
APPENDIX G
EXISTING STORMWATER
POLLUTANT LOAD

Table G.1 Landuse Areas (ha) for The Northern Beaches Subcatchments

Subcatchment	Land Use (ha)						Total
	Industrial/ Commercial	Residential	Open Space	Non urban / Rural	Native Vegetation	State (RTA) Roads	
Narrabeen Lagoon	183	1,259	725	2,048	1,089	64	5,368
	3.4%	23.5%	13.5%	38.2%	20.3%	1.2%	
Dee Why Lagoon	77	431	14	0	39	10	571
	13.5%	75.5%	2.5%	0.0%	6.8%	1.8%	
Curl Curl Lagoon	71	259	59	0	17	5	411
	17.3%	63.0%	14.3%	0.0%	4.1%	1.3%	
Manly Lagoon	234	888	274	0	346	38	1,780
	13.1%	49.9%	15.4%	0.0%	19.4%	2.1%	
North Harbour	7	230	13	0	236	1	487
	1.4%	47.2%	2.7%	0.0%	48.4%	0.3%	
Ocean Beaches	22	416	85	0	124	10	657
	3.3%	63.3%	12.9%	0.0%	18.9%	1.5%	
Totals	594	3,483	1,170	2,048	1,851	128	9,274
<i>Percentages</i>	<i>6.4%</i>	<i>37.6%</i>	<i>12.6%</i>	<i>22.1%</i>	<i>20.0%</i>	<i>1.4%</i>	

Table G.2 Landuse Areas (ha) Adopted for Pollutant Loading Assessment

(Land Uses have been summarised for the Pollutant Load Calculations by being categorised as either Urban, Rural, Forested or State Road for The Northern Beaches Subcatchments)

Subcatchment	Industrial / Commercial	Residential	Rural (Non-Urban & Open Space)	Forested	State (RTA) Roads	Totals
Narrabeen Lagoon	183 3.4%	1,259 23.5%	2,773 51.7%	1,089 20.3%	64 1.2%	5,368
Dee Why Lagoon	77 13.5%	431 75.5%	14 2.5%	39 6.8%	10 1.8%	571
Curl Curl Lagoon	71 17.3%	259 63.0%	59 14.3%	17 4.1%	5 1.3%	411
Manly Lagoon	234 13.1%	888 49.9%	274 15.4%	346 19.4%	38 2.1%	1,780
North Harbour	7 1.4%	230 47.2%	13 2.7%	236 48.4%	1 0.3%	487
Ocean Beaches	22 3.3%	416 63.3%	85 12.9%	124 18.9%	10 1.5%	657
Totals	594	3,483	3,218	1,851	128	9,274
<i>Percentages</i>	6.4%	37.6%	34.7%	20.0%	1.4%	

Table G.3 Derivation of EMCs for Northern Beaches Landuses

Source of Data	Urban Percentage (%)	Rural Percentage (%)	Forested Percentage (%)	FC (cfu/100mL)	SS (mg/L)	TP (mg/L)	TN (mg/L)	O&G ₁ (mg/L)	Pb (mg/L)
Used to Derive Typical Residential EMCs (Typical Local Urban Catchments)									
Greendale Creek, Brookvale	88	6	6	13,000	140	0.33	1.5)	Refer below for adopted EMCs	
Dee Why Creek, Dee Why	84	1	15	16,000	50	0.18	1) =>		
Burnt Bridge Creek, Manly Vale	79	4	17	24,000	60	0.14	2.6)		
Adopted Residential EMCs				<u>17,320</u>	75	0.21	1.6		
Stenstrom et al., 1984								6.23	
Adopted Mean for Pb, considering US EPA ₅ , 1983 & Sydney Water ₃ , 1992									0.06
Adopted Industrial / Commercial EMCs Equivalent to those for Residential areas				17,320	75	0.21	1.6		
Stenstrom et al., 1984 (Mean of Industrial & Commercial)								10.11	
Adopted Twice Mean for Pb for Residential, considering US EPA ₅ , 1983 & Sydney Water ₃ , 1992									0.12
Adopted Typical Rural EMCs									
Foot Onslow Creek, Camden (Typical Regional Rural Catchment)	2	98	0	6,000	200	0.22	0.9		
Stenstrom et al., 1984								0.00	
Sydney Water ₃ , 1992									0.02
Adopted Typical Forested EMCs									
Woronora River, Nth Engadine (Typical Regional Forested Catchment)	2	2	96	1,000	10	0.02	0.4		
Stenstrom et al., 1984								(N/A), adopt 0.00	
Sydney Water ₃ , 1992									0.00
Used for State (RTA) Road Catchment₂ (assume all State (RTA) Roads are greater than 30,000 ADT)	-	-	-	-	142	0.33	1.8	10.00 ₄	0.4*

