

EPA DIVISION

AIR TOXICS MONITORING  
PROGRAM FOR TASMANIA

ANNUAL REPORT 2011

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## 1. EXECUTIVE SUMMARY

The management of air quality in Tasmania is guided by the Tasmanian Air Quality Strategy that was established under the *Environment Protection Policy (Air Quality) 2004*. The Strategy has a strong focus on airborne particles, seen as the primary issue for populated areas of Tasmania, while continuing to address other pollutants of concern, as identified in the National Environment Protection Measures (NEPM) for Ambient Air Quality and Air Toxics.

The Air Toxics NEPM is concerned with the collection of data on ambient levels of benzene, toluene, xylenes, formaldehyde and benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons, PAH) at locations where elevated levels are more likely to occur and there is a likelihood of significant population exposure.

In response to the Air Toxics NEPM requirements, an Air Toxics Monitoring Program was developed for Tasmania. Systematic air toxics monitoring commenced in 2008. The monitoring undertaken has been for screening purposes and to inform the requirements for the ongoing monitoring program. The preliminary screening monitoring was conducted predominantly using passive samplers. The Air Toxics Monitoring annual reports for 2008/09 and 2010 are available on the [EPA Division](#) web site [7].

In 2011 monitoring was undertaken at six sites: South Launceston, South Hobart, Geeveston and Cleary's Gates (Hobart) and New Town.

Results of the monitoring of toxic pollutants at the sites monitored to date indicate that ambient concentrations are seasonal, with higher levels found in winter, coinciding with increased usage of domestic wood heaters. Results indicate that the NEPM Monitoring Investigation Levels (MILs) are unlikely to be exceeded at the sites monitored to date. A summary of results of the Air Toxics monitoring program at residential sites over the period January to December 2011 is presented in Table 1. Table 2 summarises the results of a limited monitoring program at 'peak' sites.

Table 1 Summary of results of the Air Toxics monitoring program for January to December 2011

Site		Benzene	Toluene	Xylenes	Formaldehyde
		ppb	ppb	ppb	ppb
<i>Air Toxics NEPM MIL</i>	<i>Annual avg</i>	3	10	200	
	<i>24 hours</i>		1000	250	40
South Launceston	Avg 7 day	0.09	0.20	0.04	1.0
	Max 7 day	1.13	1.58	0.4	2.8
Cleary's Gates, Hobart	Avg 7 day	0.19	0.63	0.28	1.4
	Max 7 day	0.56	1.11	0.76	2.0
South Hobart	Avg 7 day	0.02	0.07	0.03	1.5
	Max 7 day	0.27	0.39	0.24	3.5
Geeveston	Avg 7 day	0.17	0.08	0.11	2.0
	Max 7 day	0.77	0.47	1.3	3.5
		<b>Benzo(a) pyrene</b>			
		ng/m <sup>3</sup>			
<i>Air Toxics NEPM MIL</i>	<i>Annual avg</i>	0.3			
South Launceston	Avg 28 day	0.11			
	Max 28day	0.30			
New Town	Avg 28 day	0.34			
	Max 28day	1.45			

Notes:

1. Benzene, Toluene and Xylenes Monitoring: Method RAD130; sampling period: 7 days
2. Formaldehyde Monitoring: Method RAD165; sampling period: 7 days
3. PAH (Benzo(a)pyrene) Monitoring: Method based on US EPA compendium method TO-13A; sampling period: 28 days
4. ND: not detected. Detection Limits for Benzene, Toluene and Xylenes :0.02 ppb
5. NEPM Annual average is the mean of the 24 hour averages

Table 2 Peak Air Toxics monitoring sites: active sampling. BTX and formaldehyde results

Site		Benzene	Toluene	Xylenes	Formaldehyde
		ppb	ppb	ppb	ppb
<i>Air Toxics NEPM MIL</i>	<i>Annual average</i>	3	100	200	
	<i>24 hours</i>	*	1000	250	40
Centrepoint, Murray St, Hobart	Maximum	1.6	9.4	7.3	<2.5
Sandy Bay	Maximum	1.0	10	7.6	<2.5
North Hobart	Maximum	1.0	4.7	3.0	<2.5
Hobart, Macquarie St	Maximum	1.3	5.2	4.6	<2.5
Geeveston	Maximum	0.79	2.2	3.8	Not sampled

Notes:

1. \* Benzene The National Occupational Health and Safety Commission (NOHSC) time-weighted-average (eight-hour time weighted average) exposure limit in the workplace is 5000 ppb. The short term exposure limit for airborne benzene is 5 ppm for 15 minutes. Chemical Sampling Information Benzene. Osha.gov. Retrieved on 2011-11-23.
2. 1 hour sampling time,
3. The detection limit depends on the volume sampled, with the higher volumes having a lower detection limit

## 2. GLOSSARY AND ACRONYMS

AAQC	Ontario Ministry of the Environment Ambient Air Quality Criteria
Air Toxic	Means a pollutant selected for assessment in this Measure and listed in Schedule 1 of the Air Toxics NEPM. Air toxics are pollutants that are known or suspected to cause health or environmental problems. Information about the sources and health effects of air toxics is available at the National Environment Protection Council (NEPC) web site <sup>[4]</sup> .
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
Air Shed	Means an area that is defined by natural or topographic features affecting air quality. Once a substance is emitted into an Air Shed, it is contained therein for a reasonable period of time
Air Toxics NEPM	National Environment Protection (Air Toxics) Measure
Ambient Air	Means the external air environment, it does not include the air environment inside buildings or structures
AQMS	Air Quality Monitoring Station
AST	Analytical Services Tasmania. EPA Division chemical testing laboratory
Avg 7 day	The average of the 7 day concentration
Avg 28 day	The average of the 28 day concentration
DPIPWE	Department of Primary Industries, Parks, Water and Environment
Dustrak	Dust Trak optical particulate monitor
LVAS	Low Volume Air Sampler. Air NEPM approved methodology for measurement of PM <sub>10</sub> and PM <sub>2.5</sub>
Max 7 day	is the maximum 7 day concentration
Max 28 day	is the maximum 28 day concentration
MIL	Monitoring Investigation Level
Monitoring Investigation Level	Defined in the Air Toxics NEPM as the concentration of an air toxic which if exceeded requires an appropriate form of further investigation and evaluation
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
ng	nanogram
PAH	Polycyclic aromatic hydrocarbon
Passive sampling	The process of passive diffusion of air into the sample collection media without benefit of 'forced air'.
Peak site	Peak sites are located where the highest concentrations and exposure are expected to occur e.g. near roads, in the CBD or near industrial sources.
pg	picogram
PM <sub>2.5</sub>	Suspended particulate matter with an equivalent aerodynamic diameter of less than 2.5µm
ppb	parts per billion
ppbv	parts per billion by volume
ppm	parts per million
TCEQ	Texas Commission on Environmental Quality
Tier 2 Air Toxics	prioritised list of pollutants that are potentially of national concern
µg/m <sup>3</sup>	micrograms per cubic meter
VOCs	Volatile Organic Compounds, includes benzene, toluene and xylenes
Xylenes	Reported as total of ortho, meta and para isomers

### 3. INTRODUCTION

The management of air quality in Tasmania is guided by the Tasmanian Air Quality Strategy<sup>[1]</sup>, established under the *Environment Protection Policy (Air Quality) 2004*<sup>[2]</sup>. The Strategy has a strong focus on airborne particles, seen as the primary issue for populated areas of Tasmania, while continuing to address other pollutants of concern, as identified in the National Environment Protection Measures (NEPM) for Ambient Air Quality<sup>[3]</sup> and Air Toxics<sup>[4]</sup>.

Tasmania has an extensive network of air quality monitoring stations, with the emphasis on the measurement of airborne particulate matter concentration (PM<sub>10</sub> and PM<sub>2.5</sub>). Information about this network is available on the Department of Primary Industries, Parks, Water and Environment (DPIPWE) web site<sup>[5]</sup>.

Tasmania commenced an Air Toxics Monitoring Program in July 2008. The goal of the Air Toxics Monitoring Program is to implement the Air Toxics NEPM in Tasmania and thereby improve the information base regarding the distribution and concentration of air toxics in residential areas in Tasmania. The Program focuses on collection of data for the five priority pollutants listed in the Air Toxics NEPM: formaldehyde, toluene, xylenes, benzene and benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons, PAH). Some data have also been collected for Tier 2 air toxic pollutants<sup>[6]</sup>. These data are presented in this report.

In order to make effective use of the relatively limited resources available for Tasmania's Air Toxics Monitoring Program, preliminary monitoring was undertaken to assess the requirements for the ongoing monitoring program. The preliminary monitoring used more cost effective and less personnel intensive monitoring techniques than the Air Toxics NEPM reference methods. Preliminary monitoring data cannot be assessed against the monitoring investigation levels (MILs) listed in Schedule 3 of the Air Toxics NEPM, as the limited sampling does not give a fully representative measure of conditions at a site, but can be used for site prioritisation.

The Annual Report for 2008/09 and 2010 can be downloaded at EPA Division web site<sup>[7]</sup>.

## 4. AIR TOXICS MONITORING SITES

The Air Toxics NEPM recommends that monitoring for air toxics be undertaken at locations where significantly elevated levels are likely to occur and where there is likelihood of significant population exposure. Elevated levels are associated with locations that are close to specific sources. Sources of air toxic pollutants include clusters of industrial sites, heavily trafficked or congested roads and areas affected by wood smoke. Although industrial point sources may contribute to ambient levels in a specific area, the NEPM is not aimed at direct control of industrial emissions.

Fourteen sites in the residential areas of Hobart and Launceston were identified in a Desktop Analysis<sup>[8]</sup> that was conducted in 2005. The Desktop Analysis indicated that higher emissions of all species tend to cluster within central business districts and particular residential suburbs in each air shed. Formaldehyde and PAH dominate emissions within the Hobart and Launceston air sheds. In 2011 monitoring was undertaken at South Hobart and South Launceston, as identified in the Desktop Study 2005. Monitoring was also undertaken at Cleary's Gates (in Hobart), adjacent to a major arterial road.

