



North Lincolnshire Local Plan

Highways England

GraHAM Analysis and SRN Evidence Base

LPHUNorthLincolnshire

Report 001 | Rev A

31st July 2020

North Lincolnshire Local Plan

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Executive Summary

CH2M has been commissioned by Highways England to undertake an assessment of the development quantum being proposed by North Lincolnshire Council within their emerging Local Plan with regard its potential impact at the Strategic Road Network. In addition, and within the spirit of co-operation, Highways England and the Council have agreed that the assessment of the development quantum is to form part of a wider piece of work – of which this Report is the output – which will form part of the Council's evidence base to inform and underpin the Plan as it emerges.

Within the district of North Lincolnshire, the SRN comprises the M180, M181, A180 and A160:

- The M180 provides an east-west link between the A180 to the east and the M18 in the west;
- The M181 provides a north-south link between Scunthorpe in the north and the M180 in the south;
- The A180 provides an east-west link between Grimsby to the east and the M180 in the west; and
- The A160 provides an east-west link to the north of the A180, between Immingham to the east and the A180 in the west.

As part of Highways England's duty to co-operate, Highways England instructed CH2M to undertake the following tasks:

- Agreement with Highways England and the Council regarding the assessment years to be considered within this Report, which were subsequently agreed as 2027, 2032 and 2038;
- Use of the GraHAM tool to consider the traffic patterns associated with the quantum of development proposed within the Plan;
- High-level consideration of impacts at the SRN, which will include link flows and turning movements;
- Use of the base flow information identified during scoping to allow for merge / diverge assessments to be undertaken at M180 Junctions 4 and 5;
- Use of the base flow information identified during scoping to allow for volume / capacity mainline assessments to be undertaken;
- A detailed consideration of the A160 Upgrade Scheme, assessing the development quantum included at this location;
- A detailed consideration of the M181 Terminating Junction (Lincolnshire Lakes), based on Highways England's involvement to date at this location; and
- Identification of infrastructure interventions and considerations where required.

In order to distribute and assign the trips associated with the sites identified within the Plan, the GraHAM tool has been used. For the purposes of this task, CH2M has taken the information provided by the Council in order to run the quantum of development being proposed within the Plan, with interim assessment years of 2027 and 2032, as well as 2038 which is the end of the Plan period.

In light of the work undertaken within this Report, the following conclusions can be drawn:

- The Report concludes that it is considered that the proposed infrastructure at the M181 Terminating Junction does not necessarily accommodate the quantum of development within the Plan throughout the Plan period; and that the de-trunking of the M181 places the onus of infrastructure provision onto the Council. As such, this location may require a more detailed analysis through the Plan period to ascertain if any further mitigation needs to be provided at this location.

- The Eastbound Merge at M180 Junction 5 approaches capacity in the 2038 Morning Peak and this may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.
- Given the flows generated in the 2038 scenarios, it is considered that the A160 / Habrough Road roundabout may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.

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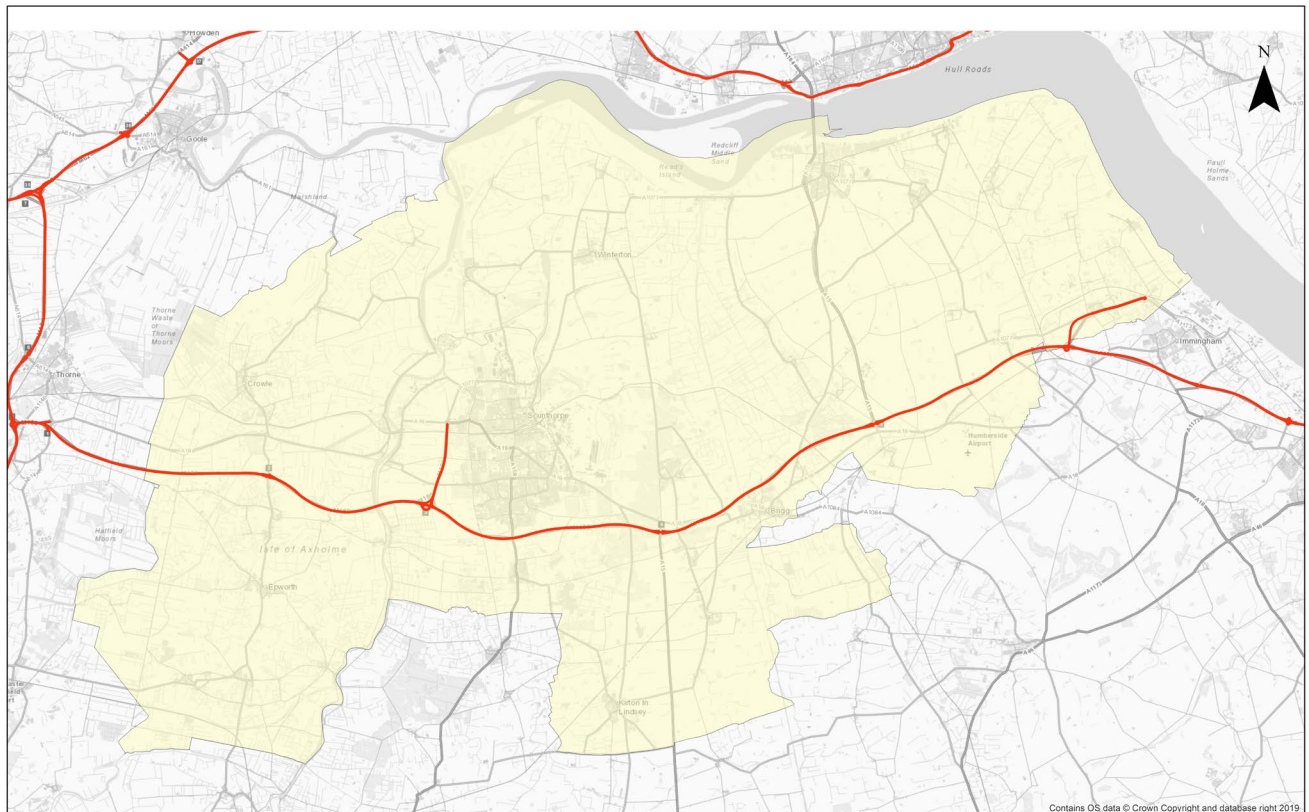
1. Introduction

CH2M has been commissioned by Highways England to undertake an assessment of the development quantum being proposed by North Lincolnshire Council [the Council] within their emerging Local Plan [the Plan] with regard its potential impact at the Strategic Road Network [SRN]. In addition, and within the spirit of co-operation, Highways England and the Council have agreed that the assessment of the development quantum is to form part of a wider piece of work – of which this Report is the output – which will form part of the Council's evidence base to inform and underpin the Plan as it emerges.

Within the district of North Lincolnshire, the SRN comprises the M180, M181, A180 and A160:

- The M180 provides an east-west link between the A180 to the east and the M18 in the west;
- The M181 provides a north-south link between Scunthorpe in the north and the M180 in the south;
- The A180 provides an east-west link between Grimsby to the east and the M180 in the west; and
- The A160 provides an east-west link to the north of the A180, between Immingham to the east and the A180 in the west.

Figure 1 – The SRN in North Lincolnshire



(Data as indicated by copyright, annotated by CH2M)

As such, Highways England needs to ensure that the development aspirations contained within the Plan do not severely impact upon the capacity, operation and safety of the SRN, and where appropriate, where mitigation infrastructure is required to ensure the Plan can come forward with the appropriate infrastructure.

1.1 Task Brief

As part of Highways England's duty to co-operate, Highways England has instructed CH2M to undertake the following tasks:

- Agreement with Highways England and the Council regarding the assessment years to be considered within this Report, which were subsequently agreed as 2027, 2032 and 2038;
- Use of the GraHAM tool to consider the traffic patterns associated with the quantum of development proposed within the Plan;
- High-level consideration of impacts at the SRN, which will include link flows and turning movements;
- Use of the base flow information identified during scoping to allow for merge / diverge assessments to be undertaken at M180 Junctions 4 and 5;
- Use of the base flow information identified during scoping to allow for volume / capacity mainline assessments to be undertaken;
- A detailed consideration of the A160 Upgrade Scheme, assessing the development quantum included at this location;
- A detailed consideration of the M181 Terminating Junction (Lincolnshire Lakes), based on Highways England's involvement to date at this location; and
- Identification of infrastructure interventions and considerations where required.

A further agreed task was the production of a Report, detailing the work undertaken and outputs, which is this Report.

1.2 Report Structure

This Report consists of four sections, of which this is the first. The other sections are:

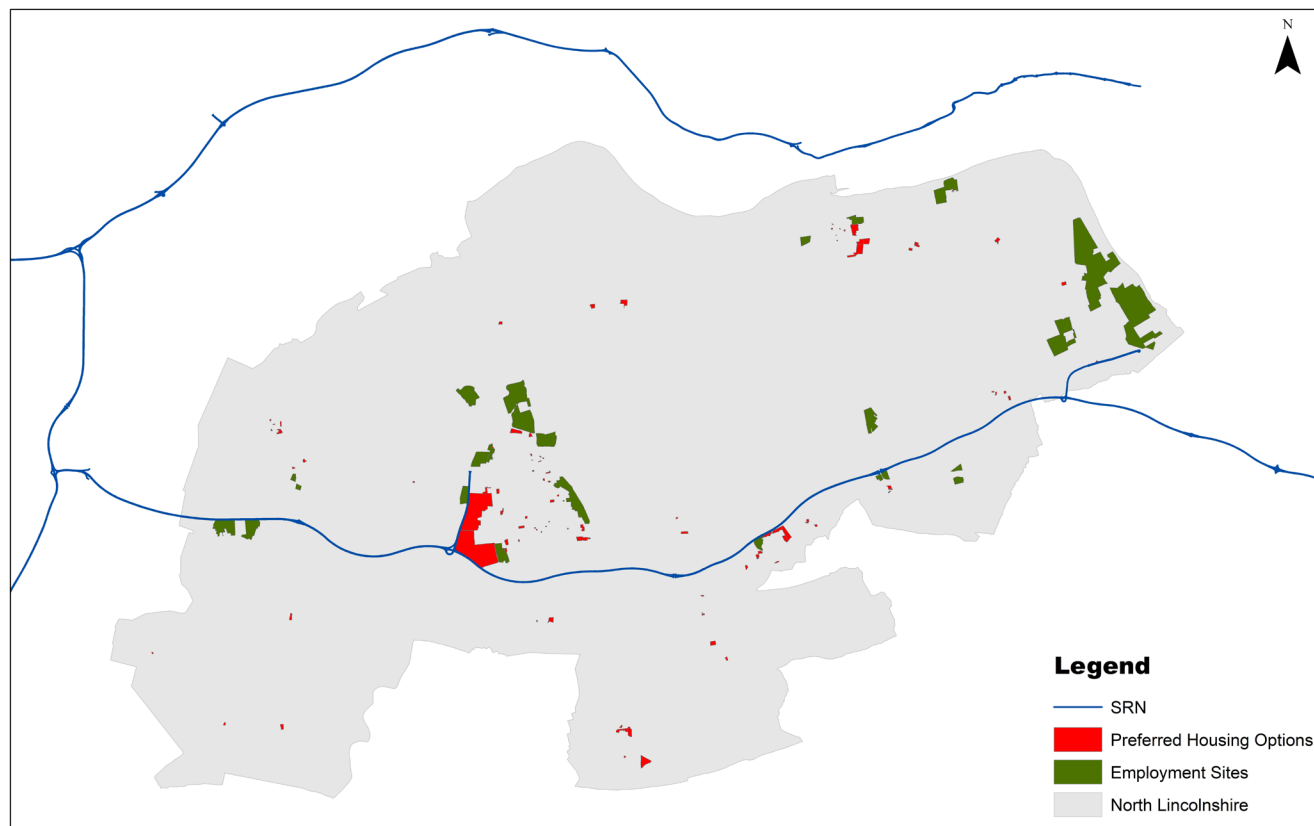
- Section 2 – Methodology;
- Section 3 – Outputs;
- Section 4 – Merge / Diverge and Mainline Analysis;
- Section 5 – A160 Upgrade Scheme;
- Section 6 – M181 Terminating Junction / Lincolnshire Lakes;
- Section 7 – Infrastructure Considerations; and
- Section 8 – Summary and Conclusions.

2. Methodology

2.1 Sites Included

The Council has provided CH2M with the list of sites within the Plan, and these are set out in Figure 2 below.

Figure 2 – North Lincolnshire Local Plan Sites



(Information provided by North Lincolnshire Council)

For completeness, the sites provided by the Council, and included within the GraHAM assessment, are detailed in Table 1 (Housing Sites), Table 2 (Strategic Allocations) and Table 3 (Employment Sites).

Table 1 – Housing Sites

Local Plan Ref	Site Name	Settlement Area	Site Location	Allocated Land	Hectares	Total Number of Dwellings
SSH1p, SSH2p	Lincolnshire Lakes (PA/2013/1000 and PA/2013/1001)	Scunthorpe	West of Scunthorpe	Greenfield	1000	3000
H1P-1p	SCUH-1 (PA/2015/0246)	Scunthorpe	Phoenix Parkway Phase 1	Greenfield	7.96	246

Local Plan Ref	Site Name	Settlement Area	Site Location	Allocated Land	Hectares	Total Number of Dwellings
H1P-2p	SCUH-2	Scunthorpe	Phoenix Parkway Phase 2	Greenfield	1.88	56
H1P-3p	SCUH-11	Scunthorpe	Land at the Council Depot, Station Road	Brownfield	1	38
H1P-4p	SCUH-C7	Scunthorpe	Land at former South Leys School, Enderby Road	Greenfield	3.27	120
H1P-5p	BARH-1 & BARH-2	Barton	Pasture Road South	Greenfield	21.4	199
H1P-6p		Barton	Land off Barrow Road	Greenfield	6	200
H1P-7p		Barton	Land to the South of Barrow Road	Greenfield	6.5	213
H1P-8p		Barton	Land at Caistor Road	Greenfield	13.91	360
H1P-9p		Barton	Land between Caistor Road and Eastfield Road	Greenfield	2.71	98
H1P-10p	BRIH-1 & BRIH-5	Brigg	Land north of Atherton Way	Brownfield	4.4	149
H1P-11p	BRIH-2	Brigg	Land at Western Avenue	Greenfield	5.54	186
H1P-12p	BRIH-3	Brigg	Wrawby Road Phase 2	Greenfield	11.97	333
H1P-13p	BRIH-4	Brigg	Wrawby Road Phase 1	Greenfield	4.31	152
H1P-14p		Barnetby le Wold	Land at King's Road Land	Greenfield	2.38	74
H1P-15p	PA/2018/845	Barrow upon Humber	Former Spencer Group Mill Lane	Brownfield	1.56	50
H1P-16p		Barrow upon Humber	Land off Ferry Road/Chestnut Rise	Greenfield	1.8	59
H1P-17p		Barrow upon Humber	Land off Ferry Road	Greenfield	1.65	54
H1P-18p		Broughton	Land off the B1207	Greenfield	2.4	74
H1P-19p	CROH-1	Crowle	Land to the east of Fieldside	Brownfield	2.8	101
H1P-20p		Crowle	Land off Mill Road	Greenfield	1.05	57
H1P-21p		Crowle	Land off Fieldside	Greenfield	0.5	20
H1P-22p		Epworth	Yealand Flats	Greenfield	2.63	92
H1P-23p		Haxey	Land at Field House	Brownfield/ Greenfield	2.96	84

Local Plan Ref	Site Name	Settlement Area	Site Location	Allocated Land	Hectares	Total Number of Dwellings
H1P-24p		Messingham	Land to the North of Brigg Road	Greenfield	4.67	92
H1P-25p		Winterton	Land at Top Road	Greenfield	2.9	83
H1P-26p		Burton upon Stather	Land off Darby Road	Greenfield	2.31	63
H1P-27p		Ealand	Land adjacent to Ivy House Farm, on Main street.	Greenfield	1	21
H1P-28p		East Halton	Land off Mill Lane	Greenfield	1	29
H1P-29p		Hibaldstow	Land to the West of Station Road	Greenfield	4.2	48
H1P-30p		New Holland	Land at Manchester Square	Greenfield	0.35	11
H1P-31p		Scawby	Land south of Main Street	Greenfield	0.79	11
H1P-32p		South Killingholme	Land at School Road	Brownfield	0.69	21
H1P-33p		Ulceby	Land east of Brocklesby Road	Greenfield	1.71	49
H1P-34p		Westwoodside	Land south of Doncaster Road	Greenfield	0.97	29
H1P-35p		Wrawby	Land off Melton Road	Greenfield	1	30
H1P-36p		Wroot	Land at Field Lane	Greenfield	0.43	11
H1C-1p	PA/2014/1183	Scunthorpe	Plot 29 Hebden Road	Brownfield	0.48	14
H1C-2p	PA/2017/2006	Scunthorpe	Former Crosby Primary School, Frodingham Road	Brownfield	0.51	24
H1C-3p	PA/2018/2186	Scunthorpe	Woods along Scotter road	Greenfield	2.98	36
H1C-4p	PA/2007/0106	Scunthorpe	30-32 Crosby Road	Brownfield	0.24	18
H1C-5p	PA/2018/999	Scunthorpe	Part of Advance Crosby Scheme Phase 2	Brownfield	0.36	22
H1C-6p	PA/2017/1483	Scunthorpe	Methodist Church Frodingham Road	Brownfield	0.12	14
H1C-7p	PA/2017/1070	Scunthorpe	Land at 1-3 Cliff Gardens Phase 1	Brownfield	0.22	14
H1C-8p	PA/2018/664	Scunthorpe	Land at 1-3 Cliff Gardens Phase 2	Greenfield	0.2	10
H1C-9p	SCUH-C3 (PA/2018/136)	Scunthorpe	Former Tennis Courts Rowland Road	Greenfield	0.65	32

