particulate Matter - PM_{10} Dichotomous Sampler – Gravimetric method

Advances in air sampler technology and the requirement to measure smaller particulate size fractions have seen the widespread adoption of US EPA compliant low volume air samplers

as the preferred method for the measurement of PM_{10} and $PM_{2.5}$ in ambient air. These techniques are now recognised by the following Australia/New Zealand standards:

AS3580.9.9:2006	Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} low volume sampler - Gravimetric Method.
AS3580.9.10:2006	Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - $PM_{2.5}$ low volume sampler - Gravimetric Method.

The Thermo-Electron/Andersen RAAS and Partisol sequential low volume air samplers used by the Environment Division are recognised as Reference Methods for $PM_{2.5}$ and PM_{10} monitoring in the US EPA *List of Designated Reference and Equivalent Methods* (www.epa.gov/ttn/amtic/criteria.html). Details are provided in the following table.

Air Sampler	**Size**	**USEPA Approval No.**
Andersen Model RAAS10-300	PM_{10}	*Manual Reference Method* RFPS-0699-132
R&P Partisol®-Plus Model 2025	PM_{10}	*Manual Reference Method* RFPS-1298-127
Thermo-Electron Model RAAS2.5-300	$PM_{2.5}$	*Manual Reference Method* RFPS-0699-132
R&P Partisol®-Plus Model 2025 FEM	$PM_{2.5}$	*Manual Reference Method* RFPS-1298-145

Continuous monitoring of the PM_{10} particle concentrations at both Launceston and Hobart have been performed using TEOMs fitted with a PM_{10} size selective inlet, in accordance with AS/NZS 3580.9.8:2008 (*Methods for sampling and analysis of ambient air – PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser*)

Where practicable, the daily average PM_{10} concentrations measured by an approved low volume air sampler were used for the purposes of determining compliance with the NEPM Standard. In the absence of validated air sampler data, the daily average PM_{10} measurement from the TEOM was used, with the following empirical temperature adjustment developed for Tasmanian conditions.

Adjusted PM_{10} = Measured PM_{10} x Temperature Correction Factor [TCF]

Where TCF = 1.00 for 24 hr average temperature $[T_{24}] \geq 15°C$

= $1.00 + (15 - T_{24}) / 25$ $0°C < T_{24} < 15°C$

= 1.60 When $T_{24} \leq 0°C$

Note: this reflects a change from 2007 and earlier years where TCF was previously equal to:

TCF =1.00 for 24 hr average temperature $[T_{24}] \geq 15°C$

TCF = $1.00 + (15 - T_{24}) / 15$ for $0°C < T_{24} < 15°C$ and

TCF = 2.00 for $T_{24} \leq 0$.

The previous TCF values came from the regression of TEOM and high-volume PM_{10} data. The new TCF was able to be determined from comparison of TEOM data with three years of low-volume air sampler data (2006-2008) from Hobart and Launceston air stations. The change in the corrected TEOM values from applying the new TCF compared to the previous TCF is of order 20% for T_{24} = 5 C. The overall effect of this change in TCF on the final data is relatively small, as there are few days with T_{24} of 5 C or below. The new TCF has not been retrospectively applied to the historical TEOM data in the Tasmanian Air Quality Database for measurements prior to 1st January 2006, but is applied to TEOM data collected after and including that date. The 1st January 2006 is chosen as it demarcates the interval where the primary PM_{10} data sources at Hobart and Launceston air stations were high-volume air samplers (pre 1st January 2006) from the interval when the primary data sources are low-

volume air samplers (from 1st January 2006 onwards). The historical number of recorded exceedences of the Air NEPM PM_{10} standard has not been affected by the application of the new TCF to the post 1st January 2006 data.

The uncertainties associated with the low-volume measurements (U95) are estimated to be 1.4 µg m^{-3} at 25 µg m^{-3} and 2.6 µg m^{-3} at 50 µg m^{-3}. For the day-averaged TEOM PM_{10}, 95% of the measurements are within 6 µg m^{-3} of the low-volume air sampler value for simultaneous observations.

A-5. NATA ACCREDITATION

An external audit of the Tasmanian Air Monitoring Programme was conducted by two NATA assessors on 16th and 17th February 2009. Following the completion of corrective actions to address minor non-compliance issues identified in the audit, the Tasmanian ambient air monitoring programme received accreditation (NATA Certificate No. 16646) for the determination of $PM_{2.5}$ and PM_{10} using the Andersen RAAS samplers according to the methods described in AS3580.9.9:2008 and 3580.9.10:2008.

The quality assurance system is currently being expanded with the intention to apply for accreditation for the determination of $PM_{2.5}$ and PM_{10} using the R&P Partisol Plus™ samplers according to the methods described in AS3580.9.9:2006 and 3580.9.10:2006, together with the continuous gravimetric determination of PM_{10} using the TEOM method according to AS3580.9.8:2008. An external NATA audit of the PM_{10} TEOM methodology is scheduled for August 2010.

A-6 SITING CRITERIA FOR AIR QUALITY MONITORING STATIONS

The following Australian Standards were used to select appropriate locations for Tasmania's air quality monitoring stations in Hobart and Launceston.

6.1 APPLICABLE AUSTRALIAN STANDARDS

1. AS2922 (Guide for siting of sampling)
   Critical criteria for location of sampling site:
   (i) Hg = Height of sampling inlet above ground. (2 to 5 m)
   (ii) Ho = Height of nearby obstacle above sampling inlet
   (iii) D = Horizontal Distance to nearby obstruction - typically >20 m.
   (iv) 120^0 = Minimum clear sky angle above sampling inlet
2. AS2923 (Ambient Air- Guide for the Measurement of Wind).
   Critical criteria for placement of 10 m meteorological tower
   Recommended minimum distance from obstruction = 10 x H
   Where H = Height of obstruction

6.2 COMPLIANCE WITH APPLICABLE STANDARDS

(i) New Town Air Quality Monitoring Site, Hobart

The Air Monitoring Station is located in a corner of an old jam factory site at 0 Bell St, New Town, which is currently used as a hockey complex. This air monitoring site has several obstructions within critical distances.

AS2922 (*Guide for siting of sampling*)

No.	Obstruction Description	Distance D (m)	H_o (m)	$2 H_o \leq D$	120^0 Sky Angle
1	Power Pole [1]	**3**	**7.6**	Does not comply	Does not comply
2	Met Mast [1]	**6**	**6.6**	Does not comply	Does not comply
3	Brick Wall	**15**	**-1**	Complies	Complies
4	Chimney	**50**	**22.6**	Complies	Complies

AS2923 (Ambient Air - Guide for the Measurement of Wind).