Five sites were chosen to determine the concentration of air toxics at 'peak' locations: four roadside sites associated with motor vehicles emissions and one site that experiences elevated levels of domestic wood smoke in winter.

Roadside sampling sites. Locations with high traffic density can be difficult to monitor due to access to suitable and secure monitoring sites. A limited roadside monitoring program was conducted, using an active sampler, at four sites during summer, when vehicular emissions are expected to dominate emissions. Sites in Hobart were selected for this monitoring program based on traffic density during the morning or afternoon peak hour. The sites were Sandy Bay, Hobart (Macquarie St), North Hobart and Hobart (Murray St, Centrepoint). Sampling was conducted during peak hour, in locations as close as possible to intersections with traffic lights.

Woodsmoke impacted site. In winter, Geeveston has a history of high particulate matter concentration associated with domestic wood smoke. It was selected as a peak location for air toxics monitoring to assess the impact of woodsmoke on air toxics concentrations. The site was also monitored as a part of the Air Toxics Monitoring Program in 2011. Sampling was conducted on two evenings in winter, when it could be expected that domestic wood heaters would be in use. There was a light drizzle on evening of 07/08/11 and there was no smell of smoke. The evening of 22/08/11 was calm and humid with a strong smell of wood smoke.

Monitoring sites are listed in Table 3 and are shown on the map in Appendix 1. Table 4 lists the detailed monitoring site characteristics, the rationale for selecting these sites, pollutants monitored, the monitoring period and the monitoring methodology.



Table 3 Air toxics monitoring sites

	Year(s) Monitored	Notes
<b>Greater Hobart area</b>		
Battery Point		[1], [8]
Glenorchy, SW Glenorchy	2008-10	[1], [4]
Hobart Cleary's Gates	2010-11	[7]
Hobart Macquarie Street	2011	[7]
Hobart Murray Street	2011	[7]
New Town	2008-09, 2011	[1], [2], [4]
New Town CBD		[1], [8]
North Hobart CBD	2011	[1], [7]
Moonah		[1], [4]
Sandy Bay	2011	[1], [7]
South Hobart CBD	2011	[1], [8]
Warrane	2008-10	[1]
West Moonah		[1], [4]
Lutana/Moonah/Derwent Park		[1], [4]
<b>Launceston area</b>		
East & South Launceston/Windmill Hill	2008-10	[1], [5]
Launceston CBD		[1], [5]
Ti Tree Bend AQMS	2008-09	[2]
West Launceston		[1], [5]
<b>Other Sites</b>		
Rowella	2008-09	[3]
New Norfolk	2010	[6]
Geeveston	2011	[6], [7]

## Notes

AT NEPM Section 4 (iv) "Where practicable jurisdictions should select Stage 2 sites for air toxic(s) monitoring that are representative of other Stage 1 sites. This will allow an indicative evaluation of other Stage 1 sites where a monitored site is considered to be representative of these sites."

Some of the sites selected could be considered representative of other sites in terms of land use (eg residential), proximity to traffic and geography, and will allow an indicative evaluation of other similar sites. See [4], [5] and [8].

- [1] Identified as possible peak location in Desktop Analysis 2005
- [2] Air NEPM AQMS.
- [3] PAH concentration at Rowella in the Tamar Valley as an extension of a baseline study associated with a proposed pulp mill
- [4] Glenorchy site is representative of other indicated sites in the Greater Hobart area \*
- [5] South Launceston site is representative of other indicated sites in the Launceston area\*
- [6] Representative of a medium sized community affected by smoke from domestic wood heaters
- [7] Peak site
- [8] South Hobart site is representative of other indicated sites in the Greater Hobart area \*

Table 4 Air Toxics Monitoring Sites for 2011

Site Name	Location		Site Description	Reason for Monitoring	Air Toxics Monitored	Other parameters monitored	Monitoring Period	Test Method Name
	MGA Easting (km)	MGA Northing (km)						
South Launceston	514,357	5,411,928	Urban residential	Desktop Analysis	Benzene, Toluene, Xylenes, Formaldehyde	PM <sub>10</sub> , PM <sub>2.5</sub> , meteorology	2011	RAD130, RAD165
South Hobart	525,267	5,250,731	Urban residential	Desktop Analysis	Benzene, toluene, xylenes, formaldehyde		May – October 2011	RAD130, RAD165
New Town	525,762	5,255,281	Urban residential, 1km from major arterial road	Air NEPM AQMS Desktop Analysis: preliminary screening	Benz(a)pyrene	PM <sub>10</sub> , PM <sub>2.5</sub> , meteorology		USEPA TO-13A
Geeveston	494,023	5,220,442	Rural town	Peak site Reports of winter smoke entrainment	Benzene, toluene, xylenes, formaldehyde	PM <sub>10</sub> , PM <sub>2.5</sub> meteorology	May – October 2011	RAD130, RAD165 USEPA TO-17 HPLC
Hobart, Cleary's Gates	525,752	5,254,406	Adjacent to arterial road	Peak site Traffic density	Benzene, Toluene, Xylenes, Formaldehyde	PM <sub>10</sub> , PM <sub>2.5</sub> , meteorology	May – October 2011	RAD130, RAD165
North Hobart CBD, Elizabeth St	525,819	5,253,169	Roadside 5 metres from curb	Peak site Traffic density	Benzene, toluene, xylenes, formaldehyde			USEPA TO-17 HPLC
Sandy Bay, Magnet Court	526,733	5,250,793	Roadside 5 metres from curb	Peak site Traffic density	Benzene, toluene, xylenes, formaldehyde			USEPA TO-17 HPLC
Hobart, Macquarie St	526,746	5,251,943	Roadside 5 metres from curb	Peak site Traffic density	Benzene, toluene, xylenes, formaldehyde			USEPA TO-17 HPLC
Hobart, Murray St, Centre Point,	526,668	5,252,121	Roadside 5 metres from curb	Peak site Traffic density	Benzene, toluene, xylenes, formaldehyde			USEPA TO-17 HPLC

## 5. MONITORING METHODOLOGY

The preliminary monitoring was conducted using both passive samplers and active samplers (pumps). The methods used in the 2011 monitoring program and their performance characteristics are detailed in Table 5.

Table 5 Details of Methods Used for Air Toxics Monitoring Program

Test Method	Minimum Detection Limit		Measurement Uncertainty	Samples	Analytical Laboratory QA/QC
<b>RAD130</b>	$\mu\text{g}/\text{m}^3$	<b>ppb</b>	<b>%</b>	<b>Passive sampler</b>  7 day integrated	AST 10 % Duplicates, batch blanks
Benzene	0.1	0.02	1.8		
Toluene	0.1	0.02	1.5		
Xylenes	0.1	0.02	2.5		
<b>RAD165</b>	$\mu\text{g}/\text{m}^3$	<b>ppb</b>	<b>%</b>	<b>Active sampler</b>  1 hour	WA Chem Centre Batch Blanks
Formaldehyde	0.1	0.08	14		
<b>TO-17A</b>	$\mu\text{g}/\text{m}^3$	<b>ppb</b>	<b>%</b>	<b>Active sampler</b>  1 hour	AST, batch blanks
Benzene	3		15		
Toluene	3		15		
Xylenes	3		15		
<b>HPLC</b>	$\mu\text{g}/\text{m}^3$	<b>ppb</b>	<b>%</b>	<b>Active sampler</b>  28 day integrated	AsureQuality Blanks, IANZ accredited
Formaldehyde	10		28		
<b>TO-13A</b>	$\text{pg}/\text{m}^3$	$\text{ng}/\text{m}^3$	<b>%</b>		
Benzo(a)pyrene	0.24	0.00002	21		

Notes: AST = Analytical Services Tasmania

## 5.1. Monitoring for BTX and formaldehyde

### 5.1.1. Passive samplers

Radiello passive samplers, RAD130, were used for monitoring benzene, toluene and xylenes (BTX). RAD145 was used for formaldehyde and the tier 2 pollutants acetaldehyde and acetone. Figure 1 shows the passive samplers deployed.



Figure 1 Radiello passive samplers

### 5.1.2. Active samplers

Monitoring for BTX and formaldehyde was conducted at selected peak sites using a dual channel pump illustrated in Figure 2. BTX analysis was conducted using US EPA TO-17, and formaldehyde was analysed by HPLC.



Figure 2 Supelco Model 1067 Tube Sampler (Dual channel)

## **5.2. Monitoring for Benzo(a)pyrene**

A PUF/XAD sampler was used for PAH monitoring. Benzo(a)pyrene is used as a marker for PAH for the purpose of the Air Toxics NEPM. The method is based on USEPA method TO-13A. Samples were collected over a 28 days, to ensure detectable levels were collected.

## 6. RESULTS OF AIR TOXICS MONITORING PROGRAM

### 6.1. Assessment of monitoring data

Air Toxics NEPM lists MILs for each of the five air toxics to assess the results of monitoring data. There are no MILs for Tier 2 pollutants, however some guidance is provided by the Ontario Ministry of the Environment Ambient Air Quality Criteria (OAQC)<sup>[9]</sup> and the Texas Commission on Environmental Quality (TCEQ)<sup>[10]</sup> screening levels. The NEPM MIL, OAAC or TECQ level are listed in Table 6.

The NEPM, OAAC or TECQ level can only be used as guides for assessment of data, as the limited sampling conducted during preliminary monitoring does not give a fully representative measure of conditions at a site.

### 6.2. Monitoring results: passive samplers

The results of the Air Toxics monitoring program over the period January to December 2011 are summarised in Table 6. Appendix 2 contains the time series plots for six of the monitoring sites.

The benzene, toluene and xylenes and formaldehyde levels exhibit seasonal fluctuations, with higher levels detected in winter. Given the very low concentrations of all pollutants monitored it is unlikely that the MILs were exceeded at any of the six sites.

