Technical Note

Project:	Sutton to Malahide Pedestrian and Cycle Scheme		
Subject:	Strand Road Portmarnock		
Author:	Atkins		
Date:	April 2022	Project No.:	5158418
Atkins No.:	5158418DG0081	Icepac No.:	
Distribution:	FCC	Representing:	FCC

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Author-ised	Date
Rev 0.0	draft	DB	CF	CF	CF	22/11/2021
Rev 1.0	draft	OC	CF	CF	CF	14/12/2021
Rev 2.0	draft	OC	CF	CF	CF	02/03/2022
Rev 3.0	draft	OC	PF	CF	CF	24/03/2022
Rev 4.0	Final	CF	PF	CF	CF	13/04/2022

Client signoff

Client	FCC
Project	Sutton to Malahide Pedestrian and Cycle Scheme
Project No.	5158418
Client signature / date	

Scheme Outline

Fingal County Council (FCC) proposes to develop a comprehensive pedestrian and cycle route with a view to providing connecting facilities between the towns of Sutton and Malahide.

To achieve this objective, Atkins have been engaged by FCC to develop route options, to undertake preliminary design work on the preferred route option and to manage and coordinate all aspects of an application to An Bord Pleanála seeking approval for the implementation of the scheme. At present the scheme is at Stage 2 (Preliminary Design).

The purpose of the proposed scheme as set out by Fingal County Council and the National Transport Authority is to develop an urban greenway to facilitate leisure and recreational pedestrian and cycling trips between Sutton and Malahide. The proposed scheme will form a part of the long-standing objective of the Fingal Development Plan in providing a greenway from Sutton to Swords and the wider Fingal Coastal Way.

Purpose of Technical Note

The purpose of this document is to study the route options for the section of the scheme that runs along the Strand Road north eastwards from The Dunes for approximate 500 meters to Blackberry Lane. The options have been assessed through a Multi Criteria Assessment (MCA) process to determine the preferred option along this short section of the scheme.

Options Study Area Description

The location of the subject area is presented in Figure 1.

