



## APPENDIX AVAILABLE ON REQUEST

### Research Report 155

### The Impact of the Congestion Charging Scheme on Air Quality in London

### Part 1. Emissions Modeling and Analysis of Air Pollution Measurements

Frank Kelly et al.

### Appendix J. Descriptive Statistics for All Monitoring Stations Used in the Time-Series Study: Weekend (Congestion Charging Hours) Background Monitoring Stations Only

Note: Appendices Available on the Web may appear in a different order than in the original Investigators' Report, and some remnants of their original names may appear in Table and Figure numbers. HEI has not changed the content of these documents, only the letter identifier.

Appendix J was originally Appendix F3.

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## **APPENDIX J**

### **Descriptive Statistics for All Monitoring Stations Used in the Time-Series Study**

#### **Weekend (Congestion Charging Hours) Background Monitoring Stations Only**

Table J.1. Summary statistics for daily concentrations (ppb) of oxides of nitrogen during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 13<sup>th</sup> February 2005 (shaded rows indicate those outer-London stations used in the analysis).

1. Background

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BN2	Barnet 2 - Finchley	5.2	10.4	16.5	27.0	303.6	372	46	11.0
BN3	Barnet 3 - Strawberry Vale	8.9	17.3	23.1	33.8	139.9	121	297	71.1
EA1	Ealing 1 - Ealing Town Hall	4.9	13.4	20.8	36.3	261.3	396	22	5.3
EA7	Ealing 7 - Southall	7.1	14.5	19.3	31.5	234.5	40	378	90.4
EN3	Enfield 3 - Salisbury Sch Ponders End	4.2	9.8	15.0	26.8	255.1	417	1	0.2
GN2	Greenwich 12 - Millennium Village	5.3	14.2	29.3	43.0	146.2	57	361	86.4
HF2	H'smith and Fulham 2 - Brook Green	7.7	14.4	20.3	31.4	172.6	133	285	68.2
HK4	Hackney 4 - Clapton	6.8	23.2	34.2	53.0	333.9	393	25	6.0
HR1	Harrow 1 - Stanmore Background	2.7	7.7	12.3	20.7	156.7	407	11	2.6
LB3	Lambeth 3 - Loughborough Junct	5.6	14.0	20.5	32.2	121.5	306	112	26.8
LH0	Harlington - AURN	6.6	17.5	23.3	33.3	302.5	118	300	71.8
LH2	Heathrow Airport	10.9	39.6	53.9	73.4	347.5	410	8	1.9
LW1	Lewisham 1 - Catford	6.9	25.0	36.9	54.9	195.0	352	66	15.8
RB1	Redbridge 1 - Perth Terrace	5.9	13.6	19.8	30.7	205.5	418	0	0.0
ST2	Sutton 2 - North Cheam	4.1	12.8	23.3	41.3	238.6	122	296	70.8
WL1	Waltham Forest 1 - Dawlish Road	4.7	11.4	18.3	30.9	237.9	382	36	8.6

2. Background surrounding

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
IS1	Islington 1 – Upper Street	6.4	16.3	24.9	38.9	284.6	409	9	2.2
KC1	Kens and Chelsea 1 – North Kensington	3.4	12.4	18.9	33.0	230.2	409	9	2.2
SK1	Southwark 1 – Elephant and Castle	11.7	25.9	34.2	49.3	146.2	366	52	12.4
TH1	Tower Hamlets 1 – Poplar	5.7	12.3	18.2	29.5	161.9	404	14	3.3
TH3	Tower Hamlets 3 – Bethnal Green	7.0	15.8	22.5	35.6	194.2	356	62	14.8
WA2	Wandsworth 2 – Town Hall	6.8	24.8	45.3	73.1	232.1	410	8	1.9
WE0	West London – AURN	9.3	21.3	28.4	45.1	173.3	413	5	1.2

### 3. Background within

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BLO	Bloomsbury - AURN	9.0	27.8	38.8	58.0	224.2	370	48	11.5
CT1	City of London 1 - Senator House	10.2	22.6	30.6	45.6	182.3	312	106	25.4
WMO	Westminster AURN	4.0	17.0	27.6	42.0	144.6	314	104	24.9

Table J.2. Summary statistics for daily concentrations (ppb) of oxides of nitrogen during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 16<sup>th</sup> February 2003 and 22<sup>nd</sup> February 2003 and 13<sup>th</sup> February 2005 respectively (shaded rows indicate those outer-London stations used in the analysis).

1. Background

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BN2	5.7	10.4	16.0	27.4	132.9	172	38	18.1		5.2	10.7	16.7	27.0	303.6	200	8	3.8
BN3	8.9	17.3	23.1	33.8	139.9	121	89	42.4		NA	NA	NA	NA	NA	0	208	100.0
EA1	5.2	13.2	21.3	39.1	199.6	200	10	4.8		4.9	13.5	19.8	33.3	261.3	196	12	5.8
EA7	NA	NA	NA	NA	NA	0	210	100.0		7.1	14.5	19.3	31.5	234.5	40	168	80.8
EN3	4.2	10.0	15.6	28.3	102.6	210	0	0.0		4.3	9.5	14.4	23.5	255.1	207	1	0.5
GN2	NA	NA	NA	NA	NA	0	210	100.0		5.3	14.2	29.3	43.0	146.2	57	151	72.6
HF2	NA	NA	NA	NA	NA	0	210	100.0		7.7	14.4	20.3	31.4	172.6	133	75	36.1
HK4	6.8	24.2	34.2	57.7	154.1	195	15	7.1		9.2	21.5	34.0	49.6	333.9	198	10	4.8
HR1	2.7	7.6	12.3	21.3	95.8	207	3	1.4		2.9	7.7	12.4	19.7	156.7	200	8	3.8
LB3	10.0	14.4	22.2	35.8	121.5	114	96	45.7		5.6	13.8	19.2	30.1	121.3	192	16	7.7
LHO	NA	NA	NA	NA	NA	0	210	100.0		6.6	17.5	23.3	33.3	302.5	118	90	43.3
LH2	10.9	39.7	55.8	78.8	277.0	206	4	1.9		14.3	39.5	52.2	70.2	347.5	204	4	1.9
LW1	7.3	25.0	39.5	57.2	195.0	146	64	30.5		6.9	24.7	35.8	52.7	154.8	206	2	1.0
RB1	5.9	13.8	19.9	32.5	152.8	210	0	0.0		6.1	13.5	19.4	29.0	205.5	208	0	0.0
ST2	4.1	12.8	23.3	41.3	238.6	122	88	41.9		NA	NA	NA	NA	NA	0	208	100.0
WL1	4.7	11.7	19.2	31.2	110.2	194	16	7.6		5.0	11.3	17.5	30.5	237.9	188	20	9.6

2. Background surrounding

	Min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
IS1	6.7	16.1	25.5	40.5	227.5	209	1	0.5		6.4	16.4	23.6	38.0	284.6	200	8	3.8
KC1	3.4	12.5	19.3	34.5	156.9	210	0	0.0		4.5	12.2	17.5	31.1	230.2	199	9	4.3
SK1	15.1	28.4	36.1	52.5	139.8	179	31	14.8		11.7	24.7	32.6	47.4	146.2	187	21	10.1
TH1	8.4	13.9	20.4	31.9	121.0	205	5	2.4		5.7	11.5	16.7	27.2	161.9	199	9	4.3
TH3	7.4	17.0	24.2	39.5	136.7	194	16	7.6		7.0	14.5	21.0	32.5	194.2	162	46	22.1
WA2	6.8	25.5	51.4	81.6	232.1	210	0	0.0		7.0	23.9	41.3	63.7	185.1	200	8	3.8
WE0	9.3	20.7	29.6	45.4	160.3	206	4	1.9		13.1	21.9	28.1	43.9	173.3	207	1	0.5

### 3. Background within

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BLO	9.0	28.0	38.4	55.8	169.3	182	28	13.3		11.4	27.3	39.3	58.6	224.2	188	20	9.6
CT1	12.6	24.2	34.5	51.5	152.9	133	77	36.7		10.2	22.4	29.7	41.6	182.3	179	29	13.9
WMO	4.0	17.0	27.0	43.1	142.9	154	56	26.7		5.9	17.0	28.0	40.5	144.6	160	48	23.1

Table J.3 Summary statistics for daily nitric oxide concentrations (ppb) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 13<sup>th</sup> February 2005 (shaded rows indicate those outer-London stations used in the analysis).