No.	Obstruction Description	Distance (m)	Height (m)	D > 20m	D > 10H
1	Power Pole [1]	**5**	**11**	Does not comply	Does not comply
2	Brick Wall	**13**	**2.4**	Does not comply	Does not comply
3	Chimney	**47**	**26**	Complies	Does not comply

Note 1. The power pole and meteorological masts are integral parts of the air monitoring station, and do not have a significant effect on air flow to the samplers and meteorological instruments.

6.2 COMPLIANCE WITH APPLICABLE STANDARDS (continued)

(ii) Ti-Tree Bend Air Quality Monitoring Site, Launceston.

Launceston Ambient Air Quality Monitoring Station is located within the grounds of the Launceston City Council Waste Water Treatment Plant at Ti-Tree Bend, as explained in Section 2.4. In December 2008, the station building and instruments were moved approximately 200 metres from its original site besides the settling lagoons to a more representative site in the north-eastern area of the treatment plant grounds as described in section 2.4.

AS2922 (*Guide for siting of sampling*) – New station location (18 Dec 2008 onwards)

No.	Obstruction Description	Distance D (m)	H_o (m)	$2 H_o \leq D$	120^0 Sky Angle
1	Met Mast [1]	**9**	**6.2**	Does not comply	Does not comply

AS2923 (Ambient Air - Guide for the Measurement of Wind). New station location (18 Dec 2008 onwards)

No.	Obstruction Description	Distance (m)	Height (m)	D > 20m	D > 10H
1	Equipment shelter[2]	**9**	**3.8**	Does not comply	Does not comply

Note 1. The meteorological mast is an integral part of the air monitoring station, and does not have a significant effect on air flow to the samplers and meteorological instruments.

Note 2. The equipment shelter houses the Air Quality instruments.

SECTION B – ASSESSMENT OF COMPLIANCE WITH STANDARDS AND GOALS

B-1 PARTICULATE MATTER

The monitoring results from 1st January 2009 to 31st December 2009, at Tasmanian Performance Monitoring stations are presented in Table 1.

Table 1: Summary of Performance against Standards for PM_{10} and $PM_{2.5}$ at Tasmanian Monitoring stations for the 2009 calendar year.

Region/Performance Monitoring Station	Data Availability Rates (% of days for sampling regime with 75% or more hourly samples per 24 hours for TEOMs)					No. of Exceedences		Performance Against Standard and Goal
Hobart: New Town	***Q1***	***Q2***	***Q3***	***Q4***	***Annual***	***Period***	***No.***	
PM_{10} (All instruments)	100	98	100	100	99	24 hour	0	***MET***
- LVAS (every day)	86	80	98	99	91	24 hour		
- TEOM [1,2]	98	98	98	96	97	24 hour		
$PM_{2.5}$ *Reporting Standard*	70	82	97	100	87	24 hour	4	
- LVAS (every day)	Average annual $PM_{2.5}$ conc. = 7.1 μg m^{-3}					Annual		
Launceston: Ti Tree bend	***Q1***	***Q2***	***Q3***	***Q4***	***Annual***	***Period***	***No.***	
PM_{10} (All instruments)	100	100	100	100	100	24 hour	0	
- LVAS (every day)	92	100	100	86	95	24 hour		***MET***
- TEOM[1,2]	99	99	100	100	99	24 hour		
$PM_{2.5}$ *Reporting Standard* - LVAS (every day)	88	67	97	84	84	24 hour	12	
	Average annual $PM_{2.5}$ conc. = 7.5 μg m^{-3}					Annual		
Devonport: (Site: TBD) PM_{10} and $PM_{2.5}$	Station scheduled to begin operation in late 2010 No data					24 hour	N/A	

Notes: **1.** Temperature adjusted using local model according to Technical Guidance Paper 10

Adjusted PM_{10} = Measured PM_{10} x Temperature Correction Factor [TCF]

Where TCF = 1.00 for 24 hr average temperature $[T_{24}] \geq 15°C$
= $1.00 + (15 - T_{24}) / 25$ $0°C < T_{24} < 15°C$
= 1.60 When $T_{24} \leq 0°C$

2. Day-averaged TEOM data are used only when LVAS PM10 data are not available.

Note: National air quality standards:

PM_{10} 24-hour standard is 50 μg m^{-3}, goal is for no more than 5 exceedences per year.

$PM_{2.5}$ 24-hour advisory reporting standard is 25 μg m^{-3},
Annual average advisory reporting standard is 8 μg m^{-3}.

B-2 SCREENING FOR OTHER POLLUTANTS

Monitoring for other listed Air NEPM pollutants is not performed at the Tasmanian NEPM stations of Launceston and Hobart because work carried out previously in Tasmania, including some screening studies, indicated the levels of these pollutants would be well below the corresponding NEPM standards.

The details of the screening studies were presented in the Air NEPM Monitoring Plan for Tasmania (available online at http://www.environment.tas.gov.au/index.aspx?base=83), and are summarised in the Table 2 below.

Table 2: Screening Results for other Air NEPM pollutants:

Pollutant (Air NEPM standard)	**Hobart**	**Launceston**
Ozone (0.1 ppm, 1 hour)	Sampled 1994-1995, max 1-hr level was 0.03 ppm	Sampled 1992-1993, max 1-hr level was 0.04 ppm
Nitrogen Dioxide (0.12 ppm, 1hour); (0.03 ppm, 1-year)	See note 1 below	Sampled 2007 May - 2008 February Peak 0.04 ppm, 1-hour Mean 0.004 ppm, 1-hour
Carbon Monoxide (9.0 ppm, 8 hours)	Sampled 2000-2004 (Prince of Wales Bay) Peak level was 2.3 ppm (8-hr), 95th percentile was 0.4 ppm (8-hr)	Sampled 2007 May-September Peak level was 2.7 ppm. Mean level was 1.0 ppm (1-hr)
Sulphur Dioxide (0.2 ppm, 1 hour); (0.08 ppm, 1 day); (0.02 ppm, 1 year)	See note 2 below	See note 2 below
Lead (50 µg m^{-3}, 5 days/year)	Sampled 1989-1996 (intermittently). Annual average for 1996 was 0.2 µg m^{-3}	Sampled 1993-1998. Annual average for 1998 was 0.02 µg m^{-3}

1. Nitrogen Dioxide.

   In work carried out subsequent to that performed for the preparation of the Tasmanian Air Monitoring Plan, NO_2 monitoring is conducted at George Town, some 50 km north-east of Launceston, near the industrial facilities of Bell Bay. Measurements here from mid 2007 to the current date showed a maximum hourly NO_2 concentration of just under 0.080 ppm. The 90th percentile of the hourly values was 0.009 ppm. The maximum daily concentration was 0.020 ppm, and the mean daily concentration was 0.003 ppm.