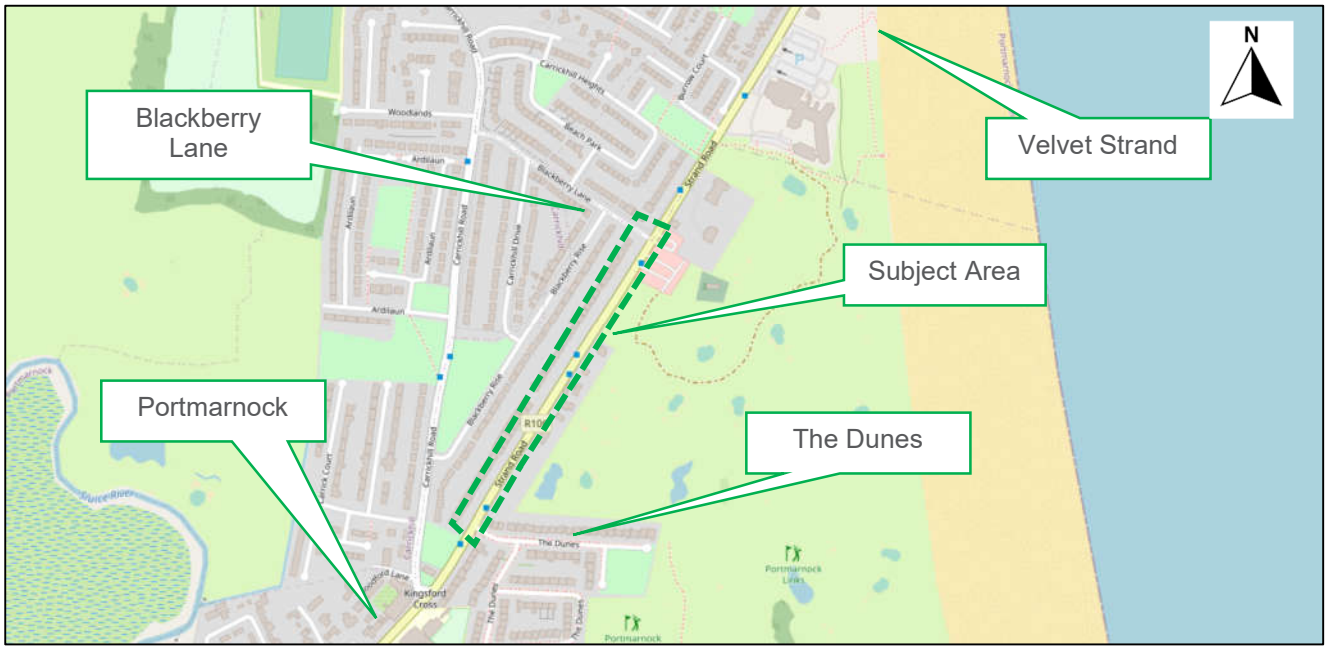


Figure 1 – Subject Study Area

The options study area includes the section of the scheme that runs along the Strand Road north eastwards from The Dunes for approximately 500 metres to Blackberry Lane. The options set out below require varying levels of road realignment and tree removal. Further details are set out within the individual options.

Multi Criteria Analysis

The MCA process has been developed with reference to the National Cycle Manual (NCM), the Common Appraisal Framework for Transport Projects and Programmes (CAF) and Unit 7.0 'Multi Criteria Analysis' of TII's Project Appraisal Guidelines. The following steps have been developed to assist in the MCA process.

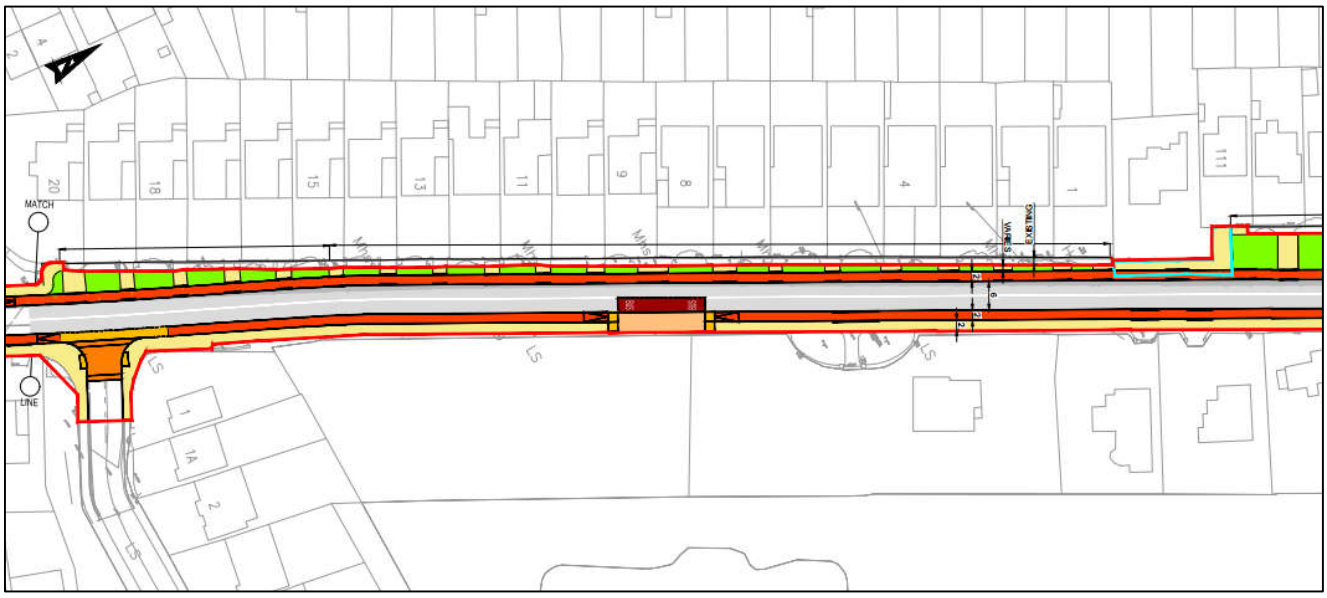
Development of Route / Link Options

Through reference to the National Cycle Manual and discussion with the Client the following design options have been identified.

- Option 1: One-way cycle tracks on both sides of the road with tree removal.

  This option proposes to provide one-way cycle tracks on both sides of the R106 (Strand Road). Looking at the cross section in a west to east orientation this will incorporate the existing footpath, a verge of varying width, a 2.0m cycle track, a 6.0m carriageway, a 2.0m cycle lane and a 2.0m footpath.