1. Background

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BN2	Barnet 2 - Finchley	0.7	2.3	3.5	8.0	244.5	372	46	11.0
BN3	Barnet 3 - Strawberry Vale	1.4	5.0	8.2	13.7	116.3	121	297	71.1
EA1	Ealing 1 - Ealing Town Hall	0.7	3.2	5.7	14.5	210.1	396	22	5.3
EA7	Ealing 7 - Southall	1.1	2.3	4.3	9.9	188.0	40	378	90.4
EN3	Enfield 3 - Salisbury Sch Ponders End	0.5	2.3	3.3	8.1	210.8	418	0	0.0
GN2	Greenwich 12 - Millennium Village	1.5	4.4	11.2	24.7	111.8	57	361	86.4
HF2	H'smith and Fulham 2 - Brook Green	0.5	3.5	5.5	9.9	127.9	133	285	68.2
HK4	Hackney 4 - Clapton	1.2	7.7	14.4	25.4	251.8	393	25	6.0
HR1	Harrow 1 - Stanmore Background	0.5	1.9	3.0	5.5	119.3	407	11	2.6
LB3	Lambeth 3 - Loughborough Junct	1.4	3.5	5.8	11.0	95.3	306	112	26.8
LH0	Harlington - AURN	1.0	4.7	7.7	14.1	246.9	118	300	71.8
LH2	Heathrow Airport	3.5	19.3	27.9	40.8	281.6	410	8	1.9
LW1	Lewisham 1 - Catford	0.7	7.7	16.1	27.9	154.8	352	66	15.8
RB1	Redbridge 1 - Perth Terrace	0.9	3.4	5.5	10.9	157.6	416	2	0.5
ST2	Sutton 2 - North Cheam	0.3	2.8	7.5	16.9	192.9	122	296	70.8
WL1	Waltham Forest 1 - Dawlish Road	0.0	2.5	4.4	10.0	184.9	382	36	8.6

2. Background surrounding

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
IS1	Islington 1 – Upper Street	1.0	3.3	5.6	13.6	227.2	408	10	2.4
KC1	Kens and Chelsea 1 – North Kensington	0.7	2.4	4.3	10.4	173.1	409	9	2.2
SK1	Southwark 1 – Elephant and Castle	1.8	9.2	13.7	22.5	103.3	367	51	12.2
TH1	Tower Hamlets 1 – Poplar	0.5	2.2	3.7	8.6	124.6	404	14	3.3
TH3	Tower Hamlets 3 – Bethnal Green	-0.2	3.0	5.2	11.4	158.0	356	62	14.8
WA2	Wandsworth 2 – Town Hall	0.2	8.1	20.7	39.3	190.4	410	8	1.9
WE0	West London – AURN	1.0	5.0	7.9	16.9	127.0	413	5	1.2

### 3. Background within

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BLO	Bloomsbury - AURN	2.2	9.0	15.0	28.2	166.6	284	134	32.1
CT1	City of London 1 - Senator House	1.4	6.1	9.6	17.6	135.0	312	106	25.4
WMO	Westminster AURN	0.0	3.9	8.7	17.2	119.6	334	84	20.1



Table J.4. Summary statistics for daily nitric oxide concentrations (ppb) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 16<sup>th</sup> February 2003 and 22<sup>nd</sup> February 2003 and 13<sup>th</sup> February 2005 respectively (shaded rows indicate those outer-London stations used in the analysis).

1. Background

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BN2	0.7	2.3	3.7	7.4	98.0	172	38	18.1		0.9	2.3	3.4	8.2	244.5	200	8	3.8
BN3	1.4	5.0	8.2	13.7	116.3	121	89	42.4		NA	NA	NA	NA	NA	0	208	100.0
EA1	1.2	3.6	6.5	16.9	164.0	200	10	4.8		0.7	2.9	5.5	11.7	210.1	196	12	5.8
EA7	NA	NA	NA	NA	NA	0	210	100.0		1.1	2.3	4.3	9.9	188.0	40	168	80.8
EN3	0.5	2.4	3.5	9.1	72.9	210	0	0.0		0.5	2.2	3.2	7.0	210.8	208	0	0.0
GN2	NA	NA	NA	NA	NA	0	210	100.0		1.5	4.4	11.2	24.7	111.8	57	151	72.6
HF2	NA	NA	NA	NA	NA	0	210	100.0		0.5	3.5	5.5	9.9	127.9	133	75	36.1
HK4	1.8	7.8	14.9	31.4	116.5	195	15	7.1		1.2	7.4	13.4	22.6	251.8	198	10	4.8
HR1	0.5	1.9	3.0	6.0	75.8	207	3	1.4		0.7	1.9	3.0	5.3	119.3	200	8	3.8
LB3	1.7	4.0	6.7	12.7	95.3	114	96	45.7		1.4	3.3	5.7	10.4	90.2	192	16	7.7
LHO	NA	NA	NA	NA	NA	0	210	100.0		1.0	4.7	7.7	14.1	246.9	118	90	43.3
LH2	3.5	19.3	30.0	45.2	230.4	206	4	1.9		4.0	19.5	26.8	38.0	281.6	204	4	1.9
LW1	0.7	6.0	16.4	29.1	154.8	146	64	30.5		1.1	8.2	15.8	26.4	112.6	206	2	1.0
RB1	0.9	3.7	5.9	11.6	118.8	208	2	1.0		0.9	3.2	5.4	9.9	157.6	208	0	0.0
ST2	0.3	2.8	7.5	16.9	192.9	122	88	41.9		NA	NA	NA	NA	NA	0	208	100.0
WL1	0.0	2.5	4.5	9.5	76.4	194	16	7.6		0.9	2.5	4.3	10.8	184.9	188	20	9.6

2. Background surrounding

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
IS1	1.0	3.4	5.8	13.8	180.1	207	3	1.4		1.1	3.1	5.3	12.6	227.2	201	7	3.4
KC1	0.7	2.5	4.5	11.4	123.6	210	0	0.0		0.9	2.2	4.1	8.9	173.1	199	9	4.3
SK1	3.7	10.6	14.9	25.1	102.7	179	31	14.8		1.8	8.4	12.7	21.7	103.3	188	20	9.6
TH1	0.5	2.5	4.1	8.9	86.2	205	5	2.4		0.5	2.1	3.5	8.2	124.6	199	9	4.3
TH3	0.0	3.6	6.3	13.5	100.8	194	16	7.6		-0.2	2.4	4.0	10.6	158.0	162	46	22.1
WA2	1.0	8.8	25.0	46.3	190.4	210	0	0.0		0.2	7.7	16.1	31.0	139.6	200	8	3.8
WE0	1.0	5.4	8.8	17.6	126.0	206	4	1.9		1.5	4.5	7.6	14.9	127.0	207	1	0.5

### 3. Background within

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BLO	4.1	12.3	18.3	31.5	116.1	96	114	54.3		2.2	7.0	12.4	26.3	166.6	188	20	9.6
CT1	2.2	6.5	11.7	22.0	112.7	133	77	36.7		1.4	5.8	8.4	14.9	135.0	179	29	13.9
WMO	0.0	4.6	9.0	19.2	119.6	154	56	26.7		0.0	3.7	8.2	16.1	104.3	180	28	13.5

Table J.5. Summary statistics for daily nitrogen dioxide concentrations (ppb) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 13<sup>th</sup> February 2005 (shaded rows indicate those outer-London stations used in the analysis).

1. Background

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BN2	Barnet 2 - Finchley	3.8	8.1	13.0	18.2	59.1	372	46	11.0
BN3	Barnet 3 - Strawberry Vale	7.5	11.7	15.3	19.8	39.1	121	297	71.1
EA1	Ealing 1 - Ealing Town Hall	3.0	9.8	15.2	22.3	51.2	396	22	5.3
EA7	Ealing 7 - Southall	6.0	11.5	15.2	20.9	46.4	40	378	90.4
EN3	Enfield 3 - Salisbury Sch Ponders End	2.0	7.2	11.6	17.4	44.3	418	0	0.0
GN2	Greenwich 12 - Millennium Village	3.9	9.7	12.9	22.0	36.5	57	361	86.4
HF2	H'smith and Fulham 2 - Brook Green	5.5	10.1	14.5	21.4	44.6	133	285	68.2
HK4	Hackney 4 - Clapton	4.5	14.3	20.3	26.9	82.1	393	25	6.0
HR1	Harrow 1 - Stanmore Background	1.6	5.4	9.3	14.5	39.3	406	12	2.9
LB3	Lambeth 3 - Loughborough Junct	4.2	10.6	14.7	21.8	45.1	316	102	24.4
LH0	Harlington - AURN	5.0	10.5	16.1	20.8	55.6	118	300	71.8
LH2	Heathrow Airport	7.4	20.1	25.7	32.3	65.9	410	8	1.9
LW1	Lewisham 1 - Catford	4.0	15.9	21.4	28.2	51.8	352	66	15.8
RB1	Redbridge 1 - Perth Terrace	4.3	9.5	14.3	19.9	48.2	418	0	0.0
ST2	Sutton 2 - North Cheam	3.5	10.0	16.1	24.9	45.7	122	296	70.8
WL1	Waltham Forest 1 - Dawlish Road	2.8	8.9	13.8	20.4	53.1	382	36	8.6

2. Background surrounding

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
IS1	Islington 1 – Upper Street	4.5	12.8	18.5	25.9	57.5	409	9	2.2
KC1	Kens and Chelsea 1 – North Kensington	1.8	9.6	14.3	22.1	57.1	409	9	2.2
SK1	Southwark 1 – Elephant and Castle	7.7	16.2	20.8	27.8	44.3	366	52	12.4
TH1	Tower Hamlets 1 – Poplar	4.4	10.2	14.4	20.6	48.1	404	14	3.3
TH3	Tower Hamlets 3 – Bethnal Green	4.5	12.2	17.6	23.6	51.2	356	62	14.8
WA2	Wandsworth 2 – Town Hall	3.9	15.9	25.0	32.6	55.7	410	8	1.9
WE0	West London – AURN	8.2	15.5	20.8	27.3	54.3	413	5	1.2

### 3. Background within

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BLO	Bloomsbury - AURN	7.7	18.7	24.5	30.8	57.6	284	134	32.1
CT1	City of London 1 - Senator House	7.9	15.8	21.9	27.6	52.2	312	106	25.4
WMO	Westminster AURN	3.9	12.6	18.2	25.4	43.1	314	104	24.9

Table J.6. Summary statistics for daily nitrogen dioxide concentrations (ppb) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 16<sup>th</sup> February 2003 and 22<sup>nd</sup> February 2003 and 13<sup>th</sup> February 2005 respectively (shaded rows indicate those outer-London stations used in the analysis).

