



A40 Gloucestershire Cycling Provision & Route Study

PIN: 553270

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1. Introduction / Background

This study report has been prepared to assess the needs of cyclists currently using the A40, specifically between Longford roundabout and Junction 11 of the M5, with a view to improving the existing provision. It also aims to address the current cycle accident record on the A40 and seeks to provide a local route network for people that may wish to cycle, but currently use other modes.

The study looks at existing cycle provision, the existing conditions on the Highways England network and alternative routes that may be available. The alternatives may utilise local authority roads or follow sections of the National Cycle Network (NCN) routes. The study looks at developing site specific solutions to each portion of the cyclists' likely journey in order to create the most continuous, direct, comfortable, safe and attractive route for people of all abilities.

The route planning process is based on the accepted 'Hierarchy of Measures' (See table below from DfT Guidance) and the widely accepted core principles of design requirements for both cyclists and, where possible, pedestrians.

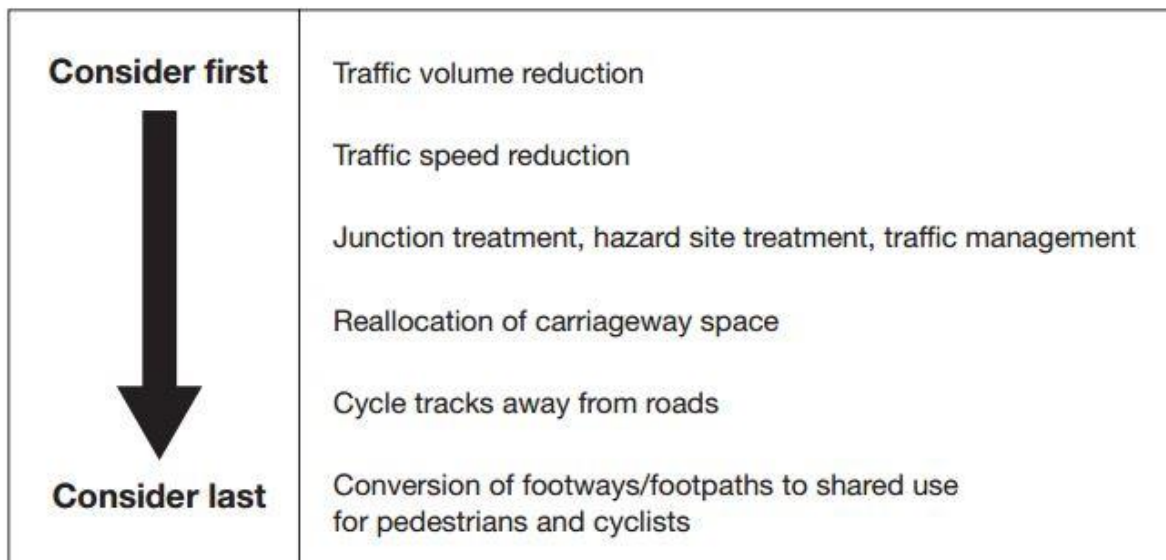


Figure 1 - Established DfT 'Hierarchy of Measures'

Whilst these core principles continue through the whole route planning process, design criteria will vary on different sections of each route and therefore the engineering design solutions will vary to balance those aspects (e.g. perceived safety versus directness). Additionally, the type of infrastructure will alter to balance the needs of the potential end users and the environmental conditions at any given point.

The A40 and potential alternative routes will be assessed and balanced against a selection of the latest guidance available with a view to cover the following user

requirements (as recommended by Local Transport Note 02/08 and subsequent LTNs):

- **Convenience**- Networks should serve all the main destinations and those places should all be properly signed (including train stations, tourist sites and amenities that may be of interest). Signal crossings and junctions should be designed to minimise delays to pedestrians and cyclists
- **Accessibility** – The routes should be continuous and coherent with consistent messages throughout (colour surface etc.) the routes should connect seamlessly to all facilities beyond the points that can be reached by car. All (off-carriageway) facilities should be accessible to wheelchair users.
- **Safety** – Routes should be perceived as safe, both from a traffic conditions and personal security perspective. This may be achieved for example by reducing traffic speeds in some cases or improving street lighting in others. Reallocation of road space and the provision of crossing points at carriageway level on desire lines as opposed to lengthy detours or underpasses or bridges.
- **Comfort** – All new infrastructure should be made to provide a smooth comfortable surface to users. Details such as flush kerbs at crossings and absence of barriers to negotiate create the quality and standard to be achieved.
- **Attractiveness** – often overlooked in engineering design. Pedestrians and cyclists benefit from the environmental quality of a route. The aesthetics, noise and surroundings can make a major difference on choice of route or even discourage people from cycling as the mode for that particular journey. People prefer to be able to walk or cycle side by side, not be funnelled single-file into places they would not normally chose to go.

Nationally, much work has been done in the last ten years or so to amalgamate various forms of guidance relating to Cycle-friendly infrastructure into simple good practice guides. These documents supersede previous iterations that may have been difficult to replicate within the UK road networks or incorporate into existing development layouts. These techniques have since been trialled by DfT and Local Authorities through “Cycle England” projects resulting in essential DfT - Local Transport Notes and Sustrans own “Handbook for Cycle Friendly Design” which consolidates a wealth of established technical guidance. Incorporating good design for walking has also been considered throughout, as well as Highways England’s approach to Inclusive Mobility and DDA compliance.

The efforts to gain a nationally recognised level of consistency are followed throughout this study and should be mirrored throughout the design and implementation process of the deliverables within this project.

2. A40 Gloucestershire – Context & Location

In order to understand the potential for cycling and the barriers to cycling, the route should be considered in the regional setting. The A40 acts as a bypass around the city of Gloucester and various villages to link Wales and the west of the region to Cheltenham and Oxfordshire in the east (see regional map below). Over the last few years, the road has been the subject of major junction improvements aimed at reducing traffic congestion and queuing. This culminated in the implementation of the 2014-2015 Highways Agency Programme of Pinch-Point schemes.

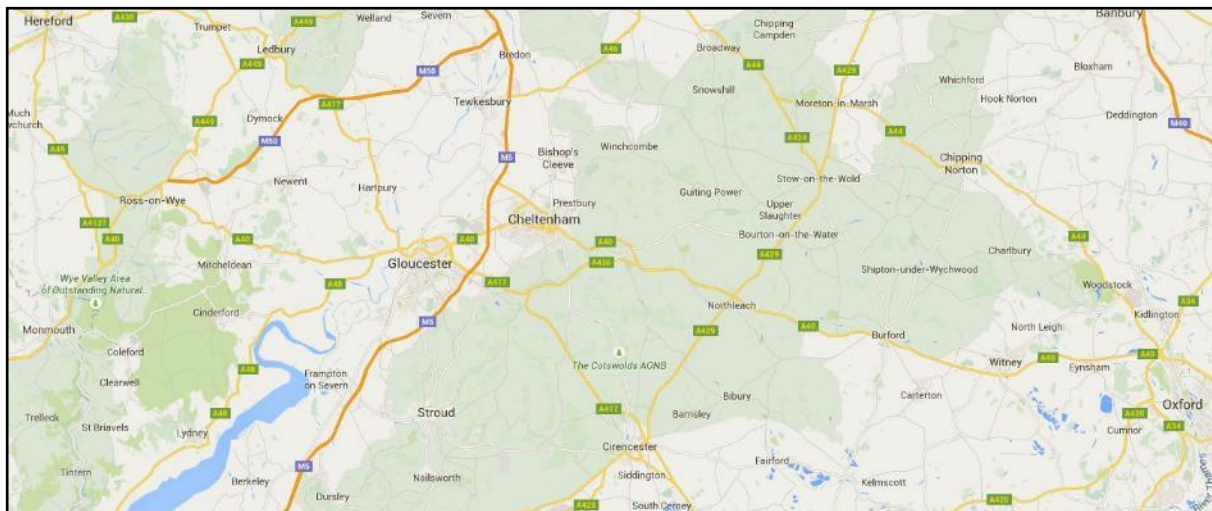


Figure 2 - ©Google Mapping

The section of the A40 being the subject of this study is between the roundabout junctions at Longford (A38 junction) and at Junction 11 of the M5, the eastern limit of Highways England network (see location plan below).

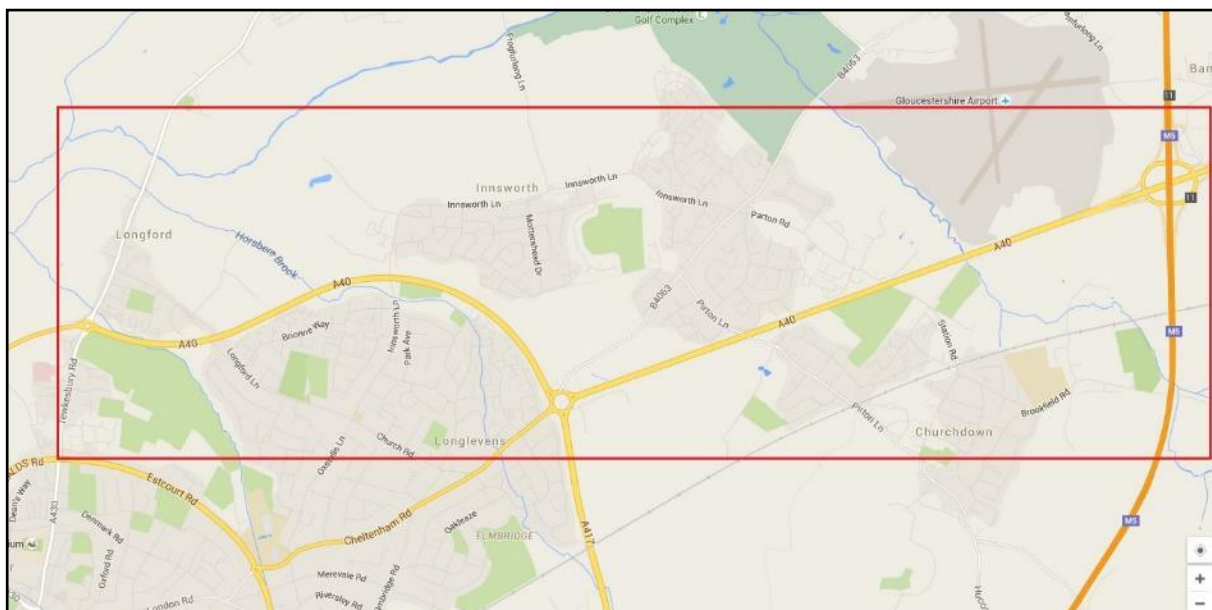


Figure 3 – Scope of Study/A40 Highways England network extents - ©Google Mapping

This section of the A40 in isolation would not form a useful, coherent route for cyclists as they would need to continue beyond the extent of Highways England's network to their main origins and destinations (including the city of Gloucester and Cheltenham). These two destinations have been established through consultation to be the main attractors and centres of employment and housing. Therefore this study will need to consider the connectivity to routes beyond the Highways England network to provide continuous, direct, coherent routes between Cheltenham and Gloucester, regardless of authority or maintenance boundaries.

From initial discussions with local and national stakeholders, the origins and destinations most likely to be reached and therefore serviced by any improvements to cycling between Cheltenham and Gloucester are likely to fall within the area shown on the plan below. The area is not finite or exhaustive but offers a wider view of who could potentially benefit from improvements to cycling on/around the A40.

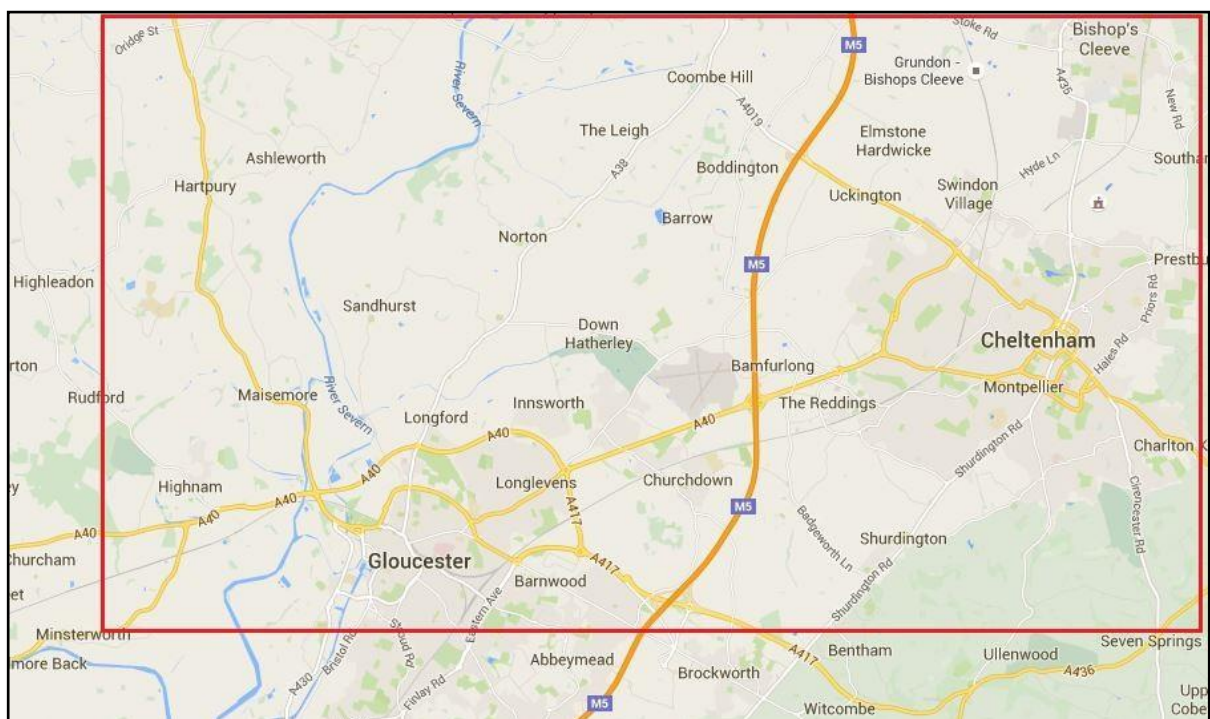


Figure 4: Potential area of service - ©Google Mapping

3. A40 Existing Road Layout and Provision

As the A40 serves as a regional and national trunk road, it effectively bypasses towns and villages and takes traffic around the outskirts of residential areas and amenities including a vast amount of cycle trip generators. By design, the local schools, residential areas, places of employment etc. adjacent to the route cannot easily be accessed directly from the A40. There is also no footway or cycleway along the roadside. There is a limited off-carriageway provision at the roundabout junctions in the form of shared controlled and uncontrolled crossing facilities, but no direct physical links or marked cycle lanes joining them along the A40. The road is not lit with a system of street lighting except at the roundabout junctions.

The road is mostly dual carriageway and subject to national speed limit (70mph) along the majority of its length, with sections of lower speed limits (50/40mph) on the approach to some of the major junctions. Recent traffic counts and studies have been commissioned which were undertaken by Tracsis during September 2015, at a central location in the study area, reveal actual average traffic speeds to be in the 70's with dry weather 85th Percentile figures to vary around 74mph.

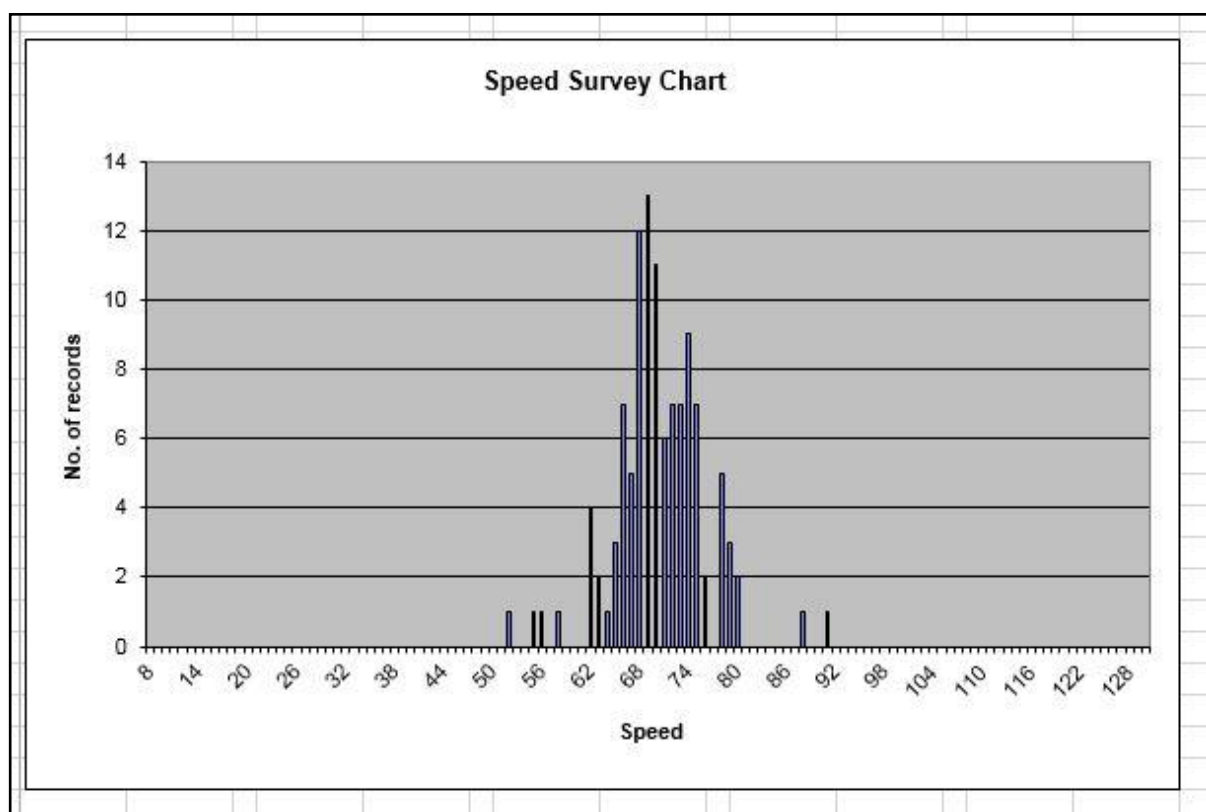


Figure 5: Typical graph of traffic speeds collected during independent surveys



Figure 6: Location of speed and video surveys collected between Elmbridge Roundabout and M5 J11

The counts show daily flows to be up around 40,000. The proportion of heavy goods vehicles is around 10% (4000 HGVs per day). In contrast the current average number of cycles is around 3 per day (See Appendix X for extracts from counts and summary XL sheets).

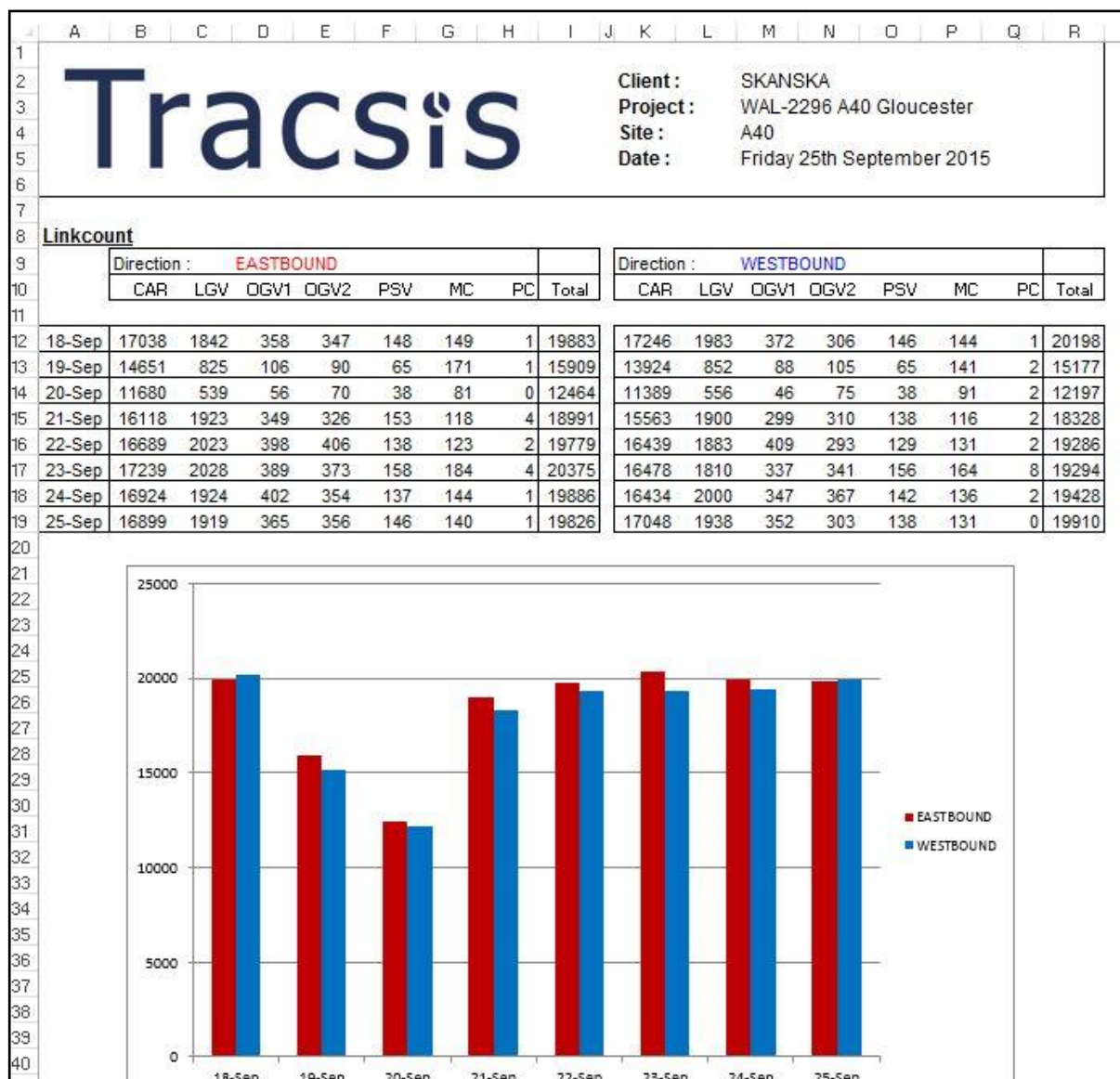


Figure 7: Typical graph of traffic volumes collected during independent surveys

The road layout of the Highways England section of trunk road is fairly consistent throughout the study area along most of its length with two traffic lanes in each direction, a central reservation, and grass verges each side of varying width (Figure 8 below).



Figure 8 – General layout of A40

The A40 connects with the M5 motorway (at Junction 11) through the means of four uncontrolled slip lanes (see below) to a grade separated roundabout junction underneath the A40. There is a VRS (Vehicle Restraint System) barrier in place in the central reservation and at various locations along the verge, including the approaches to the M5 junction.



Figure 9 – Eastbound slip lane down to M5 motorway raised roundabout junction

The grass verge is continuous along most of the section being studied. On average the flat section is around 2m wide but this varies dramatically. It also falls away down to water courses etc. and banks up to higher levels over long sections.

It contains various similar features on both sides of the carriageway: it is lined with mature trees and hedgerows, the aforementioned lengths of vehicle restraint barriers, some of which are placed in connection with structural supports to bridges (see examples below), and substantial parking laybys.



Figure 10 – Typical Bridge support structure and VRS barrier system



Figure 11 – Alternative road bridge support system

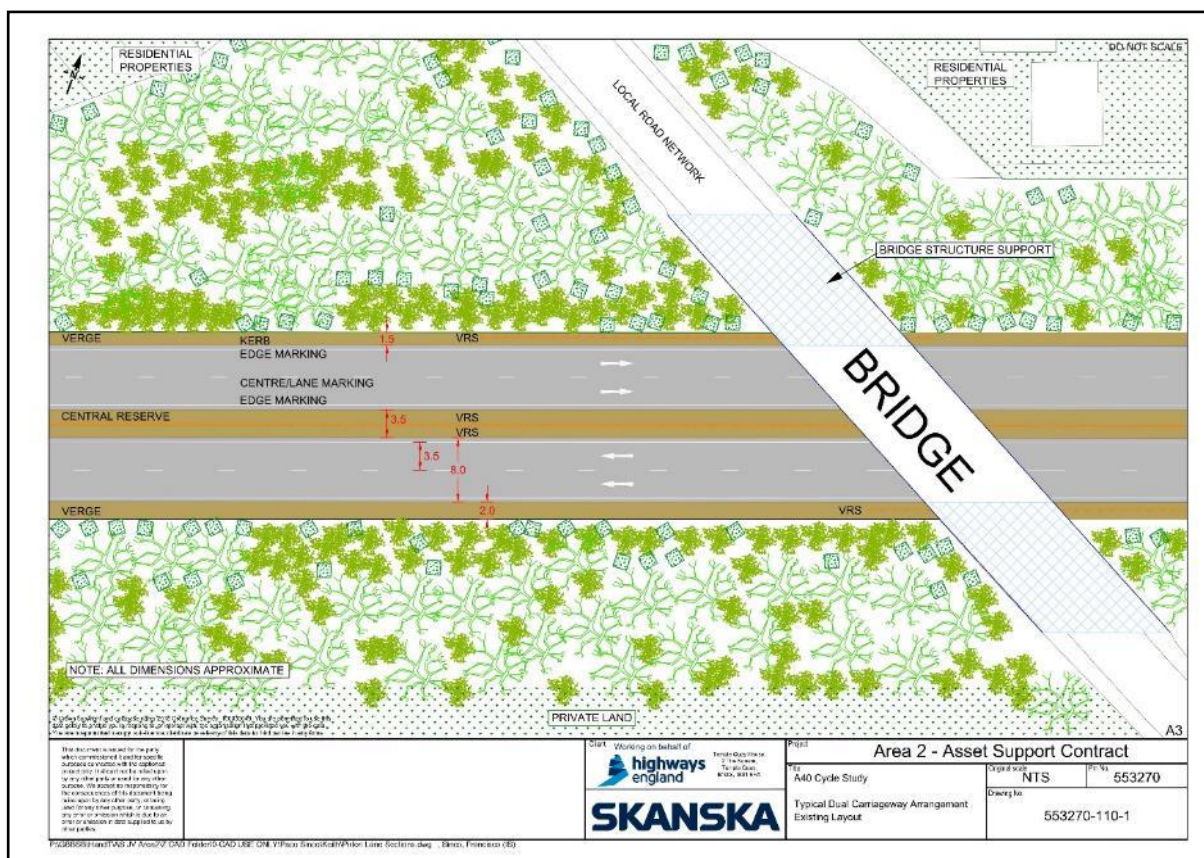


Figure 12 – Typical existing road layout along A40



Figure 13 – Typical layby and general usage

The verge also features fairly long slip lanes to junctions/side roads/entrances, including a garage forecourt and petrol station (see example below).