Acetaldehyde and acetone exhibit a relatively constant concentration during the sampling period. Given the very low concentrations of acetaldehyde and acetone measured at all sites it is unlikely that either the OAQC criteria or the TCEQ screening levels were exceeded.

### 6.3. Particulate matter

Particulate matter, PM<sub>2.5</sub>, concentration, was measured at South Launceston, Geeveston and Cleary's Gates in 2011 and at New town and Ti Tree Bend in previous years. Whilst the relationship between BTX and PM<sub>2.5</sub> was found to be statistically significant, other factors, such as temperature, humidity and wind speed are likely to contribute the seasonal changes in air toxics concentrations.

A number of papers have been published relating to the concentrations of air toxics in locations heavily impacted by woodsmoke.

- Reisen and Brown<sup>11</sup> examined the implications for community health from exposure to bushfire air toxics. The primary concern in all the regions studied was particulate exposure, due to the rapid adverse affects of smoke on individuals.
- A study of Firefighters' exposure to air toxics during prescribed burns by Reisen et al<sup>12</sup> indicated that, in general, the majority of exposure to air toxics such as benzene and formaldehyde was compliant with the relevant occupational exposure standards. Fire crew involved in patrolling and fire suppression measures had higher exposure to air toxics than crew involved in the ignition of backburns.
- Meyer et al<sup>13</sup> concluded that, on occasions, air quality in rural areas is significantly affected by smoke from biomass combustion sources. However concentrations of

benzene, toluene, ethylbenzene and xylenes (BTEX) were low and never approached the NEPM standard at any monitoring site.

- Reinhardt et al<sup>14, 15</sup> measured benzene exposure of firefighters involved in prescribed burns and wildfires, concluded that levels were low and did not approach occupational health and safety limits.
- Rheinardt and Ottmar<sup>16</sup> measured personal exposure of particulates, formaldehyde and benzene during agricultural burning in Brazil. Particulates were elevated, benzene averaged 3.2 ppb (the NEPM air toxics MIL is 3 ppb) and formaldehyde averaged 12.8 ppb (the NEPM MIL is 40 ppb). These results showed that NEPM MIL's could be exceeded on a short term basis during the 2 to 3 week burning season, although it is difficult to compare 24 hour MIL's to eight hour exposure samples.
- Ward<sup>17</sup> concluded that there were no strong correlations between VOC levels and the incidence of active wildfires. They also suggested that although biomass combustion does lead to the emission of benzene, toluene and xylene, their levels will be overwhelmed by that from fossil fuel sources.
- Naeher et al<sup>18</sup> conducted a review of health effects of woodsmoke and concluded that at this stage there is a large and growing body of evidence linking wood/biomass smoke to both acute and chronic illness, but there is insufficient evidence to support regulating smoke separately from its individual chemical constituents. In addition, they concluded there is insufficient evidence at present to conclude that woodsmoke particles are significantly less or more damaging to health than general ambient fine particles.

Table 6 Summary results of the Air Toxics monitoring program over the period January 2011 to December 2011

Monitoring Site	Formaldehyde ppb	Benzene ppb	Toluene ppb	Xylenes ppb	Benzo(a)pyrene ng/m <sup>3</sup>	Acetaldehyde µg/m <sup>3</sup>	Acetone µg/m <sup>3</sup>	Monitoring Dates	No of valid results
<b>Air Toxics NEPM MIL</b>									
24 hours	40		1000	250					
Annual avg		3	10	200	0.3				
<b>OAQC criteria</b>									
24 hours						500	11880		
<b>TCEQ level</b>									
Annual avg						9	590		
<b>Cleary's Gates</b>								12/04/11 – 4/10/11	
Avg 7 day	1.4	0.19	0.63	0.28		0.90	0.33		22
Max 7 day	2.0	0.56	1.11	0.76	NM	1.40	0.65		
<b>South Hobart</b>								12/04/11 – 4/10/11	
Avg 7 day	1.5	0.02	0.07	0.03		1.24	0.33		22
Max 7 day	3.5	0.27	0.39	0.24	NM	2.27	1.11		
<b>Geeveston</b>								12/04/11 – 4/10/11	
Avg 7 day	2.0	0.17	0.08	0.11		1.28	0.18		21
Max 7 day	3.5	0.77	0.47	1.3	NM	2.02	0.71		
<b>South Launceston</b>								5/1/11 – 12/10/11	
Avg 7 day	1.0	0.09	0.20	0.04		1.29	0.47		37
Max 7 day	2.8	1.13	1.58	0.4		1.97	1.06		
Avg 28 day					0.34				12
Max 28 day					1.45				
<b>New Town</b>								01/01/11 - 31/12/11	
Avg 28 day	NM	NM	NM	NM	0.11	NM	NM		12
Max 28 day	NM	NM	NM	NM	0.30	NM	NM		

Notes:

- Benzene, Toluene and Xylenes Monitoring: Method RAD130; Averaging Period: 7 days
- PAH (Benzo(a)pyrene) Monitoring: Method based on US EPA TO-13A; Averaging Period: 28 days
- Formaldehyde Monitoring: Method RAD165; Averaging Period: 7 days
- NM: no monitoring conducted



#### 6.4. Monitoring results at 'peak' sites

Three sets of samples were collected at five 'peak' sites. The results for BTX and formaldehyde are summarised in Table 7.

Table 7 Peak Air Toxics monitoring sites: active sampling. BTX and formaldehyde results

Site	Date	Benzene	Toluene	Xylenes	Formaldehyde
		ppb	ppb	ppb	ppb
<b>Air Toxics NEPM</b>	Annual av	3	100	200	
<b>MIL</b>	24 hours	*	1000	250	40
<b>Centrepoint, Murray St</b>	07/03/11	1.6	6.0	4.5	<2.5
	06/02/12	1.1	4.9	4.6	<2.5
	20/02/12	1.6	9.4	7.3	<2.5
<b>Sandy Bay</b>	08/03/11	<0.9	2.2	1.5	4.3
	07/02/12	<3.0	10	7.6	<2.5
	21/02/12	1.0	3.0	2.6	<2.5
<b>North Hobart</b>	09/03/11	<0.9	3.7	3.0	5.3
	28/02/12	1.0	3.9	2.9	<2.5
	13/03/12	<0.7	4.7	2.7	<2.5
<b>Hobart, Macquarie St</b>	15/03/11	<0.9	1.5	1.0	5.2
	22/02/12	1.3	5.2	4.1	<2.5
	29/02/12	1.1	4.9	4.6	<2.5
<b>Geeveston</b>	7/08/2011 19:45	0.29	2.2	<1.5	NS
	7/08/2011 22:30	<0.2	0.2	<1.5	NS
	22/08/2011 21:30	0.61	0.62	3.8	NS
	22/08/2011 22:50	0.79	0.44	<1.5	NS

Notes:

\* The National Occupational Health and Safety Commission (NOHSC) time-weighted-average (eight-hour time weighted average) exposure limit in the workplace is 5000 ppb.

The short term exposure limit for airborne benzene is 5 ppm for 15 minutes. Chemical Sampling Information Benzene. Osha.gov. Retrieved on 2011-11-23.

1 hour sampling time,

The detection limit depends on the volume sampled, with the higher volumes having a lower detection limit

NS = not sampled

## 7. CONCLUSIONS

In 2011 monitoring was undertaken at eight sites: New Town, South Hobart, Cleary's Gates (Hobart), Sandy Bay, Macquarie St (Hobart), North Hobart and Murray St (Hobart, Centrepoint), Geeveston and South Launceston.

The concentrations of benzene, toluene, xylenes, formaldehyde, acetaldehyde and acetone and benzo(a)pyrene were determined using passive and active sampling. Particulate matter (PM<sub>2.5</sub>) was measured at South Launceston, Cleary's Gates and Geeveston.

The major sources of the air toxics at the locations monitored are domestic wood heaters and motor vehicles. The majority of sampling has been conducted in the colder months when the impact of wood smoke is greater and the concentration of associated air toxic species is also likely to be greater. Other sources of air toxics, such as vehicle emissions, are not likely to show a seasonal effect.

The combination of the winter weather conditions and increased domestic wood heater usage may be a major factor in the observed seasonal fluctuations of particulate matter and air toxics concentrations. Elevated concentrations observed at other times may be due to fuel reduction, regeneration or agriculture burning or wildfires.

Preliminary monitoring data cannot be assessed against the NEPM MIL, the OAAC or the TECQ level, as the limited sampling does not give a fully representative measure of conditions at a site. The concentrations of air toxics are, however, very low and are unlikely to be greater than the levels at any site monitored.

