



Permeability

Best Practice

Guide

Introduction

Among the priorities of the National Transport Authority (NTA) are to encourage the use of more sustainable modes of transport and to ensure that transport considerations are fully addressed as part of land use planning. Walking and cycling are key sustainable travel modes. These modes of transport can substantially meet the mobility needs of people in carrying out their daily activities, if they are properly facilitated by land use planning.

With this in mind, and in order to help achieve the above priorities, the NTA funds transport infrastructure measures which facilitate and promote walking, cycling and public transport. This funding programme builds upon work already being undertaken by local authorities aimed at addressing gaps in their transport networks. In many cases, these “gaps” comprise situations where demand for walking and cycling in towns and cities is not being met by the transport network. Locations where severance is “built-in” to the environment by high walls or a preponderance of cul-de-sacs, would be common examples. The NTA encourages the transformation of such neighbourhoods into permeable ones, where people can walk or cycle through areas safely and conveniently, and in a manner which confers a competitive advantage to these modes over motorised forms, particularly the private car.

As such, the NTA, in collaboration with South Dublin County Council and AECOM, have developed this policy guidance on how best to facilitate demand for walking and cycling in existing built-up areas. This relates to the retention and creation of linkages within the urban environment for people to walk and cycle from their homes to shops, schools, local services, places of work and public transport stops and stations. In the latter case, by providing connections to existing public transport services, access to these services will be improved and increased levels of use may be expected. This in turn supports enhancement of these public transport services through increased frequency and improved stop facilities, and can also make a key difference in decisions about service retentions.

People need to access services and workplaces on a daily basis. An approach to urban development which creates choice in this regard is therefore required. This guidance note seeks to provide a basis for the delivery of this choice in existing built-up areas by promoting permeability for pedestrians and cyclists, thereby addressing the legacy of severance built-in to recent expansions of Irish towns and cities.

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Part I

The Concept of Permeability

Section 1

What is Permeability



Permeability, for the purpose of this guidance, describes the extent to which an urban area permits the movement of people by walking or cycling. It does not relate to the movement of motorised vehicles and is therefore concerned with providing a competitive advantage to walking and cycling over these modes. Such an approach is known as “filtered permeability” and it is this concept with which this document is concerned. Barriers to filtered permeability can include:

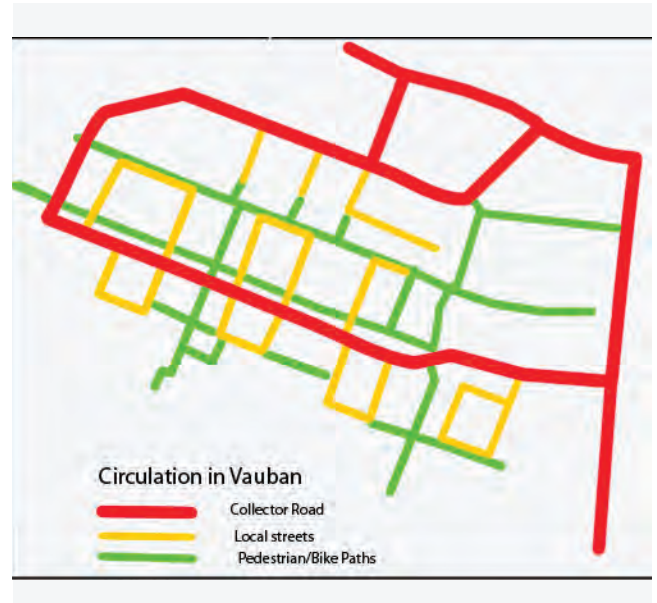
- ▶ Boundary walls around estates and within residential areas that prevent movement along natural desire lines, being usually the shortest and most direct route connecting two points;
- ▶ Cul-de-sacs which prohibit through movement;
- ▶ Poorly designed linkages that are difficult or unattractive to use; and
- ▶ Connections which require much longer travel distances than direct linkages.

A permeable district can contribute to a range of planning objectives related to design, social integration and transport. Permeability can enhance the attractiveness of a neighbourhood through the provision of additional useable open space; can increase social interactions by facilitating more activity in the public realm, and can maximise the potential for walking and cycling to a range of services. This section sets out the main benefits of maintaining and enhancing permeability in our existing urban areas.

1.1 Features of Permeability

A permeable neighbourhood may be defined as a connected neighbourhood. Consider the images on the following page:

Figure 1.1 – Impermeable Neighbourhood vs. Filtered Permeability



(Sources: Manual for Streets, Department for Transport, UK and http://en.wikipedia.org/wiki/Vauban,_Freiburg#mediaviewer/File:VaubanTrafficNetwork-Schematic.png)

In the left-hand layout, quite typical of suburban locations, the preponderance of cul-de-sacs and long winding roads make access from the housing area to the community facilities (in red) difficult by all modes and trips are longer than are necessary. This will encourage the use of the car.

In the second layout, (from Vauban, Freiburg, Germany) designed in a grid format, the area is fully permeable for walking and cycling along all routes, but permeability is maximised for walking and cycling through the provision of links dedicated to these modes. This layout encourages the use of these modes over the use of the private car, which is restricted to collector roads and local streets.

In the second two examples from Dublin below, we can clearly see how these roads are closed off physically to through motorised traffic, while pedestrians can walk along the footpaths either side of the roadway and cyclists are facilitated by the placing of gaps or ramps to allow them through. The example of filtered permeability on the left allows access for pedestrians and cyclists from workplaces through to the Grand Canal amenity and between the Grand Canal Cycleway and a Dublin Bikes station. The one to the right allows access for pedestrians and cyclists between two housing estates, but links larger housing areas to local neighbourhood centres as well as to sports facilities and public transport.

Figure 1.2 – Filtered Permeability in Dublin



Figure 1.3 – Managed Permeability in Central Dublin



In addition to the provision of full ‘round-the-clock’ filtered permeability, there is also the potential to create controlled links which are open for certain times of the day. This “managed permeability” approach would be most amenable in commercial areas which attract large numbers of pedestrians during business hours, but would be largely unused at other times. Figure 1.3 above shows two examples between Harcourt Street, Harcourt Road and Hatch Street in Dublin, which allow for mid-block pedestrian links between different workplace destinations and facilities such as the Iveagh Gardens and Harcourt Luas Stop.

As such, we can summarise the features of a permeable neighbourhood as follows:

- ▶ Interconnected pedestrian and cycle street network;
- ▶ Absence of high walls and fences segregating housing areas and local/district centres;
- ▶ Absence of cul-de-sacs for pedestrians and cyclists; and
- ▶ Secure, well-lit, overlooked pedestrian and cycle links between housing areas and between housing and local/district centres.

1.2 Importance of Permeability

1.2.1 Local Economic Wellbeing

There are tangible local economic benefits to be gained from maintaining and creating pedestrian and cycle links in urban and suburban areas. This is very important in terms of maintaining local, traditional neighbourhood centres or corner shops. If people in a housing estate are discouraged from walking or cycling to their local shop for a quick purchase, they may choose to get in the car. They then may choose to go to an out-of-town centre to avail of a larger range. The pattern becomes one in which one longer car-trip which caters for a range of purchases replaces a number of walking or cycling trips for each purchase.

This has a number of associated effects. While such a pattern is undoubtedly convenient when viewed on the surface, costs increase to the customer due to the use of the car instead of walking or cycling. The need for parking at the out-of-town centre increases. Congestion becomes a feature of the out-of-town centre and the need to service this centre by more roads and upgraded junctions increases costs to the exchequer. Local businesses suffer with their viability reduced as expenditure leaks to adjacent areas.

There is potential for some of these effects to be alleviated or overcome through providing the option of walking and cycling to local centres and this is something that local authorities may examine as a means of promoting and maintaining their existing, traditional main streets and local centres.

An example of this is illustrated below. It comes from Knocklyon in Dublin, where access from a large residential block within walking distance of the neighbourhood centre was provided by a footpath through an open space. A major desire line was evident from the track worn into the grass. Figure 1.4 shows the works necessary to serve the desire line to bring the residential

area closer to the local centre by walking and cycling. Figures 1.5 and 1.5A then show a before and after of the number of housing units within walking distance of the neighbourhood centre with and without the link. Before the link was developed, 1,699 units were within a kilometre of the centre. After the link opened there were 2,089. Taking average household size in this area from the 2011 Census of 2.9, this equates to more than 1,100 extra potential customers for Knocklyon local centre now living within walking distance. The link has had a similar impact on the numbers within cycling distance. This example is elaborated on further as a case study in Part II of this guidance and in the Appendix.

Figure 1.4: Scheme to Formalise Route

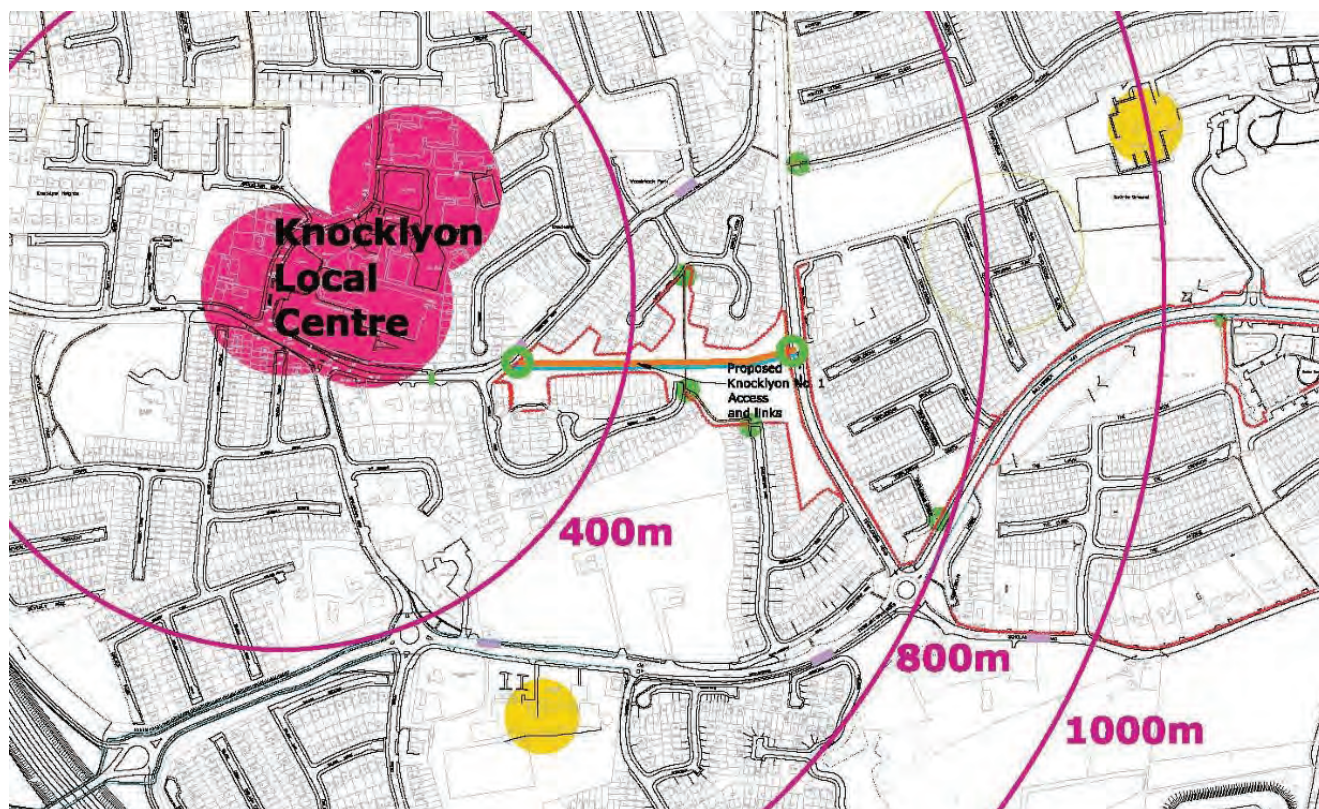


Figure 1.5: Number of Housing Units within walking distance of Neighbourhood Centre WITHOUT link



Figure 1.5A: Number of Housing Units within walking distance of Neighbourhood Centre WITH link



1.2.2 Benefits for Public Transport

Residents of a neighbourhood may not be aware that if a very simple intervention was made, such as a gate being inserted in a wall, their door-to-door journey to their workplace by walking and public transport could be cut to less than their current journey by car. This time saving would likely be accompanied by an associated financial saving. This would help meet the objective of increased use of public transport, thereby maintaining current levels of service and even rendering further improvements viable. Personal stress linked to the daily commute may also reduce, as well as the proportion of income spent on transport.

Transport operators and providers have already seen the benefits of a more permeable built environment and have been actively engaged in promoting permeability in suburban Dublin. For example, the Railway Procurement Agency have sought, in conjunction with South Dublin County Council, to address severance along the Luas Red Line in order to increase patronage.

1.2.3 Health

According to the World Health Organisation, “forms of transport that entail physical activity, such as cycling and walking, separately or in conjunction with public transport, offer significant positive health gains”¹. Forms of urban and suburban development which ‘design out’ these modes as options should therefore be discouraged on health grounds in addition to the reasons set out above. As a corollary to this, by providing for these modes, we can ‘design in’ healthy activity and seek to instil healthy travel patterns into people’s daily lives.

1.2.4 Community Development and Social Capital

Good neighbourhood planning seeks to provide connected neighbourhoods and to create lively and useable spaces in the urban environment. Such an approach, it is believed, helps to increase the social capital of a neighbourhood. This relates to the intangible benefits of day-to-day social interactions, shared norms and values such as cultural interests and community-based activities, as well as residents acting collectively for a common purpose. At its most basic level, this can foster social cohesion and help to prevent the growth of crime, particularly those offences often associated with urban and suburban areas such as vandalism.

By increasing the levels of permeability, the opportunities for social interaction increase, and with it, the social capital necessary for successful neighbourhoods is also increased. If people have a higher tendency to walk and cycle around their neighbourhood, they are more likely to meet each other. Often it is these meetings which give a sense of community more than formal arrangements and a greater sense of community is often cited as a key requirement in addressing many anti-social behaviour problems in Irish urban areas.

A higher number of pedestrians and cyclists in housing estates and neighbourhood centres also changes the perception of a place in terms of safety. Passive supervision, the mere presence of more people, makes the place safer. By maintaining or creating links for pedestrians and cyclists, this enhanced safety can be provided. Design is critical in this regard and this aspect is addressed in later sections.

¹ <http://www.euro.who.int/en/health-topics/environment-and-health/Transport-and-health/data-and-statistics/physical-activity2>

In the case of schools, if a proposal to open a new link would result in more children walking and cycling to school and less congestion at the school at peak times, this would be advantageous. Children would benefit from increased levels of exercise with consequent improved health and fitness. Parents, as well as children, will also benefit from increased social interaction. Schools are a critical element which binds a community together and their role in social capital building can be significantly aided by facilitating walking and cycling on the school trip.

Related to the above discussion, it is vital that the affected communities are fully aware of the likely benefits and any potential disbenefits of increasing permeability. Community “buy-in” is the cornerstone of this approach. Consensus must be sought, insofar as is possible, between local residents and the relevant authorities as to the objective of any proposal to maintain an existing link or create a new one. It should be borne in mind that more than one-quarter of households in Dublin City and Suburbs do not have access to a car and slightly less than one-quarter in the other main urban and suburban areas in the State. The needs of those without access to cars is a critical consideration in terms of social equity.

1.2.5 Key Points

1. Transport planning is concerned with conferring a competitive advantage to walking and cycling over the private car;
2. There are tangible local economic benefits to be gained from maintaining and creating pedestrian and cycle links in urban and suburban areas;
3. A permeable urban or suburban environment which permits people to walk and cycle can benefit public transport operators;
4. Permeable neighbourhoods can have benefits for public health; and
5. Promoting social interaction in walkable and cycleable neighbourhoods can increase social capital.

Section 2

Issues and Challenges – The Legacy of Development Patterns to Date

2

2.1 Urban Form

The legacy of urban development in Ireland can be divided into two phases – the traditional and the more recent. While this is clearly a simplification, with several distinct periods of urban development having occurred, each with their own legacy, it may be useful to categorise them into one phase of development pre-motor car and another post-motor car. The former patterns can be seen in the centres of towns and cities all over Ireland, while the latter is more evident on the edges of these urban areas.

Traditionally, urban areas were developed to a fine-grain. As such, buildings and block sizes are generally smaller in the older central areas of Irish towns and cities than on the edges. There are numerous narrow streets and laneways, criss-crossing, linking residential districts, commercial areas, services and recreational facilities. This layout facilitated the carrying out of economic and social activities in an efficient manner by locating land uses in close proximity to each other, linked by this street network. These tight-knit smaller scale patterns developed as the scale of activity was smaller than it is now and the predominant modes of transport did not lend themselves to long distance travel.

Most of these traditional central districts have maintained their role and function to this day, despite pressure from out-of-town retail development and the ongoing growth of residential suburbs. In Dublin, commercial activity still focuses on the areas around Grafton Street and Henry Street. Fine-grained collections of streets such as Wicklow Street, Drury Street,

Johnson's Court and Castle Market provide the southside of Dublin city centre with its vitality and viability. Likewise on the northside, Liffey Street, Capel Street and Henry Street play a similar role. In between these two centres, the fine-grained medieval street pattern of Temple Bar gives that area its character as a pedestrian dominated cultural, retail and nightlife quarter. In Cork city, the area bounded by South Mall to the south and Patrick Street to the north performs that function, where a grid of pedestrianised streets facilitates a high level of footfall which maintains economic activity.