   Under certain conditions Launceston may receive polluted air from Bell Bay, however the concentrations of NO_2 at Launceston under these circumstances is expected to be well under the NEPM standard. Based on the likely sources on NO_2 in Tasmania, it is considered likely that Hobart would experience similar or lower levels of NO_2 to Launceston.

2. Sulphur Dioxide.

   In work carried out subsequent to that performed for the preparation of the Tasmanian Air Monitoring Plan, continuous monitoring of SO_2 has been undertaken at George Town from mid 2007 ongoing to current date. The maximum daily SO_2 concentration seen in the George Town dataset was 0.007 ppm, well under the daily NEPM standard of 0.080 ppm. From the available data and consideration of the magnitude and location of SO_2 sources, under existing and most likely future emission scenarios, it is concluded that ambient concentrations of SO_2 in Tasmanian urban areas are likely to be well below the NEPM Standard.

SECTION C – ANALYSIS OF AIR QUALITY MONITORING

C-1. HOBART

The results of the 2009 monitoring at New Town demonstrate compliance with the Air NEPM goal for PM_{10}, as data were collected for more than 272 days (75%) of the year in total and for more than 75% of each quarter. No exceedences of the PM_{10} Standard were recorded at New Town station during the year (Table 3).

The 24 hour $PM_{2.5}$ concentration was observed to exceed the 25 μg m^{-3} advisory reporting standard on four days during 2009. (See Table 4 and section D1 below for more discussion.)

The annual average $PM_{2.5}$ concentration of 7.1 μg m^{-3} for 2009 (Table 1) is similar to the previous two years (7.3 μg m^{-3} in 2008 and 7.6 μg m^{-3} in 2007) for which $PM_{2.5}$ data have been collected at New Town. Although valid $PM_{2.5}$ air sampling operations were conducted on 319 days in 2009 (87%), compliance with the Air NEPM $PM_{2.5}$ annual advisory reporting standard of 8 μg m^{-3} cannot be demonstrated, as equipment failures restricted air sampler operation to only 63 days (70%) in the first quarter of 2009.

Table 3: Exceedences of the 24 hour PM_{10} NEPM Standard during 2009 at New Town, Hobart, with Attribution of Cause.

National Environment Protection Measure Standard: 50 μg.m^{-3} (24 hour average)

Date	LVAS (μg/m^3)	TEOM PM_{10} (μg/m^3)	Mean Temp (^oC)	Comment
NO EXCEEDENCES RECORDED				

Table 4: Exceedences of $PM_{2.5}$ 24-Hour Advisory Reporting Standard in 2009 at New Town, Hobart, with attribution of causes (in descending order of concentration).

National Environment Protection Advisory Reporting Standards: 25 μg/m^3 24 hour average
8 μg/m^3 annual average

Date	LVAS $PM_{2.5}$ (μg m^{-3})	LVAS PM_{10} (μg m^{-3})	Corr. TEOM PM_{10} (μg m^{-3})	Mean Temp. (^oC)	Comment
1. 3/6/2009	28.4	38.8	37.0	8.6	Cool & fine with light winds and smoke
2. 21/6/2009	27.7	35.4	28.3	11.1	Cool and mainly fine with smoke haze
3. 19/5/2009	26.1	36.1	36.8	6.6	Fine and cold with light winds and smoke haze
4. 25/5/2009	26.1	43.2	37.8	12.4	Fine and overcast with gentle NW breeze and smoke haze

C-2. LAUNCESTON

Results for Ti Tree Bend show that the air quality in Launceston complied with the Air NEPM goal for PM_{10} during 2009 (see Table 1), with no reported exceedences of the 50 µg m^{-3} 24 hour PM_{10} limit during the year.

The annual average $PM_{2.5}$ concentration for 2009 was 7.5 µg m^{-3} (Table 1), compared with 8.8 µg m^{-3} in 2008, 9.5 µg m^{-3} in 2007 and 10.4 µg m^{-3} in 2006, indicating a continuing gradual improvement in Launceston's air quality, measured at Ti Tree Bend, since $PM_{2.5}$ measurements commenced at the end of 2005. 2009 was also the first year in which the observed annual average $PM_{2.5}$ concentration did not exceed the annual advisory reporting standard of 8 µg m^{-3}. However, compliance with the NEPM $PM_{2.5}$ reporting standard was not demonstrated as equipment failures restricted valid operation of the $PM_{2.5}$ sampler to 61 days (69%) in the first quarter of 2009.

The 24 hour average $PM_{2.5}$ concentration exceeded the Advisory Reporting Standard of 25 µg m^{-3} on 12 days in 2009 (see Table 6), which also indicates a continuing improvement in air quality when compared with 17 days exceeding 25 µg m^{-3} during 2008, 20 days in 2007 and 36 days in 2006.

Table 5: Exceedences of PM_{10} standard at Ti Tree Bend, Launceston in 2009, with attribution of cause.

National Environment Protection Measure Standard: 50 µg.m^{-3} (24 hour average)

Date	LVAS (µg/m^3)	TEOM PM_{10} (µg/m^3)	Mean Temp (^oC)	Comment
NO EXCEEDENCES RECORDED				

Table 6: Exceedences of $PM_{2.5}$ 24-Hour Reporting Standard at Ti Tree Bend, 2009, with attribution of causes (in descending order of concentration).

National Environment Protection Advisory Reporting Standards: 25 µg/m^3 for 24 hours
8 µg/m^3 annual average

Date	LVAS $PM_{2.5}$ µg m^{-3}	LVAS PM_{10} µg m^{-3}	Corr. TEOM PM_{10} µg m^{-3}	Mean Temp [^oC]	Comments
1. 19/06/2009	36.3	43.8	41.3	5.9	Cold and calm with smoke
2. 09/07/2009	33.4	44.1	42.5	4.7	Fine, cold and almost calm with smoke
3. 18/06/2009	32.9	38.1	33.5	6.8	Cold and calm with smoke
4. 07/07/2009	32.2	40.5	41.9	2.9	Fine, cold and calm weather with smoke
5. 10/07/2009	32.2	43.1	43.6	4.8	Fine, cold and almost calm with smoke
6. 08/07/2009	29.8	38.6	37.7	4.2	Fine, cold and almost calm with smoke
7. 25/06/2009	29.6	36.1	38.9	5.4	Fine, cold and almost calm with smoke
8. 14/07/2009	28.6	34.0	29.2	5.9	Fine, cold and almost calm with smoke
9. 18/07/2009	28.4	31.0	24.7	4.9	Fine, cold and almost calm with smoke
10. 06/07/2009	26.7	33.8	39.1	4.1	Fine and cold with light winds and smoke
11. 19/05/2009	26.1	36.1	36.5	6.1	Fine with frost, very light winds and smoke
12. 17/07/2009	25.3	30.6	28.7	2.7	Fine, cold and almost calm with smoke

C-3. DEVONPORT

No data are available. A new Air NEPM monitoring station is expected to be established at Devonport by the end of 2010.

