

10219 Land at Valley Park, Didcot

Technical Note 36: Deign Rationale and further Amendments – Southern Roundabout Access Dated 26th April 2021.

1 Introduction

- 1.1 This Technical Note responds to the recent Planning Committee response and questions raised by the Committee on the 16th February 2021 on the Proposed Development known as Valley Park, Didcot. In particular this note deals with those issues raised by the Committee on the design and layout of the southern 5 arm roundabout, being the main southern access to the development on the B4493, Didcot Road and the recently constructed Harwell Link.
- **1.2** For background, Brookbanks has supported the promotion of this development over the period of the planning application, in relation to transport issues. A Transport Assessment (TA) was submitted as part of the application. This TA included a layout and assessment of the Southern Access Arrangement as described in 1.1 being a conversion of the existing roundabout on the B4493 and the Harwell Link Road to a 5 arm Roundabout providing further access to the main body of development in the north and a smaller parcel to the south of the B4493.
- **1.3** Therefore the access we see today was derived from the Transport Assessment and the form and layout, including all recent alterations to the roundabout have been agreed and previously accepted by Oxfordshire County Council (OCC) as the Highway Authority.
- **1.4** The current design was subsequently supported by OCC at the above-mentioned Committee Meeting in 1.1 and was felt an appropriate design for all users.
- **1.6** Considered in this note are the following topics:
 - Location of the Roundabout and its environs and purpose of the junction and local roads
 - Traffic volumes
 - Appropriate National and Local standards that would apply to the Design of the roundabout.
 - Further improvements to the layout
 - Further measures considered following Committee Comments.
- **1.7** Drawings showing the design proposals are included in the appendices of this report. The documents referred to in this document are available freely on the internet for reference;

Standards For Highways | Design Manual for Roads and Bridges (DMRB)

Oxfordshire Cycling Standards (oxfordshire.gov.uk)

Manual for the Streets (publishing.service.gov.uk)

Manual For Streets 2

Cycle Infrastructure Design (publishing.service.gov.uk)

2 The Design Process

Location of the Roundabout and its Environs and the local Road Network Use (existing and proposed)

- 2.1 The new junction is an alteration of an existing roundabout junction on the B4493 to the west of Didcot. It is the northern end of a new link road called the "Harwell Link". This Link Road has been constructed to carry local and commuter traffic to the surrounding road network such as London Road and further to the south through other improved areas of the network such as Hagbourne Hill and Chilton Slips on the A34.
- **2.2** The location of the junction both now and in the future is considered to be on the edge of the urban area. The immediate approaches will generally have no frontage and while the majority of the roads into the roundabout will be 30mph the link to the south is 50mph and where the majority of traffic moving through the junction will be from and to this Link.
- **2.2** The Developer is committed to delivering the entirety of the principal internal development road from the A4130 to the Harwell link to a point suitable for general traffic use (the northern arm of the proposed roundabout). This is early on in this process at 500 dwellings of the 4254 total.
- **2.3** The Harwell link and therefore the roundabout, in conjunction with the proposed Science Bridge and other HIF works that has secured funding, will form part of an important north/south route for vehicles and an important public transport route to the west of Didcot.
- **2.4** Given the volume of traffic expected, the continued/increased importance of the junction in the wider network and in discussion with OCC, the current junction design type of a Roundabout was considered an appropriate junction type for the future network.
- **2.5** To summarise, this roundabout while on a B road, clearly forms part of the existing and future strategic network of roads in and around Didcot for commuter traffic and the relief of internal traffic within Didcot.

Traffic Volumes and Design Standards

- 2.6 In line with the above, the new proposed junction was modelled by OCC in their strategic transport model for Oxfordshire in modelling software called Saturn. There were various "runs" produced by OCC in the modelling software for the developer to consider and of particular note is what is known as the future design year. The future design takes account of the development, its traffic, other future committed development and crucially here, future road improvements. This is predominantly the traffic routing from the HIF works such as Science Bridge and the A4130 dualling.
- 2.7 With the information from the modelling discussed in 2.6 to hand, the amount of traffic can be assessed, that would then be used to establish what size and form the roundabout should take. Here the traffic going through the junction on a daily basis is approximately 33,000 movements with Average Annual Daily Traffic level on the busy arms, such as the Harwell Link, of approximately 13,000. As can be seen this is not an insignificant amount and reflects the future importance of the junction to the strategic network, and effectively its important place within the wider HIF network works in the future.
- **2.8** As this is effectively part of that wider HIF network it is important to consider the same standards for design as being used for the HIF that OCC are providing. The overriding standard in this HIF work is the Design Manual for Roads and Bridges (DMRB) as published by the Department for Transport.