1. Background

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BN2	4.2	8.0	12.9	17.9	39.2	172	38	18.1		3.8	8.1	13.1	18.6	59.1	200	8	3.8
BN3	7.5	11.7	15.3	19.8	39.1	121	89	42.4		NA	NA	NA	NA	NA	0	208	100.0
EA1	3.0	9.5	15.6	22.4	38.8	200	10	4.8		3.4	10.2	14.9	22.2	51.2	196	12	5.8
EA7	NA	NA	NA	NA	NA	0	210	100.0		6.0	11.5	15.2	20.9	46.4	40	168	80.8
EN3	2.0	7.3	12.1	18.6	38.3	210	0	0.0		3.5	7.0	11.1	16.5	44.3	208	0	0.0
GN2	NA	NA	NA	NA	NA	0	210	100.0		3.9	9.7	12.9	22.0	36.5	57	151	72.6
HF2	NA	NA	NA	NA	NA	0	210	100.0		5.5	10.1	14.5	21.4	44.6	133	75	36.1
HK4	4.5	14.6	20.5	26.2	43.0	195	15	7.1		6.0	14.0	19.9	27.5	82.1	198	10	4.8
HR1	1.7	5.5	9.3	14.8	30.0	207	3	1.4		1.6	5.5	9.5	14.3	39.3	199	9	4.3
LB3	7.3	10.7	17.2	22.8	38.6	122	88	41.9		4.2	10.4	13.4	19.7	45.1	194	14	6.7
LHO	NA	NA	NA	NA	NA	0	210	100.0		5.0	10.5	16.1	20.8	55.6	118	90	43.3
LH2	7.4	19.9	25.6	31.3	48.5	206	4	1.9		9.3	20.7	25.8	32.4	65.9	204	4	1.9
LW1	6.2	16.9	22.8	28.7	43.8	146	64	30.5		4.0	15.1	20.9	28.1	51.8	206	2	1.0
RB1	4.3	9.5	14.3	20.4	40.2	210	0	0.0		4.7	9.9	14.3	19.1	48.2	208	0	0.0
ST2	3.5	10.0	16.1	24.9	45.7	122	88	41.9		NA	NA	NA	NA	NA	0	208	100.0
WL1	2.8	9.3	14.4	21.6	43.5	194	16	7.6		4.1	8.5	13.0	18.4	53.1	188	20	9.6

2. Background surrounding

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
IS1	4.5	12.5	18.9	26.0	47.4	209	1	0.5		4.7	13.0	17.9	25.3	57.5	200	8	3.8
KC1	1.8	9.4	14.6	23.1	43.8	210	0	0.0		3.5	9.6	14.1	21.4	57.1	199	9	4.3
SK1	8.7	16.6	21.6	28.1	40.6	179	31	14.8		7.7	16.0	20.0	26.9	44.3	187	21	10.1
TH1	6.4	11.4	16.0	22.6	37.0	205	5	2.4		4.4	9.3	12.9	19.1	48.1	199	9	4.3
TH3	4.5	12.4	18.6	25.3	42.9	194	16	7.6		5.5	11.8	16.9	22.0	51.2	162	46	22.1
WA2	3.9	15.7	25.4	33.3	47.7	210	0	0.0		3.9	16.0	25.0	31.6	55.7	200	8	3.8
WE0	8.2	15.0	20.4	27.6	40.7	206	4	1.9		9.5	16.1	20.9	27.3	54.3	207	1	0.5

### 3. Background within

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BLO	7.7	17.9	22.7	27.9	41.7	96	114	54.3		7.8	19.6	25.3	32.3	57.6	188	20	9.6
CT1	9.2	15.7	22.6	28.9	45.6	133	77	36.7		7.9	15.9	21.8	25.9	52.2	179	29	13.9
WMO	3.9	11.6	17.1	24.8	35.3	154	56	26.7		5.1	12.8	19.4	25.9	43.1	160	48	23.1

Table J.7. Summary statistics for daily PM<sub>10</sub> concentrations ( $\mu\text{g}/\text{m}^3$ ) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 13<sup>th</sup> February 2005 (shaded rows indicate those outer-London stations used in the analysis).

1. Background

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BN2	Barnet 2 - Finchley	4.4	14.9	18.9	26.4	82.0	410	8	1.9
BN3	Barnet 3 - Strawberry Vale	8.7	16.1	20.3	28.2	70.2	128	290	69.4
EA7	Ealing 7 - Southall	7.4	13.3	17.0	22.2	59.3	58	360	86.1
EN3b	Enfield 3 - Salisbury Sch Ponders End	4.5	13.7	18.8	26.8	78.4	373	45	10.8
GN2	Greenwich 12 - Millennium Village	6.6	13.6	17.4	24.9	74.3	41	377	90.2
HF2	H'smith and Fulham 2 - Brook Green	6.5	16.3	19.0	24.4	53.2	109	309	73.9
HR1	Harrow 1 - Stanmore Background	3.4	13.5	17.2	23.2	67.7	410	8	1.9
LB3b	Lambeth 3 - Loughborough Junct	4.7	16.0	20.5	29.1	132.9	302	116	27.8
LHO	Harlington - AURN	6.4	16.6	20.7	26.7	144.3	118	300	71.8
LH2	Heathrow Airport	5.5	17.7	23.7	30.9	92.7	400	18	4.3
RB1b	Redbridge 1 - Perth Terrace	6.6	16.5	21.8	29.6	107.3	401	17	4.1
WL1	Waltham Forest 1 - Dawlish Road	6.2	15.9	20.4	26.5	80.6	355	63	15.1

2. Background surrounding

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
IS1	Islington 1 - Upper Street	5.2	16.4	20.5	27.8	73.2	411	7	1.7
KC1	Kens and Chelsea 1 - North Kensington	4.3	15.6	20.4	27.0	85.2	411	7	1.7
SK1	Southwark 1 - Elephant and Castle	6.4	17.9	22.5	29.8	90.1	239	179	42.8
TH1	Tower Hamlets 1 - Poplar	5.3	15.7	20.1	28.5	85.9	404	14	3.3
TH3	Tower Hamlets 3 - Bethnal Green	8.2	17.8	21.6	28.7	112.8	376	42	10.0

3. Background within

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BLO	Bloomsbury - AURN	7.2	19.0	24.1	31.9	110.1	307	111	26.6

Table J.8. Summary statistics for daily PM<sub>10</sub> concentrations ( $\mu\text{g}/\text{m}^3$ ) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 16<sup>th</sup> February 2003 and 22<sup>nd</sup> February 2003 and 13<sup>th</sup> February 2005 respectively (shaded rows indicate those outer-London stations used in the analysis).

1. Background

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BN2	7.0	14.7	18.9	24.8	68.0	204	6	2.9		4.4	15.1	18.8	26.5	82.0	206	2	1.0
BN3	8.7	16.1	20.3	28.2	70.2	128	82	39.0		NA	NA	NA	NA	NA	0	208	100.0
EA7	NA	NA	NA	NA	NA	0	210	100.0		7.4	13.3	17.0	22.2	59.3	58	150	72.1
EN3b	7.3	14.9	20.3	26.8	67.1	181	29	13.8		4.5	12.7	18.3	25.9	78.4	192	16	7.7
GN2	NA	NA	NA	NA	NA	0	210	100.0		6.6	13.6	17.4	24.9	74.3	41	167	80.3
HF2	NA	NA	NA	NA	NA	0	210	100.0		6.5	16.3	19.0	24.4	53.2	109	99	47.6
HR1	6.9	14.2	17.4	22.3	63.4	210	0	0.0		3.4	13.1	16.9	24.2	67.7	200	8	3.8
LB3b	8.6	16.3	20.5	28.9	73.3	118	92	43.8		4.7	15.4	20.6	29.3	132.9	184	24	11.5
LHO	NA	NA	NA	NA	NA	0	210	100.0		6.4	16.6	20.7	26.7	144.3	118	90	43.3
LH2	9.0	18.5	24.1	31.2	82.8	197	13	6.2		5.5	17.2	23.4	30.9	92.7	203	5	2.4
RB1b	6.6	16.2	21.2	29.4	66.4	201	9	4.3		7.9	16.8	22.5	30.3	107.3	200	8	3.8
WL1	7.3	15.5	20.0	26.6	68.8	191	19	9.0		6.2	16.2	20.5	26.5	80.6	164	44	21.2

