

Appendix A: Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Table A1: Aircraft (flight operations) and aircraft (ground operations) emissions by source type

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
LTO - Avgas					
1,2,3-TRIMETHYLBENZENE	2.41×10^{-3}	0.11	0.16	2.12×10^{-3}	0.27
1,2,4-TRIMETHYLBENZENE	7.97×10^{-3}	0.35	0.52	7.01×10^{-3}	0.88
1,3,5-TRIMETHYLBENZENE	1.23×10^{-3}	5.39×10^{-2}	7.97×10^{-2}	1.08×10^{-3}	0.14
1,3-BUTADIENE	4.02	176	260	3.53	443
1-BUTENE	4.58	200	296	4.02	505
1-DECANOL	0.13	5.83	8.62	0.12	15
1-DECENE	0.38	17	25	0.34	42
1-HEXENE	1.94	85	126	1.71	214
1-METHYL NAPHTHALENE	5.64×10^{-3}	0.25	0.36	4.96×10^{-3}	0.62
1-NONENE	0.56	25	36	0.50	62
1-OCTENE	0.64	28	41	0.56	71
1-PENTENE	1.92	84	124	1.69	212
2-METHYL-1-BUTENE	3.20×10^{-3}	0.14	0.21	2.82×10^{-3}	0.35
2-METHYL-1-PENTENE	7.80×10^{-4}	3.41×10^{-2}	5.04×10^{-2}	6.86×10^{-4}	8.60×10^{-2}
2-METHYL-2-BUTENE	0.46	20	30	0.40	51
2-METHYL-2-PROPENAL (METHACROLEIN)	9.78×10^{-3}	0.43	0.63	8.60×10^{-3}	1.08
2-METHYLNAPHTHALENE	4.71×10^{-3}	0.21	0.30	4.14×10^{-3}	0.52
2-METHYLPENTANE	0.90	39	58	0.79	99
3-METHYL-1-BUTENE	2.56×10^{-3}	0.11	0.17	2.25×10^{-3}	0.28
4-METHYL-1-PENTENE	1.57×10^{-3}	6.86×10^{-2}	0.10	1.38×10^{-3}	0.17
ACENAPHTHENE	0.17	7.53	11	0.15	19
ACENAPHTHYLENE	0.97	42	63	0.85	107
ACETALDEHYDE	11	483	714	9.71	1,218
ACETONE	7.43	325	481	6.54	820
ACETYLENE	9.44	413	610	8.30	1,041
ACROLEIN (2-PROPENAL)	5.28	231	341	4.64	582
AMMONIA (TOTAL)	0.52	23	33	0.45	57
ANTHRACENE	0.20	8.77	13	0.18	22
BENZALDEHYDE	1.35	59	88	1.19	149
BENZENE	4.57	200	296	4.02	504
BENZO(A)ANTHRACENE	2.36×10^{-2}	1.03	1.52	2.07×10^{-2}	2.60
BENZO(A)PYRENE	2.36×10^{-2}	1.03	1.52	2.07×10^{-2}	2.60
BENZO(B)FLUORANTHENE	2.83×10^{-2}	1.24	1.83	2.49×10^{-2}	3.12
BENZO(G,H,I)PERYLENE	6.13×10^{-2}	2.68	3.96	5.39×10^{-2}	6.76
BENZO(K)FLUORANTHENE	2.83×10^{-2}	1.24	1.83	2.49×10^{-2}	3.12
BROMINE AND COMPOUNDS	0.12	5.32	7.86	0.11	13
BUTYRALDEHYDE	3.02	132	195	2.65	333
C10 OLEFINS	0.13	5.83	8.62	0.12	15
C16 BRANCHED ALKANES	0.33	15	22	0.29	37
C6H18O3SI3	30	1,304	1,928	26	3,289

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
C7-C16 PARAFFINS	0.68	30	44	0.60	75
C8H24O4SI4	11	465	688	9.36	1,174
CARBON DIOXIDE	40,702	1,780,045	2,631,754	35,804	4,488,306
CARBON MONOXIDE	14,412	630,290	931,868	12,678	1,589,247
CHLORINE	17	744	1,100	15	1,877
CHROMIUM (III) COMPOUNDS	3.27×10^{-4}	1.43×10^{-2}	2.11×10^{-2}	2.88×10^{-4}	3.61×10^{-2}
CHROMIUM (VI) COMPOUNDS	1.68×10^{-4}	7.37×10^{-3}	1.09×10^{-2}	1.48×10^{-4}	1.86×10^{-2}
CHRYSENE	2.36×10^{-2}	1.03	1.52	2.07×10^{-2}	2.60
CIS-2-BUTENE	1.15	50	74	1.01	126
CIS-2-PENTENE	6.29×10^{-3}	0.28	0.41	5.54×10^{-3}	0.69
COBALT & COMPOUNDS	0.12	5.32	7.86	0.11	13
COPPER & COMPOUNDS	0.12	5.32	7.86	0.11	13
CROTONALDEHYDE	2.36×10^{-2}	1.03	1.53	2.07×10^{-2}	2.60
CUMENE (1-METHYLETHYLBENZENE)	6.35×10^{-5}	2.78×10^{-3}	4.10×10^{-3}	5.58×10^{-5}	7.0×10^{-3}
DIMETHYL NAPHTHALENES	2.06×10^{-3}	9.0×10^{-2}	0.13	1.81×10^{-3}	0.23
ETHANE	2.34	102	151	2.06	258
ETHYLBENZENE	0.38	17	25	0.34	42
ETHYLENE	40	1,733	2,562	35	4,370
FLUORANTHENE	0.21	9.39	14	0.19	24
FLUORENE	0.36	16	23	0.31	39
FORMALDEHYDE	36	1,579	2,335	32	3,982
FURFURYL ALCOHOL	4.59	201	297	4.03	506
GLYOXAL	6.45	282	417	5.68	711
HEPTENES	1.33	58	86	1.17	146
HEXADECANE	0.36	16	23	0.31	39
HEXANAL (HEXANALDEHYDE)	0.51	22	33	0.45	56
INDENO(1,2,3-CD)PYRENE	1.89×10^{-2}	0.83	1.22	1.66×10^{-2}	2.08
ISOMERS OF DECANE (C10 PARAFFINS)	0.33	15	22	0.29	37
ISOMERS OF DODECANE (C12 PARAFFINS)	0.47	21	31	0.42	52
ISOMERS OF OCTADECANE (C18 PARAFFINS)	3.63×10^{-5}	1.59×10^{-3}	2.35×10^{-3}	3.19×10^{-5}	4.0×10^{-3}
ISOMERS OF PENTADECANE (C15 PARAFFINS)	0.38	17	25	0.34	42
ISOMERS OF PENTENE	1.62	71	105	1.43	179
ISOMERS OF TETRADECANE (C14 PARAFFINS)	0.44	19	28	0.38	48
ISOMERS OF XYLENE	1.13	49	73	0.99	124
ISOVALERALDEHYDE (3-METHYLBUTANAL)	7.25×10^{-4}	3.17×10^{-2}	4.69×10^{-2}	6.38×10^{-4}	8.0×10^{-2}
LEAD & COMPOUNDS	14	605	895	12	1,527
MANGANESE & COMPOUNDS	1.66×10^{-4}	7.25×10^{-3}	1.07×10^{-2}	1.46×10^{-4}	1.83×10^{-2}
METHANE	29	1,263	1,867	25	3,185
METHYL ALCOHOL	4.12×10^{-2}	1.80	2.66	3.62×10^{-2}	4.54

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHYL GLYOXAL	3.43×10^{-2}	1.50	2.22	3.02×10^{-2}	3.78
METHYLNAPHTHALENES	1.11	49	72	0.98	123
M-ETHYLTOLUENE	3.51×10^{-3}	0.15	0.23	3.09×10^{-3}	0.39
M-TOLUALDEHYDE	6.33×10^{-3}	0.28	0.41	5.57×10^{-3}	0.70
NAPHTHALENE	1.30	57	84	1.15	144
N-BUTYLBENZENE	0.57	25	37	0.50	63
N-DECANE	1.07	47	69	0.94	118
N-DODECANE	3.08	135	199	2.71	339
N-HEPTADECANE	2.55×10^{-2}	1.11	1.65	2.24×10^{-2}	2.81
N-HEPTANE	0.15	6.71	9.92	0.13	17
NICKEL & COMPOUNDS	3.61×10^{-4}	1.58×10^{-2}	2.33×10^{-2}	3.17×10^{-4}	3.98×10^{-2}
NITRIC OXIDE	21	929	1,373	19	2,342
NITROGEN DIOXIDE	1.71	75	111	1.51	189
NITROUS OXIDE	0.52	23	33	0.45	57
N-NONANE	0.38	17	25	0.34	42
N-OCTANE	0.10	4.49	6.64	9.04×10^{-2}	11
N-PENTADECANE	0.69	30	44	0.61	76
N-PENTANAL (N-VALERALDEHYDE)	5.58×10^{-3}	0.24	0.36	4.91×10^{-3}	0.61
N-PENTANE	0.49	21	31	0.43	54
N-PENTYLBENZENE	0.44	19	28	0.39	48
N-PROPYLBENZENE	1.22×10^{-3}	5.31×10^{-2}	7.86×10^{-2}	1.07×10^{-3}	0.13
N-TETRADECANE	1.50	66	97	1.32	166
N-TRIDECANE	1.68	74	109	1.48	186
N-UNDECANE	1.33	58	86	1.17	146
O-ETHYLTOLUENE	1.49×10^{-3}	6.50×10^{-2}	9.62×10^{-2}	1.31×10^{-3}	0.16
O-TOLUALDEHYDE	5.26×10^{-3}	0.23	0.34	4.63×10^{-3}	0.58
OXIDES OF NITROGEN	34	1,499	2,216	30	3,780
PARTICULATE MATTER $\leq 10 \mu\text{m}$	236	10,314	15,249	207	26,007
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	163	7,117	10,522	143	17,945
P-ETHYLTOLUENE	1.46×10^{-3}	6.39×10^{-2}	9.44×10^{-2}	1.28×10^{-3}	0.16
PHENANTHRENE	0.60	26	39	0.53	66
PHENOL (CARBOLIC ACID)	0.57	25	37	0.50	63
POLYCHLORINATED DIOXINS AND FURANS	5.80×10^{-11}	2.54×10^{-9}	3.75×10^{-9}	5.10×10^{-11}	6.40×10^{-9}
POLYCYCLIC AROMATIC HYDROCARBONS	5.45	238	352	4.79	601
PROPANE	0.51	22	33	0.45	56
PROPIONALDEHYDE	2.30	100	149	2.02	253
PROPYLENE	12	513	759	10	1,294
P-TOLUALDEHYDE {4-METHYLBENZALDEHYDE}	1.11×10^{-3}	4.84×10^{-2}	7.15×10^{-2}	9.73×10^{-4}	0.12
PYRENE	0.29	13	19	0.26	32
STYRENE (ETHENYLBENZENE)	0.94	41	61	0.83	104
SULFUR DIOXIDE	15	661	977	13	1,666
TOLUENE	1.26	55	81	1.10	139

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
TOTAL SUSPENDED PARTICULATE	243	10,633	15,721	214	26,811
TOTAL VOLATILE ORGANIC COMPOUNDS	218	9,541	14,106	192	24,057
TRANS-2-HEXENE	6.98×10^{-4}	3.05×10^{-2}	4.51×10^{-2}	6.14×10^{-4}	7.70×10^{-2}
TRANS-2-PENTENE	8.19×10^{-3}	0.36	0.53	7.20×10^{-3}	0.90
ZINC & COMPOUNDS	0.12	5.32	7.86	0.11	13
LTO - Avtur					
1,2,3-TRIMETHYLBENZENE	3.73	5.14	206	6.26×10^{-2}	215
1,2,4-TRIMETHYLBENZENE	12	17	680	0.21	710
1,3,5-TRIMETHYLBENZENE	1.90	2.62	105	3.19×10^{-2}	109
1,3-BUTADIENE	59	82	3,279	1.00	3,421
1-BUTENE	62	85	3,409	1.04	3,557
1-DECANOL	206	284	11,356	3.45	11,849
1-DECENE	6.51	8.98	360	0.11	375
1-HEXENE	26	36	1,430	0.43	1,493
1-METHYL NAPHTHALENE	8.69	12	480	0.15	501
1-NONENE	8.65	12	478	0.15	499
1-OCTENE	9.71	13	536	0.16	560
1-PENTENE	27	38	1,508	0.46	1,574
2-METHYL-1-BUTENE	4.92	6.79	272	8.27×10^{-2}	284
2-METHYL-1-PENTENE	1.20	1.65	66	2.01×10^{-2}	69
2-METHYL-2-BUTENE	6.51	8.98	360	0.11	375
2-METHYL-2-PROPENAL (METHACROLEIN)	15	21	834	0.25	870
2-METHYLNAPHTHALENE	7.25	10.00	400	0.12	418
2-METHYLPENTANE	14	20	793	0.24	827
3-METHYL-1-BUTENE	3.94	5.43	218	6.62×10^{-2}	227
4-METHYL-1-PENTENE	2.43	3.35	134	4.08×10^{-2}	140
ACETALDEHYDE	150	207	8,303	2.52	8,663
ACETONE	13	18	717	0.22	748
ACETYLENE	139	191	7,656	2.33	7,988
ACROLEIN (2-PROPENAL)	86	119	4,760	1.45	4,966
AMMONIA (TOTAL)	65	89	3,568	1.08	3,723
ANTHRACENE	1.53×10^{-3}	2.11×10^{-3}	8.44×10^{-2}	2.57×10^{-5}	8.80×10^{-2}
ARSENIC & COMPOUNDS	3.05	4.20	168	5.12×10^{-2}	176
BENZALDEHYDE	17	23	913	0.28	953
BENZENE	59	82	3,267	0.99	3,409
BENZO(A)ANTHRACENE	1.66×10^{-3}	2.28×10^{-3}	9.15×10^{-2}	2.78×10^{-5}	9.54×10^{-2}
BENZO(A)PYRENE	1.23×10^{-3}	1.69×10^{-3}	6.78×10^{-2}	2.06×10^{-5}	7.08×10^{-2}
BENZO(B)FLUORANTHENE	2.41×10^{-3}	3.33×10^{-3}	0.13	4.05×10^{-5}	0.14
BENZO(G,H,I)PERYLENE	2.22×10^{-5}	3.06×10^{-5}	1.23×10^{-3}	3.73×10^{-7}	1.28×10^{-3}
BENZO(K)FLUORANTHENE	2.41×10^{-3}	3.33×10^{-3}	0.13	4.05×10^{-5}	0.14
BUTYRALDEHYDE	4.19	5.77	231	7.03×10^{-2}	241
C10 OLEFINS	206	284	11,356	3.45	11,849

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
C16 BRANCHED ALKANES	5.14	7.08	284	8.63×10^{-2}	296
CADMIUM & COMPOUNDS	0.29	0.40	16	4.83×10^{-3}	17
CARBON DIOXIDE	7,730,286	10,663,720	427,152,108	129,865	445,675,978
CARBON MONOXIDE	26,696	36,826	1,475,119	448	1,539,089
CHROMIUM (III) COMPOUNDS	2.01	2.77	111	3.38×10^{-2}	116
CHROMIUM (VI) COMPOUNDS	1.04	1.43	57	1.74×10^{-2}	60
CHRYSENE	1.68×10^{-3}	2.31×10^{-3}	9.26×10^{-2}	2.81×10^{-5}	9.66×10^{-2}
CIS-2-BUTENE	7.39	10	408	0.12	426
CIS-2-PENTENE	9.71	13	536	0.16	560
CROTONALDEHYDE	36	50	2,008	0.61	2,095
CUMENE (1-METHYLETHYLBENZENE)	0.11	0.15	5.81	1.77×10^{-3}	6.06
DIBENZO(A,H)ANTHRACENE	3.25×10^{-3}	4.49×10^{-3}	0.18	5.46×10^{-5}	0.19
DIMETHYL NAPHTHALENES	3.17	4.37	175	5.32×10^{-2}	182
ETHANE	18	25	1,013	0.31	1,057
ETHYLBENZENE	6.12	8.44	338	0.10	353
ETHYLENE	544	750	30,050	9.14	31,353
FLUORANTHENE	3.21×10^{-3}	4.42×10^{-3}	0.18	5.38×10^{-5}	0.18
FORMALDEHYDE	433	597	23,925	7.27	24,963
GLYOXAL	64	88	3,530	1.07	3,683
HEPTENES	15	21	851	0.26	888
HEXADECANE	1.72	2.38	95	2.90×10^{-2}	99
INDENO(1,2,3-CD)PYRENE	2.61×10^{-3}	3.60×10^{-3}	0.14	4.39×10^{-5}	0.15
ISOMERS OF DECANE (C10 PARAFFINS)	514	709	28,388	8.63	29,619
ISOMERS OF DODECANE (C12 PARAFFINS)	103	142	5,677	1.73	5,923
ISOMERS OF OCTADECANE (C18 PARAFFINS)	7.01×10^{-2}	9.67×10^{-2}	3.87	1.18×10^{-3}	4.04
ISOMERS OF PENTADECANE (C15 PARAFFINS)	6.23	8.59	344	0.10	359
ISOMERS OF TETRADECANE (C14 PARAFFINS)	6.54	9.02	362	0.11	377
ISOMERS OF XYLENE	16	22	871	0.26	908
ISOVALERALDEHYDE (3-METHYLBUTANAL)	1.13	1.55	62	1.89×10^{-2}	65
LEAD & COMPOUNDS	3.16	4.36	175	5.31×10^{-2}	182
METHANE	213	294	11,779	3.58	12,290
METHYL ALCOHOL	63	88	3,508	1.07	3,660
METHYL GLYOXAL	53	73	2,921	0.89	3,048
M-ETHYLTOLUENE	5.42	7.47	299	9.10×10^{-2}	312
M-TOLUALDEHYDE	9.78	13	540	0.16	564
NAPHTHALENE	19	26	1,051	0.32	1,097
N-BUTYLBENZENE	23	32	1,275	0.39	1,330
N-DECANE	11	16	622	0.19	649
N-DODECANE	16	22	898	0.27	937

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N-HEPTADECANE	0.32	0.44	17	5.31×10^{-3}	18
N-HEPTANE	2.25	3.11	124	3.78×10^{-2}	130
NICKEL & COMPOUNDS	0.29	0.40	16	4.83×10^{-3}	17
NITRIC OXIDE	19,837	27,364	1,096,119	333	1,143,653
NITROGEN DIOXIDE	1,601	2,208	88,459	27	92,295
NITROUS OXIDE	245	338	13,539	4.12	14,126
N-NONANE	2.18	3.01	120	3.66×10^{-2}	126
N-OCTANE	2.18	3.01	120	3.66×10^{-2}	126
N-PENTADECANE	6.09	8.39	336	0.10	351
N-PENTANAL (N-VALERALDEHYDE)	8.62	12	476	0.14	497
N-PENTANE	6.96	9.61	385	0.12	402
N-PENTYL BENZENE	11	16	630	0.19	657
N-PROPYLBENZENE	1.86	2.57	103	3.13×10^{-2}	107
N-TETRADECANE	15	20	809	0.25	844
N-TRIDECANE	19	26	1,040	0.32	1,085
N-UNDECANE	16	22	863	0.26	900
O-ETHYLTOLUENE	2.29	3.15	126	3.84×10^{-2}	132
O-TOLUALDEHYDE	8.09	11	447	0.14	466
OXIDES OF NITROGEN	32,017	44,167	1,769,174	538	1,845,896
PARTICULATE MATTER $\leq 10 \mu\text{m}$	561	774	31,001	9.43	32,345
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	543	749	29,993	9.12	31,293
P-ETHYLTOLUENE	2.25	3.11	124	3.78×10^{-2}	130
PHENANTHRENE	1.43×10^{-2}	1.97×10^{-2}	0.79	2.40×10^{-4}	0.82
PHENOL (CARBOLIC ACID)	26	35	1,411	0.43	1,472
POLYCHLORINATED DIOXINS AND FURANS	1.35×10^{-5}	1.86×10^{-5}	7.44×10^{-4}	2.26×10^{-7}	7.76×10^{-4}
POLYCYCLIC AROMATIC HYDROCARBONS	38	53	2,109	0.64	2,200
PROPANE	2.74	3.78	152	4.61×10^{-2}	158
PROPIONALDEHYDE	26	35	1,413	0.43	1,474
PROPYLENE	159	220	8,812	2.68	9,194
P-TOLUALDEHYDE {4-METHYLBENZALDEHYDE}	1.69	2.33	93	2.84×10^{-2}	97
PYRENE	3.89×10^{-3}	5.37×10^{-3}	0.22	6.54×10^{-5}	0.22
SELENIUM & COMPOUNDS	0.29	0.40	16	4.83×10^{-3}	17
STYRENE (ETHENYLBENZENE)	11	15	601	0.18	627
SULFUR DIOXIDE	2,870	3,959	158,568	48	165,444
TIN & COMPOUNDS	0.29	0.40	16	4.83×10^{-3}	17
TOLUENE	23	31	1,248	0.38	1,302
TOTAL SUSPENDED PARTICULATE	575	793	31,763	9.66	33,141
TOTAL VOLATILE ORGANIC COMPOUNDS	4,332	5,975	239,354	73	249,734
TRANS-2-HEXENE	1.05	1.46	58	1.77×10^{-2}	61
TRANS-2-PENTENE	13	17	698	0.21	728
ZINC & COMPOUNDS	3.16	4.36	175	5.31×10^{-2}	182

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
APU and GSE - Diesel					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	1.14	0.22	35	-	36
(2-METHYLPROPYL)BENZENE	2.82	0.54	85	-	89
1,2,3-TRIMETHYLBENZENE	2.69	0.51	81	-	85
1,2,4-TRIMETHYLBENZENE	12	2.25	360	-	374
1,2-DIETHYLBENZENE (ORTHO)	1.92	0.37	58	-	61
1,2-PROPADIENE	10	1.98	316	-	329
1,3,5-TRIMETHYLBENZENE	4.34	0.82	132	-	137
1,3-BUTADIENE	4.10	0.78	124	-	129
1-BUTENE	15	2.83	452	-	470
1-PENTENE	7.25	1.38	220	-	228
2,2,4-TRIMETHYLPENTANE	1.58	0.30	48	-	50
2,2-DIMETHYLBUTANE	1.37	0.26	41	-	43
2,3,4-TRIMETHYLPENTANE	0.34	6.37×10^{-2}	10	-	11
2,3-DIMETHYL-1-BUTENE	0.63	0.12	19	-	20
2,3-DIMETHYLHEXANE	0.25	4.67×10^{-2}	7.46	-	7.76
2,3-DIMETHYLPENTANE	1.63	0.31	50	-	51
2,4-DIMETHYLHEXANE	0.81	0.15	24	-	25
2,4-DIMETHYLPENTANE	0.43	8.07×10^{-2}	13	-	13
2-METHYL-BUTANE	13	2.56	408	-	424
2-METHYLHEPTANE	1.28	0.24	39	-	40
2-METHYLHEXANE	2.57	0.49	78	-	81
2-METHYLPENTANE	8.77	1.67	266	-	276
2-METHYLPROPANE; ISOBUTANE	27	5.19	829	-	862
2-METHYLPROPENE (ISOBUTENE)	21	3.92	625	-	650
3,3-DIMETHYL-1-BUTENE	63	12	1,913	-	1,988
3-METHYLHEXANE	7.79	1.48	236	-	245
3-METHYLPENTANE	2.57	0.49	78	-	81
ACENAPHTHENE	4.65×10^{-2}	8.84×10^{-3}	1.41	-	1.47
ACENAPHTHYLENE	3.91×10^{-2}	7.43×10^{-3}	1.19	-	1.23
ACETALDEHYDE	117	22	3,544	-	3,683
ACETONE	168	32	5,093	-	5,293
ACETYLENE	95	18	2,886	-	2,999
ACROLEIN (2-PROPENAL)	6.67	1.27	202	-	210
ALKENE KETONE	39	7.43	1,187	-	1,233
AMMONIA (TOTAL)	17	3.15	503	-	523
ANTHRACENE	2.0×10^{-4}	3.80×10^{-5}	6.07×10^{-3}	-	6.31×10^{-3}
ANTIMONY & COMPOUNDS	6.74×10^{-2}	1.28×10^{-2}	2.04	-	2.12
ARSENIC & COMPOUNDS	1.94×10^{-3}	3.68×10^{-4}	5.88×10^{-2}	-	6.11×10^{-2}
BENZALDEHYDE	16	2.97	474	-	493
BENZENE	45	8.51	1,358	-	1,412
BENZO(A)ANTHRACENE	3.31×10^{-3}	6.28×10^{-4}	0.10	-	0.10
BENZO(A)PYRENE	1.63×10^{-4}	3.09×10^{-5}	4.94×10^{-3}	-	5.13×10^{-3}

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(B)FLUORANTHENE	2.28×10^{-4}	4.33×10^{-5}	6.91×10^{-3}	-	7.19×10^{-3}
BENZO(G,H,I)PERYLENE	8.84×10^{-5}	1.68×10^{-5}	2.68×10^{-3}	-	2.79×10^{-3}
BENZO(K)FLUORANTHENE	1.63×10^{-4}	3.09×10^{-5}	4.94×10^{-3}	-	5.13×10^{-3}
B-METHYLSTYRENE	1.05	0.20	32	-	33
BROMINE AND COMPOUNDS	5.33×10^{-3}	1.01×10^{-3}	0.16	-	0.17
BUTYLBENZENE ISOMERS	2.84	0.54	86	-	90
BUTYRALDEHYDE	42	7.94	1,267	-	1,317
C10 MONOSUBSTITUTED BENZENES	1.77	0.34	54	-	56
C5 ALDEHYDE	2.46	0.47	75	-	78
C6 ALDEHYDES	85	16	2,577	-	2,678
C9 MONOSUBSTITUTED BENZENES	11	2.11	337	-	350
CADMIUM & COMPOUNDS	3.25×10^{-2}	6.17×10^{-3}	0.98	-	1.02
CARBON DIOXIDE	2,030,024	385,502	61,542,741	-	63,958,267
CARBON MONOXIDE	60,133	11,419	1,823,021	-	1,894,573
CHLORINE	0.13	2.52×10^{-2}	4.03	-	4.19
CHROMIUM (III) COMPOUNDS	6.85×10^{-5}	1.30×10^{-5}	2.08×10^{-3}	-	2.16×10^{-3}
CHROMIUM (VI) COMPOUNDS	3.53×10^{-5}	6.70×10^{-6}	1.07×10^{-3}	-	1.11×10^{-3}
CHRYSENE	8.84×10^{-4}	1.68×10^{-4}	2.68×10^{-2}	-	2.79×10^{-2}
CIS-2-BUTENE	2.10	0.40	64	-	66
CIS-2-PENTENE	0.67	0.13	20	-	21
COBALT & COMPOUNDS	2.91×10^{-3}	5.52×10^{-4}	8.82×10^{-2}	-	9.17×10^{-2}
COPPER & COMPOUNDS	1.45×10^{-2}	2.76×10^{-3}	0.44	-	0.46
CUMENE (1-METHYLETHYLBENZENE)	0.34	6.37×10^{-2}	10	-	11
CYCLOHEXANE	0.58	0.11	18	-	18
CYCLOHEXANONE	2.39	0.45	73	-	75
CYCLOPENTANE	0.27	5.10×10^{-2}	8.14	-	8.46
DIBENZO(A,H)ANTHRACENE	1.35×10^{-6}	2.56×10^{-7}	4.09×10^{-5}	-	4.25×10^{-5}
DIETHYLBENZENES	3.02	0.57	92	-	95
ETHANE	13	2.40	383	-	398
ETHYL ALCOHOL	0.20	3.82×10^{-2}	6.11	-	6.35
ETHYLBENZENE	6.83	1.30	207	-	215
ETHYLENE	322	61	9,754	-	10,136
ETHYLHEXANE	1.37	0.26	41	-	43
FLUORANTHENE	7.91×10^{-3}	1.50×10^{-3}	0.24	-	0.25
FLUORENE	4.65×10^{-2}	8.84×10^{-3}	1.41	-	1.47
FORMALDEHYDE	260	49	7,888	-	8,198
INDAN	4.21	0.80	128	-	133
INDENO(1,2,3-CD)PYRENE	3.68×10^{-5}	6.98×10^{-6}	1.11×10^{-3}	-	1.16×10^{-3}
ISOMERS OF XYLENE	23	4.43	706	-	734
LEAD & COMPOUNDS	1.45×10^{-2}	2.76×10^{-3}	0.44	-	0.46
MANGANESE & COMPOUNDS	4.74×10^{-3}	9.0×10^{-4}	0.14	-	0.15
MERCURY & COMPOUNDS	1.26×10^{-2}	2.39×10^{-3}	0.38	-	0.40
METHANE	115	22	3,496	-	3,633
METHYL ALCOHOL	0.67	0.13	20	-	21

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	33	6.28	1,002	-	1,041
METHYL N-BUTYL KETONE	20	3.82	610	-	634
METHYLCYCLOHEXANE	1.52	0.29	46	-	48
METHYLCYCLOPENTANE	3.33	0.63	101	-	105
M-ETHYLTOLUENE	5.53	1.05	168	-	174
MOLYBDENUM	5.82×10^{-3}	1.10×10^{-3}	0.18	-	0.18
NAPHTHALENE	0.21	4.07×10^{-2}	6.49	-	6.75
N-BUTANE	2.33	0.44	71	-	73
N-DECANE	12	2.25	359	-	373
N-HEPTANE	1.52	0.29	46	-	48
N-HEXANE	3.50	0.67	106	-	110
NICKEL & COMPOUNDS	7.04×10^{-3}	1.34×10^{-3}	0.21	-	0.22
NITRIC OXIDE	5,216	990	158,117	-	164,323
NITROGEN DIOXIDE	421	80	12,760	-	13,261
NITROUS OXIDE	51	9.73	1,554	-	1,615
N-NONANE	5.15	0.98	156	-	162
N-OCTANE	3.13	0.59	95	-	99
N-PENTANE	3.92	0.74	119	-	123
N-PROPYLBENZENE	2.73	0.52	83	-	86
N-UNDECANE	5.84	1.11	177	-	184
O-ETHYLTOLUENE	3.09	0.59	94	-	97
OXIDES OF NITROGEN	8,418	1,599	255,207	-	265,224
PARTICULATE MATTER $\leq 10 \mu\text{m}$	465	88	14,112	-	14,666
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	457	87	13,862	-	14,406
PHENANTHRENE	0.12	2.30×10^{-2}	3.67	-	3.81
PHOSPHORUS	5.96×10^{-2}	1.13×10^{-2}	1.81	-	1.88
POLYCHLORINATED DIOXINS AND FURANS	3.46×10^{-6}	6.57×10^{-7}	1.05×10^{-4}	-	1.09×10^{-4}
POLYCYCLIC AROMATIC HYDROCARBONS	0.48	9.15×10^{-2}	15	-	15
PROPANE	4.14	0.79	126	-	130
PROPIONALDEHYDE	26	4.94	789	-	820
PROPYLENE	58	11	1,762	-	1,831
PYRENE	1.35×10^{-3}	2.56×10^{-4}	4.09×10^{-2}	-	4.25×10^{-2}
SELENIUM & COMPOUNDS	2.42×10^{-3}	4.60×10^{-4}	7.35×10^{-2}	-	7.64×10^{-2}
STYRENE (ETHENYLBENZENE)	1.31	0.25	40	-	41
SULFUR DIOXIDE	62	12	1,894	-	1,968
T-BUTYLBENZENE	0.13	2.55×10^{-2}	4.07	-	4.23
TIN & COMPOUNDS	2.38×10^{-2}	4.51×10^{-3}	0.72	-	0.75
TOLUENE	33	6.26	999	-	1,038
TOTAL SUSPENDED PARTICULATE	485	92	14,700	-	15,277
TOTAL VOLATILE ORGANIC COMPOUNDS	2,202	418	66,763	-	69,384
TRANS-2-BUTENE	4.36	0.83	132	-	137

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
TRANS-2-PENTENE	0.90	0.17	27	-	28
VANADIUM & COMPOUNDS	7.27×10^{-3}	1.38×10^{-3}	0.22	-	0.23
ZINC & COMPOUNDS	0.19	3.68×10^{-2}	5.88	-	6.11
Evaporative - Avgas					
1-HEXENE	0.77	22	32	-	54
1-PENTENE	3.76	107	157	-	267
2,2,4-TRIMETHYLHEXANE	0.36	10	15	-	26
2,2,4-TRIMETHYLPENTANE	1.50	43	62	-	106
2,2-DIMETHYLBUTANE	4.49	128	187	-	319
2,4-DIMETHYLPENTANE	1.86	53	78	-	132
2,5-DIMETHYLHEXANE	0.36	10	15	-	26
2-METHYL-1-BUTENE	7.11	202	297	-	506
2-METHYL-2-BUTENE	3.76	107	157	-	267
2-METHYLPROPANE; ISOBUTANE	36	1,035	1,518	-	2,590
3-METHYL-1-BUTENE	1.50	43	62	-	106
3-METHYLHEXANE	1.50	43	62	-	106
3-METHYLPENTANE	8.64	246	361	-	615
4-METHYL-TRANS-2-PENTENE	0.77	22	32	-	54
BENZENE	2.63	75	110	-	187
CIS-2-BUTENE	3.39	96	141	-	241
CIS-2-HEXENE	1.50	43	62	-	106
CIS-2-PENTENE	2.63	75	110	-	187
CYCLOHEXANE	0.77	22	32	-	54
CYCLOPENTANE	2.63	75	110	-	187
CYCLOPENTENE	0.77	22	32	-	54
ISOMERS OF BUTENE	4.12	117	172	-	293
ISOMERS OF HEPTANE	5.62	160	234	-	400
ISOMERS OF HEXANE	18	502	736	-	1,256
ISOMERS OF PENTANE	100	2,838	4,164	-	7,102
ISOMERS OF XYLENE	0.36	10	15	-	26
METHYLCYCLOHEXANE	0.36	10	15	-	26
METHYLCYCLOPENTANE	6.02	171	251	-	428
N-BUTANE	86	2,432	3,569	-	6,087
N-HEPTANE	1.13	32	47	-	80
N-HEXANE	6.75	192	281	-	480
N-PENTANE	32	906	1,330	-	2,268
PROPANE	4.49	128	187	-	319
TOLUENE	2.26	64	94	-	161
TOTAL VOLATILE ORGANIC COMPOUNDS	365	10,368	15,215	-	25,948
TRANS-2-BUTENE	4.49	128	187	-	319
TRANS-2-HEXENE	1.13	32	47	-	80
TRANS-2-PENTENE	6.02	171	251	-	428

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Evaporative - Avtur					
N-DECANE	95	52	3,379	-	3,526
N-DODECANE	88	48	3,138	-	3,274
N-HEPTANE	0.48	0.26	17	-	18
N-NONANE	23	12	810	-	845
N-OCTANE	2.42	1.32	86	-	90
N-PENTADECANE	35	19	1,241	-	1,295
N-TETRADECANE	57	31	2,017	-	2,105
N-TRIDECANE	86	47	3,051	-	3,184
N-UNDECANE	98	54	3,500	-	3,651
TOTAL VOLATILE ORGANIC COMPOUNDS	484	264	17,240	-	17,987

Table A2: Commercial boats emissions by source type

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Exhaust - Petrol 2 Stroke					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	535	1,763	1,670	26	3,994
(2-METHYLPROPYL)BENZENE	267	882	835	13	1,997
1,2,3-TRIMETHYLBENZENE	1,070	3,526	3,339	52	7,988
1,2,4-TRIMETHYLBENZENE	21,262	70,087	66,367	1,037	158,753
1,2-PROPADIENE	1,003	3,306	3,131	49	7,488
1,3,5-TRIMETHYLBENZENE	8,023	26,448	25,044	391	59,907
1,3-BUTADIENE	1,421	4,684	4,435	69	10,609
1-BUTENE	2,875	9,477	8,974	140	21,467
1-PENTENE	2,073	6,832	6,470	101	15,476
2,2,4-TRIMETHYLPENTANE	24,653	81,263	76,950	1,202	184,067
2,2-DIMETHYLBUTANE	4,012	13,224	12,522	196	29,953
2,3,4-TRIMETHYLPENTANE	7,154	23,583	22,331	349	53,417
2,3-DIMETHYL-1-BUTENE	2,006	6,612	6,261	98	14,977
2,3-DIMETHYLHEXANE	2,006	6,612	6,261	98	14,977
2,3-DIMETHYLPENTANE	4,814	15,869	15,027	235	35,944
2,4-DIMETHYLHEXANE	4,212	13,885	13,148	205	31,451
2,4-DIMETHYLPENTANE	4,079	13,444	12,731	199	30,453
2-METHYL-BUTANE	32,762	107,996	102,264	1,597	244,619
2-METHYLHEPTANE	3,611	11,902	11,270	176	26,958
2-METHYLHEXANE	10,899	35,925	34,018	531	81,373
2-METHYLPENTANE	19,056	62,814	59,480	929	142,278
2-METHYLPROPANE; ISOBUTANE	2,140	7,053	6,678	104	15,975
2-METHYLPROPENE (ISOBUTENE)	2,942	9,698	9,183	143	21,966
3-METHYLHEXANE	10,899	35,925	34,018	531	81,373
3-METHYLPENTANE	12,169	40,113	37,984	593	90,859
ACENAPHTHENE	2.64×10^{-2}	8.69×10^{-2}	8.23×10^{-2}	1.29×10^{-3}	0.20
ACENAPHTHYLENE	0.99	3.26	3.09	4.82×10^{-2}	7.38
ACETALDEHYDE	1,102	3,633	3,440	54	8,228
ACETONE	602	1,984	1,878	29	4,493
ACETYLENE	16,247	53,557	50,714	792	121,311
ACROLEIN (2-PROPENAL)	199	655	620	9.69	1,483
ALKENE KETONE	67	220	209	3.26	499
AMMONIA (TOTAL)	100	329	312	4.87	745
ANTHRACENE	0.88	2.91	2.76	4.31×10^{-2}	6.60
BENZALDEHYDE	67	220	209	3.26	499
BENZENE	16,660	54,917	52,002	812	124,391
BENZO(A)ANTHRACENE	0.45	1.48	1.40	2.19×10^{-2}	3.35
BENZO(A)PYRENE	0.38	1.26	1.19	1.86×10^{-2}	2.85
BENZO(B)FLUORANTHENE	0.21	0.70	0.66	1.03×10^{-2}	1.58
BENZO(G,H,I)PERYLENE	1.53	5.04	4.77	7.46×10^{-2}	11

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(K)FLUORANTHENE	0.18	0.61	0.58	9.0×10^{-3}	1.38
BROMINE AND COMPOUNDS	6.80	22	21	0.33	51
BUTYLBENZENE ISOMERS	2,140	7,053	6,678	104	15,975
C6 ALDEHYDES	134	441	417	6.52	998
C9 MONOSUBSTITUTED BENZENES	3,343	11,020	10,435	163	24,961
CARBON DIOXIDE	5,975,187	19,696,170	18,650,775	291,310	44,613,442
CARBON MONOXIDE	1,133,135	3,735,183	3,536,934	55,244	8,460,496
CHLORINE	951	3,136	2,970	46	7,104
CHROMIUM (III) COMPOUNDS	6.33×10^{-2}	0.21	0.20	3.09×10^{-3}	0.47
CHROMIUM (VI) COMPOUNDS	3.26×10^{-2}	0.11	0.10	1.59×10^{-3}	0.24
CHRYSENE	0.28	0.91	0.86	1.35×10^{-2}	2.07
CIS-2-BUTENE	1,137	3,747	3,548	55	8,487
CIS-2-PENTENE	3,343	11,020	10,435	163	24,961
COBALT & COMPOUNDS	6.80	22	21	0.33	51
COPPER & COMPOUNDS	6.80	22	21	0.33	51
CUMENE (1-METHYLETHYLBENZENE)	936	3,086	2,922	46	6,989
CYCLOHEXANE	401	1,322	1,252	20	2,995
CYCLOPENTANE	4,212	13,885	13,148	205	31,451
DIBENZO(A,H)ANTHRACENE	1.32×10^{-2}	4.35×10^{-2}	4.12×10^{-2}	6.43×10^{-4}	9.84×10^{-2}
DIETHYLBENZENES	1,738	5,730	5,426	85	12,980
ETHANE	1,404	4,628	4,383	68	10,484
ETHYL ALCOHOL	267	882	835	13	1,997
ETHYLBENZENE	15,865	52,297	49,522	773	118,458
ETHYLENE	8,224	27,109	25,670	401	61,404
ETHYLHEXANE	5,282	17,412	16,487	258	39,439
FLUORANTHENE	3.52	12	11	0.17	26
FLUORENE	3.15	10	9.84	0.15	24
FORMALDEHYDE	1,681	5,540	5,246	82	12,549
INDAN	735	2,424	2,296	36	5,491
INDENO(1,2,3-CD)PYRENE	0.46	1.52	1.44	2.25×10^{-2}	3.45
ISOMERS OF XYLENE	71,182	234,638	222,184	3,470	531,474
LEAD & COMPOUNDS	17	56	53	0.83	128
MANGANESE & COMPOUNDS	3.21×10^{-2}	0.11	0.10	1.57×10^{-3}	0.24
METHANE	5,764	19,000	17,991	281	43,036
METHYL ALCOHOL	669	2,204	2,087	33	4,992
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	134	441	417	6.52	998
METHYL N-BUTYL KETONE	67	220	209	3.26	499
METHYLCYCLOHEXANE	2,073	6,832	6,470	101	15,476
METHYLCYCLOPENTANE	15,311	50,471	47,793	746	114,322
M-ETHYLTOLUENE	17,518	57,745	54,680	854	130,796
NAPHTHALENE	5.27×10^{-2}	0.17	0.16	2.57×10^{-3}	0.39
N-BUTANE	7,622	25,125	23,792	372	56,911
N-DECANE	3,076	10,138	9,600	150	22,964

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-HEPTANE	4,747	15,648	14,818	231	35,445
N-HEXANE	9,372	30,892	29,253	457	69,973
NICKEL & COMPOUNDS	6.99×10^{-2}	0.23	0.22	3.41×10^{-3}	0.52
NITRIC OXIDE	7,307	24,087	22,809	356	54,559
NITROGEN DIOXIDE	590	1,944	1,841	29	4,403
NITROUS OXIDE	198	654	619	9.68	1,482
N-NONANE	3,410	11,240	10,644	166	25,460
N-OCTANE	4,079	13,444	12,731	199	30,453
N-PENTANE	11,634	38,349	36,314	567	86,865
N-PROPYLBENZENE	4,747	15,648	14,818	231	35,445
N-UNDECANE	201	661	626	9.78	1,498
O-ETHYLTOLUENE	6,954	22,922	21,705	339	51,919
OXIDES OF NITROGEN	11,794	38,877	36,814	575	88,060
PARTICULATE MATTER $\leq 10 \mu\text{m}$	13,185	43,461	41,154	643	98,442
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	12,130	39,984	37,862	591	90,567
PHENANTHRENE	2.74	9.04	8.56	0.13	20
PHOSPHORUS	4.44	15	14	0.22	33
POLYCHLORINATED DIOXINS AND FURANS	1.12×10^{-8}	3.71×10^{-8}	3.51×10^{-8}	5.48×10^{-10}	8.39×10^{-8}
POLYCYCLIC AROMATIC HYDROCARBONS	19	63	60	0.93	142
PROPANE	3,276	10,800	10,226	160	24,462
PROPIONALDEHYDE	163	539	510	7.97	1,220
PROPYLENE	7,221	23,803	22,540	352	53,916
PYRENE	4.19	14	13	0.20	31
STYRENE (ETHENYLBENZENE)	858	2,827	2,677	42	6,404
SULFUR DIOXIDE	510	1,683	1,593	25	3,811
TOLUENE	64,763	213,479	202,149	3,157	483,548
TOTAL SUSPENDED PARTICULATE	13,592	44,805	42,427	663	101,487
TOTAL VOLATILE ORGANIC COMPOUNDS	662,217	2,182,882	2,067,023	32,285	4,944,407
TRANS-2-BUTENE	1,137	3,747	3,548	55	8,487
TRANS-2-PENTENE	1,939	6,392	6,052	95	14,477
ZINC & COMPOUNDS	6.80	22	21	0.33	51
Exhaust - Petrol 4 Stroke					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	5.36	18	17	0.26	40
(2-METHYLPROPYL)BENZENE	3.57	12	11	0.17	27
1,2,3-TRIMETHYLBENZENE	77	253	240	3.74	573
1,2,4-TRIMETHYLBENZENE	486	1,601	1,516	24	3,625
1,2-DIETHYLBENZENE (ORTHO)	21	71	67	1.04	160
1,2-PROPADIENE	145	477	451	7.05	1,080
1,3,5-TRIMETHYLBENZENE	139	459	435	6.79	1,040
1,3-BUTADIENE	152	501	475	7.41	1,135

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1-BUTENE	137	453	429	6.70	1,026
1-PENTENE	37	124	117	1.83	280
2,2,4-TRIMETHYLPENTANE	235	775	734	11	1,755
2,2-DIMETHYLBUTANE	57	188	178	2.78	427
2,3,4-TRIMETHYLPENTANE	62	206	195	3.05	466
2,3-DIMETHYL-1-BUTENE	34	112	106	1.65	253
2,3-DIMETHYLHEXANE	20	65	61	0.96	147
2,3-DIMETHYLPENTANE	57	188	178	2.78	427
2,4-DIMETHYLHEXANE	45	147	139	2.18	333
2,4-DIMETHYLPENTANE	50	165	156	2.44	373
2-METHYL-BUTANE	428	1,412	1,337	21	3,199
2-METHYLHEPTANE	57	188	178	2.78	427
2-METHYLHEXANE	125	412	390	6.09	933
2-METHYLPENTANE	252	830	786	12	1,879
2-METHYLPROPANE; ISOBUTANE	45	147	139	2.18	333
2-METHYLPROPENE (ISOBUTENE)	196	647	613	9.57	1,466
3-METHYLHEXANE	134	441	418	6.53	1,000
3-METHYLPENTANE	157	518	490	7.66	1,173
ACENAPHTHENE	0.13	0.42	0.40	6.23×10^{-3}	0.95
ACENAPHTHYLENE	0.72	2.38	2.25	3.52×10^{-2}	5.39
ACETALDEHYDE	65	216	204	3.19	489
ACETONE	61	200	189	2.96	453
ACETYLENE	1,348	4,443	4,207	66	10,063
ACROLEIN (2-PROPENAL)	11	37	35	0.54	83
ALKENE KETONE	5.36	18	17	0.26	40
AMMONIA (TOTAL)	28	91	86	1.35	207
ANTHRACENE	0.15	0.49	0.46	7.25×10^{-3}	1.11
BENZALDEHYDE	16	53	50	0.78	120
BENZENE	838	2,762	2,615	41	6,255
BENZO(A)ANTHRACENE	1.75×10^{-2}	5.77×10^{-2}	5.46×10^{-2}	8.54×10^{-4}	0.13
BENZO(A)PYRENE	1.75×10^{-2}	5.77×10^{-2}	5.46×10^{-2}	8.54×10^{-4}	0.13
BENZO(B)FLUORANTHENE	2.10×10^{-2}	6.93×10^{-2}	6.56×10^{-2}	1.02×10^{-3}	0.16
BENZO(G,H,I)PERYLENE	4.55×10^{-2}	0.15	0.14	2.22×10^{-3}	0.34
BENZO(K)FLUORANTHENE	2.10×10^{-2}	6.93×10^{-2}	6.56×10^{-2}	1.02×10^{-3}	0.16
B-METHYLSTYRENE	29	94	89	1.39	213
BROMINE AND COMPOUNDS	9.02×10^{-2}	0.30	0.28	4.40×10^{-3}	0.67
BUTYLBENZENE ISOMERS	64	212	201	3.13	480
BUTYRALDEHYDE	1.79	5.88	5.57	8.70×10^{-2}	13
C10 MONOSUBSTITUTED BENZENES	43	141	134	2.09	320
C6 ALDEHYDES	21	71	67	1.04	160
C9 MONOSUBSTITUTED BENZENES	164	541	513	8.01	1,226
CARBON DIOXIDE	2,172,358	7,160,801	6,780,734	105,909	16,219,801
CARBON MONOXIDE	399,471	1,316,788	1,246,898	19,476	2,982,633
CHLORINE	13	42	39	0.62	94