- **2.9** It is important to state that the DMRB is not a restricted document to a particular form of infrastructure design. Indeed, the DMRB covers all situations and should not be considered as restricted to Trunk Road or Motorway design, which was thought to potentially be the case at the recent Committee Meeting.
- **2.10** This nationally recognised and nationally used design document is the appropriate approach for the consideration of larger and strategic infrastructure as we have here.
- 2.11 This aligns with the current approach to the wider HIF design being undertaken by the OCC. Their Engineers are following the DMRB as the main document for the design of HIF infrastructure and that this document would be the lead document for that design. That is not to say that OCC or the developer for that matter would consider this in isolation and would look to other guidance such as Local or National guidance to help inform the design process. The details of this are considered in more detail below from 2.12 onwards.

Design Standards and considerations National Guidance and Documents

- **2.12** When considering a junction design of this nature relevant standard are considered in terms of what would apply to allow the safe and appropriate design approach for all.
- **2.13** For any new design a mix of national standards are used and where they would apply, and that guidance followed. So, for general design of transport infrastructure related to new development Manual for Streets and Manual for Streets 2 as published by the Department of Transport and the Chartered Institute of Highways and Transportation respectively can be considered within that document list.
- 2.14 Within the first document, Manual for Streets, it specifically refers to itself as a design document for lightly traffic roads and as can be seen from the previous section this junction and interconnecting roads cannot be considered in this category. Therefore, this document is not considered to be applicable in most concerns for this design.
- 2.15 Manual for Streets 2 however, does go further on this matter and looks to apply the standards to a wider range of roads as discussed in section 1.3 of that document. In the same section it does acknowledge that a designer would refer to the DMRB for inter-urban non trunk road design, which this road junction would be classed as given its strategic importance and volume of traffic catered for. There is further reference to its potential use (MFS2) on all 30mph zones, however with the main routing of traffic being north/south and the southern arm of the roundabout being a 50mph limit, this is not considered to strictly meet that category.
- **2.16** Manual for Streets 2 has a whole section dedicated to the consideration of conventional roundabouts and their use in Section 9.6.
- 2.17 Within paragraphs 9.6.3 to 9.6.5 the pitfalls of designing good access for non motorised users is discussed. Reference is made to crossings located distant from arms along with trying to overcome this with underpass designs. The latter is discouraged given safety concerns and also nonconformity with other aspects of Manual for Streets, such as well lit and overlooked facilities for safety and well being.
- **2.18** Paragraphs 9.6.6 to 9.6.11 look at further design considerations for conventional roundabouts.
- **2.19** Within Paragraph 9.6.6, if placing conventional roundabouts, encourages the placement of crossings as close to the entries as possible and that single crossings rather than staggered should be considered. This approach has been taken in the latest iteration.
- **2.20** Paragraph 9.6.7 continues to discuss reducing entries to a single lane where possible to the roundabout, but again recognises the need to balance this with expected traffic flows. As this is a strategic piece of infrastructure, traffic flow has to be an important consideration.
- **2.21** Manual for Streets 2, paragraph 9.6.8 also refers to roundabout types, their appropriateness and refers back to the DMRB for guidance on such matters, which is covered in more detail later in this document.