Local Plan Ref	Site Name	Settlement Area	Site Location	Allocated Land	Hectares	Total Number of Dwellings
H1C-10p	PA/2018/217	Scunthorpe	Holgate Road	Brownfield	0.23	16
H1C-11p	SCUH-C2(PA/2015/1369 and (PA/2017)	Scunthorpe	Brumby Resource Centre, East Common Lane	Brownfield	2.03	122
H1C-12p	PA/2018/1247	Scunthorpe	Land North of Ancholme Road	Brownfield	0.24	13
H1C-13p	PA/2003/0962	Scunthorpe	Lakeside	Greenfield	37.91	206
H1C-14p	PA/2018/838	Scunthorpe	land south of Ashby Turn Primary Care Centre, The Link	Greenfield	0.26	18
H1C-15p	PA/2018/2004	Scunthorpe	Land Rear, Ashby Link, The Link, Scunthorpe, DN16 2US	Greenfield	0.3	10
H1C-16p	SCUH-12 (PA/2017/200)	Scunthorpe	Former Carpark, Collum Avenue	Brownfield	0.16	14
H1C-17p	2017/1399	Scunthorpe	Land off Bottesford Road	Brownfield	0.16	10
H1C-18p	SCUH-13 (PA/2015/072)	Scunthorpe	Former Darby Glass Offices and Factory, Sunningdale Road	Brownfield	1.71	60
H1C-19p	PA/2018/1021	Scunthorpe	Site of the Lilcas Warwick Road	Brownfield	0.5	25
H1C-20p	SCUH-5 (PA/2017/213)	Scunthorpe	Land off Burringham Road	Greenfield	2.49	85
H1C-21p	PA/2018/1541	Scunthorpe	Former Site Of The Star, Rochdale Road, Scunthorpe,	Brownfield	0.24	16
H1C-22p	PA/2018/2266	Scunthorpe	Former Priory Lane Infants School	Greenfield	0.89	36
H1C-23p	SCUH-14 (PA/2015/153)	Scunthorpe	Redevelopment of Westcliff Precinct	Brownfield	2.3	31
H1C-24p	SCUH-C8 (PA/2018/240)	Scunthorpe	Land at Dartmouth Road	Greenfield	2.49	77
H1C-25p	PA/2016/1601	Scunthorpe	Cottage Beck Road, Albert Marson Court	Brownfield	0.54	27
H1C-26p	PA/2018/483	Scunthorpe	Land at Dragonby Road	Brownfield	0.44	14
H1C-27P	PA/2018/1049	Barton	Land to the rear of 13-19 Pasture Road	Brownfield	0.35	16

Local Plan Ref	Site Name	Settlement Area	Site Location	Allocated Land	Hectares	Total Number of Dwellings
H1C-28p	PA/2016/1763	Barton	Coach and Horses Inn 86 - 88 High Street, Barton	Brownfield	0.34	18
H1C-29p	PA/2018/1118	Barton	Land adjacent to the White Swan Public House	Brownfield	0.16	5
H1C-30p	PA/2018/897	Barton	The Laurels, Preston Lane	Brownfield	0.16	5
H1C-31p	PA/2017/1109	Barton	7a, Marsh Lane	Brownfield	0.15	5
H1C-32p	PA/2017/1046	Barton	Bank House, 8 Holydyke	Brownfield	0.07	5
H1C-33p	PA/2016/1611	Brigg	Station Road	Brownfield	0.82	40
H1C-34p	PA/2014/0887	Brigg	Island Carr	Brownfield	1.88	60
H1C-35p	PA/2017/1234	Brigg	Falcon Cycles, Bridge Street, Brigg, DN20 8NQ	Brownfield	2.2	67
H1C-36p	PA/2004/0692	Brigg	Silversides Lane	Brownfield	1.57	44
H1C-37p	PA/2018/510	Barnetby le Wold	Land at Windsor Way	Greenfield	0.4	9
H1C-38p	PA/2017/1989	Barnetby le Wold	Site Of Former The Railway Inn	Brownfield	0.15	6
H1C-39p	PA/2019/752	Barnetby le Wold	Railway Inn Phase 2	Brownfield	0.23	8
H1C-40p	PA/2018/2316	Broughton	Land at Burnside	Greenfield	0.5	10
H1C-41p	PA/2019/936	Crowle	Land adjacent 28 North Street	Greenfield	0.26	8
H1C-42p	PA/2018/1259	Crowle	Land adjacent to 17 Low Cross Street	Greenfield	0.39	9
H1C-43p	PA/2018/33	Crowle	Land off Church Street, Crowle, DN17 4LE	Greenfield	0.26	7
H1C-44p	PA/2018/1391	Crowle	Manor House, Church Street	Greenfield	0.12	5
H1C-45p	PA/2018/1581	Goxhill	land off Howe Lane and Hawthorne Gardens, Goxhill	Greenfield	3.35	84
H1C-46p	PA/2016/337	Kirton in Lindsey	Gleadells Mill Station Road	Brownfield	0.82	27
H1C-47p	KIRH- (PA/2017/389)	Kirton in Lindsey	Land west of Station Road	Greenfield	2.91	91
H1C-48p	KIRH-2 (PA/2016/1704)	Kirton in Lindsey	Land at Beechcroft	Greenfield	2.49	41
H1C-49p	PA/1999/0920	Kirton in Lindsey	North of Spa Hill	Greenfield	6.52	20

Local Plan Ref	Site Name	Settlement Area	Site Location	Allocated Land	Hectares	Total Number of Dwellings
H1C-50p	KIRH-3 (PA/2017/1199)	Kirton in Lindsey	Land at Former RAF	Brownfield	14.26	302
H1C-51p	PA/2017/511	Kirton in Lindsey	Grayingham Road Land adjacent Maple Lea, Gainsborough Road	Greenfield	0.49	16
H1C-52p	PA/2018/978	Messingham	68 High Street, Messingham	Brownfield	0.25	7
H1C-53p	PA/2015/1390	Winterton	Land to the rear of North Street and Cemetery Road,	Greenfield	6.62	135
H1C-54p	PA/2013/1256, PA/2016/1710, PA/2017/233	Ealand	7 Lakes Industrial Estate, Crowle Wharf	Brownfield	0.8	17
H1C-55p	PA/2014/0196	Hibaldstow	Willow Farm, East Street	Greenfield	1.25	40
H1C-56p	PA/2017/464	Keadby	Old Railway Sidings, A18 from Althorpe to Gunness	Brownfield	0.52	14
H1C-57p	PA/2018/1884	Scawby	west street	Greenfield	0.6	8
H1C-58p	PA/2016/805	Scawby	19-23 West Street	Greenfield	0.38	5
H1C-59p	PA/2017/2080	Ulceby	Land north of Front Street, Ulceby	Greenfield	0.97	14
H1C-60p	PA/2017/1450	Ulceby	land rear of new convenience store, off Church Lane, Ulceby	Brownfield	0.61	9
H1C-61p	PA/2019/783	Ulceby	Land rear of church lane Ulceby	Greenfield	0.77	10
H1C-62p	PA/2017/674	Wrawby	Land off Applefields	Greenfield	1.78	22

(Information provided by North Lincolnshire Council)

Table 2 – Strategic Allocations

Location	Site Reference	Policy Name	Use Class	Hectares	% Use Class	Phasing
South Humber Bank	SS9p	South Humber Bank	B1,B2, B8 Estuary Related including energy generation	900	B1 - 10% B2 - 40% B8 - 50%	10% - 2023-2027 40% - 2028-2032 50% - 2033-2038
North Killingholme	SS8-2p	North Killingholme Airfield	B1, B2, B8	138	B1 - 10% B2 - 20% B8 - 70%	20% - 2023-2027 40% - 2028-2032 40% - 2033-2038

Location	Site Reference	Policy Name	Use Class	Hectares	% Use Class	Phasing
Lincolnshire Lakes	SS8-3p	Lincolnshire Lakes	Strategic Mixed-use Area	25.15	Commercial uses	50% - 2028-2032 50% - 2033-2038

(Information provided by North Lincolnshire Council)

Table 3 – Employment Sites

Location	Site Reference	Policy Name	Use Class	Hectares	% Use Class	Phasing
Scunthorpe	EC1-1p	Normanby Enterprise Park	B1,B2, B8	38.87	B1 - 30% B2 - 10% B8 - 60%	100% - 2023-2027
Scunthorpe	EC1-2p	Land north of Tesco	B1, B8	39.96	B1 - 30% B8 - 70%	50% - 2023-2027 25% - 2028-2032 25% - 2033-2038
Kirmington	EC1-3p	Humberside Airport	B1, B8	12	B1 - 30% B8 - 70%	50% - 2028-2032 50% - 2033-2038
Kirmington	EC1-4p	Humberside Airport	B1, B8	7.8	B1 - 30% B8 - 70%	100% - 2023-2027
Sandtoft	EC1-5p	Sandtoft Business Park	B1, B8	55.3	B1 - 10% B8 - 90%	50% - 2023-2027 50% - 2028-2033
Barton upon Humber	EC1-6p	Land to the north west of the A15 Barton Interchange	B1,B2, B8	15	B1 - 60% B2 - 10% B8 - 30%	50% - 2023-2027 50% - 2028-2032
Barnetby Top	EC1-7p	Land to the south of Barnetby Top Interchange and to the west of the A18	Service Station and Lorry Park	6.14	100%	100% - 2023-2027
Barnetby Top	EC1-8p	Land to the south of Barnetby Top Interchange and to the east of the A18	B1, B2, B8	10	B1 - 30% B2 - 10% B8 - 60%	25% - 2023-2027 75% - 2028-2032
M180 Junction 2	EC1-9p	Land to the south of Crowle gyratory	B1, B8	5	B1 - 30% B8 - 70%	25% - 2023-2027 75% - 2028-2032

(Information provided by North Lincolnshire Council)

2.2 GraHAM processes and approach

In order to distribute and assign the trips associated with the proposed sites listed above, the GraHAM tool has been used. GraHAM is a GIS-based program for estimating the origin and destinations of trips associated with proposed land-use developments.

Using Census 2011 data, GraHAM distributes residential and employment trips using a GIS routing algorithm, which finds the quickest path through a detailed road network. GraHAM uses standard trip rates, which are provided at **Appendix A**.

The road network within the tool is based upon Ordnance Survey [OS] Meridien2 and free hand network drawing (using OS StreetView products). OS Meridien2 data is used to define the local network (non-SRN) while the free hand network has been created for the SRN. For North Lincolnshire, the GraHAM road network has incorporated the local road network as part of the routing analysis. In addition, the network has been updated to reflect the M181 Terminating Junction and the A160 Upgrade Scheme.

Highways England has consistently commissioned CH2M to undertake GraHAM analysis when considering the impact of the Plan's aspirations, and as such, are well versed in undertaking these types of assessments and detailing the outputs to stakeholders.

For the purposes of this task, CH2M has taken the information provided by the Council in order to run the quantum of development being proposed within the Plan. Three assessment years have been agreed with the Council – 2027, 2032 and 2038 – with 2038 being the end of the Plan period.

As such, this has enabled a high-level consideration of impacts at the SRN - including link flows and turning movements – to be undertaken, as set out in the next section of the Report.

3. Outputs

3.1 Approach

Each junction on the SRN within North Lincolnshire has been considered within this section. In addition, the A180 / A160 junction (Brocklesby Interchange) junction has also been included, despite being within the district of North East Lincolnshire. This is the junction of the A180 and A160, both of which are in North Lincolnshire, and has been included due to its proximity to the area of study.

The outputs within this section are presented on a junction by junction basis and comprise an origin and destination matrix of the flows associated with the quantum of development within the Plan, with accompanying graphical output. In addition, whilst thematic flows are only shown on the SRN in the visual outputs, the origin and destination matrices provide details on the flows to and from the local road network.

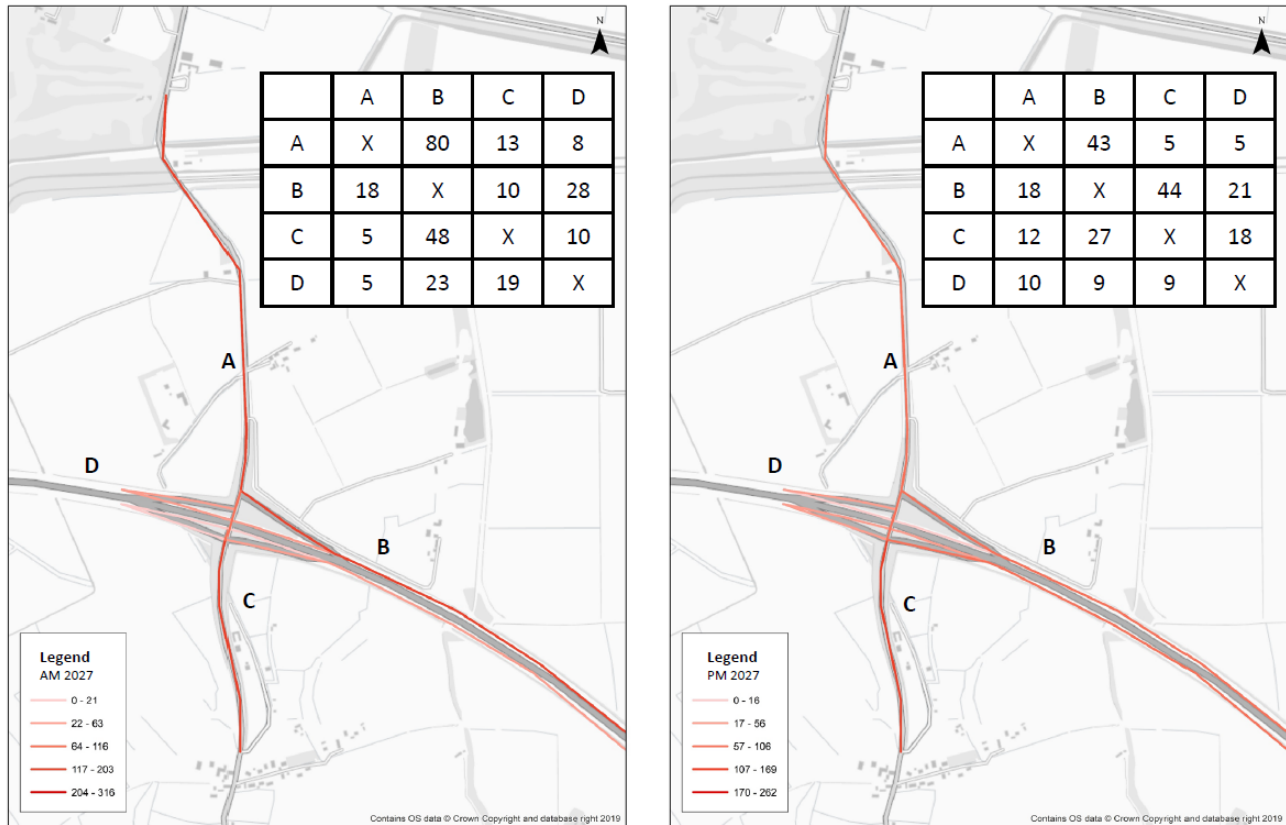
All figures are structured with the morning peak hour being represented by the left diagram and the evening peak by the right diagram. All figures have been annotated by CH2M and are based on sources identified within the individual copyright information.

For ease of reading through this section, origins of trips should be read down the left-hand side of the tables, with destinations along the top.

3.2 M180 Junction 2

2027 Assessment Year

Figure 3 – M180 Junction 2 2027

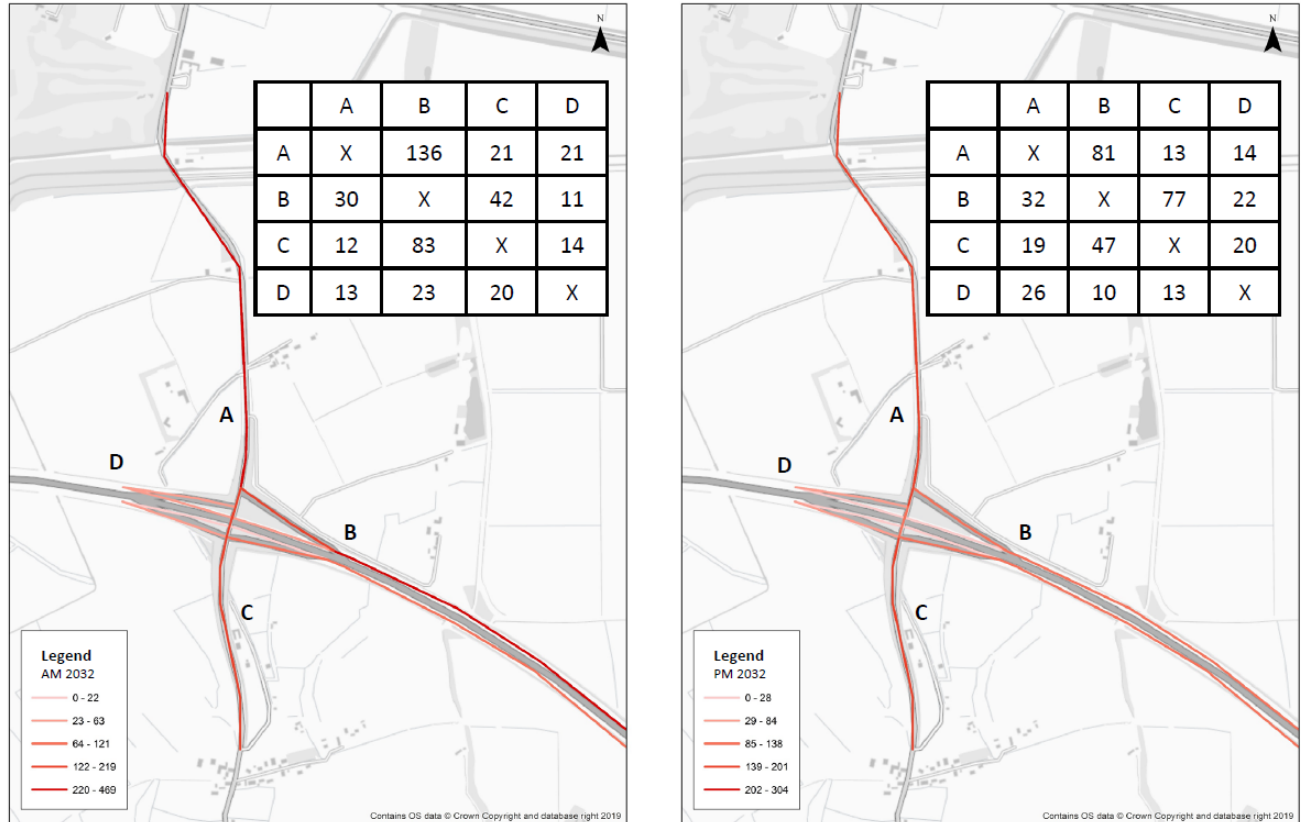


Note – morning peak is the left-hand diagram, evening peak is the right-hand diagram.

From Figure 3, it can be seen that in the 2027 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise M180 Junction 2.

