Northumberland Local Plan

Northumberland County Council

Transport Assessment

Mitigation Report

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Northumberland Local Plan

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Appendix B. Preliminary Drawings for the Preferred Mitigation Options

1. Introduction

Jacobs has been commissioned by Northumberland County Council (NCC) to undertake a Transport Assessment to establish the traffic implications of delivering the countywide growth aspirations associated with the proposed residential, employment and minerals extraction Local Plan allocations for the Local Plan period 2016 – 2036. The Local Plan aims to achieve 17,700 new dwellings and 171,500m2 of new employment land across Northumberland by 2036.

This Mitigation Report should be read in conjunction with the Northumberland Local Plan Transport Assessment, December 2018, and acts as a continuation of that report. The Local Plan Transport Assessment provides a summary of the methodology used to forecast future traffic generation associated with the development sites being proposed as part of the Local Plan. Having quantified the traffic generation associated with future development, the report provides an assessment of the impact of the Local Plan sites at several key junctions in various settlements in Northumberland. The full and detailed junction capacity modelling results are contained within chapters 6 and 7 of the Local Plan Transport Assessment.

Two scenarios were assessed for each key junction which included a range of development coming forward over the Plan period. These scenarios included the following:

- **Baseline Assessment:** Recorded traffic flows (and appropriate traffic growth factors) plus inclusion of Baseline Scenario development traffic flows; and

- **Local Plan Assessment**: Recorded traffic flows (and appropriate traffic growth factors) and Baseline traffic flows plus inclusion of the Local Plan Scenario traffic flows (Local Plan allocation sites).

The modelling assessments identified five junctions that are expected to operate beyond operational capacity when Local Plan development traffic is added to the road network and existing / committed traffic flows (also considered and summarised in the Local Plan Transport Assessment 2018).

As a result, this Mitigation Report provides a summary of those junctions that are anticipated to require physical improvements to enable future development growth to be accommodated and explores a range of potential options and their resulting impact.

2. Methodology

2.1 Overview

Based on the assessments undertaken in the Local Plan Transport Assessment 2018, this report sets out the mitigation options for five junctions, all of which are identified to be materially impacted by Local Plan development and operate beyond theoretical capacity (>1.00RFC) in either the existing baseline scenario or Local Plan assessment scenario. This suggests that either:

- The junctions already operate beyond capacity and therefore additional future development will exacerbate this residual constraint; or
- Junctions will become significantly constrained when the additional traffic associated with the allocated Local Plan sites is included.

The following junctions have been identified to operate with an RFC of >1.00 in the Transport Assessment:

- A1068 / Shilbottle Road priority junction (Alnwick);
- A6079 Rotary Way / Ferry Road priority junction (Hexham);
- A197 Morpeth Road / A1068 priority junction (Ashington);
- A189 / B1334 / Ashwood Drive roundabout junction (Ashington); and
- A1171 / A1171 Dudley Lane / Arcot Lane roundabout junction (Cramlington).

The remaining sections of this report will identify summarise the following key steps undertaken for each junction:

- The forecast junction capacity outputs from the Local Plan Transport Assessment based on current 'as-built' layouts;
- The potential mitigation improvement options that have been investigated for each junction;
- Revised capacity modelling of each mitigation improvement option to determine suitability;
- General consideration of wider opportunities and constraints associated with each mitigation improvement option that could impact on deliverability; and
- A recommended preferred option taken forward and developed into indicative design drawings for each location based on the revised capacity analysis and review of opportunities and constraints.

2.2 Junction Modelling

The junction capacity modelling software used to assess the potential mitigation options for this report is consistent with that used to inform the junction assessments reported in the Local Plan Transport Assessment. This includes a combination of industry standard software packages Junctions 9 for priority junctions and roundabouts and LinSig 3 for traffic signal control junctions.

Junctions 9 provides two main measurements of junction capacity and operation, namely junction operating capacity and queue length. Junction operating capacity or RFC (ratio of to flow capacity) provides the primary measure of the capacity of a junction and is reported for each entry arm. A junction that is operating with an RFC of between 0.85 to 1.00 is considered to be approaching maximum capacity; it operates within its theoretical capacity but will experience some degree of queuing and delay. A junction operating with an RFC of above 1.00

indicates that the junction is operating in excess of its theoretical capacity and therefore is subject to considerable delay and queuing as traffic demand exceeds available capacity.

By comparison, LinSig 3 provides a Degree of Saturation (DoS) measurement for junction capacity. This is the ratio of the relative vehicle demand to the relative saturation flow-rate and is provided for each junction approach arm. A value of over 100% indicates that demand is greater than capacity, while a value of 90% or less is considered to provide an acceptable design criterion. Additionally, LinSig 3 provides a measure of Practical Reserve Capacity (PRC) which is the rate of overall available capacity of the junction, with a positive value indicating that spare capacity is available.

Both LinSig 3 and Junctions 9 provide queue length outputs for each junction arm, and while this is not a primary measure of junction capacity, with regular queues forming but also dissipating in the case of signal control junctions, it does provide an indication of overall junction performance. Queue length is reported as the average maximum queue length over the hour long peak period being assessed.

The junctions included in the Local Plan Transport Assessment have been analysed and categorised on a 'traffic light' system based on their operation, using the criteria below:

- Green represents a junction operating within capacity (0 to 85% RFC/DoS);
- Amber represents a junction operating with some manageable impact (86% to 99% RFC/DoS); and
- Red represents a junction that operates beyond capacity, with considerable queuing and delay (100%+ RFC/DoS).

A full summary of the red, amber, green (RAG) analysis undertaken for all junctions considered in the study is provided in the Local Plan Transport Assessment. The five junctions included within the scope of this mitigation report reflect junctions that have been given a red 'RAG' rating in the Transport Assessment.

The mitigation options provided as part of this Mitigation Report should be viewed with flexibility, such that they can be revised to account for future changes / realisation of future development changes that occur relative to those planned as well as any future interventions, such as those mentioned above that may fundamentally impact on travel behaviour.

2.3 Junction Design

Following the iterative design process, in which mitigation options of varying complexity have been assessed, those that have shown to provide sufficient benefits for the future operation of a junction (and considered to be deliverable) have been pursued. Indicative layout sketches of the preferred designs have been developed.

All design options that have been considered and assessed as part of this Mitigation Report are shown in Appendix A. The preferred design options are also included within Appendix B for easy identification of the options that are deemed most effective for each junction. The preferred option drawings provided in Appendix B are subject to the following key caveats:

- The junction designs are indicative sketches only and would require detailed design prior to implementation. Although the outline designs have been developed with reference to the relevant design criteria, further refinements will be needed to ensure that proposals accord fully with highway design standards;
- Junction layout options have been designed on OS mapping provided by NCC. It is recommended that a topographical survey of the area is undertaken prior to any further levels of junction design;
- The presence of services and potential requirement for diversions has not been reviewed;

- All designs would need to be subject to Road Safety Audits if they were to be progressed and this may result in further design iterations / modifications; and

- Where possible, the designs put forward have been limited to being implementable within the existing adopted highway boundary to negate the need to acquire third party land and to avoid the need for costly modifications to existing infrastructure such as bridges. It should be noted however, that whilst some of the considered mitigation options may result in the need for the acquisition of private land, the preferred options identified in this report are deliverable within the local and strategic highway boundaries.

NCC has provided historic mitigation design drawings for improvement options for A6079 Rotary Way / Ferry Road and A197 Morpeth Road / A1068 junctions which have been assessed as part of this Mitigation Report. These drawings are also contained within Appendix A.

2.4 Mitigation Options

The following sections of the Mitigation Report summarise the modelled results from the Local Plan Transport Assessment for each of the five junctions. The modelling results of the future traffic impacts based on the existing junction layouts is provided, enabling a comparison of the capacity assessing results associated with the mitigation options being put forward compared to the existing / future operation of the existing junction arrangement.

A review of the constraints at each location and the iterative options developed is provided for each junction and provided together with the recommendations for the most suitable options considered to be taken forward.

3. A6079 Rotary Way / Ferry Road, Hexham

3.1 Existing Layout Modelling Results - 3 Arm Priority Junction

The modelling of the existing junction layout using 2016 base traffic flows shows that the junction is anticipated to be over capacity in the baseline scenario prior to the addition of any further traffic from the allocated Local Plan development sites. The capacity issues principally relate to traffic turning out of the Ferry Road minor arm with the modelling results showing an RFC of between 7.6 and 9.9 on this junction approach during the AM and PM peak periods respectively. The cause of the congestion is the high volume of traffic in both directions on the A6079 which provides few gaps in the mainline flow for vehicles to exit Ferry Road.

With the addition of Local Plan development traffic associated with proposed employment sites off Ferry Road, the extent of queuing and delay on Ferry Road increases, in addition to an increase in traffic volumes on the mainline flow, presenting fewer gaps for traffic exiting Ferry Road. The modelling results show an RFC of 9.9 and 13.2 in the AM and PM peaks respectively.

A summary of the Baseline and Local Plan modelling results for the existing junction layout are presented in Table 1.

Table 1 A6079 Rotary Way / Ferry Road Modelling Results for the Existing Junction Layout

Junction Approach	Baseline Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
Ferry Road	999%	225.7	4820.3	760%	231.7	6891.4
A6079 Hexham Bridge	78%	8.2	25.6	38%	0.8	14.2
Junction Approach	**Local Plan Scenario**					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
Ferry Road	999%	301.0	7028.8	1324%	412.6	7289.6
A6079 Hexham Bridge	101%	46.5	189.1	40%	0.9	14.5

3.2 Mitigation Options

Regarding mitigation measures for the A6079 Rotary Way/ Ferry Road junction, the impacts of future development could be lessened through 'soft' mitigation measures. Consideration could be given to adjusting the shift times of future employment development sites off Ferry Road to avoid staff arriving and leaving during the peak hours, which would contribute to reducing the impact at the junction. The implementation of travel planning measures, particularly at a Business Park level with existing tenants and targeting staff living in Hexham, may also be successful in reducing the traffic impact at the junction in the future, such as car-sharing and incentives to use sustainable modes.

However, it is acknowledged that the junction is anticipated to be operating beyond capacity in the baseline scenario prior to traffic associated with Local Plan development traffic, therefore, demonstrating that a consideration of physical mitigation measures is required. Physical improvements for the junction are constrained

by the proximity of Hexham Bridge which is situated immediately south of the junction and by the embankment to the west, works to either of which would likely be costly.

Mitigation options for a standard roundabout layout, traffic signal control junction, and improvements to the existing priority junction have been investigated. A summary of the findings for each of these options is set out below.

3.2.1 Modifications to the Existing Priority Layout

Two key improvements to the existing priority junction layout have also been considered. Firstly, the potential for limiting vehicular movements turning right out of Ferry Road was explored to reduce the queuing time on this junction approach. Providing a left turn only out of Ferry Road could reduce the wait time for vehicles on this arm as left turn movements are required to give-way to one opposing flow (Rotary Way southbound) whilst right turn movements are required to give-way to two opposing flows (Rotary Way southbound and Hexham Bridge northbound). However, this option was eliminated based upon the wider traffic redistribution impacts that would occur at surrounding nearby junctions, such as the U-turning movements by vehicles at the A6079 / Tyne Green Road roundabout south of the junction.

Secondly, the potential for widening the A6079 Hexham Bridge junction approach to provide two lanes on this approach was considered to increase capacity on the southern mainline flow approach. However, this option has been eliminated also as this would require substantial adjustments to the Grade II listed bridge structure, and land adjacent to the bridge (embankments), for which the financial costs would likely be significant when compared to the actual benefits achieved in terms of improved traffic capacity.

Overall, the opportunities for upgrading the existing priority junction layout to deliver improved capacity to the level required and reduced queuing and delay for traffic on all junction approaches is severely limited and has been eliminated as a feasible mitigation option for the junction.

3.2.2 Standard Roundabout Layout

Two standard roundabout options for the junction have been provided by NCC as preliminary indicative designs, and are provided in Appendix A. These options have been discounted because of the carriageway widths of these roundabout designs having between 1.0 and 1.2 times the largest entry width, in which this constraint has been facilitated with a large overrun. It is deemed unsafe for all traffic, including HGVs, to use the large overrun proposed as part of these two designs.

As a result, a further standard roundabout design has been developed for the junction by Jacobs, included in Appendix A. This option consists of two lanes on the circulatory carriageway and would require the acquisition of private land to the west of the roundabout to accommodate carriageway widening. Widening required to the east of the roundabout can be contained within adopted highway land.

The Local Plan modelling results for the standard roundabout option devised by Jacobs are shown in Table 2.

Table 2 A6079 Rotary Way / Ferry Road Standard Roundabout Option

Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
Ferry Road	123%	52.7	350.02	156%	174.3	992.63
A6079 Hexham Bridge	127%	171.7	601.67	144%	347.6	1318.50
A6079 Rotary Way	100%	31.4	62.29	72%	2.5	6.78

Although the results demonstrate that the standard roundabout option would operate beyond theoretical capacity limits, the junction RFCs on Ferry Road would reduce during the AM and PM peaks with a standard roundabout layout when compared to the existing 3-arm priority junction layout. The A6079 Hexham Bridge approach however, would experience worsened queuing and delay with a roundabout layout when compared to the existing layout. Queuing on the A6079 southern approach would be likely to extend over the bridge and into Hexham town centre with queues of 171 and 347 vehicles in the AM and PM peaks respectively.

3.2.3 Signal Controlled Junction Option 1

Two traffic signal control options have been investigated for this junction, the designs for which can be seen in Appendix A. Firstly, signal control has been added to the existing junction layout in a three-stage signal plan and a left turn lane has been introduced on the Rotary Way approach for vehicles turning into Ferry Road.

The Local Plan modelling results for this layout are highlighted in Table 3.

Table 3 A6079 Rotary Way / Ferry Road Signal Control Option with Existing Layout

Local Plan Scenario				
Junction Approach	AM Peak		PM Peak	
	Mean Max Queue (pcu)	Degree of Saturation (%)	Mean Max Queue (pcu)	Degree of Saturation (%)
A6079 Rotary Way Left/Ahead	227.9	132%	84.7	110%
Ferry Road Right/Left	66.5	131%	104.7	129%
A6079 Hexham Bridge Ahead/Right	156.6	130%	186.3	131%
Overall Practical Reserve Capacity (PRC)	**-46.9**		**-45.2**	

With this option, the junction is anticipated to be over capacity by 32% and 31% in the AM and PM peaks respectively, with significant queuing on all three junction approaches, but particularly on the A6079. Despite this, the signal option within the existing junction footprint provides an improved operation on Ferry Road itself compared to the existing layout, with reduced queuing and delay when compared to the modelling results for the existing 3-arm priority junction layout.

The modelling results also highlight that comparatively, the signal option provides a slightly improved operation in the PM peak and a worsened operation during the AM peak when compared to the standard roundabout option. However, it is apparent that the introduction of the signal arrangement option would still result in lengthy queues on the Hexham Bridge and Rotary Way approaches.

3.2.4 Signal Controlled Junction Option 2

Secondly, a more complex signal arrangement has been devised for the junction, which can be accommodated within adopted highway land surrounding the junction. This junction design includes a four-stage signal plan and the layout includes the following new features:

- Two-lane approach on Ferry Road;
- Banning of right turn movements from A6079 Hexham Bridge into Ferry Road (traffic will be required to travel to the A69 / Bridge End Roundabout / A6079 Rotary Way junction, perform a U-turn manoeuvre at this junction and then travel southbound on Rotary Way). Based upon the traffic distribution exercise undertaken for the Local Plan Transport Assessment 2018, this will redistribute 216 vehicles in the AM peak and 129 vehicles in the PM peak to the A69 roundabout in the north and to the Rotary Way junction approach;
- Dualling of the A6079 Rotary Way from the A69 to the junction with Ferry Road, providing a two-lane approach on this arm (dedicated ahead and left turn lanes);

- Yellow Box markings on the A6079 Rotary Way adjacent to the Starbucks/BP garage junction to enhance vehicle movements when exiting this junction. This will remove existing traffic blockages currently experienced at this location;

- Signalised Toucan crossing facilities across the A6079 Rotary Way approach to the junction, with two separate crossings running with traffic in two consecutive signal stages, and a widened shared footway on the western side of the carriageway on the A6079 at the junction. These facilities will provide improved connectivity and safety at the junction for pedestrians and cyclists and will improve provision at this location for current cycle movements on NCR 72;

- Shared use footway facility connecting the Toucan crossing on Rotary Way to the Ferry Road footway and a dropped kerb for cyclists to dismount onto the Ferry Road carriageway from the shared use facility; and

- A new pedestrian footway along the northern carriageway on Ferry Road commencing from the end of the new shared use facility and extending to the Jacksons of Hexham access junction, complemented by flush kerbs/tactile paving crossing aids positioned across Ferry Road within the vicinity of the Jacksons of Hexham junction to assist pedestrian movements across Ferry Road.

The Local Plan modelling results for this signal option are presented in Table 4.

Table 4 A6079 Rotary Way / Ferry Road Signal Control Option with a Revised Layout

Local Plan Scenario				
Junction Approach	AM Peak		PM Peak	
	Mean Max Queue (pcu)	Degree of Saturation (%)	Mean Max Queue (pcu)	Degree of Saturation (%)
A6079 Rotary Way Ahead	43.6	96%	30.8	87%
A6079 Rotary Way Left	7.6	49%	3.3	28%
Ferry Road Right/Left	19.9	95%	100.0	123%
A6079 Hexham Bridge Ahead	32.1	89%	149.1	121%
Overall Practical Reserve Capacity (PRC)	**-6.2%**		**-36.2%**	

The results demonstrate that comparatively, the signal option with a revised junction layout provides improved operation on Ferry Road when compared to the existing junction layout, standard roundabout layout, and signal option within the existing junction footprint. This option provides significantly reduced queuing on the Ferry Road junction approach during both the AM and PM peaks when compared to the reported queue lengths with the existing junction layout.

The signal option with a revised layout is anticipated to have a maximum DoS of 96% in the AM peak, demonstrating that the junction would be operating within its theoretical capacity limits, with some spare capacity. Although the junction would be expected to have an overall DoS of 123% in the PM peak, this option is likely to generate shorter queue lengths at the junction when compared to the other mitigation options devised and assessed. This option also incorporates enhanced crossing facilities for pedestrians and improves cycle connectivity on the NCR 72 at the junction.

It is noted however, with the inclusion of Local Plan traffic, both signal options will generate queuing on the Rotary Way and Hexham Bridge junction approaches, which is not reflected in the modelling results for the existing junction layout with Local Plan traffic included. Removing a priority operation and introducing a signal control junction will naturally generate a change in traffic queuing patterns at the junction, given that the mainline approaches will lose priority and will be forced to stop during a red signal stage. Furthermore, the largest queuing on the A6079 Rotary Way approach of 43.6 PCUs (AM peak) is likely to extend back to the Starbucks/BP garage junction but is unlikely to interact with the A69 / Bridge End Roundabout / A6079 Rotary Way junction. The

mitigation design however, removes traffic blockages on A6079 Rotary Way for traffic exiting the Starbucks/BP garage junction.

