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Appendices

Appendix A: Case Studies of Redway Design
1 Introduction to Redways:

1.1 What are they, how do they fit into wider policy:

The Milton Keynes Redway network was conceived very early in the development of Milton Keynes. The philosophy of the Redway system is; ‘an effective coherent network of routes separate from the city road system providing attractive, safe, direct and convenient access for pedestrians and cyclists at a local, district and city scale’ (The Milton Keynes Planning Manual 1992). The system now consists of over 200 miles of segregated walking and cycling routes, all constructed over the life of the ‘New Town’.

The Redway network is organised around a hierarchy of routes as follows:

**Redway Super Routes** – formerly known as cross-city Redways and/or priority routes, these are the key utility cycling routes connecting the city centre, public transport hubs and other main journey attractors. These routes align closely with the grid road network.

**Redways** – other utility routes serving smaller destinations and forming a finer network of walking and cycling routes between the main Redway Super Routes to link residential estates and key destinations within those estates such as local shops and schools.

The Redways are the primary, predominantly traffic free, network for pedestrians, wheelchair users and bicycle traffic and are an extremely valuable asset in the transport infrastructure of the city (Photo 1).

Redway networks will continue to be expanded and fully integrated into new developments and regeneration areas to support sustainable communities and enable active forms of travel. The inclusion of high quality Redways will be an important determining factor in the acceptability of most development proposals. All new developments must include convenient extensions of, and links to, the Redway network. As Redways are cycle routes, all links to them from carriageways must form part of the cycle network. This will ensure that cyclists can make unbroken journeys and avoid using footways.

This Design Manual replaces the 1991 Redway Design Manual.
1.2 Key Design Principles:

1.2.1 Design

- Redways are red and are easily identifiable due to their coloured surfacing.
- Redways should be a minimum of 3 metres wide but on busy routes extended to 5 metres or more to allow sufficient space for all users. Where they are located adjacent to parallel car parking spaces, there should be a 1 metre ‘wobble strip’ to avoid car doors opening over the Redway.
- No building or wall should be within 500mm of the edge of a Redway.
- No shrubbery with a mature height of 300mm should be located within 1.5m of the edge of a Redway.
- Designs must consider the space immediately bordering a Redway. Adjacent fences, hedge lines, boundary walls and building lines all reduce the usable path width and can reduce visibility around bends. Lamp columns, sign posts, benches and litter bins should be set back by at least 500mm from the path edge.
- Planting and lighting should be planned so that visibility and personal security levels are heightened.
- Designers should be aware of the ecological constraints and requirements. Sites may be important locally, regionally and nationally. Existing corridors should be maintained or new corridors created to allow wildlife to move through the landscape. Routes can be built without significant damage to the ecological value of the land. Including cost effective enhancements such as pond scrapes, log piles and areas of bare sub-soils will encourage biodiversity.
- All Redways must take into account the needs of mobility impaired and visually impaired users. As a minimum, routes must include flush crossing points, tactile paving units and appropriate signs and lighting.
- Redway routes should have priority at road crossings to provide direct, convenient and safe routes.
- Redways are lit along whole lengths.
• Designers should consider all aspects of potential users requirements in order that needs are met. Level changes are sometimes unavoidable, but designers should seek to minimise the impact of gradients on all route users, taking in to consideration wheelchair users and those with poor mobility. Where appropriate routes on gradients may need to have online, or offline rest areas included in the design.

• Redway routes are shared, and may be used by pedestrians, cyclists, wheelchair users, mobility scooters, delivery robots, e-bikes, e cargo bikes, skateboarders and in the not so distant future, e-scooters and potentially autonomous vehicles. Some users will have learning, mobility or sight concerns that make them more vulnerable.

• Redways are required in three locations (including grade separated crossings of the grid road and at roundabouts). On both sides of the grid road, forming the Redway Super Routes; adjacent to main arterial routes through estates that connect to the Redway Super Route network and key destinations within estates and through linear parks. A key requirement is that they are kept relatively direct.

• Extensions and additions to the Redway Super Route network along the grid roads will continue on the same side of the road as existing Redways (Photo 2) and will minimise the number of deviations and road crossings. Developers should contact officers in Highways Development Management and Transport Policy at an early stage to discuss Redways as special layout and junction treatment may be required.

• Provision of Redways will be required as part of all major development proposals
1.3 Understanding Path Users:

User factors to consider in the design of a Redway route include:

**Target users** – Redways need to cater for the needs and behaviour of all users, which include pedestrians, cyclists, wheelchair users, mobility scooters, delivery robots, e-bikes, e cargo bikes, skateboarders and in the not so distant future, e-scooters and potentially autonomous vehicles. Consideration must be given to the most vulnerable users of the Redway network who have either poor mobility, learning disabilities or sight impairments for whom the Redway system is essential to enable safe and independent movement around the city all year round. Providing enough room for target cycle users will allow sufficient space for all other users of the Redway.

The dimensions and characteristics of the varied cycles in use and the space (‘dynamic envelope’, as described below) that they require in motion are referred to in Figure 1. The dimension of a “design cycle” is presumed to be 2.80m long and 1.20m wide, and is in line with Highways England’s IAN 195.

**Types of cycle** - cycles vary considerably in design. The requirements of tandems, bikes with trailers and children’s tag-alongs should be accommodated in designs and the needs of recumbent, hand cranked, mobility aid cycles and adult tricycles should be included in the design process wherever possible. Accommodating E-Bikes and E-Scooters will also be increasingly important. Access controls and substandard widths and radii and are common features that exclude many of these types of cycle along with wheelchairs and mobility scooters.

**Physical effort** – Active travel on the Redways requires physical effort, especially on steep gradients and to change direction of travel. Redways should maximise priority for all Redway users, minimise the need to stop and start, slow down or dismount and should avoid sharp curves and steep gradients.

**Dynamic envelope** - a cyclist has a ‘dynamic width requirement’ (dynamic envelope) when moving which encompasses both the size of the cyclist/cycle, and their lateral deviation. This is illustrated in the section on path widths. Lateral deviation increases at low speeds, on steep gradients, in wind and rain and on uneven or poorly drained surfaces. Inexperienced cyclists have a greater dynamic envelope.

**Visibility requirements** - Redways need to provide adequate forward visibility; sight stopping distance as a minimum (for safety) and, wherever possible, sight distance in motion requirements (for user comfort). Redways also need to provide adequate visibility at junctions.
Curve radii – to enable cyclists to maintain their design speed safely, Redways need to provide minimum curve radii as detailed in this manual.

Swept paths - Redway designers should consider the swept path of cycle users to ensure there is adequate width on curves and at junctions and that any speed reducing measures do not introduce hazards or congestion.

2  Geometric Design

2.1  Path widths

Redway routes should be minimum 3 metres wide, however, a path width of 3m does not necessarily equate to a usable width of 3m. This matches the minimum widths stated in various DFT Local Transport Notes and provides sufficient width for users in each direction to pass comfortably.

The minimum value of 3m should be increased where necessary to cater for demand. Greater widths will be required for routes to schools or other major destinations where significant usage is expected. A Redway width of 5m should be the minimum requirement in areas of high demand, where flows are consistently high then this should be increased further. Providing a greater width than the minimum will increase the level of service for all users and accommodate future growth in walking and cycling.