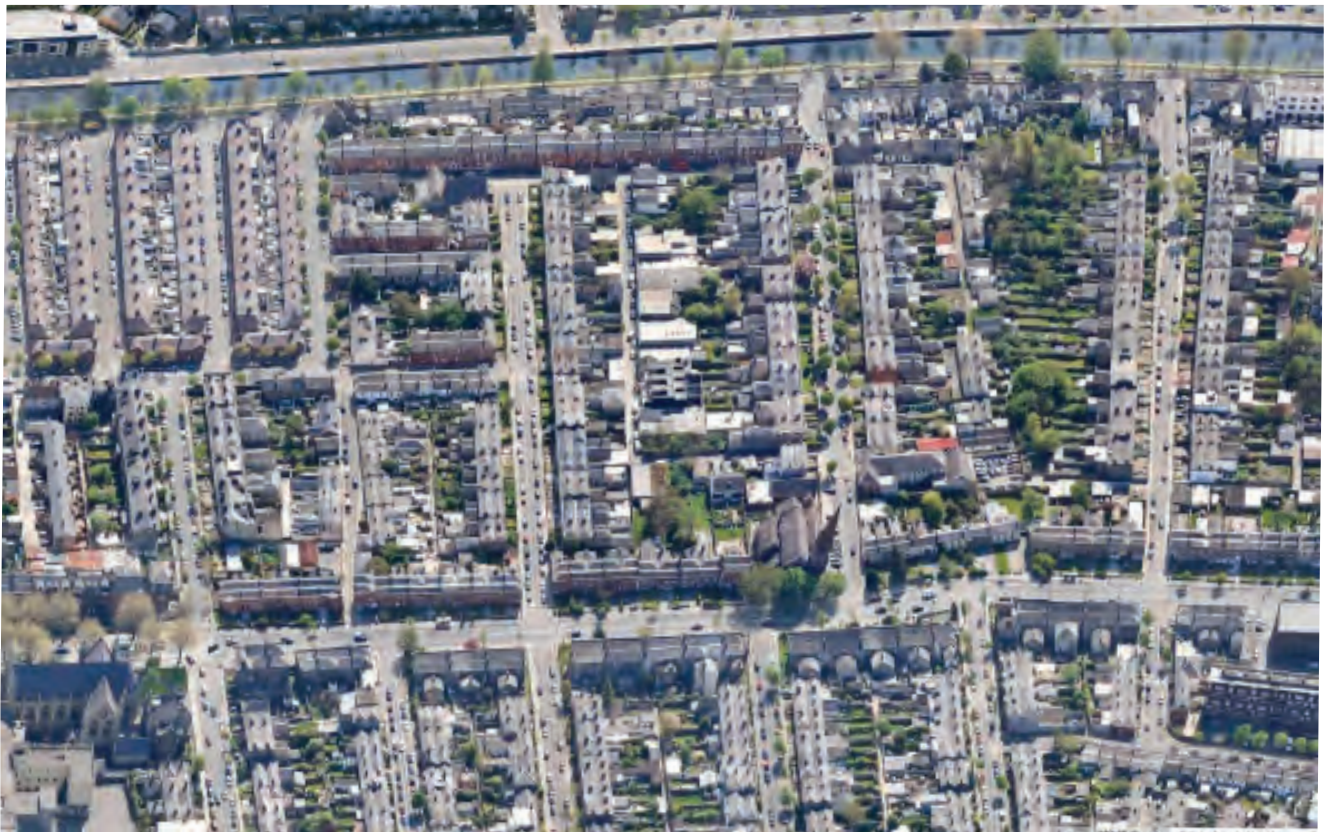
Traditionally, the commercial core of suburban centres which developed in the pre-motor car era, comprised a village main street surrounded by secondary retail streets or small neighbourhood centre-scale multi-occupant developments. In some cases, sites were assembled close to the centre for larger supermarkets with supporting services. An example of this type of suburban centre, Blanchardstown Village, is shown overleaf.

In terms of residential uses in the central areas and inner suburbs, Portobello and the area around the South Circular Road in Dublin (Figure 2.2) maintain their attractiveness as places to live for a wide range of people and families. Other traditional districts such as Stoneybatter / Oxmantown and the South Docks / Ringsend have also maintained, and even enhanced, their appeal. These districts consist of narrow streets, often arranged in a grid pattern. Through routes for all modes are generally available with few cul-de-sacs or long impermeable links. In some cases, motorised through-traffic is prohibited, giving an advantage to walking and cycling.

Figure 2.1: Traditional Suburban Commercial Area in Blanchardstown, Dublin



Figure 2.2: Traditional Inner Suburban Residential District in Dublin – Note the grid pattern



In recent decades, however, the cities, towns and villages of Ireland have undergone unprecedented levels of growth. According to the 2011 Census, 28% of all the housing stock in the State was constructed after 2001. Of these, two-thirds were detached or semi-detached houses. In many cases these were built as part of large housing estates appended onto an existing urban area, be it a suburb, town or village. It was commonplace for such developments to be characterised by a preponderance of cul-de-sacs, high walls or railings with no breaks along long distributor roads, and with no linkages to existing development areas or to local services. This is shown in Figure 2.3 where a long unbroken wall separates two large housing estates. The social objectives of planning, as referred to in Section 1.2 were not met. In fact the exact opposite was achieved in many locations throughout Ireland, as segregation between development areas contributed to a general failure to foster community spirit and boost social capital.

Allied to this, commercial development tended towards large out-of-town shopping centres located on stand-alone greenfield sites remote from the low-density suburbs they were intended to serve, often severed by major distributor roads which skirted the perimeters of the developments. In most cases, the entire centre was surrounded by car parking. Walking and cycling as modes of transport were marginalised. This was in stark contrast to the picture in Figure 2.1.

These more recent patterns, evident in many locations, have resulted in unprecedented dependency on the private car for trips for all purposes nationally. While public transport has also suffered due to the creation of complex and impenetrable road layouts, it is the ability to walk and cycle to local services, jobs and public transport itself that has been most noticeably affected. These difficulties are detailed in the next section.

Figure 2.3: More Recent Outer Suburban Residential District in Dublin



2.2 Transport Implications

The needs of pedestrians and cyclists can be categorised under five headings, as follows:

1. Safety – is it safe to walk or cycle from someone’s house to their destination?
2. Coherence – is it obvious to the cyclist or pedestrian where to go? Is the route legible?
3. Directness – is the route direct?
4. Attractiveness – does the cycle or walking route attract or deter users by virtue of the impression it gives to passers-by and is it well-maintained?
5. Comfort – is the route comfortable to walk and cycle on? Is the surface even and consistent? ²

These five features combine to provide a particular quality of service, and the implications of impermeable neighbourhoods are elaborated on under these headings below.

2.2.1 Safety

The design and environment associated with impermeable neighbourhoods can affect pedestrian and cyclist safety. Figure 2.4 shows a common feature of recent urban development in Ireland – the distributor road. This road is designed to facilitate high volumes of fast-moving vehicular traffic. The high walls on either side combine with its generally straight alignment to give it a canyon effect, while also preventing movement between housing areas.

In terms of safety, we can consider two separate issues – personal security and traffic safety. In terms of the former, there is an absence of passive supervision that would be provided by overlooking houses. A second, but related issue, is that there is no on-street frontage. This would generate activity along the street, adding to the feeling of security often associated with a sense of place. These two features combined makes the environment feel less safe than one in which overlooking and activity are features and one in which crime and anti-social behaviour may be more likely to occur, particularly after dark.

Figure 2.4: An Example of a Distributor Road in Suburban Dublin



² National Cycle Manual, NTA and Design Manual for Urban Roads and Streets, DTTAS and DECLG

In considering traffic safety, the design of the road pictured seeks to eliminate risk and promote free-flowing conditions. Drivers therefore feel more inclined to drive at higher speeds. The creation of such large free-flowing roads in urban areas, where there may be pedestrians, including children and the elderly, may increase the risk of serious collisions.

2.2.2 Coherence

The approach to urban development in recent years may be regarded as somewhat incoherent in the following ways:

- ▶ Routes are unclear due to the number of cul-de-sacs and lack of connection between housing areas and local services;
- ▶ Such layouts are difficult to service effectively by public transport and routeings become circuitous and confusing as a result;
- ▶ Uniformity of development styles and layouts and an absence of landmarks combine to make it difficult for people to know their precise location in an urban area; and
- ▶ Delays at crossings; detours from the desire line to make a safe crossing; and gaps in the network or interruptions, can make a route from, for example, a housing area to local services, inconvenient and frustrating. This may have the effect of discouraging walking and cycling.

2.2.3 Directness

By not providing for safe and direct linkages to local services, people have to walk or cycle along very circuitous routes adding distance and time to local trips. The relationship between the actual distance required to walk or cycle and the direct line distance is known as **Pedestrian Route Directness** or PRD. The lowest possible value is 1.0, with 1.2 - 1.5 regarded as an acceptable standard internationally.

Figures 2.5 and 2.6 on the following pages, taken from work undertaken by Fingal County Council a number of years ago, show how PRD can be applied to Hartstown, Dublin. The Local Authority examined the journey from a housing estate to the local neighbourhood centre.

It can be seen that the nature of the local network gives rise to a PRD of 1.9. In other words, the distance one must walk or cycle to the local centre is almost double the direct line distance. Such a high value militates against cycling and walking as a preferred mode choice, indicates obstacles to accessing public transport services and promotes a culture of car dependency.

Figure 2.6, using the An Post Geo-Directory³ and accessibility software, shows the residential units within 700 metres, point-to-point distance, of the same neighbourhood centre. 700 metres equates to just under 10 minutes' walk. It shows just how few houses in the immediate area have an acceptable PRD. All the green houses have a low PRD and therefore they have a direct route to Hartstown neighbourhood centre. The red houses have a high PRD which means they have an indirect route to the neighbourhood centre. However, the dark green houses still require a journey of over 700m to their local shops, so although they have a direct route it is still beyond what would be regarded as a desirable walking distance to local services.

This type of development is typical of the expansion of Irish towns and cities that occurred in recent years. It has had the effect of dissuading people from walking and cycling, meaning the car has become the norm as a mode for even the shortest trips for the most basic purposes such as the local shop or school.

³ GeoDirectory is a service, jointly established by An Post and Ordnance Survey Ireland, that provides a complete database of all of the buildings in the Republic of Ireland and their geolocation details. It holds records for 1.8 million properties.

Figure 2.5: Pedestrian Route Directness in Hartstown

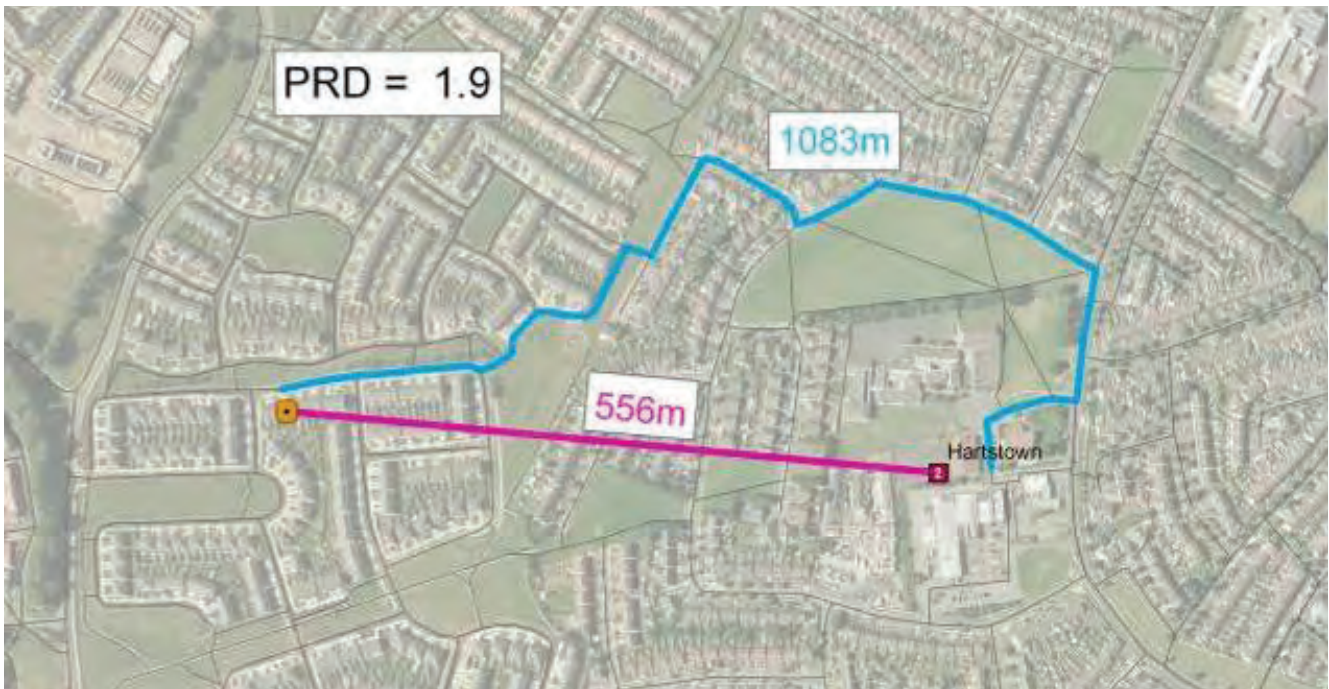
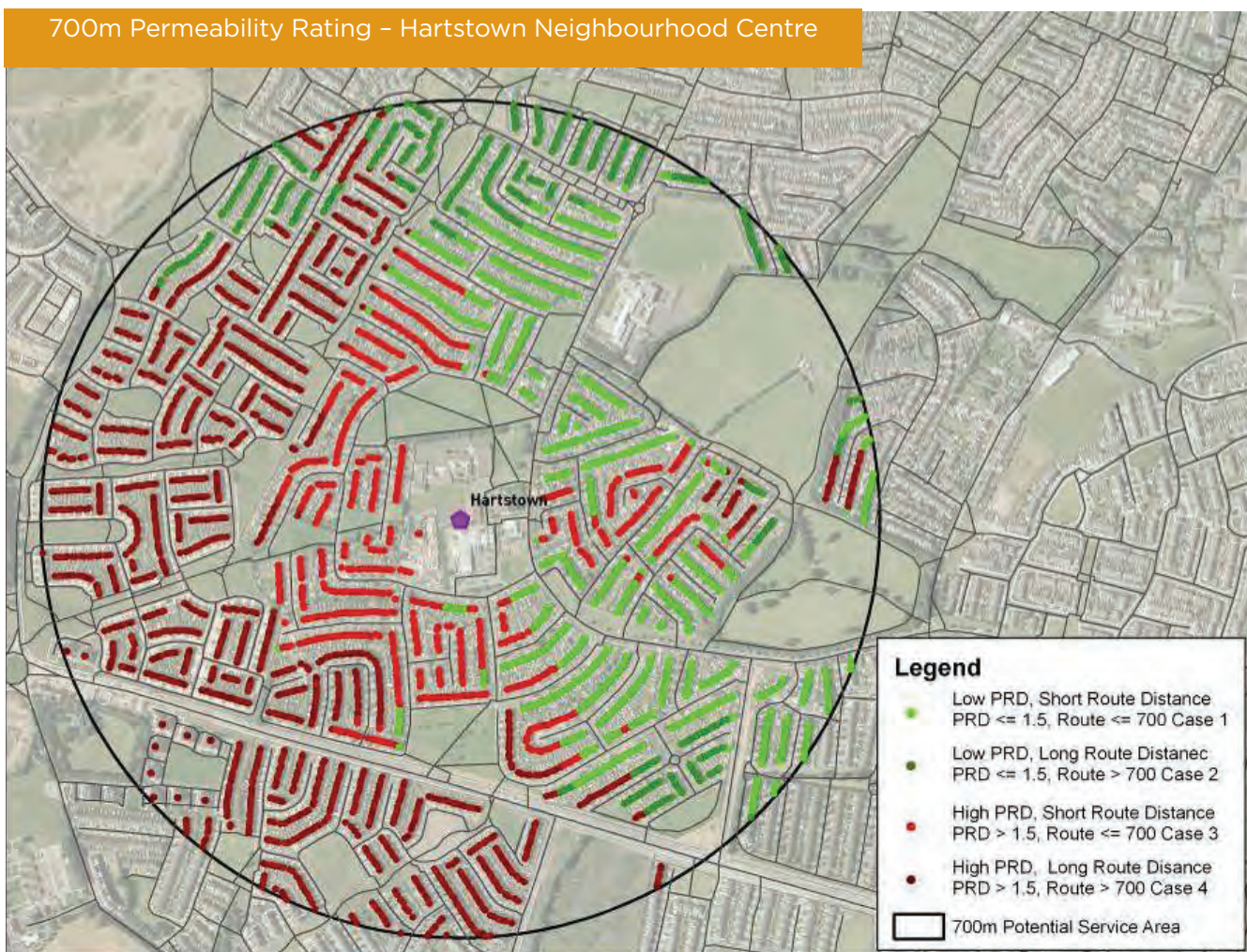


Figure 2.6: Housing Pedestrian Route Directness in Hartstown



2.2.4 Attractiveness

The attractiveness of a route is linked in some ways to the safety aspect outlined above. Certain elements of the nature of a walking and cycling environment may either attract or deter a potential user. In many parts of urban Ireland, the following have been a feature:

- ▶ Unlit footpaths and laneways;
- ▶ Narrow footpaths;
- ▶ Badly maintained footpaths with broken glass and litter present;
- ▶ Wide splayed junctions that seem hostile to pedestrian movement;
- ▶ Overgrowth of vegetation along footpaths or in laneways;
- ▶ Poor visibility – i.e. not being able to see the exit from a route or link;

While Figure 2.4 on page 15 may also be related to this point, in that it shows an inhospitable and unattractive environment for pedestrians and cyclists, it also illustrates quite well an additional point related to the attractiveness of a route. There is a distinct lack of visual points of interest along the route. Such markers make journeys on foot more pleasant and less monotonous. For cyclists the long, bland nature of the journey is not a pleasant experience either. This type of road is typical of many Irish suburbs and has been for many years. They give the observer the message that this is a road for motorised vehicles only.