Figure 14 – Garage/dealership petrol station access way

4. Accident Analysis

Within the most recent full five year period (2010-2014) 4 accidents involving cyclists have been recorded on the A40 between Longford Roundabout and M5 J11 (see accident plot below).

With a total of 74 Personal Injury accidents (all vehicles) on this section in the same period, this means that 5% of all accidents involved a cyclist despite cycle activity being an extremely low proportion of the traffic make up on this route (approximately 0.0114%).

Accidents by severity

	Fatal	Serious	Slight	Total
2010	0	0	1	1
2011	0	0	0	0
2012	0	1	0	1
2013	0	0	1	1
2014	0	1	0	1
Total	0	2	2	4

Accidents are not concentrated in any particular year, with an average of 0.8 injury accident per year.

The severity ratio of 50% is high, which can be expected with cycle accidents on high speed roads.

Analysis of accident locations shows that there are no geographical concentrations of accidents (see accident plot below).

Accident details are summarised below:

Date	Severity	Location	Description
19/10/2010	Slight	Dual carriageway between Elmbridge Ct RAB and Longford RAB (Westbound)	Car overtaking cyclist in carriageway clipped cyclist.
09/10/2012	Serious	Eastbound on slip A40 at M5 J11 (from M5 SB)	Cyclist on A40 (eastbound) struck by vehicle entering from slip, failing to give way.
24/01/2013	Slight	Elmbridge Ct RAB	Car exiting RAB across path of cyclist in roundabout (failing to see cyclist).
19/08/2014	Serious	Longford RAB	Car entering RAB struck cyclist in RAB (failing to give way to cyclist).

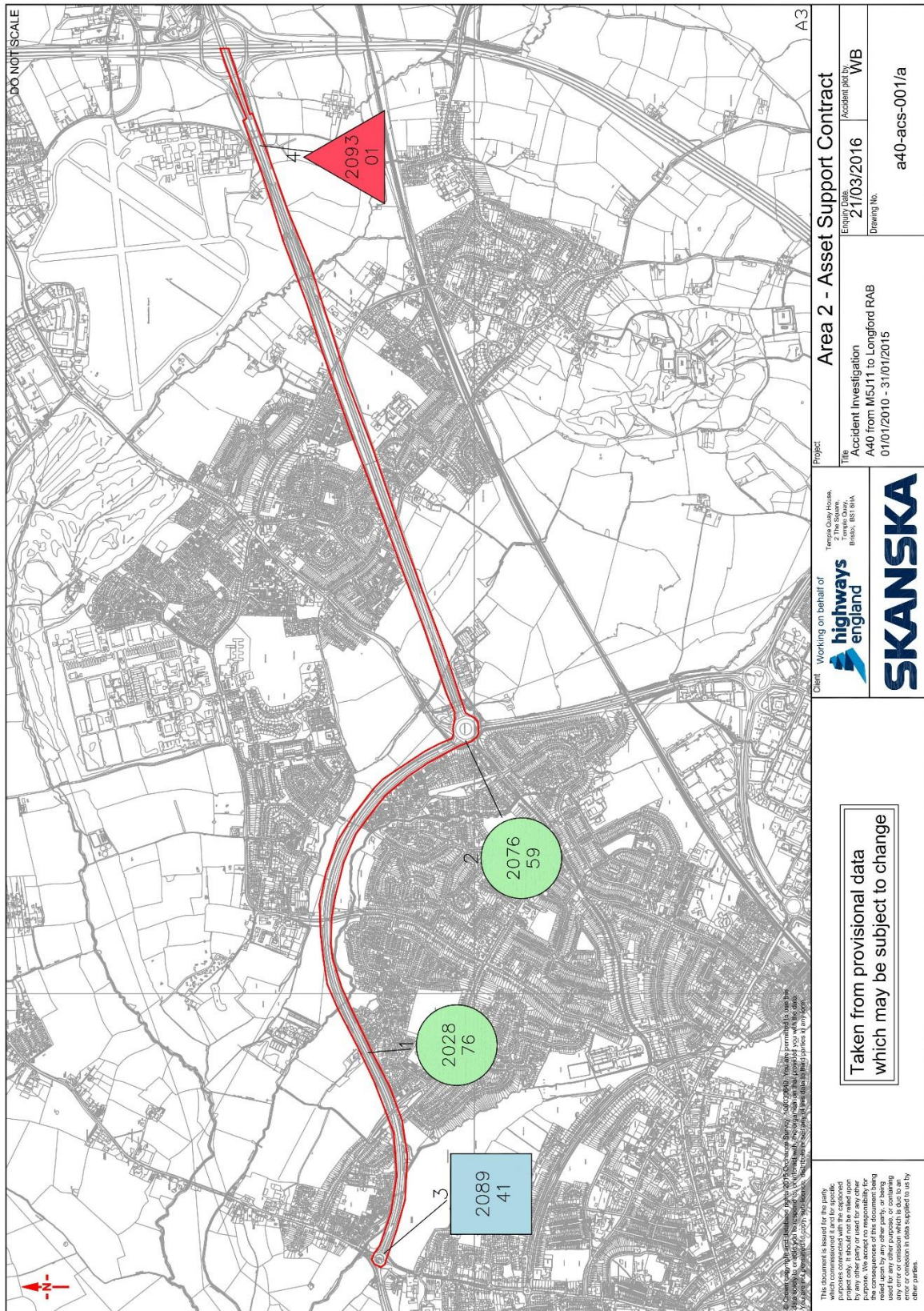
The accident details indicate that there is no obvious concentration in accident types or causation factors. The only common causation factor that can be identified is the lack of suitable and safe cycle infrastructure.

What is interesting in this respect, is that at both Elmbridge Court Roundabout and Longford Roundabout, cycle paths (or shared footways) are available around the roundabout. The cyclists involved in these two accidents had however decided not to use these cycle facilities and to cycle within the carriageway (roundabout). This could

potentially be explained by the limited perceived quality of the existing cycle infrastructure, lack of clear/convenient transitions or 'tie-ins' with detours, longer waiting times at crossing and unclear routing.

At the remaining two non-roundabout accident locations, no cycle facilities are present.

Although not included in the analysed period of 2010-2014, **it must be noted that a fatal cycle accident occurred on this section in January 2015.** This accident was located at the westbound on slip on A40 from M5 J11. An HGV entering the A40 from the slip road failed to see the cyclist already on the A40 (cycling in the carriageway in darkness). Although the origin and destination of the cyclist are unknown, it is noted that there is a traffic free cycle path near this location (around Staverton Airport). The path is however indirect, unlit, a detour for most cyclists, and an unclear routing.



5. Existing Cycle Routes in the Area

There is a significant network of pedestrian and cycle routes in and around Gloucester and Cheltenham, however the connectivity and coherence of the routes is very unclear and becomes broken by the absolute physical barrier created by the A40 and its junction with the M5 motorway. The other non-trunk routes currently include a convoluted mixture of the minor roads, non-parallel routes heading in various directions, narrow footbridges and subway alternatives.

Whilst the network mapped by Sustrans and listed as NCN Route '41' offers permeability and access to residential areas, schools and local amenities, it is not continuous or coherent and does not currently offer a natural obvious link or alternative to the A40 in terms of directness (see extract below).

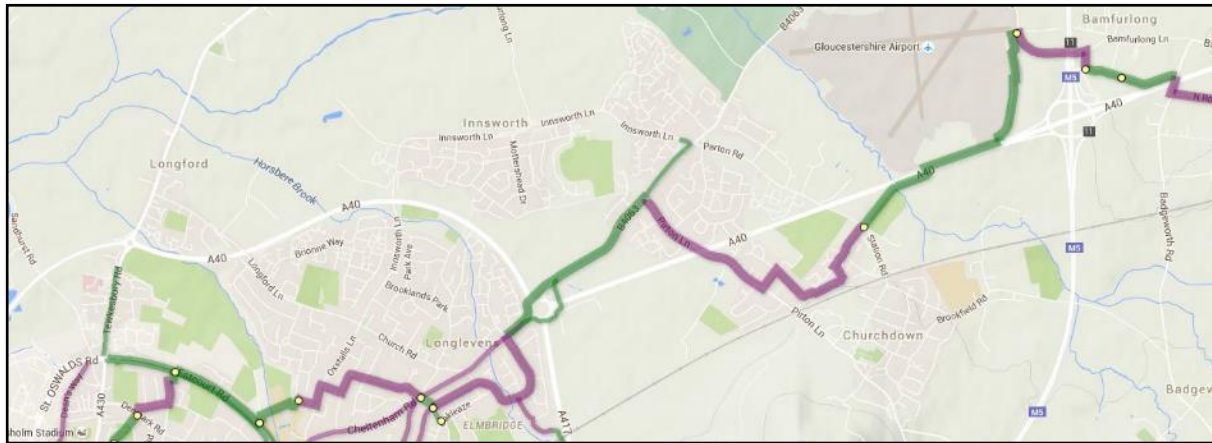


Figure 15 – Sustrans map extract of NCN (National Cycle Network) Route 41 adjacent to A40 (KEY: purple= on road routes/ green=paths/quiet roads)

Direction signing for cyclists is not currently sufficient to inspire confidence in the routes available. There are also physical barriers to movement along the route, some of which could be upgraded (e.g. A40 underpass and M5 overbridge) to make them more cycle friendly. There are however missing links and circuitous deviations which limit the feasibility of the current NCN41 as a direct alternative to the A40. Some of these gaps would need land purchase and redevelopment (e.g. Park & Ride site) but some include narrow paths between houses with little scope for widening.



Figure 16 – path between houses and very discreet NCN signing (route sticker on pole)



Figure 17 – Narrow path to footbridge over A40 with residential boundary fences and “No Cycling” regulatory sign

6. Consultation and target audience

As part of the study, the views of local and national stakeholders have been studied regarding their opinion of existing facilities, existing cyclists' current usage and also the potential for people to change to cycling as an alternative mode for certain journeys.

In addition to the Road User Intercept Survey, Highways England also commissioned Sustrans to work with Skanska to undertake a desktop study and detailed census interrogation of all the main 'attractors' and potential cycle 'trip generators' in the vicinity of the A40. These have led to and confirmed certain design approaches and decisions. By filtering the criteria to distances that can be easily cycled, the study will ensure that any proposals are best placed to reach the target audience, effect a modal shift, and maximise the destinations that can be served by the proposals.

The main residential attractors and trip generators are shown in the map extract (figure 17) below. This clearly shows the highest densities in Cheltenham and Gloucester but also each side of the B4063 (Innsworth & Churchdown).

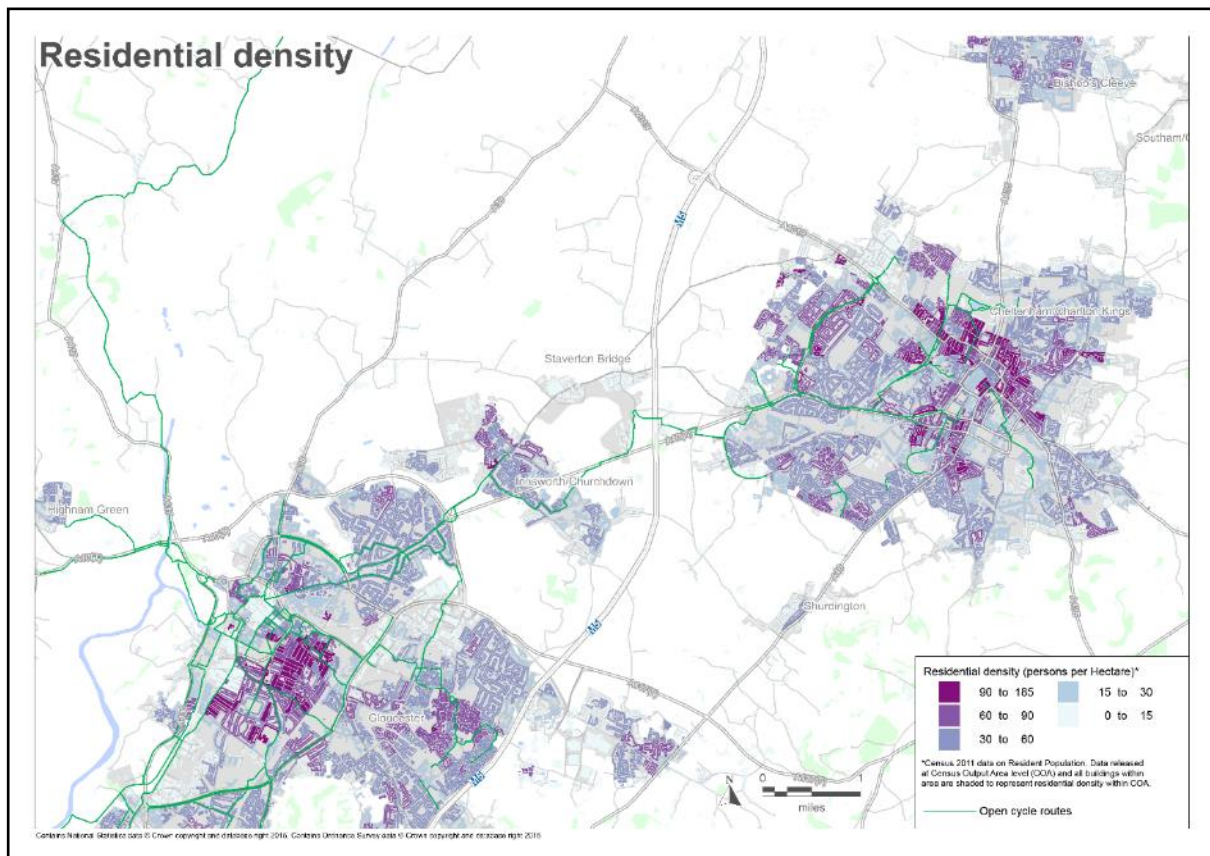


Figure 17 – Residential trip generators within cycling distance of the A40 Study area

The main education attractors and trip generators are shown in the map extract (figure 18) below. Most of the further education colleges and university campuses are located

in Cheltenham and Gloucester along with primary schools, however there are a number of primary schools in the residential areas of Innsworth and Churchdown which could be served by extensions from the existing NCN41 cycle route.

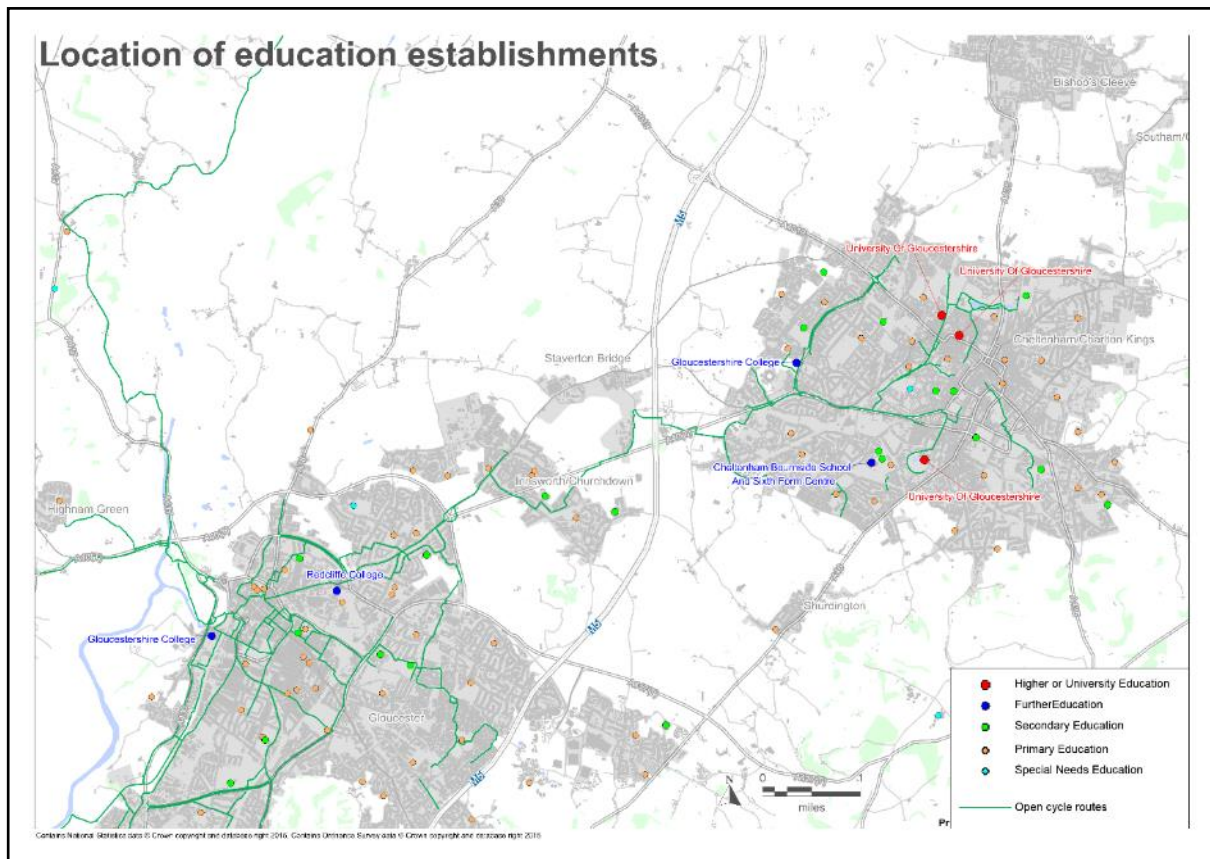


Figure 18 – Education trip generators within cycling distance of the A40 Study area

The main employment attractors and trip generators are shown in the map extract (figure 19) below. This highlights the presence of some very large places of work in the area on or close to the B4063 (north of the A40). However, the data is based on census information from 2011.

Further site investigation confirmed that the business areas here have grown in the last few years with new business premises opening adjacent to the B4063 since 2011. The commercial area is still expanding. New industrial units are being built and other premises have been upgraded. Gloucestershire County Council confirm that further development proposals have been given permission. Some of the eleven existing workplaces employ between 500 and 1000 people. Two of them employ up to 6000 workers. At present there is no continuous cycle provision to this area, and the road conditions are not suitable for cycling. Therefore, there is a great opportunity for modal shift which is not currently being catered for.

The largest place of work in the area is GCHQ, which is located adjacent to the A40 in Cheltenham, so any potential route improvements should include a direct route from the main residential areas.

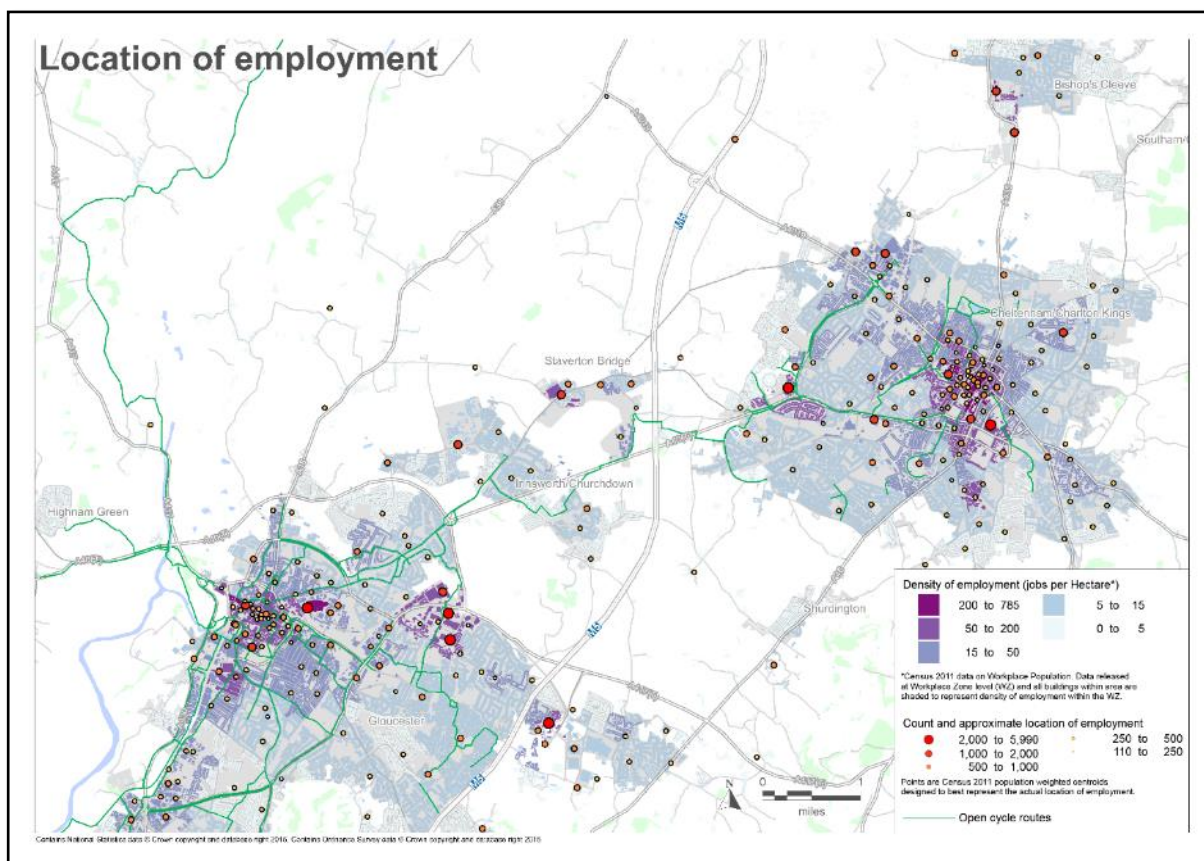


Figure 19 – Places of employment trip generators within cycling distance of the A40 Study area

When the area and local network is looked at more closely, the employment density along the B4063 is revealed which highlights the huge potential for commuter cycling along this corridor (see map extract Figure 20 below).

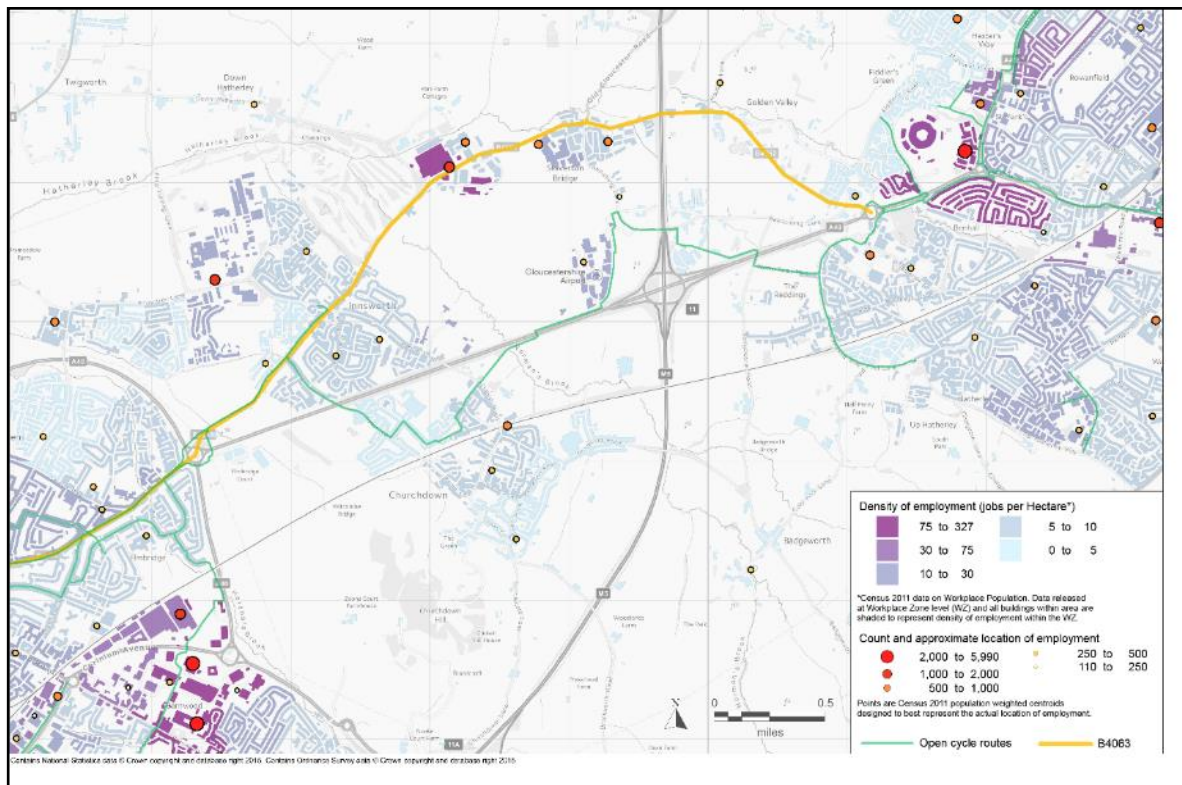


Figure 20 – Places of employment trip generators with B4063 highlighted yellow

SUSTRANS SITE INTERCEPT SURVEY

In addition to further desk based assessment of consultation data, Sustrans have been commissioned to undertake a Route User Intercept Survey (RUIS). This involves counts of NMUs and actual roadside interviews adjacent to the A40 with people who currently cycle and walk the route. This exercise was carried out in January 2016 when people were asked a series of questions to assist with identifying their usage and to highlight issues and concerns of existing users.