2.1.1  Minimum clearance

Any Redway route, when bounded by vertical features should include additional width in line with the guidance highlighted in Local Transport Note 1/12. The types of edge constraints and the amount by which a Redway requires widening to maintain a 3m wide useable path width are in Figure 2 below. This table relates to features forming a linear barrier along a path edge, and not to be confused for, or as, a visibility splay. Even a standard kerb can present a risk to inexperienced or young children where it is immediately adjacent to moving traffic and whilst a verge width edge is always preferable, a limited widening of a Redway would fit with DFT Guidance.

Path widths at structures, whether they go under or over an obstacle are increased in order to maintain a usable width of 3m. All structures generally have edge constraints on both sides and the widening should take note of this. Any path at bridges/underpasses is therefore minimum 4m wide. Structures, once built, are rarely returned to, except for routine maintenance works and delivering a high quality solution from the outset is essential.

Figure 3 below represents a typical Redway cross section, where edge constraints are softer, such as hedges or field edge/boundary fences. Hedges and verges grow, and allowing natural space for this to happen reduces immediate impact on the usable width of the Redway.

Details of how a Bridleway should cross a Redway at a junction and how a Bridleway should be set out if running parallel to a Redway are included in the ‘Bridleway Design Manual’.
2.1.2 New Developments

The provision of Redways will be required as part of all major development proposals. There are significant and cost-effective opportunities to provide Redway infrastructure during the construction and maintenance of highway works, particularly in new developments. This is recognised in the National Planning Policy Framework and the Local Cycling and Walking Infrastructure Plan Guidance.

There are generally three locations within which Redways will be provided, all of which may be required depending on the size of the development. All three enable surveillance from either passers-by in cars or from adjacent properties or parks and therefore should feel safe:

Firstly, adjacent to Avenues and Boulevards in new developments, the main local arterial routes are to be viewed as the equivalent of boulevards and avenues and are the most important and connected routes within a development – ones that are public transport routes and link up with shops and facilities. It is along these routes that Redways are to be included and these should be linked to the Redway Super Routes;

The second and third locations of Redways to be included are for Redway users who want to travel greater distances at increased speeds with less interruptions from crossing streets. Second, are Redways that follow grid roads, which provide safety from passing cars on the grid roads. These are referred to as the Redway Super Routes. Redways should be included alongside and on both sides of all grid roads. Thirdly, Redways should be included through linear parks, where surveillance is provided from users of the linear park and adjacent properties. A key requirement is that they are kept relatively direct.

Designers should consider all aspects of potential users requirements in order that needs are met. Where appropriate, routes on gradients may need to have on line, or offline rest areas included in the design. Planting and lighting should be planned so that that visibility and personal security levels are heightened.

Manual for Streets provides guidance on the planning of transport networks for new developments and generally recommends that they are well-connected to their surroundings with a choice of routes. Walking and cycling infrastructure and facilities should be regarded as an essential component of the site access/es and any off-site highway improvements that may be necessary.
Within larger sites it will be necessary to plan for a network of Redways that serve all parts of the development. This network should follow the principles set out in the other sections of this chapter.

2.2 Horizontal and Vertical Alignments:

2.2.1 Overview

This section looks at the key issues affecting design decisions on horizontal and vertical alignments. These include visibility, curves and turning radii and gradients.

In order to deliver high quality connected networks, the design of Redways should deliver all of the items listed in Figure 4. It is easy to create bland, straight-line routes that ignore ‘the experience’ of the end user. Routes that meander, changing alignments are more attractive and have the capability to slow cycles in areas where there may be interaction with pedestrian movements along or across the path, as in Figure 5 below.

<table>
<thead>
<tr>
<th>Figure 4: Redway design requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle speeds up to <strong>20mph</strong> on commuter corridors and <strong>12mph</strong> on local access routes</td>
</tr>
<tr>
<td>Alignment to control cycle speeds on the approaches to junctions or hazards</td>
</tr>
<tr>
<td>Minimal effort on gradients</td>
</tr>
<tr>
<td>Good forward visibility to other path users, hazards, obstructions and junctions</td>
</tr>
<tr>
<td>Good quality surfaces that are well drained and well maintained</td>
</tr>
<tr>
<td>Aesthetically pleasing route that blends into its immediate surroundings</td>
</tr>
<tr>
<td>Removal of sudden direction changes or steep cross falls and reduce risk of skid hazards</td>
</tr>
<tr>
<td>Although trees can form an important part of the Redway landscape, new trees should be carefully considered and located with future root growth in mind.</td>
</tr>
</tbody>
</table>

Figure 5: Example of Meandering Alignments
Vertical alignments should seek to minimise the impact of local topography, but retain a degree of directness for Redway users. A steeper path, up to 1 in 15, that meanders may be more preferable to a lengthy detour. Always consider all Redway users in any design, and where appropriate allow for resting platforms or additional flights of steps on a direct line. Where steps are necessary they should never be placed in the direct path of a Redway.

Redway routes may entail transitions from one type of route to another, e.g. railway path to canal towpath. Where this involves significant changes in levels earthworks will be necessary to ensure seamless transition. Structural solutions may be appropriate where there are space constraints, but these may come with other requirements such as planning, and the ability to construct may add further constraints. Ultimately, all users of the Redway should be able to easily transition from one route to another.

Redway routes that are close to trees should consider the impact of tree roots on construction methods, pavement design and future maintenance. Routes should not be designed to pass directly under the canopy of trees, but to move towards, or beyond, the outer limits of the canopy where it is practical to do so. Engagement with the landscape team is essential to understand more detailed requirements to ensure that damage to both path and tree is reduced and leaf fall is limited on the Redway surface.

### 2.2.2 Gradients

Redway users, particularly wheelchair users, cyclists and people with mobility issues, generally prefer to avoid steep uphill gradients. Walking, scooting or cycling uphill requires effort and could be a deterrent to active travel. LTN 2/08 and TA90/05 (DMRB) recommend that designs should aim for the gradients shown in Figure 6. Redway routes crossing steep slopes may be the only option available but the impact of the gradients should be reduced by meandering up a slope. Where possible, route designs should aim for constant gradients on an incline because these require less energy input than irregular gradients (Figure 7).

Achieving constant and less steep gradients can be achieved in three ways:

- **Earthworks** – cuttings and embankments to ‘smooth out’ irregular gradients or reduce total level difference.

<table>
<thead>
<tr>
<th>Gradient</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>1 in 33</td>
</tr>
<tr>
<td>5%</td>
<td>1 in 20</td>
</tr>
<tr>
<td>7%</td>
<td>1 in 14</td>
</tr>
<tr>
<td>&gt;7%</td>
<td>Steeper than 1 in 14</td>
</tr>
</tbody>
</table>

---

**Figure 6: Gradients (Source LTN 2/08)**
• **Structures** – bridges or tunnels to avoid valley bottoms or hill summits.

• Adapting the **route alignment** – creating a zig-zagging route up a slope or diverting to avoid the highest / lowest points of the slope, incorporating level resting platforms at 10metre intervals.

Each solution has different merits and challenges in terms of user convenience, aesthetics, land take, environmental impact, and cost, but are necessary to create functional, attractive, convenient and pleasing active travel routes.

Steep gradients increase the speed differential between different cyclists and can have an impact upon the comfort and safety of pedestrian users. The width of Redways should be increased where possible to enable cyclists to overtake slower moving users. Visibility should be clear where there are junctions abutting steep gradients and warning signs and lines may be required to notify users of the potential conflict.

