

## Appendix G      Concentrations of chlorophenols in New Zealand air

This appendix reports the concentrations of chlorophenols in air samples collected as part of the Organochlorines Programme. Results from field quality control samples are also provided.

Chlorophenol data are reported in the following tables:

Table G1	Concentrations in Baring Head air
Table G2	Concentrations in Nelson Lakes National Park air
Table G3	Concentrations in Te Wera air
Table G4	Concentrations in Culverden air
Table G5	Concentrations in Hamilton air
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Table G7	Concentrations in Greymouth air
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**Table G1 Concentrations of chlorophenols in Baring Head air (pg m<sup>-3</sup>)**

Chlorophenol	AR-06-1 (03/05/96 to 23/05/96)	AR-06-2 (09/07/96 to 29/07/96)	AR-06-3 (18/09/96 to 11/10/96)	AR-06-4 (27/11/96 to 17/12/96)	AR-06-5 (04/02/97 to 06/03/97)	AR-06-6 (06/05/97 to 27/05/97)	Number of positives	Minimum	Maximum <sup>1</sup>	Median <sup>2</sup>	Mean <sup>3</sup>	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=6)
2,4,6 Trichlorophenol	8.16	8.96	16.1	10.1	14.8	7.04	6	7.04	16.1	9.53	10.9	61
2,3,5 Trichlorophenol	< 0.4	< 0.4	0.37	< 0.4	< 0.4	< 0.1	1	< 0.1	0.37	< 0.4	-	
2,4,5 Trichlorophenol	4.32	1.13	4.16	2.41	3.14	3.75	6	1.13	4.32	3.45	3.15	76
2,3,4 Trichlorophenol	< 0.2	< 0.2	< 0.2	< 0.2	< 0.1	< 0.1	0	< 0.1	< 0.2	< 0.2	-	
2,3,5,6 Tetrachlorophenol	< 0.2	< 0.2	< 0.1	< 0.1	< 0.1	< 0.2	0	< 0.1	< 0.2	< 0.2	-	
2,3,4,6 Tetrachlorophenol	< 2	< 2	< 1	< 2	< 1	5.76	1	< 1	5.76	< 2	-	
2,3,4,5 Tetrachlorophenol	< 0.5	< 0.3	< 0.2	< 0.2	< 0.1	< 0.1	0	< 0.1	< 0.5	< 0.2	-	85
Pentachlorophenol	< 6	< 5	< 5	7.67	3.78	69.8	3	< 5	69.8	3.39	-	68

1 = Excludes any LOD value which is greater than a maximum measured value.

2 = For any individual chlorophenol, when calculating the median involved averaging an LOD value and a measured value, half the LOD value was taken.

3 = Mean value reported only if a chlorophenol detected on more than 66% of occasions (minimum of 4 positive determinations).

**Table G2 Concentrations of chlorophenols in Nelson Lakes National Park air ( $\mu\text{g m}^{-3}$ )**

Chlorophenol	AR-07-1 (22/03/96 to 11/04/96)	AR-07-2 (24/05/96 to 13/06/96)	AR-07-3 (09/10/96 to 29/10/96)	AR-07-5 (03/01/97 to 23/01/97)	Number of positives	Minimum	Maximum <sup>1</sup>	Median <sup>2</sup>	Mean <sup>3</sup>	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=4)
2,4,6 Trichlorophenol	42.6	17.7	30.1	43.3	4	17.7	43.3	36.4	33.4	37
2,3,5 Trichlorophenol	0.37	< 0.2	0.56	< 0.5	2	< 0.2	0.56	0.31	-	
2,4,5 Trichlorophenol	2.26	1.03	2.57	2.98	4	1.03	2.98	2.42	2.21	72
2,3,4 Trichlorophenol	< 0.05	< 0.1	< 0.2	< 0.2	0	< 0.05	< 0.2	< 0.2	-	
2,3,5,6 Tetrachlorophenol	< 0.05	< 0.05	0.41	< 0.2	1	< 0.05	0.41	< 0.1	-	
2,3,4,6 Tetrachlorophenol	< 0.8	< 0.6	< 2	1.92	1	< 0.6	1.92	< 1	-	
2,3,4,5 Tetrachlorophenol	< 0.2	< 0.1	0.37	< 0.3	1	< 0.1	0.37	< 0.3	-	82
Pentachlorophenol	< 4	< 3	< 4	10.3	1	< 3	10.3	< 4	-	48

1 = Excludes any LOD value which is greater than a maximum measured value.

2 = For any individual chlorophenol, when calculating the median involved averaging an LOD value and a measured value, half the LOD value was taken.