Nevertheless, it is acknowledged that sliver queues currently exist on the southbound A6079 Rotary Way junction approach. These arise from traffic queues on the A6079 southbound which extend back from junctions located south of the A6079 Rotary Way / Ferry Road junction. These junctions fall outside of the scope of the Local Plan Transport Assessment 2018 and have subsequently not been assessed. Nevertheless, sliver queues currently persist on the Rotary Way junction approach therefore, the signal option modelling results for the Rotary Way approach may not necessarily result in the development of 'new' traffic queues.

In addition, HE's improvement scheme that will commence on the A69 / Bridge End Roundabout / A6079 Rotary Way junction in Spring 2019, will develop a grade-separated junction that will therefore provide additional capacity to accommodate U-turning traffic resulting from the banned right turn movement into Ferry Road from the Hexham Bridge approach. The scheme will remove any potential impact on the A69 mainline as the arrangement is likely to reduce the existing traffic flows on the circulatory carriageway at the junction.

The signal option with a revised layout has been designed to reduce the extent of the queueing on the Rotary Way and Hexham Bridge approaches simultaneously. The removal of right turning movements into Ferry Road from the Hexham Bridge approach has been designed to reduce queuing and delay on this approach caused by right turning vehicles blocking the ahead movements on this arm. The introduction of two lanes on the Rotary Way junction approach, extending from the A69, has been designed to accommodate the redistributed traffic from the Hexham Bridge approach travelling to Ferry Road. The yellow box markings on A6079 Rotary Way at the Starbucks/BP garage junction will enable vehicles to exit this junction without delay.

Although the signal option modelling results show queuing on these two approaches, the extent of the queuing has been reduced through the mitigation design and is off-set by the significantly reduced queues on Ferry Road when compared to the existing junction layout.

3.3 Summary of the Mitigation Modelling Results

The modelling results for each mitigation option for the A6079 Rotary Way / Ferry Road junction and the ranking of the options in terms of delivering capacity improvements are summarised in Table 5. The modelling results are described in RFC (Junctions 9 outputs) and DoS (LinSig 3 outputs) as discussed in section 2 of this report. In relation to the ranking scores, 1 represents the most effective mitigation option for improving capacity and 3 represents the worst. The options have also been subject to the RAG analysis for the AM and PM peak modelling results combined, which is shown in Table 5 and is based upon the criteria outlined in section 2.2 of this report.

Table 5 Summary of the Modelling Results for the Junction Mitigation Options

A6079 Rotary Way / Ferry Road		
Mitigation Option	**Modelling Results**	**Ranking**
Standard Roundabout	AM RFC 1.27 - PM RFC 1.56	**3**
Signal Controlled Junction with Existing Layout	AM DoS 132% - PM DoS 131%	**2**
Signal Controlled Junction with a Revised Layout	AM DoS 96% - PM DoS 123%	**1**

Of the mitigation options assessed, the table demonstrates that the signal control junction with a revised layout option would provide the largest capacity improvements at the junction with the inclusion of Local Plan traffic, followed by a signal control junction with the existing layout.

3.4 Mitigation Options: Design Advantages & Constraints

The advantages and constraints associated with each of the mitigation options considered for the A6079 Rotary Way / Ferry Road junction have been identified following the development of the concept mitigation designs and modelling assessments, which are summarised in Table 6.

Table 6 A6079 Rotary Way / Ferry Road Option Design Advantages & Constraints

Mitigation Option	Advantages	Constraints
Standard Roundabout (Option 1)	• Will increase capacity on Rotary Way with a two-lane approach, and a two-lane circulatory carriageway	• This proposal will require building on the embankment to the west of the junction which could be costly. A retaining wall will be needed due to the gradient of the hill • Very few gaps in traffic making it difficult to allow traffic originating form Ferry Road to enter the circulatory • Higher cost option than option 2 • The Keep-clear markings do not maximise the queuing capacity on Ferry Road • Significant queuing on the A6079 Hexham Bridge approach, indicating queues would extend back into Hexham town centre • Significant queuing on Ferry Road • Cyclists will be required to use the circulatory carriageway to make turning movements to connect to NCR 72
Signalised Junction Existing Layout (Option 2)	• Signal timings can be altered to suit traffic demand (MOVA control) • Lower cost option than option 1	• Unknown public utility services (costs associated with potential service diversions) • Having a short dedicated left turn lane on Rotary Way can cause driver frustration if vehicles are not able to access the lane due to queuing in the ahead lane • Traffic signals will be in footway which will reduce the available width on the footway on the western side of the scheme • The proposed right turn from Hexham Bridge into Ferry Road is sub-standard • The Keep-clear markings do not maximise the queuing capacity on Ferry Road • Significant queuing on the A6079 Hexham Bridge approach, indicating queues would extend back into Hexham town centre • Significant queuing on the A6079 Rotary Way approach, extending back to the A69 junction • Significant queuing on Ferry Road • Cyclists will be required to use the highly trafficked junction to make turning movements to connect to NCR 72

Mitigation Option	Advantages	Constraints
Signalised Junction Revised Layout (Option 3)	• Signal timings can be altered to suit traffic demand - MOVA control • Greater flexibility in the signal operation, e.g. dedicated left turn on Rotary Way approach can be signalised during most of the signal stages, and run in tandem with the Ferry Road approach • Maximised capacity on the Rotary Way approach (dualling) • Reduced queuing on all three junction approaches collectively • Building out into adopted land will ensure that the traffic signals will not impede on existing footway widths on the western side of the scheme • Signalised crossing facilities provide improved connectivity at the junction for pedestrians • Improved connectivity for cyclists using NCR 72 at the junction	• Unknown public utility services (costs associated with potential service diversions) • The Keep-clear markings do not maximise the queuing capacity on Ferry Road • Redistributes Hexham Bridge right turn traffic (into Ferry Road) to A69 junction • Greater cost than option 1 and 2

3.5 Preferred Option

In consideration of the mitigation modelling results and the advantages and constraints associated with each option, the preferred mitigation for the A6079 Rotary Way / Ferry Road junction is a signal option with a revised layout operated with MOVA control as opposed to fixed signal timings.

With the inclusion of the Local Plan traffic flows, this improvement option is likely to generate the most significant reduction in traffic queueing and delay on Ferry Road, the signal configuration setup provides flexibility in terms of changing the signal timings based upon changes in traffic demand on all junction approaches (MOVA control), this option provides enhanced crossing facilities for pedestrians and cyclists, and this option does not require significant and costly building works to existing structures surrounding the junction.

Considering the preferred option, which has been assessed in LinSig 3 software, one of the limitations of the software is that it models signal timing plans in fixed time, meaning green time given to junction approaches are fixed throughout the peak hour being modelled. Given the importance of the junction in providing access to the future Local Plan allocated sites in Hexham, it is advised that the signal option is operated with MOVA control. This is a dynamic system that operates using detectors and loops in the carriageway and dynamically alters and optimises signal timings and green phases based upon changes in traffic demand and queuing on the circulatory carriageway throughout the modelled peak hour to minimise queuing. Evidence from elsewhere suggests that implementing MOVA can increase junction capacity by up to 15% over and above what can be determined from LinSig 3 modelling. Therefore, the introduction of MOVA control for the preferred option is likely to result in greater capacity benefits than those reported from the fixed signal timings assessed in LinSig 3.

Although it has been highlighted that a signal controlled junction could accommodate future Local Plan site allocation traffic more effectively than other junction layouts, it has not been possible to consider the potential benefits of implementing MOVA control due to limitations with LinSig 3 software. Vissim software in conjunction with PC MOVA software can model this form of signal timing plan. It is therefore recommended that as part of future work or as part of a planning application submitted for adjacent sites, this junction is assessed using these tools to determine any further and more realistic capacity gains that can be attained through the implementation of a MOVA control signalised junction at this location.

It is suggested that the preferred physical mitigation option is supported and is likely to be positively influenced by the following factors:

- Employing 'soft' mitigation measures at future development sites along Ferry Road (e.g. avoiding shift changeovers occurring at peak times);
- Ensuring that the proposed new employment land off Ferry Road is provided with excellent walking and cycling links (and possible link into existing bus services in the area) to minimise vehicular trips;
- Upgrading of the A69 / B6531 junction to the north-west of Hexham and the opportunity to redistribute existing traffic from the western part of Hexham to avoid the A6079 corridor and centre of Hexham;
- Upgrading of the A69 / Bridge End Roundabout / A6079 Rotary Way junction that will begin in Spring 2019 will provide available capacity at this junction to accommodate the U-turning movements being undertaken by traffic travelling from A6079 Hexham Bridge to Ferry Road (banned right turn) as part of the preferred design option; and
- Assessment of additional junctions along the A6079 / Alemouth Road corridor which provides direct access to Hexham town centre, to determine whether corridor wide traffic capacity improvements are feasible to improve northbound and southbound movements between the A69 and Hexham town centre.

3.6 Preferred Option Design Assumptions

The preliminary design assumptions associated with the signal option with a revised junction layout, which are shown on the option drawing in Appendix B, include the following:

- The preferred option is a preliminary / concept design. The preferred option would require full detailed design and be subject to the necessary Road Safety Audits;
- A street lighting assessment / design will need to be undertaken as part of the detailed design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage;
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system;
- The design has not taken account of the impact on any public utility services and/ or whether service diversions would be required;
- No allowance has been made for service diversions / issues regarding the installation of traffic signals;
- Signing has not been considered as part of this concept design;
- The land required for the carriageway widening is assumed to form part of the NCC highway boundary, based upon indicative highway adoption records provided by NCC;
- A topographical survey would be required to complete detailed design;
- The concept design has been based on traffic data and a desktop review of the site;
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at the detailed design stage; and
- The Police will need to be consulted when considering the installation of Yellow Box markings.

4. A189 / B1334 / Ashwood Drive, Ashington

4.1 Existing Layout Modelling Results - 5 Arm Priority Roundabout

The modelling of the existing junction arrangement using 2016 base traffic flows highlights that the existing junction is expected to operate beyond capacity in both the AM and PM peak periods in the baseline scenario prior to the addition of any traffic from the allocated Local Plan sites. RFCs breach theoretical capacity limits on the B1334 north east arm at 1.24 during the AM peak and on the Ashwood Drive arm at 1.22 during the PM peak, resulting in queueing and delay. This suggests that the dominant traffic flows on the A189 north and south enter the roundabout with minimal delay, which results in reduced gaps in the traffic flow on the circulatory carriageway for vehicles on the B1334 north east and Ashwood Drive approaches to enter the junction, causing queuing and delay on these two approaches.

With the addition of development traffic associated with the Local Plan site allocations, the junction is shown to deteriorate further, particularly on the B1334 north east, Ashwood Drive, and B1334 west approaches which are expected to breach the theoretical capacity threshold with RFCs of 1.74, 2.60, and 1.00 respectively, resulting in increased queuing and delay on these approaches.

A summary of the Baseline and Local Plan modelling results for the existing junction layout are presented in Table 7.

Table 7 A189 / B1334 / Ashwood Drive Modelling Results for the Existing Junction Layout

Junction Approach	Baseline Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
B1334 North East	124%	40.0	304.2	71%	2.2	28.6
A189 South	67%	2.0	3.6	72%	2.5	4.0
Ashwood Drive	9%	0.1	9.0	122%	12.6	308.6
B1334 West	71%	2.5	9.2	97%	14.8	57.0
A189 North	78%	3.5	9.0	85%	5.4	14.3
Junction Approach	**Local Plan Scenario**					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
B1334 North East	174%	82.7	634.3	88%	5.1	66.2
A189 South	72%	2.6	4.4	73%	2.6	4.2
Ashwood Drive	17%	0.2	11.5	260%	69.2	2145.6
B1334 West	79%	3.7	13.5	100%	20.6	75.7
A189 North	83%	4.7	12.2	90%	7.9	20.3

4.2 Mitigation Option

The A189 / B1334 / Ashwood Drive junction is a 5-arm at-grade roundabout junction and is one of two junctions on the A189 providing access to Ashington. The junction experiences a large through traffic movement along the A189 as well as providing the point of access to Ashwood Business Park, a large employment area in Ashington.

The junction therefore represents a major local junction, both in terms of providing access for Ashington but also for significant through traffic on the A189.

The roundabout is already a significant size and a non-typical layout with an unusual oval form. The cost of any physical mitigation changes is likely to be high, as well as potentially causing significant disruption during implementation. Initially, an option of introducing an additional left filter lane from the B1334 onto the roundabout, in combination with an additional circulatory lane on the eastern extent of the roundabout was explored. However, it was not considered that sufficient deflection or circulatory carriageway lane conformity could be achieved, and this option would also require the acquisition of third part land. Additionally, it is noted that the agricultural field bounding the roundabout houses an electricity pylon, which is in close proximity to the roundabout carriageway. The power structure represents a further constraint to physical widening of the roundabout.

It is understood that NCC has secured S106 contributions to implement some improvement works at the A189 / B1334 / Ashwood Drive junction following impacts associated with the previous Core Strategy Transport Assessment undertaken in June 2015. As part of this study, a part-signalisation option was put forward, which involved signalising the A189 north and B1334 east approaches. However, the capacity issues identified at the junction as part of the Local Plan Transport Assessment 2018, are greater and would not be satisfactorily addressed by the part-signalised option.

Recently a safety improvement scheme has been completed at the junction. This has involved the implementation of a 50mph speed limit, improved lane markings and signage, and reductions to visibility to reduce vehicle speeds. Considering theses recent works, the mitigation options explored in this Mitigation Report focus upon improvements that can be delivered within the existing junction footprint. Introducing signal control to the entire roundabout junction and the creation of three lanes on the entire circulatory carriageway within adopted land has therefore been designed and assessed, the design for which can be seen in Appendix A. The signal control option includes a three-stream signal plan, each containing two signal stages. The Local Plan modelling results for this option are shown in Table 8.

Table 8 A189 / B1334 / Ashwood Drive Signal Control Option with Existing Layout

Local Plan Scenario				
Junction Approach	**AM Peak**		**PM Peak**	
	Mean Max Queue (pcu)	**Degree of Saturation (%)**	**Mean Max Queue (pcu)**	**Degree of Saturation (%)**
A189 North	26.3	91%	28.3	92%
B1334 East	3.7	43%	2.8	35%
A189 South	12.7	68%	11.7	67%
Ashwood Drive	0.8	12%	2.8	49%
B1334 West	18	88%	14.7	90%
Circulatory Carriageway – all Lanes Collectively on an Arm	**AM Peak**		**PM Peak**	
	Mean Max Queue (pcu)	**Degree of Saturation (%)**	**Mean Max Queue (pcu)**	**Degree of Saturation (%)**
B1334 West Circulatory	18.7	87%	20.4	90%
A189 North Circulatory	18.6	88%	14.8	93%
B1334 East Circulatory	24.5	85%	18.5	75%
A189 South Circulatory	8.8	85%	6.8	83%
Ashwood Drive Circulatory	31.2	89%	37.7	92%
Overall Practical Reserve Capacity (PRC)	**-1.2%**		**-2.7%**	

The results highlight that comparatively, the signal option provides an improved operation compared to the existing priority roundabout layout. The junction approaches are anticipated to have a maximum DoS of 91% in the AM peak and 92% in the PM peak, demonstrating the junction would be operating within its theoretical capacity limits, with some spare capacity. The modelling results for the internal circulatory carriageway of the signalised

roundabout demonstrate that the average DoS for all internal lanes are within the theoretical capacity limits during the AM and PM peaks.

The mean maximum queue (MMQ) for some of these circulatory carriageway lane groups are noteworthy within the modelled peak hour, such as on Ashwood Drive and the B1334 East circulatory. The signal timings for the circulatory carriageway have been optimised to reduce the extent of potential queuing on the circulatory carriageway, whilst balancing the queuing lengths on the approach arms, and excess queue limits have been included on each circulatory carriageway lane to force LinSig 3 to consider queue lengths that extend beyond the lane lengths when the signal timings are optimised. The internal queuing is reflected in the negative PRCs for the AM and PM peaks.

Considering the preferred option, which has been assessed in LinSig 3 software, one of the limitations of the software is that it models signal timing plans in fixed time, meaning green time given to junction approaches and to the circulatory carriageway are fixed throughout the peak hour being modelled. Given the importance of the junction in providing access to Ashington and being a key junction on the A189, it is advised that the signal option is operated with MOVA control. Evidence from elsewhere suggests that implementing MOVA can increase junction capacity by up to 15% over and above what can be determined from LinSig 3 modelling.

Although it has been highlighted that a signal controlled junction could accommodate future Local Plan site allocation traffic, it has not been possible to consider the potential benefits of implementing MOVA control due to limitations with LinSig 3 software. It is therefore recommended that as part of future work or as part of a planning application submitted for adjacent sites, this junction is assessed using Vissim and PC MOVA software to determine any further and more realistic capacity gains that can be attained through the implementation of a MOVA control signalised junction at this location. These software tools enable the modelling of extended phase times, meaning that the green time for the circulatory carriageway could be extended within a stage to ensure carriageway queueing is cleared before the next signal stage change occurs.

4.3 Mitigation Option: Design Advantages & Constraints

The advantages and constraints associated with introducing signal control to the A189 / B1334 / Ashwood Drive junction are summarised in Table 9.

Table 9 A189 / B1334 / Ashwood Drive Mitigation Design Advantages & Constraints

Mitigation Option	Advantages	Constraints
Signalised Roundabout (Option 1)	• Signal timings can be altered to suit traffic demand – MOVA control, which is likely to provide further improvements to capacity than those reported from the LinSig 3 modelling results, which are fixed signal timings (do not change) • The addition of a third lane in sections would improve the capacity of the roundabout • Will allow vehicles easier access onto the roundabout • Signal operation could be implemented on a part time basis, i.e. during peak periods of traffic activity. This would enable the junction to operate as a priority roundabout in times when traffic volumes are lower, and queuing and delay are not prevalent	• Unknown public utility services (costs associated with potential service diversions) • A medium to high cost option to implement

4.4 Preferred Option

The preferred mitigation option for the A189 / B1334 / Ashwood Drive junction is a signal option operated with MOVA control as opposed to fixed signal timings, with three lanes on the entire circulatory carriageway. With the inclusion of the Local Plan traffic flows, this improvement is anticipated to generate a reduction in traffic queueing

and delay on all junction approaches and enables an improvement option to be developed within adopted land and generally within the existing junction footprint.

Although it has been shown that a signal controlled junction could accommodate future Local Plan site allocation traffic, it is recommended that this junction is assessed using Vissim and PC MOVA as part of Transport Assessments associated with planning applications for adjacent sites, to determine any further efficiencies and capacity gains that can be attained through the implementation of MOVA control and the associated impact of signalising the roundabout. These software tools enable the modelling of extended phase times, meaning that the green time for the circulatory carriageway could be extended by a few seconds within a stage to ensure carriageway queueing is cleared before the next signal stage change occurs.

Therefore, to maximise the effectiveness of the preferred option in mitigating the Local Plan traffic flows at this junction, it is recommended that the signal option is operated with MOVA control as opposed to fixed signal timings. The modelling results reported above for the preferred option are from fixed signal timings assessed in LinSig 3 software. The introduction of MOVA control for the preferred option is likely to result in greater capacity benefits than those reported from the fixed signal timings assessed.