For Redways underpasses, connections to other routes may involve a significant level difference (**Figure 8**). **Gradients should be kept to a minimum as per guidance above.** This will improve the perception of personal security as well as user convenience. In order to reduce the level difference and gradient and/or length of the links to connecting routes, it may be advantageous to change the level of the main Redway route locally; a gentle gradient can be introduced on the approaches to the link to reduce the height of an embankment or raise the base of a cutting.

![Figure 7: Consistent Gradient (Source LTN 1/12)](figure7.png)

![Figure 8: Accommodating Levels: Cuttings & Embankments](figure8.png)
2.2.3 Curve Radii

Desirable minimum curve radii on cycle tracks are governed by the speed. For the 20mph Redway speeds, refer to Figure 9 for minimum radii. Additional width on bends is desirable to provide clearance for cyclists leaning into the curve.

2.2.4 Reduced Radii to Manage Speeds

In some situations, tighter radii are necessary; at junctions or on the approach to an unavoidable hazard. The following minima for the inner radius are recommended in these situations:

- **4.0m** on cycle tracks, where speed reduction is needed, Photo 3.
- **A 45º chamfer** at track junctions can be used as an alternative, Photo 4.
- **2.0m** at an intersection between Redways or between a cycle track and the carriageway. NO RIGHT ANGLED junctions or corners are allowed, Photo 5.
- Use of a 2.0m radius or a 45º chamfer at track junctions will assist cyclists, pedestrians and users of mobility scooters.

<table>
<thead>
<tr>
<th>Figure 9: Turning radii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of cycle route</td>
</tr>
<tr>
<td>Super Redway commuter route</td>
</tr>
<tr>
<td>Redway local access route</td>
</tr>
</tbody>
</table>

Photo 3: Geometry to slow cyclists (Bristol)  
Photo 4: Chamfer at Intersection (Royston)  
Photo 5: 2m Radius at intersection (Northampton)
2.2.5 Forward Visibility

The following table relates to visibility, both at junctions and for general forward sightlines. Design speed, as with the road network, has a major impact upon what is safe, or perceived to be safe and Figure 10 shows recommended forward sight distance parameters for speeds of 12mph and 20mph. Stopping sight distance (SSD) should be provided throughout a Redway to ensure user safety. It comprises the distance travelled by a cyclist (the fastest moving Redway user) in the time taken to react and stop.

Sight distance in motion (SDM) is the (significantly greater) distance a cyclist needs to see ahead when riding in order to feel safe and comfortable; typically this is the distance covered in 8 to 10 seconds towards a fixed object. Sight distance in motion will increase in situations where there is an unavoidable narrowing of the cycle track, because of the closing speed of oncoming cyclists. Routes should be designed (and maintained) to achieve SDM visibility wherever possible.

Where trees are located close to a Redway, base tree branches should be high enough to ensure that forward visibility, and potential inter-visibility between users is improved. Street furniture should also be located so that Redway users do not get obscured by signing, control boxes, A Boards etc. This is particularly important for children, wheelchair users and recumbent cycle users as they will be easier to miss. Figure 11 provides visual explanations.

<table>
<thead>
<tr>
<th>Type of cycle route</th>
<th>Speed</th>
<th>Minimum stopping sight distance (SSD)</th>
<th>Sight distance in motion (SDM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Redway</td>
<td>20 mph</td>
<td>25 m</td>
<td>80 m</td>
</tr>
<tr>
<td>Redway</td>
<td>12 mph</td>
<td>15 m</td>
<td>50 m</td>
</tr>
</tbody>
</table>

The values for Sight Stopping Distances pertain to a level route with a sealed surface, at the speeds shown. SSD will increase significantly at greater speeds and for downhill gradients, poor surface condition, wet or icy conditions, after leaf fall, and for poorly maintained cycles. SSD values on unsealed surfaces should be increased by 50%.
It is essential to achieve SSD and SDM should be achieved within an envelope of forward visibility as defined in Figure 11. The envelope of forward visibility required by cyclists is measured slightly differently to that for motor vehicles.

### 2.2.6 Visibility at Junctions

Where a Redway joins a road or another cycle track, adequate visibility must be provided. Normally designs provide the X and Y distances as defined in Figure 12. Recommended Y distances are also given in Figure 13. Warning signing for road and Redway users will be required at priority crossing points.

It is possible to overcome visibility concerns through re-aligning paths so that a reduction in cycle speeds is achieved on the approaches to a road crossing or junction of path networks. Photo 6 highlights a change in alignment for the greenway as it crosses an existing quiet road, and deviates from the natural straight line.

#### Figure 12: Redway Junction – Sight Lines (Standard Detail 4 – Redway Design Manual 1991)

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Road Classification</th>
<th>X distance</th>
<th>Y distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through Route</td>
<td>3, 4 and 4a</td>
<td>4.5</td>
<td>70</td>
</tr>
<tr>
<td>Through Route with traffic calming</td>
<td>3, 4 and 4a</td>
<td>4.5</td>
<td>35</td>
</tr>
<tr>
<td>Cul de Sac</td>
<td>4b and 5</td>
<td>2.5</td>
<td>35</td>
</tr>
<tr>
<td>Cul de Sac with traffic calming</td>
<td>4b and 5</td>
<td>2.5</td>
<td>25</td>
</tr>
<tr>
<td>Minor Redway junction with Main Redway</td>
<td>-</td>
<td>2.5</td>
<td>20</td>
</tr>
<tr>
<td>Redway T Junction</td>
<td>-</td>
<td>2.5</td>
<td>20</td>
</tr>
<tr>
<td>Redway crossing</td>
<td>-</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

#### Figure 13: Visibility at Redway Junctions

![Figure 13: Visibility at Redway Junctions]

#### Photo 6: Changing horizontal alignments to slow cycles (Dewsbury)

![Photo 6: Changing horizontal alignments to slow cycles (Dewsbury)]
## Road Crossings

### 3.1 General Principles:

<table>
<thead>
<tr>
<th>Design Principle</th>
<th>At crossings</th>
<th>At junctions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Directness</strong></td>
<td>Avoid deviation from desire lines.</td>
<td>Priority for Redway users at junctions, across private driveways and cul-de-sacs.</td>
</tr>
<tr>
<td></td>
<td>Reduced speed on the approach to crossings, with clear prioritisation for Redway users, which will encourage and enable active travel with minimal delays for all road and Redway users.</td>
<td>Protected merges for where Redway routes link back to carriageways.</td>
</tr>
<tr>
<td></td>
<td>Avoid squeezing space through excessive guard railing.</td>
<td>Enable clear and safe passage for all Redway users</td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Reducing conflict between various transport movements.</td>
<td>Simple layouts that minimise turning movements.</td>
</tr>
<tr>
<td></td>
<td>Reducing kerbside waiting times.</td>
<td>Visibility between modes of travel.</td>
</tr>
<tr>
<td></td>
<td>The number of crossing points should be kept to a minimum.</td>
<td>Protected space for right turn movements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduced vehicle speeds with the onus on all road and Redway users to be aware, responsible and in full control of their vehicles, as per the Highway Code.</td>
</tr>
<tr>
<td><strong>Comfort</strong></td>
<td>Flush kerbing with appropriate drainage provision.</td>
<td>Reduced impact of motorised traffic movements on moving and waiting Redway traffic.</td>
</tr>
<tr>
<td></td>
<td>Wide prioritised crossings to give space and uninterrupted, direct, continuous routes for Redway users (Photo 7).</td>
<td>Reduced waiting times and spaces to cross roads safely.</td>
</tr>
<tr>
<td></td>
<td>Maximise usable width on approaches.</td>
<td>Good quality road surface and Redway path surface quality (Photo 8).</td>
</tr>
<tr>
<td><strong>Coherence</strong></td>
<td>Clear signing and the ability to have an intuitive route through at crossings or junctions (Photos 9, 10).</td>
<td></td>
</tr>
</tbody>
</table>
| Attractiveness | Social safety where major roads are crossed or junctions are negotiated via a series of underpasses.  
Junctions provide designers with space to create urban realm improvements. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptability</td>
<td>Designing to accommodate an increased number of pedestrian and bicycle user movements, as well as potential use of ‘E-bikes, E-scooters and new innovative forms of transport’</td>
</tr>
</tbody>
</table>
3.2 Road Crossings and junctions

Where a Redway crosses a road, the Redway should be given priority over the road. Redways should provide safe, direct, convenient, uninterrupted routes. For new developments this can be included in the early stages of design. When retrofitting design on to the existing Redway network, each junction will require a full safety assessment.