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CHROMIUM (III) COMPOUNDS	1.76×10^{-2}	5.79×10^{-2}	5.48×10^{-2}	8.56×10^{-4}	0.13
CHROMIUM (VI) COMPOUNDS	9.05×10^{-3}	2.98×10^{-2}	2.82×10^{-2}	4.41×10^{-4}	6.75×10^{-2}
CHRYSENE	1.75×10^{-2}	5.77×10^{-2}	5.46×10^{-2}	8.54×10^{-4}	0.13
CIS-2-BUTENE	25	82	78	1.22	187
CIS-2-PENTENE	45	147	139	2.18	333
COBALT & COMPOUNDS	9.02×10^{-2}	0.30	0.28	4.40×10^{-3}	0.67
COPPER & COMPOUNDS	9.02×10^{-2}	0.30	0.28	4.40×10^{-3}	0.67
CUMENE (1-METHYLETHYLBENZENE)	12	41	39	0.61	93
CYCLOHEXANE	7.14	24	22	0.35	53
CYCLOHEXANONE	3.57	12	11	0.17	27
CYCLOPENTANE	34	112	106	1.65	253
DIETHYLBENZENES	36	118	111	1.74	267
ETHANE	148	488	462	7.22	1,106
ETHYL ALCOHOL	3.57	12	11	0.17	27
ETHYLBENZENE	317	1,043	988	15	2,364
ETHYLENE	1,282	4,225	4,001	62	9,570
ETHYLHEXANE	57	188	178	2.78	427
FLUORANTHENE	0.16	0.53	0.50	7.77×10^{-3}	1.19
FLUORENE	0.26	0.87	0.83	1.29×10^{-2}	1.97
FORMALDEHYDE	274	903	855	13	2,045
INDAN	50	165	156	2.44	373
INDENO(1,2,3-CD)PYRENE	1.40×10^{-2}	4.62×10^{-2}	4.37×10^{-2}	6.83×10^{-4}	0.10
ISOMERS OF XYLENE	1,083	3,569	3,379	53	8,083
LEAD & COMPOUNDS	4.73	16	15	0.23	35
MANGANESE & COMPOUNDS	8.90×10^{-3}	2.94×10^{-2}	2.78×10^{-2}	4.34×10^{-4}	6.65×10^{-2}
METHANE	1,711	5,642	5,342	83	12,779
METHYL ALCOHOL	25	82	78	1.22	187
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	11	35	33	0.52	80
METHYL N-BUTYL KETONE	36	118	111	1.74	267
METHYLCYCLOHEXANE	68	224	212	3.31	506
METHYLCYCLOPENTANE	195	641	607	9.49	1,453
M-ETHYLTOLUENE	255	841	797	12	1,906
NAPHTHALENE	16	52	50	0.77	119
N-BUTANE	109	359	340	5.31	813
N-DECANE	39	129	123	1.91	293
N-HEPTANE	93	306	290	4.53	693
N-HEXANE	158	522	495	7.72	1,183
NICKEL & COMPOUNDS	1.94×10^{-2}	6.39×10^{-2}	6.05×10^{-2}	9.45×10^{-4}	0.14
NITRIC OXIDE	12,242	40,353	38,211	597	91,403
NITROGEN DIOXIDE	988	3,257	3,084	48	7,376
NITROUS OXIDE	55	181	172	2.68	411
N-NONANE	73	241	228	3.57	546
N-OCTANE	57	188	178	2.78	427

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-PENTANE	184	606	574	8.96	1,373
N-PROPYLBENZENE	62	206	195	3.05	466
N-UNDECANE	36	118	111	1.74	267
O-ETHYLTOLUENE	114	377	357	5.57	853
OXIDES OF NITROGEN	19,759	65,131	61,674	963	147,527
PARTICULATE MATTER $\leq 10 \mu\text{m}$	175	577	546	8.54	1,307
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	161	531	503	7.85	1,203
PHENANTHRENE	0.44	1.47	1.39	2.17×10^{-2}	3.32
PHOSPHORUS	1.23	4.06	3.84	6.0×10^{-2}	9.19
POLYCHLORINATED DIOXINS AND FURANS	3.12×10^{-9}	1.03×10^{-8}	9.73×10^{-9}	1.52×10^{-10}	2.33×10^{-8}
POLYCYCLIC AROMATIC HYDROCARBONS	18	60	57	0.88	135
PROPANE	123	406	384	6.00	920
PROPIONALDEHYDE	30	99	94	1.46	224
PROPYLENE	594	1,959	1,855	29	4,438
PYRENE	0.22	0.72	0.68	1.06×10^{-2}	1.62
STYRENE (ETHENYLBENZENE)	12	40	38	0.59	90
SULFUR DIOXIDE	187	618	585	9.14	1,399
TOLUENE	1,147	3,781	3,581	56	8,565
TOTAL SUSPENDED PARTICULATE	180	595	563	8.80	1,348
TOTAL VOLATILE ORGANIC COMPOUNDS	15,968	52,636	49,843	778	119,225
TRANS-2-BUTENE	36	118	111	1.74	267
TRANS-2-PENTENE	61	200	189	2.96	453
ZINC & COMPOUNDS	9.02×10^{-2}	0.30	0.28	4.40×10^{-3}	0.67
Exhaust - Diesel					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	3.88	15	64	0.29	83
(2-METHYLPROPYL)BENZENE	9.58	36	158	0.71	205
1,2,3-TRIMETHYLBENZENE	9.12	35	151	0.68	195
1,2,4-TRIMETHYLBENZENE	40	153	665	2.99	861
1,2-DIETHYLBENZENE (ORTHO)	6.54	25	108	0.49	140
1,2-PROPADIENE	35	134	585	2.63	757
1,3,5-TRIMETHYLBENZENE	15	56	243	1.10	315
1,3-BUTADIENE	14	53	230	1.04	298
1-BUTENE	51	192	836	3.76	1,082
1-PENTENE	25	93	407	1.83	526
2,2,4-TRIMETHYLPENTANE	5.38	20	89	0.40	115
2,2-DIMETHYLBUTANE	4.64	18	77	0.34	99
2,3,4-TRIMETHYLPENTANE	1.14	4.32	19	8.47×10^{-2}	24
2,3-DIMETHYL-1-BUTENE	2.13	8.06	35	0.16	45
2,3-DIMETHYLHEXANE	0.84	3.17	14	6.21×10^{-2}	18
2,3-DIMETHYLPENTANE	5.55	21	92	0.41	119

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2,4-DIMETHYLHEXANE	2.74	10	45	0.20	58
2,4-DIMETHYLPENTANE	1.44	5.47	24	0.11	31
2-METHYL-BUTANE	46	173	755	3.40	978
2-METHYLHEPTANE	4.33	16	72	0.32	93
2-METHYLHEXANE	8.74	33	144	0.65	187
2-METHYLPENTANE	30	113	492	2.21	637
2-METHYLPROPANE; ISOBUTANE	93	352	1,534	6.90	1,985
2-METHYLPROPENE (ISOBUTENE)	70	266	1,157	5.21	1,498
3,3-DIMETHYL-1-BUTENE	214	812	3,539	16	4,581
3-METHYLHEXANE	26	100	437	1.97	565
3-METHYLPENTANE	8.74	33	144	0.65	187
ACENAPHTHENE	0.44	1.65	7.20	3.24×10^{-2}	9.32
ACENAPHTHYLENE	0.37	1.39	6.05	2.72×10^{-2}	7.83
ACETALDEHYDE	397	1,504	6,555	30	8,486
ACETONE	571	2,162	9,421	42	12,196
ACETYLENE	323	1,225	5,339	24	6,911
ACROLEIN (2-PROPENAL)	23	86	374	1.68	484
ALKENE KETONE	133	504	2,195	9.88	2,841
AMMONIA (TOTAL)	123	467	2,035	9.16	2,635
ANTHRACENE	1.88×10^{-3}	7.11×10^{-3}	3.10×10^{-2}	1.39×10^{-4}	4.01×10^{-2}
ANTIMONY & COMPOUNDS	0.63	2.39	10	4.70×10^{-2}	14
ARSENIC & COMPOUNDS	1.82×10^{-2}	6.89×10^{-2}	0.30	1.35×10^{-3}	0.39
BENZALDEHYDE	53	201	877	3.95	1,136
BENZENE	152	577	2,513	11	3,253
BENZO(A)ANTHRACENE	3.10×10^{-2}	0.12	0.51	2.30×10^{-3}	0.66
BENZO(A)PYRENE	1.53×10^{-3}	5.78×10^{-3}	2.52×10^{-2}	1.13×10^{-4}	3.26×10^{-2}
BENZO(B)FLUORANTHENE	2.14×10^{-3}	8.10×10^{-3}	3.53×10^{-2}	1.59×10^{-4}	4.57×10^{-2}
BENZO(G,H,I)PERYLENE	8.29×10^{-4}	3.14×10^{-3}	1.37×10^{-2}	6.16×10^{-5}	1.77×10^{-2}
BENZO(K)FLUORANTHENE	1.53×10^{-3}	5.78×10^{-3}	2.52×10^{-2}	1.13×10^{-4}	3.26×10^{-2}
B-METHYLSTYRENE	3.57	14	59	0.27	76
BROMINE AND COMPOUNDS	5.0×10^{-2}	0.19	0.83	3.72×10^{-3}	1.07
BUTYLBENZENE ISOMERS	9.66	37	159	0.72	206
BUTYRALDEHYDE	142	538	2,344	11	3,035
C10 MONOSUBSTITUTED BENZENES	6.01	23	99	0.45	128
C5 ALDEHYDE	8.36	32	138	0.62	179
C6 ALDEHYDES	289	1,094	4,768	21	6,172
C9 MONOSUBSTITUTED BENZENES	38	143	624	2.81	807
CADMIUM & COMPOUNDS	0.30	1.15	5.03	2.26×10^{-2}	6.51
CARBON DIOXIDE	15,237,274	57,716,956	251,526,538	1,132,381	325,613,150
CARBON MONOXIDE	33,220	125,835	548,378	2,469	709,902
CHLORINE	1.25	4.72	21	9.25×10^{-2}	27
CHROMIUM (III) COMPOUNDS	5.09×10^{-4}	1.93×10^{-3}	8.39×10^{-3}	3.78×10^{-5}	1.09×10^{-2}
CHROMIUM (VI) COMPOUNDS	2.62×10^{-4}	9.92×10^{-4}	4.32×10^{-3}	1.95×10^{-5}	5.60×10^{-3}
CHRYSENE	8.29×10^{-3}	3.14×10^{-2}	0.14	6.16×10^{-4}	0.18

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CIS-2-BUTENE	7.15	27	118	0.53	153
CIS-2-PENTENE	2.28	8.64	38	0.17	49
COBALT & COMPOUNDS	2.73×10^{-2}	0.10	0.45	2.03×10^{-3}	0.58
COPPER & COMPOUNDS	0.14	0.52	2.25	1.01×10^{-2}	2.91
CUMENE (1-METHYLETHYLBENZENE)	1.14	4.32	19	8.47×10^{-2}	24
CYCLOHEXANE	1.98	7.49	33	0.15	42
CYCLOHEXANONE	8.13	31	134	0.60	174
CYCLOPENTANE	0.91	3.46	15	6.78×10^{-2}	19
DIBENZO(A,H)ANTHRACENE	1.27×10^{-5}	4.79×10^{-5}	2.09×10^{-4}	9.40×10^{-7}	2.70×10^{-4}
DIETHYLBENZENES	10	39	169	0.76	219
ETHANE	43	163	709	3.19	918
ETHYL ALCOHOL	0.68	2.59	11	5.08×10^{-2}	15
ETHYLBENZENE	23	88	383	1.72	496
ETHYLENE	1,093	4,140	18,042	81	23,357
ETHYLHEXANE	4.64	18	77	0.34	99
FLUORANTHENE	7.42×10^{-2}	0.28	1.22	5.51×10^{-3}	1.59
FLUORENE	0.44	1.65	7.20	3.24×10^{-2}	9.32
FORMALDEHYDE	884	3,348	14,592	66	18,890
INDAN	14	54	236	1.06	305
INDENO(1,2,3-CD)PYRENE	3.45×10^{-4}	1.31×10^{-3}	5.69×10^{-3}	2.56×10^{-5}	7.37×10^{-3}
ISOMERS OF XYLENE	79	300	1,307	5.88	1,692
LEAD & COMPOUNDS	0.14	0.52	2.25	1.01×10^{-2}	2.91
MANGANESE & COMPOUNDS	3.52×10^{-2}	0.13	0.58	2.61×10^{-3}	0.75
MERCURY & COMPOUNDS	0.12	0.45	1.95	8.78×10^{-3}	2.53
METHANE	114	431	1,877	8.45	2,429
METHYL ALCOHOL	2.28	8.64	38	0.17	49
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	112	425	1,854	8.34	2,400
METHYL N-BUTYL KETONE	68	259	1,128	5.08	1,461
METHYLCYCLOHEXANE	5.17	20	85	0.38	110
METHYLCYCLOPENTANE	11	43	187	0.84	242
M-ETHYLTOLUENE	19	71	310	1.40	401
MOLYBDENUM	5.45×10^{-2}	0.21	0.90	4.05×10^{-3}	1.17
NAPHTHALENE	2.01	7.60	33	0.15	43
N-BUTANE	7.91	30	131	0.59	169
N-DECANE	40	152	664	2.99	859
N-HEPTANE	5.17	20	85	0.38	110
N-HEXANE	12	45	197	0.88	254
NICKEL & COMPOUNDS	5.23×10^{-2}	0.20	0.86	3.88×10^{-3}	1.12
NITRIC OXIDE	120,866	457,828	1,995,181	8,982	2,582,858
NITROGEN DIOXIDE	9,754	36,947	161,015	725	208,441
NITROUS OXIDE	386	1,463	6,375	29	8,253
N-NONANE	17	66	289	1.30	374
N-OCTANE	11	40	176	0.79	227

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-PENTANE	13	50	220	0.99	284
N-PROPYLBENZENE	9.27	35	153	0.69	198
N-UNDECANE	20	75	328	1.47	424
O-ETHYLTOLUENE	10	40	173	0.78	224
OXIDES OF NITROGEN	195,083	738,950	3,220,293	14,498	4,168,823
PARTICULATE MATTER $\leq 10 \mu\text{m}$	4,363	16,527	72,025	324	93,240
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	4,232	16,032	69,865	315	90,443
PHENANTHRENE	1.13	4.30	19	8.43×10^{-2}	24
PHOSPHORUS	0.56	2.12	9.23	4.15×10^{-2}	12
POLYCHLORINATED DIOXINS AND FURANS	2.57×10^{-5}	9.73×10^{-5}	4.24×10^{-4}	1.91×10^{-6}	5.49×10^{-4}
POLYCYCLIC AROMATIC HYDROCARBONS	4.52	17	75	0.34	96
PROPANE	14	53	232	1.05	301
PROPIONALDEHYDE	88	335	1,459	6.57	1,889
PROPYLENE	197	748	3,259	15	4,219
PYRENE	1.27×10^{-2}	4.79×10^{-2}	0.21	9.40×10^{-4}	0.27
SELENIUM & COMPOUNDS	2.27×10^{-2}	8.61×10^{-2}	0.38	1.69×10^{-3}	0.49
STYRENE (ETHENYLBENZENE)	4.45	17	73	0.33	95
SULFUR DIOXIDE	467	1,769	7,707	35	9,978
T-BUTYLBENZENE	0.46	1.73	7.53	3.39×10^{-2}	9.75
TIN & COMPOUNDS	0.22	0.84	3.68	1.66×10^{-2}	4.76
TOLUENE	112	424	1,848	8.32	2,393
TOTAL SUSPENDED PARTICULATE	4,545	17,216	75,026	338	97,125
TOTAL VOLATILE ORGANIC COMPOUNDS	7,482	28,340	123,502	556	159,879
TRANS-2-BUTENE	15	56	245	1.10	317
TRANS-2-PENTENE	3.04	12	50	0.23	65
VANADIUM & COMPOUNDS	6.82×10^{-2}	0.26	1.13	5.07×10^{-3}	1.46
ZINC & COMPOUNDS	1.82	6.89	30	0.14	39
Evaporative					
1,2,4-TRIMETHYLBENZENE	1.23	4.53	17	8.46×10^{-2}	23
1,4-PENTADIENE	4.10	15	56	0.28	75
1-BUTENE	19	69	256	1.30	346
1-PENTENE	23	83	306	1.55	414
2,2,3-TRIMETHYLHEXANE	0.41	1.51	5.57	2.82×10^{-2}	7.52
2,2,3-TRIMETHYLBUTANE	0.82	3.02	11	5.64×10^{-2}	15
2,2,4-TRIMETHYLPENTANE	20	74	273	1.38	368
2,2-DIMETHYLBUTANE	6.15	23	84	0.42	113
2,2-DIMETHYLHEXANE	0.82	3.02	11	5.64×10^{-2}	15
2,2-DIMETHYLPENTANE	2.05	7.55	28	0.14	38
2,3,3-TRIMETHYLPENTANE	2.05	7.55	28	0.14	38
2,3,4-TRIMETHYLPENTANE	2.05	7.55	28	0.14	38
2,3-DIMETHYLBUTANE	33	122	451	2.28	609

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2,3-DIMETHYLHEXANE	3.28	12	45	0.23	60
2,3-DIMETHYLPENTANE	7.39	27	100	0.51	135
2,4-DIMETHYLHEXANE	5.74	21	78	0.39	105
2,4-DIMETHYLPENTANE	6.56	24	89	0.45	120
2,5-DIMETHYLHEXANE	2.87	11	39	0.20	53
2-METHYL-1-BUTENE	46	171	629	3.19	850
2-METHYL-2-BUTENE	182	669	2,468	12	3,331
2-METHYLHEPTANE	6.15	23	84	0.42	113
2-METHYLHEXANE	21	77	284	1.44	383
2-METHYLNONANE	0.41	1.51	5.57	2.82×10^{-2}	7.52
2-METHYLOCTANE	0.41	1.51	5.57	2.82×10^{-2}	7.52
2-METHYLPENTANE	196	722	2,663	13	3,594
2-METHYLPROPANE; ISOBUTANE	125	461	1,699	8.60	2,293
3,3-DIMETHYLPENTANE	2.46	9.06	33	0.17	45
3-ETHYLPENTANE	4.10	15	56	0.28	75
3-METHYL-1-BUTENE	1.23	4.53	17	8.46×10^{-2}	23
3-METHYLHEPTANE	5.74	21	78	0.39	105
3-METHYLHEXANE	26	95	351	1.78	474
3-METHYLOCTANE	0.82	3.02	11	5.64×10^{-2}	15
3-METHYLPENTANE	96	353	1,303	6.60	1,759
4-METHYLHEPTANE	3.28	12	45	0.23	60
4-METHYLOCTANE	0.41	1.51	5.57	2.82×10^{-2}	7.52
BENZENE	32	118	434	2.20	586
CIS-1,3-DIMETHYLCYCLOPENTANE	9.03	33	123	0.62	165
CIS-1,CIS-2,4- TRIMETHYLCYCLOPENTANE	5.74	21	78	0.39	105
CIS-1-2-DIMETHYLCYCLOPENTANE	5.74	21	78	0.39	105
CIS-2-BUTENE	12	45	167	0.85	226
CIS-2-PENTENE	66	245	902	4.57	1,218
CYCLOHEXANE	2.05	7.55	28	0.14	38
CYCLOPENTENE	1.23	4.53	17	8.46×10^{-2}	23
ETHYLBENZENE	4.10	15	56	0.28	75
ETHYLCYCLOPENTANE	1.23	4.53	17	8.46×10^{-2}	23
ISOMERS OF PENTANE	2,033	7,482	27,602	140	37,256
ISOMERS OF XYLENE	23	83	306	1.55	414
METHANE	2.65	9.76	36	0.18	49
METHYLCYCLOPENTANE	12	44	162	0.82	218
M-ETHYLTOLUENE	2.46	9.06	33	0.17	45
N-BUTANE	547	2,013	7,425	38	10,023
N-DECANE	0.41	1.51	5.57	2.82×10^{-2}	7.52
N-HEPTANE	16	59	217	1.10	293
N-HEXANE	9.03	33	123	0.62	165
N-NONANE	0.41	1.51	5.57	2.82×10^{-2}	7.52
N-PROPYLBENZENE	0.82	3.02	11	5.64×10^{-2}	15

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
P-ETHYLTOLUENE	1.23	4.53	17	8.46×10^{-2}	23
TOLUENE	78	287	1,058	5.36	1,429
TOTAL VOLATILE ORGANIC COMPOUNDS	4,103	15,099	55,705	282	75,189
TRANS 1-METHYL-4-ETHYLCYCLOHEXANE	0.41	1.51	5.57	2.82×10^{-2}	7.52
TRANS-1,2-CIS-4-TRIMETHYLCYCLOPENTANE	1.23	4.53	17	8.46×10^{-2}	23
TRANS-1,3-DIMETHYLCYCLOPENTANE	2.87	11	39	0.20	53
TRANS-1,CIS-2,3-TRIMETHYLCYCLOPENTANE	1.64	6.04	22	0.11	30
TRANS-1-2-DIMETHYLCYCLOPENTANE	2.05	7.55	28	0.14	38
TRANS-2-BUTENE	116	427	1,576	7.98	2,128
TRANS-2-ETHYLMETHYLCYCLOPENTANE	1.23	4.53	17	8.46×10^{-2}	23
TRANS-2-PENTENE	121	444	1,638	8.29	2,211

Table A3: Commercial off-road vehicles and equipment emissions by source type

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Petrol					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	1.68×10^{-3}	1.56	0.38	7.84×10^{-5}	1.93
(2-METHYLPROPYL)BENZENE	1.12×10^{-3}	1.04	0.25	5.23×10^{-5}	1.29
1,2,3-TRIMETHYLBENZENE	2.40×10^{-2}	22	5.40	1.12×10^{-3}	28
1,2,4-TRIMETHYLBENZENE	0.15	141	34	7.11×10^{-3}	175
1,2-DIETHYLBENZENE (ORTHO)	6.71×10^{-3}	6.22	1.51	3.14×10^{-4}	7.73
1,2-PROPADIENE	4.53×10^{-2}	42	10	2.12×10^{-3}	52
1,3,5-TRIMETHYLBENZENE	4.36×10^{-2}	40	9.79	2.04×10^{-3}	50
1,3-BUTADIENE	5.21×10^{-2}	48	12	2.44×10^{-3}	60
1-BUTENE	4.30×10^{-2}	40	9.67	2.01×10^{-3}	50
1-PENTENE	1.17×10^{-2}	11	2.64	5.49×10^{-4}	14
2,2,4-TRIMETHYLPENTANE	8.06×10^{-2}	75	18	3.77×10^{-3}	93
2,2-DIMETHYLBUTANE	1.79×10^{-2}	17	4.02	8.36×10^{-4}	21
2,3,4-TRIMETHYLPENTANE	1.96×10^{-2}	18	4.39	9.15×10^{-4}	23
2,3-DIMETHYL-1-BUTENE	1.06×10^{-2}	9.85	2.39	4.97×10^{-4}	12
2,3-DIMETHYLHEXANE	6.15×10^{-3}	5.70	1.38	2.87×10^{-4}	7.09
2,3-DIMETHYLPENTANE	1.79×10^{-2}	17	4.02	8.36×10^{-4}	21
2,4-DIMETHYLHEXANE	1.40×10^{-2}	13	3.14	6.53×10^{-4}	16
2,4-DIMETHYLPENTANE	1.57×10^{-2}	15	3.52	7.32×10^{-4}	18
2-METHYL-BUTANE	0.13	124	30	6.27×10^{-3}	155
2-METHYLHEPTANE	1.79×10^{-2}	17	4.02	8.36×10^{-4}	21
2-METHYLHEXANE	3.91×10^{-2}	36	8.79	1.83×10^{-3}	45
2-METHYLPENTANE	7.88×10^{-2}	73	18	3.68×10^{-3}	91
2-METHYLPROPANE; ISOBUTANE	1.40×10^{-2}	13	3.14	6.53×10^{-4}	16
2-METHYLPROPENE (ISOBUTENE)	6.15×10^{-2}	57	14	2.87×10^{-3}	71
3-METHYLHEXANE	4.19×10^{-2}	39	9.42	1.96×10^{-3}	48
3-METHYLPENTANE	4.92×10^{-2}	46	11	2.30×10^{-3}	57
ACENAPHTHENE	8.16×10^{-6}	7.56×10^{-3}	1.83×10^{-3}	3.81×10^{-7}	9.41×10^{-3}
ACENAPHTHYLENE	4.60×10^{-5}	4.27×10^{-2}	1.03×10^{-2}	2.15×10^{-6}	5.31×10^{-2}
ACETALDEHYDE	2.24×10^{-2}	21	5.04	1.05×10^{-3}	26
ACETONE	1.90×10^{-2}	18	4.27	8.88×10^{-4}	22
ACETYLENE	0.42	391	95	1.97×10^{-2}	487
ACROLEIN (2-PROPENAL)	3.83×10^{-3}	3.55	0.86	1.79×10^{-4}	4.42
ALKENE KETONE	1.68×10^{-3}	1.56	0.38	7.84×10^{-5}	1.93
AMMONIA (TOTAL)	1.45×10^{-3}	1.35	0.33	6.78×10^{-5}	1.67
ANTHRACENE	9.50×10^{-6}	8.81×10^{-3}	2.13×10^{-3}	4.44×10^{-7}	1.10×10^{-2}
BENZALDEHYDE	5.03×10^{-3}	4.67	1.13	2.35×10^{-4}	5.80
BENZENE	0.29	266	64	1.34×10^{-2}	331
BENZO(A)ANTHRACENE	1.12×10^{-6}	1.04×10^{-3}	2.51×10^{-4}	5.22×10^{-8}	1.29×10^{-3}
BENZO(A)PYRENE	1.12×10^{-6}	1.04×10^{-3}	2.51×10^{-4}	5.22×10^{-8}	1.29×10^{-3}
BENZO(B)FLUORANTHENE	1.34×10^{-6}	1.24×10^{-3}	3.01×10^{-4}	6.27×10^{-8}	1.55×10^{-3}

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(G,H,I)PERYLENE	2.91×10^{-6}	2.69×10^{-3}	6.53×10^{-4}	1.36×10^{-7}	3.35×10^{-3}
BENZO(K)FLUORANTHENE	1.34×10^{-6}	1.24×10^{-3}	3.01×10^{-4}	6.27×10^{-8}	1.55×10^{-3}
B-METHYLSTYRENE	8.94×10^{-3}	8.29	2.01	4.18×10^{-4}	10
BROMINE AND COMPOUNDS	5.76×10^{-6}	5.34×10^{-3}	1.29×10^{-3}	2.69×10^{-7}	6.64×10^{-3}
BUTYLBENZENE ISOMERS	2.01×10^{-2}	19	4.52	9.41×10^{-4}	23
BUTYRALDEHYDE	5.59×10^{-4}	0.52	0.13	2.61×10^{-5}	0.64
C10 MONOSUBSTITUTED BENZENES	1.34×10^{-2}	12	3.01	6.27×10^{-4}	15
C6 ALDEHYDES	6.71×10^{-3}	6.22	1.51	3.14×10^{-4}	7.73
C9 MONOSUBSTITUTED BENZENES	5.14×10^{-2}	48	12	2.40×10^{-3}	59
CARBON DIOXIDE	114	105,840	25,637	5.34	131,596
CARBON MONOXIDE	21	19,569	4,740	0.99	24,331
CHLORINE	8.06×10^{-4}	0.75	0.18	3.77×10^{-5}	0.93
CHROMIUM (III) COMPOUNDS	9.21×10^{-7}	8.54×10^{-4}	2.07×10^{-4}	4.30×10^{-8}	1.06×10^{-3}
CHROMIUM (VI) COMPOUNDS	4.74×10^{-7}	4.40×10^{-4}	1.07×10^{-4}	2.22×10^{-8}	5.47×10^{-4}
CHRYSENE	1.12×10^{-6}	1.04×10^{-3}	2.51×10^{-4}	5.22×10^{-8}	1.29×10^{-3}
CIS-2-BUTENE	7.83×10^{-3}	7.26	1.76	3.66×10^{-4}	9.02
CIS-2-PENTENE	1.40×10^{-2}	13	3.14	6.53×10^{-4}	16
COBALT & COMPOUNDS	5.76×10^{-6}	5.34×10^{-3}	1.29×10^{-3}	2.69×10^{-7}	6.64×10^{-3}
COPPER & COMPOUNDS	5.76×10^{-6}	5.34×10^{-3}	1.29×10^{-3}	2.69×10^{-7}	6.64×10^{-3}
CUMENE (1-METHYLETHYLBENZENE)	3.91×10^{-3}	3.63	0.88	1.83×10^{-4}	4.51
CYCLOHEXANE	2.24×10^{-3}	2.07	0.50	1.05×10^{-4}	2.58
CYCLOHEXANONE	1.12×10^{-3}	1.04	0.25	5.23×10^{-5}	1.29
CYCLOPENTANE	1.06×10^{-2}	9.85	2.39	4.97×10^{-4}	12
DIETHYLBENZENES	1.12×10^{-2}	10	2.51	5.23×10^{-4}	13
ETHANE	4.64×10^{-2}	43	10	2.17×10^{-3}	53
ETHYL ALCOHOL	1.12×10^{-3}	1.04	0.25	5.23×10^{-5}	1.29
ETHYLBENZENE	0.11	101	24	5.07×10^{-3}	125
ETHYLENE	0.40	372	90	1.88×10^{-2}	463
ETHYLHEXANE	1.79×10^{-2}	17	4.02	8.36×10^{-4}	21
FLUORANTHENE	1.02×10^{-5}	9.43×10^{-3}	2.28×10^{-3}	4.75×10^{-7}	1.17×10^{-2}
FLUORENE	1.69×10^{-5}	1.56×10^{-2}	3.79×10^{-3}	7.89×10^{-7}	1.95×10^{-2}
FORMALDEHYDE	9.38×10^{-2}	87	21	4.39×10^{-3}	108
INDAN	1.57×10^{-2}	15	3.52	7.32×10^{-4}	18
INDENO(1,2,3-CD)PYRENE	8.94×10^{-7}	8.29×10^{-4}	2.01×10^{-4}	4.18×10^{-8}	1.03×10^{-3}
ISOMERS OF XYLENE	0.37	344	83	1.73×10^{-2}	428
LEAD & COMPOUNDS	2.48×10^{-4}	0.23	5.58×10^{-2}	1.16×10^{-5}	0.29
MANGANESE & COMPOUNDS	4.67×10^{-7}	4.33×10^{-4}	1.05×10^{-4}	2.18×10^{-8}	5.38×10^{-4}
METHANE	0.11	99	24	5.01×10^{-3}	124
METHYL ALCOHOL	7.83×10^{-3}	7.26	1.76	3.66×10^{-4}	9.02
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	3.35×10^{-3}	3.11	0.75	1.57×10^{-4}	3.87
METHYL N-BUTYL KETONE	1.12×10^{-2}	10	2.51	5.23×10^{-4}	13
METHYLCYCLOHEXANE	2.12×10^{-2}	20	4.77	9.93×10^{-4}	24
METHYLCYCLOPENTANE	6.09×10^{-2}	57	14	2.85×10^{-3}	70

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
M-ETHYLTOLUENE	7.99×10^{-2}	74	18	3.74×10^{-3}	92
NAPTHALENE	1.01×10^{-3}	0.94	0.23	4.74×10^{-5}	1.17
N-BUTANE	3.41×10^{-2}	32	7.66	1.59×10^{-3}	39
N-DECANE	1.23×10^{-2}	11	2.76	5.75×10^{-4}	14
N-HEPTANE	2.91×10^{-2}	27	6.53	1.36×10^{-3}	34
N-HEXANE	5.43×10^{-2}	50	12	2.54×10^{-3}	63
NICKEL & COMPOUNDS	1.02×10^{-6}	9.42×10^{-4}	2.28×10^{-4}	4.75×10^{-8}	1.17×10^{-3}
NITRIC OXIDE	0.98	913	221	4.60×10^{-2}	1,135
NITROGEN DIOXIDE	7.95×10^{-2}	74	18	3.71×10^{-3}	92
NITROUS OXIDE	2.88×10^{-3}	2.68	0.65	1.35×10^{-4}	3.33
N-NONANE	2.29×10^{-2}	21	5.15	1.07×10^{-3}	26
N-OCTANE	1.79×10^{-2}	17	4.02	8.36×10^{-4}	21
N-PENTANE	5.76×10^{-2}	53	13	2.69×10^{-3}	66
N-PROPYLBENZENE	1.96×10^{-2}	18	4.39	9.15×10^{-4}	23
N-UNDECANE	1.12×10^{-2}	10	2.51	5.23×10^{-4}	13
O-ETHYLTOLUENE	3.58×10^{-2}	33	8.04	1.67×10^{-3}	41
OXIDES OF NITROGEN	1.59	1,474	357	7.43×10^{-2}	1,832
PARTICULATE MATTER $\leq 10 \mu\text{m}$	1.12×10^{-2}	10	2.51	5.22×10^{-4}	13
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	1.03×10^{-2}	9.53	2.31	4.81×10^{-4}	12
PHENANTHRENE	2.84×10^{-5}	2.63×10^{-2}	6.38×10^{-3}	1.33×10^{-6}	3.27×10^{-2}
PHOSPHORUS	6.45×10^{-5}	5.98×10^{-2}	1.45×10^{-2}	3.02×10^{-6}	7.44×10^{-2}
POLYCHLORINATED DIOXINS AND FURANS	1.63×10^{-13}	1.52×10^{-10}	3.67×10^{-11}	7.64×10^{-15}	1.88×10^{-10}
POLYCYCLIC AROMATIC HYDROCARBONS	1.16×10^{-3}	1.07	0.26	5.41×10^{-5}	1.33
PROPANE	3.86×10^{-2}	36	8.66	1.80×10^{-3}	44
PROPIONALDEHYDE	1.03×10^{-2}	9.54	2.31	4.81×10^{-4}	12
PROPYLENE	0.19	173	42	8.70×10^{-3}	215
PYRENE	1.39×10^{-5}	1.28×10^{-2}	3.11×10^{-3}	6.48×10^{-7}	1.60×10^{-2}
STYRENE (ETHENYLBENZENE)	4.15×10^{-3}	3.85	0.93	1.94×10^{-4}	4.79
SULFUR DIOXIDE	9.85×10^{-3}	9.13	2.21	4.60×10^{-4}	11
TOLUENE	0.39	365	88	1.84×10^{-2}	453
TOTAL SUSPENDED PARTICULATE	1.15×10^{-2}	11	2.59	5.39×10^{-4}	13
TOTAL VOLATILE ORGANIC COMPOUNDS	5.47	5,075	1,229	0.26	6,310
TRANS-2-BUTENE	1.12×10^{-2}	10	2.51	5.23×10^{-4}	13
TRANS-2-PENTENE	1.90×10^{-2}	18	4.27	8.88×10^{-4}	22
ZINC & COMPOUNDS	5.76×10^{-6}	5.34×10^{-3}	1.29×10^{-3}	2.69×10^{-7}	6.64×10^{-3}
Diesel					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	0.62	3.48	4.17	0.12	8.39
(2-METHYLPROPYL)BENZENE	1.53	8.59	10	0.30	21
1,2,3-TRIMETHYLBENZENE	1.46	8.18	9.81	0.29	20
1,2,4-TRIMETHYLBENZENE	6.45	36	43	1.28	87

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1,2-DIETHYLBENZENE (ORTHO)	1.05	5.86	7.03	0.21	14
1,2-PROPADIENE	5.67	32	38	1.13	77
1,3,5-TRIMETHYLBENZENE	2.36	13	16	0.47	32
1,3-BUTADIENE	2.13	12	14	0.42	29
1-BUTENE	8.10	45	54	1.61	110
1-PENTENE	3.94	22	26	0.78	53
2,2,4-TRIMETHYLPENTANE	0.82	4.61	5.53	0.16	11
2,2-DIMETHYLBUTANE	0.74	4.16	4.99	0.15	10
2,3,4-TRIMETHYLPENTANE	0.18	1.02	1.23	3.62×10^{-2}	2.47
2,3-DIMETHYL-1-BUTENE	0.34	1.91	2.29	6.76×10^{-2}	4.61
2,3-DIMETHYLHEXANE	0.13	0.75	0.90	2.66×10^{-2}	1.81
2,3-DIMETHYLPENTANE	0.89	4.98	5.97	0.18	12
2,4-DIMETHYLHEXANE	0.44	2.45	2.94	8.70×10^{-2}	5.92
2,4-DIMETHYLPENTANE	0.23	1.30	1.55	4.59×10^{-2}	3.13
2-METHYL-BUTANE	7.32	41	49	1.45	99
2-METHYLHEPTANE	0.69	3.89	4.66	0.14	9.38
2-METHYLHEXANE	1.40	7.84	9.40	0.28	19
2-METHYLPENTANE	4.77	27	32	0.95	64
2-METHYLPROPANE; ISOBUTANE	15	83	100	2.95	201
2-METHYLPROPENE (ISOBUTENE)	11	63	75	2.23	152
3,3-DIMETHYL-1-BUTENE	34	192	231	6.81	464
3-METHYLHEXANE	4.23	24	28	0.84	57
3-METHYLPENTANE	1.40	7.84	9.40	0.28	19
ACENAPHTHENE	7.77×10^{-2}	0.44	0.52	1.54×10^{-2}	1.05
ACENAPHTHYLENE	6.53×10^{-2}	0.37	0.44	1.30×10^{-2}	0.88
ACETALDEHYDE	61	340	408	12	821
ACETONE	91	512	614	18	1,235
ACETYLENE	52	290	348	10	700
ACROLEIN (2-PROPENAL)	3.47	19	23	0.69	47
ALKENE KETONE	21	119	143	4.23	288
AMMONIA (TOTAL)	5.07	28	34	1.01	69
ANTHRACENE	3.34×10^{-4}	1.87×10^{-3}	2.25×10^{-3}	6.64×10^{-5}	4.52×10^{-3}
ANTIMONY & COMPOUNDS	0.11	0.63	0.76	2.24×10^{-2}	1.52
ARSENIC & COMPOUNDS	3.24×10^{-3}	1.82×10^{-2}	2.18×10^{-2}	6.43×10^{-4}	4.38×10^{-2}
BENZALDEHYDE	8.50	48	57	1.69	115
BENZENE	23	130	156	4.62	315
BENZO(A)ANTHRACENE	5.52×10^{-3}	3.09×10^{-2}	3.71×10^{-2}	1.10×10^{-3}	7.47×10^{-2}
BENZO(A)PYRENE	2.72×10^{-4}	1.52×10^{-3}	1.83×10^{-3}	5.40×10^{-5}	3.68×10^{-3}
BENZO(B)FLUORANTHENE	3.81×10^{-4}	2.13×10^{-3}	2.56×10^{-3}	7.57×10^{-5}	5.15×10^{-3}
BENZO(G,H,I)PERYLENE	1.48×10^{-4}	8.28×10^{-4}	9.93×10^{-4}	2.93×10^{-5}	2.0×10^{-3}
BENZO(K)FLUORANTHENE	2.72×10^{-4}	1.52×10^{-3}	1.83×10^{-3}	5.40×10^{-5}	3.68×10^{-3}
B-METHYLSTYRENE	0.57	3.20	3.84	0.11	7.73
BROMINE AND COMPOUNDS	8.91×10^{-3}	4.99×10^{-2}	5.99×10^{-2}	1.77×10^{-3}	0.12
BUTYLBENZENE ISOMERS	1.54	8.66	10	0.31	21

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BUTYRALDEHYDE	23	127	153	4.51	307
C10 MONOSUBSTITUTED BENZENES	0.96	5.39	6.46	0.19	13
C5 ALDEHYDE	1.34	7.50	9.00	0.27	18
C6 ALDEHYDES	46	259	311	9.18	625
C9 MONOSUBSTITUTED BENZENES	6.04	34	41	1.20	82
CADMIUM & COMPOUNDS	5.42×10^{-2}	0.30	0.36	1.08×10^{-2}	0.73
CARBON DIOXIDE	623,976	3,497,548	4,195,894	123,951	8,441,369
CARBON MONOXIDE	5,855	32,817	39,369	1,163	79,203
CHLORINE	0.22	1.24	1.49	4.41×10^{-2}	3.00
CHROMIUM (III) COMPOUNDS	2.09×10^{-5}	1.17×10^{-4}	1.41×10^{-4}	4.15×10^{-6}	2.83×10^{-4}
CHROMIUM (VI) COMPOUNDS	1.08×10^{-5}	6.04×10^{-5}	7.24×10^{-5}	2.14×10^{-6}	1.46×10^{-4}
CHRYSENE	1.48×10^{-3}	8.28×10^{-3}	9.93×10^{-3}	2.93×10^{-4}	2.0×10^{-2}
CIS-2-BUTENE	1.14	6.41	7.69	0.23	15
CIS-2-PENTENE	0.36	2.05	2.45	7.25×10^{-2}	4.94
COBALT & COMPOUNDS	4.86×10^{-3}	2.72×10^{-2}	3.27×10^{-2}	9.65×10^{-4}	6.57×10^{-2}
COPPER & COMPOUNDS	2.43×10^{-2}	0.14	0.16	4.82×10^{-3}	0.33
CUMENE (1-METHYLETHYLBENZENE)	0.18	1.02	1.23	3.62×10^{-2}	2.47
CYCLOHEXANE	0.32	1.77	2.13	6.28×10^{-2}	4.28
CYCLOHEXANONE	1.30	7.29	8.75	0.26	18
CYCLOPENTANE	0.15	0.82	0.98	2.90×10^{-2}	1.97
DIBENZO(A,H)ANTHRACENE	2.25×10^{-6}	1.26×10^{-5}	1.52×10^{-5}	4.48×10^{-7}	3.05×10^{-5}
DIETHYLBENZENES	1.64	9.20	11	0.33	22
ETHANE	6.87	39	46	1.36	93
ETHYL ALCOHOL	0.11	0.61	0.74	2.17×10^{-2}	1.48
ETHYLBENZENE	3.55	20	24	0.70	48
ETHYLENE	175	980	1,176	35	2,365
ETHYLHEXANE	0.74	4.16	4.99	0.15	10
FLUORANTHENE	1.32×10^{-2}	7.41×10^{-2}	8.88×10^{-2}	2.62×10^{-3}	0.18
FLUORENE	7.77×10^{-2}	0.44	0.52	1.54×10^{-2}	1.05
FORMALDEHYDE	135	757	909	27	1,828
INDAN	2.29	13	15	0.45	31
INDENO(1,2,3-CD)PYRENE	6.14×10^{-5}	3.44×10^{-4}	4.13×10^{-4}	1.22×10^{-5}	8.31×10^{-4}
ISOMERS OF XYLENE	12	68	81	2.40	164
LEAD & COMPOUNDS	2.43×10^{-2}	0.14	0.16	4.82×10^{-3}	0.33
MANGANESE & COMPOUNDS	1.45×10^{-3}	8.11×10^{-3}	9.73×10^{-3}	2.87×10^{-4}	1.96×10^{-2}
MERCURY & COMPOUNDS	2.10×10^{-2}	0.12	0.14	4.18×10^{-3}	0.28
METHANE	69	386	464	14	932
METHYL ALCOHOL	0.36	2.05	2.45	7.25×10^{-2}	4.94
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	18	101	121	3.57	243
METHYL N-BUTYL KETONE	11	61	74	2.17	148
METHYLCYCLOHEXANE	0.83	4.64	5.56	0.16	11
METHYLCYCLOPENTANE	1.81	10	12	0.36	25
M-ETHYLTOLUENE	3.00	17	20	0.60	41

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
MOLYBDENUM	9.72×10^{-3}	5.45×10^{-2}	6.53×10^{-2}	1.93×10^{-3}	0.13
NAPHTHALENE	0.36	2.00	2.40	7.10×10^{-2}	4.84
N-BUTANE	1.26	7.09	8.51	0.25	17
N-DECANE	6.43	36	43	1.28	87
N-HEPTANE	0.83	4.64	5.56	0.16	11
N-HEXANE	1.82	10	12	0.36	25
NICKEL & COMPOUNDS	2.15×10^{-3}	1.20×10^{-2}	1.45×10^{-2}	4.27×10^{-4}	2.91×10^{-2}
NITRIC OXIDE	5,599	31,385	37,651	1,112	75,747
NITROGEN DIOXIDE	452	2,533	3,039	90	6,113
NITROUS OXIDE	16	89	107	3.15	215
N-NONANE	2.80	16	19	0.56	38
N-OCTANE	1.70	9.54	11	0.34	23
N-PENTANE	2.13	12	14	0.42	29
N-PROPYLBENZENE	1.48	8.32	9.98	0.29	20
N-UNDECANE	3.17	18	21	0.63	43
O-ETHYLTOLUENE	1.68	9.41	11	0.33	23
OXIDES OF NITROGEN	9,037	50,656	60,770	1,795	122,258
PARTICULATE MATTER $\leq 10 \mu\text{m}$	777	4,356	5,226	154	10,514
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	754	4,226	5,070	150	10,199
PHENANTHRENE	0.20	1.13	1.36	4.01×10^{-2}	2.73
PHOSPHORUS	9.96×10^{-2}	0.56	0.67	1.98×10^{-2}	1.35
POLYCHLORINATED DIOXINS AND FURANS	1.06×10^{-6}	5.92×10^{-6}	7.11×10^{-6}	2.10×10^{-7}	1.43×10^{-5}
POLYCYCLIC AROMATIC HYDROCARBONS	0.80	4.51	5.41	0.16	11
PROPANE	2.25	13	15	0.45	30
PROPIONALDEHYDE	14	76	91	2.68	183
PROPYLENE	32	177	212	6.27	427
PYRENE	2.25×10^{-3}	1.26×10^{-2}	1.52×10^{-2}	4.48×10^{-4}	3.05×10^{-2}
SELENIUM & COMPOUNDS	4.05×10^{-3}	2.27×10^{-2}	2.72×10^{-2}	8.04×10^{-4}	5.48×10^{-2}
STYRENE (ETHENYLBENZENE)	0.68	3.81	4.57	0.14	9.20
SULFUR DIOXIDE	19	107	129	3.80	259
T-BUTYLBENZENE	7.30×10^{-2}	0.41	0.49	1.45×10^{-2}	0.99
TIN & COMPOUNDS	3.97×10^{-2}	0.22	0.27	7.88×10^{-3}	0.54
TOLUENE	17	96	115	3.40	232
TOTAL SUSPENDED PARTICULATE	810	4,538	5,444	161	10,953
TOTAL VOLATILE ORGANIC COMPOUNDS	1,144	6,411	7,691	227	15,473
TRANS-2-BUTENE	2.37	13	16	0.47	32
TRANS-2-PENTENE	0.49	2.73	3.27	9.66×10^{-2}	6.58
VANADIUM & COMPOUNDS	1.21×10^{-2}	6.81×10^{-2}	8.17×10^{-2}	2.41×10^{-3}	0.16
ZINC & COMPOUNDS	0.32	1.82	2.18	6.43×10^{-2}	4.38
Gas					
1,1,2,2-TETRACHLOROETHANE	3.13×10^{-2}	0.13	0.24	5.57×10^{-4}	0.40