SECTION D – DATA ANALYSIS

D-1. HOBART:

Andersen Reference Ambient Air Samplers (RAAS), sequential Low Volume air samplers (LVAS), for $PM_{2.5}$ and PM_{10} measurements were in operation at the New Town station for the whole of 2008. Exceedences of the daily PM_{10} Air NEPM air quality standard were determined using the reference method for gravimetric PM_{10} and $PM_{2.5}$ measurements under AS 3580.9.9:2006 and AS 3580.9.10:2006. For days when LVAS data were not available measurements made with the TEOM were used to determine if a PM_{10} exceedence occurred.

There were no exceedences of the daily PM_{10} Air NEPM air quality standard at New Town station in 2009 (Figure 6).. The overall data availability for 2009 was sufficient to demonstrate that Hobart's air quality complied with the Air NEPM goal for PM_{10}. Apart from the elevated winter PM_{10} levels associated with domestic wood smoke, Hobart experienced several minor dust events associated with dry windy weather. Some planned burn smoke was also experienced in March and April.

One dust event on 12/9/2009, appears to have been the remnants of a dust cloud generated in Central Australia. This dust cloud caused a significant springtime air pollution event in northern Tasmania, and is discussed further in the Launceston data analysis.

The daily average $PM_{2.5}$ concentration measured at New Town exceeded the 25 µg m^{-3} advisory reporting standard on four days in 2009. All of these exceedences occurred on cool days in May and June, when smoke from domestic wood heaters can become trapped in temperature inversions, or become concentrated in the station area via cold air drainage from the Lennah or Derwent valleys.

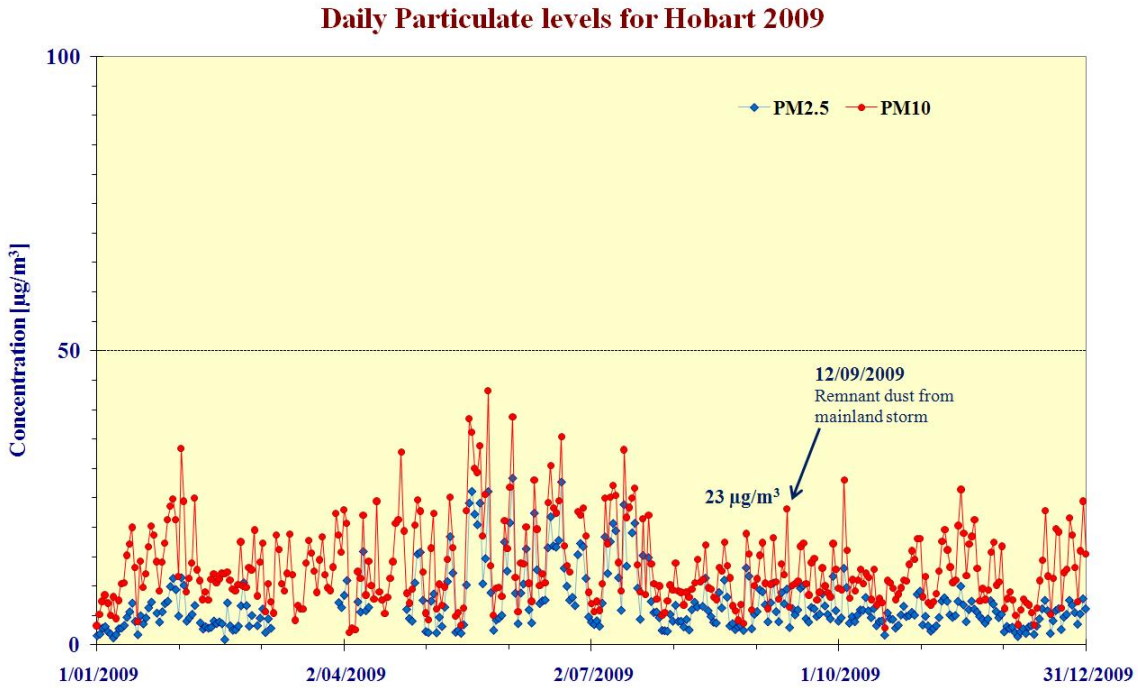

Figure 6. The daily average $PM_{2.5}$ and PM_{10} concentrations measured at New Town in 2009.

D-2. LAUNCESTON

Two RAAS LVAS instruments for PM_{10} and $PM_{2.5}$ and a TEOM with a PM_{10} size selective inlet were collocated at the Launceston station for the whole year. Exceedences of the Air NEPM PM_{10} air quality standard were primarily determined using the data from the RAAS. For days when LVAS data were not available observations made with the TEOM were used to determine if a PM_{10} exceedence occurred.

There were no exceedences of the daily PM_{10} Air NEPM standard at Ti Tree Bend in 2009. This is the first time this has occurred since monitoring began in Launceston 1992. The daily average PM_{10} concentrations measured at Ti Tree Bend in 2009 are shown in Figure 7. 2009 was the third successive year that Launceston has met the Air NEPM goal of no more than 5 exceedences of the 24-hour PM_{10} standard of 50 µg m^{-3}.

The daily average $PM_{2.5}$ concentration measured at Ti Tree Bend exceeded the 25 µg m^{-3} advisory reporting standard on 12 days during 2009. All of these exceedences occurred on cold days in June and July, with relatively calm conditions favourable to the accumulation and poor dispersal of smoke from urban wood heaters.

