Annex A

Condition 31 and Condition 32 of The Chiltern Railways (Bicester to Oxford Improvements) Order 2012

Condition 31 –Measures for the protection of the lowland hay meadow habitat at the Oxford Meadow Special Area of Conservation ("SAC")

'Development shall not commence on the Individual Section or Sections between Oxford North Junction and Rewley Abbey Stream ("the relevant sections") until a scheme of Further Assessment of Air Quality in relation to the Cassington Meadows SSSI, the Pixey and Yarnon Meads SSSI and the Wolvercote Meadow SSSI that are co-terminous with part of the Oxford Meadows SAC ("the relevant parts of the SAC") has been submitted to and approved in writing by the local planning authority for the relevant parts of the SAC (in consultation with Natural England).'

The Scheme of Further Assessment shall include the following:

i. a methodology and programme for assessing the baseline exposure to oxides of nitrogen and inferring deposition of the relevant parts of the SAC including appropriate field observations of nitrogen oxide concentrations;

ii. a methodology and programme for monitoring the rates of exposure to oxides of nitrogen (and inferring deposition) of the relevant parts of the SAC that may be emitted from such additional road traffic, which is using the A34 and A40 close to the relevant parts of the SAC, and such additional trains as are attributable to the opening of the relevant sections of the development to passenger rail traffic;

iii. predictions, based on the air quality monitoring, for a period of 10 years after opening of the relevant sections of the development to passenger rail traffic, of the likely additional rates of exposure to oxides of nitrogen (and inferred nitrogen deposition) of the relevant parts of the SAC, that are likely to arise as a result of passenger rail traffic and the developments associated road traffic;

iv. a methodology for attributing the relevant proportions of the recorded exposures to oxides of nitrogen of the relevant sections of the development once opened for rail passengers based on road traffic counts, railway operations data and surveys of modes of transport and routes used by users of the development;

v. a methodology and programme for a baseline vegetation survey of the SSSI and SAC and evaluation of the designated Annex 1 lowland hay meadow habitat situated on the relevant parts of the SAC and for subsequent vegetation surveys, if such are demonstrated to be necessary following steps (i) to (iv);

vi. criteria and threshold for determining the inferred nitrogen deposition from oxides of nitrogen which can be attributed to the opening of the development to passenger rail traffic that are designed to protect the designated Annex 1 lowland hay meadow habitat in the relevant parts of the SAC;

vii. the proposed means of mitigation (which is likely to include changes to the management regimes for the relevant parts of the SAC) in the event that the criteria of thresholds referred to in (vi) are not met or are exceeded; and

viii. the arrangements for the reporting of the monitoring and mitigation to be undertaken in accordance with the Scheme of Further Assessment.

The approved Scheme of Further Assessment shall be implemented as approved.

The development shall not be opened to passenger rail traffic, nor shall the car park or station at Water Eaton Parkway be opened for public use, until the approved assessment of baseline conditions referred to in i) above has been completed as approved and reported to the local planning authority for the relevant parts of the SAC, and any other reports made in accordance with viii) above, and the local planning authority has issued written acceptance that the report complies with the approved Scheme.

Reason: *to ensure that the development does not have a likely significant effect on the designated lowland hay meadow habitat of the SAC by virtue of deposition of nitrogen from emitted oxides of nitrogen.*

Condition 32 – Measures for the protection of the Hook Meadow and Trap Grounds SSSI

'Development shall not commence on the Individual Section or Sections between Oxford North Junction and Rewley Abbey Stream ("the relevant sections") until a Scheme of Further Assessment of air quality in relation to the Hook Meadow and Trap Grounds SSSI ("the SSSI") has been submitted to and approved by the local planning authority (in consultation with Natural England).'

The Scheme of Further Assessment shall include the following:

i. a methodology and programme for assessing the baseline exposure to oxides of nitrogen and inferring deposition on those parts of the SSSI that are identified to be assessed at the date of assessment, including appropriate field observations of nitrogen oxide concentrations;

ii. a methodology and programme for a baseline vegetation survey;

iii. a methodology and programme for monitoring the rates of exposure to oxides of nitrogen (and inferring deposition) that may arise from emissions from such additional train operations as are attributable to the use of the relevant sections of the development by passenger rail traffic ("the additional train operations");

iv. predictions, based on the air quality monitoring, railway operations and other data, for a period of 10 years after opening of the relevant sections of the development to passenger rail traffic, of the likely additional rates of exposure to oxides of nitrogen (and inferred nitrogen deposition) of the SSSI, that can be attributed to the opening and use of the relevant sections of the development for passenger rail traffic;

v. criteria and threshold, designed to protect the SSSI, for determining the rates of exposure to oxides of nitrogen (and inferred nitrogen deposition) which can be attributed to the use of the development by passenger rail traffic;

vi. the proposed means of mitigation in the event that the criteria of thresholds referred to in (v) are not met or are exceeded; and

vii. the arrangements for the reporting of the monitoring and mitigation to be undertaken in accordance with the Scheme of Further Assessment.

The approved Scheme of Further Assessment shall be implemented as approved.

The development shall not be opened to passenger rail traffic until the approved assessment of baseline conditions referred to in i) above has been completed as approved and reported to the local planning authority, and any other reports made in accordance with viii) above, and the local planning authority has issued written acceptance that the report complies with the approved Scheme.

Reason: *to ensure that the development does not cause harm or prevent restoration of the designated features of the SSSI by virtue of nitrogen deposition from the emitted oxides of nitrogen to the SSSI.*

Annex B

Survey Programme

	2017				2018								
Survey	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**
Diffusion Tube													
Lichen Transplant Bio-monitoring													
Plant Tissue													
Soil Samples													
Automatic Traffic Count													
Rail Passenger survey													

Annex C

Supporting Air Quality Information

C1.1 DIFFUSION TUBE/TRANSECT LOCATIONS

In Year One (2017/2018), the tubes were placed at the same location than in the baseline (2014/2015).

C1.1.1 Oxford Meadows SAC

Table C.1 Sample Point Locations

	Transect 1		Transect 2		Transect 3		Transect 4	
	x	y	x	y	x	y	x	y
Road side location	446677	210610	447817	210715	448351	209745	448370	209737
Sample point at 10m	n/a	n/a	447817	210705	448342	209750	448379	209730
Sample point at 20m	n/a	n/a	447819	210694	448325	209759	448389	209724
Sample point at 50m	446693	210562	447823	210665	448287	209780	448405	209700
Sample point at 100m	446707	210512	447825	210579	448248	209809	448443	209663
Sample point at 200m	446746	210422	447830	210485	448163	209872	448515	209594

C1.1.2 Hook Meadow and the Trap Grounds SSSI

Table C.2 Sample Point Locations

	Transect 5		Transect 6		Transect 7		Transect 8	
	x	y	x	y	x	y	x	y
Road side location	449803	209134	449806	209149	449900	209063	449974	208889
Sample point at 10m	n/a	n/a	449815	209154	449910	209067	449984	208893
Sample point at 20m	449786	209124	449824	209159	449920	209071	449994	208896
Sample point at 50m	449760	209109	449850	209176	449948	209083	450022	208907
Sample point at 100m	449715	209085	n/a	n/a	n/a	n/a	n/a	n/a
Sample point at 200m	449624	209042	n/a	n/a	n/a	n/a	n/a	n/a

C1.2 DIFFUSION TUBE SURVEY SCHEDULE

Table C.3 Diffusion Tube Survey Schedule Year One

Month	Date On	Date Off	Notes
September 2017	Various	27/09/17	01/09/17: Transect 1, 2 and 3 05/09/17: Transect 4 06/08/17: Transect 6, 7 and 8 07/09/17: Transect 5
October 2017	27/09/17	01/11/17	Transect 2 200m tube missing
November 2017	01/11/17	06/12/17	
December 2017	06/12/17	03/01/18	
January 2018	03/01/18	31/01/18	
February 2018	31/01/18	07/03/18	Date off was a week after Defra calendar because of heavy snow in the area
March 2018	07/03/18	28/03/18	Date on was a week after Defra calendar because of heavy snow in the area
April 2018	28/03/18	02/05/18	
May 2018	02/05/18	06/06/18	
June 2018	06/06/18	04/07/18	
July 2018	04/07/18	01/08/18	Transect 5 20m tube missing
August 2018	01/08/18	05/09/18	Transect 7 50m and Transect 8 20m tubes missing

C1.3 SUMMARY OF RESULTS FROM BASELINE AND YEAR ONE SURVEYS

C1.3.1 Measured NO_2 Concentrations

Table C.4 Measured Annual Mean NO_2 Concentrations ($\mu g/m^3$) Summary

Transect	10m	20m	50m	100m	200m	Average
Transect 1 – A40 – Oxford Meadows SAC						
Baseline	*n/a*	*n/a*	16.7	14.4	13.1	14.7
Year One	*n/a*	*n/a*	13.3	11.6	10.8	11.9
Change	*n/a*	*n/a*	-3.4	-2.8	-2.3	-2.8
Transect 2 – A40 – Oxford Meadows SAC						
Baseline	22.1	19.4	15.1	15.3	15.6	17.5
Year One	18.3	15.5	12.9	12.9	12.4	14.4
Change	-3.8	-3.9	-2.2	-2.4	-3.2	-3.1
Transect 3 – A34 – Oxford Meadows SAC						
Baseline	*n/a*	26.7	23.8	22.0	20.1	23.1
Year One	*n/a*	19.5	18.1	17.1	15.6	17.6
Change	*n/a*	-7.2	-5.7	-4.9	-4.5	-5.5
Transect 4 – A34 – Oxford Meadows SAC						
Baseline	40.8	31.6	26.2	21.9	18.5	27.8
Year One	31.2	26.3	22.6	19.4	15.6	23.0
Change	-9.6	-5.3	-3.6	-2.5	-2.9	-4.8
Transect 5 – Oxford/Birmingham Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline	*n/a*	18.9	16.5	15.3	16.5	16.8
Year One	*n/a*	15.0	14.7	13.4	13.3	14.1
Change	*n/a*	-3.9	-1.8	-1.9	-3.2	-2.7
Transect 6 – Both Train Lines – Hook Meadow and the Trap Grounds SSSI						
Baseline	17.6	17.7	16.4	*n/a*	*n/a*	17.2
Year One	14.6	15.8	14.8	*n/a*	*n/a*	15.1
Change	-3.0	-1.9	-1.6	*n/a*	*n/a*	-2.1
Transect 7 – Oxford/Bicester Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline	16.2	17.7	16.9	*n/a*	*n/a*	16.9
Year One	15.3	15.3	15.2	*n/a*	*n/a*	15.3
Change	-0.9	-2.4	-1.7	*n/a*	*n/a*	-1.6
Transect 8 – Oxford/Bicester Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline	16.3	17.7	17.4	*n/a*	*n/a*	17.1
Year One	16.2	16.6	15.6	*n/a*	*n/a*	16.2
Change	-0.1	-1.1	-1.8	*n/a*	*n/a*	-0.9

C1.3.2 Measured (Baseline) and Calculated (Year One) NO_x Concentrations

Table C.5 Measured (Baseline) and Calculated (Year One) Annual Mean NO_x Concentrations ($\mu g/m^3$) Summary

Transect	10m	20m	50m	100m	200m	Average
Transect 1 – A40 – Oxford Meadows SAC						
Baseline (Measured)	*n/a*	*n/a*	23.6	21.0	20.7	21.8
Year One (Calculated)	*n/a*	*n/a*	19.3	16.8	15.6	17.2
Change	*n/a*	*n/a*	-4.3	-4.2	-5.1	-4.6
Transect 2 – A40 – Oxford Meadows SAC						
Baseline (Measured)	31.2	27.3	23.3	23.2	22.3	25.4
Year One (Calculated)	26.4	22.4	18.6	18.7	17.9	20.8
Change	-4.8	-4.9	-4.7	-4.5	-4.4	-4.6
Transect 3 – A34 – Oxford Meadows SAC						
Baseline (Measured)	*n/a*	39.8	33.3	30.6	27.9	32.9
Year One (Calculated)	*n/a*	28.1	26.2	24.7	22.5	25.4
Change	*n/a*	-11.7	-7.1	-5.9	-5.4	-7.5
Transect 4 – A34 – Oxford Meadows SAC						
Baseline (Measured)	55.4	45.2	35.9	32.4	27.3	39.2
Year One (Calculated)	45.0	38.0	32.7	28.0	22.5	33.3
Change	-10.4	-7.2	-3.2	-4.4	-4.8	-5.9
Transect 5 – Oxford/Birmingham Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline (Measured)	*n/a*	28.8	25.2	22.8	24.6	25.4
Year One (Calculated)	*n/a*	21.7	21.2	19.3	19.2	20.3
Change	*n/a*	-7.1	-4.0	-3.5	-5.4	-5.1
Transect 6 – Both Train Lines – Hook Meadow and the Trap Grounds SSSI						
Baseline (Measured)	28.0	29.3	25.7	*n/a*	*n/a*	27.7
Year One (Calculated)	21.1	22.7	21.4	*n/a*	*n/a*	21.7
Change	-6.9	-6.6	-4.3	*n/a*	*n/a*	-6.0
Transect 7 – Oxford/Bicester Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline (Measured)	25.2	26.7	20.6	*n/a*	*n/a*	24.2
Year One (Calculated)	22.1	22.0	21.9	*n/a*	*n/a*	22.0
Change	-3.1	-4.7	+1.3	*n/a*	*n/a*	-2.2
Transect 8 – Oxford/Bicester Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline (Measured)	29.0	27.9	27.3	*n/a*	*n/a*	28.1
Year One (Calculated)	23.5	23.9	22.6	*n/a*	*n/a*	23.3
Change	-5.5	-4.0	-4.7	*n/a*	*n/a*	-4.8

C1.3.3 Calculated Nutrient Nitrogen Deposition

Table C.6 Calculated Nutrient Nitrogen Deposition (kgN/ha/yr) Summary

Transect	10m	20m	50m	100m	200m	Average
Transect 1 – A40 – Oxford Meadows SAC						
Baseline	*n/a*	*n/a*	3.40	3.02	2.97	3.13
Year One	*n/a*	*n/a*	2.77	2.41	2.24	2.47
Change	*n/a*	*n/a*	-0.63	-0.61	-0.73	-0.66
Transect 2 – A40 – Oxford Meadows SAC						
Baseline	4.48	3.93	3.35	3.34	3.20	3.66
Year One	3.80	3.22	2.68	2.69	2.57	2.99
Change	-0.68	-0.71	-0.67	-0.65	-0.63	-0.67
Transect 3 – A34 – Oxford Meadows SAC						
Baseline	*n/a*	5.72	4.80	4.41	4.02	4.74
Year One	*n/a*	4.05	3.77	3.55	3.24	3.65
Change	*n/a*	-1.67	-1.03	-0.86	-0.78	-1.09
Transect 4 – A34 – Oxford Meadows SAC						
Baseline	7.98	6.50	5.16	4.66	3.92	5.65
Year One	6.48	5.47	4.70	4.03	3.24	4.78
Change	-1.50	-1.03	-0.46	-0.63	-0.68	-0.87
Transect 5 – Oxford/Birmingham Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline	*n/a*	4.14	3.63	3.27	3.55	3.65
Year One	*n/a*	3.12	3.05	2.78	2.76	2.93
Change	*n/a*	-1.02	-0.58	-0.49	-0.79	-0.72
Transect 6 – Both Train Lines – Hook Meadow and the Trap Grounds SSSI						
Baseline	4.02	4.22	3.70	*n/a*	*n/a*	3.98
Year One	3.03	3.27	3.07	*n/a*	*n/a*	3.13
Change	-0.99	-0.95	-0.63	*n/a*	*n/a*	-0.85
Transect 7 – Oxford/Bicester Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline	3.62	3.84	2.97	*n/a*	*n/a*	3.47
Year One	3.18	3.17	3.16	*n/a*	*n/a*	3.17
Change	-0.44	-0.67	+0.19	*n/a*	*n/a*	-0.30
Transect 8 – Oxford/Bicester Train Line – Hook Meadow and the Trap Grounds SSSI						
Baseline	4.17	4.01	3.93	*n/a*	*n/a*	4.04
Year One	3.37	3.44	3.25	*n/a*	*n/a*	3.35
Change	-0.8	-0.57	-0.68	*n/a*	*n/a*	-0.69

C1.4 DETAILED RESULTS

C1.4.1 Methodology

NO_2 to NO_x conversion

The laboratory used for the baseline survey was not able to provide diffusion tubes for the monitoring of NO_x concentrations. As such, only NO_2 was measured in 2017/2018, and a ratio has been applied to the NO_2 concentrations to obtain indicative NO_x concentrations. The ratio was calculated from the baseline survey average NO_2 and NO_x concentrations measured across the eight transects. A ratio of 1.44 to convert NO_2 to NO_x was calculated and used for the results below.

Critical Level

Results from the baseline monitoring program have been compared to the current objective for the protection of vegetation and ecosystems for NO_x based on a critical level of 30µg/m^3, as an annual average (1).

Results of NO_x concentrations as a percentage of the critical level at all monitoring locations are presented below.

Critical Load

Results from the baseline monitoring have been compared to critical load range values for nutrient nitrogen and acid deposition reported in APIS (2) for low and medium altitude hay meadows and calcareous grassland respectively. The empirical critical load range for nutrient nitrogen and acidification are presented in *Table C.7* and *Table C.8*. In order to compare the results of the Year 1 monitoring with the baseline; an update to the critical loads used in 2014/2015 has not been undertaken to maintain consistency.