The surveys were carried out on a section of shared-use path the A40 just west of Arle Court Roundabout over a four day period. A total of 4146 NMUs were counted over that period and 160 interviews were carried out, 132 with pedestrians. Unfortunately, due to data protection concerns a number of respondents, employees at GCHQ could not take part.

The key findings in the survey that could help with the decision on future provision relating to the A40, NCN41 and alternatively the B4063 are:

- Based on analysis, the current estimate for NMU trips along this route is 547,231 (of which roughly 151k will be cyclists and 385k pedestrians);
- The three most popular reasons for use are commuting 71%, recreation, 17%, and shopping 7%;
- 95% of users surveyed made the journey every week, 65% of cyclists made the journey 5 days a week;
- When asked which route they had used or would be using (for ½ mile or more) as part of their journey : 41% - B4063 Cheltenham Road, 32% -A40 ,17%-NCN41;
- When NMUs we asked about the A40 (Highways England section over the M5) only 6% ever used the route with 47% saying it was too dangerous and 34% saying it was too busy.

Various other studies have been carried out previously to ascertain the perception towards cycling and cycling infrastructure in the area. The results of those historical consultations with groups and individuals have culminated in a recent report (2014) produced by Atkins for Gloucestershire County Council. This covered the whole of the county and all major towns and villages, and summarised the findings of various previous work.

That (Atkins/ GCC) study has been reviewed for this piece of work; the results and findings relating to the A40 (and the zone of interest around it) are summarised below:

1. **The top rated issue by far is the lack of a corridor between the towns & cities namely – Cheltenham to Gloucester. The barrier summary being “Lack of direct off-road or on-road providing an effective direct and continuous route between these two destinations”;**
2. Respondents perception that a major barrier to cycling is the lack of suitable infrastructure off-road (i.e. traffic free routes, shared-paths and cycle tracks);
3. Respondents perception that the second major barrier to cycling is the lack of suitable infrastructure on-road e.g. cycle lanes and features to assist at traffic signals etc.;
4. The most apparent view within the responses is that there needs to be a “focus on key commuter routes and busy roads with the idea of concentrating on “planning for utility cycling or cycling trips which have a destination context in mind e.g. commuting and school access”;
5. A key response highlights that “off-road routes need to be an attractive alternative to the existing road route in terms of directness ,maintenance and lighting”;
6. Poor or restricted access to the ‘off-road’ network was identified as a significant problem facing cyclists;
7. Gloucester and Cheltenham were highlighted as the main attractors/generators but lacking routes including those away from the road network and across the town;
8. National Cycle Network routes (NCN 41/45) were cited as opportunities that offered the most potential for increasing leisure cycling provision within the County.

7. Potential Improvements to the A40

The potential improvements for infrastructure for cyclists of varying levels of experience and confidence should be based on the chart below (versions of which are in most Cycle Planning Guidance), which shows the general thresholds and means to create satisfactory conditions for cycling.

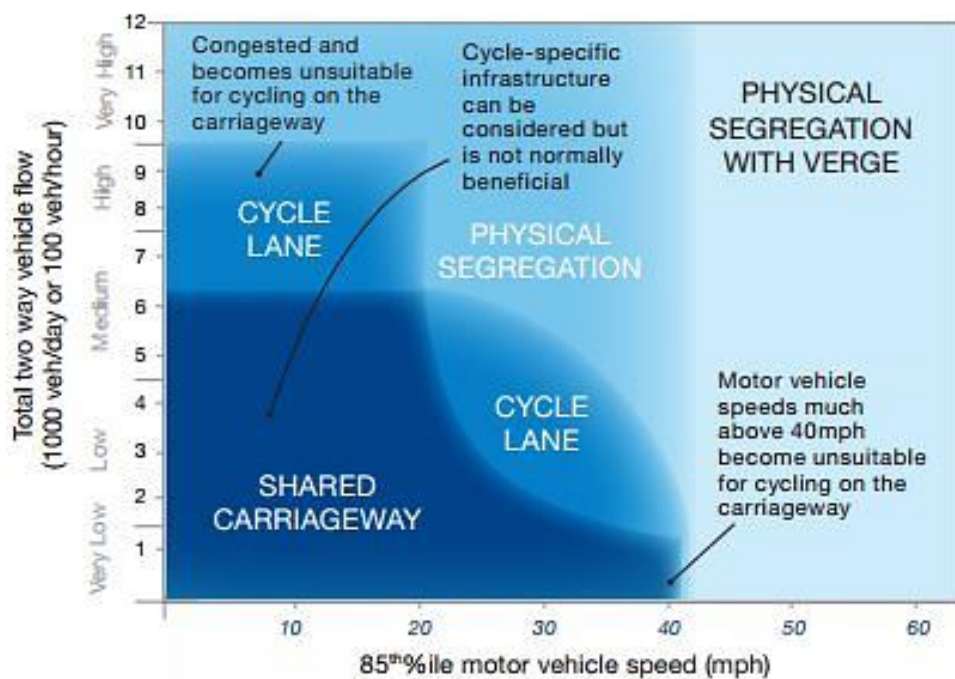


Figure 21 – Cycle route provision planning conditions chart - ©Sustrans Design Manual

The actual facility/ user requirements within these thresholds vary from person to person, and a new or novice cyclist will require a higher level of engineering infrastructure intervention than an experienced regular commuter or touring cyclist. Therefore, the graph does not have hard lines to follow but varying degrees for conditions and application. In an area with a large number of cyclists, the thresholds are blurred due to the effect of critical mass and ability to ride in a more primary road position. The opposite effect is also true.

When applying the facts and figures from recent traffic speed and traffic volume surveys to the accepted planning criteria chart, the results are literally 'off the scale' (see figure 22 below) with speeds and volume being far too excessive to contemplate encouraging cycling in such conditions. Recent 24 hour video surveys of traffic using the A40 highlights the danger faced by cyclists using the high speed road, and the manoeuvres other vehicle have to make to avoid them.

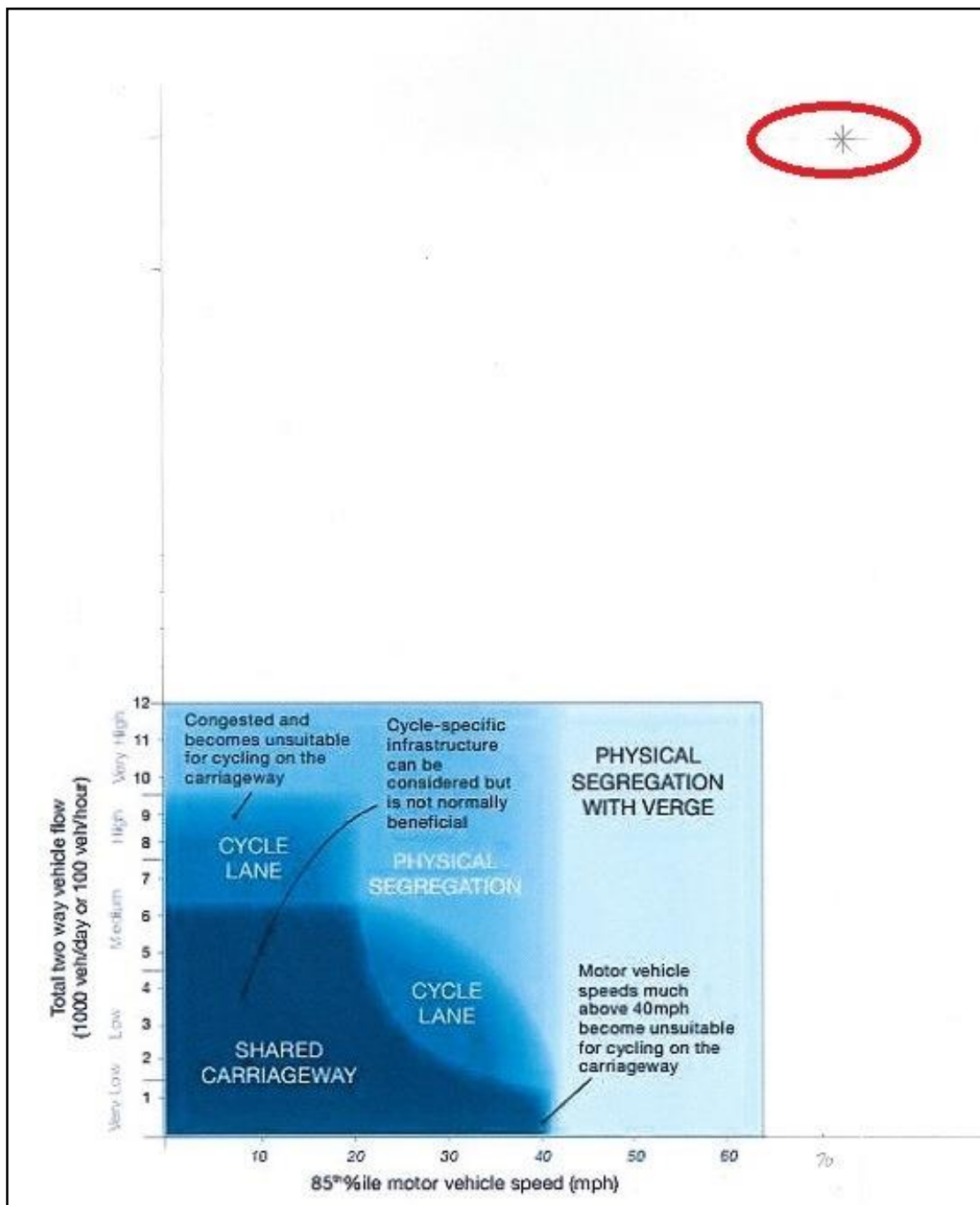


Figure 22 – Cycle route provision planning conditions chart with approximate position of A40 characteristics shown.
©Sustrans Design Manual

In addition to applying the above threshold chart to the route, the A40 has been investigated following the aforementioned, widely accepted 'Hierarchy of Measures' (set out in the introduction) and the feasibility of each stage of the hierarchy approach applied specifically to the A40 .

Below is the summary result of applying that planning approach in 'Hierarchy' order:

To create a suitable environment for cycling on the carriageway within traffic, two way vehicle volumes need to be below around 6000 vehicles a day. Above this amount, congestion or the presence of heavy traffic becomes too intimidating for cyclists to comfortably share the same road-space. A marked cycle lane on the carriageway becomes a basic requirement. However, when traffic flows are very high or combined with high speeds, physical segregation becomes the best solution.

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- **Traffic Speed Reduction**

Safety and the perception of safety also varies depending on the individual but often the high speed of vehicles will create the most intimidating of conditions for cyclists. The A40 is well established as a traffic bypass with similar characteristics and conditions to the nearby motorway network (lack of frontagers/junctions/pedestrian activity etc.). The general speeds measured during the study were as expected for a road of this purpose 70mph on average though-out the day.

It would be very difficult to create an environment on this section of the A40 where motorists would naturally travel at or below the 40mph required to create a comfortable place for cycling. Extensive traffic calming, potentially re-engineering of the road layout and the implementation of speed limits /enforcement would therefore be required. Even with such measures, the perception of the route and the requirement to drive at a lower speed would be difficult to convey due to its very purpose as a major trunk road bypass.

Potentially the most effective way to ensure this would be reallocation of road space (see item further below in the hierarchy).

- **Junction Treatment, Hazard Site Treatment , Traffic Management**

Based on the accident analysis and the lack of an established pattern of locations, the main hazards and therefore areas for remedial treatment would be throughout the whole route. This would include the junctions and slip roads. Potential treatments should reduce the length of time and distance that cyclists are currently exposed to turning traffic .The slip roads could also possibly be re-engineered to constrain speeds. Signal control could be implemented to provide 'toucan' type crossing facilities. Coloured surfacing and on-carriageway cycle lanes could raise the profile and visibility of cyclists at junctions.

Measures to provide safe transitions at the roundabouts leading to controlled 'toucan' crossings would also help at the most hazardous locations. These isolated treatments would not however reduce the risk of cyclists being struck on the main traffic line or create an environment where people could comfortably cycle on the carriageway.



Figure 24 – Location of potential signalised crossing.

NOTE: Toucan crossing provision at Elmbridge should ideally be included within any proposed or future redevelopment of Elmbridge Court Roundabout.

- **Reallocation of road space**

Based on the issues listed above, the first most viable measure to create a cycle friendly infrastructure within the confines of the A40 would be to re-allocate carriageway space. This would allow the creation of cycle facilities physically segregated from other traffic. In order to achieve this, the current dual carriageway arrangement would need to be completely re-engineered as shown in the diagram (Figure 25) below.

The cycle route would be completely segregated from traffic and therefore allow 'shared-use' with pedestrians including mobility impaired users. This arrangement would provide the straightest alignment on the section between Elmbridge Court roundabout and the M5 junction but would have a drastic effect on the traffic capacity of the A40 and the surrounding road network. It would also require major re-engineering of Junction 11 of the M5. The major impacts on traffic capacity in the whole of the surrounding area would negate the targeted work that has been implemented to improve flow and alleviate queues through the Highways England "Pinch Point Programme" over the last few years.

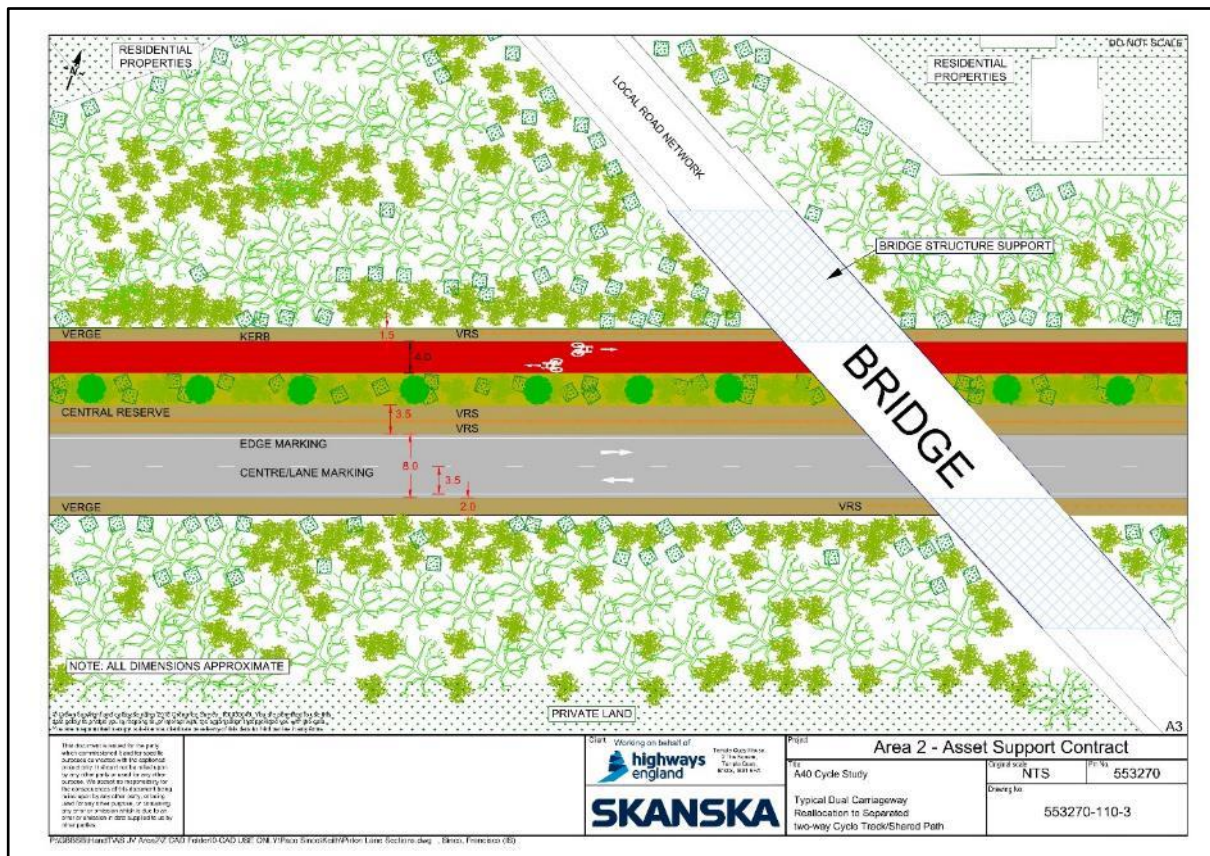


Figure 25 – Reallocation of road space diagram showing conversion of dual carriageway to single carriageway with two-way working

- **Cycle track away from Carriageway**

Creating a cycle track away from the carriageway initially appears to be the most logical solution to providing a safe, direct, coherent route for cyclists wishing to follow the alignment of the A40. This would also (if continuous) eliminate any impact on traffic capacity. At first glance, the verge along the entirety of the section in question seems to lend itself to containing a cycle track, either two-way along one verge, or both sides of the carriageway, however the presence of various substantial obstacles makes this option extremely difficult and the engineering interventions required to implement a path to the latest guidance (i.e.: between 4.5m and 7.0m wide) highly expensive. For example:

1. **Barriers**

There are approximately 1000m of VRS (Vehicle Restraint System) barriers along the section of the A40 being investigated by this study. This is located at certain points along the road side to protect various features from impact and to prevent vehicles leaving the road and plunging into various ditches/ watercourses/ motorway etc. These barriers are positioned to meet strict design requirements. The distance from the edge of road and moving traffic and the measurement from other objects is critical. In many cases this means the barrier is set back from the road edge and positioned in the middle of the remaining level area of verge, reducing the available width considerably (See figure 26 below), or preventing access to areas of the verge completely. In some places there may be adequate width to accommodate a cycle track but in some that may be in front of the barrier. That would dictate that cyclists would be potentially trapped between an errant vehicle and the barrier. There may be places where the barrier is no longer required due to the original obstacle (sign post etc.) being removed. A full review of all the VRS would be required to determine the nature and conformity of the system to latest national standards and local requirements.



Figure 26 – Typical position of VRS barrier

2. Structures

In other places the verge is narrow or has a steep slope or contains bridge supports/ substantial traffic sign posts and highway equipment (see site examples below).

In order to bypass the bridge structures, any shared path would need to be ramped up to the road bridge above the A40 and back down to the general proposed level. These ramps would need to be considerable in length to achieve the change in level with an acceptable gradient (see sketch Diagram 27 below).

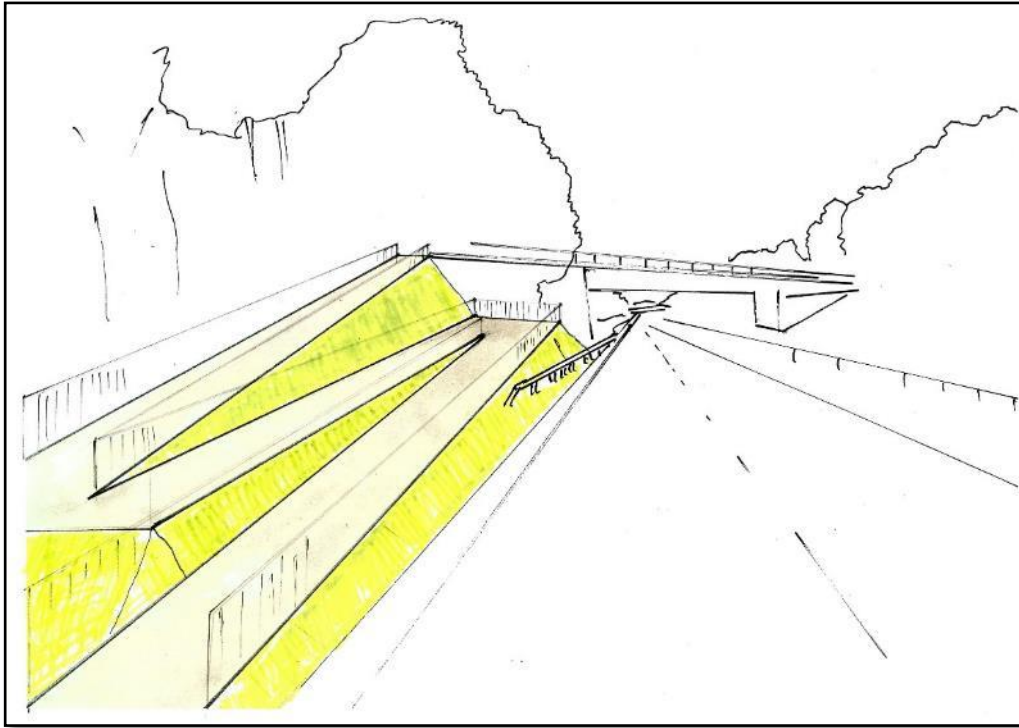


Figure 27a – Sketch of potential ramp arrangement required

Alternatively, sections of the path could be placed generally at the top of the bank at the back of the verge to gain the height required to reach the bridge levels from the road level. This option, to utilise the natural topography has been thoroughly explored on site. Placement at the top of the bank (which only exists between Elmbridge Court roundabout and drops before the M5 junction) would require removal of most of the trees and significant earthworks along the majority of the route in order to shape the bank profile to accommodate a flat area for a path (see sketch 27b below).

It would be imperative for some form of screening between the A40 and housing would be required to replace the natural barrier currently provided by the dense vegetation and treelines. A similar screen between. In order to remain at the top of the embankment there are sections where it would be easier to move the Highway boundary fence and to utilise some of the existing flat areas behind the boundary. In some cases an existing path behind the Highway boundary could be widened to the top of the embankment (Golden Vale) but again this would require substantial earthworks and fence works to make it viable.

In places, the path would be directly adjacent to residential properties and the top of a steep slope down to the busy A40. It is therefore essential that appropriate fencing, new soft landscaping and security, sound and safety barrier is installed throughout the route on both sides of the path. The environmental impact of removing such a large amount of hedgerow and mature trees would also need mitigating somehow.

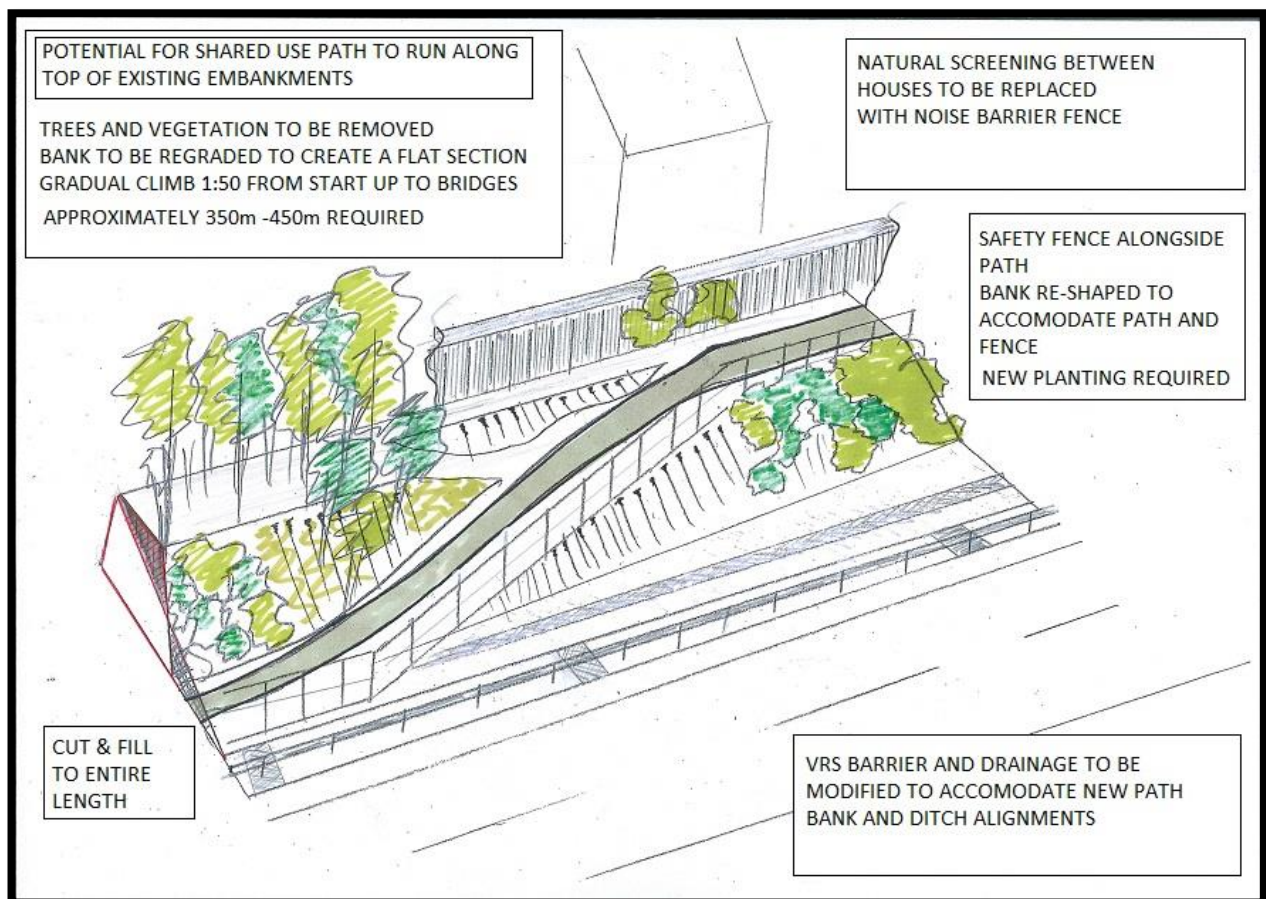


Figure 27b – Sketch of utilising natural bank gradient to reach bridge level

Formal ‘toucan’ crossing facilities would be required to assist cyclists and pedestrians across the bridge roads in each location to ensure a safe, continuous route. Ideally the path network would be extended to local roads to provide connectivity to and from local amenities (see potential layout diagram 28 below).