- **2.22** Manual for Streets 2 also refers to circulatory widths of roundabouts within paragraph 9.6.9 and looks to have the circulatory reflect the traffic using it on a regular basis. For Urban development where larger commercial traffic is less likely in any volumes then widths can be reduced. For this particular design however its strategic nature and therefore commercial traffic use must be considered and therefore the DMRB requirements become more prevalent.
- **2.23** Finally, Manual for Streets 2 in para 9.6.10 confirms that in restrictive situations not all roundabouts are circular and that ovoids or less regular shapes are accepted, as is the case for this design and is recognised and helping to slow traffic down.
- 2.24 Following on from the Manual for Streets 1 and 2 and given the routing of cyclists through the junction. Further guidance is sort from the Department of Transports "Local Transport Note 1/20 – Cycle Infrastructure Design".
- **2.25** The Local Transport Note 1/20 recognises the difficultly in integrating all users at roundabout junctions and offers advice on their design. Paragraph 10.3.9 discusses the use of compact roundabouts but also refers to the use of "normal" roundabouts on busier routes such as this design, where it recommends that cycle routes are separated out.
- **2.26** Transport Note 1/20 section 10.7 specifically refers to roundabouts. Within paragraph 10.7.5 it refers to two ways in accommodating cyclists through roundabouts, within carriageway with either mini-roundabouts or compact roundabouts, or separated facilities for larger busy roundabouts, the latter being the design approach taken here, given its strategic nature.
- **2.27** Paragraph 10.7.6 of the note talks of existing roundabouts and improvements to implement. Reconfiguring as a compact design is discussed, but also other options are considered such as "provide protected space for cycling around the junction with suitable crossings of each arm". Given the nature of this roundabout and the nature of traffic through this roundabout not suiting a compact or mini design, the protected space and crossings at each arm is the chosen approach.
- **2.28** Transport Note 1/20 paragraphs 10.7.8 to 10.7.15 covers the placement of crossings and pedestrian facilities at roundabouts with higher flows. Noting segregated facilities, crossings at each arm and two-way facilities. An idealised version of this is shown in Figure 10.37 of the note. This is ostensible the design within this document however the layout of the Didcot design reflects its constraints in its location, namely topography, land ownership and existing infrastructure.
- 2.29 Again, Compact roundabouts are discussed within Transport Note 1/20 paragraphs 10.7.28 to 10.7.32. however as noted in 10.7.29 a limit on their appropriateness is recognised in the volume of traffic using the roundabout. The general limit discussed is around 8000 a day whereas discussed earlier in this document in paragraph 2.7 the busier arms of this proposal are at 13,000. This also reaffirms the approach within para 2.27 of this document in reference to 10.7.6 of the Transport Note.
- **2.30** Finally in the national document consideration is the DMRB as referenced earlier in paragraphs 2.8 to 2.11.
- 2.31 The DMRB is a suite of design standards which cover all elements of highway and infrastructure design. Roundabouts have their own standard document within this suite known as CD116 and was recently updated dated in April 2020.
- 2.32 when considering the type of roundabout that should inform the design process, CD116 clearly states on page 16, Section 2 "Roundabout types" subsection "Normal and compact roundabouts" the considerations for that decision. These involve both traffic volumes and speed limits considerations both separately and in tandem.
- 2.33 In accordance with the above section and on consideration of the speed limits. The roundabout is located within the 30mph zone and therefore under 2.3.3. a compact roundabout could be considered. However, the Harwell link for all but the last 30 or so metres to the roundabout is 50mph so clearly shows that 2.3 of CD116 could be applied where a compact design is not recommended. Moving to traffic volumes 2.3.2 does allow a 50mph where a compact could be considered. However, there are notes to this assumption and on the same page NOTE 2 clearly states that compact design should only be considered when AADT is less than 8,000 on

all arms. Definitively in 2.7 of this document the Harwell link has nearly more than 50% more traffic. Therefore, a compact design is not appropriate.

- **2.34** Given that a compact roundabout is not appropriate within the design standards, the design recommendations for that roundabout type would not apply.
- 2.35 On non motorised users of the roundabout, the DMRB offers clear guidance on its implementation. 3.53 of the document and onwards discusses where these facilities should be placed to allow safe use by all uses.3.53.1 notes that the facilities can be within 20m of the give way, or if not there, then they should be placed at least 60m away for visibility and safety reasons.
- **2.36** When considering the placement of such facilities, all users where considered during this design process including Disabled users, who have separate consideration under the Disability Discrimination Act. On balance here, access to all facilities was considered and gradients/slopes on these facilities kept to minimum. This led to crossing points away from the roundabout and was considered a good balance of amenity and convenience.
- **2.37** Further advice and design requirements are given for pedestrian and cycle access at roundabouts in DMRB document CD195 "Designing for Cycle Traffic". Given a compact roundabout is not appropriate page 32 and section E/5.8 is considered appropriate. Within that section there are five options, with the first option being "provide cycle tracks around the junction, with cycle track crossings on each arm". This option has been used here and the crossing provided in accordance with CD116 discussed above.
- **2.38** In addition, further guidance on the interaction for non motorised users is covered in the DMRB under document CD143 "Designing for walking, cycling and horse-riding". This guidance covers more technical aspects of visibility and layout for these users, which have also been adhered to within the current design.
- **2.39** Therefore in summary, the DMRB and its design guidance are appropriate base standards to be used for the design of the roundabout.

