


Richmond 1 – Castelnau 2010 results of the roadside co-location study

### Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{g}\text{m}^{-3}$	Tube 2 $\mu\text{g}\text{m}^{-3}$	Tube 3 $\mu\text{g}\text{m}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	29/12/2009	02/02/2010	52	54	49	52	2.5	5	6.2	52	79	Good	Good
2	02/02/2010	02/03/2010	48	52	48	49	2.1	4	5.3	49	100	Good	Good
3	02/03/2010	3/03/2010	42	40	37	40	2.7	7	6.8	42	100	Good	Good
4	3/03/2010	28/04/2010	34	34	39	36	3.0	8	7.4	40	99	Good	Good
5	28/04/2010	01/06/2010	35	38	40	38	3.0	8	7.3	34	100	Good	Good
6	01/06/2010	01/07/2010	41	37	40	39	2.2	6	5.5	33	100	Good	Good
7	01/07/2010	03/08/2010	28	29	27	28	0.9	3	2.3	38	100	Good	Good
8	03/08/2010	31/08/2010	26	26	28	27	1.2	5	3.1	22	100	Good	Good
9	31/08/2010	29/09/2010	40	38	37	38	1.4	4	3.6	37	100	Good	Good
10	29/09/2010	02/11/2010	47	40	40	43	3.6	9	9.0	41	100	Good	Good
11	02/11/2010	29/11/2010	34	34	34	34	0.2	1	0.5	51	100	Good	Good
12	30/11/2010	29/12/2010	40	41	40	40	0.1	0	0.2	54	100	Good	Good
13													

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

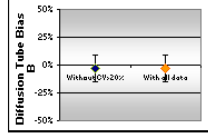
**Site Name/ID:** 23 - Castelnau Library

**Accuracy (with 95% confidence interval) without periods with CV larger than 20%**  
**Bias calculated using 12 periods of data**  
 Bias factor A: 1.06 (0.94 - 1.21)  
 Bias B: 6% (-17% - 6%)  
 Diffusion Tubes Mean: 39  $\mu\text{g}\text{m}^{-3}$   
 Mean CV (Precision): 5  
 Automatic Mean: 41  $\mu\text{g}\text{m}^{-3}$   
 Data Capture for periods used: 98%  
 Adjusted Tubes Mean: 41 (36 - 47)  $\mu\text{g}\text{m}^{-3}$

**Precision:** 12 out of 12 periods have a CV smaller than 20%

**Accuracy (with 95% confidence interval) WITH ALL DATA**  
**Bias calculated using 12 periods of data**  
 Bias factor A: 1.06 (0.94 - 1.21)  
 Bias B: 6% (-17% - 6%)  
 Diffusion Tubes Mean: 39  $\mu\text{g}\text{m}^{-3}$   
 Mean CV (Precision): 5  
 Automatic Mean: 41  $\mu\text{g}\text{m}^{-3}$   
 Data Capture for periods used: 98%  
 Adjusted Tubes Mean: 41 (36 - 47)  $\mu\text{g}\text{m}^{-3}$


**Overall survey -->** Good precision, Good Overall DC  
(Check average CV & DC from Accuracy calculations)



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Richmond 1 – Castelnau 2010 raw and bias adjusted NO2 diffusion tube results for kerbside and roadside sites 1-23.