2.2.5 Comfort

Comfort is the final aspect of the pedestrian and cycling environment worth considering and while it is related back to the previous points, it may also refer to the following further considerations;

- ▶ Is the pedestrian and / or cycle route wide enough to cater for the flows, or is it difficult and inconvenient at busy time? For example, is there room for a cyclist and a small group of pedestrians to pass on a shared footway/cycleway?
- ▶ Are gradients excessive for pedestrians and cyclists?

- ▶ Are there obstructions to pedestrian and cyclist movement? and
- ▶ Is the surface of a high quality and continuous?

2.2.6 Informal Solutions

Allied to the poor quality of service and a general absence of permeability, another aspect of this legacy is the creation of ad-hoc informal links and solutions to overcoming severance by the general public. This is common throughout urban areas and gives planners and urban designers ready-made clues as to the desire lines that should be satisfied through interventions. The images below show this common urban phenomenon clearly:

Figure 2.7: Examples of Informal Interventions by the Public



In the top example, a shopping trolley has been turned over to act as a makeshift stile for

pedestrians to jump over this high wall, which acts as a major barrier along this route. In the second example on the bottom, a large hole has been cut into a palisade fence to allow access. These types of arrangements are common all over Irish towns and cities and comprise a direct reaction to the severance that the planning and development process has built into the urban environment over the last few decades.

This legacy of poor planning of transport linkages and general permeability in some areas is a critical determinant in travel behaviour and has prompted the development of this guidance as a means of redressing severance in urban areas in order to facilitate walking and cycling.

2.3 Key Points

1. There are many instances in the existing built-up areas of the country where the environment is sub-standard and in need of renewal;
2. Low-density suburban areas in particular, fail on many of the above considerations;
3. High speed roads with wide flared junctions and large roundabouts have compromised safety for non-car users in many locations;
4. Complex road layouts, cul-de-sacs and the absence of footpaths have rendered some areas difficult to negotiate for pedestrians;
5. In some locations, even when your destination is clearly visible, it is unclear how it can be reached on foot;
6. Directness has been negatively affected by a preponderance of cul-de-sacs and circuitous road and footpath layouts;
7. Poorly maintained, back-land lanes and informal arrangements are generally unattractive to potential users;
8. Surface quality in many locations is of a low standard and can be uncomfortable and inconvenient, in addition to making certain areas inaccessible for those with mobility impairments.

This guidance is intended to assist local authorities and other organisations in tackling the issues which arise related to those elements of the walking and cycling environment which combine to provide a substandard level of permeability.

Section 3

Best Practice Principles for Maintaining and Providing Permeability

3

This section sets out the guiding principles for maintaining and providing permeability in existing urban and suburban areas, with the objective of overcoming the transport deficiencies associated with the legacy of development in recent years outlined above.

There are a number of existing guidelines and policy documents which aim to enhance the layout and design of urban areas. These include the following:

- ▶ Design Manual for Urban Roads and Streets, (DECLG, DTTAS, 2013)
- ▶ Sustainable Residential Development in Urban Areas, (DoEHLG, 2009)
- ▶ Urban Design Manual – A Best Practice Guide, (DoEHLG, 2009)
- ▶ National Cycle Manual, (National Transport Authority, 2011)

In relation to new development areas, the principles that apply to best practice permeability are found in the DoECLG publications, Sustainable Residential Development in Urban Areas and the accompanying Urban Design Manual, while the Design Manual for Urban Roads and Streets sets out some in the case of retrofitting to existing areas.

It is not the intention to replicate these here but to highlight further some of the critical considerations for maintaining and providing permeability in **existing** urban areas, building on and complimenting those elements highlighted in the Design Manual for Urban Roads and Streets.

As referred to earlier, the critical concept which runs as a common thread throughout this document is that of filtered permeability. This can be defined as the provision of a competitive advantage to walking and cycling by creating or maintaining linkages for these modes in the absence of links for motorised transport. In other words, for any trip in a built-up environment, it should be most direct by walking and cycling, but not necessarily by car. This encourages people to walk and cycle as it minimises the distance and time taken to travel by these modes relative to the car.

With this concept in mind, the key principles governing the creation and maintenance of connections in urban and suburban areas are as follows:

- ▶ Origins and destinations, such as schools and shops, should be linked in the most direct manner possible for pedestrians and cyclists;
- ▶ Greater priority should be given to pedestrians and cyclists;
- ▶ The physical design of links should be fit for purpose in terms of capacity and security; and
- ▶ Junctions in urban and suburban areas should cater for pedestrians and cyclists safely and conveniently.

Further elaboration on these principles is provided in the following sections.

3.1 Link Origins to Destinations Directly

The fundamental consideration for enhancing permeability is to set out the rationale for maintaining or providing a link – who are we serving and for what reason. In this regard, the main origins and destinations in an urban area or district should be identified and links maintained or provided between them. The following should be considered when examining permeability in urban areas:

- ▶ People should be able to walk and cycle directly and safely to their local neighbourhood centre *and* district centre from their houses;
- ▶ Children should be able to walk and cycle safely from their homes to school;
- ▶ Public transport stops and stations should be safely and directly accessible from residential areas.

3.2 Priority for Pedestrians and Cyclists

The amount of time given to pedestrians in the signal phasing at traffic signals should allow for efficient and convenient movement between origins and destinations. In urban areas, the needs of pedestrians should be the primary consideration in this regard, rather than merely maximising the flow of vehicles. In many locations, the use of on-demand pedestrian crossings would be beneficial in terms of providing for permeability in as seamless a manner as possible. For cyclists, a similar principle applies for those locations where they must cross with pedestrians – generally from off-road routes. More details of signal timings can be found in the Traffic Management Guidelines.

3.3 Design of Links

A link needs to be designed in a manner that is fit for purpose and as such will be well used. At the outset it is therefore vital that the precise function of a link is defined based on the anticipated levels of usage and the types of users. This will determine, for example, whether it is a pedestrian-only link or a shared pedestrian and cycleway. In some cases, where usage is expected to be very high, a two-way cycleway and a separate footway may be deemed necessary. The following elements, which are elaborated on below, will determine how fit for purpose a link is:

- ▶ Width and Clear Passage
- ▶ Surface Quality
- ▶ Lighting
- ▶ Overlooking or Passive Supervision

The width of a link will determine the comfort and convenience for users, particularly cyclists in a high use location. The width also has an effect on perceptions of safety, particularly the width of the access points to a laneway. Clear passage is also important. Street furniture should be placed in such a manner as to facilitate ease of movement and the branches of trees should be maintained so as not to obstruct pedestrians and cyclists. The latter is of particular importance for cyclists who may be travelling at speed. Being able to see through to the end of the link can also be advantageous, especially for enclosed laneways in locations where anti-social behaviour is an issue. Figure 3.1 shows these features quite clearly.

Figure 3.1: Wide Access to a High-Quality Visible Link



Surface quality is a critical consideration. Good quality, even and well maintained surfaces are more attractive to pedestrians and cyclists and offer a higher level of service than poorly maintained ones or those made from substandard materials.

Links should be well lit, particularly laneways and links through large open spaces, such as that shown in Figure 3.2. Vegetation must not be allowed to provide cover or hide the link from passers-by. Ideally all links would be overlooked somewhat by housing to allow passive supervision. Anti-social behaviour and crime are less likely in such an area.

Figure 3.2: Good Quality Lighting on a Link



3.4 Junction Design

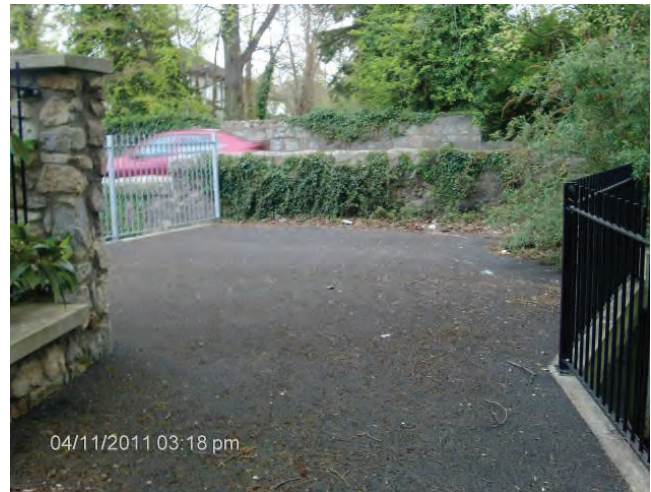
Permeability is not merely about maintaining and providing links. It is also about the treatment of the neighbourhood in terms of the road network. The design of junctions is therefore critical. If an entire residential block is permeable, it is essential that when leaving the block to access, for example, a neighbourhood centre, the pedestrian or cyclist is not confronted by severance caused by a poorly designed junction.

In order that pedestrians and cyclists in the urban environment can reach their destinations safely and conveniently, the following principles apply:

- ▶ Wide-flared junctions should be avoided;
- ▶ Large multi-lane roundabouts should only be used where necessary and full segregation of pedestrians and cyclists applied;
- ▶ Side roads should be single lane entry;
- ▶ Footpaths should be carried through minor road junctions at grade.

More detail on junction design is to be found in the Traffic Management Guidelines and the National Cycle Manual. In both publications, specifics on widths, turning radii and an overall approach which relates design to capacity and quality of service is provided. An example of a greatly enhanced junction and pedestrian crossing is shown in Figure 3.3 from Ballinteer, Co. Dublin. In this case, in order to create a greenway along the river Slang, it was necessary to overcome a significant point of severance in the pedestrian and cycle network. At this location, the link was ended by a stone wall on either side of a busy road. This was overcome by breaking through the walls on either side and by inserting a controlled pedestrian crossing.

Figure 3.3: The Slang River Greenway – Before and After



3.5 Quality of Service Scoring

Taking the issues from chapter 2 and the principles in this chapter, the NTA have developed the table below, which suggests a Quality of Service scoring system for existing and proposed pedestrian and cycling links in full from their origin to destination. This applies equally to those links which have been identified as sub-standard or those which are being proposed to overcome some of the above issues. This is based on a similar approach taken in the National Cycle Manual. For a link to achieve a certain grade, it must have achieved it in 4 of the 6 criteria and the score in both the 5th and 6th criteria can be no more than one level lower. In other words, to achieve level A, the link must attain that level in 4 criteria and level B in the other two.

This table relates to shared pedestrian and cycle links. In the case of pedestrian-only links, the width may be judged at the level below, i.e. a 3-4m footpath would achieve Level A.

Quality of Service for a Pedestrian/Cycle Link from an Origin to a Destination						
Grade	Width	Surface	Lighting	Security	Crossings	Directness
Level A	4m+	Completely Smooth	Fully lit	Fully overlooked	Few but signalised - no significant delays	PRD < 1.2
Level B	3-4m	Smooth but with occasional minor interruptions (e.g. utilities covers)	Fully lit but with some areas of darkness	Some overlooking but secured by high usage	Many but signalised - some delay	PRD 1.2-1.39
Level C	2-3m	Generally smooth but with regular interruptions	Partially lit	Some overlooking but with low usage	Unsignalised crossing necessary	PRD 1.4-1.59
Level D	1.5-2m	Uneven with several significant interruptions (potholes, covers)	Unlit but with some passive light	Not overlooked	Unsignalised unsafe crossing necessary	PRD 1.6-1.79
Level E	<1.5m	Very uneven or unsurfaced	Dark	Not overlooked and low usage	No safe crossings on route	PRD > 1.8

Local authorities in urban areas should aim to provide a Level A quality of service for any pedestrian or cycle links between residential areas and destinations such as schools and shops. There will be many occasions where, due to physical constraints, the width may not be achievable. This would be acceptable, particularly where the anticipated volumes are not high and where pedestrians and cyclists will not be sharing.

It may also not be possible to provide overlooking at all locations along a link due simply to the prevailing patterns of development. Similar rationale may apply to crossings, particularly where a distributor road severs origins from destinations.

Efforts must be made, however, to minimise delay and make crossing as safe as possible across the urban environment. In terms of PRD, the Authority recommends choosing a set of representative origin(s) and destination(s) to be served by the link and determining this index. The scoring system is therefore intended to assist local authorities in making the urban environment as attractive for walking and cycling as possible.

Section 4

Alternatives to Right-of-Way Extinguishments

4

4.1 Context

The preceding sections have set out the case for permeability in urban areas. As such, it has been demonstrated that communities can benefit if direct access by walking and cycling is maintained to the following facilities and services in towns and cities:

- ▶ Bus and tram stops;
- ▶ Rail stations;
- ▶ Neighbourhood centres;
- ▶ Local shops or services;
- ▶ Health facilities;
- ▶ Schools;
- ▶ Supermarkets;
- ▶ Sports grounds and leisure facilities; and
- ▶ Places of Work.

In many urban and suburban locations, the urban form legacy referred to in Section 2, particularly when implemented in socially disadvantaged areas, has resulted in many laneways and formal linkages, where they exist, being unfit for purpose and becoming magnets for anti-social behaviour and littering and vandalism. Inevitably, pressure is placed upon local authorities to close these links. This is understandable, as security for the community and personal safety must be considered alongside walking and cycling permeability.

4.2 Hidden Costs of Link Closures

Related to the discussion in Section 1 on the importance of permeability, it would be useful at this point to set out some of the hidden costs that pertain to the closure of existing links. These may be summarised as follows:

- ▶ Reduced accessibility to public transport resulting in increased car use and congestion;
- ▶ Associated impacts on the viability of the existing level of public transport service; and
- ▶ Impacts on viability of local shops and services.

The National Transport Authority regard each individual closure as a potentially damaging measure in relation to the above considerations. While certain older, seldom used rights of way, such as those to the rears of houses in established urban areas may be closed for security reasons, the maintenance of well-used links or lanes is a critical concern in terms of transport. If we reduce accessibility to bus and rail services in urban areas, it is certain that the levels of patronage will also drop. This would have a multi-faceted impact. Car use would increase leading to increased congestion and emissions. Inevitably, public transport services would be curtailed as they become less economical. This would have the most severe effects on those that require public transport the most – those who do not own a car, cannot drive for medical reasons, or are otherwise mobility impaired.

In terms of shops and other services, as set out in Section 1.1, the closure of existing pedestrian links can have a detrimental impact on local businesses. Short trips to local shops for regular needs such as newspapers and magazines, transport tickets and top-ups, small amounts of daily groceries such as milk or confectionery and services like the lottery and phone credit, are facilitated by the pedestrian network, which often includes rights of way such as laneways. If these are removed, people will be more likely to drive to avail of these goods and services or not go at all. Once the decision is made to drive, people may choose to carry on to a larger town

centre and buy more goods, but at less regular intervals. This will have an adverse effect on the viability of local shops. The traditional model of the local neighbourhood or corner shop is therefore threatened in its entirety by the creation of car-based urban areas which design out walking and cycling.

A single closure may not appear to have these impacts but the cumulative effects of several closures can be significant on a district-wide level. If, for example, a local authority deemed several links in one suburb to be in need of closure, and this severs people from transport services and local shops, it is almost certain that these services would be adversely affected. The NTA is seeking to avoid these negative social and economic impacts by providing an alternative to link closures.

4.3 Alternative Approach

As a general policy, closures of existing connecting links should be the exception rather than the rule. In cases where exceptional circumstances apply and all measures to overcome the issues have been exhausted, it may be accepted that a right-of-way is shut down. The measures that should be considered and implemented before any decision on a link include the following:

- ▶ New enhanced lighting;
- ▶ Removal of overgrowth;
- ▶ Widening of entrances to provide wider sightlines;
- ▶ CCTV cameras;
- ▶ Community Engagement;
- ▶ Upgrade of existing surface materials; and
- ▶ Action against littering and dumping.

These are now elaborated upon.

Visibility and passive supervision are fundamental elements of good permeable neighbourhoods in deterring anti-social behaviour and making links more attractive to potential users. New enhanced lighting is an obvious measure which can deter anti-social

behaviour. In many cases, lighting is non-existent or not working due to either neglect or vandalism. If lighting is not provided, less people will use the route, meaning it becomes more attractive for anti-social behaviour and a vicious circle develops. Lighting is the first step that should be implemented at all links that are being considered for closure.

In the same manner, overgrowth is a deterrent to users. Vegetation can hide the link from public view, cause darkness and provide cover for anti-social behaviour to go undetected. A person entering a laneway, for example, who cannot see into the space, may be deterred as they do not know what or who is in there. The removal of overgrowth which does this, or its reduction to beneath eye level, should be considered in all instances.

