highways england

A303 Stonehenge

Amesbury to Berwick Down
Technical Appraisal Report

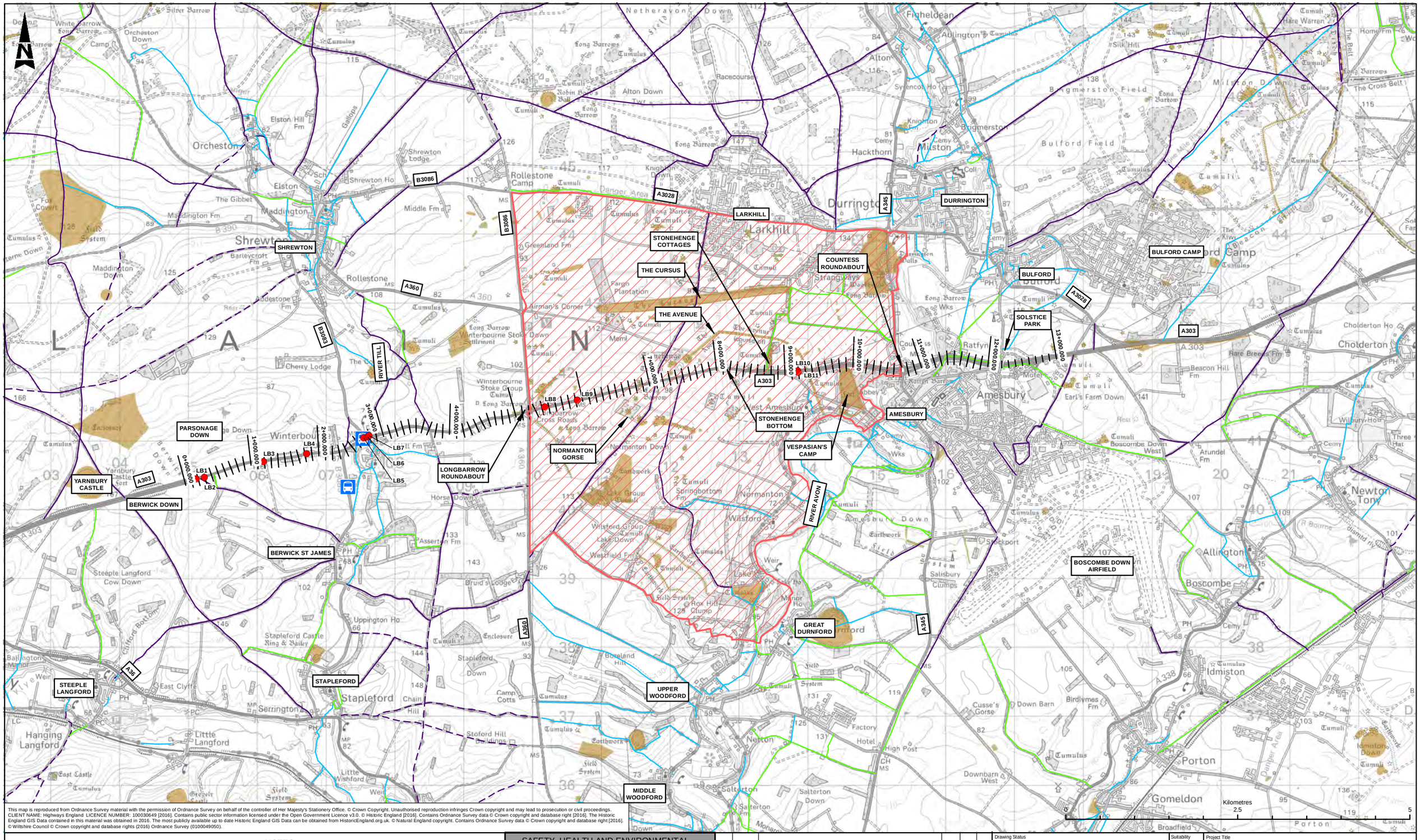
Appendix A:
Existing conditions

Volume 2

Public Consultation 2017

Appendix A Existing conditions

A.1 Existing features



LEGEND

- WORLD HERITAGE SITE
- SCHEDULED MONUMENTS
- LAY-BYS
- BUS STOPS

PUBLIC RIGHTS OF WAY

- FOOTPATH
- BRIDLEWAY
- BYWAY
- RESTRICTED BYWAY

NOTES

FOR FULL ENVIRONMENTAL CONSTRAINTS REFER TO HE551506-AA-EGN-SWI-DR-YE-000025

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Rev	Date	Description	By	Chk'd	App'd
P09	07/12/16	FINAL ISSUE	MD	GS	SL

Drawing Status: FIT FOR INTERNAL REVIEW AND COMMENT
Suitability: S3
Project Title: A303 AMESBURY TO BERWICK DOWN
Client: highways england
Drawing Title: EXISTING FEATURES
Designers: ARUP ATKINS

Scale	Designed / Drawn	Checked	Approved	Authorised
1:50,000	MD	GS	SL	SH
Original Size	Date	Date	Date	Date
A3	07/12/16	07/12/16	07/12/16	07/12/16

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551506-AA-HGN-SWI-DR-CX-000003
Revison: P09

A.2 Existing public utilities

SHEET 2
HE551506-AA-GEN-SWI-DR-CX-000022

SHEET 3
HE551506-AA-GEN-SWI-DR-CX-000023

SHREWTON
PARSONAGE DOWN
YARNBURY CASTLE
BERWICK DOWN
WINTERBOURNE STOKE
BERWICK ST JAMES
LONGBARROW ROUNDABOUT
NORMANTON GORSE
VESPASIAN'S CAMP
THE CURSUS
THE AVENUE
STONEHENGE BOTTOM
STONEHENGE
COUNTESS ROUNDABOUT
AMESBURY
SOLSTICE PARK
BULFORD
BULFORD CAMP
DURRINGTON
LARKHILL
GREAT DURNFORD
STAPLEFORD
STEEPLE LANGFORD
UPPER WOODFORD
MIDDLE WOODFORD
RIVER TILL
RIVER AVON
A303
A360
A345
A3028
B3086
B3083
A338

Note: The accuracy of the information is only as good as that provided. Site condition may vary and should be verified before commencing any works.

Kilometres
0 2.5 5

LEGEND

- EPS UTILITIES GROUP
- ESSO UTILITY PETROLEUM
- GTC – ELECTRICITY
- GTC – GAS
- HIGHWAYS ENGLAND - AREA 2 - SOMERSET AVON WILTSHIRE AND GLOUCESTERSHIRE
- INSTALCOM - [LEVEL 3 GLOBAL CROSSING (UK) & PEC AND FIBERNET UK]
- OPENREACH - [BRITISH TELECOMMUNICATIONS]
- UTILITY SGN SOUTHERN CROSS NETWORK
- SSE (SOUTHERN ELECTRIC POWER DISTRIBUTION) EXTRA HIGH VOLTAGE
- SSE (SOUTHERN ELECTRIC POWER DISTRIBUTION) HIGH VOLTAGE
- SSE (SOUTHERN ELECTRIC POWER DISTRIBUTION) LOW VOLTAGE
- VIRGIN MEDIA
- WESSEX WATER - SEWAGE
- WESSEX WATER - WATER
- WILTSHIRE COUNCIL - DRAINAGE
- WILTSHIRE COUNCIL - STREET LIGHTING
- INFORMATION BOUNDARY

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction

Some underground utilities may not be identified in the survey and therefore are not shown in this map. Further surveys needed prior to construction.

Maintenance / Cleaning

None

Use

None

Decommission / Demolition

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Rev	Date	Description	By	Chk'd	App'd
P04	06/12/16	FINAL ISSUE	AF	GS	SL

Drawing Status: FIT FOR INTERNAL REVIEW AND COMMENT
Suitability: S3

Client: highways england

Designers: ARUP ATKINS

Project Title: A303 AMESBURY TO BERWICK DOWN

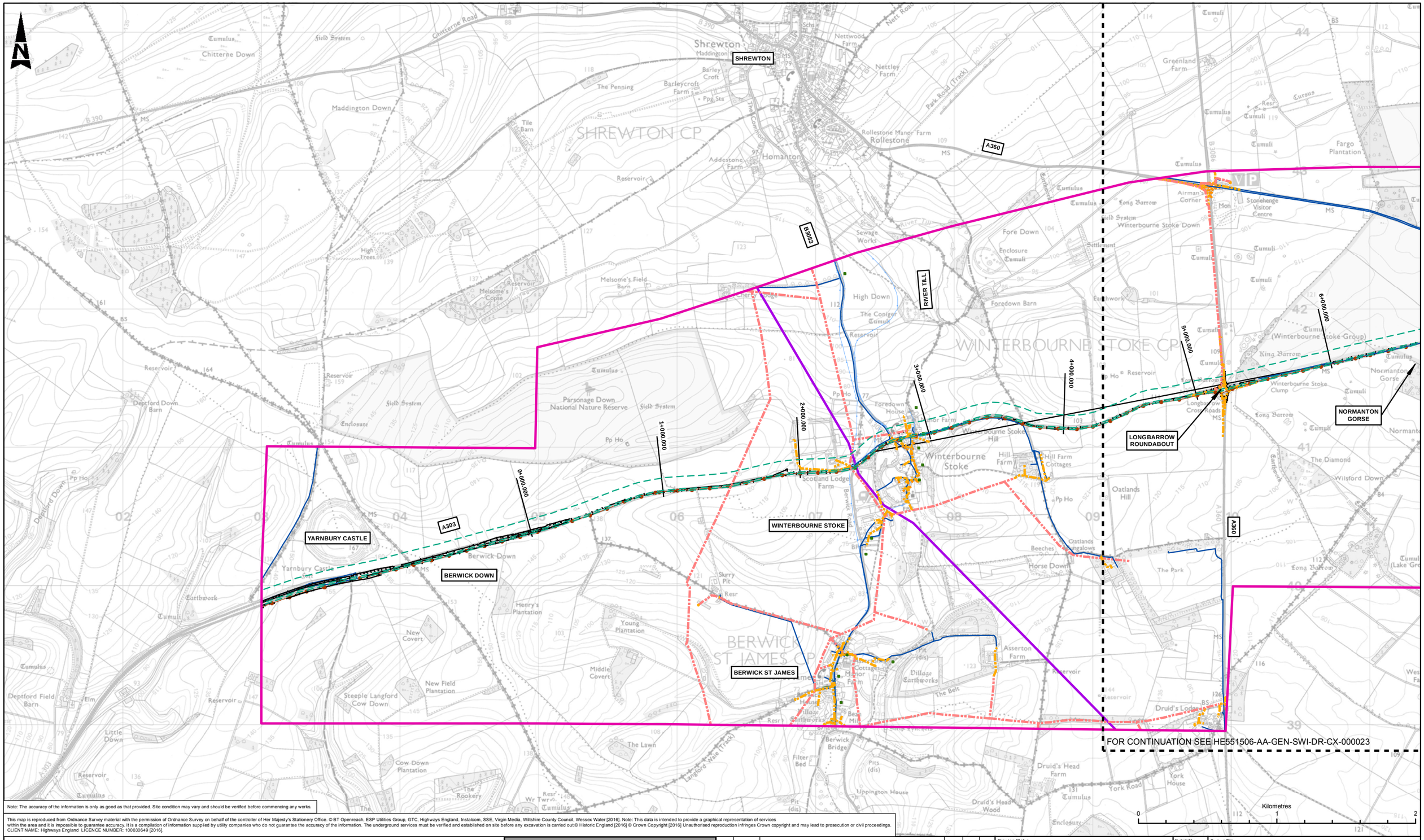
Drawing Title: EXISTING PUBLIC UTILITIES KEY PLAN SHEET 1 OF 3

Scale	Designed / Drawn	Checked	Approved	Authorised
1:50,000	AF	GS	SL	SH

Original Size	Date	Date	Date	Date
A3	06/12/16	06/12/16	06/12/16	06/12/16

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551506-AA-GEN-SWI-DR-CX-000021

Revision: P04



Note: The accuracy of the information is only as good as that provided. Site condition may vary and should be verified before commencing any works.

LEGEND

- EPS UTILITIES GROUP
- ESSO UTILITY PETROLEUM
- GTC – ELECTRICITY
- GTC – GAS
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P04	06/12/16	FINAL ISSUE	AF	GS	SL

Drawing Status: FIT FOR INTERNAL RVIEW AND COMMENT

Suitability: S3

Project Title: A303 AMESBURY TO BERWICK DOWN

Client: highways england

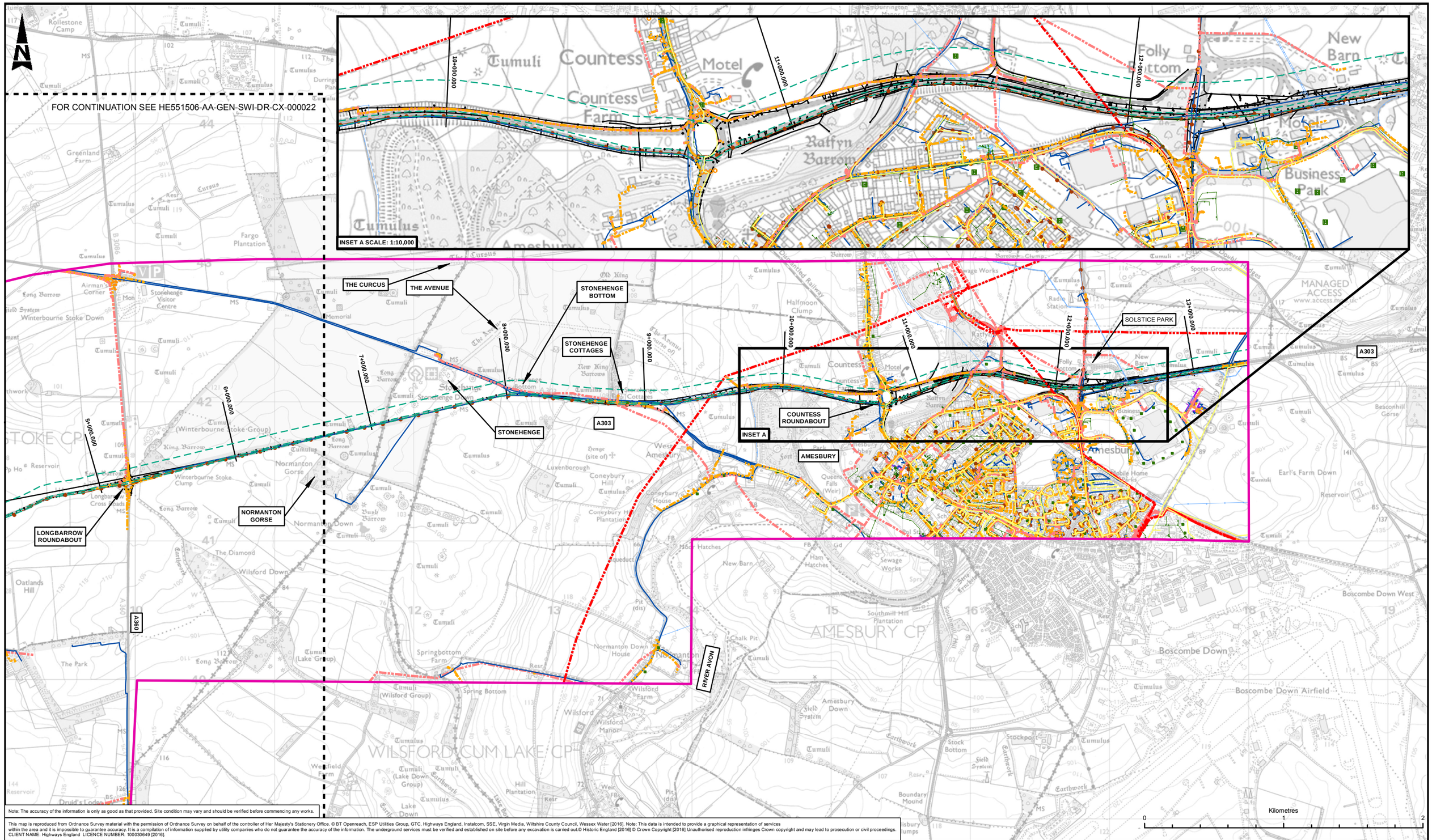
Drawing Title: EXISTING PUBLIC UTILITIES SHEET 2 OF 3

Designers: ARUP ATKINS

Scale	Designed / Drawn	Checked	Approved	Authorised
1:25,000	AF	GS	SL	SH
Original Size	Date	Date	Date	Date
A3	06/12/16	06/12/16	06/12/16	06/12/16

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number: HE551506-AA-GEN-SWI-DR-CX-000022

Revision: P04



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LEGEND

- EPS UTILITIES GROUP
- ESSO UTILITY PETROLEUM
- GTC – ELECTRICITY
- GTC – GAS
- HIGHWAYS ENGLAND - AREA 2 - SOMERSET AVON WILTSHIRE AND GLOUCESTERSHIRE
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction

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Maintenance / Cleaning

None

Use

None

Decommission / Demolition

Some underground utilities may not be identified in the survey and therefore are not shown in this map. Further surveys needed prior to construction.