3 = Mean value reported only if a chlorophenol detected on more than 66% of occasions (minimum of 3 positive determinations).

**Table G3 Concentrations of chlorophenols in Te Wera air (pg m<sup>-3</sup>)**

Chlorophenol	AR-04-1 (26/04/96 to 16/05/96)	AR-04-2 (26/06/96 to 15/07/96)	AR-04-3 (16/08/96 to 06/09/96)	AR-04-5 (20/02/97 to 13/03/97)	AR-04-6 (25/03/97 to 09/04/97)	Number of positives	Minimum	Maximum <sup>1</sup>	Median	Mean <sup>2</sup>	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=5)
2,4,6 Trichlorophenol	78.7	67.2	57.1	62.8	67.0	5	57.1	78.7	67.0	66.6	57
2,3,5 Trichlorophenol	1.43	0.47	0.53	0.84	1.06	5	0.47	1.43	0.84	0.87	
2,4,5 Trichlorophenol	3.47	1.99	2.57	5.95	6.52	5	1.99	6.52	3.47	4.10	87
2,3,4 Trichlorophenol	0.46	< 0.5	< 0.2	< 0.5	< 0.5	1	< 0.2	0.46	< 0.5	-	
2,3,5,6 Tetrachlorophenol	1.76	< 0.1	< 0.1	< 0.3	< 0.8	1	< 0.1	1.76	< 0.3	-	
2,3,4,6 Tetrachlorophenol	4.02	< 2	< 0.8	6.53	6.66	3	< 0.8	6.66	4.02	-	
2,3,4,5 Tetrachlorophenol	2.01	< 0.3	< 0.2	1.27	0.85	3	< 0.2	2.01	0.85	-	92
Pentachlorophenol	32.5	< 3	< 3	21.9	22.2	3	< 3	32.5	21.9	-	77

1 = Excludes any LOD value which is greater than a maximum measured value.

2 = Mean value reported only if a chlorophenol detected on more than 66% of occasions (minimum of 4 positive determinations).

**Table G4 Concentrations of chlorophenols in Culverden air (pg m<sup>-3</sup>)**

Chlorophenol	AR-10-1 (15/03/96 to 04/04/96)	AR-10-2 (20/05/96 to 10/06/96)	AR-10-3 (18/07/96 to 09/08/96)	AR-10-4 (12/09/96 to 02/10/96)	AR-10-5 (18/12/96 to 07/01/97)	AR-10-6 (13/02/97 to 05/03/97)	Number of positives	Minimum	Maximum	Median	Mean <sup>1,2</sup>	Mean of <sup>13</sup> C surrogate standard recoveries < %, (n=6)
2,4,6 Trichlorophenol	nd	nd	nd	26.7	44.0	21.4	3	21.4	44.0	26.7	30.7	44
2,3,5 Trichlorophenol	0.78	1.08	2.19	1.57	1.04	0.82	6	0.78	2.19	1.06	1.25	
2,4,5 Trichlorophenol	5.19	3.16	3.23	5.63	4.05	5.16	6	3.16	5.63	4.61	4.40	69
2,3,4 Trichlorophenol	< 0.5	< 0.2	< 0.2	< 0.4	< 0.5	< 0.4	0	< 0.2	< 0.5	< 0.4	-	
2,3,5,6 Tetrachlorophenol	< 0.2	0.43	0.46	0.77	0.80	0.39	5	< 0.2	0.80	0.45	0.48	
2,3,4,6 Tetrachlorophenol	2.94	2.73	< 0.5	8.97	17.5	10.8	5	< 0.5	17.5	5.96	7.16	
2,3,4,5 Tetrachlorophenol	< 0.8	0.84	1.11	1.42	2.58	1.66	5	< 0.8	2.58	1.27	1.27	77
Pentachlorophenol	29.2	14.0	15.7	39.4	123	48.1	6	14.0	123	34.3	44.9	54

1 = Mean value reported only if a chlorophenol detected on more than 66% of occasions (minimum of 4 positive determinations).

2 = For any individual chlorophenol, calculation of the mean excludes LOD values.

nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).