4.5 Preferred Option Design Assumptions

The preliminary design assumptions associated with the signalised roundabout option are shown on the option drawing in Appendix B, and can be summarised as follows:

- The preferred option is a preliminary / concept design. The preferred option would require full detailed design and the exact nature of the preferred option signal scheme would require detailed liaison with the Local Highway Authority and the Regional Traffic Signals Group;
- The preferred option will require an approved detailed design specification, which will be subject to the necessary Road Safety Audits;
- A street lighting assessment / design will need to be undertaken as part of the detailed design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage;
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system;
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required;
- No allowance has been made for service diversions / issues regarding the installation of traffic signals;
- Signing has not been considered as part of this concept design;
- The land required for the carriageway widening is assumed to form part of the NCC highway boundary based upon indicative highway adoption plans provided by NCC;
- A topographical survey would be required to complete detailed design;
- The concept design has been based on traffic data and a desktop review of the site; and
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at the detailed design stage.

5. A1068 / Shilbottle Road, Alnwick

5.1 Existing Layout Modelling Results – 3 Arm Priority Junction

The modelling of the existing junction layout using 2016 base traffic flows demonstrates that the junction is expected to operate within the acceptable theoretical capacity thresholds in the baseline scenario, with RFCs of 0.85 and 0.9 in the AM and PM peaks respectively, resulting in minimal queuing and delay at the junction. The junction is expected to operate with spare capacity during both the AM and PM peaks, although the Shilbottle Road has an RFC of 0.9 in the PM peak, which indicates that this approach is approaching the theoretical capacity limit with existing traffic flows present at the junction.

With the addition of Local Plan development traffic, the junction can be expected to operate beyond the theoretical capacity limits during the PM peak period, with the RFC reaching 1.25 on the Shilbottle Road approach, resulting in significant queuing and delay on this approach. With the addition of Local Plan traffic at the junction, the Shilbottle Road and A1068 approaches are nearing the capacity limits during the AM peak, with anticipated RFCs of 0.97 and 0.91 respectively, resulting in traffic queues and noticeable delay beginning to occur.

A summary of the Baseline and Local Plan modelling results for the existing junction layout are presented in Table 10.

Table 10 A1068 / Shilbottle Road Modelling Results for the Existing Junction Layout

Junction Approach	Baseline Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
Shilbottle Road	85%	4.8	39.5	90%	6.9	54.8
A1068 West (under A1)	69%	2.3	19.6	62%	1.6	16.0
Junction Approach	**Local Plan Scenario**					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
Shilbottle Road	97%	12.1	92.2	125%	72.3	484.6
A1068 West (under A1)	91%	8.7	47.8	64%	1.8	16.9

5.2 Mitigation Options

The modelling results for the existing junction layout with baseline traffic flows highlight that the junction is expected to operate satisfactorily. However. The modelling results for the Local Plan scenario indicate that improvements will need to be made to the junction to increase available capacity to facilitate the anticipated traffic demand generated by the surrounding Local Plan site allocations. This suggests that physical mitigation measures will be required at the junction to deliver increased capacity.

Given the junction's proximity to the access and egress slip roads from the A1, consideration has been given to the users of the A1 slip roads on this section of the road network in the development of physical mitigation options for the A1068 / Shilbottle Road junction. This is to ensure that the preferred design option for the junction does not provide the potential to negatively impact upon vehicular access to and from the A1.

Mitigation options for a standard roundabout layout, mini-roundabout layout, traffic signal control junction and changes to the existing priority junction layout have been investigated. A summary of the findings for each of these options is set out below.

5.2.1 Standard Roundabout Layout

A standard roundabout design has been developed by Jacobs, which can be seen in Appendix A. This option consists of one lane on the circulatory carriageway and would require carriageway widening on the A1068 and Shilbottle Road. Widening of the carriageway can be accommodated within the local and strategic highway boundaries surrounding the junction, suggestive of the adopted highway plan for this junction which was provided by NCC. This option also includes the provision of an uncontrolled pedestrian crossing point on the A1068 east approach and footway realignment to allow for the installation of the uncontrolled crossing.

The Local Plan modelling results for the standard roundabout option devised by Jacobs are identified in Table 11.

Table 11 A1068 / Shilbottle Road Standard Roundabout Option

Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1068 East	22%	0.3	4.19	14%	0.2	3.20
Shilbottle Road	34%	0.6	3.81	43%	0.8	3.98
A1068 West (under A1)	77%	3.5	14.52	72%	2.5	11.49

The results show that a standard roundabout layout for the A1068 / Shilbottle Road junction provides a significantly improved operation when compared to the existing 3-arm priority junction layout, with reduced queueing and delay and significantly improved RFCs. The junction would operate with 23% and 28% spare capacity during the AM and PM peaks respectively with the introduction of a standard roundabout layout. The modelling highlights that the A1068 eastern approach arm (representing the A1 southbound off-slip) has a minimum spare capacity of 78%, highlighting that no impact from the roundabout would be expected on the A1 mainline.

5.2.2 Mini-Roundabout Layout

A mini-roundabout design has been developed by Jacobs, shown in Appendix A. This option consists of one lane on the circulatory carriageway and would require carriageway widening on the A1068 and Shilbottle Road, which is assumed to be possible within adopted land surrounding the junction. This option also includes the provision of an uncontrolled pedestrian crossing point on the A1068 east approach and footway realignment to allow for the installation of the uncontrolled crossing.

The Local Plan modelling results for the mini-roundabout option devised by Jacobs are presented in Table 12.

Table 12 A1068 / Shilbottle Road Mini-Roundabout Option

Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1068 East	43%	0.8	11.40	26%	0.4	7.08
Shilbottle Road	82%	4.5	31.81	102%	22.4	116.85
A1068 West (under A1)	106%	39.2	151.67	102%	23.8	107.19

The results show that a mini-roundabout layout for the A1068 / Shilbottle Road junction provides a worsened operation during the AM and PM peaks with longer queue lengths and increased delay when compared to a standard roundabout layout. The A1068 west approach in particularly, would experience significantly increased queue lengths and delay during the AM and PM peaks with a mini-roundabout arrangement.

When compared to the existing 3-arm priority junction layout, a mini-roundabout will result in a slightly worsened operation during the AM peak where the junction RFC would increase by 9% resulting in longer queue lengths. The mini-roundabout layout would result in the junction operating beyond theoretical capacity limits during the AM peak when compared to the existing junction layout which has an RFC of 0.97. The mini-roundabout option would provide a slightly improved operation during the PM peak where the junction RFC would reduce by 23% resulting in reduced queue lengths and delay.

5.2.3 Signal Controlled Junction

A signal control option has been devised for the junction within the existing junction footprint. This option includes a two-stage signal plan, and the provision of an uncontrolled pedestrian crossing point on the A1068 east approach and footway realignment to allow for the installation of the uncontrolled crossing. The junction layout can be seen in Appendix A.

The Local Plan modelling results for the signal option with the existing layout are shown in Table 13.

Table 13 A1068 / Shilbottle Road Signal Control Option with Existing Layout

Local Plan Scenario				
Junction Approach	AM Peak		PM Peak	
	Mean Max Queue (pcu)	Degree of Saturation (%)	Mean Max Queue (pcu)	Degree of Saturation (%)
A1068 East Left/Ahead	2.7	21%	2.2	16%
Shilbottle Road Right/Left	29.6	104%	25.4	98%
A1068 West Right/Ahead	39.8	102%	25.1	96%
Overall Practical Reserve Capacity (PRC)	**-15.5%**		**-9.2%**	

The results show that a signal control option for the A1068 / Shilbottle Road junction provides an improved operation on Shilbottle Road when compared to a mini-roundabout but a worsened operation when compared to a standard roundabout layout. The reported queuing on the A1068 west approach could possibly interact with the A1068 / A1 Northbound off-slip / Willowburn Avenue roundabout particularly during the AM peak, which could be unacceptable to HE.

When compared to the modelling results for the existing 3-arm priority layout, this signal option improves the junction operation with reduced queuing, delay, and RFC during the PM peak, but provides a worsened operation

during the AM peak. The signal option would result in the junction operating beyond theoretical capacity limits during the AM peak when compared to the existing junction layout which has an RFC of 0.97.

5.2.4 Modifications to the Existing Priority Layout

The existing 3-arm priority junction provides priority to the A1068 eastbound and westbound junction approaches. An option has been developed to provide priority to the Shilbottle Road and A1068 west approaches. This option has been designed within the existing highway boundaries and includes kerb buildouts to reduce vehicle speeds on the A1068. This design option is shown in Appendix A.

The Local Plan modelling results for the change of priorities at the junction are shown in Table 14.

Table 14 A1068 / Shilbottle Road Change of Priorities

Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1068 East Minor Arm	63%	1.8	25.40	48%	0.9	18.62
Shilbottle Road Right Turn	21%	0.4	9.42	43%	1.1	9.69

The modelling results indicate that the change of priorities option for the junction would provide an improved operation when compared to the existing priority layout, standard roundabout option, mini-roundabout option, and signal control option. The junction would operate with 37% and 52% spare capacity during the AM and PM peaks respectively with a change in priorities at the junction. The modelling highlights that the A1068 eastern approach arm (representing the A1 southbound off-slip) has a minimum spare capacity of 37%, highlighting that no impact from the roundabout would be expected on the A1 mainline, despite the introduction of a give way line on this approach.

5.3 Summary of the Mitigation Modelling Results

The modelling results for each mitigation option for the A1068 / Shilbottle Road junction and the ranking of the options in terms of delivering capacity improvements are summarised in Table 15. In relation to the ranking scores, 1 represents the most effective mitigation option for improving capacity and 4 represents the worst. The options have also been subject to the RAG analysis for the AM and PM peak modelling results combined, which is highlighted in Table 15.

Table 15 Summary of the Modelling Results for the Junction Mitigation Options

A1068 / Shilbottle Road		
Mitigation Option	**Modelling Results**	**Ranking**
Standard Roundabout	AM RFC 0.77 - PM RFC 0.72	**2**
Mini Roundabout	AM RFC 1.06 - PM RFC 1.02	**4**
Signal Controlled Junction	AM DoS 104% - PM DoS 98%	**3**
Changes to Priorities	AM RFC 0.63 - PM RFC 0.48	**1**

Of the mitigation options assessed, the table demonstrates that the changes to junction priorities option would provide the largest capacity improvements at the junction with the inclusion of Local Plan traffic, followed by a standard roundabout layout.

5.4 Mitigation Options: Design Advantages & Constraints

The advantages and constraints associated with each of the mitigation options considered for the A1068 / Shilbottle Road junction have been identified following the development of the concept mitigation designs and modelling assessments and are summarised in Table 16.

Table 16 A1068 / Shilbottle Road Option Design Advantages & Constraints

Mitigation Option	Advantages	Constraints
Standard Roundabout (Option 1)	• Will avoid conflict points between the two heaviest flows of traffic (from Shilbottle Road to A1068 westbound and A1068 eastbound to Shilbottle Road) • A roundabout will have capacity for higher flows of traffic • Does not require additional land take	• Higher cost option • Unknown public utility services (costs associated with potential service diversions) • Requires footway/cycleway realignment on Shilbottle Road
Mini-Roundabout (Option 2)	• Will avoid conflict points between the two heaviest flows of traffic (from Shilbottle Road to A1068 westbound and A1068 eastbound to Shilbottle Road) • Will not alter existing cycleways • Does not require additional land take	• Higher cost option • Unknown public utility services (costs associated with potential service diversions) • Proposed central island will increase maintenance costs due to overrunning by vehicles • Large vehicles will not be able to execute a U-turn at the mini roundabout. However, a roundabout, located 70m west on the A1068, can provide large vehicles the opportunity to execute a U-turn
Signalised Junction (Option 3)	• Signal timings can be altered to suit traffic demand – MOVA control • Greater improvements to the crossing facilities for pedestrians on the eastern arm • Will not alter existing cycleways • Does not require additional land take	• Potential to introduce shunt type collisions at this location • A medium cost option • Unknown public utility services (costs associated with potential service diversions) • The reported queuing on the A1068 west approach could possibly interact with the A1068 / A1 Northbound off-slip / Willowburn Avenue roundabout which could be unacceptable to HE
Change of Priorities (Option 4)	• Lower cost option • Will not alter existing cycleways • Does not require additional land take	• Unknown impact upon existing traffic flows and future traffic flows exiting the A1, which could result in the queueing of traffic on the A1068 east approach, extending back to the A1 slip • The crossing may be affected due to cars waiting at the give way lines. This would result in blocked visibility for pedestrians • Possible reduced visibility for buses waiting in the bus stop • Unknown public utility services (costs associated with potential service diversions) • Proposed hatching will increase maintenance costs due to overrunning by vehicles

5.5 Preferred Option

In consideration of the mitigation modelling results and the advantages and constraints associated with each option, the preferred mitigation for the A1068 / Shilbottle Road junction is the standard roundabout layout.

With the inclusion of the Local Plan traffic flows, this improvement generates an acceptable reduction in traffic queuing and delay at the junction by bringing the junction to within acceptable capacity limits, whilst not impeding upon traffic flows exiting the A1 slip road and travelling on the A1068 to the same extent as an alteration of the priority arrangement.

5.6 Preferred Option Design Assumptions

The preliminary design assumptions associated with the standard roundabout layout, which are shown on the drawing in Appendix B, include the following:

- The preferred option is a preliminary / concept design. The preferred option would require full detailed design and be subject to the necessary Road Safety Audits;
- A street lighting assessment / design will need to be undertaken as part of the detailed design;
- No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage;
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system;
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required;
- Signing has not been considered as part of this concept design;
- The land required for the carriageway widening is assumed to form part of local and strategic highway boundaries, based upon indicative highway adoption records reviewed and advised upon by NCC;
- A topographical survey would be required to complete detailed design;
- The concept design has been based on traffic data and a desktop review of the site;
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at the detailed design stage; and
- The structure of the existing A1 bridge that passes over the eastbound approach to the junction will be unaffected by the concept design.

6. A197 Morpeth Road / A1068, Ashington

6.1 Existing Layout Modelling Results – 3 Arm Priority Junction

The modelling of the existing junction arrangement using 2016 base traffic flows highlights that the junction is expected to operate beyond capacity in the baseline scenario prior to the addition of any further traffic from the allocated Local Plan development sites. The junction currently operates with and RFC of 1.15 in the AM peak, with significant queuing and delay on the A1068 junction approach. The junction is expected to operate with an RFC of 1.03 in the PM peak, with noteworthy queuing and delay experienced on the A197 Morpeth Road East approach.

With the addition of Local Plan development traffic associated with proposed employment sites off the A1068, the extent of queuing and delay at the junction increases, particularly during the AM peak. The modelling results show that the RFC is anticipated to increase to 1.19 in the AM peak, resulting in longer queues and greater delay on the A1068 junction approach. A minor increase in RFC of 0.01 can be anticipated during the PM peak on the A197 Morpeth Road east junction approach.

A summary of the Baseline and Local Plan modelling results for the existing junction are presented in Table 17.

Table 17 A197 Morpeth Road / A1068 Modelling Results for the Existing Junction Layout

Junction Approach	Baseline Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1068 Left Turn	115%	35.5	262.09	61%	1.5	19.96
A1068 Right Turn	113%	19.3	291.52	59%	1.4	48.32
A197 Morpeth Road East	41%	0.7	12.2	103%	29.7	139.6
Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1068 Left Turn	119%	43.5	351.31	72%	2.4	28.98
A1068 Right Turn	118%	23.1	372.25	72%	2.2	68.17
A197 Morpeth Road East	49%	0.9	14.4	104%	35.0	173.6

6.2 Mitigation Options

The A1068 junction approach is expected to be oversaturated during the AM peak, the extent of which will be exacerbated by the Local Plan development sites located off the A1068. Additionally, the mainline flow on the A197 is also expected to be oversaturated during the PM peak, highlighting that a physical mitigation improvement will be required to deliver capacity improvements at the two junction approaches simultaneously.

Therefore, various physical improvements have been assessed to determine the junction layout that would deliver enhanced capacity for all junction approaches. Firstly, NCC has made Jacobs aware of a committed Puffin crossing scheme on the A1068, which has been assessed to determine whether this would improve platoon dispersion resulting in reduced queuing on the A1068 approach to the A197 Morpeth Road junction. Secondly, a standard roundabout layout and a signal control junction have been designed and modelled to assess their

impacts upon Local Plan traffic flows at the junction. A summary of the findings for each of these options is set out below.

6.2.1 Puffin Crossing on A1068

The committed Puffin crossing scheme on A1068 will be located approximately 50m away from the A197 Morpeth Road junction, the design for which was provided by NCC and can be seen in Appendix A. This option includes providing a two-lane approach on the A1068 extending from the Puffin crossing to the A197 junction, therefore, increasing stacking capacity for vehicles on the A1068.

The Puffin crossing scheme has been included within the existing PICADY model of the junction to determine whether this will generate any improvements on the A1068 approach to the A197 Morpeth Road junction.

The Local Plan modelling results for the Puffin crossing included on the A1068 junction approach are shown in Table 18.

Table 18 A197 Morpeth Road / A1068 Modelling Results with Puffin Crossing on A1068 Approach

Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1068 Left Turn	125%	53.1	410.46	77%	3.0	36.25
A1068 Right Turn	92%	6.7	106.87	66%	1.7	53.20
A197 Morpeth Road East	92%	6.7	106.87	66%	1.7	53.20

The results indicate that the inclusion of the Puffin crossing on the A1068 approach will exacerbate anticipated queuing and delay on the A1068 junction approach during the AM peak, particularly for the left turn lane. The junction RFC is anticipated to increase from 1.19 to 1.25 when compared to the existing junction layout without the Puffin crossing included.

6.2.2 Standard Roundabout Layout

A standard roundabout design has been provided by NCC and is shown in Appendix A. This option consists of two lanes on all three junction approaches, with varying lane lengths, and a two-lane circulatory carriageway. This option would require new carriageway, footway, and verge construction on the southern section of the roundabout between the A197 Morpeth Road east approach lanes and A197 Morpeth Road west exit lanes, which may require the need for the acquisition of private land. The A1068 approach would be contained within the existing highway boundaries, although a sub-standard entry/exit radius would be required to fit this junction approach within the existing site constraints.

The Local Plan modelling results for the standard roundabout option are identified in Table 19.

Table 19 A197 Morpeth Road / A1068 Modelling Results for the Standard Roundabout Option

Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1068	52%	1.1	5.45	32%	0.5	3.84
A197 Morpeth Road East	59%	1.4	5.78	72%	2.6	8.00
A197 Morpeth Road West	49%	1.0	4.31	59%	1.4	5.91

The modelling results demonstrate a significant improvement in the operation of the A197 Morpeth Road / A1068 junction during both the AM and PM peaks with a standard roundabout layout when compared to the existing priority junction layout. The junction would operate within theoretical capacity thresholds and would have 41% and 28% spare capacity in the AM and PM peaks respectively.

6.2.3 Signal Controlled Junction

A signal control junction layout has been devised and provided by NCC, which can be seen in Appendix A. This option consists of providing signal control to the junction within the existing highway boundaries, reallocating lane space on the A1068 to provide two lanes on the approach to the A197 Morpeth Road junction, and the realignment of the A1068 road channel to facilitate HGV movements turning left out of the A1068. This option provides a dedicated right turn lane into the A1068 from A197 Morpeth Road east, and two lanes on all junction approaches with varying lengths. Jacobs has devised a three-stage signal plan in accordance with the layout devised by NCC.

The Local Plan modelling results for the signal option with the existing junction layout are presented in Table 20.

