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Lincolnshire Lakes AAP Support

M181 Junction Location Assessment

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Prepared for:
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NORTH LINCOLNSHIRE COUNCIL

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1. INTRODUCTION

1.1.1 North Lincolnshire Council (NLC) commissioned URS to undertake an assessment of the location for a proposed new junction on the existing M181. The work has been completed with input from NLC, the Highways Agency (HA) and the partners in the consultant team for the Lincolnshire Lakes Area Action Plan (AAP).

1.1.2 The new junction on the M181 has been proposed by NLC to serve the Lincolnshire Lakes development to the west of Scunthorpe and also to assist with traffic management of the town. Following previous discussions with the HA a decision on the principle of a junction is now awaiting ministerial approval; this assessment therefore identifies the most appropriate location for a new junction should there be a positive outcome.

1.1.3 This assessment was commissioned as NLC recognise that it, the Highways Agency and other interested stakeholders such as developers require a clear indication of where the junction can be located both from the point of view of feasibility through the influence of physical constraints plus highways and planning considerations and objectives

1.1.4 Although the study is an extension of the commission for the AAP it should be noted that the optioneering for that work is not yet sufficiently advanced to materially effect the outcome of this location assessment. Conclusions and recommendations on the location have therefore been established solely on the criteria and evidence set out in this report.

1.1.5 The report is structured as follows:

- Section 2 provides the policy background and context for the report;
- Section 3 outlines the approach to the study;
- Sections 4 and 5 presents and discusses the HA and NLC inputs respectively;
- Section 6 discusses the traffic and transport planning implications of a new junction;
- Section 7 considers Planning, Flooding and Drainage, Ecology and Heritage;
- Section 8 draws together the evidence base; and
- Section 9 presents the Recommendations resulting from this study.

2. BACKGROUND

2.1 Policy

National policy

2.1.1 In general terms, the *National Planning Policy Framework* aims to ensure the delivery of sustainable development in sustainable locations, minimising adverse environmental impacts as part of this. This will be borne out through the masterplanning process, which is covered elsewhere in this assessment.

Local policy

Core Strategy

2.1.2 Paragraph 5.29 of *North Lincolnshire's Core Strategy* (adopted June 2011) states that one of the key principles of the Lincolnshire Lakes development is to provide sustainable transport infrastructure through improved access into the town, strong public transport, park and ride facilities and walking and cycling routes within the site that provide direct links to the existing networks.

2.1.3 Policy CS26: Strategic Transport Infrastructure Proposals sets a series of strategic road, rail, airport, water transport, renaissance and electronic and telecommunications projects that will enhance internal and external transport connections. Improvements identified specific to Lincolnshire Lakes include:

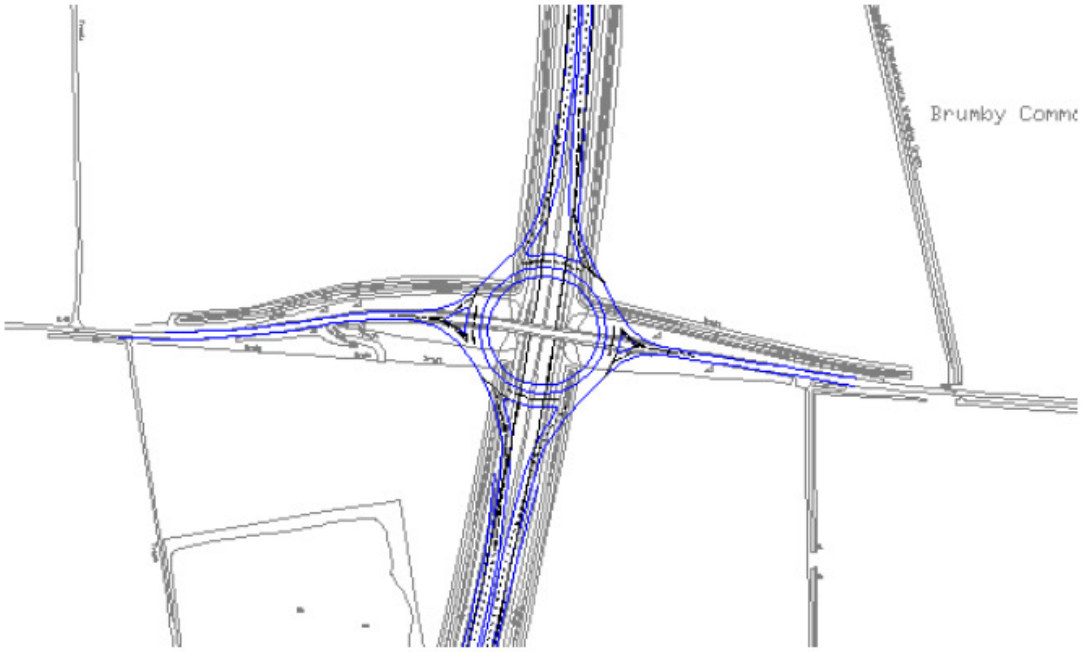
- Road – Access improvements to Scunthorpe from the west to relieve existing congestion, via improvements to the Berkeley Circle and to provide access to the Lincolnshire Lakes area; and
- Renaissance – Supporting transport improvements that will assist in the delivery of the key transformation projects proposed as part of the Scunthorpe Urban Renaissance Programme. This will involve road and potentially rail access improvements to provide better quality access to Scunthorpe and developments such as the Lincolnshire Lakes.

LDF Evidence Base

2.1.4 The *Lincolnshire Lakes Transport Strategy* (October 2010) identifies the delivery of a new junction on the M181, alongside its partial de-trunking and downgrading, as being the preferred option for providing a new gateway to Scunthorpe town centre and also the main strategic access to new development at Lincolnshire Lakes. Alongside this, the 'sustainable visions' which underpin the Strategy look to provide strong links to Scotter Road and improved access to Burringham and Gunness, while reducing the severance created by the M181.

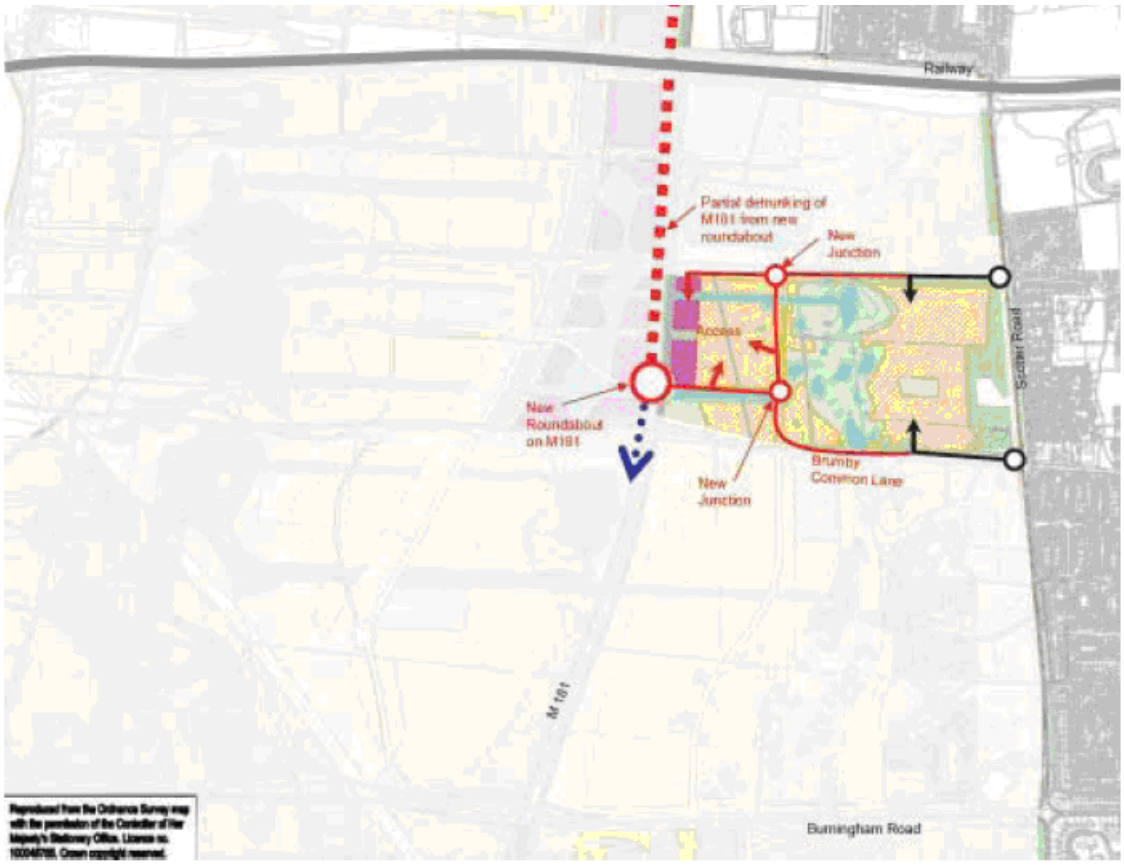
2.1.5 The feasibility exercise that was carried out as part of the Transport Strategy identified a number of potential locations where a new at-grade junction could be provided. In the first instance, the four existing bridges across the M181 were used as references from which a potential location for the junction could be identified. To tie in with the existing east-west road network, the most logical and practical location for the at-grade junction was then identified to be located approximately in the middle of the M181, as shown in the plan below. Anything further south than this was considered to be too close to the M180 slip roads, whereby a safe distance between the termination of the motorway and the existing M181/ M180 junction would not be achieved. The Transport Strategy estimated the cost for providing the new junctions as £6.5m.

Figure 1: Lincolnshire Lakes Transport Strategy Junction Location



2.1.6 The *Lincolnshire Lakes, Scunthorpe: Schematic Masterplan Framework* (December 2010), prepared by Lucent, was put forward as evidence at the Core Strategy Examination in Public. Lucent is a developer actively engaged in producing an outline planning application covering land to the east of the M181. As part of this it is seeking that the junction is located in its land. It is understood that, as part of negotiations on a S106 agreement that would be required in association with any grant of outline permission, Lucent is willing to deliver the junction. The masterplan does not constitute adopted planning policy but broadly reflects the Core Strategy policy. It assumes a new highways junction, involving the partial de-trunking of the M181, to the south of the A18. The location of the junction as shown in Figure 1 places it fully on land that will ultimately be in the ownership of Lucent.

Figure 2: Lucent Schematic Masterplan Junction Location



2.1.7 The emerging Lincolnshire Lakes Vision & Objectives are listed below, based upon the policies above and work to establish a baseline for the Lincolnshire Lakes AAP. They were developed from the North Lincolnshire Core Strategy and will be finalised as part of the optioneering process.

Vision

To deliver a sustainable development of 6,000 new homes, new business space, leisure facilities and community facilities, in an attractive village based waterside setting. Lincolnshire Lakes will bring about the fundamental transformation of Scunthorpe, making it a location of choice for the 21st century, and placing it on a new economic trajectory.

Lincolnshire Lakes will enhance Scunthorpe's role as a major sub-regional town and will create an attractive, green, western entrance to the town, drawing future investment to North Lincolnshire, and will become a focal point for people to live, work and visit.

Objectives

- To create an attractive, green, western entrance to the town, drawing future investment to North Lincolnshire and creating a focal point for people to live, work and visit;
- To phase the release of land in such a way that allows for control of the pattern and speed of growth, co-ordination of infrastructure, and delivery of sustainability objectives;

- To deliver 6,000 new homes by 2026;
- To provide well designed homes, including affordable housing, in the form of distinct villages of a density appropriate for their rural setting;
- To develop a high quality business park and office accommodation to help to diversify the local economy and to create new highly skilled jobs;
- To maximise opportunities for sustainable tourism, leisure, and recreation;
- To provide appropriate community facilities (including schools, health facilities, community centres etc.) to cater for the increased population;
- To maximise opportunities for zero carbon development and ensure that Code for Sustainable Homes and BREEAM standards (or equivalent) are met;
- To introduce new sustainable transport infrastructure providing direct links to the existing networks, whilst improving the current network and access to the town, and also ensuring a full range of transport modes are accessible to the population to encourage them to make sustainable travel choices (public transport, park and ride, walking and cycling);
- To ensure that flood risk is alleviated and mitigated for the new communities and for the existing Trentside villages;
- To introduce a new sustainable energy and waste landscape, with biomass and wind power;
- To expand the town's strong green infrastructure, whilst protecting and enhancing the area's considerable biodiversity.

2.2 Local Context

2.2.1 The local road network in west Scunthorpe is dominated by Scotter Road running north-south and the A18 running east-west. These roads meet at the Berkeley Circle roundabout, which suffers from congestion in peak periods. Almost all traffic accessing central and southern Scunthorpe from the west must use this junction. South of Berkeley Circle, West Common Lane, B1450 Burringham Road, and Moorwell Road provide east-west routes to and from Scotter Road. To the west of Berkeley Circle the A18 has an at grade junction at the termination of the M181, with the A1077 traversing the north of Scunthorpe from this point. The road network is illustrated in Figure 3.

