Winchester City Council

HEALTH AND HOUSING DEPARTMENT

Detailed Air Quality Assessment

Sulphur Dioxide Levels Adjacent to Alresford Station Steam Railway (Watercress Line)

February 2005

SUMMARY

This report has been compiled in accordance with statutory duties under Part IV of the Environment Act 1995 and the Air Quality (England) Regulations 2000 (as amended). It is a detailed study of sulphur dioxide levels adjacent to Alresford Station, which is one end of the Alresford to Alton Steam Railway (The Watercress Line) run by the Mid-Hants Railway Preservation Society.

Initial monitoring between the 26 March and 12 May 2004, on the far station platform recorded 14 exceedances of the 15 minute sulphur dioxide standard of 266µg/m^3 over these 6 weeks. Upon further investigation it was concluded that this first monitoring location was too near to the plume from the steam engine and was not fully representative of public exposure at the station platform.

Additional monitoring between 18 October and 2 November 2004 performed on the main platform, at head height, showed no failures occurred over the two weeks.

Overall the site is expected to comply with the sulphur dioxide objectives and at this stage no further action is considered necessary.

CONTENTS

1.0 INTRODUCTION

Since the implementation of Part IV of the Environment Act 1995 all local authorities have been under a duty to review air quality within their district. The current standards that have to be met are prescribed under the Air Quality (England) Regulations 2000 (as amended). It is a requirement that each local authority conducts a formal staged review of air quality within its district in accordance with a comprehensive set of guidance documents. These reports are then sent to the Department of Environment, Food and Rural Affairs (DEFRA) for approval.

This report is a detailed study of sulphur dioxide levels adjacent to Alresford Station which is at one end of the Alresford to Alton Steam Railway The necessity for this study was established by the Updating and Screening Assessment (August 03) which was submitted to and approved by DEFRA.

There are three air quality objectives for Sulphur dioxide with different exposure periods:

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Sulphur dioxide	350$\mu g/m^3$ not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125$\mu g/m^3$ not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266$\mu g/m^3$ not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

Table 1 – Sulphur dioxide air quality objectives

The Winchester to Alton branch line, often called the Watercress Line, was closed in 1973, with the Mid-Hants Railway Society being formed with the intent of reinstating it. Due to costs, services between Winchester and Alresford could not be re-established. However, the line was re-opened between Alresford and Ropley in 1977, to Medstead in 1983 and to Alton in 1985. The line is now 10 miles long, running between Alresford and Alton where it meets with main line services. There are platforms at Alresford, Ropley, Medstead/Four Marks and Alton and workshop sheds at Ropley.

Although Alresford station is within Winchester City's Council district, the majority of the railway including all other station platforms and workshop sheds are within East Hampshire District Council's jurisdiction. Regular liaison has therefore been established with officers from that Local Authority regarding this issue.

Photographs and maps of Alresford station are shown in figures 1 to 2 below, with the sampling locations being marked in red on figure 2.

