

Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Appendix 2

Table 1. 4-RAIL Analyst simulating LUL Passenger Journeys

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	ROUTE COVERED
153196/49	RD	4RSS49 - 4-RAIL Analyst, District Line	22.04.16	08:40	13:34	2.2	646.80	0.08	Edgware Road → Wimbledon → Uppminster → Richmond → Uppminster → Richmond → Turnham Green → Ealing Broadway → Westminster
153196/50	RD	4RSS50 - 4-RAIL Analyst, Piccadilly Line	25.04.16	09:01	11:45	2.2	587.40	0.33	Green Park → Heathrow Terminal 1, 2, 3 & 5 → Amros Grove → Heathrow Terminal 5 → Russell Square → Rayners Lane → Green Park
				12:00	13:43				
153196/51	RD	4RSS51 - 4-RAIL Analyst, Jubilee Line	26.04.16	08:51	13:19	2.2	589.60	0.31	Dollis Hill → Stratford → Stanmore → Stratford → Stanmore → North Greenwich → Neasden
153196/52	RD	4RSS52 - 4-RAIL Analyst, Victoria Line	27.04.16	10:36	14:53	2.2	539.00	0.63	Green Park → Walthamstow → Brixton → Walthamstow → Brixton → Walthamstow → King's Cross
				13:48	14:00				
153196/53	RD	4RSS53 - 4-RAIL Analyst, Bakerloo Line	28.04.16	08:40	12:40	2.2	528.00	0.56	Baker Street → Elephant & Castle → Harrow & Wealdstone → Elephant & Castle → Harrow & Wealdstone → Elephant & Castle
153196/54	RD	4RSS54 - 4-RAIL Analyst, Central Line	29.04.16	13:32	17:43	2.2	552.20	0.44	Bond Street → Hainault via Newbury Park → Ealing Broadway → Newbury Park → Ealing Broadway
153196/55	RD	4RSS55 - 4-RAIL Analyst, Circle Line	02.05.16	10:32	14:38	2.2	541.20	<0.02	Wood Lane → Aldgate via Baker Street → Edgware Road via Victoria → Aldgate via Baker Street → King's Cross via Baker Street (Hammersmith Line) → Wood Lane via Baker Street
153196/56	RD	4RSS56 - 4-RAIL Analyst, Northern Line	03.05.16	12:55	16:55	2.2	528.00	0.46	King's Cross → Edgware via Charring Cross → Morden via Bank → High Barnet via Charring Cross → Clapham North → Waterloo via Charring Cross

\*Note: Hammersmith and City line had delays throughout the line on the 2<sup>nd</sup> May 2016. Circle line was monitored instead.

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Table 2. District Line Train Operators

FILTER NUMBER*	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/137	RD	LU137 TO – Driver – Duties 585 & 381	30/08/16	08:52	12:47	2.2	517	0.07	Train 047 - Upminster → Ealing Broadway → Upminster (West Ham Stop)

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/04	RD	LU04 TO – Driver – Duties 533 & 535	22/03/16	09:13	12:34	2.2	726	0.08	Train 001 - Upminster → Richmond, Richmond → Barking → Upminster Train 004 - Upminster → Richmond → Victoria.
				13:14	15:23				

FILTER NUMBER*	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/139	PM 2.5	LU139 TO – Driver – Duty 206	08/09/16	09:10	11:20	3.5	863.5	0.14	Train 077 – Earls Court → Wimbledon → Edgware Road → Wimbledon Change trains - Train 056- at Earls Court → Wimbledon → Tower Hill (Westminster stop)
				12:09	13:58				

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**Table 3. Jubilee Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/07	RD	LU07 TO – Driver – Duty 641	24/03/16	09:04	12:15	2.2	767.8	0.27	Train 346 - Wembley Park → Stratford. Train 320 - Stratford → Stanmore → Stratford. Train 324 - Stratford → Stanmore → North Greenwich → Stanmore
				13:19	15:57				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/11	RD	LU11 TO – Driver – Duty 017	25/03/16	09:01	11:39	2.2	624.8	0.23	Train 331 - Stratford → Wembley Park → Stratford → Wembley Park. Train 307 → Wembley Park → Stanmore → Stratford. Train 321 - Stratford → Stanmore
				12:42	14:48				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/12	PM 2.5	LU12 TO – Driver – Duty 822	28/03/16	11:49	15:49	3.5	738.5	0.05	Train 331 - Wembley Park → Stratford → Wembley Park → North Greenwich → Stanmore → Stratford (Waterloo Stop)

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**Table 4. Piccadilly Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/13	RD	LU13 TO – Driver – Duty 527	29/03/16	08:04	10:22	2.2	699.6	0.49	Train 306 - Northfields → Cockfosters → Heathrow (Action Town Stop). Train 236 - Action Town → Heathrow T1, 2, 3 & 5 → Cockfosters → Heathrow (Duty finishes at Action town)
				11:30	14:30				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/17	RD	LU17 TO – Driver – Duties 504 & 537	30/03/16	09:42	13:15	2.2	631.4	0.24	Train 227 - Action Town → Uxbridge - Cockfosters → Heathrow T 1, 2, 3 & 5 (Northfields Stop). Duty change 537 - Train 316 Northfields → Heathrow T1, 2, 3 & 4 → Cockfosters (Earl's Court Stop)
				14:21	15:35				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/18	PM 2.5	LU18 TO – Driver – Duties 508 & 528	31/03/16	09:04	12:03	3.5	1309	0.60	Train 241 - Action Town → Rayners Lane → Wood Green → Action Town. Train 227 (Duty 528) - Action Town → Heathrow T5 → Cockfosters → Action Town.
				13:16	16:31				

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Table 5. Victoria Line Train Operators

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/19	RD	LUL19 TO – Driver Duty 817	01/04/16	08:59	11:19	2.2	598.4	0.23	Train 214 - Brixton → Seven Sisters Sidings → Brixton. Train 222 Brixton - Walthamstow Central. Train 242 - Walthamstow Central → Brixton. Train 233 Brixton → Seven Sisters → Brixton. Train 214 Brixton → Walthamstow → Brixton (Vauxhall Stop)
				12:18	14:30				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (LITRES)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/23	RD	LUL23 TO – Driver Duty 817	04/04/16	08:53	11:17	2.2	609.4	0.27	Train 214 - Brixton → Seven Sisters Sidings → Brixton. Train 222 Brixton → Walthamstow Central. Train 242 - Walthamstow Central → Brixton. Train 233 Brixton → Seven Sisters → Brixton. Train 214 Brixton → Walthamstow → Brixton (Green Park Stop)
				12:17	14:30				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/24	PM 2.5	LUL24 TO – Driver Duty 819	05/04/16	09:06	11:00	3.5	661.5	0.57	Train 224 - Brixton → Northumberland Park Depot. Train 227 to Brixton - Change train 210 to Walthamstow. Train 236 Seven Sisters → Walthamstow → Brixton → Walthamstow → Brixton → Green Park
				12:45	15:00				

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 6. Bakerloo Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (mg/m <sup>3</sup> )	ROUTE COVERED
153196/26	RD	LUL26 TO - Driver Duties 121, 020, 129	06/04/16	08:42	12:10	2.2	748	0.86	Train 207 - Queens Park → Elephant & Castle → Harrow & Wealdstone → Elephant & Castle. Train 236 - Elephant & Castle → Stonebridge Park → Queen's Park. Train 237- Queen's Park → Harrow & Wealdstone → Elephant & Castle. Train 204 - Elephant & Castle → Stonebridge Park.
				13:29	15:41				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (mg/m <sup>3</sup> )	ROUTE COVERED
153196/29	RD	LUL29 TO - Driver Duties 116, 018, 121	07/04/16	08:53	12:44	2.2	675.4	0.44	Train 224 Queens Park → Elephant & Castle. Train 237 Harrow & Wealdstone → Elephant & Castle. Duty 18: Train 235 - Elephant & Castle- Harrow & Wealdstone - Queens Park. Duty 121; Train 214 - Queens Park - Elephant & Castle. Train 221 to Stonebridge Park.
				13:45	15:01				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (mg/m <sup>3</sup> )	ROUTE COVERED
153196/30	PM 2.5	LUL30 TO - Driver Duties 008, 118, 117, 233, 126	08/04/16	08:24	12:19	3.5	1109.5	0.71	Train 205 - Queens Park → Elephant & Castle. Train 247 - Harrow & Wealdstone → Elephant & Castle → Queen's Park. Train 233 - Elephant & Castle → Queen's Park → (Train 236) Elephant & Castle → (Train 206) Stonebridge Park.
				14:06	15:28				

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 7. Central Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/32	RD	LUL32 TO – Driver Duties 807, 802, 213, 326, 634	11/04/16	09:07	14:54	2.2	763.4	0.25	Train 60 - Hainault → Leytonstone → (Train 032) West Ruislip → Epping → Loughton (Train 032) → West Ruislip (Train 032) → Bond Street (Train 047) → Ealing Broadway

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/33	RD	LUL33 TO – Driver Duty 633	12/04/16	08:47	12:27	2.2	798.6	0.30	Train 067 - Hainault → Ealing Broadway via Woodford → Hainault → White City Train 062 → Hainault → Newbury Park → Hainault → White City

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/36	PM 2.5	LUL36 TO – Driver Duty 633	13/04/16	08:50	12:26	3.5	684.2	0.32	Train 067 - Hainault → Ealing Broadway → Hainault via Newbury Park → White City
				13:22	14:57				





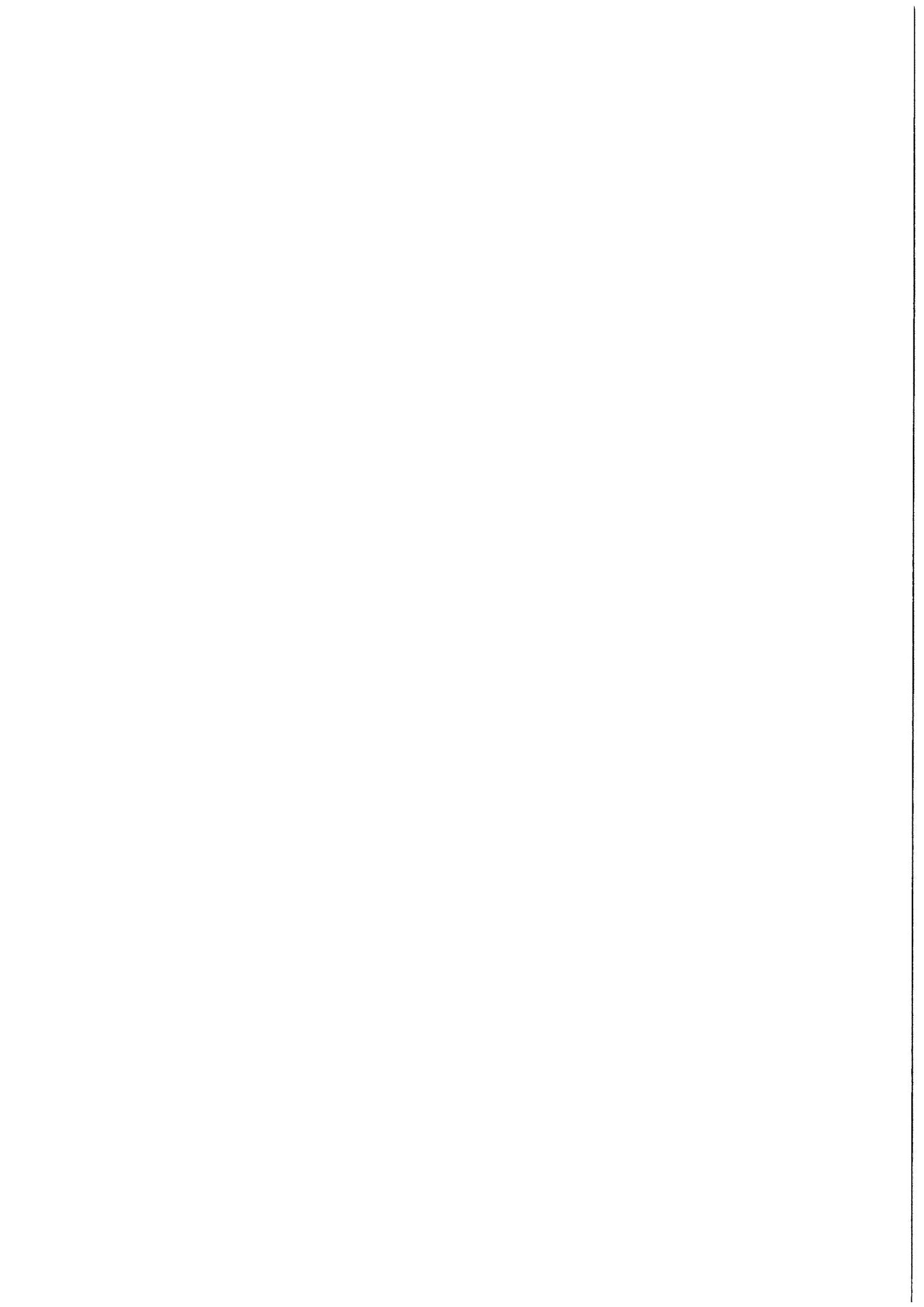
**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 8. Northern Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/38	RD	LUL38 TO - Driver Dutes 316 & 322	14/04/16	09:09	10:35	2.2	6616	0.26	Train 132 - High Barnet → Kennington via Charring Cross → High Barnet Train 150 - High Barnet → Morden via Bank → Kennington.
				11:55	15:09				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/41	RD	LUL41 TO - Driver Duty 315	15/04/16	08:30	11:23	2.2	633.6	0.21	Train 107 - High Barnet → Kennington via Charring Cross → High Barnet → Morden via Bank, Train 117 - Morden → High Barnet via Bank → Waterloo.
				12:14	14:09				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/42	PM 2.5	LUL42 TO - Driver Duty 314	18/04/16	08:24	11:08	3.5	945	0.63	Train 105 - High Barnet → Kennington via Charring Cross → High Barnet → Morden via Bank, Train 115 - Morden → High Barnet via Bank → Kennington via Charring Cross
				12:03	13:49				



## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 9. Hammersmith & City and Circle Lines Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/44	RD	LU44 TO – Driver Duty 617	19/04/16	12:38	16:30	2.2	591.8	0.05	Train 276 - Barking → Hammersmith → Barking → Hammersmith → Edgware Road → Hammersmith → Barking
				17:46	18:23				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/47	RD	LU47 TO – Driver Duty 615	20/04/16	11:36	15:10	2.2	573	0.05	Train 211 to Edgware Road via King's Cross → Hammersmith via Victoria → Edgware Road via King's cross. Train 277 Edgware Road - Hammersmith → Edgware Road
				16:10	16:56				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
153196/48	PM 2.5	LU48 TO – Driver Duty 615	21/04/16	11:36*	14:26*	3.5	374*	0.08*	Train 211 to Edgware Road (Circle Line) via Victoria. Edgware Road → Hammersmith via Victoria → Edgware Road → Liverpool Street

\*The result is indicative only due to incomplete monitoring session. The assigned driver was requested to go at Barking Station.

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 10. Aldgate East Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)*	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	OTHER COMMENTS
153196/57	RD	Static - Westbound - Platform 1	04.05.16	09:55	13:55	2.2	528.00	0.41	Dust levels within the station, during monitoring session, were noted by 4RS staff to be satisfactory. Increased dust levels were noted around 13:10pm.
153196/58	RD	Static - Eastbound -Platform 2	04.05.16	10:00	14:00	2.2	528.00	0.55	
153196/59	RD	Static - Ticket Hall (East side - High Street)	04.05.16	10:10	14:10	2.2	528.00	0.38	
153196/60	RD	Personal - LU60 Gate line Personnel	04.05.16	10:18	12:04	2.2	228.80	0.31	
153196/61	RD	Static - Ticket Hall (Whitechapel side)	04.05.16	10:26	14:26	2.2	528.00	0.41	

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**Table 11. Baker Street Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/62	RD	Static - Bakerloo Line	05.05.16	09:22	13:09	2.20	499.40	1.18	Southbound Platform 8. Some visible dust noted.
153196/63	RD	Static - Bakerloo Line	05.05.16	09:18	13:06	2.20	501.60	0.93	Northbound Platform 9. Some visible dust noted.
153196/64	RD	Static - Hammersmith & Circle Line	05.05.16	09:37	13:34	2.20	521.40	0.27	Eastbound Platform 5
153196/65	RD	Static - Jubilee Line	05.05.16	09:21	13:10	2.20	503.80	0.90	Southbound Platform 7. Some visible dust noted.
153196/66	RD	Static - Jubilee Line	05.05.16	09:14	13:05	2.20	508.20	0.98	Northbound Platform 10. Some visible dust noted.
153196/67	RD	Static - Ticket Hall	05.05.16	09:27	13:48	2.20	574.20	<0.02	Madame Tussaud's Exit
153196/68	RD	Static - Ticket Hall	05.05.16	09:32	13:38	2.20	Negative weight		Outside Station Supervisor Office
153196/69	RD	Static - Hammersmith & Circle Line	05.05.16	09:44	13:38	2.20	514.80	0.11	Westbound Platform 6
153196/70	RD	Static - Ticket Hall/ Gate Lines	05.05.16	13:26	16:34	2.20	413.60	0.20	No visible dust noted
153196/71	RD	Static -Metropolitan Line	05.05.16	13:24	16:33	2.20	415.80	0.12	Eastbound Platform 3 & 4
153196/72	RD	Static -Metropolitan Line	05.05.16	13:31	16:37	2.20	409.20	0.04	Westbound Platform 1 & 2

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**Table 12. Elephant and Castle Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/73	RD	Static - Northern Line	06.05.16	09:57	13:56	2.20	525.80	0.45	Southbound - Platform 2. Slight levels of dust visible on platforms around 13:00pm.
153196/74	RD	Static - Bakerloo Line	06.05.16	09:51	13:51	2.20	528.00	0.20	Northbound - Platform 4
153196/75	RD	Static - Bakerloo Ticket Hall	06.05.16	10:10	14:07	2.20	Filter damaged		Gate line
153196/76	RD	Static - Bakerloo Line	06.05.16	09:47	13:47	2.20	Filter damaged		Northbound - Platform 3
153196/77	RD	Static - Northern Line	06.05.16	10:14	14:12	2.20	523.60	0.03	Ticket Hall – Gate line
153196/78	RD	Static - Northern Line	06.05.16	10:01	13:59	2.20	523.60	0.69	Northbound - Platform 1. Slight levels of dust visible on platforms around 13:00pm.

\*Note: LU personnel refused to wear monitoring equipment. Only static monitoring could be carried out.