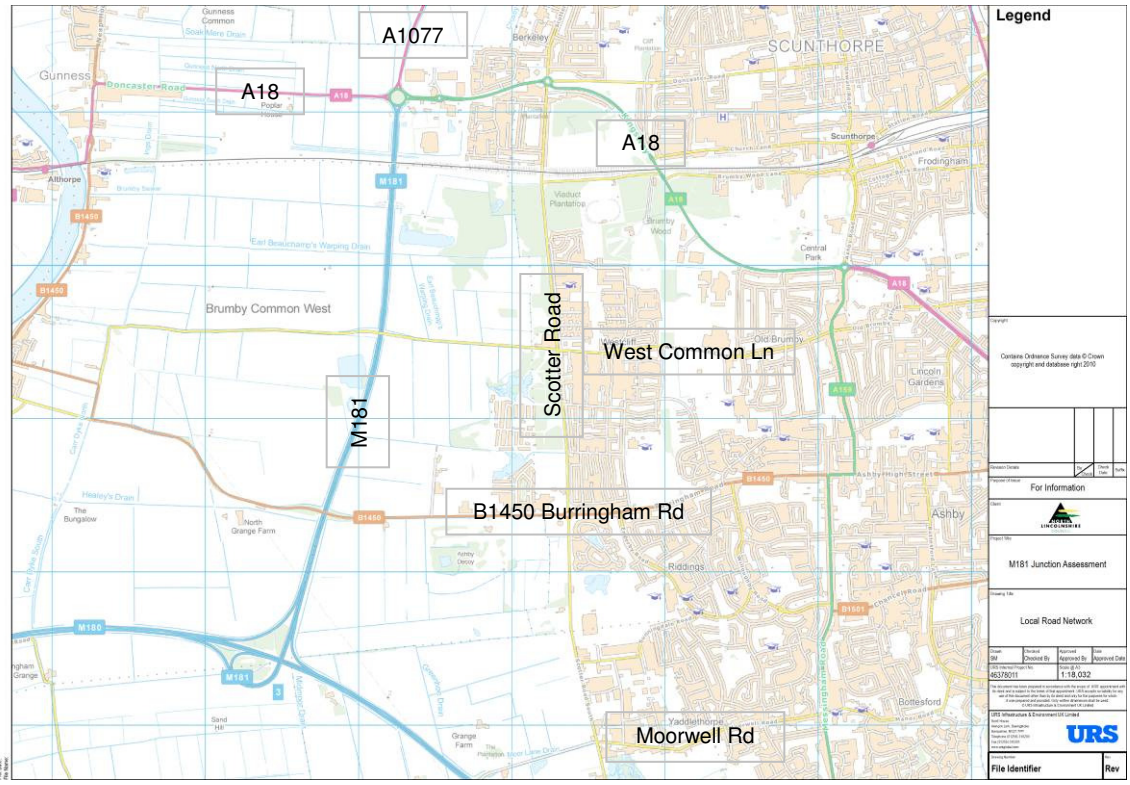
2.2.2 Because of its role as a gateway into Scunthorpe from the west, a proposed new junction on the M181 would provide an opportunity for traffic to re-route away from Berkeley Circle and for alternative management of traffic currently accessing and leaving the town via the A18. In turn this may have benefits at Berkeley circle and more widely on the Scunthorpe road network to relieve congestion.

2.2.3 The M181 forms a formidable barrier within the Lincolnshire Lakes site. There are currently only three locations that provide for movement across the motorway at:

- B1450 Burringham Road;
- Brumby Common Lane;
- A footbridge at the junction with the A18.

2.2.4 Once development is in place the severance effect imposed by the M181 would discourage travel by sustainable modes, particularly walking and cycling, within Lincolnshire Lakes and into greater Scunthorpe with impact on the sustainable credentials of the site. This is discussed in more detail in later sections. To support the sustainable aspirations for the Lakes it is therefore required by NLC that any development of the area should overcome the severance caused by the M181 to include delivery of an appropriate location for a potential new junction.

Figure 3: Local Road Network



2.2.5 Land ownership varies alongside the M181 and is illustrated in Figure 4. The principal landowners are JS Chapman and J and R Jackson. Land ownership must be considered as part of this assessment because of the agreements that must be made for its construction. There are four locations where land ownership is uncertain, introducing a greater degree of uncertainty in those places.

Figure 4: Ownership of Land Abutting the M181[1]

[1] This plan is based upon information provided by North Lincolnshire Council

3. APPROACH

3.1 Stakeholders

3.1.1 The key stakeholders involved are the HA and NLC, in response to their role as highway authority for the Strategic Road Network and local road network respectively.

3.1.2 Input was sought from both the HA and NLC on criteria against which to assess the suitable location for a new junction and supporting information to form part of the evidence base. The criteria are summarised as an assessment framework in Section 3.2, with the evidence from each considered in Sections 4 and 5.

3.1.3 In addition to the HA and NLC it is recognised that land holders and developers have an interest in the location of the junction. These interests have primarily been considered based upon previous discussions with them by NLC and GVA. The outcome of the recommendations in this report will be discussed with them by NLC.

3.1.4 NLC agreed that URS should use any evidence available from developers that the council was currently aware of. At present this is formed of work on behalf of Lucent. WSP, on behalf of Lucent, made direct contact with URS to discuss the work. As a result URS indicated that it would consider evidence provided by WSP alongside the other evidence presented in this report. The evidence provided by WSP was received on 26 September 2012 and included:

- *Lincolnshire Lakes Masterplan* (Allies & Morrison, September 2012);
- *Highways & Transportation Assessment of New M181 Junction Locations* (WSP, September 2012);
- *Lincolnshire Lakes Proposed Phase 1 Highway Works* (Davis Langdon, 26 Sep 2012); and

3.2 Method

3.2.1 The whole of the M181 has been assessed (Figure 5) to avoid prejudice to any potential option. This ensures that no feasible location is ruled out by default. Transport, Flood and Drainage, Ecology, and Heritage disciplines have all produced supporting evidence and plans to indicate where a junction ‘Should’, ‘Could’ and ‘Should Not’ based go solely on the evidence of that discipline. There are different ways by which Should to Should Not have been generated and these are identified in the relevant section for each discipline.

Figure 5: Assessment Area of Search

3.2.2 Using the individual discipline plans a 'sieve mapping'[2] exercise was conducted to clearly define where there were areas of common opportunity for a junction to be located or where there were areas that should not be taken forward in response to the evidence of one or more disciplines.

3.2.3 Following this exercise a further set of criteria, forming an assessment framework, was used to consider the location of the junction. This was based upon criteria requested from NLC and the HA. The request indicated that the criteria should be based upon existing policy and strategy and on officer knowledge where appropriate.

3.2.4 The criteria submitted by NLC for the junction and link were that it:

- Supports the development of Lincolnshire Lakes;
- Assists traffic flows within Lincolnshire Lakes
- Enhances and maintains the concept of Lincolnshire Lakes;
- Connects to the existing Scunthorpe network smoothly;
- Serves the existing town of Scunthorpe;
- Alleviates congestion in existing areas of Scunthorpe;

[2] Sieve mapping is a process that superimposes the mapped opportunities and constraints of each discipline, which have been developed using a sound evidence base, alongside the others. This highlights the common opportunities and constraints across an area including any areas of potential conflict.

- Is of sufficient strategic importance to deal with the anticipated traffic flows and does not provide a throttle to traffic; and
- Links to Scotter Road are not a 'puedo' high street.

The criteria submitted by the HA were:

- The junction will need to be designed in accordance with the Design Manual for Roads and Bridges (DMRB) and appropriate departures from standard obtained from NetServe.

3.2.5 Emerging from these the final criteria are presented in Table 1. The location to emerge from the sieve mapping exercise is assessed against these criteria in Section 8 with a rating of Poor, Neutral or Good.

Table 1: Assessment Criteria

Criteria		Source
A	Supports the development of Lincolnshire Lakes	NLC
B	Assists traffic flows within Lincolnshire Lakes	NLC
C	Enhances and maintains the concept of Lincolnshire Lakes	NLC
D	Serves the existing town of Scunthorpe	NLC
E	Alleviates congestion in existing areas of Scunthorpe	NLC
F	Ensures free flow conditions between the M181 and Scotter Road	NLC
G	Links to Scotter Road are not a puedo high street	NLC
H	The junction will need to comply with DMRB with departures where appropriate	HA

3.2.6 To assist with the assessment, particularly for Criteria C, the emerging Lincolnshire Lakes Vision & Objectives were used.

4. HIGHWAYS AGENCY CONSIDERATIONS

4.1.1 This section reports the input received from the HA. All input from the HA is without prejudice to a decision by the Roads Minister for formal approval or otherwise for a new junction on the M181.

4.1.2 The HA recognise that although a junction at less than 2km from the merge taper of the M180 with the M181 will require a departure from highway standards, a junction at 2km would not be desirable because of constraints imposed by the railway immediately to the north and small lake to the east of this location. 2km is also close to the existing junction and would not assist with reducing severance caused by the M181.

4.1.3 With respect to the location and standards relating to the junction, the HA has made comments including those from its NetServe department. NetServe has responsibility for approving departures from highway standards on the Trunk Road network.

4.1.4 NetServe agree that the position of the junction up to 100m north of the Brumby Common Lane Structure (where it has previously been proposed, see Section 7.2) is logical, especially in retaining permeability for cyclists and pedestrians. Because of the structure it will be necessary to ensure that Sight Stopping Distances are sufficient and that the implications for advanced signing of the new junction on the northern approach are assessed in detail. Consideration should also be given to yellow bar markings on the approach to the junction, which would require a departure as a longer uninterrupted lead-in would normally be provided.

4.1.5 A signal controlled crossroads is not acceptable to the HA for the reason that there is no reliable solution to mitigate against drivers violating the lights. An at-grade roundabout, similar to the existing terminal junction at the A18, would be acceptable and appropriate in scale as long as a transport assessment does not dictate that levels of traffic would require a different solution. Both NetServe and the Change Manager for Network Delivery and Development believe such a requirement is unlikely; NetServ will want to examine this at the time of design. An at-grade roundabout could be signalised subject to receiving approval for departures.

4.1.6 An at-grade junction would require a departure. It may be possible to signalise the junction if a transport assessment suggests that would be the best way to manage traffic. This would also require a departure. Yellow bar markings may be required alongside appropriate signage to provide sufficient safety on the approach to the junction. This would be confirmed through a concept safety audit.

4.1.7 The HA propose that the best solution is to terminate the M181 at the point where it joins the new junction; with the new junction then adopted and managed by NLC. This would allow the Council to include facilities for Non Motorised Users if appropriate and to make improvements to the junction over time as circumstances dictate, potentially including signalisation, provided that the termination of the trunk road network is not affected.

4.1.8 The HA recommend a concept road safety audit is completed once an indicative design is in place. The final design of the junction will have to be approved and construction overseen by the HA unless NLC elect to engage the HA service providers to undertake the design and construction of the junction. If this route is chosen NLC will be assured that current standards, and the application for departures, is applied from the start. This would minimise the potential need for redesign as the process progresses.

4.1.9 There are a number of options currently available that involve de-trunking or not de-trunking the section north of the new junction (discussed more fully in Section 5). Before proceeding with a submission to amend the M181 requires confirmation of the preferred option as a formal record.

4.2 Summary of Constraints & Opportunities

4.2.1 Key points raised by the HA are:

- It is anticipated that departures from highway standards will be required;
- The HA has indicated that it does not foresee issues in obtaining the necessary departures;
- The position of the new junction up to 100m north of the Brumby Common Lane Structure as previously proposed favoured;
- A signal controlled crossroads will not be acceptable;
- A roundabout seems the most appropriate junction form and could accommodate signalisation if justified by assessment; and
- The HA recommends de-trunking the M181 north of the proposed new junction.

5. NORTH LINCOLNSHIRE COUNCIL CONSIDERATIONS

5.1.1 This section reports the input received from NLC. It outlines the key issues of the Council and how these might affect the location or function of the junction and link road.

5.1.2 NLC acknowledges the primacy of the HA in confirming the junction design. Both parties have indicated that it will need to comply with DMRB[3] although where departures from standard may be needed the HA will be the approving authority.

5.2 Maintenance

5.2.1 The HA has indicated three potential options for management of the M181 once a new junction has been constructed. These are:

1. New junction marks the termination of the trunk road network, with NLC bearing the on-going maintenance costs of the junction itself and any connecting roads excepting the M181;

2. Construction of a grade-separated junction on the M81. Maintenance would continue to be funded by the HA; and

3. Construction of an at-grade junction on the M181, with the road re-classified as an 'A' road to the north. Maintenance would continue to be funded by the HA.

5.2.2 If the M181 is de-trunked a maintenance grant would be provided as a lump sum at the time of hand-over to NLC, dependant on the time period remaining until the road becomes part of the NLC budget allowance.

5.2.3 If the northern stretch was maintained by the HA no additional crossings would be allowed, meaning that the road would retain a significant severance effect. If masterplanning required an additional more northerly junction, the HA would need to apply the tests for an All Purpose Trunk Road and this would limit options. More flexibility in design will be enabled if the road is maintained by NLC. In addition, if the northern section is HA maintained, all future planning applications would need to be scrutinised by it in more detail.

5.2.4 NLC has therefore indicated its preference to accept responsibility for adoption and maintenance of the M181 north of a proposed new junction in a de-trunked form.

5.3 Traffic Management

5.3.1 As the local highway authority NLC has a statutory Traffic Management function under the Traffic management Act 2004. From this perspective the type of roads that connect to the M181 junction are considered more important than its location or form. In addition the locations that they tie-in to the existing highway network of Scunthorpe is also important.

5.3.2 The main issue to be considered from a Traffic Management perspective is congestion, in particular during peak times at Berkeley Circle and the roads that feed it. Any development to the west of Scunthorpe must not exacerbate this situation. In addition there is an opportunity to relieve the existing situation by redirecting traffic onto the proposed new link. It is therefore essential that the new link between the new roundabout and Scotter Road is of sufficient strategic importance to deal with the anticipated traffic flows and does not provide a throttle to traffic. Current classification of nearby roads does not accurately reflect their relative importance. For example Scotter Rd and North Moor Rd are only of 'C' road classification, yet carry more traffic than some A and B class roads in the region, providing an attractive north-

[3] Design Manual for Roads and Bridges

south route to the A159. Because it is required to perform a strategic function for Scunthorpe NLC requires that the link from the M181 must not be a 'pseudo' high street.