### Adjustment of SINGLE Tubes



Site Name/ID	Diffusion Tube Measurements													Raw Mean	Valid periods	Adjusted measurement (95% confidence interval) with all the data 12 periods used in this calculations Bias Factor A: 1.06 (0.94 - 1.21) Bias B: -6% (-17% - 6%) Tube Precision: 5, Automatic DC: 98%
	1	2	3	4	5	6	7	8	9	10	11	12	13			
1	64	54	56	46	43	45	45	40	52	47	28	55		48.0	12	51 (45 - 58)
2	48	46	36	29	32	32	22	26	33	35	43	65		37.2	12	39 (35 - 45)
3.00	54	47	42	38	35	35	33	30	43	42	50	52		41.7	12	44 (39 - 50)
4.00	2	53		41	43	45	33	31	36	47	49	61		40.0	11	42 (38 - 48)
5.00	46	41	30	30	29	33	28	24	35	36	47	53		26.0	12	38 (34 - 44)
6.00	56	53	39	35	45	43	37	35	44	76	24	58		45.3	12	48 (43 - 55)
7.00	72	68	68	77	78	61	54	45	53	64	68	72		64.9	12	69 (61 - 79)
8.00	40	47		29	35	29	28	25	36	41	39	53		36.6	11	39 (34 - 44)
9.00	62	60	58	46	50	50	44	41	41	58	56	59		52.1	12	55 (49 - 63)
10.00	58	50	40	39	46	40	34	30	46	46	52	56		44.7	12	47 (42 - 54)
11.00	58	55	44	43	41	43	40	38	50	52	61	61		48.8	12	52 (46 - 59)
12.00	65	56	49	46	41	44	39	38	49	48	58	58		49.3	12	52 (46 - 60)
13.00	59	65	55	50	47	43	36	32	46	50	59	56		49.8	12	53 (47 - 60)
14.00	59	74	53	49	50	47	41	33	47	24	53	57		48.8	12	52 (46 - 59)
15.00	62	66	40	50	47	48	41	35	48	46	59	55		49.9	12	53 (47 - 60)
16.00	54	59	40	45	39	37	35	34	45	42	52	62		45.6	12	48 (43 - 55)
17.00	96	80	57	71	82	83	80	72	42	79	78	76		74.8	12	79 (70 - 91)
18.00	72	70	61	65	65	71	49	50	66	72	73	76		65.8	12	70 (62 - 80)
19.00	79	74	62	50	51	49	49	46	52	182	72	67		69.4	12	74 (65 - 84)
20.00	59	56	45	45	40	49	44	41	56	55	53	66		50.8	12	54 (48 - 62)
21.00	55	50	43	40	38	41	33	30	43	44	52	62		44.2	12	47 (42 - 54)
22.00	59	54	60	50	47	48	44	41	52	52	59	56		51.9	12	55 (49 - 63)
23.00	52	49	42	34	35	41	28	26	40	42	46	52		40.4	12	43 (38 - 49)
23/2	54	52	40	34	38	37	29	26	38	40	45	51		40.5	12	43 (38 - 49)
23/3	49	48	37	39	40	40	27	28	37	45	47	46		40.3	12	43 (38 - 49)

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

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Diffusion Tube Measurements														Raw Mean	Valid periods
Site Name/ID	1	2	3	4	5	6	7	8	9	10	11	12	13		
24	50	52	31	33	35	37	29	27	39	42	49	54		39.8	12
25	57	53		39	44	46	32	27	43	22	53	54		42.8	11
26	61	56	48	38	35	36	23	33	44	44	51	56		43.7	12
27	56	54	39	40	37	40	33	29	40	43	45	47		41.9	12
28	41	28	18	18	17	18	13	13	19	22	29	36		22.5	12
29	53		39	36	42	41	32	28	41	44	47	35		39.7	11
30	60	43	36	35	34	38	25	25	37	43	48	54		40.4	12
31	64	61	43	55	54	46	51	45	66	49	61	65		55.6	12
32	103	108	85	106	117	98	89	75	96	91	101	82		96.6	12
34	72	64	62	59	64	63	45	51	54	64	74	49		60.0	12
35	48	47	38	36	31	36	29	30	38	41	49	59		40.1	12
33	53	54	50	51	46	46	52	45	52	50	55	80		52.9	12
36	70	70	56	54	61	60	41	38	57	45	61	67		56.8	12
37	40	35	27	22	18	23		14	24	25	35	39		27.7	11
3712	40	35	23	25	20	21	16	14	24	29	33	40		26.6	12
3713	44	32	21	22	20	23	16	15	26	27	30	39		26.3	12
38	50	43	37	31	32	33	33	28	32	39	45	49		37.8	12
39	83	77	65	62	76	76	70	57	70	60	59	38		66.0	12
40	54	43	43	28	34	31	16			37	4	57		34.8	10
41	49	46	36	43	37	38	34	32	38	40	52	48		46.2	12
42	73	77	55	80	70	76	43	43	58	56	75	71		64.8	12
43	105	89	81	95	92	89	109	87			91	95		92.4	10
44	50	46	32	44	43	46	40	37	47	47	53	63		45.8	12
45	58	56	46	42	45	45	33	30	39	45	51	56		45.5	12
46	52	58	39	44	41	41	32	24	40	44	56	66		44.8	12