Note:

Source: Managing Urban Stormwater, EPA, 1997, unless noted otherwise

1: Stenstrom et al., 1984

2: Sieber, 1995; McRobert, 1997

3: Pollutant Loadings Into The Waterways of Sydney and The Illawarra Regions, Preliminary Assessment, Sydney Water, June 1992

4: Adopted Maximum from SPCC, 1989

5: Mean Urban Runoff Concentrations by Landuse, US EPA, 1983

*: Sieber and McRobert seems reasonable, considering median concentration of runoff from urban highways (after Shelley and Gaboury, 1986) = 0.6 mg/L

(N/A): Not Available

17,320 $\frac{cfu}{100mL}$

Table G.4 Adopted EMCs for Northern Beaches Subcatchments

Land Use	FC (cfu/100mL)	SS (mg/L)	TP (mg/L)	TN (mg/L)	O&G ₁ (mg/L)	Pb ₃ (mg/L)
Industrial / Commercial	17,320	75	0.21	1.6	10.11	0.12 ₅
Residential	17,320	75	0.21	1.6	6.23	0.06 ₅
Rural / Open Space	6,000	200	0.22	0.9	0.00	0.02
Forested	1,000	10	0.02	0.4	0.00	0.00
State (RTA) Roads ₂	-	142	0.33	1.8	10.00 ₄	0.4*

Note: For details of sources, Refer Table G.3

Source: Managing Urban Stormwater, EPA, 1997, unless noted otherwise

1: Stenstrom et al., 1984

2: Sieber, 1995; McRobert, 1997

3: Pollutant Loadings Into The Waterways of Sydney and The Illawarra Regions, Preliminary Assessment, Sydney Water, June 1992

4: Adopted Maximum from SPCC, 1989

5: Adopted from "Mean Urban Runoff Concentrations by Landuse", US EPA, 1983

*: Sieber and McRobert seems reasonable, considering median concentration of runoff from urban highways (after Shelley and Gaboury, 1986) = 0.6 mg/L

$$\begin{aligned}
 * \quad & 1.18m \times 10,000m^2 \times 234 = 2,761,200 m^3 \\
 & \text{of water on cat/annum} \\
 & \times 1000 \times 10 = 2.7612 \times 10^9 \text{ L} \\
 & \times 173200 \\
 & = 4.78 \times 10^{14}
 \end{aligned}$$

TABLE G.5 POLLUTANT LOAD ASSESSMENT

ADOPTED AVERAGE ANNUAL RAINFALL						
Adopted Average Annual Rainfall (Sydney)=	1180 (mm)					
ADOPTED RUNOFF COEFFICIENTS						
	Commercial / Industrial	Residential	LAND USE Rural / Open Space	Forested	State (RTA) Roads	Total
Adopted Runoff Coeff (Typical, EPA 1997)	1.00	0.62	0.30	0.14	1.00	
ADOPTED LAND USE AREAS						
	Commercial / Industrial	Residential	LAND USE AREAS Rural / Open Space	Forested	State (RTA) Roads	Total
Catchment						
Narrabeen Lagoon	183	1259	2773	1089	64	5368
Dee Why Lagoon	77	431	14	39	10	571
Curl Curl Lagoon	71	259	59	17	5	411
Manly Lagoon	234	888	274	346	38	1780
North Harbour	7	230	13	236	1	487
Ocean Beaches	22	416	85	124	10	657
Totals	594	3483	3218	1851	128	9274
FAECAL COLIFORMS (FC)						
	Commercial / Industrial	Residential	LAND USE Rural / Open Space	Forested	State (RTA) Roads	Total
EMCs (cfu/100mL)	17,320	17,320	6,000	1,000	0	
Catchment	Faecal Coliforms (cfu/year)					
Narrabeen Lagoon	3.74E+14	1.60E+15	5.89E+14	1.80E+13	0.00E+00	2.58E+15
Dee Why Lagoon	1.57E+14	5.46E+14	2.97E+12	6.44E+11	0.00E+00	7.07E+14
Curl Curl Lagoon	1.45E+14	3.28E+14	1.25E+13	2.81E+11	0.00E+00	4.86E+14
Manly Lagoon	4.78E+14	1.13E+15	5.82E+13	5.72E+12	0.00E+00	1.67E+15
North Harbour	1.43E+13	2.91E+14	2.76E+12	3.90E+12	0.00E+00	3.12E+14
Ocean Beaches	4.50E+13	5.27E+14	1.81E+13	2.05E+12	0.00E+00	5.92E+14
Totals	1.21E+15	4.41E+15	6.84E+14	3.06E+13	0.00E+00	6.34E+15
SUSPENDED SEDIMENT (SS)						
	Commercial / Industrial	Residential	LAND USE Rural / Open Space	Forested	State (RTA) Roads	Total
EMCs (mg/L)	75	75	200	10	142	
Catchment	Suspended Sediment (kg/year)					
Narrabeen Lagoon	161,955	690,813	1,963,284	17,990	107,238	2,941,281
Dee Why Lagoon	68,145	236,490	9,912	644	16,756	331,947
Curl Curl Lagoon	62,835	142,113	41,772	281	8,378	255,379
Manly Lagoon	207,090	487,246	193,992	5,716	63,673	957,716
North Harbour	6,195	126,201	9,204	3,899	1,676	147,174
Ocean Beaches	19,470	228,259	60,180	2,048	16,756	326,714
Totals	525,690	1,911,122	2,278,344	30,579	214,477	4,960,211