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1,1,2-TRICHLOROETHANE	2.49×10^{-2}	0.10	0.19	4.43×10^{-4}	0.32
1,1-DICHLOROETHANE	1.85×10^{-2}	7.45×10^{-2}	0.14	3.29×10^{-4}	0.24
1,2,3-TRIMETHYLBENZENE	3.60×10^{-2}	0.15	0.28	6.41×10^{-4}	0.46
1,2,4-TRIMETHYLBENZENE	2.24×10^{-2}	9.02×10^{-2}	0.17	3.98×10^{-4}	0.29
1,2-DICHLOROETHANE	1.85×10^{-2}	7.45×10^{-2}	0.14	3.29×10^{-4}	0.24
1,2-DICHLOROPROPANE	2.11×10^{-2}	8.49×10^{-2}	0.16	3.75×10^{-4}	0.27
1,3,5-TRIMETHYLBENZENE	5.29×10^{-2}	0.21	0.41	9.42×10^{-4}	0.68
1,3-BUTADIENE	0.42	1.68	3.23	7.44×10^{-3}	5.34
1,3-DICHLOROPROPENE	2.07×10^{-2}	8.33×10^{-2}	0.16	3.68×10^{-4}	0.26
1-BUTENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
1-HEPTENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
1-NONENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
1-OCTENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
1-PENTENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
2,2,4-TRIMETHYLPENTANE	0.39	1.58	3.03	6.97×10^{-3}	5.00
2,2-DIMETHYLBUTANE	0.11	0.43	0.83	1.91×10^{-3}	1.37
2,4-DIMETHYLPENTANE	0.11	0.43	0.83	1.91×10^{-3}	1.37
2-METHYL-1-PENTENE	0.21	0.86	1.66	3.81×10^{-3}	2.74
2-METHYL-2-BUTENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
2-METHYLNAPHTHALENE	3.79×10^{-2}	0.15	0.29	6.75×10^{-4}	0.48
2-METHYLPROPANE; ISOBUTANE	4.61	19	36	8.20×10^{-2}	59
2-METHYLPROPENE (ISOBUTENE)	0.21	0.86	1.66	3.81×10^{-3}	2.74
3-METHYLHEPTANE	0.21	0.86	1.66	3.81×10^{-3}	2.74
3-METHYLHEXANE	0.11	0.43	0.83	1.91×10^{-3}	1.37
3-METHYLPENTANE	0.21	0.86	1.66	3.81×10^{-3}	2.74
ACENAPHTHENE	1.43×10^{-3}	5.76×10^{-3}	1.10×10^{-2}	2.54×10^{-5}	1.82×10^{-2}
ACENAPHTHYLENE	6.32×10^{-3}	2.55×10^{-2}	4.88×10^{-2}	1.12×10^{-4}	8.07×10^{-2}
ACETALDEHYDE	13	53	101	0.23	167
ACETYLENE	3.43	14	27	6.10×10^{-2}	44
ACROLEIN (2-PROPENAL)	8.05	32	62	0.14	103
AMMONIA (TOTAL)	0.67	2.69	5.16	1.19×10^{-2}	8.52
BENZENE	0.69	2.78	5.32	1.23×10^{-2}	8.80
BENZO(A)ANTHRACENE	3.43×10^{-3}	1.38×10^{-2}	2.65×10^{-2}	6.10×10^{-5}	4.38×10^{-2}
BENZO(B)FLUORANTHENE	1.90×10^{-4}	7.64×10^{-4}	1.47×10^{-3}	3.38×10^{-6}	2.42×10^{-3}
BENZO(E)PYRENE	4.74×10^{-4}	1.91×10^{-3}	3.67×10^{-3}	8.44×10^{-6}	6.06×10^{-3}
BENZO(G,H,I)PERYLENE	4.73×10^{-4}	1.91×10^{-3}	3.66×10^{-3}	8.42×10^{-6}	6.04×10^{-3}
BIPHENYL {PHENYL BENZENE}	0.24	0.98	1.87	4.31×10^{-3}	3.10
BROMINE AND COMPOUNDS	6.99×10^{-3}	2.82×10^{-2}	5.40×10^{-2}	1.24×10^{-4}	8.93×10^{-2}
BUTYRALDEHYDE	0.21	0.86	1.66	3.81×10^{-3}	2.74
C10 DIALKYL BENZENES	0.11	0.43	0.83	1.91×10^{-3}	1.37
C10 INTERNAL ALKENES	0.21	0.86	1.66	3.81×10^{-3}	2.74
C9 INTERNAL ALKENES	0.43	1.73	3.31	7.63×10^{-3}	5.48
C9 MONOSUBSTITUTED BENZENES	0.11	0.43	0.83	1.91×10^{-3}	1.37
CADMIUM & COMPOUNDS	7.92×10^{-3}	3.19×10^{-2}	6.12×10^{-2}	1.41×10^{-4}	0.10

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CARBON DIOXIDE	165,665	667,424	1,280,055	2,947	2,116,090
CARBON MONOXIDE	11,938	48,097	92,245	212	152,493
CARBON TETRACHLORIDE	2.87×10^{-2}	0.12	0.22	5.11×10^{-4}	0.37
CHLORINE	0.98	3.94	7.56	1.74×10^{-2}	12
CHLORO BENZENE	2.38×10^{-2}	9.59×10^{-2}	0.18	4.23×10^{-4}	0.30
CHLOROETHANE (ETHYL CHLORIDE)	2.93×10^{-3}	1.18×10^{-2}	2.26×10^{-2}	5.21×10^{-5}	3.74×10^{-2}
CHLOROFORM (TRICHLOROMETHANE)	2.23×10^{-2}	8.99×10^{-2}	0.17	3.97×10^{-4}	0.29
CHROMIUM (III) COMPOUNDS	1.0×10^{-2}	4.04×10^{-2}	7.75×10^{-2}	1.78×10^{-4}	0.13
CHROMIUM (VI) COMPOUNDS	5.16×10^{-3}	2.08×10^{-2}	3.99×10^{-2}	9.19×10^{-5}	6.60×10^{-2}
CHRYSENE	7.92×10^{-4}	3.19×10^{-3}	6.12×10^{-3}	1.41×10^{-5}	1.01×10^{-2}
CIS-2-BUTENE	0.21	0.86	1.66	3.81×10^{-3}	2.74
COBALT & COMPOUNDS	6.99×10^{-3}	2.82×10^{-2}	5.40×10^{-2}	1.24×10^{-4}	8.93×10^{-2}
COPPER & COMPOUNDS	7.91×10^{-2}	0.32	0.61	1.41×10^{-3}	1.01
CYCLOHEXANE	0.11	0.43	0.83	1.91×10^{-3}	1.37
CYCLOPENTANE	0.36	1.43	2.75	6.32×10^{-3}	4.54
DIBROMOETHANE	3.47×10^{-2}	0.14	0.27	6.17×10^{-4}	0.44
DICHLOROMETHANE {METHYLENE CHLORIDE}	3.13×10^{-2}	0.13	0.24	5.57×10^{-4}	0.40
ETHANE	164	663	1,271	2.93	2,101
ETHYLBENZENE	6.22×10^{-2}	0.25	0.48	1.11×10^{-3}	0.79
ETHYLENE	6.76	27	52	0.12	86
FLUORANTHENE	1.27×10^{-3}	5.11×10^{-3}	9.80×10^{-3}	2.26×10^{-5}	1.62×10^{-2}
FLUORENE	6.48×10^{-3}	2.61×10^{-2}	5.01×10^{-2}	1.15×10^{-4}	8.28×10^{-2}
FORMALDEHYDE	83	333	639	1.47	1,056
ISOBUTYRALDEHYDE	0.16	0.64	1.22	2.81×10^{-3}	2.02
ISOMERS OF BUTENE	2.79	11	22	4.96×10^{-2}	36
ISOMERS OF DECANE (C10 PARAFFINS)	0.21	0.86	1.66	3.81×10^{-3}	2.74
ISOMERS OF HEPTANE	0.43	1.73	3.31	7.63×10^{-3}	5.48
ISOMERS OF HEXANE	0.21	0.86	1.66	3.81×10^{-3}	2.74
ISOMERS OF NONANE (C9 PARAFFIN)	0.11	0.43	0.83	1.91×10^{-3}	1.37
ISOMERS OF OCTANE (C8 PARAFFIN)	0.21	0.86	1.66	3.81×10^{-3}	2.74
ISOMERS OF PENTANE	1.39	5.62	11	2.48×10^{-2}	18
ISOMERS OF XYLENE	0.29	1.16	2.23	5.13×10^{-3}	3.68
MANGANESE & COMPOUNDS	9.17×10^{-2}	0.37	0.71	1.63×10^{-3}	1.17
MERCURY & COMPOUNDS	7.58×10^{-3}	3.05×10^{-2}	5.86×10^{-2}	1.35×10^{-4}	9.68×10^{-2}
METHANE	229	924	1,773	4.08	2,930
METHYL ALCOHOL	3.92	16	30	6.97×10^{-2}	50
METHYLCYCLOHEXANE	1.93	7.76	15	3.43×10^{-2}	25
METHYLCYCLOPENTANE	0.43	1.73	3.31	7.63×10^{-3}	5.48
M-ETHYLTOLUENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
NAPHTHALENE	8.50×10^{-2}	0.34	0.66	1.51×10^{-3}	1.09
N-BUTANE	0.85	3.41	6.55	1.51×10^{-2}	11
N-DECANE	0.11	0.43	0.83	1.91×10^{-3}	1.37

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-HEPTANE	0.21	0.86	1.66	3.81×10^{-3}	2.74
N-HEXANE	1.74	7.00	13	3.09×10^{-2}	22
NICKEL & COMPOUNDS	0.13	0.53	1.01	2.33×10^{-3}	1.67
NITRIC OXIDE	1,845	7,433	14,255	33	23,565
NITROGEN DIOXIDE	149	600	1,150	2.65	1,902
NITROUS OXIDE	2.45	9.86	19	4.35×10^{-2}	31
N-NONANE	0.17	0.69	1.33	3.06×10^{-3}	2.20
N-OCTANE	0.55	2.21	4.25	9.78×10^{-3}	7.02
N-PENTANE	4.07	16	31	7.24×10^{-2}	52
O-ETHYLTOLUENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
OXIDES OF NITROGEN	2,978	11,996	23,008	53	38,035
PARTICULATE MATTER $\leq 10 \mu\text{m}$	14	56	108	0.25	179
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	14	56	108	0.25	179
PERCHLOROETHYLENE	3.88×10^{-3}	1.56×10^{-2}	3.0×10^{-2}	6.91×10^{-5}	4.96×10^{-2}
PHENANTHRENE	1.19×10^{-2}	4.79×10^{-2}	9.19×10^{-2}	2.11×10^{-4}	0.15
PHENOL (CARBOLIC ACID)	3.76×10^{-2}	0.15	0.29	6.69×10^{-4}	0.48
POLYCHLORINATED DIOXINS AND FURANS	1.33×10^{-9}	5.36×10^{-9}	1.03×10^{-8}	2.36×10^{-11}	1.70×10^{-8}
POLYCYCLIC AROMATIC HYDROCARBONS	0.40	1.61	3.09	7.11×10^{-3}	5.10
PROPANE	66	264	507	1.17	838
PROPYLENE	18	73	140	0.32	231
PYRENE	1.55×10^{-3}	6.26×10^{-3}	1.20×10^{-2}	2.77×10^{-5}	1.99×10^{-2}
STYRENE (ETHENYLBENZENE)	1.85×10^{-2}	7.45×10^{-2}	0.14	3.29×10^{-4}	0.24
SULFUR DIOXIDE	11	43	83	0.19	137
TOLUENE	0.64	2.57	4.94	1.14×10^{-2}	8.16
TOTAL SUSPENDED PARTICULATE	14	56	108	0.25	179
TOTAL VOLATILE ORGANIC COMPOUNDS	816	3,287	6,304	15	10,421
TRANS-2-BUTENE	1.39	5.62	11	2.48×10^{-2}	18
TRANS-2-PENTENE	0.11	0.43	0.83	1.91×10^{-3}	1.37
VINYL CHLORIDE MONOMER	2.33×10^{-2}	9.40×10^{-2}	0.18	4.15×10^{-4}	0.30
ZINC & COMPOUNDS	6.99×10^{-3}	2.82×10^{-2}	5.40×10^{-2}	1.24×10^{-4}	8.93×10^{-2}

Table A4: Industrial off-road vehicles and equipment emissions by source type

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Petrol					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	1.13	9.20	17	2.85	30
(2-METHYLPROPYL)BENZENE	0.75	6.13	11	1.90	20
1,2,3-TRIMETHYLBENZENE	16	132	239	41	428
1,2,4-TRIMETHYLBENZENE	103	834	1,510	259	2,705
1,2-DIETHYLBENZENE (ORTHO)	4.53	37	67	11	119
1,2-PROPADIENE	31	248	450	77	806
1,3,5-TRIMETHYLBENZENE	29	239	433	74	776
1,3-BUTADIENE	34	278	504	86	903
1-BUTENE	29	236	427	73	766
1-PENTENE	7.92	64	117	20	209
2,2,4-TRIMETHYLPENTANE	53	431	779	134	1,396
2,2-DIMETHYLBUTANE	12	98	178	30	318
2,3,4-TRIMETHYLPENTANE	13	107	194	33	348
2,3-DIMETHYL-1-BUTENE	7.17	58	105	18	189
2,3-DIMETHYLHEXANE	4.15	34	61	10	109
2,3-DIMETHYLPENTANE	12	98	178	30	318
2,4-DIMETHYLHEXANE	9.43	77	139	24	249
2,4-DIMETHYLPENTANE	11	86	155	27	278
2-METHYL-BUTANE	91	736	1,332	228	2,387
2-METHYLHEPTANE	12	98	178	30	318
2-METHYLHEXANE	26	215	389	67	696
2-METHYLPENTANE	53	432	783	134	1,402
2-METHYLPROPANE; ISOBUTANE	9.43	77	139	24	249
2-METHYLPROPENE (ISOBUTENE)	41	337	611	105	1,094
3-METHYLHEXANE	28	230	416	71	746
3-METHYLPENTANE	33	270	488	84	875
ACENAPHTHENE	1.13×10^{-2}	9.18×10^{-2}	0.17	2.85×10^{-2}	0.30
ACENAPHTHYLENE	6.37×10^{-2}	0.52	0.94	0.16	1.68
ACETALDEHYDE	15	120	217	37	389
ACETONE	13	104	189	32	338
ACETYLENE	285	2,315	4,191	718	7,509
ACROLEIN (2-PROPENAL)	2.52	20	37	6.35	66
ALKENE KETONE	1.13	9.20	17	2.85	30
AMMONIA (TOTAL)	2.32	19	34	5.85	61
ANTHRACENE	1.31×10^{-2}	0.11	0.19	3.32×10^{-2}	0.35
BENZALDEHYDE	3.40	28	50	8.56	90
BENZENE	189	1,534	2,777	476	4,976
BENZO(A)ANTHRACENE	1.55×10^{-3}	1.26×10^{-2}	2.28×10^{-2}	3.90×10^{-3}	4.08×10^{-2}
BENZO(A)PYRENE	1.55×10^{-3}	1.26×10^{-2}	2.28×10^{-2}	3.90×10^{-3}	4.08×10^{-2}
BENZO(B)FLUORANTHENE	1.86×10^{-3}	1.51×10^{-2}	2.73×10^{-2}	4.68×10^{-3}	4.89×10^{-2}

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(G,H,I)PERYLENE	4.02×10^{-3}	3.27×10^{-2}	5.92×10^{-2}	1.01×10^{-2}	0.11
BENZO(K)FLUORANTHENE	1.86×10^{-3}	1.51×10^{-2}	2.73×10^{-2}	4.68×10^{-3}	4.89×10^{-2}
B-METHYLSTYRENE	6.04	49	89	15	159
BROMINE AND COMPOUNDS	7.97×10^{-3}	6.48×10^{-2}	0.12	2.01×10^{-2}	0.21
BUTYLBENZENE ISOMERS	14	110	200	34	358
BUTYRALDEHYDE	0.38	3.07	5.55	0.95	9.95
C10 MONOSUBSTITUTED BENZENES	9.05	74	133	23	239
C6 ALDEHYDES	4.53	37	67	11	119
C9 MONOSUBSTITUTED BENZENES	35	282	511	88	915
CARBON DIOXIDE	182,926	1,487,154	2,691,623	461,406	4,823,109
CARBON MONOXIDE	34,568	281,035	508,650	87,194	911,447
CHLORINE	1.12	9.07	16	2.82	29
CHROMIUM (III) COMPOUNDS	1.47×10^{-3}	1.20×10^{-2}	2.16×10^{-2}	3.71×10^{-3}	3.88×10^{-2}
CHROMIUM (VI) COMPOUNDS	7.58×10^{-4}	6.16×10^{-3}	1.12×10^{-2}	1.91×10^{-3}	2.0×10^{-2}
CHRYSENE	1.55×10^{-3}	1.26×10^{-2}	2.28×10^{-2}	3.90×10^{-3}	4.08×10^{-2}
CIS-2-BUTENE	5.28	43	78	13	139
CIS-2-PENTENE	9.43	77	139	24	249
COBALT & COMPOUNDS	7.97×10^{-3}	6.48×10^{-2}	0.12	2.01×10^{-2}	0.21
COPPER & COMPOUNDS	7.97×10^{-3}	6.48×10^{-2}	0.12	2.01×10^{-2}	0.21
CUMENE (1-METHYLETHYLBENZENE)	2.64	21	39	6.66	70
CYCLOHEXANE	1.51	12	22	3.81	40
CYCLOHEXANONE	0.75	6.13	11	1.90	20
CYCLOPENTANE	7.17	58	105	18	189
DIETHYLBENZENES	7.54	61	111	19	199
ETHANE	31	255	461	79	826
ETHYL ALCOHOL	0.75	6.13	11	1.90	20
ETHYLBENZENE	71	580	1,049	180	1,880
ETHYLENE	271	2,202	3,985	683	7,141
ETHYLHEXANE	12	98	178	30	318
FLUORANTHENE	1.41×10^{-2}	0.11	0.21	3.55×10^{-2}	0.37
FLUORENE	2.34×10^{-2}	0.19	0.34	5.89×10^{-2}	0.62
FORMALDEHYDE	62	502	908	156	1,626
INDAN	11	86	155	27	278
INDENO(1,2,3-CD)PYRENE	1.24×10^{-3}	1.01×10^{-2}	1.82×10^{-2}	3.12×10^{-3}	3.26×10^{-2}
ISOMERS OF XYLENE	244	1,983	3,588	615	6,430
LEAD & COMPOUNDS	0.40	3.23	5.84	1.00	10
MANGANESE & COMPOUNDS	7.46×10^{-4}	6.07×10^{-3}	1.10×10^{-2}	1.88×10^{-3}	1.97×10^{-2}
METHANE	159	1,296	2,346	402	4,204
METHYL ALCOHOL	5.28	43	78	13	139
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	2.26	18	33	5.71	60
METHYL N-BUTYL KETONE	7.54	61	111	19	199
METHYLCYCLOHEXANE	14	117	211	36	378

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHYLCYCLOPENTANE	41	334	605	104	1,084
M-ETHYLTOLUENE	54	439	794	136	1,422
NAPHTHALENE	1.40	11	21	3.54	37
N-BUTANE	23	187	339	58	607
N-DECANE	8.30	67	122	21	219
N-HEPTANE	20	159	289	49	517
N-HEXANE	36	290	525	90	941
NICKEL & COMPOUNDS	1.62×10^{-3}	1.32×10^{-2}	2.39×10^{-2}	4.10×10^{-3}	4.28×10^{-2}
NITRIC OXIDE	1,660	13,499	24,433	4,188	43,781
NITROGEN DIOXIDE	134	1,089	1,972	338	3,533
NITROUS OXIDE	4.61	37	68	12	122
N-NONANE	15	126	228	39	408
N-OCTANE	12	98	178	30	318
N-PENTANE	39	316	572	98	1,024
N-PROPYLBENZENE	13	107	194	33	348
N-UNDECANE	7.54	61	111	19	199
O-ETHYLTOLUENE	24	196	355	61	637
OXIDES OF NITROGEN	2,680	21,788	39,435	6,760	70,664
PARTICULATE MATTER $\leq 10 \mu\text{m}$	15	126	228	39	408
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	14	116	209	36	375
PHENANTHRENE	3.93×10^{-2}	0.32	0.58	9.91×10^{-2}	1.04
PHOSPHORUS	0.10	0.84	1.52	0.26	2.72
POLYCHLORINATED DIOXINS AND FURANS	2.61×10^{-10}	2.12×10^{-9}	3.84×10^{-9}	6.59×10^{-10}	6.89×10^{-9}
POLYCYCLIC AROMATIC HYDROCARBONS	1.60	13	24	4.04	42
PROPANE	26	212	383	66	686
PROPIONALDEHYDE	6.77	55	100	17	178
PROPYLENE	126	1,021	1,848	317	3,312
PYRENE	1.92×10^{-2}	0.16	0.28	4.84×10^{-2}	0.51
STYRENE (ETHENYLBENZENE)	2.73	22	40	6.88	72
SULFUR DIOXIDE	16	128	232	40	416
TOLUENE	258	2,101	3,802	652	6,813
TOTAL SUSPENDED PARTICULATE	16	130	235	40	420
TOTAL VOLATILE ORGANIC COMPOUNDS	3,597	29,242	52,926	9,073	94,838
TRANS-2-BUTENE	7.54	61	111	19	199
TRANS-2-PENTENE	13	104	189	32	338
ZINC & COMPOUNDS	7.97×10^{-3}	6.48×10^{-2}	0.12	2.01×10^{-2}	0.21
Diesel					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	66	1,330	108	26	1,530
(2-METHYLPROPYL)BENZENE	162	3,287	268	63	3,780
1,2,3-TRIMETHYLBENZENE	155	3,130	255	60	3,600

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1,2,4-TRIMETHYLBENZENE	683	13,825	1,125	266	15,899
1,2-DIETHYLBENZENE (ORTHO)	111	2,243	183	43	2,580
1,2-PROPADIENE	600	12,155	989	234	13,979
1,3,5-TRIMETHYLBENZENE	250	5,060	412	97	5,820
1,3-BUTADIENE	236	4,779	389	92	5,496
1-BUTENE	858	17,372	1,414	334	19,979
1-PENTENE	417	8,451	688	163	9,719
2,2,4-TRIMETHYLPENTANE	91	1,846	150	36	2,123
2,2-DIMETHYLBUTANE	79	1,591	130	31	1,830
2,3,4-TRIMETHYLPENTANE	19	391	32	7.53	450
2,3-DIMETHYL-1-BUTENE	36	730	59	14	840
2,3-DIMETHYLHEXANE	14	287	23	5.52	330
2,3-DIMETHYLPENTANE	94	1,904	155	37	2,190
2,4-DIMETHYLHEXANE	46	939	76	18	1,080
2,4-DIMETHYLPENTANE	24	496	40	9.53	570
2-METHYL-BUTANE	776	15,703	1,278	302	18,059
2-METHYLHEPTANE	73	1,487	121	29	1,710
2-METHYLHEXANE	148	3,000	244	58	3,450
2-METHYLPENTANE	505	10,225	832	197	11,759
2-METHYLPROPANE; ISOBUTANE	1,575	31,875	2,595	613	36,658
2-METHYLPROPENE (ISOBUTENE)	1,188	24,050	1,958	463	27,658
3,3-DIMETHYL-1-BUTENE	3,634	73,558	5,988	1,415	84,594
3-METHYLHEXANE	448	9,077	739	175	10,439
3-METHYLPENTANE	148	3,000	244	58	3,450
ACENAPHTHENE	8.98	182	15	3.50	209
ACENAPHTHYLENE	7.54	153	12	2.94	176
ACETALDEHYDE	6,731	136,256	11,092	2,621	156,700
ACETONE	9,673	195,815	15,940	3,767	225,195
ACETYLENE	5,482	110,963	9,033	2,135	127,612
ACROLEIN (2-PROPENAL)	384	7,778	633	150	8,945
ALKENE KETONE	2,254	45,621	3,714	878	52,467
AMMONIA (TOTAL)	694	14,056	1,144	270	16,165
ANTHRACENE	3.86×10^{-2}	0.78	6.36×10^{-2}	1.50×10^{-2}	0.90
ANTIMONY & COMPOUNDS	12	253	21	4.86	291
ARSENIC & COMPOUNDS	0.36	7.27	0.59	0.14	8.36
BENZALDEHYDE	901	18,233	1,484	351	20,969
BENZENE	2,580	52,223	4,251	1,005	60,058
BENZO(A)ANTHRACENE	0.64	13	1.05	0.25	15
BENZO(A)PYRENE	3.14×10^{-2}	0.64	5.18×10^{-2}	1.22×10^{-2}	0.73
BENZO(B)FLUORANTHENE	4.40×10^{-2}	0.89	7.25×10^{-2}	1.71×10^{-2}	1.02
BENZO(G,H,I)PERYLENE	1.71×10^{-2}	0.35	2.81×10^{-2}	6.64×10^{-3}	0.40
BENZO(K)FLUORANTHENE	3.14×10^{-2}	0.64	5.18×10^{-2}	1.22×10^{-2}	0.73
B-METHYLSTYRENE	61	1,226	100	24	1,410
BROMINE AND COMPOUNDS	0.99	20	1.63	0.38	23

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BUTYLBENZENE ISOMERS	164	3,313	270	64	3,810
BUTYRALDEHYDE	2,407	48,725	3,966	937	56,036
C10 MONOSUBSTITUTED BENZENES	102	2,061	168	40	2,370
C5 ALDEHYDE	142	2,869	234	55	3,300
C6 ALDEHYDES	4,895	99,094	8,067	1,906	113,962
C9 MONOSUBSTITUTED BENZENES	640	12,964	1,055	249	14,909
CADMIUM & COMPOUNDS	6.02	122	9.92	2.34	140
CARBON DIOXIDE	85,563,287	1,732,048,494	140,994,703	33,318,851	1,991,925,334
CARBON MONOXIDE	736,671	14,912,355	1,213,917	286,864	17,149,807
CHLORINE	25	498	41	9.58	573
CHROMIUM (III) COMPOUNDS	2.86×10^{-3}	5.80×10^{-2}	4.72×10^{-3}	1.12×10^{-3}	6.67×10^{-2}
CHROMIUM (VI) COMPOUNDS	1.48×10^{-3}	2.99×10^{-2}	2.43×10^{-3}	5.75×10^{-4}	3.43×10^{-2}
CHRYSENE	0.17	3.45	0.28	6.64×10^{-2}	3.97
CIS-2-BUTENE	121	2,452	200	47	2,820
CIS-2-PENTENE	39	783	64	15	900
COBALT & COMPOUNDS	0.54	11	0.89	0.21	13
COPPER & COMPOUNDS	2.69	55	4.44	1.05	63
CUMENE (1-METHYLETHYLBENZENE)	19	391	32	7.53	450
CYCLOHEXANE	34	678	55	13	780
CYCLOHEXANONE	138	2,791	227	54	3,210
CYCLOPENTANE	15	313	25	6.02	360
DIBENZO(A,H)ANTHRACENE	2.60×10^{-4}	5.27×10^{-3}	4.29×10^{-4}	1.01×10^{-4}	6.06×10^{-3}
DIETHYLBENZENES	174	3,521	287	68	4,050
ETHANE	728	14,738	1,200	284	16,949
ETHYL ALCOHOL	12	235	19	4.52	270
ETHYLBENZENE	393	7,958	648	153	9,152
ETHYLENE	18,526	375,014	30,527	7,214	431,282
ETHYLHEXANE	79	1,591	130	31	1,830
FLUORANTHENE	1.53	31	2.52	0.59	36
FLUORENE	8.98	182	15	3.50	209
FORMALDEHYDE	14,983	303,290	24,689	5,834	348,796
INDAN	242	4,904	399	94	5,640
INDENO(1,2,3-CD)PYRENE	7.09×10^{-3}	0.14	1.17×10^{-2}	2.76×10^{-3}	0.17
ISOMERS OF XYLENE	1,342	27,164	2,211	523	31,240
LEAD & COMPOUNDS	2.69	55	4.44	1.05	63
MANGANESE & COMPOUNDS	0.20	4.01	0.33	7.72×10^{-2}	4.61
MERCURY & COMPOUNDS	2.33	47	3.85	0.91	54
METHANE	1,927	39,005	3,175	750	44,857
METHYL ALCOHOL	39	783	64	15	900
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	1,903	38,526	3,136	741	44,307
METHYL N-BUTYL KETONE	1,158	23,450	1,909	451	26,968
METHYLCYCLOHEXANE	88	1,774	144	34	2,040

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHYLCYCLOPENTANE	192	3,887	316	75	4,470
M-ETHYLTOLUENE	318	6,443	524	124	7,410
MOLYBDENUM	1.08	22	1.78	0.42	25
NAPHTHALENE	41	836	68	16	962
N-BUTANE	134	2,713	221	52	3,120
N-DECANE	682	13,799	1,123	265	15,869
N-HEPTANE	88	1,774	144	34	2,040
N-HEXANE	202	4,085	333	79	4,698
NICKEL & COMPOUNDS	0.29	5.96	0.49	0.11	6.85
NITRIC OXIDE	800,095	16,196,228	1,318,429	311,562	18,626,313
NITROGEN DIOXIDE	64,569	1,307,064	106,400	25,144	1,503,176
NITROUS OXIDE	2,175	44,027	3,584	847	50,633
N-NONANE	296	5,999	488	115	6,900
N-OCTANE	180	3,652	297	70	4,200
N-PENTANE	225	4,565	372	88	5,250
N-PROPYLBENZENE	157	3,182	259	61	3,660
N-UNDECANE	336	6,808	554	131	7,829
O-ETHYLTOLUENE	178	3,600	293	69	4,140
OXIDES OF NITROGEN	1,291,381	26,141,281	2,127,990	502,871	30,063,523
PARTICULATE MATTER $\leq 10 \mu\text{m}$	89,806	1,817,939	147,987	34,971	2,090,703
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	87,112	1,763,401	143,547	33,922	2,027,982
PHENANTHRENE	23	473	38	9.09	544
PHOSPHORUS	11	224	18	4.30	257
POLYCHLORINATED DIOXINS AND FURANS	1.45×10^{-4}	2.93×10^{-3}	2.38×10^{-4}	5.64×10^{-5}	3.37×10^{-3}
POLYCYCLIC AROMATIC HYDROCARBONS	93	1,881	153	36	2,163
PROPANE	238	4,826	393	93	5,550
PROPIONALDEHYDE	1,498	30,329	2,469	583	34,880
PROPYLENE	3,346	67,741	5,514	1,303	77,905
PYRENE	0.26	5.27	0.43	0.10	6.06
SELENIUM & COMPOUNDS	0.45	9.09	0.74	0.17	10
STYRENE (ETHENYLBENZENE)	75	1,526	124	29	1,755
SULFUR DIOXIDE	2,622	53,071	4,320	1,021	61,034
T-BUTYLBENZENE	7.73	157	13	3.01	180
TIN & COMPOUNDS	4.40	89	7.25	1.71	102
TOLUENE	1,898	38,420	3,128	739	44,185
TOTAL SUSPENDED PARTICULATE	93,548	1,893,687	154,153	36,428	2,177,816
TOTAL VOLATILE ORGANIC COMPOUNDS	126,809	2,566,990	208,962	49,380	2,952,142
TRANS-2-BUTENE	251	5,086	414	98	5,850
TRANS-2-PENTENE	52	1,043	85	20	1,200
VANADIUM & COMPOUNDS	1.35	27	2.22	0.52	31
ZINC & COMPOUNDS	36	727	59	14	836

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Gas					
1,1,2,2-TETRACHLOROETHANE	0.11	0.42	4.43	1.00	5.96
1,1,2-TRICHLOROETHANE	8.87×10^{-2}	0.34	3.52	0.79	4.74
1,1-DICHLOROETHANE	6.58×10^{-2}	0.25	2.62	0.59	3.52
1,2,3-TRIMETHYLBENZENE	0.13	0.49	5.10	1.15	6.86
1,2,4-TRIMETHYLBENZENE	7.98×10^{-2}	0.30	3.17	0.71	4.26
1,2-DICHLOROETHANE	6.58×10^{-2}	0.25	2.62	0.59	3.52
1,2-DICHLOROPROPANE	7.50×10^{-2}	0.28	2.98	0.67	4.01
1,3,5-TRIMETHYLBENZENE	0.19	0.71	7.49	1.68	10
1,3-BUTADIENE	1.49	5.63	59	13	80
1,3-DICHLOROPROPENE	7.36×10^{-2}	0.28	2.93	0.66	3.94
1-BUTENE	0.64	2.43	26	5.74	34
1-HEPTENE	0.64	2.43	26	5.74	34
1-NONENE	0.64	2.43	26	5.74	34
1-OCTENE	0.64	2.43	26	5.74	34
1-PENTENE	0.64	2.43	26	5.74	34
2,2,4-TRIMETHYLPENTANE	1.39	5.27	55	12	75
2,2-DIMETHYLBUTANE	0.64	2.43	26	5.74	34
2,4-DIMETHYLPENTANE	0.64	2.43	26	5.74	34
2-METHYL-1-PENTENE	1.28	4.86	51	11	69
2-METHYL-2-BUTENE	0.64	2.43	26	5.74	34
2-METHYLNAPHTHALENE	0.14	0.53	5.53	1.24	7.44
2-METHYLPROPANE; ISOBUTANE	28	104	1,098	247	1,477
2-METHYLPROPENE (ISOBUTENE)	1.28	4.86	51	11	69
3-METHYLHEPTANE	1.28	4.86	51	11	69
3-METHYLHEXANE	0.64	2.43	26	5.74	34
3-METHYLPENTANE	1.28	4.86	51	11	69
ACENAPHTHENE	5.24×10^{-3}	1.98×10^{-2}	0.21	4.68×10^{-2}	0.28
ACENAPHTHYLENE	2.32×10^{-2}	8.77×10^{-2}	0.92	0.21	1.24
ACETALDEHYDE	47	176	1,853	416	2,493
ACETYLENE	21	78	817	184	1,099
ACROLEIN (2-PROPENAL)	29	108	1,139	256	1,532
AMMONIA (TOTAL)	2.45	9.26	97	22	131
BENZENE	2.45	9.28	98	22	131
BENZO(A)ANTHRACENE	1.26×10^{-2}	4.76×10^{-2}	0.50	0.11	0.67
BENZO(B)FLUORANTHENE	6.96×10^{-4}	2.63×10^{-3}	2.77×10^{-2}	6.22×10^{-3}	3.72×10^{-2}
BENZO(E)PYRENE	1.74×10^{-3}	6.58×10^{-3}	6.92×10^{-2}	1.55×10^{-2}	9.30×10^{-2}
BENZO(G,H,I)PERYLENE	1.74×10^{-3}	6.57×10^{-3}	6.90×10^{-2}	1.55×10^{-2}	9.28×10^{-2}
BIPHENYL {PHENYL BENZENE}	0.89	3.36	35	7.94	48
BROMINE AND COMPOUNDS	2.58×10^{-2}	9.77×10^{-2}	1.03	0.23	1.38
BUTYRALDEHYDE	1.28	4.86	51	11	69
C10 DIALKYL BENZENES	0.64	2.43	26	5.74	34
C10 INTERNAL ALKENES	1.28	4.86	51	11	69

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
C9 INTERNAL ALKENES	2.57	9.72	102	23	137
C9 MONOSUBSTITUTED BENZENES	0.64	2.43	26	5.74	34
CADMIUM & COMPOUNDS	2.90×10^{-2}	0.11	1.15	0.26	1.55
CARBON DIOXIDE	595,103	2,251,034	23,649,791	5,314,652	31,810,580
CARBON MONOXIDE	44,330	167,681	1,761,689	395,892	2,369,592
CARBON TETRACHLORIDE	0.10	0.39	4.07	0.91	5.47
CHLORINE	3.62	14	144	32	193
CHLOROBENZENE	8.48×10^{-2}	0.32	3.37	0.76	4.53
CHLOROETHANE (ETHYL CHLORIDE)	1.04×10^{-2}	3.95×10^{-2}	0.41	9.31×10^{-2}	0.56
CHLOROFORM (TRICHLOROMETHANE)	7.95×10^{-2}	0.30	3.16	0.71	4.25
CHROMIUM (III) COMPOUNDS	3.68×10^{-2}	0.14	1.46	0.33	1.97
CHROMIUM (VI) COMPOUNDS	1.89×10^{-2}	7.17×10^{-2}	0.75	0.17	1.01
CHRYSENE	2.91×10^{-3}	1.10×10^{-2}	0.12	2.60×10^{-2}	0.16
CIS-2-BUTENE	1.28	4.86	51	11	69
COBALT & COMPOUNDS	2.58×10^{-2}	9.77×10^{-2}	1.03	0.23	1.38
COPPER & COMPOUNDS	0.29	1.10	12	2.59	16
CYCLOHEXANE	0.64	2.43	26	5.74	34
CYCLOPENTANE	1.27	4.79	50	11	68
DIBROMOETHANE	0.12	0.47	4.91	1.10	6.60
DICHLOROMETHANE {METHYLENE CHLORIDE}	0.11	0.42	4.43	1.00	5.96
ETHANE	586	2,215	23,274	5,230	31,306
ETHYLBENZENE	0.22	0.84	8.80	1.98	12
ETHYLENE	40	153	1,609	361	2,164
FLUORANTHENE	4.66×10^{-3}	1.76×10^{-2}	0.18	4.16×10^{-2}	0.25
FLUORENE	2.38×10^{-2}	8.99×10^{-2}	0.94	0.21	1.27
FORMALDEHYDE	295	1,114	11,704	2,630	15,742
ISOBUTYRALDEHYDE	0.56	2.13	22	5.03	30
ISOMERS OF BUTENE	17	63	664	149	893
ISOMERS OF DECANE (C10 PARAFFINS)	1.28	4.86	51	11	69
ISOMERS OF HEPTANE	2.57	9.72	102	23	137
ISOMERS OF HEXANE	1.28	4.86	51	11	69
ISOMERS OF NONANE (C9 PARAFFIN)	0.64	2.43	26	5.74	34
ISOMERS OF OCTANE (C8 PARAFFIN)	1.28	4.86	51	11	69
ISOMERS OF PENTANE	8.35	32	332	75	446
ISOMERS OF XYLENE	1.03	3.88	41	9.17	55
MANGANESE & COMPOUNDS	0.34	1.27	13	3.00	18
MERCURY & COMPOUNDS	2.78×10^{-2}	0.11	1.10	0.25	1.49
METHANE	3,438	13,006	136,640	30,706	183,789
METHYL ALCOHOL	14	53	554	125	745

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHYLCYCLOHEXANE	6.86	26	273	61	367
METHYLCYCLOPENTANE	2.57	9.72	102	23	137
M-ETHYLTOLUENE	0.64	2.43	26	5.74	34
NAPHTHALENE	0.31	1.18	12	2.79	17
N-BUTANE	3.02	11	120	27	161
N-DECANE	0.64	2.43	26	5.74	34
N-HEPTANE	1.28	4.86	51	11	69
N-HEXANE	6.19	23	246	55	331
NICKEL & COMPOUNDS	0.48	1.82	19	4.30	26
NITRIC OXIDE	6,740	25,493	267,835	60,189	360,257
NITROGEN DIOXIDE	544	2,057	21,615	4,857	29,073
NITROUS OXIDE	8.98	34	357	80	480
N-NONANE	0.61	2.32	24	5.48	33
N-OCTANE	1.96	7.41	78	17	105
N-PENTANE	15	55	576	130	775
O-ETHYLTOLUENE	0.64	2.43	26	5.74	34
OXIDES OF NITROGEN	10,878	41,147	432,296	97,147	581,467
PARTICULATE MATTER $\leq 10 \mu\text{m}$	52	195	2,054	462	2,763
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	52	195	2,054	462	2,763
PERCHLOROETHYLENE	1.38×10^{-2}	5.23×10^{-2}	0.55	0.12	0.74
PHENANTHRENE	4.36×10^{-2}	0.16	1.73	0.39	2.33
PHENOL (CARBOLIC ACID)	0.13	0.51	5.32	1.20	7.16
POLYCHLORINATED DIOXINS AND FURANS	4.88×10^{-9}	1.84×10^{-8}	1.94×10^{-7}	4.36×10^{-8}	2.61×10^{-7}
POLYCYCLIC AROMATIC HYDROCARBONS	1.47	5.55	58	13	78
PROPANE	234	884	9,288	2,087	12,492
PROPYLENE	109	411	4,315	970	5,804
PYRENE	5.70×10^{-3}	2.16×10^{-2}	0.23	5.09×10^{-2}	0.30
STYRENE (ETHENYLBENZENE)	6.58×10^{-2}	0.25	2.62	0.59	3.52
SULFUR DIOXIDE	39	147	1,543	347	2,075
TOLUENE	2.28	8.61	90	20	122
TOTAL SUSPENDED PARTICULATE	52	195	2,054	462	2,763
TOTAL VOLATILE ORGANIC COMPOUNDS	2,768	10,469	109,987	24,717	147,940
TRANS-2-BUTENE	8.35	32	332	75	446
TRANS-2-PENTENE	0.64	2.43	26	5.74	34
VINYL CHLORIDE MONOMER	8.31×10^{-2}	0.31	3.30	0.74	4.44
ZINC & COMPOUNDS	2.58×10^{-2}	9.77×10^{-2}	1.03	0.23	1.38

Table A5: Locomotives emissions by source type

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Line Haul					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	8.26	70	79	6.79	164
(2-METHYLPROPYL)BENZENE	20	174	195	17	406
1,2,3-TRIMETHYLBENZENE	19	165	186	16	387
1,2,4-TRIMETHYLBENZENE	86	730	821	71	1,707
1,2-DIETHYLBENZENE (ORTHO)	14	118	133	11	277
1,2-PROPADIENE	75	642	722	62	1,501
1,3,5-TRIMETHYLBENZENE	31	267	301	26	625
1,3-BUTADIENE	42	359	404	35	841
1-BUTENE	108	917	1,032	89	2,145
1-PENTENE	52	446	502	43	1,044
2,2,4-TRIMETHYLPENTANE	36	304	342	29	710
2,2-DIMETHYLBUTANE	9.88	84	95	8.12	197
2,3,4-TRIMETHYLPENTANE	2.43	21	23	2.00	48
2,3-DIMETHYL-1-BUTENE	4.53	39	43	3.73	90
2,3-DIMETHYLHEXANE	1.78	15	17	1.46	35
2,3-DIMETHYLPENTANE	12	101	113	9.72	235
2,4-DIMETHYLHEXANE	5.83	50	56	4.79	116
2,4-DIMETHYLPENTANE	3.08	26	29	2.53	61
2-METHYL-BUTANE	97	829	933	80	1,939
2-METHYLHEPTANE	9.23	78	88	7.59	184
2-METHYLHEXANE	19	158	178	15	370
2-METHYLPENTANE	63	540	607	52	1,263
2-METHYLPROPANE; ISOBUTANE	198	1,683	1,893	163	3,936
2-METHYLPROPENE (ISOBUTENE)	149	1,270	1,428	123	2,970
3,3-DIMETHYL-1-BUTENE	457	3,883	4,369	376	9,084
3-METHYLHEXANE	56	479	539	46	1,121
3-METHYLPENTANE	19	158	178	15	370
ACENAPHTHENE	6.09×10^{-2}	0.52	0.58	5.01×10^{-2}	1.21
ACENAPHTHYLENE	1.66	14	16	1.37	33
ACETALDEHYDE	309	2,626	2,955	254	6,143
ACETONE	1,215	10,337	11,630	1,000	24,182
ACETYLENE	689	5,858	6,591	567	13,704
ACROLEIN (2-PROPENAL)	59	500	562	48	1,169
ALKENE KETONE	283	2,408	2,710	233	5,634
AMMONIA (TOTAL)	126	1,070	1,204	103	2,503
ANTHRACENE	0.41	3.46	3.89	0.33	8.10
ANTIMONY & COMPOUNDS	1.13	9.65	11	0.93	23
ARSENIC & COMPOUNDS	3.27×10^{-2}	0.28	0.31	2.69×10^{-2}	0.65
BENZALDEHYDE	113	963	1,083	93	2,252
BENZENE	36	302	340	29	708

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(A)ANTHRACENE	9.21×10^{-2}	0.78	0.88	7.57×10^{-2}	1.83
BENZO(A)PYRENE	3.35×10^{-2}	0.28	0.32	2.75×10^{-2}	0.67
BENZO(B)FLUORANTHENE	3.35×10^{-2}	0.28	0.32	2.75×10^{-2}	0.67
BENZO(G,H,I)PERYLENE	3.35×10^{-2}	0.28	0.32	2.75×10^{-2}	0.67
BENZO(K)FLUORANTHENE	3.35×10^{-2}	0.28	0.32	2.75×10^{-2}	0.67
BERYLLIUM & COMPOUNDS	0.29	2.46	2.76	0.24	5.74
B-METHYLSTYRENE	7.61	65	73	6.26	151
BROMINE AND COMPOUNDS	8.98×10^{-2}	0.76	0.86	7.39×10^{-2}	1.79
BUTYLBENZENE ISOMERS	21	175	197	17	409
BUTYRALDEHYDE	302	2,572	2,894	249	6,017
C10 MONOSUBSTITUTED BENZENES	13	109	122	11	254
C5 ALDEHYDE	18	151	170	15	354
C6 ALDEHYDES	615	5,231	5,886	506	12,238
C9 MONOSUBSTITUTED BENZENES	80	684	770	66	1,601
CADMIUM & COMPOUNDS	0.29	2.46	2.76	0.24	5.74
CARBON DIOXIDE	15,421,430	131,168,237	147,576,280	12,686,385	306,852,332
CARBON MONOXIDE	40,347	343,177	386,106	33,192	802,822
CHLORINE	2.24	19	21	1.84	45
CHROMIUM (III) COMPOUNDS	6.77×10^{-2}	0.58	0.65	5.57×10^{-2}	1.35
CHROMIUM (VI) COMPOUNDS	3.49×10^{-2}	0.30	0.33	2.87×10^{-2}	0.69
CHRYSENE	7.0×10^{-2}	0.60	0.67	5.76×10^{-2}	1.39
CIS-2-BUTENE	15	129	146	13	303
CIS-2-PENTENE	4.86	41	46	4.00	97
COBALT & COMPOUNDS	4.90×10^{-2}	0.42	0.47	4.03×10^{-2}	0.97
COPPER & COMPOUNDS	0.24	2.08	2.34	0.20	4.87
CUMENE (1-METHYLETHYLBENZENE)	2.43	21	23	2.00	48
CYCLOHEXANE	4.21	36	40	3.46	84
CYCLOHEXANONE	17	147	166	14	345
CYCLOPENTANE	1.94	17	19	1.60	39
DIETHYLBENZENES	22	186	209	18	435
ETHANE	91	778	875	75	1,820
ETHYL ALCOHOL	1.46	12	14	1.20	29
ETHYLBENZENE	32	271	305	26	634
ETHYLENE	2,328	19,797	22,274	1,915	46,313
ETHYLHEXANE	9.88	84	95	8.12	197
FLUORANTHENE	0.46	3.89	4.38	0.38	9.10
FLUORENE	0.47	4.01	4.51	0.39	9.37
FORMALDEHYDE	650	5,526	6,217	534	12,927
INDAN	30	259	291	25	606
INDENO(1,2,3-CD)PYRENE	2.51×10^{-2}	0.21	0.24	2.07×10^{-2}	0.50
ISOMERS OF XYLENE	76	650	732	63	1,522
LEAD & COMPOUNDS	0.89	7.60	8.55	0.74	18
MANGANESE & COMPOUNDS	1.55×10^{-2}	0.13	0.15	1.28×10^{-2}	0.31
MERCURY & COMPOUNDS	0.21	1.81	2.03	0.17	4.22

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHANE	242	2,059	2,317	199	4,817
METHYL ALCOHOL	4.86	41	46	4.00	97
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	239	2,034	2,288	197	4,758
METHYL N-BUTYL KETONE	146	1,238	1,393	120	2,896
METHYLCYCLOHEXANE	11	94	105	9.06	219
METHYLCYCLOPENTANE	24	205	231	20	480
M-ETHYLTOLUENE	40	340	383	33	796
MOLYBDENUM	9.80×10^{-2}	0.83	0.94	8.06×10^{-2}	1.95
NAPHTHALENE	14	120	135	12	280
N-BUTANE	17	143	161	14	335
N-DECANE	86	728	820	70	1,704
N-HEPTANE	11	94	105	9.06	219
N-HEXANE	88	745	839	72	1,744
NICKEL & COMPOUNDS	4.98×10^{-2}	0.42	0.48	4.10×10^{-2}	0.99
NITRIC OXIDE	167,954	1,428,545	1,607,244	138,167	3,341,910
NITROGEN DIOXIDE	13,554	115,286	129,707	11,150	269,698
NITROUS OXIDE	394	3,351	3,771	324	7,840
N-NONANE	37	317	356	31	741
N-OCTANE	23	193	217	19	451
N-PENTANE	28	241	271	23	564
N-PROPYLBENZENE	20	168	189	16	393
N-UNDECANE	42	359	404	35	841
O-ETHYLTOLUENE	22	190	214	18	445
OXIDES OF NITROGEN	271,083	2,305,722	2,594,148	223,006	5,393,959
PARTICULATE MATTER $\leq 10 \mu\text{m}$	7,608	64,709	72,804	6,259	151,379
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	7,380	62,768	70,619	6,071	146,838
PHENANTHRENE	2.15	18	21	1.77	43
PHOSPHORUS	1.00	8.54	9.61	0.83	20
POLYCHLORINATED DIOXINS AND FURANS	2.62×10^{-5}	2.23×10^{-4}	2.51×10^{-4}	2.16×10^{-5}	5.22×10^{-4}
POLYCYCLIC AROMATIC HYDROCARBONS	20	172	193	17	402
PROPANE	30	255	287	25	596
PROPIONALDEHYDE	97	827	930	80	1,934
PROPYLENE	420	3,576	4,023	346	8,366
PYRENE	0.59	4.99	5.61	0.48	12
SELENIUM & COMPOUNDS	4.08×10^{-2}	0.35	0.39	3.36×10^{-2}	0.81
STYRENE (ETHENYLBENZENE)	33	285	320	28	666
SULFUR DIOXIDE	473	4,019	4,522	389	9,402
T-BUTYLBENZENE	0.97	8.26	9.30	0.80	19
TIN & COMPOUNDS	0.40	3.40	3.83	0.33	7.96
TOLUENE	51	434	488	42	1,014
TOTAL SUSPENDED PARTICULATE	8,163	69,433	78,118	6,715	162,429
TOTAL VOLATILE ORGANIC	15,932	135,512	152,464	13,107	317,014