Table 20 A197 Morpeth Road / A1068 Modelling Results for the Signal Option

Local Plan Scenario				
Junction Approach	AM Peak		PM Peak	
	Mean Max Queue (pcu)	Degree of Saturation (%)	Mean Max Queue (pcu)	Degree of Saturation (%)
A197 Morpeth Road East Ahead/Right	12.6	74%	12.1	80%
A197 Morpeth Road West Ahead/Left	14.2	77%	14.7	81%
A1068 Left/Right	10.5	76%	8.6	79%
Overall Practical Reserve Capacity (PRC)	**+17%**		**+11.7%**	

The modelling results demonstrate a significant improvement in the operation of the A197 Morpeth Road / A1068 junction during both the AM and PM peaks with a signal controlled junction when compared to the existing priority junction layout. The junction would operate within theoretical capacity thresholds and would have 17% and 11.7% spare capacity in the AM and PM peaks respectively. Comparatively, this junction would provide slightly less operational benefits in terms of spare capacity during the AM and PM peaks when compared to the standard roundabout option for the junction.

6.3 Summary of the Mitigation Modelling Results

The modelling results for each mitigation option for the A197 Morpeth Road / A1068 junction and the ranking of the options in terms of delivering capacity improvements are summarised in Table 21. In relation to the ranking scores, 1 represents the most effective mitigation option for improving capacity and 3 represents the worst. The options have also been subject to the RAG analysis for the AM and PM peak modelling results combined, which is highlighted in Table 21.

Table 21 Summary of the Modelling Results for the Junction Mitigation Options

A197 Morpeth Road / A1068		
Mitigation Option	**Modelling Results**	**Ranking**
Puffin Crossing on A1068	AM RFC 1.25 - PM RFC 0.77	**3**
Standard Roundabout	AM RFC 0.59 - PM RFC 0.72	**1**
Signal Controlled Junction	AM DoS 77% - PM DoS 81%	**2**

Of the mitigation options assessed, the table demonstrates that the standard roundabout option would provide the largest capacity improvements at the junction with the inclusion of Local Plan traffic, followed by a signal control junction with the existing layout.

6.4 Mitigation Options: Design Advantages & Constraints

The advantages and constraints associated with each of the mitigation options considered for the A197 Morpeth Road / A1068 junction have been identified following the development of the concept mitigation designs and modelling assessments. These are summarised in Table 22.

Table 22 A197 Morpeth Road / A1068 Option Design Advantages & Constraints

Mitigation Option	Advantages	Constraints
Puffin Crossing on A1068 (Option 1)	• Lowest cost option • Committed scheme already being implemented • Capacity improvements to the A197 Morpeth Road approaches	• No improvements to the existing traffic capacity issues experienced on the A1068 approach to the A197 Morpeth Road junction – worsened queuing and delay at the junction
Standard Roundabout (Option 2)	• Largest capacity benefits - the largest levels of spare capacity on all junction approaches • Roundabout option provides improved operation when compared to the existing priority arrangement	• Highest cost option to facilitate carriageway, footway and verge construction • Possible financial expense of acquiring private land • Sub-standard entry/exit radius on the A1068 approach is likely to increase the risk of rear end shuts and vehicle collisions at this location • Roundabout layout would operate in isolation to the committed Puffin crossing scheme on A1068 – no way of syncing the roundabout and crossing to ensure the operation of the crossing does not negatively impede on access to the Morpeth Road junction • Unknown public utility services (costs associated with potential service diversions)

Mitigation Option	Advantages	Constraints
Signalised Junction (Option 3)	• Second largest capacity benefits – levels of spare capacity • Signal option provides improved operation when compared to the existing priority arrangement • Signalised and safe pedestrian crossing facilities can be accommodated at the junction at a later date if required • Signal timings can be altered to suit changes in traffic demand at peak times – MOVA control • Signal timings at the junction can be coordinated with the signal timings of the committed Puffin crossing scheme to ensure optimised throughout of traffic on A1068 • Does not require the acquisition of land or costly changes to the highway alignments	• Potential to introduce shunt type collisions at this location • Unknown public utility services (costs associated with potential service diversions)

6.5 Preferred Option

In consideration of the mitigation modelling results, the advantages and constraints associated with each option, and road safety considerations, the preferred mitigation for the A197 Morpeth Road / A1068 junction is a signal control layout. This has been designed by NCC and the design drawing is shown with the preferred mitigation options in Appendix B.

With the inclusion of the Local Plan traffic flows, this improvement simultaneously improves upon the existing capacity issues for the A1068 and A197 Morpeth Road junction approaches, generating an appropriate reduction in traffic queuing and delay at the junction during the AM and PM peaks. The signal configuration setup provides flexibility in terms of changing the signal timings based upon changes in traffic demand on all junction approaches and allows for the junction to be synced with the committed Puffin crossing scheme on the A1068. This option does not require major construction works and will not need the acquisition of private land.

6.6 Preferred Option Design Assumptions

The assessments undertaken for the preferred option for the A197 Morpeth Road / A1068 junction have been undertaken in accordance with the signal control layout designed by NCC. Therefore, the recommended preferred option for this junction does not include any specific design assumptions made by Jacobs given that NCC prepared this option design. Jacobs developed an appropriate signal timing plan that aligns with the layout provided. The preferred signal option, however, would require full detailed design and be subject to the necessary Road Safety Audits.

7. A1171 / A1171 Dudley Lane / Arcot Lane, Cramlington

7.1 Existing Layout Modelling Results – 4 Arm Priority Roundabout

NCC provided the existing layout geometric data to be used in the development of the ARCADY model for the A1171 / A1171 Dudley Lane / Arcot Lane junction as part of the Local Plan Transport Assessment 2018. The modelling of the existing junction arrangement and 2016 base traffic flows highlight that the existing junction is expected to operate beyond capacity in both the PM peak period in the baseline scenario. With the addition of development traffic associated with the Local Plan site allocations, the junction is shown to deteriorate marginally further on the A1171/A19 off slip approach from the south.

A summary of the Baseline and Local Plan modelling results for the existing junction are presented in Table 23.

Table 23 A1171 / A1171 Dudley Lane / Arcot Lane Modelling Results for the Existing Junction Layout

Junction Approach	Baseline Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1171 Dudley Lane North	43%	0.8	2.9	32%	0.5	2.5
A1171 East	37%	0.6	4.4	23%	0.3	3.2
A1171 South/A19 off slip	51%	1.0	9.6	113%	61.9	255.1
Arcot Lane	5%	0.0	3.1	6%	0.1	3.6
Junction Approach	**Local Plan Scenario**					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1171 Dudley Lane North	45%	0.8	3.0	35%	0.5	2.6
A1171 East	45%	0.8	5.1	24%	0.3	3.3
A1171 South/A19 off slip	52%	1.1	10.4	114%	63.5	264.4
Arcot Lane	11%	0.1	3.5	7%	0.1	3.7

7.2 Revised ARCADY Modelling

Following a review of the ARCADY model parameters supplied by NCC, the client in conjunction with HE ascertained that the southern approach arm (A1171 South/A19 off slip) entry width set at 3m was too narrow and did not reflect the two lanes that are evident on this junction approach, which encompass Dudley Lane and the A19 off-slip diverge lanes. Furthermore, the entry radius on this junction approach was set to 3m.

Collectively, the incorrect geometric parameters used in the ARCADY model for the southern junction approach do not reflect real life conditions and have significantly constrained the available capacity for this arm within the model, causing an overestimation of RFC on this junction approach.

It was agreed with NCC that the entry width in the ARCADY model for the A1171 South/A19 off slip would be increased to 10.5m reflect the two-lane arrangement at the junction give-way line on this arm, and the entry radius would be calculated accordingly.

The Local Plan modelling results for the change of entry width and entry radius on the A1171 South/A19 off slip junction approach are shown in Table 24.

Table 24 A1171 / A1171 Dudley Lane / Arcot Lane Modelling Results for Amended Parameters

Junction Approach	Local Plan Scenario					
	AM Peak			PM Peak		
	RFC %	Max Queue	Delay (secs.)	RFC %	Max Queue	Delay (secs.)
A1171 Dudley Lane North	45%	0.8	3.3	35%	0.5	2.6
A1171 East	45%	0.8	5.14	24%	0.3	3.26
A1171 South/A19 off slip	39%	0.6	6.01	85%	5.2	22.22
Arcot Lane	11%	0.1	3.47	7%	0.1	3.87

The modelling results demonstrate that the amended entry width and entry radius on the southern junction approach which more appropriately reflect current lane usage, results in the junction operating within theoretical capacity limits with the inclusion of Local Plan traffic flows at the junction. RFCs of 0.45 and 0.85 can be expected during the AM and PM peaks respectively, resulting in 55% and 15% spare capacity during the two peak periods.

Given that the A1171 / A1171 Dudley Lane / Arcot Lane junction can be anticipated to operate within acceptable capacity limits with the addition of Local Plan traffic flows during the AM and PM peaks, it is deemed that mitigation measures are not required at this location.

8. Conclusion

8.1 Summary

This Transport Assessment Mitigation Report has been prepared for NCC to assess a range of mitigation options for those junctions that were identified as operating beyond acceptable capacity thresholds within the Local Plan Transport Assessment 2018. The Transport Assessment outlines the impact of additional traffic from the Local Plan allocation sites at key junctions in Northumberland. The modelling assessments undertaken for the Transport Assessment identified which junctions are expected to operate beyond capacity when development traffic from the Local Plan site allocations is added to existing and committed traffic flows. Five junctions were identified as operating beyond acceptable capacity thresholds. One of the five junctions has been subsequently eliminated from the mitigation development process due to the modelling issues discussed in chapter 7 of this report.

This Mitigation Report has subsequently considered and assessed capacity enhancing improvements for four of the five junctions, which are all located on the road network operate and maintained by the Local Highway Authority, and include:

1. A6079 Rotary Way / Ferry Road in Hexham;
2. A189 / B1334 / Ashwood Drive in Ashington;
3. A1068 / Shilbottle Road in Alnwick; and
4. A197 Morpeth Road / A1068 in Ashington.

The Mitigation Report summarises the capacity constraints at each of the five junctions as determined in the Local Plan Transport Assessment and identifies the mitigation options that have been devised to enable additional Local Plan traffic flows to be accommodated. A summary of the mitigation options considered for each junction is summarised in Table 25.

Table 25 Summary of Mitigation Options Considered for Each Junction

Junction	Mitigation Options
A6079 Rotary Way / Ferry Road	• Standard Roundabout • Fixed Timing Signal Controlled Junction with Existing Layout • Fixed Timing Signal Controlled Junction with a Revised Layout • Changes to Existing Priority Junction
A189 / B1334 / Ashwood Drive	• Fixed Timing Signalised Roundabout
A1068 / Shilbottle Road	• Standard Roundabout • Mini-Roundabout • Fixed Timing Signal Controlled Junction • Changes to Priorities
A197 Morpeth Road / A1068	• Puffin Crossing on A1068 • Standard Roundabout • Fixed Timing Signal Controlled Junction
A1171 / A1171 Dudley Lane / Arcot Lane	Mitigation not required to accommodate the Local Plan traffic flows. Geometric changes made to the ARCADY model.

Each of the mitigation options have been assessed using the same modelling tools used in the Local Plan Transport Assessment 2018. The modelling results for the existing junction layouts and for each mitigation option highlighted in Table 25 have been subject to a RAG analysis in accordance with the criteria outlined in section 2.2of this report, which is summarised in Table 26.

Table 26 RAG Analysis for Existing Junction Layout & Mitigation Options

Mitigation Option	RAG Analysis for the AM Peak	RAG Analysis for the PM Peak	Most Effective Options based upon the Modelling Results
A6079 Rotary Way / Ferry Road			
Existing Layout – 3 Arm Priority Junction			
Standard Roundabout			
Fixed Timing Signal Controlled Junction with Existing Layout			
Fixed Timing Signal Controlled Junction with a Revised Layout			✓
A189 / B1334 / Ashwood Drive			
Existing Layout - Priority Roundabout			
Fixed Timing Signalised Roundabout			✓
A1068 / Shilbottle Road			
Existing Layout – 3 Arm Priority Junction			
Standard Roundabout			✓
Mini-Roundabout			
Fixed Timing Signal Controlled Junction			
Changes to Priorities			✓
A197 Morpeth Road / A1068			
Existing Layout – 3 Arm Priority Junction			
Puffin Crossing on A1068			
Standard Roundabout			✓
Fixed Timing Signal Controlled Junction			✓

The modelling results for each of the mitigation options assessed have been considered alongside a wider set of benefits and constraints associated with the design requirements and impacts of each mitigation option. A review of the modelling results and the wider benefits and constraints combined has determined the identification of a preferred mitigation option for each junction.

A summary of the preferred mitigation options for each junction and the justifications for these recommendations are identified in Table 27. Given the MOVA control benefits described in sections 3.5 and 4.4 of this report for the A6079 Rotary Way / Ferry Road and A189 / B1334 / Ashwood Drive junctions respectively, it is suggested that all preferred signal options in Table 27 are considered with the operation of MOVA control as opposed to fixed signal timings.

Table 27 Preferred Mitigation Option Justification

Junction	Preferred Mitigation Option	Preferred Option Justification
A6079 Rotary Way / Ferry Road	MOVA Controlled Signalised Junction with a Revised Layout	Generates the most significant reduction in traffic queuing and delay. Signal configuration provides flexibility in changing signal times based upon traffic demand. Provides enhanced crossing facilities for pedestrians and cyclists. Does not require significant or costly building works to existing structures.
A189 / B1334 / Ashwood Drive	MOVA Controlled Signalised Roundabout	Generates a significant reduction in traffic queueing and delay on junction approaches. Likely to be accommodated within existing highway boundaries/adopted land. Does not require major construction works.
A1068 / Shilbottle Road	Standard Roundabout	Generates an acceptable reduction in traffic queuing and delay at the junction by bringing the junction to within acceptable capacity limits. Is not likely to impede upon traffic flows exiting the A1 slip road and travelling on the A1068, from both the A1 northbound and southbound off slips.
A197 Morpeth Road / A1068	MOVA Controlled Signalised Junction	Simultaneously improves upon the existing capacity issues for the A1068 and A197 Morpeth Road junction approaches. Signal configuration provides flexibility in changing signal times based upon traffic demand. Allows the junction to be synced with the committed Puffin crossing on A1068 approach. Does not require major construction works.

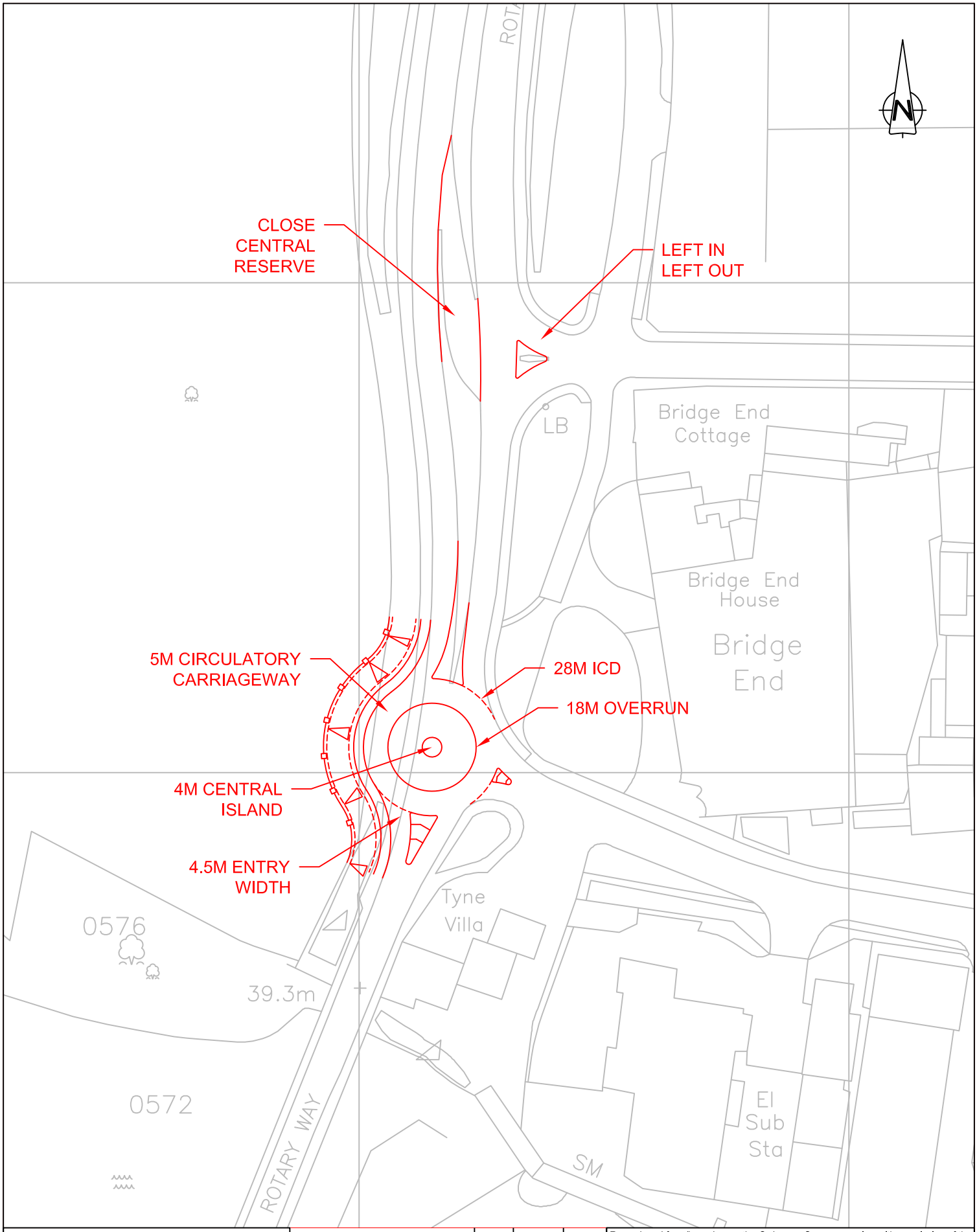
8.2 Conclusions

Based upon the indicative designs devised and considered, this Mitigation Report has highlighted that junction capacity improvements can be provided at the four junctions that are anticipated to be impacted upon by traffic associated with the Local Plan allocation sites. The mitigations that have been designed, assessed, and considered in the context of the wider opportunities and constraints, will ensure that additional development can be accommodated on the road network with improved capacity, queuing, and delay when compared to the capacity constraints associated with the existing junction layouts.

It should be noted that the analysis provided in this Mitigation Report is based on indicative concept designs only. It is therefore recommended that these designs are taken forward in more detail to consider any potential constraints that may impact on cost and deliverability. It is also recommended, in the case of signal option modelling where implementation of MOVA control is suggested, that additional bespoke modelling to capture this impact is undertaken to determine the likely additional benefits that may be generated.

In conclusion, the Mitigation Report demonstrates that mitigation is possible for those junctions identified in the Local Plan Transport Assessment 2018, as being impacted upon by the trip rates generated under the Local Plan assumptions. The report illustrates that Local Plan traffic can be accommodated on the road network in Northumberland. As planning applications are brought forward and site and development specific Transport Assessments are developed in support of these applications, the preferred options may be refined or altered from the mitigation designs identified in this report.