5.3.3 NLC has identified that the junctions with Scotter Road from the M181 will be important as it needs to be significantly attractive to provide a viable alternative to existing routes. Equally any junction must be adequately designed to cater for the increase in traffic on Scotter Road effectively (although it should also ensure that sustainable modes are not unduly impeded). As development proposals are generated the impacts on roads within Scunthorpe, particularly east-west corridors, will need to be adequately assessed and mitigation provided where necessary.

5.3.4 A strategic link at West Common Lane would encourage traffic to use that road for access with the centre of Scunthorpe. NLC consider that the road beyond Glover Road becomes inappropriate for this purpose in its current form. To address this West Common Lane may need minor junction alterations and consideration of parking controls to assist with the movement of traffic during peak periods.

5.4 Development Planning

5.4.1 Encouraging the use of sustainable modes of travel is fundamental to the overall concept of the Lincolnshire Lakes project. Travel Planning will therefore be an essential tool for travel management including to influence travel behaviours. Therefore, it will not only be necessary for the new junction and associated highway to provide good, direct (where possible) links to public transport links, but also that walking and cycling provision is given high priority in the hierarchy of modes. Designs for highways must ensure that the interaction between all modes is considered to facilitate walking and cycling as safe, logical and attractive travel choices for those living, working or visiting the Lincolnshire Lakes area.

5.4.2 The M181 is recognised as a cause of severance between the east and west halves of the Lincolnshire Lakes area, as it runs down the centre of the site from the A18 to the M180. To further the concept of Lincolnshire Lakes it is critical that this severance is effectively tackled to promote sustainable travel within, to and from the site.

5.5 Summary of Constraints and Opportunities

5.5.1 Key points raised are:

- The location of the junction is unaffected by maintenance or traffic management;
- NLC wish the M181 trunk road to terminate at the new junction and for the Council to accept responsibility for the junction and highway to the north;
- Because the link between the M181 and Scotter Road will perform a strategic function for Scunthorpe it must not be a pseudo high street; and
- To support and encourage travel by sustainable modes to, from and within Lincolnshire Lakes the road layout will need to ensure that walking and cycling are given high priority, while ensuring direct routes for strategic traffic.

6. TRAFFIC & HIGHWAYS

6.1.1 This section considers the impact on baseline traffic of a new junction on the M181. This is based upon traffic data collection commissioned for the Lincolnshire Lakes AAP. Induced traffic is also considered plus the combined impact of re-routing, induced traffic, and traffic from Lincolnshire Lakes that may use the new link between the M181 and Scotter Road. Broader transport planning issues are also considered with a brief review of potential locations for junction locations on Scotter Road from the M181.

6.2 Baseline Network Performance

6.2.1 To inform the Lincolnshire Lakes AAP Support, URS commissioned traffic surveys on behalf of NLC. These included Manual Classified Counts (MCCs) at 12 junctions with data for a further junction obtained from Highways Agency (HA) TRADS[4] sites on the M180 and M181 (see junctions 1 to 13 annotated in Figure 6). Appendix A shows 2012 Baseline Traffic Flows.

6.2.2 These junctions have been assessed using PICADY v5.1 and ARCADY v7.1 for priority junctions and roundabouts respectively and using DMRB guidance for merges at M180 Jct3. For junctions 1 to 12 the highest Ratio of Flow to Capacity (RFC) on an approach to the junction is shown; the figure quoted for junction 13 is equivalent to the RFC.[5] The detailed results of the assessment are provided within the draft report *Lincolnshire Lakes AAP Support Highways Assessment* (URS, 24 Aug 2012). The results are summarised in Table 2 and show that with the exception of Berkeley Circle and the A18 west of the River Trent the highway network is operating within capacity.

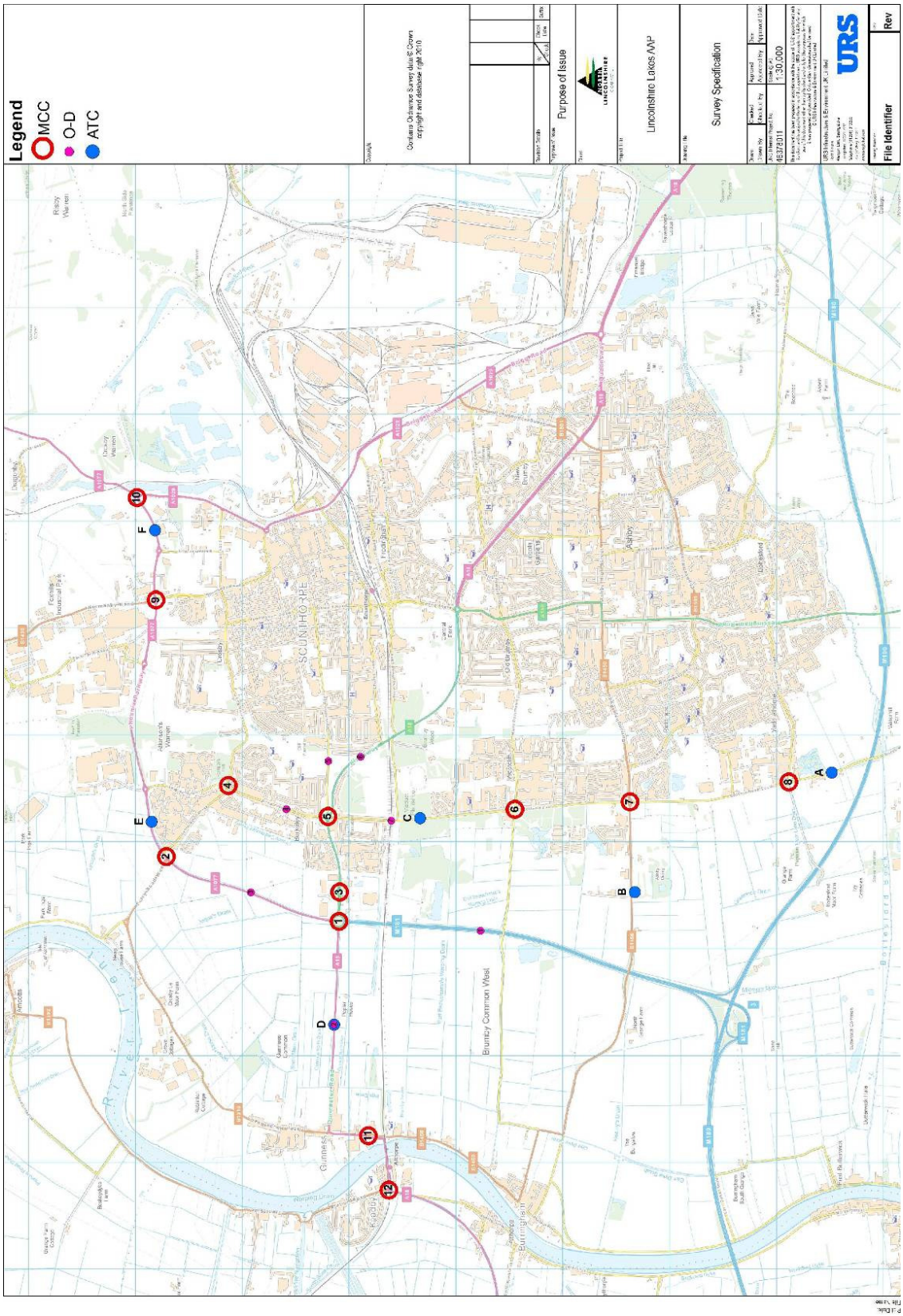
[4] TRADS stands for Traffic Information Database, which contains information from data collection sites at locations on the Highways Agency road network.

[5] Ratio of Flow to Capacity is a measure of the relative capacity of an approach to a junction compared with the vehicle demand. A score below 0.85 indicates within capacity, 0.85 to 1.00 indicates above effective operational capacity, and above 1.00 indicates well above capacity.

Table 2: Summary of 2012 Baseline Junction Assessment (Worst Approach)

Location	AM Peak	PM Peak	Comments
Jct 1 M181/ A18 Doncaster Road/ A1077	0.72	0.59	Within capacity
Jct 2 A1077/ Ferry Road West	0.22	0.43	Well within capacity
Jct 3 A18 Doncaster Road/ Retail Park	0.51	0.60	Within capacity
Jct 4 Ferry Road West/ Scotter Road	0.30	0.37	Within Capacity
Jct 5 A18/ Scotter Road/ Doncaster Road	0.80	1.11	Significantly over capacity in PM peak
Jct 6 Scotter Road/ Brumby Common Lane	0.17	0.47	Well within capacity
Jct 7 Scotter Road/ B1450 Burringham Road	0.72	0.69	Within capacity
Jct 8 Scotter Road/ Moorwell Road	0.80	0.71	Within capacity
Jct 9 A1077 Phoenix Parkway/ Normanby Road	0.56	0.56	Within capacity
Jct 10 A1077 Mannaberg Way/ A1029 Winterton Road	0.48	0.37	Well within capacity
Jct 11 A18 Station Road/ B1450 Burringham Road	0.24	0.34	Well within capacity
Jct 12 A18 Station Road/ B1392 Station Road	1.13	0.40	Significantly over capacity in AM peak
Jct 13 M180 Junction 3	0.32	0.31	Well within capacity

Figure 6: Traffic Survey Specification



6.3 Traffic Re-Distribution

Baseline Traffic

6.3.1 In addition to MCCs, Origin-Destination (OD) surveys were completed using Automatic Number Plate Recognition (ANPR) on roads around the M181/ A18 Doncaster Road and A18 Doncaster Road/ Scotter Road junctions. This information has been used to assess the potential for baseline traffic re-routing as a result of a new junction on the M181. The re-assignment presented in Appendix A is based upon the following assumptions:

- All traffic between points 1 and 7 exit via the new junction ;
- Traffic between points 2 and 7 is split equally between the de-trunked M181 and Scotter Road;
- Traffic between points 3 and 7 is split equally between the de-trunked M181 and Scotter Road;
- The distribution of traffic using West Common Lane and Scotter Road south of Brumby Common Lane and of traffic using B1450 Burringham Road and Scotter Road South at the junction of Scotter Road/ B1450 Burringham Road is based upon the current distribution taken from the commissioned traffic count at this junction;
- 10% of traffic travelling along the M181 and A18 Doncaster Road into central Scunthorpe uses West Common Lane; and
- All other traffic is unchanged

6.3.2 Based upon the OD survey between 7% and 17% (traffic between Zones 1 and 7) of one-way traffic passing through Jct 1: M181/ A18 Doncaster Road/ A1077 and Berkeley Circle could instead divert via a new junction along the M181 and connections with Scotter Road directly to the east. This excludes traffic that currently accesses Scunthorpe Town centre via A18 Kingsway, some of which is likely to re-route via a new junction providing more direct access to the southern parts of Scunthorpe town centre.

6.3.3 The traffic re-assignment exercise suggests that approximately 170 vehicles in a single direction would divert on a new link road between Scotter Road and the M181, reducing total vehicle movements through Berkely Circle by approximately 260 vehicles in the AM peak and 310 vehicles in the PM peak. This may be sufficient to reduce congestion on the approach from the north (Scotter Road), which currently has an RFC of 1.11 in the PM peak, although in future years an increase in background and/ or development traffic from Lincolnshire Lakes could reverse this benefit.

6.3.4 To assess the potential benefits of a new junction on the M181 the average journey times observed during the OD surveys have been used between each origin-destination pair, the average journey time saving is 4 minutes 38 seconds. The monetised benefit in a single year amounts to £87.1k (2002 values and prices) using WebTAG principles including an average value of time of £11.28 per hour. The steps in the calculation are shown in Table 3. The benefit calculated above represents only the benefit to diverting vehicles for the 2012 baseline between Zones 1 and 7 and must be used as a guide only; it does not account for benefit to reduced journey time on other routes or the disbenefit of greater journey time to negotiate the new junction for traffic on the M181.

Table 3: Benefits to 2012 Diverting Traffic with New M181 Junction

	AM Peak		PM Peak	
	Northbound	Southbound	Northbound	Southbound
Total Vehicles	1,164	592	761	992
Diverting Vehicles	78	104	92	117
Time saved	5m 16s	3m 44s	4m 39s	4m 53s
Benefit per vehicle	£0.99	£0.70	£0.87	£0.92
Total Benefit	**£77.22**	**£72.80**	**£80.04**	**£107.64**
Annual Benefit	*£19.9k*	*£18.8k*	*£20,7k*	*£27,8k*

6.3.5 The calculations suggest a valuable benefit to those vehicles that are most likely to change their route with a new M181 junction. The assessment assumes a junction no further north than Brumby Common Lane; if the junction is further north then journey time savings will be reduced because the distance will be longer. A new junction further south is likely to increase the journey time benefits.