Allied to the provision of lighting and removal of overgrowth, the widening of the entrances to the link, if the link is a laneway, helps with visibility and passive supervision, as more passers-by will be able to see into the link, deterring anti-social behaviour.

In extreme cases, CCTV may also be considered as a measure to promote a link as an alternative to closure, in combination with the above physical interventions.

The overarching measure, however, relates to community engagement and the type of “buy-in” referred to in Section 6.1.4. The advantages of permeability must be placed to the fore in any consultations in advance of a link closure. These may be described as follows:

- ▶ Access to local services will remain easier for those without cars, helping to overcome a key element of social exclusion;
- ▶ Those with access to cars may be more likely to walk and cycle if a link is maintained and enhanced;
- ▶ People may get more exercise;
- ▶ Local traffic congestion could decrease if the link is promoted within the area;
- ▶ Local pollution levels may fall;

- ▶ The improvement of an existing link may enable schoolchildren to walk and cycle to school more directly and safely;
- ▶ Personal transport costs may also be lowered;
- ▶ The retention and enhancement of a link may also highlight access to public transport that may not have been widely known previously. If patronage increases as a result, services will be more more viable and less susceptible to rationalisation; and
- ▶ The potential for more social interaction will increase.

If the community supports a link and sees the benefits of its maintenance, the use, supervision and general support for the link may secure its future and secure its safety. If links that are under threat of closure are ascribed a degree of community ownership, anti-social behaviour can be challenged successfully by the mere presence of more people at all times. The role of An Garda Síochána will be crucial and their views will be central to the consideration of any proposal in this regard.

Part II

The Implementation of Permeability

Section 5

Step-by-Step Guide to Implementing Permeability Schemes

5

Part II of this document comprises a step-by-step guide devised in partnership between AECOM and South Dublin County Council for the implementation of permeability schemes. This approach is complemented by a toolkit set out in the appendix. While the NTA has incorporated this approach into this guidance, it should be regarded as one of a number of ways in which to assess a scheme. There are alternative approaches, particularly in the area of GIS analysis and the NTA will collaborate with implementing agencies in order to devise the most appropriate method of analysis for a particular project.

This guide sets out each step in the process of implementing permeability schemes in existing urban areas, under the following headings, elaborated upon below:

- ▶ Scheme Identification
- ▶ Scheme Appraisal
- ▶ Scheme Prioritisation
- ▶ Consultation
- ▶ Scheme Design
- ▶ Evaluation and Monitoring

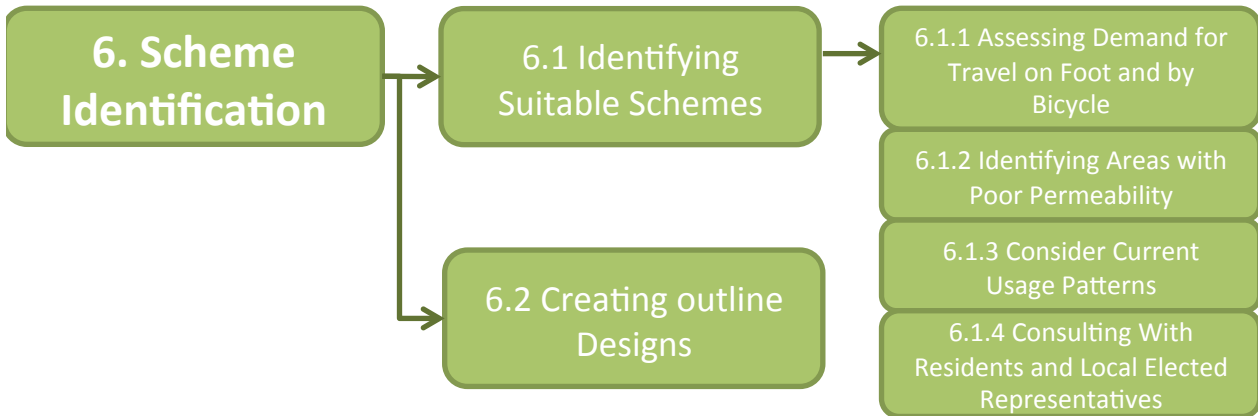
Element	Description
Scheme Identification	A set of potential permeability schemes initially needs to be identified. This can be undertaken through analysis of mapping, discussion with local elected representatives and residents and by using local knowledge.
Appraisal	Appraisal is undertaken to assess the potential positive and negative impacts of each scheme. This is undertaken before implementation to establish the viability and benefits of each scheme.
Prioritisation	Outputs from the scheme appraisal are used to establish a prioritised list of permeability schemes.
Consultation	Various types of consultation with key stakeholders and residents are recommended. The key stage of consultation comes after schemes have been appraised and prioritised and is used to inform final designs.
Design	This is the stage at which the schemes from the prioritised programme are designed in detail, taking on board feedback from consultation and ensuring designs follow best practice and are consistent with guidance and manuals.
Evaluation	Once schemes have been implemented it is important that an evaluation is undertaken to establish whether the scheme is delivering on its intended benefits. Findings from the evaluation can also be used to inform future schemes.

The above steps are presented in more detail in the following sections. To illustrate a typical approach taken to each of the above stages, a case studies has been provided from a scheme implemented by South Dublin County Council in Knocklyon.

Section 6

Scheme Identification

6



6.1 Identifying suitable schemes

Identifying suitable schemes is a simple process of assessing travel demand in an area, identifying popular destinations within walking and cycling distance of people's homes, and then assessing if a route exists or if there is a blockage to the most obvious or direct route. Key destinations such as neighbourhood centres, schools and community facilities should be identified and the pedestrian and cycle network in the area analysed. Online mapping can assist in identifying possible pedestrian barriers as can direct consultation with local communities on their specific needs.

Site visits should be undertaken to the catchment surrounding key destinations and initial outline designs carried out to establish whether a scheme would be viable and beneficial. This section provides some guidance on how potential schemes can be identified through:

- ▶ Assessing demand for travel on foot and by bicycle;
- ▶ Identifying areas with poor permeability;
- ▶ Examining current usage patterns; and
- ▶ Consulting with residents and local elected representatives.

6.1.1 Assessing Demand for Travel on Foot and by Bicycle

Local authorities can carry out analyses of various types – travel surveys, counts, land-use surveys – and use local knowledge to determine the demand that could be served by a permeability project. This could involve an examination of Census data to ascertain the number of people and number of jobs and school places in an area as well as on-the-ground work. In this manner, a clear picture of origins and destinations will emerge whereby an authority can state that x number of people would benefit from a scheme as they could travel from their origin to their destinations on foot or by bicycle whereas without the scheme, they could not. Local public transport stops should also be regarded as destinations in this regard.

6.1.2 Identifying Areas with Poor Permeability

As referenced in Part I of this document and in the Design Manual for Urban Roads and Streets (DMURS) the design of housing estates throughout Ireland has caused major issues in relation to permeability. Cul-de-sacs were particularly popular road layouts for residential streets in the 1980s and 1990s as they were perceived to reduce traffic speeds and volumes through residential areas.

These cul-de-sac designed housing estates have resulted in increased walking distances to key destinations in the wider community that are only a short distance away 'as the crow flies'. Where pedestrian through links are not provided, these type of fenced-off residential estates can greatly increase required walking and cycling distances for those who need to travel from, to, or through them; thus reducing access to local services and encouraging greater car reliance. Figures 6.1 and 6.2 provide an example of this type of issue from Moy Glas in Lucan.

The identification of these types of residential developments and the study of their proximity to local destinations is a useful starting point in identifying potential permeability schemes and could be undertaken through use of maps, GIS, local knowledge or community involvement. A site visit is also required, as often, in plan view, the barriers around estates are not always obvious.

Figure 6.1: Example of a fenced off estate with cul-de-sac road at Moy Glas, Lucan, causing pedestrians to make extensive diversions to access local facilities

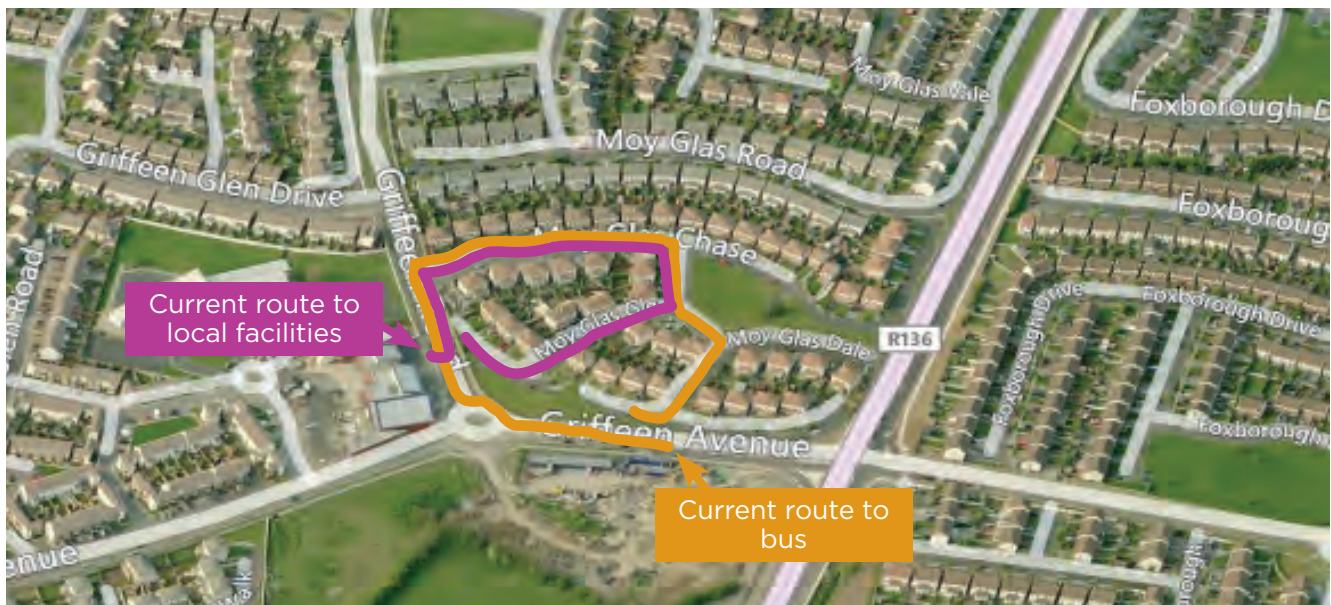


Figure 6.2 Photo from within Moy Glas towards local shopping centre (building on right of photo)



6.1.3 Consider Current Usage Patterns

In many cases potential permeability schemes can be identified from pedestrian desire lines worn into the ground. These are particularly visible in parks and open spaces. The presence of a pedestrian desire line indicates that it is already possible (at least informally) to use a particular route. However, the existing surface quality, blockages along the route (such as fences) and the perceived lack of safety of the informal route can often deter some from using a route, with most choosing alternatives. These informal routes also tend to be unlit and generally only available to those with local knowledge of the area.

The identification of desire lines, the barriers along these routes and an understanding of the destinations they serve is a useful way of identifying suitable permeability schemes.

Figure 6.3: An informal desire line from a major cycle route into a housing estate



Figure 6.4: Example of damage to the public realm with creation of steps in blockwork and the construction of a 'stile' to climb the railing. This is located on a desire line from a housing estate to the local school in Rathcoole, Co. Dublin.



6.1.4 Consulting With Residents and Local Elected Representatives

Involving Councillors, residents or community groups in the identification and outline design of permeability schemes is a useful way of using extensive local knowledge and identifying the barriers that residents perceive. This approach also has the advantage of helping to achieve local 'buy-in' to a scheme design from an early stage - an important step in the delivery of a scheme. Where possible, this consultation should seek to make use of existing scheduled events, forums or meetings to help maximise the number of local people available and enable efficient use of resources. Scheme champions from the local community can also be identified to assist in gaining wider support from other residents who may have concerns regarding permeability schemes. Often a 'before and after' example from elsewhere could be useful. An example is shown to the right from Leopardstown, Dublin. Refer to Section 9 for further guidance on consultation.

Figure 6.5: Leopardstown, Co. Dublin - Before and After



6.2 Creating Outline Designs

When undertaking an initial assessment of permeability schemes it is not necessary to have detailed engineering designs of each scheme, although potential engineering issues should be given consideration where they could have significant impacts on the viability of a scheme. Basic lines on a map indicating the proposed route and connections to it are sufficient to allow the assessment to be undertaken, with any additional infrastructure considered necessary; such as pedestrian gates, traffic management measures or pedestrian crossings identified on the maps. The on-site audits (discussed in Section 7.4) will identify site specific issues with the proposed route and additions to the scheme which can be considered at the later detailed design stage.

Case Study: Identifying Suitable Schemes: Knocklyon, South Dublin



Figure 6.6: Palisade fence at eastern boundary of Dargle Wood, Knocklyon



Figure 6.7: Young people attempt to climb the wall on the western boundary onto Knocklyon Road

Knocklyon is a local centre in South Dublin County with a cluster of high quality facilities. It was analysed with regard to its accessibility for pedestrians and cyclists. It was identified by South Dublin County Council as a local centre with good facilities and was investigated to examine accessibility for pedestrians and cyclists. The project team identified the desire line at Dargle Wood, Knocklyon as one that was used by the local community as a short cut to school, local shops and bus stops. The short cut through Dargle Wood was not obvious as it was hidden behind a palisade fence at its eastern boundary onto Templeroan Road and behind a block wall and brambles on its western boundary onto Knocklyon Road. Nevertheless, it was well used by local people as demonstrated by the muddy ground at each of the entry points. The open space within Dargle Wood however, did not seem to have the typical single track through the grass that usually occurs. On a further site visit on a dewy morning, footprints were evident across the width of the open area. It would appear that the mainly young and agile group of people who used the link tended to walk in wide-spread groups.

Further investigation also revealed the very persistent nature of the desire line; the Council had, on the request of residents, repeatedly blocked the underside of the palisade fence with concrete blocks. These concrete blocks were repeatedly removed by people using the open space to access the short cut. The rather obscure and athletic access requirements however, meant the short cut tended to be used by the more agile, perhaps younger people who had knowledge of the area. The short cut was not accessible by bicycles (with exceptions), prams, buggies or wheelchairs and led to wet and muddy conditions at times. For subsequent projects, South Dublin County Council engaged with local people as much as possible; particularly young people who do not have access to cars. Consultation with people who were using short cuts became a prime source of information for potential permeability projects.

Case Study: Creating Outline Designs: Dargle Wood, Knocklyon

Knocklyon is an established local centre comprising a large supermarket, medical centre, two schools, a church, post office and community centre. The centre is surrounded by a large residential catchment, with high frequency bus routes passing. The proposed permeability project through Dargle Wood directly links to the local centre on its western side. To the east of the link is a large school complex which contains a number of schools that serve the local area, a large sports club and sporting facilities. The proposed project aimed to reduce walking/cycle distance by 191 meters. Crucially the reduction in distance also allowed walkers and cyclists to cross the open space through Dargle Wood at a level gradient and thus avoid a hill on Knocklyon Road.

The below indicates the level of design required for scheme assessment and consultation:



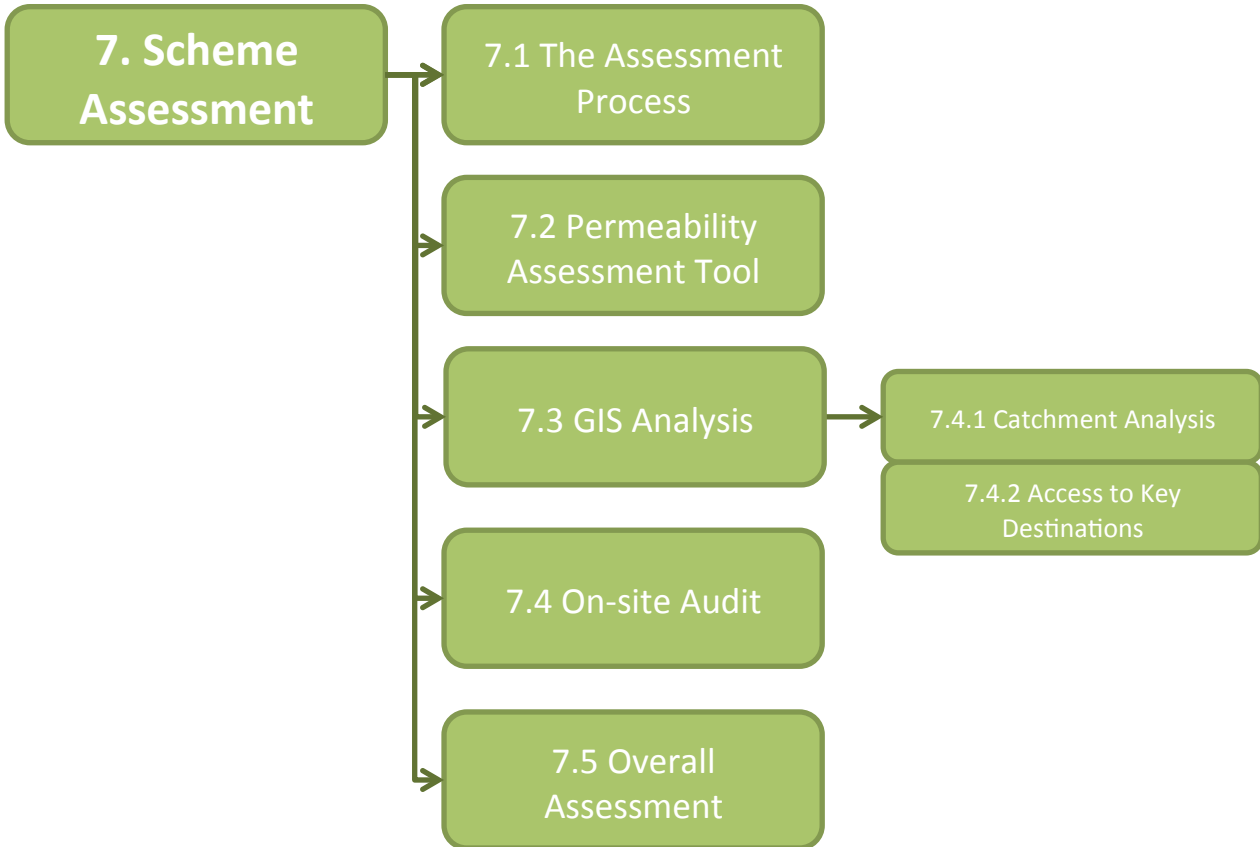
-  Proposed Access
-  Proposed 4m wide, lit, walking and cycling route
-  Existing footpath to be upgraded
-  Existing Access



KNOCKLYON CENTRE
Permeability Project:
Walking and Cycling
Link via Dargle Wood

Section 7

Scheme Assessment



7.1 The Assessment Process

The recommended process for assessing permeability schemes is based upon two separate assessments:

- ▶ GIS Analysis; and
- ▶ On Site Audits.