Design Standards and considerations Local Guidance

- **2.40** Referring to the Oxfordshire County Councils own document "Cycling Design Standards" which has been published as a guide for Developers, Planners and Engineers for the design for provisions for cyclists in the wider transport network.
- **2.41** The Oxfordshire Guidance can be generally split into to two provisions. One within the main layout of new developments, and then one on the peripheries and out with development.
- **2.42** Within the development the standards have been largely applied and as discussed in other documents there is a plethora of on and off highway facilities giving both interconnectivity and connections to the wider network.
- 2.43 For the Roundabout and referring back to the location and Environs section of this report, it is clear that this is an important junction in the strategic HIF network. Therefore, in the hierarchy as laid out in Table 1 of the OCC guidance this must be considered as at least the Primary Distributor Road and in reality, because of the Harwell link speed at above 30mph the table recommends off carriageway provision. This approach has therefore been catered for.
- **2.44** In 3.2 "Busier Roads" of the OCC guidance and in para 3.2.1. it is clear that this junction falls into the first category of 3.2.1 where built infrastructure for cyclists should be provided and 3.2.3 refers to cycle tracks totally segregated form traffic which again are provided.
- 2.45 3.3 of the OCC guidance specifically refers to junctions and refers back to the CD195 as referenced in 2.37 of this document for guidance, which has been considered. This section of the OCC Guidance also talks of Good on and off carriageway facilities, recognising that both have their place in safe and good design.

- **2.46** 3.3.5 of the OCC guidance talks of a Radial Approach to roundabout design where possible and refers back to guidance such as CD195 already discussed in this document for its suitability.
- **2.47** As discussed in this document, several methods of cycle and pedestrian routing can be considered. Given the amount of traffic using the junction and as discussed above in both the DMRB and Oxfordshire guidance, segregated facilities are preferred and are therefore shown here.
- **2.48** Even if a radial design was considered here, it would need to adhere to the same standards of traffic movement through the junction as required by the DMRB. This is catering for all vehicle types including HGV's and other large commercial vehicles. With that in mind, give ways would require more lanes and circulatory routes would need to be enlarged. This is to allow larger vehicles to enter and leave this style of roundabout safely. This would greatly increase the size of the roundabout and therefore any radial route for cyclists and pedestrians would also be increased.
- **2.49** Assuming a large radial was pursued despite the issues as raised in terms of sizing and lane numbers in 2.27 of this document. There are physical constraints which would stop the implementation of such a large roundabout in this location, including topography, level differences, landowner ship, existing infrastructure such as the A34 and the over bridge. These are shown in figure 2.1 below.

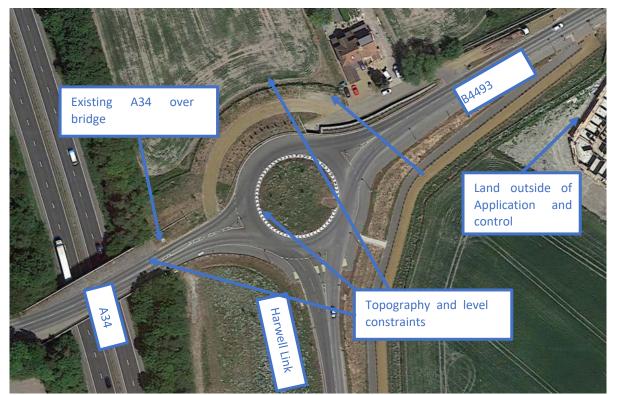


Figure 2.1- Aerial View Existing 3 arm roundabout with constraints

2.50 Finally in the OCC guidance at section 1.1.4 and 3.5.7 and the design of such facilities and the hierarchy of requirement is recognised. Specifically in terms of its own place in designing such works and refers first to the DMRB as National Design regulations and notes its own appropriateness for detailed design and considers itself as a "signpost" to those documents.