Induced Demand

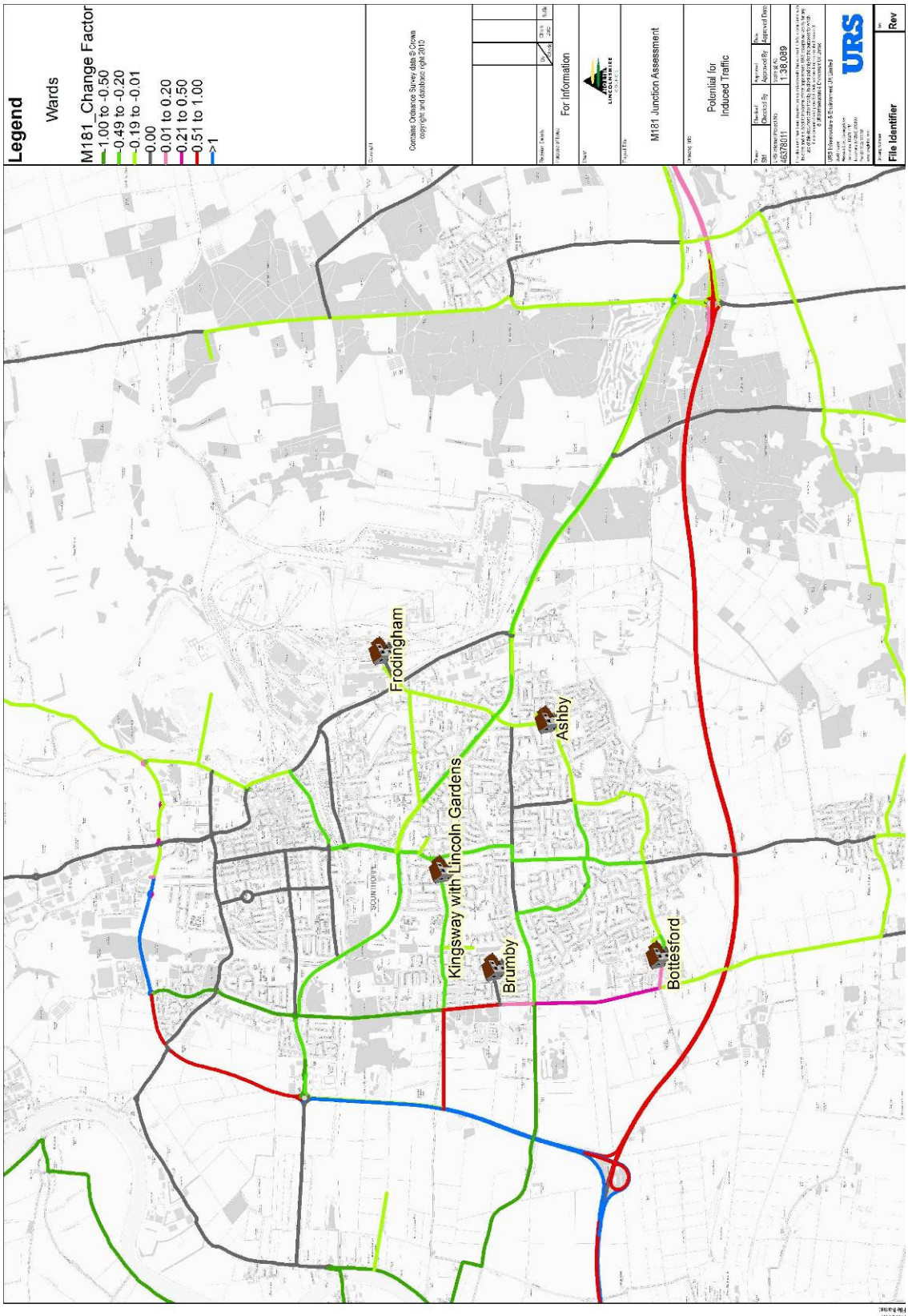
6.3.6 URS has used its gravity modelling tool ODYSSEUS[6] to asses the potential impact of induced traffic. ODYSSEUS uses journey times and ward population/ employment to forecast traffic distribution. It is a relatively coarse tool but in the absence of more detailed modelling, such as a SATURN model, URS consider that this is a robust alternative to provide an assessment of impacts of induced traffic.

6.3.7 Two model runs were completed. Both use the inbound and outbound journey to work vehicle trips for the wards in the south of Scunthorpe for in the AM peak period. It is assumed that PM peak trips will broadly reflect the same pattern. The first model run assumes the existing road network, the second model run assumed a link to a new junction on the M181 at Brumby Common Lane. It must be noted that the location for the purposes of this modelling was chosen because it is roughly equidistant between the M180 and Doncaster Road and is not a presumption of where the junction should be located.

6.3.8 The factor of change in traffic is illustrated in Figure 7, which should be treated as an order of magnitude. Green shades indicate a reduction in traffic, grey indicates no change, and pink and blue indicates an increase in traffic.

[6] ODYSSEUS is used under licence by the Highways Agency in the north of England under the name of PENELOPE.

Figure 7: Impact of Induced Traffic



6.3.9 Key points to note for changes in traffic patterns shown Figure 7, associated with the wards assessed, are:

- Re-routing from Ashby, Kingsway with Lincoln Gardens, and Frodingham appears to be minimal;
- Principal traffic re-routing induced by the new link and junction is from Bottesford and Brumby, the most south westerly wards;
- The southwesterly wards access the M181 via Jct 3 with a new link road, which is likely to increase traffic associated with them along the M181 to the east of Jct 3;
- Traffic on non-strategic roads such as those north and south of the M181 is reduced; and
- There may be some relief to roads through northwest Scunthorpe (including Berkeley Circle as also identified in Para 6.3.3 above) as it becomes easier to access employment opportunities along Phoenix Way via the new junction and the A1077.

6.3.10 Traffic on the M181 south of a new junction may double based upon the change indicated by ODYSSEUS; this is because the programme anticipates people will instead seek jobs in places to the west rather than the east (for example Doncaster instead of the Humber Gateway), this may not be reflective of what will happen. As a more realistic impact the induced traffic from the southwest of Scunthorpe that uses M180 Jct 3 to travel to and from the east has been used as an indication of potential traffic using the link road and new junction. On the M181 this amounts to 105 eastbound and 230 westbound trips. Based upon the local re-routing traffic that has been calculated in Section 6.3 and presented in Appendix A the resulting traffic flows are summarised in Table 4. All flows calculated to date are based upon Census 2001 and observed traffic flows from 2012. TEMPRO growth from 2012 to 2026, to reflect the end of the current North Lincolnshire Local Development Framework, has been added as a guide to the potential impact of local growth excluding any direct impact from development At Lincolnshire Lakes.[7]

Table 4: Forecast Traffic Flows on New Strategic Link

	AM Peak			PM Peak		
	Eastbound	Westbound	Total	Eastbound	Westbound	Total
Local Re-routing	110	149	259	145	168	313
Induced	230	105	335	105	230	335
Total Traffic	**340**	**254**	**594**	**250**	**398**	**648**
2026 Traffic	*362*	*271*	*633*	*267*	*424*	*691*

6.3.11 As an indication of traffic flows resulting from Lincolnshire Lakes the *Lincolnshire Lakes Transport Strategy* (Pell Frischmann, Oct 2010) indicates that development to the west of the M181 may be likely to generate up to 2,097 one-way vehicle trips in the AM peak and 1,373 one-way vehicle trips in the PM peak. Of this it calculated that 19% would be attracted to and from the south and west of Scunthorpe[8], the areas most likely to use the new link road from

[7] Traffic growth for North Lincolnshire from TEMPRO 6.2 with planning assumptions reduced by 6,000 dwellings for west of Scunthorpe is an increase of 6.6%.

[8] That is traffic using West Common Lane, Burringham Road and Scotter Road.

within Lincolnshire Lakes itself. This amounts to Lakes traffic on the link of between approximately 260 and 400 vehicles in a single direction, a total of over 800 vehicles on the link road in a single direction in 2026 when combined with local re-routing and induced traffic but excluding any traffic that may be accessing facilities and premises alongside the road.[9]

6.3.12 The pattern of traffic distribution in Figure 7 also suggests that there will be significant additional traffic along Scotter Road. This will need to be managed to alleviate the traffic impacts of re-routing, induced and development traffic within south west Scunthorpe. It is likely that the most effective way to manage this will be via two access points onto Scotter Road from the M181. These could be located at approximately West Common Lane and via B1450 Burringham Road. This will distribute traffic before it reaches Scotter Road and reduce the amount of traffic through individual junctions. Junction mitigation would be required at both locations on Scotter Road. This pattern may have the added benefit of more effectively serving Lincolnshire Lakes to both the north and south of Brumby Common Lane; which will be considered in more detail as part of the masterplanning for the area.

6.4 Junction Design Standards

6.4.1 The design of the junction must comply with standards set out in DMRB. There is no specific DMRB standard to define how far from a merge a downstream at-grade roundabout should be located. However *TD 22/06 Layout of Grade Separated Junctions* offers guidance using 3.75V (3.75 * Design Speed), or alternatively using 1.5*SSD (1.5 * Stopping Sight Distance). Based on the existing national speed limit of the M181, 70mph/ 113kph, this indicates a distance of 425 and 443 metres respectively (SSD taken from TD 9/ 93 for 120kph).

6.4.2 Based on this assessment with the current speed limit the distance from the tip of the northbound merge taper onto the M181 the new junction should not be less than approximately 450 metres. If speeds are reduced to 50mph on the M181 then this distance could be considered for a reduction to 300 metres.

6.4.3 Any design must be approved by the Highways Agency (HA) and with this in mind 300 metres may not be considered sufficient for traffic to weave before final approach to any proposed new roundabout. It must also be noted that because there is no specific standard the minimum desirable distance for grade separated junctions could be requested by the HA; this is two kilometres. Previous indications suggest that the HA is content with a junction that can be demonstrated as safe and designed to appropriate standards, and has previously considered a location at Brumby Common Lane, approximately one kilometre from the tip of the merge nose, to be favourable (see Section 4). This suggests that the HA could respond favourably to a junction at less than two kilometres.

6.4.4 NLC has noted that in the past there have been concerns raised about the proximity of a junction to the Brumby Common Lane bridge and the requirement for sufficient visibility. To address this a review of *TD16/ 07 Geometric Design of Roundabouts* from DMRB was conducted and gives the following requirements and advice:

- Based upon TD9/ 93 and a Design Speed of 70mph (120kph) the desirable Stopping Sight Distance (SSD) is 295 metres;
- For a junction with an Inscribed Circle Diameter of 60 to 100 metres the forward visibility from 15 metres behind the give way line must be 50 metres; and

[9] This excludes north-south traffic to and from Lincolnshire Lakes to the east of the M181

- Excessive visibility to the right can encourage excessive speeds. Therefore on roads with speed limits greater than 40mph screening may be used to a point 15 metres back from the give way line.

6.4.5 Outline design will be necessary to demonstrate the requirements for the junction in terms of both size and geometry to accurately assess whether the bridge at Brumby Common Lane might hinder a junction there, subject to approval of departures from NetServe. However a provisional review of standards does not indicate any insurmountable barriers to this. The standards considered above are for a priority roundabout and would vary for a signalised roundabout.

6.5 Transport Planning Considerations

6.5.1 The design principle for Lincolnshire Lakes is that it is formed of a number of villages. To develop sustainable urban areas these must be cohesive units that can also operate with each other. This requires that each village contains its own services and facilities such as local shops and schools to the extent that this is feasible for commercial viability and critical mass for facilities. It will also require that the roads within each village, including at the village heart, are attractive for use by sustainable modes including Non Motorised Users (NMUs) incorporating walking, cycling and horse riding. This will be essential for trips internalised within the development to be undertaken using sustainable modes. Where the street environment is considered unreasonably busy or unsafe this will discourage walking and cycling in favour of the private car for short journeys. It may also be desirable for the village hearts to act as community spaces, with places to gather within the street scene; strategic traffic is unlikely to be conducive to this kind of environment.

6.5.2 TD 79/99 indicates that if the link road also served the function of a route through a village community, with frontage access, the one way capacity of the road would be 900 vehicles (UAP4) to 1,100 vehicles (UAP3) assuming a carriageway width of 6.7 metres, the effective carriageway width along much of Ashby High Street.[10] It would therefore be inappropriate for the road between the M181 and Scotter Road to also provide a village heart function, with community facilities including schools and local shops. As a UAP4 standard road the link may be almost at capacity and side roads may inhibit the free-flow of strategic traffic. As a UAP3 standard road the speeds may be unsuitable as it may be desirable for the link to have a higher speed limit than 40mph given its role as a strategic route for Scunthorpe. Even with a wider road, which would provide greater capacity, it is likely that the road would not be suitable for the strategic traffic because of the function of the road at the village heart (for example because of loading/ unloading and the impact of side roads).

6.5.3 One of the primary constraints currently associated with the M181 is the severance effect on east-west movement. There are currently three locations that provide for this movement at:

- B1450 Burringham Road;
- Brumby Common Lane;
- A footbridge at the junction with the A18.

6.5.4 Once development is in place the severance effect imposed by the M181 would discourage travel by sustainable modes, particularly walking and cycling, within Lincolnshire Lakes and into greater Scunthorpe. At present only Burringham Road is suitable for most traffic (Brumby Common Lane has tight corners, is in relatively poor condition and is only three metres wide).

[10] UAP4 is a busy high street carrying predominantly local traffic with loading and unloading, 30mph. UAP3 is a variable standard road with frontage access, 30mph to 40mph. *TD79/ 99* Table 1.

For development at Lincolnshire Lakes, to the west of Scunthorpe, Brumby Common Lane could provide NMUs with access over the motorway but is likely to need remodelling and works to make it an attractive route during hours of darkness. Any development located north of Brumby Common Lane, particularly towards Frodingham Viaduct, would not benefit from any of the existing crossings. The further north the M181 is retained as a motorway the harder and more costly it will be to overcome as a barrier (the grade-separated NMU provision that would be required over a motorway is more costly and potentially less attractive than at-grade provision). To reduce severance a termination of the M181 approximately at or south of Brumby Common Lane is likely to be most effective.

6.5.5 As a de-trunked road the M181 is likely to be treated to emphasise its role in an urban environment. A de-trunked road could also be crossed by NMUs via at-grade crossings. A traffic signalised NMU crossing will be most suitable because of the volume of traffic and because speeds may be greater than 30mph. Traffic speeds above 50mph may not be appropriate for an at-grade pedestrian crossing.[11]

6.5.6 Depending on the location of the new junction there are two principal options with respect to the use of the Brumby Common Lane bridge in tackling severance:

1. Retain the bridge in either it's current form or redefined as an NMU only crossing; and
2. Removal of the bridge.

6.5.7 For the first option a new structure could be put in place. If the bridge is removed an at-grade crossing will be required to reduce severance. This will most likely need to be signalised and could be incorporated into the new junction, although it may reduce the efficiency of the junction for vehicles depending on the junction design. If a signalised crossing is introduced it may be desirable to signalise the whole junction to ensure that the junction is managed to prioritise sustainable modes and to promote safety there. The ultimate retention or removal of the bridge is an issue for masterplanning and detailed design.