For comparison, the NO_x concentration data has been used to estimate nitrogen and acid deposition along each transect using the Environment Agency's approach (3).

(1) Department for Environment, Food and Rural Affairs, 2007. *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*
(2) Air Pollution Information System (APIS) [Online] Available from: http://www.apis.ac.uk/ (Accessed: 13th May 2015)
(3) Environment Agency, 2014. *AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air*

Table C.7 Site Specific Critical Loads for Nutrient Nitrogen Deposition

Site	Habitat features	Nitrogen Critical Load Class	Empirical Critical Load (kg N/ha/yr)
Oxford Meadow (SAC)	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) (H6510)	Low and medium altitude hay meadows	20 - 30
Hook Meadow and the Trap Grounds (SSSI)	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	Low and medium altitude hay meadows	20 - 30

Table C.8 Site Specific Critical Loads for Acidification

Site	Habitat features	Acidity Class	Acidity Critical Load (Keq) – Low range			Acidity Critical Load (Keq) – High range			Exceedance impacts
			MinCLminN	MinCLMaxS	MinCLMaxN	MaxCLminN	MaxCLMaxS	MaxCLMaxN	
Oxford Meadow (SAC)	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) (H6510)	Calcareous grassland (using base cation)	0.856	4.000	4.856	1.710	4.000	5.710	Leaching will cause a decrease in soil base saturation, increasing the availability of Al3+ ions, mobilisation of Al3+ may cause toxicity to plants and mycorrhiza, may have direct effect on lower plants (bryophytes and lichens).
Hook Meadow and the Trap Grounds (SSSI)	Neutral grassland (Cynosurus cristatus - Centaurea nigra grassland)	Calcareous grassland (using base cation)	0.856	4.000	4.856	1.710	4.000	5.710	

C1.4.2 Transect 1

Table C.9 Measured Concentrations at Transect 1 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
20	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
50	11.1	10.5	16.3	12.9	18.1	18.5	19.3	13.6	12.3	9.9	9.4	8.4	13.3	19.3
100	9.6	8.3	13.6	12.1	14.6	17.1	16.0	12.8	11.0	8.3	8.5	7.5	11.6	16.8
200	9.2	7.4	12.5	9.7	14.7	16.4	16.6	12.4	9.4	6.7	7.4	7.2	10.8	15.6
Average	10.0	8.8	14.1	11.5	15.8	17.4	17.3	12.9	10.9	8.3	8.4	7.7	11.9	17.2

Table C.10 Critical Level at Transect 1

Distance (m)	Annual mean NO_x year 1 (µg/m^3)	Annual mean NO_x baseline (µg/m^3)	Critical Level (µg/m^3)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	*n/a*	*n/a*	30	*n/a*	*n/a*
20	*n/a*	*n/a*		*n/a*	*n/a*
50	19.3	23.6		64	79
100	16.8	21.0		56	70
200	15.6	20.7		52	69
Average	17.2	21.8		57	73

Table C.11 Critical Load for Nutrient Nitrogen at Transect 1

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	*n/a*	*n/a*	20 - 30	*n/a*	*n/a*
20	*n/a*	*n/a*		*n/a*	*n/a*
50	2.77	3.40		14	17
100	2.41	3.02		12	15
200	2.24	2.97		11	15
Average	2.47	3.13		12	16

Table C.12 Critical Load for Acidification at Transect 1

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	*n/a*	*n/a*	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	*n/a*	*n/a*
20	*n/a*	*n/a*		*n/a*	*n/a*
50	0.198	0.242		0	0
100	0.172	0.215		0	0
200	0.160	0.212		0	0
Average	0.176	0.224		0	0

C1.4.3 Transect 2

Table C.13 Measured Concentrations at Transect 2 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	14.7	12.2	20.2	17.8	20.1	25.1	23.9	18.6	18.2	17.8	16.5	14.7	18.3	26.4
20	11.7	11.0	<0.16	16.5	18.5	22.7	20.6	17.1	14.4	13.9	12.8	11.8	15.5	22.4
50	11.6	9.5	15.4	13.3	15.7	19.7	18.9	12.2	10.6	8.8	9.6	9.4	12.9	18.6
100	11.5	10.4	16.6	13.7	15.9	20.1	15.1	13.5	11.3	8.8	8.7	9.6	12.9	18.7
200	10.8	Missing	17.5	14.5	15.0	18.3	16.7	12.7	11.2	7.8	8.2	3.5	12.4	17.9
Average	12.1	10.8	17.4	15.2	17.0	21.2	19.1	14.8	13.1	11.4	11.2	9.8	14.4	20.8

Table C.14 Critical Level at Transect 2

Distance (m)	Annual mean NO_x year 1 (µg/m^3)	Annual mean NO_x baseline (µg/m^3)	Critical Level (µg/m^3)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	26.4	31.2	30	88	104
20	22.4	27.3		75	91
50	18.6	23.3		62	78
100	18.7	23.2		62	77
200	17.9	22.3		60	74
Average	20.8	25.4		69	85

Table C.15 Critical Load for Nutrient Nitrogen at Transect 2

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	3.80	4.48	20 - 30	19	22
20	3.22	3.93		16	20
50	2.68	3.35		13	17
100	2.69	3.34		13	17
200	2.57	3.20		13	16
Average	2.99	3.66		15	18

Table C.16 Critical Load for Acidification at Transect 2

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	0.271	0.320	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	0	0
20	0.230	0.280		0	0
50	0.191	0.239		0	0
100	0.192	0.238		0	0
200	0.183	0.229		0	0
Average	0.213	0.261		0	0

C1.4.4 Transect 3

Table C.17 Measured Concentrations at Transect 3 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
20	18.0	17.1	17.0	17.3	19.0	28.3	27.5	25.5	19.5	15.9	14.7	14.1	19.5	28.1
50	16.6	15.3	17.5	17.2	19.9	25.5	24.3	20.1	18.4	15.2	14.3	13.3	18.1	26.2
100	15.7	14.1	16.9	15.9	19.9	22.9	24.4	20.8	16.7	12.6	13.1	12.3	17.1	24.7
200	14.5	12.8	16.7	14.5	18.9	24.0	20.9	19.0	13.1	11.0	10.9	11.2	15.6	22.5
Average	16.2	14.8	17.0	16.2	19.4	25.1	24.3	21.4	16.9	13.7	13.3	12.7	17.6	25.4

Table C.18 Critical Level at Transect 3

Distance (m)	Annual mean NO_x year 1 ($\mu g/m^3$)	Annual mean NO_x baseline ($\mu g/m^3$)	Critical Level ($\mu g/m^3$)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	*n/a*	*n/a*	30	*n/a*	*n/a*
20	28.1	39.8		94	133
50	26.2	33.3		87	111
100	24.7	30.6		82	102
200	22.5	27.9		75	93
Average	25.4	32.9		85	110

Table C.19 Critical Load for Nutrient Nitrogen at Transect 3

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	*n/a*	*n/a*	20 - 30	*n/a*	*n/a*
20	4.05	5.72		20	29
50	3.77	4.80		19	24
100	3.55	4.41		18	22
200	3.24	4.02		16	20
Average	3.65	4.74		18	24

Table C.20 Critical Load for Acidification at Transect 3

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	*n/a*	*n/a*	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	*n/a*	*n/a*
20	0.289	0.408		0	0
50	0.269	0.342		0	0
100	0.253	0.314		0	0
200	0.231	0.286		0	0
Average	0.260	0.338		0	0

C1.4.5 Transect 4

Table C.21 Measured Concentrations at Transect 4 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	30.2	32.3	37.9	38.6	31.7	29.0	36.6	22.5	30.4	22.1	30.2	33.0	31.2	45.0
20	24.8	24.7	31.2	30.6	26.8	29.3	30.3	25.7	26.8	17.7	23.7	24.7	26.3	38.0
50	20.7	14.7	31.3	25.8	26.0	26.0	25.6	23.5	22.4	16.8	18.2	20.7	22.6	32.7
100	16.7	15.9	23.5	22.3	20.1	22.6	22.3	19.4	28.2	11.6	15.1	15.1	19.4	28.0
200	13.5	13.2	20.4	18.1	17.2	20.1	19.0	16.3	14.3	10.3	12.0	13.1	15.6	22.5
Average	21.2	20.1	28.8	27.1	24.4	25.4	26.7	21.5	24.4	15.7	19.9	21.3	23.0	33.3

Table C.22 Critical Level at Transect 4

Distance (m)	Annual mean NO_x year 1 (µg/m^3)	Annual mean NO_x baseline (µg/m^3)	Critical Level (µg/m^3)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	45.0	55.4	30	150	185
20	38.0	45.2		127	151
50	32.7	35.9		109	120
100	28.0	32.4		93	108
200	22.5	27.3		75	91
Average	33.3	39.2		111	131

Table C.23 Critical Load for Nutrient Nitrogen at Transect 4

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	6.48	7.98	20 - 30	32	40
20	5.47	6.50		27	33
50	4.70	5.16		24	26
100	4.03	4.66		20	23
200	3.24	3.92		16	20
Average	4.78	5.65		24	28

Table C.24 Critical Load for Acidification at Transect 4

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	0.462	0.568	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	0	0
20	0.390	0.464		0	0
50	0.335	0.368		0	0
100	0.287	0.332		0	0
200	0.231	0.280		0	0
Average	0.341	0.402		0	0

C1.4.6 Transect 5

Table C.25 Measured Concentrations at Transect 5 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
20	13.9	11.8	18.9	15.4	17.4	19.3	18.9	14.7	11.9	10.8	Missing	12.4	15.0	21.7
50	13.0	12.5	18.6	15.3	17.1	20.0	18.0	15.4	14.3	10.0	10.2	11.8	14.7	21.2
100	12.4	10.9	17.4	13.4	16.7	18.6	17.0	13.0	12.0	9.6	9.2	10.4	13.4	19.3
200	10.8	10.5	17.1	14.4	17.0	19.2	16.9	14.3	12.3	8.6	8.7	9.7	13.3	19.2
Average	12.5	11.4	18.0	14.6	17.0	19.3	17.7	14.3	12.6	9.7	9.4	11.1	14.1	20.3

Table C.26 Critical Level at Transect 5

Distance (m)	Annual mean NO_x year 1 (µg/m^3)	Annual mean NO_x baseline (µg/m^3)	Critical Level (µg/m^3)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	*n/a*	*n/a*	30	*n/a*	*n/a*
20	21.7	28.8		72	96
50	21.2	25.2		71	84
100	19.3	22.8		64	76
200	19.2	24.6		64	82
Average	20.3	25.4		68	85

Table C.27 Critical Load for Nutrient Nitrogen at Transect 5

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	*n/a*	*n/a*	20 - 30	*n/a*	*n/a*
20	3.12	4.14		16	21
50	3.05	3.63		15	18
100	2.78	3.27		14	16
200	2.76	3.55		14	18
Average	2.93	3.65		15	18

Table C.28 Critical Load for Acidification at Transect 5

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	*n/a*	*n/a*	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	*n/a*	*n/a*
20	0.223	0.295		0	0
50	0.217	0.259		0	0
100	0.198	0.234		0	0
200	0.197	0.252		0	0
Average	0.209	0.261		0	0

C1.4.7 Transect 6

Table C.29 Measured Concentrations at Transect 6 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	15.2	14.1	19.2	14.9	18.3	19.8	Void	13.4	13.9	8.9	11.5	11.6	14.6	21.1
20	14.8	14.9	21.1	16.5	17.6	20.5	18.6	16.1	13.6	10.1	11.6	13.7	15.8	22.7
50	13.9	13.6	18.7	15.6	18.2	19.4	17.8	14.0	14.3	9.2	10.7	12.2	14.8	21.4
100	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
200	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
Average	14.6	14.2	19.7	15.7	18.0	19.9	18.2	14.5	13.9	9.4	11.3	12.5	15.1	21.7

Table C.30 Critical Level at Transect 6

Distance (m)	Annual mean NO_x year 1 (µg/m^3)	Annual mean NO_x baseline (µg/m^3)	Critical Level (µg/m^3)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	21.1	28.0	30	70	93
20	22.7	29.3		76	98
50	21.4	25.7		71	86
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	21.7	27.7		72	92

Table C.31 Critical Load for Nutrient Nitrogen at Transect 6

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	3.03	4.02	20 - 30	15	20
20	3.27	4.22		16	21
50	3.07	3.70		15	18
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	3.13	3.98		16	20

Table C.32 Critical Load for Acidification at Transect 6

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	0.216	0.287	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	0	0
20	0.233	0.301		0	0
50	0.219	0.264		0	0
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	0.223	0.284		0	0

C1.4.8 Transect 7

Table C.33 Measured Concentrations at Transect 7 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	14.5	15.2	18.3	16.8	18.2	19.5	18.5	15.5	12.8	9.0	11.1	14.2	15.3	22.1
20	15.7	15.2	20.5	15.5	17.3	17.9	18.0	13.7	14.2	9.0	11.7	14.6	15.3	22.0
50	15.1	15.0	20.7	17.0	19.0	18.5	16.6	14.1	12.0	8.2	11.1	Missing	15.2	21.9
100	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
200	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
Average	15.1	15.1	19.8	16.4	18.2	18.6	17.7	14.4	13.0	8.7	11.3	14.4	15.3	22.0

Table C.34 Critical Level at Transect 7

Distance (m)	Annual mean NO_x year 1 (µg/m^3)	Annual mean NO_x baseline (µg/m^3)	Critical Level (µg/m^3)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	22.1	25.2	30	74	84
20	22.0	26.7		73	89
50	21.9	20.6		73	69
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	22.0	24.2		73	81

Table C.35 Critical Load for Nutrient Nitrogen at Transect 7

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	3.18	3.62	20 - 30	16	18
20	3.17	3.84		16	19
50	3.16	2.97		16	15
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	3.17	3.47		16	17

Table C.36 Critical Load for Acidification at Transect 7

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	0.227	0.259	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	0	0
20	0.226	0.274		0	0
50	0.225	0.211		0	0
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	0.226	0.248		0	0

C1.4.9 Transect 8

Table C.37 Measured Concentrations at Transect 8 (µg/m^3)

Distance (m)	NO_2													Calculated NO_x
	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Annual mean	Annual Mean
10	15.3	16.8	21.4	17.8	18.2	21.0	19.6	16.3	14.0	9.4	11.8	13.5	16.2	23.5
20	20.4	16.5	20.6	17.3	18.3	20.3	17.5	15.9	13.6	9.6	12.2	Missing	16.6	23.9
50	15.7	15.2	19.6	17.2	19.1	20.2	18.4	15.6	12.2	8.8	11.6	14.1	15.6	22.6
100	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
200	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*
Average	17.1	16.2	20.5	17.4	18.5	20.5	18.5	15.9	13.3	9.3	11.9	13.8	16.2	23.3

Table C.38 Critical Level at Transect 8

Distance (m)	Annual mean NO_x year 1 (µg/m^3)	Annual mean NO_x baseline (µg/m^3)	Critical Level (µg/m^3)	Annual mean as a percentage of the critical level year 1 (%)	Annual mean as a percentage of the critical level baseline (%)
10	23.5	29.0	30	78	97
20	23.9	27.9		80	93
50	22.6	27.3		75	91
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	23.3	28.1		78	94

Table C.39 Critical Load for Nutrient Nitrogen at Transect 8

Distance (m)	Nitrogen deposition year 1 (kgN/ha/yr)	Nitrogen deposition baseline (kgN/ha/yr)	Critical Load (kgN/ha/yr)	Nitrogen deposition as a percentage of the critical load year 1 (%)	Nitrogen deposition as a percentage of the critical load baseline (%)
10	3.37	4.17	20 - 30	17	21
20	3.44	4.01		17	20
50	3.25	3.93		16	20
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	3.35	4.04		17	20

Table C.40 Critical Load for Acidification at Transect 8

Distance (m)	Acid deposition year 1 (keq/ha/yr)	Acid deposition baseline (keq/ha/yr)	Acidity Critical Load (Keq) – Low range	Acid deposition as a percentage of the critical load year 1 (%)	Acid deposition as a percentage of the critical load baseline (%)
10	0.241	0.298	MinCLminN 0.856 MinCLMaxS: 4.000 MinCLMaxN 4.856	0	0
20	0.245	0.286		0	0
50	0.232	0.280		0	0
100	*n/a*	*n/a*		*n/a*	*n/a*
200	*n/a*	*n/a*		*n/a*	*n/a*
Average	0.239	0.288		0	0

C1.5 LOCAL AND REGIONAL MONITORING DATA

Monthly mean and annual mean concentrations of NO_x and NO_2 sourced from the Automatic Urban and Rural Network (AURN) for Wicken Fen, St Ebbe's and Oxford Centre are presented below. Harwell was decommissioned in December 2015 so the results are not presented in this annex.