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
COMPOUNDS					
TRANS-2-BUTENE	32	269	302	26	628
TRANS-2-PENTENE	6.48	55	62	5.33	129
VANADIUM & COMPOUNDS	0.12	1.04	1.17	0.10	2.44
ZINC & COMPOUNDS	3.27	28	31	2.69	65
Passenger					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	1.06	9.02	10	0.87	21
(2-METHYLPROPYL)BENZENE	2.62	22	25	2.16	52
1,2,3-TRIMETHYLBENZENE	2.50	21	24	2.05	50
1,2,4-TRIMETHYLBENZENE	11	94	105	9.07	219
1,2-DIETHYLBENZENE (ORTHO)	1.79	15	17	1.47	36
1,2-PROPADIENE	9.69	82	93	7.97	193
1,3,5-TRIMETHYLBENZENE	4.03	34	39	3.32	80
1,3-BUTADIENE	5.43	46	52	4.46	108
1-BUTENE	14	118	133	11	276
1-PENTENE	6.74	57	64	5.54	134
2,2,4-TRIMETHYLPENTANE	4.58	39	44	3.77	91
2,2-DIMETHYLBUTANE	1.27	11	12	1.04	25
2,3,4-TRIMETHYLPENTANE	0.31	2.65	2.99	0.26	6.21
2,3-DIMETHYL-1-BUTENE	0.58	4.95	5.57	0.48	12
2,3-DIMETHYLHEXANE	0.23	1.95	2.19	0.19	4.55
2,3-DIMETHYLPENTANE	1.52	13	15	1.25	30
2,4-DIMETHYLHEXANE	0.75	6.37	7.16	0.62	15
2,4-DIMETHYLPENTANE	0.40	3.36	3.78	0.33	7.86
2-METHYL-BUTANE	13	106	120	10	249
2-METHYLHEPTANE	1.19	10	11	0.98	24
2-METHYLHEXANE	2.39	20	23	1.97	48
2-METHYLPENTANE	8.15	69	78	6.71	162
2-METHYLPROPANE; ISOBUTANE	25	216	243	21	506
2-METHYLPROPENE (ISOBUTENE)	19	163	183	16	382
3,3-DIMETHYL-1-BUTENE	59	499	561	48	1,167
3-METHYLHEXANE	7.24	62	69	5.95	144
3-METHYLPENTANE	2.39	20	23	1.97	48
ACENAPHTHENE	7.82×10^{-3}	6.65×10^{-2}	7.48×10^{-2}	6.43×10^{-3}	0.16
ACENAPHTHYLENE	0.21	1.81	2.04	0.18	4.24
ACETALDEHYDE	40	337	380	33	789
ACETONE	156	1,328	1,494	128	3,106
ACETYLENE	88	752	847	73	1,760
ACROLEIN (2-PROPENAL)	7.55	64	72	6.21	150
ALKENE KETONE	36	309	348	30	724
AMMONIA (TOTAL)	16	137	155	13	322
ANTHRACENE	5.23×10^{-2}	0.44	0.50	4.30×10^{-2}	1.04
ANTIMONY & COMPOUNDS	0.15	1.24	1.39	0.12	2.90

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
ARSENIC & COMPOUNDS	4.19×10^{-3}	3.57×10^{-2}	4.01×10^{-2}	3.45×10^{-3}	8.35×10^{-2}
BENZALDEHYDE	15	124	139	12	289
BENZENE	4.57	39	44	3.76	91
BENZO(A)ANTHRACENE	1.18×10^{-2}	0.10	0.11	9.73×10^{-3}	0.24
BENZO(A)PYRENE	4.30×10^{-3}	3.66×10^{-2}	4.12×10^{-2}	3.54×10^{-3}	8.56×10^{-2}
BENZO(B)FLUORANTHENE	4.30×10^{-3}	3.66×10^{-2}	4.12×10^{-2}	3.54×10^{-3}	8.56×10^{-2}
BENZO(G,H,I)PERYLENE	4.30×10^{-3}	3.66×10^{-2}	4.12×10^{-2}	3.54×10^{-3}	8.56×10^{-2}
BENZO(K)FLUORANTHENE	4.30×10^{-3}	3.66×10^{-2}	4.12×10^{-2}	3.54×10^{-3}	8.56×10^{-2}
BERYLLIUM & COMPOUNDS	3.71×10^{-2}	0.32	0.35	3.05×10^{-2}	0.74
B-METHYLSTYRENE	0.98	8.31	9.35	0.80	19
BROMINE AND COMPOUNDS	1.15×10^{-2}	9.81×10^{-2}	0.11	9.49×10^{-3}	0.23
BUTYLBENZENE ISOMERS	2.64	22	25	2.17	53
BUTYRALDEHYDE	39	330	372	32	773
C10 MONOSUBSTITUTED BENZENES	1.64	14	16	1.35	33
C5 ALDEHYDE	2.29	19	22	1.88	46
C6 ALDEHYDES	79	672	756	65	1,572
C9 MONOSUBSTITUTED BENZENES	10	88	99	8.50	206
CADMIUM & COMPOUNDS	3.71×10^{-2}	0.32	0.35	3.05×10^{-2}	0.74
CARBON DIOXIDE	1,981,047	16,849,955	18,957,742	1,629,701	39,418,445
CARBON MONOXIDE	5,183	44,085	49,599	4,264	103,131
CHLORINE	0.29	2.44	2.75	0.24	5.72
CHROMIUM (III) COMPOUNDS	8.70×10^{-3}	7.40×10^{-2}	8.32×10^{-2}	7.16×10^{-3}	0.17
CHROMIUM (VI) COMPOUNDS	4.48×10^{-3}	3.81×10^{-2}	4.29×10^{-2}	3.69×10^{-3}	8.92×10^{-2}
CHRYSENE	8.99×10^{-3}	7.65×10^{-2}	8.60×10^{-2}	7.40×10^{-3}	0.18
CIS-2-BUTENE	1.95	17	19	1.61	39
CIS-2-PENTENE	0.62	5.31	5.97	0.51	12
COBALT & COMPOUNDS	6.29×10^{-3}	5.35×10^{-2}	6.02×10^{-2}	5.18×10^{-3}	0.13
COPPER & COMPOUNDS	3.15×10^{-2}	0.27	0.30	2.59×10^{-2}	0.63
CUMENE (1-METHYLETHYLBENZENE)	0.31	2.65	2.99	0.26	6.21
CYCLOHEXANE	0.54	4.60	5.17	0.44	11
CYCLOHEXANONE	2.23	19	21	1.83	44
CYCLOPENTANE	0.25	2.12	2.39	0.21	4.97
DIETHYLBENZENES	2.81	24	27	2.31	56
ETHANE	12	100	112	9.67	234
ETHYL ALCOHOL	0.19	1.59	1.79	0.15	3.72
ETHYLBENZENE	4.09	35	39	3.37	81
ETHYLENE	299	2,543	2,861	246	5,949
ETHYLHEXANE	1.27	11	12	1.04	25
FLUORANTHENE	5.87×10^{-2}	0.50	0.56	4.83×10^{-2}	1.17
FLUORENE	6.05×10^{-2}	0.51	0.58	4.98×10^{-2}	1.20
FORMALDEHYDE	83	710	799	69	1,661
INDAN	3.91	33	37	3.22	78
INDENO(1,2,3-CD)PYRENE	3.23×10^{-3}	2.74×10^{-2}	3.09×10^{-2}	2.65×10^{-3}	6.42×10^{-2}
ISOMERS OF XYLENE	9.82	84	94	8.08	195

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
LEAD & COMPOUNDS	0.11	0.98	1.10	9.44×10^{-2}	2.28
MANGANESE & COMPOUNDS	1.99×10^{-3}	1.70×10^{-2}	1.91×10^{-2}	1.64×10^{-3}	3.97×10^{-2}
MERCURY & COMPOUNDS	2.73×10^{-2}	0.23	0.26	2.24×10^{-2}	0.54
METHANE	31	265	298	26	619
METHYL ALCOHOL	0.62	5.31	5.97	0.51	12
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	31	261	294	25	611
METHYL N-BUTYL KETONE	19	159	179	15	372
METHYLCYCLOHEXANE	1.41	12	14	1.16	28
METHYLCYCLOPENTANE	3.10	26	30	2.55	62
M-ETHYLTOLUENE	5.14	44	49	4.23	102
MOLYBDENUM	1.26×10^{-2}	0.11	0.12	1.04×10^{-2}	0.25
NAPHTHALENE	1.81	15	17	1.49	36
N-BUTANE	2.16	18	21	1.78	43
N-DECANE	11	94	105	9.05	219
N-HEPTANE	1.41	12	14	1.16	28
N-HEXANE	11	96	108	9.26	224
NICKEL & COMPOUNDS	6.40×10^{-3}	5.44×10^{-2}	6.13×10^{-2}	5.27×10^{-3}	0.13
NITRIC OXIDE	21,575	183,512	206,468	17,749	429,304
NITROGEN DIOXIDE	1,741	14,810	16,662	1,432	34,646
NITROUS OXIDE	51	431	484	42	1,007
N-NONANE	4.78	41	46	3.93	95
N-OCTANE	2.91	25	28	2.40	58
N-PENTANE	3.64	31	35	2.99	72
N-PROPYLBENZENE	2.54	22	24	2.09	50
N-UNDECANE	5.43	46	52	4.47	108
O-ETHYLTOLUENE	2.87	24	27	2.36	57
OXIDES OF NITROGEN	34,824	296,194	333,246	28,647	692,911
PARTICULATE MATTER $\leq 10 \mu\text{m}$	977	8,313	9,352	804	19,446
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	948	8,063	9,072	780	18,863
PHENANTHRENE	0.28	2.35	2.64	0.23	5.49
PHOSPHORUS	0.13	1.10	1.23	0.11	2.57
POLYCHLORINATED DIOXINS AND FURANS	3.37×10^{-6}	2.86×10^{-5}	3.22×10^{-5}	2.77×10^{-6}	6.70×10^{-5}
POLYCYCLIC AROMATIC HYDROCARBONS	2.59	22	25	2.13	52
PROPANE	3.85	33	37	3.17	77
PROPIONALDEHYDE	12	106	119	10	248
PROPYLENE	54	459	517	44	1,075
PYRENE	7.54×10^{-2}	0.64	0.72	6.20×10^{-2}	1.50
SELENIUM & COMPOUNDS	5.24×10^{-3}	4.46×10^{-2}	5.02×10^{-2}	4.31×10^{-3}	0.10
STYRENE (ETHENYLBENZENE)	4.30	37	41	3.54	86
SULFUR DIOXIDE	61	516	581	50	1,208
T-BUTYLBENZENE	0.12	1.06	1.19	0.10	2.48
TIN & COMPOUNDS	5.14×10^{-2}	0.44	0.49	4.23×10^{-2}	1.02

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
TOLUENE	6.55	56	63	5.39	130
TOTAL SUSPENDED PARTICULATE	1,049	8,919	10,035	863	20,866
TOTAL VOLATILE ORGANIC COMPOUNDS	2,047	17,408	19,586	1,684	40,724
TRANS-2-BUTENE	4.06	34	39	3.34	81
TRANS-2-PENTENE	0.83	7.08	7.96	0.68	17
VANADIUM & COMPOUNDS	1.57×10^{-2}	0.13	0.15	1.29×10^{-2}	0.31
ZINC & COMPOUNDS	0.42	3.57	4.01	0.35	8.35

Table A6: Recreational boats emissions by source type

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Exhaust - Petrol 2 Stroke					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	279	2,410	2,690	297	5,676
(2-METHYLPROPYL)BENZENE	140	1,205	1,345	148	2,838
1,2,3-TRIMETHYLBENZENE	558	4,821	5,380	593	11,353
1,2,4-TRIMETHYLBENZENE	11,099	95,816	106,922	11,796	225,633
1,2-PROPADIENE	524	4,520	5,043	556	10,643
1,3,5-TRIMETHYLBENZENE	4,188	36,157	40,348	4,451	85,144
1,3-BUTADIENE	742	6,403	7,145	788	15,078
1-BUTENE	1,501	12,956	14,458	1,595	30,510
1-PENTENE	1,082	9,341	10,423	1,150	21,996
2,2,4-TRIMETHYLPENTANE	12,869	111,094	123,971	13,676	261,611
2,2-DIMETHYLBUTANE	2,094	18,078	20,174	2,226	42,572
2,3,4-TRIMETHYLPENTANE	3,735	32,240	35,977	3,969	75,920
2,3-DIMETHYL-1-BUTENE	1,047	9,039	10,087	1,113	21,286
2,3-DIMETHYLHEXANE	1,047	9,039	10,087	1,113	21,286
2,3-DIMETHYLPENTANE	2,513	21,694	24,209	2,671	51,087
2,4-DIMETHYLHEXANE	2,199	18,982	21,183	2,337	44,701
2,4-DIMETHYLPENTANE	2,129	18,380	20,510	2,263	43,282
2-METHYL-BUTANE	17,103	147,641	164,754	18,176	347,673
2-METHYLHEPTANE	1,885	16,271	18,157	2,003	38,315
2-METHYLHEXANE	5,689	49,113	54,806	6,046	115,654
2-METHYLPENTANE	9,947	85,873	95,826	10,571	202,218
2-METHYLPROPANE; ISOBUTANE	1,117	9,642	10,759	1,187	22,705
2-METHYLPROPENE (ISOBUTENE)	1,536	13,258	14,794	1,632	31,220
3-METHYLHEXANE	5,689	49,113	54,806	6,046	115,654
3-METHYLPENTANE	6,352	54,838	61,194	6,751	129,136
ACENAPHTHENE	1.38×10^{-2}	0.12	0.13	1.47×10^{-2}	0.28
ACENAPHTHYLENE	0.52	4.47	4.99	0.55	11
ACETALDEHYDE	575	4,966	5,542	611	11,694
ACETONE	314	2,712	3,026	334	6,386
ACETYLENE	8,482	73,218	81,705	9,014	172,417
ACROLEIN (2-PROPENAL)	104	895	999	110	2,108
ALKENE KETONE	35	301	336	37	710
AMMONIA (TOTAL)	55	475	530	58	1,119
ANTHRACENE	0.46	4.00	4.46	0.49	9.41
BENZALDEHYDE	35	301	336	37	710
BENZENE	8,697	75,077	83,779	9,242	176,796
BENZO(A)ANTHRACENE	0.23	2.03	2.26	0.25	4.78
BENZO(A)PYRENE	0.20	1.73	1.93	0.21	4.07
BENZO(B)FLUORANTHENE	0.11	0.95	1.07	0.12	2.25
BENZO(G,H,I)PERYLENE	0.80	6.92	7.72	0.85	16

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(K)FLUORANTHENE	9.67×10^{-2}	0.84	0.93	0.10	1.97
BROMINE AND COMPOUNDS	3.56	31	34	3.79	72
BUTYLBENZENE ISOMERS	1,117	9,642	10,759	1,187	22,705
C6 ALDEHYDES	70	603	672	74	1,419
C9 MONOSUBSTITUTED BENZENES	1,745	15,065	16,812	1,855	35,477
CARBON DIOXIDE	3,354,670	28,959,616	32,316,397	3,565,115	68,195,798
CARBON MONOXIDE	574,535	4,959,749	5,534,645	610,577	11,679,506
CHLORINE	499	4,305	4,804	530	10,138
CHROMIUM (III) COMPOUNDS	3.49×10^{-2}	0.30	0.34	3.71×10^{-2}	0.71
CHROMIUM (VI) COMPOUNDS	1.80×10^{-2}	0.16	0.17	1.91×10^{-2}	0.37
CHRYSENE	0.15	1.25	1.40	0.15	2.95
CIS-2-BUTENE	593	5,122	5,716	631	12,062
CIS-2-PENTENE	1,745	15,065	16,812	1,855	35,477
COBALT & COMPOUNDS	3.56	31	34	3.79	72
COPPER & COMPOUNDS	3.56	31	34	3.79	72
CUMENE (1-METHYLETHYLBENZENE)	489	4,218	4,707	519	9,934
CYCLOHEXANE	209	1,808	2,017	223	4,257
CYCLOPENTANE	2,199	18,982	21,183	2,337	44,701
DIBENZO(A,H)ANTHRACENE	6.91×10^{-3}	5.97×10^{-2}	6.66×10^{-2}	7.34×10^{-3}	0.14
DIETHYLBENZENES	907	7,834	8,742	964	18,448
ETHANE	733	6,327	7,061	779	14,900
ETHYL ALCOHOL	140	1,205	1,345	148	2,838
ETHYLBENZENE	8,282	71,496	79,783	8,802	168,363
ETHYLENE	4,293	37,061	41,357	4,562	87,273
ETHYLHEXANE	2,757	23,803	26,562	2,930	56,053
FLUORANTHENE	1.85	16	18	1.96	38
FLUORENE	1.65	14	16	1.76	34
FORMALDEHYDE	877	7,574	8,452	932	17,836
INDAN	384	3,314	3,699	408	7,805
INDENO(1,2,3-CD)PYRENE	0.24	2.09	2.33	0.26	4.92
ISOMERS OF XYLENE	37,158	320,773	357,955	39,489	755,376
LEAD & COMPOUNDS	9.41	81	91	10	191
MANGANESE & COMPOUNDS	1.77×10^{-2}	0.15	0.17	1.88×10^{-2}	0.36
METHANE	3,009	25,975	28,986	3,198	61,167
METHYL ALCOHOL	349	3,013	3,362	371	7,095
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	70	603	672	74	1,419
METHYL N-BUTYL KETONE	35	301	336	37	710
METHYLCYCLOHEXANE	1,082	9,341	10,423	1,150	21,996
METHYLCYCLOPENTANE	7,993	68,999	76,997	8,494	162,484
M-ETHYLTOLUENE	9,145	78,943	88,093	9,718	185,899
NAPHTHALENE	2.76×10^{-2}	0.24	0.27	2.94×10^{-2}	0.56
N-BUTANE	3,979	34,349	38,331	4,229	80,887
N-DECANE	1,606	13,860	15,467	1,706	32,639

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-HEPTANE	2,478	21,393	23,873	2,634	50,377
N-HEXANE	4,892	42,233	47,128	5,199	99,452
NICKEL & COMPOUNDS	3.85×10^{-2}	0.33	0.37	4.09×10^{-2}	0.78
NITRIC OXIDE	3,704	31,976	35,682	3,936	75,299
NITROGEN DIOXIDE	299	2,581	2,880	318	6,077
NITROUS OXIDE	109	944	1,054	116	2,224
N-NONANE	1,780	15,367	17,148	1,892	36,186
N-OCTANE	2,129	18,380	20,510	2,263	43,282
N-PENTANE	6,073	52,428	58,505	6,454	123,459
N-PROPYLBENZENE	2,478	21,393	23,873	2,634	50,377
N-UNDECANE	105	904	1,009	111	2,129
O-ETHYLTOLUENE	3,630	31,336	34,968	3,858	73,792
OXIDES OF NITROGEN	5,979	51,610	57,593	6,354	121,535
PARTICULATE MATTER $\leq 10 \mu\text{m}$	6,911	59,657	66,572	7,344	140,484
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	6,358	54,885	61,246	6,757	129,246
PHENANTHRENE	1.44	12	14	1.53	29
PHOSPHORUS	2.45	21	24	2.60	50
POLYCHLORINATED DIOXINS AND FURANS	6.20×10^{-9}	5.35×10^{-8}	5.97×10^{-8}	6.59×10^{-9}	1.26×10^{-7}
POLYCYCLIC AROMATIC HYDROCARBONS	9.99	86	96	11	203
PROPANE	1,710	14,764	16,475	1,818	34,767
PROPIONALDEHYDE	85	737	822	91	1,734
PROPYLENE	3,770	32,541	36,313	4,006	76,630
PYRENE	2.20	19	21	2.34	45
STYRENE (ETHENYLBENZENE)	448	3,865	4,313	476	9,102
SULFUR DIOXIDE	287	2,476	2,763	305	5,830
TOLUENE	33,807	291,847	325,676	35,928	687,259
TOTAL SUSPENDED PARTICULATE	7,124	61,502	68,631	7,571	144,829
TOTAL VOLATILE ORGANIC COMPOUNDS	345,690	2,984,217	3,330,125	367,376	7,027,408
TRANS-2-BUTENE	593	5,122	5,716	631	12,062
TRANS-2-PENTENE	1,012	8,738	9,751	1,076	20,577
ZINC & COMPOUNDS	3.56	31	34	3.79	72
Exhaust - Petrol 4 Stroke					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	1.79	15	17	1.90	36
(2-METHYLPROPYL)BENZENE	1.19	10	11	1.27	24
1,2,3-TRIMETHYLBENZENE	26	222	247	27	522
1,2,4-TRIMETHYLBENZENE	162	1,401	1,564	173	3,300
1,2-DIETHYLBENZENE (ORTHO)	7.16	62	69	7.61	146
1,2-PROPADIENE	48	417	466	51	983
1,3,5-TRIMETHYLBENZENE	47	402	448	49	946
1,3-BUTADIENE	51	439	490	54	1,033

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1-BUTENE	46	397	443	49	934
1-PENTENE	13	108	121	13	255
2,2,4-TRIMETHYLPENTANE	79	679	757	84	1,598
2,2-DIMETHYLBUTANE	19	165	184	20	388
2,3,4-TRIMETHYLPENTANE	21	180	201	22	425
2,3-DIMETHYL-1-BUTENE	11	98	109	12	231
2,3-DIMETHYLHEXANE	6.56	57	63	6.98	133
2,3-DIMETHYLPENTANE	19	165	184	20	388
2,4-DIMETHYLHEXANE	15	129	144	16	303
2,4-DIMETHYLPENTANE	17	144	161	18	340
2-METHYL-BUTANE	143	1,236	1,380	152	2,912
2-METHYLHEPTANE	19	165	184	20	388
2-METHYLHEXANE	42	361	402	44	849
2-METHYLPENTANE	84	726	811	89	1,711
2-METHYLPROPANE; ISOBUTANE	15	129	144	16	303
2-METHYLPROPENE (ISOBUTENE)	66	567	632	70	1,335
3-METHYLHEXANE	45	386	431	48	910
3-METHYLPENTANE	53	453	506	56	1,068
ACENAPHTHENE	4.78×10^{-2}	0.41	0.46	5.08×10^{-2}	0.97
ACENAPHTHYLENE	0.27	2.33	2.60	0.29	5.49
ACETALDEHYDE	22	189	211	23	445
ACETONE	20	175	195	22	412
ACETYLENE	451	3,890	4,341	479	9,160
ACROLEIN (2-PROPENAL)	3.74	32	36	3.97	76
ALKENE KETONE	1.79	15	17	1.90	36
AMMONIA (TOTAL)	11	98	109	12	230
ANTHRACENE	5.57×10^{-2}	0.48	0.54	5.92×10^{-2}	1.13
BENZALDEHYDE	5.37	46	52	5.71	109
BENZENE	280	2,418	2,698	298	5,694
BENZO(A)ANTHRACENE	6.55×10^{-3}	5.65×10^{-2}	6.31×10^{-2}	6.96×10^{-3}	0.13
BENZO(A)PYRENE	6.55×10^{-3}	5.65×10^{-2}	6.31×10^{-2}	6.96×10^{-3}	0.13
BENZO(B)FLUORANTHENE	7.86×10^{-3}	6.79×10^{-2}	7.57×10^{-2}	8.35×10^{-3}	0.16
BENZO(G,H,I)PERYLENE	1.70×10^{-2}	0.15	0.16	1.81×10^{-2}	0.35
BENZO(K)FLUORANTHENE	7.86×10^{-3}	6.79×10^{-2}	7.57×10^{-2}	8.35×10^{-3}	0.16
B-METHYLSTYRENE	9.55	82	92	10	194
BROMINE AND COMPOUNDS	3.38×10^{-2}	0.29	0.33	3.59×10^{-2}	0.69
BUTYLBENZENE ISOMERS	21	185	207	23	437
BUTYRALDEHYDE	0.60	5.15	5.75	0.63	12
C10 MONOSUBSTITUTED BENZENES	14	124	138	15	291
C6 ALDEHYDES	7.16	62	69	7.61	146
C9 MONOSUBSTITUTED BENZENES	55	474	529	58	1,116
CARBON DIOXIDE	892,481	7,704,454	8,597,496	948,468	18,142,898
CARBON MONOXIDE	142,462	1,229,817	1,372,369	151,398	2,896,046
CHLORINE	4.73	41	46	5.02	96

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CHROMIUM (III) COMPOUNDS	7.18×10^{-3}	6.20×10^{-2}	6.92×10^{-2}	7.63×10^{-3}	0.15
CHROMIUM (VI) COMPOUNDS	3.70×10^{-3}	3.19×10^{-2}	3.56×10^{-2}	3.93×10^{-3}	7.52×10^{-2}
CHRYSENE	6.55×10^{-3}	5.65×10^{-2}	6.31×10^{-2}	6.96×10^{-3}	0.13
CIS-2-BUTENE	8.36	72	80	8.88	170
CIS-2-PENTENE	15	129	144	16	303
COBALT & COMPOUNDS	3.38×10^{-2}	0.29	0.33	3.59×10^{-2}	0.69
COPPER & COMPOUNDS	3.38×10^{-2}	0.29	0.33	3.59×10^{-2}	0.69
CUMENE (1-METHYLETHYLBENZENE)	4.18	36	40	4.44	85
CYCLOHEXANE	2.39	21	23	2.54	49
CYCLOHEXANONE	1.19	10	11	1.27	24
CYCLOPENTANE	11	98	109	12	231
DIETHYLBENZENES	12	103	115	13	243
ETHANE	50	428	477	53	1,007
ETHYL ALCOHOL	1.19	10	11	1.27	24
ETHYLBENZENE	106	914	1,020	112	2,151
ETHYLENE	429	3,699	4,128	455	8,711
ETHYLHEXANE	19	165	184	20	388
FLUORANTHENE	5.96×10^{-2}	0.51	0.57	6.33×10^{-2}	1.21
FLUORENE	9.89×10^{-2}	0.85	0.95	0.11	2.01
FORMALDEHYDE	92	790	882	97	1,861
INDAN	17	144	161	18	340
INDENO(1,2,3-CD)PYRENE	5.24×10^{-3}	4.52×10^{-2}	5.05×10^{-2}	5.57×10^{-3}	0.11
ISOMERS OF XYLENE	362	3,125	3,487	385	7,358
LEAD & COMPOUNDS	1.94	17	19	2.06	39
MANGANESE & COMPOUNDS	3.64×10^{-3}	3.14×10^{-2}	3.51×10^{-2}	3.87×10^{-3}	7.40×10^{-2}
METHANE	572	4,940	5,512	608	11,632
METHYL ALCOHOL	8.36	72	80	8.88	170
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	3.58	31	34	3.81	73
METHYL N-BUTYL KETONE	12	103	115	13	243
METHYLCYCLOHEXANE	23	196	218	24	461
METHYLCYCLOPENTANE	65	562	627	69	1,322
M-ETHYLTOLUENE	85	737	822	91	1,735
NAPHTHALENE	5.94	51	57	6.32	121
N-BUTANE	36	314	351	39	740
N-DECANE	13	113	126	14	267
N-HEPTANE	31	268	299	33	631
N-HEXANE	53	457	510	56	1,077
NICKEL & COMPOUNDS	7.92×10^{-3}	6.84×10^{-2}	7.63×10^{-2}	8.42×10^{-3}	0.16
NITRIC OXIDE	4,619	39,875	44,497	4,909	93,899
NITROGEN DIOXIDE	373	3,218	3,591	396	7,578
NITROUS OXIDE	22	194	217	24	457
N-NONANE	24	211	236	26	497
N-OCTANE	19	165	184	20	388

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-PENTANE	61	531	592	65	1,250
N-PROPYLBENZENE	21	180	201	22	425
N-UNDECANE	12	103	115	13	243
O-ETHYLTOLUENE	38	330	368	41	776
OXIDES OF NITROGEN	7,455	64,359	71,819	7,923	151,556
PARTICULATE MATTER $\leq 10 \mu\text{m}$	66	565	631	70	1,332
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	60	520	581	64	1,225
PHENANTHRENE	0.17	1.44	1.60	0.18	3.38
PHOSPHORUS	0.50	4.35	4.85	0.53	10
POLYCHLORINATED DIOXINS AND FURANS	1.27×10^{-9}	1.10×10^{-8}	1.23×10^{-8}	1.35×10^{-9}	2.59×10^{-8}
POLYCYCLIC AROMATIC HYDROCARBONS	6.78	59	65	7.21	138
PROPANE	41	355	397	44	837
PROPIONALDEHYDE	10	87	97	11	204
PROPYLENE	199	1,716	1,914	211	4,040
PYRENE	8.12×10^{-2}	0.70	0.78	8.63×10^{-2}	1.65
STYRENE (ETHENYLBENZENE)	4.05	35	39	4.30	82
SULFUR DIOXIDE	77	665	742	82	1,566
TOLUENE	384	3,311	3,695	408	7,797
TOTAL SUSPENDED PARTICULATE	68	583	651	72	1,373
TOTAL VOLATILE ORGANIC COMPOUNDS	5,339	46,087	51,429	5,674	108,528
TRANS-2-BUTENE	12	103	115	13	243
TRANS-2-PENTENE	20	175	195	22	412
ZINC & COMPOUNDS	3.38×10^{-2}	0.29	0.33	3.59×10^{-2}	0.69
Exhaust - Diesel					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	8.13×10^{-2}	0.70	0.78	8.64×10^{-2}	1.65
(2-METHYLPROPYL)BENZENE	0.20	1.73	1.94	0.21	4.08
1,2,3-TRIMETHYLBENZENE	0.19	1.65	1.84	0.20	3.89
1,2,4-TRIMETHYLBENZENE	0.85	7.29	8.14	0.90	17
1,2-DIETHYLBENZENE (ORTHO)	0.14	1.18	1.32	0.15	2.79
1,2-PROPADIENE	0.74	6.41	7.16	0.79	15
1,3,5-TRIMETHYLBENZENE	0.31	2.67	2.98	0.33	6.29
1,3-BUTADIENE	0.29	2.52	2.81	0.31	5.94
1-BUTENE	1.06	9.17	10	1.13	22
1-PENTENE	0.52	4.46	4.98	0.55	11
2,2,4-TRIMETHYLPENTANE	0.11	0.97	1.09	0.12	2.29
2,2-DIMETHYLBUTANE	9.73×10^{-2}	0.84	0.94	0.10	1.98
2,3,4-TRIMETHYLPENTANE	2.39×10^{-2}	0.21	0.23	2.54×10^{-2}	0.49
2,3-DIMETHYL-1-BUTENE	4.46×10^{-2}	0.39	0.43	4.74×10^{-2}	0.91
2,3-DIMETHYLHEXANE	1.75×10^{-2}	0.15	0.17	1.86×10^{-2}	0.36
2,3-DIMETHYLPENTANE	0.12	1.00	1.12	0.12	2.37

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2,4-DIMETHYLHEXANE	5.74×10^{-2}	0.50	0.55	6.10×10^{-2}	1.17
2,4-DIMETHYLPENTANE	3.03×10^{-2}	0.26	0.29	3.22×10^{-2}	0.62
2-METHYL-BUTANE	0.96	8.29	9.25	1.02	20
2-METHYLHEPTANE	9.09×10^{-2}	0.78	0.88	9.66×10^{-2}	1.85
2-METHYLHEXANE	0.18	1.58	1.77	0.19	3.73
2-METHYLPENTANE	0.62	5.40	6.02	0.66	13
2-METHYLPROPANE; ISOBUTANE	1.95	17	19	2.07	40
2-METHYLPROPENE (ISOBUTENE)	1.47	13	14	1.56	30
3,3-DIMETHYL-1-BUTENE	4.50	39	43	4.78	91
3-METHYLHEXANE	0.55	4.79	5.34	0.59	11
3-METHYLPENTANE	0.18	1.58	1.77	0.19	3.73
ACENAPHTHENE	6.57×10^{-3}	5.68×10^{-2}	6.33×10^{-2}	6.99×10^{-3}	0.13
ACENAPHTHYLENE	5.52×10^{-3}	4.77×10^{-2}	5.32×10^{-2}	5.87×10^{-3}	0.11
ACETALDEHYDE	8.33	72	80	8.85	169
ACETONE	12	103	115	13	243
ACETYLENE	6.78	59	65	7.21	138
ACROLEIN (2-PROPENAL)	0.48	4.10	4.58	0.51	9.66
ALKENE KETONE	2.79	24	27	2.96	57
AMMONIA (TOTAL)	0.90	7.73	8.63	0.95	18
ANTHRACENE	2.83×10^{-5}	2.44×10^{-4}	2.72×10^{-4}	3.0×10^{-5}	5.75×10^{-4}
ANTIMONY & COMPOUNDS	9.52×10^{-3}	8.22×10^{-2}	9.17×10^{-2}	1.01×10^{-2}	0.19
ARSENIC & COMPOUNDS	2.74×10^{-4}	2.36×10^{-3}	2.64×10^{-3}	2.91×10^{-4}	5.57×10^{-3}
BENZALDEHYDE	1.11	9.62	11	1.18	23
BENZENE	3.19	28	31	3.39	65
BENZO(A)ANTHRACENE	4.67×10^{-4}	4.03×10^{-3}	4.50×10^{-3}	4.96×10^{-4}	9.49×10^{-3}
BENZO(A)PYRENE	2.30×10^{-5}	1.99×10^{-4}	2.22×10^{-4}	2.45×10^{-5}	4.68×10^{-4}
BENZO(B)FLUORANTHENE	3.22×10^{-5}	2.78×10^{-4}	3.10×10^{-4}	3.42×10^{-5}	6.55×10^{-4}
BENZO(G,H,I)PERYLENE	1.25×10^{-5}	1.08×10^{-4}	1.20×10^{-4}	1.33×10^{-5}	2.54×10^{-4}
BENZO(K)FLUORANTHENE	2.30×10^{-5}	1.99×10^{-4}	2.22×10^{-4}	2.45×10^{-5}	4.68×10^{-4}
B-METHYLSTYRENE	7.49×10^{-2}	0.65	0.72	7.96×10^{-2}	1.52
BROMINE AND COMPOUNDS	7.53×10^{-4}	6.50×10^{-3}	7.26×10^{-3}	8.01×10^{-4}	1.53×10^{-2}
BUTYLBENZENE ISOMERS	0.20	1.75	1.95	0.22	4.12
BUTYRALDEHYDE	2.98	26	29	3.17	61
C10 MONOSUBSTITUTED BENZENES	0.13	1.09	1.21	0.13	2.56
C5 ALDEHYDE	0.18	1.51	1.69	0.19	3.57
C6 ALDEHYDES	6.06	52	58	6.44	123
C9 MONOSUBSTITUTED BENZENES	0.79	6.84	7.63	0.84	16
CADMIUM & COMPOUNDS	4.59×10^{-3}	3.96×10^{-2}	4.42×10^{-2}	4.88×10^{-3}	9.33×10^{-2}
CARBON DIOXIDE	110,381	952,875	1,063,325	117,305	2,243,885
CARBON MONOXIDE	476	4,109	4,585	506	9,676
CHLORINE	1.88×10^{-2}	0.16	0.18	1.99×10^{-2}	0.38
CHROMIUM (III) COMPOUNDS	3.69×10^{-6}	3.19×10^{-5}	3.56×10^{-5}	3.93×10^{-6}	7.51×10^{-5}
CHROMIUM (VI) COMPOUNDS	1.90×10^{-6}	1.64×10^{-5}	1.83×10^{-5}	2.02×10^{-6}	3.87×10^{-5}
CHRYSENE	1.25×10^{-4}	1.08×10^{-3}	1.20×10^{-3}	1.33×10^{-4}	2.54×10^{-3}

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CIS-2-BUTENE	0.15	1.29	1.44	0.16	3.05
CIS-2-PENTENE	4.78×10^{-2}	0.41	0.46	5.08×10^{-2}	0.97
COBALT & COMPOUNDS	4.11×10^{-4}	3.55×10^{-3}	3.96×10^{-3}	4.37×10^{-4}	8.35×10^{-3}
COPPER & COMPOUNDS	2.05×10^{-3}	1.77×10^{-2}	1.98×10^{-2}	2.18×10^{-3}	4.18×10^{-2}
CUMENE (1-METHYLETHYLBENZENE)	2.39×10^{-2}	0.21	0.23	2.54×10^{-2}	0.49
CYCLOHEXANE	4.15×10^{-2}	0.36	0.40	4.41×10^{-2}	0.84
CYCLOHEXANONE	0.17	1.47	1.64	0.18	3.47
CYCLOPENTANE	1.91×10^{-2}	0.17	0.18	2.03×10^{-2}	0.39
DIBENZO(A,H)ANTHRACENE	1.91×10^{-7}	1.65×10^{-6}	1.84×10^{-6}	2.03×10^{-7}	3.88×10^{-6}
DIETHYLBENZENES	0.22	1.86	2.07	0.23	4.38
ETHANE	0.90	7.78	8.68	0.96	18
ETHYL ALCOHOL	1.43×10^{-2}	0.12	0.14	1.52×10^{-2}	0.29
ETHYLBENZENE	0.49	4.20	4.69	0.52	9.89
ETHYLENE	23	198	221	24	466
ETHYLHEXANE	9.73×10^{-2}	0.84	0.94	0.10	1.98
FLUORANTHENE	1.12×10^{-3}	9.65×10^{-3}	1.08×10^{-2}	1.19×10^{-3}	2.27×10^{-2}
FLUORENE	6.57×10^{-3}	5.68×10^{-2}	6.33×10^{-2}	6.99×10^{-3}	0.13
FORMALDEHYDE	19	160	179	20	377
INDAN	0.30	2.59	2.89	0.32	6.09
INDENO(1,2,3-CD)PYRENE	5.19×10^{-6}	4.48×10^{-5}	5.0×10^{-5}	5.52×10^{-6}	1.06×10^{-4}
ISOMERS OF XYLENE	1.66	14	16	1.76	34
LEAD & COMPOUNDS	2.05×10^{-3}	1.77×10^{-2}	1.98×10^{-2}	2.18×10^{-3}	4.18×10^{-2}
MANGANESE & COMPOUNDS	2.56×10^{-4}	2.21×10^{-3}	2.46×10^{-3}	2.72×10^{-4}	5.20×10^{-3}
MERCURY & COMPOUNDS	1.78×10^{-3}	1.54×10^{-2}	1.72×10^{-2}	1.89×10^{-3}	3.62×10^{-2}
METHANE	2.38	21	23	2.53	48
METHYL ALCOHOL	4.78×10^{-2}	0.41	0.46	5.08×10^{-2}	0.97
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	2.35	20	23	2.50	48
METHYL N-BUTYL KETONE	1.43	12	14	1.52	29
METHYLCYCLOHEXANE	0.11	0.94	1.04	0.12	2.20
METHYLCYCLOPENTANE	0.24	2.05	2.29	0.25	4.83
M-ETHYLTOLUENE	0.39	3.40	3.79	0.42	8.01
MOLYBDENUM	8.22×10^{-4}	7.09×10^{-3}	7.92×10^{-3}	8.73×10^{-4}	1.67×10^{-2}
NAPHTHALENE	3.02×10^{-2}	0.26	0.29	3.21×10^{-2}	0.61
N-BUTANE	0.17	1.43	1.60	0.18	3.37
N-DECANE	0.84	7.28	8.12	0.90	17
N-HEPTANE	0.11	0.94	1.04	0.12	2.20
N-HEXANE	0.25	2.16	2.41	0.27	5.08
NICKEL & COMPOUNDS	3.80×10^{-4}	3.28×10^{-3}	3.66×10^{-3}	4.04×10^{-4}	7.72×10^{-3}
NITRIC OXIDE	858	7,403	8,261	911	17,433
NITROGEN DIOXIDE	69	597	667	74	1,407
NITROUS OXIDE	2.81	24	27	2.98	57
N-NONANE	0.37	3.17	3.53	0.39	7.45
N-OCTANE	0.22	1.93	2.15	0.24	4.54

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-PENTANE	0.28	2.41	2.69	0.30	5.67
N-PROPYLBENZENE	0.19	1.68	1.87	0.21	3.95
N-UNDECANE	0.42	3.59	4.01	0.44	8.46
O-ETHYLTOLUENE	0.22	1.90	2.12	0.23	4.47
OXIDES OF NITROGEN	1,384	11,949	13,334	1,471	28,138
PARTICULATE MATTER $\leq 10 \mu\text{m}$	66	568	633	70	1,336
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	64	550	614	68	1,296
PHENANTHRENE	1.71×10^{-2}	0.15	0.16	1.82×10^{-2}	0.35
PHOSPHORUS	8.42×10^{-3}	7.27×10^{-2}	8.11×10^{-2}	8.95×10^{-3}	0.17
POLYCHLORINATED DIOXINS AND FURANS	1.87×10^{-7}	1.61×10^{-6}	1.80×10^{-6}	1.98×10^{-7}	3.79×10^{-6}
POLYCYCLIC AROMATIC HYDROCARBONS	6.80×10^{-2}	0.59	0.66	7.23×10^{-2}	1.38
PROPANE	0.29	2.55	2.84	0.31	6.00
PROPIONALDEHYDE	1.85	16	18	1.97	38
PROPYLENE	4.14	36	40	4.40	84
PYRENE	1.91×10^{-4}	1.65×10^{-3}	1.84×10^{-3}	2.03×10^{-4}	3.88×10^{-3}
SELENIUM & COMPOUNDS	3.42×10^{-4}	2.96×10^{-3}	3.30×10^{-3}	3.64×10^{-4}	6.96×10^{-3}
STYRENE (ETHENYLBENZENE)	9.33×10^{-2}	0.81	0.90	9.91×10^{-2}	1.90
SULFUR DIOXIDE	3.38	29	33	3.59	69
T-BUTYLBENZENE	9.57×10^{-3}	8.26×10^{-2}	9.22×10^{-2}	1.02×10^{-2}	0.19
TIN & COMPOUNDS	3.36×10^{-3}	2.90×10^{-2}	3.23×10^{-2}	3.57×10^{-3}	6.82×10^{-2}
TOLUENE	2.35	20	23	2.50	48
TOTAL SUSPENDED PARTICULATE	68	591	660	73	1,392
TOTAL VOLATILE ORGANIC COMPOUNDS	157	1,354	1,511	167	3,190
TRANS-2-BUTENE	0.31	2.68	2.99	0.33	6.32
TRANS-2-PENTENE	6.38×10^{-2}	0.55	0.61	6.78×10^{-2}	1.30
VANADIUM & COMPOUNDS	1.03×10^{-3}	8.87×10^{-3}	9.90×10^{-3}	1.09×10^{-3}	2.09×10^{-2}
ZINC & COMPOUNDS	2.74×10^{-2}	0.24	0.26	2.91×10^{-2}	0.56
Evaporative					
1,2,4-TRIMETHYLBENZENE	20	170	190	21	401
1,4-PENTADIENE	66	568	633	70	1,336
1-BUTENE	302	2,611	2,913	321	6,148
1-PENTENE	362	3,121	3,483	384	7,350
2,2,3-TRIMETHYLHEXANE	6.57	57	63	6.99	134
2,2,3-TRIMETHYLBUTANE	13	114	127	14	267
2,2,4-TRIMETHYLPENTANE	322	2,781	3,103	342	6,549
2,2-DIMETHYLBUTANE	99	851	950	105	2,005
2,2-DIMETHYLHEXANE	13	114	127	14	267
2,2-DIMETHYLPENTANE	33	284	317	35	668
2,3,3-TRIMETHYLPENTANE	33	284	317	35	668
2,3,4-TRIMETHYLPENTANE	33	284	317	35	668
2,3-DIMETHYLBUTANE	533	4,597	5,130	566	10,825

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2,3-DIMETHYLHEXANE	53	454	507	56	1,069
2,3-DIMETHYLPENTANE	118	1,022	1,140	126	2,406
2,4-DIMETHYLHEXANE	92	795	887	98	1,871
2,4-DIMETHYLPENTANE	105	908	1,013	112	2,138
2,5-DIMETHYLHEXANE	46	397	443	49	936
2-METHYL-1-BUTENE	743	6,413	7,156	789	15,102
2-METHYL-2-BUTENE	2,912	25,141	28,055	3,095	59,204
2-METHYLHEPTANE	99	851	950	105	2,005
2-METHYLHEXANE	335	2,894	3,230	356	6,816
2-METHYLNONANE	6.57	57	63	6.99	134
2-METHYLOCTANE	6.57	57	63	6.99	134
2-METHYLPENTANE	3,142	27,127	30,272	3,340	63,881
2-METHYLPROPANE; ISOBUTANE	2,005	17,309	19,316	2,131	40,761
3,3-DIMETHYLPENTANE	39	341	380	42	802
3-ETHYLPENTANE	66	568	633	70	1,336
3-METHYL-1-BUTENE	20	170	190	21	401
3-METHYLHEPTANE	92	795	887	98	1,871
3-METHYLHEXANE	414	3,575	3,990	440	8,420
3-METHYLOCTANE	13	114	127	14	267
3-METHYLPENTANE	1,538	13,280	14,819	1,635	31,272
4-METHYLHEPTANE	53	454	507	56	1,069
4-METHYLOCTANE	6.57	57	63	6.99	134
BENZENE	513	4,427	4,940	545	10,424
CIS-1,3-DIMETHYLCYCLOPENTANE	145	1,249	1,393	154	2,940
CIS-1,CIS-2,4-TRIMETHYLCYCLOPENTANE	92	795	887	98	1,871
CIS-1-2-DIMETHYLCYCLOPENTANE	92	795	887	98	1,871
CIS-2-BUTENE	197	1,703	1,900	210	4,009
CIS-2-PENTENE	1,065	9,194	10,260	1,132	21,650
CYCLOHEXANE	33	284	317	35	668
CYCLOPENTENE	20	170	190	21	401
ETHYLBENZENE	66	568	633	70	1,336
ETHYLCYCLOPENTANE	20	170	190	21	401
ISOMERS OF PENTANE	32,575	281,206	313,802	34,618	662,201
ISOMERS OF XYLENE	362	3,121	3,483	384	7,350
METHANE	4.77×10^{-2}	0.41	0.46	5.07×10^{-2}	0.97
METHYLCYCLOPENTANE	191	1,646	1,837	203	3,876
M-ETHYLTOLUENE	39	341	380	42	802
N-BUTANE	8,763	75,650	84,419	9,313	178,146
N-DECANE	6.57	57	63	6.99	134
N-HEPTANE	256	2,213	2,470	272	5,212
N-HEXANE	145	1,249	1,393	154	2,940
N-NONANE	6.57	57	63	6.99	134
N-PROPYLBENZENE	13	114	127	14	267

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
P-ETHYLTOLUENE	20	170	190	21	401
TOLUENE	1,249	10,783	12,033	1,327	25,392
TOTAL VOLATILE ORGANIC COMPOUNDS	65,741	567,520	633,303	69,865	1,336,430
TRANS 1-METHYL-4-ETHYLCYCLOHEXANE	6.57	57	63	6.99	134
TRANS-1,2-CIS-4-TRIMETHYLCYCLOPENTANE	20	170	190	21	401
TRANS-1,3-DIMETHYLCYCLOPENTANE	46	397	443	49	936
TRANS-1,CIS-2,3-TRIMETHYLCYCLOPENTANE	26	227	253	28	535
TRANS-1-2-DIMETHYLCYCLOPENTANE	33	284	317	35	668
TRANS-2-BUTENE	1,860	16,061	17,922	1,977	37,821
TRANS-2-ETHYLMETHYLCYCLOPENTANE	20	170	190	21	401
TRANS-2-PENTENE	1,933	16,685	18,619	2,054	39,291