**Table G5 Concentrations of chlorophenols in Hamilton air (pg m<sup>-3</sup>)**

Chlorophenol	AR-03-2/AR-03-2 CS (n=2) <sup>1</sup> (31/05/96 to 20/06/96)	AR-03-3 (19/07/96 to 08/08/96)	AR-03-4/AR-03-4 CS (n=2) <sup>1</sup> (17/09/96 to 10/10/96)	AR-03-5 (15/11/96 to 05/12/96)	AR-03-6 (20/01/97 to 10/02/97)	AR-03-7 (14/03/97 to 03/04/97)	Number of positives	Minimum	Maximum	Median	Mean <sup>2</sup>	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=6)
2,4,6 Trichlorophenol	143	88.1	nd	107	115	259	5	88.1	259	115	142	35
2,3,5 Trichlorophenol	23.8	3.59	2.20	2.09	2.61	3.63	6	2.09	23.8	3.10	6.32	
2,4,5 Trichlorophenol	14.8	5.43	6.93	8.28	9.75	8.35	6	5.43	14.8	8.32	8.92	68
2,3,4 Trichlorophenol	3.18	0.95	0.68	1.46	0.64	0.69	6	0.64	3.18	0.82	1.27	
2,3,5,6 Tetrachlorophenol	31.7	2.39	< 1	4.00	2.01	4.23	5	< 1	31.7	3.20	7.39	
2,3,4,6 Tetrachlorophenol	22.4	9.19	7.62	927	37.4	27.2	6	7.62	927	24.8	172	
2,3,4,5 Tetrachlorophenol	16.0	2.87	2.48	13.9	4.69	2.54	6	2.48	16.0	3.78	7.08	72
Pentachlorophenol	126	27.8	62.6	327	98.2	71.7	6	27.8	327	85.0	119	57

1 = Mean of collocated samples.

2 = For any individual chlorophenol, calculation of the mean excludes LOD values.

nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).

**Table G6 Concentrations of chlorophenols in Masterton air (pg m<sup>-3</sup>)**

Chlorophenol	AR-05-1 (21/03/96 to 11/04/96)	AR-05-3 (13/08/96 to 02/09/96)	AR-05-4 (11/10/96 to 21/11/96)	AR-05-5 (23/12/96 to 22/01/97)	AR-05-6 (14/03/97 to 15/04/97)	Number of positives	Minimum	Maximum	Median	Mean	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=5)
2,4,6 Trichlorophenol	nd	61.2	60.3	67.9	72.3	4	60.3	72.3	64.6	65.4	44
2,3,5 Trichlorophenol	4.95	6.12	3.04	2.05	3.71	5	2.05	6.12	3.71	3.97	
2,4,5 Trichlorophenol	22.9	16.2	17.5	297	20.1	5	16.2	297	20.1	74.7	92
2,3,4 Trichlorophenol	1.07	3.04	1.30	0.71	1.33	5	0.71	3.04	1.30	1.49	
2,3,5,6 Tetrachlorophenol	2.87	7.05	6.60	2.94	3.24	5	2.87	7.05	3.24	4.54	
2,3,4,6 Tetrachlorophenol	13.2	24.0	36.3	49.2	19.5	5	13.2	49.2	24.0	28.4	
2,3,4,5 Tetrachlorophenol	3.10	4.32	2.95	2.09	2.46	5	2.09	4.32	2.95	2.98	57
Pentachlorophenol	nd	76.7	69.4	70.1	55.6	4	55.6	76.7	69.8	68.0	77

nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).

**Table G7 Concentrations of chlorophenols in Greymouth air (pg m<sup>-3</sup>)**

Chlorophenol	AR-08-1 (21/06/96 to 12/07/96)	AR-08-2 (15/07/96 to 05/08/96)	AR-08-3 (12/08/96 to 02/09/96)	AR-08-4 (04/02/97 to 28/02/97)	AR-08-5 (04/03/97 to 24/03/97)	Number of positives	Minimum	Maximum	Median	Mean	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=5)
2,4,6 Trichlorophenol	127	135	148	149	90.0	5	90.0	149	135	130	53
2,3,5 Trichlorophenol	7.45	19.4	62.3	3.62	2.51	5	2.51	62.3	7.45	19.1	
2,4,5 Trichlorophenol	18.9	22.7	25.4	24.2	15.5	5	15.5	25.4	22.7	21.3	76
2,3,4 Trichlorophenol	2.37	3.08	5.25	2.10	1.38	5	1.38	5.25	2.37	2.84	
2,3,5,6 Tetrachlorophenol	461	359	380	248	175	5	175	461	359	325	
2,3,4,6 Tetrachlorophenol	1370	1150	1100	996	921	5	921	1370	1100	1110	
2,3,4,5 Tetrachlorophenol	66.8	71.4	110	73.8	43.6	5	43.6	110	71.4	73.1	81
Pentachlorophenol	4250	4700	4700	7240	3180	5	3180	7240	4700	4810	78