6.5.8 While it is outside the scope of this report to set out the highway layout for development to the west of Scunthorpe, it is important to note:

- The new junction on the M181 need not be the only junction between the M180 and A18; and
- Signal controlled junctions would provide opportunity to introduce at-grade signal controlled pedestrian crossings.

6.5.9 A second junction along the M181 could allow access to development alongside the de-trunked road. The role of this junction would need to be considered within masterplanning because if it served development to both the east and west of the current M181 it may provide opportunities for rat-running through villages to the east of the road. Access to the west, in addition to access via a primary junction, where the M181 would terminate, could enable traffic management within development to the west of the existing M181 alignment. As an extension of this principle if the bridge at Brumby Common Lane is not retained, a signalised NMU crossing at the junction terminating the M181 could provide a suitable alternative.

6.6 Summary of Constraints & Opportunities

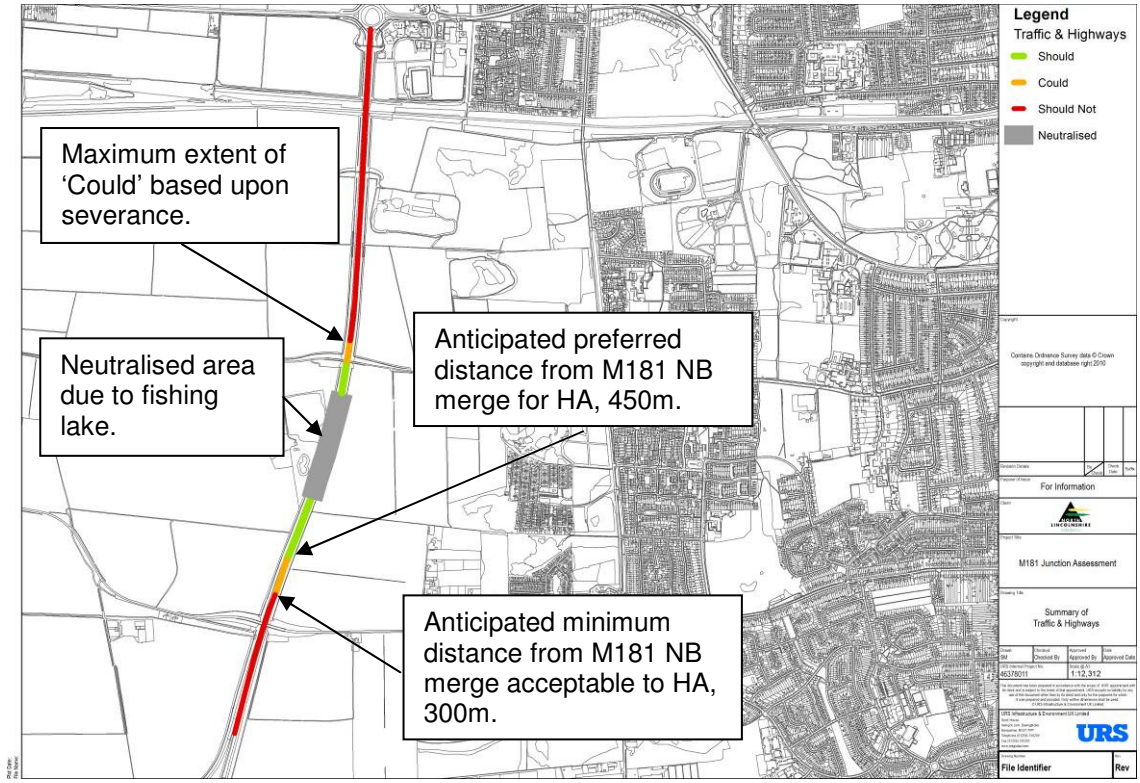
6.6.1 The traffic & Highway evidence suggests there are two areas where the junction Should be located. These are:

[11] See Local Transport Note 1/95 *The Assessment of Pedestrian Crossings*, for further guidance

- 450m north of the merge taper to the fishing pond; and
- North of the fishing pond to Brumby Common Lane.

6.6.2 These areas are considered optimum because of the opportunities to tie in to the existing road network at Scotter Road via B1450 Burringham Road and/ or West Common Lane. Areas where the junction could be located are to the south, from a point 300m north of the M181 merge taper and a short stretch to the north of Brumby Common Lane. This latter zone would accommodate a more northerly junction so that the Brumby Common Lane bridge could be retained.

Figure 8: Summary of Traffic & Highways Opportunities & Constraints



6.6.3 Other key points arising from a review of Traffic & Highways are:

- The link road between Scotter Road and the M181 will act as a strategic route for Scunthorpe, relieving traffic pressure on east-west and north-south routes to and from wards in the southwest of Scunthorpe;
- The new junction will provide an opportunity for traffic to re-route to avoid Berkely Circle, however an increase in background traffic may reverse any benefit this would otherwise realise;
- Based upon DMRB road types the link road between the M181 and Scotter Road is unlikely to be suitable to perform the function of a village high street because of its function as a route into Scunthorpe. In particular both speed and capacity are likely to be inappropriate;
- Severance caused by the M181 is an important issue. To resolve it a junction approximately at or south of Brumby Common Lane is likely to be most effective;

- The Brumby Common Lane bridge may be retained or removed, which will be resolved through masterplanning and detailed design; and
- The junction terminating the M181 need not be the only junction south the A18, which would provide opportunities for effective traffic management for Lincolnshire Lakes and Scunthorpe more widely.

7. FURTHER CONSIDERATIONS

7.1.1 This section considers other issues that are of material importance to the location of a new junction. It includes input from GVA for Planning and provides a commentary on the opportunities and constraints of Flood and Drainage, Ecology and Heritage.

7.2 Planning Policy

Planning policy at a national and local level, which is presented in Section 2.1, is generalised and does not provide a definitive steer as to the exact location of the proposed junction. In particular:

- National planning policy does not indicate a specific location / zone in which the new roundabout should be located;
- The Core Strategy therefore does not specify a location or zone in which the new roundabout should be located; and
- Previous work as part of the LDF evidence base to establish a junction location has not been definitive.

Land Ownership Delivery Considerations

7.2.1 Working from south to north, the following landowners/ developers would be required to deliver the de-trunked roundabout (also shown in Figure 9).

1. Ruth Christine Laister

Ms Laister owns a parcel of land to the east of the M181 which at the most northern extent falls within the search area for the roundabout (just south of Burringham Road).

Ms Laister has engaged an agent – Rollinson Planning Consultancy Ltd. – to assist in promoting her site for development as part of the AAP. Therefore, it is assumed that Ms Laister would not obstruct the roundabout being located on her land and that she would be happy to negotiate a sale of the necessary part of the site to facilitate that.

2. J&R Jackson

The Jacksons own land that bounds the west of the M181 from the M180 in the south as far north as approximately the mid point between Burringham Road and Brumby Common Lane. They also own land to the west of the M181 to the south of the railway line (north of Chapmans land) up to the A18.

The Jacksons do not currently have an agent but it is understood that following discussions as part of stakeholder engagement on the AAP that they are willing and happy to assist in facilitating the development. Therefore, it is assumed that the Jacksons would not obstruct the roundabout being located on their land and that they would be happy to negotiate a sale of the necessary part of their land to facilitate that.

3. JS Chapman and WS Chapman & Sons

The Chapmans own land to the east of the M181 from the midway point between Burringham Road and Brumby Common Lane up to the midway point between Brumby Common Lane and the east-west route of the railway. To the west of the M181, they also own land from Brumby Common Lane up to approximately two thirds of the distance to the railway.

The Chapmans have an agent (George F White & Sons) and have agreed an Option to sell their land to Lucent.

4. Other – to south of Brumby Common Lane

Land to the west of the motorway to the south of Brumby Common Lane but to the north of the Jackson land is known only to be in 'other' ownership (assumed to be a single party). This is an area that is largely used as a fishing pond.

The land is leased by someone locally from an unknown owner (who is understood to be based in Sheffield). Further investigation would be required to try and identify the owner of this land (which it is understood is unregistered) and to understand whether they would be willing to sell to facilitate the delivery of the AAP and /or the roundabout. Furthermore, the limitations of the fishing pond (whether it is a necessity from a drainage perspective or solely for amenity) could affect whether it suitable for a roundabout development and any potential associated uses (such as commercial office space). It must therefore be concluded that there is only a possibility that this land would be available for delivery of the junction.

5. Other – to south of railway line

Land to the south of the railway line and to the north of Chapman land on the east side of the motorway is identified as being in 'other' ownership. There is little known about this land (which it is understood is unregistered) or who is the owner. There is also a further two areas of land to the north and south of this which are shown in white on Figure 9. Again it is unknown who owns these areas of land. It must therefore be concluded that there is only a possibility that this land would be available for delivery of the junction.

Figure 9: Ownership of Land Abutting the M181[12]

[12] This plan is based upon information provided by North Lincolnshire Council

7.2.2 Analysis of the opportunities and constraints for land indicates that with the exception of two small parcels, one immediately south of Brumby Common Lane and one south of Frodingham Viaduct, the full stretch of the M181 is not restricted by land ownership. At the two locations identified as constraints these are areas of uncertainty rather than locations where a junction Should Not be located. This analysis is summarised in Figure 10 as areas where the junction Should be located and areas where the junction Could be located from a land ownership perspective.

Figure 10: Land Opportunities & Constraints[13]

7.3 Flood & Drainage

7.3.1 To determine the most appropriate location for a new junction on the M181 to serve the emerging Lincolnshire Lakes development and the wider demand of Scunthorpe, a high level assessment of flood risk constraints has been undertaken. This assessment has utilised reviewing existing ground levels along the route of the M181 using LiDAR (digital ground model) data and flood levels determined by Halcrow as part of the *Western Scunthorpe Urban Extension, Exception Test Strategy* (May 2010) undertaken for North Lincolnshire Council.

7.3.2 When comparing flood levels from the *Exception Test Strategy* to prevailing (existing) ground levels, it is possible to determine areas where less land raising would be required to enable development of the new junction on the M181. This follows the sequential approach, which relates to determining areas of lowest flood risk and steering development accordingly. On this basis Figure 11 shows the relative amounts of land raising required to accommodate the new junction. The most preferable location for the junction would be to the south of Frodingham Viaduct (areas highlighted green), where typically land raising of approximately 1 metre would be required (based on Halcrow flood levels and existing ground levels sourced from LiDAR).

[13] Should = evidence indicates no constraints, Could = uncertainty

Areas further south are highlighted as amber and red, where greater levels of ground raising would be required.

7.3.3 It is not to say that the junction is not deliverable in these locations, but that there are greater flood risk issues that would need to be overcome and in overcoming these there would be associated cost implications.

7.3.4 In constructing the junction, consideration should also be given to the impacts on the existing local drainage network. Where practicable, the crossing of local drainage ditches should be avoided. However where this is unavoidable, then measures would need to be put into place to ensure that the operation of the local drainage networks are not effected and that there is no increase in flood risk elsewhere. Due consideration should also be given to the construction phase.

Figure 11: Flood & Drainage Constraints & Opportunities[14]

7.3.5 A final consideration with respect to flooding is the provision of flood escape routes from the main areas of Lincolnshire Lakes. This provision will need to be demonstrated through the masterplanning options, although it must be recognised in this work that the new junction location will need to facilitate evacuation from the Lakes area in the event of severe flooding.

7.4 Ecology

7.4.1 This assessment is based on high level analysis i.e. Designated sites and a Phase 1 habitat survey. There may be other ecological constraints (protected species), particularly associated with drains and wetland features, but these have not formed part of the surveyed providing the evidence base. There are no statutory designations of national or international importance but

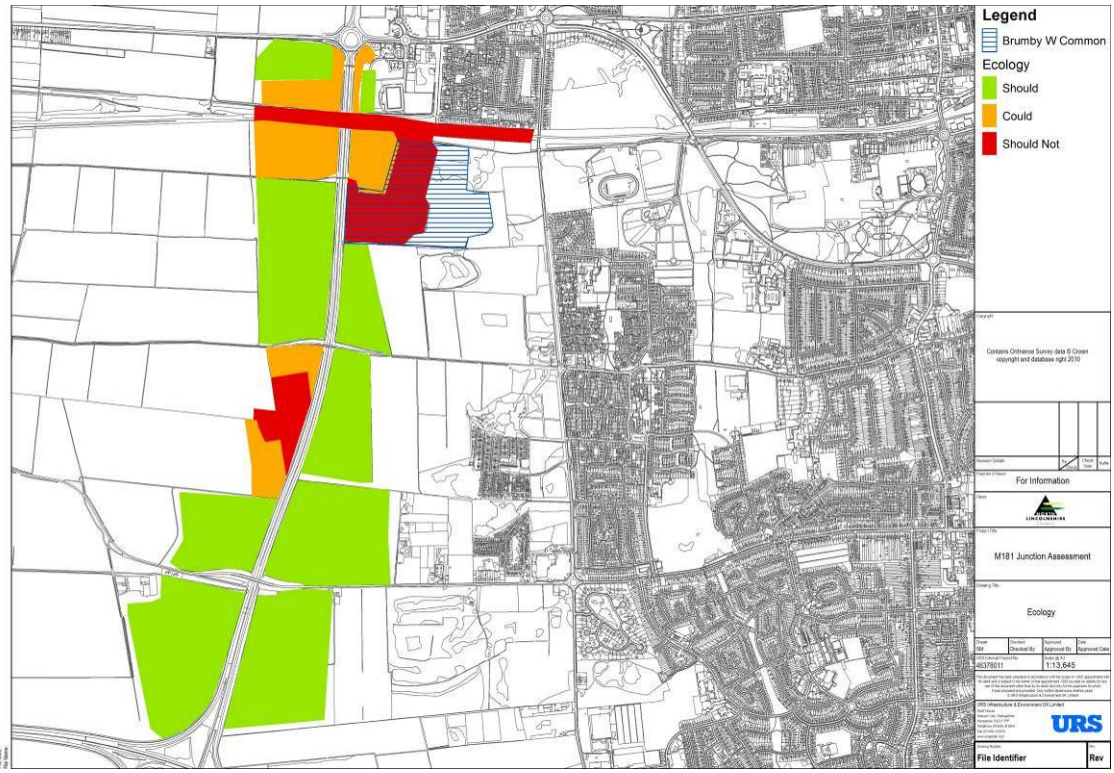
[14] Should < 1 metre fill, Could < 2 metres fill, Should Not > 2 metres fill.

the local and non-statutory sites should be avoided (see Brumby West Common illustrated in Figure 12).