2. Background surrounding

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
IS1	8.6	16.4	20.5	26.6	72.7	209	1	0.5		5.2	16.0	20.3	28.4	73.2	202	6	2.9
KC1	6.6	15.5	20.4	25.5	72.9	209	1	0.5		4.3	16.4	20.6	27.9	85.2	202	6	2.9
SK1	6.8	15.5	22.1	28.6	45.8	31	179	85.2		6.4	18.1	22.6	29.8	90.1	208	0	0.0
TH1	7.8	15.1	19.8	26.8	78.8	204	6	2.9		5.3	16.3	20.7	30.7	85.9	200	8	3.8
TH3	8.7	17.0	21.8	30.6	112.8	192	18	8.6		8.2	18.1	21.3	27.2	86.2	184	24	11.5

3. Background within

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BLO	10.5	20.4	25.7	36.1	110.1	128	82	39.0		7.2	18.6	22.8	29.3	66.3	179	29	13.9



Table J.9. Summary statistics for daily carbon monoxide concentrations (ppm) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 13<sup>th</sup> February 2005 (shaded rows indicate those outer-London stations used in the analysis).

1. Background

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
EN3	Enfield 3 - Salisbury Sch Ponders End	0.02	0.22	0.31	0.44	1.74	405	13	3.2
LH0	Harlington - AURN	0.10	0.21	0.25	0.37	1.58	110	308	75.5
LH2	Heathrow Airport	0.07	0.21	0.28	0.37	1.66	406	12	2.9

2. Background surrounding

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
HK4	Hackney 4 - Clapton	0.01	0.24	0.34	0.50	1.83	379	39	9.6
KC1	Kens and Chelsea 1 - North Kensington	0.03	0.23	0.30	0.42	1.25	401	17	4.2
SK1	Southwark 1 - Elephant and Castle	0.07	0.27	0.34	0.46	1.19	407	11	2.7
WA2	Wandsworth 2 - Town Hall	0.09	0.57	0.81	1.09	2.17	407	11	2.7
WE0	West London - AURN	0.01	0.15	0.28	0.38	1.45	411	7	1.7

3. Background within

Code	Location	min	q1	med	q3	max	n	nmiss	%miss
BLO	Bloomsbury - AURN	0.04	0.20	0.30	0.46	1.23	402	16	3.9
WMO	Westminster AURN	0.11	0.25	0.33	0.46	1.35	361	57	14.0

Table J.10. Summary statistics for daily CO concentrations (ppm) during weekend congestion charging hours between 17<sup>th</sup> February 2001 and 16<sup>th</sup> February 2003 and 22<sup>nd</sup> February 2003 and 13<sup>th</sup> February 2005 respectively (shaded rows indicate those outer-London stations used in the analysis).

1. Background

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
EN3	0.05	0.22	0.31	0.45	1.36	197	13	6.2		0.02	0.23	0.31	0.43	1.74	208	0	0.0
LH0	NA	NA	NA	NA	NA	0	210	100.0		0.10	0.21	0.25	0.37	1.58	110	98	47.1
LH2	0.07	0.18	0.25	0.37	1.66	206	4	1.9		0.08	0.23	0.29	0.37	1.56	200	8	3.8

2. Background Surrounding

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
HK4	0.01	0.23	0.35	0.56	1.49	182	28	13.3		0.04	0.24	0.33	0.45	1.83	197	11	5.3
KC1	0.03	0.18	0.29	0.41	1.07	200	10	4.8		0.12	0.25	0.32	0.43	1.25	201	7	3.4
SK1	0.09	0.26	0.34	0.50	1.19	204	6	2.9		0.07	0.27	0.34	0.41	0.90	203	5	2.4
WA2	0.09	0.55	0.78	1.07	1.99	210	0	0.0		0.12	0.59	0.83	1.11	2.17	197	11	5.3
WE0	0.01	0.11	0.18	0.34	1.45	208	2	1.0		0.01	0.26	0.32	0.40	0.88	203	5	2.4

3. Background within

	min	q1	med	q3	max	n	nmiss	%miss		min	q1	med	q3	max	n	nmiss	%miss
BLO	0.04	0.19	0.33	0.56	1.17	200	10	4.8		0.09	0.21	0.28	0.39	1.23	202	6	2.9
WMO	0.17	0.28	0.38	0.56	1.35	161	49	23.3		0.11	0.23	0.30	0.39	1.04	200	8	3.8

Table J.11. Number of valid weekend daily NO<sub>x</sub> measurements available for analysis out of a possible 418.

Station Name	Code	N	N*	N*	N*
Within charging zone background					
Bloomsbury - AURN	BL0	370			
City of London 1 - Senator House	CT1	312			
Westminster AURN	WM0	314			
Outer London background					
			BL0	CT1	WM0
Barnet 2 - Finchley	BN2	372	336	276	270
Ealing 1 - Ealing Town Hall	EA1	396	352	293	302
Enfield 3 - Salisbury Sch Ponders End	EN3	417	369	311	313
Harrow 1 - Stanmore Background	HR1	407	360	302	309
Lewisham 1 - Catford	LW1	352	310	278	266
Redbridge 1 - Perth Terrace	RB1	418	370	312	314
Waltham Forest 1 - Dawlish Road	WL1	382	334	284	303

N\* - n for combined datasets e.g. excluding days with missing CD3 and A30 data gives a dataset with 900 observations (days with conc. at both locations)

Table J.12. Number of valid weekend daily NO measurements available for analysis out of a possible 418.

Station Name	Code	N	N*	N*	N*
Within charging zone background					
Bloomsbury - AURN	BL0	284			
City of London 1 - Senator House	CT1	312			
Westminster AURN	WM0	334			
Outer London background					
Barnet 2 - Finchley	BN2	372	276	276	290
Ealing 1 - Ealing Town Hall	EA1	396	272	293	322
Enfield 3 - Salisbury Sch Ponders End	EN3	418	284	312	334
Harrow 1 - Stanmore Background	HR1	407	274	302	329
Lewisham 1 - Catford	LW1	352	232	278	286
Redbridge 1 - Perth Terrace	RB1	416	284	310	332
Waltham Forest 1 - Dawlish Road	WL1	382	251	284	323

N\* - n for combined datasets e.g. excluding days with missing CD3 and A30 data gives a dataset with observations (days with conc. at both locations)

Table J.13. Number of valid weekend daily NO<sub>2</sub> measurements available for analysis out of a possible 418.

Station Name	Code	N	N*	N*	N*
Within charging zone roadside					
Camden 3 - Shaftesbury Avenue	CD3	410			
Outer London roadside					
A3 - AURN	A30	388	380		
Croydon 2 - Purley Way	CR2	404	396		
Croydon 4 - George Street	CR4	358	352		
Crystal Palace 1 - C Palace Parade	CY1	385	377		
Ealing 2 - Acton Town Hall	EA2	398	391		
Enfield 2 - Church Street	EN2	402	396		
Enfield 4 - Derby Road Upper Edmonton	EN4	412	404		
Greenwich Bexley 6 - A2 Falconwood	GB6	411	403		
Greenwich 5 - Trafalgar Road	GR5	416	408		
Haringey 1 - Town Hall	HG1	400	394		
Hillingdon 1 - South Ruislip	HI1	392	387		
Hounslow 4 - Chiswick High Rd	HS4	374	368		
Havering 1 - Rainham	HV1	391	385		
Havering 3 - Romford	HV3	393	385		
Redbridge 4 - Gardner Close	RB4	405	397		
Richmond 1 - Castlenau	RI1	412	404		
Within charging zone background					
Bloomsbury - AURN	BL0	284			
City of London 1 - Senator House	CT1	312			
Westminster AURN	WM0	314			
Outer London background					
Barnet 2 - Finchley	BN2	372	276	276	270
Ealing 1 - Ealing Town Hall	EA1	396	272	293	302
Enfield 3 - Salisbury Sch Ponders End	EN3	418	284	312	314
Harrow 1 - Stanmore Background	HR1	406	273	302	308
Lewisham 1 - Catford	LW1	352	232	278	266
Redbridge 1 - Perth Terrace	RB1	418	284	312	314
Waltham Forest 1 - Dawlish Road	WL1	382	251	284	303

N\* - n for combined datasets e.g. excluding days with missing CD3 and A30 data gives a dataset with 900 observations (days with conc. at both locations)

Table J.14. Number of valid weekend daily PM<sub>10</sub> NO measurements available for analysis out of a possible 418.