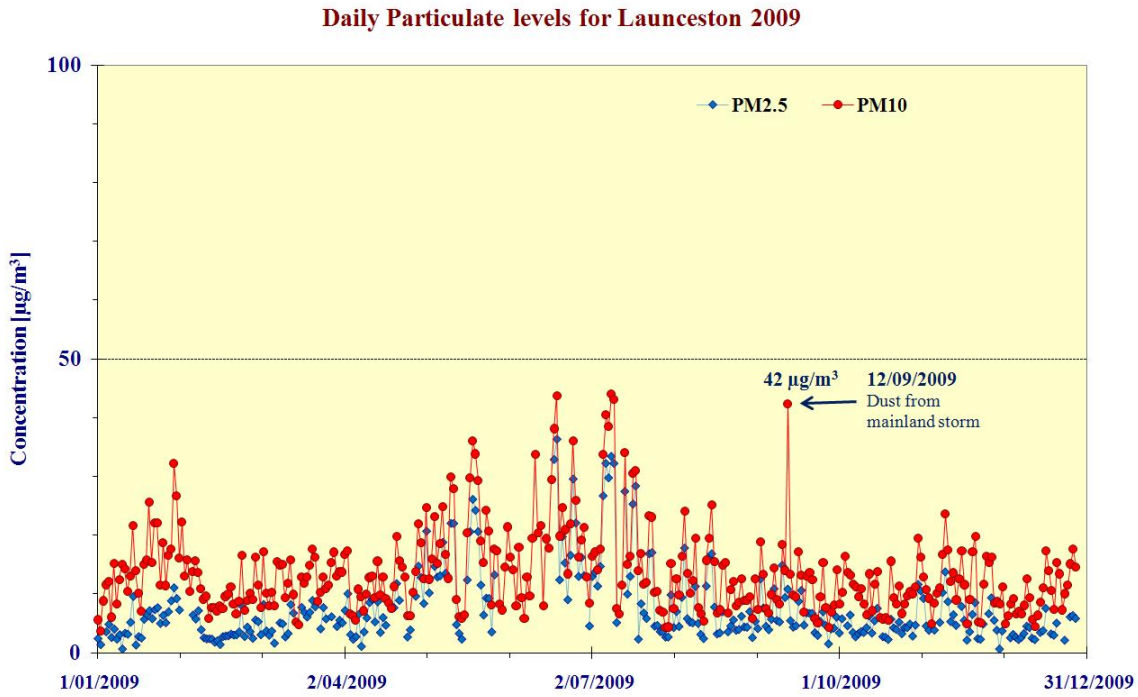

Figure 7. The daily average $PM_{2.5}$ and PM_{10} concentrations measured at Ti Tree Bend in 2009.

The isolated PM10 peak observed on the 12th September 2009 appears to have been caused by the fine fractions of a major dust storm originating in central Australia the previous day, and carried over Bass Strait by strong NW winds. The peak hourly PM_{10} concentration measured by the TEOM at Ti Tree Bend was 107 µg m^{-3}.

This dust cloud was also recorded at the George Town Air Monitoring Station, (Figure 8) where the 24 hour PM10 concentration reached 50.8 µg m^{-3} and the hourly average PM_{10} concentration observed on the *Grimm*® optical particle counter peaked at 164 µg m^{-3}. An examination of the PM_{10} LV air sampler filters from both stations showed a deposit of very fine, light coloured dust.

The remnants of this dust cloud were observed later in the day at Hobart, where the peak hourly PM_{10} concentration measured by the TEOM at New Town was 82 µg m^{-3}, with a daily average PM_{10} concentration of 23.2 µg m^{-3}. The event was also detected by the north-east BLANkET stations. A report on this event can be found at http://www.environment.tas.gov.au/?base=7529

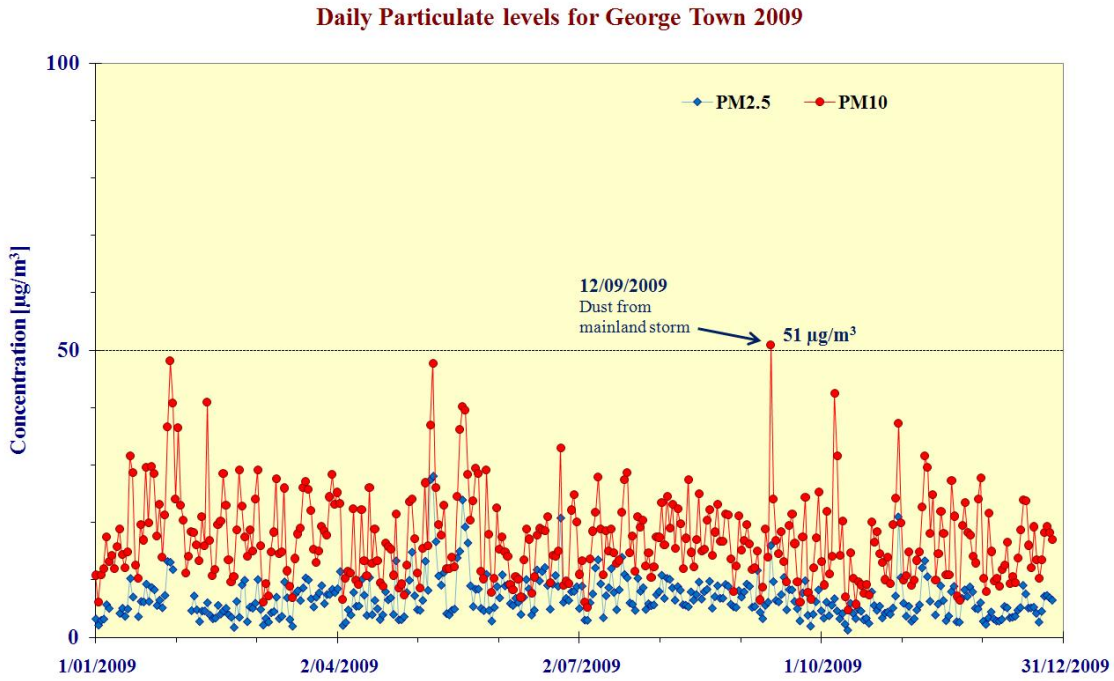

Figure 8. The daily average $PM_{2.5}$ and PM_{10} concentrations measured at George Town in 2009.

The continuing long-term improvement in Launceston's air quality is illustrated in Figures 9, 10 and 11. This improvement has been largely due to the reduction in winter smoke pollution, with average winter PM_{10} concentrations falling from over 50 µg m^{-3} in 1995 to 22 µg m^{-3} in 2007. The annual number of recorded 24-hour PM_{10} exceedences measured at Ti Tree Bend has fallen steadily from 50 in 1997 (when daily PM_{10} measurements were started at Ti Tree Bend), to only a single exceedence in 2008 (from a bushfire) , and none in 2009.