A number of key metrics are considered which collectively allow a rounded assessment of likely scheme benefits to be considered. The key metrics are listed overleaf.

Table 7.1: Key Assessment Metrics

Source	Metric	Description
GIS Analysis	Catchment Size	<p>Calculation of the number of people within 800m (approximately a 10 minute walk) of the scheme through the road and path network</p> <p>Measurement of how the catchment network performs against its theoretical maximum by comparing crow flies and through the network catchment population sizes.</p> <p>The number of households / people who will benefit from the construction of the link in accessing local services.</p>
	Walking and Cycling Journey Time Savings	The journey time savings to the most popular local destinations as a result of the scheme are calculated. (Aim to establish 5 key destinations for each project)
On-site Audit	Directness	The directness of the scheme is assessed in terms of its alignment and ability to cater for observed desire lines.
	Personal Security	A range of factors influencing personal security are assessed with and without the proposed scheme to assess its benefits.
	Legibility	The legibility of the route is assessed in terms of its signage and surface.
	Quality of Environment	The quality of the local environment is assessed in terms of the landscape, noise and air quality.
	Maintenance	The level of maintenance of the landscape and infrastructure along the route.
	Road Safety	The impact of the scheme in terms of its likely safety benefits.
	Potential Usage	Current levels of use of the scheme site as an indicator of potential future demand.

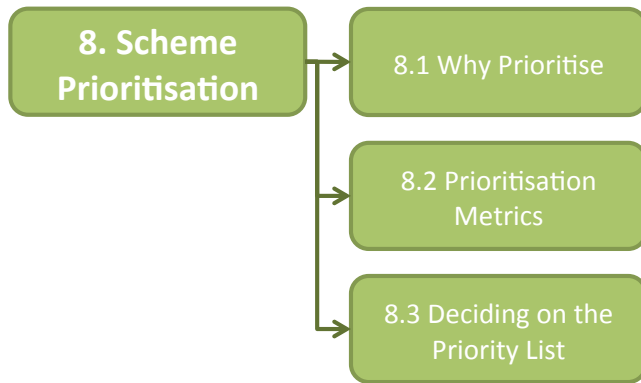
The Permeability Assessment Toolkit (PAT) set out in the appendix provides an example of a detailed approach for analysing the above key metrics for the assessment and prioritisation of schemes. However this level of detail may not always be feasible or necessary. In these cases, Local Authorities can simply use the metrics above as a checklist and apply their own weightings and scorings to easily assess the change between existing and proposed schemes, and prioritise potential schemes.

The PAT should be used, however, for large or costly schemes or in the case of contentious schemes, where the local authority feels it necessary to examine the case for implementation in detail, or demonstrate its necessity in the most comprehensive way possible.

Section 8

Scheme Prioritisation

8



8.1 Why Prioritise?

The metrics discussed in Section 7 provide an overall assessment of the benefits of each scheme under consideration, and allow schemes to be ranked by their anticipated level of benefits. This information can assist in decisions relating to which schemes should be prioritised for implementation in the short term, and which schemes have limited benefits, i.e. those which may need to be discounted or redesigned.

Where more than one scheme is under consideration, prioritisation should be undertaken to ensure that the schemes which offer the greatest benefit are implemented first to maximise the benefits for the community. Where funds are limited, prioritisation also provides the mechanism for establishing which schemes should not be taken forward and which schemes may require redesign to maximise their benefits.

8.2 Prioritisation Metrics

The appraisal process described in Section 7 outlines a number of key metrics and how these can be combined into an overall assessment of the benefits of a scheme. These metrics can be plotted for all schemes to allow schemes to be ranked in terms of the benefits they provide.

8.3 Cost Benefit Analysis

In addition to consideration of scheme benefits, it is also important to give consideration to the costs of a scheme as these can vary considerably between schemes. The (non-monetised) benefits identified can be divided by the anticipated scheme costs to provide a basic assessment of the likely 'benefit/cost ratio' of the scheme. Comparisons of cost benefit analysis should be considered in the prioritisation of schemes.

8.4 Deciding on the Priority List

The appraisal and audit process described in Section 7 and expanded above provides an indication of likely scheme priorities; however, there are other elements to consider, which are less easily included in a score that will also influence prioritisation.

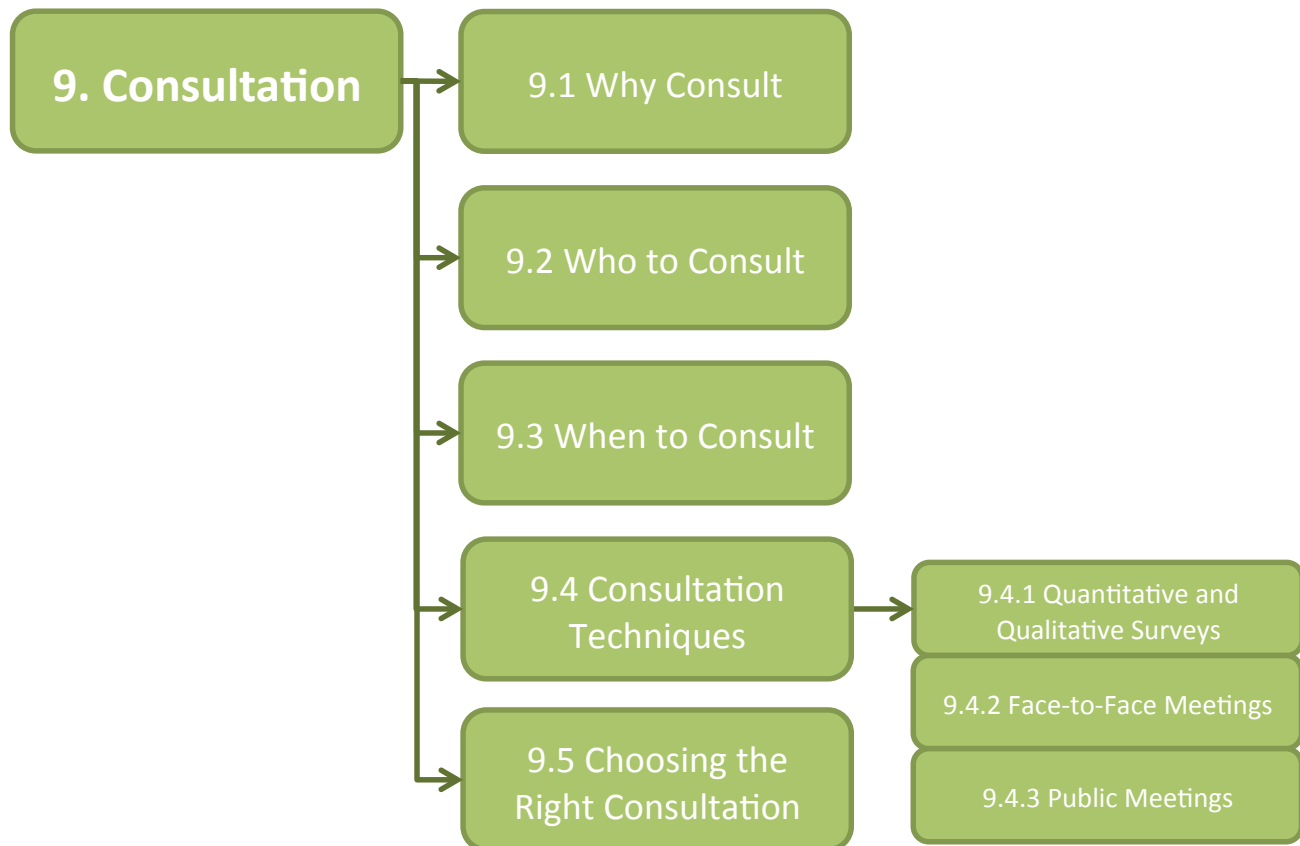
These include:

- ▶ Consultation feedback and levels of public support for each scheme;
- ▶ The complexity of scheme design and potential need for mitigation – e.g. environmental impacts; and
- ▶ Other construction works ongoing in the local area.

A workshop event including all of the key stakeholders involved in implementing the proposed schemes can be a useful way of giving consideration to all the various factors which determine which schemes should be prioritised. This can be a particularly efficient way of making decisions quickly to determine a suitable and achievable prioritisation list.

Section 9

Consultation



9.1 Why consult

It is imperative that consultation is worthwhile for both those being consulted and the Local Authority. Involving local residents and businesses through consultation and participation is one of several ways we can ensure that the design of the schemes are user-focused, and meet their needs.

From the outset of the process, it is important to be clear why consultation is being undertaken. This requires clarity over the aims and objectives of the scheme, what is to be achieved and the role that people will have in the overall process. The reasons for consulting may be to:

- ▶ Learn about local residents' and businesses' attitudes to these types of measures and to their built environment generally;

- ▶ Give information and receive responses;
- ▶ Enable people to indicate their preferences;
- ▶ Pre-empt, encourage and challenge;
- ▶ Improve relationships;
- ▶ Inform and influence professional assessment and political judgement

9.2 Who to consult

A generic term for the range of people who might have an interest in a scheme is stakeholders. Knowing who the stakeholders are helps to select the most appropriate consultation techniques for their effective involvement. Stakeholders may vary according to the scheme location, but should always include people who will be most affected. It is important to establish at an early stage who

are the end users of the scheme and in what capacity you are consulting them, in order to fully understand the responses that are returned. Different categories of end users are:

- ▶ Local Residents;
- ▶ Voluntary and Community Organisations;
- ▶ Resident Associations;
- ▶ Schools;
- ▶ Local Business Sector;
- ▶ Councillors; and
- ▶ Local Authority Staff.

It is important that local residents are consulted directly to allow individual opinions to be expressed, but this should not be limited to just those residents in the streets and roads directly affected. Those living within a certain radius, e.g. 500m, or those living in areas which will benefit from the scheme, should also be consulted.

9.3 When to consult

There are particular benefits garnered when consultation takes place at the earliest stage of the decision making process. In all cases the timing should be early enough to allow the findings to be considered before final decisions are made and enable consultees to be informed about other processes that will be used to inform the eventual decision. For example, the decision to proceed with a scheme may be subject to funding allocations.

Informing consultees of other opportunities that may be available to influence the decision is also useful; for example, the scheme may be the subject of a Part 8 planning process during which statutory consultation will be undertaken.

9.4 Consultation techniques

Several consultation techniques are available. There are various techniques available to consult and involve stakeholders, which also contributes to a range of responses. As such, it is best to consider a variety of techniques - time, resources and skills permitting.

For further information see 'REACHING OUT: Guidelines on Consultation for Public Sector Bodies' published by Department of the Taoiseach (2011)⁴.

9.4.1 Quantitative and Qualitative Surveys

Quantitative consultation techniques can be used where there is a requirement in quantifying the numbers of people who have a particular view or opinion. The most common cost-effective methods are postal surveys, leaflet drops and face-to-face interviews. These are useful for obtaining factual information but they are not as effective for understanding issues in depth. Quantitative methods are useful for gaining an overall view of residents reactions to a scheme. The reliability of the information from sample surveys is dependent on the use of a good sampling method to ensure that the survey respondents are representative of the wider target community.

Qualitative work is useful for gaining a fuller picture of the reasons behind a particular opinion. This is useful to understand in depth the reasons underlying certain views and for generating and testing ideas.

Designing a consultation exercise that incorporates both quantitative and qualitative elements enables both the size of an issue to be determined and its depth explored. A questionnaire can have both open ended questions as well as closed questions in it, in order to provide structured answers as well as detail. The use of internet link to collect the qualitative data is a relatively inexpensive way of collecting the data. An example of such a survey is provided as part of the case study below.

⁴ http://www.taoiseach.ie/eng/Publications/Publications_Archive/Publications_2011/Reaching_Out_-_Guidelines_on_Consultation_for_Public_Sector_Bodies.doc

Case Study: Consultation Approach: Dargle Wood, Knocklyon

For the Dargle Wood Scheme, South Dublin County Council circulated an information leaflet to the local residents informing them of the proposed works due for commencement. This information leaflet was circulated to 3000 households inside an 800m 'crow flies' walking distance of the proposed route in the vicinity of Knocklyon.

A 'Travel Smart Survey' was also included in the leaflet drop; this was intended to gauge opinion on the proposals and obtain information on general walking and cycling habits in the area as well as feedback on possible future links. Response to the survey was via post or online.

The cost of leaflet printing and distribution were low, relative to the estimated total cost of the scheme (less than €1,000). A very good response was received from local residents with a total of 174 responses. 86% thought the proposals were a good idea, 12% thought the proposals were not a good idea and 2% did not specify. 78% said the new route would encourage them to use a bicycle or walk instead of drive for short local journeys.

The overall results indicated support for the link, recognising the benefits of improved and safer access to the schools, church and shops. Many of the submissions mentioned existing anti-social behaviour issues in this area and indicated that the proposed route may help to address the problem.

The information leaflet was also issued to the local Community Garda for the Rathfarnham area who was consulted regarding the project particularly with regard to recommendations to reduce antisocial behaviour in the area. SDCC continued to liaise with the Gardaí while the project was being implemented on site and after its completion.

Regular meetings were also held with the Local Councillors in the area, informing them of progress and providing updates during the design and consultation and construction phases.

A meeting was held with the Chairperson and Secretary of the Residents Association of Dargle Wood who expressed serious concerns about the project proposal. At the request of the residents association, a public meeting was held in the area and a presentation was made on the project proposals and the design and consultation process. A question and answer session followed.

A number of 'Door to Door' meetings and on-site meetings with residents in the area were also conducted during the design, consultation and construction phases. These meetings mainly dealt with specific issues rather than the general principle of the project. SDCC maintained close communication links with the Residents Association and with individual residents during the project.

9.4.2 Face to Face Meetings

Face to face meetings can be a useful way of obtaining the views of organisations that represent groups within the wider community; they can also be useful in providing residents with a 'face' for the organisation. These meetings can be a relatively rapid way of gathering viewpoints, but it is important to note that community organisations may not be as

representative as they initially claim and often information provided is not statistically robust. These meetings also tend to focus on specific local issues, rather than the general principles of the project. For these reasons, meetings with community organisations are a useful way of collecting views, but are best not used in isolation.