2032 Assessment Year

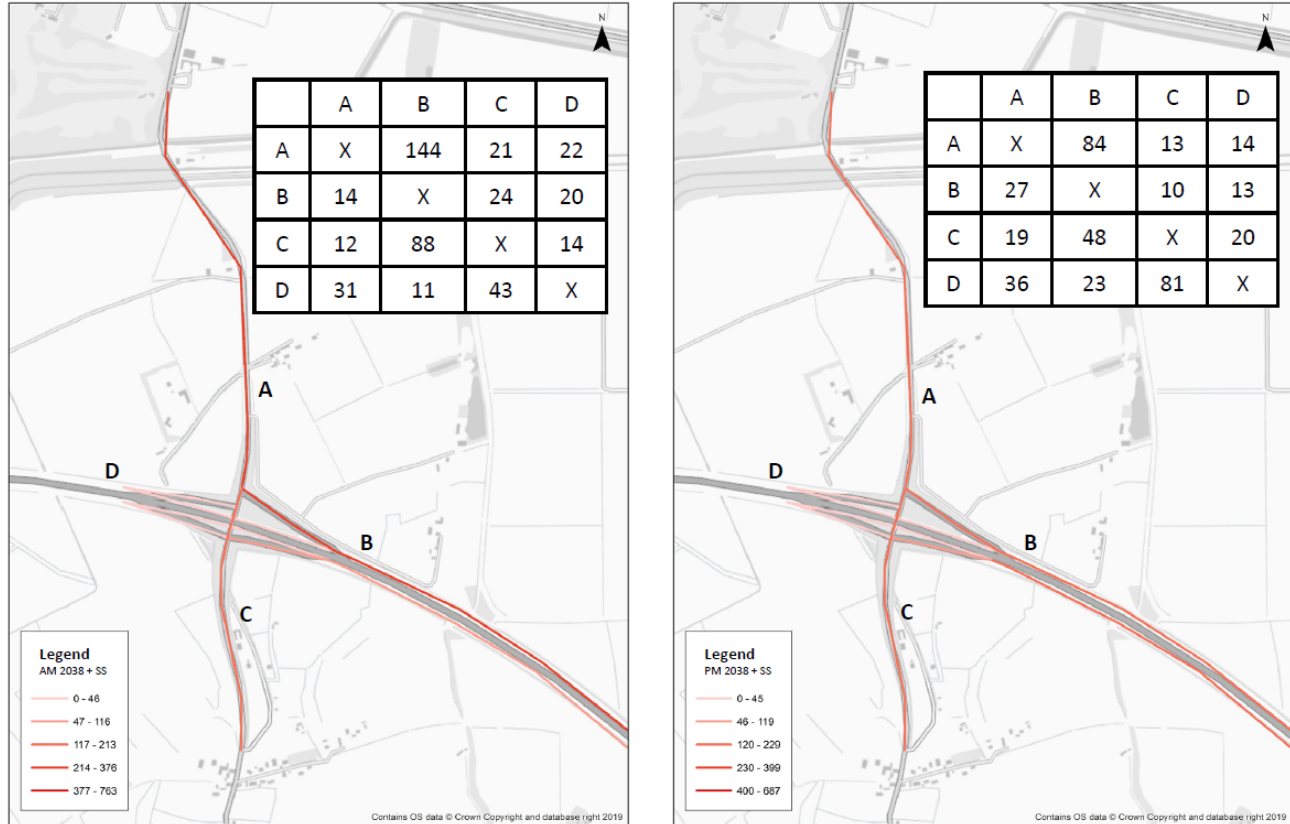
Figure 4 – M180 Junction 2 2032



From Figure 4, it can be seen that in the 2032 scenarios, there is an increased demand for the junction when compared with the 2027 scenario. This is noticeable on the demand for the eastbound on-slip from the southbound A161 in the morning peak.

2038 Assessment Year

Figure 5 – M180 Junction 2 2038

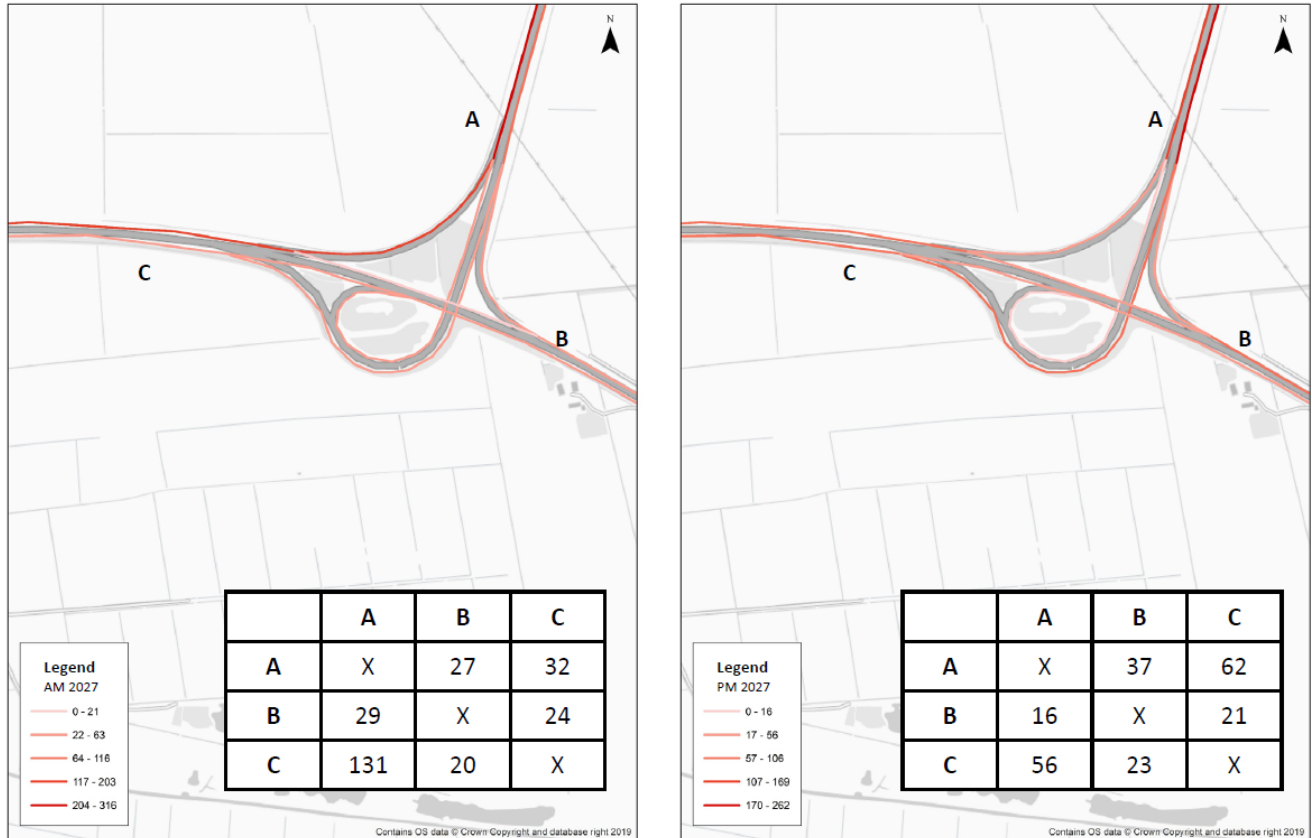


From Figure 5, it can be seen that in the 2038 scenarios – which is the full build out of the Plan and the end of the plan period - there is a slight increase in demand when compared to the 2032 scenarios, which reflects the phasing of the sites in the vicinity of the junction. As such, the dominant demand continues to be for the eastbound on-slip from the southbound A161 in the morning peak.

3.3 M180 Junction 3

2027 Assessment Year

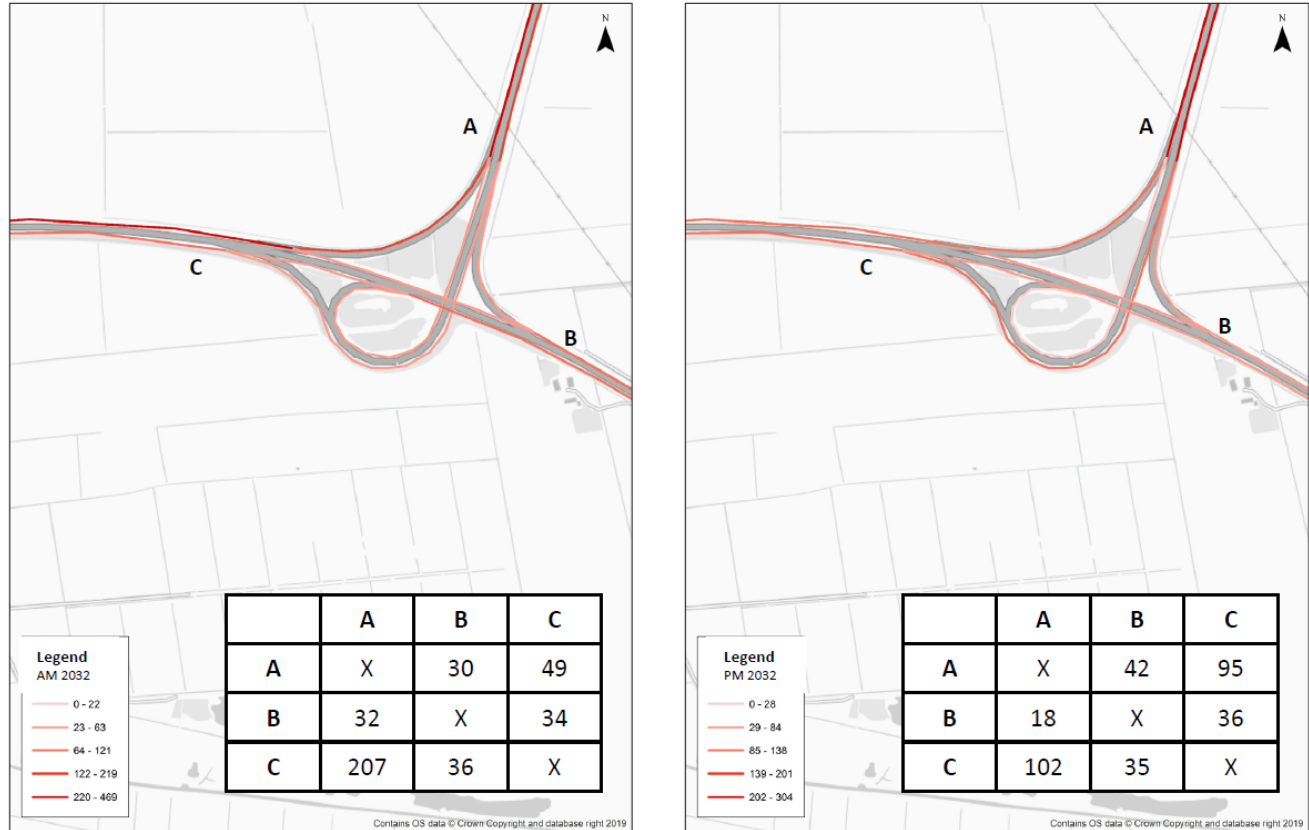
Figure 6 – M180 Junction 3 2027



From Figure 6, it can be seen that in the 2027 scenarios, the flows in both the morning and evening peaks are relatively low, with the dominant demand for the free-flow arm from the M180 eastbound heading towards Scunthorpe on the M181 in the morning peak.

2032 Assessment Year

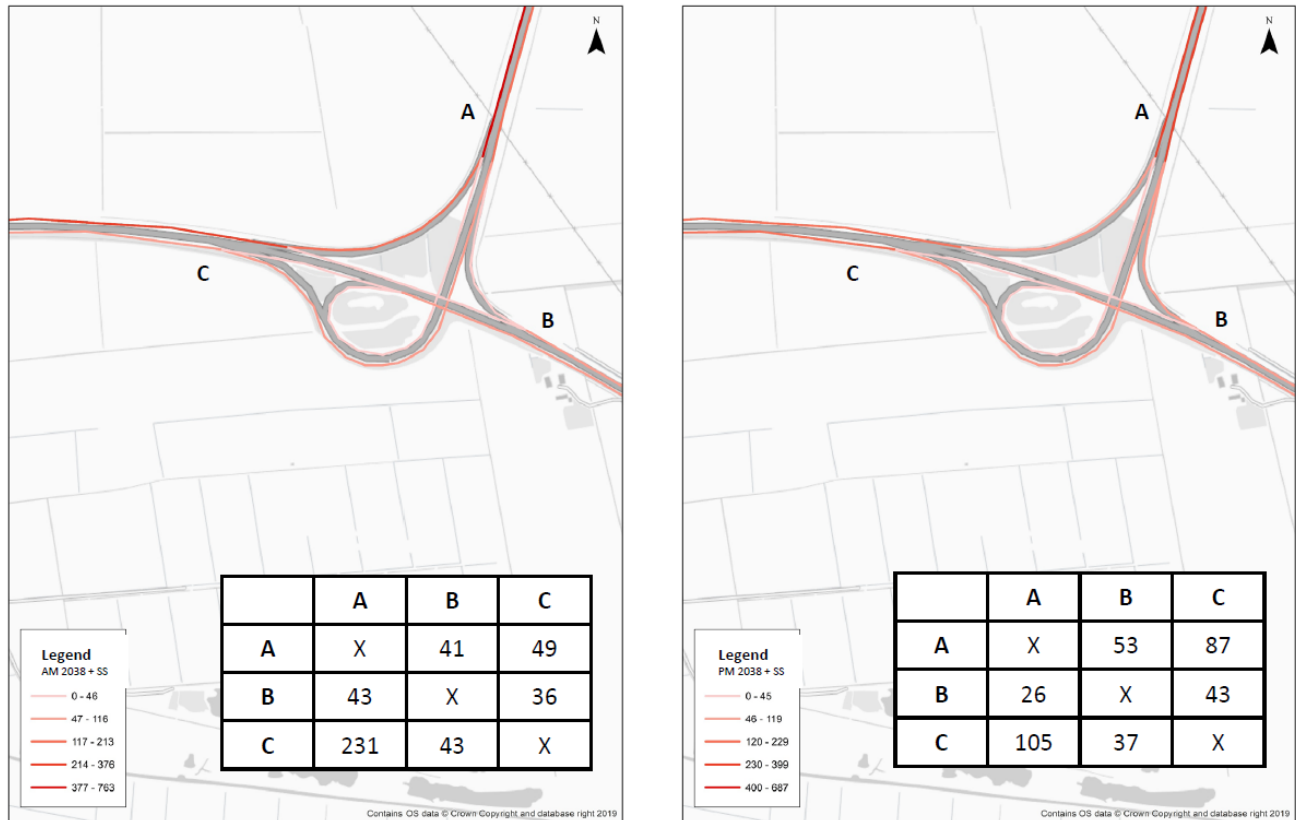
Figure 7 – M180 Junction 3 2032



From Figure 7, it can be seen that in the 2032 scenarios, there is an increased demand for the junction when compared with the 2027 scenario, with the dominant demand continuing to be for the free-flow arm from the M180 eastbound heading towards Scunthorpe on the M181, which is also reflected in the evening peak.

2038 Assessment Year

Figure 8 – M180 Junction 3 2038

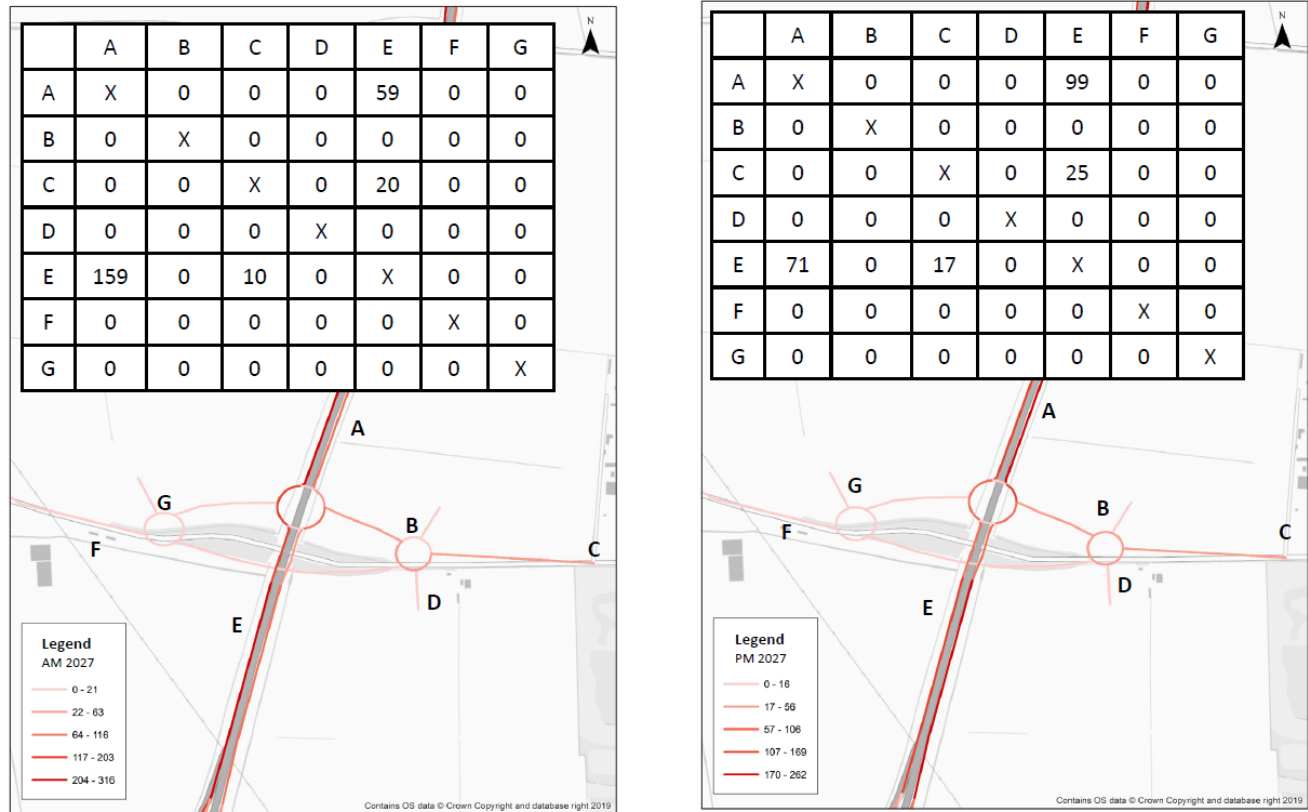


From Figure 8, it can be seen that in the 2038 scenarios – which is the full build out of the Plan and the end of the plan period - there is a slight increase in demand when compared to the 2032 scenarios, with the dominant demand as seen in Figures 6 and 7 continuing to be the same.