3 Potential Improvements

Current Layout and potential Improvements

- **3.1** In consideration of the Design requirements as outlined and detailed in this document, it is considered that segregated facilities for non motorised users, separate to the highway is the most appropriate and safe approach to the design. However, its is recognised that further improvements could be made to the design to offer additional and enhanced non motorised facilities.
- **3.2 Proposed arm South East into proposed development**. Currently as shown below figure 3.2 is the original proposal with the Pegasus crossing set back from the roundabout in accordance with DMRB and to minimise gradients for DDA concerns. Following further analysis, it is believed that the crossing can be moved closer to the roundabout to reduce journey times and offer a more convenient facility for non motorised users. As discussed in section 2 of this document this should be around 20m away from the access and this is now shown in figure 3.1. This does introduce higher gradients to the footway/cycleway/bridleway than the current design, but these would remain within guidance for DDA concerns.

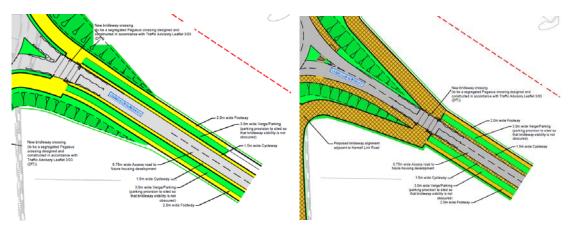


Figure 3.1- New layout.

Figure 3.2- Original layout.

Existing Southern Arm to the Harwell Link. Currently as shown below in figure 3.4 only provision for an 3.3 uncontrolled crossing at the junction was shown. Given the changes to the new south east arm as described above, this now brings the footway/cycleway/bridleway up to the higher level and affords the opportunity to provide a new controlled Pegasus crossing on this arm, adding further facilities to east/west non motorised user traffic. This is shown in figure 3.3.

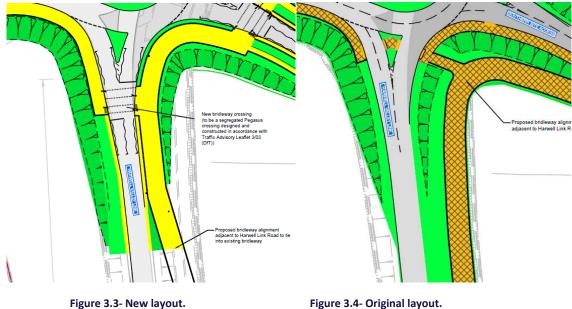


Figure 3.4- Original layout.

3.4 Existing Wester Arm bridge over the A34. Currently as shown below in figure 3.6, only provision for an uncontrolled crossing at the junction was shown. Given the changes to the new south east arm and now the southern arm as described above, brings the footway/cycleway/bridleway up to the higher level and affords the opportunity to provide a new controlled crossing on this arm, adding further facilities to east/west non motorised user traffic, as well as north/south. Given the space constraints on the bridge it is believed that this is likely to be a Toucan or similar crossing and therefore in this area the extended facility is the Footway/Cycleway. This new arrangement is shown in figure 3.5.

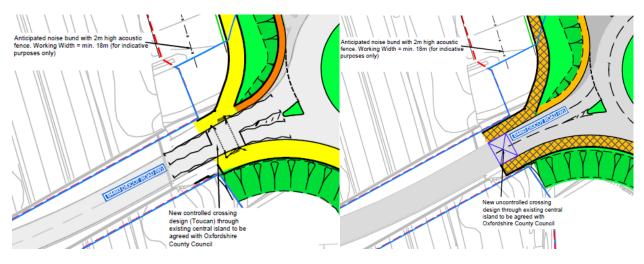


Figure 3.5- New layout.

Figure 3.6- Original layout.

3.5 Proposed arm North into development. Level and restrictive constraints from the A34, proposed noise bunding and existing properties has limited further improvements here. However, the west side of the arm has a widened facility for pedestrians and cyclists from the proposed Toucan Crossing to the west and to this proposed Pegasus crossing on the northern arm. In addition, the Pegasus crossing has been moved as far south as possible given the constraints as detailed above. This is shown in the figures 3.7 and 3.8.



Figure 3.7- New layout.

Figure 3.8- New layout.