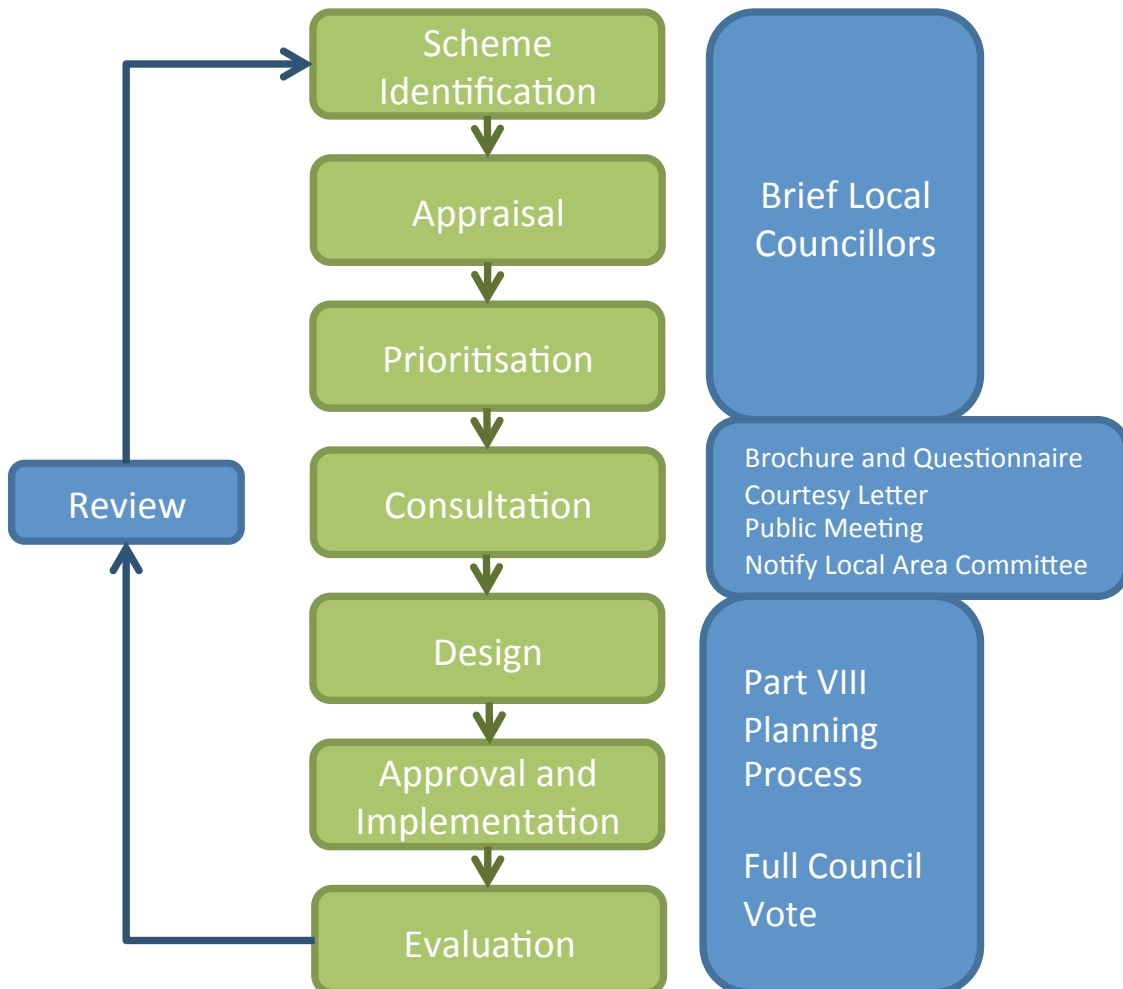
9.4.3 Public Meetings

When schemes are more complex or where there is a need to explore the feedback from the quantitative and qualitative surveys, a public meeting can be organised. These meetings provide opportunities to provide feedback on earlier consultation in more detail, discuss how the scheme has evolved and obtain further views on the schemes evolution. It is important that these meetings have a specific and definable purpose with an agenda prepared and agreed prior to the meeting. A formal meeting with an agenda and a designated chairperson ensures that the meeting does not lose focus.

9.5 Choosing the Right Consultation

Figure 9.1 below indicates the different types of consultation and when they should be undertaken in relation to the lifecycle of permeability projects.

Figure 9.1: Stages of Consultation



The following bullet points outline a typical public consultation strategy for a scheme:

- ▶ Brief Local Councillors on the project and preliminary design – Inform Councillors of the scheme under consideration and that the community will be notified and consulted;
- ▶ Brochure & Questionnaire (Non statutory public consultation) – online survey – Local residents;
- ▶ Courtesy letter – local schools – resident organisations – local Gardaí – local businesses – community organisations- offer face to face meeting;
- ▶ Public Meeting / Consultation Event on Key Issues – subject to outcome of Brochure & Questionnaire (not required for all projects);
- ▶ Use of dedicated project webpages or social media;
- ▶ Notify Local Area Committee of preliminary public consultation responses – Elected Members;

- ▶ Commence statutory Part 8 Planning Process (if required);
- ▶ Statutory Public submissions (Part 8); and
- ▶ Full Council vote on Part 8 proposal

9.6 Review and evaluate consultation

Prior to proceeding to detailed design, the project team and key stakeholders should carry out a review of the implications of the public consultation process. The key issues raised during the consultation stage and proposed design amendments are evaluated. In general, the status of the project can be categorised as one of the following:

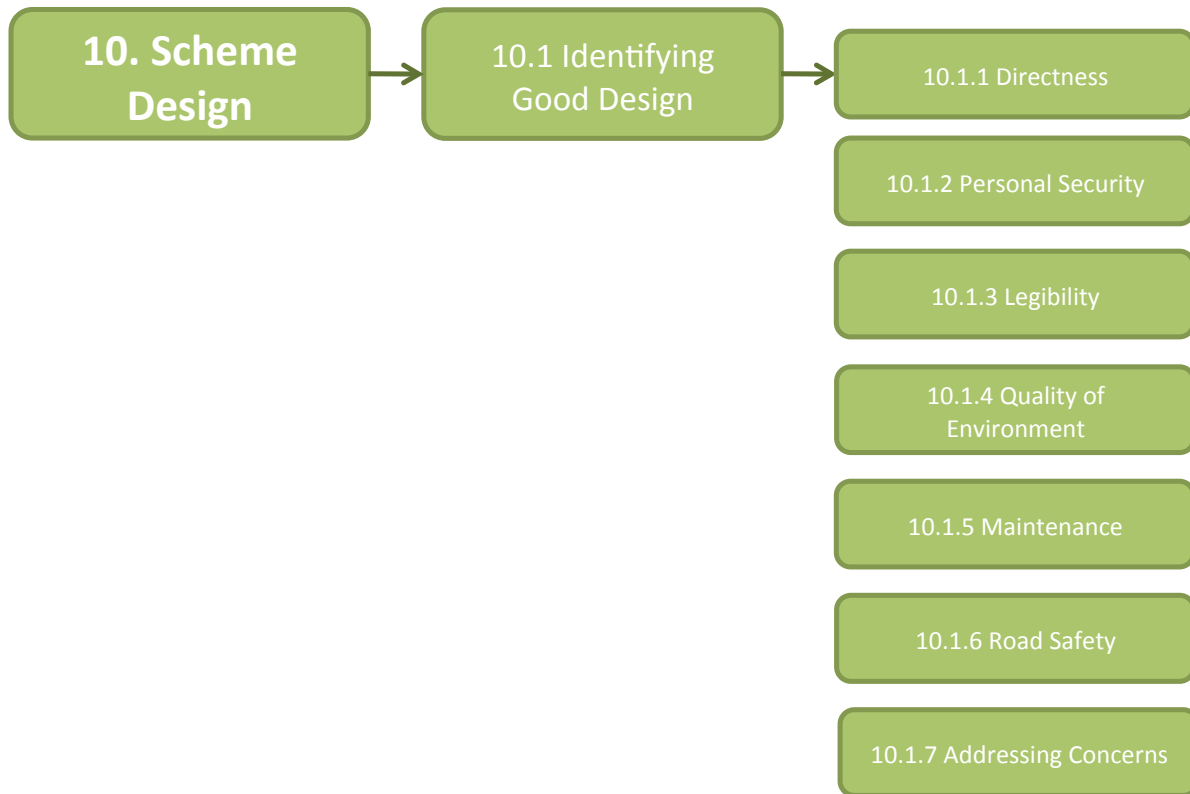
- 1. Status:** Requires minor design amendments
Action: Proceed to detailed design and construction
- 2. Status:** Significant issues raised in public consultation and/or material amendments to the preliminary design adopted
Action: Assess the amended project using PAT (or similar)

Scheme phasing, management procedures and further consultation can be incorporated to mitigate issues raised. A commitment to a post-implementation review may be beneficial with the understanding that any issues that arise will be investigated and addressed. Following the assessment of the revised scheme, the Local Authority, key stakeholders and the funding authority (if applicable) evaluate the next step for the scheme.

Significant amendments to the preliminary design and/or insurmountable issues may result in increased costs and reduced benefits and it may be recommended not to proceed to detailed design or construction

Section 10

Scheme Design



10.1 Identifying Good Design

Good design is a key element for permeability schemes to ensure that route designs are suitable for all potential users, promote safety and security and have a positive impact on the public realm. The efficiency and quality of the scheme design can dictate its effectiveness and influences its 'usability'.

There are number of sources of advice and guidance on the design of pedestrian and cycling infrastructure and streets in Ireland, including:

- ▶ The National Cycle Manual (2011).
- ▶ The Design Manual for Urban Roads and Streets (2013);
- ▶ Guidelines for Planning Authorities on Sustainable Residential Development in Urban Areas (2009); and

- ▶ Best Practice Urban Design Manual (2009).

The guidance below does not seek to replicate or supersede the above guidance, but to provide some areas for consideration that are particularly relevant to permeability schemes. The permeability scheme site audit form (discussed in Section 7) provides a framework for considering the different facets of good permeability scheme design. Methods of achieving good design and examples of good design are discussed below under each of the site audit headings.

The various proposed consultation stages outlined in Section 8 provide an opportunity to obtain feedback from local residents on outline scheme designs and to highlight their key areas of concern. Through good design these concerns may be overcome. These sections

should be read in conjunction with Chapter 3 in Part I.

10.1.1 Directness

Directness is an important consideration, particularly for permeability schemes which primarily seek to provide users with more direct alternatives to present routes. The existence of any desire lines or observed travel patterns identified in the on-site audit in addition to the proposed route alignment should be given consideration at the design stage as this may demonstrate a desire for additional elements to be added to the scheme.

It is important that any proposed new or improved routes are constructed with an appropriate width for anticipated levels of use. Generally, where usage levels are not predicted to be high, it is appropriate for paths to be shared use between pedestrians and cyclists. Where higher levels of (particularly) cycle use are anticipated it may be more appropriate for pedestrians and cyclists to be segregated and wider path widths will be required. The National Cycle Manual provides further details on the most appropriate widths for different types of cycle facility.

Scheme design should also consider the impact of obstructions along the route. The average width of a route might be sufficient for all users, but any obstructions or pinch points which limit the width could make a route unsuitable for some types of user, such as those in wheelchairs or with pushchairs.

10.1.2 Personal Security

Personal Security is another concern and can be the key factor in discouraging some users from current informal routes. Residents often perceive that opening up new pedestrian routes can affect their personal security; opening areas up to antisocial behaviour and crime.

A number of factors can influence the personal security of routes; formal surveillance, such as CCTV or informal surveillance or such as being overlooked by properties. CCTV may not always be a cost-effective proposition, therefore, designs should seek to increase perceived

personal security by maximising provision of informal surveillance and ensuring long sight lines are present where possible.

Lighting can also help to improve personal security. In South Dublin 'white light' has been an important feature of permeability schemes. This type of light mimics day-light and is particularly good for facilitating facial recognition and distance viewing. With white light it is possible to see further and distinguish people sooner during hours of darkness. As such, it is considered to be safer than more traditional forms of street lighting. The lighting used is also energy-efficient with integrated dynamic dimming and lamps which allow light to be focused on the proposed route, rather than dispersing over a wider area. As many permeability projects are through open space areas this is particularly important to contribute towards reducing light pollution and the 'dark skies' initiative, and also decreases impacts on fauna in the area. As these routes are direct routes from homes to popular destinations, once they are surfaced and adequately lit with long sightlines and / or pedestrian surveillance, they tend to be well used. To date, it has been the experience in South Dublin County Council that where shortcuts existed and anti-social behaviour was reported, that the formalising of the routes, encouraging usage of the route caused a decrease in anti-social behaviour as the increased usage and passive surveillance dispersed anti-social gatherings.

Other factors, such as graffiti, vandalism and evidence of neglect can also influence perceptions of personal security for users and residents; therefore, aesthetic improvements in addition to the provision of paths should be considered as part of final designs. Resolving such issues can have a big impact on improving the visual appeal of the area and making the route more appealing to users.

10.1.3 Legibility

Legibility is the ease with which potential users can understand and navigate through the pedestrian environment. Important factors of legibility include the presence of signage to identify routes as well as landmarks along

the way and continuity of surface material. Continuity of surface material should be incorporated into all scheme designs. Consideration should also be given to including signage where high levels of use are anticipated and particularly where the route provides direct access to nearby destinations or the wider walking and cycling network.

10.1.4 Quality of Environment

The quality of the environment affects all aspects of scheme design and can influence universal accessibility, personal security, legibility, safety and usage levels. Where possible; schemes should be designed so that path gradients are not too steep, although in practice this may be a compromise with providing suitable levels of directness. Where possible a route should aim to give the area it travels through a sense of place (being a destination in its own right). At the very least it should avoid detracting from an area which already achieves this. The use of suitable high quality materials and soft landscaping can assist in maximising the environmental quality of a permeability scheme.

10.1.5 Maintenance

Maintenance is an important consideration and the need for ongoing maintenance is often not sufficiently considered at scheme design stage. Poor maintenance has a negative impact on the quality of the environment and can also affect whether people perceive a route as safe and secure. This can ultimately affect whether people continue to use a route. If a scheme is to be implemented it is important that the ongoing maintenance costs are factored into the cost equation from the outset. Additionally it is also worth considering at the design stage whether – through careful design and selection of durable materials – the ongoing maintenance requirements of a scheme can be reduced. This could be through, for example selecting soft landscaping which requires limited maintenance or choosing materials with anti-graffiti coatings, or surfaces that are easily repaired.

10.1.6 Road Safety

Permeability schemes typically provide more direct connections between trafficked streets for use by both pedestrians and cyclists. If sufficient consideration is not given to safety issues these schemes have the potential to cause conflicts between these different transport modes; therefore, consideration of safety issues should form a significant element of the detailed design stage. Where significant numbers of pedestrians will be required to cross busy roads to access a permeability scheme it will be necessary to give consideration to providing suitable pedestrian crossings with appropriate signals. It is also important that the proposed scheme design does not increase the potential for accidents between pedestrians and cyclists and does not cause undue delay to users.

10.1.7 Addressing Public Concerns

Residents may have concerns, particularly where a permeability scheme will open up access to areas where antisocial behaviour is perceived to occur. In many cases, generic designs will not be sufficient to alleviate these concerns. Through consultation with residents about their specific concerns and through a rigorous design process, as described above, it is possible to address these concerns which primarily relate to personal security issues. Examples of completed schemes from South Dublin as outlined below have shown that areas where antisocial behaviour was a problem prior to implementation of a scheme, the area can be transformed as a result of the scheme. It is important to note the existing environment and existing issues and emphasise the improvement potential of the scheme.

Case Study: Design Changes to Address Public Concern: Dargle Wood, Knocklyon

The proposals for the permeability link at Knocklyon through Dargle Wood open space were circulated to people within a 800m radius of the link i.e. catchment area. Though the proposals were welcomed in the wider area, they generated considerable concern in the immediately adjacent area, mainly with regard to the risk of increased anti-social behaviour, increased litter and increased pedestrian and cyclist traffic through the open space where there was no existing east-west route.

The following text provided by a local resident and member of the Residents Association Committee discusses views amongst residents before implementation of the Dargle Wood Scheme:

'This green space has a long history of antisocial behaviour... drugs, alcohol abuse, loitering motorbiking etc.

Residents thought that making the area more accessible and providing public lighting would worsen these problems and they opposed the project on these grounds. Negotiations (with the council) focussed on what could be done as part of the project to improve the living conditions and environment of those residents directly affected by it.'

Project Design Summary

During the course of consultation for the above works with local residents a number of concerns were raised and variations requested that would assist in incorporating the proposed link into the wider landscape.

These included the following;

- ▶ Securing north and south boundaries, where motorbikes were gaining access, with 90 linear metres of railings and low wall.
- ▶ Creating attractive boundaries
- ▶ Creating two new access points
- ▶ Removal or covering of graffiti on boundary walls,
- ▶ Some large shrubs and trees were requested for removal and some new tree planting was requested.
- ▶ The new planting of thorny bushes close to people's back garden walls (where gardens faced onto the open space)
- ▶ Brambles were to be retained to protect garden walls, where they did not encroach onto the route.
- ▶ The proposed lights were dimmable to decrease impacts on wildlife and allow for star gazing.
- ▶ The existing north-south footpath was found to be in poor repair and required replacing with a new tar-macadam footpath.

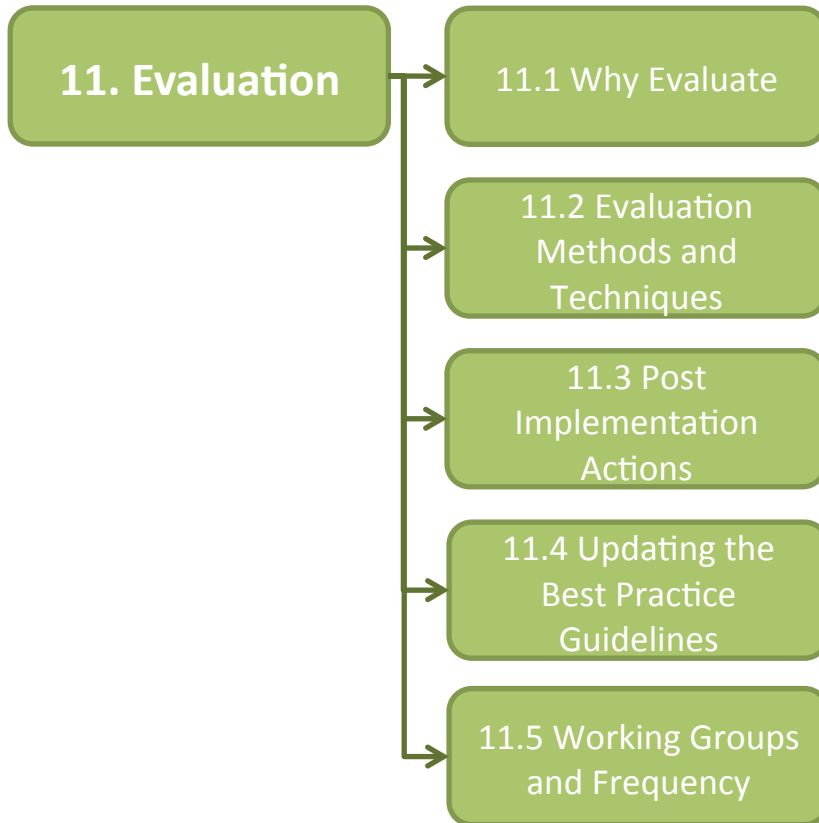
The below text provided by the same local resident indicates how residents views have changed as a result of the modified scheme.