3.4 M181 Terminating Junction

2027 Assessment Year

Figure 9 – M181 Terminating Junction 2027

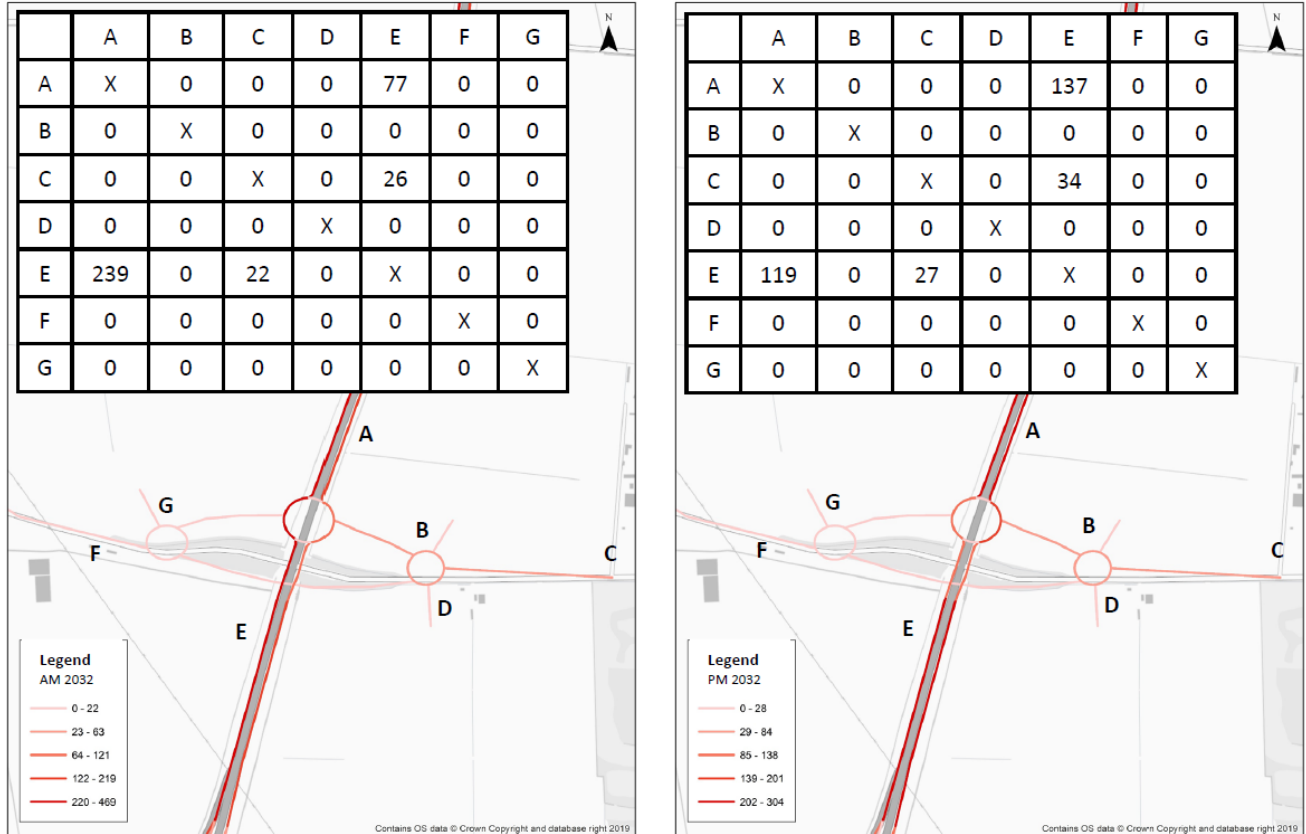


GraHAM has not been able to route the trips allied to the development proposals at Lincolnshire Lakes, which is to be served by the M181 Terminating Junction which is currently under construction.

As such, the numbers presented in Figures 9, 10 and 11 are considered to be an underrepresentation of the flows generated by the sites in this location. However, a more detailed consideration of the M181 Terminating Junction is contained within Section 6 of this Report, which provides greater detail on the proposed infrastructure at this location.

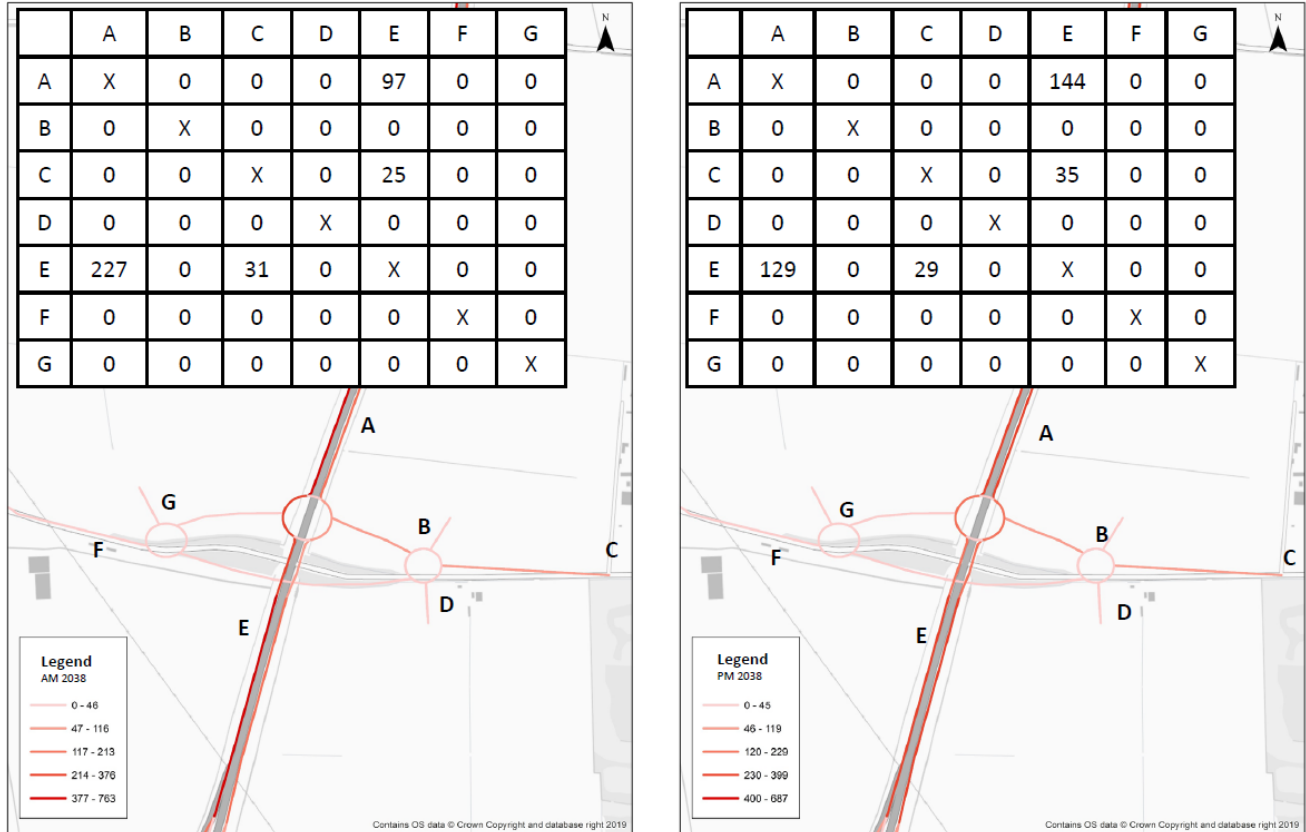
2032 Assessment Year

Figure 10 – M181 Terminating Junction 2032



2038 Assessment Year

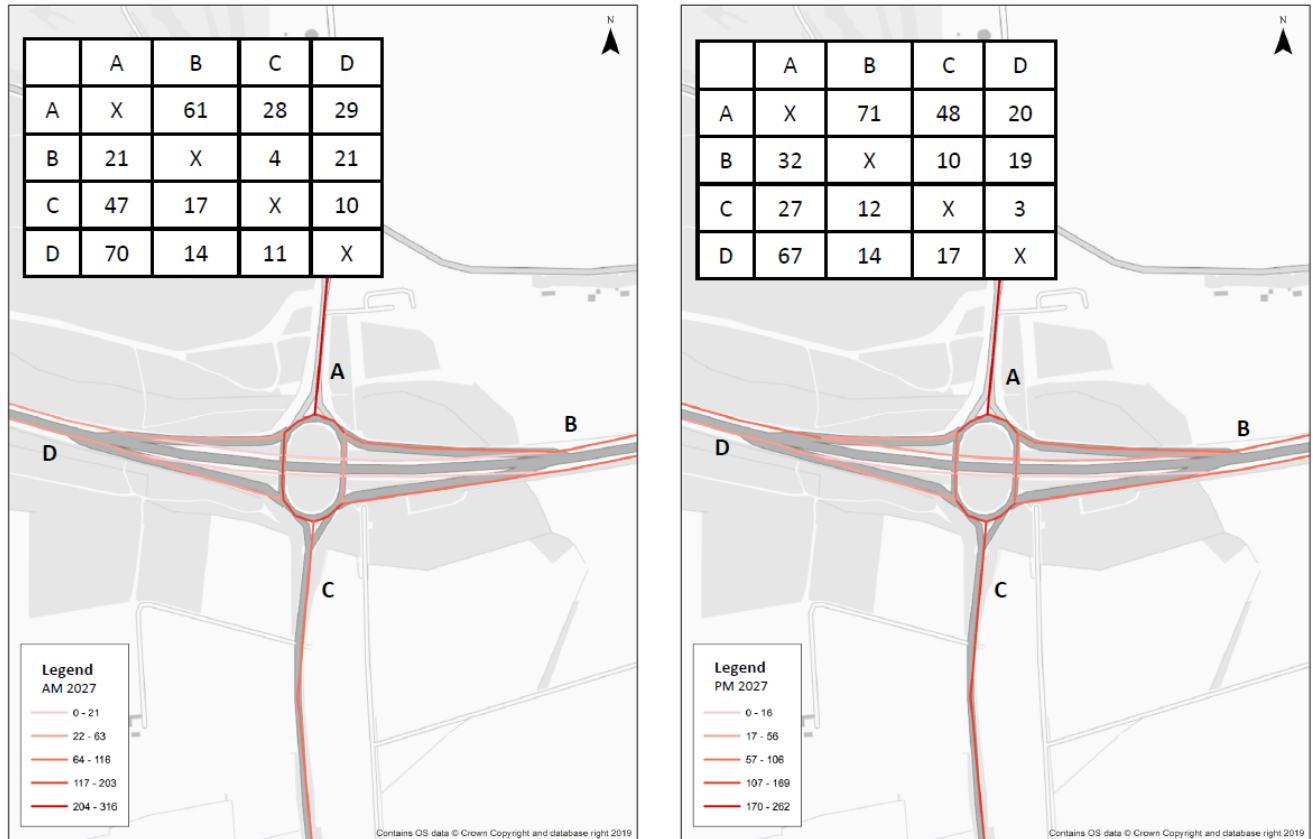
Figure 11 – M181 Terminating Junction 2038



3.5 M180 Junction 4

2027 Assessment Year

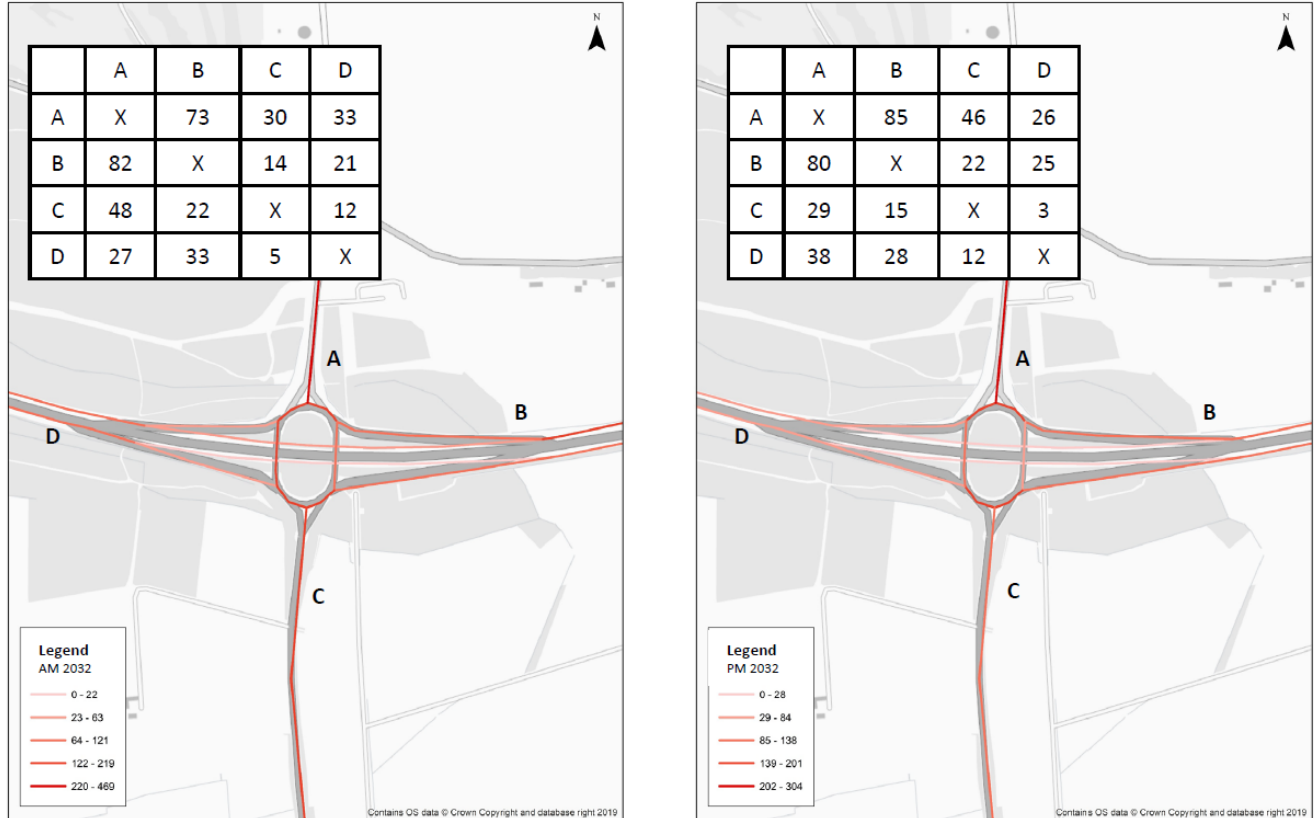
Figure 12 – M180 Junction 4 2027



From Figure 12, it can be seen that in the 2027 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise M180 Junction 4.

2032 Assessment Year

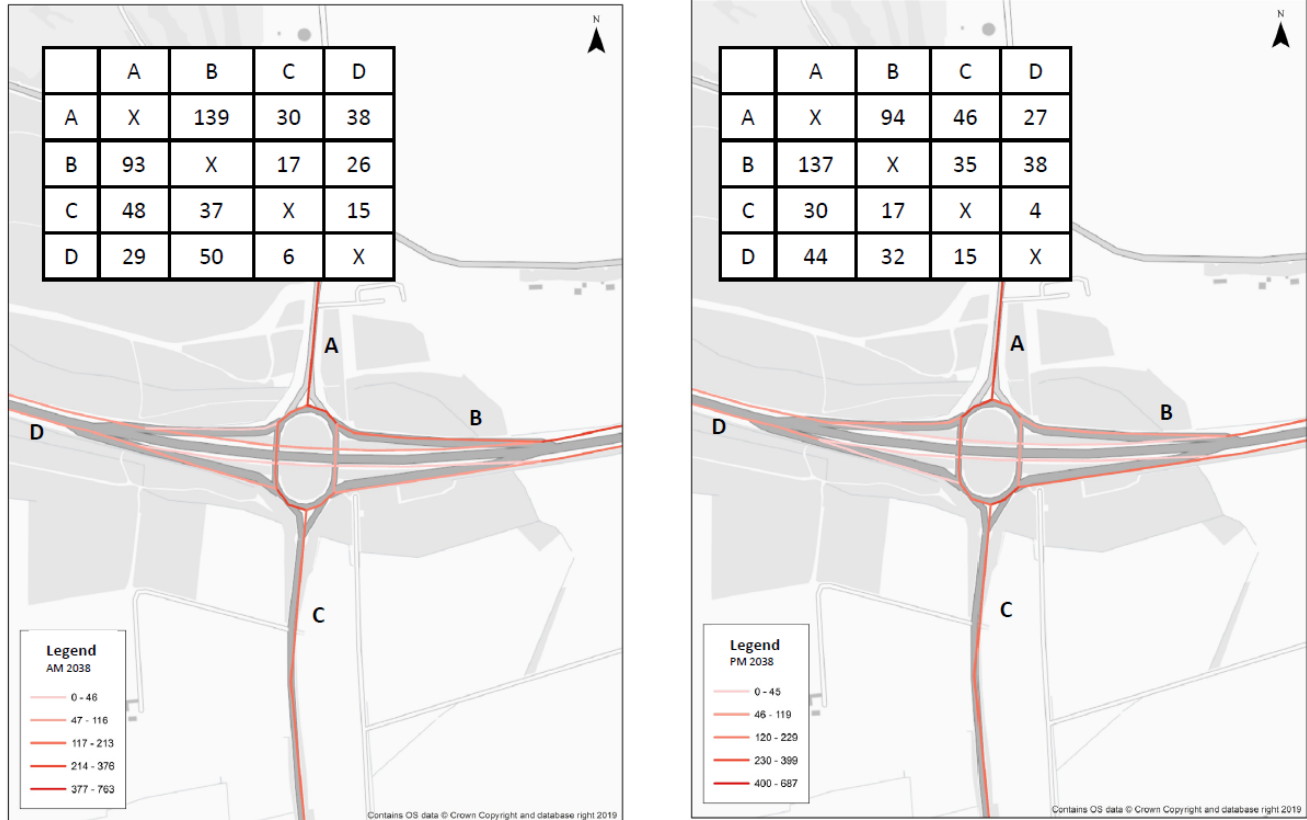
Figure 13 – M180 Junction 4 2032



From Figure 13, it can be seen that in the 2032 scenarios, there is an increased demand for the junction when compared with the 2027 scenario. However, as seen in Figure 12, there is no dominant demand for any of the links that comprise M180 Junction 4.