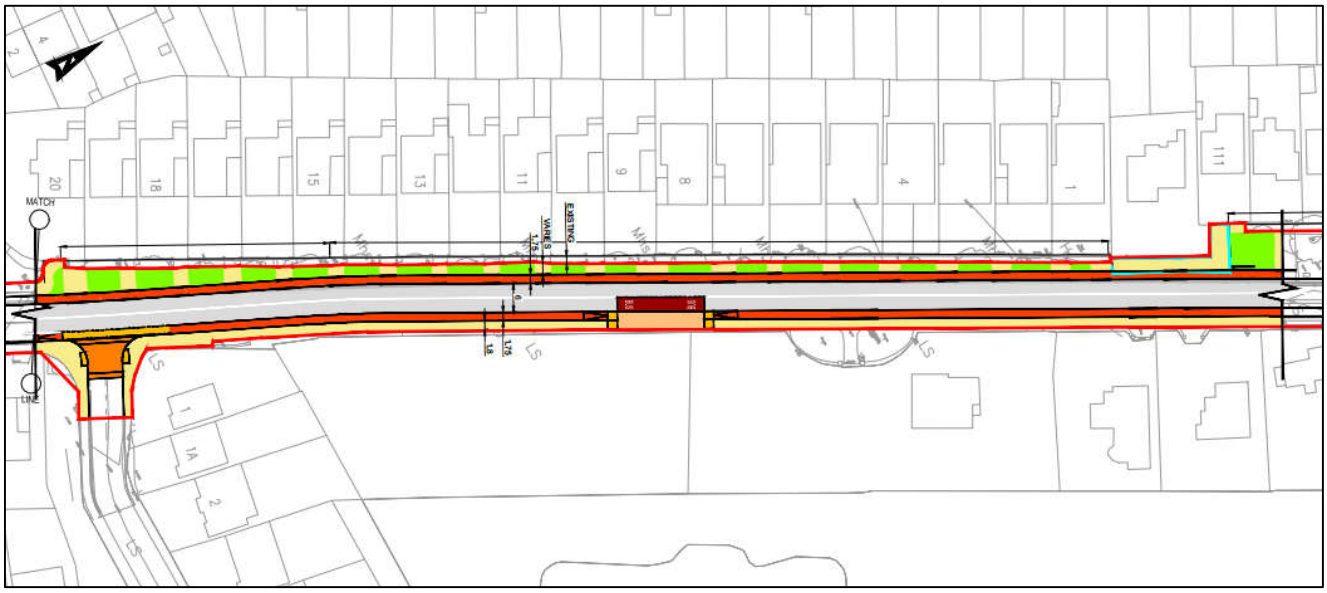
  The adjacent carriageway can operate as a 50kph speed limit. This option will require the removal of thirteen (13) trees.



- Option 2: One-way cycle tracks (reduced cross-section) on both sides of the road with tree removal.

  This option also proposes to provide one-way cycle tracks on both sides of the R106. Looking at the cross section in a west to east orientation this will incorporate the existing footpath, a verge of varying width, a 1.75m cycle track, a 6.0m carriageway, a 1.75m cycle lane and a 1.8m footpath.

  The adjacent carriageway can operate as a 50kph speed limit. This option is likely to require the removal of thirteen (13) trees.



- Option 3: One-way cycle tracks (reduced cross-section) on both sides of the road with reduced tree removal.