Rev	Date	Description	By	Chk'd	App'd
P04	06/12/16	FINAL ISSUE	AF	GS	SL

Drawing Status: FIT FOR INTERNAL REVIEW AND COMMENT
Suitability: S3

Client: highways england

Designers: ARUP ATKINS

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: EXISTING PUBLIC UTILITIES SHEET 3 OF 3

Scale	Designed / Drawn	Checked	Approved	Authorised
1:25,000	AF	GS	SL	SH

Original Size	Date	Date	Date	Date
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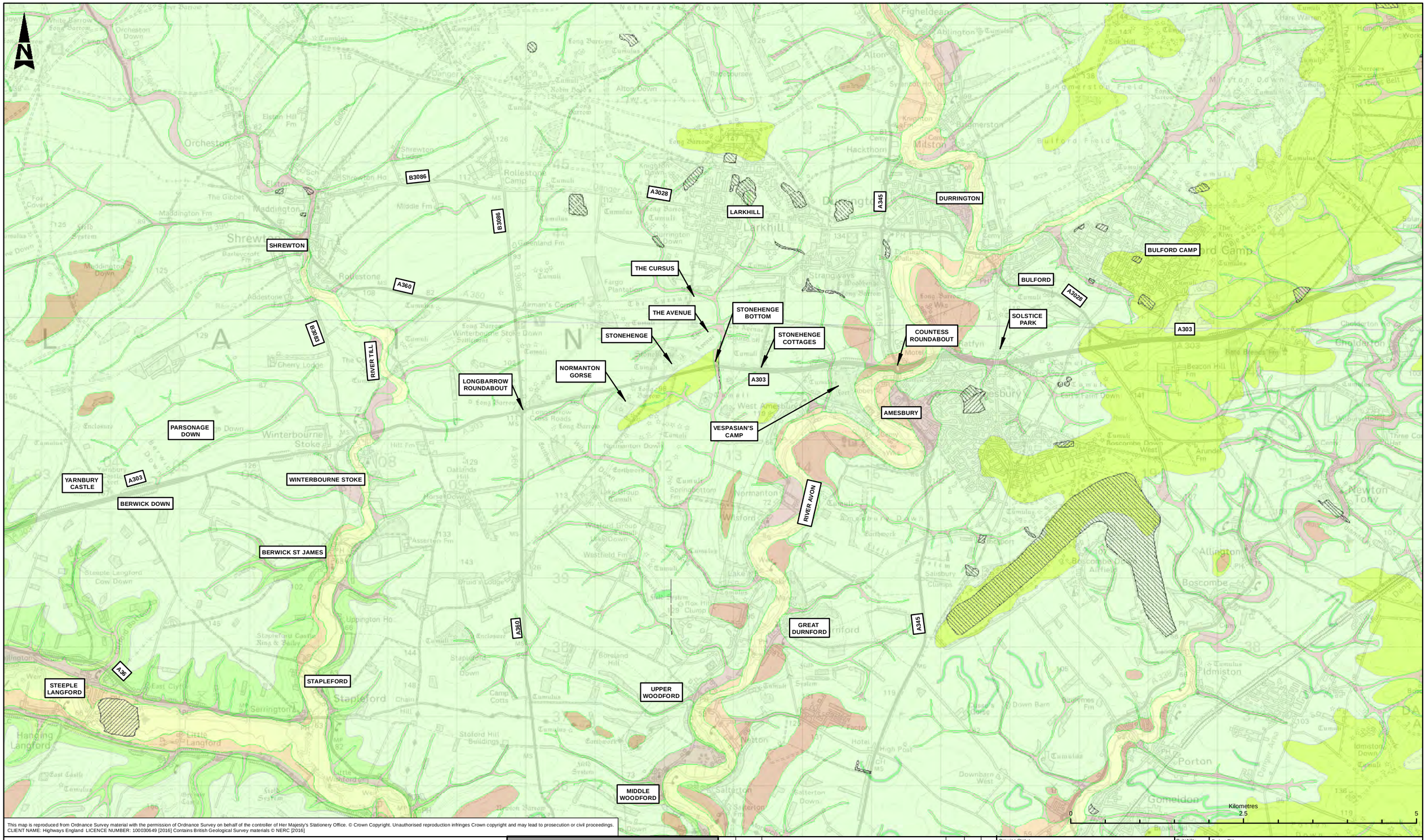
Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551506-AA-GEN-SWI-DR-CX-000023

Revison: P04

A.3 Existing geology mapping



LEGEND

ARTIFICIALLY MODIFIED GROUND
- LANDSCAPE GROUND
- MADE GROUND
- WORKED GROUND

SUPERFICIAL DEPOSITS
- CLAY WITH FLINTS
- HEAD - GRAVEL
- HEAD - CLAY, SILT, SAND & GRAVEL
- RIVER TERRACE DEPOSITS - SAND & GRAVEL
- ALLUVIUM - CLAY SILT AND SAND LOCALLY ORGANIC WITH GRAVEL

SOLID GEOLOGY
- NEWHAVEN CHALK FORMATION
- SEAFORD CHALK FORMATION
- STOCKBRIDGE ROAD MEMBER - LIMESTONE
- LEWES NODULAR CHALK FORMATION

——— FAULT LINE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Rev	Date	Description	By	Chk'd	App'd
P09	06/12/16	FINAL ISSUE	RJS	GS	SL

Drawing Status: FIT FOR INTERNAL REVIEW AND COMMENT
Suitability: S3

Client: highways england

Designers: ARUP ATKINS

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: EXISTING GEOLOGY

Scale	Designed / Drawn	Checked	Approved	Authorised
1:50,000	RJS	GS	SL	SH

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A3	06/12/16	06/12/16	06/12/16	06/12/16

Drawing Number: HE551506-AA-VGT-SWI-DR-LS-000044
(Project | Originator | Volume | Location | Type | Role | Number)

Revison: P09

A.4 Existing traffic, journey time and accident data

Appendix A4

1 Existing traffic, accidents and journey time reliability

1.1.1 This section provides details of the existing traffic conditions for the A303 Amesbury to Berwick Down section.

1.1.2 The A303/A30/A358 forms a major arterial link between London / South East and the South West Peninsula but suffers from high levels of congestion and poor journey time reliability. In part this is because much of the route is trying to accommodate levels of traffic flow well in excess of its capacity.

1.1.3 Such problems are particularly acute on weekends and during summer months when traffic volumes are at their highest. Vehicle tracking data suggests that the average journey time for a trip from Exeter to London increase from 2 hours and 32 minutes on a weekday (Monday to Thursday) in March to 3 hours 51 minutes on a Friday in August – an increase in average journey times of 1 hour and 18 minutes, or more than 50%.

'We consciously decide not to travel on the A303 on a Friday, especially in the afternoon, because it can involve so much wasted time. We also deter deliveries on Friday if possible. This is not a sensible solution for any business.'

Managing Director, Hill Brush Company Ltd, Mere, Wiltshire.

1.1.4 A corridor feasibility study[1] undertaken in 2015 identified the section between Amesbury and Berwick Down amongst five sections of the corridor with the greatest transport issues and challenges. The A303 Amesbury to Berwick Down caters for 3.9 million journeys per annum in each direction. As illustrated in Figure 1-1 its strategic importance is reflected in the fact that nearly half (48%) of journeys past Stonehenge are long distance with both origin and destination being more than 30 miles away with an additional 33% having either an origin or destination further than 30 miles. In contrast only 11% of journeys on this section of the A303 are wholly within 10 miles of Stonehenge.

[1] *Arup analysis based on Historical Journey Time Data provided by Trafficmaster Ltd.*

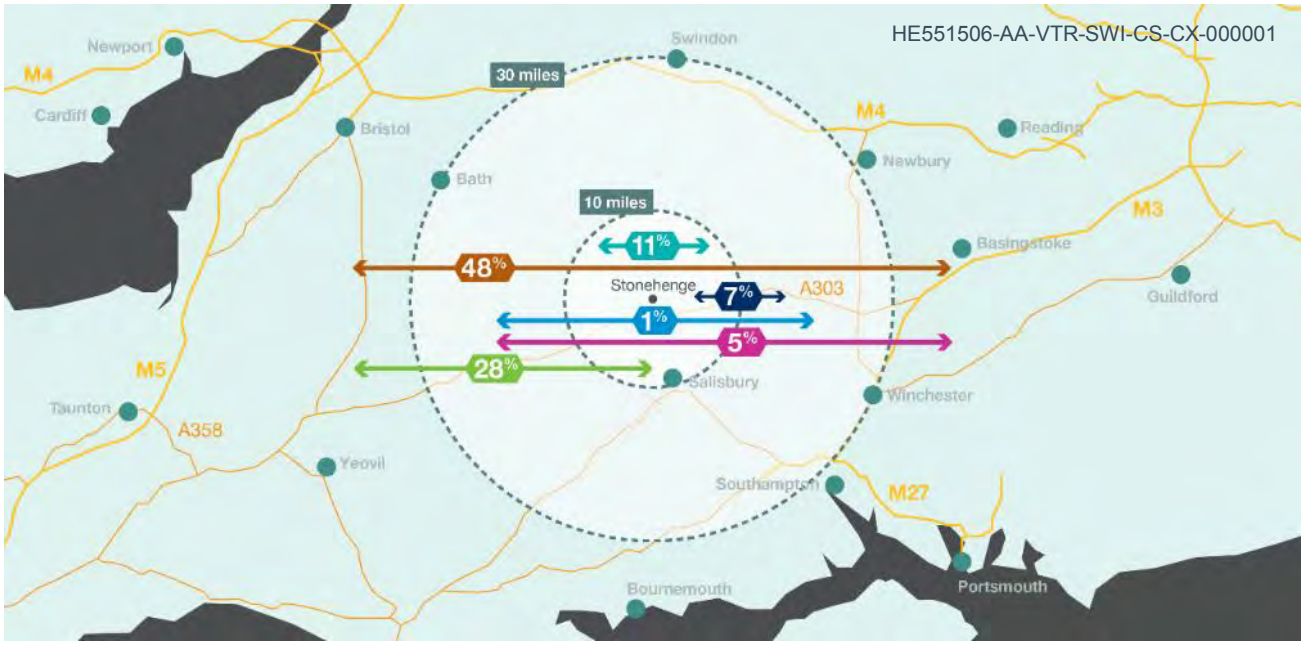


Figure 1-1 Distribution of traffic on the A303 at Stonehenge

1.1.5 The highest traffic flows along the route are found at the eastern and western extremities of the corridor, with flows varying between 35,000 and 50,000 vehicles per day. The lowest traffic flows are found on the A303/A30 section through the Blackdown Hills in Devon. Flows here vary from between 13,000 and 15,000 vehicles per day. Many of the sections towards the middle of the corridor have flows between 20,000 and 25,000 vehicles per day.

1.1.6 From the roadside interviews[2], around 25% of vehicles on the Stonehenge section of the A303 are vans or goods vehicles. Of the remaining 75% car traffic, the bulk of trips (40%) are made for leisure reasons with 26% commuting and 10% on business purposes.

Traffic characteristics of the A303 Amesbury to Berwick Down

Capacity and seasonality

1.1.7 As noted, this section of the A303 includes two non-segregated junctions and a single carriageway section of around 9kms in length. Under normal operating conditions, the single carriageway section operates beyond its capacity with daily traffic flows (Annual Average Daily Traffic, AADT) in the region of 24,000 vehicles compared to a theoretical capacity of 13,000. In the summer period, the AADT on this section of the A303 rises to nearly 29,000 – over double the theoretic capacity. Such traffic levels inevitably lead to congestion, delays for users and unreliable journeys.

1.1.8 Figure 1-2 and 1-3 shows the distribution of daily traffic volume across the year (2013) using data from Highways England HATRIS database. They clearly demonstrate the importance of the summer period as the peak traffic level occurs in July (westbound) and August (eastbound).

1.1.9 Additionally, (as indicated in Figure 1-2 and Figure 1-3) there is a noticeable difference in the patterns of demand between the two directions. In the westbound

[2] *Undertaken in October 2015.*

direction, Friday carries the largest traffic volumes throughout the year followed by a Thursday. In the opposite eastbound direction, Friday is still the busiest day of the week although not by the same margin, with Sunday tending to have the next highest volumes while Saturday is the quietest day of the weekend with flows more akin to weekdays. This suggests the general trend of travel to the South West at the end of the week with the reverse journey occurring on Sundays.

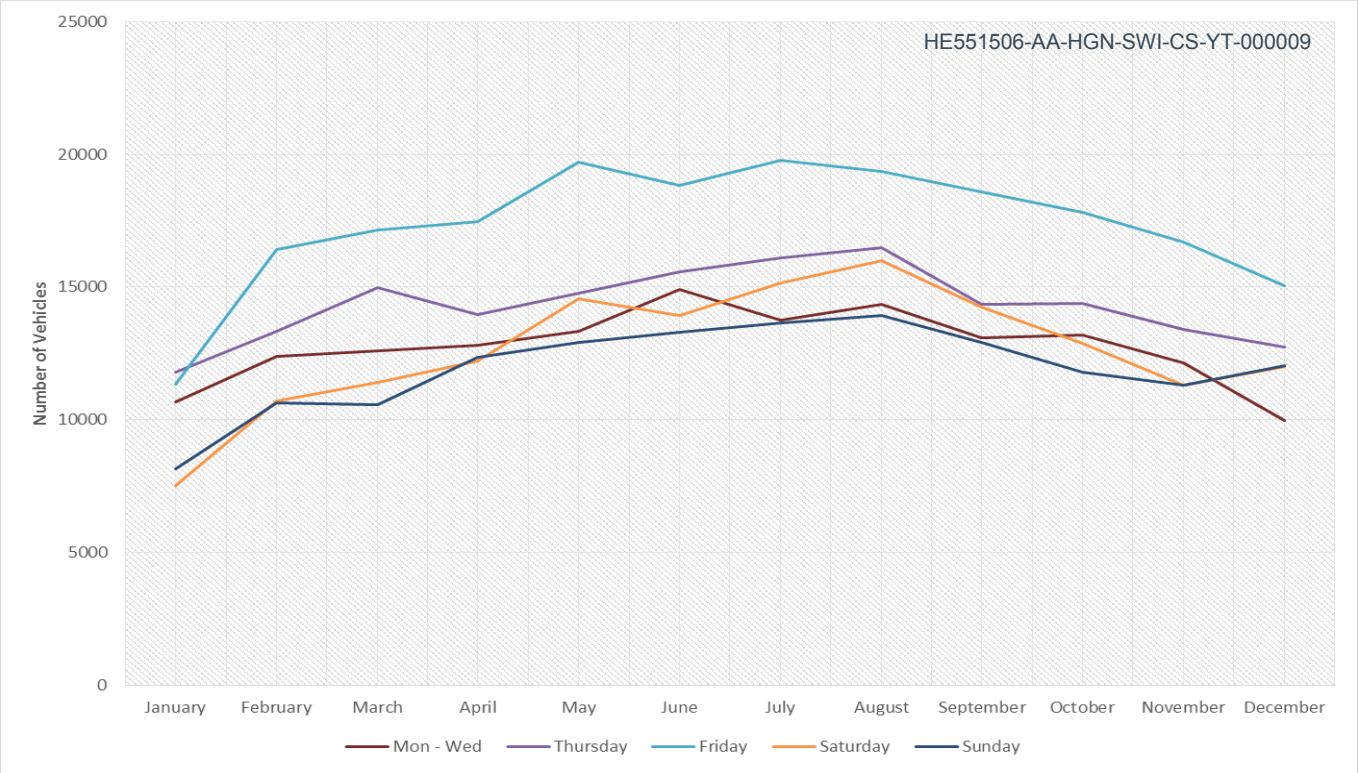


Figure 1-2 A303 – Westbound daily traffic by day and month

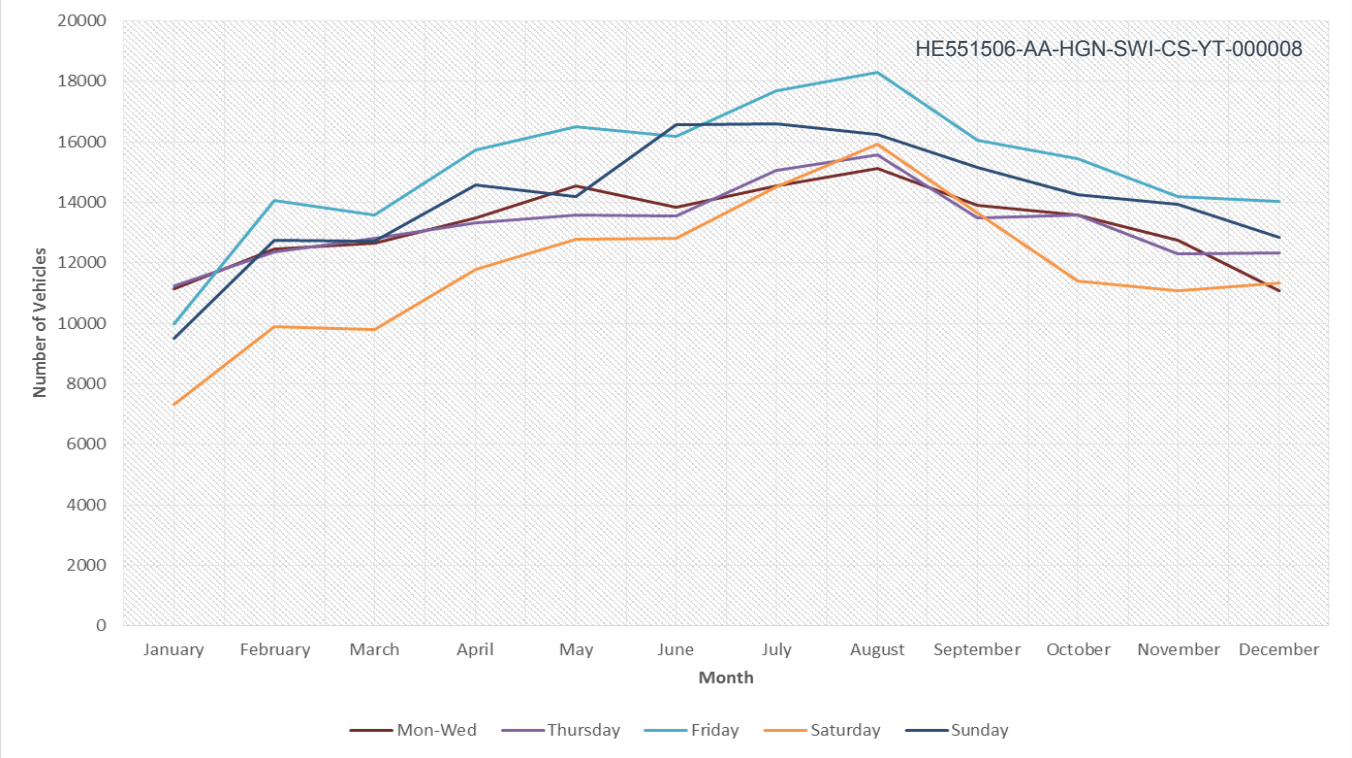


Figure 1-3 A303 – Eastbound daily traffic by day and month

1.1.10 Figure 1-4 and Figure 1-5 indicate the distribution of average daily traffic by hour of of the day and month (March, July, August and October) during 2013 using data from Highways England HATRIS database.