'Residents' fears and concerns of a worsening antisocial behaviour situation has not materialised to date and the amended project carried out has so far brought improvements that can be built upon...the putting in place of the review process post project (evaluation) has also helped to assuage residents' concerns in the event that adjustments may be required'.

Section 11

Evaluation and Monitoring

11



11.1 Why evaluate?

As permeability schemes of this nature are a relatively new concept, there is a need to ensure continuous improvement processes are in place and that best practice approaches are adopted in order to maximise the benefits of schemes once implemented. Continuous improvement can be achieved through two main processes:

- ▶ Post Scheme Evaluation and Monitoring; and
- ▶ Updating Best Practice.

This section will discuss how these two processes can be taken forward in the delivery of schemes.

Evaluation is the process of assessing the successes and failures of a scheme once it has been implemented. This is an important process

to learn from the implementation of previous schemes so the development, assessment, prioritisation and implementation of future permeability schemes are as effective and efficient as possible. Evaluation is an important part of the permeability scheme development timeline, and as such the Permeability Assessment process has been designed to assess schemes both before and after implementation.

11.2 Evaluation Methods and Techniques

The techniques for undertaking an evaluation of a scheme should be the same as for appraising the benefits prior to implementation; the Permeability Assessment process can be used for both elements. The GIS elements of the pre-implementation assessment only need to be revisited if the design of the scheme has

changed significantly from that assessed prior to implementation. If the scheme design has not changed significantly then the GIS assessment should remain valid.

The main element of the evaluation consists of completing the post-implementation on-site audit. This audit is the same as the pre-implementation audit, but includes additional questions relating to the path width and quality and durability of materials for any new infrastructure. To maintain as much consistency as possible it is preferable if the same person who completed the previous audit also completes the post implementation audit. Comparison of the pre and post implementation site audits provides an indication of the benefits achieved by the scheme. These can be compared to the predicted benefits and the reasons for any discrepancies should be considered to identify lessons for the future schemes and scheme design.

Completing a post-implementation audit also provides the opportunity to undertake further pedestrian and cycle use counts. These can be compared to the pre-implementation survey counts to identify approximate numbers of additional people using the route as a result of the scheme. If additional pedestrian and cycle usage does not meet expectations it is important to consider the reasons for this. Where additional usage is particularly high, it is also useful to give consideration as why it has been successful.

Other elements which could form part of a post scheme evaluation include:

- ▶ Further consultation with local residents to see if previous concerns were realised or not;
- ▶ Monitoring how people are using the new route – are they using it in the way intended or have other unintended usage patterns developed? and
- ▶ Assessing completed schemes to see if there are any simple actions that can be carried out to further enhance the project (e.g. toucan crossings, new access points to the route, cycle parking, signage etc.).

11.3 Post Implementation Actions

The above evaluation techniques may highlight issues with a scheme in terms of how people are using (or choosing not to use) the scheme or identify ways of further maximising scheme benefits. Where solutions are identified and considered viable and affordable further modifications to the scheme should be implemented.

Examples of ways SDCC has sought to maximise the usage of routes include:

- ▶ Community days;
- ▶ Green School Initiatives, such as 'Walk on Wednesdays'; and
- ▶ Involving the local community in the on-going management of the project, e.g. Tidy Town Committees, Community Clean ups etc.

It is important that ongoing monitoring and evaluation is then undertaken to ensure that these initiatives achieve the expected outcomes, and to assist identification of effective ways of encouraging greater use in the future.

Case Study: Post Implementation Monitoring and Evaluation: Dargle Wood, Knocklyon

During the Dargle Wood project, consideration was given to setting up a formal steering group and while this may prove beneficial for some schemes, it was not required in this case as informal consultation links were established during the project.

In practice, as potential problems arise in the area, there is a line of communication that is available where issues can be speedily addressed. The Local Authority 'Fix Your Street' initiative came on-line around the same time as the Dargle Wood project; this is a web site that allows residents to report issues in their area directly to the responsible person and allows for a quick response to particular issues.

An official opening of the Dargle Wood was held on the 21st of September 2012 at which all partners in the process were invited; this offered an opportunity to relax together and enjoy the open space. A post opening count and survey of users was carried out around the same time and revealed the large numbers of people using the route, particularly school going children. This led to a re-assessment of the initial design and a decision to build toucan crossings on the roads at either end which have proved very successful. Counters were put on the route to monitor the numbers of cyclists and pedestrians. The post implementation counts and surveys have been invaluable, allowing the Council to evaluate the scheme and apply lessons learned to other projects.

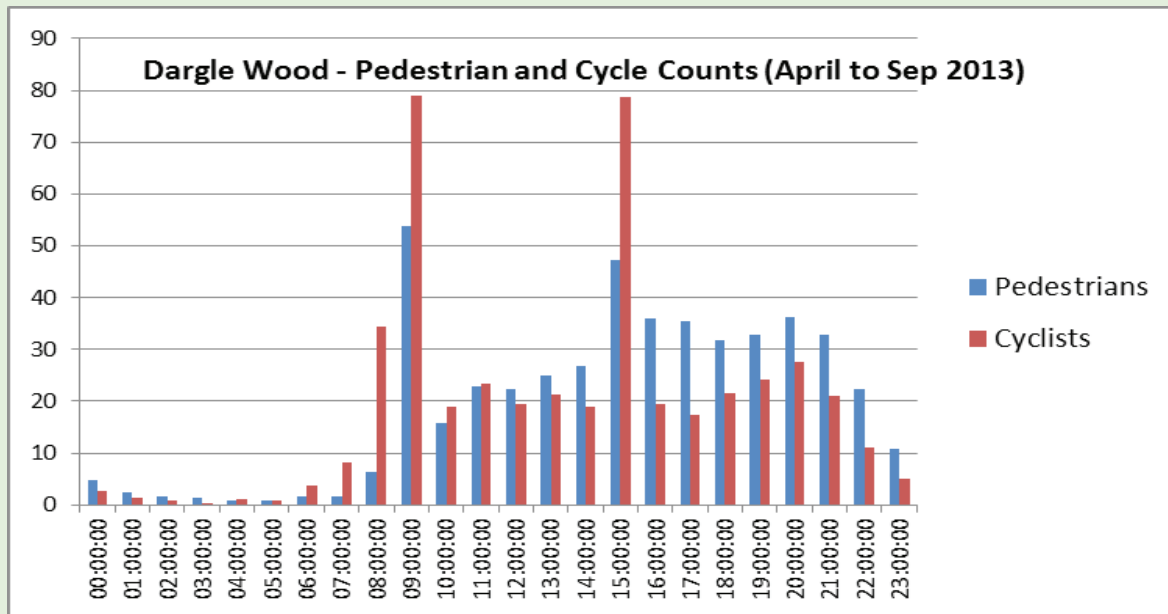
Following the implementation of the Dargle Wood scheme the lines of communication developed at the consultation stage between local residents, the community Gardai and SDCC were maintained. A post construction survey was carried out on the route both to see what usage was occurring along the route and also to assess whether the projected value of the route was being realised. Valuable survey feedback was also received from a local school (See quote below):

"Did you know? 18% of our pupils use Dargle Wood to get to St. Colmcilles SNS. That's 124 out of 676 pupils"

Survey results indicated that the route was extremely popular with school goers in particular. Following this feedback the Council applied to the National Transport Authority and received funding to install two Toucan crossings at either side of the route, one at Knocklyon Road and one on Templeroan Road. These were installed towards the end of 2012 and further enhanced the route making it safer and more attractive to vulnerable users in particular.

Pedestrian and Cycle Counters were installed on the route in 2013 and results to date indicate that high levels of use have been maintained.

Figure 11.1: Average Hourly Pedestrian and Cycle Flows, Dargle Wood, Knocklyon



11.4 Updating the best practice guidelines

Permeability schemes of this nature are a relatively new concept in Ireland. This document provides an initial summary of the current best practice approach to identifying, assessing and implementing these types of schemes based primarily upon experience and scheme examples from South Dublin County Council. As this guidance is used by different authorities in Ireland and as further schemes are implemented and evaluated, additional examples of good practice and relevant experiences may be added to these guidelines, which are intended as a 'living document', with regular updates helping to ensure it remains useful and relevant.

11.5 Working groups and frequency

It is recommended that those involved in the implementation of permeability schemes across Ireland form a working group to discuss the effectiveness and limitations of schemes, to allow dissemination of further examples of best practice and to provide mutual support. It is initially recommended that these groups meet at six monthly intervals to allow time between meetings for recommendations from previous meetings to be implemented.

Appendix

Permeability Assessment Toolkit

A.1 Permeability Assessment Toolkit (PAT)

Once potential permeability schemes have been identified the Permeability Assessment Toolkit (PAT) designed by AECOM on behalf of South Dublin County Council provides an example of a logical and consistent methodology for assessing the schemes taking account of a number of different characteristics of the scheme, including:

- ▶ The size and makeup of the catchment area which might benefit from a scheme and the propensity of the area population to walk or cycle;
- ▶ The locations of trip attractors in the area and the extent with which the proposed scheme could provide journey time benefits to these;
- ▶ The quality, safety and security of the existing environment and the likely benefits of the scheme; and
- ▶ Current levels of walking and cycling in the area.

The following section provides an overview of the key concepts used in this toolkit which could be implemented and modified to suit local requirements and capabilities.

The assessment process makes use of spatial data, which can be analysed using standard GIS software, as well as site audit data collected by surveyors on site to gather a detailed picture of an area and the likely benefits of proposed schemes. The GIS and site audit elements are combined using a scoring system to produce an overall score for each scheme which allows schemes to be prioritised. This allows schemes with the biggest impacts to be implemented first. The recommended GIS analysis and Site

Audit processes are discussed individually in the following pages, before outlining how these two elements can be combined to form an overall assessment of scheme benefits.

Case Study: Dargle Wood, Knocklyon, Rathfarnham

To illustrate the Permeability Assessment Toolkit (PAT), the results from the scheme at Dargle Wood are presented for each step of the analysis to demonstrate the nature of the outputs provided for the scheme.

A.2 GIS Analysis

To enable assessment of the permeability schemes, a GIS pedestrian network model is built to allow routing analysis to be undertaken. There are a number of packages available, but as part of the development of PAT, AECOM used the ArcGIS software alongside the Network Analyst extension for the South Dublin County Council examples. A digital roads and paths layer, such as the OpenStreet Map data is brought into the software and built into a navigable pedestrian network. The proposed schemes are then manually coded into this network following the alignments indicated in initial designs. The locations of key destinations, such as Schools, Shopping Centres, Parks, Business Parks and Healthcare facilities, which residents might wish to access, are then included.

Demographic data is then imported into the model to provide information about the populations adjacent to the schemes. The latest 2011 Census Small Area Statistics provide a useful source of information for this.

The following demographics can be useful in understanding the character or the area:

- ▶ Overall population;
- ▶ Age 0-12 (Primary School Age);
- ▶ Age 13-17 (Secondary School Age);
- ▶ Age 18-65 (Working Age);
- ▶ Age 65+ (Retired Age);
- ▶ Travel to work/school on foot;
- ▶ Travel to work/school by bike;
- ▶ Travel to work/school by car;
- ▶ Travel to work/school by public transport; and
- ▶ No car households

A.2.1 Catchment Analysis

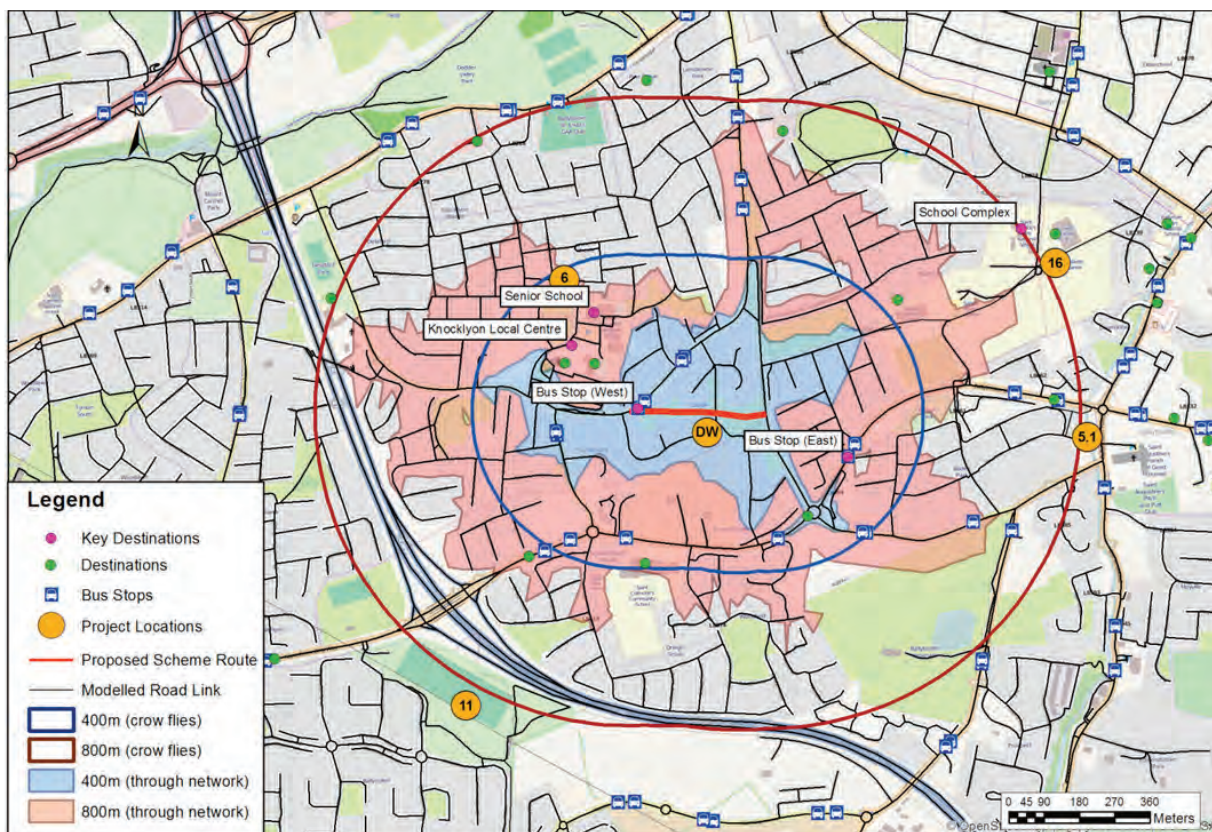
To establish the number of people who could potentially benefit from a scheme, buffers are created around the area of proposed schemes at 400m and 800m intervals to represent a likely 'crow flies' catchment on foot or by bike.

In addition to 'crow flies' catchment areas tools such as ArcGIS Network Analyst also allows 'through the road/path network' calculations of the catchment size, which better reflect the actual walking and cycling distances considering the available routes, as shown in the figure below.

Figure 7.1 shows an example of this type of catchment mapping for the Dargle Wood Scheme. Here the blue and red ovals show the theoretical 'crow flies' 400m and 800m catchments of the scheme. The blue and red filled shapes show the 400m and 800m catchments for journeys through the road and path network.

The demographic data is then analysed for the populations within these catchment areas to establish the size of population in the local area and its character (i.e. is the population younger or older than average? Are there more non-car households or people who walk to work?).

Figure 7.1: Crow flies and Through the Network Catchments for potential access to and from the Dargle Wood Scheme.



Case Study: Catchment Statistics: Dargle Wood, Knocklyon

The table below shows these key statistics for the catchment areas identified for the Dargle Wood scheme. This shows that the population who stand to benefit from this scheme includes lower than average (for South Dublin) numbers of children, with higher levels of walking and cycling than the county average.

Permeability Assessment Toolkit		Quantitative Assessment	
Scheme Details			
Scheme ID and Name:	DW	Shared route at Dargle Wood, Knocklyon	
Scheme Description	Creation of new east/west pedestrian and cycle link through green space connecting to existing pedestrian routes.		
Scheme Cost	-		
Scheme Length	349.59m		
Catchment Size			
Population within 400m (crow flies)		3,017	
Population within 800m (crow flies)		9,524	
Population within 400m (through network)		927	
Population within 800m (through network)		4,508	
Performance against theoretical maximum (Network/Crow flies)		47%	
Socio - Demographic Profile of population within 800m of the scheme		Value	Percentage
Age 0 - 12 (South Dublin = 17%)		474	(11%)
Age 13 - 17 (South Dublin = 5%)		343	(8%)
Age 18 - 65 (South Dublin = 73%)		3,540	(79%)
Age 65+ (South Dublin = 5%)		151	(3%)
No. travel to work on foot (South Dublin = 18%)		704	(19%)
No. Travel to work by bike (South Dublin = 3%)		156	(4%)
No. Travel to work by car (driver and passenger) (South Dublin = 61%)		2,085	(57%)
No. Travel to work by Public Transport (Bus or Train) (South Dublin = 16%)		538	(15%)
Households with No Car (South Dublin = 14%)		70	(5%)
Destinations (by community need)			
	1	School	
	2	School Complex	
	3	Knocklyon Local Centre	
	4	Bus stop (West)	
	5	Bus stop (East)	

A.2.2 Access to Key Destinations

The demographic information discussed above is useful in helping to understand the character of an area and aids the identification of destinations which may be important to the local population considering the local demographic patterns identified. For example, an area with a high number of primary school aged children may consider access to primary schools important; an area with an ageing population may consider access to community centres or health facilities particularly important. All services should be linked to residential areas as a principle as set out in Section 3.