Figure 1 – Aerial Photograph of Alresford Railway Station

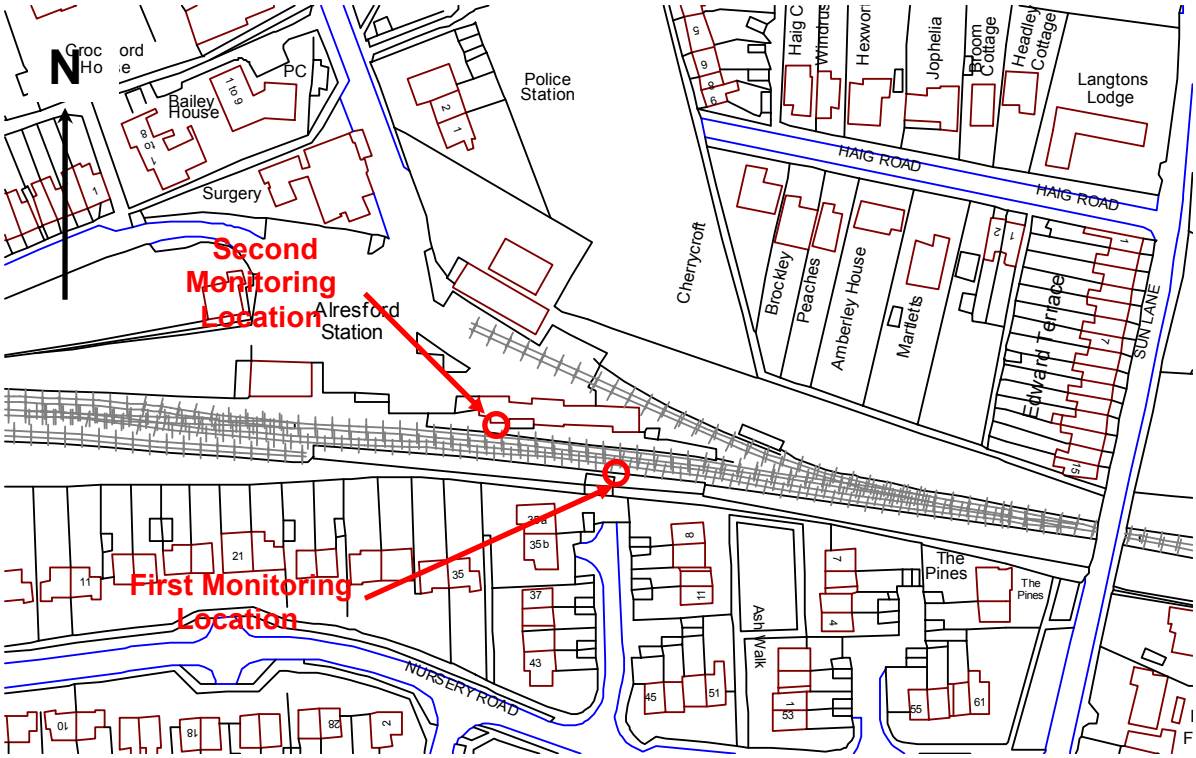


Figure 2 - Map of Alresford railway station showing location of real time sulphur dioxide monitoring

2.0 MONITORING PERFORMED

Envirotechnology Services of Stroud were contracted to perform an initial monitoring exercise at Alresford Station. This contract included the provision of a M110A UV Fluorescent analyser, on site zero/span checks to traceable gases (at beginning, middle and end of exercise) and data verification/ratification.

The Mid-Hants Railway Society assisted throughout this survey and allowed the initial use of a station platform hut on the far platform. The equipment was located within the building on the far platform with the sampling head exiting at about canopy height (3 metres). The first monitoring location is shown in figure 2 above.

Due to concerns that the initial monitoring was not representative of exposures to the public, the monitoring exercise was repeated. This time a “J type” cabinet was installed on the main public platform for this specific purpose. This second monitoring location is shown in figures 3 to 4 and was at the much lower height of 1.5 metres.

Figure 3 – Photograph of Alresford platform taken adjacent cabinet (See Figure 5)

Figure 4 - Cabinet used for second round of monitoring

Initially there was some uncertainty whether an exposure on a private station, open only to fee paying members of the public, was an appropriate exposure location in accordance with DEFRA guidance. Clarification was sought and obtained from DEFRA regarding this matter (see Appendix 1). Monitoring on the platform was also considered to be a worse case exposure location and therefore representative of other nearby exposures locations, such as domestic properties.

Train movements at the platform are due to a combination of scheduled services, special events and footplate training days. Although these operate to some extent throughout the year, the majority of the train movements occur in the spring to autumn months. Guidance was sought from the national monitoring help line

regarding a minimum time period for such monitoring. Following discussions it was agreed that one months monitoring would provide sufficient data for comparison with a 15 minute air quality standard.

The initial monitoring period of 26 March to 12 May 2004 included footplate training days, a “Thomas the Tank Engine” week over Easter (with increased engine movements) and scheduled services. A timetable of train movements is included in Appendix 2.

From the results of the initial survey it was considered important to ensure that the second monitoring period also included a period of increased train movements associated with a special events week. In this case the monitoring period of the 18 October to 02 November 2004 included the “Wizard Week” over school half term.