Station Name	Code	N	N*
Within charging zone background			
Bloomsbury - AURN	BL0	307	
Outer London background			
Barnet 2 - Finchley	BN2	410	301
Enfield 3 - Salisbury Sch Ponders End	EN3b	373	277
Harrow 1 - Stanmore Background	HR1	410	301
Redbridge 1 - Perth Terrace	RB1b	401	294
Waltham Forest 1 - Dawlish Road	WL1	355	248

N\* - n for combined datasets e.g. excluding days with missing CD3 and A30 data gives a dataset with 900 observations (days with conc. at both locations)

Figure J.1 Plots of weekend daily mean NO<sub>x</sub> concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

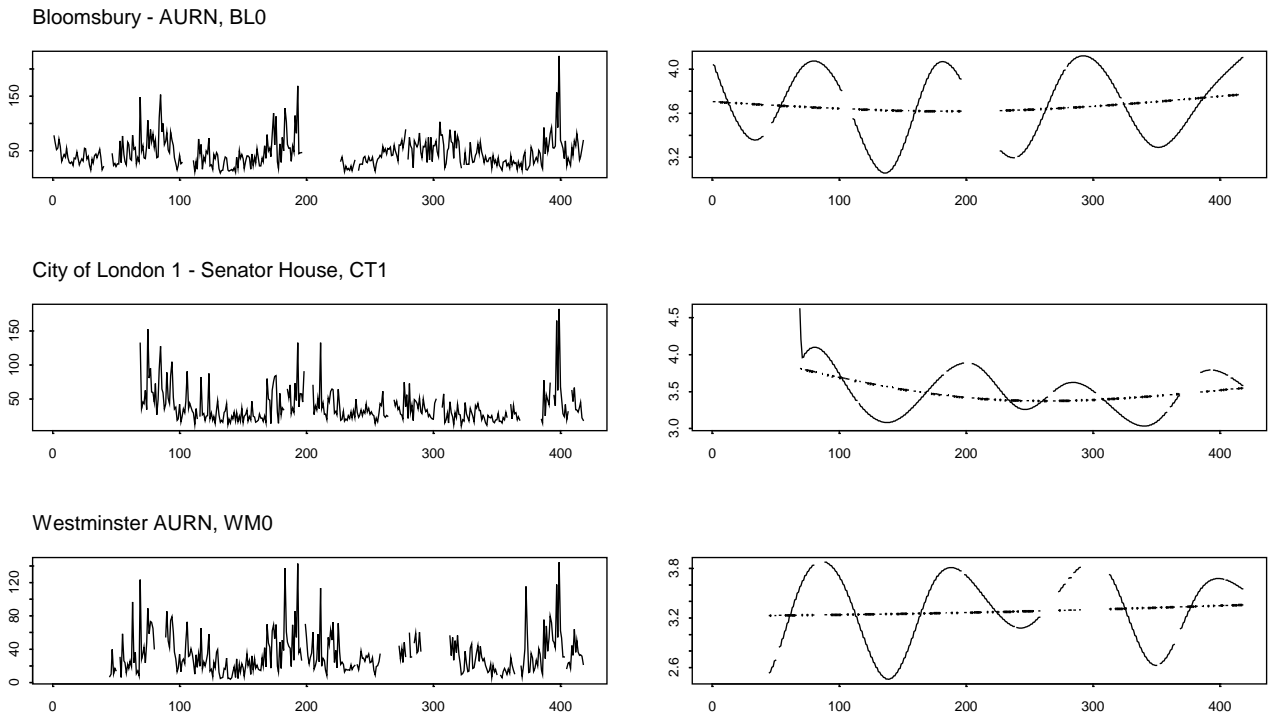


Figure J.1 (cont.) Plots of weekend daily mean  $\text{NO}_x$  concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

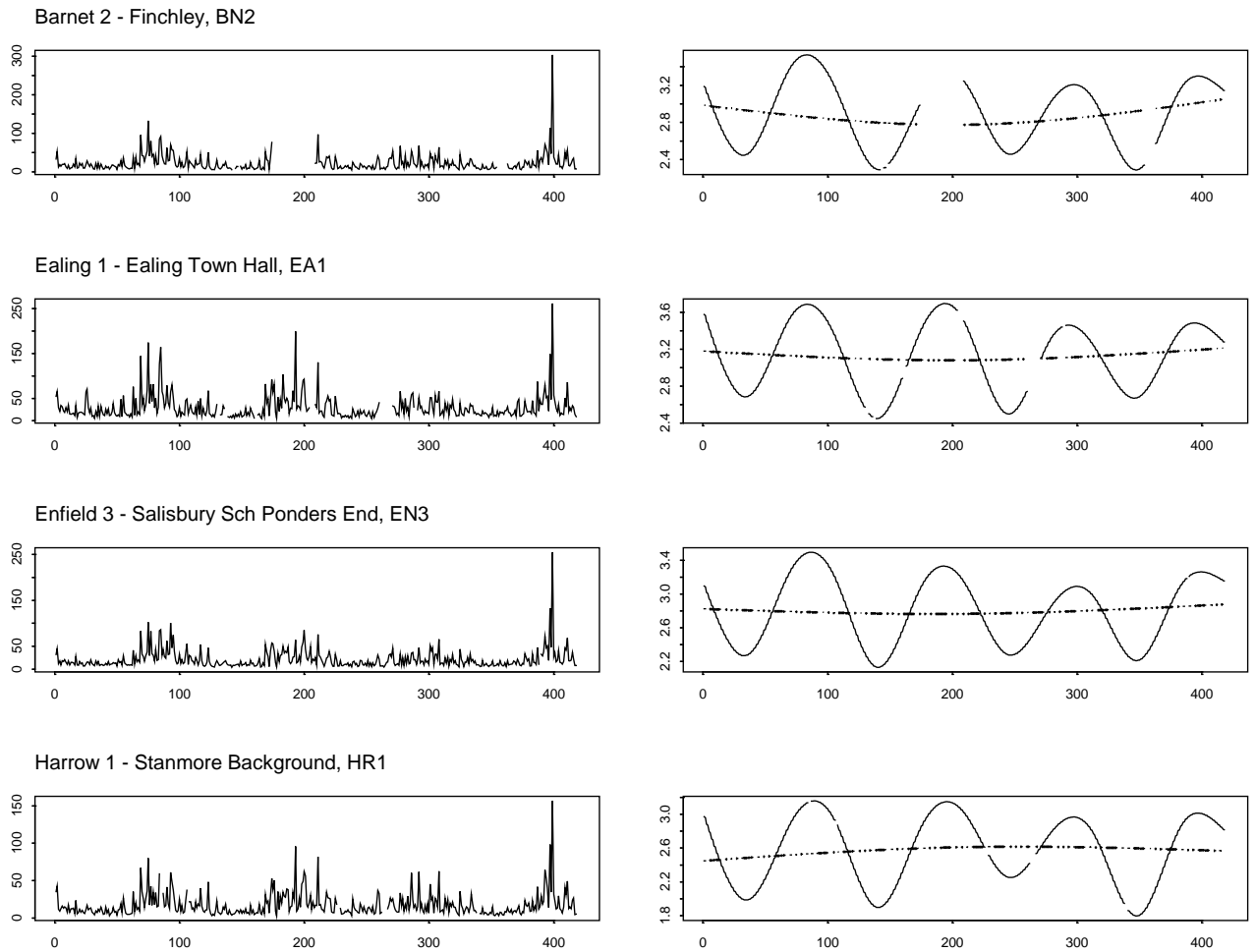




Figure J.1 (cont.) Plots of weekend daily mean  $\text{NO}_x$  concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

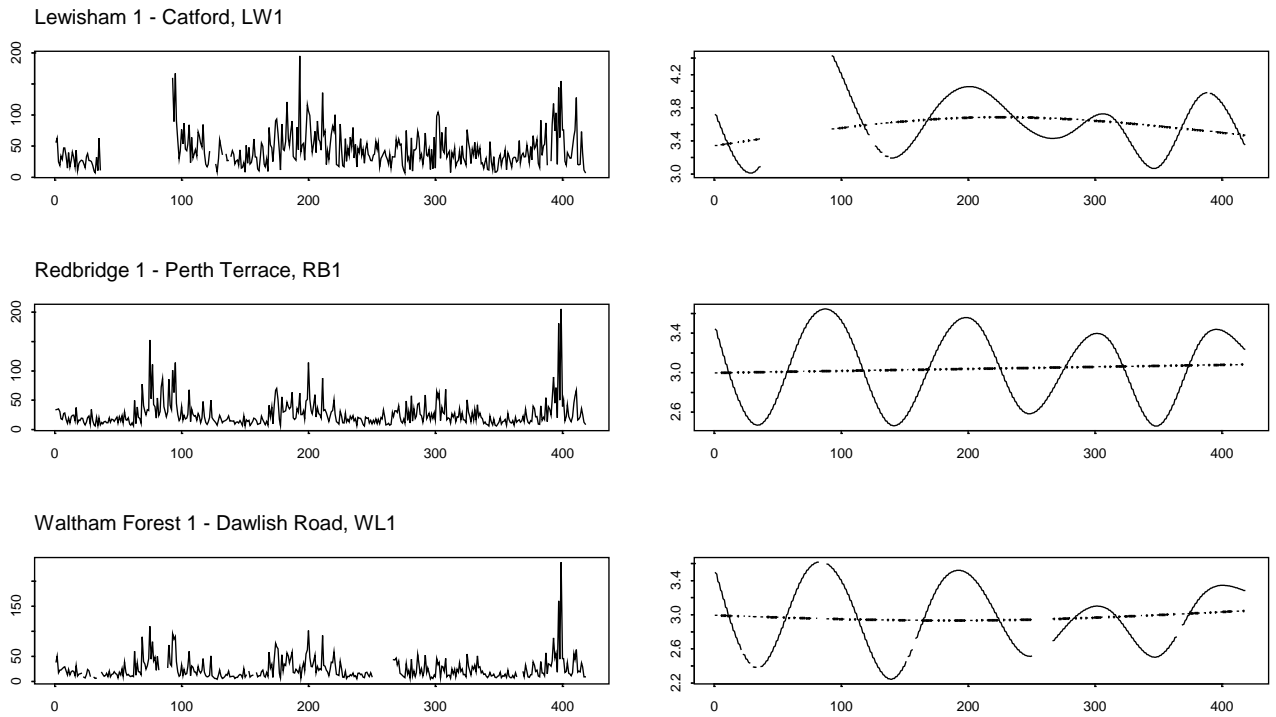


Figure J.2 Plots of weekend daily mean NO concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