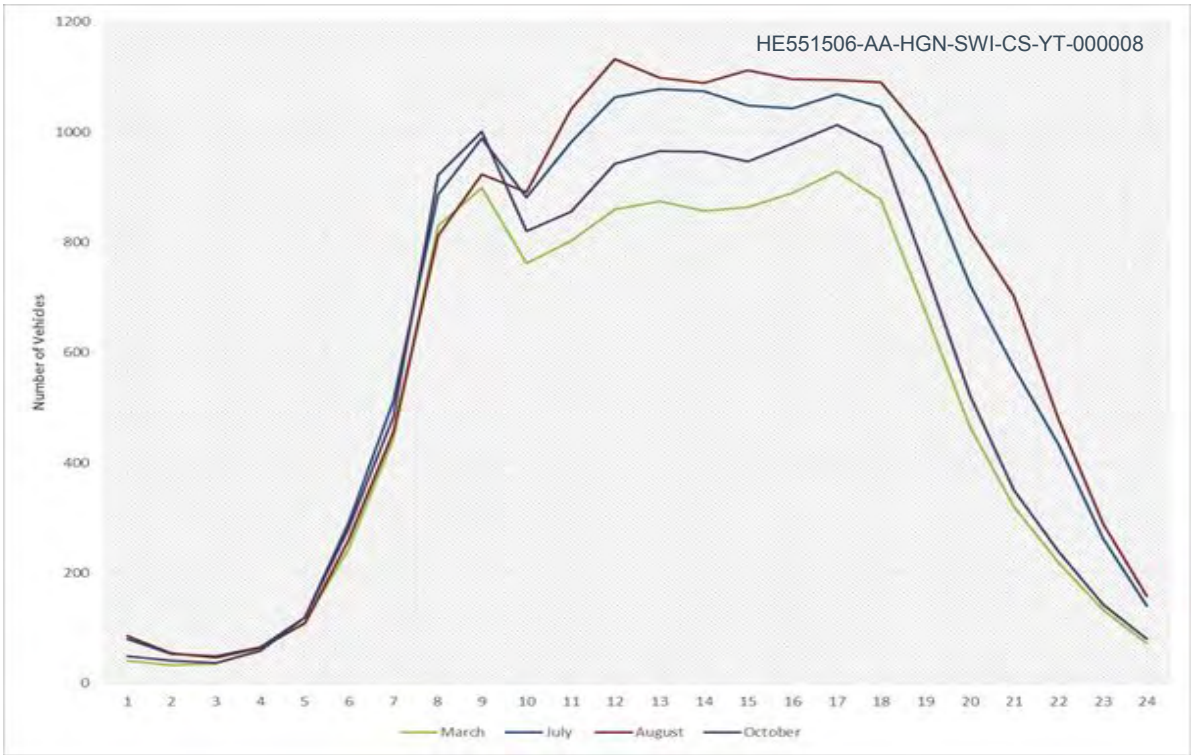


Figure 1-4 A303 – Eastbound ADT by hour and month (March, July, August and October only)

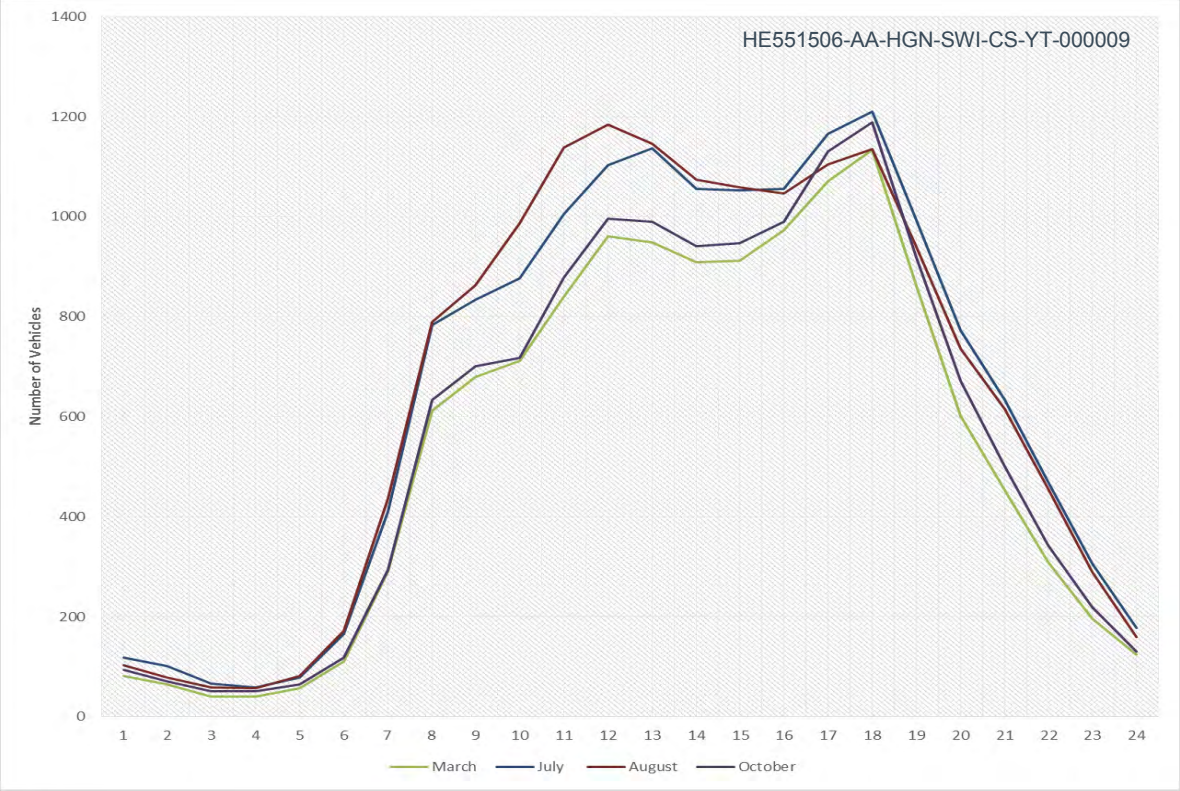


Figure 1-5 A303 – Westbound ADT by hour and month (March, July, August and October only)

1.1.11 The above figures again demonstrate the importance of the summer period as peak traffic levels occur in July and August. The above figures also show an interesting and common pattern (which occurs across all months and in both directions) this is that the inter-peak traffic levels are larger than the morning peak traffic levels. This is interesting as the normal pattern on roads is that the morning peak and evening peak have the highest traffic levels.

Journey times and delay

1.1.12 Traffic problems on the A303/A30/A358 corridor are particularly acute on weekends and during summer months when traffic volumes are at their highest. As illustrated by vehicle tracking data shown in Figure 1-6 and Figure 1-7, average journey times for a trip from Exeter to London increase from 2 hours and 32 minutes on a weekday (Monday to Thursday) in March to 3 hours 51 minutes on a Friday in August – an increase in average journey times of 1 hour and 18 minutes, or more than 50%.

AM (07.00 – 10.00) ***PM (peak time)***

HE551506-AA-VTR-SWI-CS-YT 000003

Figure 1-6 Average journey times: Exeter to London (Westbound)

AM (07.00 – 10.00) ***PM (peak time)***

HE551506-AA-VTR-SWI-CS-YT 000003

Figure 1-7 Average journey times: London to Exeter (Eastbound)

1.1.13 The extent of delays experienced by users has been estimated by considering the relationship between travel speeds and traffic volumes on the A303. If no delays

are encountered, the 11.8km section past Stonehenge from the Hampshire/Wiltshire border in the east to just west of Winterbourne Stoke can be covered in about 10 minutes, giving an average speed of about 70kph. Even during an average month, it is estimated that users experience average delays of nearly 9 minutes in a westbound direction and 3 minutes in an eastbound direction, with average speeds falling to 38kph and 53kph respectively.

1.1.14 Conditions are considerably worse on weekends and during the summer months. On a typical Saturday in August, when demand is considered to be at its peak, the average westbound journey time on the section of the A303 from the Hampshire border, past Stonehenge to Winterbourne Stoke, approaches 60 minutes – representing an average speed of less than 12kph.

1.1.15 Figures 1-8 and 1-9 show the eastbound and westbound journey times (minutes) by time and day during August 2014 from ANPR survey data.

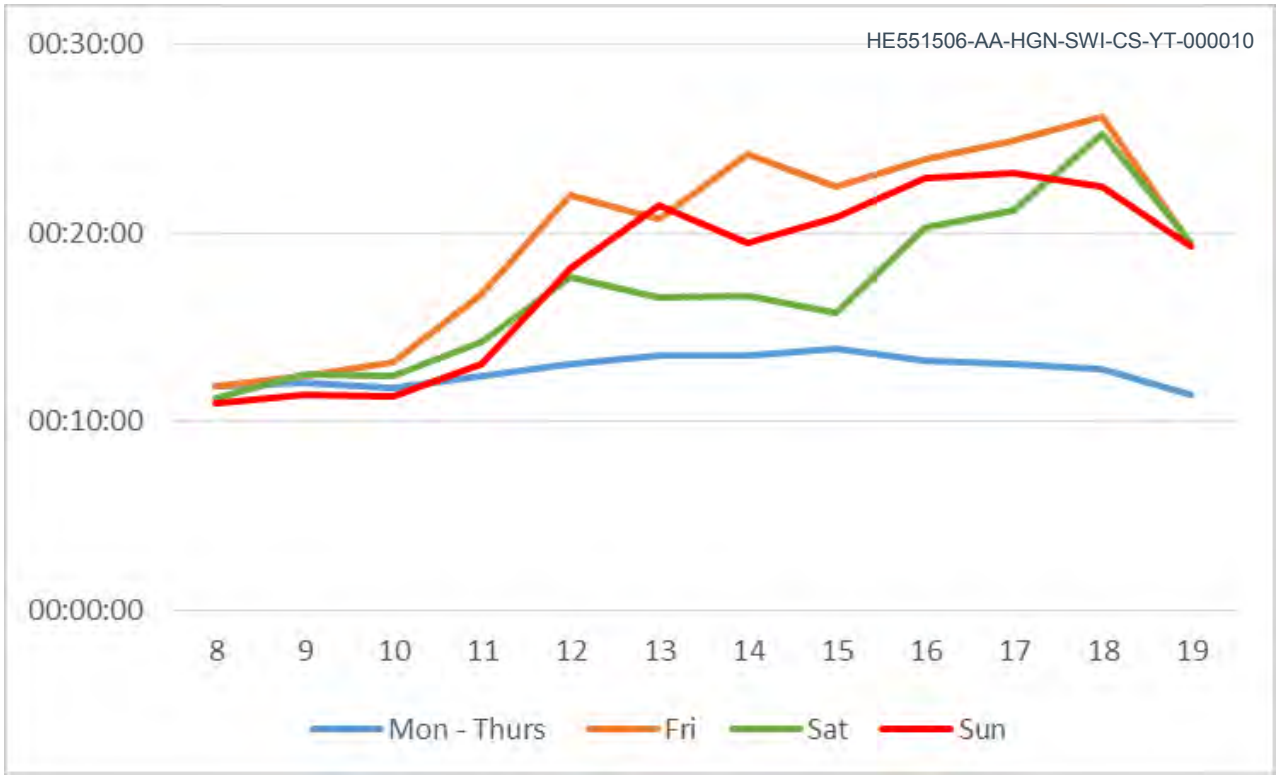


Figure 1-8 Eastbound journey times (minutes) by time of day (August 2014), Winterbourne Stoke to Hampshire border

1.1.16 Although conditions vary across the year, long delays are experienced by a large proportion of the vehicles that use this section of the A303. In the westbound direction, approximately 20% of vehicles are estimated to experience delays of at least 13 minutes and 40% of vehicles in a year experience delays of at least 5 minutes. In the eastbound direction the equivalent delays are 4 minutes for at least 20% of vehicles and 2 minutes for at least 40% of vehicles.

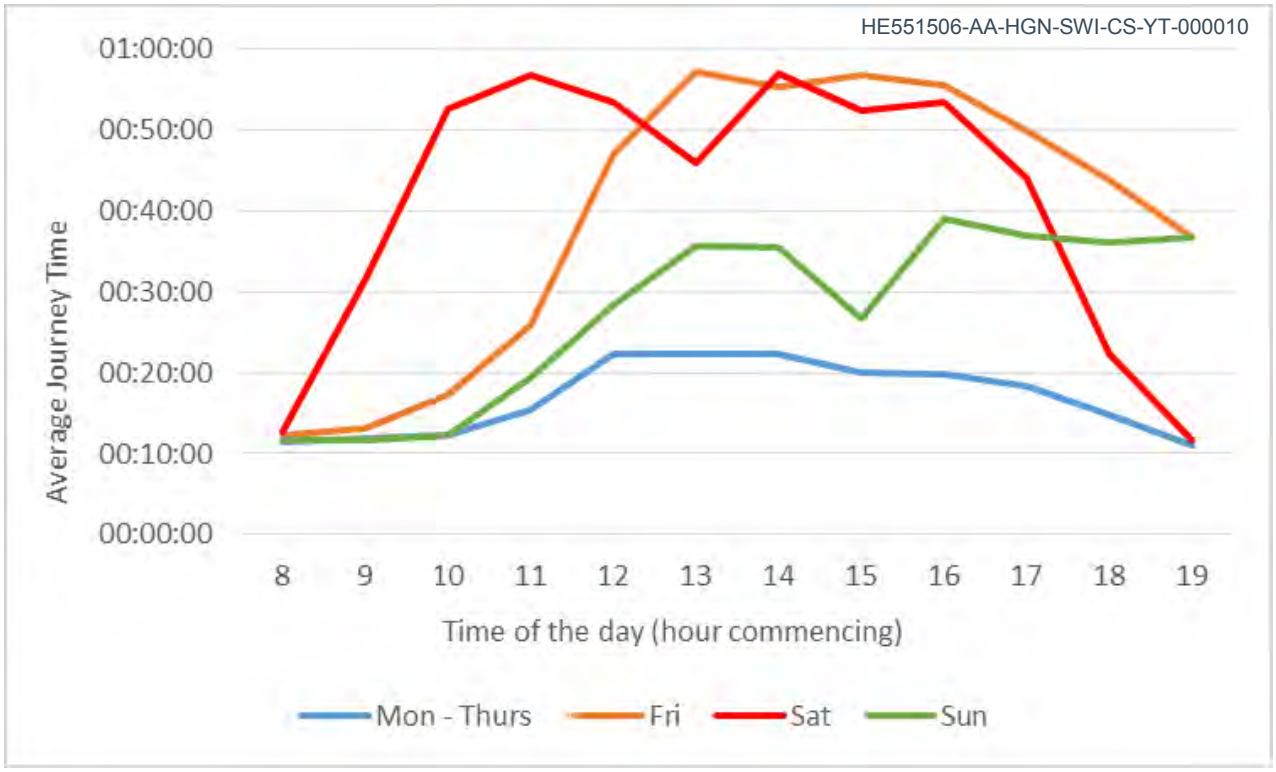


Figure 1-9 Westbound journey times (minutes) by time of day (August 2014), Hampshire border to Winterbourne Stoke

1.1.17 Figure 1-10 and Figure 1-11 show the eastbound and westbound delays. In each case, the diagrams show the proportion of annual hours (cumulative % of total) throughout the year when different levels of delays are encountered and includes predictions for 2021 and 2041. Note that in the Technical Appraisal Report (TAR) the traffic modelling has also been taken through to the horizon year in 2051.

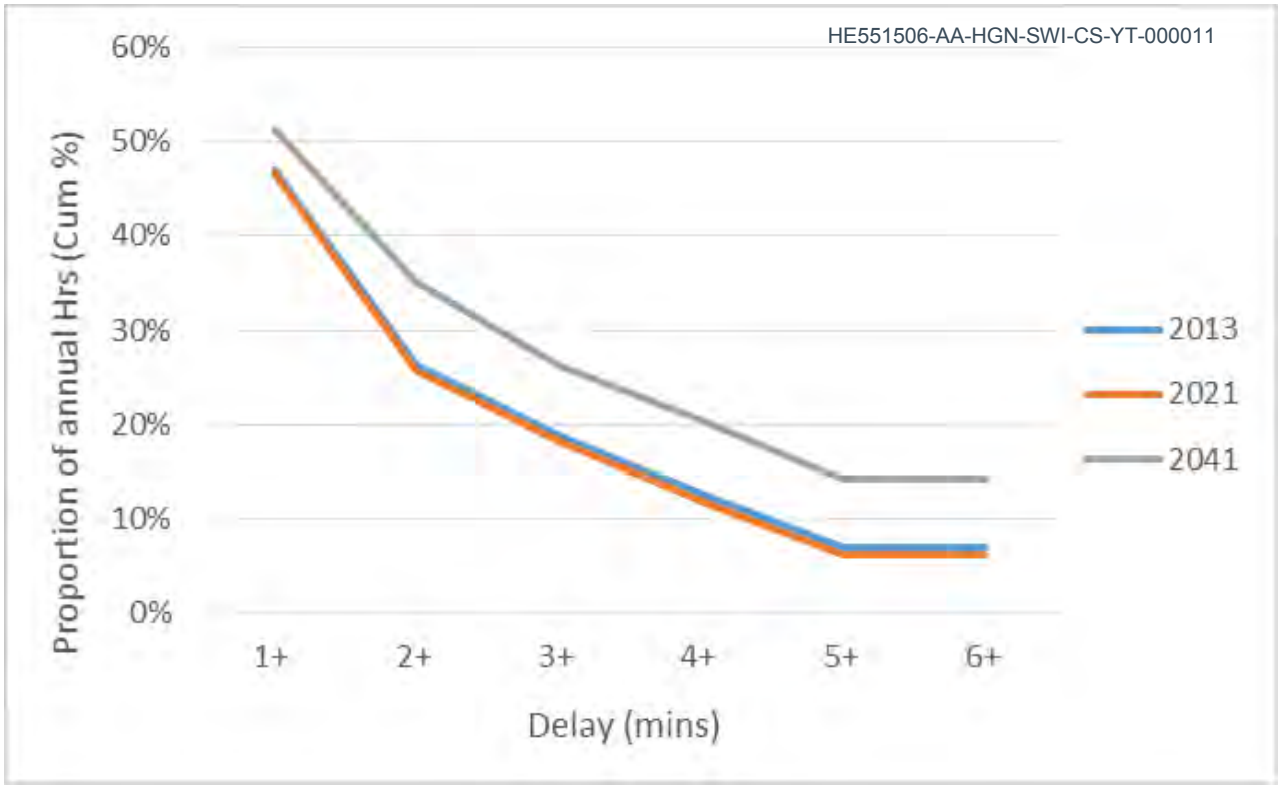


Figure 1-10 Cumulative distribution of annual delays by hours (eastbound)

1.1.18 Figure 1-10 shows that in the eastbound direction during 2013, almost half of the year (47%) of the total annual hours have delays of 1 minute and above, whilst 6% of total annual hours have delays of 6 minutes and above. By 2041, 14% of the total annual hours will have delays of 6minutes and above.

