

## Executive Summary

The Department of Environment and Climate Change NSW (DECC) has completed a three year air emissions inventory project for on-road mobile sources. The base year of the on-road mobile inventory represents activities that took place during the 2003 calendar year and is accompanied by emission projections up to the 2031 calendar year. The area included in the study covers greater Sydney, Newcastle and Wollongong regions, known collectively as the Greater Metropolitan Region (GMR).

The study region defined as the GMR measures 210 km (east-west) by 273 km (north-south). The region is defined in Table ES1 and shown in Figure ES1.

**Table ES1: Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong regions**

Region	South-west corner MGA <sup>1</sup> co-ordinates		North-east corner MGA <sup>1</sup> co-ordinates	
	Easting (km)	Northing (km)	Easting (km)	Northing (km)
Greater Metropolitan	210	6159	420	6432
Sydney	261	6201	360	6300
Newcastle	360	6348	408	6372
Wollongong	279	6174	318	6201

<sup>1</sup> MGA = Map Grid of Australia based on the Geocentric Datum of Australia 1994 (GDA94) (ICSM, 2002).

The on-road mobile air emissions inventory includes emissions from the following sources:

- exhaust emissions from petrol passenger cars
- exhaust emissions from diesel light duty vehicles
- exhaust emissions from petrol light duty commercial vehicles
- exhaust emissions from diesel heavy duty commercial vehicles
- exhaust emissions from other vehicles
- evaporative emissions from all petrol vehicles.

The substances inventoried include criteria pollutants specified in the National Environment Protection Measure (NEPM) for ambient air quality (NEPC, 2003), air toxics associated with the National Pollutant Inventory (NEPC, 2000) and the Air Toxics NEPM (NEPC, 2004).



**Figure ES1: Definition of the Greater Metropolitan, Sydney, Newcastle and Wollongong regions**

Table ES2 shows total estimated annual emissions (for selected substances) from all on-road mobile sources in the study region (i.e. GMR) and for Sydney, Newcastle and Wollongong. Total estimated annual emissions are also presented for the region defined as Non-Urban. This region is the area of the GMR minus the combined areas of the Sydney, Newcastle and Wollongong. These substances have been selected because they are:

- the most common air pollutants found in airsheds according to the National Pollutant Inventory (NEPC, 2000)
- referred to in the NEPMs for criteria pollutants (NEPC, 2003) and air toxics (NEPC, 2004)
- classified as priority air pollutants (NEPC, 2005).

**Table ES2: Total estimated annual emissions (for selected substances) from on-road mobile sources in each region**

Substance	Emissions (tonnes/year)				
	Sydney	Newcastle	Wollongong	Non-Urban	GMR
1,3 butadiene	199.04	14.06	8.66	34.54	256.31
Acetaldehyde	614.50	41.02	30.56	132.62	818.69
Benzene	1832.90	129.75	79.57	313.91	2356.13
Carbon monoxide	431269.85	31675.12	19172.63	76929.48	559047.07
Formaldehyde	709.43	48.10	33.22	138.90	929.65
Isomers of xylene	2678.95	189.98	116.23	458.84	3444.00
Lead & compounds	10.71	0.71	0.47	1.81	13.70
Oxides of nitrogen	65996.26	4947.23	3255.29	14409.90	88608.69
Particulate matter ≤ 10 µm	2552.05	177.42	119.00	500.75	3349.22
Particulate matter ≤ 2.5 µm	2426.26	169.02	113.45	479.48	3188.21
Polycyclic aromatic hydrocarbons	173.21	11.33	7.43	27.55	219.51
Sulfur dioxide	1253.77	98.11	59.45	248.63	1659.96
Toluene	1902.29	134.79	82.55	326.47	2446.10
Total suspended particulates (TSP)	2912.33	200.11	133.67	548.20	3794.30
Total VOCs	50171.04	3555.75	2194.83	8571.75	64493.38

Tables ES3, ES4, ES5, ES6 and ES7 show total estimated annual emissions (for selected substances) from each on-road mobile source type in the GMR, Sydney, Newcastle, Wollongong and Non-Urban regions respectively.