2038 Assessment Year

Figure 14 – M180 Junction 4 2038

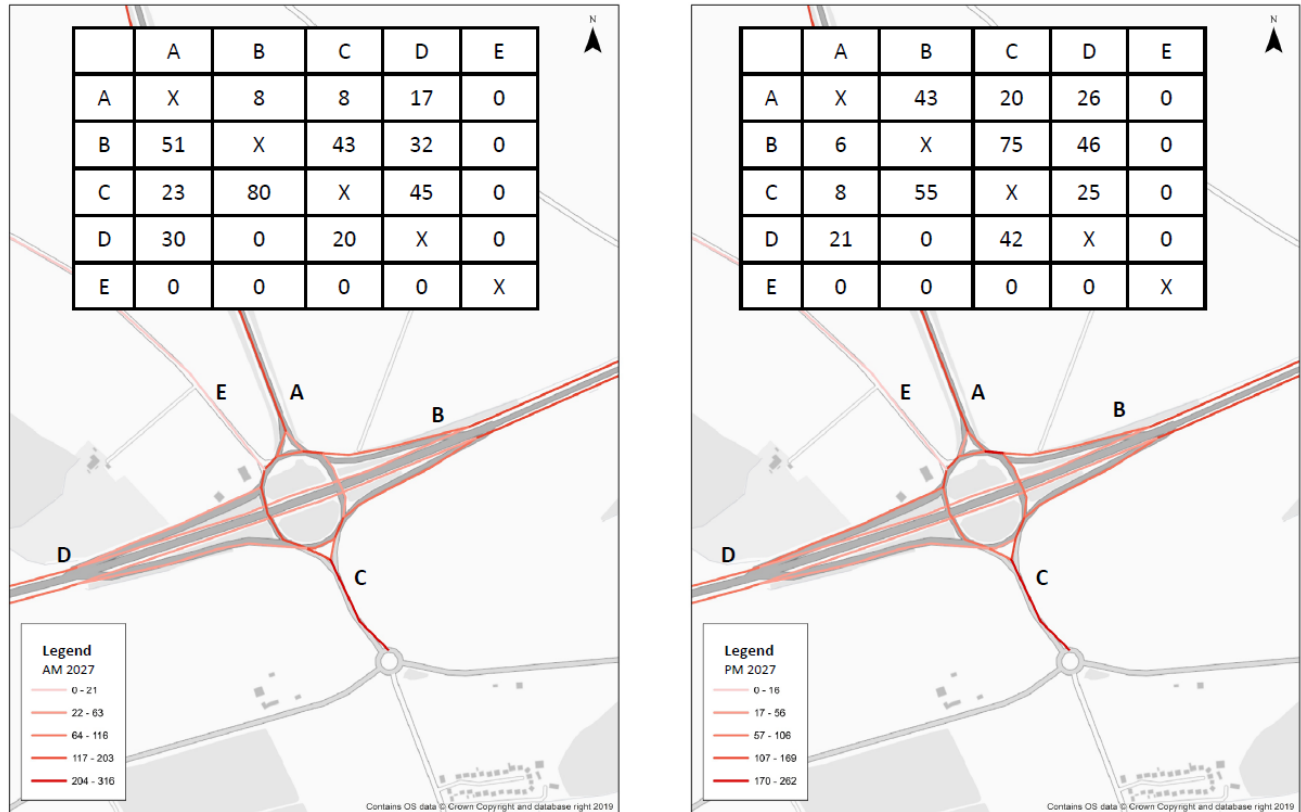


In the 2038 scenarios there is increased demand for the junction, namely between the A15 approach from the north of the junction to the M180 eastbound, with the opposite manoeuvre seeing increased demand. This occurs in both the morning and evening peak periods.

3.6 M180 Junction 5

2027 Assessment Year

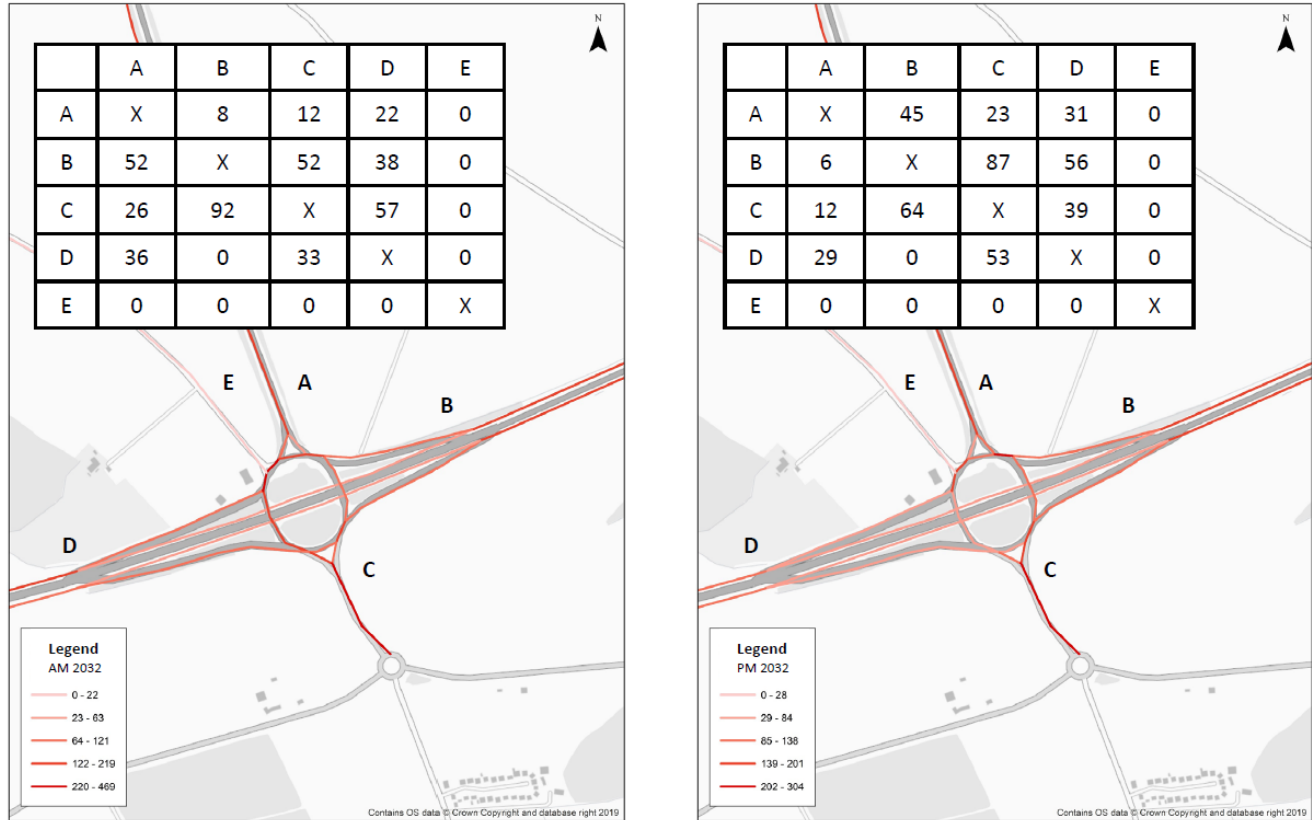
Figure 15 – M180 Junction 5 2027



From Figure 15, it can be seen that in the 2027 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise M180 Junction 4.

2032 Assessment Year

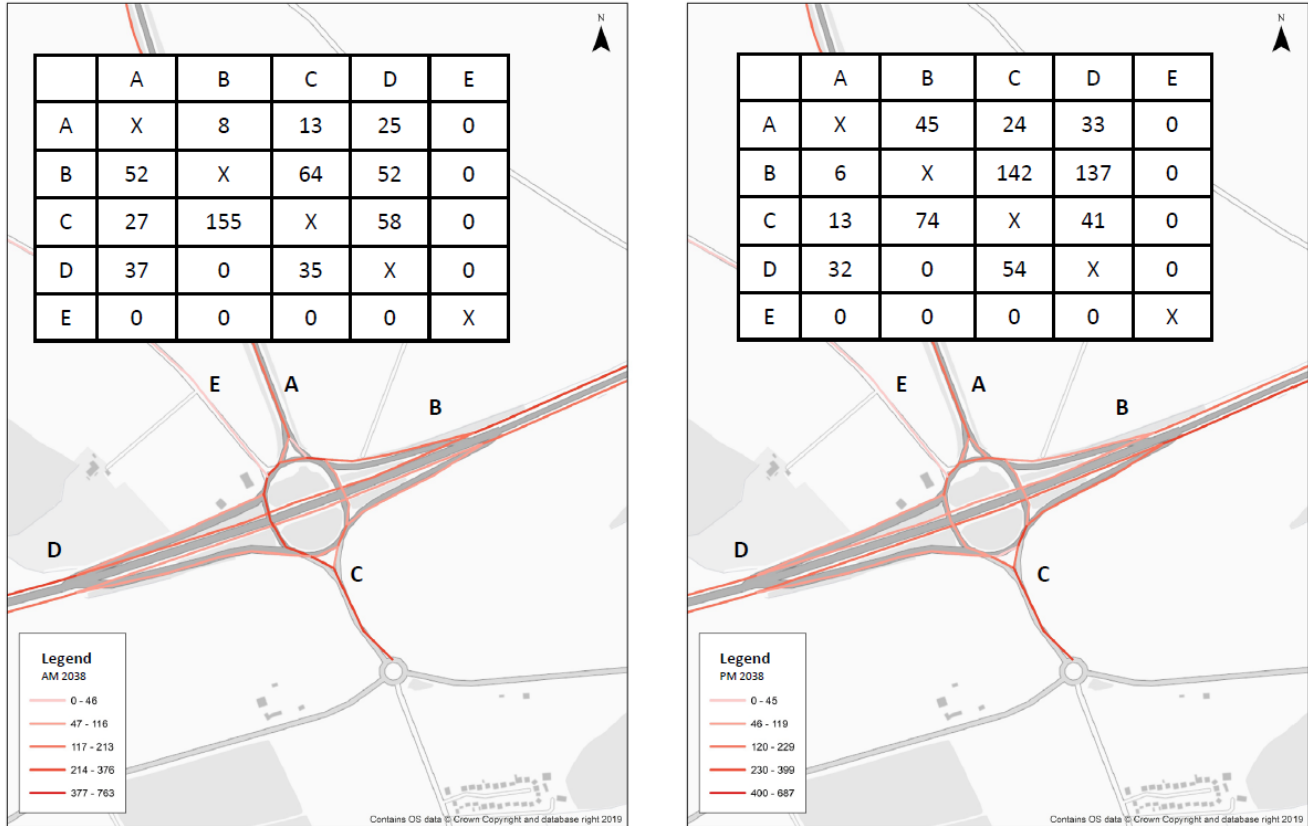
Figure 16 – M180 Junction 5 2032



From Figure 16, it can be seen that in the 2032 scenarios, there is an increased demand for the junction when compared with the 2027 scenario. However, as seen in Figure 15, there is no dominant demand for any of the links that comprise M180 Junction 5.

2038 Assessment Year

Figure 17 – M180 Junction 5 2038



In the 2038 scenarios there is increased demand for the junction, namely from the A18 arm of the junction heading eastbound on the A180 in the morning peak, and the opposite manoeuvre in the evening peak. In addition, the evening peak also sees an increased demand for westbound mainline trips from the A180 to the M180 through the junction.

3.7 A180 / A160 Brocklesby Interchange

2027 Assessment Year

Figure 18 – A180 / A160 Brocklesby Interchange 2027



From Figure 18, it can be seen that in the 2027 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise the Brocklesby Interchange.

2032 Assessment Year

Figure 19 – A180 / A160 Brocklesby Interchange 2032



From Figure 19, it can be seen that in the 2032 scenarios, there is an increased demand for the junction when compared with the 2027 scenario. However, as seen in Figure 18, there is no dominant demand for any of the links that comprise the Brocklesby Interchange.

2038 Assessment Year

Figure 20 – A180 / A160 Brocklesby Interchange 2038

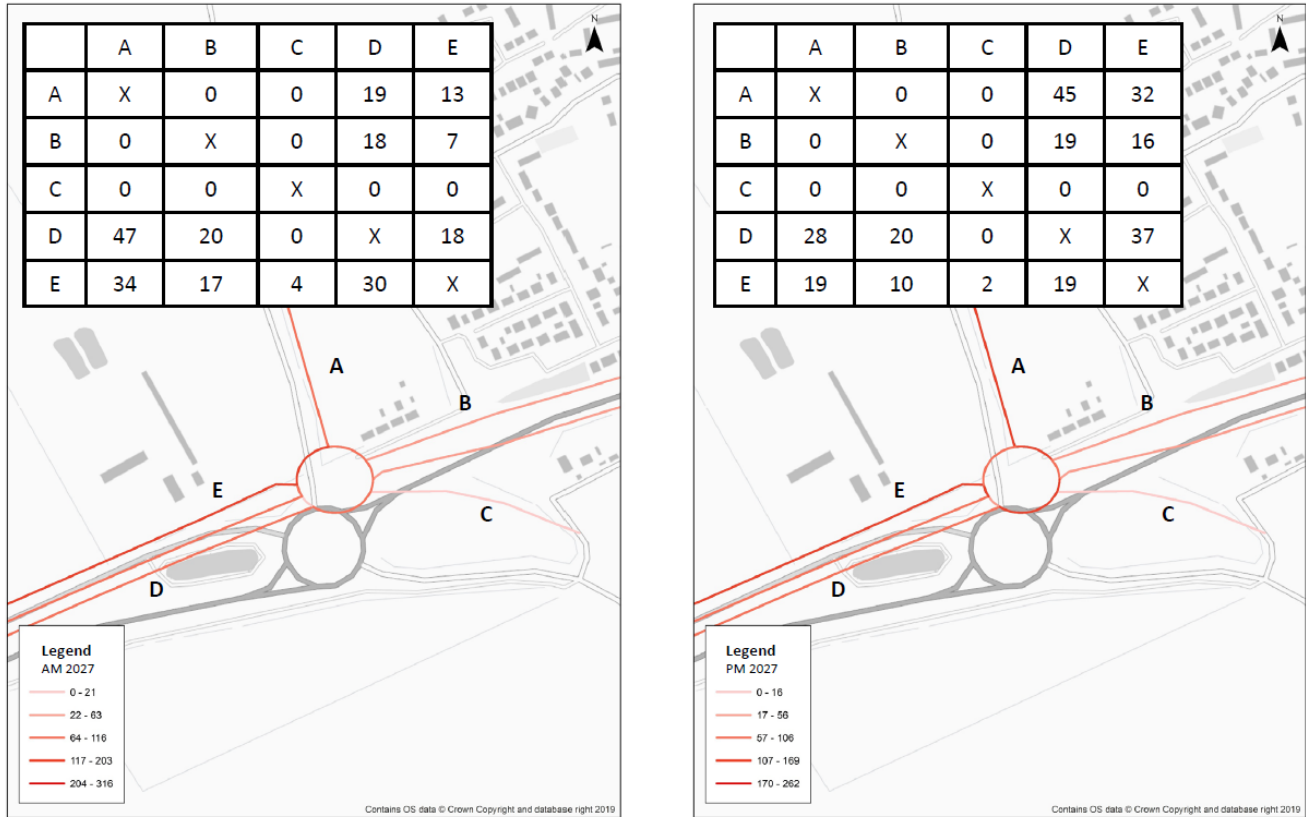


In the 2038 scenarios there is increased demand for the junction, which is as a consequence of the phasing of sites within the vicinity of the junction. In the morning peak, the dominant demand is from the eastbound A180 heading towards the A160. In the evening peak, the dominant demand is from the westbound A180 towards the A160, but also large flows on the A160 southbound heading towards Brocklesby Interchange.

3.8 A160 / Habrough Road

2027 Assessment Year

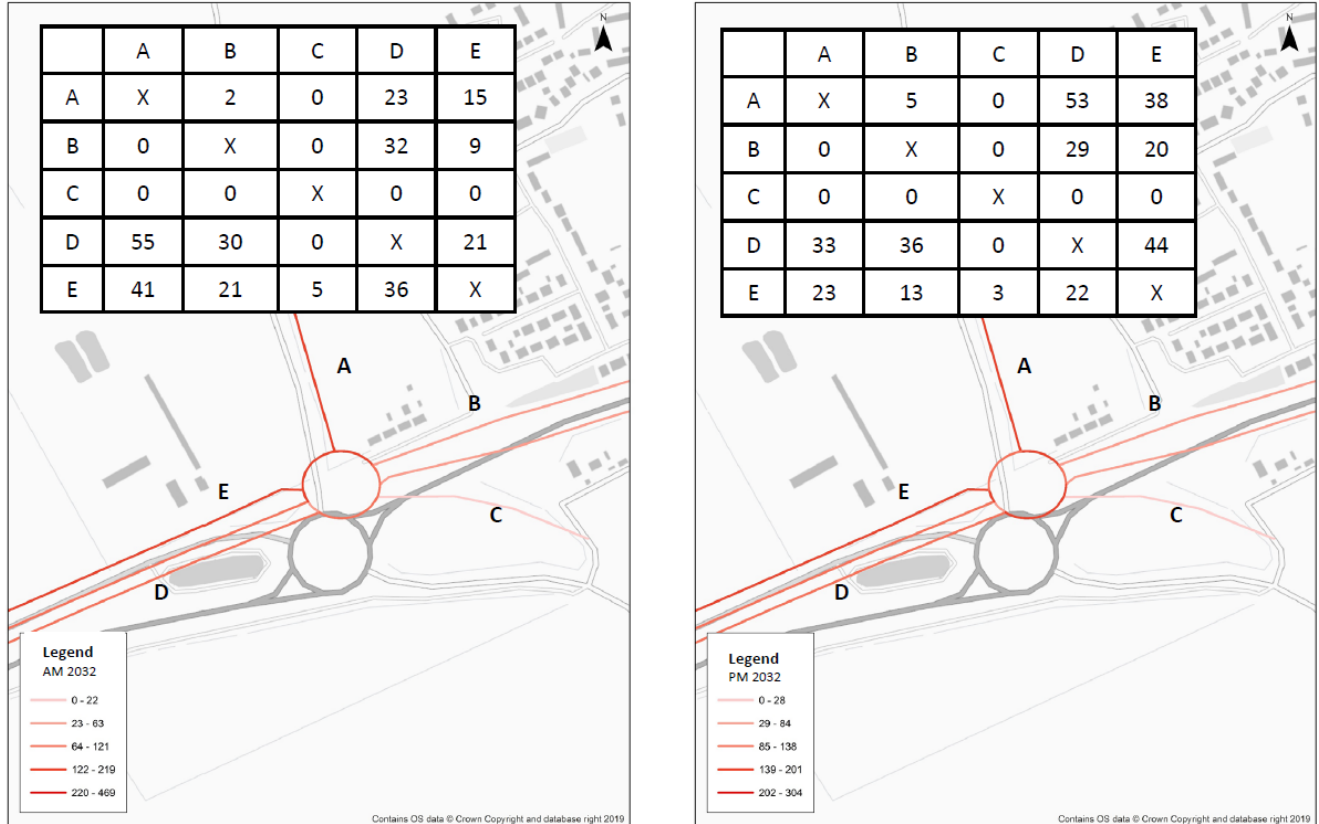
Figure 21 – A160 / Habrough Road 2027



From Figure 21, it can be seen that in the 2027 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise the A160 / Habrough Road junction.