Appendix A. Preliminary Drawings for Considered Mitigation Options



REVISION:	BY	DATE	REV

NORTHUMBERLAND
Northumberland County Council
TECHNICAL SERVICES

TITLE

A6079/FERRY ROAD JUNCTION
COMPACT ROUNDABOUT
OPTION 1

Drn: GM Date: April 16

Scale: 1:1000

Checked: Passed:

Drg No: TDI160009/A6079/0/01/001

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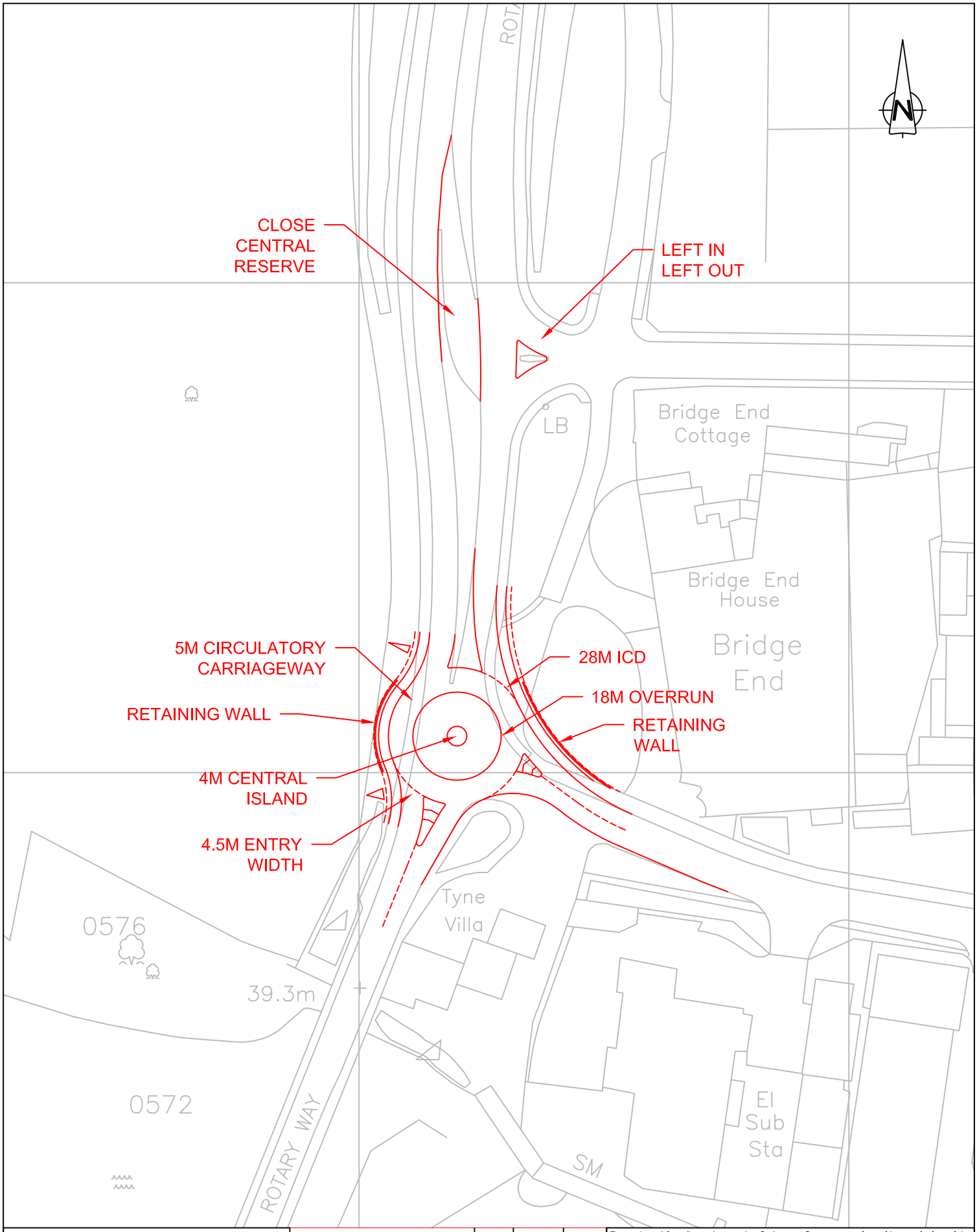

REVISION:	BY	DATE	REV

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Northumberland County Council
TECHNICAL SERVICES

TITLE

A6079/FERRY ROAD JUNCTION COMPACT ROUNDABOUT OPTION 2

Drn: GM Date: April 16
Scale: 1:1000
Checked: Passed:
Drg No: TDI160009/A6079/0/01/002

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B2348900/J2/01

Proposed central hatching to tie in with existing hatching

Existing splitter island to be extended to the edge of the Inscribed Circle Diameter

Proposed retaining wall due to the embankment

Proposed footway realignment

Centre island with diameter 8m and an overrun with diameter of 13m

Rotary Way

Proposed end of central hatching to allow to two-lane approach

Footway realignment to allow space for the roundabout

Proposed carriageway widening for installation of the roundabout

Proposed new splitter islands

KEEP CLEAR

Ferry Road

Rotary Way

N

KEY:

- Proposed Splitter island extension
- Proposed footway realignment
- Proposed kerb buildout
- Proposed overrun for HGVs / buses
- Proposed carriageway widening

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
0	DEC 18	Concept	JK	OW	PB	RP

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Northumberland County Council

Project

Northumberland Junction Improvements

Drawing Title

Northumberland Local Plan
A6079 - Rotary Way / Ferry Road
Concept Drawings
Option 1

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Scale	NTS @ A3	DO NOT SCALE
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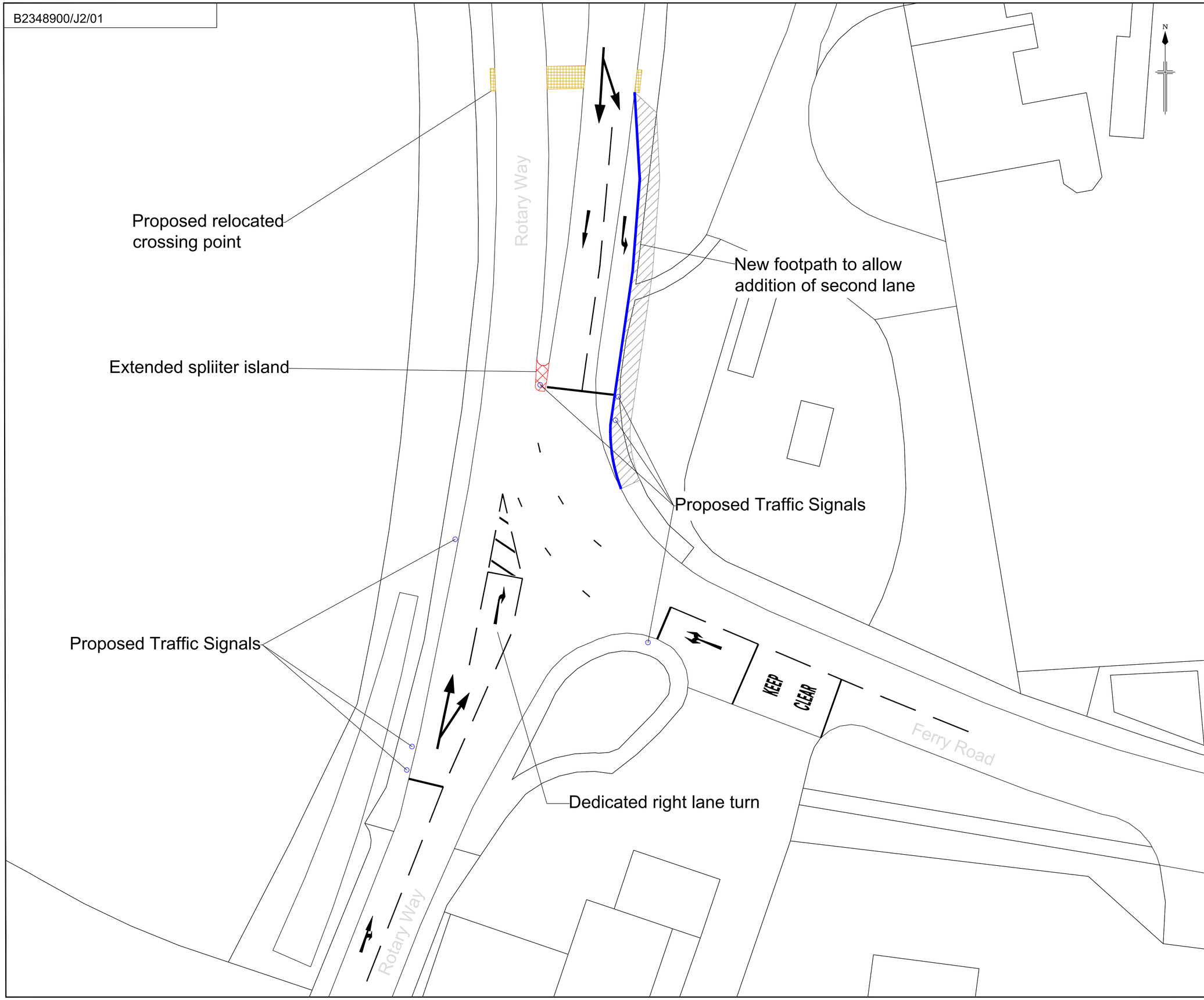
Client no.	-	

Drawing number: B2348900/J2/01 Rev: R0

B2348900/J2/01



KEY:

- Proposed Splitter island extension
- Proposed footway realignment
- Proposed crossing location
- Proposed Traffic Signals
- Proposed carriageway widening

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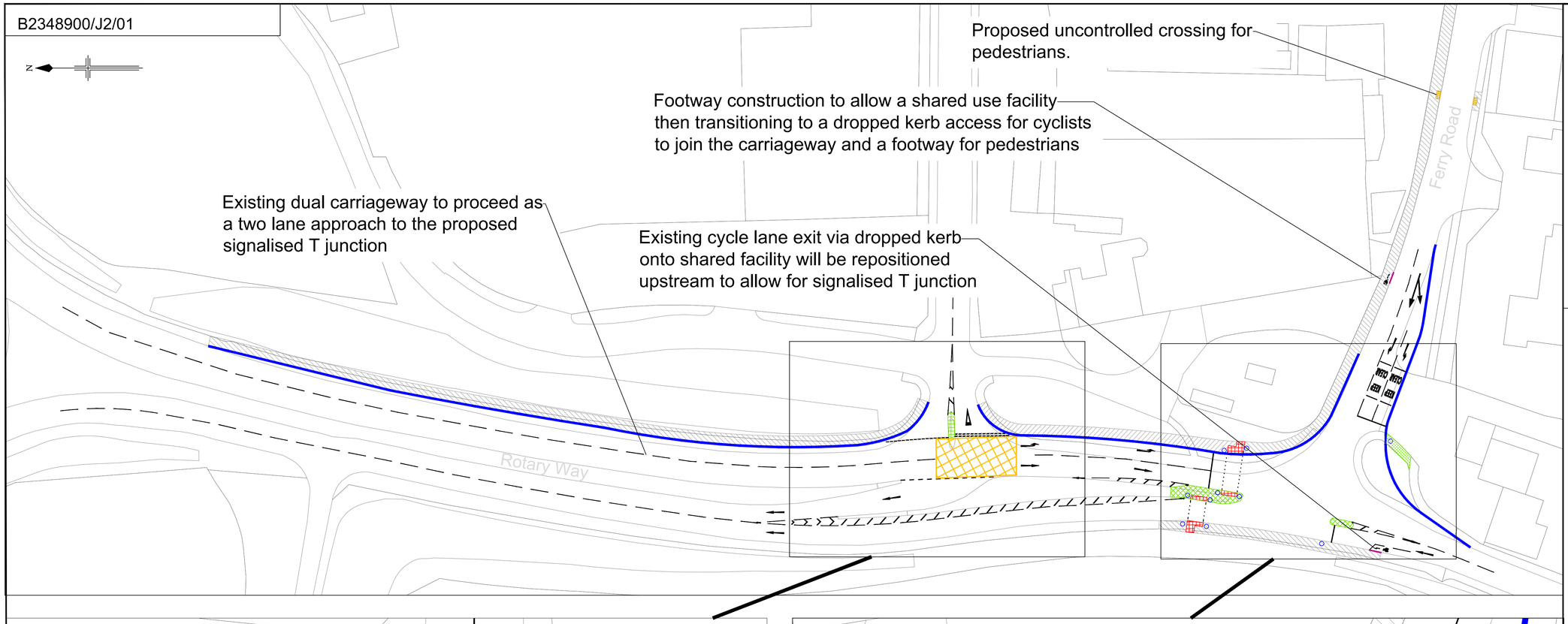

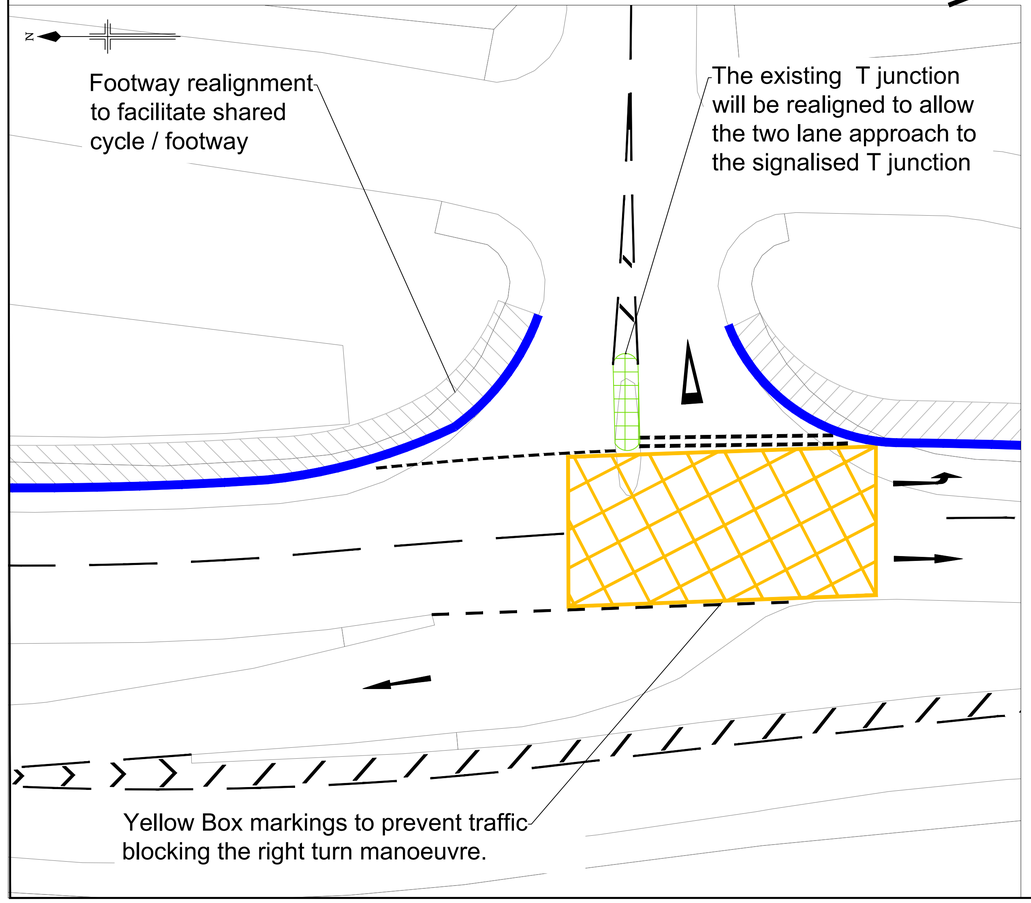

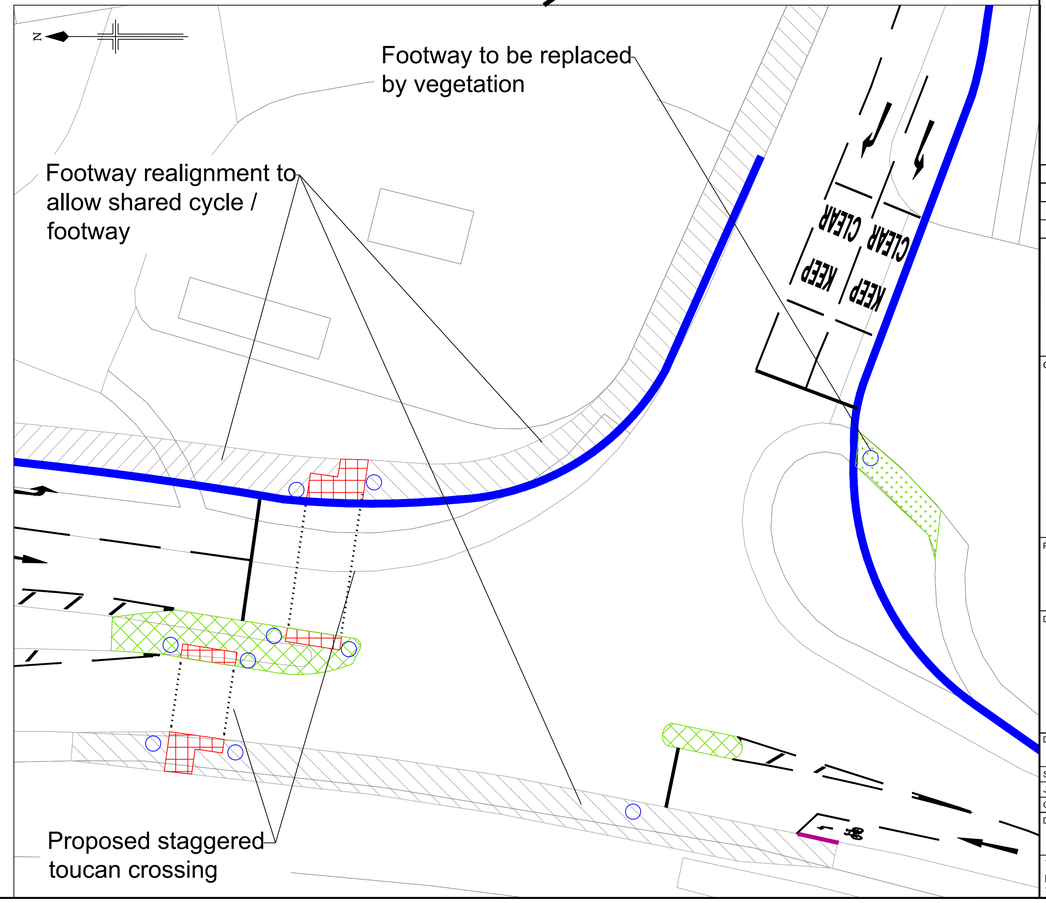

KEY:

- Proposed Splitter island
- Proposed footway realignment
- Proposed red blister tactiles and crossing locations
- Proposed buff tactiles and crossing locations
- Proposed Traffic Signals
- Proposed carriageway widening
- Proposed dropped kerb for cyclists transitioning between footway and carriageway
- Proposed footway link to be replaced by vegetation

Assumptions:

- A street lighting assessment / design will need to be undertaken as part of the detail design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage.
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system.
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required.
- No allowance has been made for service diversions / issues with regard to installing traffic signals.
- Signing has not been considered as part of this concept design.
- The land required for the carriageway widening is assumed to form part of the NCC highway boundary.
- A topographical survey would be required to complete detailed design.
- The concept design has been based on traffic data and a desktop review of the site.
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at detail design.
- Police should be consulted when installing Yellow Box markings.