C1.5.1 Wicken Fen

Table C.41 Monthly Mean April 2014 – March 2015

Period	Monthly mean NO_x concentration ($\mu g/m^3$)	Monthly mean NO_2 concentration ($\mu g/m^3$)
April-14	11.7	9.28
May-14	7.58	5.99
June-14	5.77	4.25
July-14	5.52	3.77
August-14	6.71	4.66
September-14	7.68	5.67
October-14	*n/a*	*n/a*
November-14	*n/a*	*n/a*
December-14	13.4	11.7
January-15	13.8	10.9
February-15	15.5	13.0
March-15	10.3	8.52
Annual	9.61	7.59

Table C.42 Monthly Mean September 2017 – August 2018

Period	Monthly mean NO_x concentration ($\mu g/m^3$)	Monthly mean NO_2 concentration ($\mu g/m^3$)
September-17	7.71	6.45
October-17	7.93	6.95
November-17	15.8	13.3
December-17	14.5	12.3
January-18	12.6	11.4
February-18	11.8	10.7
March-18	11.2	10.3
April-18	8.61	7.76
May-18	6.94	6.08
June-18	4.35	3.64
July-18	6.16	8.62
August-18	6.58	7.87
Annual	9.51	8.77

Table C.43 Annual Mean 2013 - 2018

Period	Annual Mean NO_x concentration ($\mu g/m^3$)	Annual Mean NO_2 concentration ($\mu g/m^3$)
2013	12	8
2014	10	8
2015	9	7
2016	13	10
2017	11	9
2018 (up to November 2018)	9	8

C1.5.2 Oxford St Ebbe's

Table C.44 Monthly Mean April 2014 – March 2015

Period	Monthly mean NO_x concentration ($\mu g/m^3$)	Monthly mean NO_2 concentration ($\mu g/m^3$)
April-14	28.2	17.2
May-14	23.4	13.7
June-14	19.7	12.4
July-14	18.4	12.1
August-14	15.0	10.4
September-14	40.4	19.3
October-14	25.3	15.5
November-14	63.5	24.2
December-14	39.5	19.5
January-15	37.5	17.1
February-15	37.0	22.1
March-15	27.1	16.4
Annual	31.1	16.6

Table C.45 Monthly Mean September 2017 – August 2018

Period	Monthly mean NO_x concentration ($\mu g/m^3$)	Monthly mean NO_2 concentration ($\mu g/m^3$)
September-17	21.0	11.8
October-17	23.9	11.2
November-17	45.0	17.9
December-17	30.4	15.4
January-18	30.3	15.7
February-18	26.2	17.7
March-18	25.0	16.4
April-18	19.9	13.1
May-18	20.2	12.7
June-18	13.0	8.59
July-18	11.5	9.96
August-18	15.6	10.7
Annual	23.4	13.4

Table C.46 Annual Mean 2013 - 2018

Period	Annual Mean NO_x concentration ($\mu g/m^3$)	Annual Mean NO_2 concentration ($\mu g/m^3$)
2013	31	18
2014	30	16
2015	25	14
2016	41	19
2017	27	14
2018 (up to November 2018)	22	14

C1.5.3 Oxford Centre

Table C.47 Monthly Mean April 2014 – March 2015

Period	Monthly mean NO_x concentration ($\mu g/m^3$)	Monthly mean NO_2 concentration ($\mu g/m^3$)
April-14	161	51.7
May-14	157	53.1
June-14	142	46.0
July-14	134	52.0
August-14	111	41.5
September-14	227	70.9
October-14	152	47.6
November-14	262	65.3
December-14	143	49.7
January-15	136	41.0
February-15	161	52.3
March-15	136	46.1
Annual	160	51.4

Table C.48 Monthly Mean September 2017 – August 2018

Period	Monthly mean NO_x concentration ($\mu g/m^3$)	Monthly mean NO_2 concentration ($\mu g/m^3$)
September-17	103	36.5
October-17	101	34.3
November-17	116	38.7
December-17	88.7	35.1
January-18	106	35.4
February-18	126	43.1
March-18	116	41.5
April-18	95.1	37.0
May-18	102	40.7
June-18	91.9	36.0
July-18	87.1	35.7
August-18	73.7	28.6
Annual	100	36.9

Table C.49 Annual Mean 2013 - 2018

Period	Annual Mean NO_x concentration ($\mu g/m^3$)	Annual Mean NO_2 concentration ($\mu g/m^3$)
2013	166	58
2014	162	52
2015	141	49
2016	152	49
2017	122	40
2018 (up to November 2018)	101	37

Annex D

Lichen and Plant Tissue Analysis

James Hutton Limited

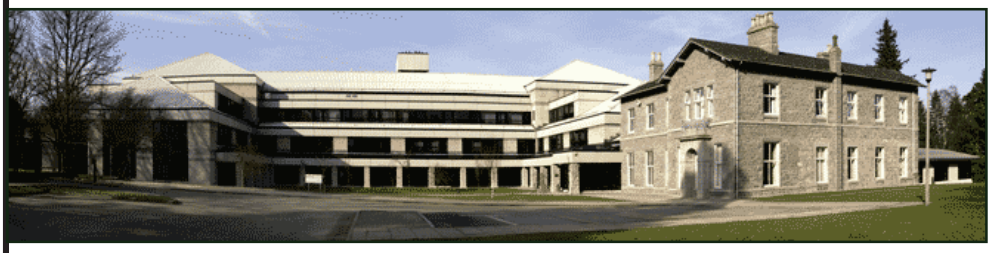
ANALYTICAL LABORATORY SERVICES
Assured Analytical Excellence

Analytical Report

^{13}C, ^{15}N, Total N and Total C Content of Vegetation

FOR:

Georgia Tew-Street
Environmental Resources Management
2nd Floor, One Castel Park
Tower Hill
Bristol
BS2 0JA



REPORT AUTHOR:

Gillian Martin
(email: gillian.martin@hutton.ac.uk T: 01224 395000)

INVESTORS IN PEOPLE

[redacted]
Maureen Procee
Report Authorisation
2018-07-27 12:30+01:00

Job and Sample Information:	
Job No(s):	*2018-26256*
Client Order No/Reference:	Project code 0221083
Date Sample(s) Received:	07/05/18
Lab Code	**Client Code**
1287604 - 1287647	**Various – see table**

Methods

Samples were ball milled prior to analysis.

Methods	Accreditation Reference
^{13}C, ^{15}N, Total N and Total C using Continuous Flow Isotope Ratio Mass Spectrometry	N/A

Measurement Parameters:
Isotope Referencing: $d^{15}N$ wrt Air, $d^{13}C$ wrt V-PDB *Requirements for Accurate Isotope Analysis:* 30µg N and 400µg C for natural abundance. 15µg N for ^{15}N enriched samples 20µg C for low carbon mode

Note:
Samples will be stored for a period of eight weeks following completion of analysis and acceptance of analytical report(s) at no extra cost after which samples will be disposed of unless a specific instruction is given (with the sample analysis request/order) to store the sample beyond this period. Extended storage charges will apply.

Results

Please see table below for results

No.	Client Code	Lab Code	Weight (mg)	C (%, w/w)	$\delta^{13}C$ (‰)	^{13}C (Atom %)	N (%, w/w)	$\delta^{15}N$ (‰)	^{15}N (Atom %)	Amount C (µg)	Amount N (µg)
1	4b, T2 10m Xanthoria	1287604	5.311	45.7	-23.19	1.0803	2.41	-9.86	0.3629	2429	128
2	5b, T2 20m Xanthoria	1287605	5.101	45.4	-22.59	1.0810	2.14	-10.6	0.3626	2318	109
3	6b, T2 50m Xanthoria	1287606	5.533	45.6	-22.92	1.0806	1.60	-11.8	0.3622	2525	88
4	7b, T2 100m Xanthoria	1287607	5.336	45.0	-23.04	1.0805	2.05	-11.3	0.3623	2399	110
5	8b, T2 200m Xanthoria	1287608	5.795	45.6	-23.35	1.0801	2.32	-10.0	0.3628	2644	135
6	13b, T4 10m Xanthoria	1287609	5.227	45.6	-22.77	1.0808	2.40	-10.2	0.3627	2383	125
7	14b, T4 20m Xanthoria	1287610	5.412	45.2	-23.26	1.0802	1.94	-13.0	0.3617	2446	105
8	15b, T4 50m Xanthoria	1287611	5.119	45.4	-24.54	1.0788	1.71	-9.48	0.3630	2327	88
9	16b, T4 100m Xanthoria	1287612	5.179	45.3	-22.97	1.0805	2.04	-11.0	0.3625	2345	105
10	17b, T4 200m Xanthoria	1287613	5.359	45.6	-23.45	1.0800	2.30	-11.7	0.3622	2444	123
11	18b, T5 20m Xanthoria	1287614	5.219	45.5	-23.58	1.0799	1.81	-10.2	0.3627	2375	95
12	19b, T5 50m Xanthoria	1287615	5.570	45.8	-22.41	1.0812	2.13	-7.60	0.3637	2549	119
13	20b, T5 100m Xanthoria	1287616	5.505	45.3	-23.28	1.0802	1.90	-12.5	0.3619	2494	105
14	21b, T5 200m Xanthoria	1287617	5.897	45.6	-22.56	1.0810	2.32	-11.5	0.3623	2691	137
15	22b, T6 10m Xanthoria	1287618	5.914	45.3	-22.83	1.0807	2.42	-10.8	0.3625	2679	143
16	23b, T6 20m Xanthoria	1287619	5.197	45.4	-22.76	1.0808	2.30	-10.1	0.3628	2359	120
17	24b, T6 50m Xanthoria	1287620	5.359	45.1	-23.04	1.0805	2.34	-10.5	0.3626	2415	125
18	25b, T7 10m Xanthoria	1287621	5.668	45.3	-23.66	1.0798	2.15	-12.7	0.3618	2568	122
19	26b, T7 20m Xanthoria	1287622	5.806	45.6	-22.81	1.0807	2.43	-9.90	0.3629	2647	141
20	27b, T7 50m Xanthoria	1287623	5.110	45.3	-22.50	1.0810	2.20	-12.5	0.3619	2312	112
21	34b, T2 10m Evernia	1287624	5.860	45.4	-21.35	1.0823	1.17	-11.7	0.3622	2661	68
22	35b, T2 20m Evernia	1287625	5.334	45.4	-22.73	1.0808	1.40	-15.2	0.3609	2421	75
23	36b, T2 50m Evernia	1287626	5.665	45.5	-22.37	1.0812	1.14	-17.8	0.3600	2580	64
24	37b, T2 100m Evernia	1287627	5.166	45.3	-23.23	1.0802	1.42	-15.4	0.3609	2342	74
25	38b, T2 200m Evernia	1287628	5.250	46.0	-21.88	1.0817	1.70	-14.9	0.3610	2413	89
26	43b, T4 10m Evernia	1287629	5.259	45.9	-21.68	1.0819	1.36	-17.0	0.3603	2412	72
27	44b, T4 20m Evernia	1287630	5.243	45.4	-21.64	1.0820	1.60	-14.6	0.3611	2378	84
28	45b, T4 50m Evernia	1287631	5.127	46.0	-24.02	1.0794	0.97	-18.0	0.3599	2357	50

No.	Client Code	Lab Code	Weight (mg)	C (%, w/w)	$\delta^{13}C$ (‰)	^{13}C (Atom %)	N (%, w/w)	$\delta^{15}N$ (‰)	^{15}N (Atom %)	Amount C (µg)	Amount N (µg)
29	46b, T4 100m Evernia	1287632	5.236	44.8	-23.44	1.0800	1.70	-13.2	0.3616	2344	89
30	47b, T4 200m Evernia	1287633	5.461	44.6	-21.84	1.0818	1.40	-11.7	0.3622	2437	77
31	48b, T5 20m Evernia	1287634	5.298	45.9	-21.57	1.0821	1.46	-16.7	0.3604	2433	78
32	49b, T5 50m Evernia	1287635	5.115	45.3	-22.51	1.0810	1.55	-13.5	0.3615	2318	79
33	50b, T5 100m Evernia	1287636	5.138	46.1	-23.60	1.0798	1.37	-18.9	0.3596	2368	70
34	51b, T5 200m Evernia	1287637	5.456	45.4	-23.07	1.0804	1.67	-12.1	0.3621	2479	91
35	52b, T6 10m Evernia	1287638	5.911	45.2	-21.46	1.0822	1.73	-15.4	0.3608	2670	102
36	53b, T6 20m Evernia	1287639	5.447	46.0	-22.78	1.0807	1.28	-14.9	0.3610	2508	70
37	54b, T6 50m Evernia	1287640	5.171	45.4	-22.05	1.0815	1.66	-14.2	0.3613	2347	86
38	55b, T7 10m Evernia	1287641	5.231	46.1	-22.43	1.0811	1.45	-11.8	0.3622	2413	76
39	56b, T7 20m Evernia	1287642	5.364	44.9	-24.25	1.0791	1.41	-14.2	0.3613	2411	76
40	57b, T7 50m Evernia	1287643	5.350	45.6	-22.26	1.0813	1.56	-13.6	0.3615	2442	83
41	61b, Control 1 Xanthoria	1287644	5.570	44.6	-21.83	1.0818	2.12	-13.4	0.3616	2482	118
42	62b, Control2 Xanthoria	1287645	5.406	44.4	-22.64	1.0809	2.30	-11.1	0.3624	2401	124
43	64b, Control 1 Evernia	1287646	5.160	45.6	-23.73	1.0797	1.61	-14.3	0.3613	2355	83
44	65b, Control 2 Evernia	1287647	5.228	45.4	-21.96	1.0816	1.30	-14.8	0.3611	2373	68

James Hutton Limited

ANALYTICAL LABORATORY SERVICES
Assured Analytical Excellence

Analytical Report

on the ^{13}C, ^{15}N, Total C and Total N Content of Vegetation Samples

FOR:

Jessie Hine
ERM
36 King's Stables Road
Edinburgh
EH1 2EU

REPORT AUTHOR:

Gillian Martin, BSc (Research Scientist)
(email: gillian.martin@hutton.ac.uk T: 01224 395000)

[redacted]

Digitally signed by BarryThornton
Reason: I am approving this document
Location:
Date: 2018-11-21 11:17Z

Job and Sample Information:	
Job No(s):	*2018-27440*
Client Order No/Reference:	Project code 0221083
Date Sample(s) Received:	29/10/18
Lab Code	**Client Code**
1298449 - 1298492	**Various – see table**

Methods

Methods	Date analysis completed
^{13}C, ^{15}N, Total N and Total C using Continuous Flow Isotope Ratio Mass Spectrometry (non-accredited)	08/11/18

Measurement Parameters:
Isotope Referencing: $d^{15}N$ wrt Air, $d^{13}C$ wrt V-PDB *Requirements for Accurate Isotope Analysis:* 30µg N and 400µg C for natural abundance. 15µg N for ^{15}N enriched samples 20µg C for low carbon mode

Results

Please see table below for results.

Note:
Samples will be stored for a period of eight weeks following completion of analysis and acceptance of analytical report(s) at no extra cost after which samples will be disposed of unless a specific instruction is given (with the sample analysis request/order) to store the sample beyond this period. Extended storage charges will apply.

No.	Client Code	Lab Code	Weight (mg)	C (%, w/w)	$\delta^{13}C$ (‰)	^{13}C (Atom %)	N (%, w/w)	$\delta^{15}N$ (‰)	^{15}N (Atom %)	Amount C (µg)	Amount N (µg)
1	4a	1298449	5.249	42.99	-23.10	1.0804	2.40	-9.07	0.3632	2256	126
2	5a	1298450	5.262	43.24	-23.14	1.0804	2.57	-7.22	0.3638	2275	135
3	6a	1298451	5.215	43.46	-23.26	1.0802	2.39	-5.68	0.3644	2267	125
4	7a	1298452	5.338	42.90	-23.11	1.0804	3.04	-4.33	0.3649	2290	162
5	8a	1298453	5.194	43.12	-23.09	1.0804	3.25	-4.56	0.3648	2240	169
6	13a	1298454	5.352	42.90	-23.19	1.0803	2.32	-9.01	0.3632	2296	124
7	14a	1298455	5.241	42.98	-23.65	1.0798	2.61	-8.22	0.3635	2252	137
8	15a	1298456	5.567	43.18	-24.15	1.0792	2.52	-7.16	0.3639	2404	140
9	16a	1298457	5.336	42.13	-23.37	1.0801	3.68	-1.80	0.3658	2248	196
10	17a	1298458	5.329	43.34	-23.63	1.0798	2.38	-9.82	0.3629	2310	127
11	18a	1298459	No sample								
12	19a	1298460	5.228	41.22	-22.70	1.0808	3.13	-2.04	0.3657	2155	163
13	20a	1298461	No sample								
14	21a	1298462	5.261	42.92	-23.10	1.0804	3.00	-6.76	0.3640	2258	158
15	22a	1298463	5.825	42.99	-23.04	1.0805	2.49	-8.71	0.3633	2504	145
16	23a	1298464	5.192	43.20	-22.94	1.0806	2.56	-8.15	0.3635	2243	133
17	24a	1298465	5.198	42.04	-22.85	1.0807	2.92	-4.34	0.3649	2185	152
18	25a	1298466	5.199	42.29	-23.58	1.0799	2.34	-9.82	0.3629	2199	121
19	26a	1298467	5.129	42.84	-23.25	1.0802	3.23	-4.59	0.3648	2197	165
20	27a	1298468	5.385	42.96	-22.90	1.0806	2.44	-10.65	0.3626	2313	132
21	34a	1298469	5.148	44.56	-22.13	1.0815	1.42	-9.20	0.3631	2294	73
22	35a	1298470	5.149	45.15	-23.38	1.0801	1.84	-10.44	0.3627	2325	95
23	36a	1298471	5.553	45.24	-23.41	1.0801	2.37	-8.27	0.3635	2512	132
24	37a	1298472	5.451	44.80	-22.73	1.0808	2.80	-3.80	0.3651	2442	153
25	38a	1298473	5.301	45.47	-22.63	1.0809	2.76	-6.85	0.3640	2410	146
26	43a	1298474	5.149	45.14	-22.82	1.0807	1.90	-9.25	0.3631	2324	98
27	44a	1298475	5.345	44.84	-22.24	1.0813	1.72	-11.31	0.3623	2397	92
28	45a	1298476	5.587	45.38	-24.14	1.0793	2.00	-11.76	0.3622	2535	112
29	46a	1298477	5.191	45.05	-23.39	1.0801	2.49	-6.40	0.3641	2338	129
30	47a	1298478	5.211	44.31	-22.54	1.0810	1.79	-8.35	0.3634	2309	93
31	48a	1298479	No sample								
32	49a	1298480	No sample								