Unfortunately the embankment falls away quite steeply between Parton Road and the M5 junction to a point below the level of the carriageway. This change in level would probably necessitate the construction of a ‘zig-zag’ type ramp as described to achieve the recommended desired gradients over the length and height restrictions.

The physical barrier created by the M5 junction cannot be overcome by this route option. A new route would either require the provision of slip-road crossings (unachievable due to safety requirements), a new purpose built bridge or connection into the less direct existing NCN41 path network under and alongside the A40.

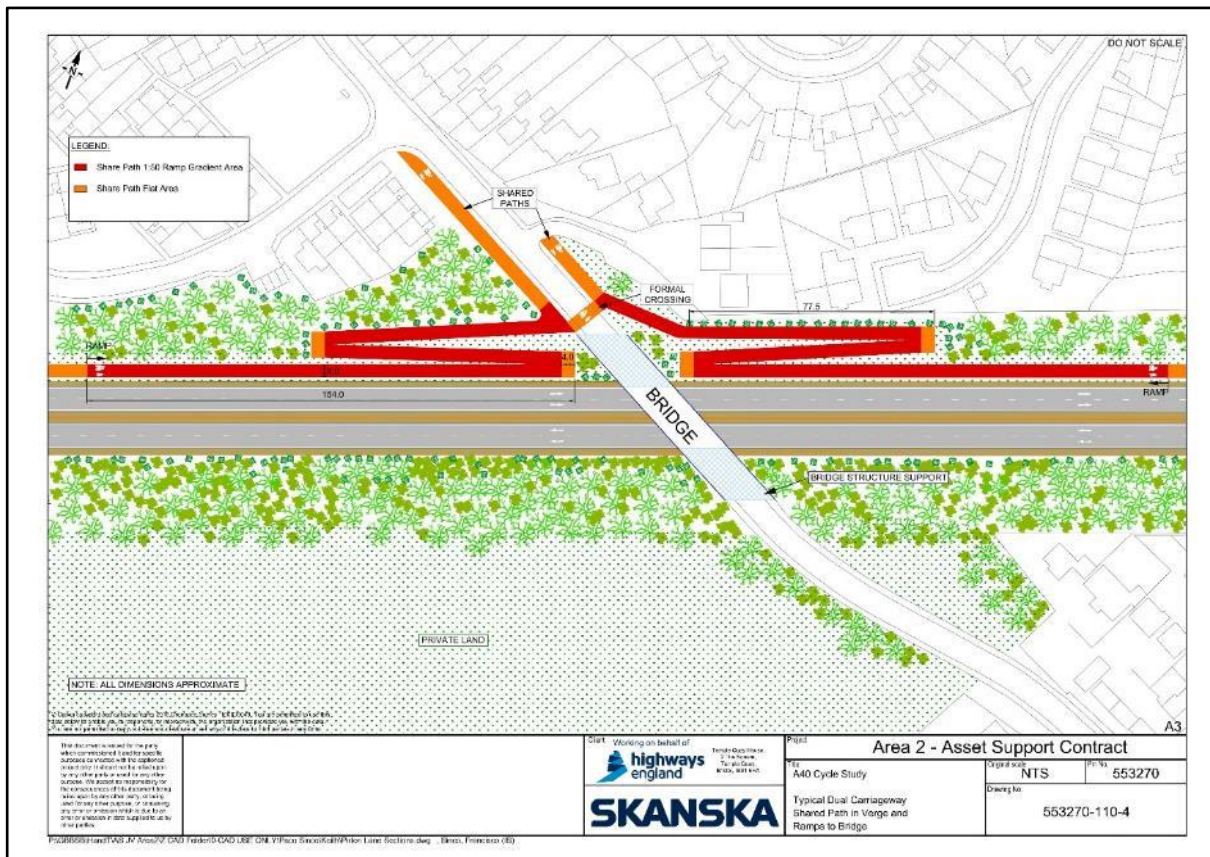


Figure 28 – Diagram of ramps required to negotiate bridge supports from carriageway level

3. Water Courses

There are streams and brooks which flow under the A40 and parallel to it in places which would require bridging or culverting in order to carry a path. A drainage ditch also exists in various places between the verge and bushes which would also need covering with a structure or relocating before a path could be installed.

4. Vehicle Access

One issue that only exists on the southern side of the A40 in the form of a petrol filling station and car dealership serviced by a long slip road junction with no verge or footway along the roadside. It has a fence/barrier along the entire length (Figure 29 A and B). Therefore, potential design solutions to accommodate an A40 aligned cycle route 'off-carriageway' have for the purposes of the rest of the study been concentrated on the northern side of the A40 only.



Figure 29 (A and B) – Garage service road with no path or verge conversion potential



Figure 30 (A and B) – Verge restricted by VRS barriers bridges and supports



Figure 31– Verge restricted by VRS barriers and bridge supports

5. Laybys

There are laybys recessed into the verge on both sides of the carriageway that are very well used by cars and trucks. These currently provide approximately 850m of parking bay on the north side of the road. These would need to be closed permanently and in-filled to create an adequate width path for cyclists. This could cause motorists to stop in the carriageway in an emergency, or park on the verge, causing a hazard and danger to themselves and other road users.

6. Environmental Issues

The verges have established trees and hedgerow along most of their length. These create a green visual corridor and offer a natural barrier between the busy road and the adjacent properties. They are also potentially an important habitat for species of wildlife. In order to accommodate a path within the verge a significant swathe of this vegetation line would need to be removed along most of the route. This environmental damage would be increased if a path alignment were to be located at the top of the embankment. The trees in that area are more mature/substantial and form more of a barrier for residents. Lighting a path in this location would also create light pollution which may be an intrusion into those houses below.

7. Personal security

At present, only a short section of the A40 is lit with a system of columns at each roundabout. In order for a facility to be used fully, it needs to be safe and perceived as safe. Therefore, street lighting to a level currently experienced on neighbouring roads and paths should be incorporated over the full length of the route so that it can be used at night, in winter, and in poor weather.

8. Motorway slip roads

In order to provide a continuous route for non-motorised users along the A40 alignment, the slip roads to/from the M5 need to be crossed in two places. Traffic volumes are too high and too fast (recent surveys confirmed one daily speed averages 71mph/ peak surveyed 92 mph) for people to safely judge when to cross the road.

At the location where a path could be physically accommodated in the verge, the slip lane is two-lanes wide (see marked aerial photograph Figure 32 below). Therefore, formal signalised crossing facilities would be required in both locations. There are general safety implications of installing isolated traffic signals on high speed roads which need careful design and positioning to mitigate. Due to the physical constraints and major level differences in this location, the ideal safe positioning may be impossible to achieve. This could make provision of signals in this scenario unsafe, or so far beyond the actual desire line that cyclists would use. **The route crossing of a slip lane therefore is potentially not buildable.**



Figure 32 – Diagram of potential path alignment along verge and across M5 slip road- ©Google Mapping



Figure 32b –Trees and vegetation that would need to be removed to construct path at top of bank



Figure 33 - Steep bank narrow path over water course/brook



Figure 34– Southern verge restricted by barrier/fence structure at rear and VRS barrier at front

The general engineering measures required to implement a cycle route within the verge along the A40, over the length being studied, have been combined into two conceptual drawings below (Figure 35a and Figure 35b).

In addition to the measures shown on the drawings, there would need to be a barrier or substantial fence-line between the carriageway and the path and ideally an earthworks mound to create an environment conducive to cycling. If a path were to be located at the back of the Highways England land between Elmbridge Court roundabout and M5 (at the top of the embankment) serious amounts of soft landscaping would be required to replace the current tree-line.

The general engineering measures required to implement a cycle route within the verge at the top of the bank between Elmbridge Court and the M5 junction, over the length being studied, have been combined into two further conceptual drawings below (Figure 36a and Figure 36b).

The drawings do not show the system of street lighting that would be required in all scenarios to enable the route to be used all year round.

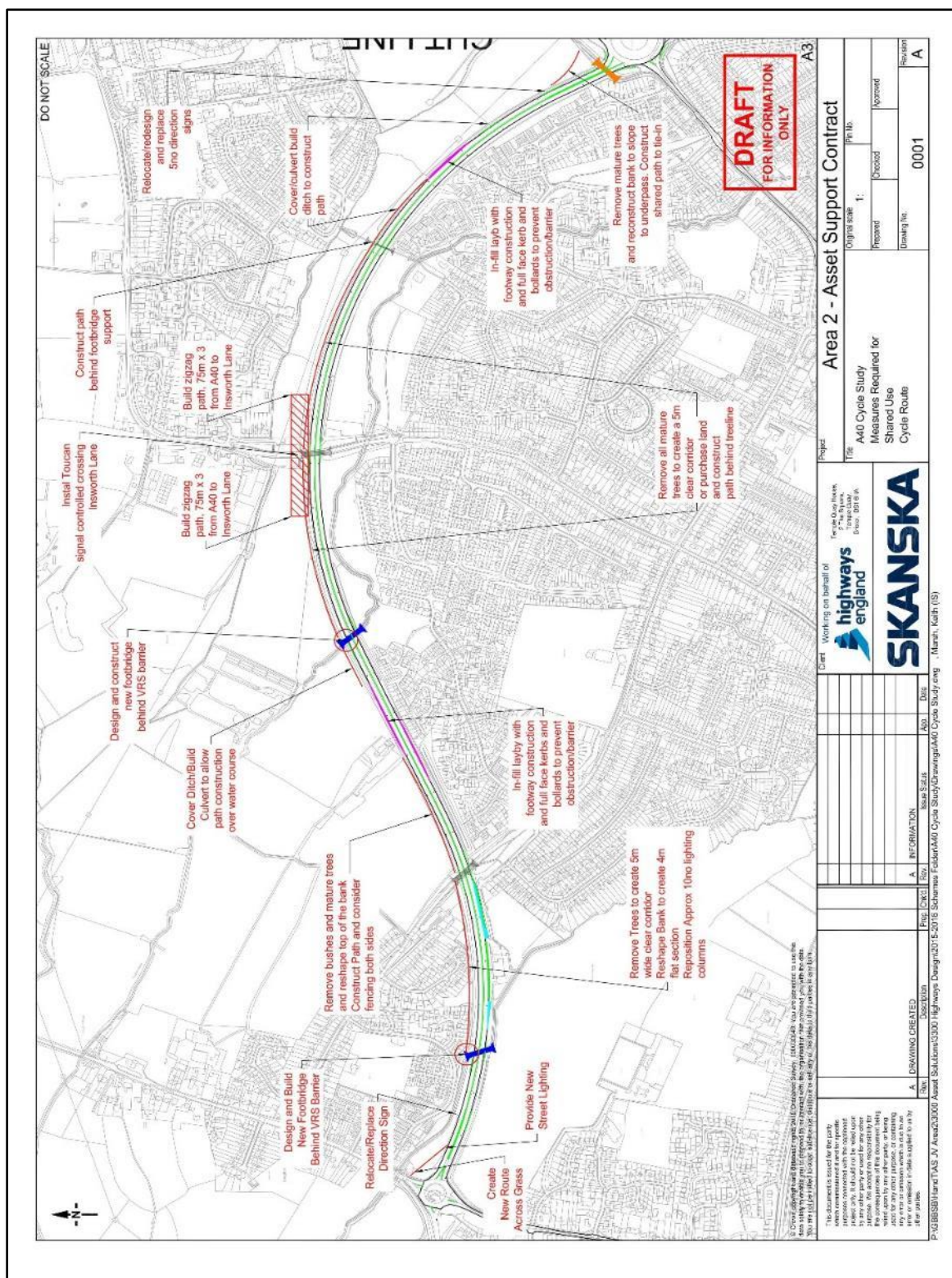


Figure 35a – Works required to accommodate a cycle route on A40 alignment (Longford to Elmbridge)

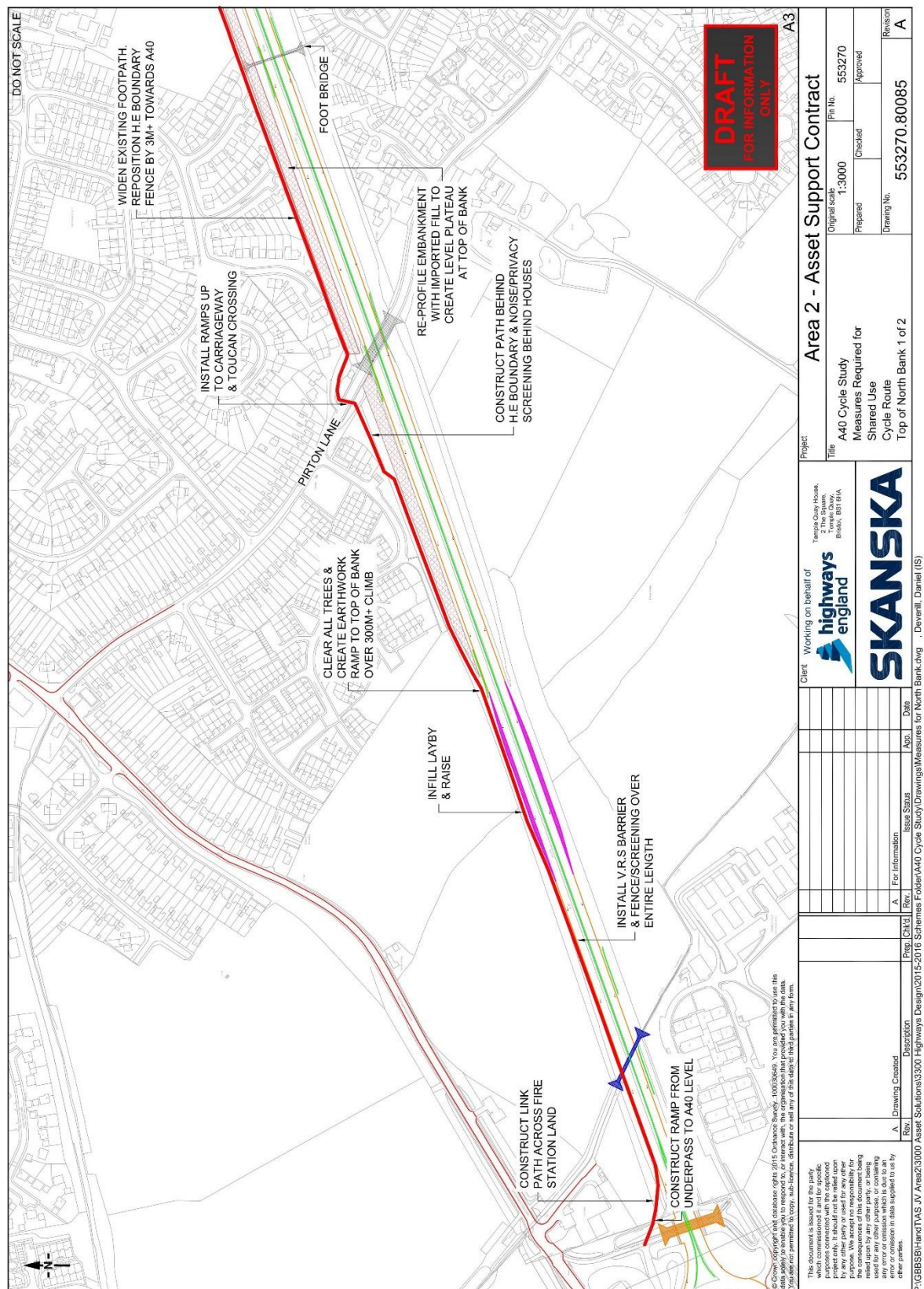
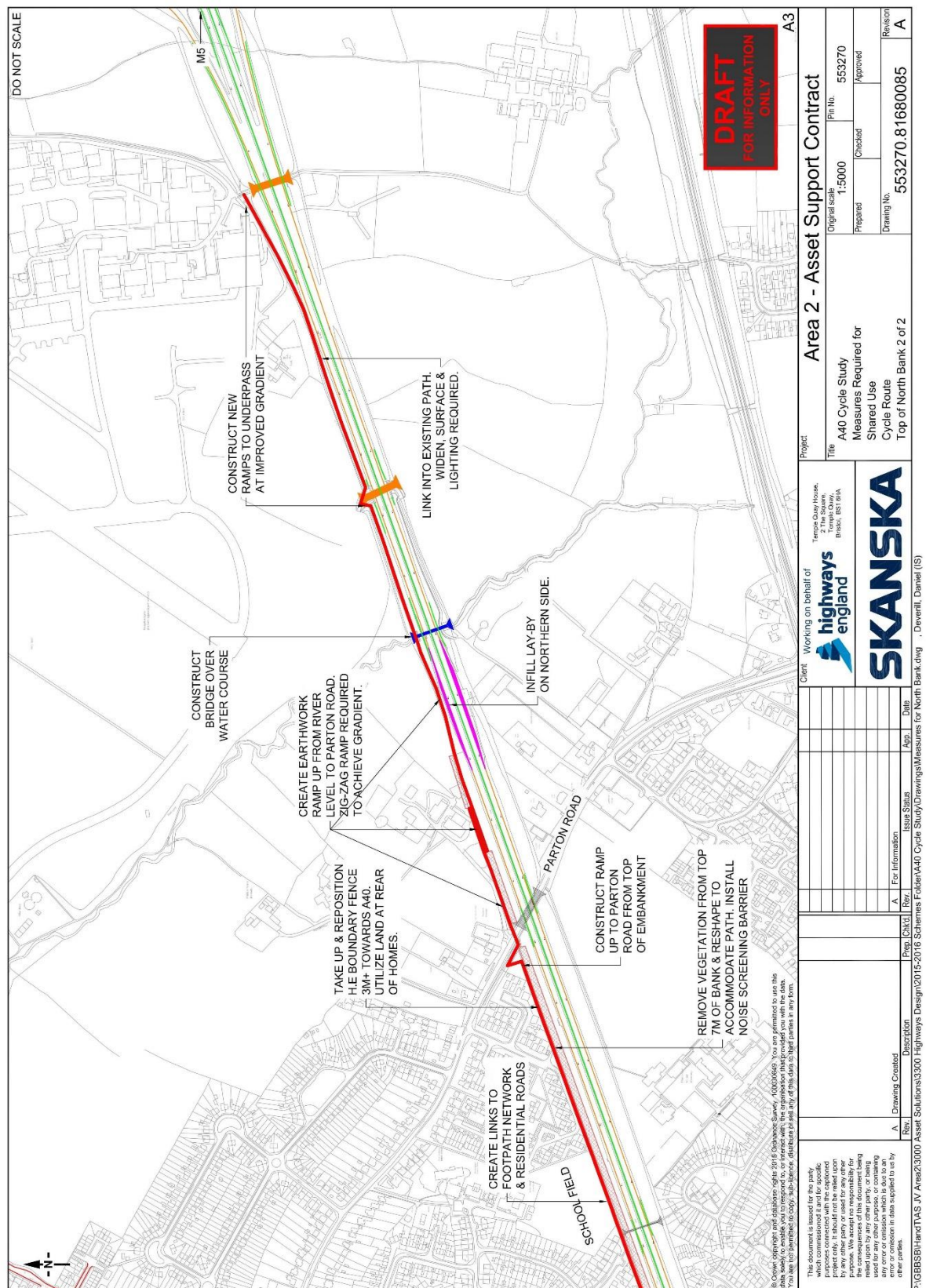


Figure 36a – Works required to accommodate a cycle route on A40 alignment (top of bank Elmbridge to footbridge)



- **Conversion of footways/footpaths to shared-use**

Unfortunately, there are no existing fully continuous paths or footways in entirety along the sections being considered. There are some paths including parts of the existing Sustrans NCN 41 network and others that follow the alignment of the A40 for short distances at various levels. These paths form a useful feed into neighbouring areas but deviate to the north and south of the road (see examples below) away from a direct, coherent, intuitive route. They are also unlit and in some places not surfaced.



Figure 37 - Existing footpath south of A40 near Longford

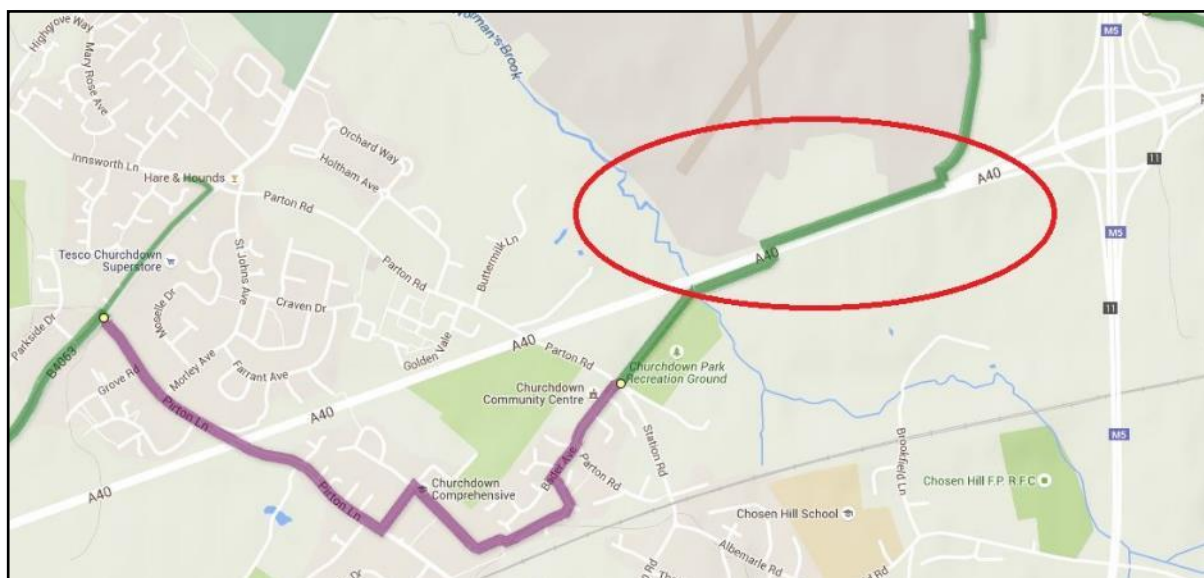


Figure 38 – Sections of NCN following the A40 alignment at bottom of embankment (extract Sustrans mapping)

8. Initial Conclusions for providing improvements for Cyclists along the A40 alignment

Comparing the traffic conditions and road layout over the study section against accepted guidance and criteria highlights the lack of opportunity to implement simple measures that would improve provision for cyclists on the A40 itself.

If the carriageway were redesigned and road space reallocated to create a proper cycle corridor, the financial cost and impact on traffic capacity within the Highways England route network and the surrounding region is unlikely to offer real value. The positive effects of walking and cycling and the modal shift that may result may be small as this section of road does not link too many of the main conurbation origins and destinations that people wish to reach.

The financial cost of implementing the engineering measures required to provide an 'off carriageway' route along the A40 section from Longford roundabout to Arle Court Roundabout has been evaluated. The initial assessment based on the preliminary sketches and standard design elements is £5.3 Million.

This figure could be reduced if the route was shortened to the section from Elmbridge Court Roundabout to Arle Court and the existing road network was improved to facilitate cycling from those junctions to the town centres of Cheltenham and Gloucester where most people are likely to be cycling to and from.

The route is not currently easily accessible from the residential areas, places of education and places of employment that exist in the surrounding areas. This could be improved slightly with ramped access to the network of overbridges or by installing the path at the top of the embankment between Elmbridge Court and the M5 motorway but at the expense of lack of continuity and directness for cyclists wishing to follow the A40 alignment. Any A40 aligned path would however fail to be direct at the M5 and would require either a highly expensive, purpose built bridge and land acquisition or diverting the route around an indirect alternative route. Therefore, developing an alternative route nearby would be the better course of action.