17,320 cfu / 100mL

11.80 mm

1180 mm

10,000 m³
41-180

276,200 m³

261,200,000 L

261,200,000 / 100mL

1.2

TOTAL PHOSPHORUS (TP)

	Commercial / Industrial	Residential	LAND USE			State (RTA) Roads	Total
			Rural / Open Space	Forested			
EMCs (mg/L)	0.21	0.21	0.22	0.02	0.33		
Catchment	Total Phosphorus (kg/year)						
Narrabeen Lagoon	453	1,934	2,160	36	249	4,833	
Dee Why Lagoon	191	662	11	1	39	904	
Curl Curl Lagoon	176	398	46	1	19	640	
Manly Lagoon	580	1,364	213	11	148	2,317	
North Harbour	17	353	10	8	4	393	
Ocean Beaches	55	639	66	4	39	803	
Totals	1,472	5,351	2,506	61	498	9,889	

TOTAL NITROGEN (TN)

	Commercial / Industrial	Residential	LAND USE			State (RTA) Roads	Total
			Rural / Open Space	Forested			
EMCs (mg/L)	1.6	1.6	0.9	0.4	1.8		
Catchment	Total Nitrogen (kg/year)						
Narrabeen Lagoon	3,455	14,737	8,835	720	1,359	29,106	
Dee Why Lagoon	1,454	5,045	45	26	212	6,782	
Curl Curl Lagoon	1,340	3,032	188	11	106	4,678	
Manly Lagoon	4,418	10,395	873	229	807	16,721	
North Harbour	132	2,692	41	156	21	3,043	
Ocean Beaches	415	4,870	271	82	212	5,850	
Totals	11,215	40,771	10,253	1,223	2,719	66,180	

OIL AND GREASE (O&G)

	Commercial / Industrial	Residential	LAND USE			State (RTA) Roads	Total
			Rural / Open Space	Forested			
EMCs (mg/L)	10.1	6.2	0.0	0.0	10.0		
Catchment	Oil & Grease (kg/year)						
Narrabeen Lagoon	21,832	57,384	0	0	7,552	86,767	
Dee Why Lagoon	9,186	19,644	0	0	1,180	30,010	
Curl Curl Lagoon	8,470	11,805	0	0	590	20,865	
Manly Lagoon	27,916	40,474	0	0	4,484	72,874	
North Harbour	835	10,483	0	0	118	11,436	
Ocean Beaches	2,625	18,961	0	0	1,180	22,765	
Totals	70,863	158,751	0	0	15,104	244,718	

LEAD (Pb)

	Commercial / Industrial	Residential	LAND USE			State (RTA) Roads	Total
			Rural / Open Space	Forested			
EMCs (mg/L)	0.12	0.06	0.02	0.00	0.40		
Catchment	Lead (kg/year)						
Narrabeen Lagoon	259	553	196	0	302	1,310	
Dee Why Lagoon	109	189	1	0	47	346	
Curl Curl Lagoon	101	114	4	0	24	242	
Manly Lagoon	331	390	19	0	179	920	
North Harbour	10	101	1	0	5	117	
Ocean Beaches	31	183	6	0	47	267	
Totals	841	1,529	228	0	604	3,202	