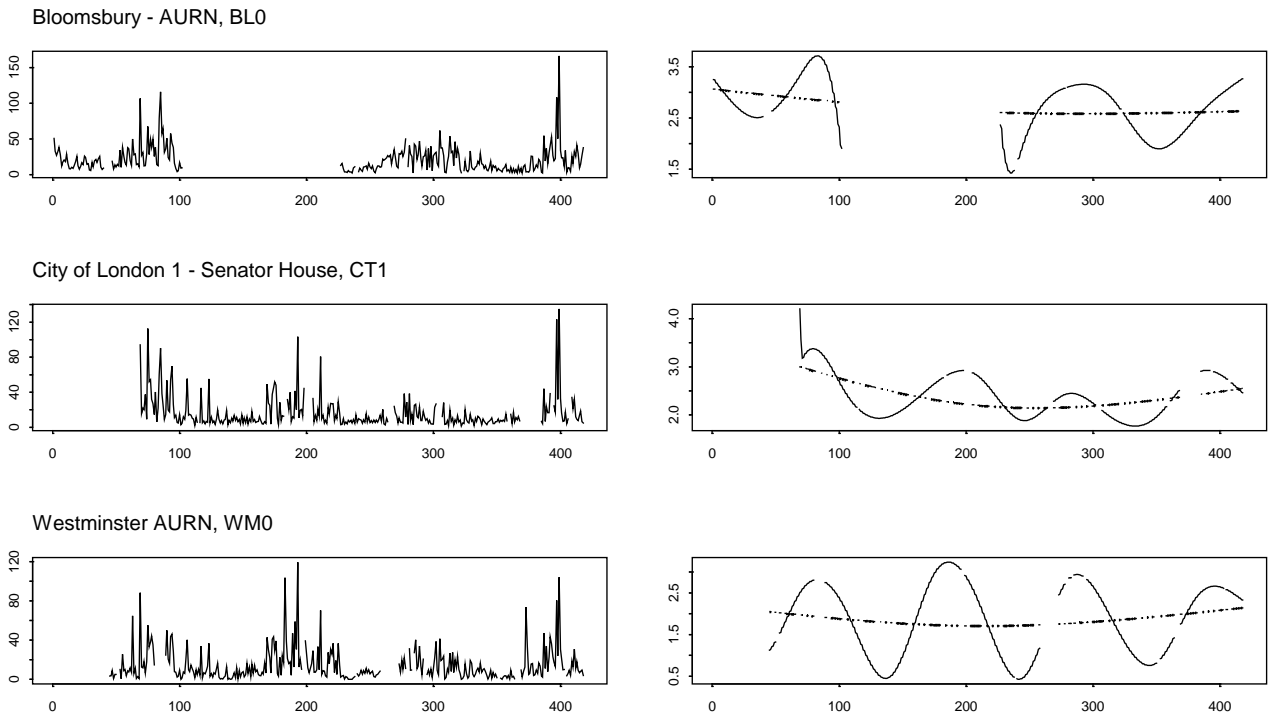


Figure J.2 (cont.) Plots of weekend daily mean NO concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

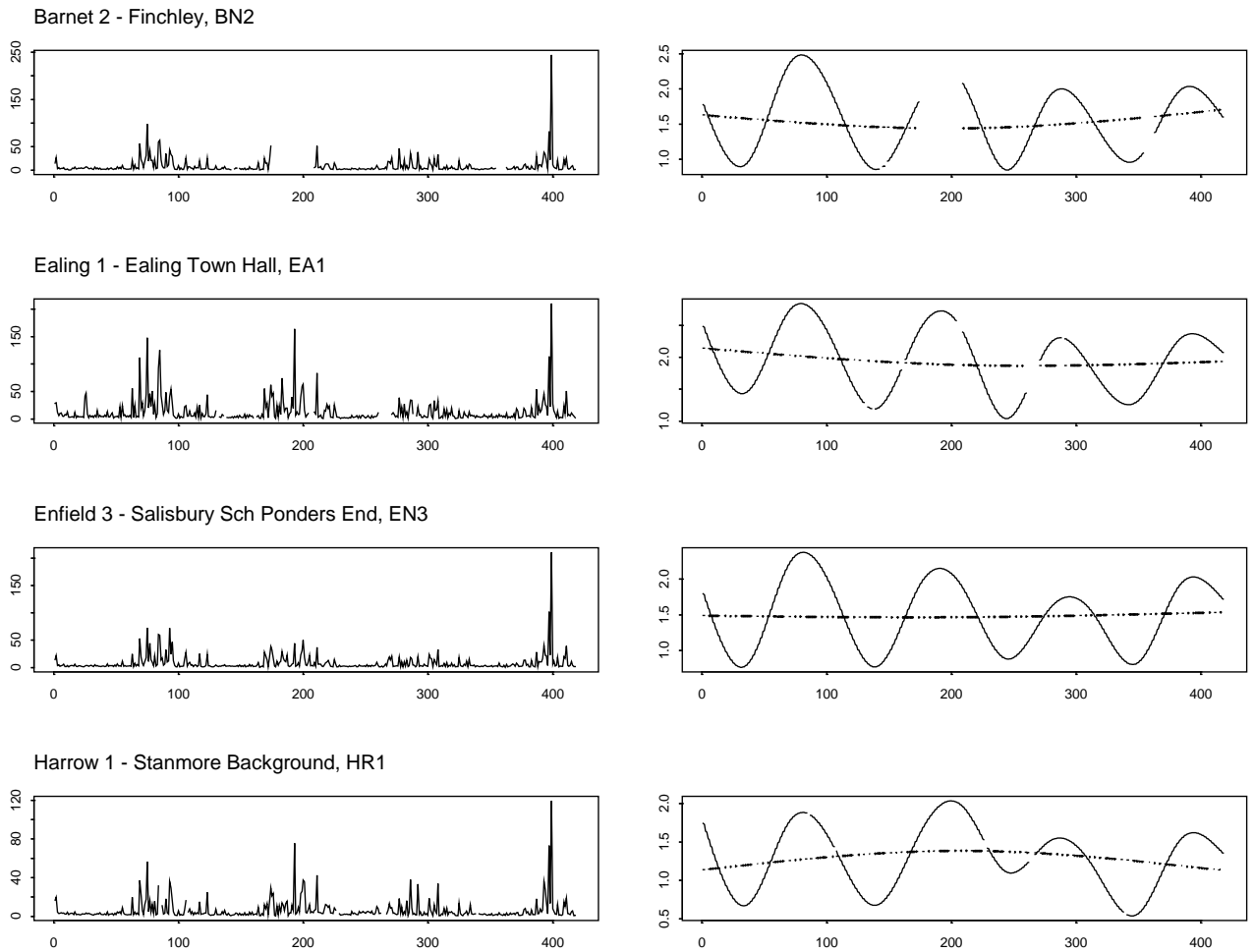


Figure J.2 (cont.) Plots of weekend daily mean NO concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