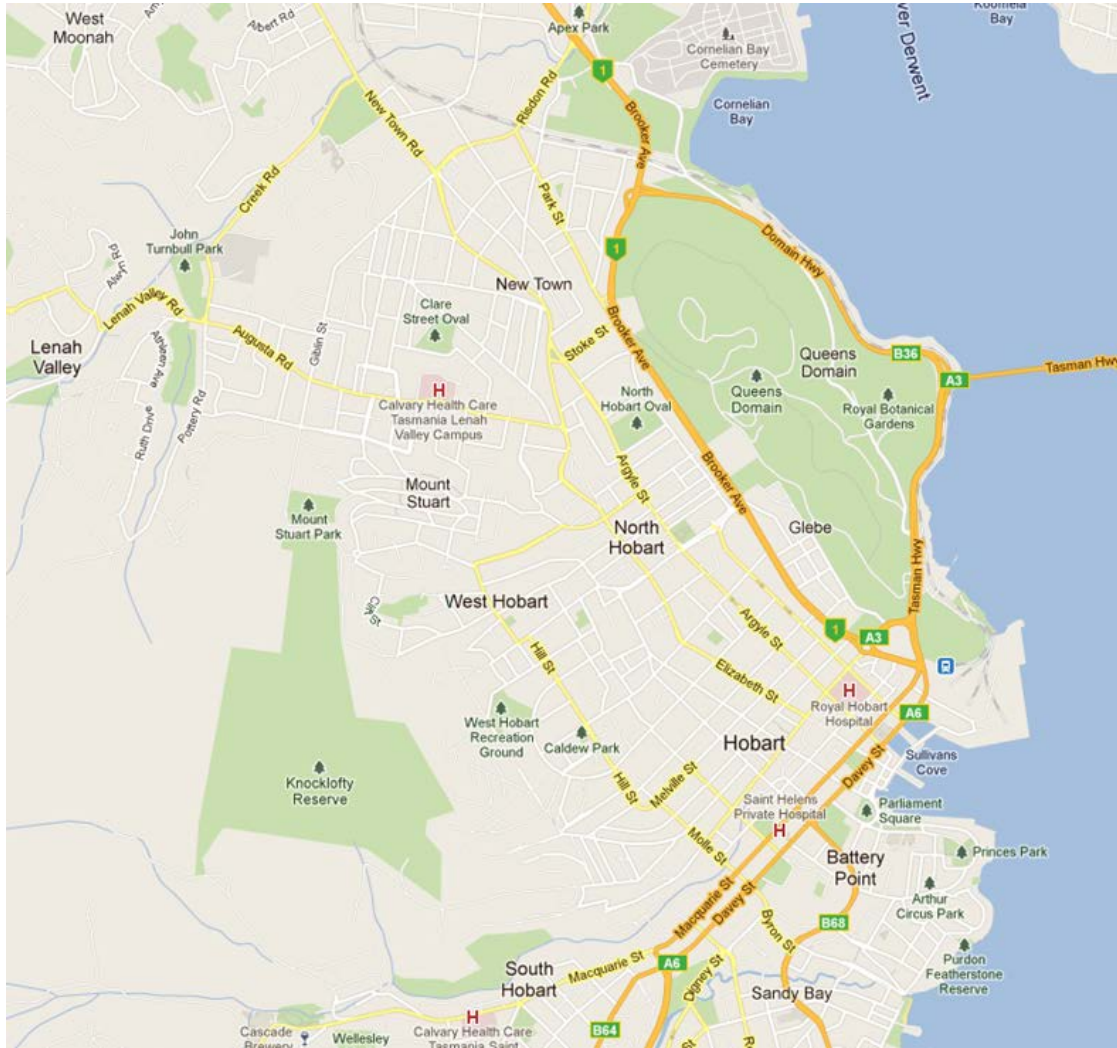
Data collected at 'peak' sites indicates the NEPM MILs are unlikely to be exceeded for any of the pollutants monitored.

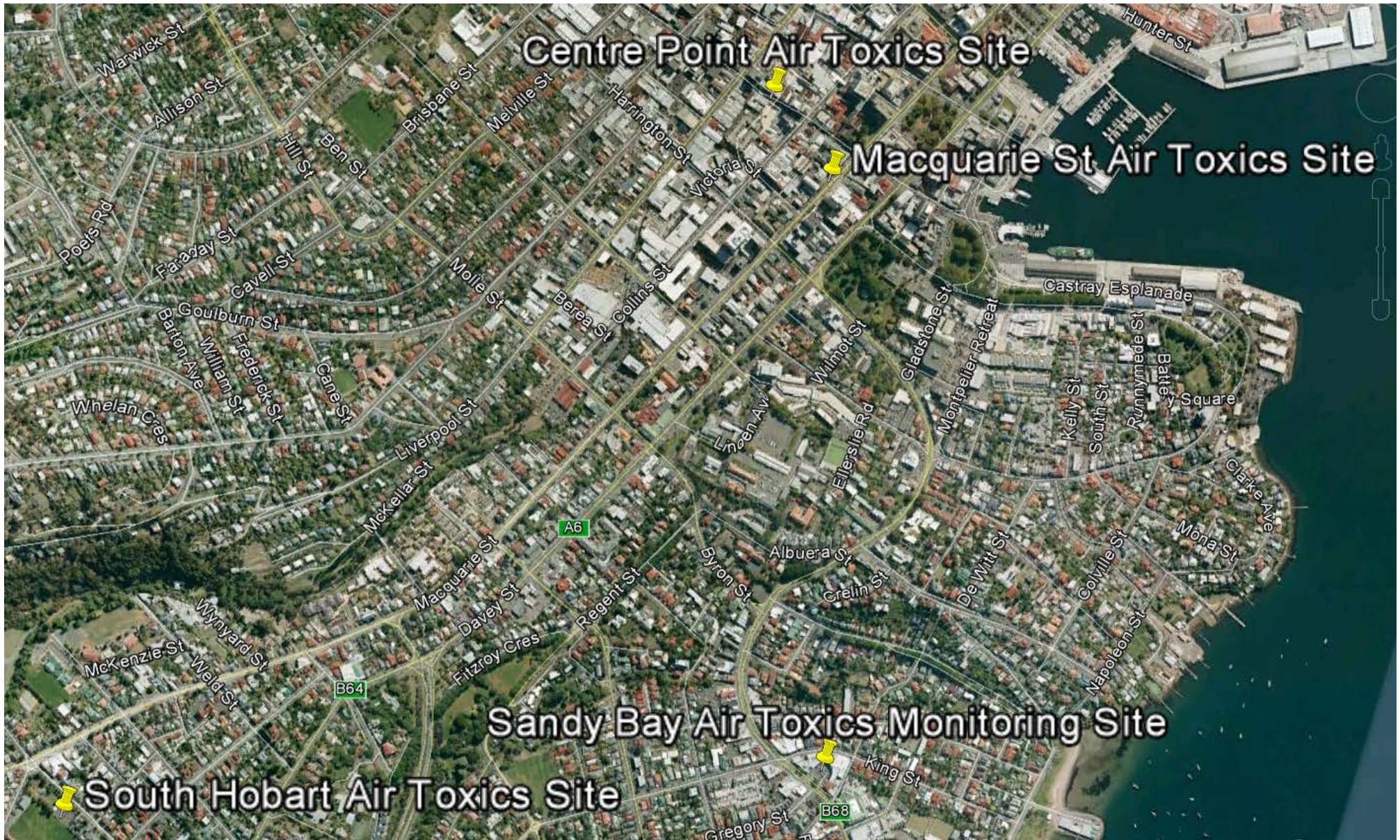
Particulate matter, PM<sub>2.5</sub>, concentration, was measured at South Launceston, Geeveston and Cleary's Gates in 2011 and at New town and Ti Tree Bend in previous years. Whilst the relationship between BTX and PM<sub>2.5</sub> was found to be statistically significant, other factors, such as temperature, humidity and wind speed are likely to contribute the seasonal changes in air toxics concentrations.

A review of published literature indicates that the primary concern with wood smoke exposure is particulate matter and that levels of air toxics may be elevated for short periods, but that the levels do not exceed occupational exposure standards.