*The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.*

**Adjusted measurement (95% confidence interval) with all the data**  
**12 periods used in this calculations**  
 Bias Factor A 1.07 (0.95 - 1.22)  
 Bias B -7% (-18% - 5%)  
 Tube Precision: 6 Automatic DC: 38%  
 Adjusted with 95% CI 43 (38 - 49)  
 Adjusted with 95% CI 46 (41 - 52)  
 Adjusted with 95% CI 47 (41 - 53)  
 Adjusted with 95% CI 45 (40 - 51)  
 Adjusted with 95% CI 24 (21 - 28)  
 Adjusted with 95% CI 42 (38 - 48)  
 Adjusted with 95% CI 43 (38 - 49)  
 Adjusted with 95% CI 59 (53 - 68)  
 Adjusted with 95% CI 103 (92 - 118)  
 Adjusted with 95% CI 64 (57 - 73)  
 Adjusted with 95% CI 43 (38 - 49)  
 Adjusted with 95% CI 57 (50 - 65)  
 Adjusted with 95% CI 61 (54 - 69)  
 Adjusted with 95% CI 30 (26 - 34)  
 Adjusted with 95% CI 29 (25 - 33)  
 Adjusted with 95% CI 28 (25 - 32)  
 Adjusted with 95% CI 40 (36 - 46)  
 Adjusted with 95% CI 71 (63 - 81)  
 Adjusted with 95% CI 37 (33 - 43)  
 Adjusted with 95% CI 49 (44 - 56)  
 Adjusted with 95% CI 69 (62 - 79)  
 Adjusted with 95% CI 99 (88 - 113)  
 Adjusted with 95% CI 49 (44 - 56)  
 Adjusted with 95% CI 49 (43 - 56)  
 Adjusted with 95% CI 48 (43 - 55)

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Diffusion Tube Measurements														Raw Mean	Valid periods
Site Name/ID	1	2	3	4	5	6	7	8	9	10	11	12	13		
47	64	59	41	39	39	42	37	39	43	43	61	59		46.4	12
48	62	57	52	46	49	49	44	42	49	50	53	60		50.8	12
49	68	52	41	45	44	46	32	31	47	45	53	60		47.0	12
50	72	59	62	52	55	60	51	48	60	62	76	63		60.0	12
51	49	53	34	33	33	31	23	24	33	37	43	52		37.1	12
52	73	69	58	59	70	81	59	54	66	74	75	65		66.7	12
53	53	57	59	52	49	49	46	43	58	51	51	54		52.0	12
5312	60	64	45	51	56	46	44	43	49	56	53	53		51.9	12
5313	59	59	52	49	51	56	46	39	55	50	53	54		51.6	12
54	64	63	60	64	54	62	42	38	51	52	65	61		56.6	12
55	61	58	59	61	49	59	43	46	54	76	36	77		60.0	12
56	49	33	41	39	36	32	33	39	42	56	58			42.2	11
57	81	32	34	31	36	35	34	37	44	57				39.2	10
RUT1	60	55	53	51	53	53	53	52	60	185	69	48		65.9	12
RUT2	120	109	109	102	106	119	107	107	115		111	98		109.3	11
RUT3	43	30	27	27	25	24	19	20	26	28	42	44		28.9	11
RUT4	36	36	22	23	23	21	20	20	26	31	35	40		27.1	11

*The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.*

**Adjusted measurement (95% confidence interval) with all the data**  
**12 periods used in this calculations**  
 Bias Factor A 1.07 (0.95 - 1.22)  
 Bias B -7% (-18% - 5%)  
 Tube Precision: 6 Automatic DC: 38%  
 Adjusted with 95% CI 50 (44 - 57)  
 Adjusted with 95% CI 54 (48 - 62)  
 Adjusted with 95% CI 50 (45 - 57)  
 Adjusted with 95% CI 64 (57 - 73)  
 Adjusted with 95% CI 40 (35 - 45)  
 Adjusted with 95% CI 71 (63 - 81)  
 Adjusted with 95% CI 56 (49 - 63)  
 Adjusted with 95% CI 56 (49 - 63)  
 Adjusted with 95% CI 55 (49 - 63)  
 Adjusted with 95% CI 61 (54 - 69)  
 Adjusted with 95% CI 64 (57 - 73)  
 Adjusted with 95% CI 45 (40 - 51)  
 Adjusted with 95% CI 42 (37 - 48)  
 Adjusted with 95% CI 71 (63 - 80)  
 Adjusted with 95% CI 117 (104 - 133)  
 Adjusted with 95% CI 31 (27 - 35)  
 Adjusted with 95% CI 29 (26 - 33)