While there is some anecdotal evidence from Launceston residents that the recent winters are not as severe as they were in the 1990s, this is not supported by a preliminary analysis of the meteorological records (Figure 12), which indicates a marginal increase in the frequency of frosts and cold days over the last 16 years. As there is a clear cause and effect relationship between the frequency of cold days, wood heater use and smoke dispersion, the observation that the number of cold days has not decreased over the interval of the data record strongly suggests that it is unlikely that the steady decline in PM_{10} in Launceston over the past 16 years can be adequately explained by meteorological factors alone.

It is considered more likely that the primary cause for the reduction in Launceston's winter particulate levels over the past decade has been a reduction in the overall emission of wood smoke through a combination of emission reduction programs, including a reduction in wood heater numbers through buy-back schemes, and lower individual wood heater emissions through better design and community education programmes leading to better operating habits. Other factors that may have contributed to the improvement in air quality are the

reticulation of natural gas, conversion of commercial wood-fired boilers to other energy sources, and improved thermal efficiency of houses (insulation, double-glazing etc.).

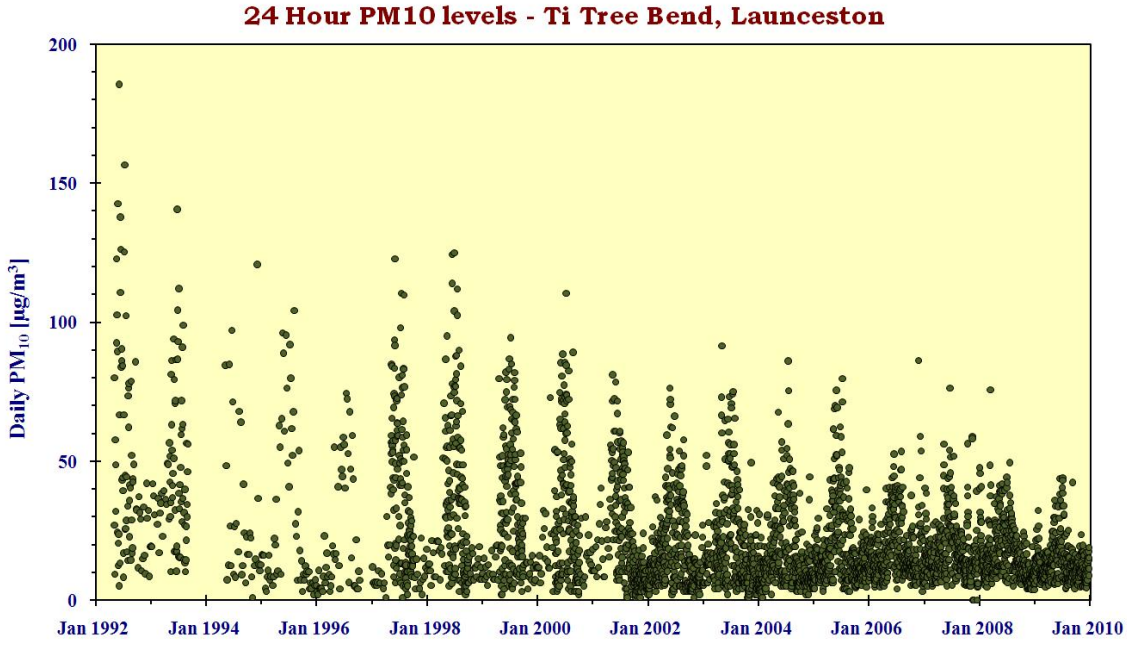

Figure 9. The daily average PM_{10} concentrations measured at Ti Tree Bend 1992 - 2008.

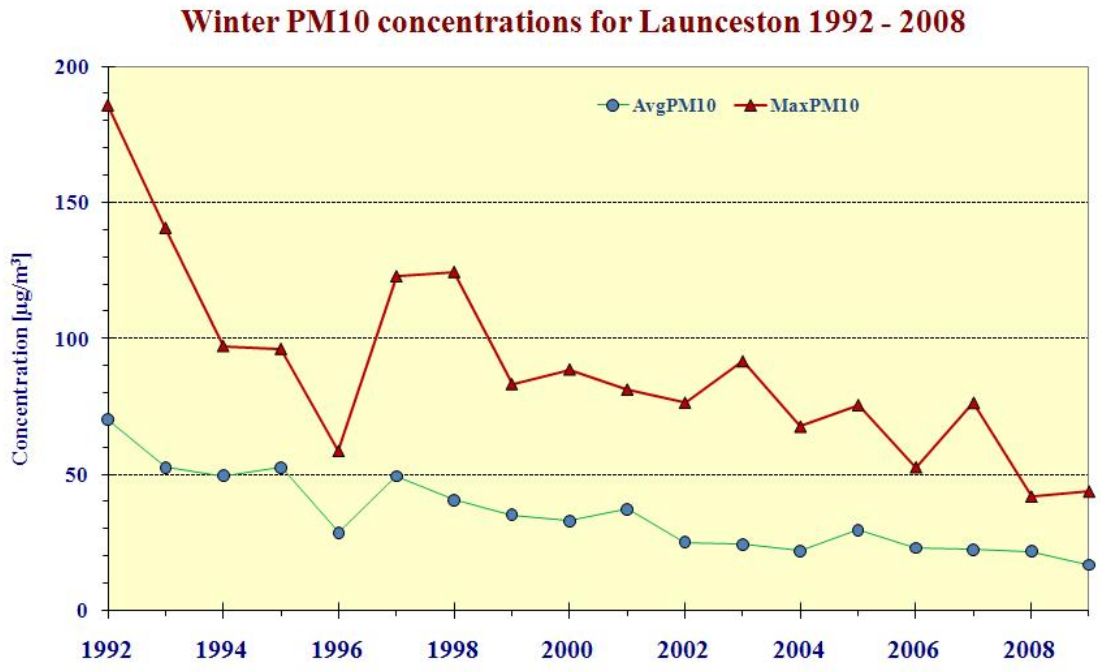

Figure 10. The daily average Winter PM_{10} concentrations measured at Ti Tree Bend 1992 - 2008.