Following the identification of the key destinations in the catchment area, the walk/cycle distances and journey times from a nominal origin point on the scheme to each destination is calculated using GIS software. This is repeated to illustrate the 'before' and 'after' scenarios for the scheme.

The difference between these two sets of journey times provides an estimate of the likely 'journey time benefits' of the scheme. In the calculation of the overall benefits of the scheme, the average journey time benefit for all of the destinations is used to provide a 'journey time benefit' score as part of the wider assessment of benefits.

Case Study: Journey time statistics: Dargle Wood, Knocklyon

For the Dargle Wood scheme the destinations considered important included a school to the west, bus stops, a school complex to the east and an area of retail employment. Journey time benefits for these destinations varied, with the greatest benefit identified in improving journey times to the school complex and bus stop, and lower journey time benefits for access to the second bus stop and retail area.

Permeability Assessment Toolkit

Quantitative Assessment

Scheme Details

Scheme ID and Name:	DW	Shared route at Dargle Wood, Knocklyon
Scheme Description	Creation of new east/west pedestrian and cycle link through green space connecting to existing pedestrian routes.	
Scheme Cost	€	-
Scheme Length	349.59m	

Destinations (by community need)

1	School
2	School Complex
3	Knocklyon Local Centre
4	Bus stop (West)
5	Bus stop (East)

Calculated Walking and Cycling Distances (and times) to Key Destinations

	Prior Conditions			Anticipated Impact			Time Saving	
	Distance (m)	Cycle Time (min)	Walk Time (min)	Distance (m)	Cycle Time (min)	Walk Time (min)	Cycle Time saving (min)	Walk saving Time (min)
School	1,246.2	4.7	15.6	908.1	3.4	11.4	1.3	4.2
School Complex	1,689.6	6.3	21.1	1,345.6	5.0	16.8	1.3	4.3
Knocklyon Local Centre	1,156.3	4.3	14.5	818.1	3.1	10.2	1.3	4.2
Bus stop (West)	709.4	2.7	8.9	317.2	1.2	4.0	1.5	4.9
Bus stop (East)	1,103.2	4.1	13.8	830.8	3.1	10.4	1.0	3.4

Further analysis of the type set out in Section 1.2 of this document could then be carried out in order to assess the impact of the scheme on the number of residential units within walking distance before and after implementation. In the Knocklyon case, before the link was developed, 1,699 units were within a kilometre of the local centre by walking. After the link opened there were 2,089. Taking average household size in this area from the 2011 Census of 2.9, this equates to more than 1,100 extra potential customers for the shops and services at this location now living within walking distance. The link has had a similar impact on the numbers within cycling distance. This is a very important measure in the assessment of a proposed link in terms of local economic well-being.

A.3 On Site Audit

The previously discussed GIS analysis provides a good understanding of the catchment size and likely journey time improvements of any proposed scheme. In addition to these elements, it is also important to consider other less easily quantified impacts, such as the quality of the environment, which can also have a significant impact on people's likelihood of using a proposed route. On-site audits are a useful method to consider these impacts.

The On Site Audit form below is taken from the Dargle Wood project at Knocklyon. The audit form has been designed to be quick and easy to fill out to avoid excessive on-site time, and where possible uses 'yes' and 'no' answers to avoid variations in assessments between different surveyors, although some subjectivity still exists.

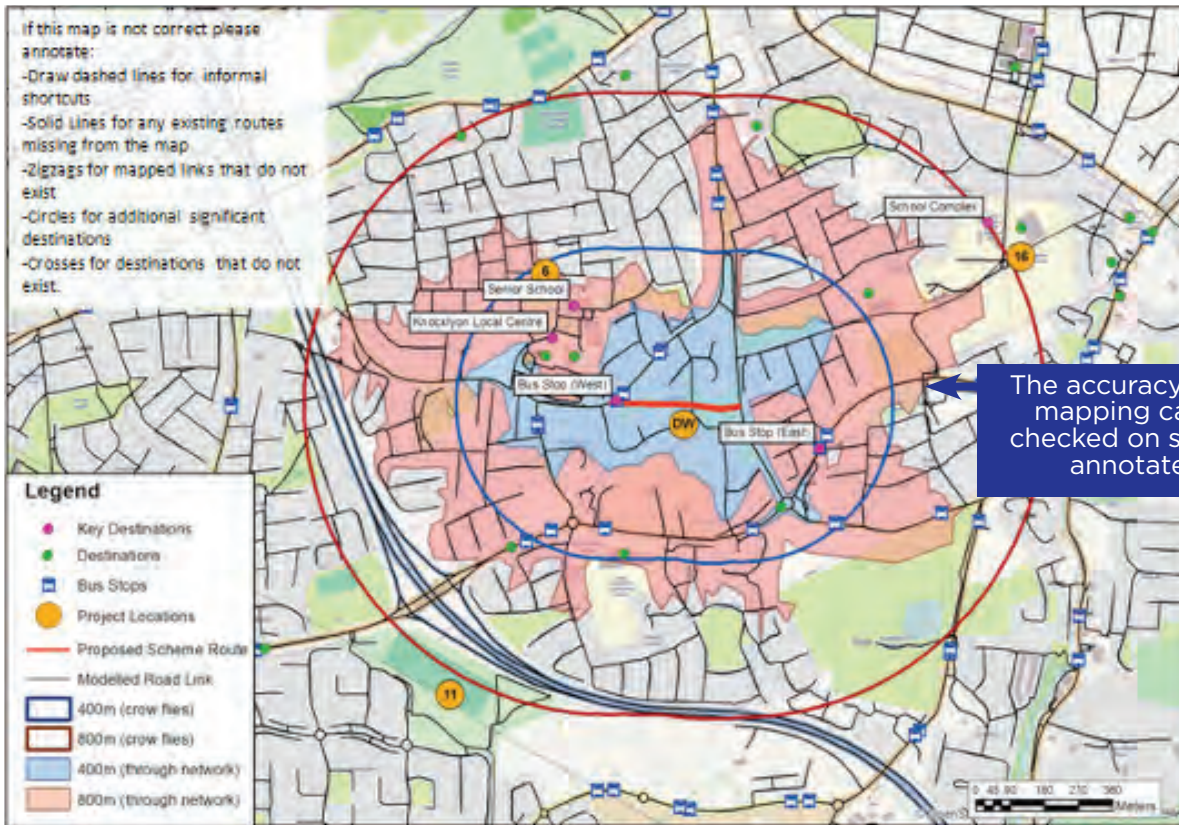
The form breaks the assessment down into the following different criteria:

- ▶ Directness;
- ▶ Personal Security;
- ▶ Legibility;
- ▶ Quality of Environment;
- ▶ Maintenance;
- ▶ Road Safety; and
- ▶ Usage.

It is intended that the same Audit form could be used both before and after implementation of the scheme to provide a consistent assessment of the impacts of the scheme; the questions highlighted in pink are only applicable once the scheme is completed. The completion of the on-site audit should take around 15 minutes per site. Surveyors should also use the visit to record pedestrian and cycle usage numbers, and to check the accuracy of the mapping to be used in the GIS assessment relative to the map on the back of the audit forms.

Figure 7.2: Example of a Site Audit form for Dargle Wood, Knocklyon

Site number	Scheme G		SIDE 1 OF 2		AECOM	
Location	Dargle Wood, Rathfarnham		From	To		
Auditor			Time			
Scheme Status	Completed		Date			
	Proposed					
Questions highlighted in pink only related to completed schemes.			CIRCLE THE APPROPRIATE ANSWER			COMMENTS
Scheme Category	Breaking through barriers	1				What type of scheme is it?
	Formalising existing desire lines	2				
	Upgrading existing routes	3				
Directness	Evidence of short cuts (in addition to proposed route) Please draw and label on map on reverse.	Y	N			How direct and obstruction free are any current routes?
	Number of additional short cuts					
	Path Width <or> 1.5m	<	>			
	Obstructions along route inc entry and exit points (Photos)	Y	N			
Personal	Minimum effective width without restriction along route			(in metres)		How secure does the area feel?
	Presence of informal surveillance - e.g. overlooked by properties	Y	N			
	Quality of street activity - evidence of antisocial behaviour?	FRIENDLY	MIXED	HOSTILE		
	Perceived fear of crime	LOW	MEDIUM	HIGH		
Legibility	CCTV present	Y	N			Is the current route legible to follow?
	Extent of sight lines	10m	30m	50m+	100m+	
	Is the route signed - along and to the route	TO PATH	ALONG PATH	BOTH		
Quality of the Environment	Surface continuity - extent of surface changes along the route (e.g Tarmac to mud)	HARD STANDING	MUD	INCONSISTANT		How nice is the environment?
	Gradient of path	EASY	MEDIUM	HARD		
	Soft Landscaping - e.g planting to improve environment	Y	N			
	Quality of materials	GOOD	AVERAGE	BAD		
Maintenance	Does the route have a sense of place - as a destination in its own right?	Y	N			How well maintained is the route and environment?
	Background Noise	LOW	MEDIUM	HIGH		
	Cleanliness	GOOD	AVERAGE	BAD		
	Perceived air quality	GOOD	AVERAGE	BAD		
Road Safety	Drainage - evidence of ponding?	GOOD	BAD			How safe does it feel?
	Evidence of neglect - e.g poor maintenance	Y	N			
	Leaf litter on route	Y	N			
Usage	Graffiti	SOME	MODERATE	LOTS		How well used is it?
	Durability of materials	GOOD	AVERAGE	BAD		
	Potential for conflict - e.g between peds, cyclists, cars.	Y	N			
	Traffic Speeds / Volume	LOW	MEDIUM	HIGH		
	Pedestrian count					



The table overleaf shows the results of the site audit for the Dargle Wood scheme. The column in white shows the results of the survey of conditions prior to implementation of the scheme. The results are then used as a starting point to assess the benefits of the proposed scheme, with scores amended to take account of how the predicted scheme is anticipated to influence conditions (as shown in the pink 'Proposed Scheme' column). The columns on the right indicate how the survey responses are converted into numeric scores. Measured attributes, such as pedestrian/cycle counts or path widths have been converted into scores (1 to 5) using appropriate ranges which can then be compared to other elements of the assessment. These ranges have been calculated through analysis of the observed measurements across all the schemes.

Case Study: Audit Results: Dargle Wood, Knocklyon

For the Dargle Wood scheme the audit results indicate that the scheme does overcome some obstructions along the route (in this case fences and walls). Levels of personal security were already considered good, so were not thought to benefit significantly from the scheme. However, the scheme would improve legibility through the provision of continuity of surface, where previously it was inconsistent. The scheme has also improved the cleanliness of the area, helping to overcome some of the graffiti found on the route.

Permeability Assessment Toolkit Qualitative Assessment

Scheme Summary

Scheme ID and Name:	DW	Shared route at Dargle Wood, Knocklyon	
Scheme Description	Creation of new east/west pedestrian and cycle link through green space connecting to existing pedestrian routes.		
	Prior Conditions	Proposed Scheme	Scoring Criteria

Directness

Evidence of short cuts (in addition to proposed route)	1	1	Y 1	N 2
Number of additional short cuts	0	0	Count	
Path Width <or> 1.5m	0	2	< 1	> 2
Obstructions along route incl. entry and exit points	1	2	Y 1	N 2
Minimum effective width without restriction along route	0	4	(in metres)	

Personal Security

Presence of informal surveillance - e.g. overlooked by properties	1	1	Y 2	N 1		
Quality of street activity - evidence of antisocial behaviour?	2	3	FRIENDLY 3	MIXED 2	HOSTILE 1	
Perceived fear of crime	3	3	LOW 3	MEDIUM 2	HIGH 1	
CCTV present	1	1	Y 2	N 1		
Extent of sight lines	4	4	10m 1	30m 2	50m+ 3	100m+ 4

Legibility

Is the route signed - along and to the route	0	0	TO PATH 1	ALONG P.1	BOTH 3	None 0
Surface continuity - extent of surface changes along the route	2	3	HARD STANDING 3	MUD 1	INCONSISTENT 2	

Quality of the Environment

Gradient of path	3	3	EASY 3	MEDIUM 2	HARD 1
Soft Landscaping - e.g. planting to improve environment	2	2	Y 2	N 1	
Quality of materials	0	3	GOOD 3	AVERAGE 2	BAD 1
Does the route have a sense of place - as a destination in its own right?	2	2	Y 2	N 1	
Background Noise	3	3	LOW 3	MEDIUM 2	HIGH 1
Perceived air quality	3	3	GOOD 3	AVERAGE 2	BAD 1

Maintenance

Permeability Assessment Toolkit		Qualitative Assessment				
Cleanliness	2	3	GOOD 3	AVERAGE 2	BAD 1	
Drainage - evidence of ponding?	2	2	GOOD 2	BAD 1		
Evidence of neglect - e.g poor maintenance	2	2	Y 1	N 2		
Leaf litter on route	2	2	Y 1	N 2		
Graffiti	1	3	NONE 4	SOME 3	MODERATE 2	LOTS 1
Durability of materials	0	3	GOOD 3	AVERAGE 2	BAD 1	
Road Safety						
Potential for conflict - e.g between peds, cyclists, cars.	2	2	Y 1	N 2		
Traffic Speeds / Volume	3	3	LOW 3	MEDIUM 2	HIGH 1	
Usage						
Pedestrian count		20		Count		
Cycling count		2		Count		

A.4 Overall Assessment

This section has so far provided an outline of the processes recommended to assess permeability schemes based upon a combination of the use of GIS and on-site audits. Each of the key metrics from the GIS and site audits shown previously should then be scored out of 5 and these scores combined to produce an overall assessment of the benefits of each scheme. It is critical that there is consistency across the scoring for each scheme as some elements are subjective. It would be best practice to have the same person scoring each scheme.

Case Study: Overall Assessment: Dargle Wood, Knocklyon

The table overleaf shows the overall assessment of the benefits of the Dargle Wood scheme assessed using the AECOM PAT approach. For the GIS elements of the assessment it shows that the scheme scored moderately well both in terms of its catchment size and for its socio-demographic profile as it relates to the propensity of the population to walk or cycle. Current levels of usage of the site by walkers was high, and the journey time benefits of the scheme were also high. The on-site audit results indicate that the scheme should provide directness benefits and improve the legibility and maintenance of the local environment, but other elements do not improve as they were already scored highly in the survey of prior conditions.

Permeability Assessment Toolkit		Overall Assessment							
Scheme Details									
Scheme ID and Name:	DW	Shared route at Dargle Wood, Knocklyon							
Scheme Description	Creation of new east/west pedestrian and cycle link through green space connecting to existing pedestrian routes.								
Catchment Size									SCORE: 5/10
Population within 800m (through network)	4,508							3	
Performance against theoretical maximum	47%							2	
Socio - Demographic Profile of population within 800m of the scheme (through network)									SCORE: 8/15
	Value	Percentage							
No. travel to work on foot (Average = 18%)	704	(19%)						3	
No. Travel to work by bike (Average = 3%)	156	(4%)						4	
No car households (Average = 14%)	70	(5%)						1	
Current Usage									SCORE: 3/5
Walkers and cyclists (per hour)	20.0							4	
Cyclists (per hour)	2.0							2	
Calculated Walking and Cycling Distances (and times) to Key Destinations									SCORE: 3/5
	Prior Conditions			Anticipated Impact			Time Saving		
	Distance (m)	Cycle Time (mm:ss)	Walk Time (minutes)	Distance (m)	Cycle Time (minutes)	Walk Time (minutes)	Cycle time saving (minutes)	Walk time saving (minutes)	
Weighted Average Journey Time for top 5 destinations	1164.64	04:22	14:33	827.925	03:06	10:21	01:16	04:13	3
Modal Shift Potential - Quantitative Assessment Score									43%

Permeability Assessment Toolkit

Overall Assessment

Qualitative Survey Results

	Existing	With Proposed Scheme	Improvement	
Directness	1	5	4	
Personal Security	4	4	0	
Legibility	2	3	1	
Quality of Environment	5	5	0	
Maintenance	3	5	2	
Road safety	5	5	0	
Overall Qualitative Score	58%	88%	29%	29%

Contribution to Objectives (aligned to national and local policy objectives)

Text based upon interpretation of wider assessment

Encourage the use of walking and cycling for local trips; encouraging modal shift away from car use.	This scheme would benefit a large catchment area of people with a relatively high propensity to walk and cycle. The likely journey time benefits of the scheme are moderately high.
Provide safe and secure walking and cycling routes which have a positive impact upon the public realm.	The area is already considered fairly safe and secure, with a relatively high quality environment, which will be improved by the scheme
Provide routes which more directly serve key local education, employment, health, retail and community destinations.	The scheme will provide more direct access to a local shopping centre, schools and bus stops.
Provide more direct connections to the wider walking, cycling and public transport networks.	The scheme would slightly improve access to bus routes on main distributor roads.

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