Typical of many existing estates where Redways follow streets internal to them, it is permissible for driveways to cross the Redway. Care needs to be taken however that cars, cyclists and pedestrians leaving houses located adjacent to Redways have good visibility over the Redway to the front to avoid accidents with cyclists in particular. To ensure appropriate visibility there should be a 2m strip of adoptable highway between the Redway and the property boundary. Front boundary treatment in these cases should be no more than 1m in height.
3.2.1 Raised Priority Crossings

Where a Redway crosses a relatively lightly trafficked street*, the Redway can be given priority over the road without the need for signalised crossings and expensive infrastructure. This treatment will help to maintain continuity and priority for cycle routes alongside main roads. The crossing should generally be sited on a flat-topped road hump to ensure low vehicle speeds (Photo 11) although this treatment is not always possible on key bus routes. Road narrowing may be used as a traffic calming measure to make road users more aware of their surroundings. This treatment can be used at crossings of side roads where they join a larger road, or mid link. Treatment options with and without bending out the Redway can be considered. Where speeds on the main road exceed 30mph consideration should be given to the Redway track being set back, with this informed by specific site conditions (visibility and the speed, volume and mix of traffic using the side road). For any set back the Redway should not deflect more than 4 degrees. If the track is not to be bent out then reduced entry radii should be included in the design.

Traffic calming measures, along with signs and lines will make it clear to motorists that they must give way to Redway users (Photo 12). The Redway surface and colour should continue over the road crossing point as a visual cue that the Redway is continuous. There should be sufficient inter-visibility between drivers and Redway users approaching the road and Redway junction. This helps cyclists to maintain momentum as well as ensuring safety and enables drivers to adjust their driving speed on approach to allow Redway users to cross.

Coloured high skid resistant surfacing can be helpful to enhance driver awareness, and adequate street lighting is essential.

*With 85th percentile speeds at or below 30mph with flows below 4000 vehicles per day
Benefits

- Continuous, direct, safe, attractive, uninterrupted routes for Redway users
- Encourages 20mph speeds on approach in to and on residential estates - the target vehicle speed in all residential areas in Milton Keynes.
- Supports the Transport User Hierarchy and the creation of built environments that encourage greater and safer use of sustainable transport modes. Developments and new transport scheme proposals should meet the needs of transport users in the following order of priority:
  - Pedestrians and those with impaired mobility
  - Cyclists
  - Passenger transport users
  - Powered two wheeler (mopeds and motorbikes) users
  - Other motor vehicle users

Key design features

- The coloured Redway surfacing should be continuous over the road crossing point so that it is clear that the Redway user has priority over the road.
- The crossing should generally be sited on a flat-topped road hump to ensure low vehicle speeds, however this is not desirable on bus routes.
- Road narrowing should be considered to reduce vehicle speeds and encourage traffic calming, creating an environment which is more conducive to safety and an awareness of pedestrian, cyclists and other road users. However, road narrowing should be designed so as to not inconvenience people who choose to ride a bike on the carriageway.
- For side streets, consideration may be needed on whether there is enough space for vehicles to stop clear of the main road when having to give way at the crossing.
- Illuminated Give Way signs and lines are required as per the revised Traffic Signs and General Directions (TSRGD) 2016.
- Tactile paving is required on Redway junction where it meets the road and at the junction with any adjoining footpaths.
- A single centrally located bollard located at road/Redway junction may be required to alert motorists to presence of Redway and to alert Redway users of the road crossing. Bollards also prevent vehicles illegally accessing the Redway.
- Signage indicating shared space to be used when footpaths meet shared Redways. Location of signage should consider RDM and TSRGD guidelines regarding placement of infrastructure in relation to the Redway and visibility at junctions. Street clutter should be minimised wherever possible.
Where there are gradients on approach to a road/Redway crossing that increase speeds, TSRGD diagram 1058.1 SLOW (Figure 14)

Coloured high skid resistant surfacing can be helpful to enhance driver awareness.

Adequate street lighting is essential.

3.2.2 Blended Footways (including private driveways and cul-de-sacs)

Blended Redways should be considered where low traffic volumes use the access road and vehicle speeds are also low on the private forecourt/access road/cul-de-sac. At these locations the shared use path material is simply continued unbroken across the mouth of the junction (Photos 13 and 14) – similar to a private driveway.

Photo 13: Blended footway cycle track and pedestrian route (Nottingham)

Photo 14: Blended footway pedestrian route (London)
3.2.3 Parallel Pedestrian & Zebra Crossings

Where it is not possible to install a raised priority crossing point, due to vehicle speeds and volume of traffic, a Zebra, Parallel or signalised crossing should be considered.

Timings for signalised crossings on Redways and Super Redway routes will be optimised to benefit main cycle and pedestrian movements. This reduces kerbside waiting, improves safety for the Redway user and promotes and enables active travel. The preference would be for non-signalised crossings wherever possible as this reduces the waiting time for both Redway and road users.

The revised Traffic Signs and General Directions (TSRGD) 2016 includes a priority crossing similar to a Zebra crossing with provision for both cyclists and pedestrians. This new crossing type allows for parallel pedestrian and cycle crossings without the need for signal control. This priority crossing is similar in appearance to a zebra crossing but with a parallel route for cyclists, marked with diagram 1055.3 ‘elephants’ footprints’ within the controlled area of the crossing (Figure 15). Cyclists do not need to dismount at this crossing type when installed as part of a continuous, safe route. Photos 15 and 16 below give examples of this type of crossing in practice.

![Figure 15: TSRGD Diagram Number 1001.5](image)
![Photo 15: Nottingham](image)
![Photo 16: Kings Lynn](image)
### 3.2.4 Signalised Crossings

Signalised Toucan crossings in urban areas are preferred where there is a greater pedestrian and cycle presence, as Zebra crossings are not necessarily suited to areas of high demand. Where there was no previous provision, suppressed demand may be higher than anticipated, especially in residential areas.

Signalised crossings should not be used where 85th percentile speeds exceed 50mph.

**Benefits**

- Signalised crossings can give priority to Redway users and can be set to respond to demand with minimal delay
- Signalised crossings can allow cyclists to re-join the carriageway ahead of traffic

**Key design features**

Minimise delay at road crossings.

Toucans that have a long delay time before going green once a demand has been registered cause frustration and lead to frequent attempts to cross before the green light.

Technology should be incorporated into new crossings. Microwave sensors are capable of detecting users approaching and waiting at kerbsides. Detector loops cut into approach paths can call the pedestrian/cycle signal stage so that the pedestrian/cycle signal is green when the user reaches the crossing.