3.0 RESULTS

3.1 First Monitoring Exercise

These are shown in figure 5 below. During the six weeks monitoring there were 14 exceedances of the 15 minute sulphur dioxide air quality objective of 266µg/m^3. The objective allows for 35 exceedances per year. During this six week monitoring period the highest 24 hour average sulphur dioxide level recorded was on 10 April 2004 at 39µg/m^3. This is below the 24 hour mean sulphur dioxide objective of 125µg/m^3.

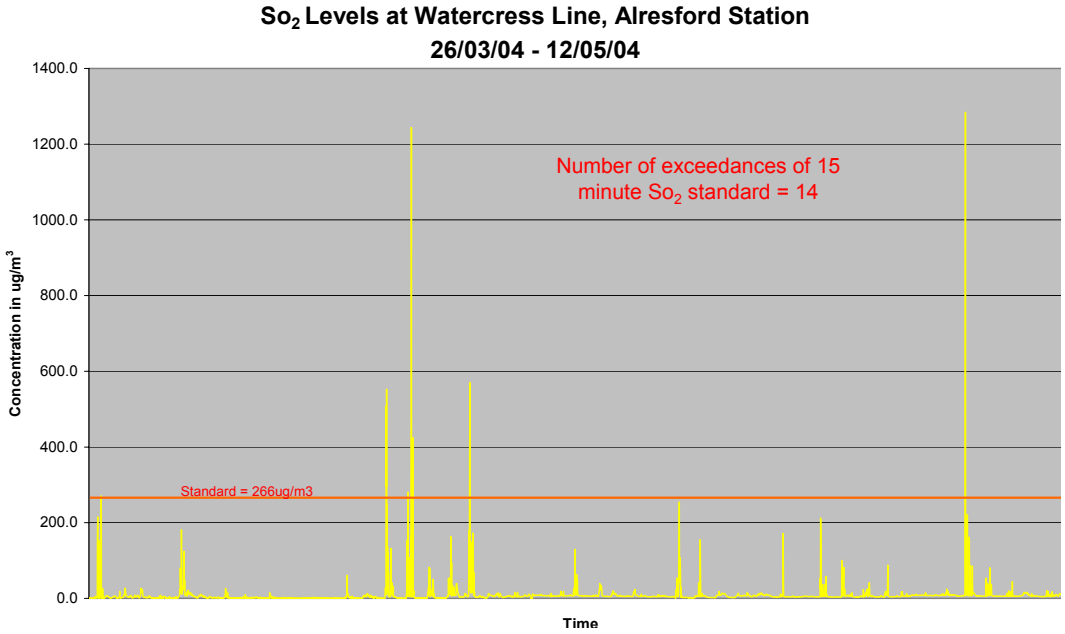


Figure 5 – Results from first monitoring location

The exact dates and times of the failures of the 15 minute objective are shown in Table 1 on the next page. Following discussion with site operatives these always occurred at times when an engine was likely to have been present at Alresford station. Meteorological data used was based on the median wind directions from 3 amateur metrological stations within Hampshire.

Date	Times (BST)	Train Movements	Wind Direction
26/03/2004	14.00-14.15	**Advanced footplate course**	N
		(engine could have been	
		at platform at this time)	
09/04/2004	9.45-10.30	**Thomas (all day)**	NNW
		Steam Train left 9.56	
		Steam Train left 10.26	
10/04/2004	10.45-11.00	**Thomas (all day)**	NNE
	15.00-15.15	Steam Train arrived 10.42	
	16.30-17.15	Steam Train left 14.56	
		Steam Train arrived 16.39	
		Steam Train arrived 17.29	
13/04/2004	10.45-11.00	**Thomas (all day)**	N
		Steam Train left 11.00	
07/05/2004	10.00-10.30	**Advanced footplate course**	NW
		(engine could have been	
		at platform at this time)	
12/05/2004	11.00-11.15	**Scheduled Services**	NE
	13.00-13.15	Steam Train left 11.10	
		Steam Train left 13.10	

Table 2 - Failures of 15 minute objective versus wind direction and train movements

3.2 Second Monitoring Exercise

The results of the second monitoring exercise are shown in figure 6 below. In this instance no failures of the 15 minute objective were observed. The highest result being 125.7µg/m^3 between 12.00 to 12.15 on 27 October. The highest 24 hour mean was 13.6µg/m^3 on 19 October which is well below the 24 hour mean objective of 125µg/m^3.