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Table 13. Euston Square Station

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/79	RD	Personal - LU79 Gate line personnel	09.05.16	10:40	13:40	2.20	396.00	0.20	Dust levels satisfactory within gate line area.
153196/80	RD	Static – Metropolitan, Hammersmith & City, Circle Lines	09.05.16	10:46	14:46	2.20	528.00	0.37	Westbound Platform 1 Dust levels visible – 12:45 – north tunnel particularly, but satisfactory by 14:30
153196/81	RD	Static – Metropolitan, Hammersmith & City, Circle Lines	09.05.16	10:50	14:50	2.20	528.00	0.46	Eastbound Platform 2
153196/82	RD	Static - Ticket Hall/ Gate Lines	09.05.16	11:00	15:00	2.20	Filter damaged		Warren Street Exit

Table 14. Hampsstead Station

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/83	RD	Static - Northern Line	10.05.16	10:05	14:05	2.20	528.00	0.27	Southbound Platform
153196/84	RD	Static - Northern Line -	10.05.16	10:14	14:14	2.20	528.00	0.84	Northbound Platform
153196/85	RD	Static - Ticket Hall/ Gate line	10.05.16	10:35	14:33	2.20	523.60	0.10	-

\*Note: LU personnel refused to wear monitoring equipment. Only static monitoring could be carried out.

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 15. King's Cross Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/87	RD	Static - Piccadilly Line	11.05.16	10:20	14:27	2.20	543.40	0.03	Westbound Platform 5
153196/88	RD	Static - Victoria Line	11.05.16	10:05	13:20	2.20	429.00	0.62	Northbound Platform 3
153196/89	RD	Static - Victoria Line	11.05.16	10:10	13:18	2.20	413.60	0.36	Southbound Platform 4
153196/90	RD	Static - Piccadilly Line	11.05.16	10:16	14:30	2.20	558.80	0.34	Eastbound Platform 6
153196/91	RD	Static - Northern Line	11.05.16	10:06	13:21	2.20	429.00	0.29	Northbound Platform 7
153196/92	RD	Static - Northern Line	11.05.16	10:14	14:22	2.20	545.60	0.57	Southbound Platform 8
153196/B94	RD	Static - Hammersmith & City, Circle, Metropolitan Lines	11.05.16	10:27	14:40	2.20	556.60	0.20	Eastbound Platform 2
153196/93	RD	Static - Hammersmith & City, Circle, Metropolitan Lines	11.05.16	10:36	14:37	2.20	Negative weight		Westbound Platform 1
153196/94	RD	Static - Main Gate Line	11.05.16	13:32	16:30	2.20	391.60	0.04	-
153196/95	RD	Static - Northern Line Gate/ Ticket Hall	11.05.16	13:40	16:37	2.20	389.40	0.07	-
153196/96	RD	Static - Western Gate Line	11.05.16	13:38	16:32	2.20	382.80	0.11	-



## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 16. Oxford Circus Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC DUST CONC <sup>a</sup> (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/97	RD	Static - Victoria Line	12.05.16	10:58	15:00	2.2	532.40	0.58	Southbound Platform 5 Slight levels of dust noted between 13:20 – 13:50 hours.
153196/98	RD	Static - Gate Line	12.05.16	11:22	15:22	2.2	Negative weight	0.13	By Station Supervisor Office Exits 1 - 4 Exits 5 - 8
153196/99	RD	Static - Gate Line	12.05.16	11:17	15:17	2.2			
153196/100	RD	Static - Bakerloo Line	12.05.16	10:49	14:54	2.2	539.00	0.64	Northbound Platform 4
153196/101	RD	Static - Central Line	12.05.16	11:05	15:07	2.2	532.40	0.09	Westbound Platform 1 Slight levels of dust noted on all platforms between 13:20 – 13:50 hours.
153196/102	RD	Static - Bakerloo Line	12.05.16	10:54	14:58	2.2	536.80	0.69	Southbound Platform 3
153196/103	RD	Static - Victoria Line	12.05.16	10:45	14:53	2.2	545.60	0.57	Northbound Platform 6
153196/104	RD	Static - Central Line	12.05.16	11:10	15:10	2.2	528.00	0.65	Eastbound Platform 2

\*Note: LU personnel refused to wear monitoring equipment. Only static monitoring could be carried out.

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 17. Archway Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/105	RD	Static - Station Gate Line	13.05.16	10:34	14:34	2.20	528.00	0.22	LU Gate line personnel inform 4RS staff of elevated dust levels in the early hours, prior to monitoring commencing.
153196/107	RD	Static - Northern Line	13.05.16	10:23	14:23	2.20	528.00	0.31	
153196/108	RD	Static - Northern Line	13.05.16	10:27	14:27	2.20	528.00	0.56	

**Table 18. Piccadilly Circus Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/109	RD	Static - Piccadilly Line	16.05.16	10:49	14:51	2.20	532.40	0.54	Eastbound Platform 3
153196/110	RD	Static - Piccadilly Line	16.05.16	10:53	14:54	2.20	530.20	0.71	Westbound Platform 4
153196/111	RD	Static - Bakerloo Line	16.05.16	10:43	14:48	2.20	539.00	0.86	Southbound Platform 2
153196/112	RD	Static - Bakerloo Line	16.05.16	10:37	14:46	2.20	547.80	1.01	Northbound Platform 1
153196/113	RD	Static - Main Gate Line	16.05.16	10:57	14:58	2.20	530.20	0.58	-

No visible dust levels noted at the beginning of the sampling period. Slight levels of dust noted around 13:30 hours.

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 19. Tottenham Court Road Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/114	RD	Static - Central Line	17.05.16	10:12	14:13	2.20	530.20	1.15	Eastbound Platform 2 Westbound Platform 1 Northbound Platform 3 Southbound Platform 4 Slight levels of dust visible around 13:10 hours.
153196/115	RD	Static - Central Line	17.05.16	10:19	14:19	2.20	528.00	1.30	
153196/116	RD	Static - Northern Line	17.05.16	10:28	14:28	2.20	528.00	0.79	
153196/117	RD	Static - Northern Line	17.05.16	10:35	14:35	2.20	528.00	1.12	
153196/118	RD	Static - Northern & Central Gate Lines	17.05.16	10:43	14:43	2.20	528.00	0.10	-

\*Note: LU personnel refused to wear monitoring equipment. Only static monitoring could be carried out.

**Table 20. Vauxhall Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/119	RD	Static - Victoria Line	18.05.16	10:23	14:34	2.2	552.2	0.57	Northbound Platform 1 Southbound Platform 2 No visible dust noted throughout the sampling period.
153196/120	RD	Static - Victoria Line	18.05.16	10:31	14:31	2.2	528	0.77	
153196/121	RD	Static - Ticket Hall/ Gate Line	18.05.16	10:41	14:41	2.2	528	0.08	No visible dust noted throughout the sampling period.

\*Note: LU personnel refused to wear monitoring equipment. Only static monitoring could be carried out.

## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 21. Waterloo Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
153196/122	RD	Static - Gate Line – Northern & Bakerloo Lines	19.05.16	09:57	13:15	2.2	435.6	0.42	-
153196/123	RD	Static – Jubilee Line	19.05.16	10:10	14:10	2.2	528	1.02	Eastbound Platform 6
153196/124	RD	Static – Jubilee Line	19.05.16	10:15	14:15	2.2	528	0.86	Westbound Platform 5
153196/125	RD	Static – Bakerloo Line	19.05.16	10:06	13:25	2.2	437.8	0.98	Northbound Platform 3
153196/126	RD	Static – Bakerloo Line	19.05.16	10:13	14:22	2.2	547.8	1.19	Southbound Platform 4
153196/127	RD	Static – Northern Line	19.05.16	10:19	14:26	2.2	543.4	1.08	Southbound Platform 2
153196/128	RD	Static – Northern Line	19.05.16	10:24	14:29	2.2	539	1.02	Northbound Platform 1
153196/129	RD	Gate Line – Jubilee Line	19.05.16	10:40	14:40	2.2	528	0.06	-
153196/130	RD	Static - Waterloo & City Line	19.05.16	13:20	16:20	2.2	396	0.06	Platform Head Wall
153196/B109	RD	Static - Waterloo & City Line	19.05.16	13:35	16:30	2.2	385	0.36	Platform End Wall

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 22. Paddington Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/131	RD	Static – District & Circle Lines	20/05/16	12:05	16:05	2.2	528	0.08	Westbound Platform 1 No visible dust noted on the platforms as they are located in an open air section.
153196/132	RD	Static – District & Circle Lines	20/05/16	12:11	16:11	2.2	528	0.01	Eastbound Platform 2
153196/133	RD	Static – District & Circle Gate Line	20/05/16	12:15	16:15	2.2	528	0.10	No visible dust noted.
153196/134	RD	Static – Bakerloo & National RAIL Gate Line	20/05/16	12:22	16:22	2.2	528	0.12	Bakerloo Line trains not running at the time of sampling

## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 23. Train Operator Respirable Crystalline Silica Monitoring**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION – PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	CRYSTALLINE SILICA (mg/filter)	CRYSTALLINE SILICA (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/04	RD	District Line Train Operators Driving Trains	22/03/16	726	< 0.01	<0.02	Train 001 - Uppminster → Richmond. Richmond → Barking → Uppminster Train 004 - Uppminster → Richmond → Victoria
153196/11	RD	Jubilee Line Train Operator Driving Trains	25/03/16	624.8	< 0.01	<0.02	Train 331 - Stratford → Wembley Park → Stratford → Wembley Park. Train 307 → Wembley Park → Stanmore → Stratford. Train 321 - Stratford → Stanmore
153196/17	RD	Piccadilly Line Train Operator Driving Trains	30/03/16	631.4	0.01	0.016	Train 227 - Acton Town → Uxbridge - Cockfosters → Heathrow T 1,2,3 & 5 (Northfields Stop). Duty change 537 - Train 316 Northfields → Heathrow T1,2,3 & 4 → Cockfosters (Earl's Court Stop)
153196/23	RD	Victoria Line Train Operators Driving Trains	04/04/16	609.4	< 0.01	<0.02	Train 214 - Brixton → Seven Sisters Sidings → Brixton. Train 222 Brixton → Walthamstow Central. Train 242 - Walthamstow Central → Brixton. Train 233 Brixton → Seven Sisters → Brixton. Train 214 Brixton → Walthamstow → Brixton (Green Park Stop)
153196/29	RD	Bakerloo Line Train Operators Driving Trains	07/04/16	675.4	< 0.01	<0.02	Train 224 Queens Park → Elephant & Castle. Train 237 Harrow & Wealdstone → Elephant & Castle. Duty 18. Train 235 - Elephant & Castle - Harrow & Wealdstone - Queens Park. Duty 121. Train 214 - Queens Park - Elephant & Castle. Train 221 to Stonebridge Park.
153196/33	RD	Central Line Train Operator Driving Trains	12/04/16	798.6	0.01	0.013	Train 067 - Hainault → Ealing Broadway via Woodford → Hainault → White City Train 062 → Hainault → Newbury Park → Hainault → White City
153196/41	RD	Northern Line Train Operator Driving Trains	15/04/16	633.6	0.01	0.016	Train 107 - High Barnet → Kennington via Charing Cross → High Barnet → Morden via Bank. Train 117 - Morden → High Barnet via Bank → Waterloo.
153196	RD	Hammersmith & City Line Train Operator Driving Trains	20/04/16	573	< 0.01	<0.02	Train 211 to Edgware Road via King's Cross → Hammersmith via Victoria → Edgware Road via King's cross. Train 277 Edgware Road - Hammersmith → Edgware Road

Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Appendix 3

Table 23. Train Operator Respirable Crystalline Silica Monitoring

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION – PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	CRYSTALLINE SILICA (mg/filter)	CRYSTALLINE SILICA (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/04	RD	District Line Train Operators Driving Trains	22/03/16	726	< 0.01	<0.02	Train 001 - Uppminster → Richmond. Richmond → Barking → Uppminster Train 004 - Uppminster → Richmond → Victoria
153196/11	RD	Jubilee Line Train Operator Driving Trains	25/03/16	624.8	< 0.01	<0.02	Train 331 - Stratford → Wembley Park → Stratford → Wembley Park. Train 307 → Wembley Park → Stanmore → Stratford. Train 321 - Stratford → Stanmore
153196/17	RD	Piccadilly Line Train Operator Driving Trains	30/03/16	631.4	0.01	0.016	Train 227 - Acton Town → Uxbridge - Cockfosters → Heathrow T 1,2,3 & 5 (Northfields Stop). Duty change 537 - Train 316 Northfields → Heathrow T1,2,3 & 4 → Cockfosters (Earl's Court Stop)
153196/23	RD	Victoria Line Train Operators Driving Trains	04/04/16	609.4	< 0.01	<0.02	Train 214 - Brixton → Seven Sisters Sidings → Brixton. Train 222 Brixton → Walthamstow Central. Train 242 - Walthamstow Central → Brixton. Train 233 Brixton → Seven Sisters → Brixton. Train 214 Brixton → Walthamstow → Brixton (Green Park Stop)
153196/29	RD	Bakerloo Line Train Operators Driving Trains	07/04/16	675.4	< 0.01	<0.02	Train 224 Queens Park → Elephant & Castle. Train 237 Harrow& Wealdstone → Elephant & Castle. Duty 18; Train 235 - Elephant & Castle - Harrow & Wealdstone - Queens Park. Duty 121; Train 214 - Queens Park - Elephant & Castle. Train 221 to Stonebridge Park.
153196/33	RD	Central Line Train Operator Driving Trains	12/04/16	798.6	0.01	0.013	Train 067 - Hainault → Ealing Broadway via Woodford → Hainault → White City Train 062 → Hainault → Newbury Park → Hainault → White City
153196/41	RD	Northern Line Train Operator Driving Trains	15/04/16	633.6	0.01	0.016	Train 107 - High Barnet → Kennington via Charring Cross → High Barnet → Morden via Bank. Train 117 - Morden → High Barnet via Bank → Waterloo.
153196	RD	Hammersmith & City Line Train Operator Driving Trains	20/04/16	573	< 0.01	<0.02	Train 211 to Edgware Road via King's Cross → Hammersmith via Victoria → Edgware Road via King's cross. Train 277 Edgware Road - Hammersmith → Edgware Road

## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 24. Train Operator PM 2.5 Iron and Zinc Monitoring**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION - PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	IRON (mg/liter)	ZINC (mg/liter)	IRON CONC. (mg/m <sup>3</sup> )	ZINC CONC. (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/139	PM 2.5	District Line Train Operators Driving Trains	08/09/16	863.5	0.02	Rejected sample*	0.02	-	Train 077 - Earls Court → Wimbledon → Edgware Road → Wimbledon Change trains - Train 056- at Earls Court → Wimbledon → Tower Hill (Westminster stop)
153196/12	PM 2.5	Jubilee Line Train Operator Driving Trains	28/03/16	738.5	0.026	Rejected sample*	0.035	-	Train 331 - Wembley Park → Stratford → Wembley Park → North Greenwich → Stanmore → Stratford (Waterloo Stop)
153196/18	PM 2.5	Piccadilly Line Train Operator Driving Trains	31/03/16	1309	0.437	0.125	0.334	0.095	Train 241 - Acton Town → Rayners Lane → Wood Green → Acton Town. Train 227 (Duly 528) - Acton Town → Heathrow T5 → Cockfosters → Acton Town.
153196/24	PM 2.5	Victoria Line Train Operators Driving Trains	05/04/16	661.5	0.124	Rejected sample*	0.19	-	Train 224 - Brixton → Northumberland Park Depot. Train 227 to Brixton - Change train 210 to Walthamstow. Train 236 Seven Sisters → Walthamstow → Brixton → Walthamstow → Brixton → Green Park
153196/30	PM 2.5	Bakerloo Line Train Operators Driving Trains	08/04/16	1109.5	0.363	0.088	0.327	0.08	Train 205 - Queen's Park → Elephant & Castle. Train 247 - Harrow & Wealdstone → Elephant & Castle → Queen's Park. Train 233 - Elephant & Castle → Queen's Park → (Train 236) Elephant & Castle → (Train 206) Stonebridge Park.
153196/34	PM 2.5	Central Line Train Operator Driving Trains	13/04/16	684.2	0.2	Rejected sample*	0.29	-	Train 067 - Hainault → Ealing Broadway → Hainault via Newbury Park → White City
153196/42	PM 2.5	Northern Line Train Operator Driving Trains	18/04/16	945	0.210	0.027	0.22	0.03	Train 105 - High Barnet → Kennington via Charring Cross → High Barnet → Morden via Bark. Train 115 - Morden → High Barnet via Bark → Kennington via Charring Cross
153196/48	PM 2.5	Hammersmith & City Line Train Operator Driving Trains	21/04/16	374	0.017**	Rejected sample*	0.04**	-	Train 211 to Edgware Road (Circle Line) via Victoria. Edgware Road → Hammersmith via Victoria → Edgware Road → Liverpool Street

\*Sample was rejected, due to negative weight obtained when correcting for field blank, meaning minimal metal deposition  
 \*\* Results are indicative due to incomplete monitoring session; assigned driver requested at Barking station.



## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 25. Train Operator PM 2.5 Chromium and Copper Monitoring**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION – PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	CHROMIUM (mg/filter)	COPPER (mg/filter)	CHROMIUM CONC. (mg/m <sup>3</sup> )	COPPER CONC. (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/139	PM 2.5	District Line Train Operators Driving Trains	08/09/16	863.5	<0.001	<0.001	<0.001	<0.001	Train 077 – Earls Court → Wimbledon → Edgware Road → Wimbledon Change trains - Train 056- at Earls Court → Wimbledon → Tower Hill (Westminster stop)
153196/12	PM 2.5	Jubilee Line Train Operator Driving Trains	28/03/16	738.5	<0.001	<0.001	<0.001	<0.001	Train 331 - Wembley Park → Stratford → Wembley Park → North Greenwich → Stanmore → Stratford (Waterloo Stop)
153196/18	PM 2.5	Piccadilly Line Train Operator Driving Trains	31/03/16	1309	<0.001	<0.001	<0.001	<0.001	Train 241 - Acton Town → Rayners Lane → Wood Green → Acton Town. Train 227 (Duly 528) - Acton Town → Heathrow T5 → Cockfosters → Acton Town.
153196/24	PM 2.5	Victoria Line Train Operators Driving Trains	05/04/16	661.5	<0.001	<0.001	<0.001	<0.001	Train 224 - Brixton → Northumberland Park Depot. Train 227 to Brixton - Change train 210 to Walthamstow. Train 236 Seven Sisters → Walthamstow → Brixton → Walthamstow → Brixton → Green Park
153196/30	PM 2.5	Bakerloo Line Train Operators Driving Trains	08/04/16	1109.5	<0.001	<0.001	<0.001	<0.001	Train 205 - Queen's Park → Elephant & Castle. Train 247 - Harrow & Wealdstone → Elephant & Castle → Queen's Park. Train 233 - Elephant & Castle → Queen's Park → (Train 236) Elephant & Castle → (Train 206) Stonebridge Park.
153196/34	PM 2.5	Central Line Train Operator Driving Trains	13/04/16	684.2	<0.001	<0.001	<0.001	<0.001	Train 067 - Hainault → Ealing Broadway → Hainault via Newbury Park → White City
153196/42	PM 2.5	Northern Line Train Operator Driving Trains	18/04/16	945	<0.001	<0.001	<0.001	<0.001	Train 105 - High Barnet → Kennington via Charring Cross → High Barnet → Morden via Bank. Train 115 - Morden → High Barnet via Bank → Kennington via Charring Cross
153196/48	PM 2.5	HammerSmith & City Line Train Operator Driving Trains	21/04/16	374	<0.001	<0.001	0.001	<0.001	Train 211 to Edgware Road (Circle Line) via Victoria. Edgware Road → HammerSmith via Victoria → Edgware Road → Liverpool Street

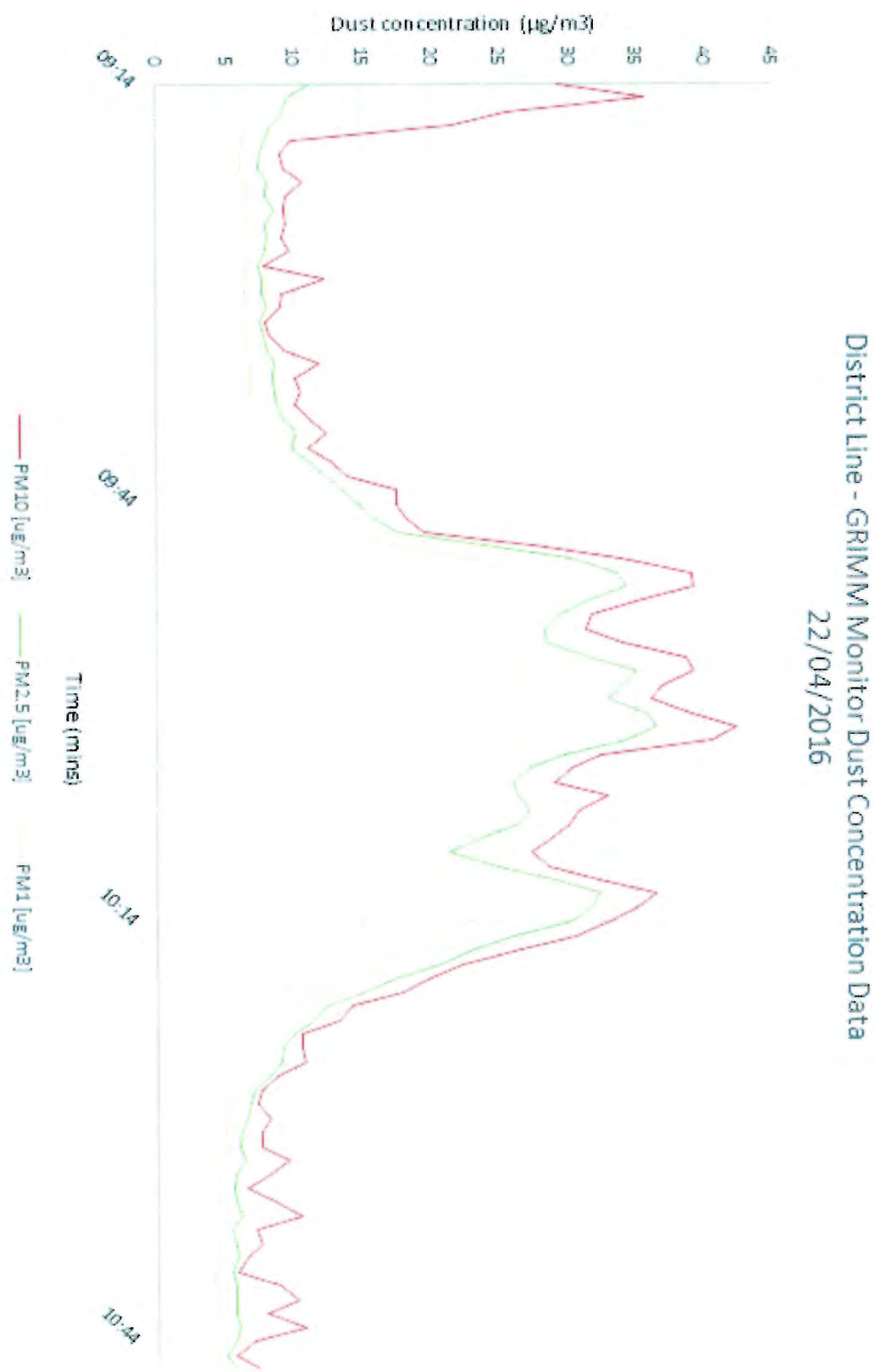
## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 26. Train Operator PM 2.5 Nickel and Manganese Monitoring**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION – PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	NICKEL (mg/filter)	MANGANESE (mg/filter)	NICKEL CONC. (mg/m <sup>3</sup> )	MANGANES E CONC. (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
153196/139	PM 2.5	District Line Train Operators Driving Trains	08/09/16	863.5	Rejected sample*	<0.001	-	<0.001	Train 077 – Earls Court → Wimbledon → Edgware Road → Wimbledon Change trains - Train 056- at Earls Court → Wimbledon → Tower Hill (Westminster stop)
153196/12	PM 2.5	Jubilee Line Train Operator Driving Trains	28/03/16	738.5	<0.001	<0.001	<0.001	<0.001	Train 331 - Wembley Park → Stratford → Wembley Park → North Greenwich → Stanmore → Stratford (Waterloo Stop)
153196/18	PM 2.5	Piccadilly Line Train Operator Driving Trains	31/03/16	1309	<0.001	0.005	<0.001	0.004	Train 241 - Acton Town → Rayners Lane → Wood Green → Acton Town. Train 227 (Duty 528) - Acton Town → Heathrow T5 → Cockfosters → Acton Town.
153196/24	PM 2.5	Victoria Line Train Operators Driving Trains	05/04/16	661.5	<0.001	0.005	<0.001	0.007	Train 224 - Brixton → Northumberland Park Depot. Train 227 to Brixton - Change train 210 to Walthamstow. Train 236 Seven Sisters → Walthamstow → Brixton → Walthamstow → Brixton → Green Park
153196/30	PM 2.5	Bakerloo Line Train Operators Driving Trains	08/04/16	1109.5	<0.001	0.004	<0.001	0.004	Train 205 - Queen's Park → Elephant & Castle. Train 247 - Harrow & Wealdstone → Elephant & Castle → Queen's Park. Train 233 - Elephant & Castle → Queen's Park → (Train 236) Elephant & Castle → (Train 206) Stonebridge Park.
153196/34	PM 2.5	Central Line Train Operator Driving Trains	13/04/16	684.2	<0.001	0.002	<0.001	0.002	Train 067 - Hainault → Ealing Broadway → Hainault via Newbury Park → White City
153196/42	PM 2.5	Northern Line Train Operator Driving Trains	18/04/16	945	<0.001	0.002	<0.001	0.002	Train 105 - High Barnet → Kennington via Charring Cross → High Barnet → Morden via Bank. Train 115 - Morden → High Barnet via Bank → Kennington via Charring Cross
153196/48	PM 2.5	Hammersmith & City Line Train Operator Driving Trains	21/04/16	374	<0.001**	<0.001**	<0.001**	<0.001**	Train 211 to Edgware Road (Circle Line) via Victoria. Edgware Road → Hammersmith via Victoria → Edgware Road → Liverpool Street

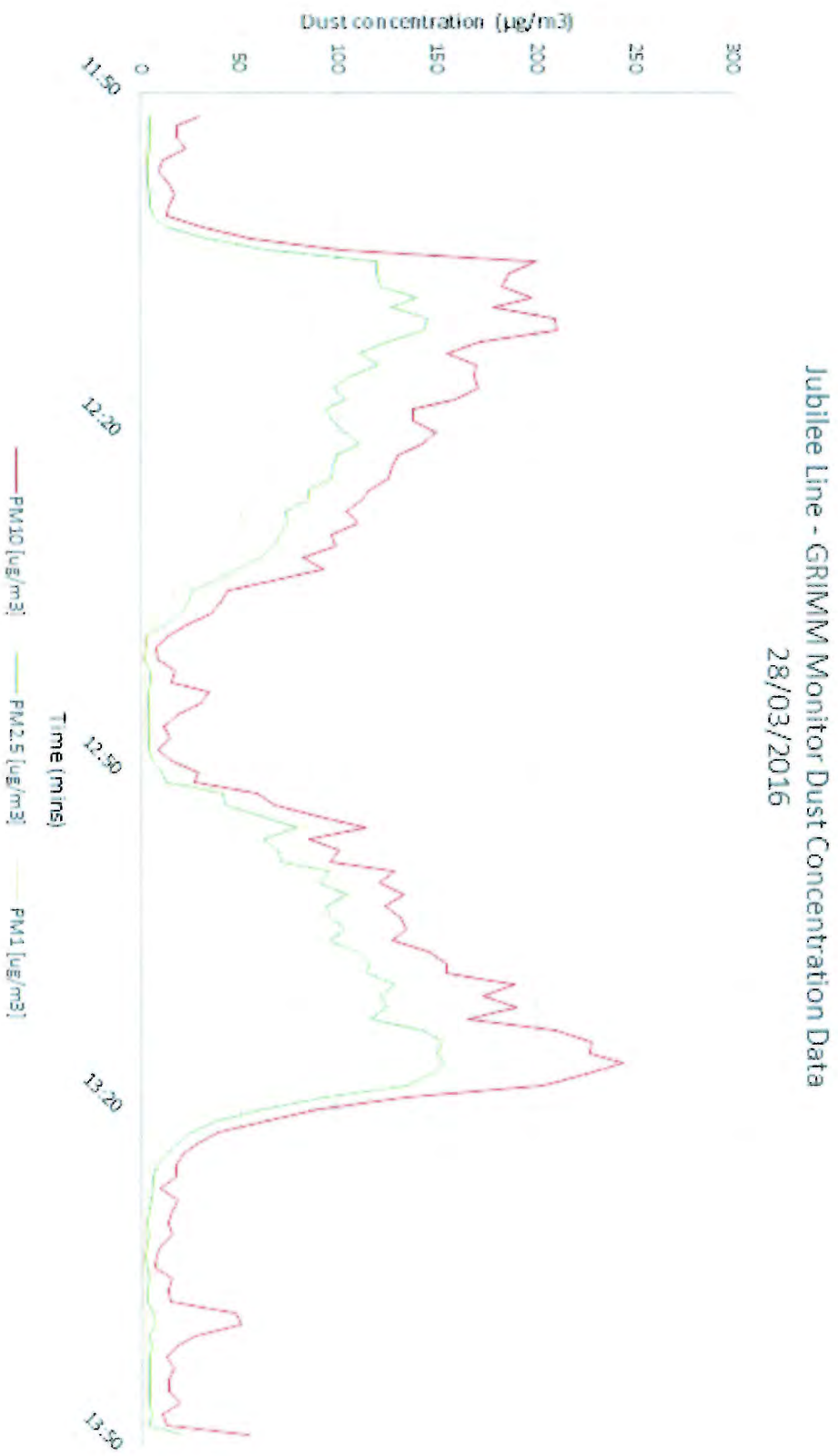
\*Sample was rejected, due to negative weight obtained when correcting for field blank, meaning minimal metal deposition  
 \*\* Results are indicative due to incomplete monitoring session; assigned driver requested at Barking station.

Figure 1. GRIMM monitor dust concentration data at the District line on the 22<sup>nd</sup> April 2016.



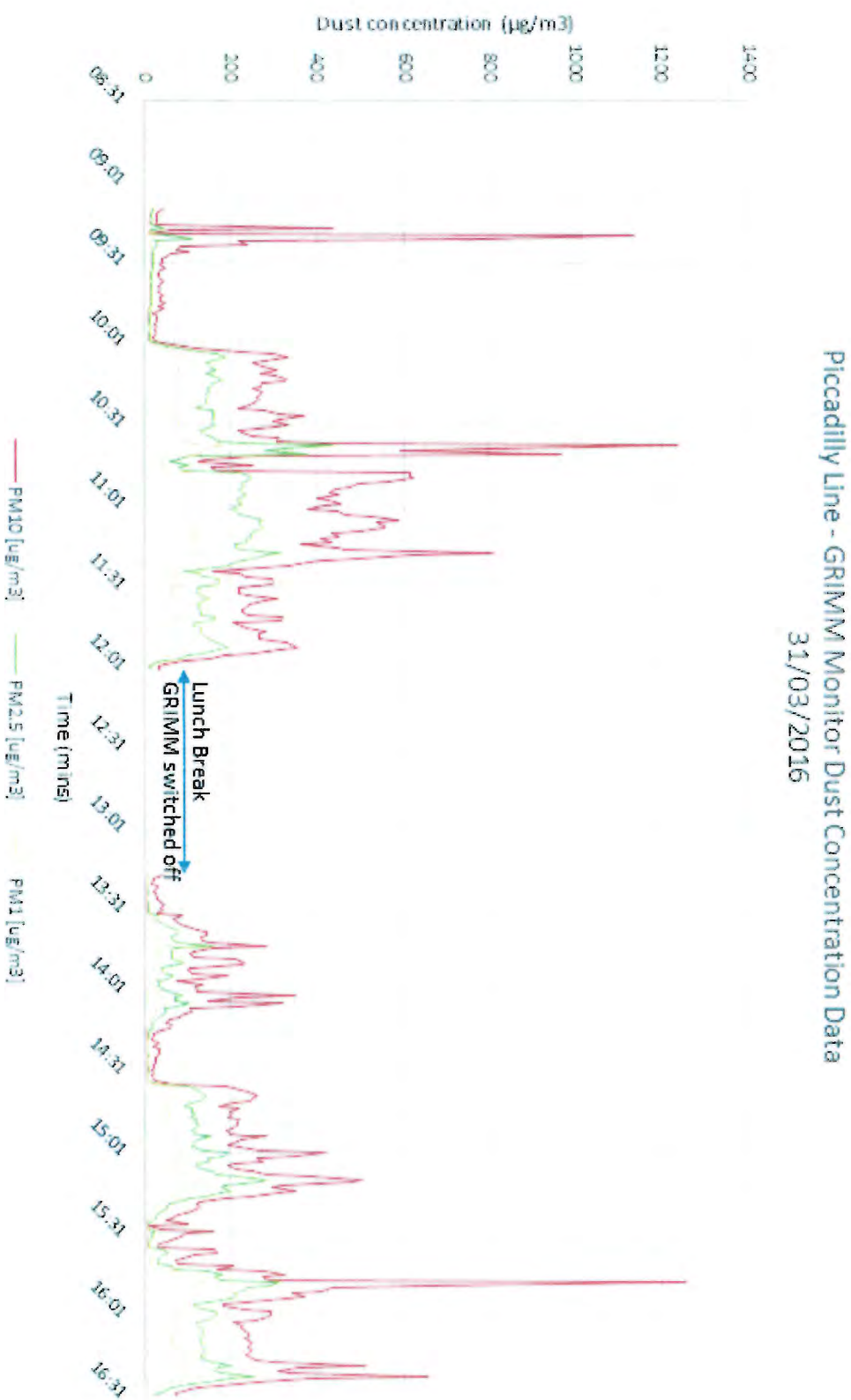
**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Figure 2. GRIMM monitor dust concentration data at the Jubilee line on the 28<sup>th</sup> March 2016.**



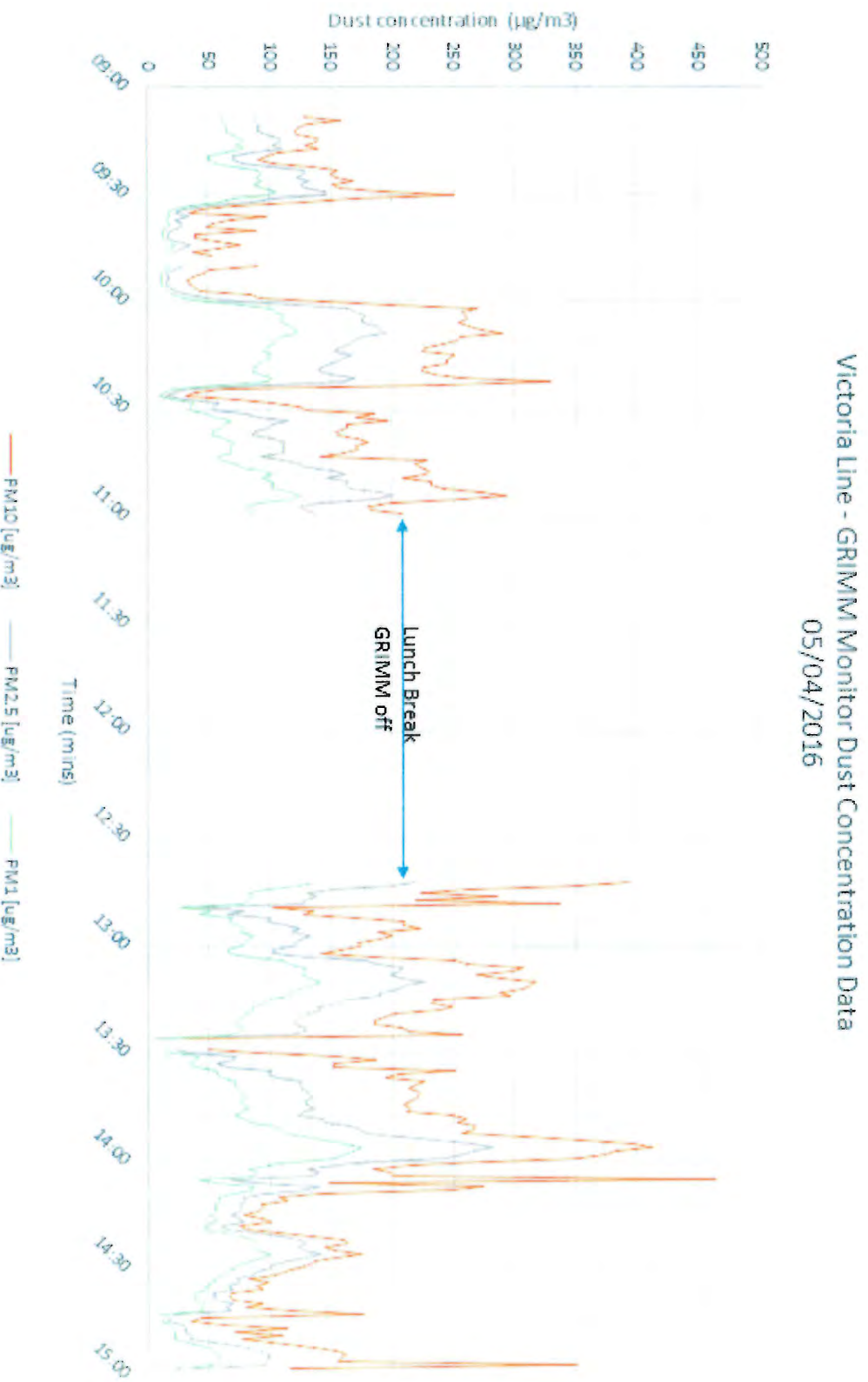
**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Figure 3. GRIMM monitor dust concentration data at the Piccadilly line on the 31<sup>st</sup> March 2016.**