Table A7: Ocean going vessel emissions by source type

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
Main Engine - Residual Oil					
1-METHYL NAPHTHALENE	21	32	59	8.25	120
1-METHYLPHENANTHRENE	3.03	4.47	8.32	1.17	17
1-OCTANOL	3.91	5.77	11	1.51	22
2,2,4,4-TETRAMETHYL-3-PENTANONE	25	37	70	9.79	143
2,3,5-TRIMETHYLNAPHTHALENE	1.20	1.77	3.29	0.46	6.72
2,4,5-TRIMETHYLHEPTANE	231	340	634	89	1,294
2,4-DIMETHYL-1-PENTENE	18	26	48	6.78	99
2,4-DIMETHYLOCTANE	254	375	698	98	1,425
2,6-DIMETHYL NAPHTHALENE	5.92	8.75	16	2.28	33
2-METHYLANTHRACENE	7.28×10^{-2}	0.11	0.20	2.81×10^{-2}	0.41
2-METHYLDECANE	164	242	451	63	921
2-METHYLNAPHTHALENE	34	50	93	13	190
2-METHYLNONANE	164	242	451	63	921
2-METHYLOCTANE	59	87	161	23	329
4-PROPYL-3-HEPTENE	21	32	59	8.28	121
ACENAPHTHENE	0.79	1.17	2.18	0.31	4.46
ACENAPHTHYLENE	0.10	0.15	0.28	3.97×10^{-2}	0.58
ACETYLENE	846	1,249	2,326	326	4,747
AMMONIA (TOTAL)	183	271	505	71	1,030
ANTHRACENE	0.21	0.31	0.58	8.18×10^{-2}	1.19
A-PINENE	3.91	5.77	11	1.51	22
ARSENIC & COMPOUNDS	10	15	28	3.96	58
BENZENE	422	623	1,160	163	2,368
BENZO(A)ANTHRACENE	0.17	0.25	0.46	6.43×10^{-2}	0.94
BENZO(A)PYRENE	8.23×10^{-2}	0.12	0.23	3.17×10^{-2}	0.46
BENZO(B)FLUORANTHENE	4.48×10^{-2}	6.61×10^{-2}	0.12	1.73×10^{-2}	0.25
BENZO(E)PYRENE	9.46×10^{-2}	0.14	0.26	3.65×10^{-2}	0.53
BENZO(G,H,I)PERYLENE	0.35	0.52	0.97	0.14	1.97
BENZO(K)FLUORANTHENE	4.31×10^{-2}	6.36×10^{-2}	0.12	1.66×10^{-2}	0.24
BENZOTHAZOLE	1.95	2.88	5.37	0.75	11
BICYCLO[4.3.0]NONANE (OCTAHYDROINDENE)	5.86	8.65	16	2.26	33
BIPHENYL {PHENYL BENZENE}	29	42	79	11	161
BROMINE AND COMPOUNDS	45	67	124	17	253
BUTYLBENZENE ISOMERS	147	216	403	56	822
BUTYLCYCLOHEXANE	66	98	183	26	373
C10 ALKYLPHENOLS	16	23	43	6.02	88
C10 INTERNAL ALKENES	84	124	231	32	471
C11 ALKYLPHENOLS	5.86	8.65	16	2.26	33
C11 DIALKYL BENZENES	3.91	5.77	11	1.51	22
C11 INTERNAL ALKENES	39	58	107	15	219

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
C12 INTERNAL ALKENES	3.91	5.77	11	1.51	22
C12H22	7.81	12	21	3.01	44
CADMIUM & COMPOUNDS	0.16	0.23	0.43	6.05×10^{-2}	0.88
CARBON DIOXIDE	38,353,983	56,625,806	105,473,358	14,783,697	215,236,844
CARBON MONOXIDE	35,943	53,066	98,842	13,854	201,705
CHLOROBENZENE	9.77	14	27	3.77	55
CHROMIUM (III) COMPOUNDS	9.81	14	27	3.78	55
CHROMIUM (VI) COMPOUNDS	5.05	7.46	14	1.95	28
CHRYSENE	0.66	0.98	1.83	0.26	3.73
CIS-BICYCLO[3.3.0]OCTANE	3.91	5.77	11	1.51	22
COBALT & COMPOUNDS	45	67	124	17	253
COPPER & COMPOUNDS	24	36	66	9.31	136
CORONENE	0.61	0.90	1.67	0.23	3.41
DIBENZO(A,H)ANTHRACENE	0.36	0.53	0.98	0.14	2.00
DIETHYLCYCLOHEXANE	18	26	48	6.78	99
DIETHYLMETHYLCYCLOHEXANES	21	32	59	8.28	121
DIMETHYLBENZYLALCOHOL	5.86	8.65	16	2.26	33
DIMETHYLBUTYLCYCLOHEXANE	1.95	2.88	5.37	0.75	11
DIMETHYLDECANE	12	17	32	4.52	66
DIMETHYLETHYLCYCLOHEXANE	37	55	102	14	208
DIMETHYLHEPTANES	21	32	59	8.28	121
DIMETHYLNONANES	98	144	269	38	548
DIMETHYLUDECANES	9.77	14	27	3.77	55
DIMETHYOCTYNE DIOL	3.91	5.77	11	1.51	22
ETHANE	90	133	247	35	504
ETHYL PROPYLCYCLOHEXANES	20	29	54	7.53	110
ETHYLBENZENE	14	20	38	5.27	77
ETHYLCYCLOHEXANE	23	35	64	9.04	132
ETHYLENE	2,381	3,516	6,549	918	13,364
ETHYLHEXANE	14	20	38	5.27	77
ETHYLMETHYLCYCLOHEXANES	168	248	462	65	943
ETHYLMETHYLHEXANE	3.91	5.77	11	1.51	22
ETHYLOCTANE	7.81	12	21	3.01	44
FLUORANTHENE	1.26	1.86	3.47	0.49	7.09
FLUORENE	5.01	7.39	14	1.93	28
FORMALDEHYDE	20	29	54	7.53	110
INDENE	14	20	38	5.27	77
INDENO(1,2,3-CD)PYRENE	0.36	0.54	1.00	0.14	2.04
ISOMERS OF C10H18	1.95	2.88	5.37	0.75	11
ISOMERS OF DECANE (C10 PARAFFINS)	471	695	1,295	181	2,642
ISOMERS OF DODECANE (C12 PARAFFINS)	43	63	118	17	241
ISOMERS OF TRIDECANE (C13 PARAFFINS)	1.95	2.88	5.37	0.75	11

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
ISOMERS OF UNDECANE (C11 PARAFFINS)	311	459	854	120	1,743
ISOMERS OF XYLENE	215	317	591	83	1,206
ISOPROPYLCYCLOHEXANE (2-METHYLETHYL CYCLOHEXANE)	82	121	226	32	460
ISOPROPYLMETHYLCYCLOHEXANE	18	26	48	6.78	99
LEAD & COMPOUNDS	1.81	2.67	4.98	0.70	10
MANGANESE & COMPOUNDS	45	67	124	17	253
MERCURY & COMPOUNDS	3.62×10^{-2}	5.35×10^{-2}	9.96×10^{-2}	1.40×10^{-2}	0.20
METHANE	371	548	1,020	143	2,081
METHYL PROPYLCYCLOHEXANES	234	346	645	90	1,316
METHYLANTHRACENES	0.83	1.23	2.30	0.32	4.68
METHYLDECALINS	21	32	59	8.28	121
METHYLDECENES	25	37	70	9.79	143
METHYLUNDECANE	35	52	97	14	197
MOLYBDENUM	45	67	124	17	253
NAPHTHALENE	137	202	377	53	769
N-BUTANE	711	1,050	1,956	274	3,991
N-HEPTANE	90	133	247	35	504
N-HEXANE	311	459	854	120	1,743
NICKEL & COMPOUNDS	411	606	1,129	158	2,305
NITRIC OXIDE	668,095	986,375	1,837,259	257,520	3,749,249
NITROGEN DIOXIDE	53,916	79,602	148,270	20,782	302,571
NITROUS OXIDE	1,900	2,805	5,225	732	10,663
N-NONANE	363	536	999	140	2,039
N-OCTANE	90	133	247	35	504
NONADIENE	5.86	8.65	16	2.26	33
N-PENTADECANE	7,810	11,531	21,479	3,011	43,831
N-PENTANE	400	591	1,101	154	2,247
N-PROPYLBENZENE	39	58	107	15	219
O-ETHYLTOLUENE	16	23	43	6.02	88
OXIDES OF NITROGEN	1,078,329	1,592,044	2,965,401	415,646	6,051,420
PARTICULATE MATTER $\leq 10 \mu\text{m}$	87,415	129,060	240,392	33,695	490,561
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	80,422	118,735	221,160	30,999	451,316
PENTYLIDENECYCLOHEXANE	5.86	8.65	16	2.26	33
PERYLENE	6.94×10^{-2}	0.10	0.19	2.68×10^{-2}	0.39
PHENANTHRENE	23	35	64	9.01	131
POLYCHLORINATED DIOXINS AND FURANS	6.12×10^{-6}	9.03×10^{-6}	1.68×10^{-5}	2.36×10^{-6}	3.43×10^{-5}
POLYCYCLIC AROMATIC HYDROCARBONS	269	397	740	104	1,510
PROPENYLCYCLOHEXANE	29	43	81	11	164
PROPYLENE	891	1,315	2,450	343	4,999
PYRENE	1.00	1.48	2.76	0.39	5.64
RETENE	1.96×10^{-2}	2.89×10^{-2}	5.39×10^{-2}	7.55×10^{-3}	0.11

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
SELENIUM & COMPOUNDS	0.24	0.36	0.66	9.31×10^{-2}	1.36
SULFUR DIOXIDE	630,481	930,842	1,733,822	243,022	3,538,167
T-BUTYLBENZENE	12	17	32	4.52	66
T-DECAHYDRONAPHTHALENE (TRANS-DECALIN)	23	35	64	9.04	132
TETRAMETHYLCYCLOPENTANE	21	32	59	8.28	121
TETRAMETHYLTHIOUREA	1.95	2.88	5.37	0.75	11
TOLUENE	420	620	1,155	162	2,357
TOTAL SUSPENDED PARTICULATE	90,119	133,051	247,826	34,737	505,733
TOTAL VOLATILE ORGANIC COMPOUNDS	18,544	27,378	50,996	7,148	104,066
TRANS-1,3-DIMETHYLCYCLOHEXANE	18	26	48	6.78	99
TRIMETHYLBENZENES	133	196	365	51	745
TRIMETHYLCYCLOHEXANES	78	115	215	30	439
TRIMETHYLCYCLOHEXANOL	5.86	8.65	16	2.26	33
TRIMETHYLCYCLOPENTANONE	5.86	8.65	16	2.26	33
TRIMETHYLHEXENE	14	20	38	5.27	77
TRIMETHYLOCTANES	14	20	38	5.27	77
VANADIUM & COMPOUNDS	1,123	1,658	3,089	433	6,304
ZINC & COMPOUNDS	17	25	47	6.52	95
Main Engine - Diesel Oil					
(1-METHYLPROPYL)BENZENE (SEC- BUTYL BENZENE)	0.78	1.15	2.14	0.30	4.36
(2-METHYLPROPYL)BENZENE	1.92	2.83	5.28	0.74	11
1,2,3-TRIMETHYLBENZENE	1.83	2.70	5.02	0.70	10
1,2,4-TRIMETHYLBENZENE	8.07	12	22	3.11	45
1,2-DIETHYLBENZENE (ORTHO)	1.31	1.93	3.60	0.50	7.35
1,2-PROPADIENE	7.10	10	20	2.74	40
1,3,5-TRIMETHYLBENZENE	2.95	4.36	8.12	1.14	17
1,3-BUTADIENE	2.89	4.27	7.96	1.12	16
1-BUTENE	10	15	28	3.91	57
1-METHYL NAPHTHALENE	1.89	2.79	5.20	0.73	11
1-METHYLPHENANTHRENE	0.34	0.51	0.95	0.13	1.94
1-PENTENE	4.93	7.28	14	1.90	28
2,2,4-TRIMETHYLPENTANE	4.54	6.70	12	1.75	25
2,2-DIMETHYLBUTANE	0.93	1.37	2.55	0.36	5.21
2,3,4-TRIMETHYLPENTANE	0.23	0.34	0.63	8.80×10^{-2}	1.28
2,3,5-TRIMETHYLNAPHTHALENE	0.12	0.18	0.34	4.73×10^{-2}	0.69
2,3-DIMETHYL-1-BUTENE	0.43	0.63	1.17	0.16	2.39
2,3-DIMETHYLHEXANE	0.17	0.25	0.46	6.46×10^{-2}	0.94
2,3-DIMETHYLPENTANE	1.11	1.64	3.06	0.43	6.24
2,4-DIMETHYLHEXANE	0.55	0.81	1.51	0.21	3.08
2,4-DIMETHYLPENTANE	0.29	0.43	0.80	0.11	1.62
2,6-DIMETHYL NAPHTHALENE	0.56	0.83	1.54	0.22	3.14

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2-METHYLANTHRACENE	4.97×10^{-3}	7.34×10^{-3}	1.37×10^{-2}	1.92×10^{-3}	2.79×10^{-2}
2-METHYL-BUTANE	9.17	14	25	3.53	51
2-METHYLHEPTANE	0.87	1.28	2.39	0.33	4.87
2-METHYLHEXANE	1.75	2.59	4.82	0.67	9.83
2-METHYLNAPHTHALENE	3.48	5.14	9.57	1.34	20
2-METHYLPENTANE	5.97	8.81	16	2.30	33
2-METHYLPROPANE; ISOBUTANE	19	27	51	7.17	104
2-METHYLPROPENE (ISOBUTENE)	14	21	39	5.41	79
3,3-DIMETHYL-1-BUTENE	43	63	118	17	241
3-METHYLHEXANE	5.30	7.82	15	2.04	30
3-METHYLPENTANE	1.75	2.59	4.82	0.67	9.83
ACENAPHTHENE	4.81×10^{-3}	7.10×10^{-3}	1.32×10^{-2}	1.85×10^{-3}	2.70×10^{-2}
ACENAPHTHYLENE	5.64×10^{-3}	8.32×10^{-3}	1.55×10^{-2}	2.17×10^{-3}	3.16×10^{-2}
ACETALDEHYDE	112	165	308	43	628
ACETONE	114	169	314	44	641
ACETYLENE	65	96	178	25	364
ALKENE KETONE	27	39	73	10	149
AMMONIA (TOTAL)	15	23	42	5.94	86
ANTHRACENE	6.13×10^{-3}	9.06×10^{-3}	1.69×10^{-2}	2.36×10^{-3}	3.44×10^{-2}
ANTIMONY & COMPOUNDS	0.27	0.40	0.75	0.10	1.52
ARSENIC & COMPOUNDS	3.04×10^{-2}	4.48×10^{-2}	8.35×10^{-2}	1.17×10^{-2}	0.17
BENZALDEHYDE	11	16	29	4.10	60
BENZENE	30	45	84	12	171
BENZO(A)ANTHRACENE	4.31×10^{-3}	6.36×10^{-3}	1.19×10^{-2}	1.66×10^{-3}	2.42×10^{-2}
BENZO(A)PYRENE	6.63×10^{-3}	9.79×10^{-3}	1.82×10^{-2}	2.56×10^{-3}	3.72×10^{-2}
BENZO(B)FLUORANTHENE	4.14×10^{-3}	6.12×10^{-3}	1.14×10^{-2}	1.60×10^{-3}	2.33×10^{-2}
BENZO(E)PYRENE	3.81×10^{-3}	5.63×10^{-3}	1.05×10^{-2}	1.47×10^{-3}	2.14×10^{-2}
BENZO(G,H,I)PERYLENE	4.31×10^{-2}	6.36×10^{-2}	0.12	1.66×10^{-2}	0.24
BENZO(K)FLUORANTHENE	3.65×10^{-3}	5.38×10^{-3}	1.0×10^{-2}	1.41×10^{-3}	2.05×10^{-2}
BIPHENYL {PHENYL BENZENE}	0.56	0.82	1.53	0.21	3.13
B-METHYLSTYRENE	0.72	1.06	1.97	0.28	4.02
BROMINE AND COMPOUNDS	2.15×10^{-2}	3.17×10^{-2}	5.90×10^{-2}	8.27×10^{-3}	0.12
BUTYLBENZENE ISOMERS	1.93	2.86	5.32	0.75	11
BUTYRALDEHYDE	28	42	78	11	160
C10 MONOSUBSTITUTED BENZENES	1.20	1.78	3.31	0.46	6.75
C5 ALDEHYDE	1.67	2.47	4.61	0.65	9.40
C6 ALDEHYDES	58	85	159	22	325
C9 MONOSUBSTITUTED BENZENES	7.57	11	21	2.92	42
CADMIUM & COMPOUNDS	5.06×10^{-3}	7.47×10^{-3}	1.39×10^{-2}	1.95×10^{-3}	2.84×10^{-2}
CARBON DIOXIDE	3,217,743	4,750,675	8,848,786	1,240,292	18,057,496
CARBON MONOXIDE	3,548	5,238	9,757	1,368	19,910
CHLORINE	0.53	0.79	1.47	0.21	3.00
CHROMIUM (III) COMPOUNDS	3.34×10^{-2}	4.93×10^{-2}	9.19×10^{-2}	1.29×10^{-2}	0.19
CHROMIUM (VI) COMPOUNDS	1.72×10^{-2}	2.54×10^{-2}	4.73×10^{-2}	6.63×10^{-3}	9.66×10^{-2}

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CHRYSENE	3.45×10^{-2}	5.09×10^{-2}	9.48×10^{-2}	1.33×10^{-2}	0.19
CIS-2-BUTENE	1.43	2.11	3.94	0.55	8.03
CIS-2-PENTENE	0.46	0.67	1.26	0.18	2.56
COBALT & COMPOUNDS	1.17×10^{-2}	1.73×10^{-2}	3.22×10^{-2}	4.51×10^{-3}	6.57×10^{-2}
COPPER & COMPOUNDS	1.72	2.54	4.73	0.66	9.66
CORONENE	7.46×10^{-2}	0.11	0.21	2.88×10^{-2}	0.42
CUMENE (1-METHYLETHYLBENZENE)	0.23	0.34	0.63	8.80×10^{-2}	1.28
CYCLOHEXANE	0.40	0.58	1.09	0.15	2.22
CYCLOHEXANONE	1.63	2.41	4.48	0.63	9.14
CYCLOPENTANE	0.18	0.27	0.50	7.04×10^{-2}	1.03
DIBENZO(A,H)ANTHRACENE	4.14×10^{-2}	6.12×10^{-2}	0.11	1.60×10^{-2}	0.23
DIETHYLBENZENES	2.06	3.03	5.65	0.79	12
ETHANE	8.60	13	24	3.32	48
ETHYL ALCOHOL	0.14	0.20	0.38	5.28×10^{-2}	0.77
ETHYLBENZENE	4.64	6.86	13	1.79	26
ETHYLENE	219	323	602	84	1,229
ETHYLHEXANE	0.93	1.37	2.55	0.36	5.21
FLUORANTHENE	7.29×10^{-2}	0.11	0.20	2.81×10^{-2}	0.41
FLUORENE	0.25	0.37	0.68	9.58×10^{-2}	1.40
FORMALDEHYDE	224	331	616	86	1,257
INDAN	2.86	4.23	7.87	1.10	16
INDENO(1,2,3-CD)PYRENE	4.31×10^{-2}	6.36×10^{-2}	0.12	1.66×10^{-2}	0.24
ISOMERS OF XYLENE	16	23	44	6.11	89
LEAD & COMPOUNDS	0.15	0.22	0.42	5.85×10^{-2}	0.85
MERCURY & COMPOUNDS	5.06×10^{-4}	7.47×10^{-4}	1.39×10^{-3}	1.95×10^{-4}	2.84×10^{-3}
METHANE	29	43	80	11	164
METHYL ALCOHOL	0.46	0.67	1.26	0.18	2.56
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	22	33	62	8.67	126
METHYL N-BUTYL KETONE	14	20	38	5.28	77
METHYLANTHRACENES	9.95×10^{-2}	0.15	0.27	3.83×10^{-2}	0.56
METHYLCYCLOHEXANE	1.04	1.53	2.85	0.40	5.81
METHYLCYCLOPENTANE	2.27	3.35	6.24	0.87	13
M-ETHYLTOLUENE	3.76	5.55	10	1.45	21
MOLYBDENUM	2.34×10^{-2}	3.46×10^{-2}	6.44×10^{-2}	9.03×10^{-3}	0.13
NAPHTHALENE	4.08	6.02	11	1.57	23
N-BUTANE	1.58	2.34	4.35	0.61	8.89
N-DECANE	8.05	12	22	3.10	45
N-HEPTANE	1.04	1.53	2.85	0.40	5.81
N-HEXANE	2.39	3.53	6.57	0.92	13
NICKEL & COMPOUNDS	1.01	1.49	2.78	0.39	5.68
NITRIC OXIDE	50,614	74,727	139,189	19,509	284,039
NITROGEN DIOXIDE	4,085	6,031	11,233	1,574	22,922
NITROUS OXIDE	168	249	463	65	945

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-NONANE	3.50	5.17	9.63	1.35	20
N-OCTANE	2.13	3.15	5.86	0.82	12
N-PENTANE	2.66	3.93	7.33	1.03	15
N-PROPYLBENZENE	1.86	2.74	5.11	0.72	10
N-UNDECANE	3.97	5.87	11	1.53	22
O-ETHYLTOLUENE	2.10	3.10	5.78	0.81	12
OXIDES OF NITROGEN	81,693	120,611	224,655	31,489	458,448
PARTICULATE MATTER $\leq 10 \mu\text{m}$	1,873	2,766	5,152	722	10,513
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	1,723	2,544	4,739	664	9,672
PERYLENE	5.30×10^{-3}	7.83×10^{-3}	1.46×10^{-2}	2.04×10^{-3}	2.98×10^{-2}
PHENANTHRENE	1.09	1.61	3.00	0.42	6.12
PHOSPHORUS	0.24	0.35	0.66	9.25×10^{-2}	1.35
POLYCHLORINATED DIOXINS AND FURANS	1.57×10^{-7}	2.32×10^{-7}	4.32×10^{-7}	6.06×10^{-8}	8.82×10^{-7}
POLYCYCLIC AROMATIC HYDROCARBONS	13	19	36	5.05	73
PROPANE	2.82	4.16	7.75	1.09	16
PROPIONALDEHYDE	15	22	41	5.69	83
PROPYLENE	40	58	109	15	222
PYRENE	6.30×10^{-2}	9.30×10^{-2}	0.17	2.43×10^{-2}	0.35
RETENE	2.65×10^{-3}	3.92×10^{-3}	7.29×10^{-3}	1.02×10^{-3}	1.49×10^{-2}
SELENIUM & COMPOUNDS	5.06×10^{-5}	7.47×10^{-5}	1.39×10^{-4}	1.95×10^{-5}	2.84×10^{-4}
STYRENE (ETHENYLBENZENE)	0.88	1.30	2.43	0.34	4.96
SULFUR DIOXIDE	12,866	18,996	35,383	4,959	72,205
T-BUTYLBENZENE	9.14×10^{-2}	0.13	0.25	3.52×10^{-2}	0.51
TIN & COMPOUNDS	9.56×10^{-2}	0.14	0.26	3.69×10^{-2}	0.54
TOLUENE	22	33	62	8.65	126
TOTAL SUSPENDED PARTICULATE	1,951	2,881	5,366	752	10,951
TOTAL VOLATILE ORGANIC COMPOUNDS	1,459	2,154	4,013	562	8,189
TRANS-2-BUTENE	2.97	4.38	8.17	1.14	17
TRANS-2-PENTENE	0.61	0.90	1.67	0.23	3.42
VANADIUM & COMPOUNDS	1.72	2.54	4.73	0.66	9.66
ZINC & COMPOUNDS	1.01	1.49	2.78	0.39	5.68
Main Engine - Gas Oil					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	0.16	0.23	0.43	5.99×10^{-2}	0.87
(2-METHYLPROPYL)BENZENE	0.38	0.57	1.06	0.15	2.15
1,2,3-TRIMETHYLBENZENE	0.37	0.54	1.01	0.14	2.05
1,2,4-TRIMETHYLBENZENE	1.61	2.38	4.44	0.62	9.06
1,2-DIETHYLBENZENE (ORTHO)	0.26	0.39	0.72	0.10	1.47
1,2-PROPADIENE	1.42	2.10	3.90	0.55	7.97
1,3,5-TRIMETHYLBENZENE	0.59	0.87	1.63	0.23	3.32
1,3-BUTADIENE	0.58	0.85	1.59	0.22	3.25

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1-BUTENE	2.03	3.00	5.58	0.78	11
1-METHYL NAPHTHALENE	0.27	0.39	0.73	0.10	1.49
1-METHYLPHENANTHRENE	3.14×10^{-4}	4.63×10^{-4}	8.63×10^{-4}	1.21×10^{-4}	1.76×10^{-3}
1-PENTENE	0.99	1.46	2.71	0.38	5.54
2,2,4-TRIMETHYLPENTANE	0.91	1.34	2.50	0.35	5.09
2,2-DIMETHYLBUTANE	0.19	0.27	0.51	7.16×10^{-2}	1.04
2,3,4-TRIMETHYLPENTANE	4.57×10^{-2}	6.75×10^{-2}	0.13	1.76×10^{-2}	0.26
2,3,5-TRIMETHYLNAPHTHALENE	3.02×10^{-2}	4.46×10^{-2}	8.31×10^{-2}	1.17×10^{-2}	0.17
2,3-DIMETHYL-1-BUTENE	8.53×10^{-2}	0.13	0.23	3.29×10^{-2}	0.48
2,3-DIMETHYLHEXANE	3.35×10^{-2}	4.95×10^{-2}	9.22×10^{-2}	1.29×10^{-2}	0.19
2,3-DIMETHYLPENTANE	0.22	0.33	0.61	8.57×10^{-2}	1.25
2,4-DIMETHYLHEXANE	0.11	0.16	0.30	4.23×10^{-2}	0.62
2,4-DIMETHYLPENTANE	5.79×10^{-2}	8.55×10^{-2}	0.16	2.23×10^{-2}	0.32
2,6-DIMETHYL NAPHTHALENE	7.97×10^{-2}	0.12	0.22	3.07×10^{-2}	0.45
2-METHYLANTHRACENE	5.65×10^{-4}	8.34×10^{-4}	1.55×10^{-3}	2.18×10^{-4}	3.17×10^{-3}
2-METHYL-BUTANE	1.83	2.71	5.04	0.71	10
2-METHYLHEPTANE	0.17	0.26	0.48	6.69×10^{-2}	0.97
2-METHYLHEXANE	0.35	0.52	0.96	0.14	1.97
2-METHYLNAPHTHALENE	0.33	0.48	0.90	0.13	1.83
2-METHYLPENTANE	1.19	1.76	3.28	0.46	6.70
2-METHYLPROPANE; ISOBUTANE	3.72	5.50	10	1.44	21
2-METHYLPROPENE (ISOBUTENE)	2.81	4.15	7.72	1.08	16
3,3-DIMETHYL-1-BUTENE	8.59	13	24	3.31	48
3-METHYLHEXANE	1.06	1.57	2.92	0.41	5.95
3-METHYLPENTANE	0.35	0.52	0.96	0.14	1.97
ACENAPHTHENE	3.05×10^{-2}	4.50×10^{-2}	8.38×10^{-2}	1.18×10^{-2}	0.17
ACENAPHTHYLENE	4.89×10^{-3}	7.22×10^{-3}	1.35×10^{-2}	1.89×10^{-3}	2.75×10^{-2}
ACETALDEHYDE	22	33	62	8.63	126
ACETONE	23	34	63	8.82	128
ACETYLENE	13	19	36	5.00	73
ALKENE KETONE	5.33	7.87	15	2.05	30
AMMONIA (TOTAL)	2.95	4.35	8.10	1.14	17
ANTHRACENE	2.58×10^{-2}	3.82×10^{-2}	7.11×10^{-2}	9.96×10^{-3}	0.15
ANTIMONY & COMPOUNDS	4.20×10^{-2}	6.20×10^{-2}	0.12	1.62×10^{-2}	0.24
ARSENIC & COMPOUNDS	6.22×10^{-3}	9.18×10^{-3}	1.71×10^{-2}	2.40×10^{-3}	3.49×10^{-2}
BENZALDEHYDE	2.13	3.14	5.86	0.82	12
BENZENE	6.10	9.00	17	2.35	34
BENZO(A)ANTHRACENE	1.67×10^{-2}	2.46×10^{-2}	4.59×10^{-2}	6.43×10^{-3}	9.36×10^{-2}
BENZO(A)PYRENE	4.23×10^{-3}	6.25×10^{-3}	1.16×10^{-2}	1.63×10^{-3}	2.38×10^{-2}
BENZO(B)FLUORANTHENE	1.84×10^{-2}	2.72×10^{-2}	5.07×10^{-2}	7.11×10^{-3}	0.10
BENZO(E)PYRENE	1.02×10^{-2}	1.50×10^{-2}	2.79×10^{-2}	3.92×10^{-3}	5.70×10^{-2}
BENZO(G,H,I)PERYLENE	1.55×10^{-2}	2.29×10^{-2}	4.26×10^{-2}	5.97×10^{-3}	8.70×10^{-2}
BENZO(K)FLUORANTHENE	5.46×10^{-3}	8.06×10^{-3}	1.50×10^{-2}	2.10×10^{-3}	3.06×10^{-2}
BIPHENYL {PHENYL BENZENE}	8.84×10^{-2}	0.13	0.24	3.41×10^{-2}	0.50

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
B-METHYLSTYRENE	0.14	0.21	0.39	5.52×10^{-2}	0.80
BROMINE AND COMPOUNDS	3.32×10^{-3}	4.90×10^{-3}	9.13×10^{-3}	1.28×10^{-3}	1.86×10^{-2}
BUTYLBENZENE ISOMERS	0.39	0.57	1.06	0.15	2.17
BUTYRALDEHYDE	5.69	8.40	16	2.19	32
C10 MONOSUBSTITUTED BENZENES	0.24	0.36	0.66	9.28×10^{-2}	1.35
C5 ALDEHYDE	0.34	0.49	0.92	0.13	1.88
C6 ALDEHYDES	12	17	32	4.46	65
C9 MONOSUBSTITUTED BENZENES	1.51	2.24	4.16	0.58	8.50
CADMIUM & COMPOUNDS	1.04×10^{-3}	1.53×10^{-3}	2.85×10^{-3}	4.0×10^{-4}	5.82×10^{-3}
CARBON DIOXIDE	659,284	973,367	1,813,030	254,124	3,699,805
CARBON MONOXIDE	648	957	1,783	250	3,639
CHLORINE	8.27×10^{-2}	0.12	0.23	3.19×10^{-2}	0.46
CHROMIUM (III) COMPOUNDS	6.84×10^{-3}	1.01×10^{-2}	1.88×10^{-2}	2.64×10^{-3}	3.84×10^{-2}
CHROMIUM (VI) COMPOUNDS	3.52×10^{-3}	5.20×10^{-3}	9.69×10^{-3}	1.36×10^{-3}	1.98×10^{-2}
CHRYSENE	3.60×10^{-2}	5.31×10^{-2}	9.89×10^{-2}	1.39×10^{-2}	0.20
CIS-2-BUTENE	0.29	0.42	0.79	0.11	1.61
CIS-2-PENTENE	9.14×10^{-2}	0.13	0.25	3.52×10^{-2}	0.51
COBALT & COMPOUNDS	1.81×10^{-3}	2.67×10^{-3}	4.98×10^{-3}	6.98×10^{-4}	1.02×10^{-2}
COPPER & COMPOUNDS	0.35	0.52	0.97	0.14	1.98
CORONENE	1.16×10^{-3}	1.71×10^{-3}	3.19×10^{-3}	4.47×10^{-4}	6.51×10^{-3}
CUMENE (1-METHYLETHYLBENZENE)	4.57×10^{-2}	6.75×10^{-2}	0.13	1.76×10^{-2}	0.26
CYCLOHEXANE	7.92×10^{-2}	0.12	0.22	3.05×10^{-2}	0.44
CYCLOHEXANONE	0.33	0.48	0.90	0.13	1.83
CYCLOPENTANE	3.66×10^{-2}	5.40×10^{-2}	0.10	1.41×10^{-2}	0.21
DIBENZO(A,H)ANTHRACENE	2.26×10^{-2}	3.34×10^{-2}	6.23×10^{-2}	8.73×10^{-3}	0.13
DIETHYLBENZENES	0.41	0.61	1.13	0.16	2.31
ETHANE	1.72	2.54	4.73	0.66	9.66
ETHYL ALCOHOL	2.74×10^{-2}	4.05×10^{-2}	7.54×10^{-2}	1.06×10^{-2}	0.15
ETHYLBENZENE	0.93	1.37	2.56	0.36	5.21
ETHYLENE	44	65	120	17	246
ETHYLHEXANE	0.19	0.27	0.51	7.16×10^{-2}	1.04
FLUORANTHENE	0.12	0.18	0.34	4.82×10^{-2}	0.70
FLUORENE	9.39×10^{-2}	0.14	0.26	3.62×10^{-2}	0.53
FORMALDEHYDE	45	66	123	17	252
INDAN	0.57	0.85	1.58	0.22	3.21
INDENO(1,2,3-CD)PYRENE	1.30×10^{-2}	1.92×10^{-2}	3.57×10^{-2}	5.01×10^{-3}	7.29×10^{-2}
ISOMERS OF XYLENE	3.17	4.68	8.72	1.22	18
LEAD & COMPOUNDS	3.11×10^{-2}	4.59×10^{-2}	8.55×10^{-2}	1.20×10^{-2}	0.17
MERCURY & COMPOUNDS	1.04×10^{-4}	1.53×10^{-4}	2.85×10^{-4}	4.0×10^{-5}	5.82×10^{-4}
METHANE	5.84	8.62	16	2.25	33
METHYL ALCOHOL	9.14×10^{-2}	0.13	0.25	3.52×10^{-2}	0.51
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	4.50	6.64	12	1.73	25
METHYL N-BUTYL KETONE	2.74	4.04	7.53	1.06	15

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHYLANTHRACENES	0.11	0.16	0.30	4.19×10^{-2}	0.61
METHYLCYCLOHEXANE	0.21	0.31	0.57	7.99×10^{-2}	1.16
METHYLCYCLOPENTANE	0.45	0.67	1.25	0.17	2.55
M-ETHYLTOLUENE	0.75	1.11	2.07	0.29	4.22
MOLYBDENUM	3.62×10^{-3}	5.35×10^{-3}	9.96×10^{-3}	1.40×10^{-3}	2.03×10^{-2}
NAPHTHALENE	0.64	0.94	1.76	0.25	3.59
N-BUTANE	0.32	0.47	0.87	0.12	1.78
N-DECANE	1.61	2.38	4.43	0.62	9.04
N-HEPTANE	0.21	0.31	0.57	7.99×10^{-2}	1.16
N-HEXANE	0.48	0.71	1.32	0.18	2.68
NICKEL & COMPOUNDS	0.21	0.31	0.57	7.99×10^{-2}	1.16
NITRIC OXIDE	9,998	14,760	27,493	3,854	56,105
NITROGEN DIOXIDE	807	1,191	2,219	311	4,528
NITROUS OXIDE	36	54	100	14	204
N-NONANE	0.70	1.03	1.93	0.27	3.93
N-OCTANE	0.43	0.63	1.17	0.16	2.39
N-PENTANE	0.53	0.79	1.47	0.21	2.99
N-PROPYLBENZENE	0.37	0.55	1.02	0.14	2.09
N-UNDECANE	0.80	1.17	2.19	0.31	4.46
O-ETHYLTOLUENE	0.42	0.62	1.16	0.16	2.36
OXIDES OF NITROGEN	16,136	23,824	44,375	6,220	90,555
PARTICULATE MATTER $\leq 10 \mu\text{m}$	290	428	797	112	1,627
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	267	394	733	103	1,496
PERYLENE	5.02×10^{-4}	7.41×10^{-4}	1.38×10^{-3}	1.93×10^{-4}	2.82×10^{-3}
PHENANTHRENE	0.44	0.65	1.21	0.17	2.47
PHOSPHORUS	3.71×10^{-2}	5.48×10^{-2}	0.10	1.43×10^{-2}	0.21
POLYCHLORINATED DIOXINS AND FURANS	3.15×10^{-8}	4.64×10^{-8}	8.65×10^{-8}	1.21×10^{-8}	1.77×10^{-7}
POLYCYCLIC AROMATIC HYDROCARBONS	2.62	3.87	7.21	1.01	15
PROPANE	0.56	0.83	1.55	0.22	3.16
PROPIONALDEHYDE	2.96	4.36	8.13	1.14	17
PROPYLENE	7.91	12	22	3.05	44
PYRENE	0.16	0.24	0.44	6.22×10^{-2}	0.91
RETENE	3.08×10^{-2}	4.55×10^{-2}	8.47×10^{-2}	1.19×10^{-2}	0.17
SELENIUM & COMPOUNDS	1.04×10^{-5}	1.53×10^{-5}	2.85×10^{-5}	4.0×10^{-6}	5.82×10^{-5}
STYRENE (ETHENYLBENZENE)	0.18	0.26	0.49	6.81×10^{-2}	0.99
SULFUR DIOXIDE	1,540	2,274	4,235	594	8,643
T-BUTYLBENZENE	1.83×10^{-2}	2.70×10^{-2}	5.03×10^{-2}	7.05×10^{-3}	0.10
TIN & COMPOUNDS	1.48×10^{-2}	2.18×10^{-2}	4.07×10^{-2}	5.70×10^{-3}	8.30×10^{-2}
TOLUENE	4.49	6.63	12	1.73	25
TOTAL SUSPENDED PARTICULATE	302	446	830	116	1,694
TOTAL VOLATILE ORGANIC COMPOUNDS	292	431	803	113	1,638
TRANS-2-BUTENE	0.59	0.88	1.63	0.23	3.33

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
TRANS-2-PENTENE	0.12	0.18	0.34	4.70×10^{-2}	0.68
VANADIUM & COMPOUNDS	0.35	0.52	0.97	0.14	1.98
ZINC & COMPOUNDS	0.21	0.31	0.57	7.99×10^{-2}	1.16
Auxiliary Engine - Residual Oil					
1-METHYL NAPHTHALENE	9.34	4.23	38	5.23	56
1-METHYLPHENANTHRENE	1.32	0.60	5.32	0.74	7.98
1-OCTANOL	2.25	1.02	9.06	1.26	14
2,2,4,4-TETRAMETHYL-3-PENTANONE	15	6.63	59	8.18	88
2,3,5-TRIMETHYLNAPHTHALENE	0.52	0.24	2.11	0.29	3.16
2,4,5-TRIMETHYLHEPTANE	133	60	535	74	802
2,4-DIMETHYL-1-PENTENE	10	4.59	41	5.66	61
2,4-DIMETHYLOCTANE	146	66	589	82	883
2,6-DIMETHYL NAPHTHALENE	2.58	1.17	10	1.45	16
2-METHYLANTHRACENE	3.17×10^{-2}	1.44×10^{-2}	0.13	1.78×10^{-2}	0.19
2-METHYLDECANE	94	43	380	53	571
2-METHYLNAPHTHALENE	15	6.71	60	8.28	89
2-METHYLNONANE	94	43	380	53	571
2-METHYLOCTANE	34	15	136	19	204
4-PROPYL-3-HEPTENE	12	5.61	50	6.92	75
ACENAPHTHENE	0.35	0.16	1.40	0.19	2.09
ACENAPHTHYLENE	4.49×10^{-2}	2.04×10^{-2}	0.18	2.52×10^{-2}	0.27
ACETYLENE	487	221	1,961	273	2,941
AMMONIA (TOTAL)	80	36	322	45	484
ANTHRACENE	9.26×10^{-2}	4.19×10^{-2}	0.37	5.18×10^{-2}	0.56
A-PINENE	2.25	1.02	9.06	1.26	14
ARSENIC & COMPOUNDS	5.15	2.33	21	2.88	31
BENZENE	243	110	978	136	1,467
BENZO(A)ANTHRACENE	7.28×10^{-2}	3.30×10^{-2}	0.29	4.07×10^{-2}	0.44
BENZO(A)PYRENE	3.59×10^{-2}	1.63×10^{-2}	0.14	2.01×10^{-2}	0.22
BENZO(B)FLUORANTHENE	1.95×10^{-2}	8.85×10^{-3}	7.87×10^{-2}	1.09×10^{-2}	0.12
BENZO(E)PYRENE	4.13×10^{-2}	1.87×10^{-2}	0.17	2.31×10^{-2}	0.25
BENZO(G,H,I)PERYLENE	0.15	6.94×10^{-2}	0.62	8.57×10^{-2}	0.93
BENZO(K)FLUORANTHENE	1.88×10^{-2}	8.52×10^{-3}	7.58×10^{-2}	1.05×10^{-2}	0.11
BENZOTHAZOLE	1.12	0.51	4.53	0.63	6.79
BICYCLO[4.3.0]NONANE (OCTAHYDROINDENE)	3.37	1.53	14	1.89	20
BIPHENYL {PHENYL BENZENE}	12	5.66	50	6.99	75
BROMINE AND COMPOUNDS	20	8.88	79	11	118
BUTYLBENZENE ISOMERS	84	38	340	47	509
BUTYLCYCLOHEXANE	38	17	154	21	231
C10 ALKYLPHENOLS	8.99	4.08	36	5.03	54
C10 INTERNAL ALKENES	48	22	195	27	292
C11 ALKYLPHENOLS	3.37	1.53	14	1.89	20
C11 DIALKYL BENZENES	2.25	1.02	9.06	1.26	14

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
C11 INTERNAL ALKENES	22	10	91	13	136
C12 INTERNAL ALKENES	2.25	1.02	9.06	1.26	14
C12H22	4.50	2.04	18	2.52	27
CADMIUM & COMPOUNDS	7.87×10^{-2}	3.57×10^{-2}	0.32	4.41×10^{-2}	0.48
CARBON DIOXIDE	19,234,637	8,718,117	77,491,300	10,766,240	116,210,295
CARBON MONOXIDE	29,350	13,303	118,244	16,428	177,326
CHLOROBENZENE	5.62	2.55	23	3.15	34
CHROMIUM (III) COMPOUNDS	4.92	2.23	20	2.75	30
CHROMIUM (VI) COMPOUNDS	2.53	1.15	10	1.42	15
CHRYSENE	0.29	0.13	1.17	0.16	1.75
CIS-BICYCLO[3.3.0]OCTANE	2.25	1.02	9.06	1.26	14
COBALT & COMPOUNDS	20	8.88	79	11	118
COPPER & COMPOUNDS	12	5.49	49	6.78	73
CORONENE	0.26	0.12	1.07	0.15	1.60
DIBENZO(A,H)ANTHRACENE	0.16	7.06×10^{-2}	0.63	8.72×10^{-2}	0.94
DIETHYLCYCLOHEXANE	10	4.59	41	5.66	61
DIETHYLMETHYLCYCLOHEXANES	12	5.61	50	6.92	75
DIMETHYLBENZYLALCOHOL	3.37	1.53	14	1.89	20
DIMETHYLBUTYLCYCLOHEXANE	1.12	0.51	4.53	0.63	6.79
DIMETHYLDECANE	6.75	3.06	27	3.78	41
DIMETHYLETHYLCYCLOHEXANE	21	9.68	86	12	129
DIMETHYLHEPTANES	12	5.61	50	6.92	75
DIMETHYLNONANES	56	25	226	31	340
DIMETHYLUDECANES	5.62	2.55	23	3.15	34
DIMETHYOCTYNE DIOL	2.25	1.02	9.06	1.26	14
ETHANE	52	23	208	29	312
ETHYL PROPYLCYCLOHEXANES	11	5.10	45	6.29	68
ETHYLBENZENE	7.87	3.57	32	4.41	48
ETHYLCYCLOHEXANE	13	6.12	54	7.55	82
ETHYLENE	1,371	621	5,522	767	8,281
ETHYLHEXANE	7.87	3.57	32	4.41	48
ETHYLMETHYLCYCLOHEXANES	97	44	390	54	584
ETHYLMETHYLHEXANE	2.25	1.02	9.06	1.26	14
ETHYLOCTANE	4.50	2.04	18	2.52	27
FLUORANTHENE	0.55	0.25	2.22	0.31	3.33
FLUORENE	2.18	0.99	8.80	1.22	13
FORMALDEHYDE	11	5.10	45	6.29	68
INDENE	7.87	3.57	32	4.41	48
INDENO(1,2,3-CD)PYRENE	0.16	7.17×10^{-2}	0.64	8.86×10^{-2}	0.96
ISOMERS OF C10H18	1.12	0.51	4.53	0.63	6.79
ISOMERS OF DECANE (C10 PARAFFINS)	271	123	1,092	152	1,637
ISOMERS OF DODECANE (C12 PARAFFINS)	25	11	100	14	149

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
ISOMERS OF TRIDECANE (C13 PARAFFINS)	1.12	0.51	4.53	0.63	6.79
ISOMERS OF UNDECANE (C11 PARAFFINS)	179	81	720	100	1,080
ISOMERS OF XYLENE	124	56	498	69	747
ISOPROPYLCYCLOHEXANE (2-METHYLETHYL CYCLOHEXANE)	47	21	190	26	285
ISOPROPYLMETHYLCYCLOHEXANE	10	4.59	41	5.66	61
LEAD & COMPOUNDS	0.91	0.41	3.66	0.51	5.49
MANGANESE & COMPOUNDS	20	8.88	79	11	118
MERCURY & COMPOUNDS	1.82×10^{-2}	8.24×10^{-3}	7.32×10^{-2}	1.02×10^{-2}	0.11
METHANE	107	48	430	60	645
METHYL PROPYLCYCLOHEXANES	135	61	544	76	815
METHYLANTHRACENES	0.36	0.17	1.47	0.20	2.20
METHYLDECALINS	12	5.61	50	6.92	75
METHYLDECENES	15	6.63	59	8.18	88
METHYLUDECANE	20	9.17	82	11	122
MOLYBDENUM	20	8.88	79	11	118
NAPHTHALENE	60	27	241	33	361
N-BUTANE	409	186	1,649	229	2,473
N-HEPTANE	52	23	208	29	312
N-HEXANE	179	81	720	100	1,080
NICKEL & COMPOUNDS	206	93	830	115	1,244
NITRIC OXIDE	221,486	100,389	892,308	123,973	1,338,155
NITROGEN DIOXIDE	17,874	8,102	72,011	10,005	107,991
NITROUS OXIDE	827	375	3,332	463	4,997
N-NONANE	209	95	843	117	1,264
N-OCTANE	52	23	208	29	312
NONADIENE	3.37	1.53	14	1.89	20
N-PENTADECANE	4,495	2,037	18,110	2,516	27,159
N-PENTANE	230	104	929	129	1,393
N-PROPYLBENZENE	22	10	91	13	136
O-ETHYLTOLUENE	8.99	4.08	36	5.03	54
OXIDES OF NITROGEN	357,486	162,031	1,440,216	200,096	2,159,828
PARTICULATE MATTER $\leq 10 \mu\text{m}$	38,021	17,233	153,178	21,282	229,714
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	34,980	15,855	140,924	19,579	211,337
PENTYLIDENECYCLOHEXANE	3.37	1.53	14	1.89	20
PERYLENE	3.03×10^{-2}	1.37×10^{-2}	0.12	1.69×10^{-2}	0.18
PHENANTHRENE	10	4.62	41	5.71	62
POLYCHLORINATED DIOXINS AND FURANS	2.67×10^{-6}	1.21×10^{-6}	1.07×10^{-5}	1.49×10^{-6}	1.61×10^{-5}
POLYCYCLIC AROMATIC HYDROCARBONS	117	53	473	66	709
PROPENYLCYCLOHEXANE	17	7.64	68	9.44	102
PROPYLENE	513	232	2,066	287	3,098