There are two days which show elevated levels of sulphur dioxide, these were the 27 and 30 October. On both of these days trains were running the increased service associated with the Wizard Week. Again meteorological data was obtained by using the median wind directions from 3 amateur metrological stations within Hampshire. This showed that the mean wind direction was East South East on the 27 October and East on the 30 October. The two week period included wind from most directions and the elevated levels occurred on two of the four days where the mean wind direction was coming from the “East”.

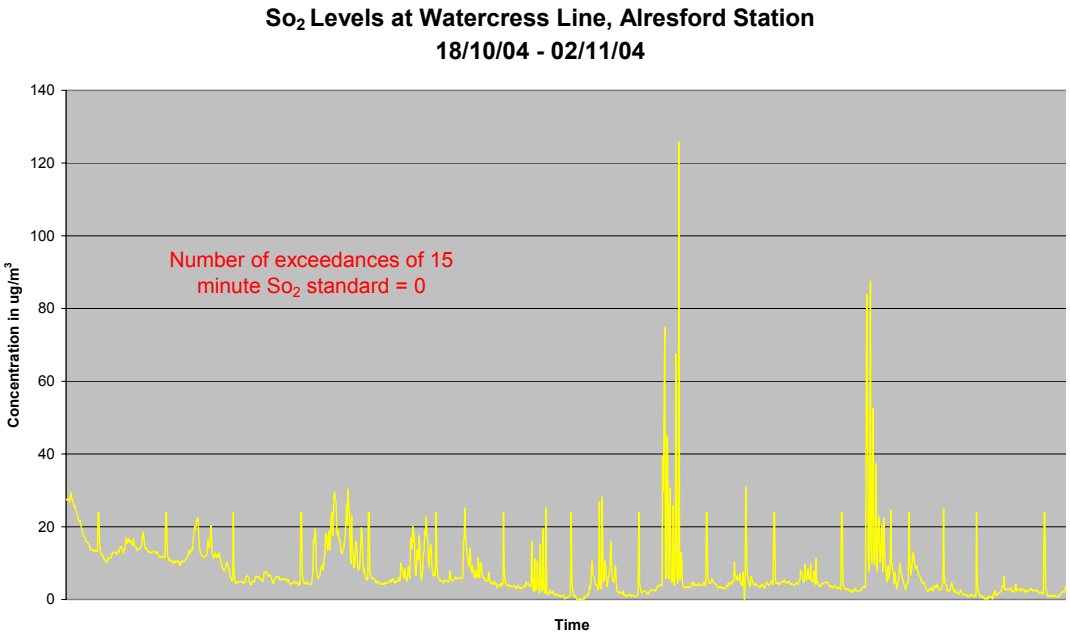


Figure 6 – Results from second monitoring location

4. DISCUSSION

The first set of results was a cause for concern as they showed very short periods of highly elevated levels. No immediate explanation could be found as to why the levels peaked for isolated short periods and then dropped back to almost background levels (assumed to be about 3 to 4 µg/m^3 from DEFRA background data maps). It was confirmed for all these periods there were steam engines at the station platform and that the wind was "Northerly". Peak concentrations during Northerly winds was not expected as most of the time the engines rest to the far East of the station as shown in figure 7 below. It was expected to see peak concentrations when an Easterly wind dispersed the plume towards the main platform area.

Figure 7 – Typical location of steam engine when at rest

Following discussions with Watercress Line personnel it was hypothesised that the observed peaks occurred when the engine parked further down the station platform than normal and the wind blew the **still rising** visible plume directly north into the path of the sampling head. However, as the sampling height was at three metres it was questioned that this would be representative of exposure to the public.

During ad hoc site visits in August and September 2004 this situation was observed on one occasion. In this instance the bank and trees on the side of the track caused the plume to be entrapped close to the first monitoring location before dispersing. This topography can clearly be seen in figure 7.