Crossings should be located on desire lines ([Photo 17](#)), and provide direct connections to Redway routes on either side of the road. Diagonal Toucan crossings are appropriate where approach tracks to a crossing are not aligned, thereby avoiding a dog leg.

In addition to providing a safe and convenient crossing for cyclists, a Toucan crossing should also take account of cyclists wishing to join or leave the carriageway at the crossing. Whilst joining the carriageway can generally be done direct from the crossing manoeuvre, cyclists leaving the carriageway to access the Toucan need a separate slip off the carriageway in advance of the crossing to avoid potential conflict.

Use of high level nearside displays on Toucans, as the display can be masked by a group of cyclists/pedestrians.

LTN 2/08 Cycle Infrastructure Design states that “staggered or split crossings are not generally recommended for cyclists, because they can cause delay to people crossing and give rise to potential conflict between cyclists and pedestrians”. LTN 2/95 recommends that if a road width is greater than 11m a staggered layout should be considered and if it exceeds 15m a staggered crossing layout should be provided.

There are an increasing number of examples of single stage Toucan crossings over dual carriageways and other wide roads which operate satisfactorily, and give significant advantage to cyclists. ([Photo 18](#))

Where a Toucan crossing is required on a wide road, a single-stage crossing should generally be provided for widths below 15m. For widths over 15m, the option of a staggered layout crossing should be considered.
Where a two-stage Toucan operates under SCOOT, delays for cyclists may be increased. However, it is possible to improve its performance for cyclists by considering it as a multi-node, in effect treating both halves as a single crossing.

Where staggered or multi-stage crossings are the only viable solution, Redway designers should maximise space within the central waiting areas by realigning kerb lines or removing guard railing. Use of containment kerbs can be an effective means to avoid use of guard rail (Photos 19 and 20).

Photo 17: Allow for parallel pedestrian and bicycle traffic (Glasgow)
Photo 18: 4 traffic lanes wide toucan crossing (Belton)
Photo 19: Removal of guard rail and other street furniture to maximise space for pedestrian and bicycle traffic (Croydon)
Photo 20: Include pedestrian provision on new segregated routes (London)
3.2.4 Informal Redway crossing or road junction

Non priority crossings are discouraged, but where priority crossings cannot be implemented safely such as in some older urban areas, they can be considered. Informal crossing points should simply be denoted through a set of dropped kerbs. The design or adaptation of junctions to facilitate and encourage cycling and walking on Redways should provide convenient, comfortable passage through the junction, catering for all possible manoeuvres and match desire lines. Key features are:

- The length of dropped kerbs installed is wider than the connecting path.
- Kerb upstands should be minimal.
- Drainage requirements must be considered, with gullies placed to intercept run off before reaching the crossing.

3.2.5 Central refuge

Where Redway routes cross roads with speed limits greater than 30mph, or where vehicle flows are high, it can be difficult to find an adequate gap in the traffic to cross the carriageway in one movement, even with prioritised crossing points and traffic calming measures. A central refuge may be required which allows crossing to be undertaken in two easier movements and can considerably reduce the time taken to cross a road. However, the arrangement needs to be carefully designed to avoid the refuge creating pinch points that can disadvantage cyclists using the carriageway. Provision of a refuge for uncontrolled crossings is not ideal or preferable, but is appropriate where two-way vehicle flows exceed 6,000 vehicles per day and 85th percentile speeds are greater than 35 mph as follows:

- Urban: two-way traffic flows less than 8,000 vpd; 85th percentile speeds less than 50 mph.
- Rural: two-way traffic flows less than 10,000 vpd; 85th percentile speeds less than 60 mph.

Key design features

- Central refuges should be a minimum of 2.0m wide (between traffic lanes) and at least as long as the width of the approach tracks. Refuge dimensions should cater for peak flows in excess of current usage and allow for groups of cyclists (especially families) to wait together. Where a refuge of adequate width cannot be accommodated, a signalised crossing may be needed.
- A straight line crossing is generally preferred.
- Designs should avoid refuges that retain a running lane width of between 3.1m and 3.9m. This range of dimensions causes difficulties for cyclists using the carriageway because drivers attempt to pass cyclists at the refuge where there is inadequate lane width. Where lane widths are 3.0m or less, drivers tend to wait behind cyclists at the refuge.

---

1 85th percentile speeds greater than 35 mph precludes use of a zebra crossing
### 3.2.6 Redway Crossing Design Summary

<table>
<thead>
<tr>
<th>Figure 16: Redway crossing design requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority for Redway users. It should be easier and more convenient to travel actively than it is by car, as per the Transport User Hierarchy.</td>
</tr>
<tr>
<td>Designs need a strong visual priority including at least a 20% tonal surface difference.</td>
</tr>
<tr>
<td>Low vehicle entry and exit speeds needed which should be reinforced through tighter junction geometry, traffic calming measure, raised tables, road narrowing to force speed reduction.</td>
</tr>
<tr>
<td>Maximum visibility with minimum street clutter.</td>
</tr>
<tr>
<td>Site by site basic safety assessment.</td>
</tr>
<tr>
<td>Smooth and attractive ‘at level’ surfacing.</td>
</tr>
</tbody>
</table>
3.3 Underpasses

- Gradients should be minimised as much as possible (section 2.2.2). Where underpasses are provided (down then up) is more comfortable for cyclists than bridges with approach ramps.

**Key design features**

- Underpasses should have a minimum width of 5 metres without level changes but with flush edging.
- Underpasses attract high numbers of pedestrians and cyclists and the aim should be to provide effective segregation (without level changes) so that each group can travel at their preferred speed (Photo 21).
- Underpass approaches and the crossings themselves should be straight or nearly straight. Right angled turns are difficult for cyclists to negotiate.
- Gradients should be within the maximum values given below, depending on slope length. Gradients steeper than 7% are not recommended.
- Where the topography is favourable the need for approach ramps can be minimised.
- Vegetation in the vicinity of subways should comply with what is stated in the ‘Specification for Highways and Construction Works’, i.e. ‘There should be no planting other than grass seed or turf within one metre of the carriageway (or Redway) or within visibility splays. Landscape Architects team will advise on appropriate, location specific, solutions.

The key minimum dimensions for new underpasses are noted below:

- Underpasses for use by cyclists require headroom of 2.4m (2.7m for lengths over 23m) and width of at least 4m.
- Headroom of 3.7m is required for mounted equestrians.

Other design considerations that are important for underpasses include:

- Lighting should be vandal proof.
- Ceilings and walls should be finished with light reflective paint.
- No corners/recesses.
- Exit must be visible on entering the subway.
- Generous headroom and width will be highly beneficial in terms of subjective safety, natural surveillance and personal security.
- A greater width or walls diverging towards the top increases natural light.
- Light wells are desirable to maximise natural illumination. Where an existing underpass is being adapted for use by cyclists consideration needs to be given to wildlife that might use the feature. In particular where an underpass is not currently well-lit it may act as a roost site or commuting route for local wildlife that would be disturbed or prevented from using the feature should it become well-lit throughout the night.

4  Access & Speed Controls:

4.1  Overview:

Illegal use of Redway routes and excessive speeds by some cyclists can be problematic to other path users. Managing these issues too often defaults to installing barriers that in turn compromise the access for other legitimate Redway users (Photo 22). Most impact is felt by mobility impaired users and family groups.