7.4.2 The habitats are largely agricultural (arable) with ecological interests limited mainly to the field boundaries (hedgerows, woodland and drainage network) in addition to discrete pond and wetland habitats adjacent to the existing road. Areas subject to local wildlife site designations in the immediate locality include Brumby Common West in the north, and the golf course to the south. Brumby Common west is a designated Site of Nature Conservation Interest immediatley adjacent to the M181, comprising A mosaic of habitats comprising coniferous plantation woodland, broadleaved semi-natural woodland, scrub, common reed, grassland, arable and tall ruderal vegetation. Previous studies have identified opportunities for ecological enhancement in an east-west direction along the railway line that crosses the Frodingham viaduct and so this corridor adjacent to Brumby Common West is considered to have a relatively higher level of known and potential ecological constraint to future highway development. Winter and ground-nesting birds utilise the open fields to the west of the M181, though surveys in the past have indicated that the main interests are further to the west and north of the motorway, as well as on land to the south of the M180. So a new junction in itself is unlikely to have a significant impact on these interests. Elsewhere along the existing M181, ecological interests are limited to hedgerows and small woodland plantations which, though small, are uncommon and should be preserved where possible.

7.4.3 Protected and notable species records are sparse in this area and may be under-recorded. Wetlands and drains could support species such as otter, water vole or great crested newt and this should be investigated further as part of the options selection process as these species could influence scheme location and design, including land required for mitigation.

Figure 12: Ecology Opportunities & Constraints[15]



[15] Should to Should Not = increasing ecological impact/ constraints

7.5 Heritage

7.5.1 A high level cultural heritage appraisal was undertaken in December 2011 to assess the cultural heritage resource for the *Lincolnshire Lakes Area Action Plan Evidence Base*. A number of these assets are recorded within the vicinity of the M181. These assets are listed in Table 5 and their impact on the location for a junction assessed below. The M181 impact corridor was set at 250m either side of the motorway, the standard tolerance for such an assessment

7.5.2 Located to the north of Earl Beauchamp's Warping Drain and to the south of the A18 are a number of archaeological assets (MLS20574, MLS10812 & MLS7767) that lie to the west of the M181. These include cropmarks and an artefact scatter of possible prehistoric or later date. These either fall within or lie adjacent to the defined impact corridor and are likely to be more widespread that indicated on the annotated figure. Similarly it is feasible that they may relate to one another to form an occupation/ settlement site of possible prehistoric date. Given the sensitivity of this area it is recommended that this area and a buffer either side of it is avoided for junction development as annotated in Figure 13.

7.5.3 A number of archaeological assets (MLS21095, MLS21096 & MLS21097) are recorded within the southern section of the site, immediately to the north of the M180 and west of the M181. All of the assets recorded comprise cropmarks of uncertain data although a prehistoric or later date is possible. Collectively these assets could infer an occupation/ settlement site which may extend beyond its known extent and into the impact corridor. On this basis it is recommended that this area be avoided.

Figure 13: Heritage Constraints & Opportunities including larger Heritage Features[16]

[16] Should = Preferred development area, Could = should be avoided but can be encroached upon if necessary, Should Not = Area to be avoided, site investigations required if these areas are considered.

Table 5: Archaeological Assets within impact corridor of M181

HER No.	Site Identifier	Description	Period	Assessment	Probability	Impact	Risk	Potential Impact
MLS7767	Findspot	Unspecified flints were found on Brumby Common (Burringham parish) at some time before 1931	Prehistoric	The flints were found immediately to the south of the Earl of Beauchamp's warping drain. It is highly likely that the flints were deposited by warping.	Low	Low	Low/ Medium	These artefacts could be associated with the activity recorded to the north (MLS 10812) and may suggest the features recorded in this area are of prehistoric date.
MLS10812 /ELS3236	Linear cropmark	East - west linear cropmarks - period uncertain. The eastern section is now beneath the M181.	Unknown	The cropmarks suggest evidence of occupation. Until further investigation is undertaken the origin of the feature/s cannot be determined.	High	Medium	High	These features will be impacted if junction development was undertaken in this area. Similarly the features are likely to be more widespread than that depicted. They may also relate to MLS20574 which would infer a wider occupation/ settlement site.
MLS21095 /ELS3226	Semi-circular cropmark	A large semicircular cropmark, c.180m in diameter, visible on an aerial photograph. Period unknown.	Unknown	The cropmarks suggest evidence of occupation. Until further investigation is undertaken the origin of the feature/s cannot be determined.	High	Medium	High	It is feasible that this feature is associated with those recorded to the east (MLS21097) which collectively would infer occupation/ settlement activity.
MLS21096 /ELS3226	Cropmark	Part of a sub-rectangular cropmark, possibly an enclosure, visible on an aerial photograph.	Unknown	The cropmarks suggest evidence of occupation. Until further investigation is undertaken the origin of the feature/s cannot be determined.	High	Medium	High	There is a probability that this feature is associated with MLS21095 and MLS21097. These may form part of an occupation/ settlement site.
MLS21097 /ELS3226	Linear cropmark	A broad, double ditched linear cropmark, visible on an aerial photograph to the south west of North Grange Farm. It extends over a distance of 800m. A probable 19th century warping drain.	Unknown	The cropmarks suggest evidence of occupation. Until further investigation is undertaken the origin of the feature/s cannot be determined.	High	Medium	High	Cropmarks would be impacted by junction development in this area. Similarly it is likely that additional features will occur in this area either side of the current motorway. It is also probable that they link to MLS21095 and MLS21096.
MLS20574	Parallel Linear ditches	Two parallel linear ditches are visible as cropmarks on an aerial photograph taken in 1989. The northern ditch is visible for approximately 60 metres, running in a NE-20574SW direction immediately south of the railway line. A parallel ditch runs about 8m to its south for a shorter distance, perhaps 30 metres.	Unknown	The cropmarks suggest evidence of occupation. Until further investigation is undertaken the origin of the feature/s cannot be determined.	High	Medium	High	There is potential for the linear features to extend into the impact corridor. These may be associated with asset no. MLS10812.

7.6 Costing

7.6.1 WSP has provided two costed options for a junction location as an indication of opportunities and constraints. Option 1 is located approximately 200 metres north of the Brumby Common Lane bridge over the M181 (the Northern Option). Option 2 is located approximately 440 metres south of the Brumby Common Lane bridge (the Southern Option). These options were costed by Davis Langdon with the costs shown in Table 6. The junction locations and original costings are included in Appendix B for reference. The cost of de-trunking is calculated on a pro rata basis using the cost calculated by Davis Langdon, approximately £900k per kilometre.

7.6.2 The evidence base for other Further Considerations suggests that the options above may be outside the optimal location for the junction. A junction at Brumby Common Lane (BCL) has been costed as an alternative based upon the information provided by WSP. Because it has been assessed in less detail than Options 1 and 2 a ten percent contingency has been included. It assumes that the Brumby Common Lane bridge would be retained for NMUs. The resulting cost is included in Table 6.

Table 6: M181 Junction Costs (£k)[17]

Cost Element	Option 1	Option 2	BCL
Junction Cost	£2,110	£2,210	£2,110
Ground Stabilisation & Land Raising	£0	£250	£0
Cost of De-trunking	£1,161	£2,241	£1,341
10% Junction Contingency	£0	£0	£211
Total	**£3,271**	**£4,701**	**£3,662**

7.6.3 Based upon the costs provided by WSP the junction on the M181 may cost between £3.27m and £4.70m. A junction located at Brumby Common Lane may cost between £3.45m and £3.66m. It must be noted that because design of this junction is in the early stages all costs are indicative.

7.6.4 Any costs associated with the connecting road layout to Lincolnshire Lakes and beyond are excluded form the cost considerations. The principles and form of the layout are issues for more detailed masterplaning and may be considered somewhat independently from the costs of the junction itself. For example the number of junctions along the M181 is not directly dependent on the location of the junction at which the M181 terminates.

7.6.5 A more southerly junction location is likely to be more costly both because of ground conditions and the additional cost of de-trunking (i.e. treating the road north of the new junction so that it is in keeping with its new role serving Lincolnshire Lakes). The additional cost associated with ground conditions will be directly related to the final location of the junction.

7.7 Summary of Constraints & Opportunities

7.7.1 Based on earlier evidence it is assumed that the junction will be located along the current M181 alignment due to the cost implications of an off-line junction. This is likely to require an

[17] Costs for Options 1 and 2 taken directly from *Lincolnshire Lakes Proposed Phase 1 Highway Works* (Davis Langdon, 26 Sep 2012). Costs for Brumby Common Lane used from the Davis Langdon work with additional costs for de-trunking calculated on a pro-rata basis.

area of approximately 100 metres across (50 metres either side of the existing central reservation) based upon the Inscribed Circle Diameter of the M181/ A18 junction. This excludes the impact of side roads that will tie-in to the junction. The summary of constraints and opportunities for Further Considerations is based upon this assumption.

7.7.2 Using sieve mapping to summarise the opportunities and constraints of Further Considerations a small zone where the junction should be located is identified. This begins at the southern edge of Brumby Common Lane bridge and extends north for approximately 80 metres.

7.7.3 To the south the primary constraints are Land, Flood and Drainage, and Ecology. In particular the fishing pond immediately south of Brumby Common Lanes is restricts where the junction should be located. To the north the primary constraint is Heritage.

7.7.4 The area where the junction Could be located extends a further 260 metres north of the location where the junction Should be located. In addition the junction Could be located in an area approximately 180 metres south of Brumby Common Lane or an area that extends 510 metres north from B1450 Burringham Road.

Figure 14: Summary of Further Considerations Opportunities & Constraints

7.7.5 Other key points arising from a review of Further Considerations are:

- The Core Strategy requires Lincolnshire Lakes to provide improved access to Scunthorpe;
- The Core Strategy requires Lincolnshire Lakes road infrastructure to relieve existing congestion;
- The new junction will need to assist with flood evacuation;

- The *Lincolnshire Lakes Transport Strategy* indicates that the development should reduce severance caused by the M181;
- A junction located south of Brumby Common Lane is likely to be more costly than one at or north of Brumby Common Lane;
- A junction within the Should zone identified in Figure 14 may cost approximately £3.5m including re-treatment of the M181 north of the new junction.

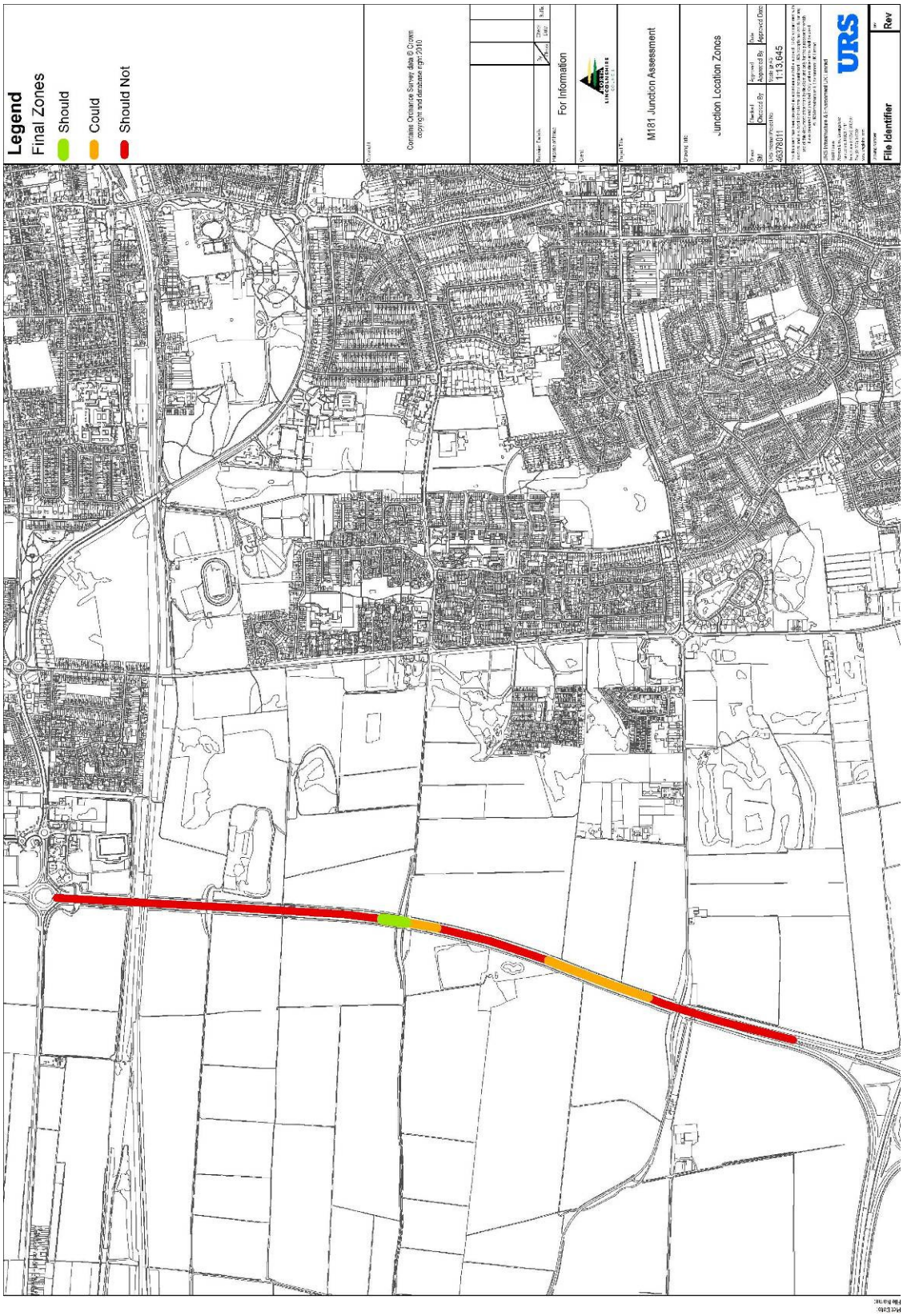
8. FRAMEWORK CRITERIA ASSESSMENT

8.1 Zone for Junction Location

8.1.1 Evidence and criteria from the Highways Agency, North Lincolnshire Council has been considered alongside the evidence base developed by URS including consideration of information provided by WSP. Based upon this evidence and sieve mapping of Traffic & Highways and Further Considerations the zones for the junction location is shown in Figure 15 using the Should (Green), Could (Amber) and Should Not (Red) categories.