**Table G8 Concentrations of chlorophenols in Christchurch air (pg m<sup>-3</sup>)**

Chlorophenol	AR-09-1 (19/06/96 to 09/07/96)	AR-09-2 (14/08/96 to 04/09/96)	AR-09-3 (09/10/96 to 01/11/96)	AR-09-4 (13/11/96 to 04/12/96)	AR-09-5 (22/01/97 to 12/02/97)	AR-09-6 (10/03/97 to 25/03/97)	Number of positives	Minimum	Maximum	Median	Mean	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=6)
2,4,6 Trichlorophenol	59.1	67.1	36.8	37.0	47.5	nd	5	36.8	67.1	47.5	49.5	44
2,3,5 Trichlorophenol	12.0	9.39	2.70	1.23	1.97	3.19	6	1.23	12.0	2.95	5.08	
2,4,5 Trichlorophenol	7.95	14.8	6.94	5.01	7.34	5.86	6	5.01	14.8	7.14	7.98	111
2,3,4 Trichlorophenol	3.11	3.32	0.73	0.59	0.55	0.97	6	0.55	3.32	0.85	1.55	
2,3,5,6 Tetrachlorophenol	22.1	12.9	8.68	4.66	4.57	5.06	6	4.57	22.1	6.87	9.66	
2,3,4,6 Tetrachlorophenol	29.8	30.5	41.0	54.5	55.0	16.7	6	16.7	55.0	35.8	37.9	
2,3,4,5 Tetrachlorophenol	13.5	6.21	3.27	2.54	2.47	3.45	6	2.47	13.5	3.36	5.24	69
Pentachlorophenol	190	108	67.0	85.2	80.5	101	6	67.0	190	93.1	105	82

nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).

**Table G9 Concentrations of chlorophenols in Auckland City air (pg m<sup>-3</sup>)**

Chlorophenol	AR-01-2 (17/07/96 to 06/08/96)	AR-01-3 (11/11/96 to 02/12/96)	AR-01-4 (07/01/97 to 28/01/97)	AR-01-5 (06/03/97 to 26/03/97)	Number of positives	Minimum	Maximum	Median	Mean	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=4)
2,4,6 Trichlorophenol	186	79.5	150	nd	3	79.5	186	150	139	34
2,3,5 Trichlorophenol	3.85	1.90	3.67	1.93	4	1.90	3.85	2.80	2.84	
2,4,5 Trichlorophenol	10.4	10.0	13.7	10.3	4	10.0	13.7	10.4	11.1	128
2,3,4 Trichlorophenol	1.15	0.62	1.39	0.54	4	0.54	1.39	0.89	0.93	
2,3,5,6 Tetrachlorophenol	3.73	8.49	16.6	3.64	4	3.64	16.6	6.11	8.12	
2,3,4,6 Tetrachlorophenol	30.8	98.9	215	39.9	4	30.8	215	69.4	96.2	
2,3,4,5 Tetrachlorophenol	5.54	4.78	28.7	5.36	4	4.78	28.7	5.45	11.1	79
Pentachlorophenol	274	293	1240	347	4	274	1240	320	539	90

nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).

**Table G10 Concentrations of chlorophenols in Auckland South air (pg m<sup>-3</sup>)**

Chlorophenol	AR-02-1 (15/03/96 to 04/04/96)	AR-02-2/AR-02-2 CS (n=2) <sup>1</sup> (26/06/96 to 16/07/96)	AR-02-3 (12/08/96 to 03/09/96)	AR-02-4/AR-02-4 CS (n=2) <sup>1</sup> (16/10/96 to 05/11/96)	AR-02-5/AR-02-5 CS (n=2) <sup>1</sup> (06/12/96 to 26/12/96)	Number of positives	Minimum	Maximum	Median	Mean	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=5)
2,4,6 Trichlorophenol	nd	652	202	186	nd	3	186	652	202	347	35
2,3,5 Trichlorophenol	18.3	10.8	6.86	2.92	2.25	5	2.25	18.3	6.86	8.23	
2,4,5 Trichlorophenol	45.7	12.1	8.36	10.3	9.01	5	8.36	45.7	10.3	17.1	70
2,3,4 Trichlorophenol	17.8	3.63	1.98	1.79	1.46	5	1.46	17.8	1.98	5.33	
2,3,5,6 Tetrachlorophenol	12.5	18.0	5.82	9.54	4.59	5	4.59	18.0	9.54	10.1	
2,3,4,6 Tetrachlorophenol	82.6	74.4	27.3	81.4	30.2	5	27.3	82.6	74.4	59.2	
2,3,4,5 Tetrachlorophenol	14.7	18.9	8.92	6.83	4.34	5	4.34	18.9	8.92	10.7	53
Pentachlorophenol	251	890	559	336	179	5	179	890	336	443	65

1 = Mean of collocated samples.

nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).