## APPENDIX 1 SITE LOCATIONS

Figure 3 Southern air toxics monitoring sites: Hobart and Geeveston







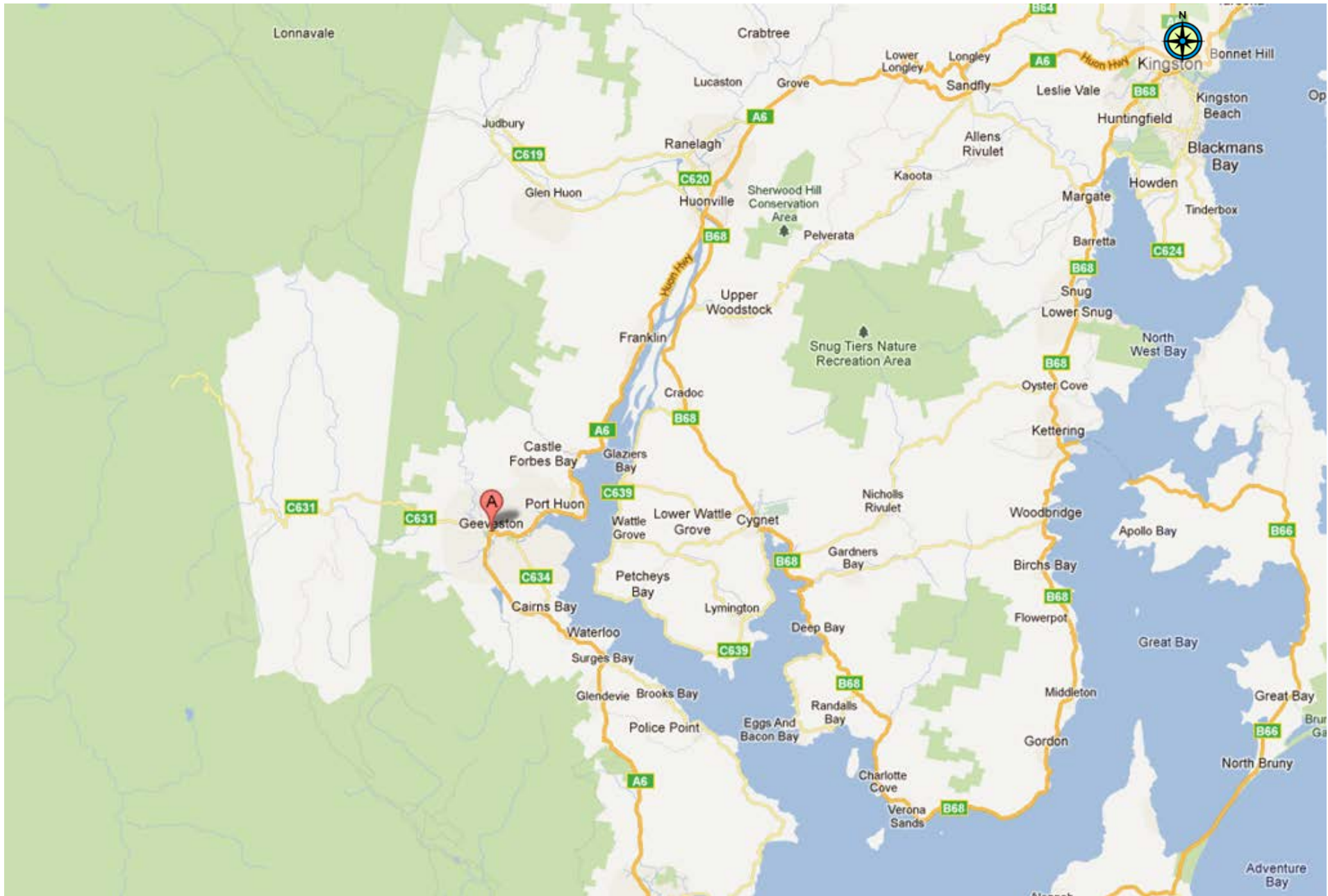




Figure 4 South Launceston air toxics monitoring site

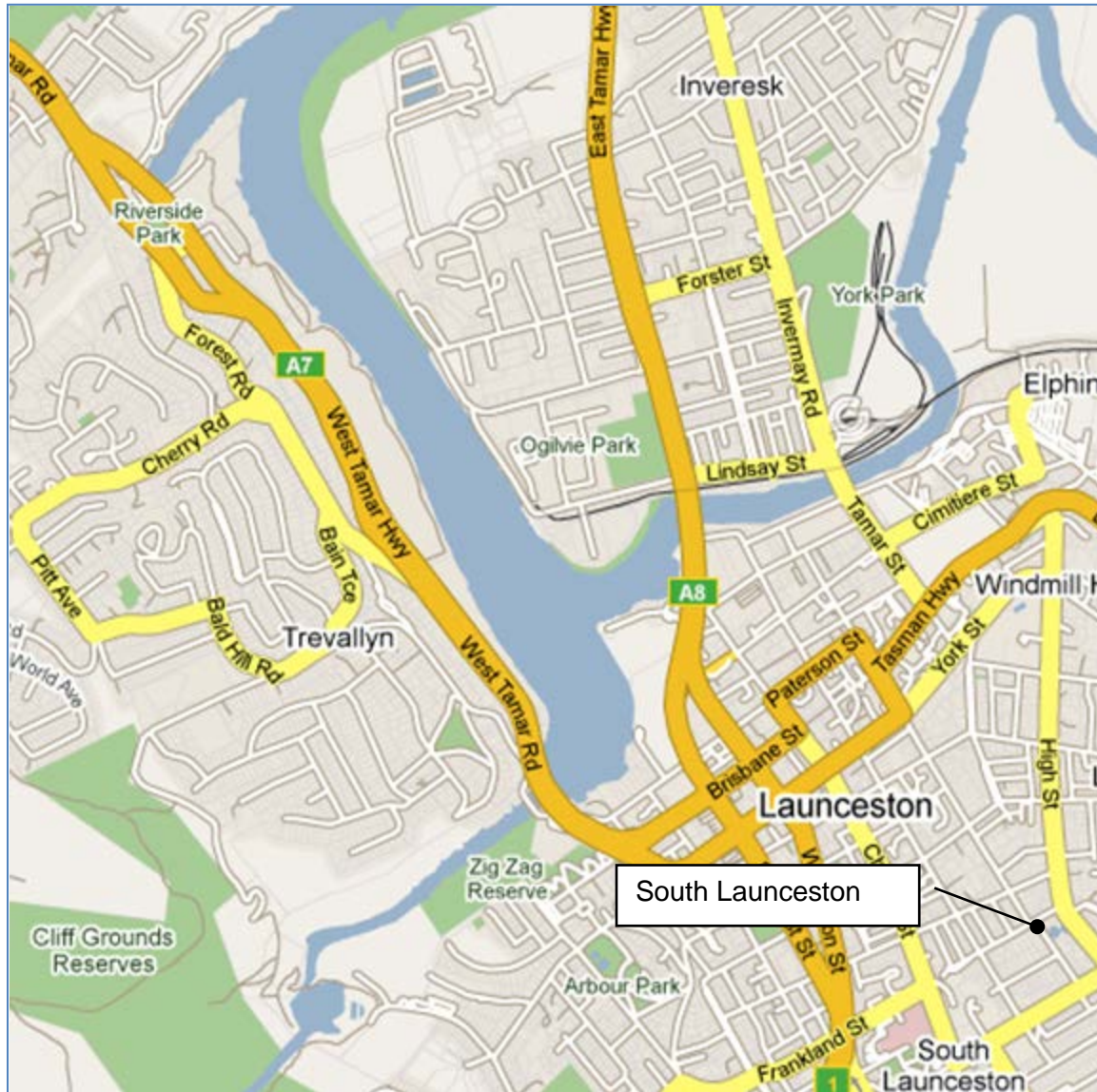
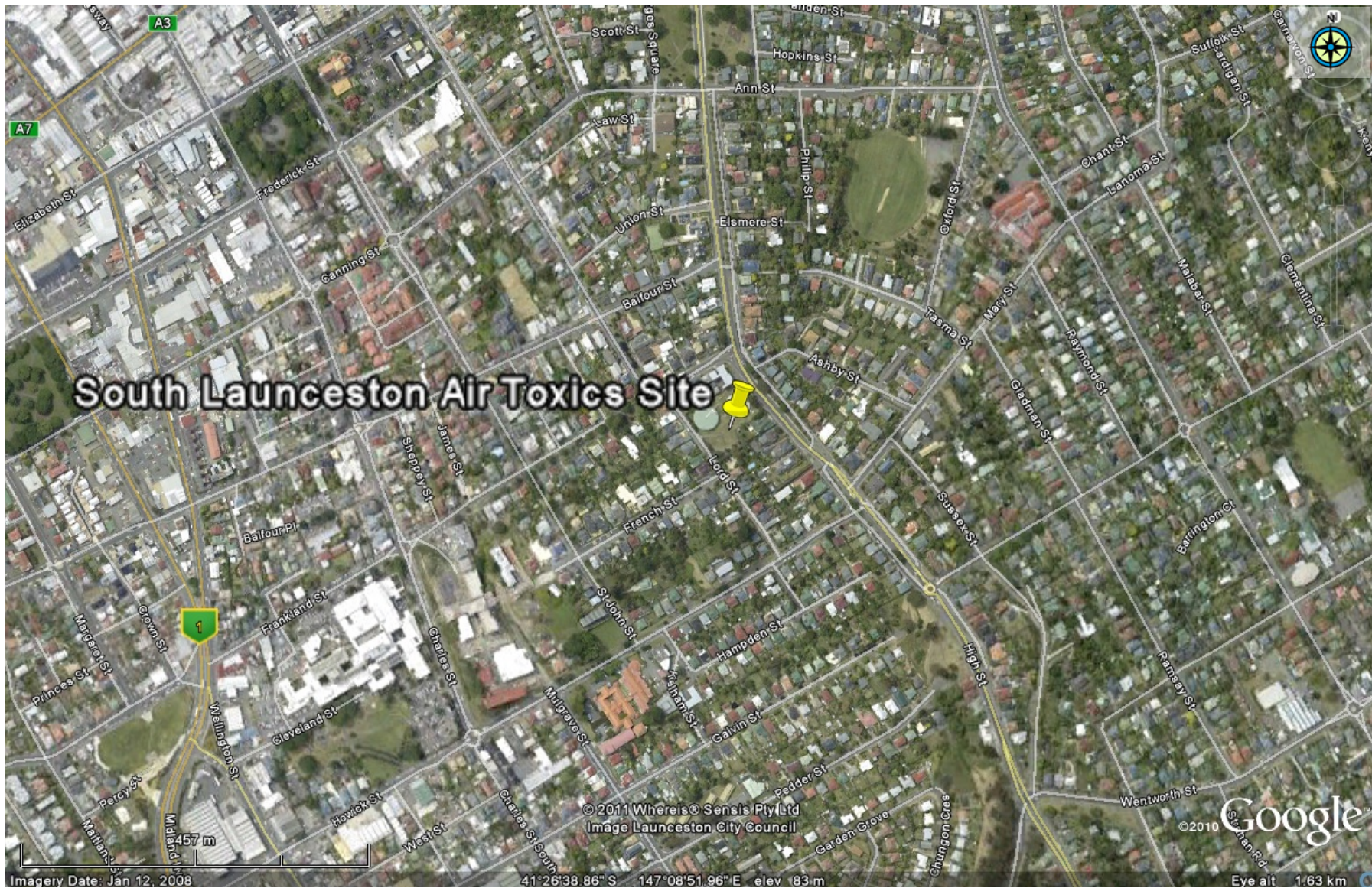




Figure 5 South Launceston air toxics monitoring site



## APPENDIX 2 GRAPHED MONITORING RESULTS

Figure 6 South Launceston: benzene, toluene and xylenes by RAD130, weekly averages