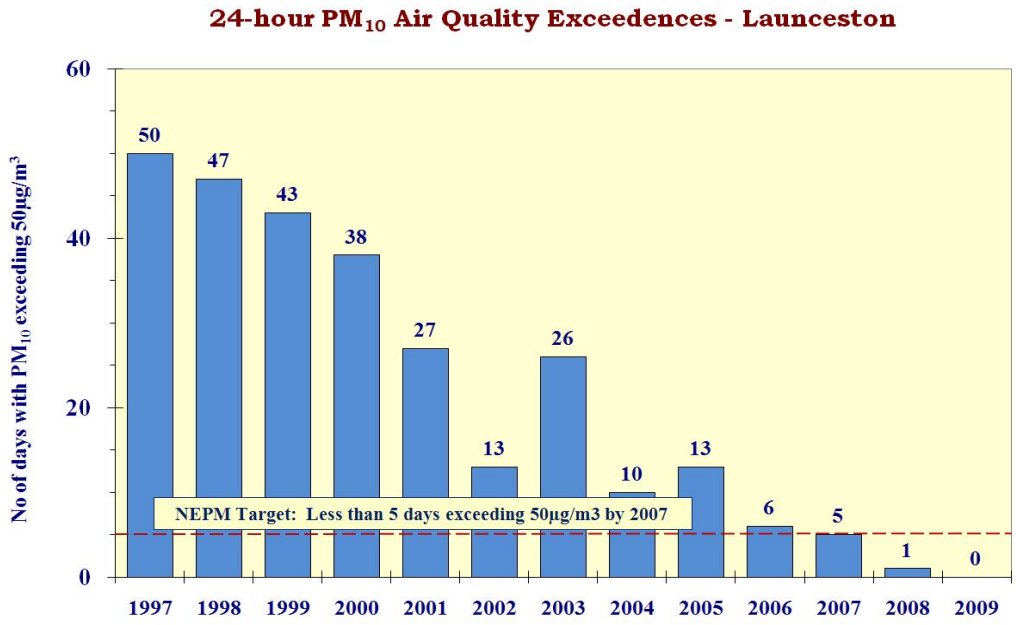

Figure 11. The number of days each year where the 24-hour average PM10 concentration at Ti Tree Bend exceeded the Air NEPM standard of 50 µg m^{-3}, since daily winter monitoring began in 1997.

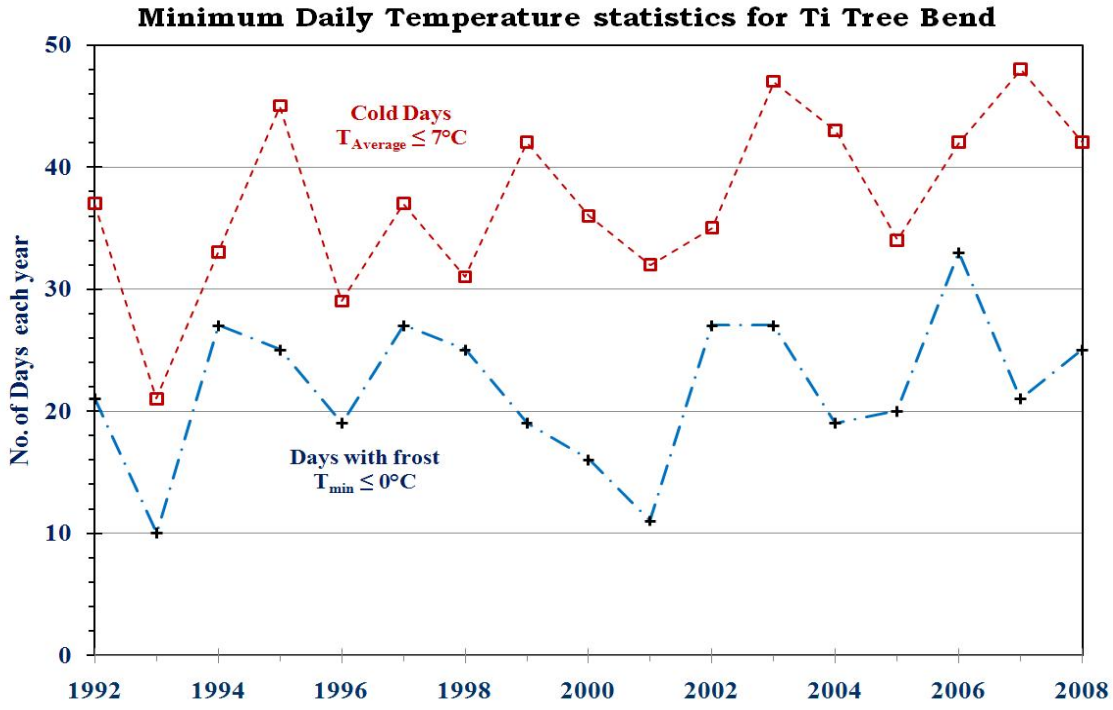

Figure 12. The annual frequency of frosts (minimum temperature ≤ 0°C) and cold days (Average Temperature ≤ 7°C) measured at Ti Tree Bend 1992 - 2008.

However, an inspection of the $PM_{2.5}$ and PM_{10} data for 2008 (Figure 8) indicates that Launceston still experiences relatively high levels of fine particulate pollution in the winter, when PM_{10} concentrations regularly exceed 40 µg m^{-3}. There is clearly a need for further improvements in Launceston's air quality.

D-3. DEVONPORT

The winter monitoring campaign in Devonport during winter 2003 showed that the local air quality is adversely affected by particulate pollution and may not comply with the NEPM goal. It is planned to establish a PM_{10} and $PM_{2.5}$ monitoring station at Devonport by the end of 2010.

D-4. STATISTICAL SUMMARY

The statistical summary of the PM_{10} and $PM_{2.5}$ data collected in Tasmania during 2009 against the National Environment Protection Measure for Air Quality are listed in Tables 7 and 8 below.

Table 7: 2009 Summary Statistics for PM_{10}

National Environment Protection (Ambient Air Quality) Measure:

PM_{10} Standard: 50 µg m^{-3} (24 hour average)

Region and Performance Monitoring Station	Data Availability (% of days)	Max. µg/m^3	Percentiles (µg/m^3)						
			99th	98th	95th	90th	75th	50th	25th
Hobart									
New Town	99.5	43.2	36.1	33.4	26.4	23.3	17.3	11.4	8.5
Launceston									
Ti Tree Bend	100	44.1	42.3	38.1	29.8	22.1	16.4	12.2	8.4

Exceedences shown in **bold**.