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
PYRENE	0.44	0.20	1.77	0.25	2.65
RETENE	8.55×10^{-3}	3.87×10^{-3}	3.44×10^{-2}	4.78×10^{-3}	5.16×10^{-2}
SELENIUM & COMPOUNDS	0.12	5.49×10^{-2}	0.49	6.78×10^{-2}	0.73
SULFUR DIOXIDE	316,167	143,303	1,273,752	176,968	1,910,190
T-BUTYL BENZENE	6.75	3.06	27	3.78	41
T-DECAHYDRONAPHTHALENE (TRANS-DECALIN)	13	6.12	54	7.55	82
TETRAMETHYLCYCLOPENTANE	12	5.61	50	6.92	75
TETRAMETHYLTHIOUREA	1.12	0.51	4.53	0.63	6.79
TOLUENE	242	110	974	135	1,461
TOTAL SUSPENDED PARTICULATE	39,197	17,766	157,915	21,940	236,819
TOTAL VOLATILE ORGANIC COMPOUNDS	10,673	4,837	42,998	5,974	64,482
TRANS-1,3-DIMETHYLCYCLOHEXANE	10	4.59	41	5.66	61
TRIMETHYLBENZENES	76	35	308	43	462
TRIMETHYLCYCLOHEXANES	45	20	181	25	272
TRIMETHYLCYCLOHEXANOL	3.37	1.53	14	1.89	20
TRIMETHYLCYCLOPENTANONE	3.37	1.53	14	1.89	20
TRIMETHYLHEXENE	7.87	3.57	32	4.41	48
TRIMETHYLOCTANES	7.87	3.57	32	4.41	48
VANADIUM & COMPOUNDS	563	255	2,269	315	3,403
ZINC & COMPOUNDS	8.48	3.84	34	4.75	51
Auxiliary Engine - Diesel Oil					
(1-METHYLPROPYL)BENZENE (SEC- BUTYL BENZENE)	0.93	0.42	3.77	0.52	5.65
(2-METHYLPROPYL)BENZENE	2.31	1.05	9.30	1.29	14
1,2,3-TRIMETHYLBENZENE	2.20	1.00	8.86	1.23	13
1,2,4-TRIMETHYLBENZENE	9.71	4.40	39	5.44	59
1,2-DIETHYLBENZENE (ORTHO)	1.58	0.71	6.35	0.88	9.52
1,2-PROPADIENE	8.54	3.87	34	4.78	52
1,3,5-TRIMETHYLBENZENE	3.56	1.61	14	1.99	21
1,3-BUTADIENE	3.48	1.58	14	1.95	21
1-BUTENE	12	5.53	49	6.83	74
1-METHYL NAPHTHALENE	1.58	0.72	6.38	0.89	9.57
1-METHYLPHENANTHRENE	0.29	0.13	1.16	0.16	1.75
1-PENTENE	5.94	2.69	24	3.32	36
2,2,4-TRIMETHYLPENTANE	5.46	2.48	22	3.06	33
2,2-DIMETHYLBUTANE	1.12	0.51	4.50	0.63	6.75
2,3,4-TRIMETHYLPENTANE	0.27	0.12	1.11	0.15	1.66
2,3,5-TRIMETHYLNAPHTHALENE	0.10	4.66×10^{-2}	0.41	5.76×10^{-2}	0.62
2,3-DIMETHYL-1-BUTENE	0.51	0.23	2.07	0.29	3.10
2,3-DIMETHYLHEXANE	0.20	9.14×10^{-2}	0.81	0.11	1.22
2,3-DIMETHYLPENTANE	1.34	0.61	5.39	0.75	8.08
2,4-DIMETHYLHEXANE	0.66	0.30	2.66	0.37	3.99

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2,4-DIMETHYLPENTANE	0.35	0.16	1.40	0.19	2.10
2,6-DIMETHYL NAPHTHALENE	0.47	0.21	1.89	0.26	2.84
2-METHYLANTHRACENE	4.17×10^{-3}	1.89×10^{-3}	1.68×10^{-2}	2.33×10^{-3}	2.52×10^{-2}
2-METHYL-BUTANE	11	5.00	44	6.18	67
2-METHYLHEPTANE	1.04	0.47	4.21	0.58	6.31
2-METHYLHEXANE	2.11	0.96	8.49	1.18	13
2-METHYLNAPHTHALENE	2.92	1.32	12	1.63	18
2-METHYLPENTANE	7.18	3.26	29	4.02	43
2-METHYLPROPANE; ISOBUTANE	22	10	90	13	135
2-METHYLPROPENE (ISOBUTENE)	17	7.66	68	9.46	102
3,3-DIMETHYL-1-BUTENE	52	23	208	29	312
3-METHYLHEXANE	6.38	2.89	26	3.57	39
3-METHYLPENTANE	2.11	0.96	8.49	1.18	13
ACENAPHTHENE	4.03×10^{-3}	1.83×10^{-3}	1.62×10^{-2}	2.26×10^{-3}	2.43×10^{-2}
ACENAPHTHYLENE	4.73×10^{-3}	2.14×10^{-3}	1.90×10^{-2}	2.64×10^{-3}	2.85×10^{-2}
ACETALDEHYDE	135	61	543	75	814
ACETONE	138	62	554	77	831
ACETYLENE	78	35	314	44	471
ALKENE KETONE	32	15	129	18	194
AMMONIA (TOTAL)	13	5.97	53	7.37	80
ANTHRACENE	5.14×10^{-3}	2.33×10^{-3}	2.07×10^{-2}	2.88×10^{-3}	3.11×10^{-2}
ANTIMONY & COMPOUNDS	0.24	0.11	0.95	0.13	1.42
ARSENIC & COMPOUNDS	2.86×10^{-2}	1.30×10^{-2}	0.12	1.60×10^{-2}	0.17
BENZALDEHYDE	13	5.81	52	7.17	77
BENZENE	37	17	148	21	222
BENZO(A)ANTHRACENE	3.61×10^{-3}	1.64×10^{-3}	1.46×10^{-2}	2.02×10^{-3}	2.18×10^{-2}
BENZO(A)PYRENE	5.56×10^{-3}	2.52×10^{-3}	2.24×10^{-2}	3.11×10^{-3}	3.36×10^{-2}
BENZO(B)FLUORANTHENE	3.47×10^{-3}	1.57×10^{-3}	1.40×10^{-2}	1.94×10^{-3}	2.10×10^{-2}
BENZO(E)PYRENE	3.20×10^{-3}	1.45×10^{-3}	1.29×10^{-2}	1.79×10^{-3}	1.93×10^{-2}
BENZO(G,H,I)PERYLENE	3.61×10^{-2}	1.64×10^{-2}	0.15	2.02×10^{-2}	0.22
BENZO(K)FLUORANTHENE	3.06×10^{-3}	1.39×10^{-3}	1.23×10^{-2}	1.71×10^{-3}	1.85×10^{-2}
BIPHENYL {PHENYL BENZENE}	0.47	0.21	1.88	0.26	2.82
B-METHYLSTYRENE	0.86	0.39	3.47	0.48	5.20
BROMINE AND COMPOUNDS	1.86×10^{-2}	8.44×10^{-3}	7.50×10^{-2}	1.04×10^{-2}	0.11
BUTYLBENZENE ISOMERS	2.33	1.05	9.38	1.30	14
BUTYRALDEHYDE	34	16	138	19	207
C10 MONOSUBSTITUTED BENZENES	1.45	0.66	5.83	0.81	8.75
C5 ALDEHYDE	2.02	0.91	8.12	1.13	12
C6 ALDEHYDES	70	32	280	39	421
C9 MONOSUBSTITUTED BENZENES	9.11	4.13	37	5.10	55
CADMIUM & COMPOUNDS	4.76×10^{-3}	2.16×10^{-3}	1.92×10^{-2}	2.67×10^{-3}	2.88×10^{-2}
CARBON DIOXIDE	3,028,068	1,372,475	12,199,291	1,694,906	18,294,740
CARBON MONOXIDE	4,830	2,189	19,457	2,703	29,179
CHLORINE	0.46	0.21	1.87	0.26	2.80

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CHROMIUM (III) COMPOUNDS	3.14×10^{-2}	1.43×10^{-2}	0.13	1.76×10^{-2}	0.19
CHROMIUM (VI) COMPOUNDS	1.62×10^{-2}	7.34×10^{-3}	6.53×10^{-2}	9.07×10^{-3}	9.79×10^{-2}
CHRYSENE	2.89×10^{-2}	1.31×10^{-2}	0.12	1.62×10^{-2}	0.17
CIS-2-BUTENE	1.72	0.78	6.94	0.96	10
CIS-2-PENTENE	0.55	0.25	2.21	0.31	3.32
COBALT & COMPOUNDS	1.02×10^{-2}	4.60×10^{-3}	4.09×10^{-2}	5.68×10^{-3}	6.13×10^{-2}
COPPER & COMPOUNDS	1.62	0.73	6.53	0.91	9.79
CORONENE	6.25×10^{-2}	2.83×10^{-2}	0.25	3.50×10^{-2}	0.38
CUMENE (1-METHYLETHYLBENZENE)	0.27	0.12	1.11	0.15	1.66
CYCLOHEXANE	0.48	0.22	1.92	0.27	2.88
CYCLOHEXANONE	1.96	0.89	7.90	1.10	12
CYCLOPENTANE	0.22	9.97×10^{-2}	0.89	0.12	1.33
DIBENZO(A,H)ANTHRACENE	3.47×10^{-2}	1.57×10^{-2}	0.14	1.94×10^{-2}	0.21
DIETHYLBENZENES	2.47	1.12	9.97	1.38	15
ETHANE	10	4.69	42	5.80	63
ETHYL ALCOHOL	0.16	7.48×10^{-2}	0.66	9.23×10^{-2}	1.00
ETHYLBENZENE	5.59	2.53	23	3.13	34
ETHYLENE	263	119	1,061	147	1,592
ETHYLHEXANE	1.12	0.51	4.50	0.63	6.75
FLUORANTHENE	6.11×10^{-2}	2.77×10^{-2}	0.25	3.42×10^{-2}	0.37
FLUORENE	0.21	9.45×10^{-2}	0.84	0.12	1.26
FORMALDEHYDE	270	122	1,086	151	1,629
INDAN	3.45	1.56	14	1.93	21
INDENO(1,2,3-CD)PYRENE	3.61×10^{-2}	1.64×10^{-2}	0.15	2.02×10^{-2}	0.22
ISOMERS OF XYLENE	19	8.65	77	11	115
LEAD & COMPOUNDS	0.14	6.48×10^{-2}	0.58	8.0×10^{-2}	0.86
MERCURY & COMPOUNDS	4.76×10^{-4}	2.16×10^{-4}	1.92×10^{-3}	2.67×10^{-4}	2.88×10^{-3}
METHANE	18	7.96	71	9.83	106
METHYL ALCOHOL	0.55	0.25	2.21	0.31	3.32
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	27	12	109	15	164
METHYL N-BUTYL KETONE	16	7.47	66	9.22	100
METHYLANTHRACENES	8.34×10^{-2}	3.78×10^{-2}	0.34	4.67×10^{-2}	0.50
METHYLCYCLOHEXANE	1.25	0.56	5.02	0.70	7.53
METHYLCYCLOPENTANE	2.73	1.24	11	1.53	16
M-ETHYLTOLUENE	4.53	2.05	18	2.53	27
MOLYBDENUM	2.03×10^{-2}	9.20×10^{-3}	8.18×10^{-2}	1.14×10^{-2}	0.12
NAPHTHALENE	3.42	1.55	14	1.91	21
N-BUTANE	1.91	0.86	7.68	1.07	12
N-DECANE	9.69	4.39	39	5.43	59
N-HEPTANE	1.25	0.56	5.02	0.70	7.53
N-HEXANE	2.88	1.30	12	1.61	17
NICKEL & COMPOUNDS	0.95	0.43	3.84	0.53	5.76
NITRIC OXIDE	34,383	15,584	138,522	19,246	207,735

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
NITROGEN DIOXIDE	2,775	1,258	11,179	1,553	16,765
NITROUS OXIDE	136	62	548	76	822
N-NONANE	4.21	1.91	17	2.36	25
N-OCTANE	2.57	1.16	10	1.44	16
N-PENTANE	3.21	1.45	13	1.80	19
N-PROPYLBENZENE	2.24	1.01	9.01	1.25	14
N-UNDECANE	4.78	2.17	19	2.68	29
O-ETHYLTOLUENE	2.53	1.15	10	1.42	15
OXIDES OF NITROGEN	55,496	25,154	223,579	31,063	335,292
PARTICULATE MATTER $\leq 10 \mu\text{m}$	1,624	736	6,544	909	9,813
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	1,494	677	6,020	836	9,028
PERYLENE	4.45×10^{-3}	2.02×10^{-3}	1.79×10^{-2}	2.49×10^{-3}	2.69×10^{-2}
PHENANTHRENE	0.91	0.41	3.68	0.51	5.52
PHOSPHORUS	0.21	9.43×10^{-2}	0.84	0.12	1.26
POLYCHLORINATED DIOXINS AND FURANS	1.32×10^{-7}	5.97×10^{-8}	5.31×10^{-7}	7.37×10^{-8}	7.96×10^{-7}
POLYCYCLIC AROMATIC HYDROCARBONS	11	4.98	44	6.14	66
PROPANE	3.39	1.54	14	1.90	20
PROPIONALDEHYDE	18	8.06	72	9.95	107
PROPYLENE	48	22	192	27	288
PYRENE	5.28×10^{-2}	2.39×10^{-2}	0.21	2.96×10^{-2}	0.32
RETENE	2.22×10^{-3}	1.01×10^{-3}	8.96×10^{-3}	1.24×10^{-3}	1.34×10^{-2}
SELENIUM & COMPOUNDS	4.76×10^{-5}	2.16×10^{-5}	1.92×10^{-4}	2.67×10^{-5}	2.88×10^{-4}
STYRENE (ETHENYLBENZENE)	1.06	0.48	4.28	0.59	6.42
SULFUR DIOXIDE	12,107	5,488	48,777	6,777	73,149
T-BUTYLBENZENE	0.11	4.98×10^{-2}	0.44	6.15×10^{-2}	0.66
TIN & COMPOUNDS	8.29×10^{-2}	3.76×10^{-2}	0.33	4.64×10^{-2}	0.50
TOLUENE	27	12	109	15	163
TOTAL SUSPENDED PARTICULATE	1,692	767	6,816	947	10,222
TOTAL VOLATILE ORGANIC COMPOUNDS	1,756	796	7,075	983	10,611
TRANS-2-BUTENE	3.57	1.62	14	2.00	22
TRANS-2-PENTENE	0.73	0.33	2.95	0.41	4.43
VANADIUM & COMPOUNDS	1.62	0.73	6.53	0.91	9.79
ZINC & COMPOUNDS	0.95	0.43	3.84	0.53	5.76
Auxiliary Engine - Gas Oil					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	0.12	5.30×10^{-2}	0.47	6.54×10^{-2}	0.71
(2-METHYLPROPYL)BENZENE	0.29	0.13	1.16	0.16	1.74
1,2,3-TRIMETHYLBENZENE	0.27	0.12	1.11	0.15	1.66
1,2,4-TRIMETHYLBENZENE	1.21	0.55	4.89	0.68	7.34
1,2-DIETHYLBENZENE (ORTHO)	0.20	8.93×10^{-2}	0.79	0.11	1.19
1,2-PROPADIENE	1.07	0.48	4.30	0.60	6.45

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1,3,5-TRIMETHYLBENZENE	0.44	0.20	1.79	0.25	2.69
1,3-BUTADIENE	0.44	0.20	1.75	0.24	2.63
1-BUTENE	1.53	0.69	6.15	0.85	9.22
1-METHYL NAPHTHALENE	0.14	6.31×10^{-2}	0.56	7.79×10^{-2}	0.84
1-METHYLPHENANTHRENE	1.64×10^{-4}	7.44×10^{-5}	6.61×10^{-4}	9.19×10^{-5}	9.92×10^{-4}
1-PENTENE	0.74	0.34	2.99	0.42	4.48
2,2,4-TRIMETHYLPENTANE	0.68	0.31	2.75	0.38	4.12
2,2-DIMETHYLBUTANE	0.14	6.33×10^{-2}	0.56	7.82×10^{-2}	0.84
2,3,4-TRIMETHYLPENTANE	3.44×10^{-2}	1.56×10^{-2}	0.14	1.92×10^{-2}	0.21
2,3,5-TRIMETHYLNAPHTHALENE	1.58×10^{-2}	7.17×10^{-3}	6.38×10^{-2}	8.86×10^{-3}	9.56×10^{-2}
2,3-DIMETHYL-1-BUTENE	6.41×10^{-2}	2.91×10^{-2}	0.26	3.59×10^{-2}	0.39
2,3-DIMETHYLHEXANE	2.52×10^{-2}	1.14×10^{-2}	0.10	1.41×10^{-2}	0.15
2,3-DIMETHYLPENTANE	0.17	7.58×10^{-2}	0.67	9.36×10^{-2}	1.01
2,4-DIMETHYLHEXANE	8.25×10^{-2}	3.74×10^{-2}	0.33	4.62×10^{-2}	0.50
2,4-DIMETHYLPENTANE	4.35×10^{-2}	1.97×10^{-2}	0.18	2.44×10^{-2}	0.26
2,6-DIMETHYL NAPHTHALENE	4.17×10^{-2}	1.89×10^{-2}	0.17	2.33×10^{-2}	0.25
2-METHYLANTHRACENE	2.95×10^{-4}	1.34×10^{-4}	1.19×10^{-3}	1.65×10^{-4}	1.79×10^{-3}
2-METHYL-BUTANE	1.38	0.63	5.56	0.77	8.33
2-METHYLHEPTANE	0.13	5.92×10^{-2}	0.53	7.31×10^{-2}	0.79
2-METHYLHEXANE	0.26	0.12	1.06	0.15	1.59
2-METHYLNAPHTHALENE	0.17	7.72×10^{-2}	0.69	9.54×10^{-2}	1.03
2-METHYLPENTANE	0.90	0.41	3.62	0.50	5.43
2-METHYLPROPANE; ISOBUTANE	2.80	1.27	11	1.57	17
2-METHYLPROPENE (ISOBUTENE)	2.11	0.96	8.51	1.18	13
3,3-DIMETHYL-1-BUTENE	6.46	2.93	26	3.62	39
3-METHYLHEXANE	0.80	0.36	3.21	0.45	4.82
3-METHYLPENTANE	0.26	0.12	1.06	0.15	1.59
ACENAPHTHENE	1.60×10^{-2}	7.23×10^{-3}	6.43×10^{-2}	8.93×10^{-3}	9.64×10^{-2}
ACENAPHTHYLENE	2.56×10^{-3}	1.16×10^{-3}	1.03×10^{-2}	1.43×10^{-3}	1.55×10^{-2}
ACETALDEHYDE	17	7.63	68	9.43	102
ACETONE	17	7.79	69	9.63	104
ACETYLENE	9.75	4.42	39	5.45	59
ALKENE KETONE	4.01	1.82	16	2.24	24
AMMONIA (TOTAL)	1.65	0.75	6.63	0.92	9.95
ANTHRACENE	1.35×10^{-2}	6.13×10^{-3}	5.45×10^{-2}	7.57×10^{-3}	8.17×10^{-2}
ANTIMONY & COMPOUNDS	2.21×10^{-2}	1.0×10^{-2}	8.89×10^{-2}	1.24×10^{-2}	0.13
ARSENIC & COMPOUNDS	3.57×10^{-3}	1.62×10^{-3}	1.44×10^{-2}	2.0×10^{-3}	2.16×10^{-2}
BENZALDEHYDE	1.60	0.73	6.45	0.90	9.67
BENZENE	4.58	2.08	18	2.57	28
BENZO(A)ANTHRACENE	8.73×10^{-3}	3.96×10^{-3}	3.52×10^{-2}	4.89×10^{-3}	5.28×10^{-2}
BENZO(A)PYRENE	2.22×10^{-3}	1.0×10^{-3}	8.93×10^{-3}	1.24×10^{-3}	1.34×10^{-2}
BENZO(B)FLUORANTHENE	9.65×10^{-3}	4.38×10^{-3}	3.89×10^{-2}	5.40×10^{-3}	5.83×10^{-2}
BENZO(E)PYRENE	5.32×10^{-3}	2.41×10^{-3}	2.14×10^{-2}	2.98×10^{-3}	3.21×10^{-2}
BENZO(G,H,I)PERYLENE	8.11×10^{-3}	3.68×10^{-3}	3.27×10^{-2}	4.54×10^{-3}	4.90×10^{-2}

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(K)FLUORANTHENE	2.86×10^{-3}	1.29×10^{-3}	1.15×10^{-2}	1.60×10^{-3}	1.73×10^{-2}
BIPHENYL {PHENYL BENZENE}	4.63×10^{-2}	2.10×10^{-2}	0.19	2.59×10^{-2}	0.28
B-METHYLSTYRENE	0.11	4.88×10^{-2}	0.43	6.03×10^{-2}	0.65
BROMINE AND COMPOUNDS	1.75×10^{-3}	7.92×10^{-4}	7.04×10^{-3}	9.78×10^{-4}	1.06×10^{-2}
BUTYLBENZENE ISOMERS	0.29	0.13	1.17	0.16	1.76
BUTYRALDEHYDE	4.28	1.94	17	2.40	26
C10 MONOSUBSTITUTED BENZENES	0.18	8.20×10^{-2}	0.73	0.10	1.09
C5 ALDEHYDE	0.25	0.11	1.02	0.14	1.52
C6 ALDEHYDES	8.70	3.94	35	4.87	53
C9 MONOSUBSTITUTED BENZENES	1.14	0.52	4.59	0.64	6.88
CADMIUM & COMPOUNDS	5.95×10^{-4}	2.70×10^{-4}	2.40×10^{-3}	3.33×10^{-4}	3.60×10^{-3}
CARBON DIOXIDE	378,780	171,682	1,526,003	212,015	2,288,480
CARBON MONOXIDE	604	274	2,432	338	3,647
CHLORINE	4.35×10^{-2}	1.97×10^{-2}	0.18	2.44×10^{-2}	0.26
CHROMIUM (III) COMPOUNDS	3.93×10^{-3}	1.78×10^{-3}	1.58×10^{-2}	2.20×10^{-3}	2.37×10^{-2}
CHROMIUM (VI) COMPOUNDS	2.02×10^{-3}	9.18×10^{-4}	8.16×10^{-3}	1.13×10^{-3}	1.22×10^{-2}
CHRYSENE	1.88×10^{-2}	8.53×10^{-3}	7.59×10^{-2}	1.05×10^{-2}	0.11
CIS-2-BUTENE	0.22	9.76×10^{-2}	0.87	0.12	1.30
CIS-2-PENTENE	6.87×10^{-2}	3.11×10^{-2}	0.28	3.85×10^{-2}	0.42
COBALT & COMPOUNDS	9.53×10^{-4}	4.32×10^{-4}	3.84×10^{-3}	5.33×10^{-4}	5.76×10^{-3}
COPPER & COMPOUNDS	0.20	9.18×10^{-2}	0.82	0.11	1.22
CORONENE	6.07×10^{-4}	2.75×10^{-4}	2.45×10^{-3}	3.40×10^{-4}	3.67×10^{-3}
CUMENE (1-METHYLETHYLBENZENE)	3.44×10^{-2}	1.56×10^{-2}	0.14	1.92×10^{-2}	0.21
CYCLOHEXANE	5.96×10^{-2}	2.70×10^{-2}	0.24	3.33×10^{-2}	0.36
CYCLOHEXANONE	0.25	0.11	0.99	0.14	1.48
CYCLOPENTANE	2.75×10^{-2}	1.25×10^{-2}	0.11	1.54×10^{-2}	0.17
DIBENZO(A,H)ANTHRACENE	1.19×10^{-2}	5.37×10^{-3}	4.78×10^{-2}	6.63×10^{-3}	7.16×10^{-2}
DIETHYLBENZENES	0.31	0.14	1.25	0.17	1.87
ETHANE	1.29	0.59	5.21	0.72	7.82
ETHYL ALCOHOL	2.06×10^{-2}	9.34×10^{-3}	8.31×10^{-2}	1.15×10^{-2}	0.12
ETHYLBENZENE	0.70	0.32	2.81	0.39	4.22
ETHYLENE	33	15	133	18	199
ETHYLHEXANE	0.14	6.33×10^{-2}	0.56	7.82×10^{-2}	0.84
FLUORANTHENE	6.54×10^{-2}	2.96×10^{-2}	0.26	3.66×10^{-2}	0.40
FLUORENE	4.92×10^{-2}	2.23×10^{-2}	0.20	2.75×10^{-2}	0.30
FORMALDEHYDE	34	15	136	19	204
INDAN	0.43	0.20	1.74	0.24	2.60
INDENO(1,2,3-CD)PYRENE	6.80×10^{-3}	3.08×10^{-3}	2.74×10^{-2}	3.80×10^{-3}	4.11×10^{-2}
ISOMERS OF XYLENE	2.38	1.08	9.61	1.33	14
LEAD & COMPOUNDS	1.79×10^{-2}	8.10×10^{-3}	7.20×10^{-2}	1.0×10^{-2}	0.11
MERCURY & COMPOUNDS	5.95×10^{-5}	2.70×10^{-5}	2.40×10^{-4}	3.33×10^{-5}	3.60×10^{-4}
METHANE	2.20	1.00	8.84	1.23	13
METHYL ALCOHOL	6.87×10^{-2}	3.11×10^{-2}	0.28	3.85×10^{-2}	0.42
METHYL ETHYL KETONE (MEK) (2-	3.38	1.53	14	1.89	20

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BUTANONE)					
METHYL N-BUTYL KETONE	2.06	0.93	8.30	1.15	12
METHYLANTHRACENES	5.68×10^{-2}	2.58×10^{-2}	0.23	3.18×10^{-2}	0.34
METHYLCYCLOHEXANE	0.16	7.06×10^{-2}	0.63	8.72×10^{-2}	0.94
METHYLCYCLOPENTANE	0.34	0.15	1.38	0.19	2.06
M-ETHYLTOLUENE	0.57	0.26	2.28	0.32	3.42
MOLYBDENUM	1.91×10^{-3}	8.64×10^{-4}	7.68×10^{-3}	1.07×10^{-3}	1.15×10^{-2}
NAPHTHALENE	0.33	0.15	1.35	0.19	2.02
N-BUTANE	0.24	0.11	0.96	0.13	1.44
N-DECANE	1.21	0.55	4.88	0.68	7.32
N-HEPTANE	0.16	7.06×10^{-2}	0.63	8.72×10^{-2}	0.94
N-HEXANE	0.36	0.16	1.45	0.20	2.17
NICKEL & COMPOUNDS	0.12	5.40×10^{-2}	0.48	6.67×10^{-2}	0.72
NITRIC OXIDE	4,298	1,948	17,316	2,406	25,968
NITROGEN DIOXIDE	347	157	1,397	194	2,096
NITROUS OXIDE	17	7.71	69	9.52	103
N-NONANE	0.53	0.24	2.12	0.29	3.18
N-OCTANE	0.32	0.15	1.29	0.18	1.94
N-PENTANE	0.40	0.18	1.62	0.22	2.42
N-PROPYLBENZENE	0.28	0.13	1.13	0.16	1.69
N-UNDECANE	0.60	0.27	2.41	0.33	3.61
O-ETHYLTOLUENE	0.32	0.14	1.27	0.18	1.91
OXIDES OF NITROGEN	6,937	3,144	27,948	3,883	41,913
PARTICULATE MATTER $\leq 10 \mu\text{m}$	152	69	614	85	921
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	140	64	565	79	847
PERYLENE	2.63×10^{-4}	1.19×10^{-4}	1.06×10^{-3}	1.47×10^{-4}	1.59×10^{-3}
PHENANTHRENE	0.23	0.10	0.93	0.13	1.39
PHOSPHORUS	1.95×10^{-2}	8.85×10^{-3}	7.87×10^{-2}	1.09×10^{-2}	0.12
POLYCHLORINATED DIOXINS AND FURANS	1.65×10^{-8}	7.46×10^{-9}	6.63×10^{-8}	9.22×10^{-9}	9.95×10^{-8}
POLYCYCLIC AROMATIC HYDROCARBONS	1.37	0.62	5.53	0.77	8.29
PROPANE	0.42	0.19	1.71	0.24	2.56
PROPIONALDEHYDE	2.22	1.01	8.95	1.24	13
PROPYLENE	5.95	2.70	24	3.33	36
PYRENE	8.44×10^{-2}	3.83×10^{-2}	0.34	4.72×10^{-2}	0.51
RETENE	1.61×10^{-2}	7.31×10^{-3}	6.49×10^{-2}	9.02×10^{-3}	9.74×10^{-2}
SELENIUM & COMPOUNDS	5.95×10^{-6}	2.70×10^{-6}	2.40×10^{-5}	3.33×10^{-6}	3.60×10^{-5}
STYRENE (ETHENYLBENZENE)	0.13	6.02×10^{-2}	0.54	7.44×10^{-2}	0.80
SULFUR DIOXIDE	885	401	3,565	495	5,346
T-BUTYLBENZENE	1.37×10^{-2}	6.23×10^{-3}	5.54×10^{-2}	7.69×10^{-3}	8.30×10^{-2}
TIN & COMPOUNDS	7.78×10^{-3}	3.53×10^{-3}	3.14×10^{-2}	4.36×10^{-3}	4.70×10^{-2}
TOLUENE	3.37	1.53	14	1.89	20
TOTAL SUSPENDED PARTICULATE	159	72	640	89	959

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
TOTAL VOLATILE ORGANIC COMPOUNDS	220	100	884	123	1,326
TRANS-2-BUTENE	0.45	0.20	1.80	0.25	2.70
TRANS-2-PENTENE	9.16×10^{-2}	4.15×10^{-2}	0.37	5.13×10^{-2}	0.55
VANADIUM & COMPOUNDS	0.20	9.18×10^{-2}	0.82	0.11	1.22
ZINC & COMPOUNDS	0.12	5.40×10^{-2}	0.48	6.67×10^{-2}	0.72
Auxiliary Boiler - Residual Oil					
1-METHYL NAPHTHALENE	6.73	1.58	30	2.50	41
1-METHYLPHENANTHRENE	0.95	0.22	4.31	0.35	5.83
1-OCTANOL	0.41	9.52×10^{-2}	1.83	0.15	2.48
2,2,4,4-TETRAMETHYL-3-PENTANONE	2.64	0.62	12	0.98	16
2,3,5-TRIMETHYLNAPHTHALENE	0.38	8.85×10^{-2}	1.70	0.14	2.31
2,4,5-TRIMETHYLHEPTANE	24	5.62	108	8.87	147
2,4-DIMETHYL-1-PENTENE	1.82	0.43	8.25	0.68	11
2,4-DIMETHYLOCTANE	26	6.19	119	9.77	161
2,6-DIMETHYL NAPHTHALENE	1.86	0.44	8.42	0.69	11
2-METHYLANTHRACENE	2.29×10^{-2}	5.38×10^{-3}	0.10	8.49×10^{-3}	0.14
2-METHYLDECANE	17	4.00	77	6.31	104
2-METHYLNAPHTHALENE	11	2.51	48	3.96	65
2-METHYLNONANE	17	4.00	77	6.31	104
2-METHYLOCTANE	6.08	1.43	27	2.25	37
4-PROPYL-3-HEPTENE	2.23	0.52	10	0.83	14
ACENAPHTHENE	0.25	5.86×10^{-2}	1.13	9.26×10^{-2}	1.53
ACENAPHTHYLENE	3.24×10^{-2}	7.61×10^{-3}	0.15	1.20×10^{-2}	0.20
ACETYLENE	88	21	397	33	538
AMMONIA (TOTAL)	7.70	1.81	35	2.85	47
ANTHRACENE	6.67×10^{-2}	1.57×10^{-2}	0.30	2.47×10^{-2}	0.41
A-PINENE	0.41	9.52×10^{-2}	1.83	0.15	2.48
ARSENIC & COMPOUNDS	4.99	1.17	23	1.85	31
BENZENE	44	10	198	16	268
BENZO(A)ANTHRACENE	5.25×10^{-2}	1.23×10^{-2}	0.24	1.95×10^{-2}	0.32
BENZO(A)PYRENE	2.59×10^{-2}	6.08×10^{-3}	0.12	9.60×10^{-3}	0.16
BENZO(B)FLUORANTHENE	1.41×10^{-2}	3.31×10^{-3}	6.37×10^{-2}	5.22×10^{-3}	8.63×10^{-2}
BENZO(E)PYRENE	2.98×10^{-2}	6.99×10^{-3}	0.13	1.10×10^{-2}	0.18
BENZO(G,H,I)PERYLENE	0.11	2.59×10^{-2}	0.50	4.09×10^{-2}	0.68
BENZO(K)FLUORANTHENE	1.36×10^{-2}	3.18×10^{-3}	6.13×10^{-2}	5.03×10^{-3}	8.31×10^{-2}
BENZOTHAZOLE	0.20	4.76×10^{-2}	0.92	7.51×10^{-2}	1.24
BICYCLO[4.3.0]NONANE (OCTAHYDROINDENE)	0.61	0.14	2.75	0.23	3.73
BIPHENYL {PHENYL BENZENE}	9.01	2.12	41	3.34	55
BROMINE AND COMPOUNDS	14	3.38	65	5.33	88
BUTYLBENZENE ISOMERS	15	3.57	69	5.64	93
BUTYLCYCLOHEXANE	6.89	1.62	31	2.55	42
C10 ALKYLPHENOLS	1.62	0.38	7.33	0.60	9.94

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
C10 INTERNAL ALKENES	8.72	2.05	39	3.23	53
C11 ALKYLPHENOLS	0.61	0.14	2.75	0.23	3.73
C11 DIALKYL BENZENES	0.41	9.52×10^{-2}	1.83	0.15	2.48
C11 INTERNAL ALKENES	4.05	0.95	18	1.50	25
C12 INTERNAL ALKENES	0.41	9.52×10^{-2}	1.83	0.15	2.48
C12H22	0.81	0.19	3.67	0.30	4.97
CADMIUM & COMPOUNDS	7.63×10^{-2}	1.79×10^{-2}	0.34	2.83×10^{-2}	0.47
CARBON DIOXIDE	18,638,061	4,377,173	84,272,800	6,907,964	114,195,998
CARBON MONOXIDE	3,848	904	17,401	1,426	23,580
CHLOROBENZENE	1.01	0.24	4.58	0.38	6.21
CHROMIUM (III) COMPOUNDS	4.76	1.12	22	1.77	29
CHROMIUM (VI) COMPOUNDS	2.45	0.58	11	0.91	15
CHRYSENE	0.21	4.91×10^{-2}	0.95	7.75×10^{-2}	1.28
CIS-BICYCLO[3.3.0]OCTANE	0.41	9.52×10^{-2}	1.83	0.15	2.48
COBALT & COMPOUNDS	14	3.38	65	5.33	88
COPPER & COMPOUNDS	12	2.76	53	4.35	72
CORONENE	0.19	4.49×10^{-2}	0.86	7.08×10^{-2}	1.17
DIBENZO(A,H)ANTHRACENE	0.11	2.64×10^{-2}	0.51	4.16×10^{-2}	0.69
DIETHYLCYCLOHEXANE	1.82	0.43	8.25	0.68	11
DIETHYLMETHYLCYCLOHEXANES	2.23	0.52	10	0.83	14
DIMETHYLBENZYLALCOHOL	0.61	0.14	2.75	0.23	3.73
DIMETHYLBUTYLCYCLOHEXANE	0.20	4.76×10^{-2}	0.92	7.51×10^{-2}	1.24
DIMETHYLDECANE	1.22	0.29	5.50	0.45	7.45
DIMETHYLETHYLCYCLOHEXANE	3.85	0.90	17	1.43	24
DIMETHYLHEPTANES	2.23	0.52	10	0.83	14
DIMETHYLNONANES	10	2.38	46	3.76	62
DIMETHYLUDECANES	1.01	0.24	4.58	0.38	6.21
DIMETHYOCTYNE DIOL	0.41	9.52×10^{-2}	1.83	0.15	2.48
ETHANE	9.32	2.19	42	3.46	57
ETHYL PROPYLCYCLOHEXANES	2.03	0.48	9.17	0.75	12
ETHYLBENZENE	1.42	0.33	6.42	0.53	8.69
ETHYLCYCLOHEXANE	2.43	0.57	11	0.90	15
ETHYLENE	247	58	1,117	92	1,514
ETHYLHEXANE	1.42	0.33	6.42	0.53	8.69
ETHYLMETHYLCYCLOHEXANES	17	4.09	79	6.46	107
ETHYLMETHYLHEXANE	0.41	9.52×10^{-2}	1.83	0.15	2.48
ETHYLOCTANE	0.81	0.19	3.67	0.30	4.97
FLUORANTHENE	0.40	9.33×10^{-2}	1.80	0.15	2.43
FLUORENE	1.57	0.37	7.12	0.58	9.65
FORMALDEHYDE	2.03	0.48	9.17	0.75	12
INDENE	1.42	0.33	6.42	0.53	8.69
INDENO(1,2,3-CD)PYRENE	0.11	2.68×10^{-2}	0.52	4.23×10^{-2}	0.70
ISOMERS OF C10H18	0.20	4.76×10^{-2}	0.92	7.51×10^{-2}	1.24
ISOMERS OF DECANE (C10	49	11	221	18	299

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
PARAFFINS)					
ISOMERS OF DODECANE (C12 PARAFFINS)	4.46	1.05	20	1.65	27
ISOMERS OF TRIDECANE (C13 PARAFFINS)	0.20	4.76×10^{-2}	0.92	7.51×10^{-2}	1.24
ISOMERS OF UNDECANE (C11 PARAFFINS)	32	7.57	146	12	197
ISOMERS OF XYLENE	22	5.24	101	8.26	137
ISOPROPYLCYCLOHEXANE (2-METHYLETHYL CYCLOHEXANE)	8.51	2.00	38	3.16	52
ISOPROPYLMETHYLCYCLOHEXANE	1.82	0.43	8.25	0.68	11
LEAD & COMPOUNDS	0.88	0.21	3.98	0.33	5.39
MANGANESE & COMPOUNDS	14	3.38	65	5.33	88
MERCURY & COMPOUNDS	1.76×10^{-2}	4.13×10^{-3}	7.96×10^{-2}	6.53×10^{-3}	0.11
METHANE	38	9.04	174	14	236
METHYL PROPYLCYCLOHEXANES	24	5.71	110	9.02	149
METHYLANTHRACENES	0.26	6.17×10^{-2}	1.19	9.73×10^{-2}	1.61
METHYLDECALINS	2.23	0.52	10	0.83	14
METHYLDECENES	2.64	0.62	12	0.98	16
METHYLUNDECANE	3.65	0.86	16	1.35	22
MOLYBDENUM	14	3.38	65	5.33	88
NAPHTHALENE	43	10	195	16	264
N-BUTANE	74	17	334	27	452
N-HEPTANE	9.32	2.19	42	3.46	57
N-HEXANE	32	7.57	146	12	197
NICKEL & COMPOUNDS	200	47	902	74	1,223
NITRIC OXIDE	25,036	5,880	113,202	9,279	153,397
NITROGEN DIOXIDE	2,020	475	9,136	749	12,379
NITROUS OXIDE	1,539	362	6,960	571	9,432
N-NONANE	38	8.86	170	14	231
N-OCTANE	9.32	2.19	42	3.46	57
NONADIENE	0.61	0.14	2.75	0.23	3.73
N-PENTADECANE	810	190	3,665	300	4,966
N-PENTANE	42	9.76	188	15	255
N-PROPYLBENZENE	4.05	0.95	18	1.50	25
O-ETHYLTOLUENE	1.62	0.38	7.33	0.60	9.94
OXIDES OF NITROGEN	40,409	9,490	182,712	14,977	247,589
PARTICULATE MATTER $\leq 10 \mu\text{m}$	27,916	6,556	126,223	10,347	171,042
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	25,683	6,032	116,125	9,519	157,359
PENTYLIDENECYCLOHEXANE	0.61	0.14	2.75	0.23	3.73
PERYLENE	2.18×10^{-2}	5.13×10^{-3}	9.87×10^{-2}	8.09×10^{-3}	0.13
PHENANTHRENE	7.35	1.73	33	2.73	45
POLYCHLORINATED DIOXINS AND FURANS	1.92×10^{-6}	4.52×10^{-7}	8.70×10^{-6}	7.13×10^{-7}	1.18×10^{-5}
POLYCYCLIC AROMATIC	85	20	383	31	519

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Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
HYDROCARBONS					
PROPENYLCYCLOHEXANE	3.04	0.71	14	1.13	19
PROPYLENE	92	22	418	34	566
PYRENE	0.32	7.42×10^{-2}	1.43	0.12	1.94
RETENE	6.16×10^{-3}	1.45×10^{-3}	2.79×10^{-2}	2.28×10^{-3}	3.78×10^{-2}
SELENIUM & COMPOUNDS	0.12	2.76×10^{-2}	0.53	4.35×10^{-2}	0.72
SULFUR DIOXIDE	306,360	71,949	1,385,222	113,549	1,877,080
T-BUTYLBENZENE	1.22	0.29	5.50	0.45	7.45
T-DECAHYDRONAPHTHALENE (TRANS-DECALIN)	2.43	0.57	11	0.90	15
TETRAMETHYLCYCLOPENTANE	2.23	0.52	10	0.83	14
TETRAMETHYLTHIOUREA	0.20	4.76×10^{-2}	0.92	7.51×10^{-2}	1.24
TOLUENE	44	10	197	16	267
TOTAL SUSPENDED PARTICULATE	28,779	6,759	130,127	10,667	176,332
TOTAL VOLATILE ORGANIC COMPOUNDS	1,924	452	8,701	713	11,790
TRANS-1,3-DIMETHYLCYCLOHEXANE	1.82	0.43	8.25	0.68	11
TRIMETHYLBENZENES	14	3.24	62	5.11	84
TRIMETHYLCYCLOHEXANES	8.11	1.90	37	3.01	50
TRIMETHYLCYCLOHEXANOL	0.61	0.14	2.75	0.23	3.73
TRIMETHYLCYCLOPENTANONE	0.61	0.14	2.75	0.23	3.73
TRIMETHYLHEXENE	1.42	0.33	6.42	0.53	8.69
TRIMETHYLOCTANES	1.42	0.33	6.42	0.53	8.69
VANADIUM & COMPOUNDS	546	128	2,468	202	3,344
ZINC & COMPOUNDS	8.22	1.93	37	3.05	50
Auxiliary Boiler - Diesel Oil					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	0.15	3.60×10^{-2}	0.69	5.68×10^{-2}	0.94
(2-METHYLPROPYL)BENZENE	0.38	8.89×10^{-2}	1.71	0.14	2.32
1,2,3-TRIMETHYLBENZENE	0.36	8.47×10^{-2}	1.63	0.13	2.21
1,2,4-TRIMETHYLBENZENE	1.59	0.37	7.20	0.59	9.76
1,2-DIETHYLBENZENE (ORTHO)	0.26	6.07×10^{-2}	1.17	9.58×10^{-2}	1.58
1,2-PROPADIENE	1.40	0.33	6.33	0.52	8.58
1,3,5-TRIMETHYLBENZENE	0.58	0.14	2.64	0.22	3.57
1,3-BUTADIENE	0.57	0.13	2.58	0.21	3.50
1-BUTENE	2.00	0.47	9.05	0.74	12
1-METHYL NAPHTHALENE	1.04	0.24	4.70	0.39	6.37
1-METHYLPHENANTHRENE	0.19	4.45×10^{-2}	0.86	7.03×10^{-2}	1.16
1-PENTENE	0.97	0.23	4.40	0.36	5.96
2,2,4-TRIMETHYLPENTANE	0.90	0.21	4.05	0.33	5.49
2,2-DIMETHYLBUTANE	0.18	4.30×10^{-2}	0.83	6.79×10^{-2}	1.12
2,3,4-TRIMETHYLPENTANE	4.51×10^{-2}	1.06×10^{-2}	0.20	1.67×10^{-2}	0.28
2,3,5-TRIMETHYLNAPHTHALENE	6.74×10^{-2}	1.58×10^{-2}	0.30	2.50×10^{-2}	0.41
2,3-DIMETHYL-1-BUTENE	8.41×10^{-2}	1.98×10^{-2}	0.38	3.12×10^{-2}	0.52

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2,3-DIMETHYLHEXANE	3.31×10^{-2}	7.76×10^{-3}	0.15	1.22×10^{-2}	0.20
2,3-DIMETHYLPENTANE	0.22	5.15×10^{-2}	0.99	8.13×10^{-2}	1.34
2,4-DIMETHYLHEXANE	0.11	2.54×10^{-2}	0.49	4.01×10^{-2}	0.66
2,4-DIMETHYLPENTANE	5.71×10^{-2}	1.34×10^{-2}	0.26	2.12×10^{-2}	0.35
2,6-DIMETHYL NAPHTHALENE	0.31	7.23×10^{-2}	1.39	0.11	1.89
2-METHYLANTHRACENE	2.73×10^{-3}	6.42×10^{-4}	1.24×10^{-2}	1.01×10^{-3}	1.68×10^{-2}
2-METHYL-BUTANE	1.81	0.42	8.18	0.67	11
2-METHYLHEPTANE	0.17	4.02×10^{-2}	0.77	6.35×10^{-2}	1.05
2-METHYLHEXANE	0.35	8.11×10^{-2}	1.56	0.13	2.12
2-METHYLNAPHTHALENE	1.91	0.45	8.65	0.71	12
2-METHYLPENTANE	1.18	0.28	5.33	0.44	7.22
2-METHYLPROPANE; ISOBUTANE	3.67	0.86	17	1.36	22
2-METHYLPROPENE (ISOBUTENE)	2.77	0.65	13	1.03	17
3,3-DIMETHYL-1-BUTENE	8.47	1.99	38	3.14	52
3-METHYLHEXANE	1.05	0.25	4.73	0.39	6.41
3-METHYLPENTANE	0.35	8.11×10^{-2}	1.56	0.13	2.12
ACENAPHTHENE	2.64×10^{-3}	6.21×10^{-4}	1.20×10^{-2}	9.80×10^{-4}	1.62×10^{-2}
ACENAPHTHYLENE	3.10×10^{-3}	7.28×10^{-4}	1.40×10^{-2}	1.15×10^{-3}	1.90×10^{-2}
ACETALDEHYDE	22	5.19	100	8.19	135
ACETONE	23	5.30	102	8.36	138
ACETYLENE	13	3.00	58	4.74	78
ALKENE KETONE	5.25	1.23	24	1.95	32
AMMONIA (TOTAL)	1.15	0.27	5.21	0.43	7.06
ANTHRACENE	3.37×10^{-3}	7.92×10^{-4}	1.52×10^{-2}	1.25×10^{-3}	2.07×10^{-2}
ANTIMONY & COMPOUNDS	0.18	4.15×10^{-2}	0.80	6.54×10^{-2}	1.08
ARSENIC & COMPOUNDS	0.73	0.17	3.32	0.27	4.50
BENZALDEHYDE	2.10	0.49	9.50	0.78	13
BENZENE	6.01	1.41	27	2.23	37
BENZO(A)ANTHRACENE	2.37×10^{-3}	5.56×10^{-4}	1.07×10^{-2}	8.78×10^{-4}	1.45×10^{-2}
BENZO(A)PYRENE	3.65×10^{-3}	8.56×10^{-4}	1.65×10^{-2}	1.35×10^{-3}	2.23×10^{-2}
BENZO(B)FLUORANTHENE	2.28×10^{-3}	5.35×10^{-4}	1.03×10^{-2}	8.44×10^{-4}	1.40×10^{-2}
BENZO(E)PYRENE	2.10×10^{-3}	4.92×10^{-4}	9.48×10^{-3}	7.77×10^{-4}	1.28×10^{-2}
BENZO(G,H,I)PERYLENE	2.37×10^{-2}	5.56×10^{-3}	0.11	8.78×10^{-3}	0.15
BENZO(K)FLUORANTHENE	2.01×10^{-3}	4.71×10^{-4}	9.07×10^{-3}	7.43×10^{-4}	1.23×10^{-2}
BIPHENYL {PHENYL BENZENE}	0.31	7.19×10^{-2}	1.38	0.11	1.88
B-METHYLSTYRENE	0.14	3.32×10^{-2}	0.64	5.23×10^{-2}	0.87
BROMINE AND COMPOUNDS	1.40×10^{-2}	3.28×10^{-3}	6.32×10^{-2}	5.18×10^{-3}	8.56×10^{-2}
BUTYLBENZENE ISOMERS	0.38	8.96×10^{-2}	1.73	0.14	2.34
BUTYRALDEHYDE	5.61	1.32	25	2.08	34
C10 MONOSUBSTITUTED BENZENES	0.24	5.57×10^{-2}	1.07	8.80×10^{-2}	1.45
C5 ALDEHYDE	0.33	7.76×10^{-2}	1.49	0.12	2.02
C6 ALDEHYDES	11	2.68	52	4.23	70
C9 MONOSUBSTITUTED BENZENES	1.49	0.35	6.75	0.55	9.15
CADMIUM & COMPOUNDS	1.12×10^{-2}	2.64×10^{-3}	5.08×10^{-2}	4.16×10^{-3}	6.88×10^{-2}