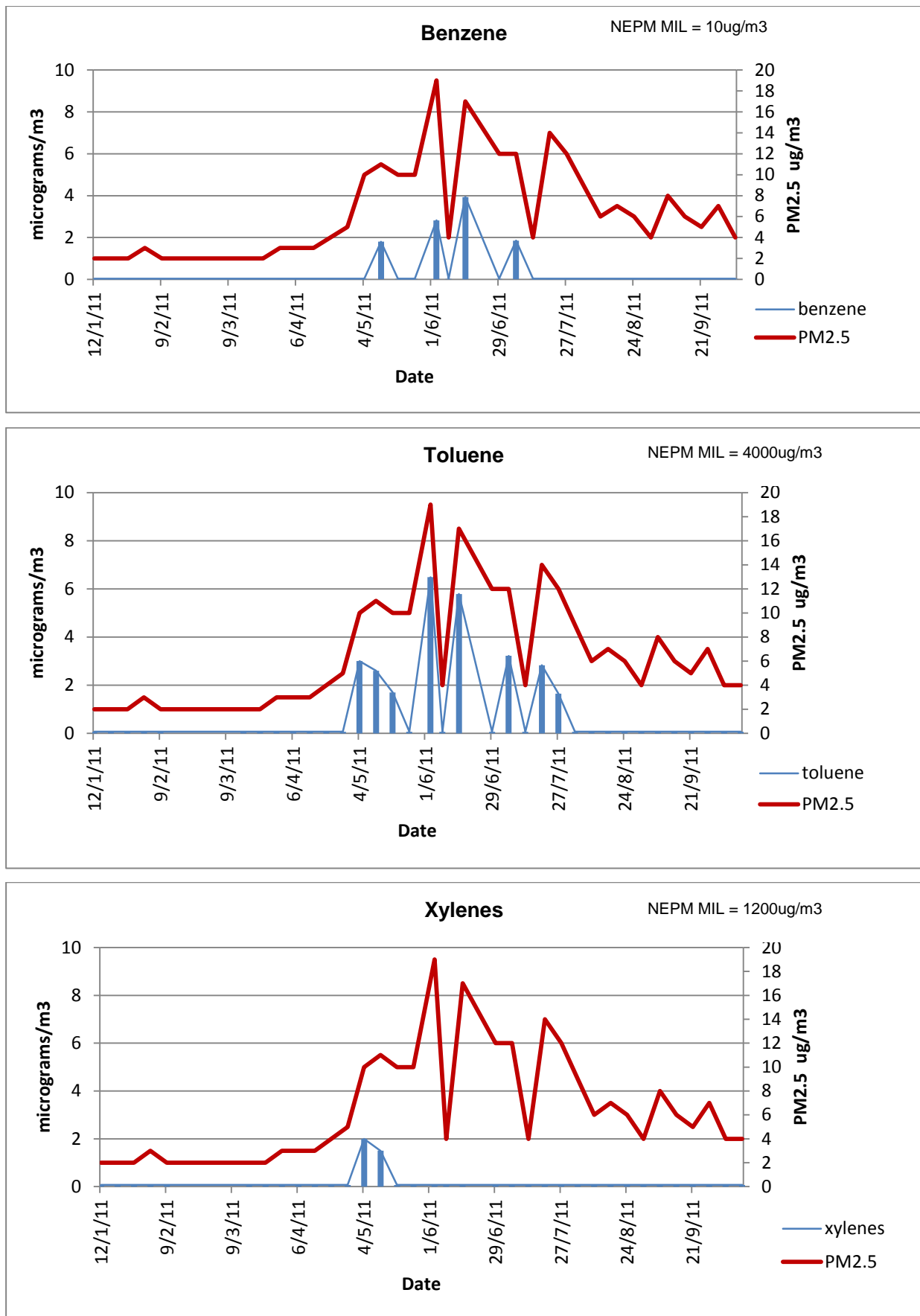


Figure 7 Cleary's Gates: benzene, toluene and xylenes by RAD130, weekly averages

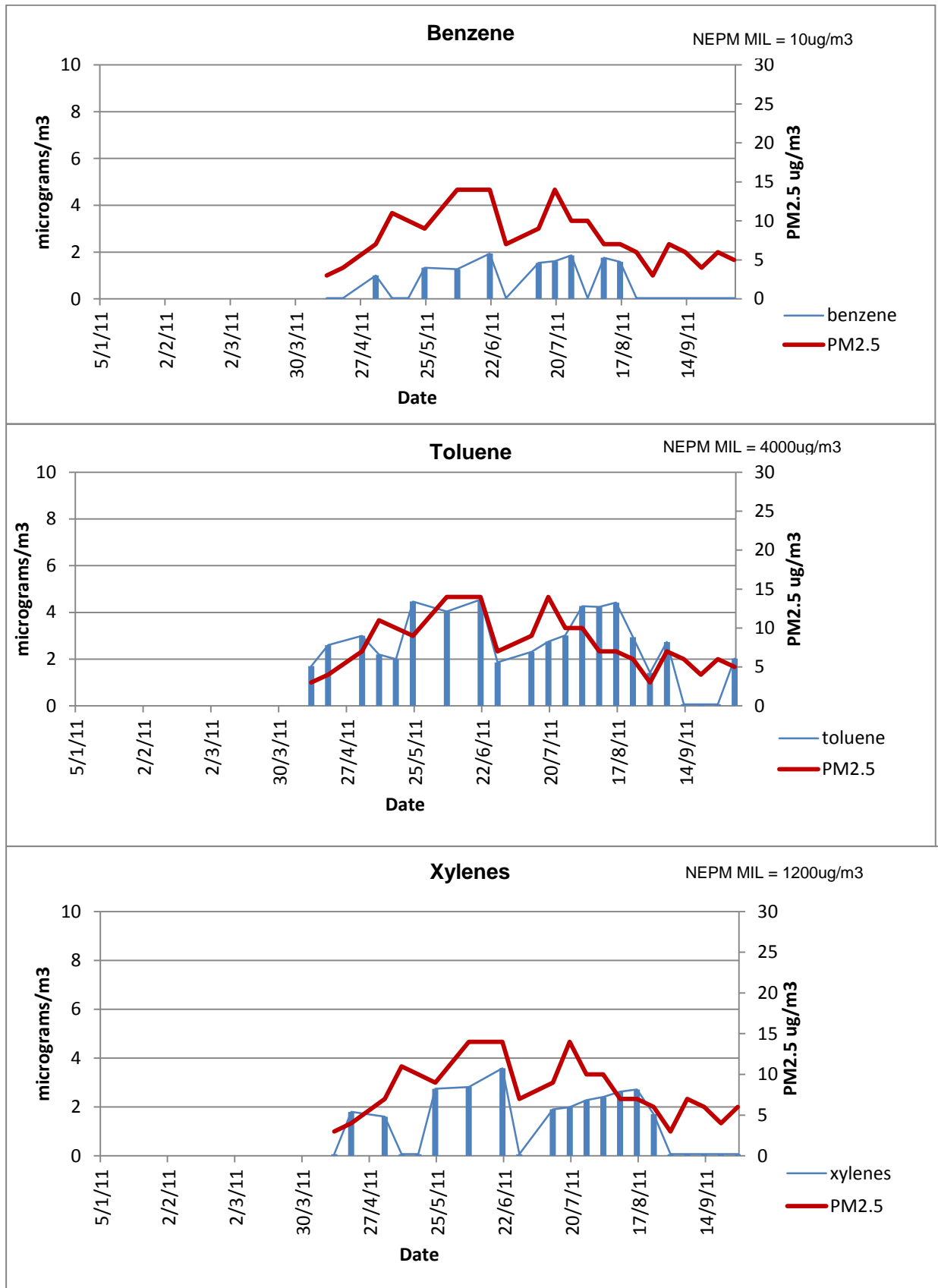


Figure 8 Geeveston: benzene, toluene and xylenes by RAD130, weekly averages

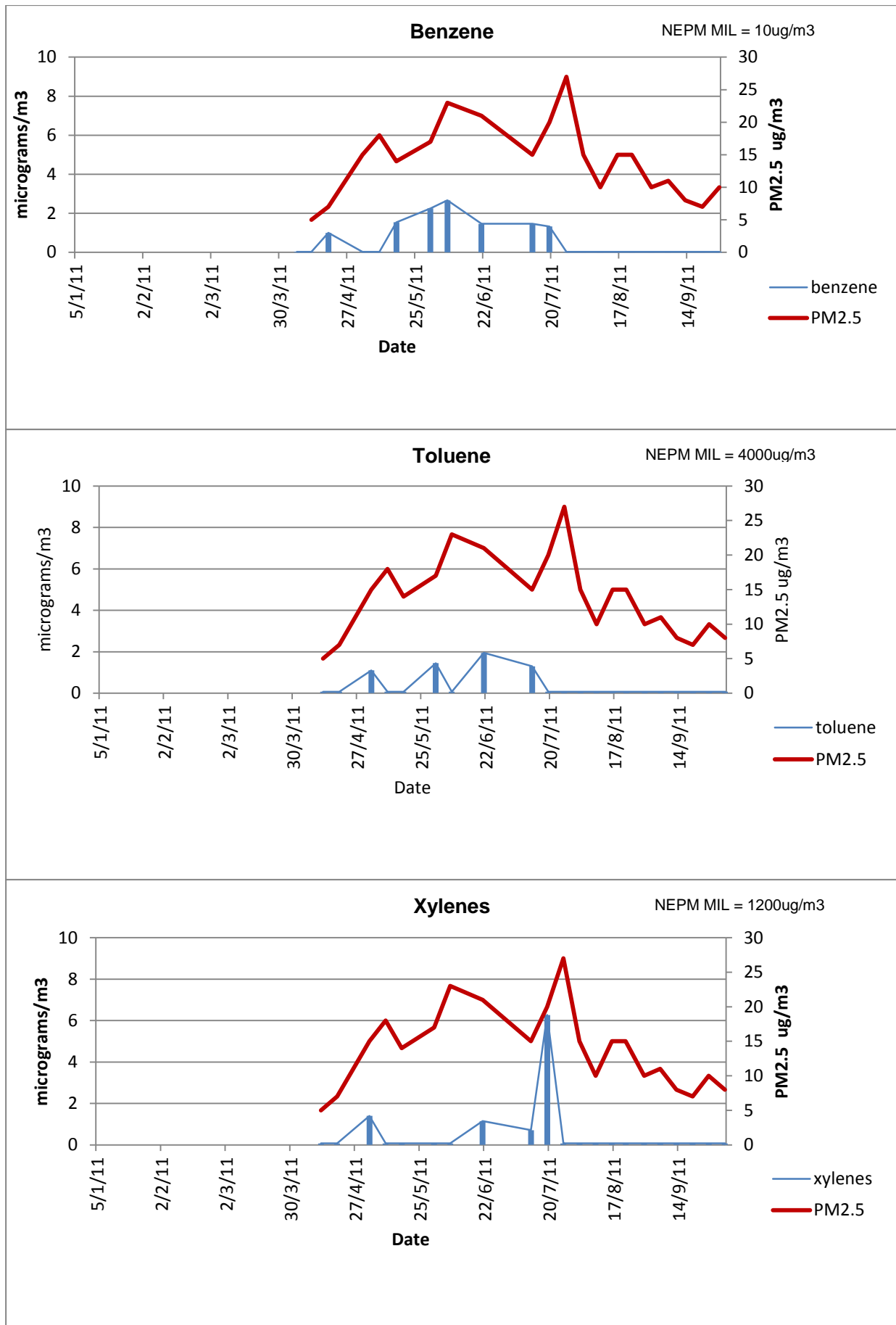