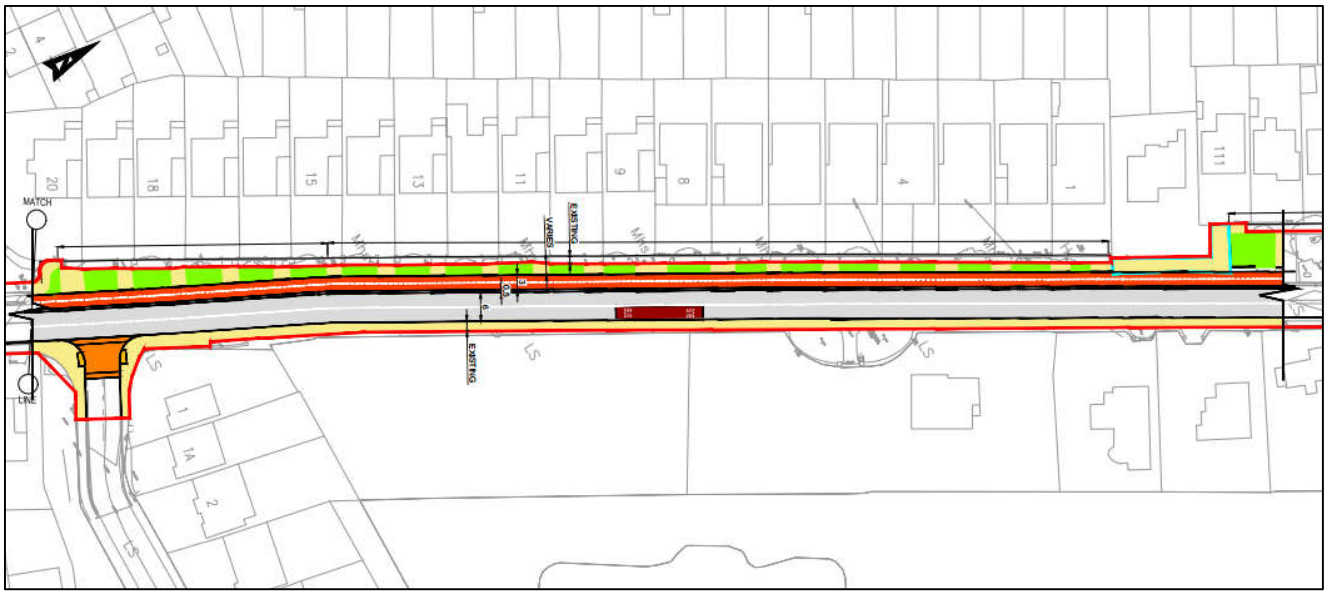
  This option also proposes to provide one-way cycle tracks on both sides of the R106. Looking at the cross section in a west to east orientation this will incorporate the existing footpath, a verge of varying width, a 1.5m cycle track, a 6.0m carriageway, a 1.5m cycle lane and a 1.8m footpath.

  The adjacent carriageway will be required to operate as a 30kph speed limit. This option would increase the width of the verge to the west and is therefore likely to reduce impact significantly on the adjacent trees, however this would need to be confirmed through further investigation.

- Option 4: Two-way cycle track on landward side of carriageway.

  This option proposes to provide a two-way cycle track on the landward (western) side of the R106. Looking at the cross section in a west to east orientation this will incorporate the existing footpath, a verge of varying width, a 3.0m two-way cycle track, a 0.5m buffer, a 6.0m carriageway, and a 1.8m footpath.

  The adjacent carriageway can operate as a 50kph speed limit. This option will require the removal of thirteen (13) trees.



- Option 5: Two- way cycle track on coastal side of carriageway.

  This option proposes to provide a two-way cycle track on the coastal (eastern) side of the R106. Looking at the cross section in a west to east orientation this will incorporate the existing footpath, a verge of varying width, a 6.0m carriageway, a 0.5m buffer, a 3.0m two-way cycle track, and a 1.8m footpath.

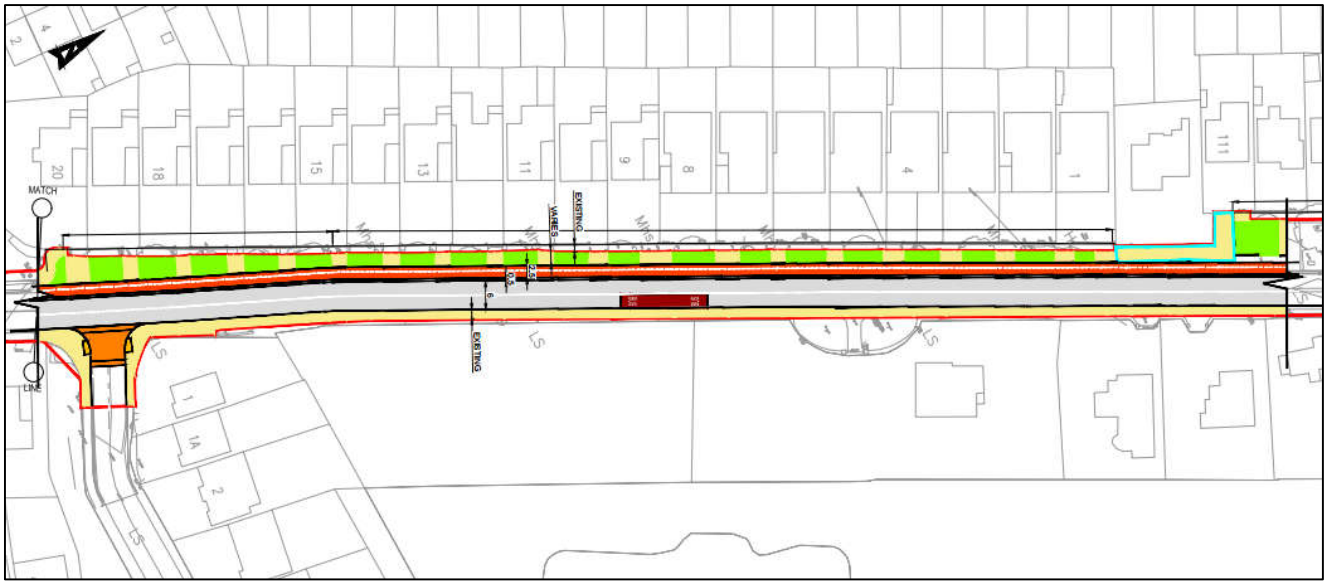
  The adjacent carriageway can operate as a 50kph speed limit. This option will require the removal of thirteen (13) trees.