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
CARBON DIOXIDE	2,745,351	644,749	12,413,222	1,017,530	16,820,852
CARBON MONOXIDE	576	135	2,604	213	3,528
CHLORINE	0.35	8.17×10^{-2}	1.57	0.13	2.13
CHROMIUM (III) COMPOUNDS	0.70	0.16	3.17	0.26	4.30
CHROMIUM (VI) COMPOUNDS	0.36	8.48×10^{-2}	1.63	0.13	2.21
CHRYSENE	1.90×10^{-2}	4.45×10^{-3}	8.57×10^{-2}	7.03×10^{-3}	0.12
CIS-2-BUTENE	0.28	6.63×10^{-2}	1.28	0.10	1.73
CIS-2-PENTENE	9.01×10^{-2}	2.12×10^{-2}	0.41	3.34×10^{-2}	0.55
COBALT & COMPOUNDS	7.62×10^{-3}	1.79×10^{-3}	3.45×10^{-2}	2.82×10^{-3}	4.67×10^{-2}
COPPER & COMPOUNDS	1.73	0.41	7.81	0.64	11
CORONENE	4.10×10^{-2}	9.63×10^{-3}	0.19	1.52×10^{-2}	0.25
CUMENE (1-METHYLETHYLBENZENE)	4.51×10^{-2}	1.06×10^{-2}	0.20	1.67×10^{-2}	0.28
CYCLOHEXANE	7.81×10^{-2}	1.83×10^{-2}	0.35	2.90×10^{-2}	0.48
CYCLOHEXANONE	0.32	7.55×10^{-2}	1.45	0.12	1.97
CYCLOPENTANE	3.61×10^{-2}	8.47×10^{-3}	0.16	1.34×10^{-2}	0.22
DIBENZO(A,H)ANTHRACENE	2.28×10^{-2}	5.35×10^{-3}	0.10	8.44×10^{-3}	0.14
DIETHYLBENZENES	0.41	9.53×10^{-2}	1.83	0.15	2.49
ETHANE	1.70	0.40	7.68	0.63	10
ETHYL ALCOHOL	2.70×10^{-2}	6.35×10^{-3}	0.12	1.0×10^{-2}	0.17
ETHYLBENZENE	0.92	0.22	4.14	0.34	5.61
ETHYLENE	43	10	195	16	265
ETHYLHEXANE	0.18	4.30×10^{-2}	0.83	6.79×10^{-2}	1.12
FLUORANTHENE	4.01×10^{-2}	9.42×10^{-3}	0.18	1.49×10^{-2}	0.25
FLUORENE	0.14	3.21×10^{-2}	0.62	5.07×10^{-2}	0.84
FORMALDEHYDE	44	10	200	16	271
INDAN	0.56	0.13	2.55	0.21	3.46
INDENO(1,2,3-CD)PYRENE	2.37×10^{-2}	5.56×10^{-3}	0.11	8.78×10^{-3}	0.15
ISOMERS OF XYLENE	3.13	0.73	14	1.16	19
LEAD & COMPOUNDS	0.13	3.04×10^{-2}	0.59	4.80×10^{-2}	0.79
MERCURY & COMPOUNDS	2.59×10^{-3}	6.09×10^{-4}	1.17×10^{-2}	9.60×10^{-4}	1.59×10^{-2}
METHANE	5.76	1.35	26	2.13	35
METHYL ALCOHOL	9.01×10^{-2}	2.12×10^{-2}	0.41	3.34×10^{-2}	0.55
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	4.44	1.04	20	1.64	27
METHYL N-BUTYL KETONE	2.70	0.63	12	1.00	17
METHYLANTHRACENES	5.47×10^{-2}	1.28×10^{-2}	0.25	2.03×10^{-2}	0.34
METHYLCYCLOHEXANE	0.20	4.80×10^{-2}	0.92	7.57×10^{-2}	1.25
METHYLCYCLOPENTANE	0.45	0.11	2.02	0.17	2.74
M-ETHYLTOLUENE	0.74	0.17	3.36	0.28	4.55
MOLYBDENUM	1.52×10^{-2}	3.58×10^{-3}	6.89×10^{-2}	5.65×10^{-3}	9.34×10^{-2}
NAPHTHALENE	2.24	0.53	10	0.83	14
N-BUTANE	0.31	7.34×10^{-2}	1.41	0.12	1.91
N-DECANE	1.59	0.37	7.19	0.59	9.74
N-HEPTANE	0.20	4.80×10^{-2}	0.92	7.57×10^{-2}	1.25

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-HEXANE	0.47	0.11	2.13	0.17	2.89
NICKEL & COMPOUNDS	29	6.90	133	11	180
NITRIC OXIDE	3,568	838	16,132	1,322	21,860
NITROGEN DIOXIDE	288	68	1,302	107	1,764
NITROUS OXIDE	230	54	1,042	85	1,411
N-NONANE	0.69	0.16	3.12	0.26	4.23
N-OCTANE	0.42	9.88×10^{-2}	1.90	0.16	2.58
N-PENTANE	0.53	0.12	2.38	0.19	3.22
N-PROPYLBENZENE	0.37	8.61×10^{-2}	1.66	0.14	2.25
N-UNDECANE	0.78	0.18	3.55	0.29	4.80
O-ETHYLTOLUENE	0.41	9.74×10^{-2}	1.87	0.15	2.54
OXIDES OF NITROGEN	5,759	1,352	26,038	2,134	35,283
PARTICULATE MATTER $\leq 10 \mu\text{m}$	1,219	286	5,513	452	7,471
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	1,122	263	5,072	416	6,873
PERYLENE	2.92×10^{-3}	6.85×10^{-4}	1.32×10^{-2}	1.08×10^{-3}	1.79×10^{-2}
PHENANTHRENE	0.60	0.14	2.71	0.22	3.67
PHOSPHORUS	0.16	3.67×10^{-2}	0.71	5.79×10^{-2}	0.96
POLYCHLORINATED DIOXINS AND FURANS	8.64×10^{-8}	2.03×10^{-8}	3.91×10^{-7}	3.20×10^{-8}	5.29×10^{-7}
POLYCYCLIC AROMATIC HYDROCARBONS	7.20	1.69	33	2.67	44
PROPANE	0.56	0.13	2.51	0.21	3.41
PROPIONALDEHYDE	2.91	0.68	13	1.08	18
PROPYLENE	7.80	1.83	35	2.89	48
PYRENE	3.46×10^{-2}	8.13×10^{-3}	0.16	1.28×10^{-2}	0.21
RETENE	1.46×10^{-3}	3.42×10^{-4}	6.59×10^{-3}	5.40×10^{-4}	8.93×10^{-3}
SELENIUM & COMPOUNDS	1.73×10^{-2}	4.06×10^{-3}	7.81×10^{-2}	6.40×10^{-3}	0.11
STYRENE (ETHENYLBENZENE)	0.17	4.09×10^{-2}	0.79	6.46×10^{-2}	1.07
SULFUR DIOXIDE	10,977	2,578	49,633	4,068	67,256
T-BUTYLBENZENE	1.80×10^{-2}	4.23×10^{-3}	8.15×10^{-2}	6.68×10^{-3}	0.11
TIN & COMPOUNDS	6.22×10^{-2}	1.46×10^{-2}	0.28	2.31×10^{-2}	0.38
TOLUENE	4.43	1.04	20	1.64	27
TOTAL SUSPENDED PARTICULATE	1,270	298	5,743	471	7,782
TOTAL VOLATILE ORGANIC COMPOUNDS	288	68	1,302	107	1,764
TRANS-2-BUTENE	0.59	0.14	2.65	0.22	3.59
TRANS-2-PENTENE	0.12	2.82×10^{-2}	0.54	4.45×10^{-2}	0.74
VANADIUM & COMPOUNDS	80	19	363	30	492
ZINC & COMPOUNDS	1.21	0.28	5.47	0.45	7.41
Auxiliary Boiler - Gas Oil					
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	2.08×10^{-2}	4.88×10^{-3}	9.40×10^{-2}	7.70×10^{-3}	0.13
(2-METHYLPROPYL)BENZENE	5.14×10^{-2}	1.21×10^{-2}	0.23	1.90×10^{-2}	0.31
1,2,3-TRIMETHYLBENZENE	4.89×10^{-2}	1.15×10^{-2}	0.22	1.81×10^{-2}	0.30

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Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
1,2,4-TRIMETHYLBENZENE	0.22	5.07×10^{-2}	0.98	8.01×10^{-2}	1.32
1,2-DIETHYLBENZENE (ORTHO)	3.50×10^{-2}	8.23×10^{-3}	0.16	1.30×10^{-2}	0.21
1,2-PROPADIENE	0.19	4.46×10^{-2}	0.86	7.04×10^{-2}	1.16
1,3,5-TRIMETHYLBENZENE	7.91×10^{-2}	1.86×10^{-2}	0.36	2.93×10^{-2}	0.48
1,3-BUTADIENE	7.74×10^{-2}	1.82×10^{-2}	0.35	2.87×10^{-2}	0.47
1-BUTENE	0.27	6.37×10^{-2}	1.23	0.10	1.66
1-METHYL NAPHTHALENE	9.91×10^{-2}	2.33×10^{-2}	0.45	3.67×10^{-2}	0.61
1-METHYLPHENANTHRENE	1.17×10^{-4}	2.74×10^{-5}	5.28×10^{-4}	4.33×10^{-5}	7.16×10^{-4}
1-PENTENE	0.13	3.10×10^{-2}	0.60	4.89×10^{-2}	0.81
2,2,4-TRIMETHYLPENTANE	0.12	2.85×10^{-2}	0.55	4.50×10^{-2}	0.74
2,2-DIMETHYLBUTANE	2.49×10^{-2}	5.84×10^{-3}	0.11	9.21×10^{-3}	0.15
2,3,4-TRIMETHYLPENTANE	6.11×10^{-3}	1.44×10^{-3}	2.76×10^{-2}	2.27×10^{-3}	3.75×10^{-2}
2,3,5-TRIMETHYLNAPHTHALENE	1.13×10^{-2}	2.64×10^{-3}	5.09×10^{-2}	4.17×10^{-3}	6.90×10^{-2}
2,3-DIMETHYL-1-BUTENE	1.14×10^{-2}	2.68×10^{-3}	5.16×10^{-2}	4.23×10^{-3}	6.99×10^{-2}
2,3-DIMETHYLHEXANE	4.48×10^{-3}	1.05×10^{-3}	2.03×10^{-2}	1.66×10^{-3}	2.75×10^{-2}
2,3-DIMETHYLPENTANE	2.98×10^{-2}	6.99×10^{-3}	0.13	1.10×10^{-2}	0.18
2,4-DIMETHYLHEXANE	1.47×10^{-2}	3.45×10^{-3}	6.63×10^{-2}	5.44×10^{-3}	8.99×10^{-2}
2,4-DIMETHYLPENTANE	7.74×10^{-3}	1.82×10^{-3}	3.50×10^{-2}	2.87×10^{-3}	4.74×10^{-2}
2,6-DIMETHYL NAPHTHALENE	2.97×10^{-2}	6.97×10^{-3}	0.13	1.10×10^{-2}	0.18
2-METHYLANTHRACENE	2.10×10^{-4}	4.94×10^{-5}	9.51×10^{-4}	7.79×10^{-5}	1.29×10^{-3}
2-METHYL-BUTANE	0.25	5.76×10^{-2}	1.11	9.09×10^{-2}	1.50
2-METHYLHEPTANE	2.32×10^{-2}	5.46×10^{-3}	0.11	8.61×10^{-3}	0.14
2-METHYLHEXANE	4.69×10^{-2}	1.10×10^{-2}	0.21	1.74×10^{-2}	0.29
2-METHYLNAPHTHALENE	0.12	2.85×10^{-2}	0.55	4.49×10^{-2}	0.74
2-METHYLPENTANE	0.16	3.75×10^{-2}	0.72	5.92×10^{-2}	0.98
2-METHYLPROPANE; ISOBUTANE	0.50	0.12	2.25	0.18	3.05
2-METHYLPROPENE (ISOBUTENE)	0.38	8.82×10^{-2}	1.70	0.14	2.30
3,3-DIMETHYL-1-BUTENE	1.15	0.27	5.20	0.43	7.04
3-METHYLHEXANE	0.14	3.33×10^{-2}	0.64	5.26×10^{-2}	0.87
3-METHYLPENTANE	4.69×10^{-2}	1.10×10^{-2}	0.21	1.74×10^{-2}	0.29
ACENAPHTHENE	1.14×10^{-2}	2.67×10^{-3}	5.13×10^{-2}	4.21×10^{-3}	6.96×10^{-2}
ACENAPHTHYLENE	1.82×10^{-3}	4.28×10^{-4}	8.24×10^{-3}	6.75×10^{-4}	1.12×10^{-2}
ACETALDEHYDE	3.00	0.70	14	1.11	18
ACETONE	3.06	0.72	14	1.13	19
ACETYLENE	1.73	0.41	7.84	0.64	11
ALKENE KETONE	0.71	0.17	3.22	0.26	4.37
AMMONIA (TOTAL)	0.16	3.67×10^{-2}	0.71	5.79×10^{-2}	0.96
ANTHRACENE	9.63×10^{-3}	2.26×10^{-3}	4.35×10^{-2}	3.57×10^{-3}	5.90×10^{-2}
ANTIMONY & COMPOUNDS	1.67×10^{-2}	3.93×10^{-3}	7.57×10^{-2}	6.21×10^{-3}	0.10
ARSENIC & COMPOUNDS	9.96×10^{-2}	2.34×10^{-2}	0.45	3.69×10^{-2}	0.61
BENZALDEHYDE	0.28	6.69×10^{-2}	1.29	0.11	1.75
BENZENE	0.82	0.19	3.69	0.30	5.00
BENZO(A)ANTHRACENE	6.21×10^{-3}	1.46×10^{-3}	2.81×10^{-2}	2.30×10^{-3}	3.81×10^{-2}
BENZO(A)PYRENE	1.58×10^{-3}	3.70×10^{-4}	7.13×10^{-3}	5.85×10^{-4}	9.66×10^{-3}

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
BENZO(B)FLUORANTHENE	6.87×10^{-3}	1.61×10^{-3}	3.11×10^{-2}	2.55×10^{-3}	4.21×10^{-2}
BENZO(E)PYRENE	3.78×10^{-3}	8.89×10^{-4}	1.71×10^{-2}	1.40×10^{-3}	2.32×10^{-2}
BENZO(G,H,I)PERYLENE	5.77×10^{-3}	1.36×10^{-3}	2.61×10^{-2}	2.14×10^{-3}	3.54×10^{-2}
BENZO(K)FLUORANTHENE	2.03×10^{-3}	4.77×10^{-4}	9.19×10^{-3}	7.53×10^{-4}	1.25×10^{-2}
BIPHENYL {PHENYL BENZENE}	3.29×10^{-2}	7.74×10^{-3}	0.15	1.22×10^{-2}	0.20
B-METHYLSTYRENE	1.92×10^{-2}	4.50×10^{-3}	8.66×10^{-2}	7.10×10^{-3}	0.12
BROMINE AND COMPOUNDS	1.32×10^{-3}	3.11×10^{-4}	5.99×10^{-3}	4.91×10^{-4}	8.12×10^{-3}
BUTYLBENZENE ISOMERS	5.18×10^{-2}	1.22×10^{-2}	0.23	1.92×10^{-2}	0.32
BUTYRALDEHYDE	0.76	0.18	3.44	0.28	4.66
C10 MONOSUBSTITUTED BENZENES	3.22×10^{-2}	7.56×10^{-3}	0.15	1.19×10^{-2}	0.20
C5 ALDEHYDE	4.48×10^{-2}	1.05×10^{-2}	0.20	1.66×10^{-2}	0.27
C6 ALDEHYDES	1.55	0.36	7.00	0.57	9.49
C9 MONOSUBSTITUTED BENZENES	0.20	4.76×10^{-2}	0.92	7.51×10^{-2}	1.24
CADMIUM & COMPOUNDS	1.52×10^{-3}	3.58×10^{-4}	6.89×10^{-3}	5.65×10^{-4}	9.33×10^{-3}
CARBON DIOXIDE	372,644	87,516	1,684,926	138,116	2,283,201
CARBON MONOXIDE	78	18	353	29	479
CHLORINE	3.30×10^{-2}	7.75×10^{-3}	0.15	1.22×10^{-2}	0.20
CHROMIUM (III) COMPOUNDS	9.51×10^{-2}	2.23×10^{-2}	0.43	3.53×10^{-2}	0.58
CHROMIUM (VI) COMPOUNDS	4.90×10^{-2}	1.15×10^{-2}	0.22	1.82×10^{-2}	0.30
CHRYSENE	1.34×10^{-2}	3.15×10^{-3}	6.06×10^{-2}	4.97×10^{-3}	8.21×10^{-2}
CIS-2-BUTENE	3.83×10^{-2}	9.0×10^{-3}	0.17	1.42×10^{-2}	0.23
CIS-2-PENTENE	1.22×10^{-2}	2.87×10^{-3}	5.53×10^{-2}	4.53×10^{-3}	7.49×10^{-2}
COBALT & COMPOUNDS	7.23×10^{-4}	1.70×10^{-4}	3.27×10^{-3}	2.68×10^{-4}	4.43×10^{-3}
COPPER & COMPOUNDS	0.23	5.50×10^{-2}	1.06	8.69×10^{-2}	1.44
CORONENE	4.32×10^{-4}	1.02×10^{-4}	1.95×10^{-3}	1.60×10^{-4}	2.65×10^{-3}
CUMENE (1-METHYLETHYLBENZENE)	6.11×10^{-3}	1.44×10^{-3}	2.76×10^{-2}	2.27×10^{-3}	3.75×10^{-2}
CYCLOHEXANE	1.06×10^{-2}	2.49×10^{-3}	4.79×10^{-2}	3.93×10^{-3}	6.49×10^{-2}
CYCLOHEXANONE	4.36×10^{-2}	1.02×10^{-2}	0.20	1.62×10^{-2}	0.27
CYCLOPENTANE	4.89×10^{-3}	1.15×10^{-3}	2.21×10^{-2}	1.81×10^{-3}	3.0×10^{-2}
DIBENZO(A,H)ANTHRACENE	8.43×10^{-3}	1.98×10^{-3}	3.81×10^{-2}	3.13×10^{-3}	5.17×10^{-2}
DIETHYLBENZENES	5.50×10^{-2}	1.29×10^{-2}	0.25	2.04×10^{-2}	0.34
ETHANE	0.23	5.41×10^{-2}	1.04	8.53×10^{-2}	1.41
ETHYL ALCOHOL	3.67×10^{-3}	8.61×10^{-4}	1.66×10^{-2}	1.36×10^{-3}	2.25×10^{-2}
ETHYLBENZENE	0.12	2.92×10^{-2}	0.56	4.61×10^{-2}	0.76
ETHYLENE	5.86	1.38	26	2.17	36
ETHYLHEXANE	2.49×10^{-2}	5.84×10^{-3}	0.11	9.21×10^{-3}	0.15
FLUORANTHENE	4.65×10^{-2}	1.09×10^{-2}	0.21	1.72×10^{-2}	0.29
FLUORENE	3.50×10^{-2}	8.21×10^{-3}	0.16	1.30×10^{-2}	0.21
FORMALDEHYDE	6.00	1.41	27	2.22	37
INDAN	7.66×10^{-2}	1.80×10^{-2}	0.35	2.84×10^{-2}	0.47
INDENO(1,2,3-CD)PYRENE	4.84×10^{-3}	1.14×10^{-3}	2.19×10^{-2}	1.79×10^{-3}	2.96×10^{-2}
ISOMERS OF XYLENE	0.42	9.96×10^{-2}	1.92	0.16	2.60
LEAD & COMPOUNDS	1.76×10^{-2}	4.13×10^{-3}	7.95×10^{-2}	6.51×10^{-3}	0.11
MERCURY & COMPOUNDS	3.51×10^{-4}	8.26×10^{-5}	1.59×10^{-3}	1.30×10^{-4}	2.15×10^{-3}

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
METHANE	0.78	0.18	3.53	0.29	4.79
METHYL ALCOHOL	1.22×10^{-2}	2.87×10^{-3}	5.53×10^{-2}	4.53×10^{-3}	7.49×10^{-2}
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	0.60	0.14	2.72	0.22	3.69
METHYL N-BUTYL KETONE	0.37	8.60×10^{-2}	1.66	0.14	2.24
METHYLANTHRACENES	4.04×10^{-2}	9.50×10^{-3}	0.18	1.50×10^{-2}	0.25
METHYLCYCLOHEXANE	2.77×10^{-2}	6.51×10^{-3}	0.13	1.03×10^{-2}	0.17
METHYLCYCLOPENTANE	6.07×10^{-2}	1.43×10^{-2}	0.27	2.25×10^{-2}	0.37
M-ETHYLTOLUENE	0.10	2.36×10^{-2}	0.46	3.73×10^{-2}	0.62
MOLYBDENUM	1.45×10^{-3}	3.39×10^{-4}	6.54×10^{-3}	5.36×10^{-4}	8.86×10^{-3}
NAPHTHALENE	0.24	5.60×10^{-2}	1.08	8.83×10^{-2}	1.46
N-BUTANE	4.24×10^{-2}	9.95×10^{-3}	0.19	1.57×10^{-2}	0.26
N-DECANE	0.22	5.06×10^{-2}	0.97	7.99×10^{-2}	1.32
N-HEPTANE	2.77×10^{-2}	6.51×10^{-3}	0.13	1.03×10^{-2}	0.17
N-HEXANE	6.40×10^{-2}	1.50×10^{-2}	0.29	2.37×10^{-2}	0.39
NICKEL & COMPOUNDS	3.98	0.94	18	1.48	24
NITRIC OXIDE	484	114	2,188	179	2,965
NITROGEN DIOXIDE	39	9.17	177	14	239
NITROUS OXIDE	31	7.34	141	12	191
N-NONANE	9.37×10^{-2}	2.20×10^{-2}	0.42	3.47×10^{-2}	0.57
N-OCTANE	5.71×10^{-2}	1.34×10^{-2}	0.26	2.11×10^{-2}	0.35
N-PENTANE	7.13×10^{-2}	1.67×10^{-2}	0.32	2.64×10^{-2}	0.44
N-PROPYLBENZENE	4.97×10^{-2}	1.17×10^{-2}	0.22	1.84×10^{-2}	0.30
N-UNDECANE	0.11	2.50×10^{-2}	0.48	3.94×10^{-2}	0.65
O-ETHYLTOLUENE	5.62×10^{-2}	1.32×10^{-2}	0.25	2.08×10^{-2}	0.34
OXIDES OF NITROGEN	781	183	3,532	290	4,786
PARTICULATE MATTER $\leq 10 \mu\text{m}$	116	27	523	43	708
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	106	25	481	39	652
PERYLENE	1.87×10^{-4}	4.39×10^{-5}	8.45×10^{-4}	6.93×10^{-5}	1.15×10^{-3}
PHENANTHRENE	0.16	3.85×10^{-2}	0.74	6.07×10^{-2}	1.00
PHOSPHORUS	1.48×10^{-2}	3.48×10^{-3}	6.70×10^{-2}	5.49×10^{-3}	9.08×10^{-2}
POLYCHLORINATED DIOXINS AND FURANS	1.17×10^{-8}	2.75×10^{-9}	5.30×10^{-8}	4.34×10^{-9}	7.18×10^{-8}
POLYCYCLIC AROMATIC HYDROCARBONS	0.98	0.23	4.41	0.36	5.98
PROPANE	7.54×10^{-2}	1.77×10^{-2}	0.34	2.79×10^{-2}	0.46
PROPIONALDEHYDE	0.40	9.28×10^{-2}	1.79	0.15	2.42
PROPYLENE	1.06	0.25	4.79	0.39	6.48
PYRENE	6.01×10^{-2}	1.41×10^{-2}	0.27	2.23×10^{-2}	0.37
RETENE	1.15×10^{-2}	2.69×10^{-3}	5.19×10^{-2}	4.25×10^{-3}	7.03×10^{-2}
SELENIUM & COMPOUNDS	2.34×10^{-3}	5.50×10^{-4}	1.06×10^{-2}	8.69×10^{-4}	1.44×10^{-2}
STYRENE (ETHENYLBENZENE)	2.36×10^{-2}	5.55×10^{-3}	0.11	8.76×10^{-3}	0.14
SULFUR DIOXIDE	870	204	3,936	323	5,333
T-BUTYLBENZENE	2.45×10^{-3}	5.74×10^{-4}	1.11×10^{-2}	9.06×10^{-4}	1.50×10^{-2}
TIN & COMPOUNDS	5.90×10^{-3}	1.39×10^{-3}	2.67×10^{-2}	2.19×10^{-3}	3.62×10^{-2}

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
TOLUENE	0.60	0.14	2.71	0.22	3.68
TOTAL SUSPENDED PARTICULATE	120	28	545	45	738
TOTAL VOLATILE ORGANIC COMPOUNDS	39	9.17	177	14	239
TRANS-2-BUTENE	7.95×10^{-2}	1.87×10^{-2}	0.36	2.95×10^{-2}	0.49
TRANS-2-PENTENE	1.63×10^{-2}	3.83×10^{-3}	7.37×10^{-2}	6.04×10^{-3}	9.99×10^{-2}
VANADIUM & COMPOUNDS	11	2.56	49	4.04	67
ZINC & COMPOUNDS	0.16	3.85×10^{-2}	0.74	6.08×10^{-2}	1.01
Evaporative - Residual Oil					
C11 CYCLOALKANES	3.95×10^{-2}	-	0.13	2.26×10^{-2}	0.19
C12 CYCLOALKANES	2.98×10^{-2}	-	9.91×10^{-2}	1.71×10^{-2}	0.15
C13 INTERNAL ALKENES	5.39×10^{-2}	-	0.18	3.08×10^{-2}	0.26
C2 ALKYL DECALIN	3.75×10^{-2}	-	0.12	2.15×10^{-2}	0.18
C2 ALKYL INDAN	0.11	-	0.36	6.17×10^{-2}	0.53
C4 SUBSTITUTED CYCLOHEXANONE	2.21×10^{-2}	-	7.36×10^{-2}	1.27×10^{-2}	0.11
ISOMERS OF TETRADECANE (C14 PARAFFINS)	2.98×10^{-2}	-	9.91×10^{-2}	1.71×10^{-2}	0.15
ISOMERS OF TRIDECANE (C13 PARAFFINS)	9.24×10^{-2}	-	0.31	5.29×10^{-2}	0.45
METHYLNAPHTHALENES	9.82×10^{-2}	-	0.33	5.62×10^{-2}	0.48
NAPHTHALENE	6.26×10^{-2}	-	0.21	3.58×10^{-2}	0.31
N-DECANE	2.70×10^{-2}	-	8.95×10^{-2}	1.54×10^{-2}	0.13
N-DODECANE	0.18	-	0.59	0.10	0.87
N-PENTYLCYCLOHEXANE	1.93×10^{-2}	-	6.40×10^{-2}	1.10×10^{-2}	9.42×10^{-2}
N-UNDECANE	7.41×10^{-2}	-	0.25	4.24×10^{-2}	0.36
POLYCYCLIC AROMATIC HYDROCARBONS	0.16	-	0.53	9.20×10^{-2}	0.79
TOTAL VOLATILE ORGANIC COMPOUNDS	0.96	-	3.18	0.55	4.69
TRIMETHYLBENZENES	8.57×10^{-2}	-	0.28	4.90×10^{-2}	0.42
Evaporative - Diesel Oil					
2-METHYLPROPANE; ISOBUTANE	0.34	-	0.92	0.13	1.39
CYCLOHEXANE	0.13	-	0.37	5.29×10^{-2}	0.56
ETHANE	0.13	-	0.37	5.29×10^{-2}	0.56
ISOMERS OF HEPTANE	0.27	-	0.74	0.11	1.11
ISOMERS OF HEXANE	0.40	-	1.11	0.16	1.67
ISOMERS OF NONANE (C9 PARAFFIN)	6.71×10^{-2}	-	0.18	2.65×10^{-2}	0.28
ISOMERS OF OCTANE (C8 PARAFFIN)	0.40	-	1.11	0.16	1.67
ISOMERS OF PENTANE	0.67	-	1.84	0.26	2.78
METHANE	0.56	-	1.55	0.22	2.33
N-BUTANE	1.70	-	4.68	0.67	7.06
N-DECANE	1.98	-	5.45	0.78	8.22
N-HEPTANE	1.15	-	3.17	0.46	4.78

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-HEXANE	1.21	-	3.32	0.48	5.00
N-NONANE	0.87	-	2.40	0.34	3.61
N-OCTANE	1.33	-	3.65	0.52	5.50
N-PENTANE	1.48	-	4.05	0.58	6.11
PROPANE	0.71	-	1.95	0.28	2.94
TOTAL VOLATILE ORGANIC COMPOUNDS	13	-	37	5.29	56
Evaporative – Gas Oil					
2-METHYLPROPANE; ISOBUTANE	5.89×10^{-2}	-	0.17	2.03×10^{-2}	0.25
CYCLOHEXANE	2.36×10^{-2}	-	6.81×10^{-2}	8.12×10^{-3}	9.98×10^{-2}
ETHANE	2.36×10^{-2}	-	6.81×10^{-2}	8.12×10^{-3}	9.98×10^{-2}
ISOMERS OF HEPTANE	4.71×10^{-2}	-	0.14	1.62×10^{-2}	0.20
ISOMERS OF HEXANE	7.07×10^{-2}	-	0.20	2.43×10^{-2}	0.30
ISOMERS OF NONANE (C9 PARAFFIN)	1.18×10^{-2}	-	3.41×10^{-2}	4.06×10^{-3}	4.99×10^{-2}
ISOMERS OF OCTANE (C8 PARAFFIN)	7.07×10^{-2}	-	0.20	2.43×10^{-2}	0.30
ISOMERS OF PENTANE	0.12	-	0.34	4.06×10^{-2}	0.50
METHANE	9.90×10^{-2}	-	0.29	3.41×10^{-2}	0.42
N-BUTANE	0.30	-	0.87	0.10	1.27
N-DECANE	0.35	-	1.01	0.12	1.48
N-HEPTANE	0.20	-	0.59	6.98×10^{-2}	0.86
N-HEXANE	0.21	-	0.61	7.30×10^{-2}	0.90
N-NONANE	0.15	-	0.44	5.27×10^{-2}	0.65
N-OCTANE	0.23	-	0.67	8.03×10^{-2}	0.99
N-PENTANE	0.26	-	0.75	8.93×10^{-2}	1.10
PROPANE	0.12	-	0.36	4.30×10^{-2}	0.53
TOTAL VOLATILE ORGANIC COMPOUNDS	2.36	-	6.81	0.81	9.98

Table A8: Estimated annual emissions of all substances from off-road mobile sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
(1-METHYLPROPYL)BENZENE (SEC-BUTYL BENZENE)	905	5,648	4,719	363	11,635
(2-METHYLPROPYL)BENZENE	617	5,650	2,976	251	9,495
1,1,2,2-TETRACHLOROETHANE	0.14	0.55	4.68	1.00	6.36
1,1,2-TRICHLOROETHANE	0.11	0.44	3.72	0.79	5.06
1,1-DICHLOROETHANE	8.43×10^{-2}	0.32	2.76	0.59	3.75
1,2,3-TRIMETHYLBENZENE	1,946	12,348	10,387	801	25,482
1,2,4-TRIMETHYLBENZENE	34,007	184,939	182,010	13,670	414,626
1,2-DICHLOROETHANE	8.43×10^{-2}	0.32	2.76	0.59	3.75
1,2-DICHLOROPROPANE	9.61×10^{-2}	0.37	3.14	0.67	4.28
1,2-DIETHYLBENZENE (ORTHO)	173	2,588	724	79	3,564
1,2-PROPADIENE	2,508	22,081	12,371	1,058	38,018
1,3,5-TRIMETHYLBENZENE	12,745	69,191	68,005	5,107	155,047
1,3-BUTADIENE	2,777	17,877	17,906	1,160	39,720
1,3-DICHLOROPROPENE	9.43×10^{-2}	0.36	3.09	0.66	4.20
1,4-PENTADIENE	70	583	689	70	1,412
1-BUTENE	6,059	45,208	35,672	2,651	89,591
1-DECANOL	206	289	11,365	3.57	11,863
1-DECENE	6.89	26	384	0.45	418
1-HEPTENE	0.75	2.86	26	5.74	36
1-HEXENE	29	142	1,588	2.14	1,761
1-METHYL NAPHTHALENE	51	54	625	18	749
1-METHYLPHENANTHRENE	6.12	5.98	21	2.62	36
1-NONENE	9.97	39	541	6.38	597
1-OCTANOL	6.56	6.88	22	2.91	38
1-OCTENE	11	44	604	6.47	666
1-PENTENE	4,157	29,004	24,815	1,901	59,877
2,2,3-TRIMETHYLHEXANE	6.98	58	69	7.01	141
2,2,3-TRIMETHYLBUTANE	14	117	138	14	282
2,2,4,4-TETRAMETHYL-3-PENTANONE	43	45	141	19	247
2,2,4-TRIMETHYLHEXANE	0.36	10	15	-	26
2,2,4-TRIMETHYLPENTANE	38,386	199,446	207,430	15,538	460,800
2,2-DIMETHYLBUTANE	6,403	34,486	34,856	2,627	78,372
2,2-DIMETHYLHEXANE	14	117	138	14	282
2,2-DIMETHYLPENTANE	35	291	345	35	706
2,3,3-TRIMETHYLPENTANE	35	291	345	35	706
2,3,4-TRIMETHYLPENTANE	11,045	57,046	59,338	4,422	131,851
2,3,5-TRIMETHYLNAPHTHALENE	2.45	2.39	8.36	1.05	14
2,3-DIMETHYL-1-BUTENE	3,151	16,714	16,840	1,261	37,967
2,3-DIMETHYLBUTANE	566	4,719	5,581	568	11,434
2,3-DIMETHYLHEXANE	3,157	16,587	17,153	1,293	38,189
2,3-DIMETHYLPENTANE	7,660	41,127	41,461	3,135	93,383

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
2,4,5-TRIMETHYLHEPTANE	387	406	1,277	172	2,242
2,4-DIMETHYL-1-PENTENE	30	31	97	13	171
2,4-DIMETHYLHEXANE	6,637	35,059	35,938	2,707	80,340
2,4-DIMETHYLOCTANE	426	447	1,406	189	2,470
2,4-DIMETHYLPENTANE	6,430	33,754	35,038	2,639	77,862
2,5-DIMETHYLHEXANE	49	418	498	49	1,014
2,6-DIMETHYL NAPHTHALENE	12	12	40	5.08	69
2-METHYL-1-BUTENE	801	6,793	8,355	793	16,742
2-METHYL-1-PENTENE	2.70	7.41	119	12	140
2-METHYL-2-BUTENE	3,106	25,949	31,095	3,114	63,264
2-METHYL-2-PROPENAL (METHACROLEIN)	15	21	834	0.26	871
2-METHYLANTHRACENE	0.14	0.14	0.48	6.0×10^{-2}	0.82
2-METHYL-BUTANE	51,506	276,031	274,740	20,585	622,862
2-METHYLDECANE	276	289	909	122	1,596
2-METHYLHEPTANE	5,781	31,113	31,349	2,377	70,619
2-METHYLHEXANE	17,324	92,259	94,224	7,131	210,937
2-METHYLNAPHTHALENE	76	78	640	31	824
2-METHYLNONANE	283	347	978	129	1,737
2-METHYLOCTANE	105	162	393	51	711
2-METHYLPENTANE	33,383	189,652	193,860	15,358	432,253
2-METHYLPROPANE; ISOBUTANE	7,511	70,264	48,925	4,553	131,253
2-METHYLPROPENE (ISOBUTENE)	6,282	50,431	31,478	2,600	90,790
3,3-DIMETHYL-1-BUTENE	4,585	79,100	17,063	1,922	102,670
3,3-DIMETHYLPENTANE	42	350	413	42	847
3-ETHYLPENTANE	70	583	689	70	1,412
3-METHYL-1-BUTENE	26	223	487	21	757
3-METHYLHEPTANE	99	821	1,017	110	2,048
3-METHYLHEXANE	17,803	99,612	96,634	7,388	221,437
3-METHYLOCTANE	14	117	138	14	282
3-METHYLPENTANE	20,596	113,348	117,906	9,223	261,072
4-METHYL-1-PENTENE	2.43	3.42	134	4.21×10^{-2}	140
4-METHYLHEPTANE	56	466	551	56	1,129
4-METHYLOCTANE	6.98	58	69	7.01	141
4-METHYL-TRANS-2-PENTENE	0.77	22	32	-	54
4-PROPYL-3-HEPTENE	36	38	119	16	209
ACENAPHTHENE	11	195	42	4.53	253
ACENAPHTHYLENE	14	226	116	6.76	363
ACETALDEHYDE	9,974	151,494	46,697	4,262	212,427
ACETONE	13,234	216,103	52,104	5,544	286,985
ACETYLENE	35,321	259,322	184,787	14,794	494,223
ACROLEIN (2-PROPENAL)	932	10,586	9,902	600	22,020
ALKENE KETONE	2,953	49,624	11,179	1,238	64,994
AMMONIA (TOTAL)	1,552	17,250	10,838	639	30,278

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
ANTHRACENE	2.70	22	27	1.39	53
ANTIMONY & COMPOUNDS	15	267	49	6.33	338
A-PINENE	6.56	6.88	22	2.91	38
ARSENIC & COMPOUNDS	25	31	245	9.25	310
BENZALDEHYDE	1,281	20,342	5,928	533	28,085
BENZENE	30,915	196,012	164,413	12,855	404,194
BENZO(A)ANTHRACENE	1.87	19	9.78	0.90	32
BENZO(A)PYRENE	0.87	5.28	5.88	0.38	12
BENZO(B)FLUORANTHENE	0.59	4.39	4.79	0.27	10
BENZO(E)PYRENE	0.20	0.20	0.73	9.85×10^{-2}	1.23
BENZO(G,H,I)PERYLENE	3.26	16	20	1.38	41
BENZO(K)FLUORANTHENE	0.51	3.90	4.41	0.23	9.05
BENZOTHAZOLE	3.28	3.44	11	1.46	19
BERYLLIUM & COMPOUNDS	0.33	2.77	3.12	0.27	6.48
BICYCLO[4.3.0]NONANE (OCTAHYDROINDENE)	9.84	10	32	4.37	57
BIPHENYL {PHENYL BENZENE}	53	56	212	30	351
B-METHYLSTYRENE	121	1,552	556	59	2,288
BROMINE AND COMPOUNDS	91	159	337	39	626
BUTYLBENZENE ISOMERS	3,808	21,041	19,630	1,547	46,027
BUTYLCYCLOHEXANE	112	117	368	50	646
BUTYRALDEHYDE	3,048	52,555	11,799	1,289	68,691
C10 ALKYLPHENOLS	26	28	87	12	152
C10 DIALKYL BENZENES	0.75	2.86	26	5.74	36
C10 INTERNAL ALKENES	143	154	518	74	888
C10 MONOSUBSTITUTED BENZENES	195	2,567	886	94	3,741
C10 OLEFINS	206	289	11,365	3.57	11,863
C11 ALKYLPHENOLS	9.84	10	32	4.37	57
C11 CYCLOALKANES	3.95×10^{-2}	-	0.13	2.26×10^{-2}	0.19
C11 DIALKYL BENZENES	6.56	6.88	22	2.91	38
C11 INTERNAL ALKENES	66	69	216	29	380
C12 CYCLOALKANES	2.98×10^{-2}	-	9.91×10^{-2}	1.71×10^{-2}	0.15
C12 INTERNAL ALKENES	6.56	6.88	22	2.91	38
C12H22	13	14	43	5.83	76
C13 INTERNAL ALKENES	5.39×10^{-2}	-	0.18	3.08×10^{-2}	0.26
C16 BRANCHED ALKANES	5.47	22	305	0.38	333
C2 ALKYL DECALIN	3.75×10^{-2}	-	0.12	2.15×10^{-2}	0.18
C2 ALKYL INDAN	0.11	-	0.36	6.17×10^{-2}	0.53
C4 SUBSTITUTED CYCLOHEXANONE	2.21×10^{-2}	-	7.36×10^{-2}	1.27×10^{-2}	0.11
C5 ALDEHYDE	179	3,085	666	75	4,005
C6 ALDEHYDES	6,413	107,779	24,281	2,690	141,163
C6H18O3SI3	30	1,304	1,928	26	3,289
C7-C16 PARAFFINS	0.68	30	44	0.60	75

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
C8H24O4Si4	11	465	688	9.36	1,174
C9 INTERNAL ALKENES	3.00	11	105	23	143
C9 MONOSUBSTITUTED BENZENES	6,151	41,374	31,844	2,516	81,885
CADMIUM & COMPOUNDS	7.40	127	38	3.06	175
CARBON DIOXIDE	228,705,460	2,100,817,384	1,455,356,306	96,878,939	3,881,758,090
CARBON MONOXIDE	3,342,879	27,974,916	20,801,007	1,698,188	53,816,990
CARBON TETRACHLORIDE	0.13	0.50	4.29	0.91	5.84
CHLORINE	1,521	8,823	9,224	645	20,212
CHLOROBENZENE	17	18	58	8.04	100
CHLOROETHANE (ETHYL CHLORIDE)	1.34×10^{-2}	5.13×10^{-2}	0.44	9.32×10^{-2}	0.59
CHLOROFORM (TRICHLOROMETHANE)	0.10	0.39	3.33	0.71	4.53
CHROMIUM (III) COMPOUNDS	23	22	186	9.11	240
CHROMIUM (VI) COMPOUNDS	12	12	96	4.69	124
CHRYSENE	2.05	8.80	9.83	0.92	22
CIS-1,3-DIMETHYLCYCLOPENTANE	154	1,282	1,516	154	3,106
CIS-1,CIS-2,4-TRIMETHYLCYCLOPENTANE	98	816	965	98	1,976
CIS-1-2-DIMETHYLCYCLOPENTANE	98	816	965	98	1,976
CIS-2-BUTENE	2,144	13,621	12,814	997	29,576
CIS-2-HEXENE	1.50	43	62	-	106
CIS-2-PENTENE	6,350	36,819	39,661	3,216	86,047
CIS-BICYCLO[3.3.0]OCTANE	6.56	6.88	22	2.91	38
COBALT & COMPOUNDS	90	150	335	38	614
COPPER & COMPOUNDS	68	166	276	31	542
CORONENE	1.24	1.21	4.25	0.53	7.24
CROTONALDEHYDE	36	51	2,009	0.63	2,097
CUMENE (1-METHYLETHYLBENZENE)	1,469	7,827	7,845	587	17,727
CYCLOHEXANE	700	4,234	3,898	307	9,140
CYCLOHEXANONE	179	3,031	681	76	3,968
CYCLOPENTANE	6,487	33,563	34,889	2,593	77,533
CYCLOPENTENE	22	197	239	21	478
DIBENZO(A,H)ANTHRACENE	0.79	0.86	2.91	0.34	4.90
DIBROMOETHANE	0.16	0.61	5.18	1.10	7.05
DICHLOROMETHANE {METHYLENE CHLORIDE}	0.14	0.55	4.68	1.00	6.36
DIETHYLBENZENES	2,921	17,643	15,325	1,175	37,064
DIETHYLCYCLOHEXANE	30	31	97	13	171
DIETHYLMETHYLCYCLOHEXANES	36	38	119	16	209
DIMETHYL NAPHTHALENES	3.17	4.46	175	5.50×10^{-2}	183
DIMETHYLBENZYLALCOHOL	9.84	10	32	4.37	57
DIMETHYLBUTYLCYCLOHEXANE	3.28	3.44	11	1.46	19
DIMETHYLDECANE	20	21	65	8.74	114

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
DIMETHYLETHYLCYCLOHEXANE	62	65	206	28	361
DIMETHYLHEPTANES	36	38	119	16	209
DIMETHYLNONANES	164	172	541	73	950
DIMETHYLUDECANES	16	17	54	7.29	95
DIMETHYIOCTYNE DIOL	6.56	6.88	22	2.91	38
ETHANE	4,207	31,181	42,480	6,674	84,542
ETHYL ALCOHOL	427	2,369	2,268	171	5,235
ETHYL PROPYLCYCLOHEXANES	33	34	108	15	190
ETHYLBENZENE	25,217	135,452	135,179	10,157	306,005
ETHYLCYCLOHEXANE	39	41	130	17	228
ETHYLCYCLOPENTANE	21	175	207	21	423
ETHYLENE	42,501	484,795	213,685	18,147	759,128
ETHYLHEXANE	8,250	43,418	44,039	3,293	99,000
ETHYLMETHYLCYCLOHEXANES	282	296	930	125	1,634
ETHYLMETHYLHEXANE	6.56	6.88	22	2.91	38
ETHYLOCTANE	13	14	43	5.83	76
FLUORANTHENE	11	76	62	4.62	154
FLUORENE	25	240	113	11	389
FORMALDEHYDE	21,500	333,441	112,535	10,807	478,284
FURFURYL ALCOHOL	4.59	201	297	4.03	506
GLYOXAL	70	370	3,947	6.75	4,394
HEPTENES	17	79	937	1.43	1,035
HEXADECANE	2.08	18	118	0.34	139
HEXANAL (HEXANALDEHYDE)	0.51	22	33	0.45	56
INDAN	1,502	11,421	7,608	619	21,150
INDENE	23	24	76	10	133
INDENO(1,2,3-CD)PYRENE	1.54	5.67	8.14	0.66	16
ISOBUTYRALDEHYDE	0.72	2.77	24	5.03	32
ISOMERS OF BUTENE	24	192	857	149	1,222
ISOMERS OF C10H18	3.28	3.44	11	1.46	19
ISOMERS OF DECANE (C10 PARAFFINS)	1,306	1,558	31,069	372	34,306
ISOMERS OF DODECANE (C12 PARAFFINS)	175	238	5,946	34	6,393
ISOMERS OF HEPTANE	8.93	171	341	23	544
ISOMERS OF HEXANE	20	508	790	12	1,329
ISOMERS OF NONANE (C9 PARAFFIN)	0.83	2.86	27	5.77	36
ISOMERS OF OCTADECANE (C18 PARAFFINS)	7.02×10^{-2}	9.83×10^{-2}	3.88	1.21×10^{-3}	4.05
ISOMERS OF OCTANE (C8 PARAFFIN)	1.97	5.72	54	12	73
ISOMERS OF PENTADECANE (C15 PARAFFINS)	6.61	25	369	0.44	401
ISOMERS OF PENTANE	34,718	291,563	345,913	34,833	707,027

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
ISOMERS OF PENTENE	1.62	71	105	1.43	179
ISOMERS OF TETRADECANE (C14 PARAFFINS)	7.01	28	390	0.51	425
ISOMERS OF TRIDECANE (C13 PARAFFINS)	3.37	3.44	11	1.51	19
ISOMERS OF UNDECANE (C11 PARAFFINS)	522	547	1,720	232	3,021
ISOMERS OF XYLENE	112,381	596,424	601,961	45,193	1,355,959
ISOPROPYLCYCLOHEXANE (2-METHYLETHYL CYCLOHEXANE)	138	145	454	61	798
ISOPROPYLMETHYLCYCLOHEXANE	30	31	97	13	171
ISOVALERALDEHYDE (3-METHYLBUTANAL)	1.13	1.58	62	1.95×10^{-2}	65
LEAD & COMPOUNDS	59	851	1,285	30	2,224
MANGANESE & COMPOUNDS	80	85	284	37	485
MERCURY & COMPOUNDS	2.84	50	10	1.40	64
METHANE	18,207	115,304	225,776	36,556	395,842
METHYL ALCOHOL	1,186	6,421	9,964	573	18,145
METHYL ETHYL KETONE (MEK) (2-BUTANONE)	2,621	42,560	10,129	1,098	56,408
METHYL GLYOXAL	53	74	2,923	0.92	3,052
METHYL N-BUTYL KETONE	1,618	26,031	6,325	687	34,660
METHYL PROPYLCYCLOHEXANES	394	413	1,298	175	2,280
METHYLANTHRACENES	1.90	1.85	6.52	0.82	11
METHYLCYCLOHEXANE	3,379	18,680	18,253	1,422	41,735
METHYLCYCLOPENTANE	24,059	127,116	129,899	9,751	290,825
METHYLDECALINS	36	38	119	16	209
METHYLDECENES	43	45	141	19	247
METHYLNAPHTHALENES	1.21	49	72	1.04	123
M-ETHYLTOLUENE	27,507	146,066	147,437	11,028	332,038
METHYLUNDECANE	59	62	195	26	342
MOLYBDENUM	80	102	272	34	489
M-TOLUALDEHYDE	9.78	14	541	0.17	564
NAPHTHALENE	355	1,431	2,392	151	4,329
N-BUTANE	22,534	144,647	163,273	14,682	345,136
N-BUTYLBENZENE	24	57	1,312	0.89	1,393
N-DECANE	5,719	39,334	32,814	2,268	80,135
N-DODECANE	108	205	4,235	3.08	4,551
N-HEPTADECANE	0.34	1.55	19	2.77×10^{-2}	21
N-HEPTANE	7,910	42,187	43,426	3,351	96,874
N-HEXANE	15,527	81,486	83,323	6,417	186,753
NICKEL & COMPOUNDS	853	767	3,059	365	5,044
NITRIC OXIDE	2,198,100	19,718,427	10,060,395	990,331	32,967,254
NITROGEN DIOXIDE	177,391	1,591,312	811,892	79,921	2,660,515
NITROUS OXIDE	8,609	55,788	49,860	3,524	117,781

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
N-NONANE	6,321	34,391	32,945	2,568	76,226
N-OCTANE	6,683	36,396	35,429	2,696	81,204
NONADIENE	9.84	10	32	4.37	57
N-PENTADECANE	13,158	13,817	44,875	5,828	77,677
N-PENTANAL (N-VALERALDEHYDE)	8.62	12	477	0.15	497
N-PENTANE	19,008	98,906	102,205	7,743	227,861
N-PENTYLBENZENE	12	35	658	0.58	705
N-PENTYLCYCLOHEXANE	1.93×10^{-2}	-	6.40×10^{-2}	1.10×10^{-2}	9.42×10^{-2}
N-PROPYLBENZENE	7,602	41,163	40,481	3,050	92,295
N-TETRADECANE	73	117	2,923	1.57	3,114
N-TRIDECANE	106	146	4,200	1.80	4,454
N-UNDECANE	900	9,312	8,003	334	18,548
O-ETHYLTOLUENE	11,014	59,098	58,835	4,415	133,362
O-TOLUALDEHYDE	8.10	11	447	0.14	467
OXIDES OF NITROGEN	3,547,811	31,826,233	16,237,831	1,598,429	53,210,305
PARTICULATE MATTER $\leq 10 \mu\text{m}$	283,904	2,185,399	1,018,621	119,011	3,606,935
PARTICULATE MATTER $\leq 2.5 \mu\text{m}$	266,378	2,103,878	951,549	111,609	3,433,414
PENTYLIDENECYCLOHEXANE	9.84	10	32	4.37	57
PERCHLOROETHYLENE	1.77×10^{-2}	6.80×10^{-2}	0.58	0.12	0.79
PERYLENE	0.14	0.13	0.46	5.78×10^{-2}	0.79
P-ETHYLTOLUENE	23	178	331	21	553
PHENANTHRENE	77	594	304	33	1,008
PHENOL (CARBOLIC ACID)	26	61	1,454	2.13	1,543
PHOSPHORUS	22	282	91	9.27	404
POLYCHLORINATED DIOXINS AND FURANS	2.29×10^{-4}	3.32×10^{-3}	1.84×10^{-3}	8.80×10^{-5}	5.48×10^{-3}
POLYCYCLIC AROMATIC HYDROCARBONS	730	3,178	5,017	315	9,240
PROPANE	5,786	33,064	39,163	4,308	82,320
PROPENYLCYCLOHEXANE	49	52	162	22	285
PROPIONALDEHYDE	2,102	33,391	9,205	834	45,532
PROPYLENE	17,926	136,844	99,186	8,333	262,289
P-TOLUALDEHYDE {4-METHYLBENZALDEHYDE}	1.69	2.38	93	2.93×10^{-2}	97
PYRENE	10	60	70	4.59	145
RETENE	9.90×10^{-2}	9.50×10^{-2}	0.34	4.26×10^{-2}	0.58
SELENIUM & COMPOUNDS	1.31	10	19	0.43	31
STYRENE (ETHENYLBENZENE)	1,458	8,721	8,385	593	19,158
SULFUR DIOXIDE	1,299,973	1,245,946	4,724,597	553,125	7,823,642
T-BUTYLBENZENE	29	189	101	13	332
T-DECAHYDRONAPHTHALENE (TRANS-DECALIN)	39	41	130	17	228
TETRAMETHYLCYCLOPENTANE	36	38	119	16	209
TETRAMETHYLTHIOUREA	3.28	3.44	11	1.46	19

Air Emissions Inventory for the Greater Metropolitan Region of New South Wales
Appendix A. Estimated Annual Emissions of all Substances from Off-Road Mobile Sources

Substance	Emissions (kg/year)				
	Newcastle	Non Urban	Sydney	Wollongong	GMR
TIN & COMPOUNDS	5.70	95	33	2.24	136
TOLUENE	104,603	566,367	562,810	42,699	1,276,479
TOTAL SUSPENDED PARTICULATE	294,122	2,275,848	1,056,100	123,381	3,749,451
TOTAL VOLATILE ORGANIC COMPOUNDS	1,302,626	8,715,322	7,341,261	591,194	17,950,403
TRANS 1-METHYL-4-ETHYLCYCLOHEXANE	6.98	58	69	7.01	141
TRANS-1,2-CIS-4-TRIMETHYLCYCLOPENTANE	21	175	207	21	423
TRANS-1,3-DIMETHYLCYCLOHEXANE	30	31	97	13	171
TRANS-1,3-DIMETHYLCYCLOPENTANE	49	408	482	49	988
TRANS-1,CIS-2,3-TRIMETHYLCYCLOPENTANE	28	233	276	28	565
TRANS-1-2-DIMETHYLCYCLOPENTANE	35	291	345	35	706
TRANS-2-BUTENE	4,093	31,284	30,813	2,912	69,102
TRANS-2-ETHYLMETHYLCYCLOPENTANE	21	175	207	21	423
TRANS-2-HEXENE	2.19	34	106	1.83×10^{-2}	141
TRANS-2-PENTENE	5,183	34,069	37,856	3,323	80,430
TRIMETHYLBENZENES	223	234	736	99	1,292
TRIMETHYLCYCLOHEXANES	131	138	433	58	760
TRIMETHYLCYCLOHEXANOL	9.84	10	32	4.37	57
TRIMETHYLCYCLOPENTANONE	9.84	10	32	4.37	57
TRIMETHYLHEXENE	23	24	76	10	133
TRIMETHYLOCTANES	23	24	76	10	133
VANADIUM & COMPOUNDS	2,329	2,096	8,257	987	13,669
VINYL CHLORIDE MONOMER	0.11	0.41	3.48	0.74	4.74
ZINC & COMPOUNDS	93	864	504	38	1,500

Appendix B: Industrial Survey Questionnaire Form

DECCW Industrial Emissions Inventory Survey 2009
Facility ID: <<Facility ID>>

MINING FOR COAL QUESTIONNAIRE

Please indicate as much of the following information as possible. If information is unavailable or is difficult to obtain, please provide a best estimate. Please indicate where a question is not applicable (e.g. "NA") or where no data are available (e.g. "ND"). Department of Environment, Climate Change & Water (DECCW) acknowledges that the information may be commercially sensitive. All information presented in this survey will be kept strictly confidential.