The currently mapped NCN Route 41, whilst offering a potentially safer, more attractive choice to the A40 is not currently direct or coherent enough to offer as a valid direct alternative. It could be made more suitable in places and this is discussed later in the report. There are however sections that could be connected utilising an intuitive corridor of County Council roads along the B4063 and existing road/ shared-path sections of NCN41 that could be upgraded and improved to a consistent standard.

The approach of upgrading specific local roads (and some sections of NCN 41) would create a viable, sophisticated more attractive network. By utilising routes that connect into the main town centres, the route would be more direct and equivalent in length (or shorter) between the main identified destinations of

Cheltenham and Gloucester than utilising the A40 alignment between Longford & M5 J11.

Much of the foundation in developing a non-A40 network has been undertaken in some form:

- The main trip generators and attractors have been identified as Cheltenham and Gloucester town centres as part of previous studies;
- Demand has been assessed through previous consultation;
- Existing usage has been established through cycle counts, anecdotal evidence from the local authority officers, surveys and desk based analysis;
- Existing constraints have been identified routes through this study and the GCC/Atkins study;
- A significant section of the GCC route and road network have been equipped with cycle and pedestrian facilities.

Therefore, the most viable means of providing a good quality cycle provision to serve local needs (and potentially increase the amount of people choosing to cycle as a viable transport mode) would be to consider developing the direct alternative (the B4063) :- a local route to connect Cheltenham to Gloucester town centres that is already used by cyclists. By utilising the B4063, the longest gap in NCN 41 could be filled, the local residential areas and places of education and employment would be connected and the main conurbations will become linked.

Other routes and parts of route are also available which utilise a whole range of residential roads, local path networks and an existing bridge over the M5 .These are less direct between the two main local destinations and some do not connect them but offer a 'cross-hatch' of links into places like Churchdown and Innsworth. Some of this network could be linked with additional improvements to a main intuitive spine corridor (B4063) to provide full permeability and flexibility for cycling.

However, other routes may be much more difficult to realise and their potential may not provide the same benefits. A selection of alternative route plans suggested and provided by Gloucestershire County Council (including the B4063) have been investigated as part of this study.

These have been assessed against the same accepted criteria and aims in order to gauge the level of cycle route provision they may be able to achieve and what engineering measures may be required to realise them.

A comparison matrix of the attributes and deliverability of all of the schemes discussed in this report can be found below the following descriptions.

The suggested routes are:

GCC – Blue Route

This follows the alignment of the A40 between Elmbridge Court and Arle Court roundabouts but diverts to the north to utilise Bamfurlong Bridge to avoid the M5 junction (see Figure 39 below).

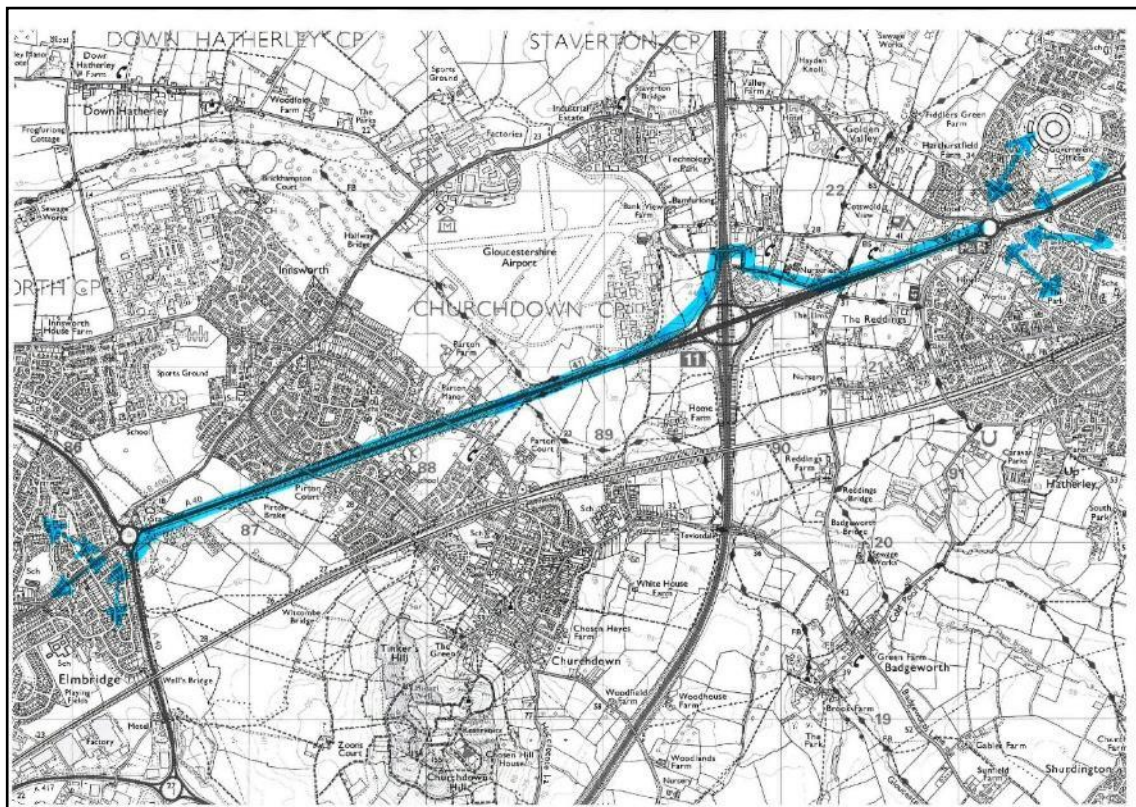


Figure 39 – Gloucestershire County Council suggested 'Blue Route'

This route would require the same measures as shown in the earlier drawing for a shared route along the A40 with a path alignment achieved along the top of the embankment. This has been explored earlier in the report and would require substantial vegetation removal. This, combined with the provision of street lighting to create a secure route all year round could cause an environmental intrusion for the adjacent residential properties. Sound barriers and screening will also need to be installed in place of the tree line.

Signal controlled crossings would need to be put in place for cyclist to negotiate the bridges that cross the A40 and earthworks and ramps to deal with level changes would need to be constructed at those points.

The route diverts north from the A40 alignment onto a network of PROWs (footpaths and bridleways in this case), joins the carriageway at Bamfurlong Lane, over the M5 bridge then heads south on bridleways back to the A40 (see map extract Figure 40 below).



Figure 40 – PROW map extract

This section of the route has part of NCN41 signed along it, forming part of a network of local walking and cycling routes. It is however not a direct route, being very convoluted and incoherent, requiring a good knowledge of the local topography. It does not connect to local amenities or facilities. Whilst the countryside here is attractive, featuring a tree lined country lane (Elm Garden Drive) and there is the nearby airport to add interest, the route is not lit and not subject to natural surveillance, being bounded by hedges and barbed wire fences in places with various blind corners. This would make it appear unsafe and therefore not attractive especially in poor weather or hours of darkness.

It is uncertain if these issues could be overcome as the land ownership could not be verified by Gloucestershire County Council. At the time of writing this report, no records were made available for this section of land.

The highway M5 bridge parapets at Bamfurlong Lane currently do not appear of a standard to allow safe cycling over the bridge paths and this is something that should be addressed as part of any routing maintenance or refurbishment.

GCC- Green Route

This follows the alignment of the A40 between Elmbridge Court and Arle Court roundabouts but diverts to the north to utilise Bamfurlong Bridge to avoid the M5 junction the diverts to the south to use an existing section of NCN41 then follows Grovefield Way north towards Arle Court Roundabout (See Figure 41 below).

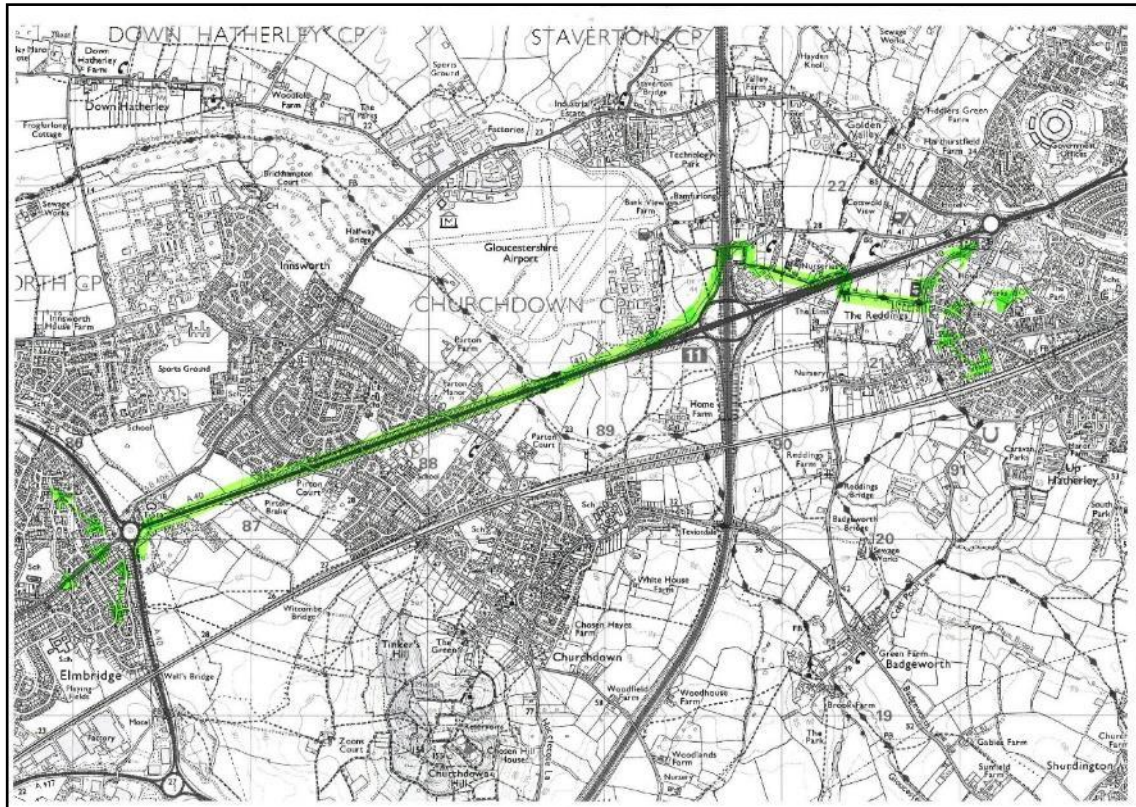


Figure 41 – Gloucestershire County Council suggested 'Green Route'

This route utilises the A40 alignment and would therefore require the same measures as shown in the initial study here, with the addition of measures to follow the longer detour. It duplicates much of the same network of PROWs and NCN41 as the 'blue route' above. It therefore duplicates the same issues, land ownership questions and engineering requirements over those sections, however this route utilises a carriageway southwards under the A40 (Badgeworth Road). This road is rural, open and not lit. It is currently subject to a 50mph speed limit. It then turns onto a narrower unlit country road (North Road West) and heads east until its junction with Grovefield Way, which has a shared use path that continues on the eastern side only. This can be reached by dismounting and utilising a pelican crossing.

The path continues, diverting to uncontrolled crossing points to the south side of Arle Court Roundabout where the network of underpasses can be used to cross under the A40 to reach employment attractors such as GCHQ.

This route is not direct, coherent or convenient and is unlikely to become so as it heads in so many directions heading both north and south in order to progress from east to west. It does not pass adjacent to any main attractors (employment etc.)

In addition to the A40 interventions required, it would also require road safety measures along the rest of the route (carriageway sections) to make those roads suitable for cycling including traffic speed limit reduction, traffic calming, system of street lighting, on-carriageway cycle lanes, junction improvements, and toucan crossings. The current pelican crossing would need to be converted and cycle priority measures/ toucan crossings would be required to provide continuity for cyclists at junctions on Grovefield Way.

There are sections of this general route alignment that could possibly be achieved with less substantial construction requirement and in more pleasant, traffic-free surroundings. This alignment could be more matched to the recommended National Cycle Network path construction guidance layouts (see Figure 42 below). It could also be aligned with sections of the existing NCN41 route. The design approach to this route would be a combination of off-road, traffic-free paths and using and creating quiet roads and lanes.

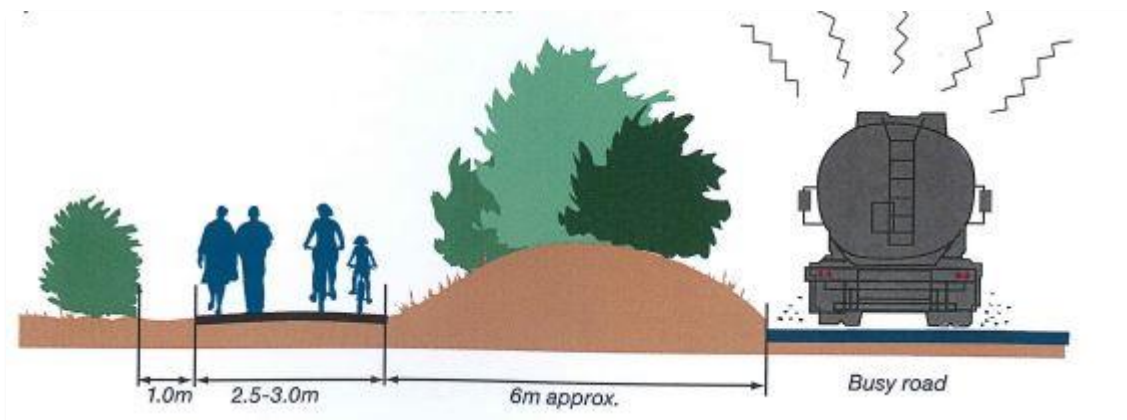


Figure 42 – Extract from Sustrans Design and Construction Guidance of 'Traffic Free' Sections

The main barrier to this route is still the M5 and the need to cross it somehow either utilising the existing Bamfurlong Bridge which would need to be modified to make it suitable for cycling in safety or to provide a new bridge specifically for NMUs. Alternative parcels of land would need to be agreed or purchased and links achieved within land development proposals. For the purposes of this report the route is split into two sections with various features and treatments required throughout. The measures are listed in the following pages.

Section 1 (see marked-up aerial photographs)

A. South side of A40 – a link from the Elmbridge Court roundabout underpasses, through the proposed Elmbridge Court Park & Ride site (if/when it is built) and a link to it within the fields east to Pirton Lane (see Figure 43 below). A toucan crossing will be required at Pirton Lane:



Figure 43 – Elmbridge Court Roundabout to Pirton Lane

B. In this area the rear gardens of residential properties extend close to the Highways England boundary of the A40 therefore any cycle route will probably need to run along the A40 embankment (see Figure 44 below). This will entail the removal of treeline and clearance of vegetation combined with earthworks to create the width for a shared-use path on top of the Highways England A40 embankment. The installation of some kind of fence or screen between the path and the A40 will be required along with noise barrier banks/ privacy screening between any path and neighbouring houses will be necessary (see Figure 45 further below):



Figure 44 – Pirton Lane to Parton Road

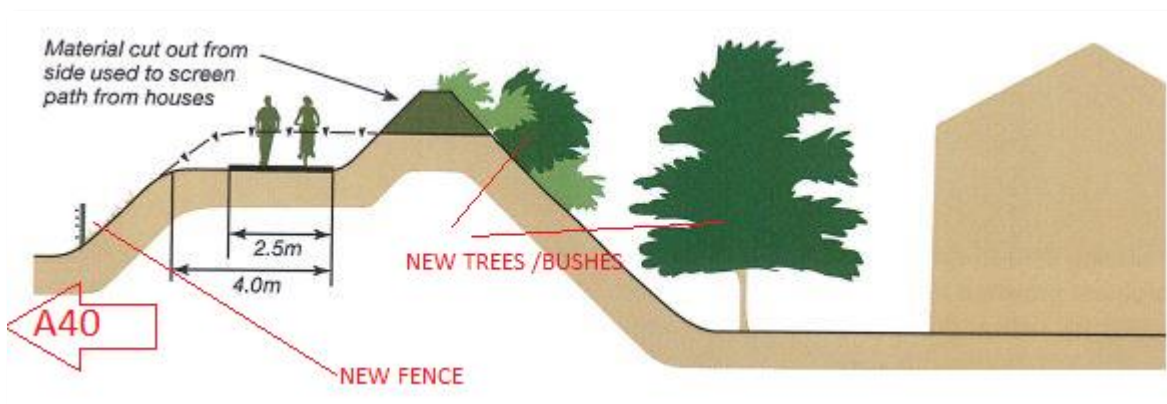


Figure 45 – Proximity of houses to potential path /A40 will require measures to maintain privacy/security/ traffic noise reduction (original diagram courtesy Sustrans guidance)

C. Utilise (and widen) an existing path within Churchdown School Academy grounds (see Figure 46 below) if the school were willing to allow the land to be accessed/purchased. The path would need to be widened and lit with a system of path lighting and possibly fenced to deter/prevent unauthorised access to the school.



Figure 46 – Churchdown School Grounds

D. Create a shared-use path along the western side of Parton Road within the verge and providing a new toucan crossing at the Station Road junction. This would also assist the current demand for a safe crossing facility for pedestrians (especially young school children - see Figure 47 below) then link to PROW Footpath ECN 39/1 opposite with some localised footway widening;

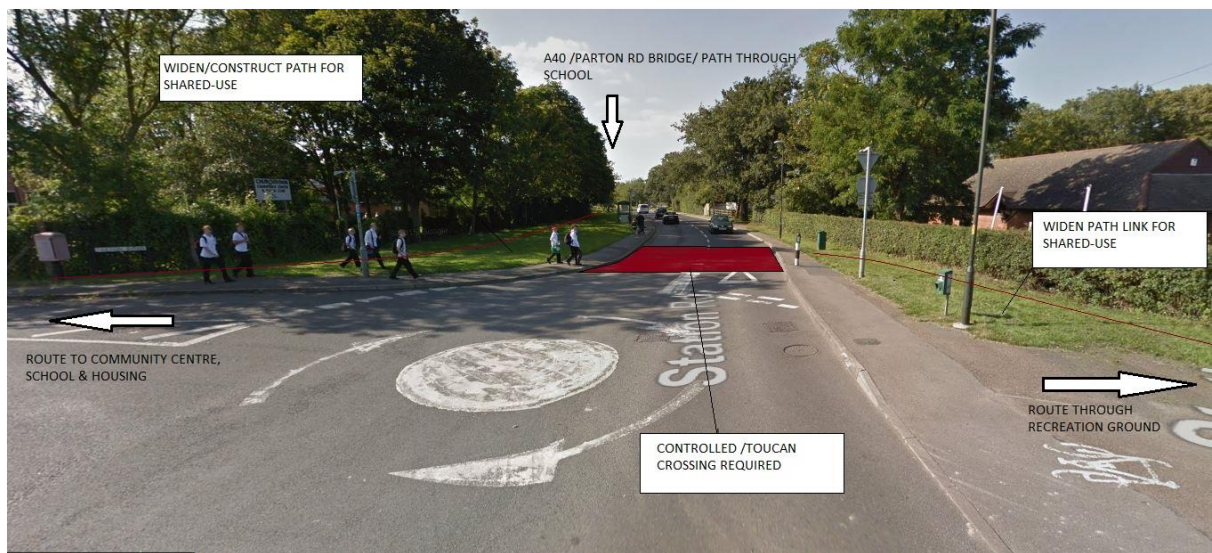


Fig 47 – Existing PROW route with no crossing provision

E. If land-use negotiation proves acceptable, follow the PROW through Recreation Ground (shown as Churchdown Parish Council's Park Recreation Ground – Figure 48 below) adjacent to garden allotments. Localised widening, surfacing and lighting would be required over this section and potentially fencing to deter encroachment.

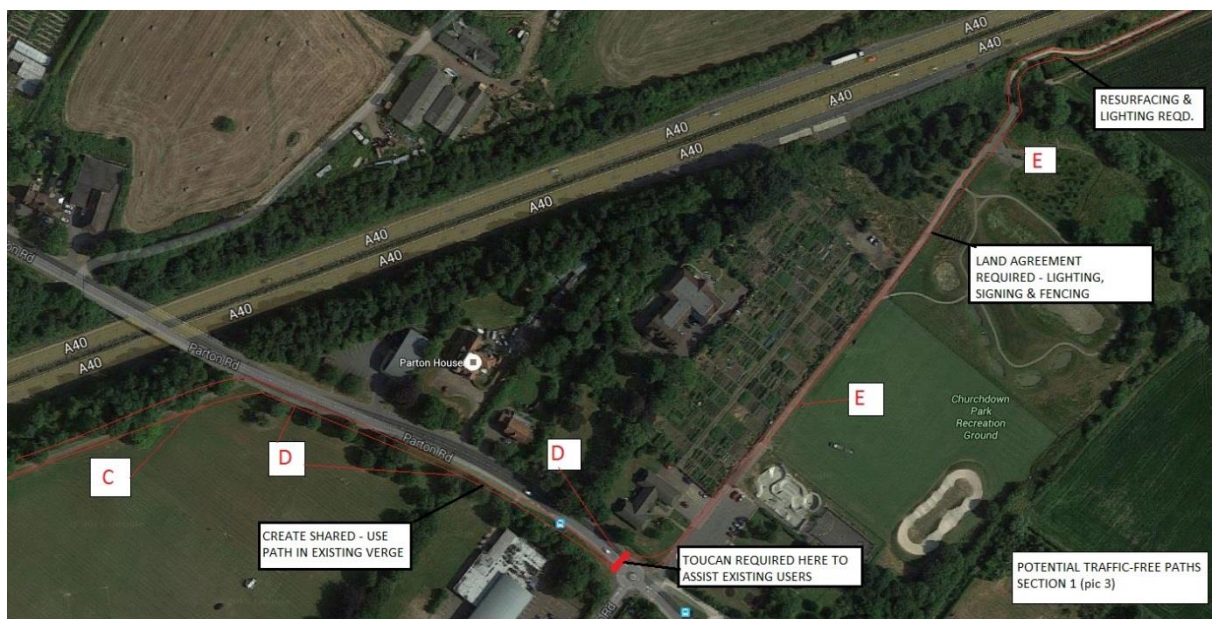


Fig 48 – Allotments and Public Right of Way

This path links to the underpass of the A40 which requires regrading of the ramps and surfacing and a system of lighting to make the path usable all year round.

This would then continue to the current NCN 41 route around the airfield as described and highlighted 'green' on the O.S Plan (Figure 41) at the beginning of this chapter/ page 44 and detailed below as 'Section 2'. The accompanying list of measures and

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interventions would be required to bring parts of NCN41 up to a consistent style and standard. It would then be usable by cyclists of all ages and abilities. It is unlikely to be attractive to commuters who would usually desire a more direct route but if signed correctly with a comprehensive system of signing, could encourage less confident cyclists to make the journey by bike.

Section 2 (see marked-up aerial photographs below)

This half of the route suggested by Gloucestershire County Council and listed earlier as the 'green route' continues to follow NCN 41.

- A. Construct and surface existing stone dust path (ascertain land ownership);
- B. Remove two right-angle corners from path alignment near airfield carpark and realign path (ascertain land ownership);
- C. Install system of lighting along exiting shared-use footway/cycleway adjacent to carriageway (ascertain land ownership);
- D. Widen footway on southern side of A40 for 'shared-use' by utilising verge and repositioning kerb-line and VRS barrier where required both approaches to the bridge deck;



Figure 49 – Green route Section 2 –Airfield to Arle Court Roundabout

- E. Upgrade existing bridge structure to accommodate cyclists (& equestrians due to proximity /gap in Bridleway). This will require parapet modifications to make it safe and suitable for use by cycles and also equestrians to bridge gap in the Bridleway BA4/A before it can be considered as a suitable route for cycling.

This will involve replacing parapets with higher (1.4m-1.8m) potentially with panelling to reduce cross-winds due to the height /location, widening the footway for shared-use (reposition kerblines).

Alternatively a new bridge specifically for NMUs could be considered (see sketch Figure 50 below for a potential alignment). This possibility of this has been loosely investigated. In order to make a new bridge advantageous it would need to be positioned closer to the A40 alignment than Bamfurlong Bridge. This would entail crossing the main carriageway and the slip roads. Which will dictate a vast span of over 100m and also headroom that would clear the slip-road ramps adequately. These factors would mean position, design and foundations of the supports will be major works to enable a very high bridge with a considerable span to be constructed in this location. The ramps serving the bridge will need to be accessible by all NMUs of all abilities and would need to be routed carefully to achieve the correct gradients. These ramps would be on private land which will need to be purchased prior to construction. On the western side of the M5 the ramp would need to fit around or over the Highways Maintenance depot. There are also likely to be extensive environmental issues associated with such a large new structure in a rural setting.