  This option will also require the main line of the road to be realigned.

- Option 6: Two- way cycle track (reduced cross-section) on landward side of carriageway.

  This option proposes to provide a two-way cycle track on the landward (western) side of the R106. Looking at the cross section in a west to east orientation this will incorporate the existing footpath, a verge of varying width, a 2.5m two-way cycle track, a 0.5m buffer, a 6.0m carriageway, and a 1.8m footpath.

  The adjacent carriageway will be required to operate as a 30kph speed limit. This option would increase the width of the verge to the west and is therefore likely to reduce impact significantly on the adjacent trees, however this would need to be confirmed through further investigation.



- Option 7: One-way cycle track on both sides of the road, full width,

  This option proposes to provide one-way cycle tracks on both sides of the R106. Looking at the cross section in a west to east orientation this will incorporate the existing footpath, a verge of varying width, a 2.0m cycle track, a 6.0m carriageway, a 2.0m cycle lane and a 2.0m footpath.

  The adjacent carriageway can operate as a 50kph speed limit. This option does not require the removal of thirteen (13) trees but will result in the loss of some vegetation on the eastern side.

  This option shifts the alignment of the road to the east and thus requires land take from 5no. properties including 'South Lodge' which is listed as RPS 0918 on the Fingal County Council record of protected structures.

Development of Assessment Criteria

With reference to design principles set out within the NCM and impacts that are relevant to the adjacent community and to the delivery of the proposed scheme the following criteria have been identified.

Table 1. Criteria Summary

Context	Design Context The assessment criteria relating to design refers to the five key design principles for cycle friendly infrastructure. These include the following:	Community Context The interests of the community are also considered within the assessment criteria. These include the following:	Delivery Context The consideration of risks in terms of construction costs and programme are also assessed. These include the following:	Environmental Context The consideration of risks in terms of impacts on heritage features and ecology:
Criteria	• Safety. • Directness. • Coherence. • Attractiveness. • Comfort.	• Local Resident impacts • Operational impacts	• Planning risks • Budget risks • Programme risks	• Heritage • Ecology
Considerations	• Traffic volumes and speeds. • Pedestrian conflicts. • Perception of safety. • Ability to overtake. • Route continuity and consistency. • Cycling experience. • Impact on local heritage and landscape values. • Provision of adequate width. • Suitability for all users.	• Property access. • Parking. • Privacy/Security. • Impact of land / property acquisition. • Impact on junctions. • Impact on maintenance costs.	• Public / stakeholder views on tree loss. • Construction costs. • Land / property acquisition costs. • Land / property acquisition legal processes.	• Impact on Record of Protected Structures / National Inventory of Architectural Heritage • Impacts on features with heritage value • Direct loss of tree line and hedge lies • Removal of vegetation • Impacts on green infrastructure features (i.e. ditches and watercourses)

Development of Scoring Process

Each of the five options are assessed against the above identified criteria in a performance matrix which indicates how each option performs against the criteria and in comparison, to the other six options.

Each criterion is scored on a five-point ordinal colour coded scale as presented in Table 2 below. This scale rates how well each alternative satisfies a particular criterion.

Table 2. Scoring Scale

Colour Coding	Rank Description
5	Positive
4	Slightly Positive
3	Neutral
2	Slightly Negative
1	Negative

Development of Weighting Procedure

It is considered that safety is central to all good design and as such Safety is the most important criteria. Thus, this criterion has been given a weighting of fifteen (15), whereas all other criteria are given a weighting of ten (10).