No.	Client Code	Lab Code	Weight (mg)	C (%, w/w)	$\delta^{13}C$ (‰)	^{13}C (Atom %)	N (%, w/w)	$\delta^{15}N$ (‰)	^{15}N (Atom %)	Amount C (µg)	Amount N (µg)
33	50a	1298481	No sample								
34	51a	1298482	5.242	44.00	-23.57	1.0799	2.95	-4.54	0.3637	2306	155
35	52a	1298483	5.289	44.87	-22.51	1.0810	2.11	-9.50	0.3627	2373	112
36	53a	1298484	5.438	45.46	-23.06	1.0804	1.92	-8.75	0.3640	2472	105
37	54a	1298485	5.24	44.64	-22.42	1.0811	2.12	-7.48	0.3624	2339	111
38	55a	1298486	5.213	44.87	-22.92	1.0806	1.65	-10.27	0.3622	2339	86
39	56a	1298487	5.528	44.73	-24.44	1.0789	1.90	-6.84	0.3630	2473	105
40	57a	1298488	5.267	44.93	-23.00	1.0805	1.67	-11.15	0.3624	2367	88
41	61a	1298489	No sample								
42	62a	1298490	5.325	43.45	-23.29	1.0802	2.67	-11.65	0.3622	2314	142
43	64a	1298491	No sample								
44	65a	1298492	5.236	43.90	-21.96	1.0816	1.92	-9.41	0.3630	2299	101

END OF REPORT

James Hutton Limited

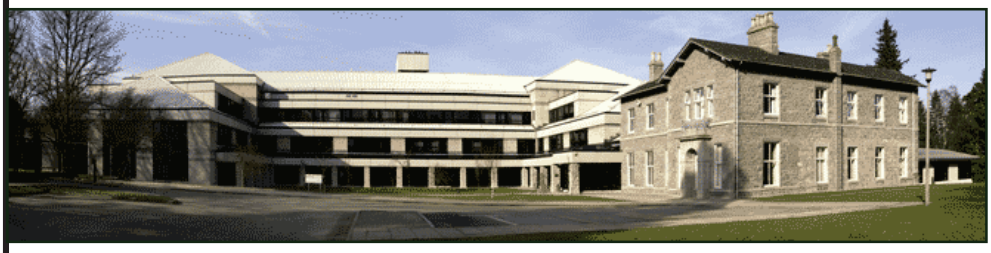
ANALYTICAL LABORATORY SERVICES
Assured Analytical Excellence

Analytical Report

^{13}C, ^{15}N, Total N and Total C Content of Vegetation

FOR:

Jessie Hine
Environmental Resources Management
36 King's Stables Road
Edinburgh



REPORT AUTHOR:

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[redacted]

Digitally signed by BarryThornton
Reason: I am approving this document
Location:
Date: 2018-09-26 14:33+01:00

Job and Sample Information:	
Job No(s):	*2018-26928*
Client Order No/Reference:	Project code 0221083
Date Sample(s) Received:	30/07/18
Lab Code	**Client Code**
1294155 - 1294244	**Various – see table**

Methods

Samples were ball milled prior to analysis.

Methods	Accreditation Reference
^{13}C, ^{15}N, Total N and Total C using Continuous Flow Isotope Ratio Mass Spectrometry	N/A

Measurement Parameters:
Isotope Referencing: $d^{15}N$ wrt Air, $d^{13}C$ wrt V-PDB *Requirements for Accurate Isotope Analysis:* 30µg N and 400µg C for natural abundance. 15µg N for ^{15}N enriched samples 20µg C for low carbon mode

Note:
Samples will be stored for a period of eight weeks following completion of analysis and acceptance of analytical report(s) at no extra cost after which samples will be disposed of unless a specific instruction is given (with the sample analysis request/order) to store the sample beyond this period. Extended storage charges will apply.

Results

Please see table below for results

Figures in bold did not contain enough material for accurate analysis.

No.	Client Code	Lab Code	Weight (mg)	C (%, w/w)	$\delta^{13}C$ (‰)	^{13}C (Atom %)	N (%, w/w)	$\delta^{15}N$ (‰)	^{15}N (Atom %)	Amount C (µg)	Amount N (µg)
1	T1 50 A	1294155	5.212	47.9	-27.86	1.0752	2.02	7.19	0.3691	2499	105
2	T1 50 B	1294156	5.146	45.9	-28.17	1.0748	1.22	3.64	0.3678	2362	63
3	T1 50 C	1294157	5.694	46.0	-28.41	1.0746	1.68	4.40	0.3681	2617	96
4	T1 100 A	1294158	5.421	44.8	-28.48	1.0745	1.53	5.30	0.3684	2428	83
5	T1 100 B	1294159	5.303	46.2	-28.47	1.0745	1.13	5.75	0.3686	2449	60
6	T1 100 C	1294160	5.255	46.2	-31.21	1.0715	1.03	4.62	0.3682	2428	54
7	T1 200 A	1294161	5.643	46.7	-28.36	1.0746	1.87	5.45	0.3685	2636	105
8	T1 200 B	1294162	5.314	43.1	-29.06	1.0739	0.98	2.12	0.3672	2289	52
9	T1 200 C	1294163	5.196	45.1	-29.64	1.0732	1.82	4.10	0.3680	2344	95
10	T2 10 A	1294164	5.445	43.0	-28.63	1.0743	1.24	4.42	0.3681	2342	68
11	T2 10 B	1294165	5.359	44.9	-27.53	1.0755	1.83	5.73	0.3686	2404	98
12	T2 10 C	1294166	5.743	41.4	-26.53	1.0766	2.81	6.65	0.3689	2380	161
13	T2 20 A	1294167	5.257	47.0	-28.66	1.0743	2.54	5.08	0.3683	2471	134
14	T2 20 B	1294168	5.219	46.4	-26.90	1.0762	1.33	4.19	0.3680	2420	69
15	T2 20 C	1294169	5.149	41.8	-27.54	1.0755	2.61	5.31	0.3684	2155	134
16	T2 50 A	1294170	5.206	46.5	-28.34	1.0747	2.63	5.24	0.3684	2421	137
17	T2 50 B	1294171	5.122	42.4	-28.77	1.0742	1.06	9.28	0.3699	2170	54
18	T2 50 C	1294172	5.838	46.5	-29.50	1.0734	2.70	4.15	0.3680	2714	158
19	T2 100 A	1294173	5.144	46.8	-27.94	1.0751	1.87	4.28	0.3680	2409	96
20	T2 100 B	1294174	5.224	42.2	-28.39	1.0746	1.26	4.21	0.3680	2205	66
21	T2 100 C	1294175	5.507	40.6	-26.39	1.0768	2.29	8.04	0.3694	2236	126
22	T2 200 A	1294176	5.438	44.5	-28.37	1.0746	0.80	3.30	0.3677	2422	44
23	T2 200 B	1294177	5.629	47.0	-27.87	1.0752	1.52	-0.07	0.3664	2647	86
24	T2 200 C	1294178	5.334	46.8	-27.91	1.0751	1.86	3.19	0.3676	2495	99
25	T3 20 A	1294179	5.330	42.8	-27.72	1.0753	2.73	9.54	0.3700	2279	145
26	T3 20 B	1294180	5.349	42.5	-30.83	1.0719	1.64	1.89	0.3672	2271	88
27	T3 20 C	1294181	5.767	40.5	-27.69	1.0754	2.40	5.92	0.3686	2338	139
28	T3 50 A2	1294182	5.117	43.7	-28.97	1.0740	0.92	7.61	0.3692	2238	47

No.	Client Code	Lab Code	Weight (mg)	C (%, w/w)	$\delta^{13}C$ (‰)	^{13}C (Atom %)	N (%, w/w)	$\delta^{15}N$ (‰)	^{15}N (Atom %)	Amount C (µg)	Amount N (µg)
29	T3 50 B	1294183	5.167	41.9	-30.52	1.0723	0.69	-1.28	0.3660	2164	36
30	T3 50 C	1294184	5.177	44.9	-28.62	1.0743	1.38	6.92	0.3690	2324	71
31	T3 100 A	1294185	5.238	45.8	-28.41	1.0746	2.16	-1.72	0.3658	2401	113
32	T3 100 B	1294186	5.396	42.3	-30.45	1.0723	0.85	2.19	0.3673	2284	46
33	T3 100 C	1294187	5.140	46.1	-29.36	1.0735	1.58	-1.21	0.3660	2370	81
34	T3 200 A	1294188	5.395	47.0	-28.85	1.0741	2.30	2.92	0.3675	2534	124
35	T3 200 B	1294189	5.533	46.5	-28.86	1.0741	2.47	4.83	0.3682	2574	137
36	T3 200 C	1294190	5.135	41.1	-30.48	1.0723	0.76	0.53	0.3667	2111	39
37	T4 10 A2	1294191	5.969	45.2	-29.02	1.0739	2.28	2.01	0.3672	2695	136
38	T4 10 B	1294192	5.693	46.2	-28.76	1.0742	2.26	-0.11	0.3664	2629	129
39	T4 10 C	1294193	5.287	43.0	-27.58	1.0755	1.73	6.26	0.3688	2276	92
40	T4 20 A	1294194	5.537	38.8	-28.96	1.0740	2.83	4.03	0.3679	2150	157
41	T4 20 B	1294195	5.926	45.5	-29.76	1.0731	2.66	6.04	0.3687	2698	157
42	T4 20 C	1294196	5.536	43.3	-27.40	1.0757	2.31	8.96	0.3697	2397	128
43	T4 50 A	1294197	5.498	42.3	-27.70	1.0754	1.85	4.31	0.3680	2328	102
44	T4 50 B	1294198	5.132	45.4	-29.42	1.0735	2.60	2.94	0.3675	2332	133
45	T4 50 C	1294199	5.456	41.1	-31.10	1.0716	0.56	-0.89	0.3661	2245	31
46	T4 100 A	1294200	5.221	43.8	-24.73	1.0786	2.76	10.85	0.3704	2286	144
47	T4 100 B	1294201	5.126	41.6	-30.44	1.0724	0.87	0.85	0.3668	2132	45
48	T4 100 C2	1294202	5.244	41.3	-24.64	1.0787	3.17	7.85	0.3693	2168	166
49	T4 200 A	1294203	5.134	45.5	-30.13	1.0727	2.67	5.90	0.3686	2338	137
50	T4 200 B	1294204	5.238	42.4	-27.02	1.0761	2.41	8.58	0.3696	2222	126
51	T4 200 C	1294205	5.414	41.5	-28.75	1.0742	3.28	3.53	0.3678	2247	178
52	T5 20 A	1294206	5.232	46.4	-27.98	1.0751	2.17	3.65	0.3678	2426	113
53	T5 20 B	1294207	5.162	46.5	-27.90	1.0751	1.79	4.62	0.3682	2401	92
54	T5 20 C	1294208	5.930	45.0	-28.44	1.0746	1.87	4.50	0.3681	2670	111
55	T5 50 A	1294209	5.569	45.7	-27.93	1.0751	1.90	2.85	0.3675	2543	106
56	T5 50 B	1294210	5.330	45.6	-28.93	1.0740	2.17	3.27	0.3677	2430	116
57	T5 50 C	1294211	5.191	41.8	-30.90	1.0719	**0.46**	**1.84**	**0.3671**	2169	**24**
58	T5 100 A	1294212	5.406	47.1	-28.13	1.0749	1.83	-0.21	0.3664	2548	99
59	T5 100 B	1294213	5.347	41.8	-30.18	1.0727	0.69	2.71	0.3675	2238	37

No.	Client Code	Lab Code	Weight (mg)	C (%, w/w)	$\delta^{13}C$ (‰)	^{13}C (Atom %)	N (%, w/w)	$\delta^{15}N$ (‰)	^{15}N (Atom %)	Amount C (µg)	Amount N (µg)
60	T5 100 C	1294214	5.491	46.7	-29.23	1.0737	1.26	1.65	0.3671	2562	69
61	T5 200 A	1294215	5.145	46.7	-28.03	1.0750	1.78	4.71	0.3682	2401	92
62	T5 200 B	1294216	5.203	43.2	-30.65	1.0721	0.77	4.08	0.3680	2246	40
63	T5 200 C	1294217	5.268	45.9	-29.86	1.0730	1.63	3.51	0.3678	2417	86
64	T6 10 A	1294218	5.071	46.6	-28.71	1.0743	2.20	8.49	0.3696	2363	112
65	T6 10 B	1294219	5.390	45.7	-27.40	1.0757	2.28	3.92	0.3679	2465	123
66	T6 10 C	1294220	5.359	44.5	-31.46	1.0712	1.79	5.55	0.3685	2387	96
67	T6 20 A	1294221	5.326	46.7	-29.29	1.0736	1.99	1.47	0.3670	2488	106
68	T6 20 B	1294222	5.970	45.3	-28.05	1.0750	1.61	3.01	0.3676	2703	96
69	T6 20 C	1294223	5.257	45.6	-31.64	1.0711	1.66	4.38	0.3681	2397	87
70	T6 50 A	1294224	5.132	46.0	-29.01	1.0739	2.16	4.81	0.3682	2363	111
71	T6 50 B	1294225	5.565	44.8	-27.68	1.0754	1.96	3.16	0.3676	2493	109
72	T6 50 C	1294226	5.160	45.9	-27.72	1.0753	2.00	1.94	0.3672	2370	103
73	T7 10 A	1294227	5.893	35.2	-30.98	1.0718	0.77	3.39	0.3677	2074	45
74	T7 10 B	1294228	5.326	51.4	-28.32	1.0747	3.27	4.98	0.3683	2737	174
75	T7 10 C	1294229	5.450	42.5	-30.14	1.0727	1.23	4.85	0.3682	2316	67
76	T7 20 A	1294230	5.215	46.6	-28.78	1.0742	1.92	8.59	0.3696	2431	100
77	T7 20 B	1294231	5.219	45.0	-28.26	1.0748	0.97	3.64	0.3678	2348	51
78	T7 20 C	1294232	5.360	42.0	-30.39	1.0724	1.72	2.73	0.3675	2252	92
79	T7 50 A	1294233	5.866	44.6	-29.47	1.0734	2.56	3.87	0.3679	2617	150
80	T7 50 B	1294234	5.138	41.1	-30.21	1.0726	0.81	0.43	0.3666	2109	42
81	T7 50 C	1294235	5.451	44.6	-28.96	1.0740	2.32	6.50	0.3688	2430	127
82	T8 10 A	1294236	5.452	45.2	-28.81	1.0741	1.27	8.95	0.3697	2463	69
83	T8 10 B	1294237	5.233	41.5	-30.23	1.0726	1.22	-0.36	0.3663	2170	64
84	T8 10 C	1294238	5.000	41.0	-31.96	1.0707	1.14	3.23	0.3677	2052	57
85	T8 20 A	1294239	5.057	46.1	-29.68	1.0732	2.54	-0.62	0.3662	2331	128
86	T8 20 B	1294240	4.711	41.3	-31.41	1.0713	1.30	2.93	0.3675	1945	61
87	T8 20 C	1294241	5.155	44.6	-29.72	1.0731	2.42	1.74	0.3671	2301	125
88	T8 50 A	1294242	5.473	46.3	-29.03	1.0739	2.37	4.46	0.3681	2536	130
89	T8 50 B	1294243	4.875	42.6	-30.03	1.0728	1.34	3.87	0.3679	2075	65
90	T8 50 C	1294244	5.019	44.0	-28.89	1.0741	1.71	5.00	0.3683	2210	86

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19861

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241131	T2 100C 10.07.18	2563
241132	T2 200A 10.07.18	1009
241133	T2 200B 10.07.18	1963
241134	T2 200C 10.07.18	2043
241135	T3 20A 04.07.18	2390
241136	T3 20B 10.07.18	3195
241137	T3 20C 04.07.18	3957
241138	T3 50A2 10.07.18	1379
241139	T3 50B 10.07.18	816
241140	T3 50C 04.07.18	1587

Released by Darren Whitbread Date 18/07/18

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19862

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241141	T3 100A 04.07.18	1660
241142	T3 100B 10.07.18	874
241143	T3 100C 04.07.18	1279
241144	T3 200A 04.07.18	2251
241145	T3 200B 04.07.18	2187
241146	T3 200C 10.07.18	705
241147	T4 10A2 10.07.18	1778
241148	T4 10B 04.07.18	2139
241149	T4 10C 04.07.18	2173
241150	T4 20A 10.07.18	2862

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19863

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241151	T4 20B 04.07.18	2999
241152	T4 20C 04.07.18	2041
241153	T4 50A 04.07.18	1839
241154	T4 50B 04.07.18	2399
241155	T4 50C 10.07.18	1313
241156	T4 100A 04.07.18	2724
241157	T4 100B 10.07.18	1673
241158	T4 100C2 10.07.18	3169
241159	T4 200A 04.07.18	2552
241160	T4 200B 04.07.18	2456

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19864

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241161	T4 200C 04.04.18	3901
241162	T5 20A 10.07.18	2834
241163	T5 20B 10.07.18	2991
241164	T5 20C 10.07.18	2228
241165	T5 50A 10.07.18	1985
241166	T5 50B 10.07.18	2158
241167	T5 50C 10.07.18	721
241168	T5 100A 10.07.18	2002
241169	T5 100B 10.07.18	523
241170	T5 100C 10.07.18	1592

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19865

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241171	T5 200A 10.07.18	2141
241172	T5 200B 10.07.18	697
241173	T5 200C 10.07.18	2192
241174	T6 10A 11.07.18	1940
241175	T6 10B 11.07.18	2468
241176	T6 10C 11.07.18	2141
241177	T6 20A 11.07.18	1536
241178	T6 20B 11.07.18	1987
241179	T6 20C 11.07.18	1989
241180	T6 50A 11.07.18	2044

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19866

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241181	T6 50B 11.07.18	2768
241182	T6 50C 11.07.18	1409
241183	T7 10A 11.07.18	3797
241184	T7 10B 11.07.18	2169
241185	T7 10C 11.07.18	1375
241186	T7 20A 11.07.18	2964
241187	T7 20B 11.07.18	852
241188	T7 20C 11.07.18	1653
241189	T7 50A 11.07.18	3470
241190	T7 50B 11.07.18	2776

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TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19867

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241191	T7 50C 11.07.18	1175
241192	T8 10A 11.07.18	3314
241193	T8 10B 11.07.18	1669
241194	T8 10C 11.07.18	1547
241195	T8 20A 11.07.18	2914
241196	T8 20B 11.07.18	1665
241197	T8 20C 11.07.18	2387
241198	T8 50A 11.07.18	2564
241199	T8 50B 11.07.18	972
241200	98 50C 11.07.18	1446

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19859

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241111	T1 50A 10.07.18	2475
241112	T1 50B 10.07.18	1302
241113	T1 50C 10.07.18	1827
241114	T1 100A 10.07.18	1671
241115	T1 100B 10.07.18	1397
241116	T1 100C 10.07.18	1197
241117	T1 200A 10.07.18	2280
241118	T1 200B 10.07.18	1167
241119	T1 200C 10.07.18	1946
241120	T2 10A 10.07.18	1636

Released by ..... *Darren Whitbread* ..... Date ..... *18/07/18* .....