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
2	JAN 19	Changes following Client's comments 29/01/19	JK	AC	AC	RP
1	JAN 19	Included Yellow Box markings	JK	AC	PB	RP
0	JAN 19	Concept	JK	AC	PB	RP

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Project: Northumberland Junction Improvements

Drawing Title: Northumberland Local Plan
A6079 - Rotary Way / Ferry Road
Concept Drawings
Option 3

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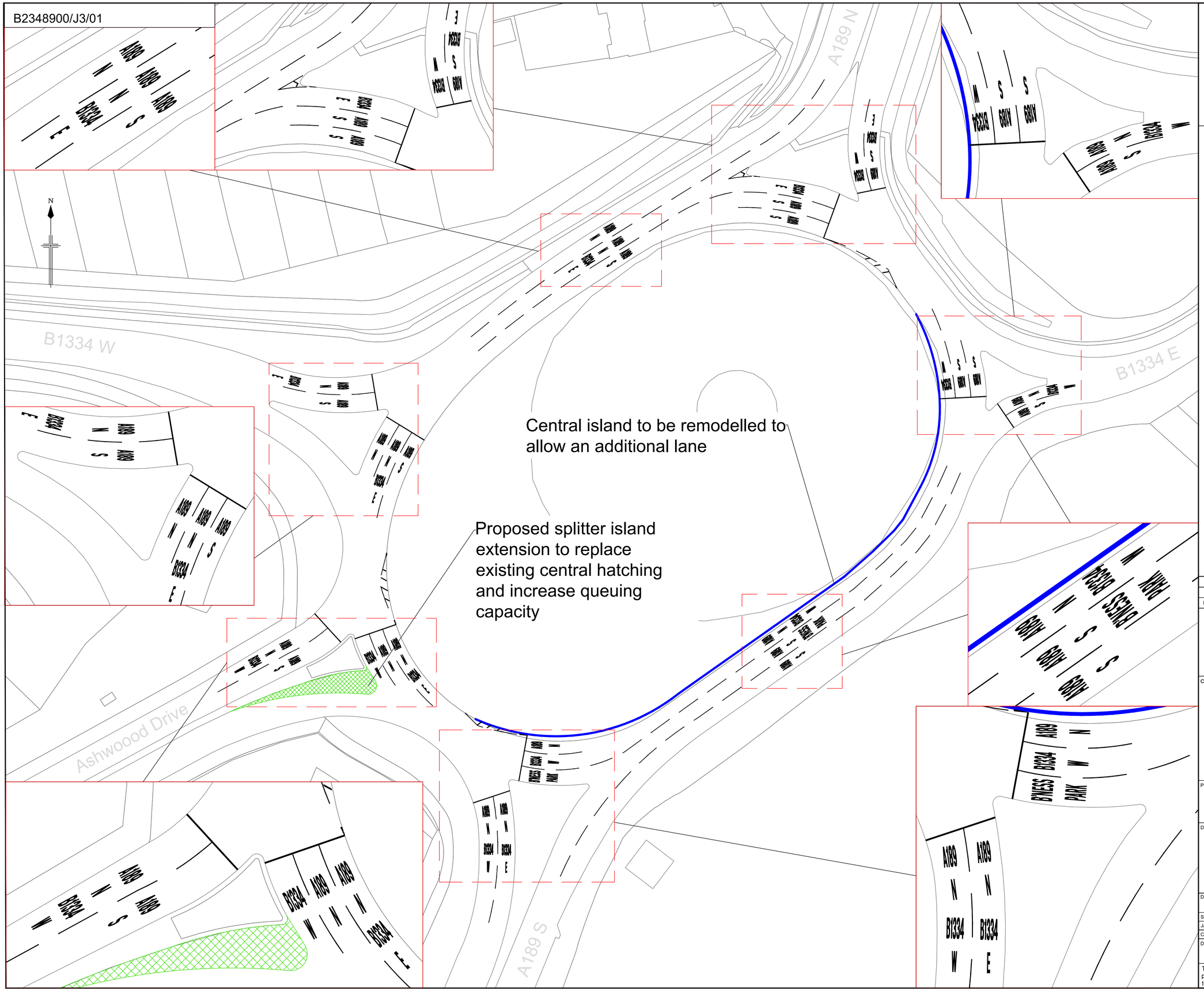

KEY:

- Proposed Splitter island extension
- Proposed carriageway widening

Assumptions:

- A street lighting assessment / design will need to be undertaken as part of the detail design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage.
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system.
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required.
- No allowance has been made for service diversions / issues with regard to installing traffic signals.
- Signing has not been considered as part of this concept design.
- The land required for the carriageway widening is assumed to form part of the NCC highway boundary.
- A topographical survey would be required to complete detailed design.
- The concept design has been based on traffic data and a desktop review of the site.
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at detail design.

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
1	JAN 19	Concept	JK	AC	PB	RP
0	DEC 18	Concept	JK	OW	PB	RP

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A189 & B1334 - Ashwood Drive
Concept Drawings
Option 1

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Client no.	-	

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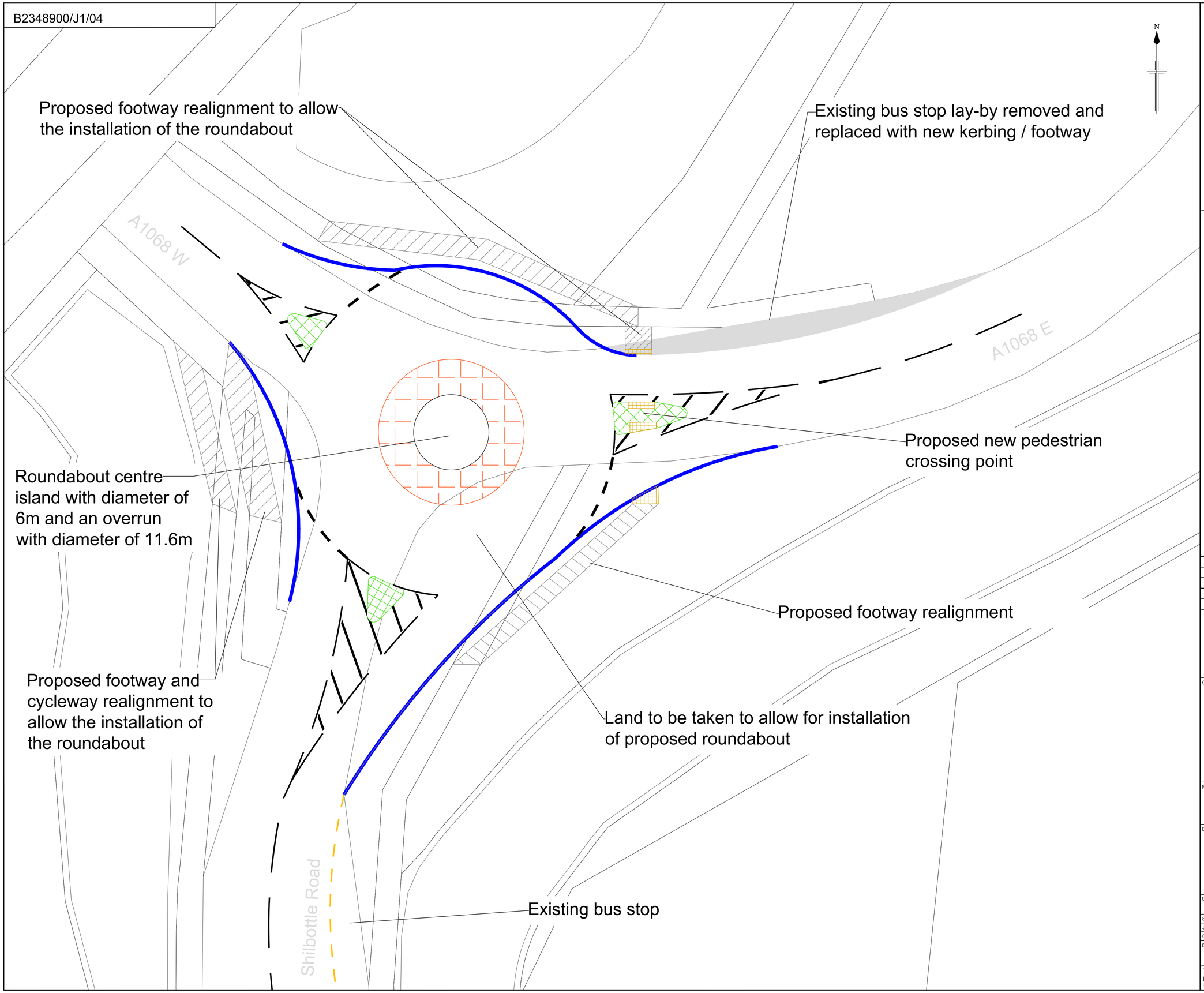

KEY:

- Proposed Splitter island
- Proposed overrun for HGVs / buses
- Proposed footway / cycleway realignment
- Proposed buff tactiles at crossing location
- Proposed kerb buildout
- Proposed carriageway widening

Design Constraints / Assumptions:

- A street lighting assessment / design will need to be undertaken as part of the detail design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage.
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system.
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required.
- Signing has not been considered as part of this concept design.
- The land required for the carriageway widening does fall with local NCC and Highways England's boundaries.
- A topographical survey would be required to complete detailed design.
- The concept design has been based on traffic data and a desktop review of the site.
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at detail design.
- The structure of the existing A1 bridge that passes over the eastbound approach to the junction will be unaffected by the concept design.
- The existing bus stop on the A1068 will be removed.

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
3	JAN 19	Revised design constraints re:NCC highway land	JK	AC	PB	RP
2	JAN 19	Revised design constraints re:NCC highway land	JK	AC	PB	RP
1	JAN 19	Concept	JK	AC	PB	RP
0	JAN 19	Concept	JK	OW	PB	RP

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Client

NORTHUMBERLAND COUNTY COUNCIL

Project

Northumberland Junction Improvements

Drawing Title

Northumberland Local Plan
A1068 - Shilbottle Road
Concept Drawings
Option 4

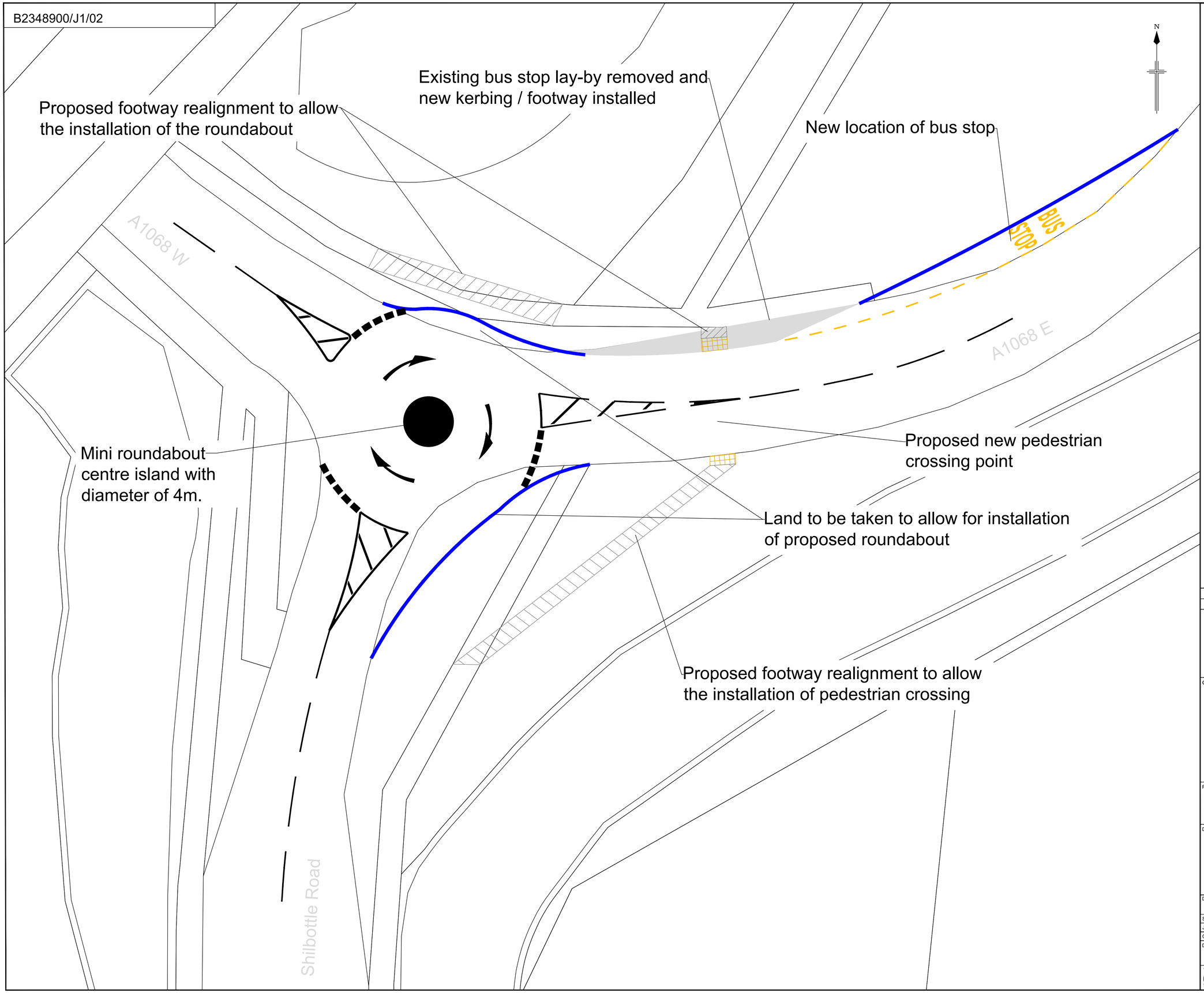
Drawing Status

FOR INFORMATION

Scale	NTS @ A3	DO NOT SCALE
Jacobs No.	B2348900	
Client no.	-	

Drawing number: B2348900/J1/04 Rev: R3

B2348900/J1/02



KEY:

- Proposed footway realignment
- Proposed crossing location
- Proposed kerb buildout
- Proposed carriageway widening
- Proposed Bus Stop markings (BUS STOP)

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
0	DEC 18	Concept	JK	OW	PB	RP

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Project

Northumberland Junction Improvements

Drawing Title

Northumberland Local Plan
A1068 - Shilbottle Road
Concept Drawings
Option 2

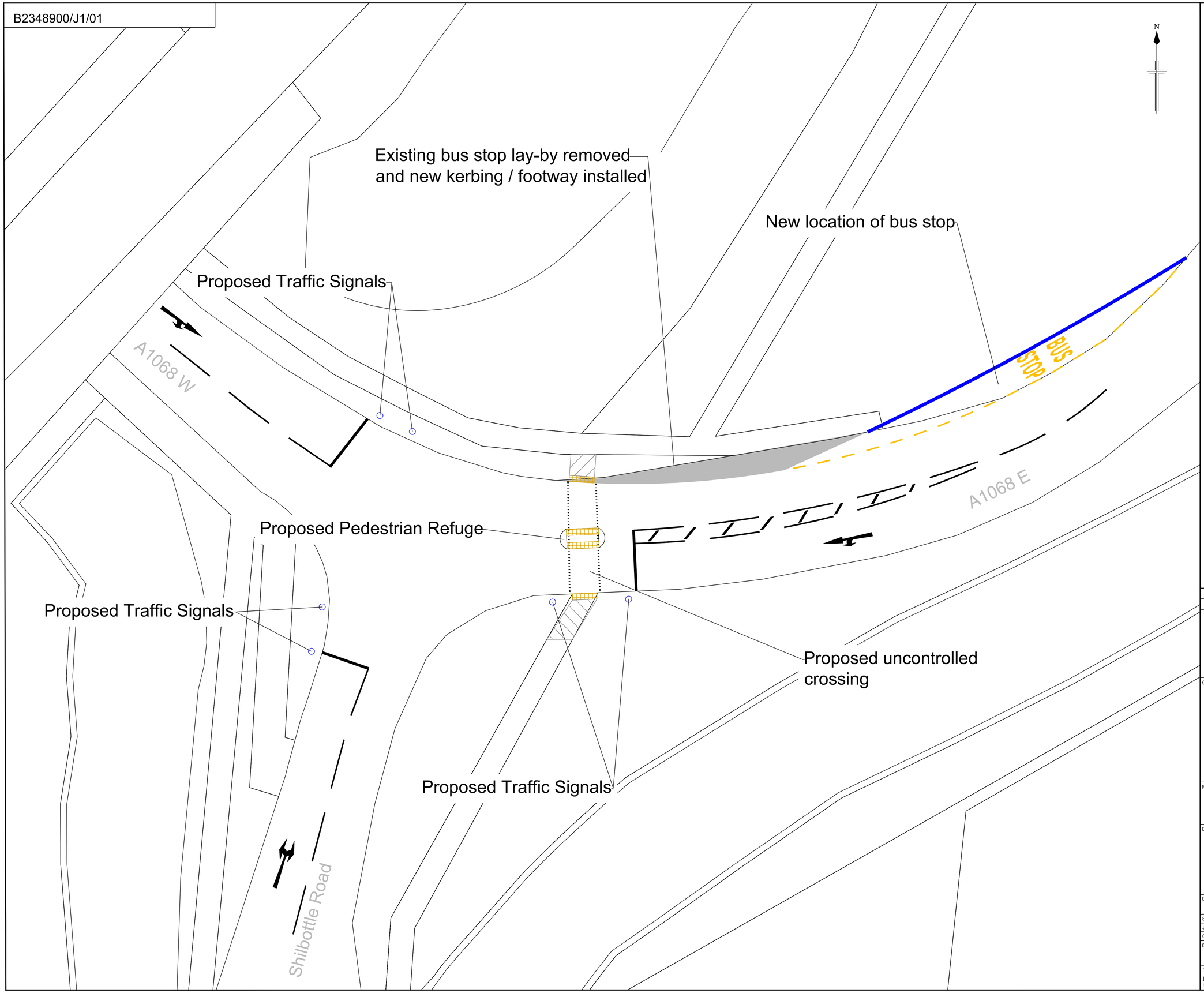
Drawing Status

FOR INFORMATION

Scale	NTS @ A3	DO NOT SCALE
Jacobs No.	B2348900	
Client no.	-	

Drawing number: B2348900/J1/02 Rev: R0

B2348900/J1/01



KEY:

- Proposed footway realignment
- Proposed crossing location
- Proposed kerb buildout
- Proposed Traffic Signals
- Proposed carriageway widening
- Proposed Bus Stop markings

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
0	DEC 18	Concept	JK	OW	PB	RP