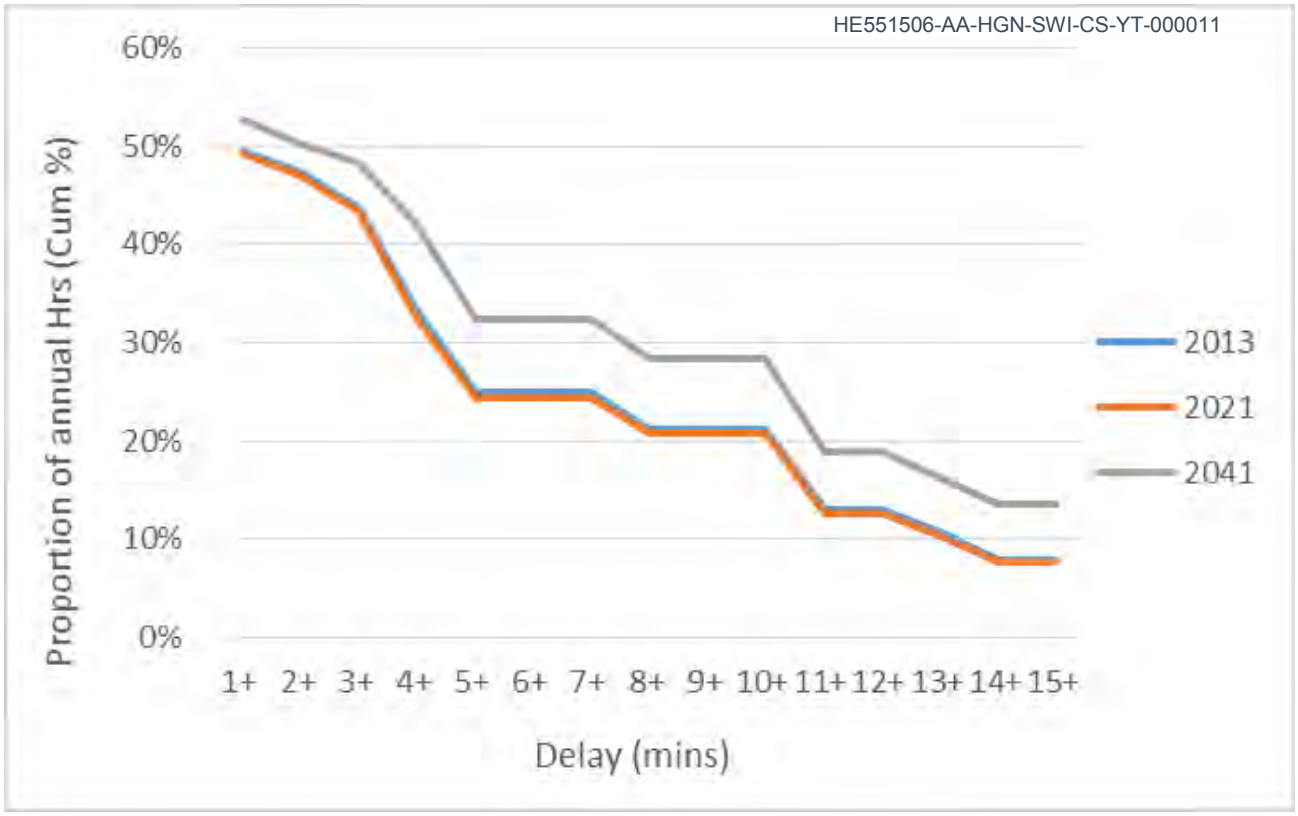


Figure 1-11 Cumulative distribution of annual delays by hours (westbound)

1.1.19 Figure 1-11 shows that in the westbound direction during 2013, almost half of the year (49%) of the total annual hours have delays of 1 minute and above, whilst 8% of total annual hours have delays of 15 minutes and above. By 2041, 13% of total annual hours will have delays of 15 minutes and above.

1.1.20 However there are larger traffic flows in the periods of largest delays. Figure 1-12 and Figure 1-13 present the distribution of delays by cumulative vehicle hours (eastbound and westbound directions) when different levels of delays are encountered.

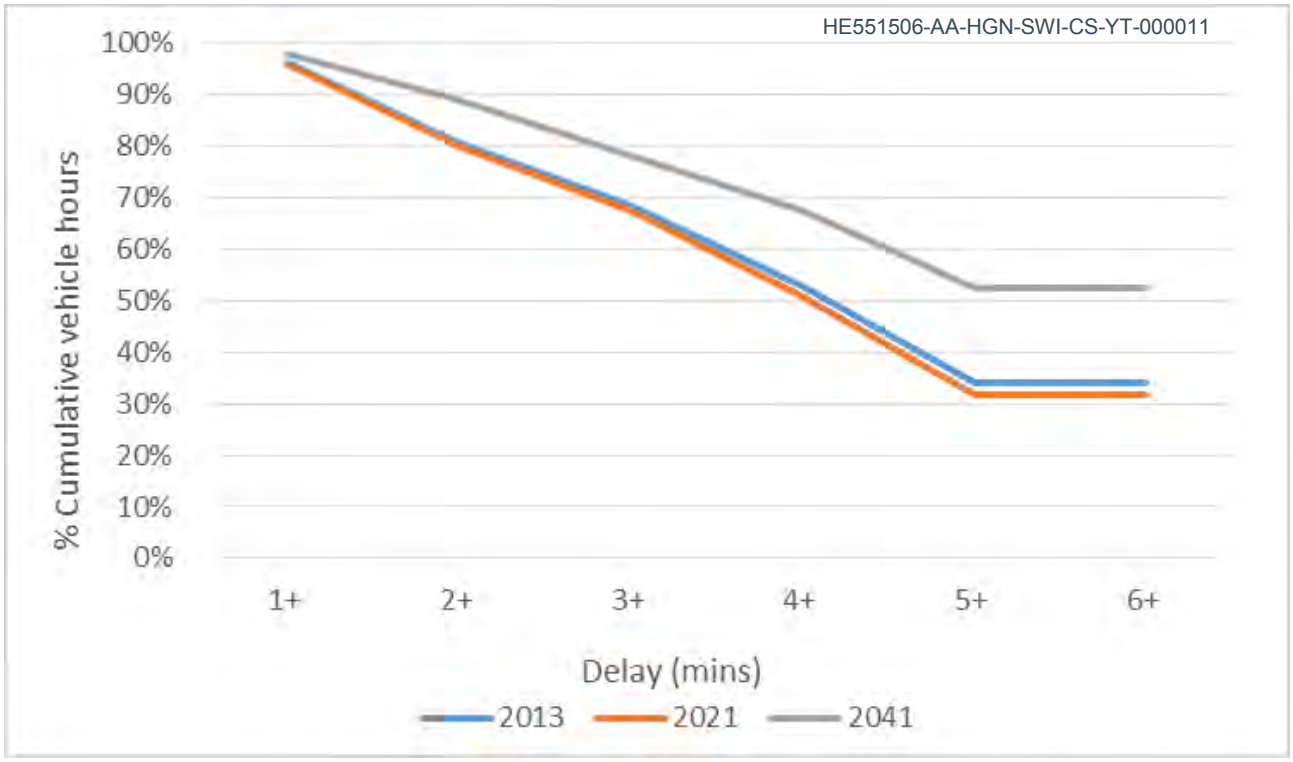


Figure 1-12 Cumulative distribution of annual delays by vehicles (eastbound)

1.1.21 Figure 1-12 shows that in the eastbound direction during 2013, 98% of the total annual vehicle hours have delays of 1 minute and above, whilst 32% of total annual vehicle hours have delays of 6 minutes and above. By 2041, 52% of total annual vehicles hours will have delays of 6 minutes and above.

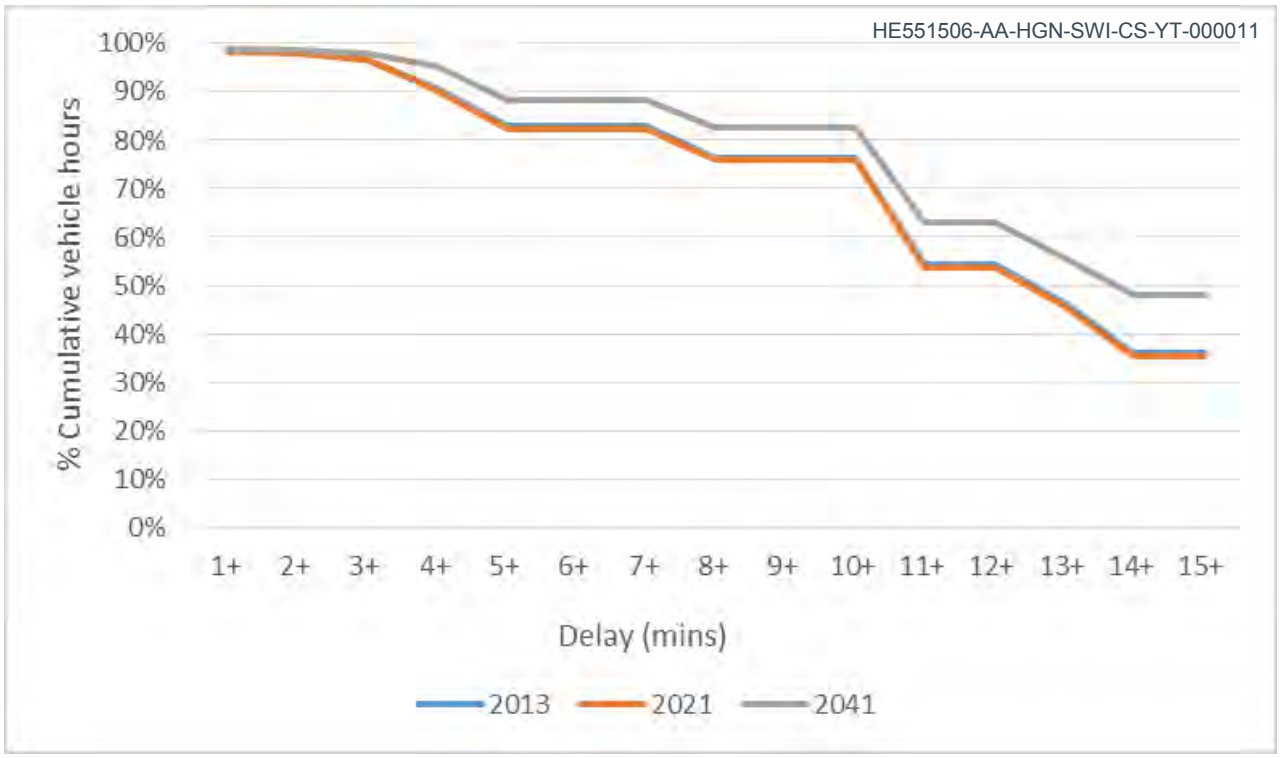


Figure 1-13 Cumulative distribution of annual delays by vehicles (westbound)

1.1.22 Figure 1-13 shows that in the westbound direction during 2013, 99% of the total annual vehicle hours have delays of 1 minute and above, whilst 35% of total annual

vehicle hours have delays of 15 minutes and above. By 2041, 48% of total annual vehicles hours will have delays of 14 minutes and above.

Travel Times and Speeds

1.1.23 Table 1-1 to Table 1-4 show the average 12 hour speeds measured on sections of the corridor during March and August 2015 – a summer holiday and non-holiday month. The tables show:

- There are generally low increases in travel time and low reductions in travel time (speed, kph) from Monday to Thursday in both directions.
- On Fridays, the single carriageway sections (sections 1 & 2) have much lower journey times and much higher speeds in the neutral months when compared to the summer months.
- Similarly and as expected on Saturdays and Sundays, the single carriageway sections will also have much lower journey times and much higher speeds in the neutral months when compared to the summer months.

Table 1-1 Monday - Thursday travel time speeds

No.	Section	Travel Time (mins: secs)				Travel Speed (kph)				Summer Travel Speeds decreases	
		EB		WB		EB		WB			
		Neutral	Summer	Neutral	Summer	Neutral	Summer	Neutral	Summer	EB	WB
1	A36 - B3083	04:42	05:58	04:58	05:04	95	75	90	88	20	2
2	B3083 - A345	06:57	08:40	06:45	12:04	69	56	71	40	13	31
3	A345 - Allington Track	01:51	01:51	02:12	02:22	91	91	79	73	0	6
4	Allington Track - A338	02:58	02:58	03:02	03:21	106	106	103	93	0	10
	All Sections	16:30	19:28	16:57	22:51	82	69	79	59	13	20

Table 1-2 Friday travel time speeds

No.	Section	Travel Time (mins: secs)				Travel Speed (kph)				Summer Travel Speeds decreases	
		EB		WB		EB		WB			
		Neutral	Summer	Neutral	Summer	Neutral	Summer	Neutral	Summer	EB	WB
1	A36 - B3083	04:48	13:20	04:55	05:10	93	33	91	86	60	5
2	B3083 - A345	07:32	11:58	14:00	23:56	64	40	34	20	24	14
3	A345 - Allington Track	01:58	01:53	02:09	05:39	86	90	80	31	-4	49
4	Allington Track - A338	03:03	03:04	02:54	03:00	102	102	108	104	0	4
	All Sections	17:23	30:16	23:59	37:46	77	44	56	36	33	20

Table 1-3 Saturday travel time speeds

No.	Section	Travel Time (mins: secs)				Travel Speed (kph)				Summer Travel Speeds decreases	
		EB		WB		EB		WB			
		Neutral	Summer	Neutral	Summer	Neutral	Summer	Neutral	Summer	EB	WB
1	A36 - B3083	04:19	10:56	04:35	04:51	103	41	97	92	62	5
2	B3083 - A345	06:28	12:21	10:49	23:19	75	39	45	21	35	24
3	A345 - Allington Track	01:45	01:47	02:51	05:33	96	95	61	31	1	29
4	Allington Track - A338	02:45	02:48	02:46	06:14	114	112	113	50	2	63
	All Sections	15:18	27:53	21:01	40:24	88	48	64	33	40	31

Table 1-4 Sunday travel time speeds

No.	Section	Travel Time (mins: secs)				Travel Speed (kph)				Summer Travel Speed decreases	
		EB		WB		EB		WB			
		Neutral	Summer	Neutral	Summer	Neutral	Summer	Neutral	Summer	EB	WB
1	A36 - B3083	05:00	07:50	04:46	04:47	84	54	88	88	30	0
2	B3083 - A345	07:51	12:17	07:51	15:19	61	39	61	31	22	30
3	A345 - Allington Track	01:45	01:46	02:03	02:33	99	98	85	68	1	17
4	Allington Track - A338	02:47	02:48	02:44	04:31	108	107	110	66	1	43
	All Sections	17:24	24:43	17:24	27:10	77	54	77	49	23	28

Impacts on alternative routes

1.1.24 Congestion experienced on weekends during the summer months results in severe delays for customers. This is demonstrated by comparing the variation in weekday and weekend travel times. This analysis is based on Automatic Number Plate Recognition (ANPR) surveys in March and August 2014 which identify the route options and travel times for traffic travelling through the area, on the A303 and other local roads.

1.1.25 Figure 1-14 demonstrates the range of journey times in August on different days of the week for journeys westbound on the section of the A303 from the Hampshire border, past Stonehenge to Winterbourne Stoke. On a Wednesday, the average westbound journey time on this section is between 10 minutes (or 71kph) and 18 minutes (or 39kph). On a typical August Saturday this rises significantly to approaching 60 minutes (or less than 12kph) for a long period of the day. A similar journey time is experienced on Fridays, although starting later in the day.

1.1.26 The analysis concentrates on the impact in the westbound direction in which the delays, and hence the level of diversion, is more severe. The ANPR survey also identified the diversion by eastbound traffic. Although the extent of the diversion ('rat running') by eastbound traffic does not reach the same volumes as experienced for the westbound traffic, due to the lower delays and journey time increases.