Where vehicle access control is necessary and/or to indicate to cyclists to slow down approaching a road crossing, a single bollard located centrally leaving between 1.6 and 1.9 metres either side is the default option on the Redways. With clear sight lines, and appropriate signs and lines as per TSRGD (‘give way’ road markings, ‘slow’ markings, illuminated Give Way signs, shared path signage) on the Redway and road, all users will understand the potential conflict ahead. In locations where a single bollard is assessed to be inadequate to control vehicle access, consideration can be given to the installation of two bollards, with spacing in between of 1.5m. This option can further reduce cycle speeds and deter motorcycle/car access, while retaining permeability for users.

4.1.1  Accessibility

Retaining convenient accessibility for legitimate Redway users is essential. Kerbs or barriers can make crossing movements difficult, particularly for wheelchair users and so barriers or excessive use of bollards that compromise accessibility for all users should be avoided. If controls are required they should be designed using the turning movements of mobility scooters and a range of types of cycle (Figure 1, p.8) in order to minimise the impact upon users; this may require additional manoeuvring width either side of the access control.

Any barrier design or bollard layout whilst generally effective in slowing speed, funnel all Redway users to a point where path width is compromised. This can introduce delays as many designs only permit one path user at a time and become a point of conflict between users.
4.1.2 Positioning

Measures that reduce capacity or increase complexity around road junctions may quickly become a hazard to Redway and road users.

Understanding the dynamics of a Redway is essential to any effective control needs. A Redway that is quiet during the working week may become a key corridor for family groups over a weekend. Any controls need to be set sufficiently back from a road edge to allow family groups with trailer bikes to wait safely. As a minimum this should be 5m with localised path widening in the vicinity of the control.

4.1.3 Visibility

Barrier control of any sort needs to be visible to all Redway users. Where Redways link back into the public highway any control measures should ideally be visible to drivers but crucially provide sufficient space for groups of path users to wait safely. Any feature is potentially a hazard. They should remain visible during poor light and at night should be capable of reflecting torch or cycle lights.

4.2 Speed Control

Excessive speeds by some cyclists using traffic free routes can be problematic to other path users. Education of users may have some effect, but in certain instances this will need to be complemented by physical measures. Generally the control of cycling speed is to be avoided, as it reduces the attractiveness of the mode as an alternative to short journeys by car. To control speeds Redway design and education should include:

- Signing and surface markings.
- Horizontal alignment with tighter 4.0m radii on bends.
- Vertical alignment.
- Rumble strips.
- Artwork and interpretation panels.
- Engagement with individual path users, user groups, local schools, employers etc. and active promotion of the path and how it should be used.
### 4.3 Types of access control

Redway access control and guidance on siting and cost is provided below (Figure 17).

**Figure 17: Single bollard/Single row of bollards**

<table>
<thead>
<tr>
<th>Suitable for</th>
<th>Redways, Footpaths, Bridleways</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate costs</td>
<td>£200-£500</td>
</tr>
<tr>
<td>Pros</td>
<td>Minimal impact on the legitimate user. Can be used for signing.</td>
</tr>
<tr>
<td>Cons</td>
<td>Does not prevent access by motorcycles.</td>
</tr>
<tr>
<td>Restricts</td>
<td>Cars, vans.</td>
</tr>
<tr>
<td>Impact on legitimate users</td>
<td>Minimal. Consider potential impact where cycle and/or pedestrian flows are high or where restricted sightlines require cyclists to move away from the path edge.</td>
</tr>
</tbody>
</table>
| Spacing               | Single bollard located centrally leaving between 1.6 and 1.9 metres either side is the default option on the Redways
Two bollards, allow at least a 1.5m gap between bollards and path edge to permit recumbent cycles, tricycles and trailer bikes.
Bollards should have smooth tops and edges and have at least 1.5m between them on a bridleway.
Ideally set bollard at least 5.0m back from the carriageway so users do not have to concentrate on the bollard and highway traffic simultaneously. |
| Height                | 1000mm will ensure that the bollard is visible.
A retro-reflective band may be desirable to improve visibility. |
5 Lighting and Drainage

5.1 Lighting

All Redways are lit and there is a requirement for new Redways to be lit to the standards noted in the Highways Design Guide and Highways Construction Guide. Lighting design should make provision for locating lamp columns at road crossings and Redway junctions. The specification set out in the above document is as follows:

Subsidiary Roads - Redways - and Footpaths BS 5489

<table>
<thead>
<tr>
<th>Category</th>
<th>Av. Illuminance</th>
<th>Min. Illuminance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/2</td>
<td>6 lux</td>
<td>2.5 lux</td>
</tr>
</tbody>
</table>

Standards, advice and legislation - The main national relevant references for the design of lighting along cycle routes are:

- BS 5489-1: 2003 - Code of Practice for the Design of Road Lighting; Section 9 refers to the lighting of cycle tracks and this is the main document that the Council’s Street Lighting Section would refer to if a cycle track is to be illuminated.
- Lighting of Cycle Tracks, Institution of Lighting Engineers (now Institution of Lighting Professionals) Technical Report Number 23, 1998 is largely out of date although its principles can still be applied to a certain degree.

Brief advice is also contained in:

- LTN 2/08: Cycle Infrastructure Design; Section 8.12
- Cycling England Design Portfolio, C.10 Lighting
- The Highways Act 1980, section 65(1) contains powers to light cycle tracks.
5.2 Drainage

Moving water efficiently off and away from a Redway route will increase its longevity, reduce maintenance requirements and encourage greater user numbers. Drainage standards for Redways are included within the Highways Design Guide and Highways Construction Guide.

Drainage for Redways should be constructed according to the specifications set out in the Highways Design Guide and Highways Construction Guide. Of particular importance is that gulley grates should always be installed perpendicular to the direction of travel.

When drainage design is carried out for new Redways consideration should be given to the use of SUDS (Sustainable Urban Drainage Systems) within the landscaping. SUDS features to be considered include:

- **Pre-treatment** steps, such as vegetated swales (ditches) or filter trenches (remove pollutants from surface water prior to discharge).
- **Retention** systems, such as ponds, delay the discharge of surface water to watercourses.
- **Infiltration** systems, such as infiltration trenches and soakaways (mimic natural recharge, allowing water to soak into the ground).

6 Landscaping

Verges

Redway landscaping should be provided to make routes attractive and be planned to place emphasis on the visibility requirements at junctions and points of connections (underpasses, bridges and footpath links to bus stops), and create a sense of safety and security. Key points to note when designing Redway landscaping are:

- The **mature size** of planting should be taken into account.
- Planting in the visibility envelope at any junction between a Redway and a footpath, bridleway, Redway or road, should be grass or ground cover with a mature height of less than 300mm. No trees are to be planted within the visibility envelope.
- Planting in the Redway verge for a depth of 1.5m either side of the Redway should be grass or ground cover with a mature height of less than 300m.
- Tree planting and lighting should be planned together to maximise the effect of the lighting system. The design should show the position of all light columns and trees.
- Trees should be at least 1.5m back from the edge of the Redway. Planting should combine the benefits of trees with opportunities for sustainable
drainage systems. Protection from future root damage to the Redway must be considered.

- Heavy leaf fall trees should not be used close to ramps, corners or tight bends.
- Thorny and poisonous plants should not be used on a Redway route.
- Planting design should ensure good surveillance of the Redway from adjoining roads and development. Escape routes should be provided to housing or roads.
- Mounding within the vicinity of the Redway should be designed to create a 0.5m level of verge in order to avoid soil being washed onto the Redway surface.