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JESSIE HINE

TISSUE

ANALYTICAL REPORT

Laboratory Reference
Report Number 19860

Date Received 16-JUL-2018
Date Reported 18-JUL-2018

Sample Matrix : TISSUE

The sample submitted was of adequate size to complete all analysis requested.
The sample will be kept as the dry ground sample for at least 1 month.

ANALYTICAL RESULTS *on 'dry matter' basis.*

Laboratory Reference	Sample Reference	Total Phosphorus
		mg/kg
241121	T2 10B 10.07.18	3031
241122	T2 10C 10.07.18	4272
241123	T2 20A 10.07.18	2350
241124	T2 20B 10.07.18	1531
241125	T2 20C 10.07.18	1939
241126	T2 50A 10.07.18	1943
241127	T2 50B 10.07.18	828
241128	T2 50C 10.07.18	2213
241129	T2 100A 10.07.18	2381
241130	T2 100B 10.07.18	2222

Released by ..... Darren Whitbread ..... Date ..... 18/07/18 .....

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Annex E

Soil Analysis

ALS Life Sciences Ltd
Soil Analysis

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

ERM
St. Nicolas House
31-34 High Street
Bristol
BS1 2AW

Attention: Jessie Hine

CERTIFICATE OF ANALYSIS

Date:	22 August 2018
Customer:	H_ERM_BRI
Sample Delivery Group (SDG):	180816-83
Your Reference:	
Location:	Chilterns
Report No:	469228

We received 30 samples on Thursday August 16, 2018 and 30 of these samples were scheduled for analysis which was completed on Wednesday August 22, 2018. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

Approved By:

[redacted]

Sonia McWhan

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
18129918	Transet1		100.00	
18129919	Transet1		200.00	
18129917	Transet1		50.00	
18129920	Transet2		10.00	
18129923	Transet2		100.00	
18129921	Transet2		20.00	
18129925	Transet2		200.00	
18129922	Transet2		50.00	
18129929	Transet3		100.00	
18129927	Transet3		20.00	
18129930	Transet3		200.00	
18129928	Transet3		50.00	
18129932	Transet4		10.00	
18129936	Transet4		100.00	
18129933	Transet4		20.00	
18129937	Transet4		200.00	
18129934	Transet4		50.00	
18129941	Transet5		100.00	
18129938	Transet5		20.00	
18129943	Transet5		200.00	
18129940	Transet5		50.00	
18129944	Transet6		10.00	
18129945	Transet6		20.00	
18129946	Transet6		50.00	
18129947	Transet7		10.00	
18129948	Transet7		20.00	
18129950	Transet7		50.00	
18129951	Transet8		10.00	
18129953	Transet8		20.00	
18129954	Transet8		50.00	

Maximum Sample/Coolbox Temperature (°C) : **17.8**

ISO5667-3 Water quality - Sampling - Part3 -
During Transportation samples shall be stored in a cooling device capable of maintaining a temperature of (5±3)°C.

ALS have data which show that a cool box with 4 frozen icepacks is capable of maintaining pre-chilled samples at a temperature of (5±3)°C for a period of up to 24hrs.

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Results Legend

X **Test**

N **No Determination Possible**

Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)	18129918	18129919	18129917	18129920	18129923	18129921	18129925	18129922	18129929	18129927	18129930	18129928	18129932	18129936	18129933	18129937	18129934	18129941	18129938
Customer Sample Reference	Transet1	Transet1	Transet1	Transet2	Transet2	Transet2	Transet2	Transet2	Transet3	Transet3	Transet3	Transet3	Transet4	Transet4	Transet4	Transet4	Transet4	Transet5	Transet5
AGS Reference																			
Depth (m)	100.00	200.00	50.00	10.00	100.00	20.00	200.00	50.00	100.00	20.00	200.00	50.00	10.00	100.00	20.00	200.00	50.00	100.00	20.00
Container	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG	BAG
Sample Type	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
pH — All — NDPs: 0 Tests: 30	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sample description — All — NDPs: 0 Tests: 30	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

18129954	Transet8		50.00	BAG	S		X		X
18129953	Transet8		20.00	BAG	S		X		X
18129951	Transet8		10.00	BAG	S		X		X
18129950	Transet7		50.00	BAG	S		X		X
18129948	Transet7		20.00	BAG	S		X		X
18129947	Transet7		10.00	BAG	S		X		X
18129946	Transet6		50.00	BAG	S		X		X
18129945	Transet6		20.00	BAG	S		X		X
18129944	Transet6		10.00	BAG	S		X		X
18129940	Transet5		50.00	BAG	S		X		X
18129943	Transet5		200.00	BAG	S		X		X

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	**fine**	0.063mm - 0.1mm	**medium**	0.1mm - 2mm	**coarse**	2mm - 10mm	**very coarse**	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
18129917	Transet1	50.00	Light Brown	Silty Clay Loam	Stones	Vegetation
18129918	Transet1	100.00	Dark Brown	Silty Clay Loam	Stones	Vegetation
18129919	Transet1	200.00	Dark Brown	Sandy Loam	Vegetation	None
18129920	Transet2	10.00	Dark Brown	Loamy Sand	Stones	Metal
18129921	Transet2	20.00	Dark Brown	Sandy Loam	Stones	Vegetation
18129922	Transet2	50.00	Dark Brown	Silty Clay Loam	Stones	Vegetation
18129923	Transet2	100.00	Dark Brown	Sandy Loam	Stones	Vegetation
18129925	Transet2	200.00	Dark Brown	Sandy Loam	Vegetation	None
18129927	Transet3	20.00	Dark Brown	Silty Clay Loam	Stones	Vegetation
18129928	Transet3	50.00	Dark Brown	Sandy Loam	Stones	Vegetation
18129929	Transet3	100.00	Dark Brown	Sandy Clay	Stones	Vegetation
18129930	Transet3	200.00	Dark Brown	Sandy Loam	Vegetation	None
18129932	Transet4	10.00	Dark Brown	Loamy Sand	Stones	Vegetation
18129933	Transet4	20.00	Dark Brown	Sandy Clay	Vegetation	None
18129934	Transet4	50.00	Dark Brown	Sandy Silt Loam	Stones	Vegetation
18129936	Transet4	100.00	Dark Brown	Loamy Sand	Stones	Vegetation
18129937	Transet4	200.00	Dark Brown	Silty Clay Loam	Stones	Vegetation
18129938	Transet5	20.00	Dark Brown	Sandy Loam	Vegetation	Stones
18129940	Transet5	50.00	Dark Brown	Loamy Sand	Vegetation	Stones
18129941	Transet5	100.00	Dark Brown	Sandy Loam	Stones	Vegetation
18129943	Transet5	200.00	Dark Brown	Sandy Loam	Stones	Vegetation
18129944	Transet6	10.00	Dark Brown	Sandy Loam	Stones	Vegetation
18129945	Transet6	20.00	Dark Brown	Loamy Sand	Stones	Vegetation
18129946	Transet6	50.00	Dark Brown	Loamy Sand	Stones	Vegetation
18129947	Transet7	10.00	Dark Brown	Sandy Loam	Vegetation	None
18129948	Transet7	20.00	Dark Brown	Sandy Loam	Vegetation	None
18129950	Transet7	50.00	Dark Brown	Loamy Sand	Stones	Vegetation
18129951	Transet8	10.00	Dark Brown	Loamy Sand	Vegetation	Stones
18129953	Transet8	20.00	Dark Brown	Loamy Sand	Stones	Vegetation
18129954	Transet8	50.00	Dark Brown	Loamy Sand	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Transet1	Transet1	Transet1	Transet2	Transet2	Transet2
			Depth (m)	100.00	200.00	50.00	10.00	100.00	20.00
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	-	-	-	-	-	-
			Sample Time	.	.	.	.	.	.
			Date Received	16/08/2018	16/08/2018	16/08/2018	16/08/2018	16/08/2018	16/08/2018
			SDG Ref	180816-83	180816-83	180816-83	180816-83	180816-83	180816-83
			Lab Sample No.(s)	18129918	18129919	18129917	18129920	18129923	18129921
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		27 §	25 §	26 §	4.2 §	27 §	19 §
pH	1 pH Units	TM133		7.07 § M	7.21 § M	7.8 § M	7.81 § M	7.67 § M	7.58 § M

Validated

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Transet2	Transet2	Transet3	Transet3	Transet3	Transet3
			Depth (m)	200.00	50.00	100.00	20.00	200.00	50.00
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
			Date Sampled	-	-	-	-	-	-
			Sample Time	.	.	.	.	.	.
			Date Received	16/08/2018	16/08/2018	16/08/2018	16/08/2018	16/08/2018	16/08/2018
			SDG Ref	180816-83	180816-83	180816-83	180816-83	180816-83	180816-83
			Lab Sample No.(s)	18129925	18129922	18129929	18129927	18129930	18129928
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		36 §	33 §	15 §	17 §	27 §	25 §
pH	1 pH Units	TM133		7.46 § M	7.18 § M	6.29 § M	7.9 § M	7.31 § M	7.19 § M

Validated

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Depth (m)	Sample Type	Date Sampled	Sample Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
			Transet4	10.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129932	
			Transet4	100.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129936	
			Transet4	20.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129933	
			Transet4	200.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129937	
			Transet4	50.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129934	
			Transet5	100.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129941	
Moisture Content Ratio (% of as received sample)	%	PM024	37 §	33 §	38 §	28 §	28 §	25 §			
pH	1 pH Units	TM133	7.35 § M	7.77 § M	7.22 § M	7.66 § M	7.39 § M	7.55 § M			

Validated

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SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Depth (m)	Sample Type	Date Sampled	Sample Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
			Transet5	20.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129938	
			Transet5	200.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129943	
			Transet5	50.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129940	
			Transet6	10.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129944	
			Transet6	20.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129945	
			Transet6	50.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129946	
Moisture Content Ratio (% of as received sample)	%	PM024	31 §	38 §	30 §	28 §	36 §	28 §			
pH	1 pH Units	TM133	7.18 § M	7.47 § M	7.15 § M	7.18 § M	6.92 § M	6.32 § M			

Validated

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	Depth (m)	Sample Type	Date Sampled	Sample Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
			Transet7	10.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129947	
			Transet7	20.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129948	
			Transet7	50.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129950	
			Transet8	10.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129951	
			Transet8	20.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129953	
			Transet8	50.00	Soil/Solid (S)	-	.	16/08/2018	180816-83	18129954	
Moisture Content Ratio (% of as received sample)	%	PM024	41 §	31 §	21 §	31 §	30 §	29 §			
pH	1 pH Units	TM133	6.69 § M	6.08 § M	7.57 § M	7.2 § M	6.48 § M	6.03 § M			

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

CERTIFICATE OF ANALYSIS

SDG:	180816-83	**Client Reference:**		**Report Number:**	469228
Location:	Chilterns	**Order Number:**	0221083	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	18129917	18129918	18129919	18129920	18129921	18129922	18129923	18129925	18129927	18129928
Customer Sample Ref.	Transet1	Transet1	Transet1	Transet2	Transet2	Transet2	Transet2	Transet2	Transet3	Transet3
AGS Ref.										
Depth	50.00	100.00	200.00	10.00	20.00	50.00	100.00	200.00	20.00	50.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
pH	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018
Sample description	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018

Lab Sample No(s)	18129929	18129930	18129932	18129933	18129934	18129936	18129937	18129938	18129940	18129941
Customer Sample Ref.	Transet3	Transet3	Transet4	Transet4	Transet4	Transet4	Transet4	Transet5	Transet5	Transet5
AGS Ref.										
Depth	100.00	200.00	10.00	20.00	50.00	100.00	200.00	20.00	50.00	100.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
pH	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018
Sample description	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018

Lab Sample No(s)	18129943	18129944	18129945	18129946	18129947	18129948	18129950	18129951	18129953	18129954
Customer Sample Ref.	Transet5	Transet6	Transet6	Transet6	Transet7	Transet7	Transet7	Transet8	Transet8	Transet8
AGS Ref.										
Depth	200.00	10.00	20.00	50.00	10.00	20.00	50.00	10.00	20.00	50.00
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
pH	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018	22-Aug-2018
Sample description	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018	17-Aug-2018

Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP - No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals - total metals must be requested separately.

11. Results relate only to the items tested.

12. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

14. **Product analyses** - Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

24. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before presevation was performed
§	Sampled on date not provided
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Annex F

Plant Root Simulator Analysis

Western Agg. Laboratory

Plant Root Simulator Analysis

PRS(tm)-probe nutrient supply rates 2018 (in-situ burials).