Figure 9 South Hobart: benzene, toluene and xylenes by RAD130, weekly averages

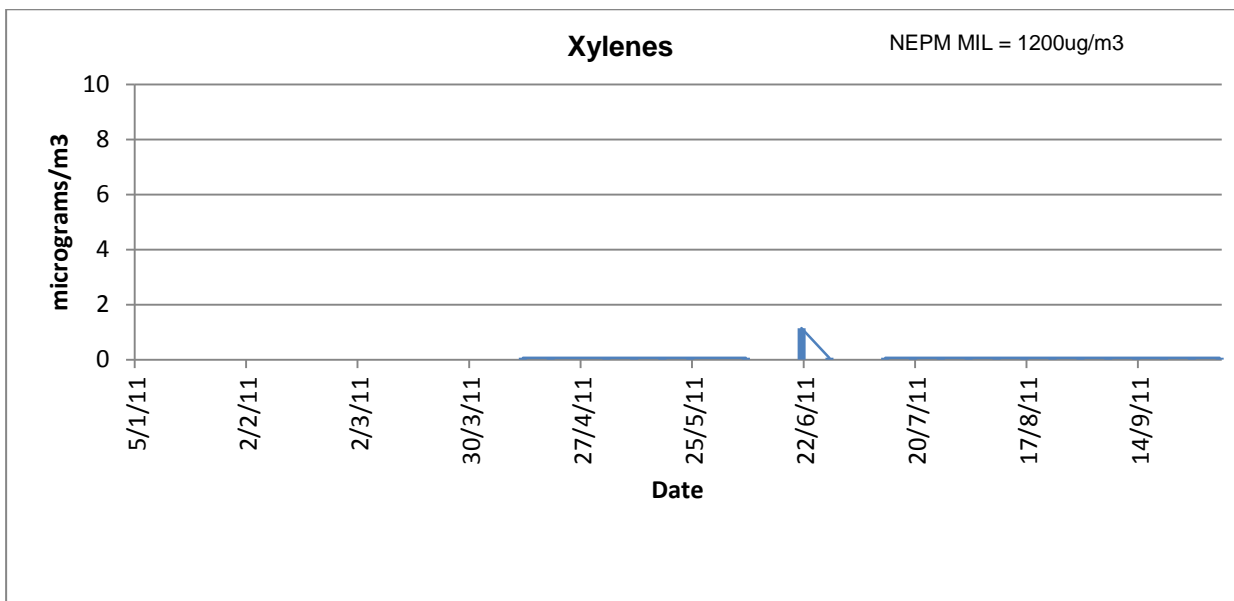
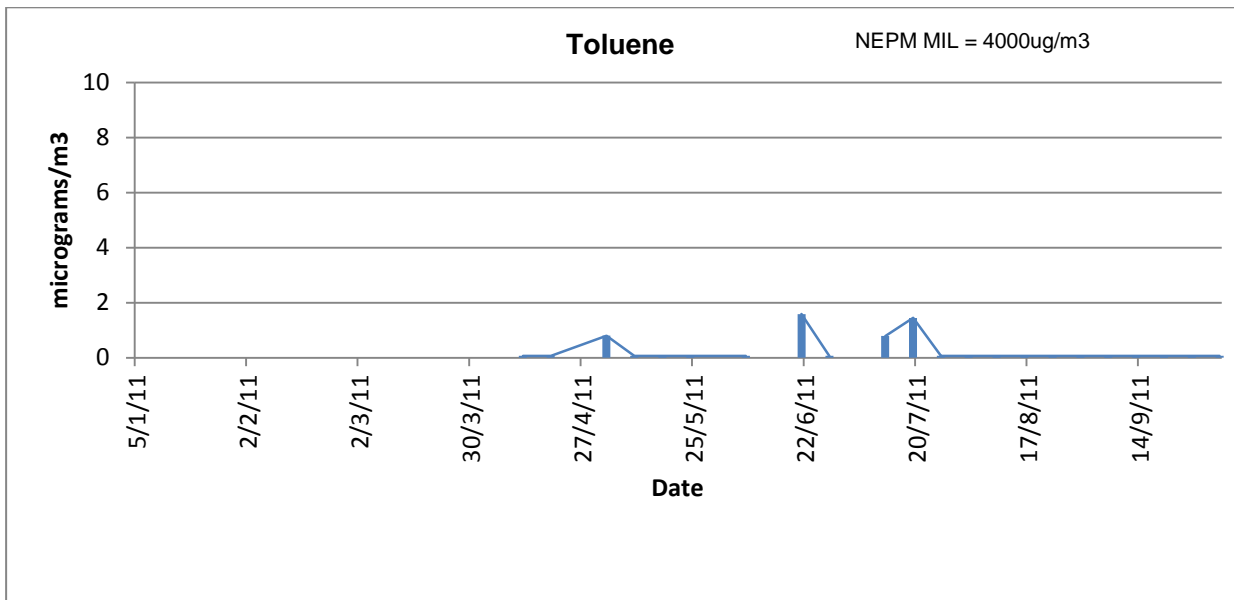
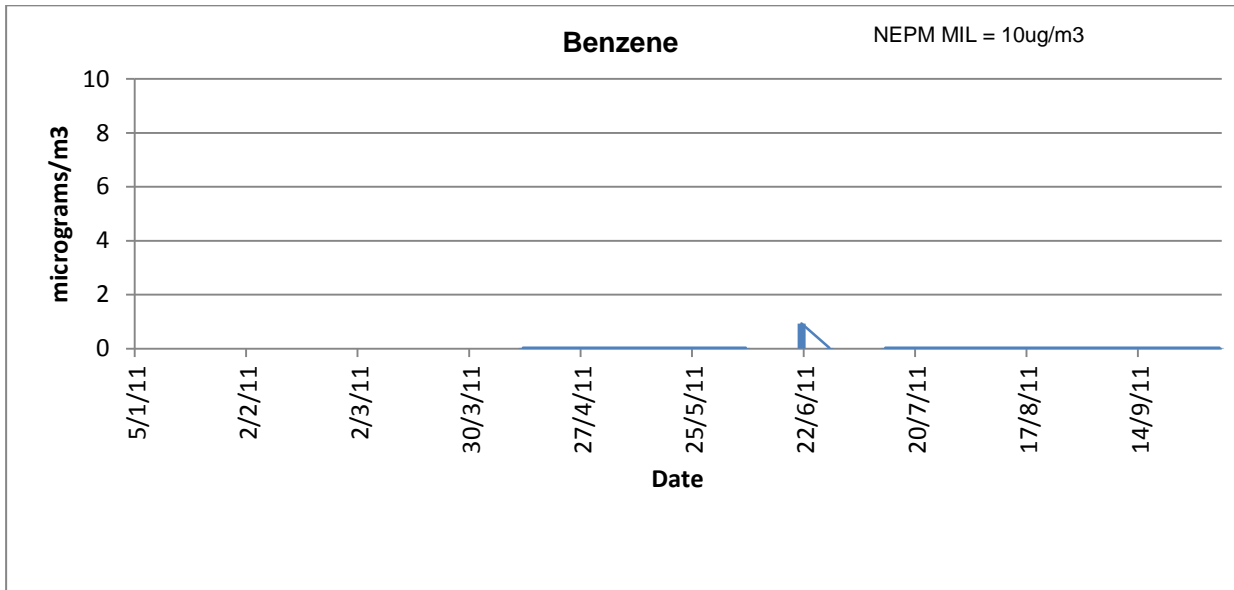


Figure 10 Formaldehyde by RAD165, weekly averages at South Launceston, Hobart (Cleary's Gates), South Hobart and Geeveston