2032 Assessment Year

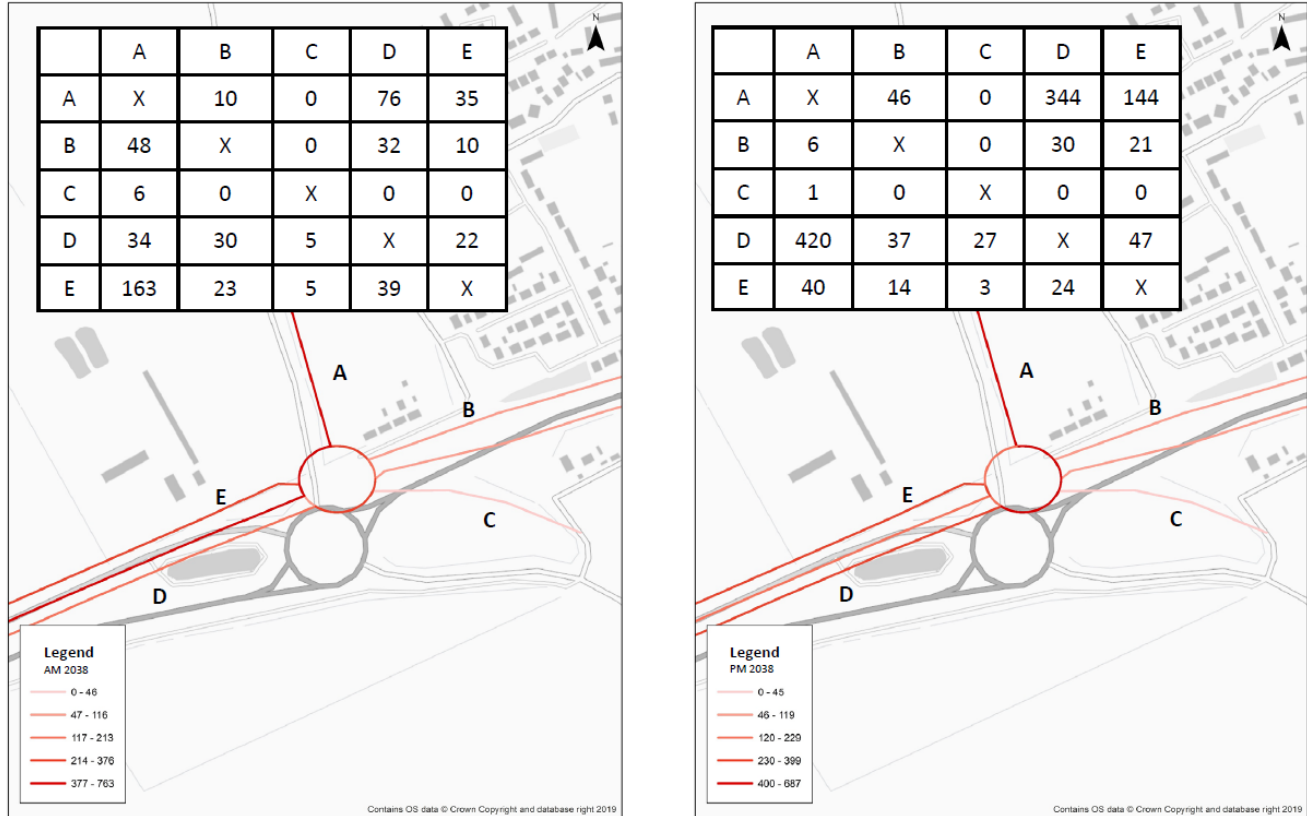
Figure 22 – A160 / Habrough Road 2032



From Figure 22, it can be seen that in the 2032 scenarios, there is an increased demand for the junction when compared with the 2027 scenario. However, as seen in Figure 21, there is no dominant demand for any of the links that comprise the A160 / Habrough Road junction.

2038 Assessment Year

Figure 23 – A160 / Habrough Road 2038

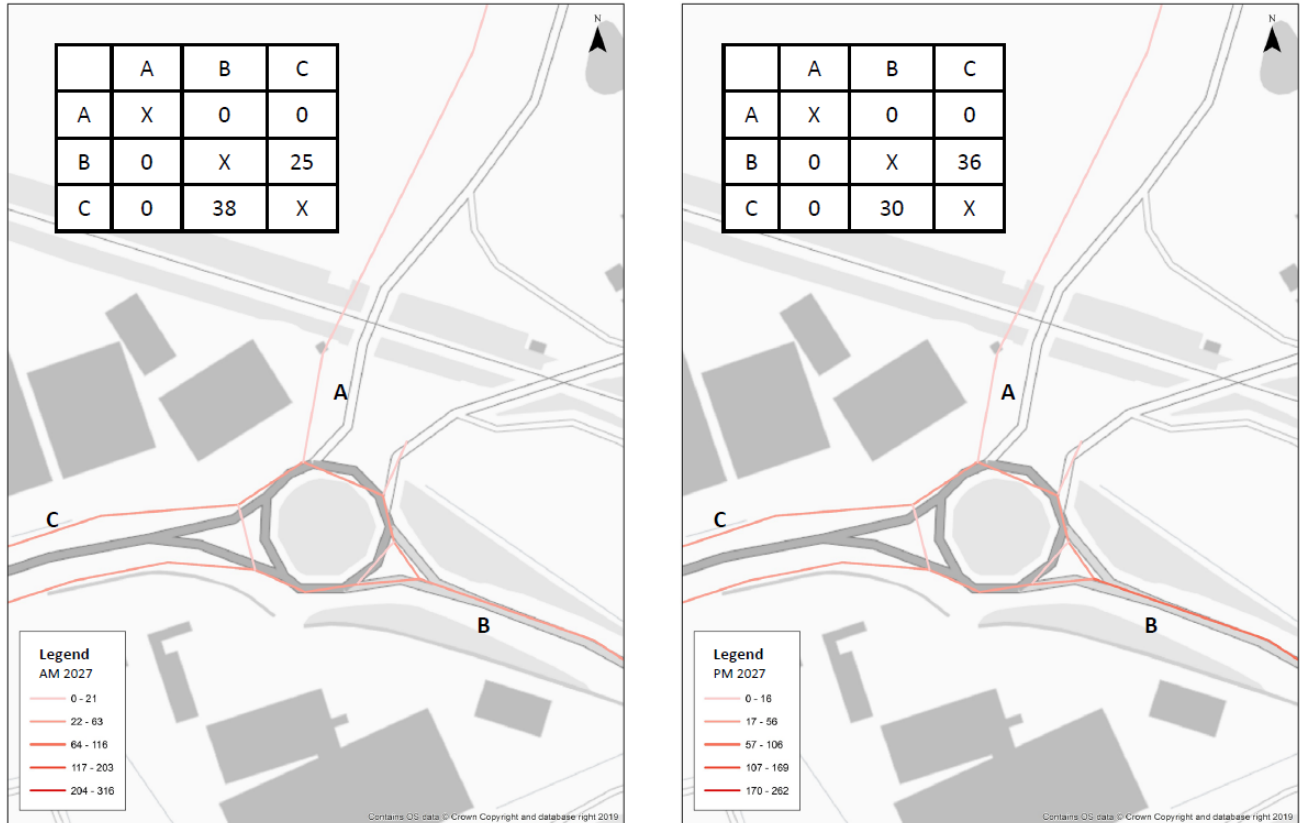


In the 2038 scenarios there is increased demand for the junction, which is as a consequence of the phasing of sites within the vicinity of the junction. In the morning peak, the dominant demand is for East Halton Road from the junction, with this demand predominantly coming from the A1077 eastbound. In the evening peak, the dominant flow is southbound on East Halton Road towards the junction, with the majority of these vehicles heading southbound on the A160. Also, in the evening peak, there is a large demand from the A160 northbound towards East Halton Road.

3.9 A160 / Manby Road

2027 Assessment Year

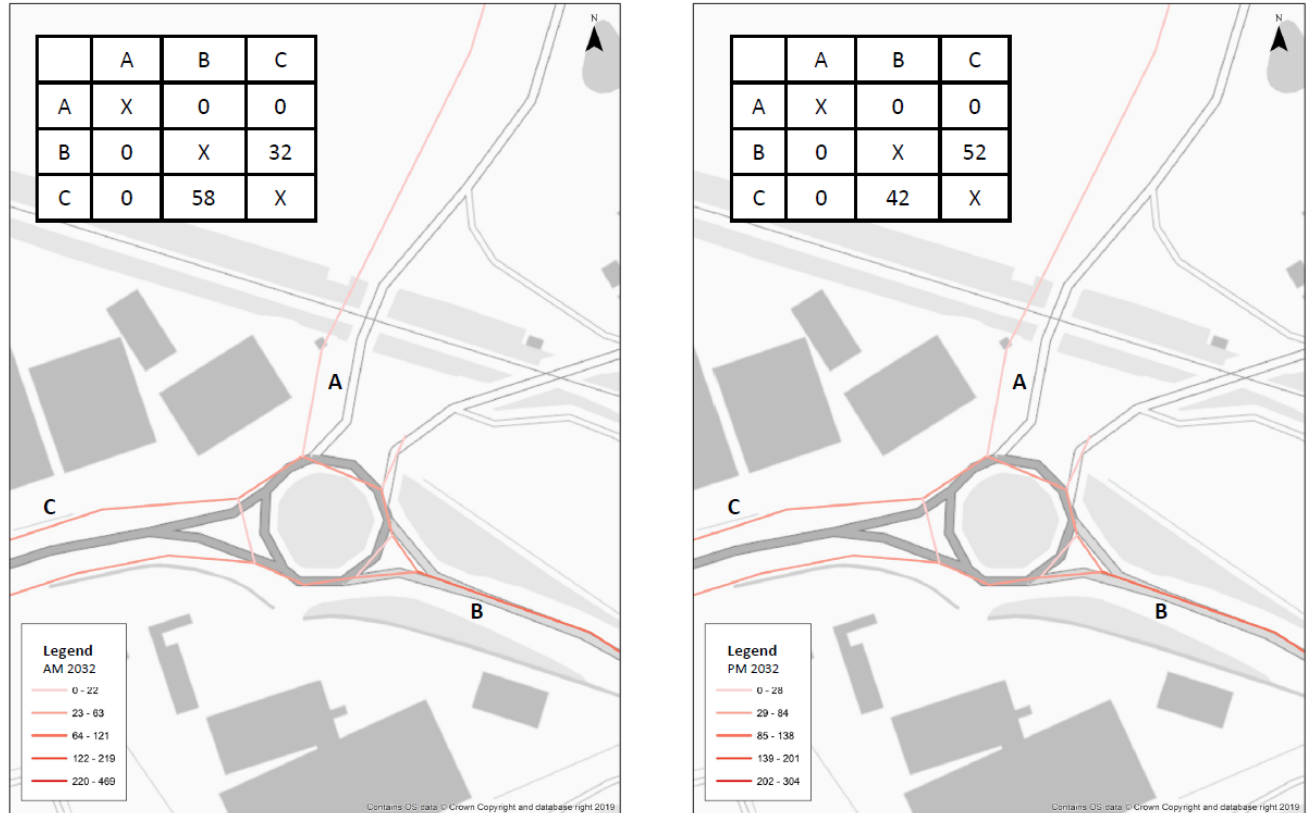
Figure 24 – A160 / Manby Road 2027



From Figure 24, it can be seen that in the 2027 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise the A160 / Manby Road junction.

2032 Assessment Year

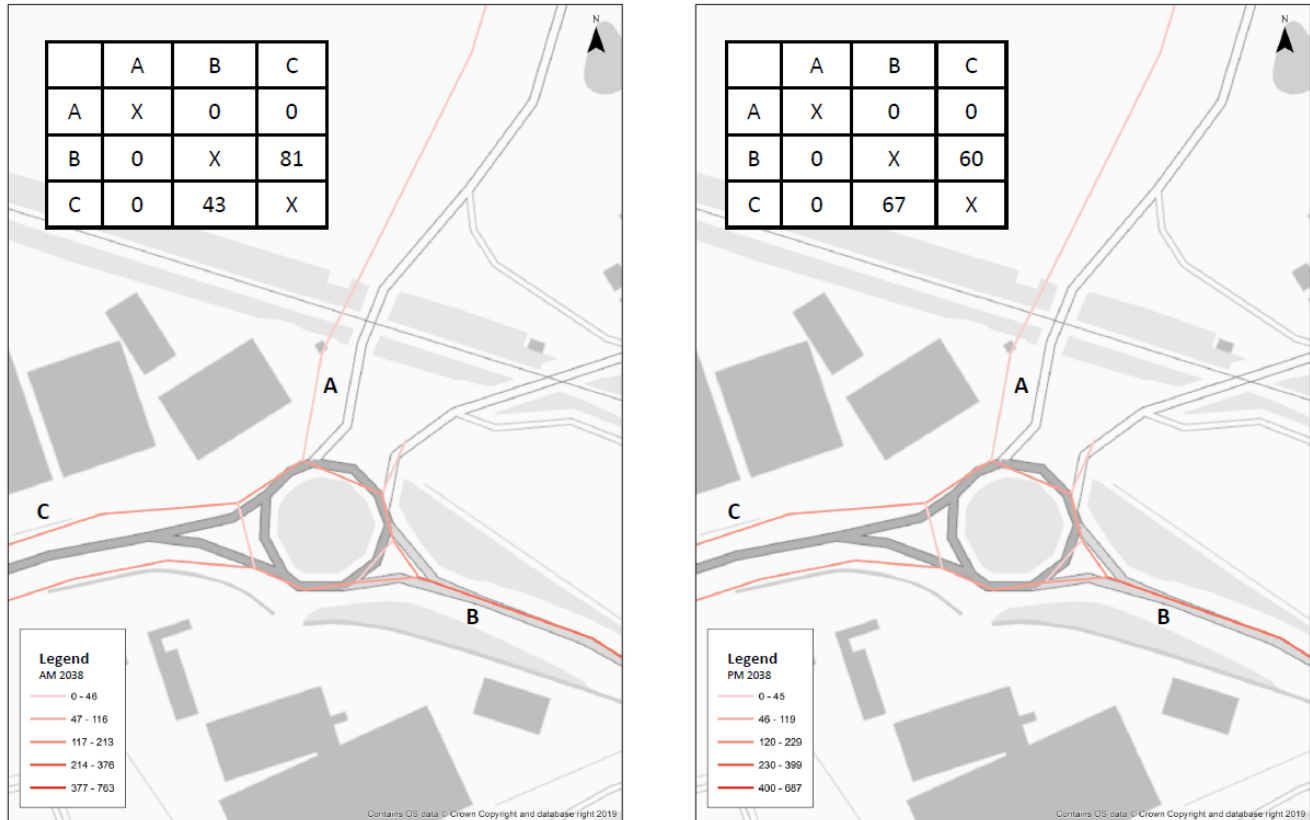
Figure 25 – A160 / Manby Road 2032



From Figure 25, it can be seen that in the 2032 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise the A160 / Manby Road junction.

2038 Assessment Year

Figure 26 – A160 / Manby Road 2038



From Figure 26, it can be seen that in the 2038 scenarios, the flows in both the morning and evening peaks are relatively low, with no dominant demand for any of the links that comprise the A160 / Manby Road junction.

4. Merge / Diverge and Mainline Analysis

In order to build up a picture of the study area with regards base (2019) flows, CH2M has interrogated the WEBTRIS¹ database to extract flows for all links on the SRN within the study area, as well as identifying the morning and evening peak hours. Such an interrogation allows for merge / diverge and mainline analysis to be undertaken at locations within the study area where data exists. The base flows are presented in Table 4.

Table 4 – WEBTRIS Flows

Road	Link / Direction	Morning Peak	Evening Peak
A160	Westbound between A1173 and A1077	459 (07:00 – 08:00)	634 (16:00 – 17:00)
A160	Eastbound between A1077 and A1173	-	-
A160	Westbound between A1077 and A180	488 (08:00 – 09:00)	621 (16:00 – 17:00)
A160	Eastbound between A180 and A1077	1,173 (07:00 – 08:00)	628 (16:00 – 17:00)
A180 / A160	Brocklesby Interchange Eastbound Off-Slip	-	-
A180 / A160	Brocklesby Interchange Westbound Off-Slip	-	-
A180 / A160	Brocklesby Interchange Eastbound On-Slip	-	-
A180 / A160	Brocklesby Interchange Westbound On-Slip	-	-
M180	Junction 5 Eastbound On-Slip	981 (08:00 – 09:00)	493 (17:00 – 18:00)
M180	Junction 5 Westbound Off-Slip	544 (07:00 – 08:00)	744 (17:00 – 18:00)
M180	Junction 5 Westbound On-Slip	965 (08:00 – 09:00)	760 (16:00 – 17:00)
M180	Junction 5 Eastbound Off-Slip	755 (08:00 – 09:00)	838 (17:00 – 18:00)
M180	Junction 5 Westbound Mainline	981 (07:00 – 08:00)	1,257 (16:00 – 17:00)
M180	Junction 5 Eastbound Mainline	1,318 (07:00 – 08:00)	973 (16:00 – 17:00)
M180	Junction 4 Westbound Off-Slip	938 (08:00 – 09:00)	1,086 (17:00 – 18:00)
M180	Junction 4 Eastbound On-Slip	1,129 (07:00 – 08:00)	894 (16:00 – 17:00)
M180	Junction 4 Westbound Mainline	905 (08:00 – 09:00)	986 (17:00 – 18:00)
M180	Junction 4 Eastbound Mainline	967 (07:00 – 08:00)	968 (17:00 – 18:00)
M180	Junction 4 Westbound On-Slip	445 (07:00 – 08:00)	406 (16:00 – 17:00)
M180	Junction 4 Eastbound Off-Slip	442 (08:00 – 09:00)	483 (17:00 – 18:00)
M180	Westbound between Junction 3 and Junction 4	1,382 (08:00 – 09:00)	1,294 (17:00 – 18:00)
M180	Eastbound between Junction 3 and Junction 4	1,228 (07:00 – 08:00)	1,100 (16:00 – 17:00)
M180	Westbound between Junction 2 and Junction 3	1,742 (07:00 – 08:00)	1,884 (16:00 – 17:00)
M180	Eastbound between Junction 2 and Junction 3	1,974 (07:00 – 08:00)	1,706 (17:00 – 18:00)
M180	Junction 2 Westbound Off-Slip	159 (07:00 – 08:00)	342 (17:00 – 18:00)

¹ <http://webtris.highwaysengland.co.uk/>

Road	Link / Direction	Morning Peak	Evening Peak
M180	Junction 2 Eastbound Off-Slip	342 (07:00 – 08:00)	209 (16:00 – 17:00)
M181	Northbound between A18 and M180	1,132 (08:00 – 09:00)	888 (17:00 – 18:00)
M181	Southbound between A18 and M180	848 (07:00 – 08:00)	1,029 (16:00 – 17:00)

(WEBTRIS)

The data above has been extracted from the WEBTRIS Standard Daily Reports at locations on the SRN from Tuesday 19th November 2019, a recent neutral month, with no known school holidays, road works or events. Whilst it can be seen that there is a considerable amount of data available, there is a paucity of data available for the Brocklesby Interchange (A180 / A160 junction).

It is considered that due to the COVID-19 pandemic, there is no realistic option of collecting traffic count data in the short or medium-term, and as such, the use of 2019 data is considered to be the most realistic and accurate option for assessment purposes. Furthermore, the gaps in the data available has resulted in a number of methods of assessing the impact of the Plan at the SRN. If a full suite of data was available, then it would be possible to undertake more detailed junction modelling, either micro-simulation on a junction by junction basis or modelling the entirety of the SRN within North Lincolnshire in a larger model such as SATURN or DYNAMEQ.