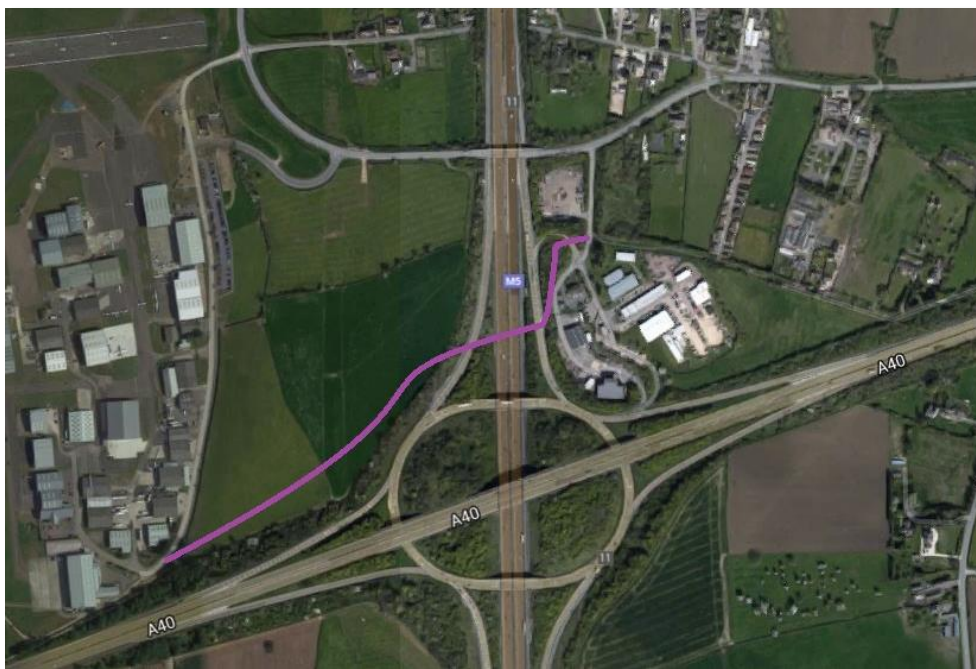


Figure 50 – Potential alignment of new NMU Bridge

F. Repair & resurface sections of Elm Garden Drive, install system of street lighting (the ownership of this lane is not immediately clear/ GCC have been asked for land records);

G. Improve junctions for cyclists – provide ‘shared-use’ pathways in the verge on Badgeworth Road to provide consistent separation for cyclists from heavy/fast traffic and link the two junctions via a new ‘Toucan’ crossing at a suitable point;

H. Install new 30mph speed limit along derestricted half of North Road West with traffic calming (e.g. pairs of preformed speed cushions at 60m+/- spacing). Consider closing the road at mid-point to prevent through-traffic;

I. Reinforce existing 30mph speed limit half of North Road West with traffic calming measures (e.g. pairs of preformed speed cushions at 60m+/- spacing);

J. Convert existing pelican crossing of Grovefield Way to 'Toucan' operation to allow cycle usage;

K. Install 'toucan' crossing at existing pedestrian refuge location on Hatherley Lane – this would also benefit visitors to Nuffield Health Cheltenham Hospital;

L. Construct raised/level crossover points at side roads and access-ways to create cycle/pedestrian priority.

Additional Essential Elements:

M. To enable links to Cheltenham, the existing footways on the northern side of the A40 will need to be widened and converted to 'shared-use' with appropriate signs and markings. This could link from Arle Court roundabout past the frontage of GCHQ to join Princess Elizabeth Way and an existing cycle facility;

N. This route would need a comprehensive system of direction signing in order to create a level of continuity and legibility that is not naturally present or instinctive due to the convoluted nature and multiple changes in style of provision and direction;

O. This route would require the upgrading of B4063 from Elmbridge Court Roundabout to Gloucester with all the features and interventions as listed for that option i.e. B4063 – PART B

An initial breakdown of the works required to implement the 'Green Route'/NCN41 upgrades to the current standards and design guidelines is estimated to cost £3.8 million plus the cost of land that would be required to accommodate the route.

GCC- Pink Route

This follows the alignment of the A40 between Longford Roundabout and Innsworth Lane bridge over the A40 (See Figure 51 below).

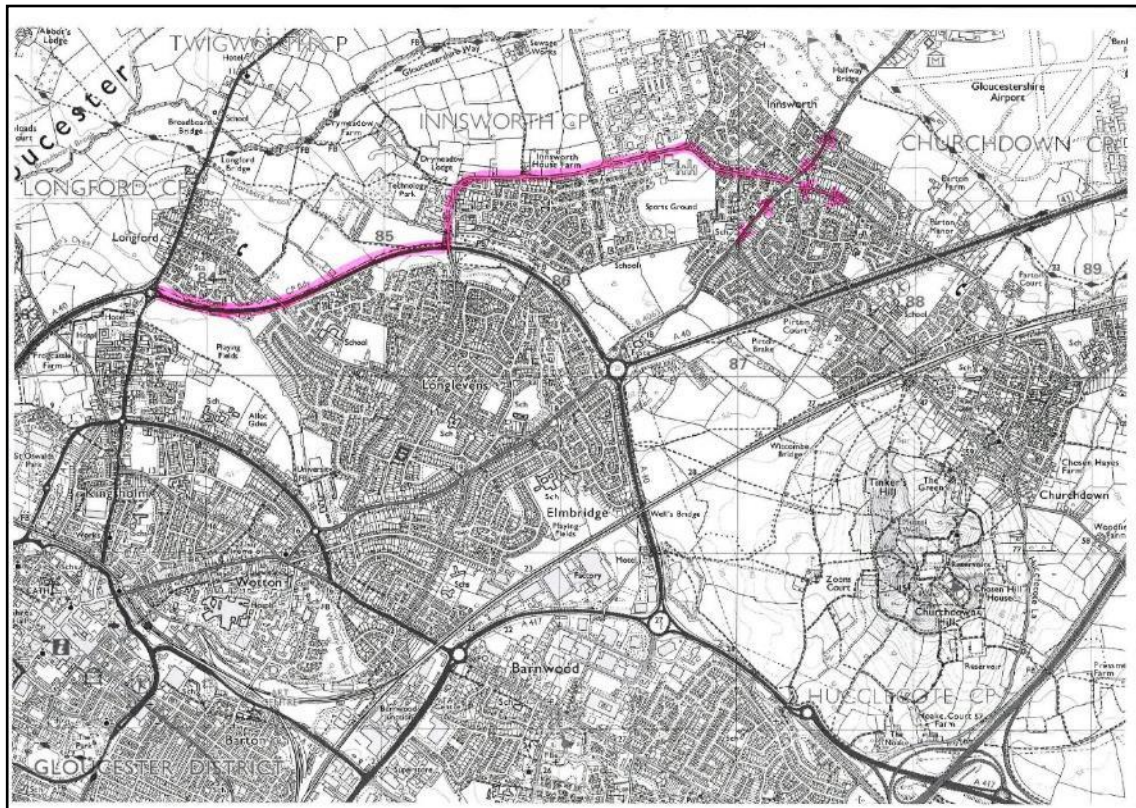


Figure 51 – Gloucestershire County Council suggested 'Pink Route'

This route does not connect to Cheltenham or Gloucester or reach the M5. It would however provide a useful connection between Churchdown, Innsworth, and Longford and runs past several attractors including schools, barracks and a technology park but requires the same interventions recommended for a section of the A40, without connecting to the main Town/City centre hubs.

The majority of the route is on an open rural road which is currently subject to a 40mph limit. Speed reduction measure would be probably be required to create an environment suitable for cycling and/or the existing footway would need to be widened to accommodate 'shared-use'. For this route to be fully connected, it would also require the B4063 scheme to be put in place to reach the many other attractors in the area and main hubs.

GCC- Orange Route

This follows the alignment of the A40 between Longford roundabout and the Longford Lane overbridge. It follows Longford Lane and Church Road and joins up with the B4063 between Elmbridge Roundabout and Gloucester (see Figure 52 below).

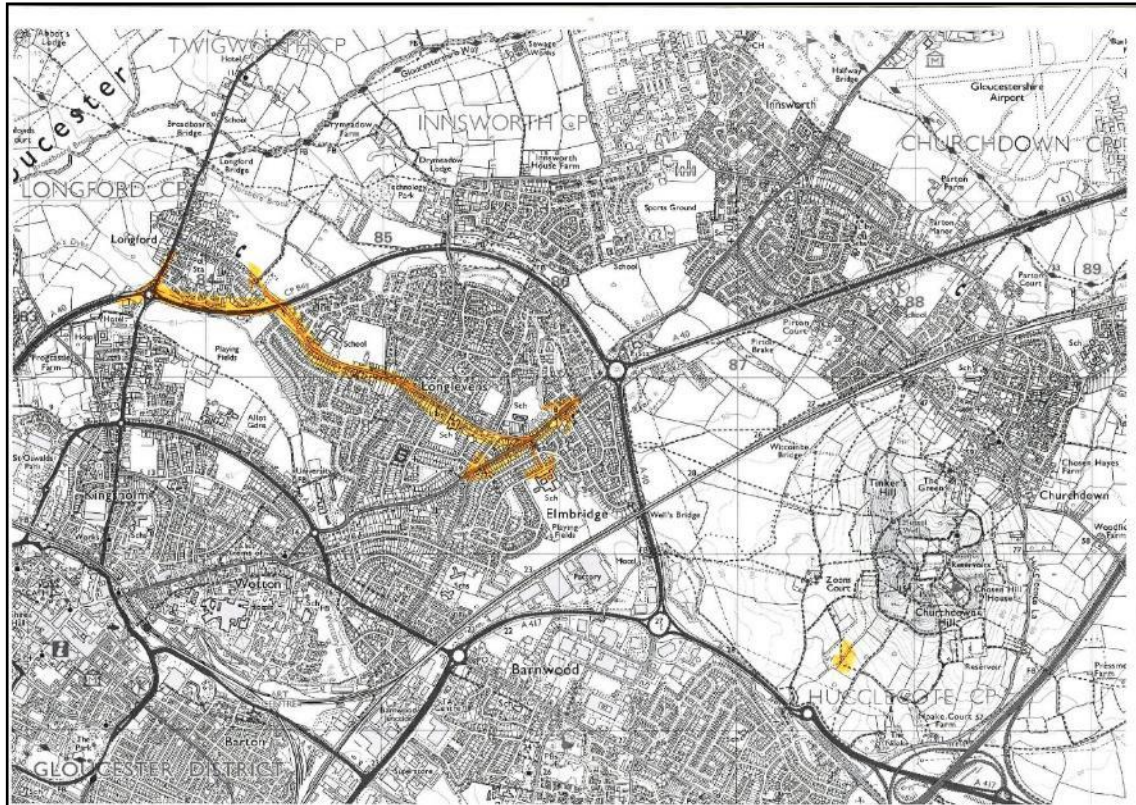


Figure 52 – Gloucestershire County Council suggested 'Orange Route'

Longford Lane (changing to Church Road) is mainly residential, it is lined with houses along most of its length and also serving several schools, shops and a library. Cyclists currently use the carriageway but with no specific cycle facilities at present. The route is however subject to low speed limits in places, including a 20mph outside of the school with road humps to provide calming in places. The straight sections with no existing calming or engineering features may need to be treated and the 20mph zones extended to incorporate bus-friendly traffic calming measures (speed cushions).

The road provides a useful local link from Longford to the B4063 and could potentially bypass the A40. However, it does not link to the main hubs of Gloucester or Cheltenham or provide a direct alternative to the A40 east-west corridor. It would require the B4063 improvement measures from Elmbridge to Gloucester to be implemented, and a section of the A40 engineering measures to make it viable. The bridge parapets on Longford Lane Bridge over the A40 are likely to need replacing to cater for cyclists safely.

The initial conclusion therefore is to concentrate efforts on the nearest clear alternative corridor- the B4063 (Cheltenham Road) part of which is already an established NCN National cycle route, (other parts link to Gloucestershire County Council's suggested routes), identify barriers and gaps in provision along that route and design practical, achievable, engineering interventions to overcome them and deliver them in a given time frame.

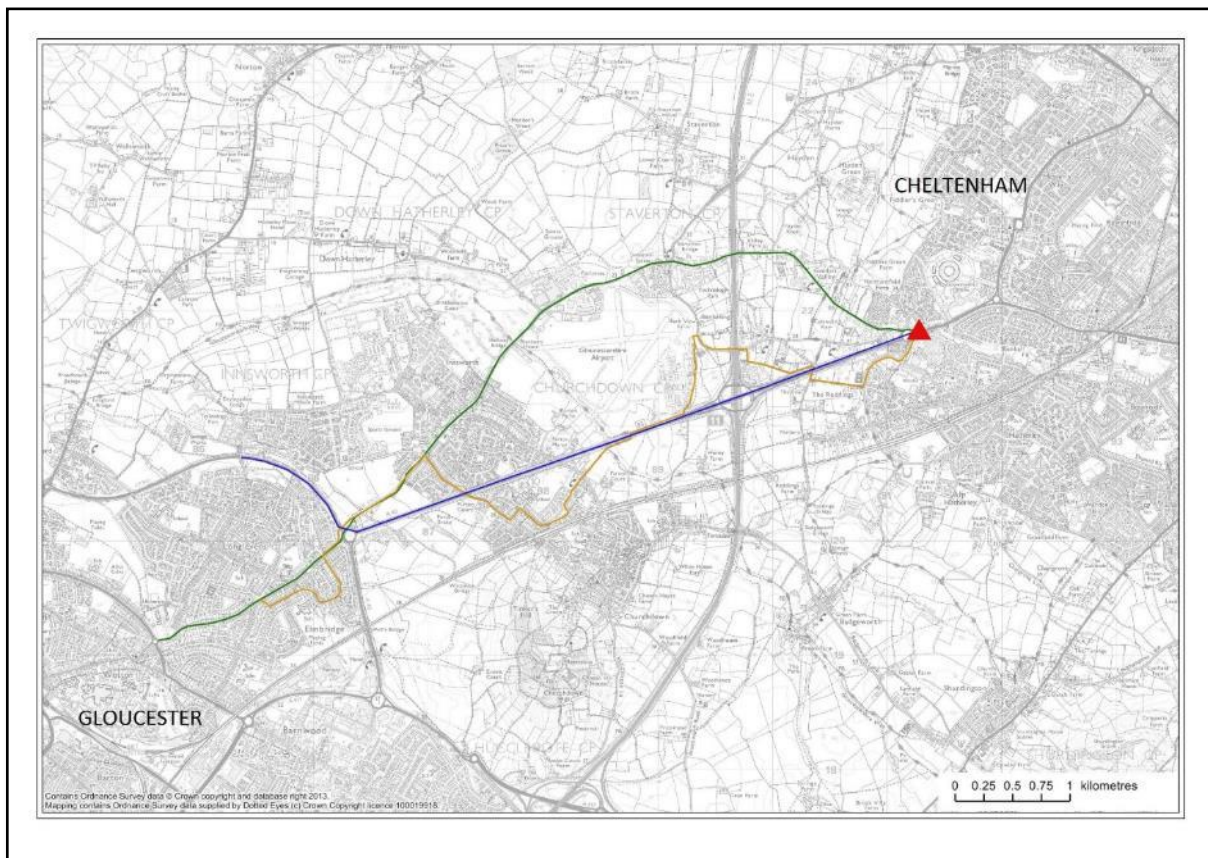
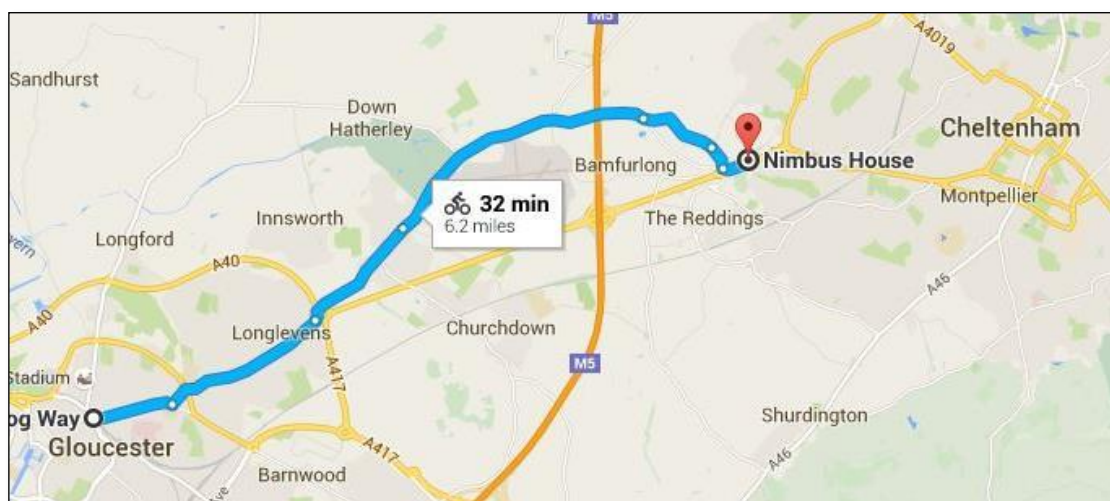
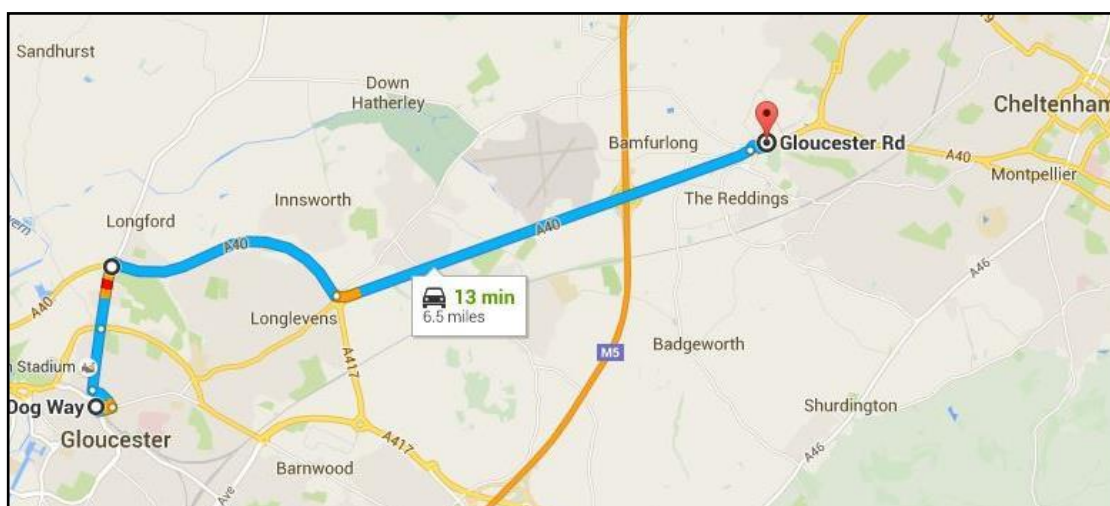


Figure 53 – Comparison of A40 (Purple), B4063 (Green) and NCN41 (Yellow)

9. Alternative Cycle Route utilising the B4063 Cheltenham Road

This route may seem initially to be a longer, less straight route in sections, but is actually a more direct route between town centres than the A40 which bypasses Gloucester completely.

The diagrams below extracted from Google mapping highlight the comparison when searching for car and cycle journeys between two similar points chosen to give an uncomplicated general comparison. Firstly, selecting a route that covers the original A40 Route Study parameters of Longford roundabout utilising the A40 corridor (note Google mapping does not recognise the A40 as a cycle option) and a rough position on the edge of Cheltenham (to avoid complex town centre mapping options). Secondly, stipulating the same start and end points, the shortest distance between the main locations by cycle is generated (see Figure 54 A and B below), confirming a distance advantage avoiding Longford and utilising the B4063 corridor.



Figures 54 A and B– Google journey mapping between Gloucester and Cheltenham

10. Existing issues and potential improvements for cyclists along the B4063 alignment.

Whilst the route features some cycle provision in places (cycle lanes on carriageway and some shared use paths) they are not continuous or to current design standards or guidance. An analysis of accidents along this route has been undertaken to assess the road safety record and to reveal if there is a history of incidents involving cyclists. Accidents from 01 January 2011 to 31 December 2015 were analysed. During that period a total of 22 accidents involving pedal cycles occurred (an average of 4.4 PIAs per annum).

Year	Slight	Serious	Fatal	Total
2011	4	2	0	6
2012	2	1	0	3
2013	1	1	0	2
2014	4	1	0	5
2015	4	2	0	6
Total	15	7	0	22

The most common accident types are shown in the table below:

	Fatal	Serious	Slight
Right turn crash into and opposing vehicle		1	2
Vehicle from side road hits vehicle approaching from its left			
Vehicle from side road hits vehicle approaching from its right		1	4
Overtaking: vehicle hits vehicle travelling same direction			3
Overtaking: vehicle in front turning left			3
Head to tail collision			3
Collision with or due to parked vehicle			2
Cyclist crossing carriageway at the crossing			1
Cyclist overtaking stationary vehicles hits oncoming vehicle		1	
Roundabout accident		1	
Sub totals		4	18
Total	22		

The B4063 has two distinct parts with very different characteristics. One, mostly rural section from Arle Court Roundabout to Elmbridge Court Roundabout and a more residential/ urban section leading from Elmbridge into Gloucester. For the purpose of this study they will be referred to as Part A and Part B (see Figure 55 below). Both parts can be split into finer sections that have individual features that need to be addressed with specific engineering measures. The following text summarises the route, highlights the issues and offers solutions based on the accepted methodology

to be developed into practical engineering solutions. (Note for the purposes of this study, Elmbridge Court Roundabout junction has been omitted as it is being redesigned and redeveloped as a separate project. It is essential NMU (Non-Motorised User) facilities are integrated as part of any redevelopment process.

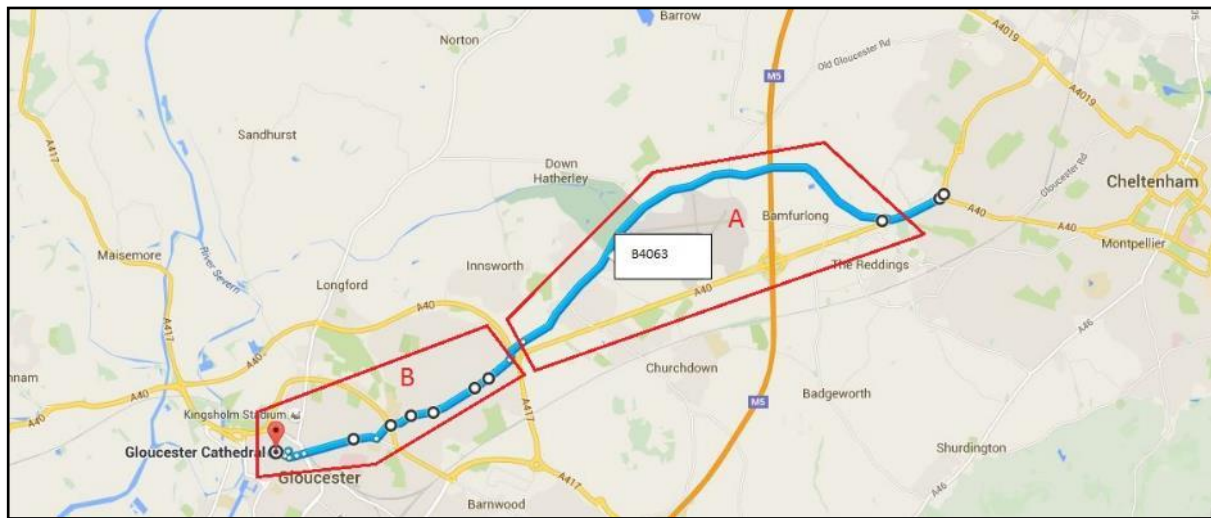


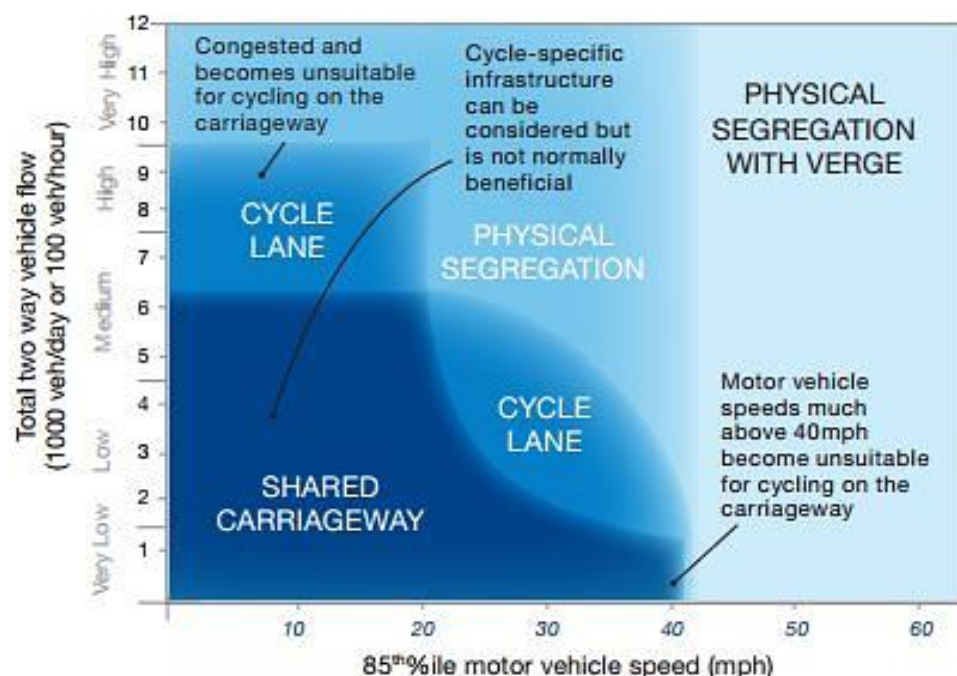
Figure 55 – The B4063 route cut into two parts to study potential improvements

B4063 Part A - Existing issues & Potential Solutions

Generally, there appears to be an issue with inappropriate traffic speeds along this route. The speed limit varies (50, 40, 30mph) along the B4063 and does the surroundings (rural open road, residential areas, new retail development, industrial business park entrances, sheltered housing etc.) but it appears that the speed limits and motorists compliance to them may need to be reviewed. Applying the Hierarchy of Measures identifies the following solutions.