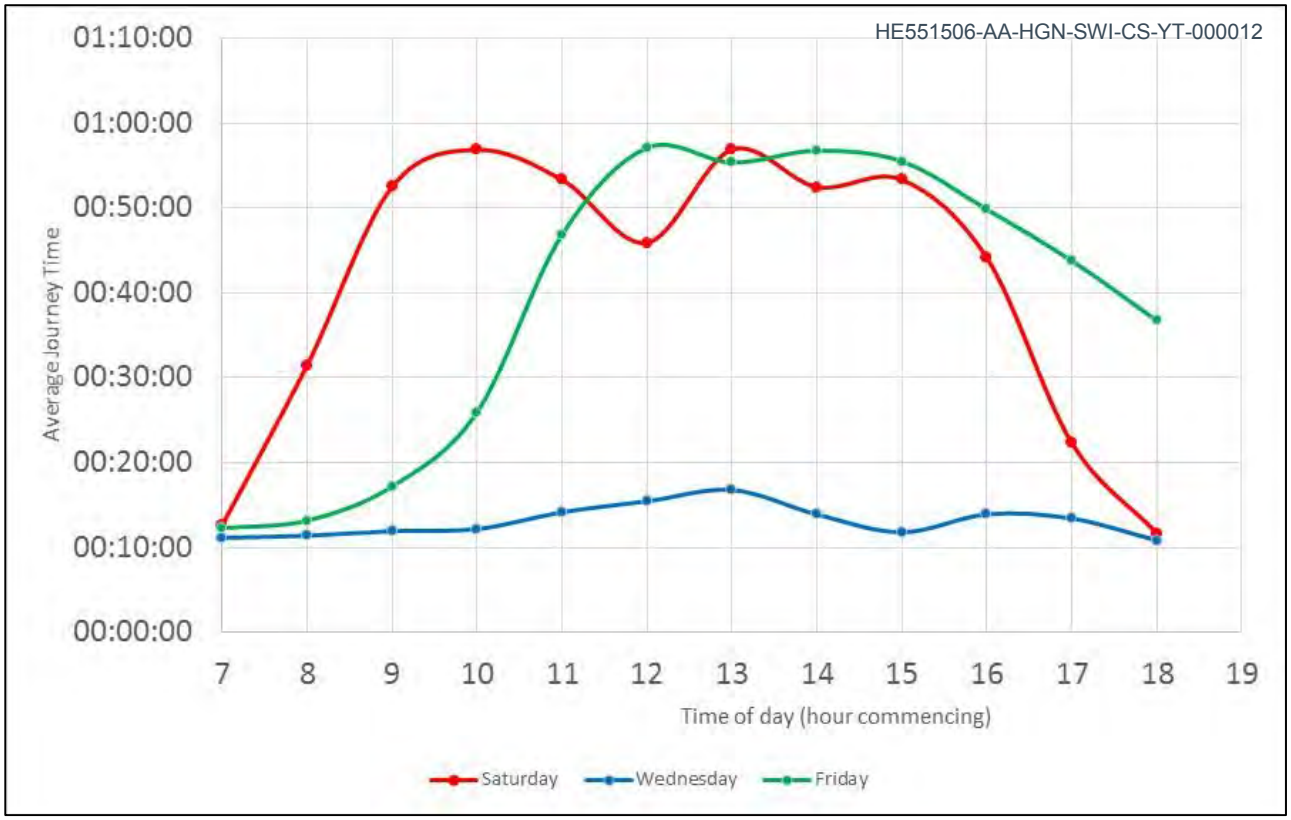


Figure 1-14 Distribution of westbound journey time (mins) (August 2014)

1.1.27 The issue of 'rat running' has been investigated by analysing the ANPR data gathered in August 2014. Figure 1-15 highlights the alternative route options followed by traffic travelling west along the A303 and diverting off the trunk road. Weekend and weekday traffic movements have been compared.

1.1.28 The analysis in Figure 1-15 is based on the ANPR survey and hence differs from the traffic flows shown earlier in Figure 1-2 because:

- The ANPR survey covered the period 0700-1900 rather than the full 24 hour days;
- Figure 1-15 relates to vehicles intercepted as they enter the area on the A303 to the west of the junction with A338 and leave to the west of Winterbourne Stoke – it does include vehicles which, for example, join the A303 at the Solstice Park and A345 junctions or leave before Winterbourne Stoke, e.g. on the A345, A360, B390 or to the Visitor Centre; and
- the ANPR analysis is restricted to vehicles for which the registration number at the entry and exit points are matched which therefore represents a sample of the full population.

1.1.29 Figure 1-15 presents the proportion of vehicles following each route with the absolute number of vehicles involved; so, for example, on Monday-Thursday 2% of traffic (or 112 vehicles) diverts via Larkhill. The figures in bold highlight the significant diversion of traffic from the direct route.

1.1.30 In the normal Monday to Thursday weekday period only 4% of the traffic is encouraged by congestion to leave the main A303 route. However, the situation changes on Fridays and Saturdays when 18% and 16% of traffic respectively leaves the A303 and uses local roads. Figure 1-15 also presents the principal route

options followed by the traffic on the local roads and highlights the communities affected by the additional traffic.

1.1.31 The diversion of traffic onto the local roads results in slower speeds and increased journey times for all vehicles using the local network. Comparing the journey times for the alternative route shown in Figure 1-15 on Wednesday and Saturday, there is an 18% drop in average speed of 10 kph from 56kph to 46kph. This results in a 4 minute (or 22%) increase in average journey times on the route option from 18 minutes to 22 minutes.

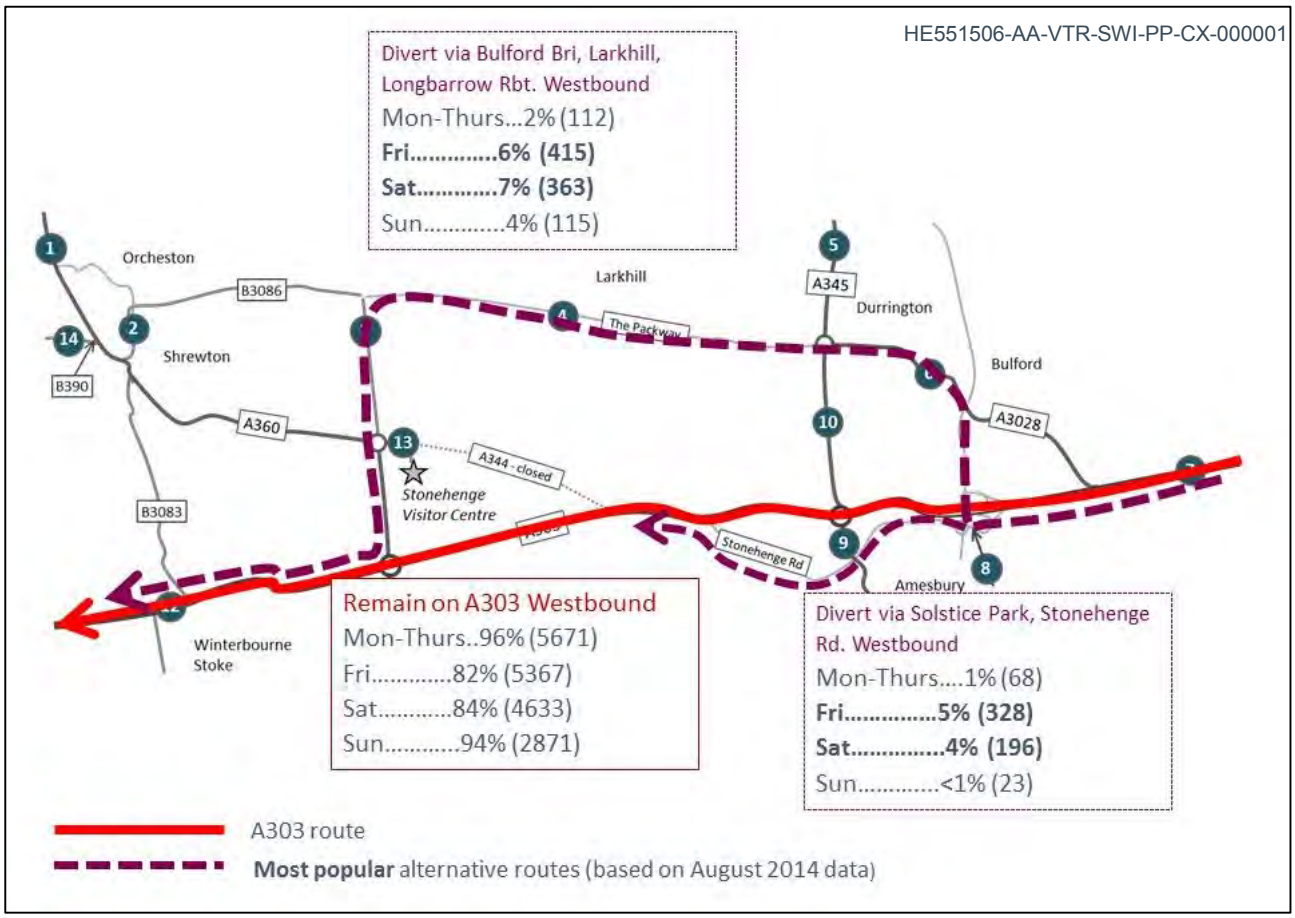


Figure 1-15 A303 through traffic (between Hampshire border and Winterbourne Stoke)

1.1.32 The volumes of eastbound traffic which divert onto local roads shows a similar distribution to those for westbound traffic, although the volumes are lower, because the eastbound delays are not as large and hence the traffic encouraged to divert from the A303 is diminished.

1.1.33 Analysis of the cumulative effects of traffic leaving the A303 corridor to travel on minor roads through the local communities to the north of Stonehenge has demonstrated the severe impacts on these communities, particularly in summer. On a typical Friday in August, Larkhill experiences 1,730 extra vehicles travelling westbound; an increase of 49% on normal local traffic levels. At Shrewton there are an extra 1,150 vehicles travelling southbound through the village, a rise of 62% on normal levels.

1.1.34 Furthermore given the busy nature of the A303 during heavily trafficked periods, motorists undertaking strategic journeys may consider using wider route options to bypass the A303 completely. For example instead of using the M3, A303, A358

and A30 to travel between the M25 and Exeter. Motorists may choose to use alternate route options (e.g. the M4, M5, or the M3, M27, A31, A35 and A30).

1.1.35 The use of inappropriate route options by through traffic, including Heavy Goods Vehicles (HGVs), represents a safety issue whilst also adding to air and noise pollution in the villages affected.

1.1.36 Figures 1-16 and 1-17 show the volume of HGVs by day using the A303 during August (eastbound and westbound directions).

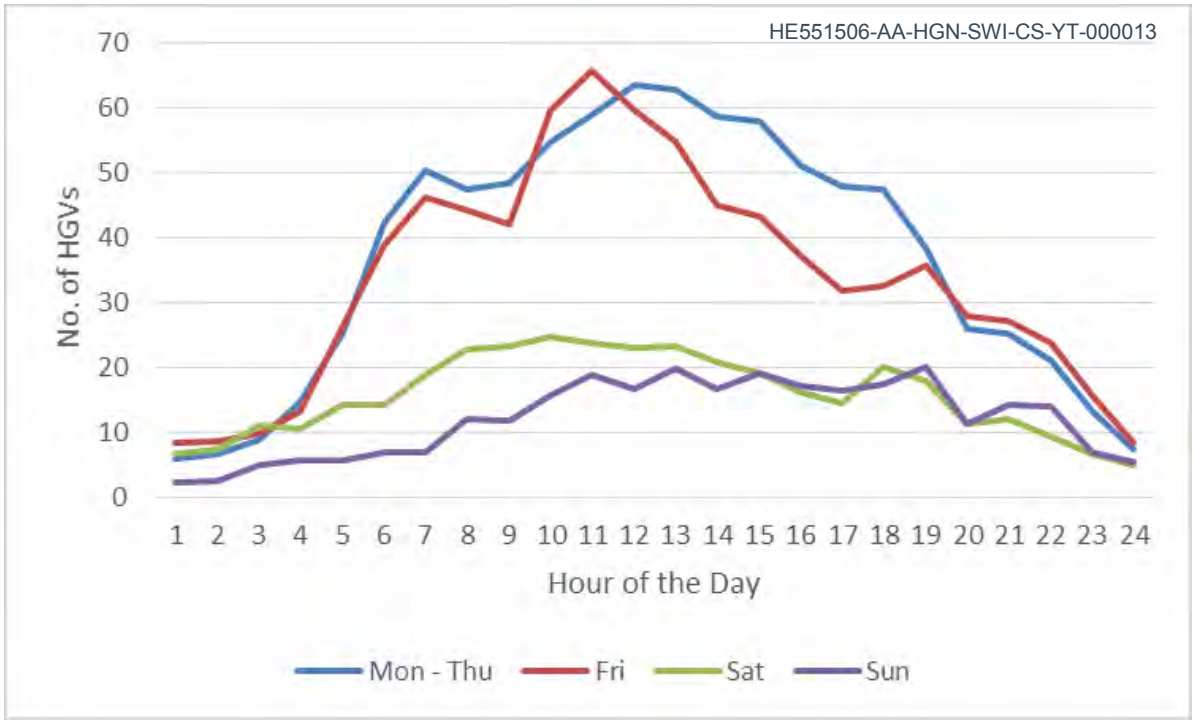


Figure 1-16 A303 - Volume of HGVs (Eastbound) during August

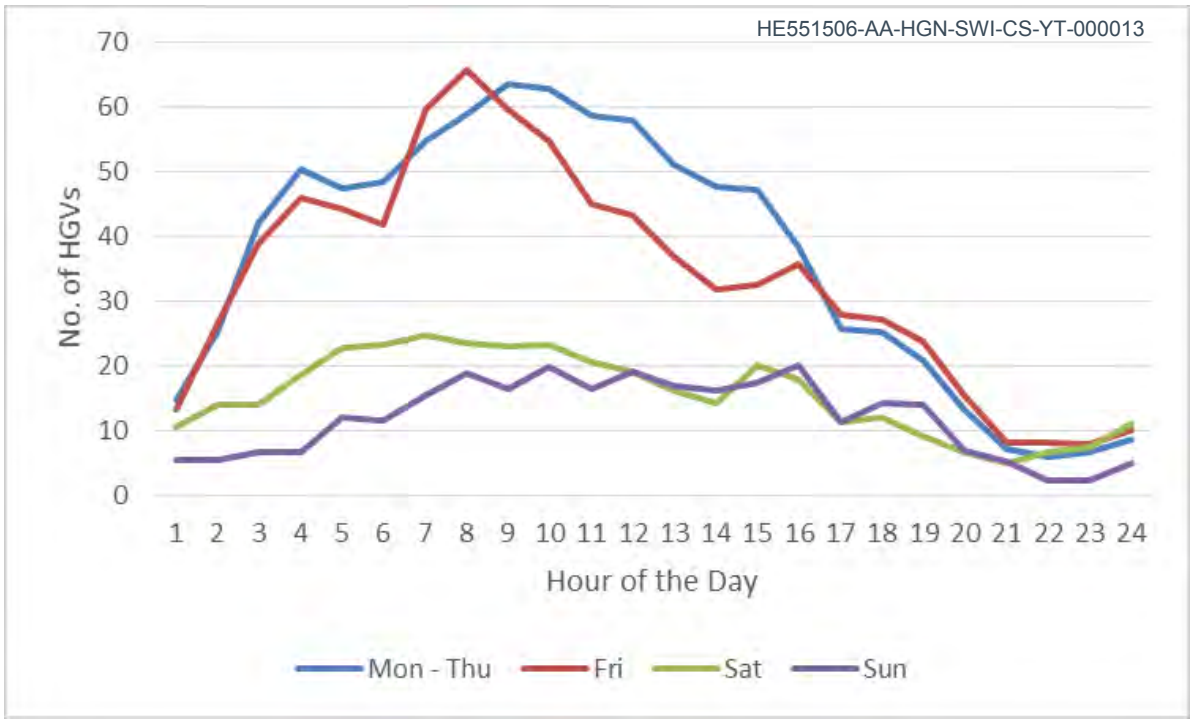


Figure 1-17 A303 - Volume of HGVs (Westbound) during August

1.1.37 As expected the highest HGV traffic volumes occur during the week (Monday - Friday). Interestingly the peak HGV volumes differ by direction. In the eastbound direction the peak occurs around midday and in the westbound direction the peak occurs in the morning.

1.2 Road layout and standards

Congestion and stress

1.2.1 An approach to understanding the impact of traffic flow on network performance is to calculate the network "stress" using traffic flow data compared with the Congestion Reference Flow (CRF). The CRF is the maximum achievable hourly throughput on a link expressed in terms of Annual Average Daily Traffic (AADT). Links which operate with flows in excess of this value (i.e. above 100%) are likely to suffer from operational issues and congestion, including flow breakdown and queuing. Where the stress factor lies between 85% and 100% turbulent traffic conditions will also be experienced during peak periods.

1.2.2 Link specific information has been gained from Highway England's traffic database (WebTRIS) and applied to the CRF formula to gain a 'local' CRF value as shown below.

CRF = CAPACITY * NL * Wf * 100/PkF * 100/PkD * AADT/AAWT

where …

- CAPACITY is the maximum hourly lane throughput;
- NL is the Number of Lanes per direction;
- Wf is a Width Factor;
- PkF is the proportion (percentage) of the total daily flow (2-way) that occurs in the peak hour;
- PkD is the directional split (percentage) of the peak hour flow;
- AADT is the Annual Average Daily Traffic flow on the link; and
- AAWT is the Annual Average Weekday Traffic flow on the link.

1.2.3 Table 1-5 and Table 1-6 show typical two-way limiting CRFs for the four parts of the Amesbury to Berwick Down section taking road geometries and traffic profiles including HGV proportions into account for a 2015 neutral (March) and 2015 summer (August) month. Road stress ratios, the ratio of actual demand to CRF, are also shown.

Existing Scenario

Table 1-5 Corridor CRFs and stresses - 2015 neutral month (March)

			Eastbound			Westbound			Both directions		
No.	Section	No. of Lanes	CRF	ADT	Stress factor	CRF	ADT	Stress factor	CRF	ADT	Stress factor
1	A36 - B3083	1	15,578	10,446	0.67	10,678	10,387	0.97	25,289	20,833	0.82
2	B3083 - A345	1	12,421	12,810	1.03	10,290	12,630	1.23	22,466	25,440	1.13
3	A345 - A3028	2	51,891	14,155	0.27	38,498	12,032	0.31	88,248	26,187	0.30
4	A3028 - A338	2	49,440	11,910	0.24	33,956	15,447	0.45	80, 312	27,357	0.34

Table 1-6 Corridor CRFs and stresses - 2015 summer month (August)

			Eastbound			Westbound			Both directions		
No.	Section	No. of Lanes	CRF	ADT	Stress factor	CRF	ADT	Stress factor	CRF	ADT	Stress factor
1	A36 - B3083	1	10,904	13,077	1.20	9,828	12,762	1.30	20,672	25,839	1.25
2	B3083 - A345	1	11,264	14,730	1.31	12,083	13,391	1.11	23,724	28,121	1.19
3	A345 - A3028	2	38,264	16,829	0.44	42,261	15,423	0.36	81,387	32,252	0.40
4	A3028 - A338	2	33,725	19,139	0.57	34,039	18,770	0.55	68,717	37,909	0.55

1.2.4 Table 1-5 and Table 3-6 clearly indicate the capacity issues along the single carriageway sections of the corridor in both neutral and summer months. In general, as would be expected due to the higher traffic levels in the summer, all sections experience increased stress levels.