It was therefore agreed to perform an additional monitoring exercise at the exact location where the nearest public exposure occurred i.e. head height (1.5 metres) on the main platform. As there was no usable sampling location available this required the installation of a “J type” cabinet on the platform. The results from this monitoring showed much lower levels with flatter peaks occurring for longer periods of the day. This suggests that the plume had dispersed to a greater extent at this sampling point avoiding the “all or nothing” results previously obtained. In addition the two days with the highest levels were both during easterly winds as would be expected.

5. CONCLUSIONS

The first sampling location is considered to poorly represent public exposure. Although the second monitoring exercise was only for two weeks, it was performed during a period with maximum train movements and is therefore considered to be representative of the worst case exposure to the public. It is therefore concluded that the site is in compliance with Sulphur dioxide air quality objectives.

APPENDIX 1
Letter from DEFRA regarding exposure locations

Zone 4/E12
Ashdown House
123 Victoria Street
London. SW1E 6DE

Telephone 020 7944 6286
Website www.defra.gov.uk
Direct Line 020 7944 6286 **GTN**
Fax 020 7944 6286
Email ekoere.deinne@defra.gsi.gov.uk

defra
Department for Environment
Food and Rural Affairs

Mr P Tidridge
Scientific Officer (Environmental Protection)
Winchester City Council
Health & Housing
City Offices
Colebrook Street
Winchester
Hampshire SO23 9LJ

Date 01 July 2004

Dear Mr Tidridge

Thank you for your letter of 7 June 2004, requesting confirmation that a station platform constitutes relevant exposure for the purposes of Review & Assessment.

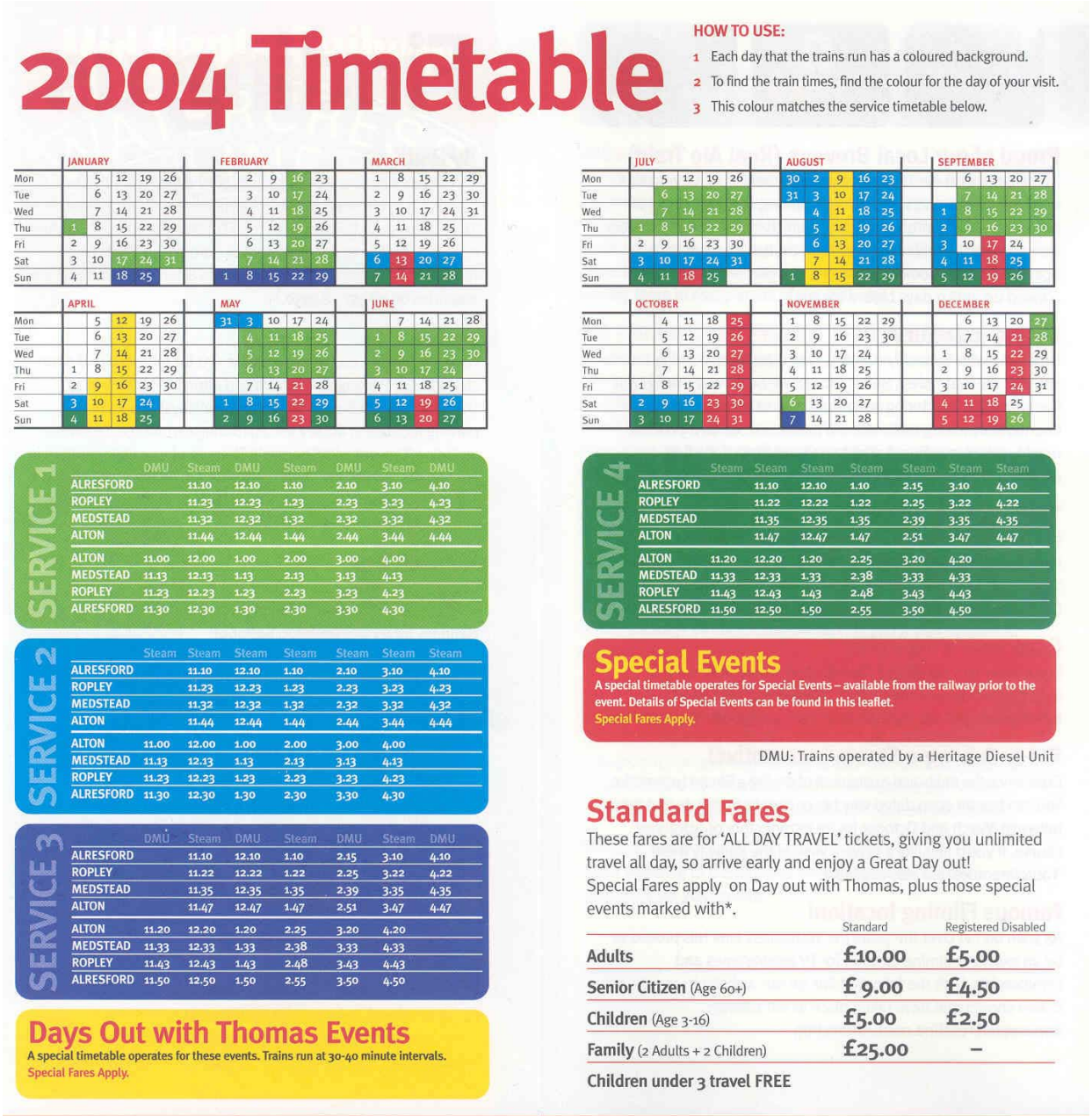
We can confirm that the objectives apply to all outside locations with relevant exposure, and that an open station platform will count as a relevant location. We would therefore ask you to submit your Detailed Assessment report as soon as possible.