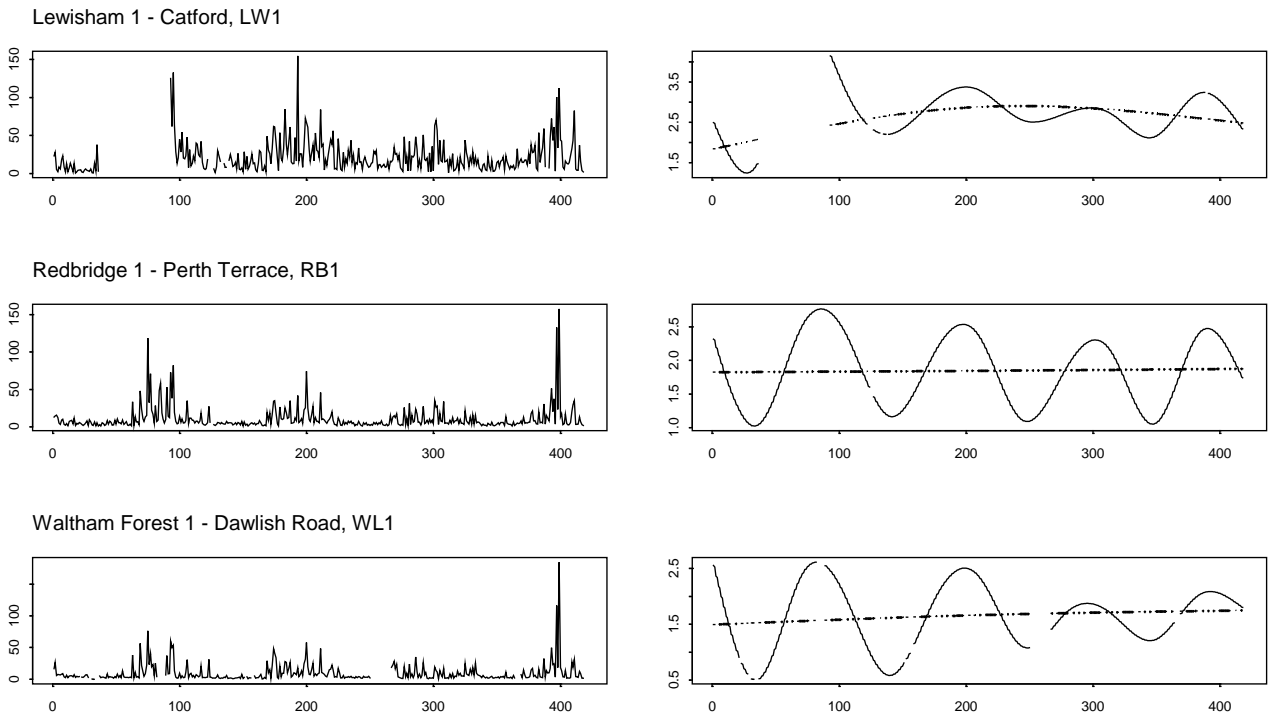


Figure J.3 Plots of weekend daily mean NO<sub>2</sub> concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

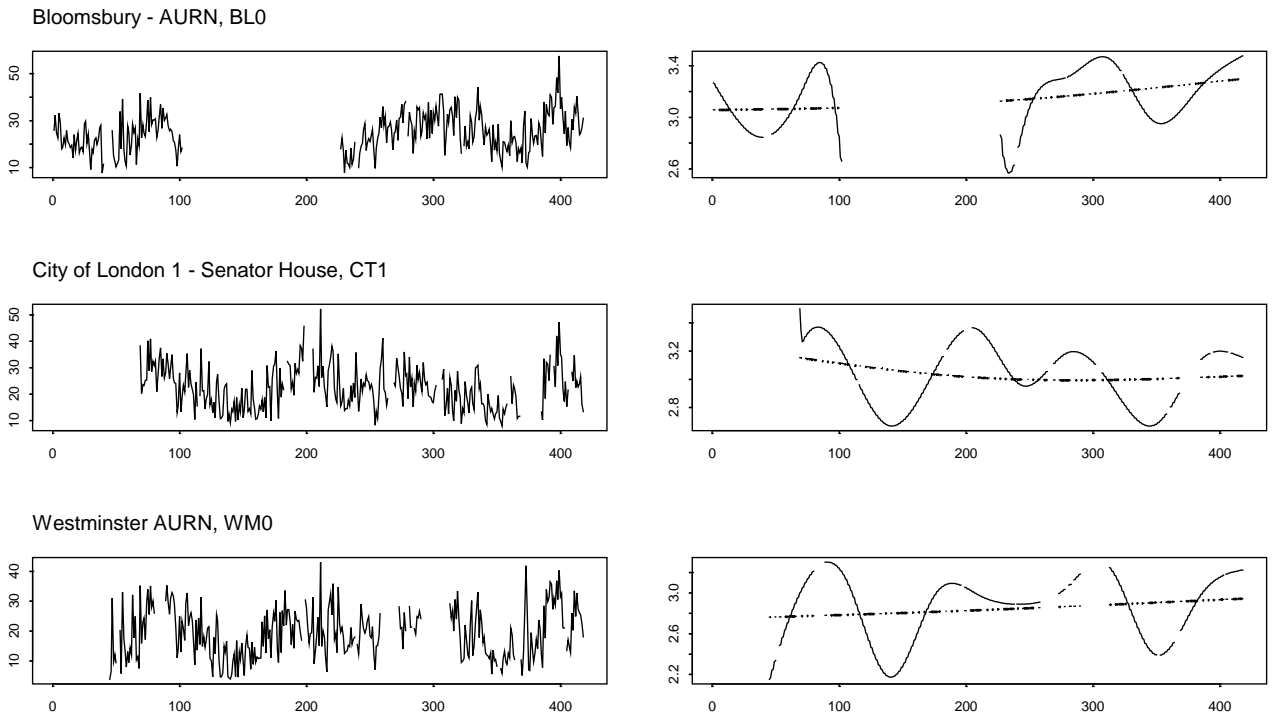


Figure J.3 (cont.) Plots of weekend daily mean NO<sub>2</sub> concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

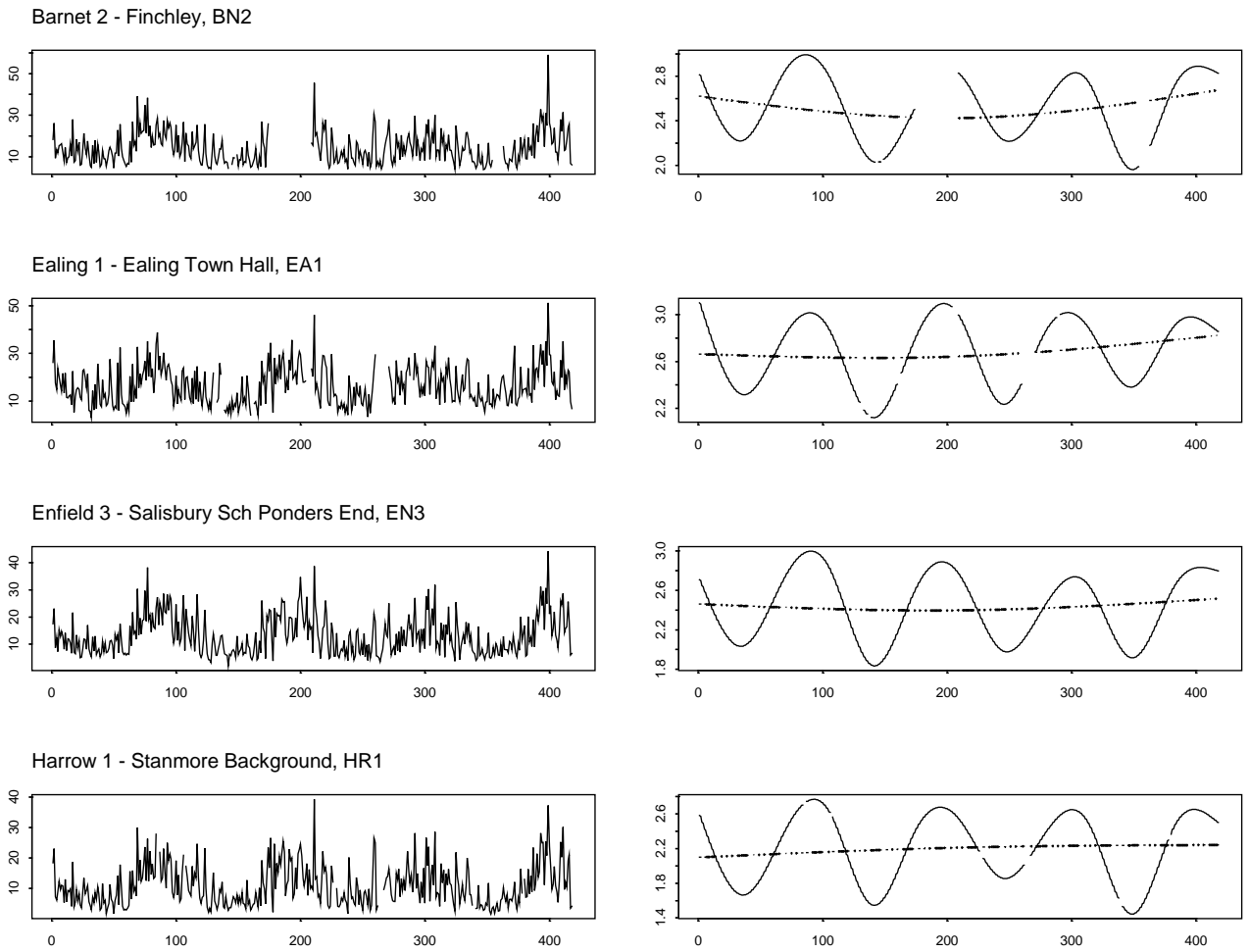


Figure J.3 (cont.) Plots of weekend daily mean NO<sub>2</sub> concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