**Maintenance**

Redway verges can fall into three rough management categories:

1. That which is regularly mown for amenity reasons
2. Grassland in the wider verge that is less intensively managed
3. Areas that are managed specifically for wildflowers.

All grassland usually requires some management to prevent it being gradually invaded by scrub and woodland.

Verges may not just be grass, they can include other woody or herbaceous species. Maintenance should be considered at the earliest stage of development, appropriate to species attributes and to prevent encroachment into sightlines or onto the Redway.

To prevent vegetation falling into and obstructing paths, the first metre from the edge of a path should be regularly mown, ideally 1-2 times per year. Where a bridleway runs parallel with a Redway there should be a 1m unobstructed grass verge of separation that is mown twice per year. For any new bridleways, the width of the bridleway including verge should be 3.5m. Please refer to the Bridleway Design Manual for further technical details. Areas around seating and signage should also be regularly mown to allow access and visibility. These mown areas can support a variety of wildflowers and best practice includes:

- Mow only when it is required to preserve the path width.
- Where rare species are present leave some patches uncut and allow seeds to set (these patches can be in different places every year).

A wider verge cut is recommended once per year in late summer or autumn to prevent the gradual encroachment of woody vegetation and encourage wildlife. This maintains grass habitat in the wider verge and prevents the route from become too enclosed. To maximise the value of this wider verge to wildlife management should;
- Favour wavy rather than straight edges.
- Retain small patches of scrub, taller vegetation and uncut grassland.
- Avoid cutting right up to the base of a hedgerow or scrub, leave a buffer of taller grass and wildflowers.
- Remove arisings where possible or create hay bales / habitat piles.

Managing grassland for wildflowers can be labour intensive. As such it is a good idea to select patches where the wildflower interest is greatest along the greenway to focus habitat management. Some important principals of grassland management are;

- Cut grass once per year in autumn where wildflower rich patches occur. Consider a second cut in spring in patches where grasses dominate.
- Remove grass cuttings – these smother wildflowers and favour grass growth (these can be piled off your target patch to create habitat for other wildlife).
- Create a varied structure: leave uncut areas, consider using a strimmer/scythe rather than a mower and create wavy rather than straight edges.
- Keep bramble and shrubs in check so they form small patches within the grassland only.

If the patch is not already rich in wildflowers you could also consider;

- Adding yellow rattle seed in autumn: this reduces the vigour of grasses and so favours wildflower growth.
- Rake up dead grass and matted vegetation before adding wildflower seed to the existing sward; use seed from a reputable supplier, ideally of local provenance.
- Import green hay from a nearby species-rich donor site which will contain a mix of local wildflower seeds and invertebrates.
- Non-native or garden varieties of species such as daffodils may be appropriate or other non-native species in urban locations.

Changes in grassland management can be unpopular as locals may think it looks unkempt and temporary interpretation is recommended. In some places user safety would override aesthetics or wildlife conservation.

**Trees**

Working around trees can be contentious. They create privacy, support wildlife and can be a dominant feature of a path; users value them highly but trees can also block light and can perceived seen as dangerous by neighbours. They can also impede users on bike or horse and therefore a minimum height of 2.5-3.5m over the path should be kept free of vegetation.
Tree shape is determined by species, space and light; by managing an open strip where the path is, the uppermost branches (outside of the head clearance area) will slowly spread over the path. Where trees are abundant this can create a tunnel effect making a path dark, damp and raise personal security concerns for some path users. Dense stands of trees should therefore be managed to prevent tunnels developing and to allow trees to develop into mature standards whilst limiting the damage and disease often associated with overcrowding and monoculture planting. Tree species should be chosen with due regard to local soil and climate and attributes which minimise issues such as leaf mulch, fruit or other detritus.

Tree planting should be treated with caution. Improving the variety of native species in the right location can have wildlife and community benefits, however well-meaning tree planting in the wrong location can destroy valuable habitats such as wildflower-rich meadows. Trees can also cause on-going maintenance problems if located too close to paths or structures.

Carefully consider where you can plant trees and what you wish to achieve. Always bear in mind that trees could be in place for hundreds of years and reach a significant size. Where vegetation has been removed natural regeneration may be preferable to artificial planting as it creates more variety and attracts a greater abundance of wildlife. If you are considering planting trees, contact an ecologist or tree specialist for advice.

Trees on Redways, in particular those bordering private gardens, can be a source of conflict. Concerns over safety, shading and leaves in the autumn can put pressure on landowners to manage otherwise healthy and valuable trees. Clear communication and compromise are important in making sure reasonable concerns are addressed.

**Problem Plant Species**

Problem plant species on greenways include invasive non-native species, injurious weeds and ornamental plants.

Species listed as invasive non-native species under schedule 9 of the Wildlife and Countryside Act 1981 often grow on cycle paths, including giant hogweed, Japanese knotweed and Himalayan balsam. There is no obligation to control these species if they occur on land but it is an offence to cause these species to spread. Under public nuisance laws there is an obligation not to let these species spread onto a neighbours land.
Giant hogweed (Photo 23) poses a serious hazard and can cause chemical burns if people come into direct contact with it, children are particularly vulnerable. It is therefore essential that it is eliminated from accessible areas as quickly as possible and not allowed to regrow. Maintenance staff are also vulnerable and only trained and competent personnel following and approved method statement should attempt to control this species.

Japanese knotweed (Photo 24) can damage structures, path surfaces and other features. It is highly persistent and will readily regrow from small fragments of material. For this reason all soils within 7m of a knotweed plant should be considered contaminated land. Regular treatment with herbicide will control knotweed but full eradication can take several years.

Himalayan balsam (Photo 25) dies in the winter and regrows from seeds every year. This species can readily be tackled by staff and volunteers through clearance or hand pulling. Once flowers develop management should stop to avoid spreading seeds and exacerbating the problem.

Injurious weeds

These are species detrimental to agriculture listed on the Weeds Act 1959. It is not an offense to have these species on your land but they should not be allowed to spread onto neighbouring agricultural (especially grazing) land. The species of most concern is ragwort Senecio jacobaea which can harm livestock. Control is only recommended in medium or high risk situations although once ragwort is established it is difficult to eradicate and an early response may be appropriate.
• **Medium risk:** Ragwort is 50 m to 100 m from land used for grazing or feed production: Consider establishing a control programme to prevent it spreading closer. Control may not be necessary if prevailing winds, topography, natural barriers, soil type or other vegetation cover make it unlikely that ragwort would spread.

• **High risk:** Ragwort is within 50 m from land used for grazing or feed production - action should be taken to prevent its spread onto the adjacent agricultural land.

  Young ragwort plants can easily be pulled by hand and more established plants removed using a spade or fork. It is important to wear gloves and also to remove the material from site if the greenway is used by horses as it is when it has been pulled that livestock are more likely to ingest it. Ragwort is biennial so it usually takes a few years to remove it from an area.

### 7 Maintenance

The following local guidance is available regarding Redway maintenance:

• **Winter Maintenance/Winter Maintenance Service Plan.**
  
  o This plan supports key corporate objectives, of which one is: A Healthy City - We want Milton Keynes to be an active, vibrant place with people living long, healthy and fulfilling lives and the Winter Service has a vital role to play in encouraging people to make healthy transport choices throughout the whole year. The approach to Winter Service considers the needs of all types of user and emphasises the need to manage and maintain our streets, footways and Redways to ensure they are safe attractive options for walking and cycling even during inclement weather.