- **Traffic Volume and Traffic Speed Reduction**

The first step in creating a cycle friendly environment along this route would be to review the speed limits throughout the whole area and reduce them to a level that is more appropriate for the latest surrounding conditions.



At present there are stretches which have developed to contain housing, business accesses, bus stops, cycle lanes and major junctions (see figure 56 below) but currently subject to 50mph limit throughout.


Existing speed limit signing is inconsistent and may currently be difficult to enforce.



Figure 56 – Typical conditions – multiple entrances, bus stops, pedestrian and cycle activity within a 50mph limit

Speed limit implementation is guided by the nature of the surroundings and environment combined with usage. The nature of this road may have changed considerably due to recent redevelopment. The usage and vehicle flows are likely to have changed also. National guidance on setting speed limits has altered to reflect national policies on road safety and accident reduction combined with widespread local transport policy to encourage walking and cycling and inclusive access to public transport. Correct application of these policies to this route would be required through an extensive review, including the consideration of technology and engineering methods to bring about effective enforcement and general conformance.

By implementing lower speed limits, gateway entry features and traffic calming measures (especially within the main built conurbations) to naturally enforce these limits, traffic speeds may be reduced to create an attractive, suitable place to cycle. With proper advance signing and publicity, a proportion of the current through-traffic could also transfer to the more appropriate 'A' roads thereby reducing the volume of unnecessary traffic on the B4063. In similar scenarios, local drivers have realised that cycling is a viable option and parents have chosen not to drive their children to nearby schools. This should thereby create a new base level by which to apply the other DfT "Hierarchy of Measures".

<p>Consider first</p>  <p>Consider last</p>	<p>Traffic volume reduction</p> <p>Traffic speed reduction</p> <p>Junction treatment, hazard site treatment, traffic management</p> <p>Reallocation of carriageway space</p> <p>Cycle tracks away from roads</p> <p>Conversion of footways/footpaths to shared use for pedestrians and cyclists</p>
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- **Junction Treatment , Hazard Site Treatment ,Traffic Management**

There are junctions throughout 'Part A' that are not cycle friendly. In places wide central hatching has been installed to provide for right turning traffic movements whilst allowing 'straight on' traffic to proceed without reducing speed. This arrangement reduces the safe width available and "squeezes" cyclists.



Figure 57 – wide central worn hatching space could be reallocated to create cycle lanes

Various signalised junctions are not equipped with crossing phases, 'Toucan' facilities, and pedestrian 'Inclusive Mobility' ramps or have adequate feeder lanes for cycles.



Figure 58 – Typical layout of B4063 traffic signal arrangement (this one has a 50mph approach limit on a bend and access to a bus stop) with no NMU facilities

Most 'shared-use' path crossings of side roads have no facilities to highlight those points or give priority over traffic. Simple measures can be implemented to give cyclists and pedestrians priority at all of these points.



Figure 59 – typical access conflict with 'shared-use' path with no indication of cycle use or priority



Figure 60 – Example of measures (in South Gloucestershire) to highlight routes and raise profile/priority of vulnerable users

Individual sites could be hazardous and perceived as unsafe for cyclists but various site specific measures could be implemented to deal with those issues. For example, the route under the M5 Bridge has no lighting. This issue is a problem even during daylight hours whereby a motorist entering the section in bright sun would not be able to easily spot a cyclists in the shadow created by the bridge. In this case, improved lighting and full segregation utilising a kerb line or a level difference to protect cyclists.



Figure 61 – potentially hazardous shadow areas potentially worse in bright sunlight

Other measures could include preformed segregation kerb units to physically protect cyclists in such locations.



Figure 62 – preformed segregation kerb units

The most obvious traffic engineering measure required for any provision to be successful here would be a full system of clear informative cycle (and pedestrian) finger post direction signing from end to end ,and to and from the route. Without this, the route does not really become a viable facility. Any signing needs to be combined with road markings and symbol roundels.



Figure 63 – Example from DfT Cycle England/Cycle City project of clear, informative direction signing utilising a highly recognisable robust finger-post system. This provides information important to cyclists and pedestrians (also acts as an advert to motorists to use an alternative mode with confidence)



Figure 64 – Example of integrated system of signing, bollards and route demarcation using colour surface and markings

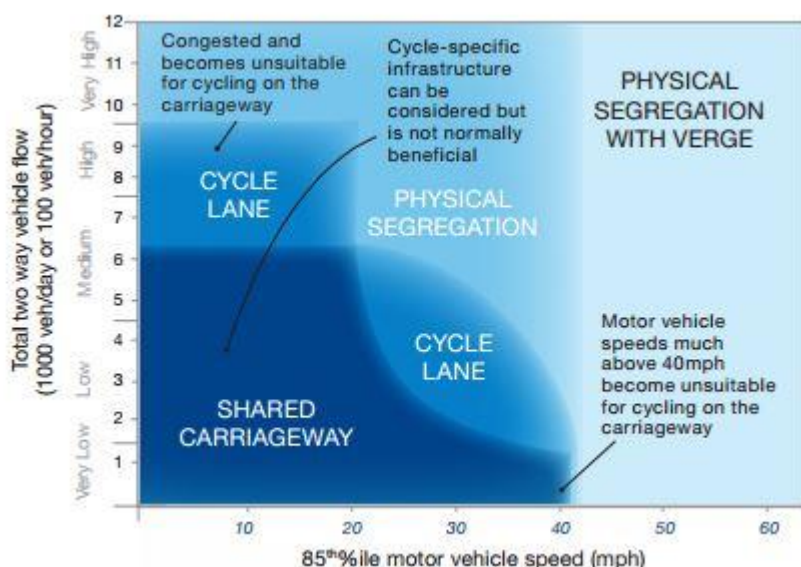
The upgrading of existing cycle/pedestrian signing and markings to the latest standards (and maintenance of the existing facilities) is also required. This combined with reshaping existing side road junctions to make pedestrians and cyclists less vulnerable when dealing with them (providing Inclusive Mobility measures ramps, tactile demarcations etc.) would create improved conditions along the route.



Figure 65 – Overly wide junction layout, exposing cyclists to more hazards

- **Reallocation of carriageway space**

There is the potential, once traffic speeds and volume have been suitably managed to reallocate road space to cyclists along most of the route. Good practice guidance would normally suggest providing cycle lanes in this scenario (see chart below).



Some of the existing cycles lanes are well below standard with a lack of cycle symbol markings and contrasting colour and most worrying a general average width along 'Part A' of only 900mm. These should be widened to the dimensions recommended in national guidance (1500mm min). Traffic lanes could be reduced or even omitted in places to create safe space for cycle lanes.



Figure 66 – Cyclists currently forced against kerb by road layout and traffic speeds

Centre-line road marking removal has also been trialled successfully throughout the UK in similar scenarios and is commonplace in other European countries (see example below Figure 67 courtesy Sustrans Design Manual).



Figure 67 – Reallocation of road space to advisory cycle lanes guidance



Figure 68 – Reallocation of road space to advisory cycle lanes – Wiltshire © Sustrans (additional symbols and colour surface would add further clarity)



Figure 69 – Reallocation of road space to advisory cycle lanes – colour surface treatment improves conspicuity even in wet weather © Sustrans

The existing cycle lanes are also not particularly visible along the route and the surface is in need of maintenance in many places. Whilst it is important to retain the rural character of the area, colour surface in a suitable durable contrasting colour should be considered throughout and definitely used at junctions, crossings and any other hazardous locations (see example below of NCN in Plymouth).

A great deal of Highway authorities choose to inlay the colour surface in areas of high wear using a coloured macadam material as used for bus lanes etc. This ensures the colour will last and not rub off when trafficked. Other authorities apply alternative modern high pigment materials where over-running is less of an issue. There are also reflective colour surface treatments that show up at night.

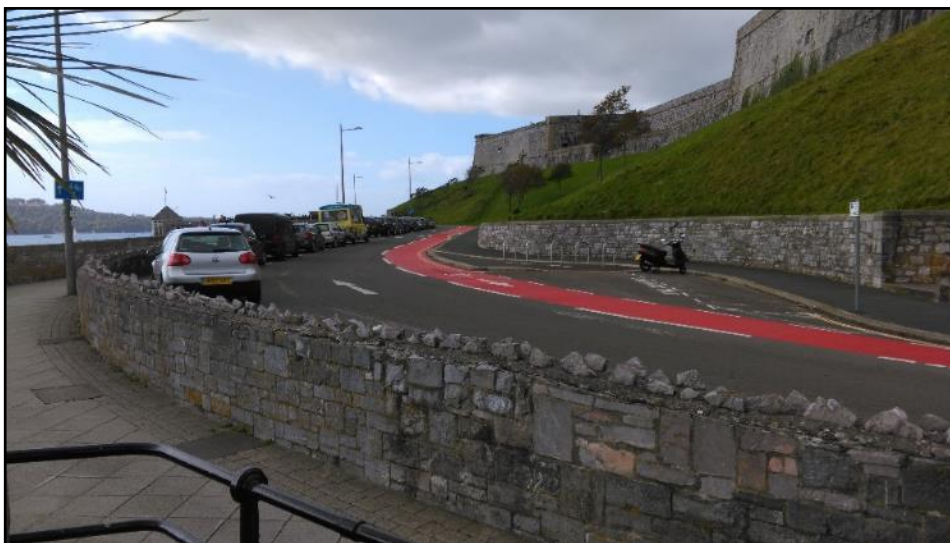


Figure 70 – Example of high contrast colour surfacing to make the cycle route prominent (Plymouth)

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- **Cycle tracks away from roads**

There are sections of the route particularly near to the roundabouts at Elmbridge and Arle Court where creating a cycle track away from the carriageway in the existing verge or by widening the footway and converting to 'shared-use' would offer a real advantage to cyclists – especially commuter cyclists in being offered a means to bypass any queuing back from the junctions. It would also provide a comfortable separation at the point where traffic is heaviest moving away from the junctions (see potential location below) and provide a link to the existing underpasses. Proper frequent ramp transitions should be put in place to allow cyclists to smoothly switch between carriageway and path.

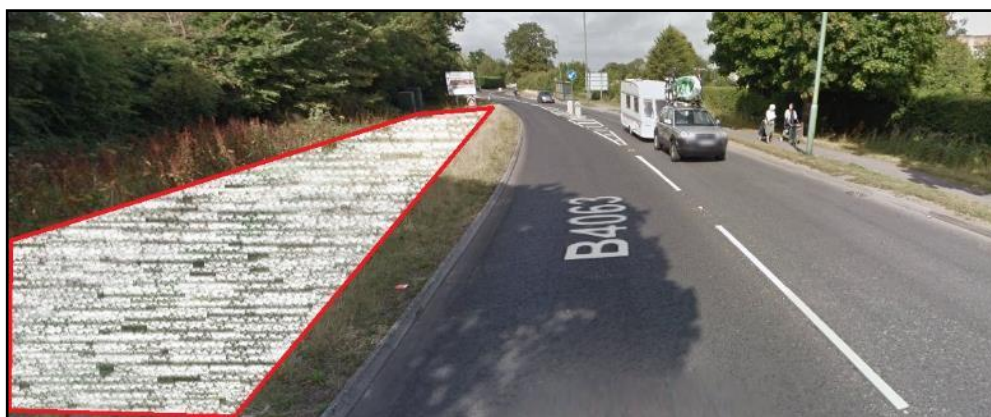


Figure 71 – verge that could accommodate a beneficial 'shared-use' path

A suitable location for physical separation from traffic would be the aforementioned M5 bridge over B4063 where the change in lighting levels puts cyclists at more risk of being struck. A simple parallel ramp transition to a segregated path in each direction could alleviate danger at that point.

- **Conversion of footpaths/footways to 'shared-use' for pedestrians and cyclists**

By widening the footway and converting to 'shared-use' in key locations (e.g. where traffic is heaviest) and on the approach to the main roundabouts (see Figure 72 below) a real advantage could be offered to cyclists – especially commuter cyclists who could then bypass all stationary or heavy queuing traffic. It would also provide a comfortable separation at the point where traffic is busiest and provide a link to the existing underpass network.



Figure 72 – Path that could be widened and equipped with transition ramps to provide a ‘shared-use’ link to Elmbridge roundabout underpass paths



Figure 73 – Path in front of GCHQ that should be widened to complete the route from Elmbridge roundabout to Cheltenham

In some locations the existing ‘shared-use path is on one side of the carriageway only with no means of crossing the carriageway to access and use it and no facility in the opposite direction. These paths are also not clearly marked or signed (see figure 74 below). In these instances the existing path should be fully upgraded to provide an obvious attractive facility and where possible, augmented with a cycle lane in the opposite direction. This could potentially be achieved by repositioning the central carriageway marking ‘off-centre’ or removing it completely.



Figure 74 – Unmarked 'shared- use' path requiring improved signing, marking, surface repairs and transition/access kerbs (and a westbound facility)

11. Design Solutions to Provide for Cycling - B4063, Part A

- A. Review and lowering of speed limits from Arle Court Roundabout to Elmbridge Court Roundabout – introduce the most appropriate limit for the current conditions, sign with entry gateway features and reinforce where possible with appropriate traffic calming measures centred on the areas with most local activity; Consider 20mph Zones in Churchdown/Innsworth centred around schools;
- B. Implement a full robust system of cycle & pedestrian direction signing featuring all local attractions, amenities and facilities with distances symbols and route numbers. This should cover the whole route and the surrounding area route network;
- C. Review all carriageway markings with a view to reallocating road space to cyclists and install cycle lanes;
- D. Widen all existing cycle lanes to recommended standards .Install colour surface treatment to cycle lanes at all locations where hazard or conflict could occur e.g. all junctions, bus stops , entrances, transitions etc.;
- E. Upgrade and existing ‘shared-use’ paths with clear regulation signing and markings. Incorporate raised priority features at all side roads and entrances;
- F. Upgrade signal junctions with ‘Toucan’ facilities on all arms, Advance Stop Lines connected to cycle lanes on all approaches. Provide transition ramps to allow cyclists to reach the crossing facilities or bypass the signals or queuing traffic where feasible. Investigate/trial colour surface ‘lanes’ through the junction;
- G. Convert exist pelican crossings to ‘Toucan’ operation;
- H. Install lighting under the M5 bridge & implement physical segregation from traffic;
- I. Reshape wide bell-mouth side road junctions to reduce cyclists exposure to hazards;
- J. Widen existing paths and convert to ‘shared-use’ with regulatory signs and markings on the approach/exit from the main roundabout junctions and at GCHQ;
- K. Construct new ‘shared-use’ path in the verge on the approach/exit from the Arle Court roundabout junction.

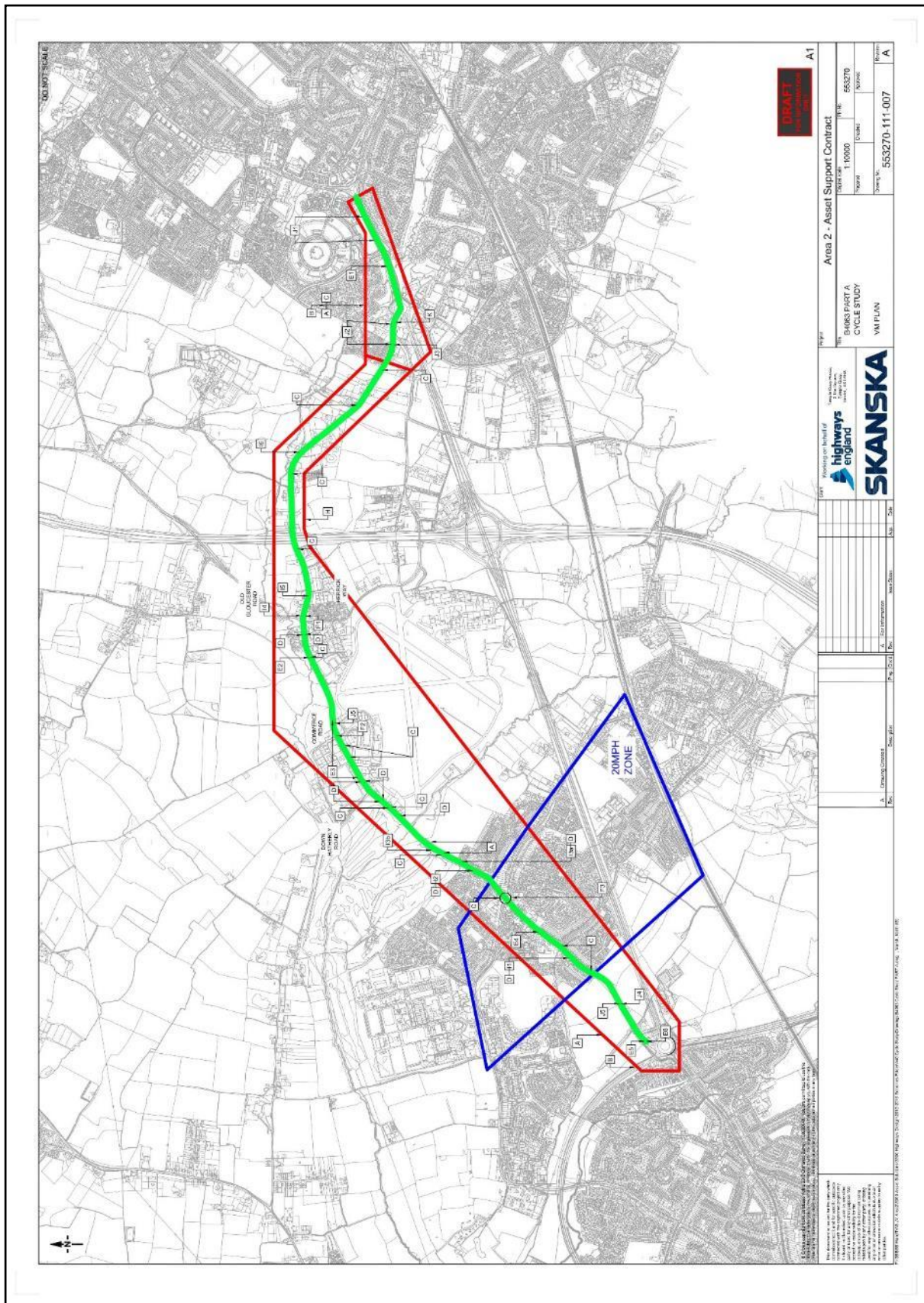


Figure 75 – Potential locations for improvements to B4063

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Note:

The route from GCHQ into the centre of Cheltenham already exists at some level. Improvements to those routes are not covered by this report as they are proposed as part of other projects. These projects include an extension of the existing 'Honeybourne Line' traffic free path from Lansdown Road to Cheltenham Spa Railway Station as part of a Cycle Rail Integration project involving GWR.

There is also scope for sections of the Cheltenham inner circuit road including contraflow treatment of that could further improve permeability. These improvements fall beyond the current scope of this project.

B4063 Part B (Elmbridge Roundabout to Gloucester) - Existing issues

Generally the traffic patterns on this section of the route are heavier, more congested and the road layout contains a multitude of side road junctions. For cyclists there is an existing level of provision in the form of both cycles lanes on the carriageway and some 'shared-use' path but neither are complete or continuous, not particularly well marked and showing signs of neglect. More worryingly, the width of cycle lanes on the carriageway do not meet current standards (they generally measure around only 900mm) which makes cyclists vulnerable and will potentially deter them from using the route or cycling as an alternative mode. A full accident analysis has been undertaken as part of this project and research shows patterns associated with junctions and turning traffic and lack of NMU provision. Most accidents involving cyclists on the entire B4063 are mainly concentrated on the Cheltenham Road, section between Estcourt Road and the Elmbridge Roundabout. This section is approximately 1.4 miles long but 16 out of 22 accidents occurred within this section (73%).

This is the most urban area with a number of side roads joining the Cheltenham road as well as many parked vehicles, bus stops etc. There is the greatest potential however for upgrading this provision, reallocating more space and creating suitable conditions to for more high profile, safer, continuous facility. In some places, actually removing a substandard or inappropriate cycle lane may provide a better 'facility' for cyclists.

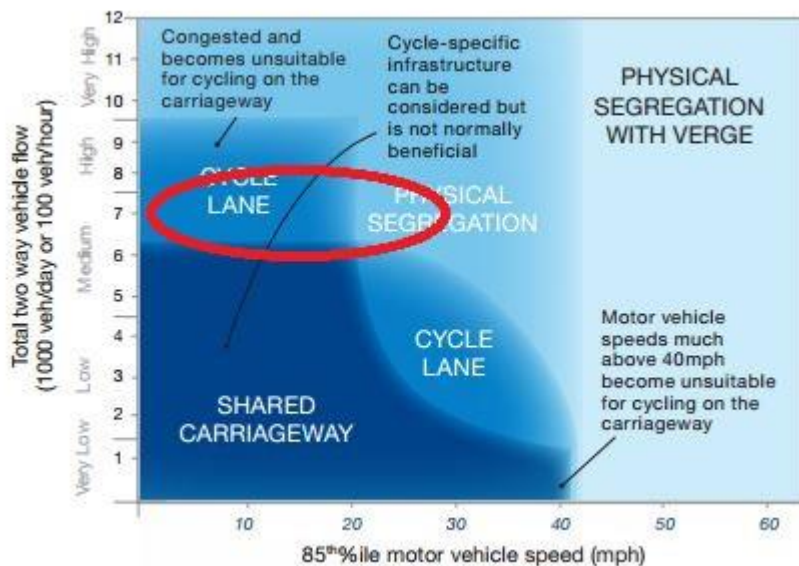


Figure 76 – Existing sub-standard cycle lanes – very narrow, no cycle symbols with unused carriageway space currently hatched which guides traffic towards kerb

Applying the Hierarchy methodology again to this section of route reveals a different set of problems and therefore slightly different solutions as follows:

- **Traffic Volume and Traffic Speed Reduction**

The latest automatic count surveys show that traffic volume is particularly high for creating a cycle friendly environment on the carriageway even within a cycle lane. However the negative impact of this traffic (congestion, frequent turning manoeuvres, high speeds off-peak etc.) could be offset along the route with other measures which may also reduce the volume sufficient to make cycle lanes a viable option (see area highlighted on chart below).



Almost the whole length of this section is within a 30mph speed limit. The latest automatic speed surveys indicate that this is probably the most appropriate speed limit in general for most of this route. However, there are long, straight stretches (see example Figure 77 below) that may have a problem with excessive speeds particularly off-peak (when traffic is lighter and able to move freely), that may require physical calming measures to create a better, safer local environment.



Figure 77 – Existing sub-standard cycle lanes with straight, unobstructed road

There are also areas beyond this route that could benefit from lower, 20mph Zones (and the associated calming treatment that should augment it) particularly near to the shops, schools and other cycle network routes traversing the 'B' road.

Creating a safe attractive corridor as an alternative to the Strategic Road Network will encourage more people to cycle and existing cyclists to choose this route rather than have to use the unsuitable A40 dual carriageway between Gloucester and Cheltenham.

At present there are a couple of isolated calming features (including a road hump and some speed cushions but nothing that recognisable as a 'zone' or an area where motorists need to modify their behaviour or pay special attention. Whilst the focus of this study is to create a simple corridor, the effect could easily be extended in future into the areas shown below (Figure 78).

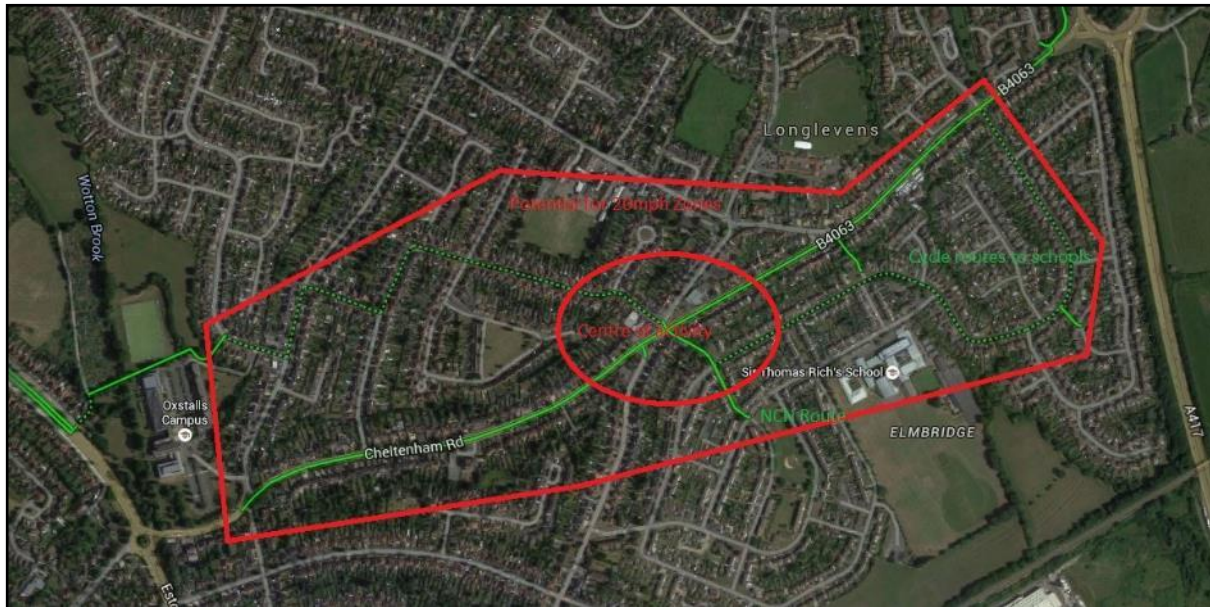


Figure 78 – Potential focus for lower 20mph speed limits & calming measures initially on B4063

- **Junction Treatment , Hazard Site Treatment ,Traffic Management**

A review and analysis of recent accident patterns highlights the common thread-junction/ turning accidents from side roads. This is common in most similar urban areas and can be reduced with methods mentioned for Part A of the route including remodelling of junction bell-mouths to reduce vehicle speeds and reduce the exposure of cyclists to hazards. Highlighting any cycle lanes using colour surface and making them wide enough for cyclists to be able to steer around emerging vehicles can all help. Where a 'shared-use' path crosses a side road, cyclists should be given priority over traffic (See example of improved junction detail)



Figure 79 A – Maple Court, wide junction with long, sweeping radius encourages high entry speeds with priority over cyclists & pedestrians



Figure 79 B - Alternative layout example with cycle/pedestrian priority over traffic

Hazard treatment is required in some areas where the crossing facility to assist pedestrians (and reduce the speed of traffic) can create a pinch-point for cyclists i.e. pedestrian refuge islands. This is a fairly typical problem but can be improved with the combined use of markings, coloured surface and lower speed limits. The prominence of cyclists and their priority can be raised even where a cycle lane marking cannot fit (see example below where each refuge island on a cycle route parallel to the A4 / M4 has this treatment).