1.2.5 As expected, the A303 adjacent to Stonehenge (section 2) is an issue, with the stress factor above 1.0 for each direction and in both neutral month and summer periods. The section to the west of Winterbourne Stoke (section 1) also exhibits high stress levels, particularly in the summer.

Traffic and capacity

1.2.6 Table 1-7 shows the annual average hourly flows for different times of the day on three key sections which currently operate as a single carriageway. These sections are listed below:

- Between the A36 and B3083.
- Between the B3083 and A345.
- Between the A345 and A3028.

1.2.7 Road capacity is the theoretical limit on the average number of vehicles per hour that can travel along a section of road. For high flows, i.e. between the full capacity and 85% of the capacity, the interaction between vehicles on the road becomes significant, leading to a fall in average journey times and increased variability in these journey times. The typical one direction hourly capacity of a single carriageway road such as represented over the section between Stonehenge Road and Berwick Down, has been estimated at 1,250 vehicles. This is based on the DfT WebTAG Unit M3.1 (Highway Assignment Modelling). The corresponding 85% level, at which point flow breakdown occurs, is estimated at 1,050 vehicles per hour per direction.

1.2.8 Table 1-7 demonstrates that for the traffic levels for the period between 0700 and 1800, for long periods the section between A360 and A345 operates at above the 85% level. As the analysis considers **average** traffic flow levels over the whole year and hence does not specifically identify the much higher flow levels experienced in the summer months and at weekends when flows exceed the capacity levels by significant amounts, the table understates the scale of the issue. Although the section west of Winterbourne Stoke experiences lower average flows, the existence of the lower speed limit of 40 mph and the signalised pedestrian crossing would act to reduce the effective capacity of the section below the 1,250 vehicles used in the analysis.

Table 1-7 Traffic flows (0700-2000) - average hourly flows across full year

No.	Section	Westbound							
		0700-0759	0800-0859	0900-0959	1000-1559 (ave)	1600-1659	1700-1759	1800-1859	1900-1959
1	A36 - B3083	238	462	521	734	773	824	843	683
2	B3083 - A345	302	623	702	903	925	1003	1018	829
3	A345 - A3028	329	647	707	934	949	1059	1096	885
No.	Section	Eastbound							
		0700-0759	0800-0859	0900-0959	1000-1559 (ave)	1600-1659	1700-1759	1800-1859	1900-1959
1	A36 - B3083	338	617	650	746	781	764	725	604
2	B3083 - A345	365	834	926	900	943	956	943	777
3	A345 - A3028	485	949	1066	970	1035	1046	1005	827

1.3 Accidents and journey time reliability

Accidents – corridor analysis

1.3.1 Personal Injury Accident (PIA) data was obtained for the most recent ten year period (2005 to 2014) for the A303 Amesbury to Berwick Down scheme corridor section. The corridor consists of four separate sections:

- Dual carriageway section to the east of the section.
- Countess Roundabout.
- Longbarrow Roundabout.
- Remaining single carriageway section.

1.3.2 Figure 1-18 illustrates the four sections of corridor; a buffer of 100m was applied to the corridor to capture the accidents at the junctions.

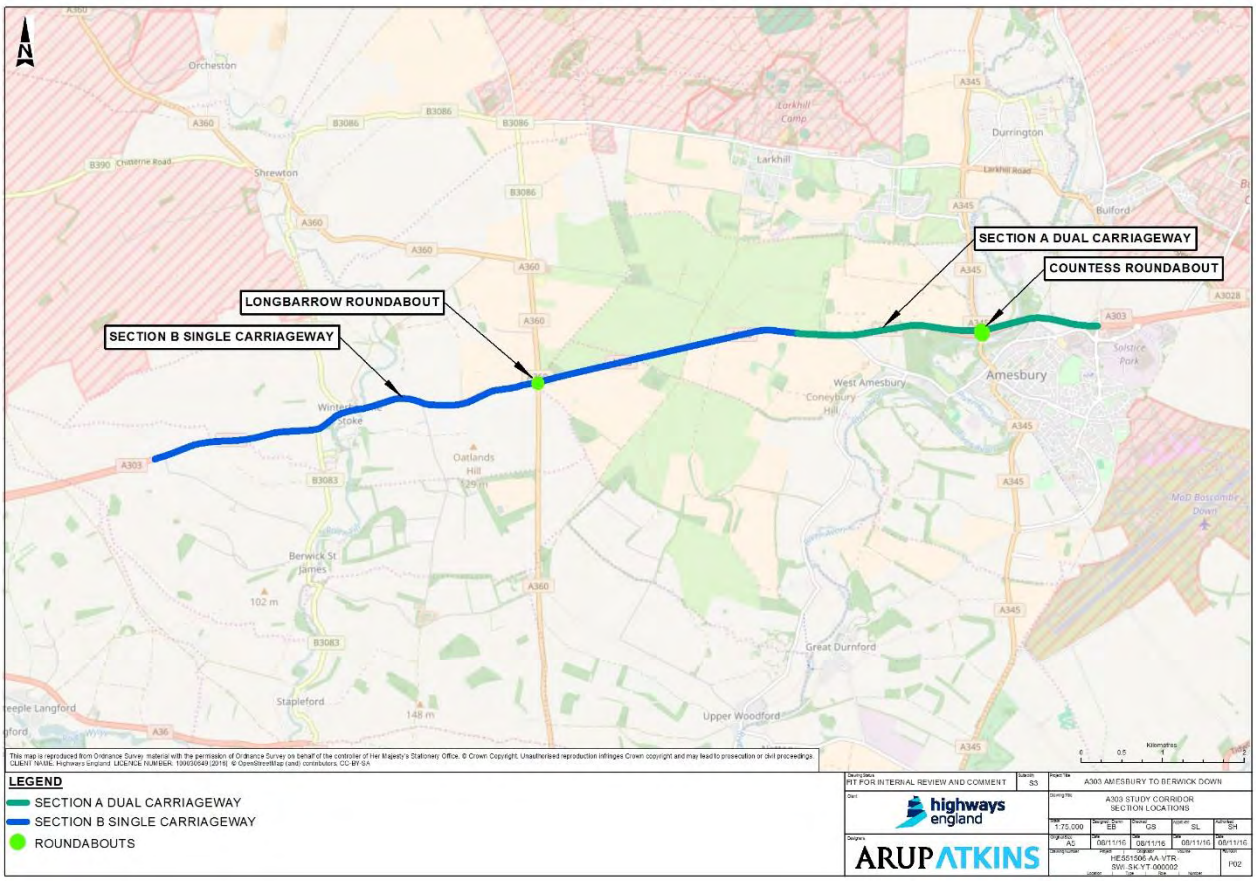


Figure 1-18 A303 study corridor – section locations

1.3.3 Table 1-8 shows the breakdown of PIAs on the A303 study corridor from Amesbury to Berwick Down, also illustrated in Figure 1-19. The table shows that there were a total of 215 accidents on the corridor for the ten year period, with 17% (36) Killed or Seriously Injured (KSIs). The overall accident totals are decreasing, also illustrated in Figure 1-19. The five-year period 2005-2009 accounts for 60% (130) of all accidents, with also 58% (21) of KSIs. The subsequent five-year period 2010-2014 shows an average of 17 accidents per year, although 2012 the total drops to 9 accidents but this includes two fatal and two serious (44% KSI).

Table 1-8 Accidents by severity and year

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Fatal		1	2		1		1	2		1	8
Serious	2	6	5	1	3	4	4	2	1		28
Slight	27	16	29	18	19	14	15	5	17	19	179
Total	29	23	36	19	23	18	20	9	18	20	215

1.3.4 Figure 1-19 shows that the total accidents are on a decreasing trend line. There is a slight peak and trough, with a total of 36 accidents in 2007, and just 9 in 2012. The average total accidents per year are 21, as shown in Figure 1-20.

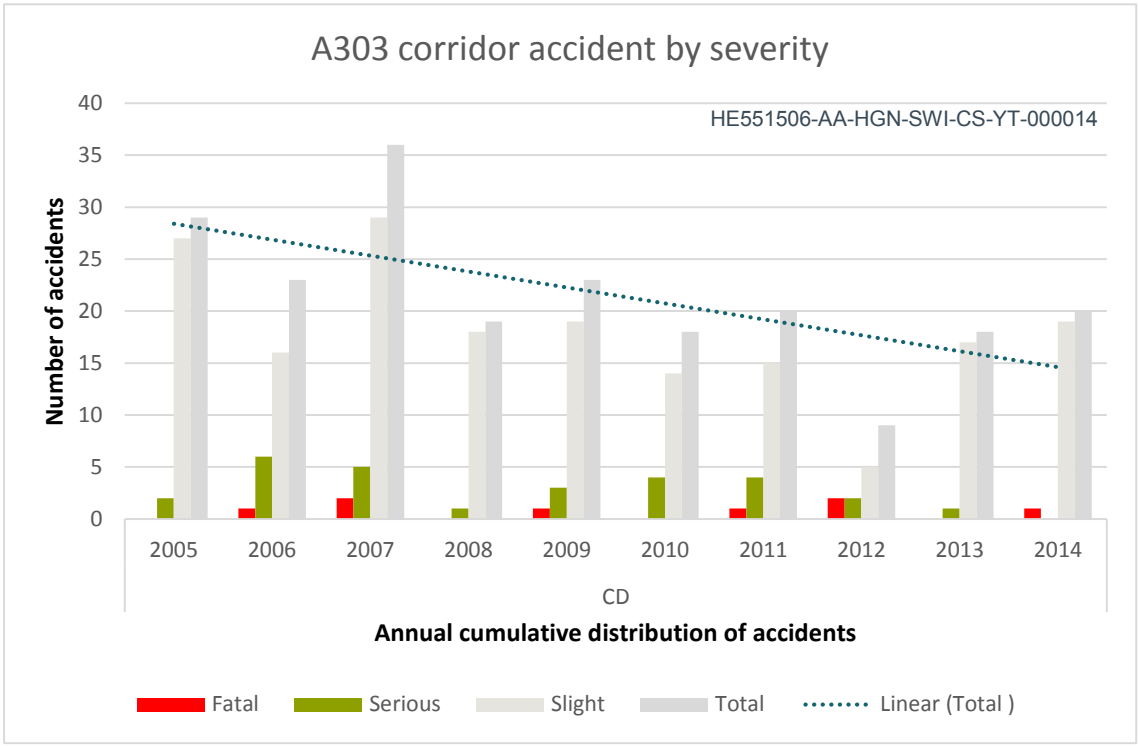


Figure 1-19 Accidents by severity and year

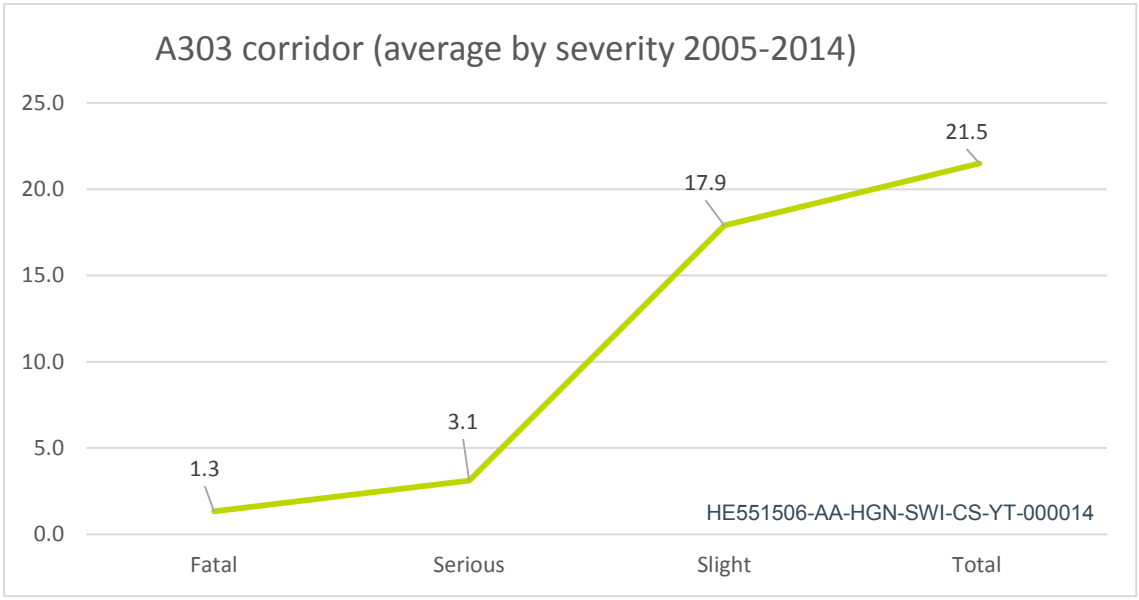


Figure 1-20 Average of accident severity over the period 2005-2014

1.3.5 Figure 1-21 shows the four sections of the A303 Amesbury to Berwick Down corridor, across which the 215 total accidents are distributed. Figure 1-21 and Figure 1-22 shows the breakdown of accidents by severity for each section. The 8km single carriageway section accounts for 55% (119) of the accidents, and a significant proportion of the total KSIs (58%). The dual carriageway section (although shorter at 3.5km) accounts for only 13% (27) of accidents, although that includes 25% (9) of the total KSIs. The Countess Roundabout that adjoins the dual carriageway section has the second highest total (37) although this comprises mainly slight accidents (91%). Similarly, at Longbarrow Roundabout the accidents are almost all slight in severity.

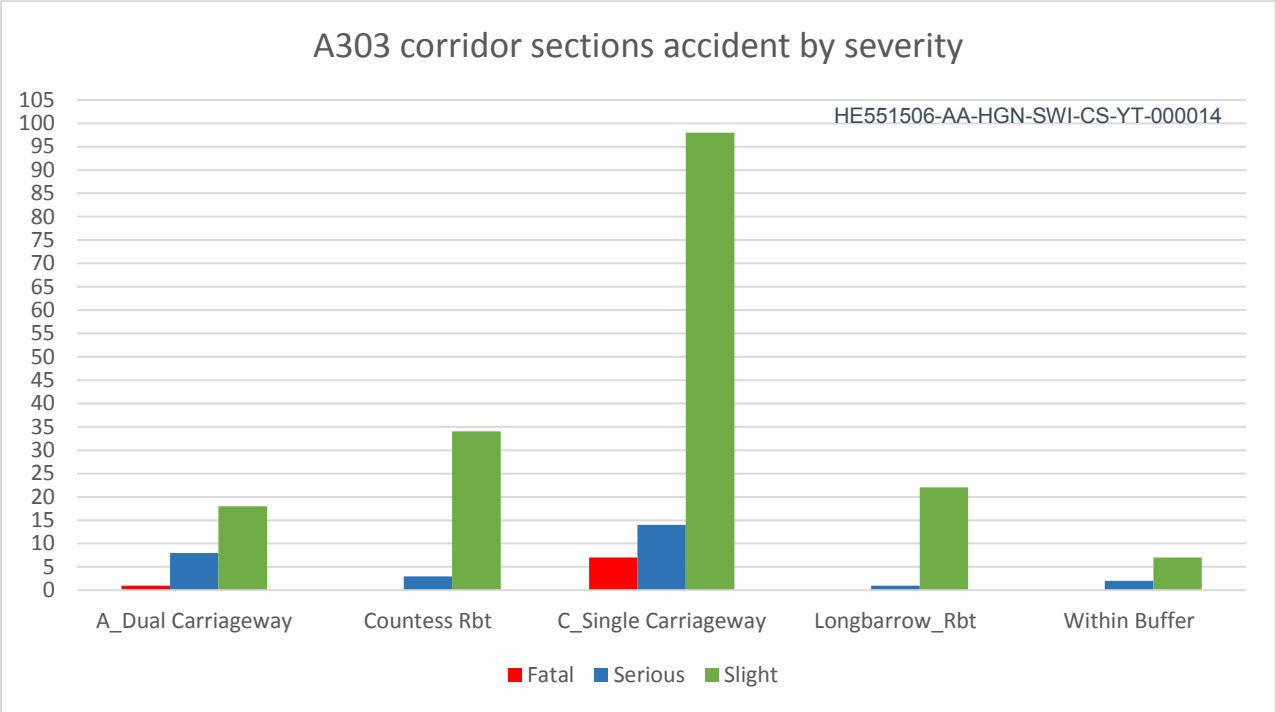


Figure 1-21 A303 study corridor – sections Amesbury to Berwick Down

1.3.6 The summer period (June – August) has the highest occurrence of accidents (66). This is likely to be the impact of the increased traffic volumes, particularly leisure traffic, typified by the August peak of 26 accidents consisting of 1 fatal, 1 serious and 24 slight accidents. The winter period (December – February) accounts for the lowest total accidents per season (41), but the highest amount of KSIs (10), consisting of 3 fatal and 7 serious accidents.

1.3.7 The impact of tourist traffic as indicated in the seasonal trends, is also highlighted by the 'day of week' breakdown; with 44% of accidents occurring on a Friday, Saturday or Sunday. However, the highest number of fatal (3) accidents occurred on a Monday.

1.3.8 Figure 1-22 illustrates the total accidents by severity along the A303 Amesbury to Berwick Down corridor. The map illustrates the clusters of accidents at Countess Roundabout and the junction with Porton Road (the eastern extent of the study corridor). Moving west, there is a small cluster as the carriageway transitions from single to dual.