Performance Matrix

The full definition of the MCA criteria including sub criteria is provided in Table 3. The MCA assessment is provided in Table 4.

Table 3. MCA Assessment Criteria

Context	Main Criteria	Sub Criteria	Weighting
Design Context	Safety	Traffic volumes and speeds. Pedestrian conflicts. Perception of safety.	15
	Directness	Ability to overtake.	10
	Coherence	Route continuity and consistency.	10
	Attractiveness	Cycling experience. Impact on local heritage and landscape values.	10
	Comfort	Provision of adequate width. Suitability for all users.	10
Community Context	Local Resident Impact	Property access. Parking Privacy/Security Impact of land / property acquisition.	10
	Operational Impacts	Impact on junctions. Impact on maintenance costs.	10
Delivery Context	Planning Risks	Public / stakeholder views on tree loss	10
	Budget Risks	Construction costs. Land / property acquisition costs;	10
	Programme Risks	Land / property acquisition legal processes.	10
Environmental Context	Heritage	Impact on RPS / NIAH Impacts on features with heritage value	10

Ecology	Direct loss of tree line and hedge lines Removal of vegetation Impacts on green infrastructure features (i.e. ditches and watercourses)	10

Table 4. MCA Performance Matrix

Context	Criteria	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Design Context	Safety							
	Directness							
	Coherence							
	Attractiveness							
	Comfort							
Community Context	Local Resident Impacts							
	Operational Impacts							
Delivery Context	Planning Risks							
	Budget Risks							
	Programme Risks							
Environmental Context	Heritage							
	Environmental							
Rankings		2nd	5th	6th	3rd	4th	1st	7th

Note:
A weighting of 15 has been applied to the safety criterion.
A weighting of 10 has been applied to all remaining criteria.

Assessment Discussion

The ranking of the seven design options as presented within Table 4 'Performance Matrix' gives an indication of how each option performs against each criterion and therefore illustrates the overall strengths and weaknesses of each option.

It should be noted that this ranking only provides a guide to the impact of the each of the five design options which should be balanced through discussion and engineering judgement. The following such discussion weighs up the strength of individual criteria and the impacts imposed by each option in order to determine the overall impacts and identify an emerging preferred design option.

Option 1: One-way cycle tracks on both sides of the road with tree removal

This option performs well in most of the design contexts. It does not perform well on the attractiveness criteria as it removes thirteen (13) trees and thus impacts on the landscape character of the existing road corridor. In terms of the community context this option falls slightly in that the western cycle track will interact with the adjacent dwelling access points. In terms of the delivery context the most significant issue is that this option removes a total of thirteen (13) trees. This has a significant environmental, landscape character and green infrastructure impact and is highly likely to raise potential for objections to the scheme if this option were proposed.

Option 2: One-way cycle tracks (reduced cross-section) on both sides of the road with tree removal.

This option performs marginally less well in terms of the design context primarily in that the width of the cycle track is reduced to 1.75m. This has some impacts on safety, comfort and directness as it doesn't facilitate overtaking or evasive movements as well as a 2.0m wide cycle track can. In terms of the community context this option does not perform well in that the western cycle track will interact with the adjacent dwelling access points. The narrower cycle track width also makes it more difficult to undertake regular maintenance. In terms of delivery context, whilst this will have less impact on the trees, from a practical and construction point of view there is still potential that some, if not all, trees may need to be removed. This has the potential for a significant environmental, landscape character and green infrastructure impact and is highly likely to raise potential for objections to the scheme if this option were proposed.

Option 3: One-way cycle tracks (reduced cross-section) on both sides of the road with reduced tree removal.

This option is similar to Option 2. The main difference is that the cycle tracks are reduced to 1.5m and the adjacent carriageway speed limit would need to be reduced to 30kph through implementation of some additional speed management features. The reduction in width has further impacts on safety, comfort and directness. In terms of the community context this option falls slightly in that the western cycle track will interact with the adjacent dwelling access points. The narrower cycle track width also makes it more difficult to undertake regular maintenance. This option is likely to remove any impacts on the adjacent trees however this cannot be fully ascertained at this stage and would be subject to further investigation. In terms of delivery, given the likely retention of the trees this option is unlikely to receive objections from that point of view.