Shipment 4913, Received 2018-08-17, Tracking # 8547405370																			
PRS(tm)-probe supply rate (micro grams/10cm2/burial length)																			
WAL #	**Sample ID**	**Burial Date**	**Retrieval Date**	**# Anion**	**# Cation**	**Notes**	**NO3-N**	**NH4-N**	**Ca**	**Mg**	**K**	**P**	**Fe**	**Mn**	**Cu**	**Zn**	**B**	**S**	**Pb**	**Al**	**Cd**
Method Detection Limits (mdl):							**2**	**2**	**2**	**4**	**4**	**0.2**	**0.4**	**0.2**	**0.2**	**0.2**	**0.2**	**2**	**0.2**	**0.4**	**0.2**
175133	Transect 1 - 50	2018-06-06	2018-08-01	4	4		116	2	2064	86	717	26.0	5.9	1.4	1.6	11.8	0.1	69	0.2	6.5	0.0
175134	Transect 1 - 100	2018-06-06	2018-08-01	4	4	2 Broken	81	3	2396	90	535	22.9	6.0	1.4	2.7	1.1	0.2	73	0.4	7.5	0.0
175135	Transect 1 - 200	2018-06-06	2018-08-01	4	4		120	3	2486	77	182	24.3	3.8	1.4	2.1	0.8	0.1	78	0.1	6.2	0.0
175136	Transect 2 - 10	2018-06-06	2018-08-01	3	4		364	23	1658	92	936	21.0	5.2	12.2	0.6	4.9	0.0	53	3.2	7.4	0.1
175137	Transect 2 - 20	2018-06-06	2018-08-01	4	4		277	8	2233	82	231	5.8	5.3	0.8	0.4	0.7	0.0	43	0.3	8.1	0.0
175138	Transect 2 - 50	2018-06-06	2018-08-01	4	4		133	4	2935	88	122	15.5	7.4	1.4	1.1	0.9	0.4	203	0.3	7.5	0.1
175139	Transect 2 - 100	2018-06-06	2018-08-01	4	4		68	2	3299	79	149	10.2	15.2	0.9	1.7	2.0	0.4	111	0.8	8.3	0.0
175140	Transect 2 - 200	2018-06-06	2018-08-01	4	4	1 Broken	34	3	3571	97	184	19.0	50.3	3.0	1.2	3.4	0.2	195	2.2	7.1	0.0
175141	Transect 3 - 20	2018-06-06	2018-08-01	4	4	1 Broken, 2 burial dates	197	3	2643	86	366	18.9	7.3	1.2	0.4	3.5	0.5	128	0.7	9.9	0.0
175142	Transect 3 - 50	2018-06-06	2018-08-01	4	4	2 burial dates	36	12	2794	96	135	25.6	14.4	3.3	1.7	1.2	0.0	209	0.6	6.5	0.0
175143	Transect 3 - 100	2018-06-06	2018-08-01	4	4	2 burial dates	37	36	1574	101	228	19.4	13.3	4.0	2.2	1.7	0.1	190	0.3	6.0	0.0
175144	Transect 3 - 200	2018-06-06	2018-08-01	4	4	2 burial dates	130	141	2576	174	476	29.8	21.9	3.6	2.1	1.9	0.1	125	1.3	4.8	0.0
175145	Transect 4 - 10	2018-06-06	2018-08-01	4	4	1 Broken, 2 burial dates	26	4	2179	114	251	6.3	46.4	2.3	1.9	10.5	0.9	77	4.5	8.8	0.0
175146	Transect 4 - 20	2018-06-06	2018-08-01	4	4	2 burial dates	39	2	1492	69	465	13.2	18.2	1.2	6.5	3.0	0.3	47	1.3	9.1	0.1
175147	Transect 4 - 50	2018-06-06	2018-08-01	4	4	2 burial dates	12	2	1123	48	345	9.2	4.6	0.7	1.3	1.1	0.3	54	0.3	4.0	0.0
175148	Transect 4 - 100	2018-06-06	2018-08-01	4	4	2 burial dates	95	5	1711	63	314	21.5	4.1	0.4	0.3	0.8	0.6	46	0.2	7.7	0.0
175149	Transect 4 - 200	2018-06-06	2018-08-01	4	4	2 burial dates	66	3	2246	117	1007	15.5	3.2	0.3	0.5	0.9	0.2	27	0.1	7.7	0.0
175150	Transect 5 - 20	2018-06-06	2018-08-01	4	4		51	2	3213	109	127	21.1	13.2	1.4	4.2	1.4	1.4	51	0.5	16.7	0.0
175151	Transect 5 - 50	2018-06-06	2018-08-01	4	4		12	5	3048	97	176	10.9	11.4	2.1	1.4	0.8	1.2	58	0.4	21.9	0.0
175152	Transect 5 - 100	2018-06-06	2018-08-01	4	4		31	3	3016	85	72	11.9	7.4	1.0	0.6	0.7	0.5	46	0.2	10.8	0.0
175153	Transect 5 - 200	2018-06-06	2018-08-01	4	4		43	2	2545	100	317	21.4	5.4	0.7	1.9	0.9	0.3	77	0.3	7.0	0.0
175154	Transect 6 - 10	2018-06-06	2018-08-01	4	4		200	7	2776	115	184	8.6	10.9	1.3	1.1	0.9	0.7	51	0.8	11.3	0.0
175155	Transect 6 - 20	2018-06-06	2018-08-01	4	4	1 Broken	25	2	2845	123	183	8.5	5.8	0.7	0.3	0.5	0.2	25	0.1	7.9	0.0
175156	Transect 6 - 50	2018-06-06	2018-08-01	5	4	2 Broken	64	3	2823	106	324	22.0	13.7	1.0	0.7	1.2	0.9	119	0.4	9.1	0.0
175157	Transect 7 - 10	2018-06-06	2018-08-01	4	3		34	2	3570	95	68	16.3	124.7	7.1	3.9	7.4	1.6	274	5.4	13.2	0.0
175158	Transect 7 - 20	2018-06-06	2018-08-01	4	4		10	29	2237	127	154	17.2	14.9	3.0	1.9	1.2	0.1	95	0.4	5.4	0.0
175159	Transect 7 - 50	2018-06-06	2018-08-01	4	4		149	9	2840	101	128	55.1	10.4	2.7	1.8	1.1	0.6	96	0.3	9.9	0.0
175160	Transect 8 - 10	2018-06-06	2018-08-01	4	4		109	9	2963	137	265	12.7	82.4	2.6	2.9	12.4	0.4	225	45.3	7.1	0.1
175161	Transect 8 - 20	2018-06-06	2018-08-01	4	4		21	11	2495	141	182	18.0	9.3	2.0	3.3	1.8	0.8	152	4.4	10.5	0.0
175162	Transect 8 - 50	2018-06-06	2018-08-01	4	4		28	9	2702	80	125	8.8	11.7	2.0	1.5	1.0	0.2	71	1.9	6.5	0.0

Annex G

Supporting Traffic Information

CHILTERN RAILWAYS ORDER 2012

CONDITION 31 – IMPACT OF SCHEME ON TRAFFIC FLOWS ON A34(T) & A40

CHILTERN RAILWAYS

MARCH 2020

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engineering the future

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DOCUMENT CONTROL

Job No	E142	
File Reference	G:\workfiles\E142 CHILTERN RAILWAYS\REPORTS\E142-DOC03_Issue 3.docx	
	Name	Date
Prepared By	P Key	19 September 2018
Checked By	J Alexander	27 September 2018

Issue	Approved	Date	Comments
1	J Alexander	28 September 2018	-
2	J Alexander	26 November 2018	Minor revisions
3	J Alexander	6 March 2020	Revisions following comments from ERM

CONTENTS

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1. INTRODUCTION

Background

1.1. Chiltern Railways Company Limited (CRCL), assisted by Network Rail (NR), has constructed an improved railway between Bicester and Oxford, with a new chord line to link to the London Marylebone to Birmingham Moor Street railway at Bicester. The Scheme is called the 'Bicester to Oxford Improvements'. A Transport and Works Act Order (TWAO) application was submitted to the Secretary of State for Transport in January 2010 and the Order was approved by the Secretary of State on 23rd October 2012. The Scheme was completed and has been operational since October 2015 to Oxford Parkway Station and into Oxford main Station from December 2016.

1.2. Approval for the Scheme was granted subject to a range of conditions. Two of these conditions relate specifically to the effects of gaseous emissions, and contain measures which have to be implemented to protect designated sites. Condition 31 relates to the Cassington Meadows SSSI, the Pixey and Yarnton Meads SSSI and the Wolvercote Meadow SSSI (parts of the Oxford Meadows SAC), and Condition 32 to the Hook Meadow and Trap Grounds SSSI.

1.3. The locations of the above areas are shown on the plan included at **Appendix A**.

1.4. As can be seen from the plan at **Appendix A**, the Hook Meadow and Trap Grounds SSSI borders the railway and is not impacted by road traffic, such that changes in road traffic as a result of the Scheme would not affect air quality within the SSSI. Therefore no input is required from a highway traffic perspective for Condition 32.

1.5. Condition 31 is worded as follows:

> **''Development shall not commence on the Individual Section or Sections between Oxford North Junction and Rewley Abbey Stream ("the relevant sections") until a Scheme of Further Assessment of Air Quality in relation to the Cassington Meadows SSSI, the Pixey and Yarton Meads SSSI and the Wolvercote Meadow SSSI that are co-terminous with part of the Oxford Meadows SAC ("the relevant parts of the SAC") has been submitted to and approved in writing by the local planning authority for the relevant parts of the SAC (in consultation with Natural England).**

1.6. An approach for the establishment of baseline surveys and future monitoring of the Scheme in respect of Conditions 31 and 32 was agreed with the relevant authorities.

1.7. It is anticipated that changes to road traffic movements will occur on the A34(T) and A40 following the introduction of the new station at Oxford Parkway which could potentially have a bearing on air quality in relation to the SSSIs.

1.8. To assess the effect of the Scheme a comparison of the Pre-Scheme 'baseline' position has been undertaken for the following:

- Traffic flows on the A34(T) and A40, using Automatic Traffic Counters and Highways England TRIS data; and
- The proportion of London bound passengers travelling from Oxford, Oxford Parkway, and Bicester Stations that access the stations by car, taxi or motorcycle and travel to the stations via either the A34(T) or the A40.

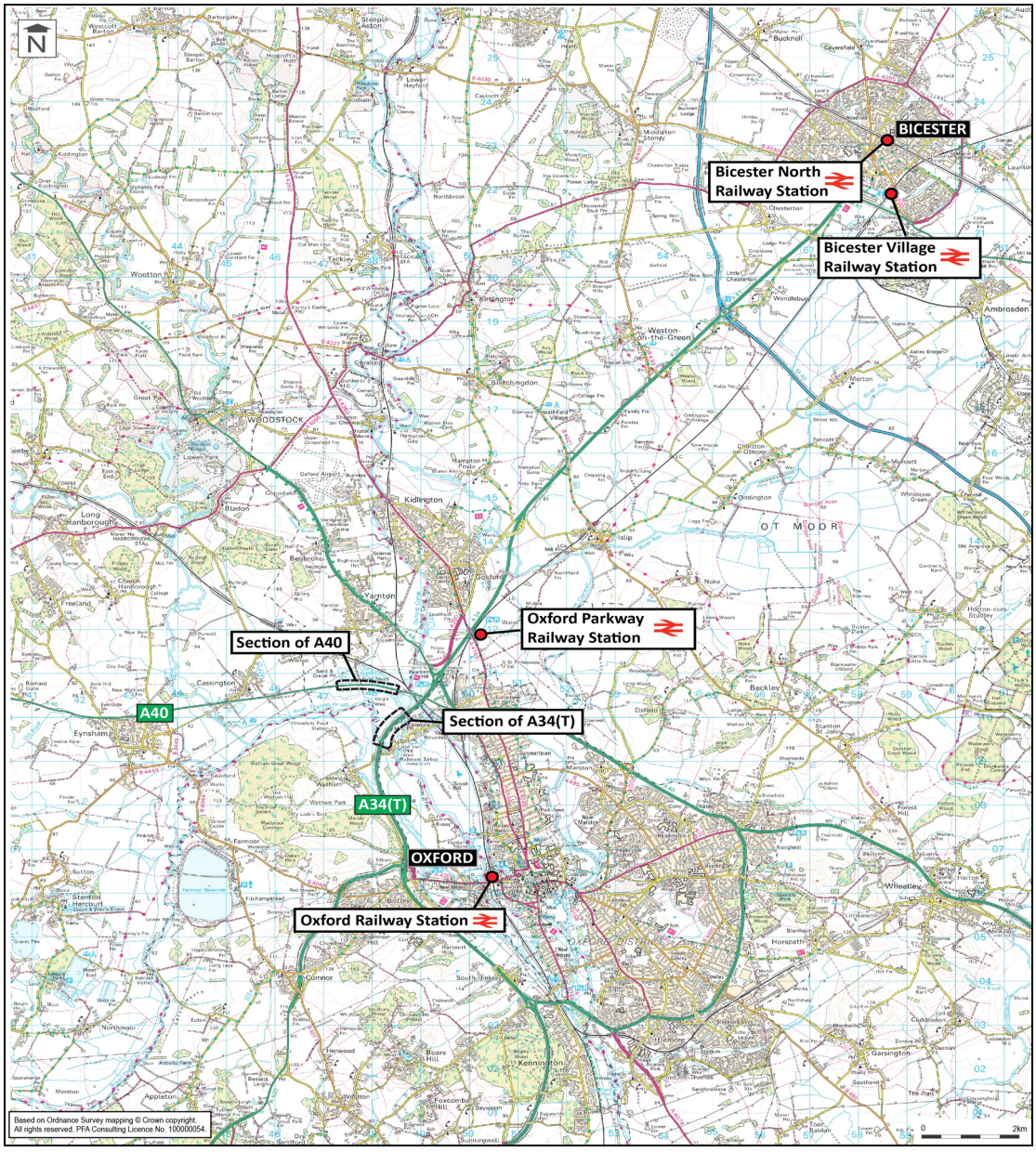
1.9. Pre- Scheme 'baseline' traffic data to inform air quality assessment has been previously collated and issued in 2014/15 in PFA Consulting's report E142-DOC01.

1.10. It was originally the intention to only provide future year data following the opening of the new station at Oxford Parkway, based on a survey of actual passenger use. However, Oxford City Council requested that future year predicted data also be supplied before operation of the new station at Oxford Parkway. This was estimated using the traffic modelling which informed the TWAO and was set out in PFA Consulting's report E142-DOC02.

1.11. This technical report has been prepared by PFA Consulting to predict future year transport conditions based on actual passenger surveys and count data undertaken following the opening of the Scheme to inform the air quality assessment as required by Condition 31. The report compares the results of the Pre-Scheme and Post-Scheme rail passenger surveys to establish the impacts of the Scheme on traffic flows using the relevant sections of the A34(T) and A40.

1.12. The location of the stations and the relevant sections of the A34(T) and A40 are shown on **Figure 1.1**.

Figure 1.1: Site Context Plan



2. DATA COLLECTION AND METHODOLOGY

2017/18 Survey Data

Automatic Traffic Counts

2.1. Automatic Traffic Counts (ATCs) were undertaken monthly for a period of one year on the A40 from September 2017 to August 2018. The ATCs recorded data for one week at the start of each month. Data for the A34(T), was obtained from the Highways England webTRIS website. The ATCs and TRIS data provides traffic data at the count points to allow comparison with the 2014/15 Pre-Scheme data.

Rail Passenger Surveys

2.2. Rail passenger surveys were undertaken on a suitable weekday once every 3 months on Chiltern rail services between Bicester Village and Oxford Stations between 07:00 and 19:00. The first survey was undertaken in October 2017 and the final survey in July 2018. The surveys comprised passenger interviews of passengers travelling traveling on the train between Bicester Village and Oxford Stations.

2.3. The post scheme surveys do not pick up data for GWR Oxford passengers, however it is considered logical that they would have comparable travel patterns with Chiltern Oxford passengers.

2.4. The passenger interviews recorded information about departure station, destination rail station, journey start postcode, method of travel to the departure station, if they routed along the relevant sections of the A34(T), A40 or both, when travelling to the station. It also recorded if they have changed their travel habits since the opening of the Scheme, and how did they previously travel before the Scheme. All interview data was crosschecked to ensure accuracy and to identify any errors. A copy of the survey questionnaire is included at **Appendix B**.

2.5. Daily passenger numbers have also been obtained for Bicester Village, Oxford Parkway and Oxford Stations from ticket data. The ticket data was for a full week's data corresponding to the months of the rail passenger surveys. The data provides comparatively accurate data on passenger numbers for all movements between specific stations not just total movements from each station.

Methodology

2.6. The passenger interview data was analysed to establish which passengers used car, taxi or motorcycle and routed along the relevant sections of the A34(T), A40 or both, when travelling to Bicester Village, Oxford Parkway and Oxford Stations. This sample interview data was factored up to reflect daily passenger numbers using the ticket data.

2.7. The daily passenger data provides information on which destination station passengers travel to. This is important as the Scheme has not impacted on all passengers travelling from Oxford.

2.8. Post Scheme, passengers travelling from Oxford to London have the option to switch to Oxford Parkway for journeys to London, or use the new service from Oxford, and passengers to major stations such as Didcot and Reading have the option to switch to travel from Oxford Parkway to Oxford, and then onto Didcot/Reading. Other stations along the GWR Oxford to London route have been excluded as passenger numbers are minimal and travel patterns are anticipated to remain unchanged. All stations along the new Oxford to London route were included.

2.9. Travel patterns change throughout the year, which is why surveys of passengers were undertaken every three months. The daily passenger ticket data was obtained for the week in which the interviews were undertaken.

2.10. Daily vehicular travel by rail passengers using the sections of the A34(T) and A40 (as shown on **Figure 1.1**) were derived from the survey data and compared with the Pre-Scheme results to establish the Scheme impacts on these two roads in terms of annual average daily traffic flows.

3. 2014/15 PRE-SCHEME SURVEY DATA

3.1. The Pre-Scheme survey data, which was previously reported in PFA report E142-DOC01 in 2015, has been further analysed to establish the average daily trips for rail passengers travelling by car, taxi or motorcycle which pass along the relevant sections of the A34(T) and A40. This has made use of ticketing data for a full week rather than relying on ticket data for a single day in order to factor up the rail passenger interview surveys. This will ensure the Pre-Scheme survey data can be directly compared with the Post-Scheme survey data.

Traffic Flows on A34(T) and A40

3.2. A summary of the ATC and TRIS data for the 12-month period (April 2014-March 2015) is set out in **Tables 3.1 and 3.2** for the A34(T) and A40 respectively.

Table 3.1: 2014/15 A34(T) Traffic Data

Period	AADT (Vehicles)		HGV %		Average Speed (mph)	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
April	35,393	35,177	18.8	16.1	61.7	62.1
May	34,157	34,612	17.7	15.3	61.9	62.6
June	36,563	36,972	18.4	16.3	61.6	62.6
July	37,163	38,343	18.5	16.2	60.6	61.9
August	37,391	37,363	18.4	16.8	61.1	-
September	37,383	37,345	17.6	18.5	-	-
October	35,355	35,865	17.7	18.9	-	-
November	35,016	35,837	18.0	18.9	-	-
December	35,073	35,191	20.0	18.3	61.0	-
January	32,519	32,364	19.4	17.3	61.7	61.5
February	33,494	34,102	19.2	17.1	62.3	62.3
March	35,163	35,848	19.1	17.1	63.0	62.1
Annual Average	**35,122**	**36,351**	**12.3%**	**13.2%**	**61.7**	**62.2**

Note: Speed data not available for some months

Table 3.2: 2014/15 A40 Traffic Data

Period	AADT (Vehicles)		HGV %		Average Speed (mph)	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
April	12,141	11,401	10.0	10.7	39.7	48.9
May	12,036	11,028	10.8	10.2	40.5	52.0
June	12,084	11,467	10.6	11.2	39.4	52.0
July	11,566	11,206	10.4	10.2	37.9	50.2
August	12,215	11,899	10.8	11.0	36.1	53.9
September	12,079	11,952	10.3	9.0	40.3	47.8
October	11,443	11,326	10.8	11.4	37.7	50.0
November	11,795	11,474	9.0	11.3	41.1	51.0
December	10,803	10,797	9.6	11.7	39.2	51.7
January	10,938	10,843	11.8	11.4	44.4	51.7
February	11,194	10,662	11.3	12.5	43.0	51.2
March	11,687	11,436	11.3	11.9	42.6	48.5
Annual Average	**11,665**	**11,291**	**10.6%**	**11.0%**	**40.2**	**50.7**

2014/15 Rail Passenger Interviews

3.3. A summary of the rail passenger interview surveys for each of the six survey days are set out in **Tables 3.3 to 3.8**. Data is only taken for London, Reading and Didcot journeys from Oxford as the modelling of the scheme identifies negligible impact on other minor stations along the Oxford to London route.