- **3.6** With the alterations as discussed in 3.1 to 3.5 we now have controlled crossings on every arm of the proposal for non motorised users. In addition, where constraints have allowed and a more balanced approach to non motorised users and DDA compliance has taken place. Crossings on 3 of the arms have been moved closer the roundabout to offer as short a distance as practicable through the roundabout.
- **3.7** These 3 crossings as referred to above also coincide with the largest commuter route for cyclists, east/west traffic.
- **3.7** The above facilities give non motorised users priority green time on push to call facilities on all arms. This means that north south and east west routes now have safe routing through the roundabout as close to the roundabout as safe standards and design allows.

Further measures considered following Committee Comments.

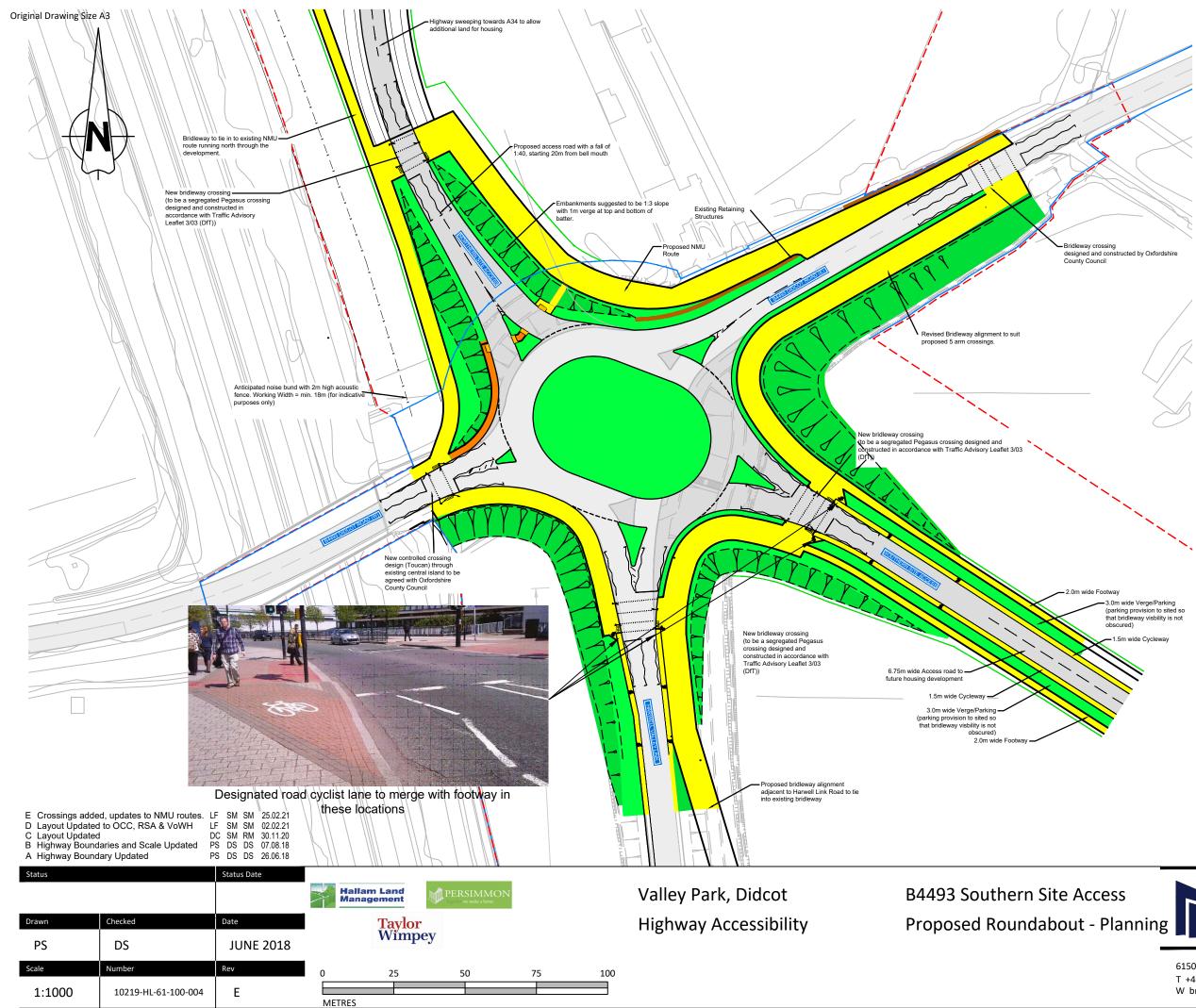
- **3.8** The Consortium recognise that cyclist routing through the junction and in particular commuter routing would potentially benefit from not stopping for the green stage at the signals to appear after pushing a button.
- **3.9** The Consortium has conducted some research in this area and it is no surprise that in Europe there are several systems at varying stages of design and implementation already tackling this point. These schemes offer a detection system for cyclist to trigger green time as cyclists arrive. In addition, some can also trigger further green signals through the connected crossings to offer an uninterrupted route for cyclists through the junctions reducing the need to stop.
- **3.10** The most prevalent system found to date is a system known as Green Wave. As the name implies this is about giving a wave of green lights for cyclists who could travel through the junction and is based on detection, speed and number of cyclists. First used in Copenhagen, but now used in other cities around the world like Amsterdam, San Francisco and Melbourne. There is no reason therefore why this could not be considered here.
- **3.11** The system is explained in a video link here <u>How 'green waves' can make city riding better CyclingTips</u> This could be implemented on either the East West or North South routes discussed as there are several crossing that would be used on these routes at any one time. This would be, as far as we know, the first system of its kind in such a location.
- **3.12** the Consortium are keen to explore an installation here, but obviously this would have to be in conjunction with OCC, who have tentatively reacted positively to this approach in the first instance. This unique and exemplar approach would need to be subject to monitoring and trialling over a set time period to be agreed with OCC and results assessed. After all this would be unique as previous installations are more urban/City based.