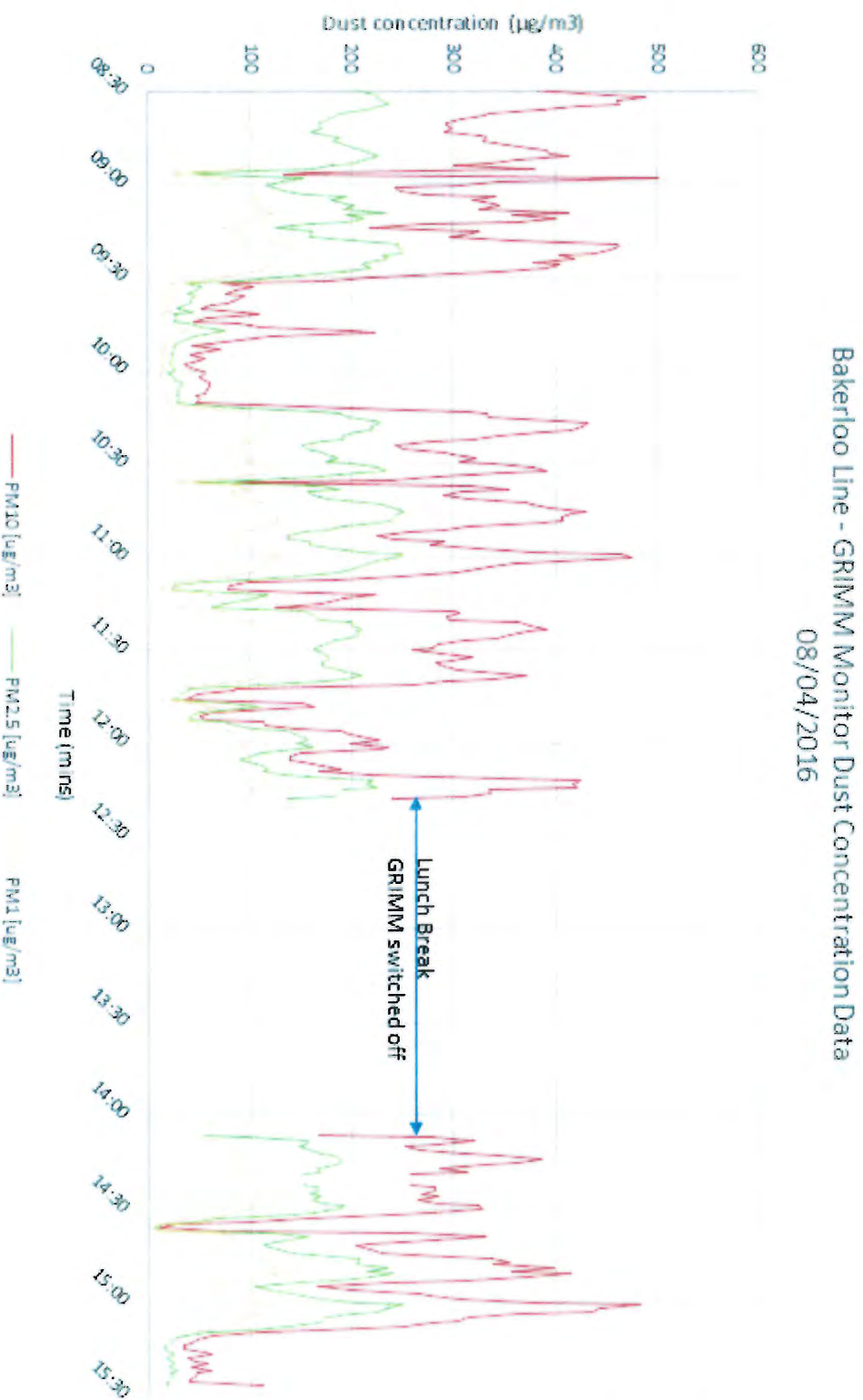
**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Figure 4. GRIMM monitor dust concentration data at the Victoria line on the 5<sup>th</sup> April 2016.**



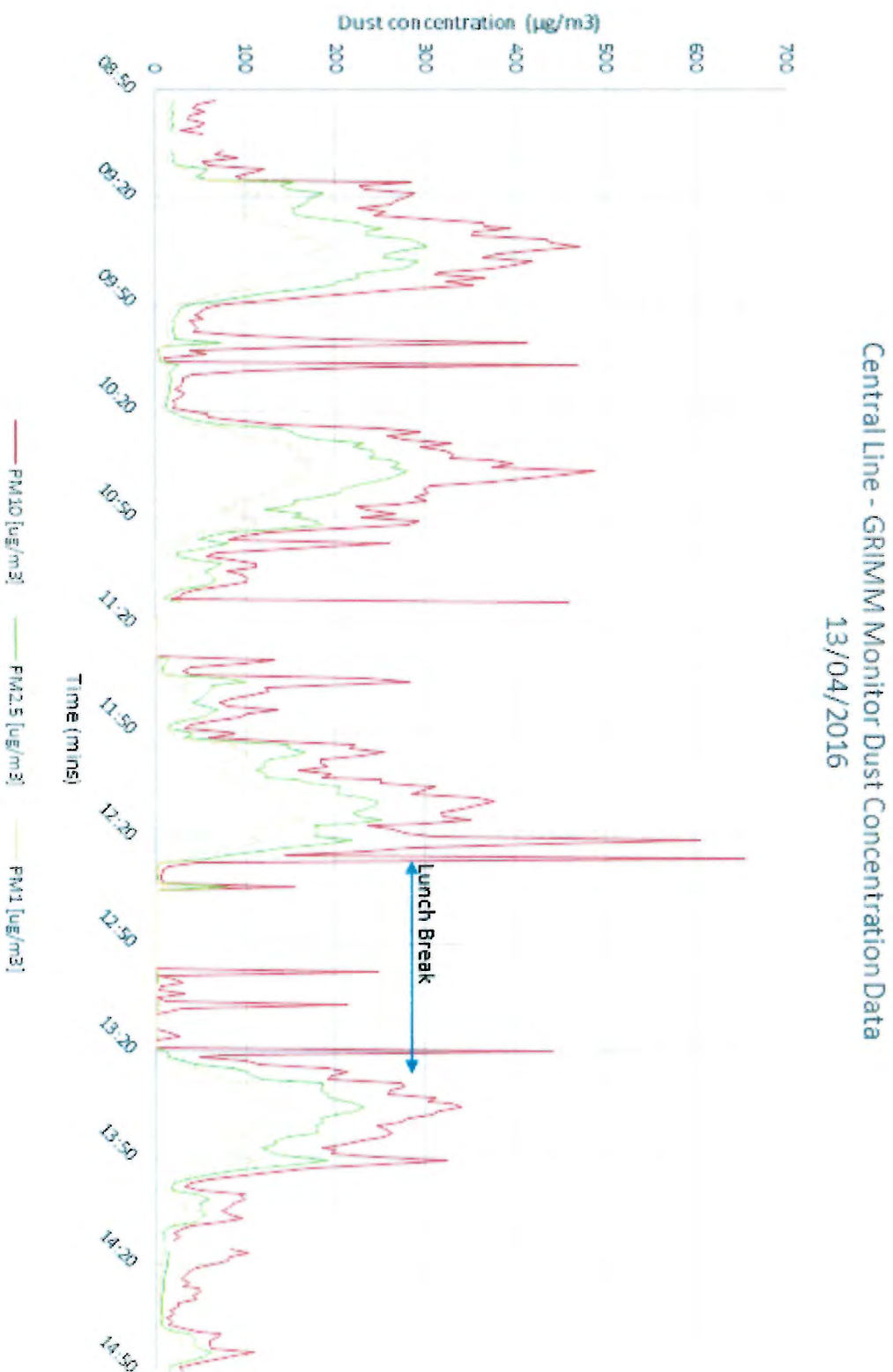
**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Figure 5. GRIMM monitor dust concentration data at the Bakerloo line on the 8<sup>th</sup> April 2016.**



**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

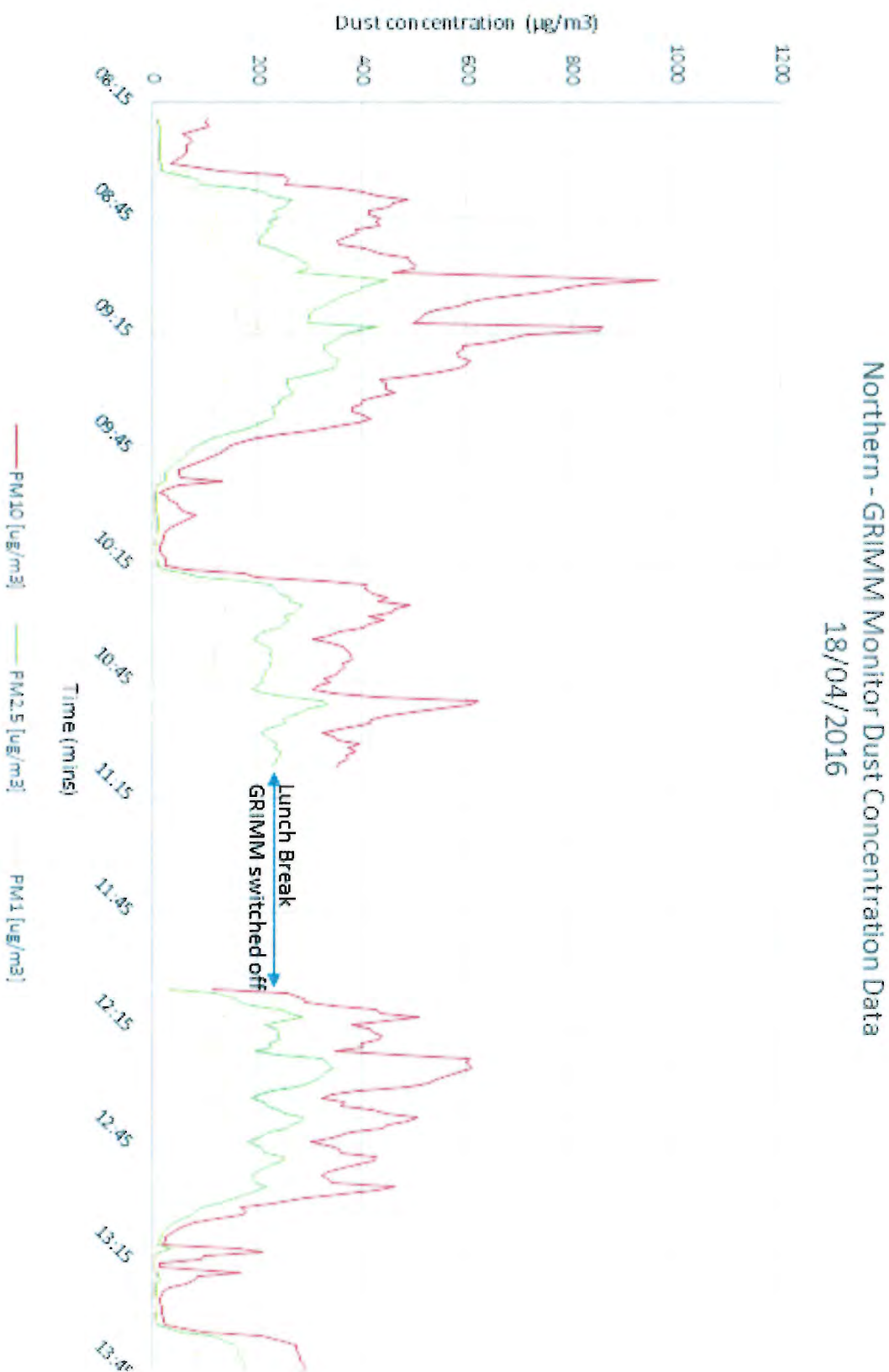
**Figure 6. GRIMM monitor dust concentration data at the Central line on the 13<sup>th</sup> April 2016.**

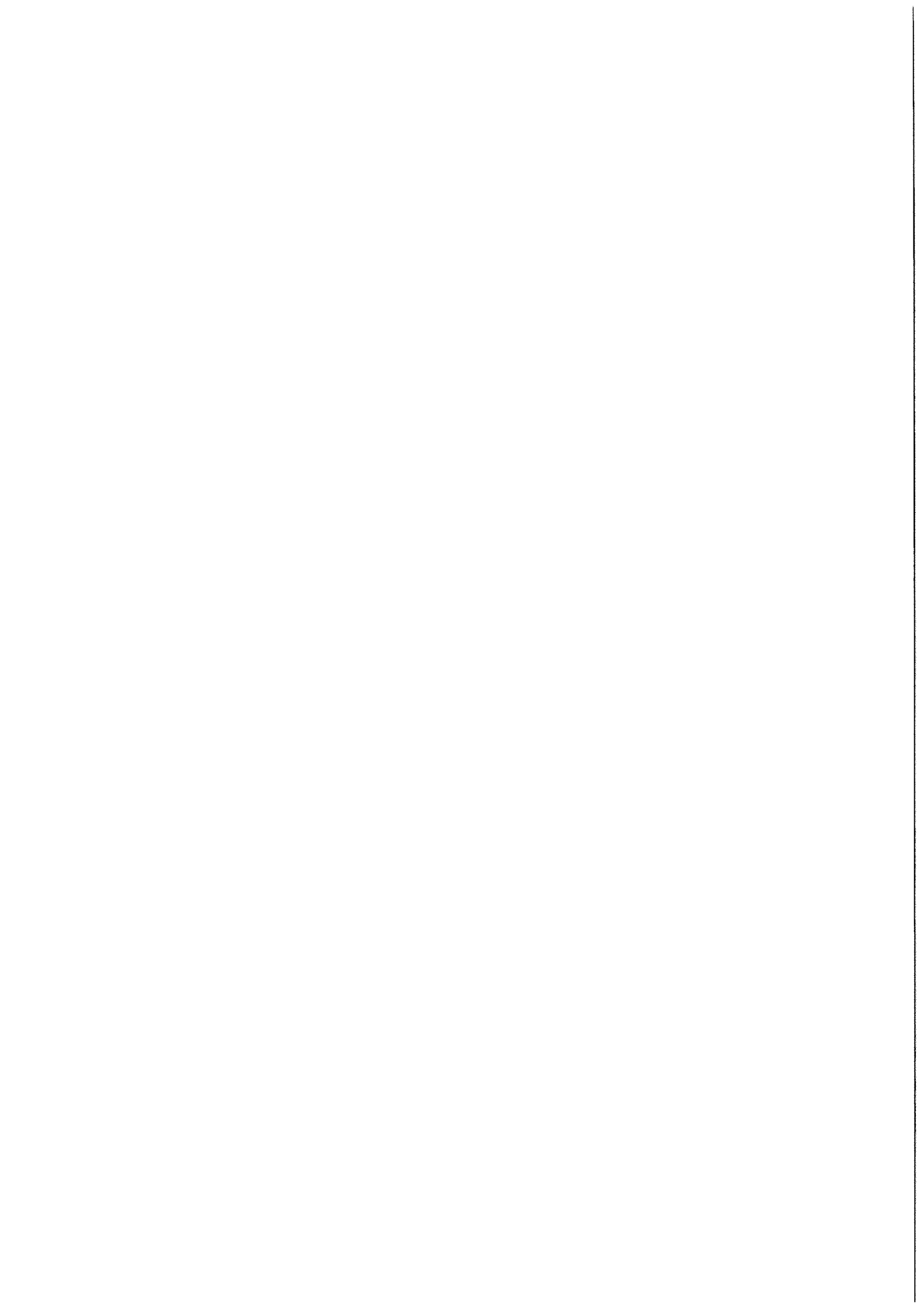




**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

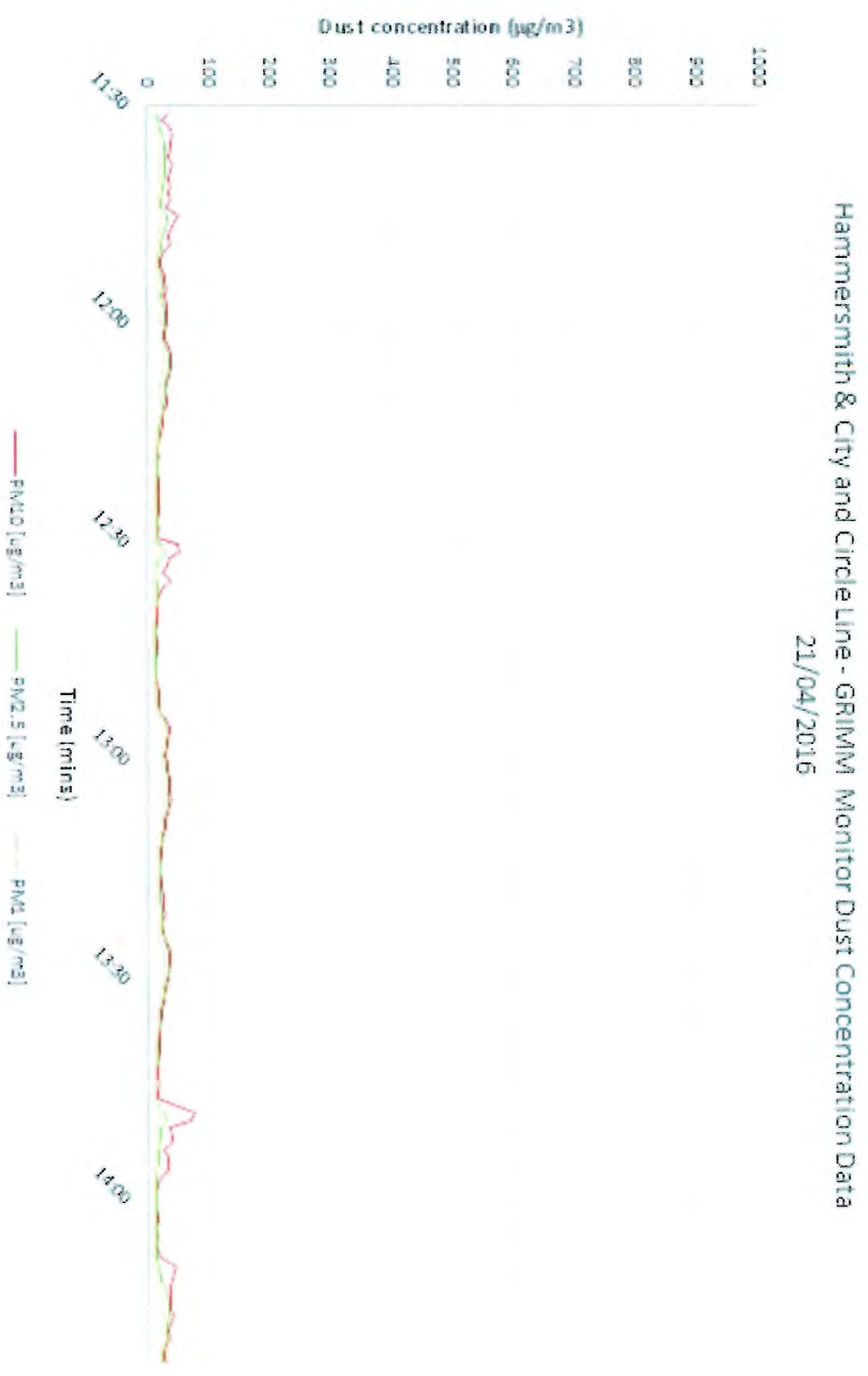
**Figure 7. GRIMM monitor dust concentration data at the Northern line on the 18<sup>th</sup> April 2016.**