As such, this section assesses the SRN using the following approaches:

- Merge / diverge analysis of M180 Junctions 4 and 5; and
- Mainline analysis of the M180 between Junction 2 and Junction 5.

It is accepted that different elements of the SRN have different peak periods. However, for robustness purposes, the peak morning and evening flows have been used for analysis period, alongside the peak hour development flows from the sites in the Plan.

4.1 Merge / Diverge Analysis: M180 Junction 4

With the flow data available, combined with the outputs from GraHAM, it has been possible to undertake merge / diverge analysis of M180 Junction 4, using the diagrams in CD122 *Geometric design of grade separated junctions* TD22/06 *Layout of Grade Separated Junctions* as the mechanism for assessing whether the current provision is capable of providing the capacity for the development flows allied to the sites contained within the Plan.

Table 5 below identifies the current merge/diverge provision and shows whether the current provision provides the capacity across the different assessment years for M180 Junction 4. Where the current provision is not considered sufficient, the required provision is stated.

Table 5 – Merge / Diverge : M180 Junction 4

Link	Current Provision	Morning Peak				Evening Peak			
		2019	2027	2032	2038	2019	2027	2032	2038
Eastbound Merge	E2:3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Westbound Diverge	D3:2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Westbound Merge	D2:2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastbound Diverge	A2:2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

From considering the current provision against the different scenarios, from the analysis undertaken, it is considered by CH2M that the current provision at M180 Junction 4 is sufficient to accommodate the flows generated by the Plan.

4.2 Merge / Diverge Analysis: M180 Junction 5

With the flow data available, combined with the outputs from GraHAM, it has been possible to undertake merge / diverge analysis of M180 Junction 4, using the diagrams in CD122 *Geometric design of grade separated junctions* as the mechanism for assessing whether the current provision is capable of providing the capacity for the development flows allied to the sites contained within the Plan.

Table 6 below identifies the current provision and shows whether the current provision provides the capacity across the different assessment years for M180 Junction 4. Where the current provision is not considered sufficient, the required provision is stated.

Table 6 – Merge / Diverge : M180 Junction 5

Link	Current Provision	Morning Peak				Evening Peak			
		2019	2027	2032	2038	2019	2027	2032	2038
Eastbound Merge	D2:2	Yes	Yes	Yes	Yes*	Yes	Yes	Yes	Yes
Westbound Diverge	A2:2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Westbound Merge	D2:2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastbound Diverge	D3:2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

From considering the current provision against the different scenarios, from the analysis undertaken, it is considered by CH2M that the current provision at M180 Junction 5 is sufficient to accommodate the flows generated by the Plan. However, the Eastbound Merge approaches capacity in the 2038 Morning Peak and this may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.

The detailed merge / diverge analysis for both junctions can be found in Appendix B.

4.3 Mainline Analysis: M180 Junction 2 – Junction 3

Using the information provided within Table 3 earlier in this section, alongside a theoretical capacity of 1,800 vehicles per lane, CH2M has undertaken volume / capacity [V/C] analysis of the mainline links on the M180 within the study area where the data exists for such calculations to be undertaken.

As such, Table 7 below presents the V/C between M180 Junctions 2 and 3, starting from the 2019 base and including the different assessment years:

Table 7 – M180 Junction 2 – Junction 3

	Morning Peak				Evening Peak			
	2019	2027	2032	2038	2019	2027	2032	2038
Westbound between Junction 2 and Junction 3	0.32	0.33	0.34	0.34	0.35	0.36	0.37	0.37
Eastbound between Junction 2 and Junction 3	0.37	0.39	0.41	0.41	0.32	0.33	0.34	0.34

From the numbers presented in Table 7, it is evident that the capacity of the mainline between M180 Junctions 2 and 3 will not be adversely affected by the flows from the sites within the Plan.

4.4 Mainline Analysis: M180 Junction 3 – Junction 4

Table 8 below presents the V/C between M180 Junctions 3 and 4, starting from the 2019 base and including the different assessment years:

Table 8 – M180 Junction 3 – Junction 4

	Morning Peak				Evening Peak			
	2019	2027	2032	2038	2019	2027	2032	2038
Westbound between Junction 3 and Junction 4	0.38	0.40	0.40	0.41	0.36	0.37	0.37	0.38
Eastbound between Junction 3 and Junction 4	0.34	0.35	0.36	0.36	0.31	0.32	0.33	0.33

From the numbers presented in Table 8, it is evident that the capacity of the mainline between M180 Junctions 3 and 4 will not be adversely affected by the flows from the sites within the Plan.

4.5 Mainline Analysis: M180 Junction 4 – Junction 5

Table 9 below presents the V/C between M180 Junctions 4 and 5, starting from the 2019 base and including the different assessment years:

Table 9 – M180 Junction 4 – Junction 5

	Morning Peak				Evening Peak			
	2019	2027	2032	2038	2019	2027	2032	2038
Westbound between Junction 4 and Junction 5	0.36	0.38	0.38	0.39	0.37	0.39	0.40	0.41
Eastbound between Junction 4 and Junction 5	0.38	0.40	0.41	0.43	0.34	0.35	0.36	0.36

From the numbers presented in Table 9, it is evident that the capacity of the mainline between M180 Junctions 4 and 5 will not be adversely affected by the flows from the sites within the Plan.

4.6 Summary

From the analysis presented in this section, it is clear that the sites contained within the Plan will not adversely affect the mainline flow between M180 Junction 2 and M180 Junction 5. In addition, it is considered that the current merge and diverge provision at M180 Junctions 4 and 5 will not require upgrading as a consequence of the sites contained within the Plan. However, the Eastbound Merge at M180 Junction 5 approaches capacity in the 2038 Morning Peak and this may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.

5. A160 Upgrade Scheme

5.1 A160 Upgrade Information

Completed and opened in March 2017, the A160 Upgrade scheme was required as it was considered by Highways England to be an important strategic route which experienced congestion – particularly along the single carriageway section – due to the very high proportion of heavy goods vehicles heading towards / from the Port of Immingham.

The length of the scheme is approximately 5km, and the key elements of the scheme included:

- Upgrade of the Brocklesby Interchange to an oval two bridge roundabout layout, including a dedicated left turn lane for vehicles travelling from the eastbound A180 to the A160;
- Upgrade of the single carriageway section of the A160 to dual carriageway standard;
- A relocation of Habrough Roundabout to the west of its current position, with new link roads provided from the A160 to Ulceby Road, Top Road and Habrough Road;
- The closure of the central reserve gap at the junction with Town Street and partial closure of the gap at the entrance to the oil refinery;
- Provision of a new road bridge at Town Street to provide vehicle and pedestrian access between the two parts of South Killingholme;
- Provision of a new gyratory carriageway system between the Manby Road roundabout, Rosper Road junction and the Port of Immingham, which required the construction of a new link road and bridge beneath the railway; and
- A localised diversion of third-party gas pipelines that cross beneath the A160.

The scheme was delivered with an aim to stimulate growth and unlock economic benefits in the area by:

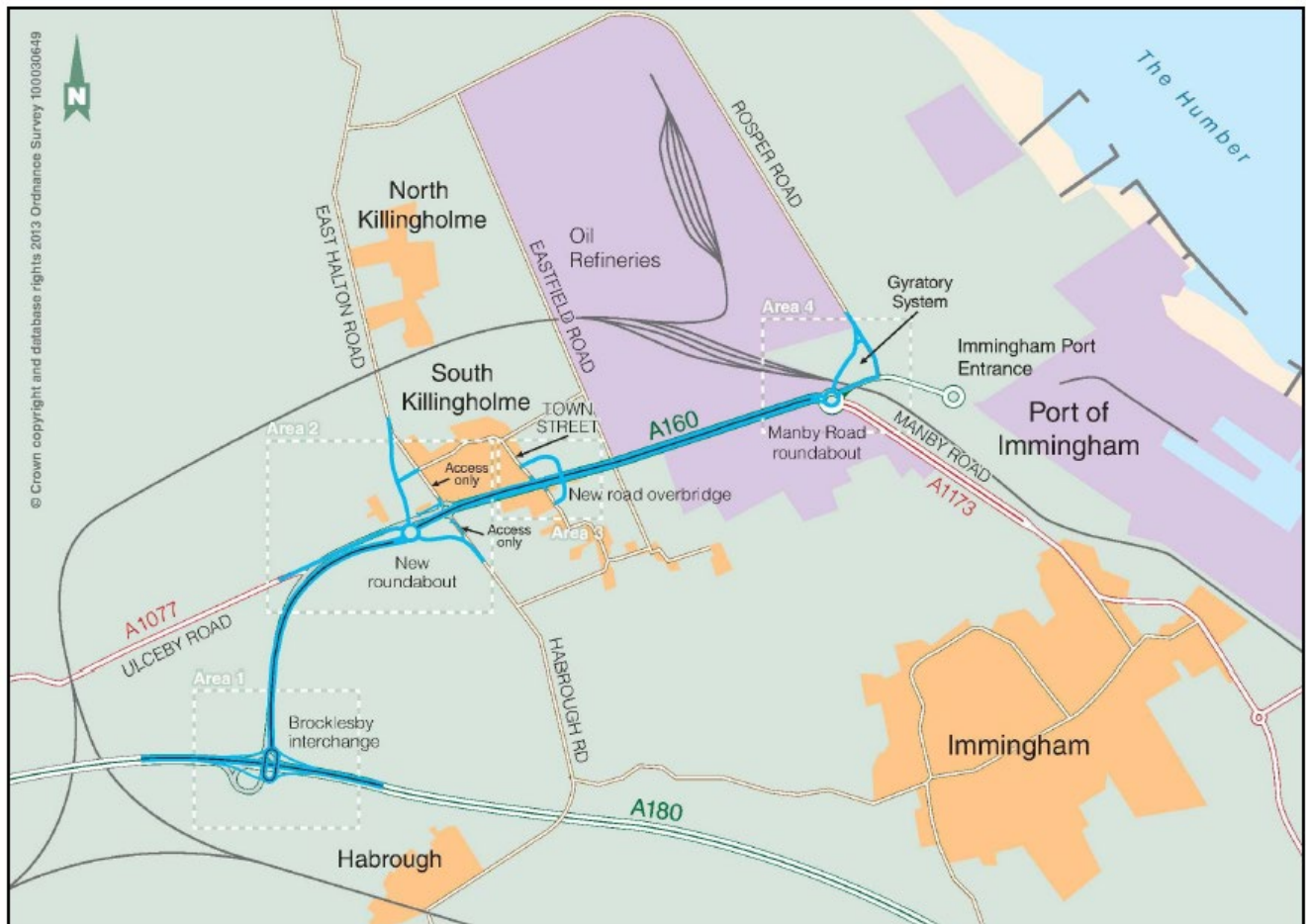
- Reducing traffic congestion;
- Improving journey time reliability;
- Meeting the demands of the predicted growth in traffic resulting from existing and future developments nearby; and
- Improving safety for road users and the local community.

Following liaison with Highways England, the Traffic Forecasting Report [TFR] for the scheme was shared with CH2M, and this is considered below.

5.2 Traffic Forecasting Report - A160 / A180 Port of Immingham Improvement – January 2014

The extents of the scheme can be seen in Figure 27, replicated from the TFR.

Figure 27 – A160 Scheme



(TFR, Page 8)

The TFR sets out the process undertaken in preparing the A160 Port of Immingham Model [the Model] for use in the forecasting of future traffic conditions on the A160 between the A180 and the Port of Immingham with (Do Something) and without (Do Minimum) the scheme.

It is stated that the model forecasts are intended to be used in the assessment of economic benefits and environmental impact of the scheme. It should be noted that CH2M has undertaken a high-level review of the TFR to see how it aligns with the wider scoping undertaken in this TM and how the Model might be able to be used going forward.

The TFR provides details of the methodology used in the development of the traffic forecasts for both the Do Minimum and Do Something preferred route scheme; and is stated that it aims to demonstrate that the Model has been developed to represent projected changes in both travel demand and network supply. The Model has a base year of 2010 and was built in SATURN.

The TFR states that to account for a general reduction in trips in the area due to the effects of the economic recession, a 2012 interim forecast traffic model was developed. The Model was developed using TRADS and survey data (both collected in 2012) to apply a growth factor between 2010 and 2012. It is stated that the 2012 demand matrices have been developed using the 2010 base model and a set of 2012 traffic surveys.

The 2012 demand matrices have been produced to act as an alternative base year from which to forecast future demand. It is stated that this is necessary to account for a general reduction in trips in the area between 2010 and 2012 due to the effects of the economic recession. The TFR concludes that both TEMPro and NTM data were not suitable for use in determining changes in traffic between 2010 and 2012 in this area.

The future year travel supply relates to updating the highway network to represent the future year both 'with' and 'without' the scheme. The 'without' network, known as Do Minimum, included other committed changes to the network which were planned to be delivered irrespective of the scheme going ahead. The 'with' network, known as the Do Something, includes the same committed schemes as in the Do Minimum plus the improvements relating to the scheme.

With regard to design years, an opening year of 2016 was modelled as the first of the future years, with a design year of 2031, 15 years after scheme opening, was also modelled. In addition, it is stated that for accurate assessment purposes, an intermediate year of 2023 and a final year of 2041 were also modelled.

In order to model the impact of developments within the study area – which formed part of the scheme's uncertainty log – lists of developments were received from the Council and North East Lincolnshire Council. Of these development sites there are seven specific development sites which were identified within the North Lincolnshire model area:

- Able Marine (South Humber Bank);
- Able Logistics (South Humber Bank);
- Bio-ethanol Plant (South Humber Bank);
- Glass Wool Manufacturing Plant (South Humber Bank);
- Hargreaves Warehousing and Industrial Development (North Killingholme Airfield);
- Two small container storage sites (North Killingholme Airfield); and
- Scunthorpe Residential Sites (multiple sites grouped into single model zone).

There were nine specific development sites identified within the North East Lincolnshire model area:

- Abengoa Bioethanol Plant (Immingham);
- XHelius Biomass Plant (Immingham);
- ABP (Immingham);
- Katoen Natie (Immingham);
- Encycle (Immingham);
- Real Ventures (Immingham);
- Graypen Ltd (Immingham);
- Vireol Bioethanol Plant (Grimsby); and
- Residential Sites (mainly in Grimsby / Cleethorpes area).

The TFR concludes that the forecast scenarios show that the scheme improves traffic conditions in the area by reducing delay along the A160 corridor between the A180 and the Port of Immingham; and this reduction in traffic delay results in a rise in traffic volumes on the A160, due to re-assignment from a range of alternative routes.

It is considered by CH2M from reviewing the TFR in the context of this work that the seven specific development sites listed above – and included within the uncertainty log – are also included within the sites being considered by CH2M within this Report. As such, this provides a level of comfort and surety that the A160 Upgrade scheme can accommodate the development aspirations of the Council on this section of the SRN. In addition, this assessment of the work undertaken previously reduces the need for complex and expensive modelling of this part of the SRN, given that the TFR has a final year of 2041 within its assessment, which is beyond the end of the Plan period.

DRAFT

6. M181 Terminating Junction / Lincolnshire Lakes

In October 2017, CH2M reviewed the Transport Assessments [TA] prepared by AECOM on behalf of Highways England in support of a planning application (reference: PA/2017/1386) for a new terminating junction on the M181, which was subsequently approved.

The proposed scheme includes a central roundabout on the M181, with two junctions providing access to the B1450 Burringham Road. Burringham Road will provide access to the proposed Lincolnshire Lakes development, which has gained planning consent (Planning application reference: PA/2015/0396). In addition, it was stated within the TA that it is the intention for the M181 to be detrunked, with the remaining length of the M181 reclassified as an all-purpose trunk road, with the proposed terminating junction the point of de-trunking.

For the purposes of this Report, CH2M has referenced the review to provide the context of the M181 Terminating Junction as a piece of highways infrastructure to support the development quantum proposed at Lincolnshire Lakes, within the wider context of the Plan.

6.1 AECOM Transport Assessment Review

The TA considered that the Lincolnshire Lakes scheme comprises up to 2,500 dwellings, as well as commercial floorspace and leisure facilities, which will be located either side of the existing M181. As part of the reserved matters application for Lincolnshire Lakes, details of the proposed M181 Terminating Junction were included within the TA, including an assessment of the junction.

The M181 Terminating Junction comprises the following:

- Roundabout 1 is a five arm, un-signalised roundabout junction, located on the B1450 Burringham Road to the west of the existing M181 and would provide access to the Maltgrade Phase 2 development plot as well as the proposed Lakes area to the south-west;
- Roundabout 2 comprises the new at grade, four-arm, un-signalised roundabout junction of the de-trunked M181 with B1450 Burringham Road, providing a new access route from the M181 to Scunthorpe and local villages via Burringham Road. A single lane approach will be provided towards the roundabout from Roundabouts 1 and 2, which then flare at the approach to a three-arm entry. The B181 would provide a two-lane dual carriageway both north and southbound of the roundabout, which would also flare to a three-arm entry at the junction. The gyratory will provide three lanes, with an inscribed diameter of 80 m; and
- Roundabout 3 is located on the B1450 Burringham Road to the east of the existing M181 and would provide access to the Maltgrade Phase 1 development plot as well as potential future Lincolnshire Lakes development sites to the south-east.