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Client

NORTHUMBERLAND COUNTY COUNCIL

Project

Northumberland Junction Improvements

Drawing Title

Northumberland Local Plan
A1068 - Shilbottle Road
Concept Drawings
Option 1

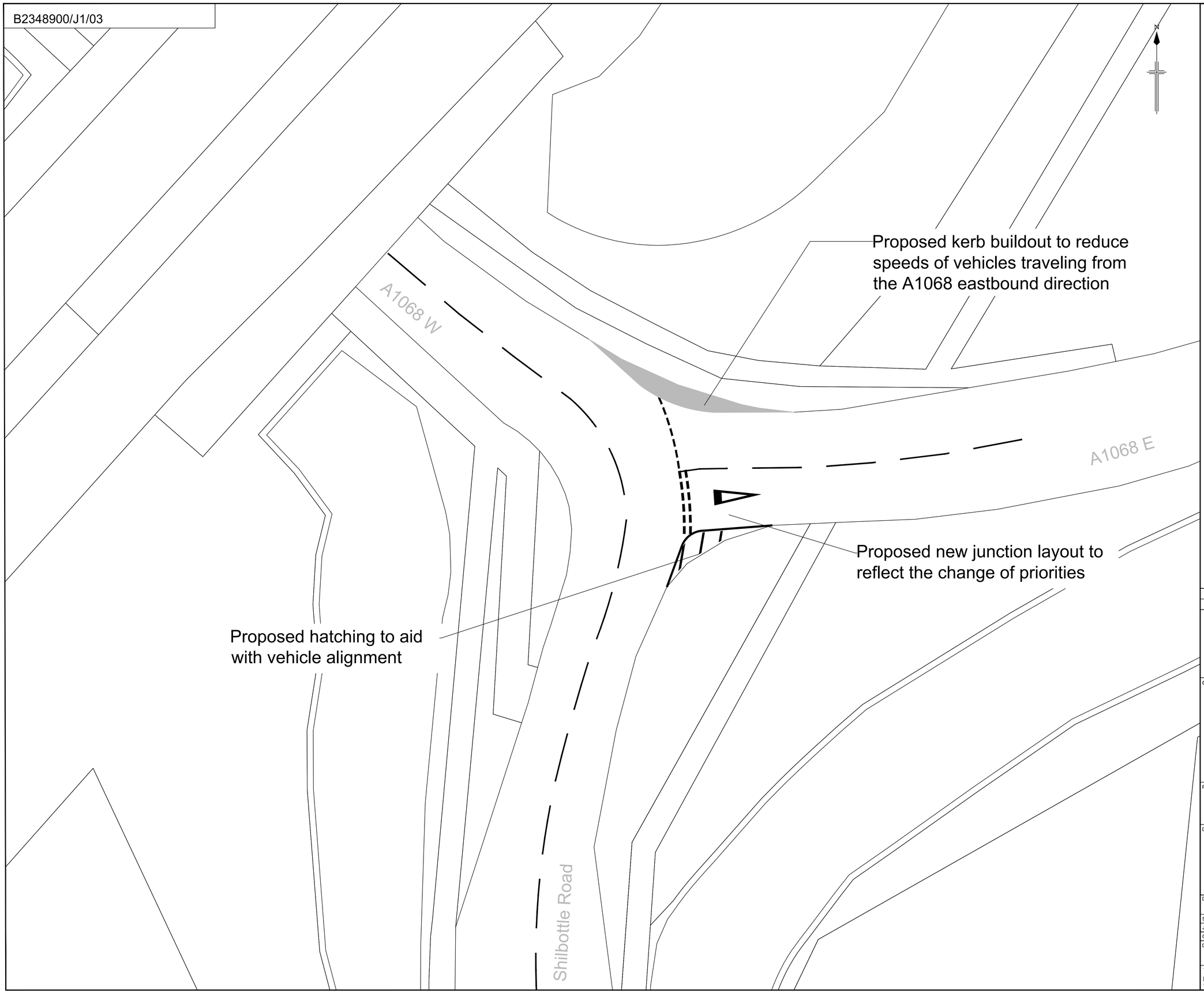
Drawing Status

FOR INFORMATION

Scale	NTS @ A3	DO NOT SCALE
Jacobs No.	B2348900	
Client no.	-	

Drawing number: B2348900/J1/01 Rev: R0

B2348900/J1/03



KEY:

Proposed kerb buildout

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
0	DEC 18	Concept	JK	OW	PB	RP

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Client

NORTHUMBERLAND COUNTY COUNCIL

Project

Northumberland Junction Improvements

Drawing Title

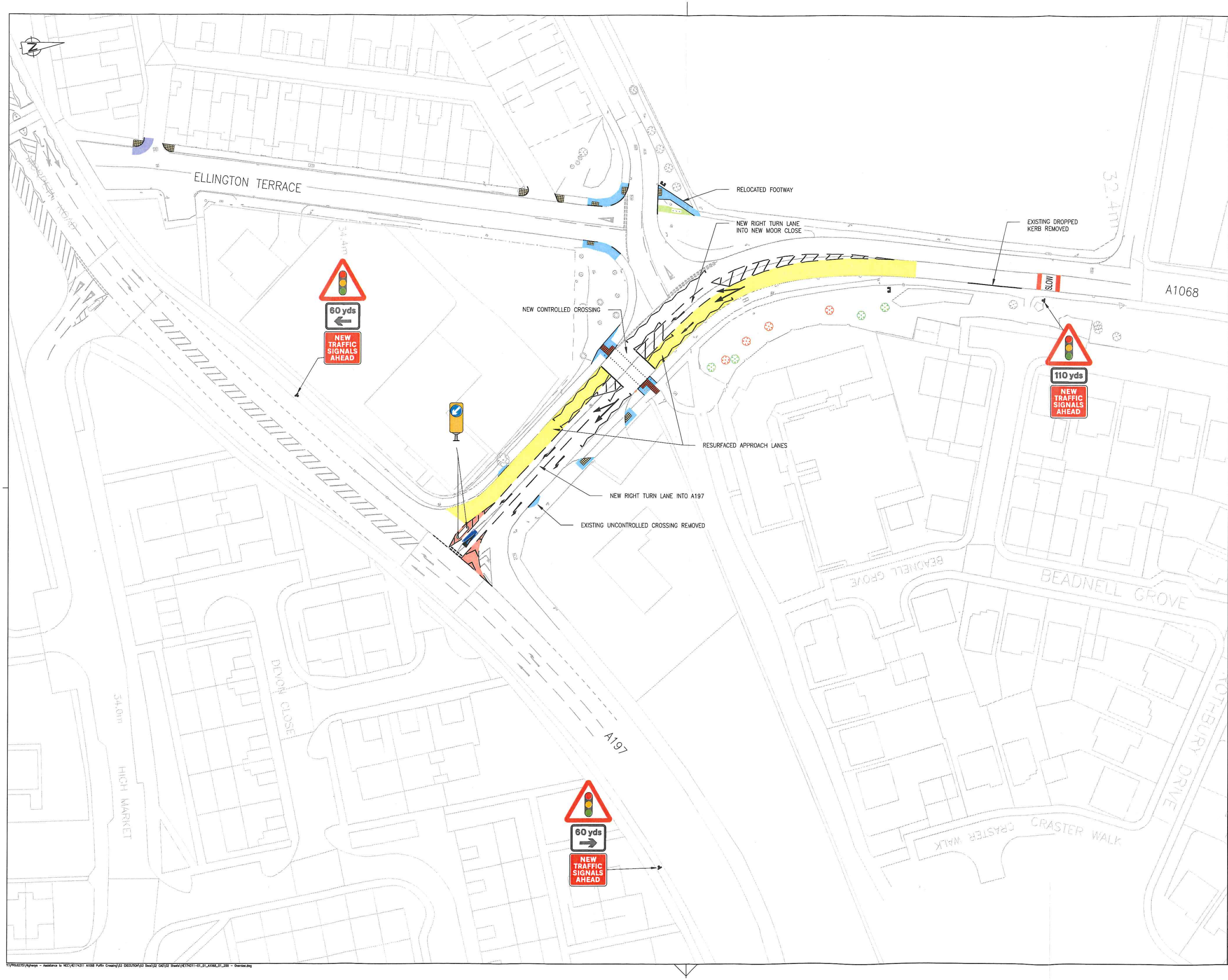
Northumberland Local Plan
A1068 - Shilbottle Road
Concept Drawings
Option 3

Drawing Status

FOR INFORMATION

Scale	NTS @ A3	DO NOT SCALE
Jacobs No.	B2348900	
Client no.	-	

Drawing number B2348900/J1/03 Rev R0



CONTRACT DRAWING No.

DRAWING SIZE A1

NORTHUMBERLAND
Northumberland County Council

LEGEND:

- FOOTWAY
- NEW GRASS VERGE
- RECONSTRUCTED CARRIAGEWAY
- PROPOSED BUFF BLISTER TACTILE PAVING
- PROPOSED RED BLISTER TACTILE PAVING
- PAVEMENT BUILD-UP
- TRAFFIC SIGNAL POST
- TREE TO BE REMOVED
- NEW TREE
- NEW KERBS (TYPE DENOTED)
- EDGING KERBS
- PROPOSED GULLY
- PROPOSED SIGN
- BUFF HARD WEARING ANTI-SKID MATERIAL
- RED HARD WEARING ANTI-SKID MATERIAL

REVISION	By	Date	Rev.

Drawing Status: INFORMATION

Client: NORTHUMBERLAND COUNTY COUNCIL
COUNTY HALL, MORPETH.
NORTHUMBERLAND. NE61 2EF Tel. 01670 533000

Job Title: A1068 PUFFIN CROSSING

Drawing Title: OVERVIEW

Scale: NOT TO SCALE

NORTHUMBERLAND
Northumberland County Council
TECHNICAL SERVICES

Drn	Date	Checked	Passed
DP	NOV 17	LW	

Drawing Number: HE174311/01/A1068/01/200 Rev

Job Number/File Number: HE174311/01 Rev

T:\PROJECTS\Highways - Assistance to NCC\HE174311 A1068 Puffin Crossing\03 EXECUTION\03 Docs\02 CAD\02 Sheets\HE174311-01_01_A1068_01_200 - Overview.dwg

EXISTING FOOTWAY REDUCED IN WIDTH TO ACCOMMODATE EXTRA TRAFFIC LANE

OVER-RUN AREA REQUIRED FOR HEAVY GOODS VEHICLES

SUB-STANDARD ENTRY / EXIT RADIUS REQUIRED TO FIT ROUNDABOUT WITHIN EXISTING CONSTRAINTS

Alandale

EXISTING ACCELERATION LANE TO BE REUSED FOR MULTILANE EXIT FROM ROUNDABOUT.

IMPLEMENTATION OF PLANNING APPROVAL FOR VEHICLE RENTAL ENTRANCE WOULD SEE THE EXISTING ACCELERATION LANE TERMINATE HERE.

INSUFFICIENT ENTRY DEFLECTION FOR VEHICLES CONTINUING WEST ON A197, CREATING A SAFETY ISSUE

PROPOSED WORKS EXTEND BEYOND EXISTING HIGHWAY BOUNDARY, ENCROACHING UPON RESIDENTIAL PROPERTY AND SIDE STREETS.

DEVON CLOSE

10 11 | 14 15 | 12 13 | 20 21 | 7 8 | 5 6 | 6 7 | 1 | 16 17

LOCATION PLAN
SCALE:
1:10,000 @A1 – 1:20,000 @A3

CONTRACT DRAWING No.

DRAWING SIZE A1

Northumberland County Council

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

- NEW CARRIAGEWAY CONSTRUCTION
- NEW FOOTWAY F1
- OVERRUN AREA
- NEW VERGE
- NEW KERBING
- NEW PEDESTRIAN GUARDRAIL
- NEW KEEP LEFT BOLLARD

REVISION	By	Date	Rev.

Drawing Status: INFORMATION

Client: NORTHUMBERLAND COUNTY COUNCIL
COUNTY HALL, MORPETH.
NORTHUMBERLAND. NE61 2EF Tel. 01670 533000

Job Title: A1068 / A197 JUNCTION

Drawing Title: FEASIBILITY OPTION A

Scale 1:200 @ A1

Northumberland County Council
TECHNICAL SERVICES

Drn	Date	Checked	Passed
LC	JUN 18	MH	

Drawing Number: HE174327-02/00/A1068/01/101 Rev

Job Number/File Number: HE174327/00 Rev

S:\Highways\PROJECT\17\HE MINOR IMPROVEMENTS\HE174327 Ashington Town Centre Parking\HE174327-02 A1068-A197 Junction\Drawings\General\02 Sheets\HE174327-02_00_A1068_01_101 - Option A Roundabout.dwg

REALLOCATION OF LANE WIDTHS ON A1068 TO JUNCTION TO ALLOW FOR TWO LANE APPROACH.

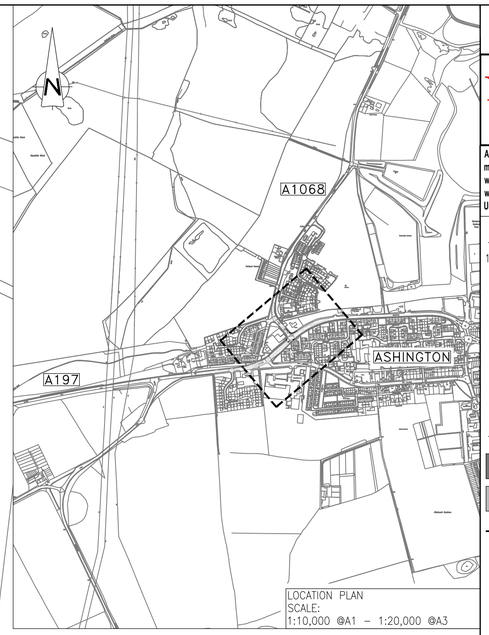
REALIGNMENT OF ROAD CHANNEL REQUIRED FOR HEAVY GOODS VEHICLE MANOEUVRES

EXISTING ACCELERATION LANE TO BE REUSED.

IMPLEMENTATION OF PLANNING APPROVAL FOR VEHICLE RENTAL ENTRANCE WOULD SEE THE EXISTING ACCELERATION LANE TERMINATE HERE.

NEW TRAFFIC ISLAND

DEVON CLOSE



LOCATION PLAN
SCALE:
1:10,000 @A1 – 1:20,000 @A3

CONTRACT DRAWING No.

DRAWING SIZE A1

Northumberland County Council

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

- NEW CARRIAGEWAY CONSTRUCTION
- NEW FOOTWAY F1
- NEW KERBING
- NEW KEEP LEFT BOLLARD
- NEW TRAFFIC SIGNAL

REVISION	By	Date	Rev.

Drawing Status
INFORMATION

Client
NORTHUMBERLAND COUNTY COUNCIL
COUNTY HALL, MORPETH.
NORTHUMBERLAND. NE61 2EF Tel. 01670 533000

Job Title
A1068 / A197 JUNCTION

Drawing Title
FEASIBILITY OPTION B

Scale 1:200 @ A1

Northumberland County Council
TECHNICAL SERVICES

Drn	Date	Checked	Passed
LC	JUN 18	MH	

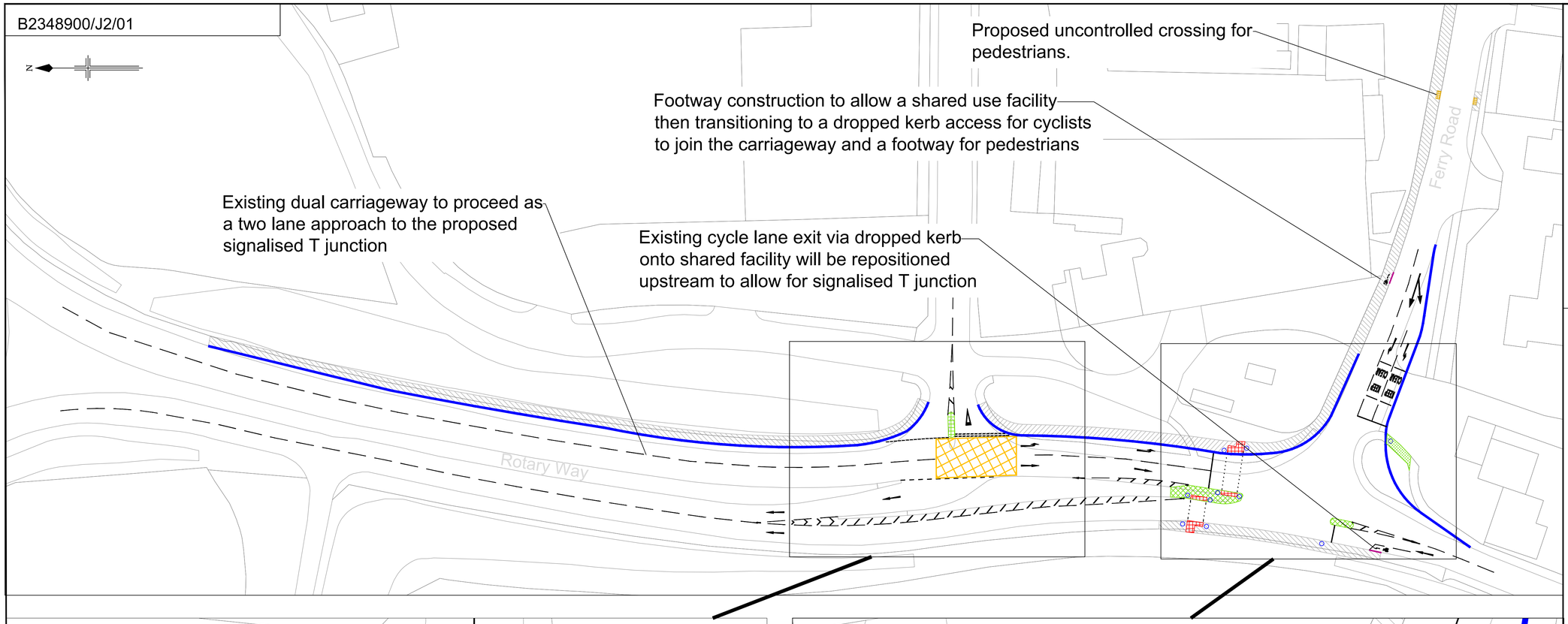
Drawing Number HE174327-02/00/A1068/01/102 Rev