Table 8: Percentiles of 24-hour PM10 at New Town, Hobart (2006 – 2009)

National Environment Protection (Ambient Air Quality) Measure:

PM_{10} Standard: 50 µg m^{-3} (24 hour average)

AAQ NEPM 2008 goal: Standard exceeded on no more than 5 days per year

Year	Data Availability (% of days)	No. of exceedences (days)	Max. µg m^{-3}	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2006	*69.3*	*0*	*46.7*	*39.2*	*36.3*	*31.9*	*27.8*	*20.5*	*13.9*	*9.0*
2007	99.7	0	43.8	39.3	36.1	30.3	25.9	18.5	13.7	9.5
2008	100	0	48.7	38.7	37.1	29.6	25.3	18.7	12.9	8.6
2009	99.5	0	43.2	36.1	33.4	26.4	23.3	17.3	11.4	8.5

Years with data availability less than 75% are shown in italics. Exceedences are shown in bold

Table 9: Percentiles of 24-hour PM10 at Ti Tree Bend, Launceston (1992 – 2009)

National Environment Protection (Ambient Air Quality) Measure:

PM_{10} Standard: 50 µg m^{-3} (24 hour average)

AAQ NEPM 2008 goal: Standard exceeded on no more than 5 days per year

Year	Data Availability (% of days)	No. of exceedences (days)	Max. µg m^{-3}	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
1992	*21.0*	***27***	***185.6***	***185.6***	***156.6***	***137.8***	***110.7***	***78.9***	*40.4*	*22.9*
1993	*21.4*	***25***	***140.6***	***140.6***	***112.1***	***98.9***	***86.7***	***59.6***	*37.6*	*27.4*
1994	*9.6*	***7***	***120.8***	***120.8***	***120.8***	***97.5***	***84.8***	*41.8*	*22.4*	*12.4*
1995	*15.6*	***15***	***104.3***	***104.3***	***104.3***	***95.4***	***79.8***	***53.8***	*16.1*	*7.3*
1996	*12.8*	***9***	***74.4***	***74.4***	***74.4***	***72.5***	***58.6***	*44.6*	*14.6*	*5.3*
1997	*46.8*	***50***	***122.8***	***110.4***	***109.7***	***83.5***	***73.9***	***54.0***	*23.5*	*12.0*
1998	*51.0*	***47***	***125.0***	***124.4***	***112.0***	***88.0***	***74.8***	***51.2***	*24.1*	*11.6*
1999	*51.8*	***43***	***94.4***	***86.8***	***83.2***	***79.0***	***66.6***	*48.5*	*24.9*	*11.7*
2000	*53.0*	***38***	***110.4***	***89.2***	***85.6***	***74.8***	***71.5***	*42.3*	*23.6*	*10.3*
2001	*65.5*	***27***	***81.2***	***78.4***	***71.7***	***57.0***	***51.6***	*34.9*	*15.5*	*7.4*
2002	91.0	**13**	**76.4**	**70.6**	**59.4**	47.4	39.0	24.3	13.6	7.4
2003	85.5	**26**	**91.5**	**74.3**	**70.7**	**56.0**	43.4	26.5	15	8.3
2004	92.3	**10**	**86.1**	**67.6**	**54.0**	44.3	37.5	21.8	12.4	7.4
2005	99.2	**13**	**79.6**	**70.2**	**62.3**	47.6	39.6	23.4	13.9	9.5
2006	97.3	**6**	**86.3**	**53.5**	47.0	40.0	35.4	23.7	15.3	10.9
2007	96.4	5	**76.3**	**56.4**	**51.9**	40.0	31.1	21.6	15.0	11.1
2008	97.5	1	**75.7**	47.7	42.4	39.0	30.5	22.4	15.0	10.0
2009	100.0	0	44.1	42.3	38.1	29.8	22.1	16.4	12.2	8.4

Years with data availability less than 75% are shown in italics. Exceedences are shown in bold

Table 10: 2009 Summary Statistics for $PM_{2.5}$

National Environment Protection (Ambient Air Quality) Measure:

Advisory Reporting Standards: 25 µg m^{-3} (24 Hour Average); 8 µg m^{-3} (Annual Average)

Region and Performance Monitoring Station	Data Availability (% of days)	Max. µg/m^3	Percentiles (µg/m^3)						
			99th	98th	95th	90th	75th	50th	25th
Hobart									
New Town	87.4	**28.4**	**26.1**	24.1	19.1	15.2	8.5	5.6	3.7
Launceston									
Ti Tree Bend	83.8	**36.3**	**32.9**	**29.8**	22	14.8	8.9	5.4	3.6

Exceedences shown in **bold**.

Table 11: Percentiles of 24-hour $PM_{2.5}$ at New Town, Hobart (2006 – 2009)

National Environment Protection (Ambient Air Quality) Measure:

Advisory Reporting Standards: 25 µg m^{-3} (24 Hour Average); 8 µg m^{-3} (Annual Average)

Year	Data Availability (% of days)	No. of exceedences (days)	Max. µg m^{-3}	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2006	*54.8*	*2*	***29.4***	***27.6***	*23.0*	*21.4*	*16.0*	*9.6*	*4.8*	*3.1*
2007	86.6	7	**31.5**	**28.0**	**25.4**	21.1	16.6	9.3	5.4	3.5
2008	91.5	9	**41.9**	**33.8**	**28.3**	21.2	16.9	9.0	4.8	3.2
2009	87.4	4	**28.4**	**26.1**	24.1	19.1	15.2	8.5	5.6	3.7

Years with data availability less than 75% are shown in italics. Exceedences are shown in bold

Table 12: Percentiles of 24-hour $PM_{2.5}$ at Ti Tree Bend, Launceston (2005 – 2009)

National Environment Protection (Ambient Air Quality) Measure:

Advisory Reporting Standards: 25 µg m^{-3} (24 Hour Average); 8 µg m^{-3} (Annual Average)

Year	Data Availability (% of days)	No. of exceedences (days)	Max. µg m^{-3}	Percentiles (µg/m^3)						
				99th	98th	95th	90th	75th	50th	25th
2005	*20.3*	*0*	*12.9*	*12.9*	*12.9*	*8.1*	*7.7*	*6.3*	*4.9*	*4.0*
2006	92.1	35	**43.6**	**39.9**	**34.6**	**30.5**	**26.3**	13.6	6.3	4.2
2007	8.6.	20	**53.6**	**39.7**	**37.3**	**26.5**	20.6	11.4	6.4	4.4
2008	86.1	17	**41.6**	**34.6**	**31.2**	**25.3**	20.3	12.0	5.8	3.4
2009	83.8	12	**36.3**	**32.9**	**29.8**	22.0	14.8	8.9	5.4	3.6

Years with data availability less than 75% are shown in italics. Exceedences are shown in bold

References:

DELM, 1995, 'The Tamar Valley Airshed Study', report by SEMF Consultants to the Tasmanian Department of Environment and Land Management.

Power, M., 2000, 'Air pollution dispersion within the Tamar valley', PhD thesis, University of Tasmania.