**Table G11 Comparative chlorophenol concentrations in primary and collocated samples (pg m<sup>-3</sup>)**

Chlorophenol	Hamilton; AR-03-2 (31/05/96 to 20/06/96)			Hamilton; AR-03-4 (17/09/96 to 10/10/96)			Auckland South; AR-02-2 (26/06/96 to 16/07/96)			Auckland South; AR-02-4 (16/10/96 to 05/11/96)			Auckland South; AR-02-5 (06/12/96 to 26/12/96)		
	Primary	Collocated	%D <sup>1</sup>	Primary	Collocated	%D	Primary	Collocated	%D	Primary	Collocated	%D	Primary	Collocated	%D
2,4,6 Trichlorophenol	159	126	23.2	160	nd	-	224	1080	131	92.4	280	101	nd	nd	-
2,3,5 Trichlorophenol	26.0	21.5	18.9	1.99	2.40	18.7	10.9	10.6	2.8	2.83	3.01	6.2	2.15	2.34	8.5
2,4,5 Trichlorophenol	16.2	13.4	18.9	6.66	7.19	7.7	10.5	13.7	26.4	9.75	10.9	11.1	8.02	10.0	22.0
2,3,4 Trichlorophenol	3.56	2.79	24.3	0.66	0.70	5.9	3.26	4.00	20.4	1.57	2.00	24.1	1.15	1.77	42.5
2,3,5,6 Tetrachlorophenol	33.0	30.3	8.5	< 1	< 1	-	18.0	18.0	0	9.48	9.60	1.3	4.09	5.09	21.8
2,3,4,6 Tetrachlorophenol	23.4	21.3	9.4	8.43	6.81	21.3	69.6	79.1	12.8	85.8	76.9	10.9	19.0	41.4	74.2
2,3,4,5 Tetrachlorophenol	16.7	15.2	9.4	1.43	3.53	84.7	18.2	19.5	6.9	5.78	7.88	30.7	3.94	4.74	18.4
Pentachlorophenol	127	124	2.4	39.5	85.7	73.8	919	861	6.5	385	287	29.2	190	167	12.9

1 = % Difference as calculated from Equation 1 (refer Section 5.6.1).

nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).

**Table G12 Concentrations of chlorophenols in field and equipment rinsate blanks (pg m<sup>-3</sup>)<sup>1</sup>**

Chlorophenol	Field blank; AR-07-3 FB (Nelson Lakes National Park: Reference)	Field blank; AR-04-1 FB (Te Wera: Rural)	Field blank; AR-03-2 FB (Hamilton: Urban)	Field blank; AR-05-3 FB (Masterton: Urban)	Field blank; AR-09-2 FB (Christchurch: Urban)	Field blank; AR-02-1 FB (Auckland South: Industrial)	Equipment rinsate blank; AR-10-5 RB (Culverden: Rural)	Equipment rinsate blank; AR-01-1 RB (Auckland City: Urban)	Equipment rinsate blank; AR-01-2 RB (Auckland City: Urban)	Mean of <sup>13</sup> C surrogate standard recoveries, %, (n=9)
2,4,6 Trichlorophenol	< 0.5	nd	< 1	< 2	< 1	< 0.5	< 0.05	< 0.3	< 0.2	71
2,3,5 Trichlorophenol	< 0.01	< 0.03	< 0.02	< 0.06	< 0.04	< 0.05	< 0.05	< 0.04	< 0.03	
2,4,5 Trichlorophenol	< 0.7	< 0.3	< 0.2	< 0.8	< 0.8	< 0.2	< 0.08	< 0.2	< 0.3	80
2,3,4 Trichlorophenol	< 0.01	< 0.03	< 0.02	< 0.05	< 0.04	< 0.05	< 0.05	< 0.04	< 0.03	
2,3,5,6 Tetrachlorophenol	< 0.02	< 0.06	< 0.02	< 0.04	< 0.06	< 0.04	< 0.05	< 0.05	< 0.1	
2,3,4,6 Tetrachlorophenol	< 0.3	< 0.2	< 0.2	< 0.8	< 0.6	< 0.5	< 0.08	< 0.2	< 0.8	
2,3,4,5 Tetrachlorophenol	< 0.02	nd	< 0.04	< 0.04	< 0.06	< 0.04	< 0.05	< 0.05	< 0.1	66
Pentachlorophenol	< 2	< 1	< 2	< 2	< 2	< 2	< 0.5	< 2	13.0	63

1 = Results reported using the volume of the associated primary air sample collected.  
nd = not determined (<sup>13</sup>C recovery outside acceptance criteria).