Table 3.3: 7 May 2014 Survey Summary

Station	Total Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	242	56	4	1.65%	6	2.48%
Bicester	417	196	3	0.72%	0	0.00%

Note: Oxford data is just for London/Reading/Didcot trips, Bicester data is for all stations on London Route

Table 3.4: 2 July 2014 Survey Summary

Station	Total Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	221	55	5	2.26%	5	2.26%
Bicester	383	232	4	1.04%	1	0.26%

Note: Oxford data is just for London/Reading/Didcot trips, Bicester data is for all stations on London Route

Table 3.5: 3 September 2014 Survey Summary

Station	Total Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	373	95	4	1.07%	2	0.54%
Bicester	291	164	1	0.34%	0	0.00%

Note: Oxford data is just for London/Reading/Didcot trips, Bicester data is for all stations on London Route

Table 3.6: 5 November 2014 Survey Summary

Station	Total Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	259	50	2	0.77%	1	0.39%
Bicester	309	155	5	1.62%	1	0.32%

Note: Oxford data is just for London/Reading/Didcot trips, Bicester data is for all stations on London Route

Table 3.7: 7 January 2015 Survey Summary

Station	Total Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	200	39	4	2.00%	4	2.00%
Bicester	339	193	7	2.06%	1	0.29%

Note: Oxford data is just for London/Reading/Didcot trips, Bicester data is for all stations on London Route

Table 3.8: 4 March 2015 Survey Summary

Station	Total Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	200	45	2	1.00%	3	1.50%
Bicester	322	227	3	0.93%	2	0.62%

Note: Oxford data is just for London/Reading/Didcot trips, Bicester data is for all stations on London Route

3.4. **Table 3.9** below combines the above survey data to establish the percentage of rail passenger trips for each station travelling by car, taxi or motorcycle using the relevant sections of the A34(T) and A40.

Table 3.9: Pre-Scheme – Proportion of Rail Passenger Interviews using A34(T) & A40

Station Start	Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	1495	340	21	1.40%	21	1.40%
Bicester	2061	1167	23	1.12%	5	0.24%

Note: Combination of the Passenger Interview surveys over the six survey days

2014/15 Ticket Data

3.5. Ticket data for a full week within each of the months corresponding to the rail passenger interview surveys was provided by Chiltern Railways for both Oxford and Bicester Stations, as set out in **Table 3.10**. The estimated annual average daily rail passenger numbers derived from the data is also provided.

Table 3.10: 2014/15 Ticket Data Summary

Station	May	July	September	November	January	March	Estimated Annual Average Daily Rail Passengers
Oxford	4,898	4,546	5,547	5,371	5,317	5,170	**5,525**
Bicester	1,622	2,097	2,551	2,119	2,352	1,818	**2,112**

Daily Traffic using A34(T) and A40 from Rail Passengers

3.6. The number of rail passengers who travelled to/from Oxford or Bicester Stations by car, taxi or motorcycle who routed along the A34(T) or A40 has been calculated by applying the percentages derived from the rail passenger interviews to the estimated annual average daily passenger numbers for each station.

3.7. **Tables 3.11 and 3.12** below show the calculated daily numbers of car, taxi or motorcycle trips for each station using the A34(T) and A40 respectively.

Table 3.11: Pre-Scheme - Daily Car Trips using A34(T)

Station Start	Estimated Annual Average Daily Rail Passengers	% Routeing on A34(T)	A34(T) trips (one-way)
Oxford	5,525	1.40%	77
Bicester	2,112	1.12%	24
Total			101

Table 3.12: Pre-Scheme - Daily Car Trips using A40

Station Start	Estimated Annual Average Daily Rail Passengers	% Routeing on A40	A40 trips (one-way)
Oxford	5,525	1.40%	77
Bicester	2,112	0.24%	5
Total			82

3.8. The above figures are one-way figures and therefore need to be doubled to reflect two-way totals for traffic using the A34(T) and A40, as shown in **Table 3.13** below.

Table 3.13: Pre-Scheme – Rail Passenger Average Daily Traffic Flows on A34(T) & A40 (two-way)

Key Road	Annual Average Daily Traffic Flows (two-way)
A34(T)	202
A40	164

3.9. From the above it is estimated that the annual average daily traffic flows from rail passengers using either Oxford or Bicester Stations is 202 vehicles on the A34(T) and 164 vehicles on the A40. These Pre-Scheme traffic flows can be compared to the Post-Scheme traffic flows to establish the impact of the Scheme on traffic flows in these roads.

4. 2017/18 POST SCHEME SURVEY DATA

Traffic Flows on A34(T) and A40

4.1. A summary of the ATC and TRIS data for the 12-month period (April 2017-March 2018) is set out in **Tables 4.1 and 4.2** for the A34(T) and A40 respectively.

Table 4.1: 2017/18 A34(T) Traffic Data

Period	AADT (Vehicles)		HGV %		Average Speed (mph)	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
April	37,705	35,726	12.4	13.8	58.9	59.6
May	39,388	39,924	13.1	13.3	-	-
June	37,445	40,669	-	13.3	-	-
July	37,530	41,578	-	13.4	-	-
August	40,358	41,440	-	13.7	-	-
September	38,727	40,917	-	14.1	55.6	56.8
October	40,461	40,220	-	14.0	55.7	57.1
November	39,140	39,014	13.7	14.2	57.1	57.6
December	33,457	34,411	12.1	12.9	56.0	58.6
January	34,193	34,185	13.3	13.7	58.2	58.5
February	36,626	36,849	13.0	13.6	56.9	55.6
March	35,560	35,104	13.1	14.6	55.9	56.7
Annual Average	**37,549**	**38,293**	**13.0%**	**13.7%**	**56.8**	**57.6**

Notes: Speed and HGV data not available for some months

Table 4.2: 2017/18 A40 Traffic Data

Period	AADT (Vehicles)		HGV %		Average Speed (mph)	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
April	12,364	11,335	12.3	13.0	44.3	51.9
May	12,374	11,731	11.5	12.4	47.2	50.7
June	12,381	11,586	13.1	13.3	48.3	53.5
July	12,681	12,043	12.9	13.3	47.6	52.0
August	11,807	11,339	13.4	14.1	46.0	56.1
September	12,150	10,957	13.2	14.1	46.7	55.0
October	12,115	11,402	13.7	13.7	47.2	56.1
November	11,864	11,119	13.3	15.2	47.5	54.6
December	12,043	11,198	12.8	14.3	47.0	54.6
January	11,021	10,195	13.8	14.5	48.8	55.5
February	11,684	10,966	12.7	13.3	46.0	53.9
March	11,952	11,107	12.2	13.4	42.5	52.6
Annual Average	**12,036**	**11,248**	**12.9%**	**13.7%**	**46.6**	**52.5**

2017/18 Rail Passenger Interviews

4.2. A summary of the rail passenger interview surveys for each of the four survey days are set out in **Tables 4.3 to 4.6**. Data is only taken for London, Reading and Didcot journeys from Oxford as the modelling of the Scheme identified negligible impacts on other minor stations along the Oxford to London route.

4.3. The survey results were classified by station, dependent on either which station the interviewee got on the train, and established for those travelling by car, taxi or motorcycle whether they routed along the key sections of the A34(T) or A40.

Table 4.3: 19 October 2017 Survey Summary

Station Start	Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	456	57	1	0.22%	1	0.22%
Oxford Parkway	154	71	3	1.95%	6	3.90%
Bicester Village	133	37	0	0.00%	0	0.00%

Table 4.4: 9 January 2018 Survey Summary

Station Start	Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	658	95	1	0.15%	6	0.91%
Oxford Parkway	158	68	3	1.90%	7	4.43%
Bicester Village	186	44	0	0.00%	0	0.00%

Table 4.5: 17 April 2018 Survey Summary

Station Start	Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	499	70	0	0.00%	0	0.00%
Oxford Parkway	117	51	4	3.42%	6	5.13%
Bicester Village	216	64	0	0.00%	0	0.00%

Table 4.6: 5 July 2018 Survey Summary

Station Start	Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	450	91	0	0.00%	2	0.44%
Oxford Parkway	130	75	6	4.62%	8	6.15%
Bicester Village	177	58	0	0.00%	0	0.00%

4.4. **Table 4.7** below combines the above survey data to establish the percentage of rail passenger trips for each station travelling by car, taxi or motorcycle using the relevant sections of the A34(T) and A40.

Table 4.7: Post-Scheme – Proportion of Rail Passenger Interviews using A34(T) & A40

Station Start	Number of Interviews	Total Traveling by Car/Taxi/MC	Routeing along A34(T)	% of All Trips	Routeing along A40	% of All Trips
Oxford	2063	313	2	0.10%	9	0.44%
Oxford Parkway	559	265	16	2.86%	27	4.83%
Bicester Village	712	203	0	0.00%	0	0.00%

Note: Combination of the Passenger Interview surveys over the four survey days

4.5. It can be seen that the 'Scheme' has resulted in no passengers impacting on the A34(T) or A40 for rail passengers using Bicester Village Station.

Travel Habits

4.6. The travel habits of those passengers interviewed were also recorded and are summarised in **Table 4.8** below.

Table 4.8: Travel Habits from Rail Passenger Interviews

Station Start	Passengers who have changed Travel Habits	Previously Drove	Previously used Bicester North	Previously used GWR Oxford Service now use Oxford Parkway	Previously used GWR Oxford Service now use Chiltern Oxford Service	Previously used different station, bus or cycle	No response
Oxford	607	104	20	0	232	219	19
Oxford Parkway	555	51	90	254	0	177	4
Bicester Village	212	70	33	0	10	94	5

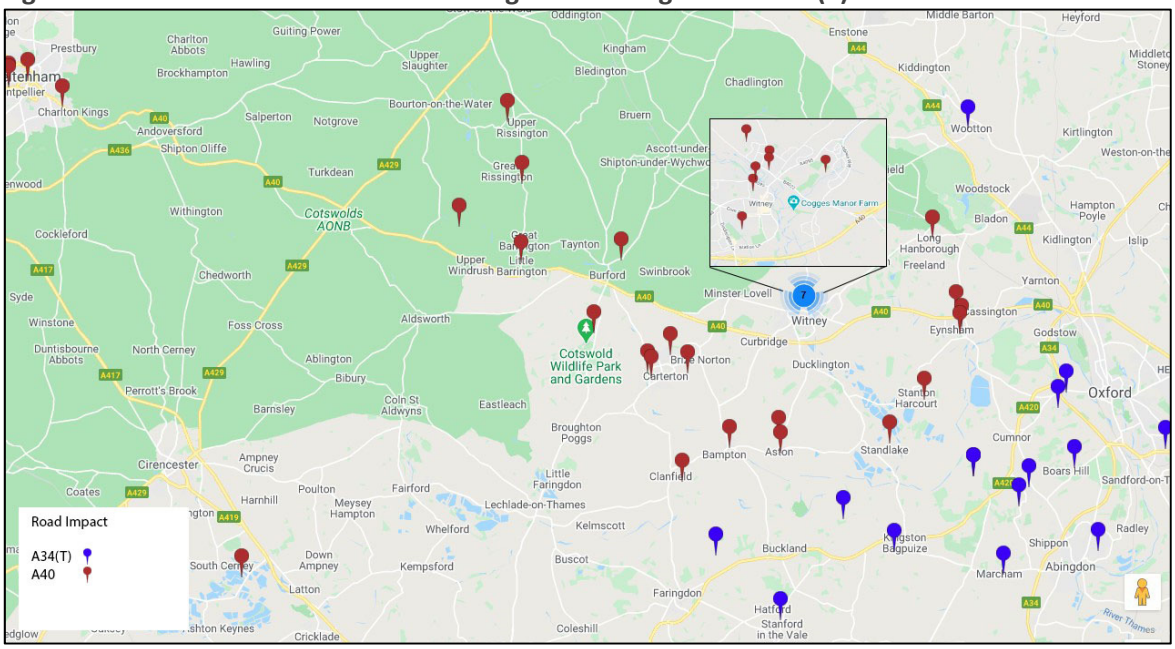
Note: Combination of the Passenger Interview surveys over the four survey days

4.7. Passengers that accessed stations by car and routed through the relevant sections of the A34(T) and A40, travelled from locations shown in **Figure 4.1** and summarised in **Table 4.9**.

Table 4.9: Summary of Location of Passengers that travelled by Car on the A34(T) and A40

Station	A34(T)	A40
Oxford	North of Oxford	West of Oxford
Parkway	South of Oxford, Oxford, Southeast Oxfordshire	West of Oxford
Bicester Village	-	-

Figure 4.1: Home Locations of Rail Passengers Routeing via the A34(T) and A40



4.8. All of the passengers at Oxford, who identified travelling by car and impacting on the A34(T), had journeys and locations that would allow them to use Oxford Parkway. In the future such passengers could switch from Oxford to Oxford Parkway, resulting in a reduced impact on the A34(T).

4.9. Passengers using Oxford Parkway that used the A34(T) either previously used Didcot Station, routed from south of Oxford, used the Bus (X90 or P&R), or used Bicester Station. Some rail passengers who previously drove to Oxford Station from the south of the City now drive to Oxford Parkway via the A34(T).

4.10. Passengers using Oxford Parkway that route via the A40 either previously either used Oxford Station from destinations to the west of Oxford; other stations, including Cheltenham and Didcot; or previously travelled to their destination by car.

2017/18 Ticket Data

4.11. Ticket data for a full week within each of the months corresponding to the rail passenger interview surveys was provided by Chiltern Railways for all stations, as set out in **Table 4.10**. The estimated annual average daily rail passenger numbers derived from the ticket data is also provided.

Table 4.10: 2017/18 Ticket Data Summary

Station	October	January	April	July	Estimated Annual Average Daily Rail Passengers
Oxford	5,733	6,434	5,723	5,937	**5,957**
Oxford Parkway	2,366	2,290	2,329	2,742	**2,432**
Bicester Village	2,394	2,954	2,631	2,794	**2,693**

Note: Oxford data is just for London/Reading/Didcot trips on GWR service, and all stations on Chiltern London Route, Oxford Parkway/Bicester data is for all stations on London Route

4.12. The ticket data for Oxford covers both GWR and Chiltern Services as it has not been possible to differentiate between the two.

Daily Traffic using A34(T) and A40 from Rail Passengers

4.13. The number of rail passengers who travelled to/from Oxford, Oxford Parkway or Bicester Village Stations by car, taxi or motorcycle who routed along the A34(T) or A40, has been calculated by applying the percentages derived from the rail passenger interviews to the estimated annual average daily passenger numbers for each station.

4.14. **Tables 4.11 and 4.12** below show the calculated daily numbers of car, taxi or motorcycle trips using the A34(T) and A40 respectively.

Table 4.11: Post-Scheme - Daily Car Trips using A34(T)

Station Start	Estimated Annual Average Daily Rail Passengers	% Routeing on A34(T)	A34(T) trips (one-way)
Oxford	5,957	0.10%	6
Oxford Parkway	2,432	2.86%	70
Bicester Village	2,693	0.00%	0
Total			76

Table 4.12: Post Scheme - Daily Car Trips using A40

Station Start	Estimated Annual Average Daily Rail Passengers	% Routeing on A40	A40 trips (one-way)
Oxford	5,957	0.44%	26
Oxford Parkway	2,432	4.83%	117
Bicester Village	2,693	0.00%	0
Total			143

4.15. The above figures are one-way figures and therefore need to be doubled to reflect two-way totals for traffic using the A34(T) and A40, as shown in **Table 4.13** below.

Table 4.13: Post-Scheme -Rail Passenger Average Daily Traffic Flows on A34(T) & A40 (two-way)

Key Road	Annual Average Daily Traffic Flows (two-way)
A34(T)	152
A40	286

4.16. From the above it is estimated that the annual average daily traffic flows from rail passengers using either Oxford or Bicester Stations is 152 vehicles on the A34(T) and 286 vehicles on the A40.

Discounting trips for rail passengers that had previously driven

4.17. The interview surveys identified that a proportion of the above rail passenger trips which passed along the A34(T) and A40 had previously travelled by car for their entire journey. These trips could reasonably therefore be discounted from the above totals to reflect the true impact on the two roads as a result of the Scheme.

4.18. From the passenger interview surveys it was established that 6% of those that routed via the A34(T) previously did not use the rail service and travelled by car, taxi or motorcycle for their entire journey. The percentage for those that routed via the A40 was higher at 11%. **Table 4.14** below shows the true impact on the A34(T) and A40 of the scheme discounting those that had previously driven.