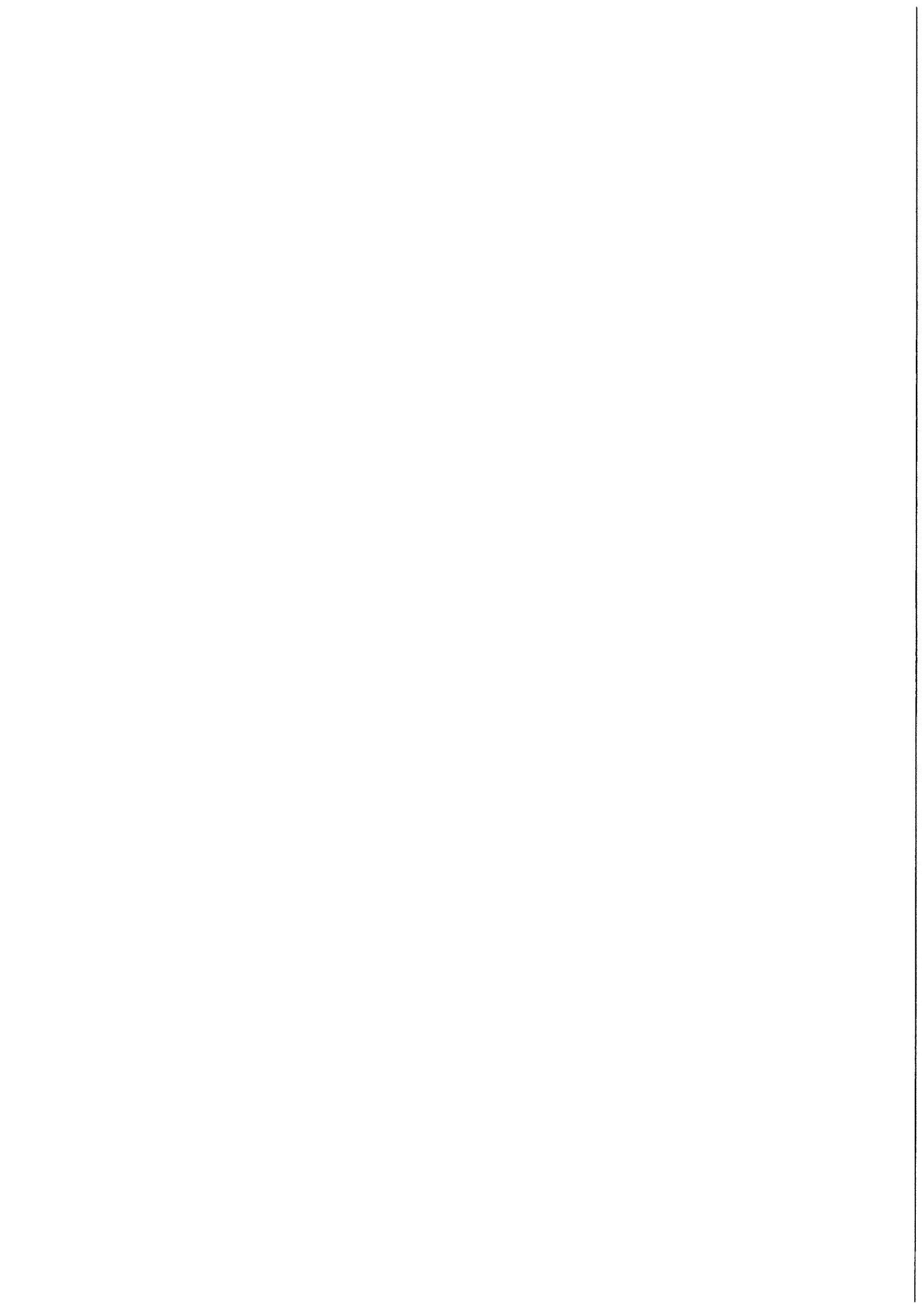




**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Figure 8. GRIMM monitor dust concentration data at the Hammersmith & City and Circle Line on the 21<sup>st</sup> April 2016.**





Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Appendix 4

Table 1: 4-Rail Analyst simulating LUL Passenger Journeys

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>a</sup> (mg/m <sup>3</sup> )	ROUTE COVERED
140792/135	RD	4RS135 - 4-Rail Analyst, Bakerloo Line	28/01/15	13:50	17:30	2.2	484	0.55	Baker Street → Elephant & Castle → Kensal Green → Elephant & Castle → Queen's Park → Elephant & Castle → Queen's park → Elephant & Castle → Waterloo
140792/03	RD	4RS03 - 4-Rail Analyst, Central Line	10/11/14	09:20	13:20	2.2	528	0.07	Epping → West Ruislip → Bethnal Green → Hanger Lane → Bethnal Green → Oxford Circus
140792/134	RD	4RS134 - 4-Rail Analyst, Circle Line	27/01/15	13:30	17:55	2.2	583	0.04	Baker Street → (via Paddington) Edgware Road → (via Victoria) Edgware Road → (via King's Cross) Edgware Road → (via Paddington) Victoria
140792/136	RD	4RS136 - 4-Rail Analyst, District Line	03/02/15	14:50	19:10	2.2	561.06	0.04	Victoria → Richmond → Turnham Green → Ealing Broadway → Earl's Court → Wimbledon → Earl's Court → Richmond → Turnham Green → Ealing Broadway → Earl's Court
140792/132	RD	4RS132 - 4-Rail Analyst, Jubilee Line	21/01/15	13:40	17:45	2.2	527.33	0.60	Neasden → Canning Town → Finchley Road → Canning Town → Finchley Road → Stratford → London Bridge
140792/133	RD	4RS133 - 4-Rail Analyst, Northern Line	23/01/15	13:30	17:30	2.2	528	0.32	King's Cross → South Wimbledon → Highgate → Kennington (via Charing Cross) → Edgware (via Charing Cross) → Hampstead → Morden (via Bank) → High Barnet (via Bank) → London Bridge
140792/131	RD	4RS131 - 4-Rail Analyst, Piccadilly Line	20/01/15	09:47	13:47	2.2	528	0.10	King's Cross → Amos Grove → Barons Court → Amos Grove → Green park
140792/130	RD	4RS130 - 4-Rail Analyst, Victoria Line	19/01/15	13:21	17:21	2.2	528	0.08	Green Park → Walthamstow Central → Brixton → Walthamstow Central → Brixton → Walthamstow Central → Brixton → Walthamstow central → Green Park

## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 2: Bakerloo Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	ROUTE COVERED
140792/14	RD	LUL14 TO - Driver	13/11/14	09:15	11:43	2.2	466.4	0.51	Queens Park → Elephant & Castle → Queens Park → Elephant & Castle → Queens Park
				12:26	13:30	2.2			

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	ROUTE COVERED
140792/11	RD	LUL11 TO - Driver	17/11/14	09:11	14:36	2.2	715	0.41	Queens Park → Elephant & Castle → Queens Park → Elephant & Castle → Queens Park * Queens Park → Harrow & Wealdstone → Elephant & Castle → Queens Park

\*Change of train at Queen's park and short break but pumps were not disconnected.

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	ROUTE COVERED
140792/10F	PM 2.5	LUL10F TO - Driver	18/11/14	07:30	10:12	3.5	567	0.26	Queens Park → Elephant & Castle → Stonebridge Park → Elephant & Castle → Queens Park

\*Short monitoring time due to a signal failure on this line.

## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 3: Central Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	ROUTE COVERED*
140792/01	RD	LUL01 TO - Driver	10/11/14	08:16	10:30	2.2	316.8	0.45	White City → Epping → West Ruislip White City → Northolt → Loughton → Northolt → White City
				12:50	13:00				

\* Pump was disconnected at West Ruislip for lunch break and then re-commenced from White City.

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	ROUTE COVERED
140792/6	RD	LUL6 TO - Driver	11/11/14	08:46	11:02	2.2	776.6	0.23	White City → Loughton → West Ruislip West Ruislip → Epping → West Ruislip → White City
				12:41	16:18				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC* (MG/M <sup>3</sup> )	ROUTE COVERED
140792/8	PM 2.5	LUL8 TO - Driver	12/11/14	10:10	12:40	3.5	525	0.23	White City → Hainault → Ealing Broadway → White City

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 4: Circle and Hammersmith & City Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/45	PM 2.5	LUL45 TO - Driver	10/12/14	10:52	14:40	3.5	798	0.08	Edgware Road (via King's Cross) → Edgware Road (via Paddington) → Hammersmith (via King's Cross) → Edgware Road (via Victoria) → Hammersmith

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/50	RD	LUL50 TO - Driver	11/12/14	08:36	11:30	2.2	558.8	0.07	Hammersmith (via King's Cross) → Edgware Road (via King's Cross) → Edgware Road (via Paddington) → Hammersmith
				11:45	13:05	2.2			

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/47	RD	LUL47 TO - Driver	12/12/14	08:10	09:55	2.2	671	0.04	Hammersmith (via King's Cross) → Moorgate (via King's Cross) → Edgware Road (via King's Cross) → Edgware Road (via Paddington) → Hammersmith (via King's Cross) → Edgware Road (via King's Cross) → Paddington (via White City) → Hammersmith (via Paddington) → Edgware Road
				11:05	14:25	2.2			



Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Table 5: District Line Train Operators

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/34	PM 2.5	LUL34 TO - Driver	27/11/14	09:21	13:00	3.5	766.5	0.09	Action Town → Upminster → Ealing Broadway → Earl's Court

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/30	RD	LUL30 TO - Driver	01/12/14	09:15	11:45	2.2	671	0.28*	Action Town → Dagenham East → Earl's Court → Upminster → Action Town
				12:55	15:30	2.2			

\* This result is possibly indicative because the dust pattern on the filter suggests that the filter has moved within the sampling head.

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/33	RD	LUL33 TO - Driver	02/12/14	08:33	11:21	2.2	605	0.15	Action Town → Upminster → Earl's Court → Wimbledon → Tower Hill → Earl's Court
				12:10	13:57	2.2			

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 6: Jubilee Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>u</sup> (mg/m <sup>3</sup> )	ROUTE COVERED
140792/25	RD	LUL25 TO - Driver	24/11/14	10:42	12:30	2.2	635.8	0.14	Stratford → Wembley Park → Stratford Stratford → Willesden Green → Stratford → Stanmore → Neasden
				13:35	16:36	2.2			

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>u</sup> (mg/m <sup>3</sup> )	ROUTE COVERED
140792/23	RD	LUL23 TO - Driver	25/11/14	13:30	14:12	2.2	338.8	0.11	North Greenwich → Wembley Park *Wembley Park → Neasden Depot
				15:20	17:12	2.2			

\* Issues on the Jubilee line so this train was diverted from Wembley Park to Neasden Depot at 15:20. The driver was sitting within the train cab for 2 hours at Neasden Depot and his pump was running on him for this time.

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>u</sup> (mg/m <sup>3</sup> )	ROUTE COVERED
140792/27	PM 2.5	LUL27 TO - Driver	26/11/14	09:40	10:30	3.5	847	0.14	North Greenwich → Wembley Park Wembley Park → Stanmore → North Greenwich → Stanmore → Stratford
				11:38	14:50	3.5			

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 7: Northern Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START	FINISH	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
				TIME	TIME				
140792/57	RD	LUL57 TO - Driver	15/12/14	07:29	10:15	2.2	880	0.40	Morden → Edgware → Kennington - High Barnet High Barnet → Morden → High Barnet → Morden
				11:31	15:25				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START	FINISH	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
				TIME	TIME				
140792/54	RD	LUL54 TO - Driver	16/12/14	08:25	12:25	2.2	756.8	0.61	Morden - High Barnet → Kennington - High Barnet - Morden Morden → Colindale → Morden
				13:16	15:00				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START	FINISH	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
				TIME	TIME				
140792/58	PM 2.5	LUL58 TO - Driver	17/12/14	12:00	16:20	3.5	910	0.18	Morden → Edgware → Morden → Edgware → Morden

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 8: Piccadilly Line Train Operators**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>a</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/18	RD	LUL18 TO - Driver	19/11/14	11:44	15:31	2.2	499.4	0.18	Action Town → Cockfosters → Heathrow T4 → Action Town

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>a</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/15	RD	LUL15 TO - Driver	20/11/14	17:20	20:00	2.2	352	0.60	Action Town → Cockfosters → Action Town

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>a</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/20	PM 2.5	LUL20 TO - Driver	21/11/14	08:25	11:10	3.5	577.5	0.17	Action Town → Artos Grove → Cockfosters → Action Town

Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Table 9: Victoria Line Train Operators

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/37	PM 2.5	LUL37 TO - Driver	09/12/14	09:16	12:10	3.5	966	0.16	Brixton → Walthamstow Central → Brixton → Seven Sisters → Brixton → Seven Sisters → Walthamstow Central → Brixton → Green park
				13:23	15:05				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/38	RD	LUL38 TO - Driver	04/12/14	09:24	13:04	2.2	635.5	1.81	Brixton → Seven Sisters → Northumberland Park Depot → Brixton → Walthamstow Central → Brixton → Seven Sisters → Brixton → Walthamstow Central → Brixton
				14:10	15:20				

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	ROUTE COVERED
140792/41	RD	LUL41 TO - Driver	08/12/14	09:25	10:45	2.2	343.2	0.46	Brixton → Seven Sisters → Victoria → Brixton → Walthamstow Central → Brixton
				11:48	13:04				

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 10: Aldgate East Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)*	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>a</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/60	RD	LUL 60 Station Personnel	18/12/14	08:05	12:05	2.2	528	0.38	Gate line duties, A - end by SSO
140792/61	RD	Static on head wall Platform 1, WB, District Line	18/12/14	08:00	12:00	2.2	528	0.75	Behind gate by tunnel entrance.
140792/62	RD	Static on head wall Platform 2, EB, District Line	18/12/14	12:10	16:10	2.2	528	0.53	Behind gate by tunnel entrance.
140792/63	RD	LUL63 Station Personnel	18/12/14	12:15	15:20	2.2	407	0.26	Gate line duties, B - end
140792/64	RD	4RS64 - 4-Rail Analyst	18/12/14	15:22	16:25	2.2	138.6	0.75	Middle of WB platform 1

**Table 11: Baker Street Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>a</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/66	RD	Static on head wall Platform 10, NB, Jubilee Line	19/12/14	10:52	14:55	2.2	534.6	1.03	Behind gate, by tunnel entrance.
140792/67	RD	Static on head wall Platform 7, SB, Jubilee Line	19/12/14	10:43	14:48	2.2	539	1.02	Behind gate, by tunnel entrance.
140792/69	RD	LUL69 Station Personnel	19/12/14	10:33	11:20	2.2	103.4	1.45	S.A.T on Platform 7
140792/70	RD	LUL70 Station Personnel	19/12/14	10:33	14:40	2.2	543.4	0.97	Security checks

## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 12: Elephant and Castle Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792773	RD	Static on head wall Platform 4, NB, Bakerloo Line	22/12/14	08:47	12:50	2.2	534.6	0.29	Behind gate by tunnel entrance.
140792774	RD	Static on head wall Platform 3, NB, Bakerloo Line	22/12/14	08:54	12:59	2.2	539	0.27	Behind gate by tunnel entrance.
140792775	RD	LUL75 Station Personnel	22/12/14	08:59	11:01	2.2	268.4	0.10	Platform 4, platform 3 and ticket hall.
140792776	RD	LUL76 Station Personnel	22/12/14	09:04	13:05	2.2	530.2	0.84	Gate line duties, Bakerloo line exit
140792777	RD	4RS77 - 4-Rail Analyst	22/12/14	09:15	11:15	2.2	264	1.76	Platform 4, platform 3 and ticket hall.

**Table 13: Euston Square Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792182	RD	LUL82 Station Personnel	23/12/14	08:56	15:06	2.2	814	0.15	Gate line duties
140792183	RD	Static on booking hall	23/12/14	09:16	15:05	2.2	767.8	0.39	Booking hall 2/002
140792184	RD	Static on head wall Platform 1, WB, H&C line	23/12/14	08:50	15:04	2.2	822.8	0.61	Behind gate by tunnel entrance.
140792185	RD	4RS85- 4-Rail Analyst	23/12/14	10:16	15:07	2.2	640.2	0.23	Shadowing platform and gate line duties
140792187	RD	Static on head wall Platform 2, EB, H&C line	23/12/14	09:25	15:01	2.2	739.2	0.71	Behind gate by tunnel entrance.