1.3.9 There is a cluster of accidents at the junction with the A344 with a total 16 accidents, including 1 fatal, 2 serious and 14 slight. These all occurred in the period 2005-2011, prior to the road closure in 2013.

1.3.10 The section west of the A344 junction, to the east of the Longbarrow Roundabout, is likely to have many vantage points of the Stonehenge site. Over the period a total of 32 accidents (14%) occurred in this section, included 2 fatal and 6 serious.

1.3.11 The western extent of the corridor through Winterbourne Stoke has a cluster of 33 accidents over the ten year period, including 3 fatal, 1 serious and 28 slight accidents.

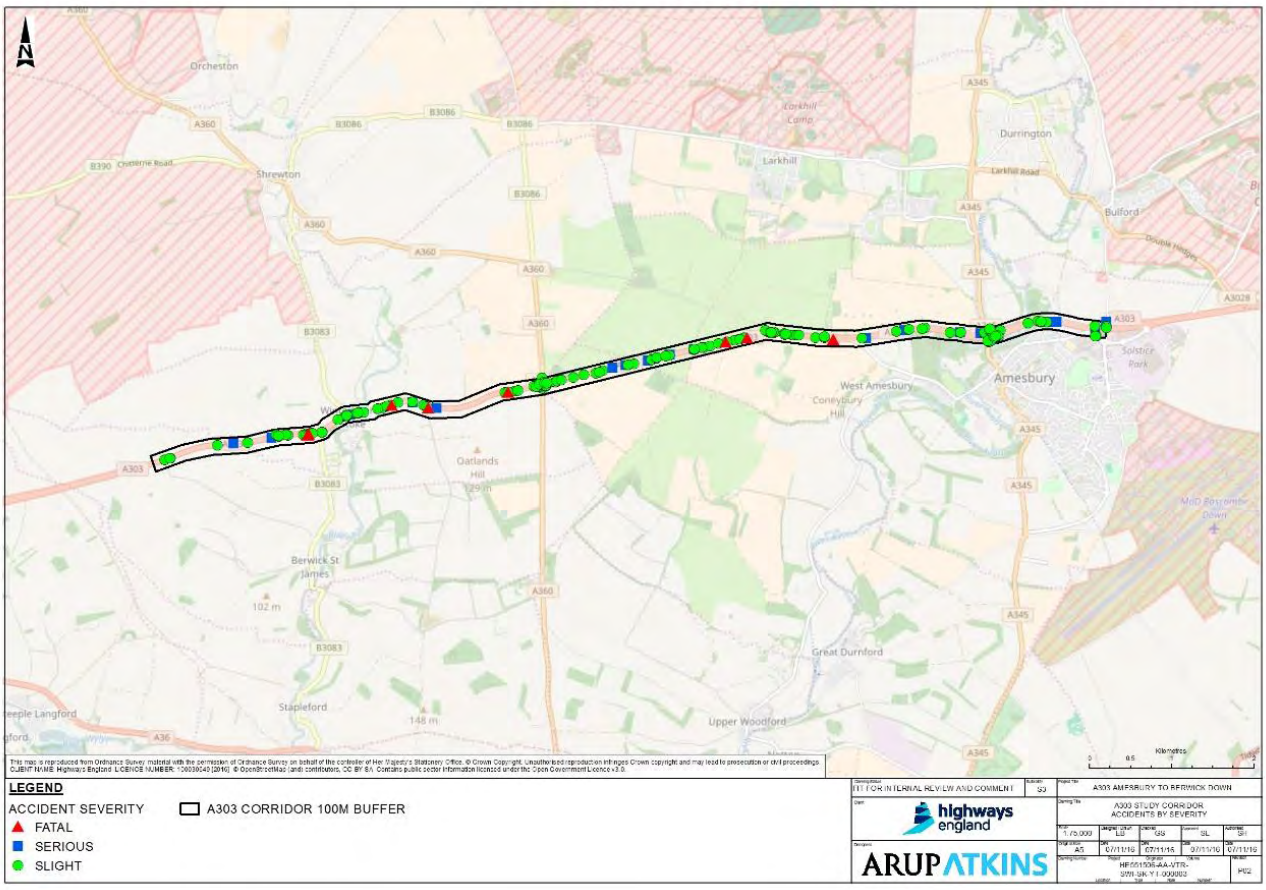


Figure 1-22 A303 study corridor – accidents by severity over the section Amesbury to Berwick Down (2005 – 2014)

1.4 Accidents – 3 km buffer analysis

1.4.1 To understand the impact of the scheme on the wider surrounding road network, a buffer of 3km was applied to the A303 study corridor to include all accidents within the vicinity of the scheme. This is to understand the accident patterns on the surrounding network, where drivers may seek alternative route options away from the A303. The buffer was based on both the traffic modelling information, and key land use locations, such as the Larkhill Training Camp, to the north of the A303 on the edge of the Salisbury Plain military training area. The following analysis excludes all accidents presented above as part of the immediate A303 section. Figure 1-23 illustrates the 3km buffer applied to the corridor.

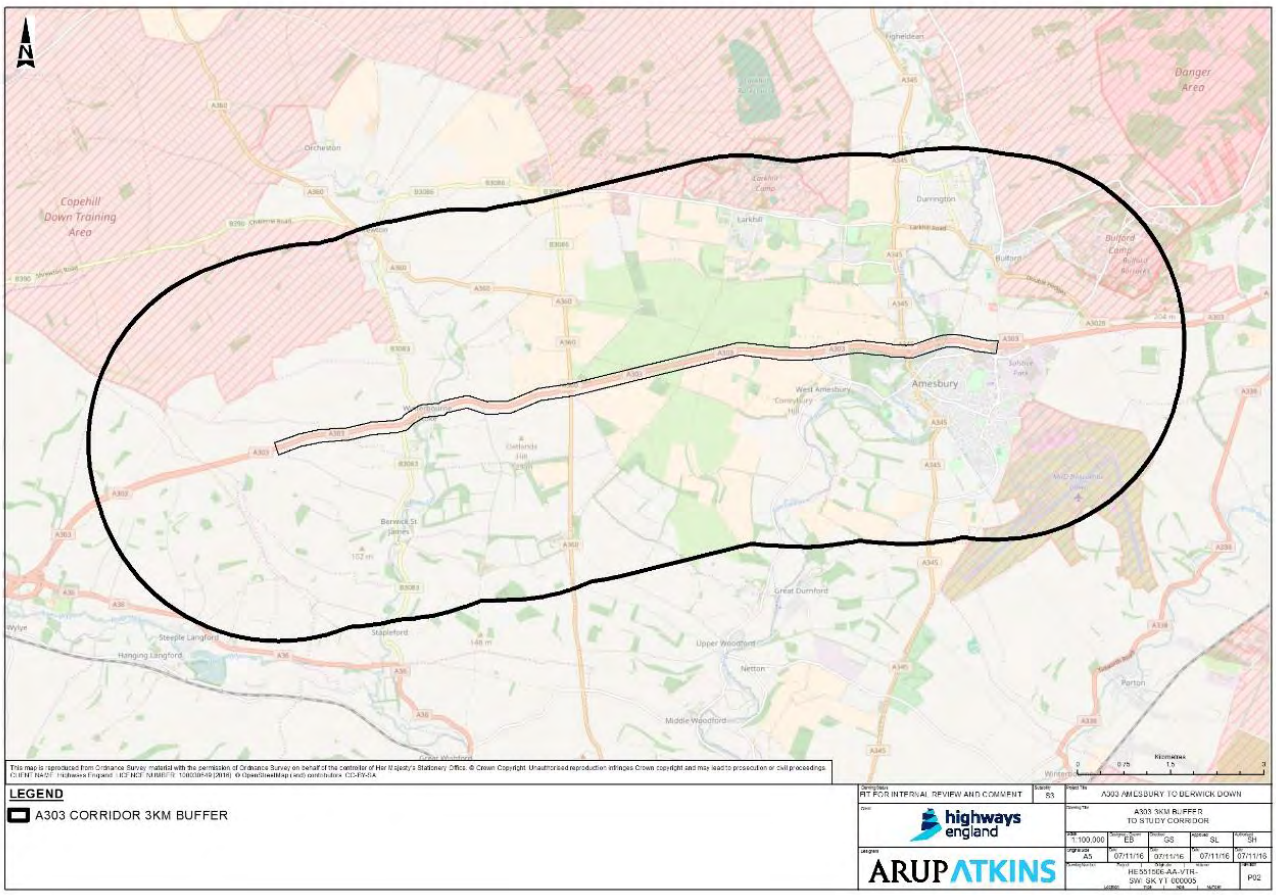


Figure 1-23 A303 3km buffer to study corridor

1.4.2 Table 1-9 shows the breakdown of PIAs within a 3km buffer of the A303 study corridor, and is illustrated in Figure 1-24. The table shows that there were a total of 400 accidents for the ten year period, with 22% (89) KSIs. The overall accident totals are decreasing slightly, as illustrated in Figure 1-24. The period 2005-2009 accounts for 53% (213) of all accidents, with 49% (44) KSIs, significantly though this includes 80% of the fatal accidents. The period 2010-2014 shows a 13% drop in the average accidents per year (37), with no fatal accidents having been recorded after 2010.

Table 1-9 3km corridor buffer – accidents by severity and year

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Fatal	2	2	3	2	3	3					15
Serious	7	5	6	8	6	8	9	10	7	8	74
Slight	38	40	34	32	25	24	24	27	31	36	311
Total	47	47	43	42	34	35	33	37	38	44	400

1.4.3 Figure 1-24 shows that the total accidents in the buffer area are on a decreasing tread line. The total accidents decreases per year in the period 2005 – 2010, with a slight increase to 2014. The average accidents per year (40), is shown in Figure 1-25.

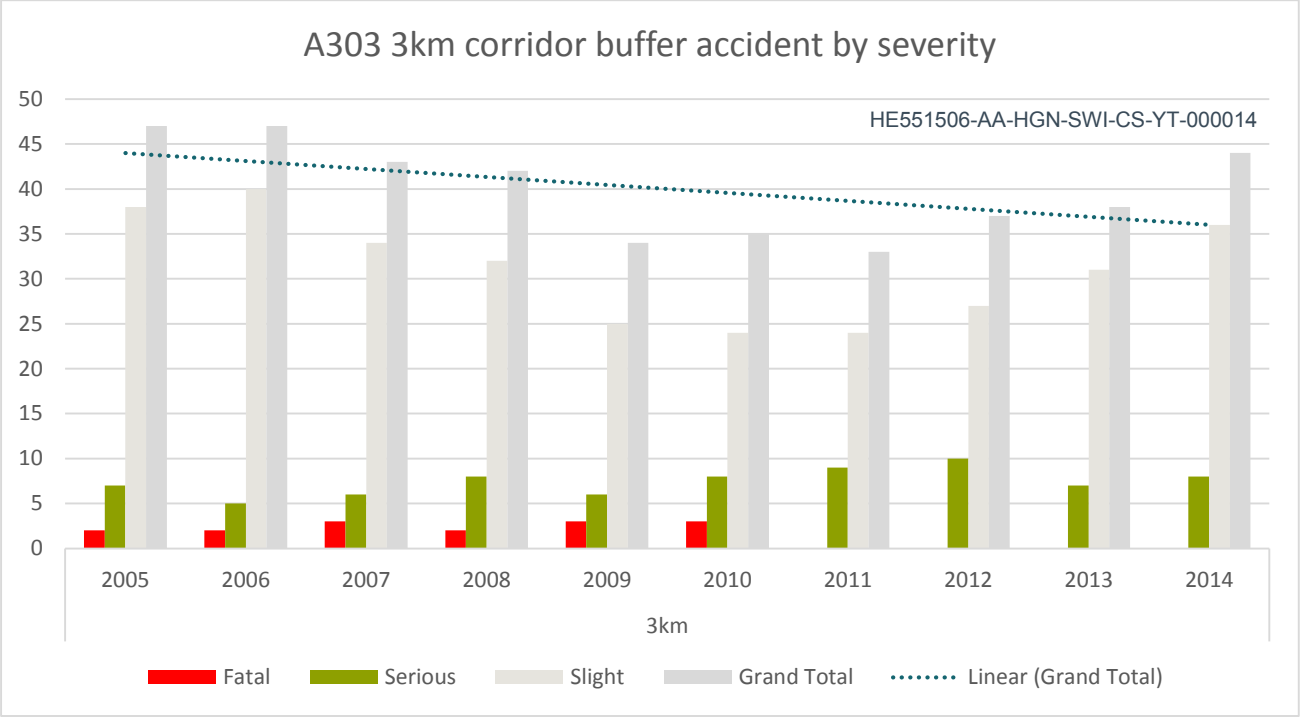


Figure 1-24 3km corridor buffer – accidents by severity and year

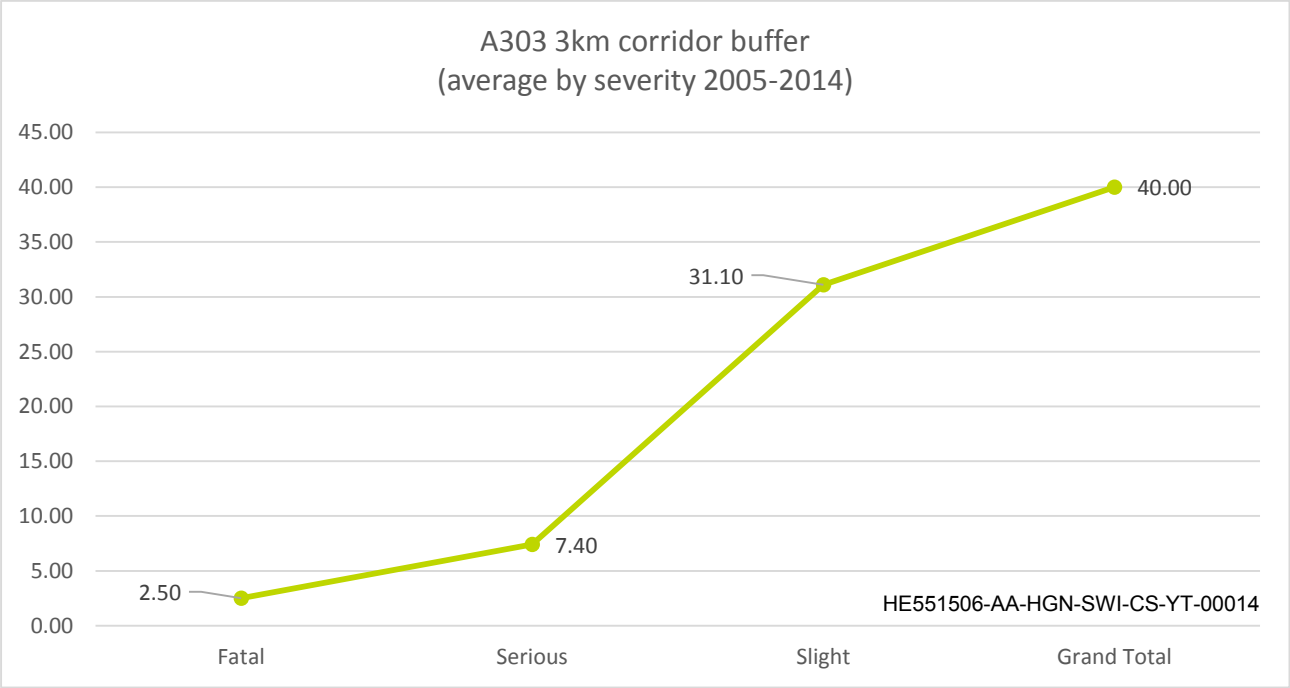


Figure 1-25 3km corridor buffer – average of accident severity over the period 2005-2014

1.4.4 Figure 1-26 shows the breakdown for all accidents by severity within the 3km corridor buffer. The area consists of a number of road classifications, A roads accounts for 50% of accidents, with 46% KSIs; B roads accounted for just 4% of accidents; with 21% of accidents recorded on C class roads. The remaining 24% of accidents were recorded on unclassified roads.

1.4.5 The accident breakdown by severity and seasonal trends within the 3km corridor buffer, shows that the summer period (June – August) has the highest occurrence

of accidents (130). The August peak of 50 accidents consists of 1 fatal, 11 serious and 38 slight accidents. The winter period (December – February) accounts for the lowest total accidents per season (87). The autumn period (September – November) has the highest amount of KSIs (30), consisting of 5 fatal and 25 serious accidents, 50% of which occurred on A class roads. The 'day of week' breakdown shows that weekdays account for three quarters of all KSIs, with Wednesday, recording the highest amount of accidents with 76 accidents, including 27% KSIs.

1.4.6 Figure 1-26 also illustrates the clusters of accidents to the eastern extent of the buffer, which includes the residential areas of Amesbury and Durrington. To the south of the A303, the A345 (30 accidents, 1 fatal 5 serious and 25 slight) and A360 (12 accidents, 1 fatal, 2 serious and 9 slight) both provide a north-south link to Salisbury.

1.4.7 The east-west route option to the north of the A303, via the A3028 Double Bridges and Larkhill Road to The Packway accounts for 54 accidents (1 fatal , 12 serious and 41 slight). The other east-west route option via the A344 on to the A360, is now no longer open due to the closure of the A344. Before the closure, there were a total 13 accidents, including 2 fatal, 1 serious and 10 slight. The section west on the A360 to Shrewton recorded 31 accidents (1 fatal, 2 serious and 28 slight).

1.4.8 The sections of the A303 within the 3km buffer, beyond the eastern and western extent of the corridor account for 16% of accidents in the buffer; significantly this includes 40% of all fatal accidents (6). The western extent includes 19 accidents, 2 fatal and 3 serious; and the eastern extent a total of 47accidents, including 4 fatal and 9 serious.