**Table ES3: Total estimated annual emissions (for selected substances) by on-road mobile source type in the GMR**

Substance	Emissions (tones/year)						
	Exhaust emissions – petrol passenger cars	Exhaust emissions – diesel light duty vehicles	Exhaust emissions – petrol light duty commercial vehicles	Exhaust emissions – diesel heavy duty commercial vehicles	Exhaust emissions - other vehicles	Evaporative emissions – all petrol vehicles	On-Road Mobile Total
1,3 butadiene	185.12	0.47	33.13	4.96	32.64	0.00	256.31
Acetaldehyde	261.61	23.20	46.81	440.95	46.12	0.00	818.69
Benzene	1543.59	22.54	276.22	42.62	272.14	199.02	2356.13
Carbon monoxide	413721.34	10193.65	71128.51	12424.36	51579.21	0.00	559047.07
Formaldehyde	431.85	44.86	77.28	299.53	76.14	0.00	929.65
Isomers of xylene	2302.07	13.48	411.95	42.12	405.86	268.53	3444.00
Lead & compounds	8.18	1.44	0.47	2.88	0.72	0.00	13.70
Oxides of nitrogen	49010.88	5286.69	5851.35	25288.73	3171.03	0.00	88608.69
Particulate matter ≤ 10 µm	1056.26	1105.88	61.03	1032.77	93.28	0.00	3349.22
Particulate matter ≤ 2.5 µm	971.76	1072.71	56.15	1001.78	85.82	0.00	3188.21
Polycyclic aromatic hydrocarbons (PAH)	148.78	11.63	15.28	25.92	17.90	0.00	219.51
Sulfur dioxide	821.48	317.52	63.81	425.25	31.91	0.00	1659.96
Toluene	1662.53	9.94	297.51	31.06	293.11	151.97	2446.10
Total suspended particulates (TSP)	1425.95	1116.94	82.39	1043.09	125.93	0.00	3794.30
Total VOCs	33061.68	1146.80	5916.30	3583.30	5828.85	14956.44	64493.38

**Table ES4: Total estimated annual emissions (for selected substances) by on-road mobile source type in the Sydney region**

Substance	Emissions (tonnes/year)						
	Exhaust emissions – petrol passenger cars	Exhaust emissions – diesel light duty vehicles	Exhaust emissions - petrol light duty commercial vehicles	Exhaust emissions – diesel heavy duty commercial vehicles	Exhaust emissions - other vehicles	Evaporative emissions – all petrol vehicles	On-Road Mobile Total
1,3 butadiene	145.95	0.39	25.91	3.59	23.20	0.00	199.04
Acetaldehyde	206.26	19.31	36.61	319.54	32.79	0.00	614.50
Benzene	1217.00	18.76	216.01	30.89	193.45	156.80	1832.90
Carbon monoxide	323953.12	7935.39	55293.61	8533.58	35554.14	0.00	431269.85
Formaldehyde	340.48	37.34	60.43	217.06	54.12	0.00	709.43
Isomers of xylene	1814.99	11.22	322.16	30.52	288.51	211.55	2678.95
Lead & compounds	6.72	1.13	0.39	1.96	0.52	0.00	10.71
Oxides of nitrogen	38175.02	4245.05	4533.89	16907.72	2134.59	0.00	65996.26
Particulate matter ≤ 10 µm	866.76	865.77	50.14	701.69	67.68	0.00	2552.05
Particulate matter ≤ 2.5 µm	797.42	839.80	46.13	680.64	62.27	0.00	2426.26
Polycyclic aromatic hydrocarbons (PAH)	120.27	9.47	12.05	18.59	12.83	0.00	173.21
Sulfur dioxide	644.96	249.06	49.67	287.86	22.22	0.00	1253.77
Toluene	1310.77	8.27	232.66	22.51	208.36	119.72	1902.29
Total suspended particulates (TSP)	1170.13	874.43	67.69	708.71	91.37	0.00	2912.33
Total VOCs	26066.45	954.65	4626.73	2596.68	4143.46	11783.08	50171.04

**Table ES5: Total estimated annual emissions (for selected substances) by on-road mobile source type in the Newcastle region**

Substance	Emissions (tones/year)						
	Exhaust emissions – petrol passenger cars	Exhaust emissions – diesel light duty vehicles	Exhaust emissions – petrol light duty commercial vehicles	Exhaust emissions – diesel heavy duty commercial vehicles	Exhaust emissions - other vehicles	Evaporative emissions – all petrol vehicles	On-Road Mobile Total
1,3 butadiene	10.78	0.02	1.26	0.23	1.77	0.00	14.06
Acetaldehyde	15.23	1.02	1.79	20.48	2.50	0.00	41.02
Benzene	89.87	0.99	10.54	1.98	14.77	11.61	129.75
Carbon monoxide	24897.06	567.86	2783.93	637.87	2788.39	0.00	31675.12
Formaldehyde	25.14	1.96	2.95	13.91	4.13	0.00	48.10
Isomers of xylene	134.03	0.59	15.71	1.96	22.03	15.66	189.98
Lead & compounds	0.42	0.08	0.02	0.15	0.04	0.00	0.71
Oxides of nitrogen	2951.60	265.00	217.26	1340.23	173.14	0.00	4947.23
Particulate matter ≤ 10 µm	54.71	61.98	2.10	53.93	4.69	0.00	177.42
Particulate matter ≤ 2.5 µm	50.33	60.13	1.93	52.32	4.32	0.00	169.02
Polycyclic aromatic hydrocarbons (PAH)	8.04	0.56	0.57	1.23	0.94	0.00	11.33
Sulfur dioxide	51.49	18.50	2.64	23.71	1.78	0.00	98.11
Toluene	96.80	0.43	11.35	1.44	15.91	8.86	134.79
Total suspended particulates (TSP)	73.85	62.60	2.83	54.47	6.34	0.00	200.11
Total VOCs	1924.95	50.18	225.66	166.43	316.42	872.12	3555.75