4 Summary

4.1 This document demonstrates that the roundabout at the southern end of the proposed development known as Valley Park forms part of the strategic network. It is an important piece in the jigsaw of the HIF infrastructure and as such should be designed to the same standards.

- **4.2** It also demonstrates that as part of the HIF Jigsaw it needs to follow similar design standards as other HIF elements being design by OCC. These are predominantly designed to and accord with the DMRB in the first instance.
- **4.2** The DMRB as is the National Standard for highway design and is not limited to the Trunk Roads and Motorways, it is therefore the correct document to be considered for this design. It also has prevalence over other guidance as published on such designs and its hierarchy is recognised in these other publications.
- **4.3** In all the Design documents and standards as considered and listed in 1.7 of this document. Without exception all recognise that there is a fine balance of design for roundabouts when considering the volume of traffic and type of junction considered. In all cases and for the specific circumstance for this design, separated facilities are recommended with crossings provided on each arm.
- **4.4** That other types of design discussed at the Committee are restricted either on safety grounds and not recommended in the guidance and/or are not able to be constructed due to existing physical constraints. In particular compact roundabouts which is covered extensively in section 2 of this note.
- **4.5** Immaterial to point 4.4 the design now offers a quicker flatter and shorter route without serious gradient changes to the other options such as the underpass and bridge suggested.
- **4.4** That through continued analysis, further modifications of the design could be done within context of the above standards to improve amenity by moving the controlled crossing closer to the main circulatory carriageway and add further controlled priority for non motorised users on the remaining 2 arms with improved width provisions on the segregated facilities, where room allows. These arms did not have facilities on the previous design.
- **4.5** That following research the site could be considered for the trialling of innovative additions to those controlled facilities to offer detection and automatic green time and continued green stages through the roundabout for non motorised users irrespective of traffic volumes.

Appendix A – Proposed Design



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Construction Design and Management (CDM) Key Residual Risks

Contractors entering the site should gain permission from the relevant land owners and/or principle contractor working on site at the time of entry. Contractors shall be responsible for carrying out their own risk assessments and for liaising with the relevant services companies and authorities. Listed below are Site Specific key risks associated with the project.

- 1) Overhead and underground services
- 2) Street Lighting Cables
- 3) Working adjacent to water courses and flood plain
- 4) Soft ground conditions 5) Working adjacent to live highways and railway line
- 6) Unchartered services
- 7) Existing buildings with potential asbestos hazards

X

KEY:

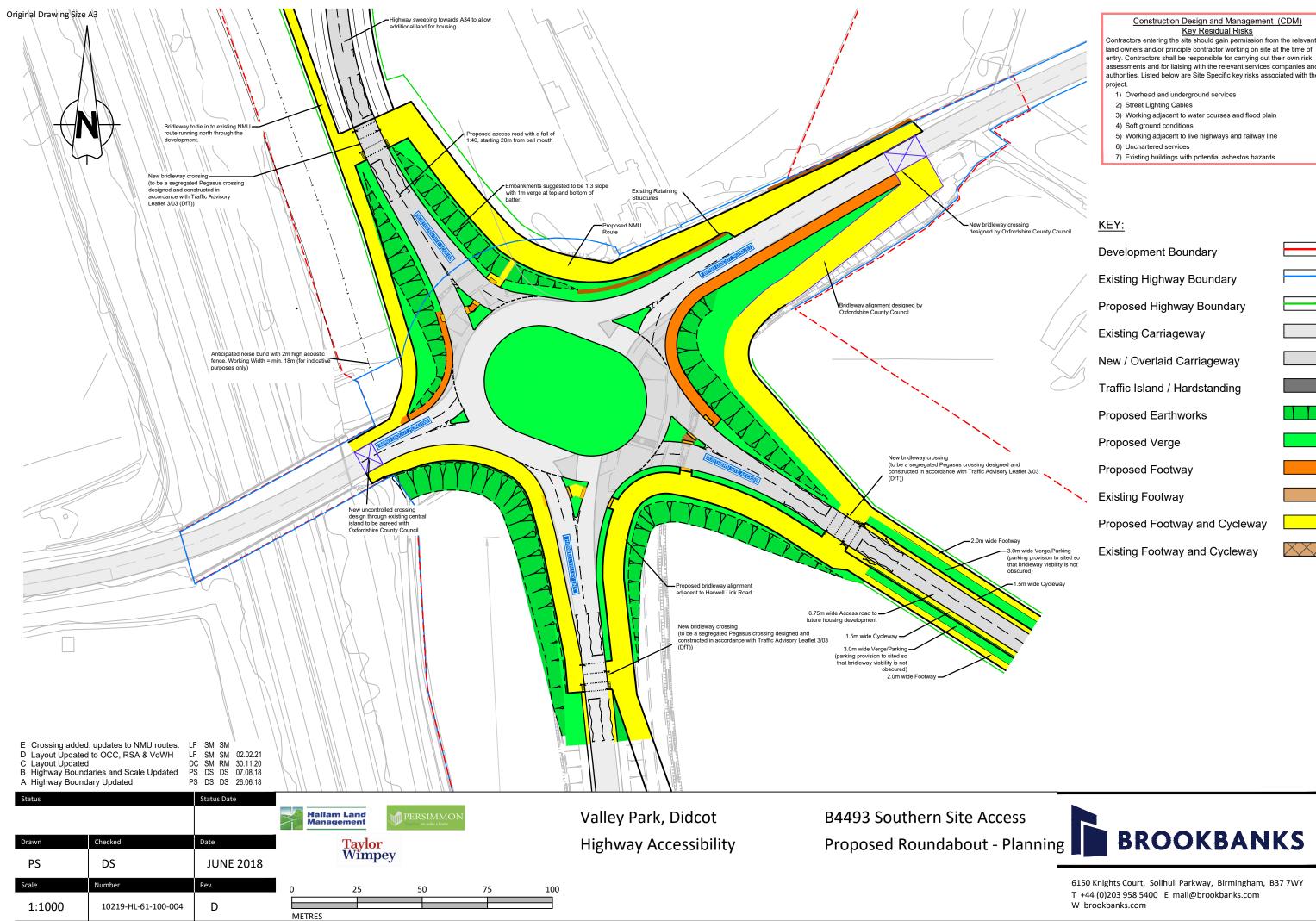
Development Boundary Existing Highway Boundary Proposed Highway Boundary Existing Carriageway New / Overlaid Carriageway Traffic Island / Hardstanding Proposed Earthworks Proposed Verge Proposed Footway **Existing Footway** Proposed Footway and Cycleway

Existing Footway and Cycleway

Proposed Roundabout - Planning BROOKBANKS

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Appendix B – Previous Design



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land owners and/or principle contractor working on site at the time of entry. Contractors shall be responsible for carrying out their own risk assessments and for liaising with the relevant services companies and authorities. Listed below are Site Specific key risks associated with the

Development Boundary	
Existing Highway Boundary	
Proposed Highway Boundary	
Existing Carriageway	
New / Overlaid Carriageway	
Traffic Island / Hardstanding	
Proposed Earthworks	ŶŶ
Proposed Verge	
Proposed Footway	
Existing Footway	
Proposed Footway and Cycleway	
Existing Footway and Cycleway	$\times\!$