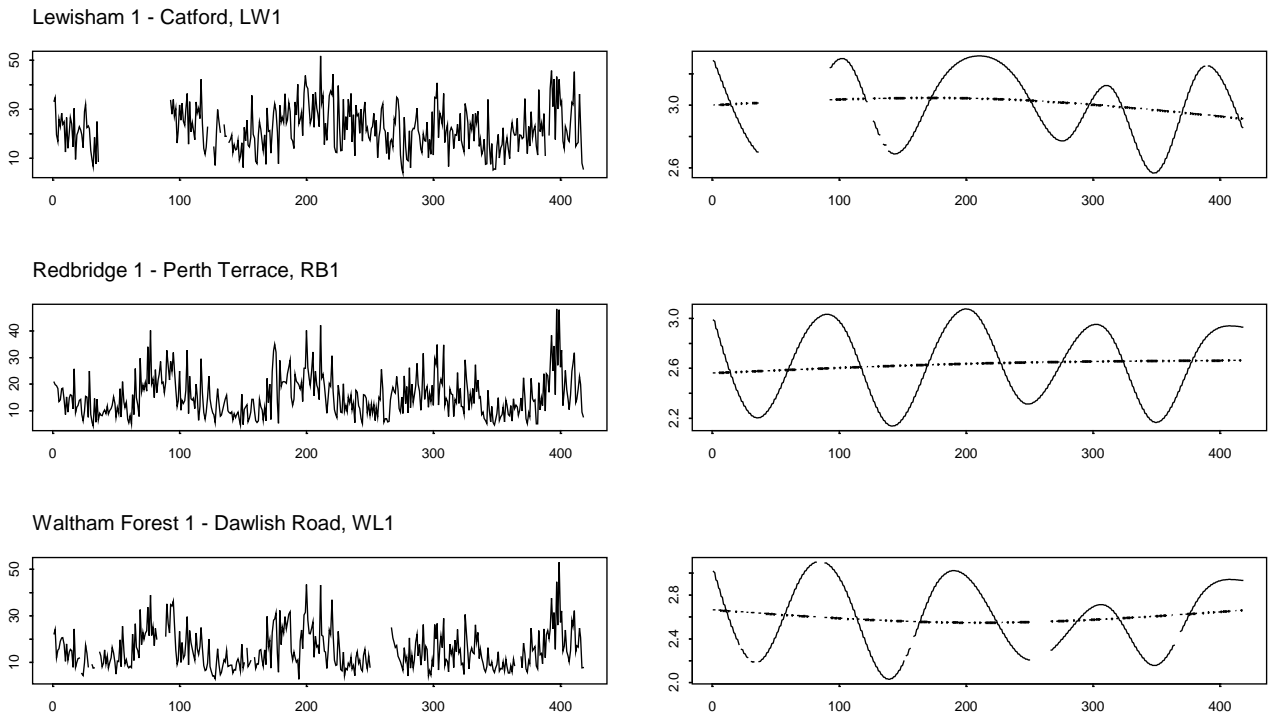


Figure J.4 Plots of weekend daily mean PM<sub>10</sub> concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

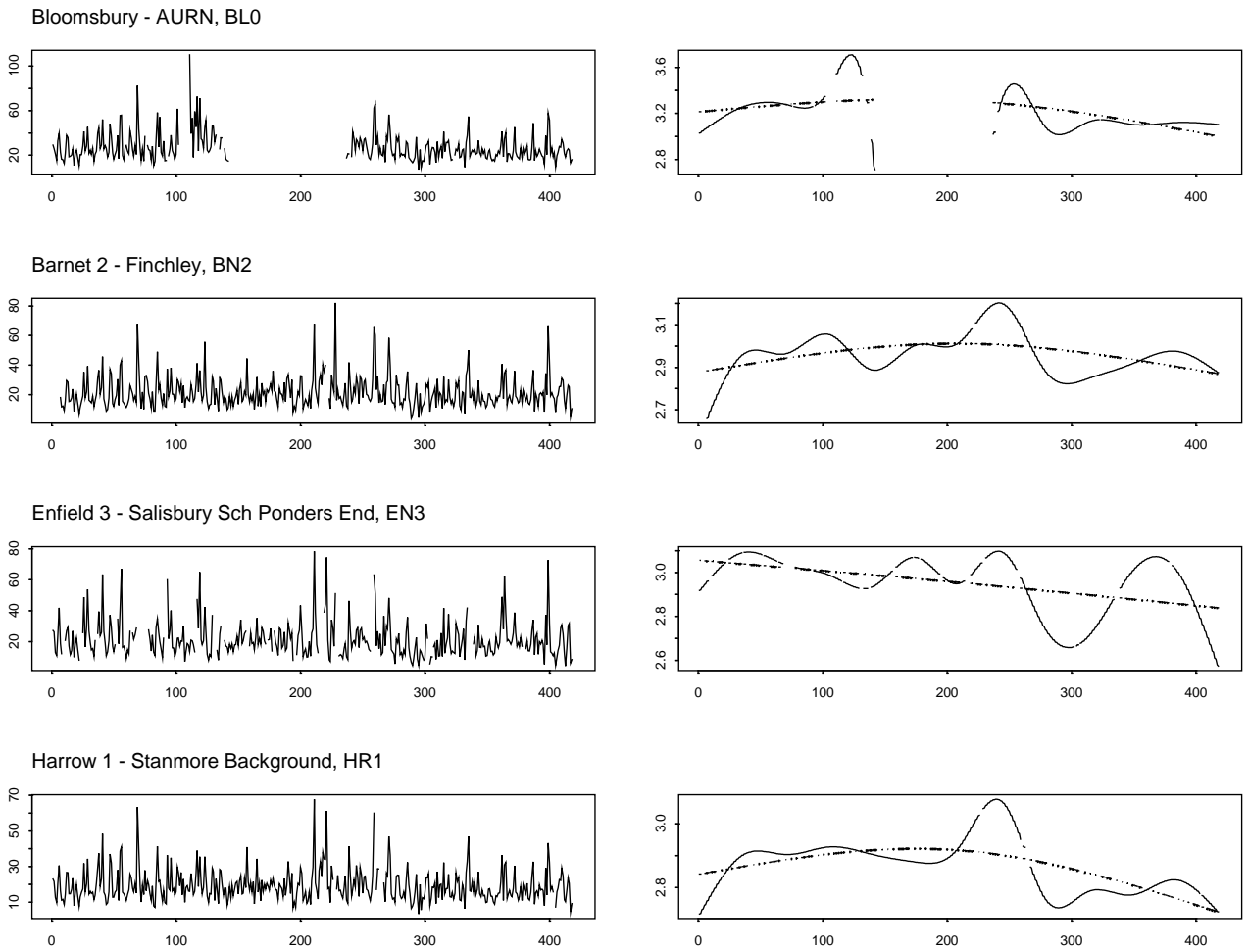




Figure J.4 (cont.) Plots of weekend daily mean  $PM_{10}$  concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

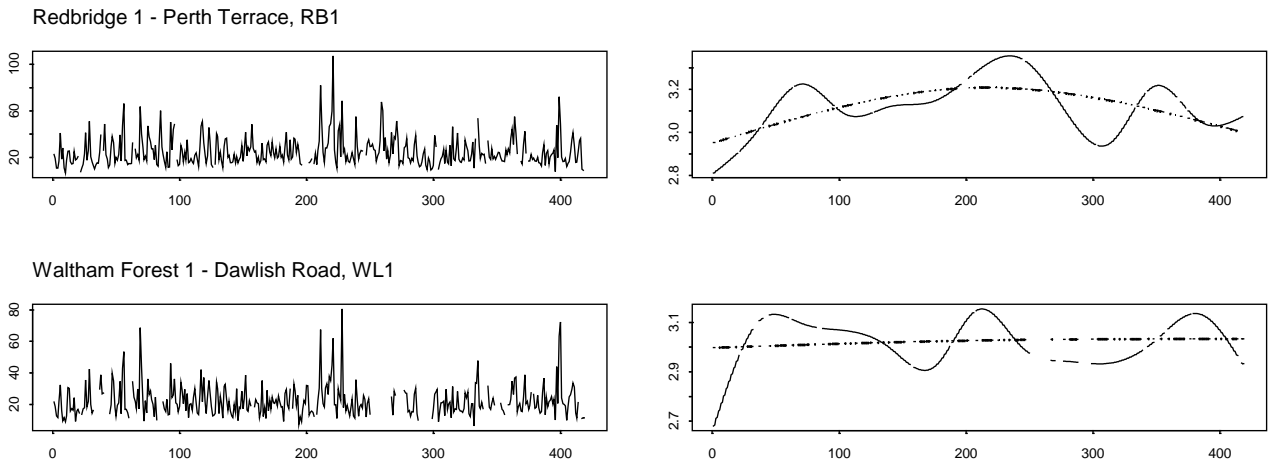


Figure J.5 Plots of weekend daily mean CO concentrations and of temporal/seasonal patterns at background monitoring stations in the CCS zone and 8 km+ from zone center – congestion charging hours