8.1.2 The analysis concludes that the preferred location should be an area from Brumby Common Lane bridge north for approximately 100 metres. This includes a small area of overlap at Brumby Common Lane with the northern area where the Traffic & Highways assessment indicates the junction should be built and the Should area from the sieve mapping of Further Considerations. The zone where the junction should be built has been extended north of this to accommodate the retention of Brumby Common Lane bridge. This can be decided through masterplanning and the consideration of any additional costs associated with upgrades to the bridge or its removal by NLC.

Figure 15: Zone for Junction Location Using Sieve Mapping



8.2 Framework Assessment

8.2.1 In addition to the sieve mapping exercise above further considerations have also influenced the outcome, these are summarised below and the junction zone emerging from this study has been assessed using the framework criteria listed in Section 3.2

Highways Agency

- It is anticipated that departures from highway standards will be required;
- The HA has indicated that it does not foresee issues in obtaining the necessary departures;
- The position of the new junction up to 100m north of the Brumby Common Lane Structure as previously proposed favoured;
- A signal controlled crossroads will not be acceptable;
- A roundabout seems the most appropriate junction form and could accommodate signalisation if justified by assessment; and
- The HA recommends de-trunking the M181 north of the proposed new junction.

North Lincolnshire Council

- The location of the junction is unaffected by maintenance or traffic management;
- NLC wish the M181 trunk road to terminate at the new junction and for the Council to accept responsibility and adopt the junction and highway to the north;
- If the HA retain its maintenance function an agreement will need to be made as to how the road will be crossed by cyclists and pedestrians and also what other junctions can be accommodated along the existing alignment. If no agreement can be reached NLC should consider taking responsibility for the road;
- Because the link between the M181 and Scotter Road will perform a strategic function for Scunthorpe it must not be a pseudo high street; and
- To support and encourage travel by sustainable modes to, from and within Lincolnshire Lakes the road layout will need to ensure that walking and cycling are given high priority, while ensuring direct routes for strategic traffic.

Traffic & Highways

- The new junction will provide an opportunity for traffic to re-route to avoid Berkely Circle, however an increase in background traffic may reverse any benefit this would otherwise realise;
- The link road between Scotter Road and the M181 will act as a strategic route for Scunthorpe, relieving traffic pressure on east-west and north-south routes to and from wards in the southwest of Scunthorpe;
- Based upon DMRB road types the link road between the M181 and Scotter Road is unlikely to be suitable to perform the function of a village high street because of its function as a route into Scunthorpe. In particular both speed and capacity are likely to be inappropriate;

- Severance caused by the M181 is an important issue. To resolve it a junction approximately at or south of Brumby Common Lane is likely to be most effective; and
- The junction terminating the M181 need not be the only junction south the A18, which would provide opportunities for effective traffic management for Lincolnshire Lakes and Scunthorpe more widely.

Further Considerations

- The Core Strategy requires Lincolnshire Lakes to provide improved access to Scunthorpe;
- The Core Strategy requires Lincolnshire Lakes road infrastructure to relieve existing congestion;
- The Lincolnshire Lakes Transport Strategy indicates that the development should reduce severance caused by the M181;
- A junction located south of Brumby Common Lane is likely to be more costly than one at or north of Brumby Common Lane; and
- A junction within the 'Should' zone identified in Figure 12 may cost approximately £3.5m including re-treatment of the M181 north of the new junction.

8.2.2 The framework assessment indicates that the junction zone emerging from this study fulfils the assessment criteria well. It can therefore be considered that the zone identified for the junction in Figure 15 is a good match with the assessment criteria.

Table 7: Framework Assessment

Criteria		HA	NLC	Traffic & Highways	Further Considerations
A	Supports the development of Lincolnshire Lakes	Neutral	Good	Good	Good
B	Assists traffic flows within Lincolnshire Lakes	Neutral	Good	Good	Good
C	Enhances and maintains the concept of Lincolnshire Lakes	Neutral	Good	Good	Good
D	Serves the existing town of Scunthorpe	Neutral	Good	Good	Good
E	Alleviates congestion in existing areas of Scunthorpe	Neutral	Good	Good	Good
F	Ensures free flow conditions between the M181 and Scotter Road	Good	Good	Good	Good
G	Links to Scotter Road are not a puedo high street	Neutral	Good	Good	Neutral
H	The junction will need to comply with DMRB with departures where appropriate	Good	Good	Good	Neutral

9. RECOMMENDATIONS

9.1.1 Following a consideration of the evidence discussed in Sections 4 to 7 and analysis through sieve mapping in Section 8 the recommendations from the study are:

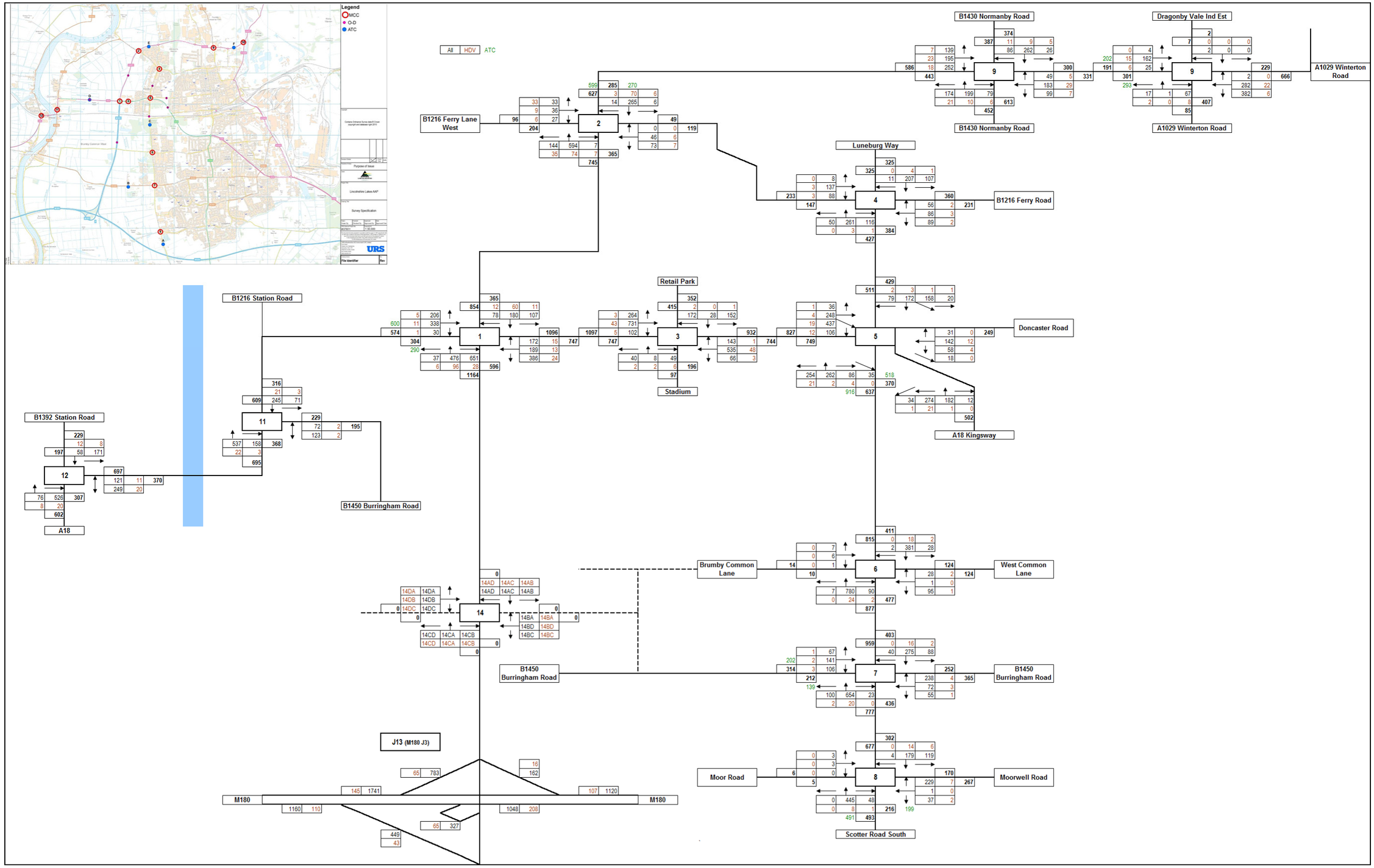
1. The junction on the M181 should be located in a zone starting at the southern edge of Brumby Common Lane bridge extending north for approximately 100 metres. Any exception to the whole of the junction being outside this zone should be dictated by highway design standards. The M181 would terminate at the new junction and be de-trunked to the north;

2. Strategic links to Scotter Road at West Common Lane and via B1450 Burringham Road should be adopted to assist with managing traffic. The villages of Lincolnshire Lakes to the east of the existing M181 should be accessed via roads that connect to the link roads and not create alternative through routes that could attract rat-running; and

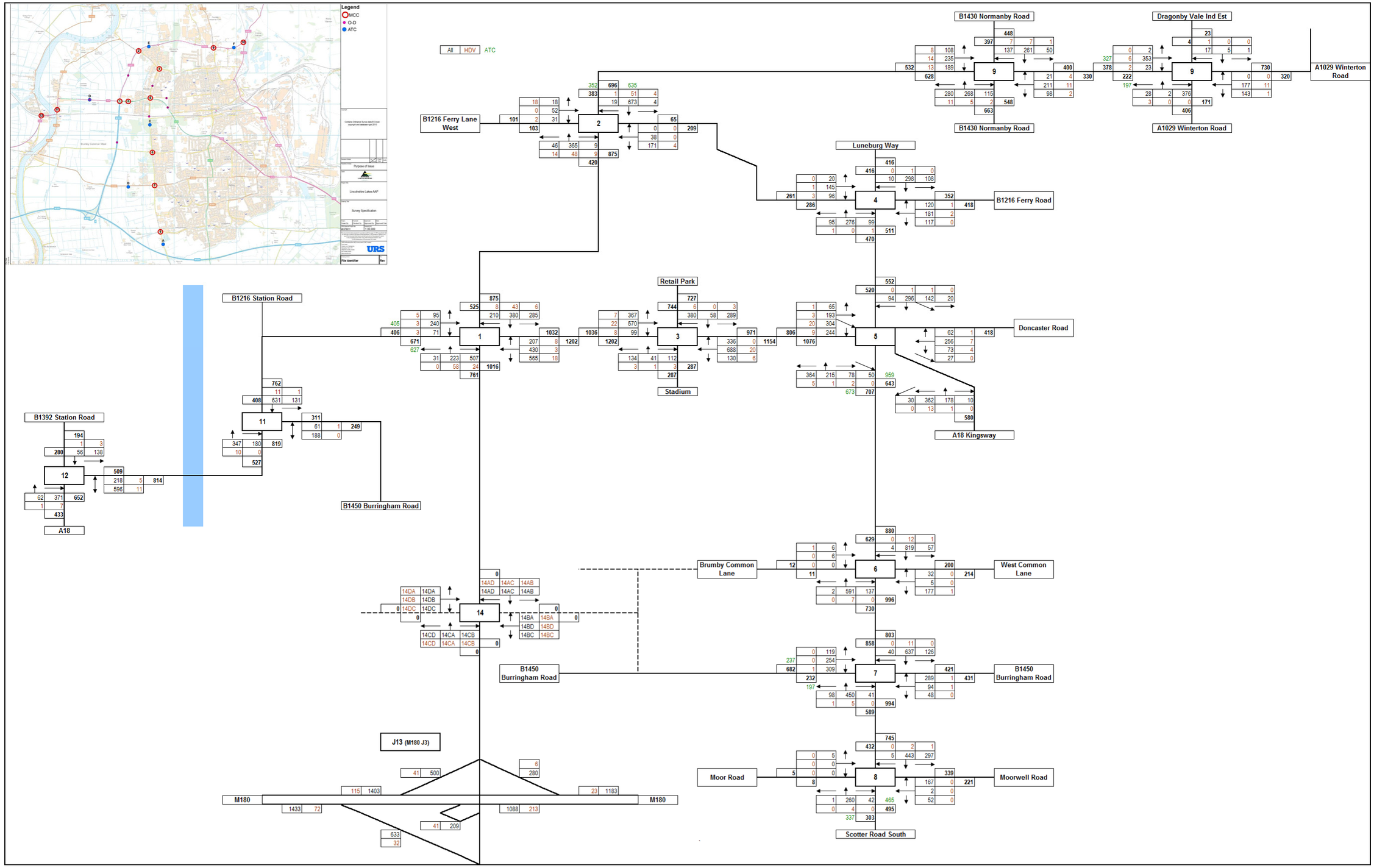
3. Masterplanning should consider a secondary junction that serves the villages to the west of the existing M181 and potentially to the east provided that the road layout will not encourage rat-running.