**Table ES6: Total estimated annual emissions (for selected substances) by on-road mobile source type in the Wollongong region**

Substance	Emissions (tonnes/year)						
	Exhaust emissions – petrol passenger cars	Exhaust emissions – diesel light duty vehicles	Exhaust emissions – petrol light duty commercial vehicles	Exhaust emissions – diesel heavy duty commercial vehicles	Exhaust emissions - other vehicles	Evaporative emissions – all petrol vehicles	On-Road Mobile Total
1,3 butadiene	6.35	0.01	0.94	0.20	1.16	0.00	8.66
Acetaldehyde	8.97	0.69	1.33	17.93	1.63	0.00	30.56
Benzene	52.92	0.67	7.86	1.73	9.64	6.74	79.57
Carbon monoxide	14415.00	346.52	2049.71	513.07	1848.33	0.00	19172.63
Formaldehyde	14.80	1.34	2.20	12.18	2.70	0.00	33.22
Isomers of xylene	78.92	0.40	11.73	1.71	14.37	9.09	116.23
Lead & compounds	0.27	0.05	0.01	0.12	0.03	0.00	0.47
Oxides of nitrogen	1742.61	169.66	163.51	1067.05	112.45	0.00	3255.29
Particulate matter ≤ 10 µm	34.44	37.63	1.70	41.73	3.50	0.00	119.00
Particulate matter ≤ 2.5 µm	31.68	36.50	1.56	40.48	3.22	0.00	113.45
Polycyclic aromatic hydrocarbons (PAH)	4.93	0.37	0.43	1.05	0.65	0.00	7.43
Sulfur dioxide	29.38	10.97	1.93	15.94	1.22	0.00	59.45
Toluene	56.99	0.30	8.47	1.26	10.38	5.15	82.55
Total suspended particulates (TSP)	46.49	38.00	2.29	42.15	4.73	0.00	133.67
Total VOCs	1133.42	34.33	168.45	145.68	206.43	506.53	2194.83

**Table ES7: Total estimated annual emissions (for selected substances) by on-road mobile source type in the Non-Urban region**

Substance	Emissions (tones/year)						
	Exhaust emissions – petrol passenger cars	Exhaust emissions – diesel light duty vehicles	Exhaust emissions – petrol light duty commercial vehicles	Exhaust emissions – diesel heavy duty commercial vehicles	Exhaust emissions – other vehicles	Evaporative emissions – all petrol vehicles	On-Road Mobile Total
1,3 butadiene	22.04	0.04	5.01	0.93	6.51	0.00	34.54
Acetaldehyde	31.15	2.18	7.09	83.00	9.20	0.00	132.62
Benzene	183.81	2.12	41.81	8.02	54.28	23.88	313.91
Carbon monoxide	50456.15	1343.88	11001.26	2739.84	11388.35	0.00	76929.48
Formaldehyde	51.42	4.21	11.70	56.38	15.18	0.00	138.90
Isomers of xylene	274.12	1.27	62.35	7.93	80.95	32.22	458.84
Lead & compounds	0.78	0.18	0.05	0.66	0.13	0.00	1.81
Oxides of nitrogen	6141.65	606.99	936.69	5973.73	750.85	0.00	14409.90
Particulate matter ≤ 10 µm	100.35	140.50	7.09	235.41	17.40	0.00	500.75
Particulate matter ≤ 2.5 µm	92.32	136.28	6.52	228.35	16.01	0.00	479.48
Polycyclic aromatic hydrocarbons (PAH)	15.54	1.23	2.24	5.05	3.49	0.00	27.55
Sulfur dioxide	95.64	38.99	9.57	97.74	6.69	0.00	248.63
Toluene	197.97	0.93	45.03	5.85	58.46	18.24	326.47
Total suspended particulates (TSP)	135.48	141.90	9.57	237.76	23.49	0.00	548.20
Total VOCs	3936.86	107.64	895.46	674.53	1162.55	1794.71	8571.75