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 14: Hampstead Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/01a	RD	LUL01a Station Personnel	05/01/15	08:45	16:30	2.2	1023	0.47	Gate line duty position.
140792/02a	RD	LUL02a Station Personnel	05/01/15	08:50	16:35	2.2	1023	0.32	Gate line duty position.
140792/03a	RD	Static on head wall Platform 2, SB, Northern Line	05/01/15	08:55	16:45	2.2	1034	0.36	Behind gate, by tunnel entrance.
140792/04a	RD	Static on head wall Platform 1, NB, Northern Line	05/01/15	09:00	16:55	2.2	1045	0.93	Behind gate, by tunnel entrance.
140792/05a	RD	Static in Ticket office	05/01/15	12:30	16:33	2.2	534.6	0.27	Ticket office

**Table 15: King's Cross Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/10a	RD	LUL156 Station Personnel	06/01/15	09:00	17:00	2.2	1056	< 0.02	Platform 1 / Gate line duties
140792/12a	RD	Static on head wall Platform 2, Metropolitan Line	06/01/15	09:18	16:50	2.2	994.4	0.05	Behind gate, by tunnel entrance.
140792/13a	RD	Static on head wall Platform 1, Metropolitan Line	06/01/15	09:25	16:56	2.2	992.2	0.05	Behind gate, by tunnel entrance.
140792/14a	RD	Ticket Hall Office	06/01/15	11:00	16:00	2.2	660	< 0.02	Ticket office



**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 16: Oxford Circus Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
140792/120	RD	Static on head wall Platform 1, WB, Central Line	15/01/15	09:40	13:55	2.2	561	0.74	Behind gate, by tunnel entrance.
140792/119	RD	Static on head wall Platform 2, EB, Central Line	15/01/15	09:38	16:40	2.2	928.4	0.87	Behind gate, by tunnel entrance.
140792/118	RD	Static on head wall Platform 3, SB, Bakerloo Line	15/01/15	09:45	16:55	2.2	946	0.72	Behind gate, by tunnel entrance.
140792/117	RD	Static on head wall Platform 4, NB, Bakerloo Line	15/01/15	09:15	16:35	2.2	968	0.43	Behind gate, by tunnel entrance.
140792/116	RD	Static on head wall Platform 5, SB, Victoria Line	15/01/15	09:30	16:48	2.2	963.6	0.74	Behind gate, by tunnel entrance.
140792/115	RD	Static on head wall Platform 6, NB, Victoria Line	15/01/15	09:00	16:30	2.2	990	0.31	Behind gate, by tunnel entrance.
140792/114	RD	LUL 114 Station Personnel	15/01/15	09:55	17:00	2.2	935	0.14	Gate line Argyll duty
140792/113	RD	LUL 113 Station Personnel	15/01/15	09:05	15:00	2.2	781	0.24	S.A.T Platform 6 duty
140792/112	RD	LUL 112 Station Personnel	15/01/15	09:20	14:30	2.2	682	0.50	S.A.T Platform 4 duty

## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 17: Paddington Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/121	RD	LUL121 Station Personnel	14/01/15	09:04	13:25	2.2	574.2	0.29	S.A.T Platform 4 & Station checks & Ticket Hall duties
140792/122	RD	LUL122 Station Personnel	14/01/15	09:27	13:29	2.2	532.4	0.46	Station checks and various ticket Hall duties
140792/123	RD	LUL123 Station Personnel	14/01/15	09:20	13:32	2.2	554.4	0.25	Station checks and various ticket Hall duties
140792/124	RD	4RS124 - 4-Rail Analyst	14/01/15	09:31	13:33	2.2	532.4	0.53	Shadowing platform and gate line duties
140792/125	RD	Static on head wall Platform 3, NB, Bakerloo Line	14/01/15	09:11	13:22	2.2	552.2	1.03	Behind gate, by tunnel entrance.
140792/126	RD	Static on head wall Platform 4, SB, Bakerloo Line	14/01/15	09:16	13:20	2.2	536.8	1.07	Behind gate, by tunnel entrance

**Table 18: Piccadilly Circus Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/92	RD	LUL92 Station Personnel	08/01/15	09:50	17:12	2.2	972.4	0.16	Gate line duties
140792/91	RD	Static in travel Information centre	08/01/15	10:10	17:15	2.2	935	0.45	By travel Information centre
140792/93	RD	Static on head wall Platform 4, WB, Piccadilly Line	08/01/15	09:40	17:01	2.2	970.2	0.40	Behind gate, by tunnel entrance.
140792/94	RD	Static on head wall Platform 3, EB, Piccadilly Line	08/01/15	09:45	17:03	2.2	963.6	0.24	Behind gate, by tunnel entrance.
140792/95	RD	Static in ticket office	08/01/15	10:25	16:50	2.2	847	0.21	Ticket office

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 19: Tottenham Court Road Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/07a	RD	LUL07a Station Personnel	07/01/15	09:40	16:46	2.2	937.2	< 0.02	Gate line duties
140792/08a	RD	Static on head wall Platform 3, NB, Northern Line	07/01/15	09:18	16:30	2.2	950.4	0.14	Behind gate, by tunnel entrance.
140792/16a	RD	Static on head wall Platform 4, SB, Northern Line	07/01/15	09:15	16:35	2.2	968	0.52	Behind gate, by tunnel entrance.
140792/17a	RD	Static within SSO	07/01/15	12:30	16:55	2.2	583	< 0.02	Station Supervisor's office

**Table 20: Vauxhall Station**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (l/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>m</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/97	RD	LUL97 Station Personnel	12/01/15	08:25	16:15	2.2	1034	0.04	Platform & Gate line duties
140792/98	RD	LUL98 Station Personnel	12/01/15	08:50	16:35	2.2	1023	0.07	POM room & Gate line duties
140792/99	RD	Static on head wall Platform 2, SB, Victoria Line	12/01/15	08:35	16:20	2.2	1023	0.43	Behind gate, by tunnel entrance
140792/100	RD	Static on head wall Platform 1, NB, Victoria Line	12/01/15	08:38	16:25	2.2	1027.4	0.33	Behind gate, by tunnel entrance
140792/101	RD	LUL101 Station Personnel	12/01/15	09:30	13:30	2.2	528	0.14	Gate line duties
140792/102	RD	4RS102 - 4-Rail Analyst	12/01/15	12:30	16:40	2.2	550	0.09	Shadowing platform and gate line duties

**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Table 21 : Waterloo Station**

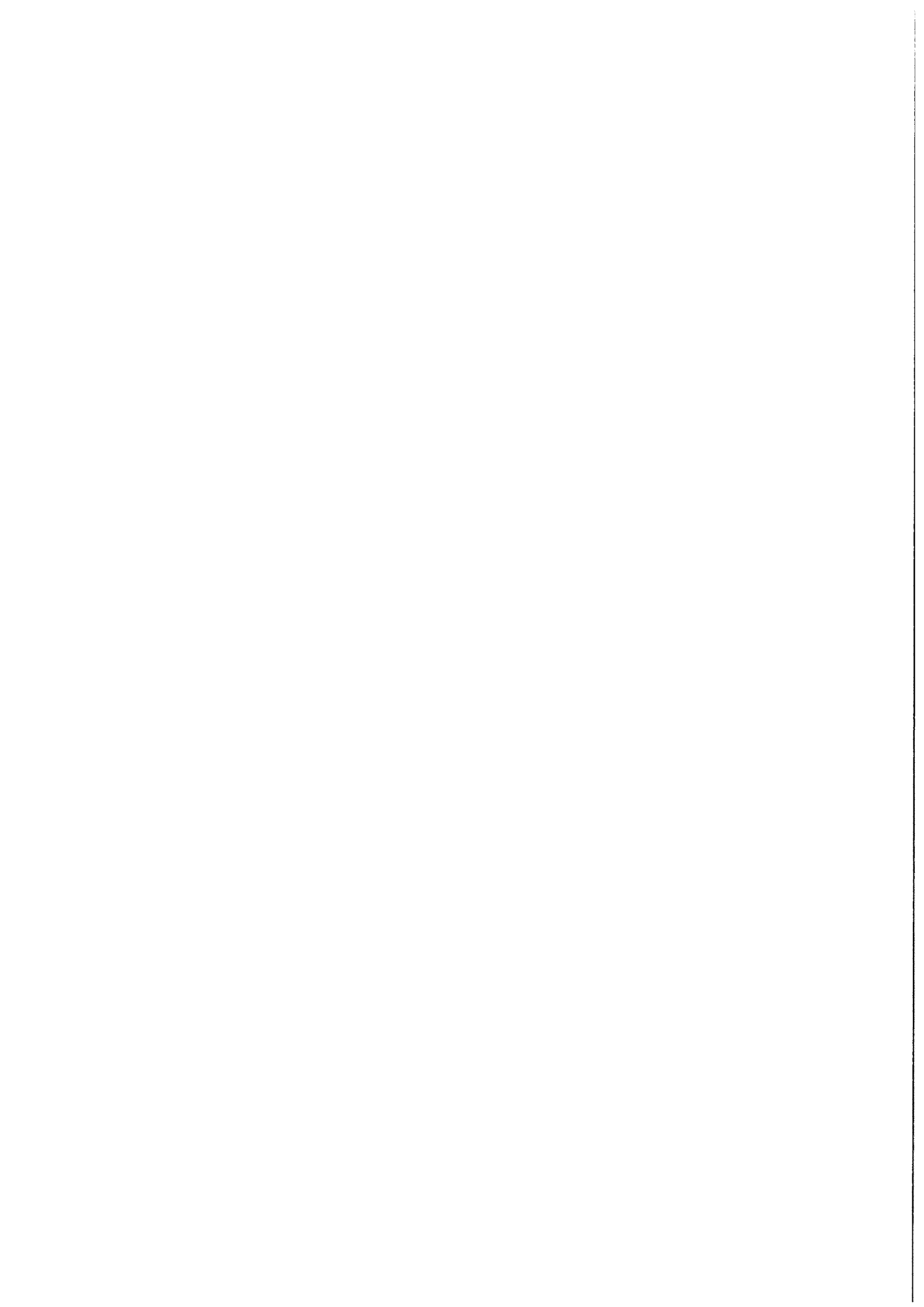
FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION	DATE	START TIME	FINISH TIME	FLOW RATE (/min)	VOLUME OF AIR (litres)	CALC. DUST CONC <sup>n</sup> (MG/M <sup>3</sup> )	LOCATIONS & COMMENTS
140792/103	RD	LUL103 Station Personnel	13/01/15	08:54	10:00	2.2	145.2	0.80	S.A.T. duty at Platform 3, Bakerloo Line
140792/104	RD	LUL104 Station Personnel	13/01/15	09:04	10:13	2.2	151.8	0.67	S.A.T. duty at WB Platform, Jubilee Line
140792/105	RD	LUL105 Station Personnel	13/01/15	09:08	10:05	2.2	125.4	0.83	S.A.T. duty at EB Platform, Jubilee Line
140792/106	RD	Static on head wall departures Platform, W&C Line	13/01/15	09:16	14:22	2.2	673.2	0.69	Behind gate, by tunnel entrance.
140792/107	RD	Static on middle of Platform 4, Bakerloo Line	13/01/15	09:32	14:35	2.2	666.6	0.08	Middle of Bakerloo Line Platform
140792/108	RD	4RS108 - 4-Rail Analyst	13/01/15	11:01	14:42	2.2	486.2	0.32	Shadowing platform and gate line duties
140792/109	RD	LUL109 Station Personnel	13/01/15	10:46	14:09	2.2	446.6	0.17	Main, Shell and Jubilee ticket hall duties
140792/110	RD	LUL110 Station Personnel	13/01/15	11:06	14:55	2.2	503.8	0.26	Main Ticket Hall & Station checks duties

Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Appendix 5

Table 22: Train Operator Respirable Crystalline Silica Monitoring

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION – PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	CRYSTALLINE SILICA (mg/filter)	CRYSTALLINE SILICA (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
140792/13	RD	Bakerloo Line 4-Rail Analyst Sitting in the train cab	13/11/14	486.4	< 0.01	< 0.02	Queens Park → Elephant & Castle → Queens Park Elephant & Castle → Queens Park
140792/14	RD	Bakerloo Line Train Operator Driving Trains	13/11/14	466.4	< 0.01	< 0.02	Queens Park → Elephant & Castle → Queens Park
140792/5	RD	Central Line 4-Rail Analyst Sitting in the train cab	11/11/14	772.2	< 0.01	< 0.01	White City → Loughton → West Ruislip West Ruislip → Epping → West Ruislip → White City
140792/6	RD	Central Line Train Operator Driving Trains	11/11/14	776.6	< 0.01	< 0.01	
140792/49	RD	Circle and Hammersmith & City Line 4-Rail Analyst Sitting in the train cab	11/12/14	558.8	< 0.01	< 0.02	Hammersmith → Edgware Road → Hammersmith Hammersmith → Edgware Road
140792/50	RD	Circle and Hammersmith & City Line Train Operator Driving Trains	11/12/14	558.8	< 0.01	< 0.02	
140792/32	RD	District Line 4-Rail Analyst Sitting in the train cab	2/12/14	602.8	< 0.01	< 0.02	Action Town → Upminster → Earl's Court → Wimbledon → Tower Hill → Earl's Court
140792/33	RD	District Line Train Operator Driving Trains	2/12/14	605	< 0.01	< 0.02	
140792/25	RD	Jubilee Line Train Operator Driving Trains	24/11/14	635.8	< 0.01	< 0.02	Stratford → Wembley Park → Stratford Stratford → Willersden Green → Stratford → Stanmore → Neasden
140792/26	RD	Jubilee Line 4-Rail Analyst Sitting in the train cab	24/11/14	629.2	0.01	0.016	
140792/56	RD	Northern Line 4-Rail Analyst Sitting in the train cab	15/12/14	880	< 0.01	< 0.02	Morden → Edgware → Kennington – High Barnet High Barnet → Morden → High Barnet → Morden
140792/57	RD	Northern Line Train Operator Driving Trains	15/12/14	880	< 0.01	< 0.02	
140792/18	RD	Piccadilly Line Train Operator Driving Trains	19/11/14	489.4	< 0.01	< 0.02	Action Town → Cockfosters → Heathrow T4 → Heathrow T4 → Action Town
140792/19	RD	Piccadilly Line 4-Rail Analyst Sitting in the train cab	19/14/14	497.2	< 0.01	< 0.02	
140792/41	RD	Victoria Line Train Operator Driving Trains	8/12/14	343.2	< 0.01	< 0.03	Brixton → Seven Sisters → Victoria → Brixton Brixton → Walthamstow Central → Brixton
140792/42	RD	Victoria Line 4-Rail Analyst Sitting in the train cab	8/12/14	343.2	< 0.01	< 0.03	

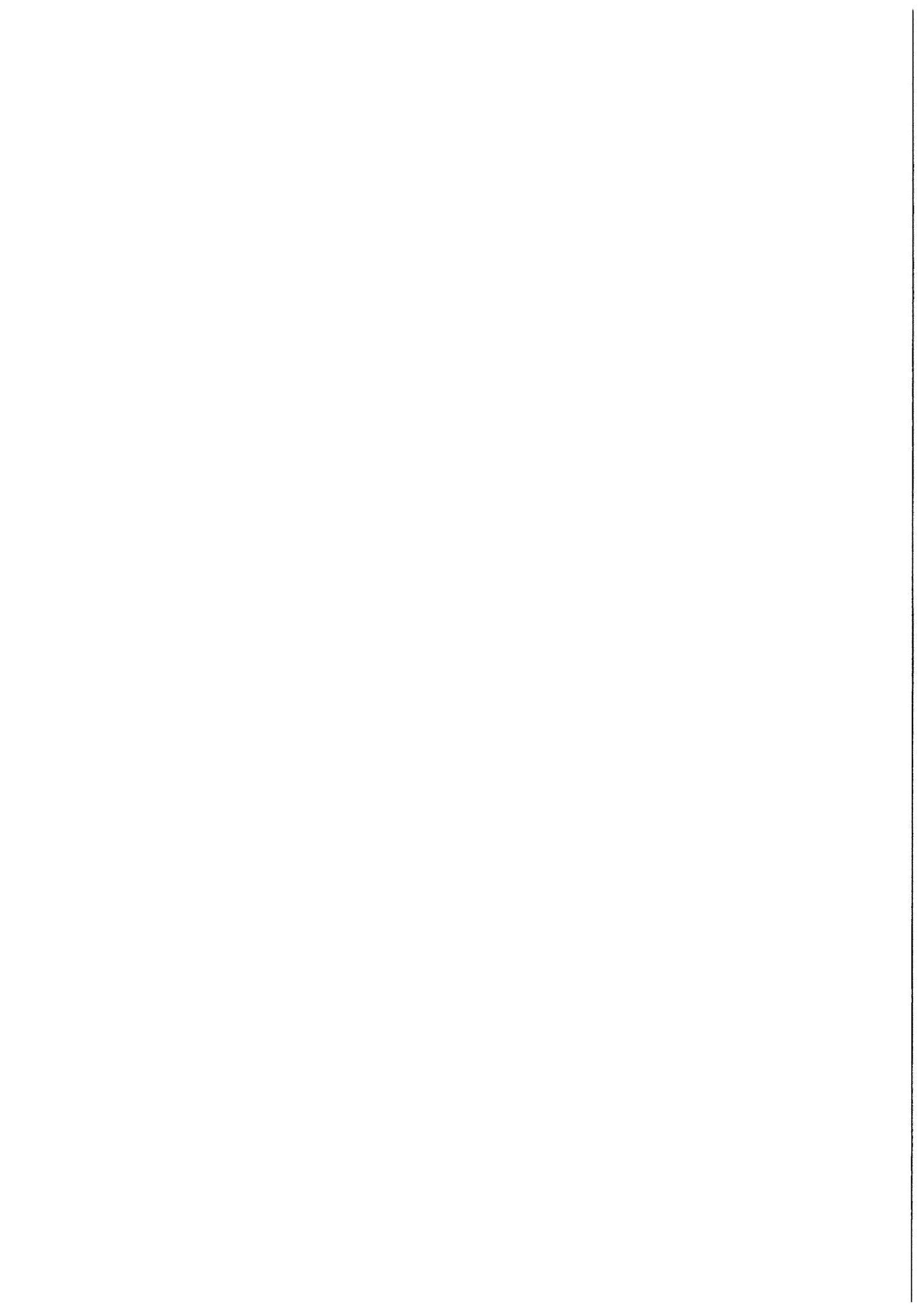


## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 23: Train Operator PM 2.5 Iron and Zinc Monitoring**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALABLE DUST, ID)	SAMPLE LOCATION—PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	IRON (mg/filter)	ZINC (mg/filter)	IRON CONCENTRATION (mg/m <sup>3</sup> )	ZINC CONCENTRATION (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
140792/10F	PM 2.5	Bakerloo Line Train Operator Driving Trains	18/11/14	567	0.045	< 0.004	0.079	< 0.007	Queens Park → Elephant & Castle → Stonebridge Park → Elephant & Castle → Queens Park Queens Park → Baker Street
140792/8	PM 2.5	Central Line Train Operator Driving Trains	12/11/14	525	0.033	< 0.004	0.063	< 0.008	White City → Hainault → Ealing Broadway → White City
*140792/44	PM 2.5	Circle and Hammersmith & City Line Train Operator Driving Trains	10/12/14	945	< 0.004	< 0.004	< 0.004	< 0.004	Hammersmith → Edgware Road → Paddington → Hammersmith → Edgware Road → Hammersmith Hammersmith → Whitechapel
140792/34	PM 2.5	District Line Train Operator Driving Trains	27/11/13	766.5	0.017	< 0.004	0.022	< 0.005	Action Town → Upminster → Ealing Broadway → Earl's Court
140792/27	PM 2.5	Jubilee Line Train Operator Driving Trains	26/11/14	847	0.022	< 0.004	0.026	< 0.005	North Greenwich → Wembley Park Wembley Park → Stanmore → North Greenwich → Stanmore → Stratford
140792/58	PM 2.5	Northern Line Train Operator Driving Trains	17/12/14	910	0.045	< 0.004	0.05	< 0.004	Morden → Edgware → Morden → Edgware → Morden
140792/20	PM 2.5	Piccadilly Line Train Operator Driving Trains	21/11/14	577.5	0.024	< 0.004	0.042	< 0.007	Action Town → Amos Grove → Cockfosters → Action Town
140792/37	PM 2.5	Victoria Line Train Operator Driving Trains	03/12/14	966	0.041	< 0.004	0.042	< 0.004	Brixton → Walthamstow Central → Brixton → Seven Sisters → Brixton → Seven Sisters Seven Sisters → Walthamstow Central → Brixton → Green park

\*Filter worn by the 4-RAL analyst was analysed instead of the train driver's filter as it looked heavier loaded so it represents the worst case scenario results.





## Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

**Table 24: Train Operator PM 2.5 Chromium and Copper Monitoring**

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION – PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	CHROMIUM (mg/filter)	COPPER (mg/filter)	CHROMIUM CONCENTRATION (mg/m <sup>3</sup> )	COPPER CONCENTRATION (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
140792/10F1	PM 2.5	Bakerloo Line Train Operator Driving Trains	18/11/14	567	< 0.004	< 0.004	< 0.007	< 0.007	Queens Park → Elephant & Castle → Stonebridge Park → Elephant & Castle → Queens Park Queens Park → Baker Street
140792/8	PM 2.5	Central Line Train Operator Driving Trains	12/11/14	525	< 0.004	< 0.004	< 0.008	< 0.008	White City → Hainault → Ealing Broadway → White City
*140792/44	PM 2.5	Circle and Hammersmith & City Line Train Operator Driving Trains	10/12/14	945	< 0.004	< 0.004	< 0.004	< 0.004	Hammersmith → Edgware Road → Paddington → Hammersmith → Edgware Road → Hammersmith Hammersmith → Whitechapel
140792/34	PM 2.5	District Line Train Operator Driving Trains	27/11/13	766.5	< 0.004	< 0.004	< 0.005	< 0.005	Action Town → Upminster → Ealing Broadway → Earl's Court
140792/27	PM 2.5	Jubilee Line Train Operator Driving Trains	26/11/14	847	< 0.004	< 0.004	< 0.005	< 0.005	North Greenwich → Wembley Park Wembley Park → Stanmore → North Greenwich → Stanmore → Stratford
140792/58	PM 2.5	Northern Line Train Operator Driving Trains	17/12/14	910	< 0.004	< 0.004	< 0.004	< 0.004	Morden → Edgware → Morden → Edgware → Morden
140792/20	PM 2.5	Piccadilly Line Train Operator Driving Trains	21/11/14	577.5	< 0.004	< 0.004	< 0.007	< 0.007	Action Town → Amos Grove → Cockfosters → Action Town
140792/37	PM 2.5	Victoria Line Train Operator Driving Trains	03/12/14	966	< 0.004	< 0.004	< 0.004	< 0.004	Brixton → Walthamstow Central → Brixton → Seven Sisters → Brixton → Seven Sisters Seven Sisters → Walthamstow Central → Brixton → Green park

\*Filter worn by the 4-Rail analyst was analysed instead of the train driver's filter as it looked heavier loaded so it represents the worst case scenario results.

Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Table 25: Train Operator PM 2.5 Nickel and Manganese Monitoring

FILTER NUMBER	SAMPLE TYPE (RESPIRABLE DUST, RD, INHALEABLE DUST, ID)	SAMPLE LOCATION - PROCESS MONITORED	DATE	VOLUME OF AIR (litres)	NICKEL (mg/filter)	MANGANESE (mg/filter)	NICKEL CONCENTRATION (mg/m <sup>3</sup> )	MANGANESE CONCENTRATION (mg/m <sup>3</sup> )	LOCATIONS & COMMENTS
140792/10F1	PM 2.5	Bakerloo Line Train Operator Driving Trains	18/11/14	567	< 0.004	< 0.004	< 0.007	< 0.007	Queens Park → Elephant & Castle → Stonebridge Park → Elephant & Castle → Queens Park → Baker Street
140792/8	PM 2.5	Central Line Train Operator Driving Trains	12/11/14	525	< 0.004	< 0.004	< 0.008	< 0.008	White City → Hainault → Ealing Broadway → White City
*140792/44	PM 2.5	Circle and Hammersmith & City Line Train Operator Driving Trains	10/12/14	798	< 0.004	< 0.004	< 0.004	< 0.004	Hammersmith → Edgware Road → Paddington → Hammersmith → Edgware Road → Hammersmith → Hammersmith → Whitechapel
140792/34	PM 2.5	District Line Train Operator Driving Trains	27/11/13	766.5	< 0.004	< 0.004	< 0.005	< 0.005	Action Town → Upminster → Ealing Broadway → Earl's Court
140792/27	PM 2.5	Jubilee Line Train Operator Driving Trains	26/11/14	847	< 0.004	< 0.004	< 0.005	< 0.005	North Greenwich → Wembley Park → Wembley Park → Stanmore → North Greenwich → Stanmore → Stratford
140792/58	PM 2.5	Northern Line Train Operator Driving Trains	17/12/14	910	< 0.004	< 0.004	< 0.004	< 0.004	Morden → Edgware → Morden → Edgware → Morden
140792/20	PM 2.5	Piccadilly Line Train Operator Driving Trains	21/11/14	577.5	< 0.004	< 0.004	< 0.007	< 0.007	Action Town → Amos Grove → Cockfosters → Action Town
140792/37	PM 2.5	Victoria Line Train Operator Driving Trains	03/12/14	966	< 0.004	< 0.004	< 0.004	< 0.004	Brixton → Walthamstow Central → Brixton → Seven Sisters → Brixton → Seven Sisters → Seven Sisters → Walthamstow Central → Brixton → Green Park

\*Filter worn by the 4-Rail analyst was analysed instead of the train driver's filter as it looked heavier loaded so it represents the worst case scenario results.

Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Figure 8: GRIMM monitor dust concentration data at the Victoria line on the 3<sup>rd</sup> December 2014.

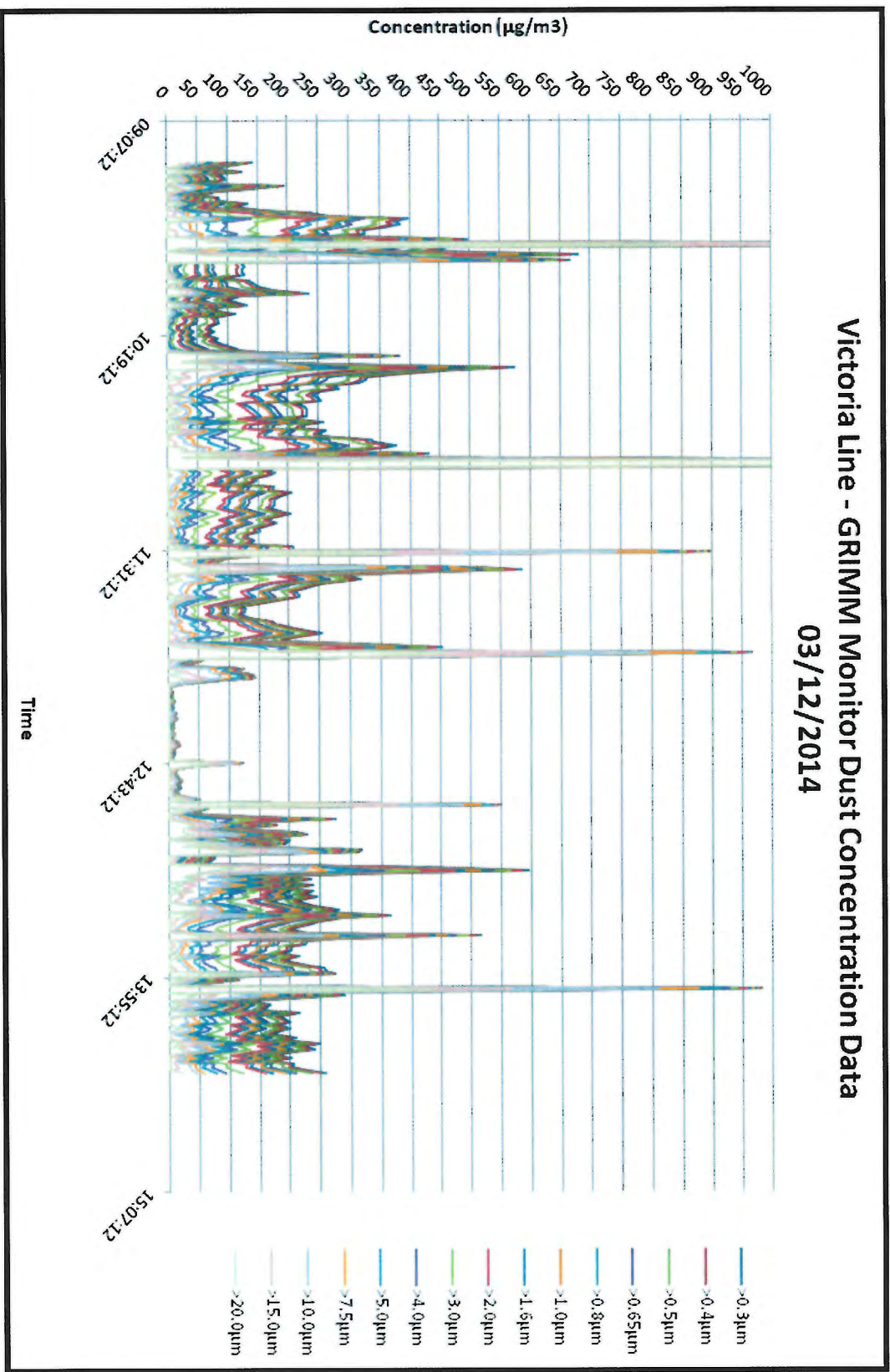
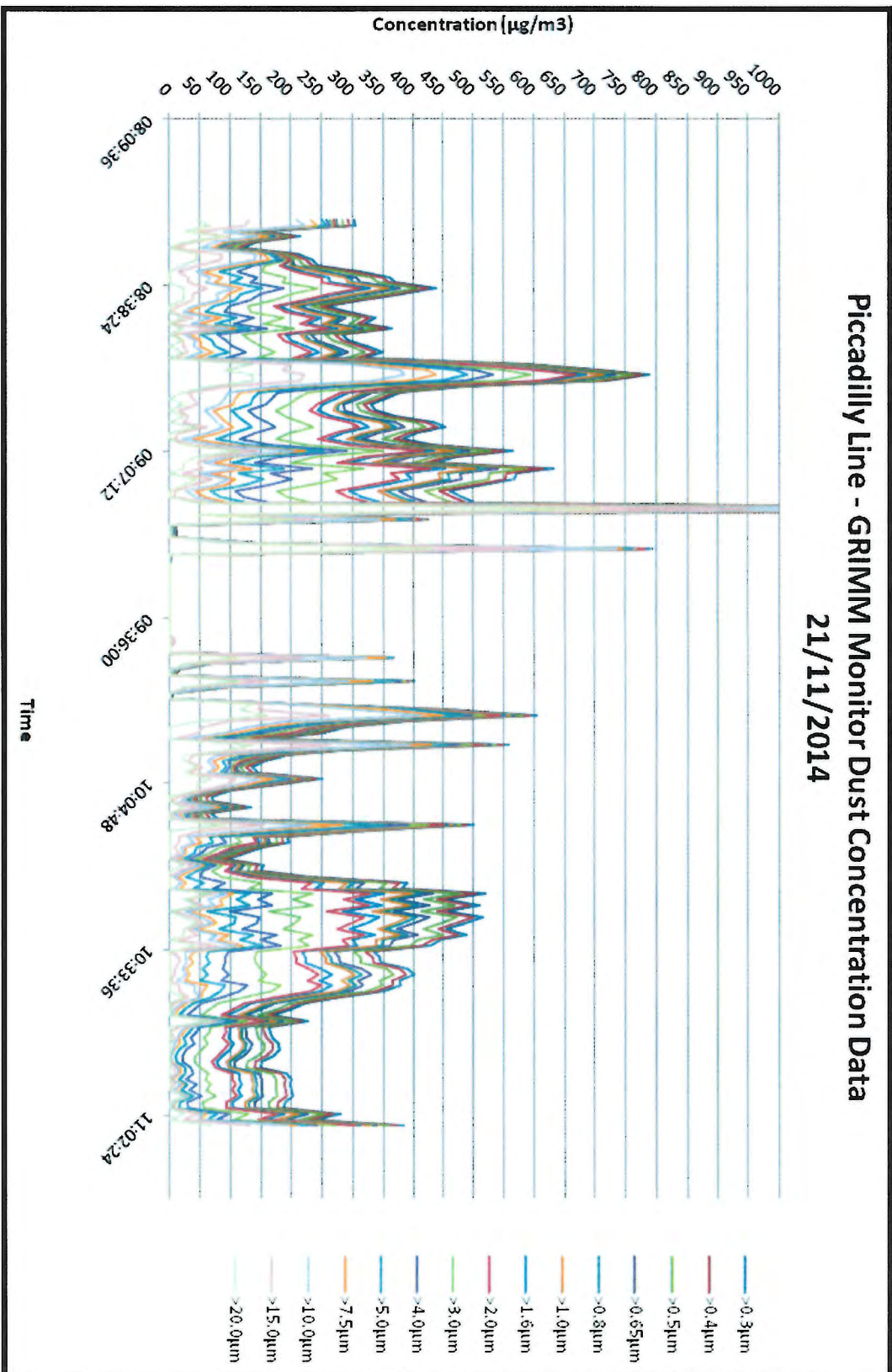
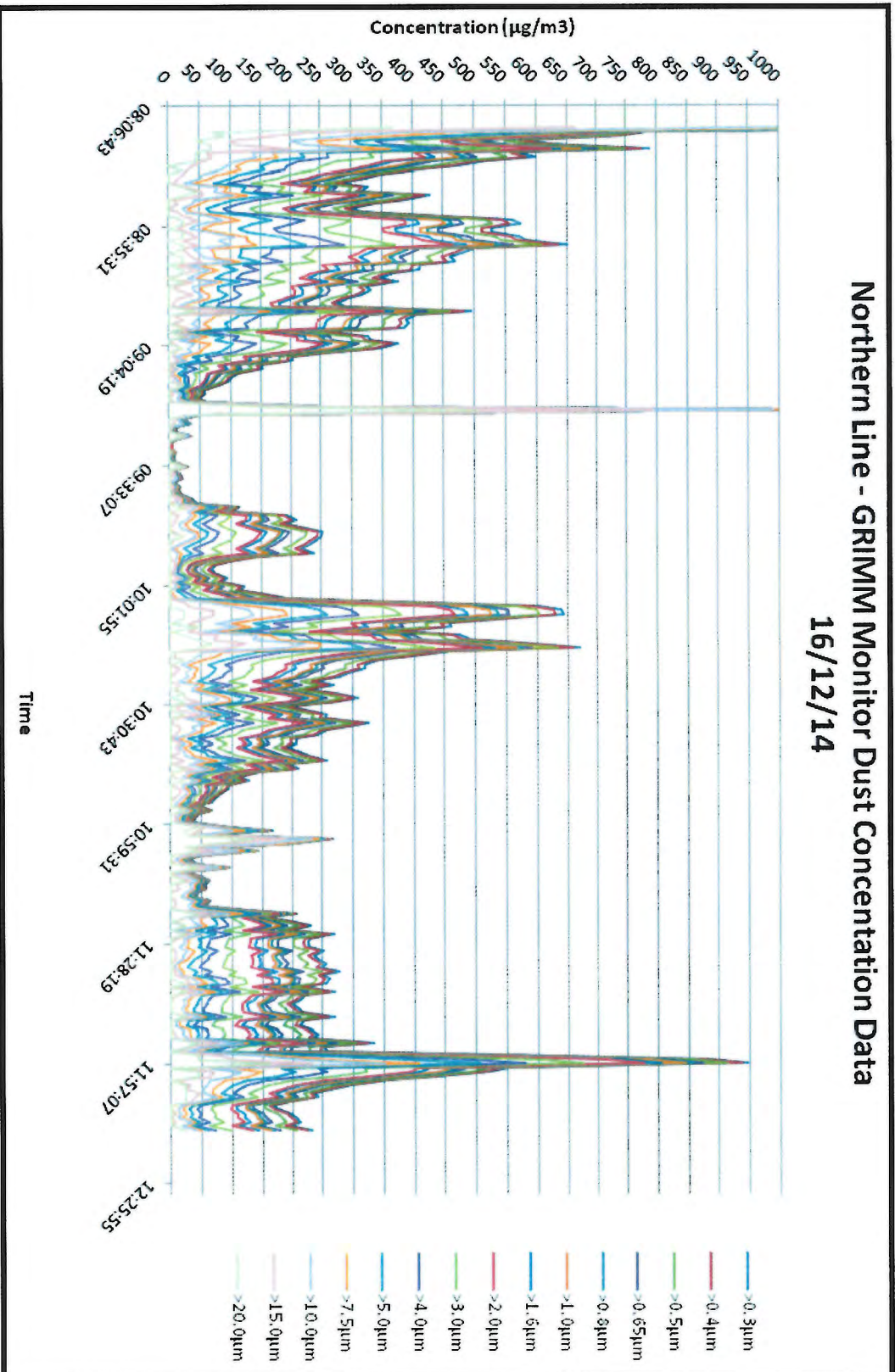


Figure 7: GRIMM monitor dust concentration data at the Piccadilly line on the 21<sup>st</sup> November 2014.