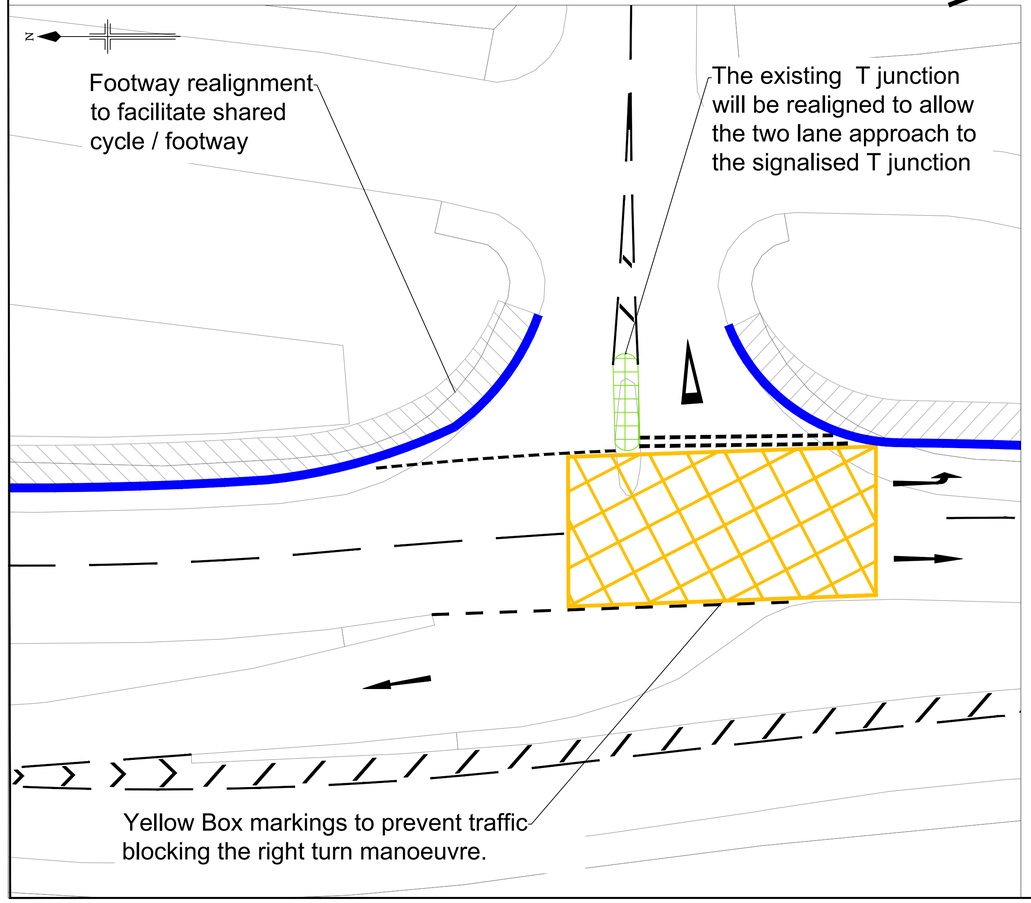
Job Number/File Number HE174327/00 Rev

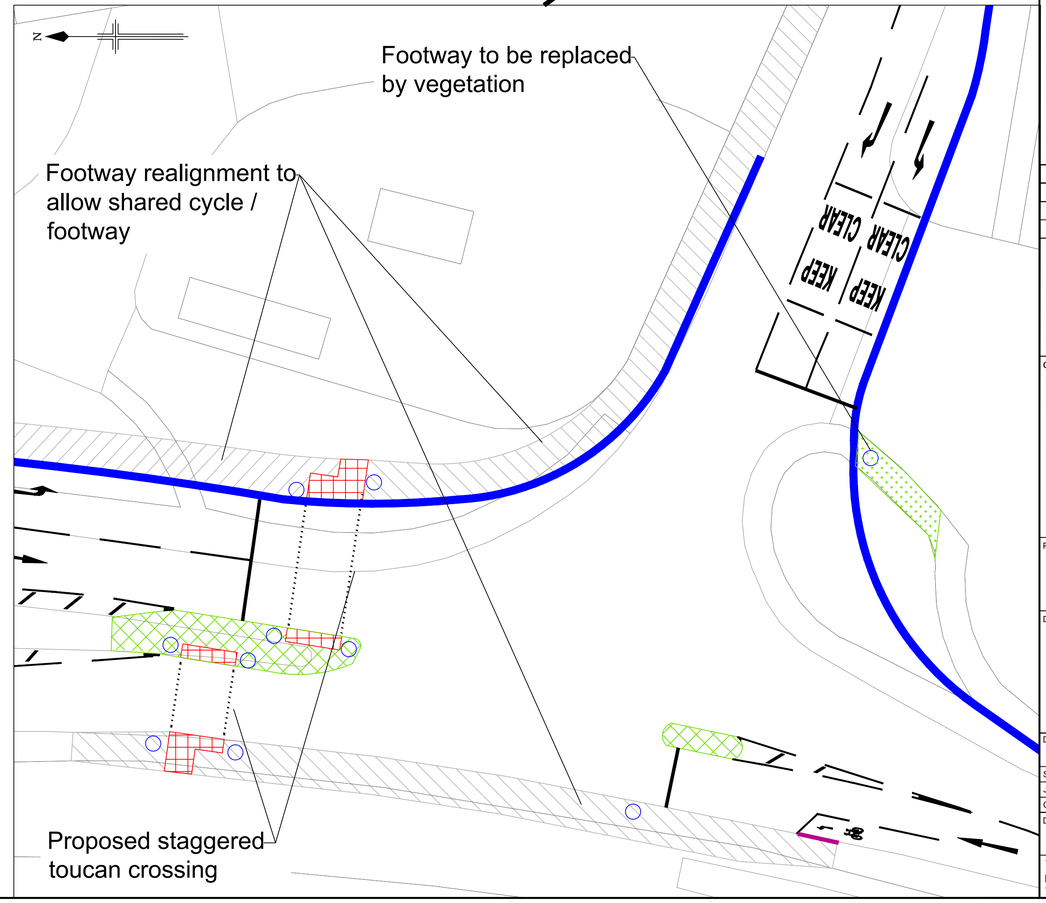
S:\Highways\PROJECT\17\HE MINOR IMPROVEMENTS\HE174327 Ashington Town Centre Parking\HE174327-02 A1068-A197 Junction\Drawings\General\02 Sheets\HE174327-02_00_A1068_01_102 – Option B Signals.dwg

Appendix B. Preliminary Drawings for the Preferred Mitigation Options

B2348900/J2/01







KEY:

- Proposed Splitter island
- Proposed footway realignment
- Proposed red blister tactiles and crossing locations
- Proposed buff tactiles and crossing locations
- Proposed Traffic Signals
- Proposed carriageway widening
- Proposed dropped kerb for cyclists transitioning between footway and carriageway
- Proposed footway link to be replaced by vegetation

Assumptions:

- A street lighting assessment / design will need to be undertaken as part of the detail design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage.
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system.
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required.
- No allowance has been made for service diversions / issues with regard to installing traffic signals.
- Signing has not been considered as part of this concept design.
- The land required for the carriageway widening is assumed to form part of the NCC highway boundary.
- A topographical survey would be required to complete detailed design.
- The concept design has been based on traffic data and a desktop review of the site.
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at detail design.
- Police should be consulted when installing Yellow Box markings.

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
2	JAN 19	Changes following Client's comments 29/01/19	JK	AC	AC	RP
1	JAN 19	Included Yellow Box markings	JK	AC	PB	RP
0	JAN 19	Concept	JK	AC	PB	RP

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Client: Northumberland County Council

Project: Northumberland Junction Improvements

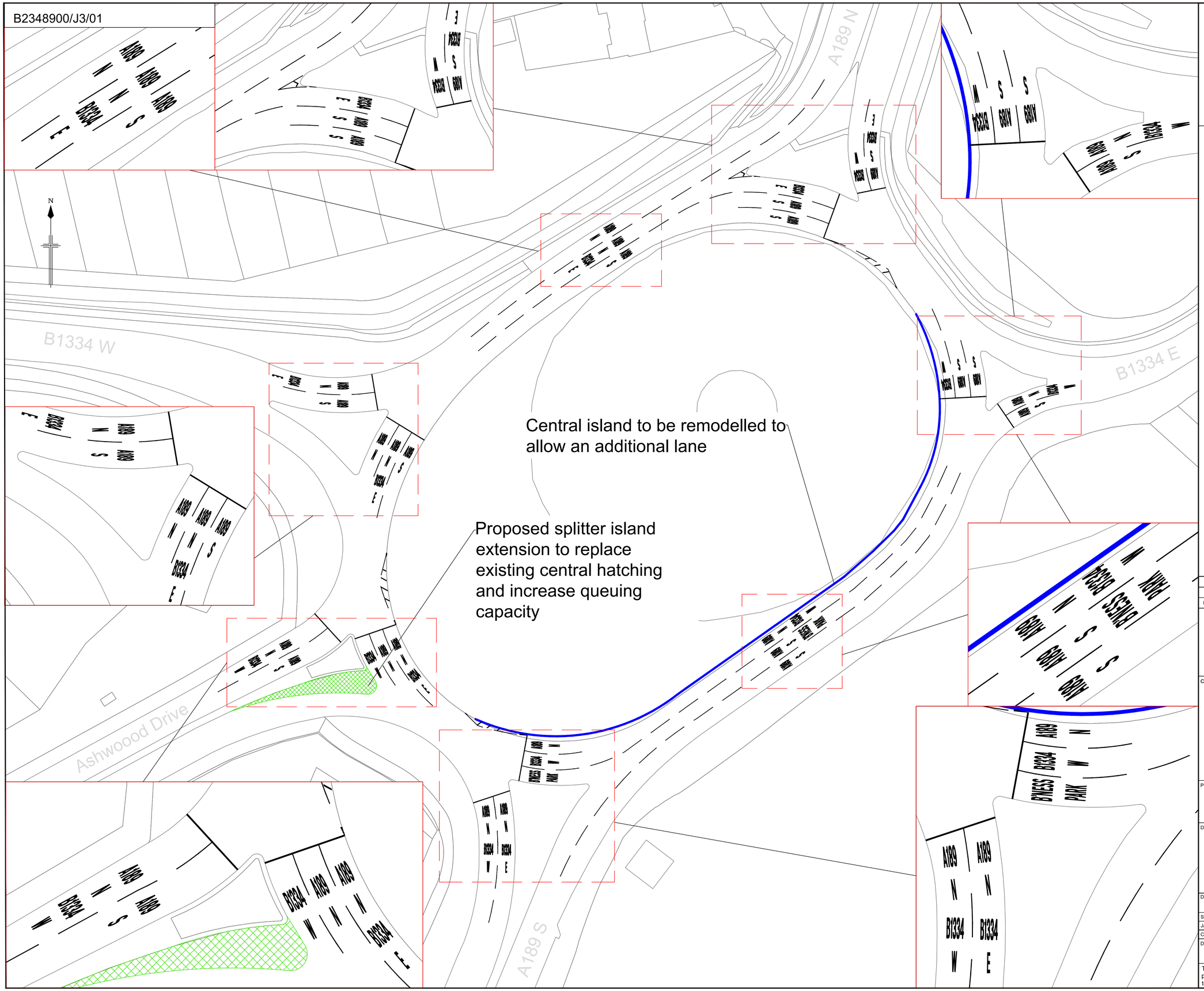
Drawing Title: Northumberland Local Plan
A6079 - Rotary Way / Ferry Road
Concept Drawings
Option 3

Drawing Status: FOR INFORMATION

Scale	NTS @ A3	DO NOT SCALE
Jacobs No.	B2348900	
Client no.	-	

Drawing number: B2348900/J2/03 Rev: R2

B2348900/J3/01



KEY:

- Proposed Splitter island extension
- Proposed carriageway widening

Assumptions:

- A street lighting assessment / design will need to be undertaken as part of the detail design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage.
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system.
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required.
- No allowance has been made for service diversions / issues with regard to installing traffic signals.
- Signing has not been considered as part of this concept design.
- The land required for the carriageway widening is assumed to form part of the NCC highway boundary.
- A topographical survey would be required to complete detailed design.
- The concept design has been based on traffic data and a desktop review of the site.
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at detail design.

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
1	JAN 19	Concept	JK	AC	PB	RP
0	DEC 18	Concept	JK	OW	PB	RP

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Client

NORTHUMBERLAND COUNTY COUNCIL

Project

Northumberland Junction Improvements

Drawing Title

Northumberland Local Plan
A189 & B1334 - Ashwood Drive
Concept Drawings
Option 1

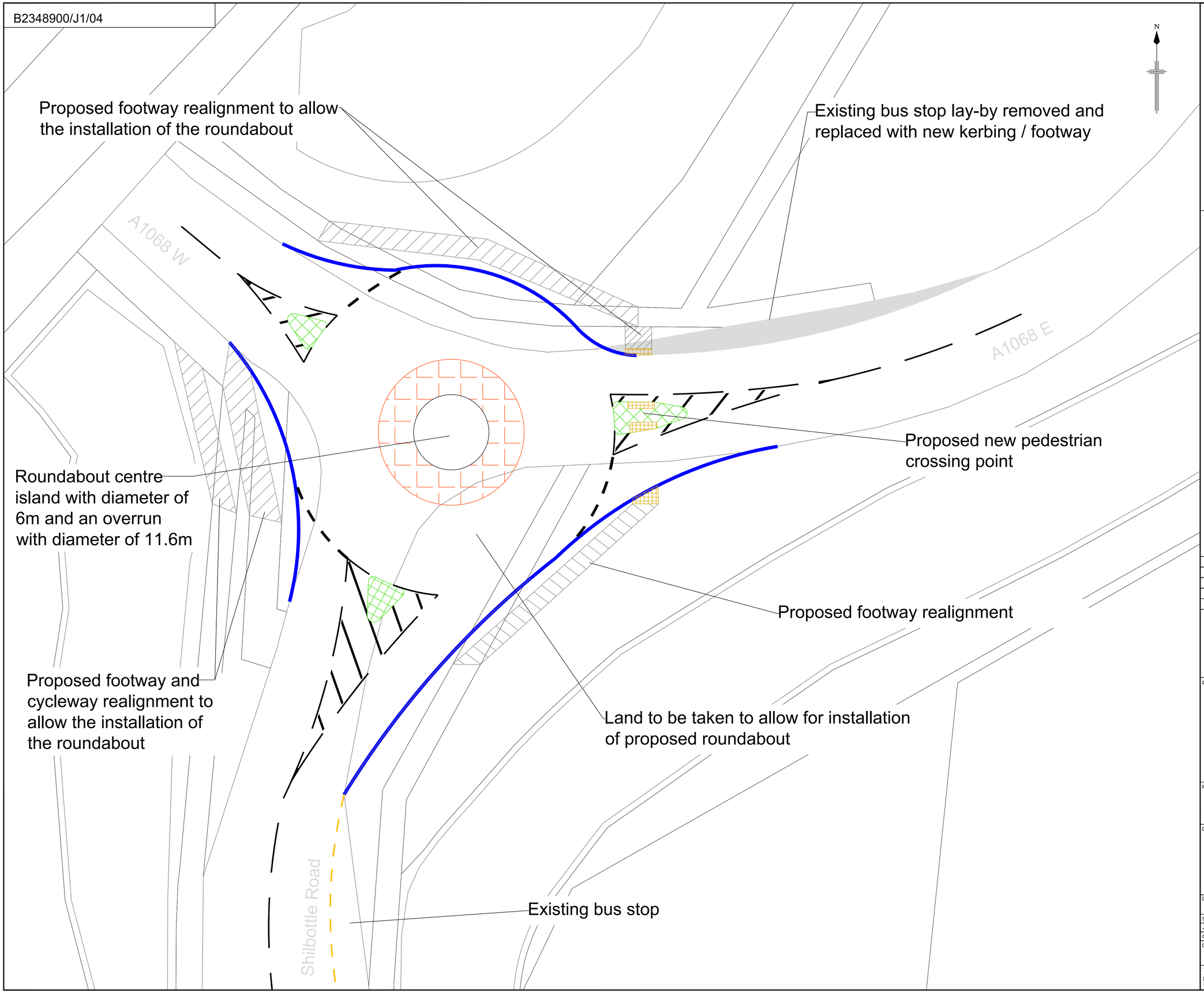
Drawing Status

FOR INFORMATION

Scale	NTS @ A3	DO NOT SCALE
Jacobs No.	B2348900	
Client no.	-	

Drawing number: B2348900/J3/01 Rev: R1

B2348900/J1/04



KEY:

- Proposed Splitter island
- Proposed overrun for HGVs / buses
- Proposed footway / cycleway realignment
- Proposed buff tactiles at crossing location
- Proposed kerb buildout
- Proposed carriageway widening

Design Constraints / Assumptions:

- A street lighting assessment / design will need to be undertaken as part of the detail design. No allowance for electrical connections or positioning to determine any relocations are feasible, have been undertaken at this stage.
- No drainage surveys / design has been undertaken to determine how any changes to the highway alignment would impact on the existing drainage system.
- The design has not taken account of the impact on any public utility services and / or whether service diversions would be required.
- Signing has not been considered as part of this concept design.
- The land required for the carriageway widening does fall with local NCC and Highways England's boundaries.
- A topographical survey would be required to complete detailed design.
- The concept design has been based on traffic data and a desktop review of the site.
- Proposed kerb lines are indicative to determine vehicle movements. Exact highway alignments, kerb radii, levels, retaining features etc, may impact on the overall buildability of the design and may change at detail design.
- The structure of the existing A1 bridge that passes over the eastbound approach to the junction will be unaffected by the concept design.
- The existing bus stop on the A1068 will be removed.

Rev	Rev. Date	Purpose of revision	Drawn	Checked	Rev'd	Apprv'd
3	JAN 19	Revised design constraints re:NCC highway land	JK	AC	PB	RP
2	JAN 19	Revised design constraints re:NCC highway land	JK	AC	PB	RP
1	JAN 19	Concept	JK	AC	PB	RP
0	JAN 19	Concept	JK	OW	PB	RP

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Client

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Project

Northumberland Junction Improvements

Drawing Title

Northumberland Local Plan
A1068 - Shilbottle Road
Concept Drawings
Option 4

Drawing Status

FOR INFORMATION

Scale	NTS @ A3	DO NOT SCALE
Jacobs No.	B2348900	
Client no.	-	

Drawing number: B2348900/J1/04 Rev: R3

REALLOCATION OF LANE WIDTHS ON A1068 TO JUNCTION TO ALLOW FOR TWO LANE APPROACH.

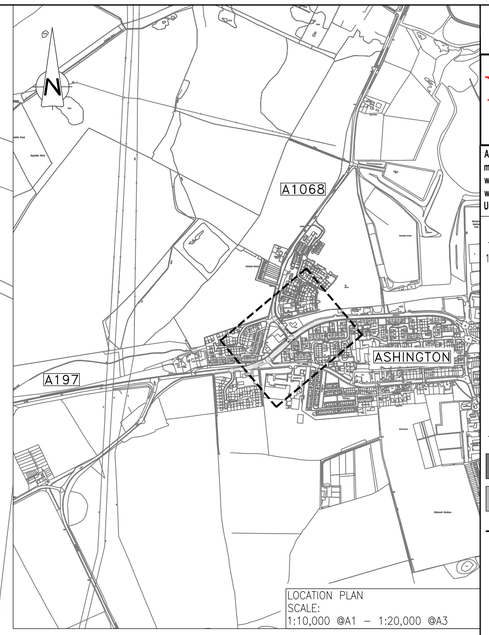
REALIGNMENT OF ROAD CHANNEL REQUIRED FOR HEAVY GOODS VEHICLE MANOEUVRES

EXISTING ACCELERATION LANE TO BE REUSED.

IMPLEMENTATION OF PLANNING APPROVAL FOR VEHICLE RENTAL ENTRANCE WOULD SEE THE EXISTING ACCELERATION LANE TERMINATE HERE.

NEW TRAFFIC ISLAND

DEVON CLOSE



LOCATION PLAN
SCALE:
1:10,000 @A1 – 1:20,000 @A3

CONTRACT DRAWING No.

DRAWING SIZE A1

Northumberland County Council

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.

LEGEND:

- NEW CARRIAGEWAY CONSTRUCTION
- NEW FOOTWAY F1
- NEW KERBING
- NEW KEEP LEFT BOLLARD
- NEW TRAFFIC SIGNAL

REVISION	By	Date	Rev.

Drawing Status
INFORMATION

Client
NORTHUMBERLAND COUNTY COUNCIL
COUNTY HALL, MORPETH.
NORTHUMBERLAND. NE61 2EF Tel. 01670 533000

Job Title
A1068 / A197 JUNCTION

Drawing Title
FEASIBILITY OPTION B

Scale 1:200 @ A1

Northumberland County Council
TECHNICAL SERVICES

Drn	Date	Checked	Passed
LC	JUN 18	MH	

Drawing Number HE174327-02/00/A1068/01/102 Rev

Job Number/File Number HE174327/00 Rev

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