REPORTING YEAR: The data provided is for the 2007-2008 financial year ☐, 2008 calendar year ☐ or 2008-2009 financial year ☐ (Please tick one).

- Q1.** Facility name: <<Facility>>
- Q2.** Facility street address <<Premises Street>>
<<Premises Suburb>>
<<Premises State>>
<<Premises Postcode>>
- Q3.** Facility main activity: <<Activity>>
- Q4.** Facility primary ANZSIC code <<ANZSIC>>
(Please indicate if incorrect)
- Q5.** Does the facility perform any other activity other than described in Question 3?
(provide ANZSIC Code if known) _____
- Q6.** Person completing questionnaire: _____
- Q7.** Contact Details Phone number: _____
Fax number: _____
Email: _____

Operating Schedule (cross out when not operating)

Q8. Months of the Year: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Q9. Days of the Week: MON TUES WED THUR FRI SAT SUN

Q10. Weekday Hours of the Day:
1 2 3 4 5 6 7 8 9 10 11 12 (noon) 1 2 3 4 5 6 7 8 9 10 11 12 (midnight)

Weekend Hours of the Day:
1 2 3 4 5 6 7 8 9 10 11 12 (noon) 1 2 3 4 5 6 7 8 9 10 11 12 (midnight)

Q11. Seasonal Variation
If activity varies for any reason please indicate the **approximate** variation as a percentage of a full year.
e.g.: JAN – MAR 30%, APR – JUNE 20%, JULY – SEP 10%, OCT – DEC 40%

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Q12. Are there any additional variations in production not addressed by Q8-Q11 above?

Department of
Environment, Climate Change and Water NSW



DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

Major Materials and Products

Q13. Please estimate the annual quantity of the main raw materials consumed (e.g. tonnes/year, litres/year). Also indicate the physical state of the raw material (i.e. solid/liquid or gas)^a. Attach a separate sheet if there is insufficient space in the table below.

Raw Material	Please circle:	Annual Quantity Used ^a
1.	solid / liquid / gas	
2.	solid / liquid / gas	
3.	solid / liquid / gas	
4.	solid / liquid / gas	
5.	solid / liquid / gas	
6.	solid / liquid / gas	
7.	solid / liquid / gas	

^a Department of Environment, Climate Change & Water (DECCW) acknowledges that this information may be commercially sensitive. All information presented in this survey will be kept strictly confidential.

Q14. What product(s) are mined:

1. _____
2. _____
3. _____
4. _____
5. _____

Q15. Please specify the following information for each product(s) mined that is sent off-site. Attach a separate sheet if there is insufficient space in the table below.

Product Material	Annual Quantity Produced (tonnes) ^a	Off-site transfer method (e.g. truck, rail)

^a Department of Environment, Climate Change & Water (DECCW) notes that this information may be commercially sensitive. All information presented in this survey will be kept strictly confidential.

Q16. Please estimate the total area of land that is exposed (e.g. has no vegetative cover) in ha: _____

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

- Q17.** Please estimate the average total area of land being worked at any particular time of the year (ha): _____
- Q18.** Please estimate the average total area of land that is cleared annually through burn off (ha): _____
- Q19.** Please indicate the 'burn off' regime (e.g. one day every three weeks) and please indicate whether there are specific periods when burning does not occur (e.g. December): _____
- Q20.** Please sketch a flow diagram representing the main stages involved in the process (e.g. land clearing → top soil removal → storage of top soil → blasting → removal of mineral → crushing → stockpile). If a "ready-made" sketch or more detailed flow diagram is available, please attach it to this questionnaire.

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

Q21. Regarding the storage of materials in piles, please specify the following information as best as possible (please read the footnotes beneath the table). Attach a separate sheet if there is insufficient space in the table below.

[illegible]

- | | |
|---|---|
| a | Please indicate the material type (such as topsoil, overburden, mineral (please name), coal) |
| b | Only approximate values are required. |
| c | Please indicate the number of piles that are the same or very similar in size and shape, that are used for the storage of the same material. |
| d | Silt is defined as particles equal to or less than 75 µm (micrometres) in diameter. |
| e | <p>Categorise dust control methods into one of the following categories:</p> <p>(1) Watering by periodic spraying;</p> <p>(2) Watering by wind activated spraying system;</p> <p>(3) Chemical wetting agents;</p> <p>(4) Continuous chemical spray onto input material;</p> <p>(5) Surface crusting agents;</p> <p>(6) Covered (e.g. using a shed); and/or</p> <p>(7) Other (please specify) .</p> <p>If dust generation reduction efficiencies are available please specify (%).</p> |

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Air Emission Sources

Q22. Please identify all air emission sources at the facility, indicating whether any emission control technologies (e.g. baghouse or low NO_x burners for point sources) and/or management practices (e.g. watering and chemical wetting agents on stockpiles for fugitive sources) are utilised and the date they were first commissioned and/or either significantly modified, upgraded or replaced. Note that point, fugitive, controlled and uncontrolled sources should be included. Note also that, where there is more than one, all emission control technologies and/or management practices should be included for each source. Attach a separate sheet if there is insufficient space in the table below.

Emission Source Name	Stack/Vent Number ^a	Control Technology	Reduction Efficiency (%)	Date First Commissioned ^{b,d}	Date Significantly Modified, Upgraded or Replaced ^{c,d}

a Insert "NA" (not applicable) for fugitive sources

b Include the earliest date (i.e. day, month and year) that either:

- An application for pollution control approval (PCA) was lodged under the *Pollution Control Act 1970*
- A development application (DA) was lodged under the *Environmental Planning and Assessment Act 1979*; or
- A licence application was lodged under the *Protection of the Environment Operations Act 1997*,
Otherwise, include that date the emission source was "First Commissioned", if this information is not available.

c Include the earliest date (i.e. day, month and year) that either:

- An application for pollution control approval (PCA) was lodged under the *Pollution Control Act 1970*
- A development application (DA) or modification to an existing development consent was lodged under the *Environmental Planning and Assessment Act 1979*; or
- A licence application or variation to an existing licence was lodged under the *Protection of the Environment Operations Act 1997*,
Otherwise, include that date the emission source was "Significantly Modified, Upgraded or Replaced", if this information is not available.

d Include codes PCA, EP&A and POEO beside date to denote Pollution Control Act 1970, Environmental Planning and Assessment Act 1979 and Protection of the Environment Operations Act 1997 respectively, where relevant

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

Fuel Combustion

Q23. If combustion devices (e.g. see below) are utilised by the facility, please specify their characteristics in the table below). Please read the footnotes. Attach a separate sheet if there is insufficient space in the table below.

Type of Combustion Device	Stack/Vent Number	Rated Capacity (kW)	Fuel Type ^a	Estimated Annual Fuel Consumption (either tonnes, litres, cubic metres or MJ)	Emission Control(s) ^b	Control Efficiency (%)

^a If the fuel type is an oil, please indicate the type of oil (e.g. residual, distillate, No.6 Residual Oil).

^b Emission controls include flue gas controls such as baghouses and scrubbers as well as the use of combustion related controls such as low NO_x burners. If more than one control device is used, please number the controls and place a corresponding control efficiency for each numbered control in the adjacent column (e.g. with "(1) baghouse, (2) scrubber" entered into the "Emission Control(s)" column, the adjacent column would read "(1) 99%, (2) 80%". for the corresponding control efficiencies).

Combustion Types

External Combustion	Internal Combustion
Boiler - dry bottom - wall fired Boiler - dry bottom - tangentially fired Boiler - dry bottom - cell burner fired Boiler - wet bottom - wall fired Boiler - wet bottom - tangentially fired Boiler - wet bottom - cell burner fired Boiler (other) Cyclone furnace	Spreader stoker Overfeed stoker Handfed unit Fluidised bed combustor - circulating Fluidised bed combustor - bubbling Space heater Fuel cell/Dutch oven Gas turbine 4-stroke lean burn 4-stroke rich burn 2 stroke lean burn

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

Q24. Please provide source specific emission estimates for any point sources at the facility in the table below. Please indicate any available information on stack properties (e.g. location, height, diameter, exit velocity) even if no emissions data are available. Attach a separate sheet if there is insufficient space in the table below.

	Stack/ Vent Number	Stack/ Vent Number	Stack/ Vent Number	Stack/ Vent Number	Stack/ Vent Number	Stack/ Vent Number
STACK DETAILS:						
Stack Identification						
Emission Source ID (please use ID number used in Q22 and Q23) ^a						
Stack Location Easting (MGA) (km)						
Stack Location Northing (MGA) (km)						
Stack height (m)						
Stack internal diameter @ exit (m)						
Gas discharge velocity (m/s) @ discharge temperature						
Gas discharge volume (m ³ /s) @ discharge temperature						

EMISSION COMPONENTS

(kg/year):

Total Solid Particulates						
PM ₁₀						
CO						
NO						
NO ₂						
SO ₂						
SO ₃						
VOCs ^b						
Lead						
Formaldehyde						
Benzene						
Toluene						
Benzo(a)pyrene or PAHs						
Isomers of xylene						
Other (please specify)						

a Please use the same naming convention as used for Q22 and Q23 (where applicable).

b If the species-specific composition of total VOCs is known, please attach this information separately.

Q25. If the emissions of any of the sources specified in Q22-Q24 vary from the operating regime of the facility, described in Q8-Q12, please describe this variation below.

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

Q26. Please indicate the following information for any fuel or organic liquid storage tanks at the facility. All volumes should be expressed in kilolitres (kL). Attach a separate sheet if there is insufficient space in the table below.

Tank Type (please tick)		Capacity (kL)	Material Stored (e.g. petrol, diesel, LPG, acetone)	Estimated Loss (if known) (kL)	Filling Method (i.e. splash loading, submerged loading or bottom loading) ^b	During filling tanks, are the vapours displaced from the tank vented directly to the atmosphere or are they returned to the filling tanker?	Annual Throughput (kL/y)	Please specify any emission control measures utilised on the tanks ^c
Above Ground ^a	Below Ground							

^a If any above ground tanks are present, please indicate whether the tank design is fixed roof, floating roof (internal or external), or a pressure tank.

^b *Submerged Filling:* The liquid enters the tank from the top of the tank, freefalling and splashing to the bottom of the tank;

Submerged Filling: The liquid enters the tank via a pipe which reaches down to the bottom of the tank, allowing the end of the pipe to become submerged shortly after filling commences; and *Bottom Loading:* The liquid is filled via a pipe that enters through the bottom of the tank. For gas filled tanks please indicate "NA".

^c Emission controls may include devices such as secondary seals (for above ground tanks), vapour recovery units (VRUs) and/or activated carbon filters used on the storage tank vents to minimise breathing and filling releases. Indicate the control efficiency where possible.

Q27. Please provide (attach to the questionnaire) fuel speciation profiles for fuels used at the facility.

Facility ID: <<Facility ID>>

[illegible]

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

Q29. Do you have an on-site wastewater treatment system? If so, please provide the following data:

VOC emissions to air estimate from wastewater treatment: _____
kg/year

Please specify method of calculation:

Please estimate the annual volume of wastewater treated (i.e. megalitres/year)

_____ ML/yr

Please estimate the minimum, maximum and average Biological Oxygen Demand (BOD) of wastewater as received by the treatment plant (i.e. influent BOD).

_____ kg/m³ (min)

_____ kg/m³ (max)

_____ kg/m³ (annual average)

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

On-Site Vehicles

Q30. Please specify the following information pertaining to vehicles used for ON-SITE operations as best as possible (please read the footnotes beneath the table). Attach a separate sheet if there is insufficient space in the table below.

Type of vehicle ^a	Vehicle model year	Number of vehicles of this type operating	Fuel type (Petrol, diesel, LPG)	Engine Size (or power rating – kW or HP)	ON-SITE operating regime (e.g. 6am – 6pm, Monday to Friday) ^b	Typical operating hours per day	Number of operating days per year	Annual ON-SITE VKT per vehicle (km) ^{c, d}	% of VKT on PAVED roads (%) ^{c, d}	% of VKT on UNPAVED roads (%) ^{c, d}

- a Covers Off-Road vehicles only. Off-Road vehicles typically are not registered with the Road and Traffic Authority (RTA) because they do not access the road network. Some may have Conditional Registrations with the RTA, when it requires limited access to the road network. Example: front end loader, grader, bulldozer, fork lifts.
- b Please characterise the ON-SITE operating regime if it differs to that described in Q8 – Q12.
- c It is important to ensure that only ON-SITE operations are considered when providing these data.
- d VKT = Vehicle Kilometres Travelled (km). Provide these data on a 'per vehicle' basis (i.e. so the TOTAL VKT's for a particular vehicle type will be the 'number of vehicles' by the 'VKT's' for each vehicle). This data only needs to be approximate.

Q31. Please specify the total fuel consumed by on-site vehicles:

Petrol: _____ kL/year

Diesel: _____ kL/year

LPG: _____ m³/year

DECCW Industrial Emissions Inventory Survey 2009
Facility ID: <<Facility ID>>

NPI dust emissions from on-site vehicles, material handling, stockpiles and exposed areas

Q32. If you report to the National Pollutant Inventory (NPI), you will have been required to estimate PM₁₀ emissions from these operations. Please list these emissions here. Attach a separate sheet if there is insufficient space in the table below.

Equipment Type	PM ₁₀ emission rates ^a	Units

^a Emission rates should be the emission rate while the equipment is operating, not the hourly equivalent of annual emissions. The hours of operation should be provided in Q30.

Stockpiles and Exposed Areas	PM ₁₀ emission rates ^a	Units

^a Emission rates should be the emission rate while the equipment is operating, not the hourly equivalent of annual emissions. The hours of operation should be provided in Q30.

DECCW Industrial Emissions Inventory Survey 2009

Facility ID: <<Facility ID>>

Q33. Please specify any other activities leading to airborne emissions that have not been considered already in this questionnaire. If any estimates of emissions have been performed by the facility (e.g. fugitive emissions such as solvent loss, particulates from blasting) please present them in the following table. Attach a separate sheet if there is insufficient space in the table below.

Activity	Pollutant Emitted	Emission Estimate ^a

^a Please specify the units of measurement, as well as the method used to estimate the emission (e.g. source testing, mass balance).

Q34. Please estimate the annual electricity consumption at the facility (MWh):

Q35. Please provide any site-specific emission estimates (by source) not already covered by this questionnaire and air emission test data (please attach to the completed questionnaire):

Q36. Any additional comments relating to this questionnaire.

Appendix C: Domestic Survey Questionnaire Form



Why a domestic survey?

The domestic survey is the most accurate way to obtain information on activities affecting air emissions carried out by people at home.

What's covered in the domestic survey?

This survey covers the usage of lawn mowers, garden appliances, watercraft and domestic heating and cooking appliances.

Confidentiality

The DECCW project team will not release any information you provide in a way which would enable an individual's or household's data to be identified.

Help available

If you need help completing this form, you can contact the DECCW project team via email air.majorprojects@environment.nsw.gov.au or telephone (02) 9995 6047.



Rec No (D- C)

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NSW Department of Environment, Climate Change and Water

Domestic Survey

The NSW Department of Environment, Climate Change and Water (DECCW) seeks to collect some information from your household anonymously to assist us in developing means to improve the air quality in the NSW Greater Metropolitan Region. The focus of this survey is to establish the usage patterns of devices in a household that burn solid, liquid or gas fuel, including lawn mowers, garden appliances, watercraft and domestic heating and cooking appliances. The survey will help to assess total household emissions from fuel burning in NSW.

Telephone number listings have been used to generate a list of survey subjects at random in the Sydney, Newcastle and Wollongong areas. The survey takes about 15 minutes to complete and can be returned in the reply paid envelope supplied. Information collected is strictly confidential and will not be used in a manner that allows individual or household data to be identified. We appreciate your participation in this survey.

If you would like more information about the survey, you can contact the DECCW Project Manager, Mr Nick Agapides on (02) 9995 6047 or email the DECCW project team at air.majorprojects@environment.nsw.gov.au. You can also obtain more information about this survey at the DECCW website <http://www.environment.nsw.gov.au/air/airinventory.htm>.

What you need to do

- Use this form to record, to your best knowledge, details of the identified activities that take place at your home, or the usage of watercraft on waterways.
- Return the completed form in the supplied reply paid envelope.

How to answer

- Please use a black or blue pen.
- Please use block letters.
- If you do not know how to answer, give the best answer you can.

1. Dwelling Description

Post code:

Council rates paid to:

Type of dwelling

- ☐ Separate house
- ☐ Semi detached, terrace house or townhouse
- ☐ Flat, unit or apartment
- ☐ Something else (Please specify).

[illegible]Number of people in the household:

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2a. Lawn Mowing and Garden Equipment (Continued on next page)

Do you use a lawn mower or other garden equipment around your home?

☐ No – GO TO SECTION 2C

☐ Yes – answer questions below

Equipment type	1. Push Lawnmower	2. Ride on Lawnmower	3. Brush Cutter	4. Hedge Trimmer	5. Edge Trimmer	6. Chipper or Mulcher
Number of units owned? (E.g. 0, 1, 2, 3, 4, 5, etc)	Own:	Own:	Own:	Own:	Own:	Own:
Fuel type? (X in box) 1. Unleaded petrol 2. Petrol/oil mix 3. Electricity	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3
Engine type? (X in box) 1. 2 stroke carburettor 2. 2 stroke injected 3. 4 stroke carburettor 4. 4 stroke injected 5. Electric	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
In Spring (Sep-Nov): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never In Spring (Sep-Nov): Average operating time (write in time in minutes?)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes
In Summer (Dec-Feb): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never In Summer (Dec-Feb): Average operating time (write in time in minutes?)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes
In Autumn (Mar-May): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never In Autumn (Mar-May): Average operating time (write in time in minutes?)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes
In Winter (June-Aug): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never In Winter (June-Aug): Average operating time (write in time in minutes?)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 On average: minutes
Main operating times? 1. Weekdays 2. Weekends	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2
How old is this device? If it is less than one year old, write in 0.	years old	years old	years old	years old	years old	years old

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2a. Lawn Mowing and Garden Equipment (Continued from previous page)						
Equipment type	7. Compactor	8. High-Pressure Cleaner	9. Blower	10. Chainsaw	11. Garden Vacuum	12. Other (Please specify)
Number of units owned? (E.g. 0, 1, 2, 3, 4, 5, etc)	Own:	Own:	Own:	Own:	Own:	Own:
Fuel type? (X in box) 1. Unleaded petrol 2. Petrol/oil mix 3. Electricity	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3	☐ 1 ☐ 2 ☐ 3
Engine type? (X in box) 1. 2 stroke carburettor 2. 2 stroke injected 3. 4 stroke carburettor 4. 4 stroke injected 5. Electric	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
In Spring (Sep-Nov): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
In Spring (Sep-Nov): Average operating time (write in time in minutes?)	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes
In Summer (Dec-Feb): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
In Summer (Dec-Feb): Average operating time (write in time in minutes?)	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes
In Autumn (Mar-May): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
In Autumn (Mar-May): Average operating time (write in time in minutes?)	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes
In Winter (June-Aug): Average operating frequency? (X in box) 1. At least weekly 2. Fortnightly 3. Monthly 4. Once or twice only 5. Never	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
In Winter (June-Aug): Average operating time (write in time in minutes?)	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes	On average: minutes
Main operating times? 1. Weekdays 2. Weekends	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2	☐ 1 ☐ 2
How old is this device? If it is less than one year old, write in 0.	years old	years old	years old	years old	years old	years old

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2b. Lawn Mowing

Do you use a push lawn mower or ride on lawn mower to mow your lawn?

☐ No – GO TO SECTION 2C

☐ Yes – answer i) to iv) below

- i) What **time of day** do you mainly use the lawn mower? If this varies, put an x in the box for **all** the hours of the day when you would be likely to use that type of equipment.

☐ midnight to 1am

☐ midday to 1pm

☐ 1am to 2 am

☐ 1pm to 2 pm

☐ 2 am to 3 am

☐ 2 pm to 3 pm

☐ 3 am to 4 am

☐ 3 pm to 4 pm

☐ 4 am to 5 am

☐ 4 pm to 5 pm

☐ 5 am to 6 am

☐ 5 pm to 6 pm

☐ 6 am to 7 am

☐ 6 pm to 7 pm

☐ 7 am to 8 am

☐ 7 pm to 8 pm

☐ 8 am to 9 am

☐ 8 pm to 9 pm

☐ 9 am to 10 am

☐ 9 pm to 10 pm

☐ 10 am to 11 am

☐ 10 pm to 11 pm

☐ 11 am to midday

☐ 11 pm to midnight

- ii) What is the **area** of the lawn you mow? If you can answer in square metres, please write your answer in **square metres** below.

Area mown in square metres

IF ANSWERED IN SQUARE METRES GO TO SECTION 2c

- iii) If you cannot estimate this in square metres, can you say how long and wide the area of the lawn you mow is in **paces** below?

paces long and paces wide

IF ANSWERED IN PACES GO TO SECTION 2c

- iv) If you cannot estimate how long and wide the area is in paces, what else can you tell us about the area of lawn you mow? For example, how long it takes to mow it, or the sizes of different patches that you mow? Please write your answer below:

2c. Lawn Mowing Contractor

Do you have someone (e.g. a gardener) mow any of your lawn for you?

☐ No – GO TO SECTION 3

☐ Yes – answer i) to viii)

How **often** does the person mow the lawn in (Please put an x in the appropriate box for **each season**)

- i) Spring (Sep-Nov)? ☐ weekly ☐ fortnightly ☐ monthly ☐ once or twice ☐ never
- ii) Summer (Dec-Feb)? ☐ weekly ☐ fortnightly ☐ monthly ☐ once or twice ☐ never
- iii) Autumn (Mar-May)? ☐ weekly ☐ fortnightly ☐ monthly ☐ once or twice ☐ never
- iv) Winter (Jun-Aug)? ☐ weekly ☐ fortnightly ☐ monthly ☐ once or twice ☐ never

v) How **long** on average does it take the person to mow your lawn? |__| |__| |__| **minutes** on average

vi) What **types** of equipment does the person use?

☐ Push lawn mower ☐ Ride on lawn mower

 Edge trimmer

☐ Other (Please specify) _____

vii) **When** does the person mainly mow the lawn?

☐ Weekdays ☐ Weekends

viii) What is the **area** of the lawn the person mows?

If you can answer in square metres, please write your answer in **square metres** square metres
IF ANSWERED IN SQUARE METRES GO TO SECTION 3

If you cannot estimate this in square metres, can you say how long and wide the area of the lawn the person mows is in **paces**?

| | | paces long and | | | paces wide IF ANSWERED IN PACES GO TO SECTION 3

If you cannot estimate how long and wide the area the person mows is in paces, what else can you tell us about the area of lawn the person mows? For example, how long it takes to mow it, or the sizes of different patches that are mown? Please write your answer below:

3. Solid Fuel Heaters (Wood or Coal) (Continues on next page)

Do you have a heater that uses wood or coal including a slow combustion heater, potbelly stove or open fireplace? ☐ No – GO TO SECTION 4 ☐ Yes – answer 3

☐ No – GO TO SECTION 4 ☐ Yes – answer 3 a) to 3 i)

3a. What **type** of wood/coal heating do you have?

- ☐ Slow Combustion heater (**with** AS/NZS 4012: 1992 or AS/NZS 4013: 1999 compliance plate)
- ☐ Slow Combustion heater (**without** AS/NZS 4012: 1992 or AS/NZS 4013: 1999 compliance plate)
- ☐ Potbelly stove
- ☐ An open fireplace
- ☐ Other (Please specify) _____

3b. Which **months** do you use wood/coal for heating?

☐ Jan ☐ Feb ☐ Mar ☒ Apr ☐ May ☐ Jun
☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec

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3. Solid Fuel Heaters (Wood or Coal) (Continued from previous page)			
3c. How many times a week do you use wood/coal heating?	☐ Most days ☐ 4-5 times a week ☐ 2-3 times a week ☐ About once a week ☐ Less than once a week		
3d. Do you usually use wood/coal heating?	☐ On week days only ☐ On weekend days only ☐ Both weekdays and weekends		
3e. What times of day do you usually use wood/coal heating?	Hours used on weekdays		Hours used on weekends
If you usually use only on weekdays, just answer for weekdays. If you usually use only for weekends, just answer for weekends. If you usually use on both, answer both. If the time of day varies, put an x in the boxes for all the hours of the day when you would be likely to use wood/coal heating.	☐ midnight to 1am	☐ midday to 1pm	☐ midnight to 1am
	☐ 1am to 2am	☐ 1pm to 2pm	☐ 1am to 2am
	☐ 2am to 3am	☐ 2pm to 3pm	☐ 2am to 3am
	☐ 3am to 4am	☐ 3pm to 4pm	☐ 3am to 4am
	☐ 4am to 5am	☐ 4pm to 5pm	☐ 4am to 5am
	☐ 5am to 6am	☐ 5pm to 6pm	☐ 5am to 6am
	☐ 6am to 7am	☐ 6pm to 7pm	☐ 6am to 7am
	☐ 7am to 8am	☐ 7pm to 8pm	☐ 7am to 8am
	☐ 8am to 9am	☐ 8pm to 9pm	☐ 8am to 9am
	☐ 9am to 10am	☐ 9pm to 10pm	☐ 9am to 10am
	☐ 10am to 11am	☐ 10pm to 11pm	☐ 10am to 11am
	☐ 11am to midday	☐ 11pm to midnight	☐ 11am to midday
	☐ No weekday use		☐ No weekend day use
	3f. What type of fuel do you normally use? Please put an x in the box for all the types you normally use	☐ Hardwood (such as eucalyptus) PLEASE ANSWER 3 f(1) ☐ Softwood (such as pine) PLEASE ANSWER 3 f(1) ☐ Coal PLEASE ANSWER 3 f(2)	
3f(1). How much firewood do you typically use in a full year? THEN ANSWER 3g	(Approximate total in tonnes, trailer loads, or cubic metres) _____ tonnes of firewood _____ trailer loads (of approximately 2 m ³ each) of firewood _____ cubic metres of firewood IF YOU CAN'T ESTIMATE, WHAT CAN YOU TELL US ABOUT HOW MUCH FIREWOOD YOU USE IN A YEAR: _____ _____		
3f(2). How much coal do you typically use in a full year? THEN ANSWER 3g	(Approximate total in tonnes, trailer loads, or cubic metres) _____ tonnes of coal _____ trailer loads (of approximately 2 m ³ each) of coal _____ cubic metres of coal IF YOU CAN'T ESTIMATE, WHAT CAN YOU TELL US ABOUT HOW MUCH COAL YOU USE IN A YEAR: _____ _____		
3g. Where do you get your firewood or coal?	☐ From a wood/coal merchant ☐ Collect from woodland ☐ From a service station or market ☐ Other (Please specify) _____		
3h. Was the heater installed ?	☐ Installed before 1992 ☐ Installed between 1992 and 1999 ☐ Installed after 1999		
3i. Please estimate how many years old the heater is?	__ years. If it is less than one year old, write in 0.		

- 7 -

4. Liquid Fuel Heating (Fuel Oil, Heating Oil, Kerosene or other Liquid Fuel)

Do you use liquid fuel (fuel oil, heating oil, kerosene or other liquid fuel)

☐ No – GO TO SECTION 5

for heating at your home?

☐ Yes – answer 4 a) to 4 e)

4a. What type of liquid fuel do you use for heating in your home?	☐ Fuel oil ☐ Kerosene ☐ Heating oil ☐ Other (Please specify)_____																								
4b. How many litres of liquid fuel was used for heating in the last year?	_ _ _ litres of liquid fuel used in a year																								
4c. Which months do you usually use liquid fuel for heating?	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec																								
4d. When you use liquid fuel for heating, how many times a week do you use it?	☐ Most days ☐ 4-5 times a week ☐ 2-3 times a week ☐ About once a week ☐ Less than once a week																								
4e. What times of day do you usually use liquid fuel for heating? If the time of day varies, put an x in the box for all the hours of the day when you would be likely to use liquid fuel for heating.	<table border="0"> <tr> <td>☐ midnight to 1am</td> <td>☐ midday to 1pm</td> </tr> <tr> <td>☐ 1am to 2 am</td> <td>☐ 1pm to 2 pm</td> </tr> <tr> <td>☐ 2 am to 3 am</td> <td>☐ 2 pm to 3 pm</td> </tr> <tr> <td>☐ 3 am to 4 am</td> <td>☐ 3 pm to 4 pm</td> </tr> <tr> <td>☐ 4 am to 5 am</td> <td>☐ 4 pm to 5 pm</td> </tr> <tr> <td>☐ 5 am to 6 am</td> <td>☐ 5 pm to 6 pm</td> </tr> <tr> <td>☐ 6 am to 7 am</td> <td>☐ 6 pm to 7 pm</td> </tr> <tr> <td>☐ 7 am to 8 am</td> <td>☐ 7 pm to 8 pm</td> </tr> <tr> <td>☐ 8 am to 9 am</td> <td>☐ 8 pm to 9 pm</td> </tr> <tr> <td>☐ 9 am to 10 am</td> <td>☐ 9 pm to 10 pm</td> </tr> <tr> <td>☐ 10 am to 11 am</td> <td>☐ 10 pm to 11 pm</td> </tr> <tr> <td>☐ 11 am to midday</td> <td>☐ 11 pm to midnight</td> </tr> </table>	☐ midnight to 1am	☐ midday to 1pm	☐ 1am to 2 am	☐ 1pm to 2 pm	☐ 2 am to 3 am	☐ 2 pm to 3 pm	☐ 3 am to 4 am	☐ 3 pm to 4 pm	☐ 4 am to 5 am	☐ 4 pm to 5 pm	☐ 5 am to 6 am	☐ 5 pm to 6 pm	☐ 6 am to 7 am	☐ 6 pm to 7 pm	☐ 7 am to 8 am	☐ 7 pm to 8 pm	☐ 8 am to 9 am	☐ 8 pm to 9 pm	☐ 9 am to 10 am	☐ 9 pm to 10 pm	☐ 10 am to 11 am	☐ 10 pm to 11 pm	☐ 11 am to midday	☐ 11 pm to midnight
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5. Natural Gas and Bottled LPG (Continues on next page)

Do you have a natural gas connection in your home or use bottled LPG

☐ No – GO TO SECTION 6

(not just for BBQ)?

☐ Yes – answer 5 a) to 5 i)

5a. Do you have a natural gas connection in your home or use bottled LPG (not just for BBQ)?	☐ Yes, use natural gas ☐ Yes, use bottled LPG
5b. What do you use the natural gas connection for? Put an x in the boxes of all that apply.	☐ Heating ☐ Cooking ☐ Hot water ☐ Other (Please specify)_____
5c. What was your latest billing period for natural gas usage ? Provide the billing period in dd/mm/yyyy format from either the front or rear of your bill?	From _ _ _ to _ _ _ dd / mm / yyyy dd / mm / yyyy
5d. How much did you pay for natural gas consumption for this billing period? Just give the amount in whole dollars for natural gas consumption only without service charges. You can get this from either the front or back of your latest bill.	\$ _ _ _
5e. Please write in opposite how much natural gas you used in that period, using the line with the units you can most easily find on the bill.	Check the front or rear of the bill and record the amount in: _ _ _ Total Megajoules (MJ) for the period OR _ _ _ Average Megajoules (MJ) per day for the period

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5. Natural Gas and Bottled LPG (Continued from previous page)

5f. Please provide the natural gas usage for the previous three billing periods. For each, just 1) give the months 2) give the size of the bill in whole dollars 3) and give the natural gas consumption for the period in one of - total MJ for billing period or - average MJ/day for billing period You can find the consumption for these periods on either the front or rear of your latest bill. If you cannot find your latest bill, please write in D (for Don't Know).	PERIOD 1 From to mm mm	IN PERIOD 1 PAID \$
	IN PERIOD 1 USED: (Enter amount for whichever unit is easiest to find) Total Megajoules (MJ) for the period OR Average Megajoules (MJ) per day for the period	
	PERIOD 2 From to mm mm	IN PERIOD 2 PAID \$
	IN PERIOD 2 USED: (Enter amount for whichever unit is easiest to find) Total Megajoules (MJ) for the period OR Average Megajoules (MJ) per day for the period	
	PERIOD 3 From to mm mm	IN PERIOD 3 PAID \$
	IN PERIOD 3 USED: (Enter amount for whichever unit is easiest to find) Total Megajoules (MJ) for the period OR Average Megajoules (MJ) per day for the period	
	5g. What do you use the bottled LPG for, apart from fuelling a barbecue? Put an x in the boxes of all that apply. ☐ Heating ☐ Cooking ☐ Hot water ☐ Other (Please specify):	
	5h. Please write in opposite the weight of the LPG bottle you use in kilograms or the dimensions of the bottle? Weight in kilograms (kg) IF YOU CAN'T GIVE THE WEIGHT OF BOTTLE IN KILOGRAMS, PLEASE GIVE THE BOTTLE DIMENSIONS IN: Width in centimetres (cm) AND Height in centimetres (cm)	
5i. How many LPG bottles do you typically consume in a year?	bottles of LPG gas used per year	

6. Barbecues, Outdoor and Portable Stoves (Continues on next page)

Do you use a barbecue, outdoor or portable stove at your home? ☐ No – GO TO SECTION 7
☐ Yes – answer 6 a) to 6 l)

6a. Which one of those listed below do you use most outdoors ?		
☐ Barbecue using natural gas with a piped connection	☐ Barbecue using an LPG cylinder	☐ Barbecue using briquettes
☐ Outdoor stove using natural gas with a piped connection	☐ Portable stove with a butane cartridge	☐ Barbecue using wood

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6. Barbecues, Outdoor and Portable Stoves (Continued from previous page)

6b. How **many** of the type that you use most do you own? (write in number opposite e.g. 1)

6c. Please tell us below **how often** and **how long** you use it in each season.

IN SPRING (Sep to Nov)

How **often** do you use the device in spring

- ☐ 1. Daily or most days in spring
☐ 2. Weekly in spring
☐ 3. Fortnightly in spring
☐ 4. Monthly in spring
☐ 5. Less often/never in spring

What is the average number of **minutes** you use the device in spring? Write your answer below

|_|_| minutes in spring

IN AUTUMN (Mar to May)

How **often** do you use the device in autumn

- ☐ 1. Daily or most days in autumn
☐ 2. Weekly in autumn
☐ 3. Fortnightly in autumn
☐ 4. Monthly in autumn
☐ 5. Less often/never in autumn

What is the average number of **minutes** you use the device in autumn? Write your answer below

|_|_| minutes in autumn

IN SUMMER (Dec to Feb)

How **often** do you use the device in summer

- ☐ 1. Daily or most days in summer
☐ 2. Weekly in summer
☐ 3. Fortnightly in summer
☐ 4. Monthly in summer
☐ 5. Less often/never in summer

What is the average number of **minutes** you use the device in summer? Write your answer below

|_|_| minutes in summer

IN WINTER (June to Aug)

How **often** do you use the device in winter

- ☐ 1. Daily or most days in winter
☐ 2. Weekly in winter
☐ 3. Fortnightly in winter
☐ 4. Monthly in winter
☐ 5. Less often/never in winter

What is the average number of **minutes** you use the device in winter? Write your answer below

|_|_| minutes in winter

6d. How **old** is this device? Please write in its age in whole years. If it is less than one year old, write in 0.

AGE IN WHOLE YEARS:

|_|_| YEARS

6e. What **times of day** do you mainly use the outdoor cooking device you use most?

If the time of day varies, put an x in the box for **all** the hours of the day when you would be likely to use that outdoor cooking device.

- ☐ midnight to 1am
☐ 1am to 2 am
☐ 2 am to 3 am
☐ 3 am to 4 am
☐ 4 am to 5 am
☐ 5 am to 6 am
☐ 6 am to 7 am
☐ 7 am to 8 am
☐ 8 am to 9 am
☐ 9 am to 10 am
☐ 10 am to 11 am
☐ 11 am to midday

- ☐ midday to 1pm
☐ 1pm to 2 pm
☐ 2 pm to 3 pm
☐ 3 pm to 4 pm
☐ 4 pm to 5 pm
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☐ 6 pm to 7 pm
☐ 7 pm to 8 pm
☐ 8 pm to 9 pm
☐ 9 pm to 10 pm
☐ 10 pm to 11 pm
☐ 11 pm to midnight

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6. Barbecues, Outdoor and Portable Stoves (Continued from previous page)	
IF YOU USE LPG BOTTLES FOR A BARBECUE PLEASE ANSWER 6 f) AND 6 g). IF YOU DO NOT USE LPG BOTTLES PLEASE GO TO 6 h).	
6f. Please write in opposite the weight of the LPG bottle you use in kilograms or the dimensions of the bottle.	Weight in kilograms (kg) IF YOU CAN'T GIVE THE WEIGHT OF BOTTLE IN KILOGRAMS, PLEASE GIVE THE BOTTLE DIMENSIONS IN: Width in centimetres (cm) AND Height in centimetres (cm)

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7. First Watercraft

Do you own a dinghy or boat with outboard motor, boat with inboard motor or jet ski?

☐ No – GO TO SECTION 8 ☐ Yes – answer 7a) to 7i)

(If you own a second watercraft, also fill in Section 7. Second Watercraft)

7a. What type of watercraft do you have?	☐ Dinghy with outboard motor ☐ Boat with outboard motor ☐ Boat with inboard motor ☐ Jet ski		
7b. What type of fuel does it use?	☐ Unleaded Petrol ☐ Petrol/oil mix ☐ Diesel		
7c. What is the capacity of the engine? Please fill this in horsepower, kilowatts or cubic centimetres .	Power in horsepower:	Power in kilowatts:	Capacity in ccs cubic centimetres:
	_ _ _ Horsepower	_ _ _ kW	_ _ _ ccs
7d. What is the engine type ? Please put an x in the box.	☐ 2 stroke carburettor ☐ 2 stroke injected ☐ 4 stroke carburettor ☐ 4 stroke injected.		
7d. How old is the engine?	_ _ years old. If it is less than one year old, write in 0.		
7e. Where do you normally use this watercraft? Put an x in the boxes for all the places you normally use it.	☐ 1. Port Stevens ☐ 2. Hunter River ☐ 3. Lake Macquarie ☐ 4. Tuggerah Lake ☐ 5. Broken Bay ☐ 6. Hawkesbury River ☐ 7. Port Jackson ☐ 8. Parramatta River ☐ 9. Nepean River ☐ 10. Botany Bay ☐ 11. Port Hacking ☐ 12. Lake Illawarra ☐ 13. Other River ☐ 14. Open Ocean		
7f. Which months do you use the watercraft? Put an x in the boxes of all the months you use it.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec		
7g. In the months that you indicated, how often do you use the watercraft?	☐ Most days ☐ 2-3 times a week ☐ About once a week ☐ Once or twice a month ☐ Less than once a month		
7h. When you use your watercraft, how long do you typically have the engine running? Please enter the time in minutes.	_ _ _ Engine operating time in minutes		
7i. What times of day do you mainly use that watercraft? If the time of day varies, put an x in the box for all the hours of the day when you would be likely to use that watercraft.	☐ midnight to 1am ☐ midday to 1pm ☐ 1am to 2 am ☐ 1pm to 2 pm ☐ 2 am to 3 am ☐ 2 pm to 3 pm ☐ 3 am to 4 am ☐ 3 pm to 4 pm ☐ 4 am to 5 am ☐ 4 pm to 5 pm ☐ 5 am to 6 am ☐ 5 pm to 6 pm ☐ 6 am to 7 am ☐ 6 pm to 7 pm ☐ 7 am to 8 am ☐ 7 pm to 8 pm ☐ 8 am to 9 am ☐ 8 pm to 9 pm ☐ 9 am to 10 am ☐ 9 pm to 10 pm ☐ 10 am to 11 am ☐ 10 pm to 11 pm ☐ 11 am to midday ☐ 11 pm to midnight		

(If you have a second watercraft please complete Section 7. Second Watercraft on the next page. If not, please fill in the last details in Section 8. Follow Up at the bottom of the next page)

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7. Second Watercraft (*If you do not own a second watercraft, go to Section 8. Follow Up)																										
7a. What type of watercraft do you have?	☐ Dinghy with outboard motor ☐ Boat with outboard motor ☐ Boat with inboard motor ☐ Jet ski																									
7b. What type of fuel does it use?	☐ Unleaded Petrol ☐ Petrol/oil mix ☐ Diesel																									
7c. What is the capacity of the engine? Please fill this in horsepower, kilowatts or cubic centimetres	Power in horsepower: _____ Power in kilowatts: _____ Capacity in ccs cubic centimetres: _____ _ _ _ _ Horsepower _ _ _ _ kW _ _ _ _ ccs																									
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7e. Where do you normally use this watercraft? Put an x in the boxes for all the places you normally use it.	<table border="0"> <tr> <td>☐ 1. Port Stevens</td> <td>☐ 2. Hunter River</td> </tr> <tr> <td>☐ 3. Lake Macquarie</td> <td>☐ 4. Tuggerah Lake</td> </tr> <tr> <td>☐ 5. Broken Bay</td> <td>☐ 6. Hawkesbury River</td> </tr> <tr> <td>☐ 7. Port Jackson</td> <td>☐ 8. Parramatta River</td> </tr> <tr> <td>☐ 9. Nepean River</td> <td>☐ 10. Botany Bay</td> </tr> <tr> <td>☐ 11. Port Hacking</td> <td>☐ 12. Lake Illawarra</td> </tr> <tr> <td>☐ 13. Other River</td> <td>☐ 14. Open Ocean</td> </tr> </table>		☐ 1. Port Stevens	☐ 2. Hunter River	☐ 3. Lake Macquarie	☐ 4. Tuggerah Lake	☐ 5. Broken Bay	☐ 6. Hawkesbury River	☐ 7. Port Jackson	☐ 8. Parramatta River	☐ 9. Nepean River	☐ 10. Botany Bay	☐ 11. Port Hacking	☐ 12. Lake Illawarra	☐ 13. Other River	☐ 14. Open Ocean										
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8. Follow Up (*Thank you for completing this form. DECCW Project Team)																										
May we contact you to clarify your survey response? Yes/No. If yes, the contact person is: _____																										
Contact Number: _____ Preferred contact time: _____																										