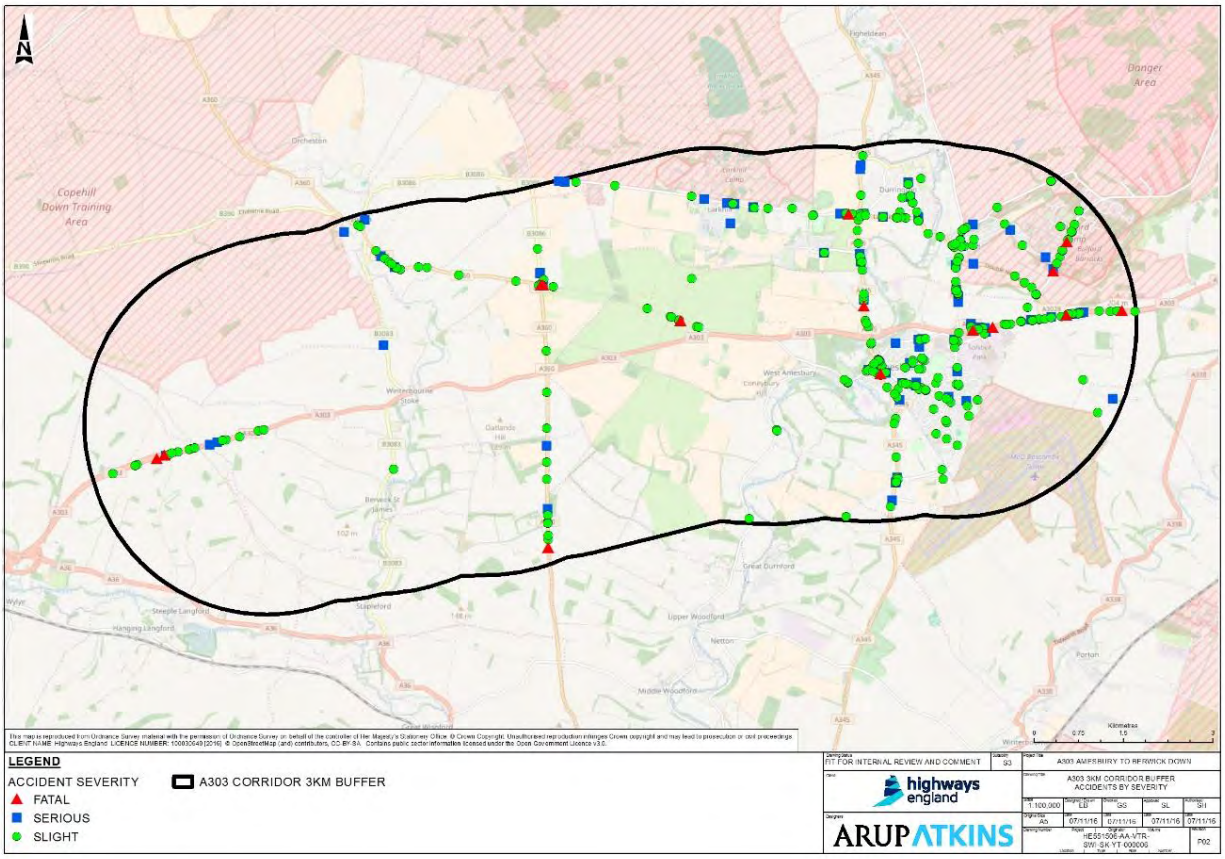


Figure 1-26 A303 3km corridor buffer – accidents by severity over the section Amesbury to Berwick Down (2005-2014)

Journey time reliability

1.4.9 The congestion caused by peak traffic levels and limited capacity create significant delays for traffic on the A303 between Amesbury and Berwick Down. This is reflected in measures of journey time reliability. The 'On Time Reliability' measure, calculates the proportion of journeys on a section of the network which are completed within a set reference time, based on historical data on that particular section of road. For the A303 Amesbury to Berwick Down, the On Time Reliability Measure, shows that, of the 3.9 million annual journeys in each direction on this stretch, just 67.0% of eastbound journeys and 58.8% of westbound journeys are 'on time.'

1.4.10 Vehicle tracking data (Trafficmaster) has been used to measure the variability of journey times on the A303 between Amesbury and Berwick Down. Journey time variability on this section is compared with the dual carriageway section between Andover and Amesbury which is already dual carriageway.

1.4.11 The standard deviation of journey times is used as a measure of the degree of variability in journey times experienced by users. This is broken down by time of day and by days of the week. The analysis has been undertaken separately for July and August and all other months, given the increase in traffic levels experienced during these months.

1.4.12 In particular the road suffers from unreliability during the inter-peak (10.00 to 16.00) period and the PM period (16.00:19:00) shown in Figure 1-27.

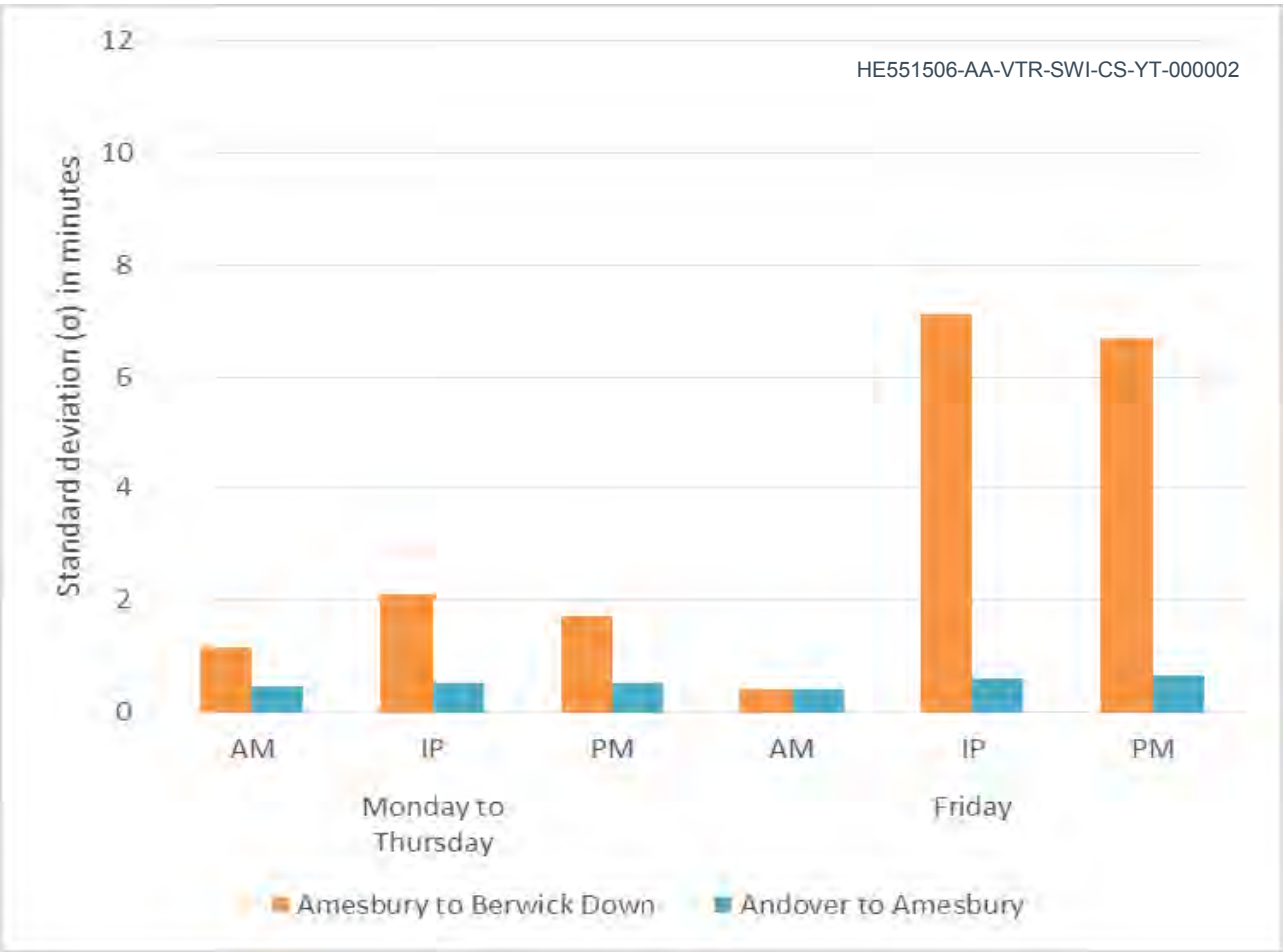


Figure 1-27 Journey time variability by time period (all months excluding July/ August)

Source: AAJV Analysis of Trafficmaster Data

1.4.13 Reliability is particularly poor on Fridays. This accords with the fact that traffic flows are significantly higher on Fridays than other weekdays. Therefore, the analysis demonstrates that reliability is a function of the level of traffic demand relative to capacity.

1.4.14 Figure 1-28 shows the same analysis but for July and August – the most heavily trafficked months of the year. Variability, at least during the inter-peak and PM periods, is substantially greater during these months. Both sections of the A303 show similar patterns of variability across the week. However, it is clear from the analysis that the section between Amesbury and Berwick Down performs poorly in comparison with the dual carriageway section between Andover and Amesbury.

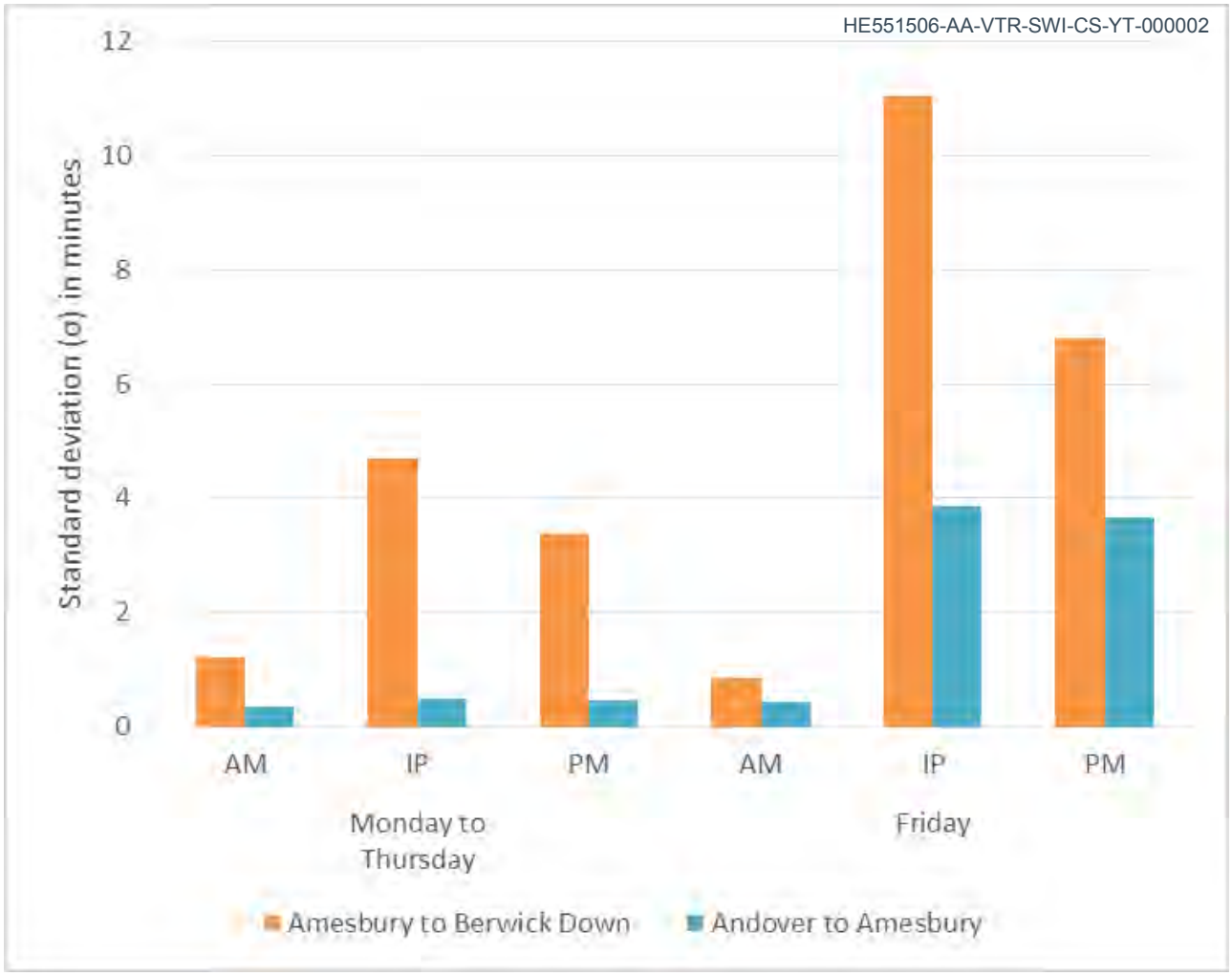
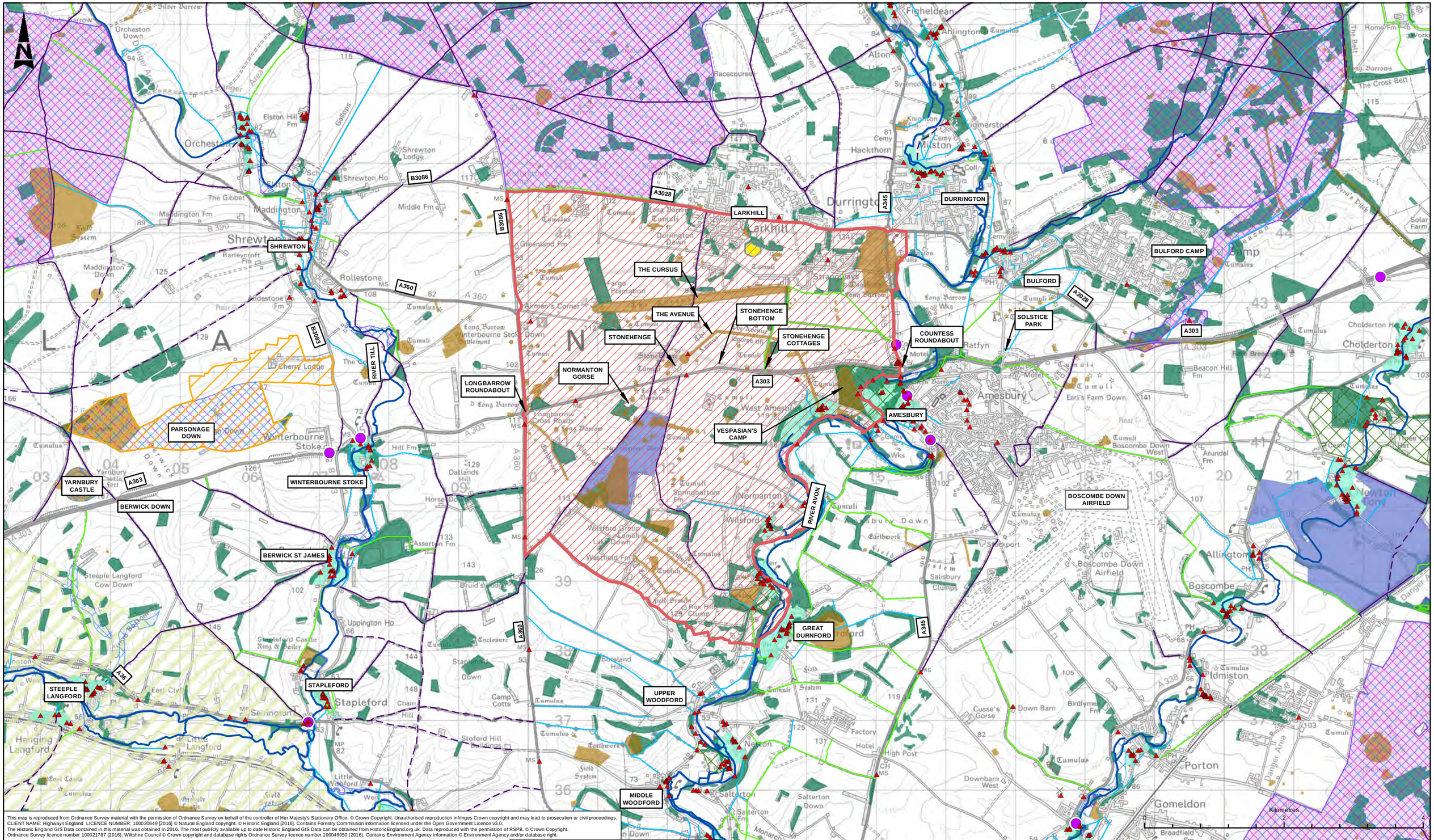


Figure 1-28 Journey time variability by time period (July/August)

Source: AAJV Analysis of Trafficmaster Data

A.5 Environmental constraints



LEGEND

- WORLD HERITAGE SITE
- RIVER NETWORK
- SPECIAL AREAS OF CONSERVATION (SAC)
- SITES OF SPECIAL SCIENTIFIC INTEREST (SSSI)
- SPECIAL PROTECTION AREAS (SPA)
- ANCIENT WOODLANDS
- NATIONAL NATURE RESERVES (NNR)
- AREAS OF OUTSTANDING NATURAL BEAUTY (AONB)
- CONSERVATION AREAS
- REGISTERED PARK & GARDEN
- RSPB RESERVES
- NATIONAL FOREST INVENTORY
- HISTORIC LANDFILL
- SCHEDULED MONUMENTS

PUBLIC RIGHTS OF WAY

- FOOTPATH
- BRIDLEWAY
- BYWAY
- RESTRICTED BYWAY
- LISTED BUILDINGS
- NOISE IMPORTANT AREAS (NIA)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

None

Maintenance / Cleaning

None

Use

None

Decommission / Demolition

None

Rev	Date	Description	By	Chk'd	App'd
P07	07/12/16	FINAL ISSUE	RJS	GS	SL

Drawing Status: FIT FOR INTERNAL REVIEW AND COMMENT
Suitability: S3

Client: highways england

Designers: ARUP ATKINS

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: ENVIRONMENTAL CONSTRAINTS

Scale	Designed / Drawn	Checked	Approved	Authorised
1:50,000	RJS	GS	SL	SH

Original Size	Date	Date	Date	Date
A3	07/12/16	07/12/16	07/12/16	07/12/16

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The Technical Assessment Report details the assessment of options leading up to consultation.