Yours sincerely

E. Deinne

Eko Deinne
AIR, ENVIRONMENT QUALITY DIVISION

APPENDIX 2
Watercress Line Timetable 2004



2004 Timetable

HOW TO USE:

1. Each day that the trains run has a coloured background.
2. To find the train times, find the colour for the day of your visit.
3. This colour matches the service timetable below.

	JANUARY					FEBRUARY					MARCH				
Mon		5	12	19	26		2	9	16	23	1	8	15	22	29
Tue		6	13	20	27		3	10	17	24	2	9	16	23	30
Wed		7	14	21	28		4	11	18	25	3	10	17	24	31
Thu	1	8	15	22	29		5	12	19	26	4	11	18	25	
Fri	2	9	16	23	30		6	13	20	27	5	12	19	26	
Sat	3	10	17	24	31		7	14	21	28	6	13	20	27	
Sun	4	11	18	25		1	8	15	22	29	7	14	21	28	

	APRIL					MAY					JUNE				
Mon		5	12	19	26	31	3	10	17	24		7	14	21	28
Tue		6	13	20	27		4	11	18	25	1	8	15	22	29
Wed		7	14	21	28		5	12	19	26	2	9	16	23	30
Thu	1	8	15	22	29		6	13	20	27	3	10	17	24	
Fri	2	9	16	23	30		7	14	21	28	4	11	18	25	
Sat	3	10	17	24		1	8	15	22	29	5	12	19	26	
Sun	4	11	18	25		2	9	16	23	30	6	13	20	27	

	JULY					AUGUST					SEPTEMBER				
Mon		5	12	19	26	30	2	9	16	23		6	13	20	27
Tue		6	13	20	27	31	3	10	17	24		7	14	21	28
Wed		7	14	21	28		4	11	18	25	1	8	15	22	29
Thu	1	8	15	22	29		5	12	19	26	2	9	16	23	30
Fri	2	9	16	23	30		6	13	20	27	3	10	17	24	
Sat	3	10	17	24	31		7	14	21	28	4	11	18	25	
Sun	4	11	18	25		1	8	15	22	29	5	12	19	26	

	OCTOBER					NOVEMBER					DECEMBER				
Mon		4	11	18	25	1	8	15	22	29		6	13	20	27
Tue		5	12	19	26	2	9	16	23	30		7	14	21	28
Wed		6	13	20	27	3	10	17	24		1	8	15	22	29
Thu		7	14	21	28	4	11	18	25		2	9	16	23	30
Fri	1	8	15	22	29	5	12	19	26		3	10	17	24	31
Sat	2	9	16	23	30	6	13	20	27		4	11	18	25	
Sun	3	10	17	24	31	7	14	21	28		5	12	19	26	