Figure 80 – typical Refuge Island where cyclists get 'squeezed'



Figure 81 – Example of treatment at refuges where a cycle lanes cannot be accommodated (Langley, Berks)

Throughout the route, there is a lack of a coherent cycle direction signing system. The omission of clear information is more detrimental where the route diverts from the main road and follows quieter residential roads (e.g. to avoid the Estcourt Road roundabout). Cyclists need to be able to easily follow routes that are less instinctive than the main road or they will inadvertently use routes deemed unsuitable for cycling. At 'decision nodes' the combination of fingerpost signs, cycle symbol bollards, bold road markings with direction arrows and colour surface treatment is absolutely crucial.

For example, the junctions of London road and Cheltenham Road, Kenilworth Avenue and Estcourt Road and Cheltenham Road with Grafton Road (see Google map extract below). The instinctive route would be to continue on the main (B4063) road, especially for somebody that is used to driving the route.

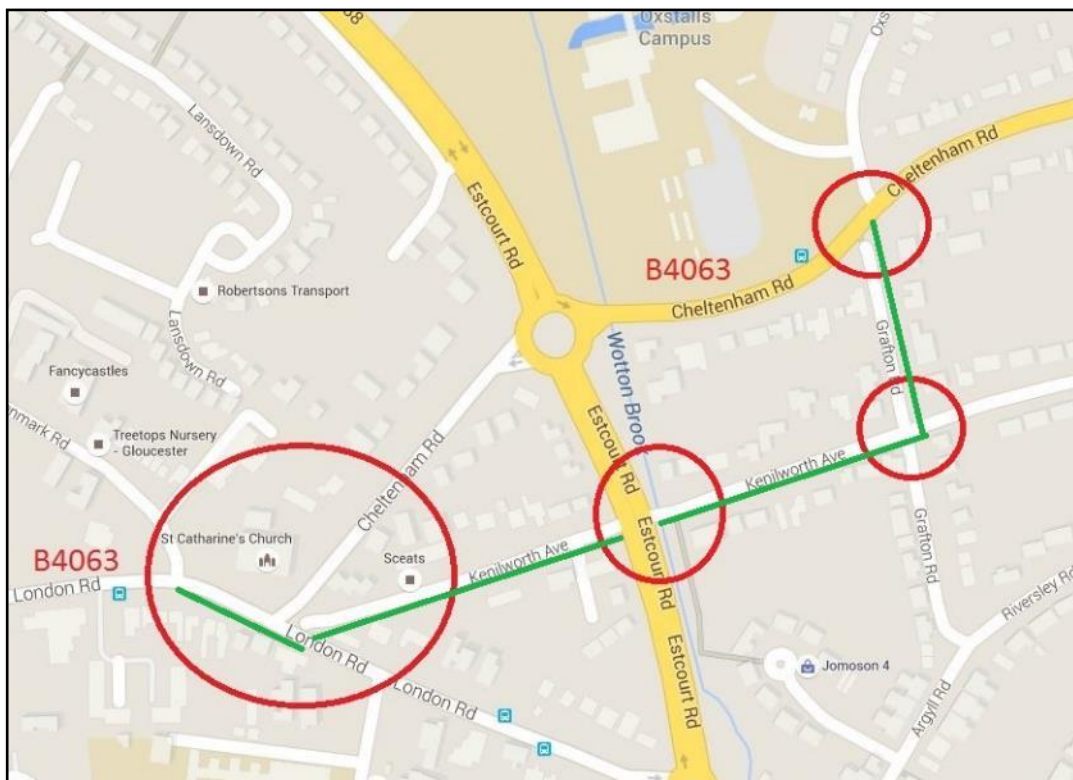


Figure 82 – Mapped cycle route with unclear direction nodes

However, the cycle route diverts along Kenilworth road which is closed to through 'other' traffic and can only be reached by cycling over the footway between the two more obvious 'open' roads (see marked photograph below). The arrangement for pedestrians, cyclists and traffic needs to be completely redesigned to make each provision and route obvious and highlight this important node point.

Note: the choice of route and potential route improvement options, is discussed separately after the general application of the 'Hierarchy of Measures' to the whole of Part B.



Figure 83 – hidden cycle route with no obvious or defined provision

- **Reallocation of carriageway space**

Throughout the length of road in Part B there are extensive sections of central hatching used as a means of separating opposing flows of traffic (see example Figure 84 below and previous image featuring a bus) .They have the effect of guiding vehicles towards the kerb and squeezing any cyclist that happens to be there. A lot of these hatched areas could be significantly reduced in length and width or removed completely. The equivalent width could be reallocated to the cycle lanes.



Figure 84 – Typical hatching on B4063 which could be modified

In some locations, a cycle lane has been incorporated in one direction only (uphill as recommended good practice) but no complimentary measures have been introduced to assist cyclists in the other direction to deal with hazards (e.g. car parking bays, junctions or bus stops) such as colour surface and repeated symbols. The example below shows how motorists could be made more aware of cyclists if there were coloured surfacing around the parking bays. The standard cycle symbol at regular spacing would also raise awareness and encourage people using the bays to be more observant. The existing lanes need to be wider and potentially the centre line could be removed.

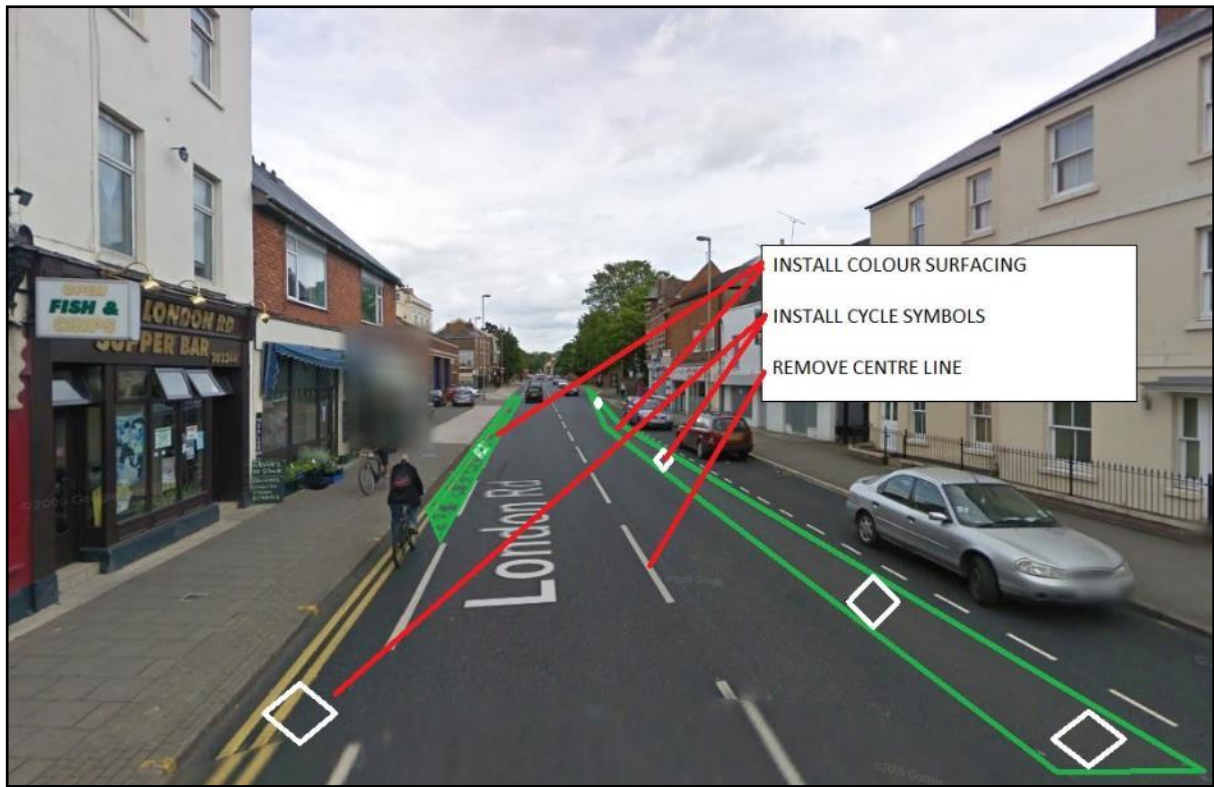


Figure 85 – Typical parking bay arrangement for B4063 London Road

Some of the existing cycle lanes are well below standard with a lack of cycle symbol markings and contrasting colour and most worrying a general average width along 'Part B' of only 900mm. These lanes should be widened to the dimensions recommended in all national guidance. As mentioned earlier, traffic lane markings could be reduced or even omitted in places to create safe space for cycle lanes and coloured tarmac could be inlaid for low maintenance highlighting of the safety features.

- **Cycle tracks away from roads**

Most of the sections of this part of the route that have grass verge (only a short length), already have some kind of path provision for pedestrians. Some have the potential for conversion to 'shared use' (see next bullet point below). There is also a network of local roads either side of the 'B' road that link to schools, residential areas etc. that also utilise paths and lanes to connect together. These are marked on the Sustrans map below. These routes currently form a really important role in permeating the areas where people live, shop and go to school and connect perfectly to the main corridor of the B4063 which if improved would remove the need to utilise the A40 corridor for these trips.

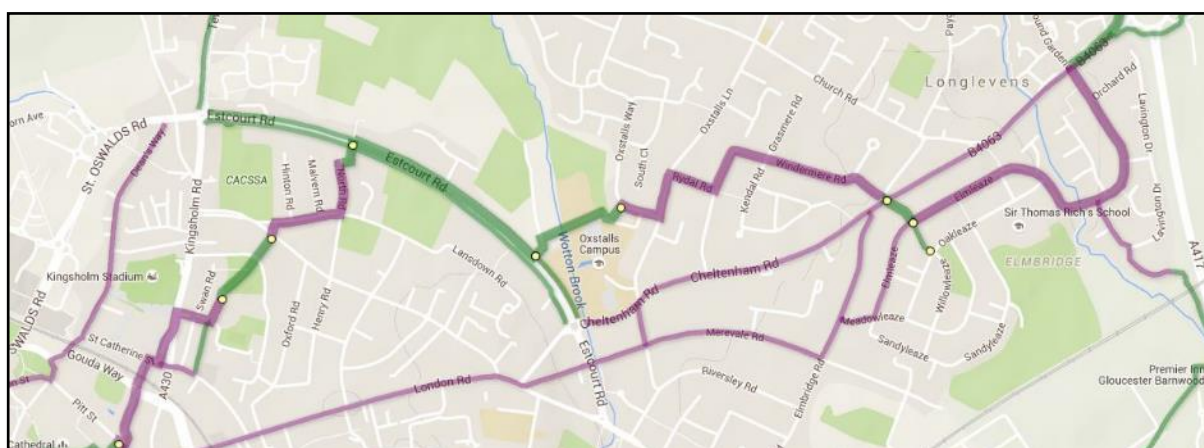


Figure 86 – Extract from Sustrans route maps showing connections to the B4063 corridor

- **Conversion of footpaths/footways to ‘shared-use’ for pedestrians and cyclists**

As with Part A, there are a few locations where cyclists may gain some advantage over traffic by using the footway. Conversion to ‘shared-use’ has already been implemented in some those locations. In further key places (e.g. where traffic is heaviest and space cannot be easily reallocated) an alternative could be offered to cyclists – especially commuter cyclists who could be given a means to bypass any stationary traffic or slow queuing back from junctions. These locations need to be engineered carefully so that cyclists and pedestrians do not feel uncomfortable sharing the same space and so that cyclists can re-enter the carriageway in safety (see Figure 87 below in Bradley Stoke, which would be better with colour surface and markings).



Figure 87 – Example of ‘shared-use’ path to reach A.S.L at front of queue (Bradley Stoke)

- **Discussion - Estcourt Road area - Main Road (B4063) or Existing 'Quiet Residential' alternatives**

As mentioned earlier when looking at traffic management and signing measures, there are issues with the current mapped route along Grafton Road and Kenilworth Avenue. The route features cycle lanes that are completely blocked by cars both sides of the road (see Google image below) where the road is closed to through traffic and could better serve cyclists if the current parking arrangement were recognised formally. Traffic volumes are very low so the inaccessible lanes could be removed and cyclists could comfortably ride along the remaining carriageway with other measures (cycle symbols, speed cushions etc.) to create a cycle friendly environment.



Figure 88 – Cycle lanes currently used as parking bays

Another difficulty in this short deviation from the B4063 is the physical barrier created by Estcourt Road. This dual carriageway with central reservation and guard railings bisects the route. Cyclists are currently pointed in the direction of the 'City Centre' via a continuation across this road which means utilising two signal-controlled crossings and a 'sheep-pen' arrangement in the central reservation.

The existing cycle direction sign is augmented closely by a 'CYCLISTS DISMOUNT' sign, a clear, bold indication that the route is currently not designed for cyclists.



Figure 89 – Existing route across Estcourt Road (A38)

The solution in this case is to either upgrade the designated route with suitable facilities throughout or make the B4063, Cheltenham Road and the roundabout with Estcourt Road suitable for cycling. Both options have been investigated and compared herewith below.

The section of Cheltenham Road (currently by-passed using the residential streets) has a 'peak-time' bus lane in one direction which can legally be used by cyclists. This bus lane is not particularly wide and could be uncomfortable/intimidating for cyclists to sharing this space with a bus in such close confines. There is no facility for cyclists in the opposite (southbound) direction towards Gloucester and no spaces to create a lane on the carriageway.

The footways are just about wide enough to convert to 'shared-use' but they contain a number of private residential driveways with high boundary fences and almost zero inter-visibility with path users (see figure 90 below).



Figure 90 – Cheltenham Road – Bus lane and footways with obscured residential accesses

The current junction arrangement which is currently bypassed using the residential route is a large roundabout with two-lane approaches and exits (see aerial view Figure 91 below) and uncontrolled ramped crossing points to the splitter islands on each arm.



Figure 91 – aerial view of Estcourt Road Roundabout

Roundabout junctions are generally considered to be one of the safest forms of at-grade junction. **The exception to this rule being for two-wheelers. The accident involvement rate is 10 to 15 times higher than those of cars. The proportion of cyclists involved in accidents at this type of junction is as high as 15% even though they make up a much smaller percentage of the traffic.** For this reason,

traditional large roundabouts are not the best choice for a route where cyclists are expected or encouraged.

There are means of modifying such roundabouts to make them safer for two-wheelers including narrowing the entry and exit widths and reducing the circulatory carriageway to a compact design. These techniques could be incorporated at this junction at the expense of traffic capacity and increased queueing on all arms.

Cyclists could be provided with off-carriageway facilities and signalised 'Toucan' crossings of the arms. However if these crossings entail waiting to cross each arm then they may not offer much advantage over the existing non-direct route. Another method which has not been extensively trialled, is the implementation of circulatory cycle lanes within the roundabout carriageway area. In order to be worthwhile, these need to be dual-lane and wide enough not to force cyclists to the periphery of view and bold enough to give cyclists freedom of movement to make all turns and exits safely in a prominent position. If they aren't designed with these features, they are likely to put cyclists into a less safe riding position.



Figure 92 – Example of circulatory cycle lanes (which could be wider), Berkshire

- **Conclusion – Estcourt Road Roundabout area – main Cheltenham Road (B4063) or existing ‘Quiet Residential’ alternative route**

There are advantages and disadvantages of both routes as they currently stand. One is more direct, whilst the other is more pleasant to use. There are engineering methods to bring both up to a better standard. However to make the roundabout at Estcourt Road cycle friendly it is likely to require full signalisation or reduction in size and traffic capacity. Discussion with Gloucestershire County Council reveals plans for large development in the vicinity which may result in major alterations to this junction.

This area and the development should therefore be modelled and cycle route options should be consulted upon with local users before a clear political local decision can be made.

It may be prudent to upgrade the existing routes to offer continuity now and permeability of the wider network until the roundabout junction options are fully realised.

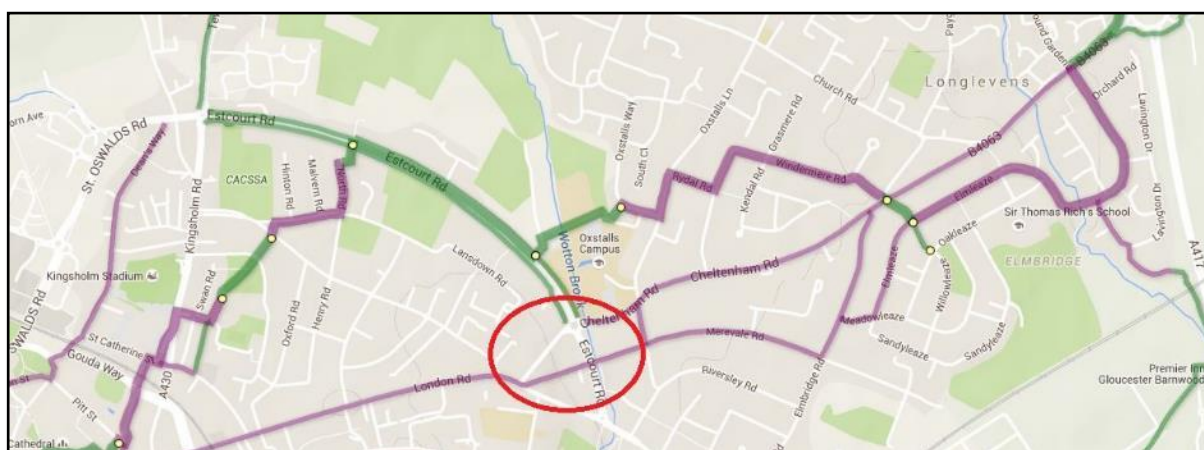


Figure 93 – Sustrans mapped routes around Estcourt Road roundabout

11. Design Solutions to Provide for Cycling - B4063, Part B

- L. Review speed limit and implement 20mph Zones along B4063 and extend where appropriate from Elmbridge Court Roundabout to Gloucester –reinforce with appropriate gateway features, highly visible traffic calming measures (bus friendly) e.g. speed cushions;
- M. Implement a full, robust system of cycle & pedestrian direction signing featuring all local attractions, amenities and facilities with distances symbols and route numbers; This should cover the whole route and the surrounding area route network;
- N. Review all carriageway markings with a view to reallocating road space to cyclists and install cycle lanes where gaps exist;
- O. Widen all existing cycle lanes to recommended standards .Install colour surface treatment to cycle lanes at all locations where hazard or conflict could occur e.g. all junctions, bus stops , entrances, transitions etc.;
- P. Upgrade any existing 'shared-use' paths with clear regulation signing and markings. Incorporate raised priority features at all side roads and entrances, implement transitions at regular suitable locations;
- Q. Upgrade signal junctions with 'Toucan' facilities on all arms, Advance Stop Lines connected to cycle lanes on all approaches. Provide transition ramps to allow cyclists to reach the crossing facilities or bypass the signals or queuing traffic where feasible. Investigate/trial colour surface 'lanes' through the junction;
- R. Convert exist pelican crossings to 'Toucan' operation;
- S. Reshape wide bell-mouth side road junctions to reduce cyclists exposure to hazards;
- T. Widen existing paths and convert to 'shared-use' with regulatory signs and markings and regularly spaced transitions where an advantage would be gained off-carriageway;
- U. Remove cycle lanes where they are not observed;
- V. Install wide colour surface priority treatments at Refuge Island;
- W. Redesign NMU layout (footway & carriageway) ;
- X. Redesign and remodel roundabout to single lane entry/exit continental style layout.

12. Summary – Providing for Cycling between Cheltenham and Gloucester

The initial aspiration of this study was to identify the means to provide a straight, continuous cycleway to the latest standards along the A40 Strategic Road Network. It was established very soon that:

- this would not meet the travel requirements of the local community or connect to the main local town and city centres;
- a safe, direct, continuous route could not physically be accommodated within the A40 alignment.

Therefore alternative routes that could meet the main user and potential user objectives needed to be investigated. The result, a direct alternative route between the main hubs of Cheltenham and Gloucester utilising local roads, modified to be cycle friendly.

The key route that stands out as the most prominent solution, the B4063, could provide a direct alternative to cycling along the A40 corridor and will actually connect the main two centres of Cheltenham and Gloucester unlike any of the alternative routes available (summarised in matrix diagram Figure 95 below).

Connecting the town & city centres was shown through consultation as the main issue to be addressed and the highest ranking barrier to cycling in the area. Providing a safe, coherent, direct alternative to the A40 removes the inherent risk posed to cyclists currently using the Strategic Road Network dual carriageway due to lack of any intuitive, direct, alternative facility between the two centres.

Investing in cycle friendly infrastructure on this, nearest available alternative route will also link into some of the largest employers around Cheltenham and Gloucester and therefore offer the largest potential for modal shift at commuting times. This corridor also features some of highest residential densities outside of the main two conurbations, offering the link to not only Cheltenham and Gloucester but also providing a safe, direct, accessible route from the areas where people live and work.

Creating a route away from the dual carriageway opens up the opportunity for children to cycle to school, something that could not even be contemplated on the A40 due to the inherent nature of the road. This could in turn reduce the amount of parents currently driving their children to school, which has been demonstrated by the DfT 'Cycle England' projects in the South West which saw dramatic increase in cycling to school through the creation of quality

infrastructure. This would reduce pressure on the Strategic Road Network and local road networks.

Providing a prominent cycle corridor away from the A40 alignment could create many additional benefits within the local communities it passes through. The reduction in traffic speed and implementation of crossing facilities for all non-motorised users should also realise a reduction in the community severance currently caused by the presence of the main road. This in turn makes public transport more accessible to all and another viable travel alternative.

Reducing motor vehicle impact along the B4063 will create an environment which is more pleasant to walk to school and visit local amenities thereby reducing the dependence on the private motor car and giving parents the confidence to allow their children to walk and cycle to school.

Reducing speed limits to an appropriate level will bring about a reduction in accident frequency and accident severity. Vulnerable road users are more likely to be severely or fatally injured when a car is travelling more than 30mph (source RoSPA). Applying traffic speed reduction measures especially 20 mph Zones where the risk of being injured in a collision will significantly decrease and to create an environment where cycling as a mode can flourish.

The combination of implementing quality infrastructure, based on national guidance alongside non-engineering promotion and community engagement projects such as employers 'Bicycle User Groups (BUGSs)' could bring about dramatic changes to the local community. This in turn is often seen to bring about the otherwise elusive modal shift that would have dramatic effects on the efficiency of the local and Strategic Road Network.

Of all the route options explored, and the multitude of permutations that could be developed from them there is only one that has the potential to directly link the main conurbations and reach the most densely populated areas. Only one route option connects to the biggest places of employment and provides a general road safety benefit to all road users.

		CRITERIA																
		Convenience	Directness	Accessibility	Safety	Personal Security	Comfort	Coherence	Attractiveness	Connects Cheltenham to Gloucester	Deliverability	Potential Planning/Land Issues	Environmental Impact	Connectivity to Main Attractors	Adjacent to Attractors	Additional Road Safety Benefit for Community	Connects to NCN 41	Cost £ = 1million
ROUTE																		
1	A40 Verge	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1b	A40 Verge (top bank)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2	B4063	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3	GCC Blue Route	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
4	GCC Green Route/NCN	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5	GCC Pink Route	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5	GCC Orange Route	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

KEY

●

YES /GOOD

●

NO/BAD

Figure 95 – Matrix of Route Options against accepted criteria

13. Highways Agency Project Sponsor Approval

In connection with the Study Report prepared for the A40 Gloucestershire Cycle Study – Longford Roundabout to M5 J11, I acknowledge receipt of this report and make the following comments:

Project Sponsor:			
Signed:		Date:	