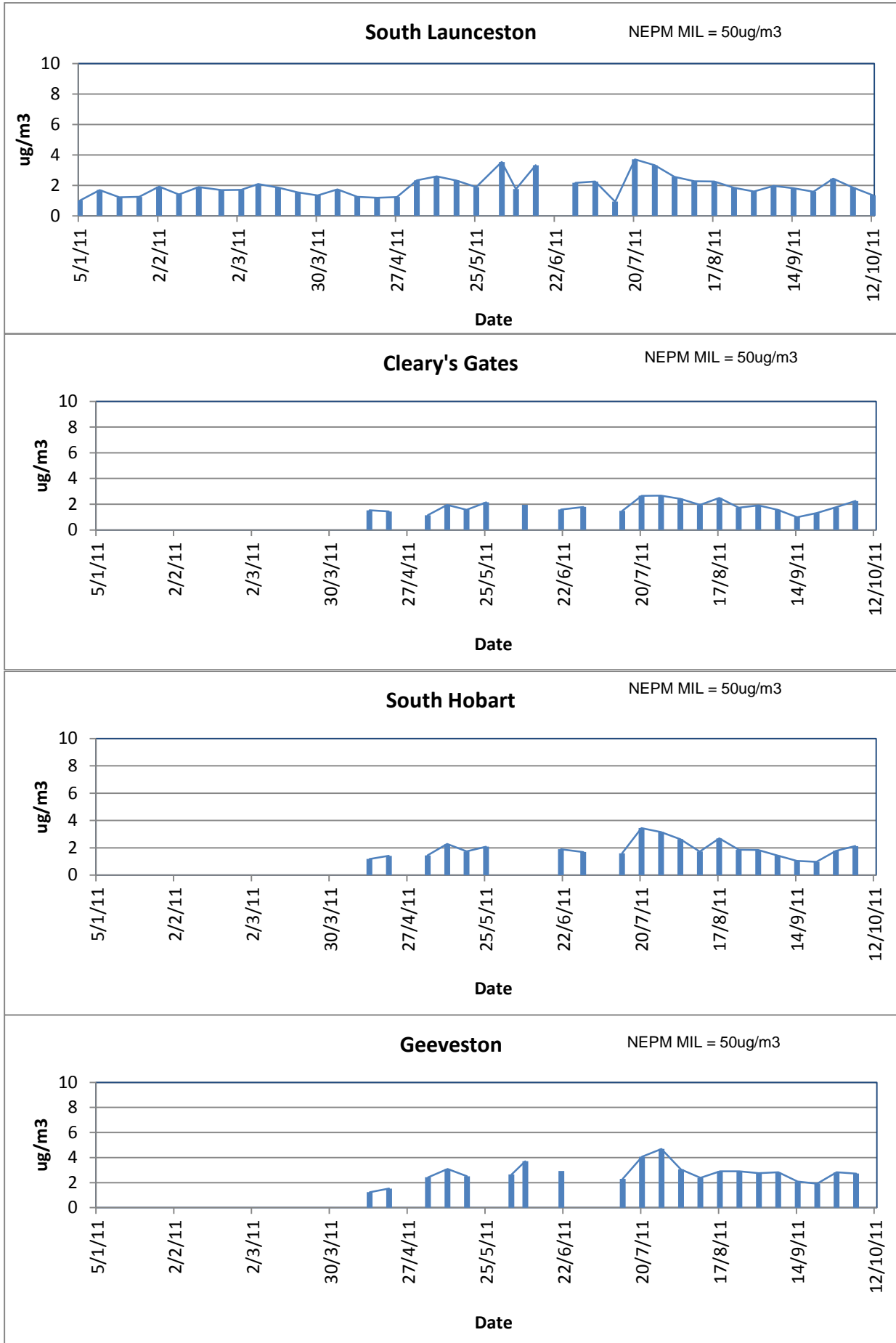


Figure 11 Acetaldehyde by RAD165, weekly averages at South Launceston, Hobart (Cleary's Gates), South Hobart and Geeveston

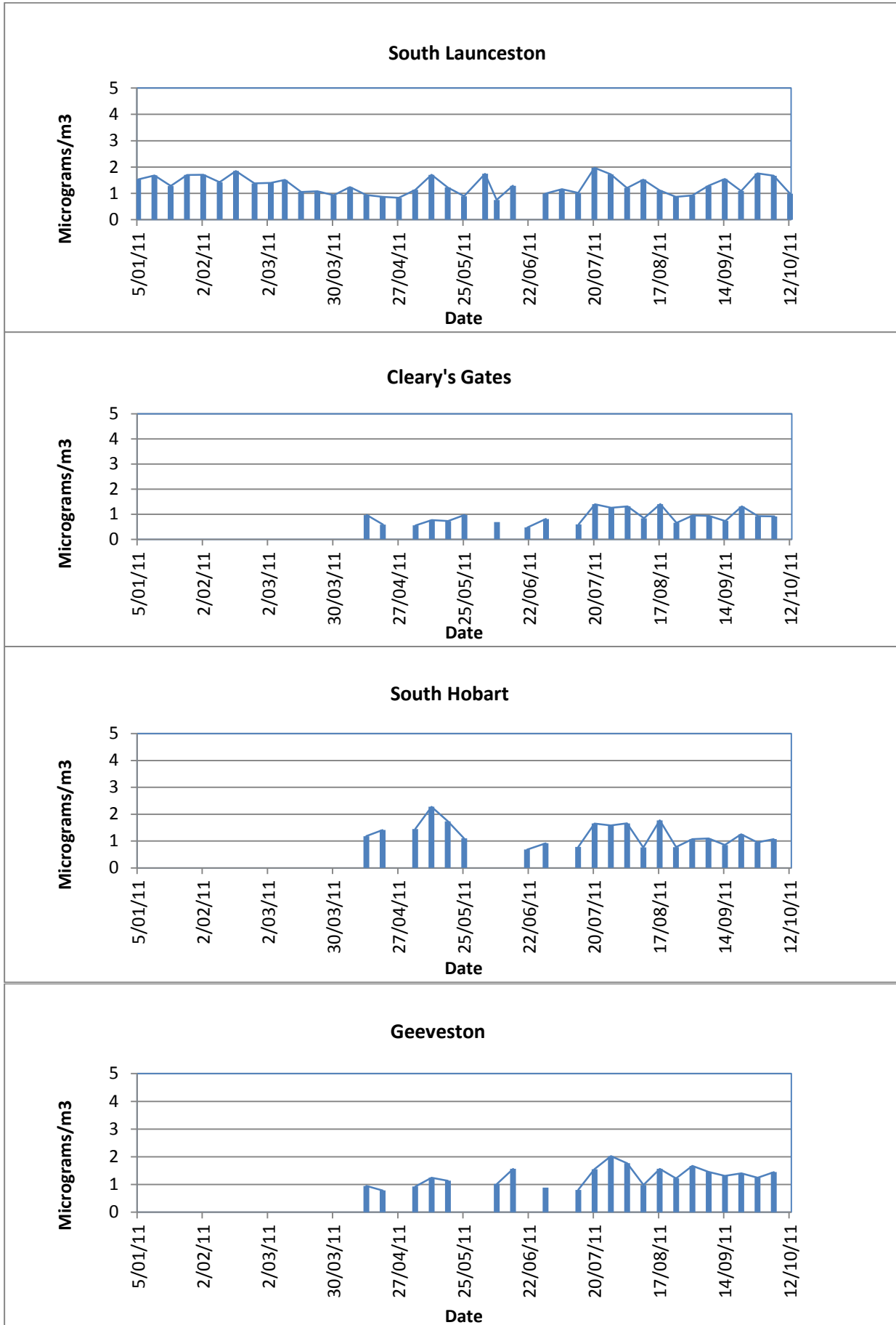
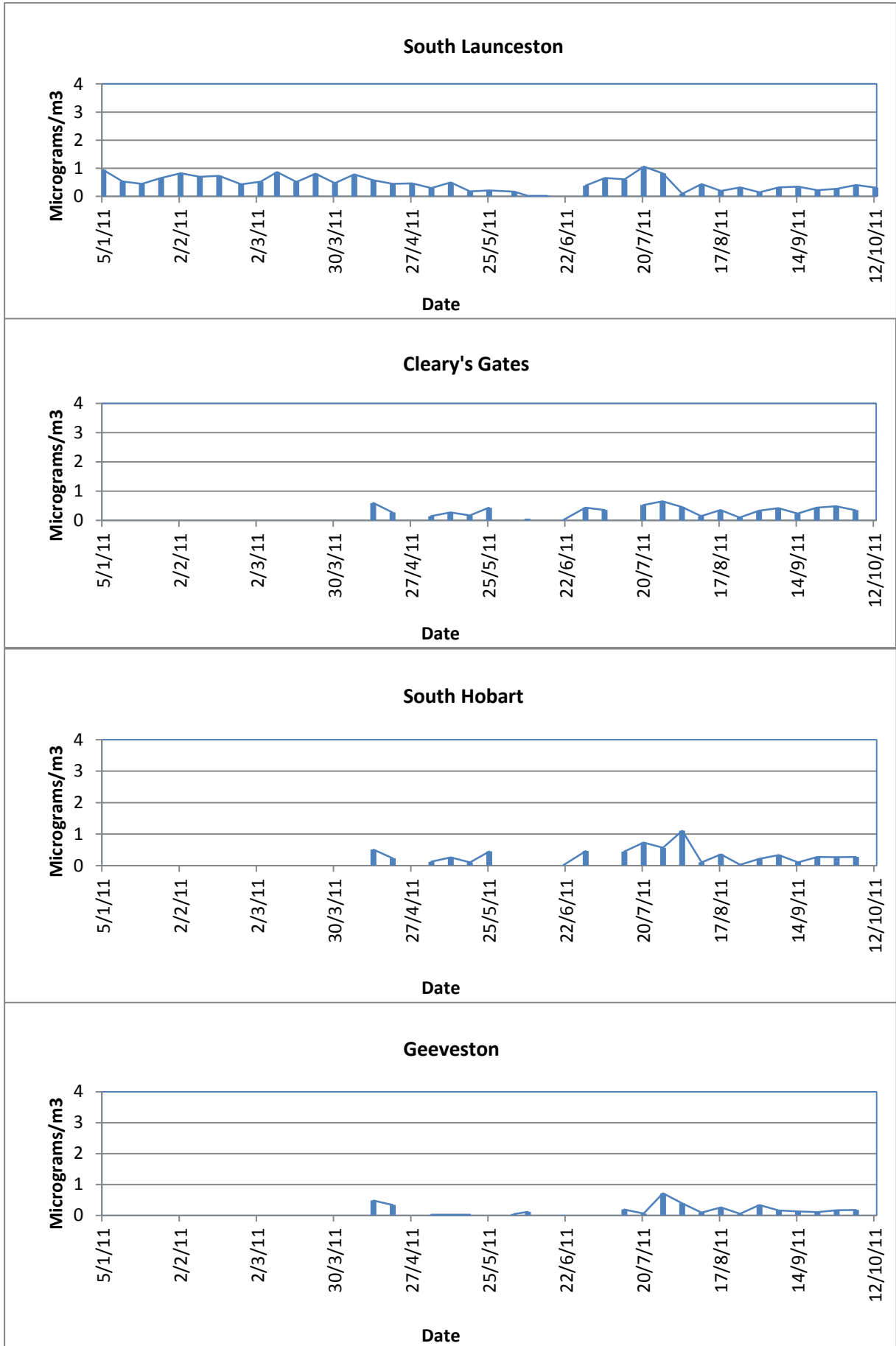


Figure 12 Acetone by RAD165, weekly averages at South Launceston, Hobart (Cleary's Gates), South Hobart and Geeveston





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