SERVICE 1

	DMU	Steam	DMU	Steam	DMU	Steam	DMU
ALRESFORD		11.10	12.10	1.10	2.10	3.10	4.10
ROPLEY		11.23	12.23	1.23	2.23	3.23	4.23
MEDSTEAD		11.32	12.32	1.32	2.32	3.32	4.32
ALTON		11.44	12.44	1.44	2.44	3.44	4.44
ALTON	11.00	12.00	1.00	2.00	3.00	4.00	
MEDSTEAD	11.13	12.13	1.13	2.13	3.13	4.13	
ROPLEY	11.23	12.23	1.23	2.23	3.23	4.23	
ALRESFORD	11.30	12.30	1.30	2.30	3.30	4.30	

SERVICE 2

	Steam	Steam	Steam	Steam	Steam	Steam	Steam
ALRESFORD		11.10	12.10	1.10	2.10	3.10	4.10
ROPLEY		11.23	12.23	1.23	2.23	3.23	4.23
MEDSTEAD		11.32	12.32	1.32	2.32	3.32	4.32
ALTON		11.44	12.44	1.44	2.44	3.44	4.44
ALTON	11.00	12.00	1.00	2.00	3.00	4.00	
MEDSTEAD	11.13	12.13	1.13	2.13	3.13	4.13	
ROPLEY	11.23	12.23	1.23	2.23	3.23	4.23	
ALRESFORD	11.30	12.30	1.30	2.30	3.30	4.30	

SERVICE 3

	DMU	Steam	DMU	Steam	DMU	Steam	DMU
ALRESFORD		11.10	12.10	1.10	2.15	3.10	4.10
ROPLEY		11.22	12.22	1.22	2.25	3.22	4.22
MEDSTEAD		11.35	12.35	1.35	2.39	3.35	4.35
ALTON		11.47	12.47	1.47	2.51	3.47	4.47
ALTON	11.20	12.20	1.20	2.25	3.20	4.20	
MEDSTEAD	11.33	12.33	1.33	2.38	3.33	4.33	
ROPLEY	11.43	12.43	1.43	2.48	3.43	4.43	
ALRESFORD	11.50	12.50	1.50	2.55	3.50	4.50	

Days Out with Thomas Events

A special timetable operates for these events. Trains run at 30-40 minute intervals.
Special Fares Apply.

SERVICE 4

	Steam	Steam	Steam	Steam	Steam	Steam	Steam
ALRESFORD		11.10	12.10	1.10	2.15	3.10	4.10
ROPLEY		11.22	12.22	1.22	2.25	3.22	4.22
MEDSTEAD		11.35	12.35	1.35	2.39	3.35	4.35
ALTON		11.47	12.47	1.47	2.51	3.47	4.47
ALTON	11.20	12.20	1.20	2.25	3.20	4.20	
MEDSTEAD	11.33	12.33	1.33	2.38	3.33	4.33	
ROPLEY	11.43	12.43	1.43	2.48	3.43	4.43	
ALRESFORD	11.50	12.50	1.50	2.55	3.50	4.50	

Special Events

A special timetable operates for Special Events – available from the railway prior to the event. Details of Special Events can be found in this leaflet.
Special Fares Apply.

DMU: Trains operated by a Heritage Diesel Unit

Standard Fares

These fares are for 'ALL DAY TRAVEL' tickets, giving you unlimited travel all day, so arrive early and enjoy a Great Day out!
Special Fares apply on Day out with Thomas, plus those special events marked with*.

	Standard	Registered Disabled
Adults	£10.00	£5.00
Senior Citizen (Age 60+)	£ 9.00	£4.50
Children (Age 3-16)	£5.00	£2.50
Family (2 Adults + 2 Children)	£25.00	–

Children under 3 travel FREE

APPENDIX 3
Monitoring Data

SEE ENCLOSED CD