APPENDIX A TRAFFIC FLOWS

Baseline Traffic 08:00-09:00


Legend
MCC
O-D
ATC
All
HDV
ATC
B1430 Normanby Road
Dragonby Vale Ind Est
A1029 Winterton Road
B1216 Ferry Lane West
Luneburg Way
B1216 Ferry Road
Retail Park
Doncaster Road
B1216 Station Road
B1392 Station Road
A18 Kingsway
B1450 Burringham Road
Stadium
A18
Brumby Common Lane
West Common Lane
J13 (M180 J3)
M180
M180
Moor Road
Moorwell Road
Scotter Road South

Baseline Traffic 06:45-17:45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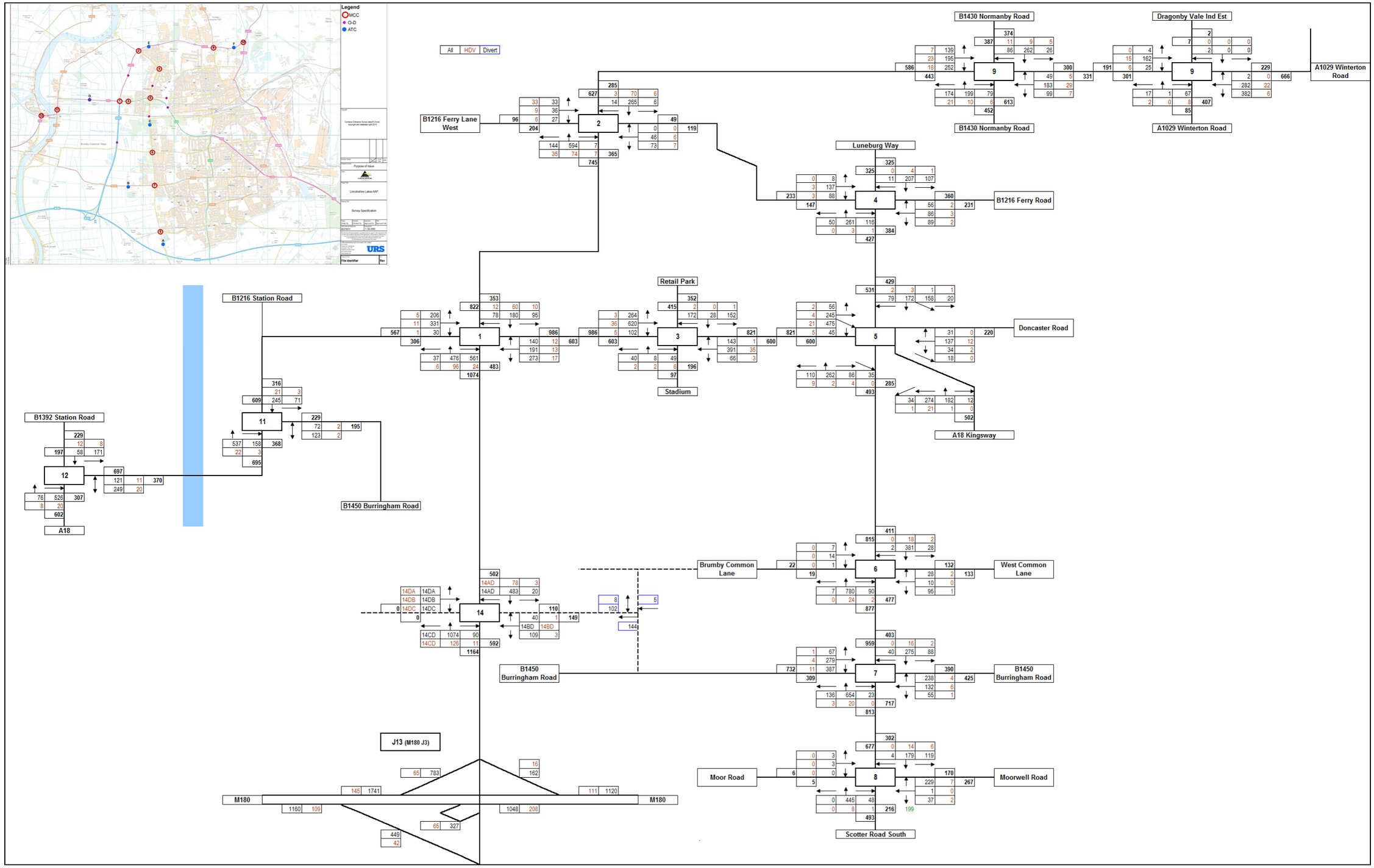
B1216 Ferry Road
Retail Park
B1216 Station Road
Doncaster Road
B1392 Station Road
Stadium
A18 Kingsway
B1450 Burringham Road
Brumby Common Lane
West Common Lane
J13 (M180 J3)
M180
Moor Road
Moorwell Road
B1450 Burringham Road
Scotter Road South
A18

2012 AM Peak Re-distributed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Retail Park
Doncaster Road
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B1392 Station Road
A18 Kingsway
A18
B1450 Burringham Road
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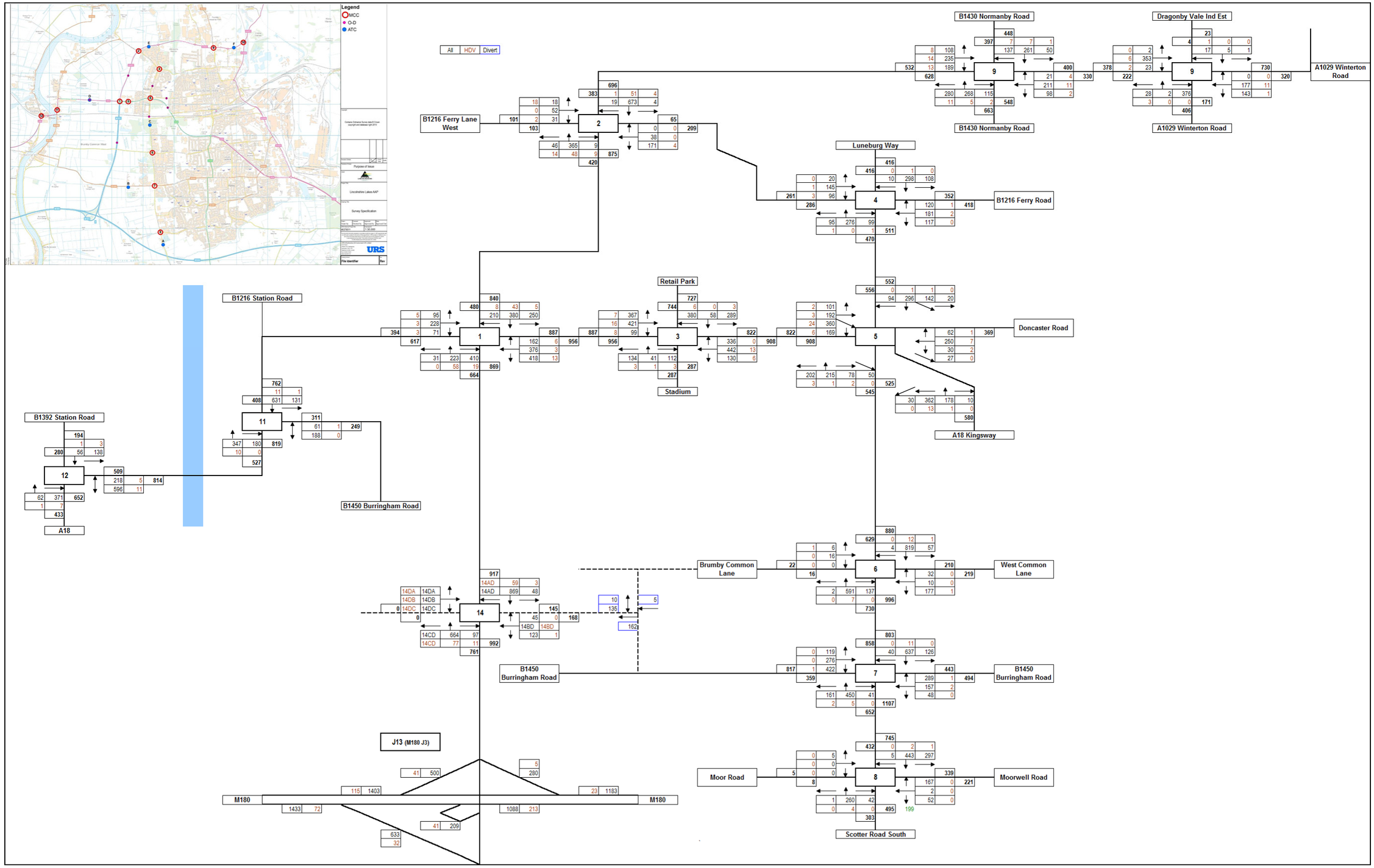
M180
Brumby Common Lane
West Common Lane
Moor Road
Moorwell Road
Scotter Road South

2012 PM Peak Re-distributed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West Common Lane
J13 (M180 J3)
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M180
Moor Road
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Scotter Road South

APPENDIX B PRIMARY EVIDENCE FROM WSP

Junction Costs[18]

[18] Sourced from *Lincolnshire Lakes Proposed Phase 1 Highway Works* (Davis Langdon, 26 Sep 2012).

Lincolnshire Lakes

Davis Langdon

Proposed Phase 1 Highways Works - 26/9/12

	Description	Option 1	Option 2	Additional Costs for Option 2	Notes / Assumptions
1	**M181 New Junction**				**The following are High Level Construction Costs Only and Exclude any Land Acquisition Costs**
	Option 1 - (Northern location)	2,110,000	2,210,000	100,000	Traffic management costs assumed higher for Option 2 due to proximity of the M180 junction
	Extra over costs associated with Option 2 (Southern Location)				
	Ground stabilisation and land raising	-	250,000	250,000	Not required for Option 1
	Additional length of M181 de-trunking	-	900,000	900,000	Not required for Option 1 - Approx 1km long
	Additional junction in original Northern Location		1,250,000	1,250,000	Not required for Option 1
2	**Detrunking approx 1.2km of the M181**	1,080,000	1,080,000	-	From Northern roundabout location - Approx 1.2km
3	**New Urban Link Road to Scotter Road**				
	Proposed link road from M181 to Scotter Road	1,200,000	1,200,000	-	7m wide, 2 way single carriageways, West to East Approx 1.2km
	New Scotter Road Junction	350,000	350,000	-	Allowance for signalised junction
	Extra over costs associated with Option 2 (Southern Location)				
	New link road, East & then South to Burringham Rd	-	1,000,000	1,000,000	7m wide, 2 way single carriageways - Approx 1km.
4	**New Urban Link Road to Burringham Road**				
	Proposed link road from new Scotter Road link	1,400,000	1,400,000	-	Total length of 1.4km included
	New Burringham Road Junction	250,000	500,000	250,000	Increased traffic volumes anticipated for Option 2 due to proximity of the M180 junction
5	**Improvements to Burringham Road**				
	Allowance only - scope to be defined	250,000	450,000	200,000	Increased traffic volumes anticipated for Option 2 due to proximity of the M180 junction
6	**Improvement to Burringham Road / Scotter Road Junction**				
	Allowance only - scope to be defined	250,000	400,000	150,000	Increased traffic volumes anticipated for Option 2 due to proximity of the M180 junction
7	**Potential New Link to Scotter Road South**				
	Proposed link road to Scotter Road South	-	2,200,000	2,200,000	Not required for Option 1
	New Scotter Road South Junction	-	350,000	350,000	Not required for Option 1
8	**Berkeley Circle Alterations**				
	Scope of works to be developed	TBC	TBC	TBC	Scope of works yet to be defined, but will be the same for both options
9	**Land Acquisition Costs**	-	TBC	TBC	There would be land acquisition costs associated with Option 2. We do not have an indication of these costs, but they are likely to be significant as it would involve up to three land ownerships
	£	6,890,000	13,540,000	6,650,000	

The above scope of works and costs are based upon WSP e-mail dated 25/9/12 and Drawings SK 1104/SK/11 A & Southern Junction mark up as part of the Criterior Based Appraisal. The scope of works and costs currently identified are based upn limited information. They should therefore be seen as high level and indicative only at this stage, for comparison purposes. The costs will be comprehensively reviewed and updated as the scheme develops and further information becomes available.

The cost summary has been produced to show the overall costs of the highways / infrastructure we are currently aware of, along with the relative difference between Options 1 & 2. This assessmment does not attempt to apportion who would be liable to pay the additional costs associated with Option 2.

The above costs exclude the following :-

a) VAT
b) Professional, statutory and all other fees
c) Inflation
d) Any landfill tax implications for materials removed from site

JUNCTION LOCATIONS CONSIDERED BY WSP[19]

[19] Images are sourced from *Highways & Transportation Assessment of New M181 Junction Locations* (WSP, September 2012).

Figure A 1: Northern Location

Figure A 2: Southern Location