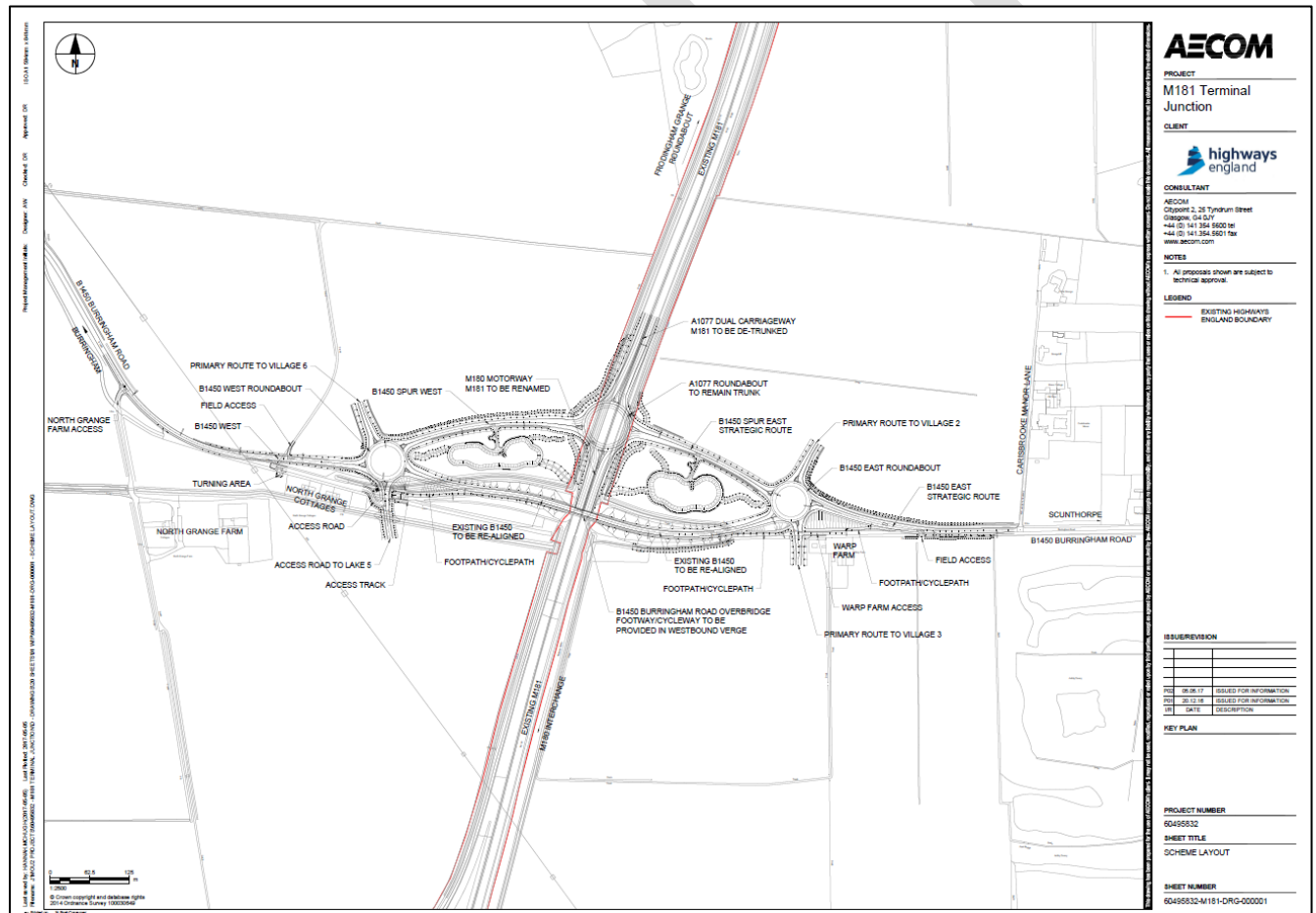
In addition, to the three roundabouts, the following infrastructure is proposed:

- The realignment of the existing B1450, locating the overpass slightly further to the south of its current crossing with the M181, with the existing overpass removed. The B1450 Burringham Road will be upgraded to create a strategic route from the de-trunked route, providing a shared footway / cycle way along the westbound carriageway, linking Roundabouts 1 and 2; this will also connect to a network of pedestrian, cycle and bridleways, which shall be provided throughout and between the Lincolnshire Lakes villages;
- Walking and cycling facilities associated with the Lincolnshire Lakes development will also link to existing facilities along B1450 Burringham Road to the east, connecting Scunthorpe, Lincolnshire Lakes and local villages;
- The B1450 will continue to provide a single lane in each direction on both its spur roads from the central roundabout and its bypass section to the south. The bypass between Roundabouts 1 and 3 is proposed in order to alleviate potential congestion caused by increased east / west traffic along the B1450, associated with the proposed Lincolnshire Lakes development sites;

- Access to existing properties along the B1450, such as North Grange Cottages to the west and Warp Farm to the east of the existing M181 will also be provided by new spurs linking to Roundabouts 1 and 3;
- The new M181 roundabout junction will be located approximately 500m north of the point the M180 northbound off-slip merges at the de-trunked M181;
- The existing B1450 overbridge would remain and tie into the roundabouts either side of the M181. It will serve as a link over the M181 for all road users and act as a Non-Motorised User [NMU] route. This link would be part of the larger NMU strategy to be implemented as part of the Lincolnshire Lakes development to encourage walking and cycling. This strategy encompasses a network of pedestrian and cycle routes to be provided throughout and between the villages that are safe, attractive and useable. There are no existing NMU routes within the proposed Scheme area; and
- A shared footpath / cycleway will be provided to the north of the western roundabout into the Village 6 Primary Access Road and to the south of the western roundabout into Lake 5. A shared footway / cycleway would be provided to continue north and south route of the existing B1450 carriageway on the southern leg of the eastern roundabout to access to Lakes 1 and 2 and Village 2 and 3 Primary Access Road.

Figure 28 provides the layout of the M181 terminating junction.

Figure 28 – M181 Terminating Junction



(AECOM TA, Appendix A)

It was stated that traffic flow data to inform the TA had been derived from the following sources:

- 2015 AECOM M181 Terminal Junction – Junction Modelling Report;
- 2016 (January Update), Maltgrade Lincolnshire Lakes Transport Assessment; and
- Webtris 2017 M181 Traffic Flows.

It was considered that these are appropriate sources of data for assessment purposes. Furthermore, it was stated that 'worst case' 2033 traffic flows were used after the traffic flow data sources were compared by AECOM. Again, this was considered robust for such an approach to be utilised.

Trip generation, trip distribution and committed developments identified within the TA for the Lincolnshire Lakes approval were utilised within the TA. Given that the Lincolnshire Lakes TA was consented, this approach was considered appropriate. The committed developments included the following sites:

- Gallagher residential development consisting of 1,056 dwellings, located north of Doncaster Road;
- Doncaster Road retail development located the south of Doncaster Road;
- Derby Glass Site consisting of 80 residential units, located on Sunningdale Road, south of Burringham Road; and
- A golf course redevelopment site on Burringham Road consisting of 80 residential units.

It is stated that the 2033 forecast traffic flows were derived by comparing the link and turning flows from the previously identified sources and growing the flows – where required – to the 2033 assessment year using TEMPro growth factors. This approach – and the TEMPro growth factors utilised – were accepted.

In order to obtain a separate comparison to the above methodology, a separate forecast was undertaken for the M181 traffic flows using existing M181 counts obtained from Webtris database. These were obtained to provide confidence that a robust set of M181 flows had been used. From considering the comparison presented within the TA, it was considered that the flows used in the TA are the 'worst case' and as such, offered the most robust assessment of the proposed junction.

The proposed junction was assessed using Junctions 8, and the following junctions within the proposed scheme were modelled within the TA for the 2028 morning and evening peak hours:

- The Western Roundabout;
- The M181 Terminating Junction; and
- The Eastern Roundabout.

The TA details the use of 'one hour' and 'flat' profiles with regard to input flows into Junctions 8. Given that the existing traffic flows are not considered to peak significantly across the assessment hour, both the 'one hour' and 'flat' profiles have been used for assessment purposes. This was considered by CH2M to be a robust approach.

From considering the Junctions 8 outputs presented within the TA, the following conclusions were drawn:

- The Western Roundabout operates within capacity in the 2033 morning and evening peak scenarios;
- The M181 Northern Arm of the Central Roundabout operates over capacity in the morning peak 'one hour' assessment, with a number of arms approaching capacity with a Ratio of Flow to Capacity [RFC] between 0.85 and 1. In the morning peak 'flat' assessment, the M181 Northern Arm is observed as approaching capacity; and
- The Eastern Roundabout operates within capacity in the 2033 morning and evening peak scenarios.

Table 7 of the TA showed that there was a queue of 47 vehicles in the morning peak, although this occurs on the de-trunked section of the M181 on the southbound approach to the terminating junction. In addition, there was a queue of 11 vehicles on the SRN on the northbound approach to the terminating junction.

Whilst a queue of 11 vehicles on the SRN may be considered acceptable, given that a new junction is being proposed, it was considered that a revised layout of the proposed scheme could be considered to mitigate the impact of the development traffic considered within the TA to reduce queuing on the SRN. Furthermore, it was not known what capacity and safety implications the proposed queuing would have for the SRN.

The TA stated that 'Although no queue is desirable, this level of queueing is not considered to represent a significant traffic problem at the junction'. It was stated that the junction is likely to operate between the two profiles ('one hour' and 'flat') but given that this could result in an operating RFC of 1 or above, this was not considered to be an acceptable RFC.

6.2 Updated AECOM Transport Assessment Review

CH2M's concerns regarding the TA were shared with AECOM, and subsequently a meeting between CH2M, AECOM and Highways England was held on Tuesday 10th October 2017 to discuss the issues. At the meeting, an updated TA was presented, which had taken into account the concerns raised by CH2M through the above review. In order to progress the review of the development proposals, the review of the updated TA was been added to the original review process.

Whilst AECOM provided a robust assessment of the base flows within their TA, subsequent discussions with AECOM considered that there was an over-robustness in the consideration of the base flows, which led to an over estimation of the trips on the M181. As such, updated 2017 M181 base flows were available from the DfT and this were used by AECOM in the updated TA.

Table 3 of the updated TA showed the difference in flows between the 2017 Webtris flows and the 2014 flows used within the Maltgrade TA. It is stated that the May 2017 morning and evening peak flows are lower than the previous 2014 base flows used in the original Maltgrade TA. This is particularly the case for the Southbound morning peak hour traffic flow which was observed as being significantly higher in the Maltgrade TA. Given that the Webtris traffic flows are based on long term traffic data, AECOM stated that they are confident that the recorded traffic flows for May 2017 are consistent with other months and years and therefore provided a robust baseline that were representative of current flows. This was accepted by CH2M.

From considering the Junctions 8 outputs presented within the updated TA, the following conclusions were drawn:

- The Western Roundabout operates within capacity in the 2033 morning and evening peak scenarios;
- The M181 Northern Arm of the Central Roundabout operates over capacity in the morning peak 'one hour' assessment, with a queue of ten vehicles. Also, in the morning peak, the Southern Arm also operates with a queue of ten vehicles. All of the other arms, in both the morning and evening peaks operate at an RFC less than 0.85; and
- The Eastern Roundabout operates within capacity in the 2033 morning and evening peak scenarios.

Given that the flat profiles of the above the queues of ten vehicles are reduced to a queue of four vehicles on the Northern Arm and five vehicles on the Southern Arm of the Central Roundabout.

As such, it is considered that the three roundabouts which comprise the terminating junction will operate within capacity in 2033, given the above, and that it is considered that an element of double counting has been undertaken due to both committed developments and TEMPro growth being included within the base flows. As such, CH2M accepted the contents of the updated TA.

6.3 Summary

This section has reviewed CH2M's review of the TAs prepared in support of the M181 Terminating Junction, which were prepared in support of the infrastructure required to enable the Lincolnshire Lakes development to be accessed, and to come forward as part of the Plan.

Given the above, it is considered that the M181 Terminating Junction will be operating within capacity in 2033, when considering the impact of 2,500 dwellings at Lincolnshire Lakes, and as such the level of mitigation infrastructure provided at the SRN is considered appropriate.

It is accepted that the Plan period runs to 2038, and as such, it is considered that the proposed infrastructure does not necessarily accommodate the quantum of the Plan throughout the Plan period. However, the de-trunking of the M181 places the onus of infrastructure provision onto the Council.

7. Infrastructure Considerations

Given the nature of the Report brief and the GraHAM outputs, the consideration of the infrastructure needed at the SRN to accommodate the development flows from the aspirations within the Plan can only be presented on a high-level basis. Notwithstanding, the considerations presented within this section can be used for feeding into the Council's infrastructure considerations as part of the wider evidence base to support the Plan.

There are no planned infrastructure interventions at the SRN within North Lincolnshire between the time of writing this Report and the end of the Plan period in 2038.

7.1 M180 Junction 2

It is not considered that a mitigation intervention is required at this junction as a consequence of the flows generated by the sites within the Plan.

7.2 M180 Junction 3

It is not considered that a mitigation intervention is required at this junction as a consequence of the flows generated by the sites within the Plan.

7.3 M181 Terminating Junction

Section 6 of this Report provides a detailed consideration of the operational issues at this location, more so than the GraHAM analysis work undertaken within this Report. Section 6 concluded that it is considered that the proposed infrastructure does not necessarily accommodate the quantum of the Plan throughout the Plan period; and that the de-trunking of the M181 places the onus of infrastructure provision onto the Council.

As such, this location and may require a more detailed analysis through the Plan period to ascertain if any further mitigation needs to be provided at this location.

7.4 M180 Junction 4

It is not considered that a mitigation intervention is required at this junction as a consequence of the flows generated by the sites within the Plan.

7.5 M180 Junction 5

It is not considered that a mitigation intervention is required at this junction as a consequence of the flows generated by the sites within the Plan.

However, the Eastbound Merge at M180 Junction 5 approaches capacity in the 2038 Morning Peak and this may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.

7.6 A180 / A160 Brocklesby Interchange

It is not considered that a mitigation intervention is required at this junction as a consequence of the flows generated by the sites within the Plan, combined with the recent works completed as part of the A160 Upgrade scheme.

7.7 A160 / Habrough Road

It is not considered that a mitigation intervention is required at this junction as a consequence of the flows generated by the sites within the Plan, combined with the recent works completed as part of the A160 Upgrade scheme.

However, given the flows generated in the 2038 scenarios, it is considered that this location may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.

7.8 A160 / Manby Road

It is not considered that a mitigation intervention is required at this junction as a consequence of the flows generated by the sites within the Plan, combined with the recent works as part of the A160 Upgrade scheme.

8. Summary and Conclusions

8.1 Summary

CH2M has been commissioned by Highways England to undertake an assessment of the development quantum being proposed by North Lincolnshire Council within their emerging Local Plan with regard its potential impact at the Strategic Road Network. In addition, and within the spirit of co-operation, Highways England and the Council have agreed that the assessment of the development quantum is to form part of a wider piece of work – of which this Report is the output – which will form part of the Council's evidence base to inform and underpin the Plan as it emerges.

Within the district of North Lincolnshire, the SRN comprises the M180, M181, A180 and A160:

- The M180 provides an east-west link between the A180 to the east and the M18 in the west;
- The M181 provides a north-south link between Scunthorpe in the north and the M180 in the south;
- The A180 provides an east-west link between Grimsby to the east and the M180 in the west; and
- The A160 provides an east-west link to the north of the A180, between Immingham to the east and the A180 in the west.

As part of Highways England's duty to co-operate, Highways England instructed CH2M to undertake the following tasks:

- Agreement with Highways England and the Council regarding the assessment years to be considered within this Report, which were subsequently agreed as 2027, 2032 and 2038;
- Use of the GraHAM tool to consider the traffic patterns associated with the quantum of development proposed within the Plan;
- High-level consideration of impacts at the SRN, which will include link flows and turning movements;
- Use of the base flow information identified during scoping to allow for merge / diverge assessments to be undertaken at M180 Junctions 4 and 5;
- Use of the base flow information identified during scoping to allow for volume / capacity mainline assessments to be undertaken;
- A detailed consideration of the A160 Upgrade Scheme, assessing the development quantum included at this location;
- A detailed consideration of the M181 Terminating Junction (Lincolnshire Lakes), based on Highways England's involvement to date at this location; and
- Identification of infrastructure interventions and considerations where required.

A further agreed task was the production of a Report, detailing the work undertaken and outputs, which is this Report.

In order to distribute and assign the trips associated with the proposed sites listed above, the GraHAM tool has been used. For the purposes of this task, CH2M has taken the information provided by the Council in order to run the quantum of development being proposed within the Plan, with different assessment years to reflect the Council's aspirations with regard to the phasing and emergence of development through the Plan period.

As such, this has enabled a high-level consideration of impacts at the SRN - including link flows and turning movements – to be undertaken for each junction on the SRN within North Lincolnshire. In addition, due cognisance has been paid to the other key considerations for the SRN within North Lincolnshire, namely the M181

Terminating Junction and the A160 Upgrade, which impact upon the infrastructure before the Plan period ends in 2038.

8.2 Conclusions

In light of the work undertaken within this Report, the following conclusions can be drawn:

- The Report concludes that it is considered that the proposed infrastructure at the M181 Terminating Junction does not necessarily accommodate the quantum of the Plan throughout the Plan period; and that the de-trunking of the M181 places the onus of infrastructure provision onto the Council. As such, this location and may require a more detailed analysis through the Plan period to ascertain if any further mitigation needs to be provided at this location.
- The Eastbound Merge at M180 Junction 5 approaches capacity in the 2038 Morning Peak and this may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.
- Given the flows generated in the 2038 scenarios, it is considered that the A160 / Habrough Road roundabout may require a more detailed analysis through the Plan period to ascertain if any mitigation needs to be provided at this location.

Appendix A. GraHAM Trip Rates

Category	Area	Trip Rate	AM In	AM Out	PM In	PM Out	Jobs (area per employee)
Housing							
Private Houses	Hectares	Average	3.85	10.16	9.58	5.74	-
	Dwellings	Average	0.15	0.41	0.38	0.23	-
Houses for Rent	Hectares	Average	5.23	9.81	11.78	7.20	-
	Dwellings	Average	0.13	0.25	0.30	0.18	-
Private Flats	Hectares	Average	6.35	23.87	20.94	8.43	-
	Dwellings	Average	0.05	0.20	0.17	0.07	-
Flats for Rent	Hectares	Average	5.28	7.89	6.96	6.75	-
	Dwellings	Average	0.06	0.09	0.08	0.08	-
Mixed Private	Hectares	Average	4.25	11.70	10.05	6.92	-
	Dwellings	Average	0.12	0.32	0.28	0.19	-
Mixed Non-private	Hectares	Average	3.71	12.45	13.27	7.56	-
	Dwellings	Average	0.08	0.27	0.28	0.16	-
Employment							
B1	Hectares	Average	26.61	4.10	3.28	22.85	0.0083
	Square Metres	Average	0.01	0.00	0.00	0.01	0.2
<i>(Note - hectare values not provided from TRICS - assumed 21% density)</i>							
B2	Hectares	Average	13.61	4.62	2.59	11.53	0.0116
	Square Metres	Average	0.00	0.00	0.00	0.00	0.4
B8	Hectares	Average	5.58	2.83	2.34	5.17	0.0183
	Square Metres	Average	0.00	0.00	0.00	0.00	0.8
<i>(Note - hectare values not provided from TRICS - assumed 41% density)</i>							
B1 / B2 / B8 average	Hectares	Average	15.26	3.85	2.73	13.18	0.0127
	Square Metres	Average	0.01	0.00	0.00	0.01	0.4
B1 / B2 average	Hectares	Average	20.11	4.36	2.93	17.19	0.0099
	Square Metres	Average	0.01	0.00	0.00	0.01	0.3
B1 / B8 average	Hectares	Average	16.09	3.46	2.81	14.01	0.0133
	Square Metres	Average	0.01	0.00	0.00	0.01	0.5
B2 / B8 average	Hectares	Average	9.59	3.73	2.46	8.35	0.0150
	Square Metres	Average	0.00	0.00	0.00	0.00	0.6

Appendix B. Merge / Diverge Outputs