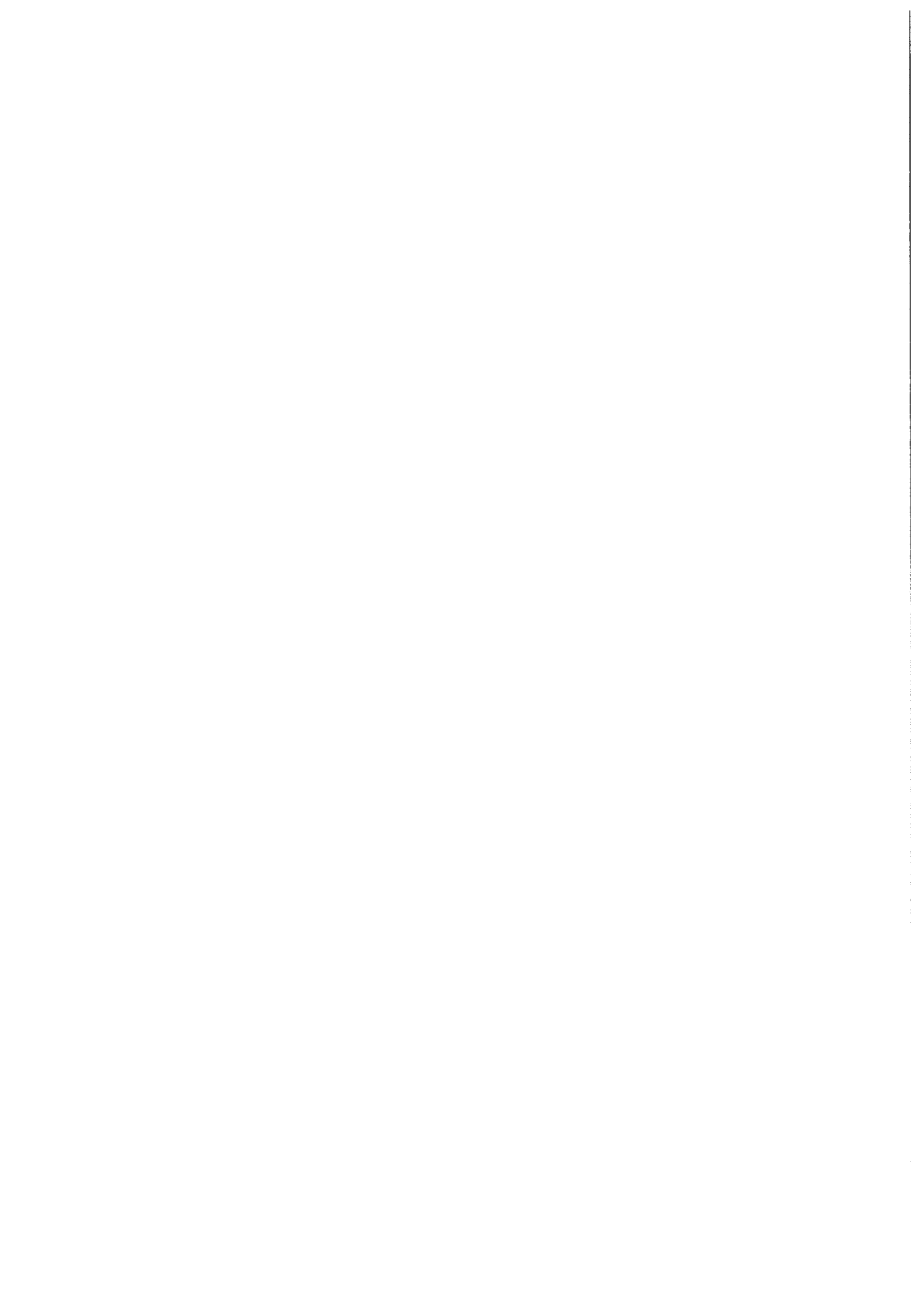


Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Figure 6: GRIMM monitor dust concentration data at the Northern line on the 16<sup>th</sup> December 2014.

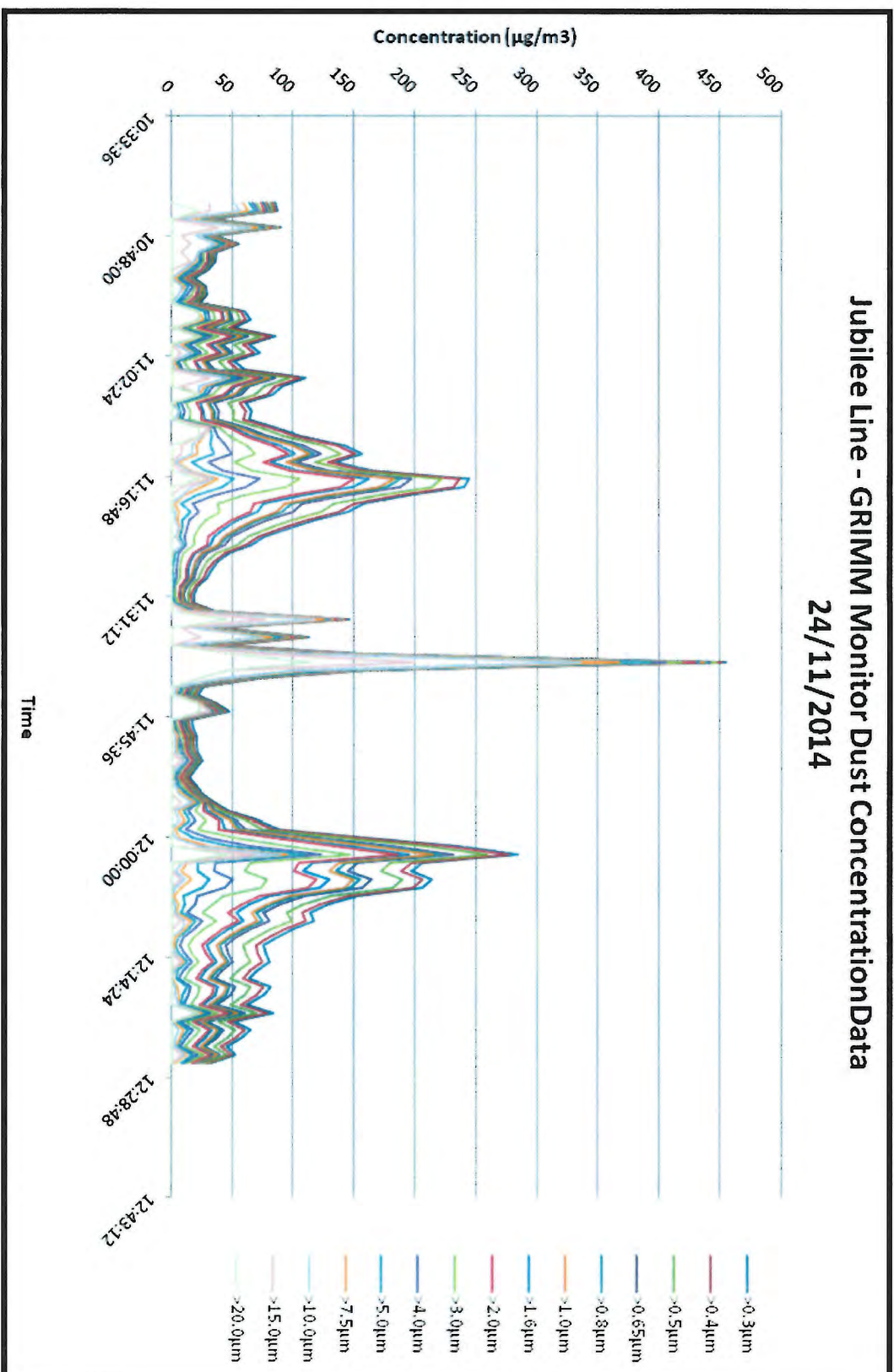






**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

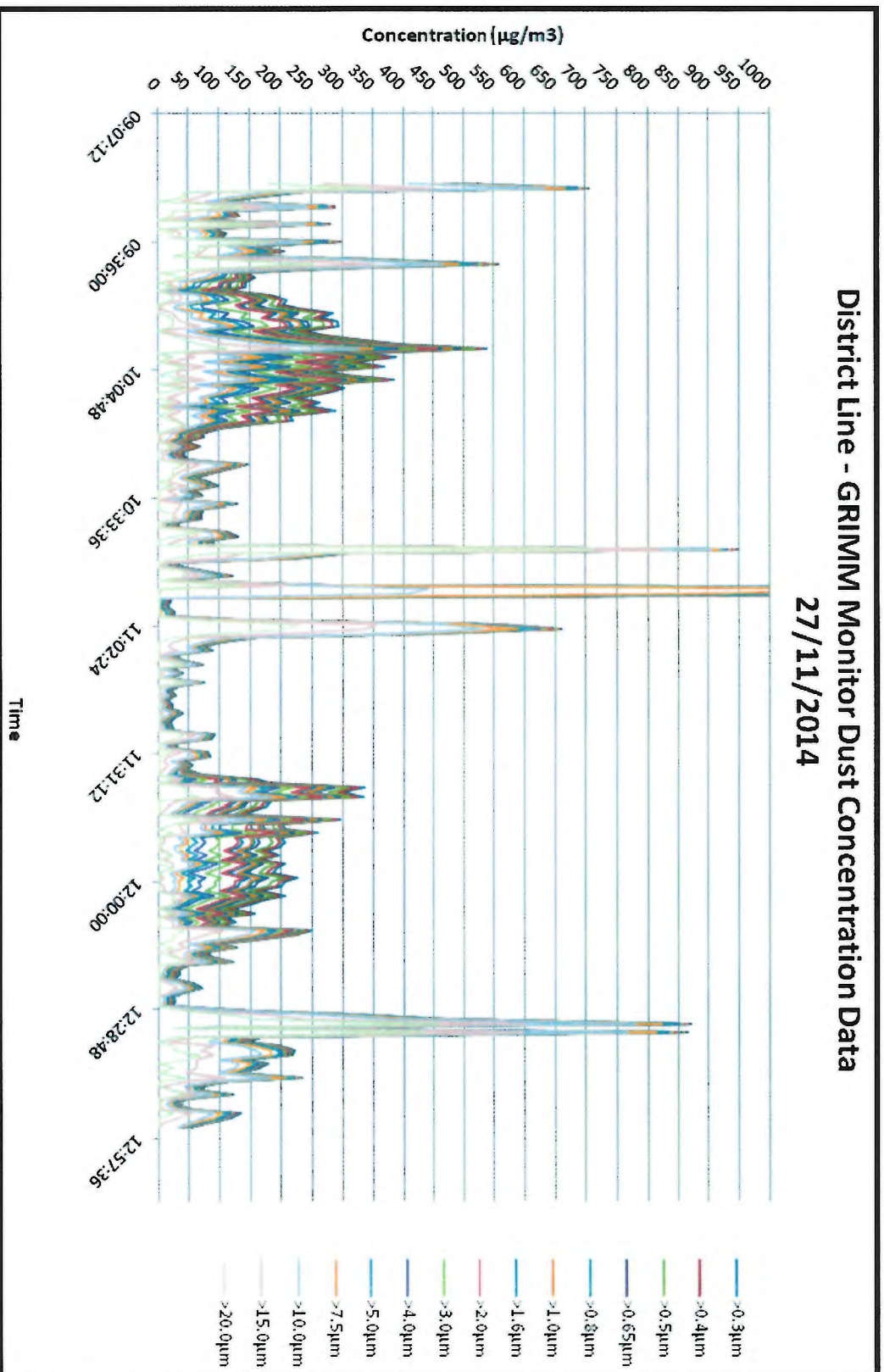
**Figure 5: GRIMM monitor dust concentration data at the Jubilee line on the 24<sup>th</sup> November 2014.**





Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines

Figure 4: GRIMM monitor dust concentration data at the District line on the 27<sup>th</sup> November 2014.



**Respirable Airborne Dust Monitoring At Various London Underground Stations And Train Lines**

**Figure 3: GRIMM monitor dust concentration data at the Circle and Hammersmith & City Line on the 12<sup>th</sup> December 2014.**

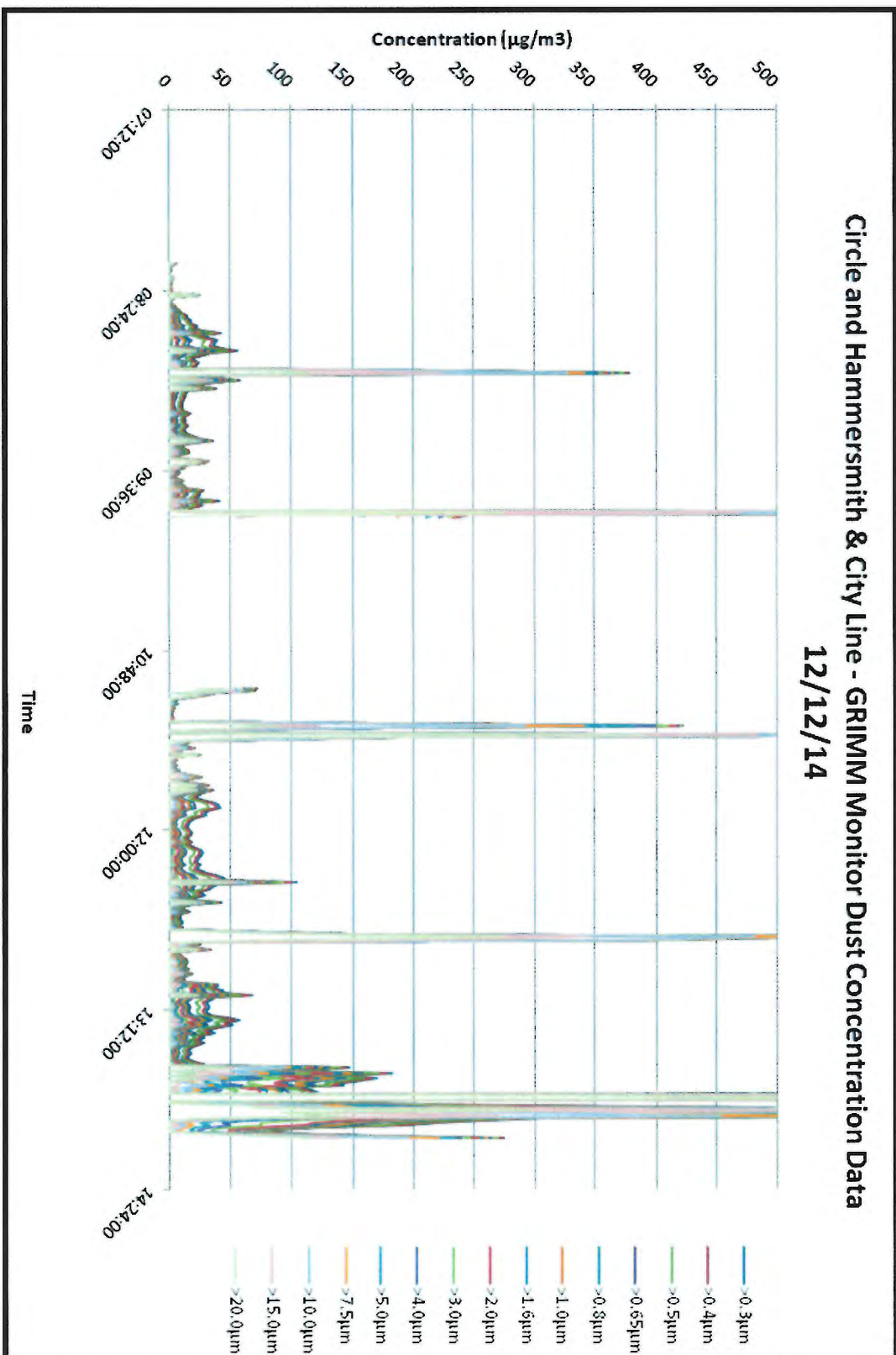


Figure 2: GRIMM monitor dust concentration data at the Central line on the 12<sup>th</sup> November 2014.

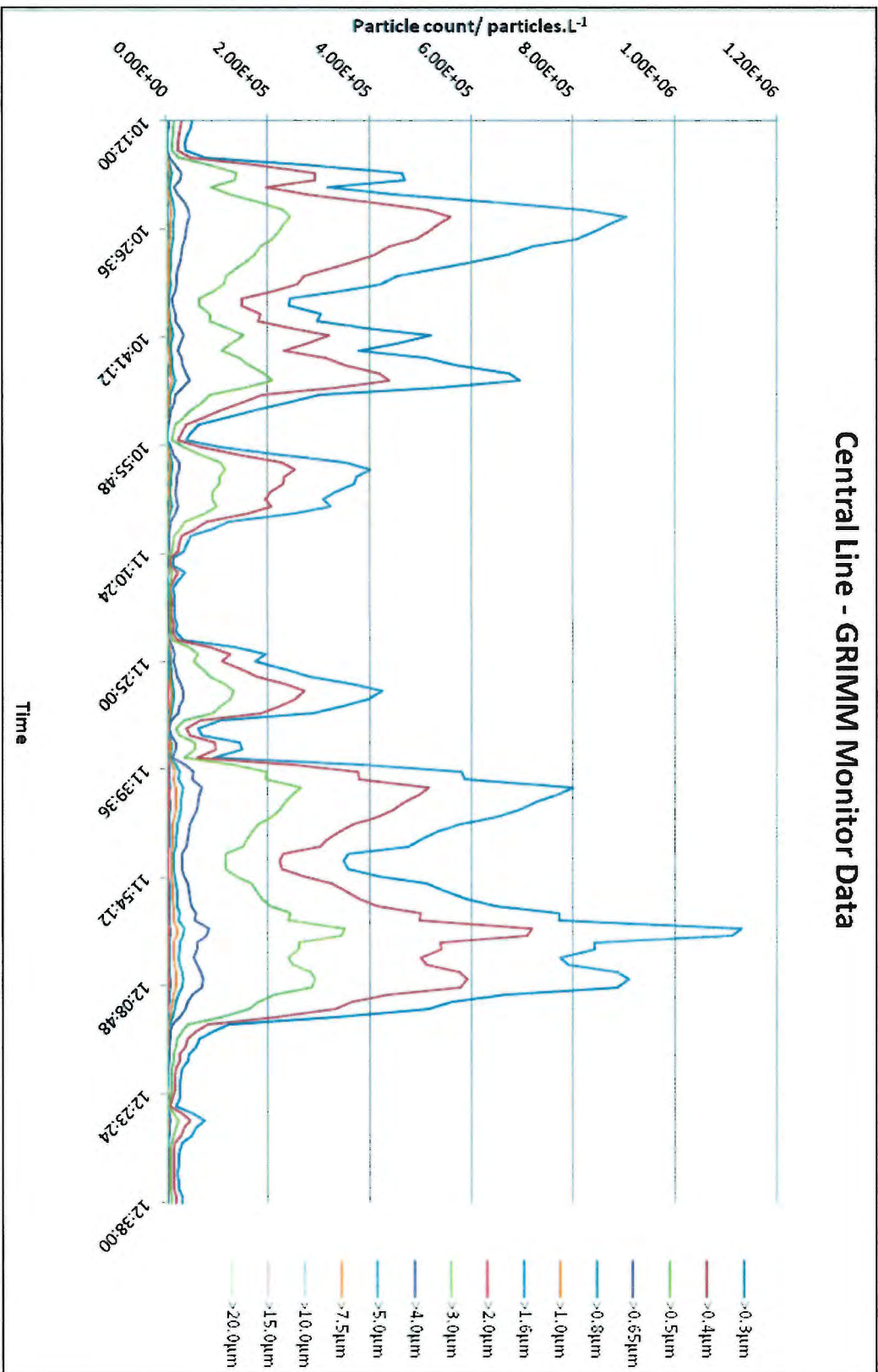


Figure 1: GRIMM monitor dust concentration data at the Bakerloo line on the 18<sup>th</sup> November 2014.