Table 4.14: Post Scheme –Rail Passenger Average Daily Traffic Flows on A34(T) & A40 (two-way) following discount of those that had previously driven

Key Road	Annual Average Daily Traffic Flows (two-way)
A34(T)	143
A40	255

5. IMPACT OF RAIL SCHEME ON A34(T) AND A40 TRAFFIC FLOWS

5.1. This section of the report considers the impact of the proposed rail scheme on traffic flows using those key sections of the A34(T) and A40. It compares the results derived from the Pre-Scheme and Post-Scheme surveys to establish changes to daily traffic flows on the two roads as a consequence of the Scheme.

5.2. **Table 5.1** shows the impact of the Scheme on traffic flows on the A34(T). Annual average daily traffic flows on the A34(T) can be seen to reduce by 59 vehicles with the proposed Scheme.

Table 5.1: Traffic Impact of Rail Scheme on A34(T) Traffic Flows

Key Road	Rail Passenger Average Daily Traffic Flows		Increase / decrease
	Pre-Scheme	Post-Scheme	
A34(T)	202	143	-59

Note: Calculated from values in Tables 3.13 and 4.14

5.3. **Table 5.2** shows the impact of the Scheme on traffic flows on the A40. Annual average daily traffic flows on the A40 can be seen to increase by 91 vehicles with the Scheme.

Table 5.2: Traffic Impact of Rail Scheme on A40 Traffic Flows

Key Road	Rail Passenger Average Daily Traffic Flows		Increase / decrease
	Pre-Scheme	Post-Scheme	
A40	164	255	+91

Note: Calculated from values in Tables 3.13 and 4.14

5.4. **Tables 5.3 and 5.4** show the 2017/18 AADT traffic flows on the A34(T) & A40 for both the Pre-Scheme and Post-Scheme. The percentage impacts of the Scheme are also identified.

Table 5.3: 2017/ 2018 AADT Traffic Flows on A34(T) With and Without Scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	37,579	37,549	-30	-0.08%
Southbound	38,322	38,293	-29	-0.08%
Total	75,901	75,842	-59	-0.08%

Table 5.4: 2017 /2018 AADT Traffic Flows on A40 With and Without Scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	11,990	12,036	+46	+0.39%
Southbound	11,203	11,248	+45	+0.39%
Total	23,193	23,284	+91	+0.39%

5.5. For consistency with the air quality assessment, AADT traffic flows on the A34(T) and A40 have been provided for 2020, 2023 & 2027 forecast years, both with and without the Scheme applying TEMPRO traffic growth. The forecast traffic flows are provided in **Appendix C.**

Summary

5.6. The survey results indicate that the Scheme, which includes the new station at Oxford Parkway, has resulted in an increase in overall rail passenger numbers and changes to passengers travel patterns.

5.7. The daily number of rail passengers routeing via the A34(T) has reduced following the introduction of the Scheme; this is primarily a result of rail passengers living to the west of Oxford, in towns such as Witney and Eynsham, re-routing to use the new Oxford Parkway Station rather than Oxford Station as they had previously done.

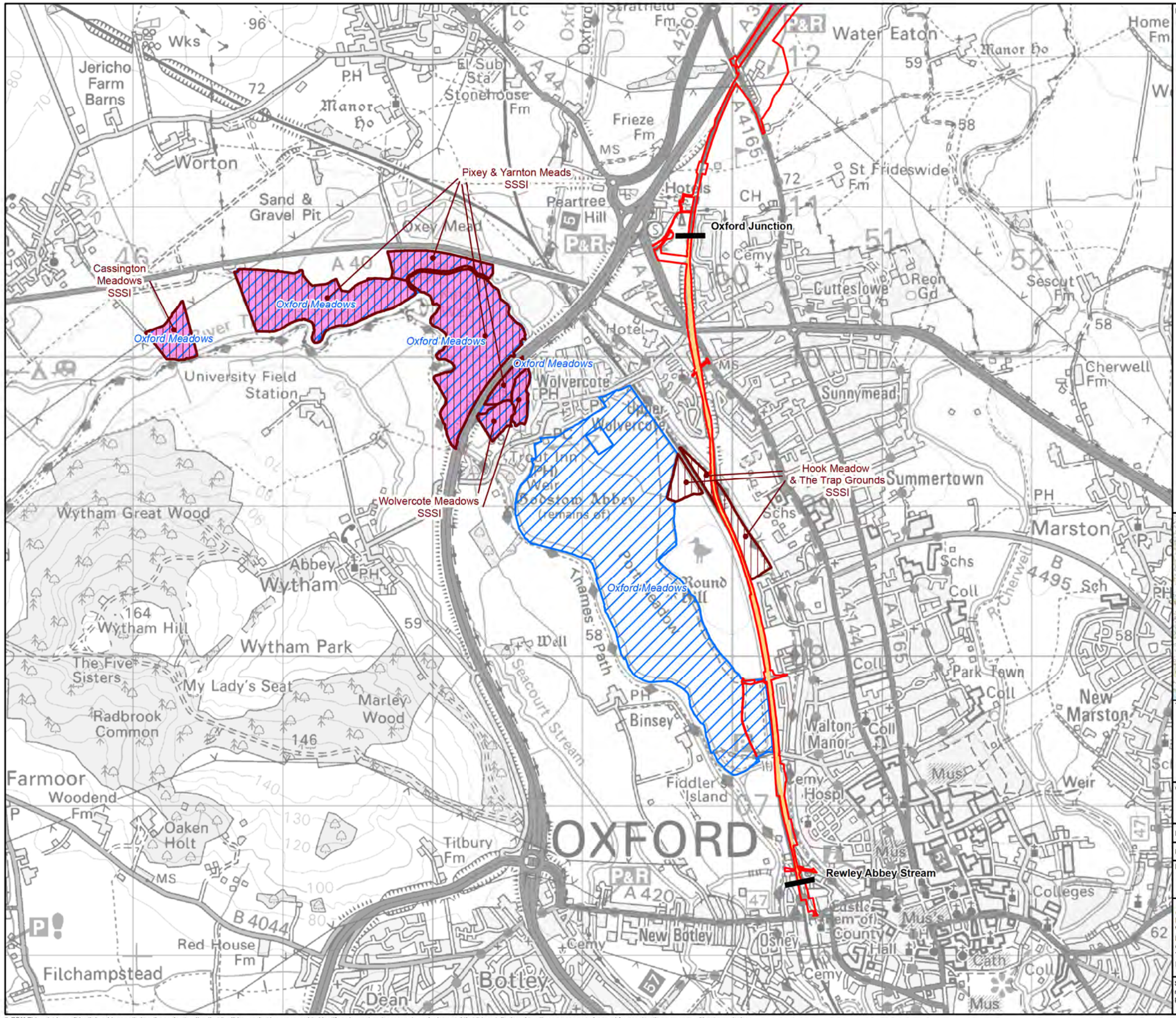
5.8. The daily number of rail passengers routeing via the A40 has increased slightly as it has attracted more people living to the west of Oxford to use Oxford Parkway Station. The level of increase in traffic flows on the A40 as a result of the Scheme is however small, at less than 100 vehicles (two-way) per day. This level of traffic is not considered to be material given the traffic flows on the A40 on a typical day (it represents less than 0.4% of the total daily flow).

5.9. The small increase in traffic on the relevant section of the A40 is much less than had been predicted from the earlier modelling work previously reported. The modelling predicted an increase in traffic on the A40 of some 750 vehicles (two-way) as a consequence of the Scheme.

5.10. The A40 has not seen any significant increase in traffic flows following the introduction of the Scheme with AADT flows (two-way) increasing by only 300 vehicles between 2014/15 and 2017/18. This further suggests that the Scheme has not had a material impact on traffic flows on the A40 and validates the results of the rail passenger surveys.

Appendices

Appendix A



KEY:

- Scheme Boundary and Extent of Rail Improvement Works
- The Relevant Section of Development Under Conditions 31 and 32
- Sites of Special Scientific Interest
- Special Area of Conservation
- Parts of SAC as Including Annex I Habitats Lowland Hay Meadows

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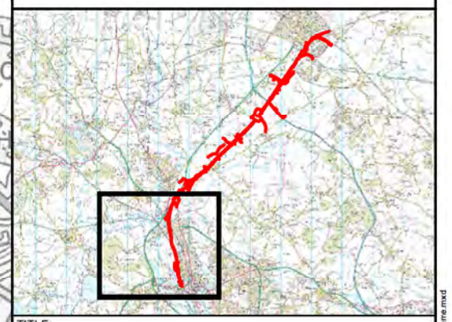

TITLE:

Plan 1.2
Designated Sites and Relevant Section of the Scheme

CLIENT: Chiltern Railways

SIZE: A3

DATE: 12/07/2013 | CHECKED: RM | PROJECT: 0172205

DRAWN: AZ | APPROVED: SG | SCALE: As Scale Bar

DRAWING: Plan 1_2 - Designated Sites amd Relevant Section of the Scheme.mxd

REV: 0

ERM
Eaton House
Wallbrook Court
North Hinksey Lane
Oxford, OX2 0QS
Tel: 01865 384800
Fax: 01865 384848

PROJECTION: British National Grid

File: T:\Projects\0172205\Chiltern\GIS_AZ_SG\MAPS\AQ_PROTOCAL\Plan 1_2 - Designated Sites and Relevant Section of the Scheme.mxd

Appendix B

NATIONWIDE DATA COLLECTION - RAIL INTERVIEWS **STATION START: BICESTER / OXFORD** **DATE** ..... **ENUMERATOR** ..... ***(office use)*** **SERIAL No.** .....

1 **INTERVIEW TIME:** .....

Q1 - What was your departure station?	Q2 - What was your main form of travel to get to your departure station?	Q3 - Did your route include the A34(T) or A40 *AS SHOWN ON THE MAP*?	Q4 - Have you changed your travel arrangements since the opening of Oxford Parkway Station and the new train service from Oxford to London Marylebone?	Q5 - Before the opening of Oxford Parkway Station did you use a different rail station or an alternative mode of transport to using the train?	Q6 - What is your destination station?	Q7 - Please state the full address you have just come from?
1 Oxford ☐ 2 Oxford Parkway ☐ 3 Bicester Village ☐ 4 Other (specify) ☐	1 Car as driver ☐ 2 Car as passenger (with another rail user) ☐ 3 Car as passenger (dropped off) ☐ 4 Taxi ☐ 5 Motorcycle ☐ 6 Pedal Cycle ☐ 7 **Bus** ☐ **Go to Q4** 8 **On Foot** ☐ **Go to Q4** 9 Other (specify) ☐	1 A34(T) only ☐ 2 A40 only ☐ 3 Both A34 & A40 ☐ 4 No ☐	1 Yes ☐ 2 **No** ☐ **Go to Q6**	1 Used to drive ☐ 2 Used Bicester North ☐ 3 Used Oxford ☐ 4 Other transport (specify) ☐	1 London (Any Station) ☐ 2 Other (specify) ☐	Firm, House Name or ZONE ..... Number & Street ..... Town ..... County ..... Postcode .....

2 **INTERVIEW TIME:** .....

Q1 - What was your departure station?	Q2 - What was your main form of travel to get to your departure station?	Q3 - Did your route include the A34(T) or A40 *AS SHOWN ON THE MAP*?	Q4 - Have you changed your travel arrangements since the opening of Oxford Parkway Station and the new train service from Oxford to London Marylebone?	Q5 - Before the opening of Oxford Parkway Station did you use a different rail station or an alternative mode of transport to using the train?	Q6 - What is your destination station?	Q7 - Please state the full address you have just come from?
1 Oxford ☐ 2 Oxford Parkway ☐ 3 Bicester Village ☐ 4 Other (specify) ☐	1 Car as driver ☐ 2 Car as passenger (with another rail user) ☐ 3 Car as passenger (dropped off) ☐ 4 Taxi ☐ 5 Motorcycle ☐ 6 Pedal Cycle ☐ 7 **Bus** ☐ **Go to Q4** 8 **On Foot** ☐ **Go to Q4** 9 Other (specify) ☐	1 A34(T) only ☐ 2 A40 only ☐ 3 Both A34 & A40 ☐ 4 No ☐	1 Yes ☐ 2 **No** ☐ **Go to Q6**	1 Used to drive ☐ 2 Used Bicester North ☐ 3 Used Oxford ☐ 4 Other transport (specify) ☐	1 London (Any Station) ☐ 2 Other (specify) ☐	Firm, House Name or ZONE ..... Number & Street ..... Town ..... County ..... Postcode .....

3 **INTERVIEW TIME:** .....

Q1 - What was your departure station?	Q2 - What was your main form of travel to get to your departure station?	Q3 - Did your route include the A34(T) or A40 *AS SHOWN ON THE MAP*?	Q4 - Have you changed your travel arrangements since the opening of Oxford Parkway Station and the new train service from Oxford to London Marylebone?	Q5 - Before the opening of Oxford Parkway Station did you use a different rail station or an alternative mode of transport to using the train?	Q6 - What is your destination station?	Q7 - Please state the full address you have just come from?
1 Oxford ☐ 2 Oxford Parkway ☐ 3 Bicester Village ☐ 4 Other (specify) ☐	1 Car as driver ☐ 2 Car as passenger (with another rail user) ☐ 3 Car as passenger (dropped off) ☐ 4 Taxi ☐ 5 Motorcycle ☐ 6 Pedal Cycle ☐ 7 **Bus** ☐ **Go to Q4** 8 **On Foot** ☐ **Go to Q4** 9 Other (specify) ☐	1 A34(T) only ☐ 2 A40 only ☐ 3 Both A34 & A40 ☐ 4 No ☐	1 Yes ☐ 2 **No** ☐ **Go to Q6**	1 Used to drive ☐ 2 Used Bicester North ☐ 3 Used Oxford ☐ 4 Other transport (specify) ☐	1 London (Any Station) ☐ 2 Other (specify) ☐	Firm, House Name or ZONE ..... Number & Street ..... Town ..... County ..... Postcode .....

4 **INTERVIEW TIME:** .....

Q1 - What was your departure station?	Q2 - What was your main form of travel to get to your departure station?	Q3 - Did your route include the A34(T) or A40 *AS SHOWN ON THE MAP*?	Q4 - Have you changed your travel arrangements since the opening of Oxford Parkway Station and the new train service from Oxford to London Marylebone?	Q5 - Before the opening of Oxford Parkway Station did you use a different rail station or an alternative mode of transport to using the train?	Q6 - What is your destination station?	Q7 - Please state the full address you have just come from?
1 Oxford ☐ 2 Oxford Parkway ☐ 3 Bicester Village ☐ 4 Other (specify) ☐	1 Car as driver ☐ 2 Car as passenger (with another rail user) ☐ 3 Car as passenger (dropped off) ☐ 4 Taxi ☐ 5 Motorcycle ☐ 6 Pedal Cycle ☐ 7 **Bus** ☐ **Go to Q4** 8 **On Foot** ☐ **Go to Q4** 9 Other (specify) ☐	1 A34(T) only ☐ 2 A40 only ☐ 3 Both A34 & A40 ☐ 4 No ☐	1 Yes ☐ 2 **No** ☐ **Go to Q6**	1 Used to drive ☐ 2 Used Bicester North ☐ 3 Used Oxford ☐ 4 Other transport (specify) ☐	1 London (Any Station) ☐ 2 Other (specify) ☐	Firm, House Name or ZONE ..... Number & Street ..... Town ..... County ..... Postcode .....

Appendix C

CHILTERN RAILWAYS ORDER 2012

FILE NOTE DEALING WITH FUTURE YEAR IMPACT

1. A34(T) Impact

1.1. **Tables 1.1 to 1.3** set out the with and without scheme AADT traffic flows and impacts for 2020, 2023 and 2027 for the A34(T).

Table 1.1: 2020 AADT traffic flows on A34(T) with and without scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	39,229	39,198	-31	-0.08%
Southbound	40,004	39,974	-30	-0.08%
Total	79,233	79,172	-61	-0.08%

Table 1.2: 2023 AADT traffic flows on A34(T) with and without scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	40,732	40,700	-32	-0.08%
Southbound	41,537	41,506	-31	-0.08%
Total	82,269	82,205	-64	-0.08%

Table 1.3: 2027 AADT traffic flows on A34(T) with and without scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	42,543	42,509	-34	-0.08%
Southbound	43,384	43,351	-33	-0.08%
Total	85,927	85,860	-67	-0.08%

2. A40 Impact

2.1. **Tables 2.1 to 2.3** set out the with and without scheme AADT traffic flows and impacts for 2020, 2023 and 2027 for the A40.

Table 2.1: 2020 AADT traffic flows on A40 with and without scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	12,306	12,354	+48	+0.38%
Southbound	11,499	11,545	+46	+0.40%
Total	23,805	23,899	+94	+0.39%

Table 2.2: 2023 AADT traffic flows on A40 with and without scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	12,683	12,732	+49	+0.38%
Southbound	11,851	11,898	+47	+0.40%
Total	24,534	24,630	+96	+0.39%

Table 2.3: 2027 AADT traffic flows on A40 with and without scheme

Direction	AADT Traffic Flow without Scheme	AADT Traffic Flow with Scheme	Difference	% Impact
Northbound	13,161	13,212	+51	+0.39%
Southbound	12,298	12,347	+49	+0.40%
Total	25,459	25,559	+100	+0.39%