• **Third Party Maintenance.**

• **Highway Code of Practice.**

• **Urban Tree Strategy (in draft)**

**Overall principles:**

• All Redways should be included in an annual maintenance programme and kept in good condition. Redway routes should be prioritised for maintenance to ensure routes are always accessible, usable and attractive which enables active travel, particularly for the most vulnerable users.
Maintained areas and routes enable people to make healthy transport choices all year round. Having invested in the route’s construction it is important that it remains maintained to maximise the life span and functionality of the route.

- Design and materials used should minimise maintenance liabilities. Redways should be included in a ‘lifelong’ maintenance programme which takes into account the life span of materials and how that lifespan can be maximised through scheduled maintenance and care.

- Good design achieves the right balance between initial outlay and long-term maintenance costs – a more expensive surface construction, for example, could have a lower whole-life cost.

- Maintenance should be considered as part of the route development process long before work to build it starts. Secure funding for maintenance at project development stage.

- A poorly maintained route, (pot holed surface, broken glass, broken lights, overgrown vegetation, blind corners and litter) gives out a very different message to the public when compared to something that has good quality lighting, both naturally and artificially, has artwork rather than graffiti, is accessible by street sweepers, and retains a direct well maintained route.
Maintenance should include:

- Regular condition surveys
- Leaf sweeping or blowing (Photo 26)
- Surface damage repairs (Photo 27)
- Clear drainage channels and culverts
- Regular sweeping and litter picking (Photos 28 and 29)
- Mow verges / remove edge creep
- Cut back encroaching trees and other vegetation
- Survey, clean, repair and replace damaged and missing wayfinding signs and totems
- Maintain lighting, furniture, structures
- Develop a wider habitat management plan to enhance the biodiversity value of the route
- Maintenance policies to include Redways
- Frequent route inspections on a bike
- Publicise fault reporting methods, with quick response to problems
Photo 26: Leaves accumulating and creating a slippery surface in autumn. Sweeping or leaf blowing can tackle this.

Photo 27: Do not pull weeds growing through the path surface, use herbicides or other modes (e.g. heat/freezing) if necessary.

Photo 28: Litter on paths is unsightly and unhealthy, adequate bin storage and a rigorous maintenance regime is often necessary.

Photo 29: Well positioned bins can help keep a route clean and tidy encouraging people onto the path.
7.1 Trees

Trees roots can damage paths and create trip hazards. Depending upon the value and protection of the tree and on the extent of the damage there are four main ways to deal with this:

- Careful root pruning (in line with British Standards BS 5837 – Trees in relation to design, demolition and construction and the National Joint Utilities Group Guidelines vol 4).
- Planning the path surface (Photo 30).
- Re-construction of the section of path affected by the roots.
- Tree removal.

The extent of reconstruction depends on the extent of the root damage. It might only be necessary to locally excavate the surface asphalt layer of the path, scrape out excess path base material and resurface the path. Where root damage is more extensive, the whole depth of the path will need reconstructing. Structural geotextiles or structural reinforcement can be used to reduce the risk of future damage at the design and construction stage.

7.2 Surface Degradation and pot holes

The depth, size and location of a pothole on any route used by cycles is always a hazard to be avoided, and repaired as quickly as practicable. Whilst road potholes are reported directly to the highways maintenance team, such a system is not necessarily available for traffic free routes, and the process times are likely to be more prolonged.

An accident with a pothole on a bicycle can have serious consequences, broken bones or worse. Whilst standards are applied to a road surface these are suited to the motor vehicle and are not appropriate for Redway or any other traffic free route. The depth at which potholes are repaired should be much less, around 25-30mm, on a Redway route, but the sooner and shallower the better. The rate at which they are repaired is also reliant on the rate at which
the information is reported, either through routine inspections or by the public – and having a workable system in place that allows for reporting easily and quickly, through a variety of reporting methods really helps.

8. Technology

New technology to enhance the Redway network will be embraced. Good examples are:

Solar cycle lanes

The first Solar panels embedded in a cycle path have recently been installed near Amsterdam potentially generating enough electricity to power three houses (Photo 31).

SolaRoad in Krommenie, the Netherlands, will be the world’s first cycle path with embedded solar panels. The 70 metre path that connects the Amsterdam suburbs of Krommenie and Wormerveer is used by an average of 2,000 school children and commuters per day.

The road is made up of rows of crystalline silicon solar cells, encased within concrete and covered with a translucent layer of tempered glass. A non-adhesive finish and a slight tilt provide drainage and help to keep the surface clean therefore not reducing exposure to sunlight.
**Surface mounted solar studs**

Solar studs (Photo 32) are not a new idea but their quality is improving fast as the technology develops. They were originally developed as a solution for providing lighting.

Models with a long lifespan (8 to 10 years) should be chosen; some cheaper models are advertised with a lifespan as little as two years.

Path maintenance must address issues of leaf fall covering the studs in the autumn and encroachment of verges hiding the studs.

Solar studs can also serve to highlight barriers / bollards in the path, changes in alignment and the edge of a path adjacent to a river.

Lighting is very directional, so closer spacing may be required on bends.

**8. Monitoring**

Information about the way that Redways are used and who are using them is vital when we assess the impact and benefits of projects and initiatives that we have invested in to get more people using our Redways. It helps us understand where to channel our resources and build a business case for further investment.

Information is gathered through a number of ways, from pedestrian and cycle counters, or more recently ‘I-Sight’ where people can see almost instantaneously how many cycle trips have been made past a particular location, to stop and interview surveys where specific journeys can be logged as part of a more user friendly’ survey process (Photo 33).

Sites such as Strava (Figure 18) can collate information about members journeys, building a picture of what/where/when – however accessing the data may be more complex and time consuming.

Typically, monitoring will be used to:
• Compare and prioritle scheme design options.
• Demonstrate that schemes represent value for money.
• Review benefits of an experimental scheme.
• Assess the operation of innovative schemes to learn lessons on how the design might be developed/improved in future.
• Assess progress towards scheme targets and outputs/outcomes.

Figure 18: Apps such as Strava can be used to access key routes.
9. References

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Appendices

Appendix A: Case Studies of Redway Design

**Case Study: Orford Court, Milton Keynes**

Good example of Redway design with clear, level, continuation of the Redway across the entrance to Orford Court.

**Benefits:**

- Continued colouration of the Redway indicates priority for Redway users
- Bollards alert the presence of a road entrance
- Small raised table and junction radii encourage road users to

**Potential Improvements:**

- Improve landscaping in line with RDM guidance to allow full use of the width of Redway
- Paint ‘give way’ lines on the road for road users to avoid any misinterpretation of priority
- Consider bollard removal due to the speed and volume of traffic, and visibility at the junction, or, if they are required for safety, reduce to 1 bollard in the centre of the Redway, on both sides of the junction, with reflective paint to ensure good night visibility.
- Adequate lighting is also required at the junction.
- Road name plate should also be set back at least 500 mm from the Redway.
An example of a well-designed Redway crossing point

Benefits:
• Flush surface crossing
• Raised table
• Good visibility
• Road narrowing to reduce road speeds and notify drivers of Redway users

Potential Improvements:
• Paint ‘give way’ markings for road traffic
• Clear continuation of Redway colouring over the raised table
• Tactile paving where the road meets the Redway and adjoining footpaths.
• Bollards may not be required at all at this location as there is good visibility.
Appendix B - Wayfinding and lining guidance – to be added

Appendix C - Surface and construction material - to be added