Option 4: Two-way cycle track on landward side of carriageway.

This option performs well in all of the design contexts. In terms of the community context it does have a local resident impact in that it is a two-way cycle track that intersects with all of the adjacent residential access points. A common issue with this type of cycle track is that drivers would be less likely to expect a cyclist to approach from the left. Notwithstanding, training could be offered to residents so that they are comfortable with what to anticipate. In addition, they will be utilising their access daily and thus would be very familiar with their potential interaction with cyclists. In terms of the delivery context the most significant issue is that this option removes a total of thirteen (13) trees. This has a significant environmental, landscape character and green infrastructure impact and is highly likely to raise potential for objections to the scheme if this option were proposed.

Option 5: Two-way cycle track on coastal side of carriageway.

This option performs well in all of the design contexts. As it is located on the opposite side of the R106 it does not have the extensive vehicle and cyclist interaction as other options. In terms of the delivery context the most significant issue is that this option removes a total of thirteen (13) trees. This has a significant environmental, landscape character and green infrastructure impact and is highly likely to raise potential for objections to the scheme if this option were proposed. In addition, this option will require the main line of the road to be realigned and thus this will lead to extensive construction, drainage, services and utilities costs.

Option 6: Two-way cycle track (reduced cross-section) on landward side of carriageway.

This option performs well in all of the design contexts. The 2.5m wide two-way cycle track and 0.5m buffer could be reallocated as a 3.0m wide two-way cycle track without the buffer. The with-flow cyclist would be positioned nearside adjacent to the carriageway to align with Sustainable Safety Principles whilst the contraflow cyclist would be on the offside position. In terms of the community context it does have a local resident impact in that it is a two-way cycle track that intersects with all of the adjacent residential access points. A common issue with this type of cycle track is that drivers would be less likely to expect a cyclist to approach from the left. Notwithstanding, training could be offered to residents so that they are comfortable with what to anticipate. In addition, they will be utilising their access daily and thus would be very familiar with their potential interaction with cyclists. This option is likely to remove any impacts on the adjacent trees however this cannot be fully ascertained at this stage and would be subject to further investigation. In terms of delivery, given the likely retention of the trees this option is unlikely to receive objections from that point of view.

Option 7: One-way cycle track on both sides of the road, full width

This option scores highly in terms of the design context however the land-take and wall / hedge removal on the eastern side has the potential to impact on the landscape character of the R106 at this location. In terms of the community context this option falls slightly in that the western cycle track will interact with the adjacent dwelling access points. In terms of the delivery context the most significant issue is that this option will remove extensive

hedge / tree line on the eastern side of the R106 and will require additional land take. This option will also require significant construction, drainage, services and utilities costs relative to other options. This option would also impact on the protected structure, in terms of land take from its associated curtilage. This option will also remove hedge row and tree line from the eastern side and as such this has a significant environmental, landscape character and green infrastructure impact and is highly likely to raise potential for objections to the scheme if this option were proposed. This option presents the most significant impact to programme compared to other options due to land take, removal of hedge rows, impact on protected structure etc.

Recommendation

It is recommended that Option 6: Two-way cycle track (reduced cross-section) on landward side of carriageway is the preferred option to be progressed. It presents the best option to provide a high-quality facility with much reduced impact on the adjacent trees within the existing road corridor and will be relatively inexpensive to deliver with limited risks to delivery.

The primary residual risk pertaining to this option is the potential for construction to damage the tree root systems. It is recommended that an arborculturalist survey, which may include slit trenches, is undertaken initially to determine the likely spread of the roots systems and that a construction methodology is developed arising out of this survey.

The secondary residual risk is the potential for the root system to impact on the pavement quality due to heave. The arborist survey should assess this potential risk and recommend potential construction methods and measures such as ‘no dig solutions’ and ‘tree root barrier systems’.

Tree Retention Process

The following outlines the process that would be implemented to retain as many trees as possible.

There are a number of locations along the Preferred Scheme Layout where the proposed route is in close proximity to trees and the root protection areas of trees. In some instances this is less than one metre. This can present two issues:

- Construction works causing harm to tree root systems; and
- Root intrusion to the footpath and cycle track foundations leading to deformation of pavement surface.

At these locations, and where practicably possible, it is intended to retain existing trees rather than remove them as there are opportunities and methodologies to allow for pathway construction whilst also offsetting impacts on the root protection area of trees adjacent to the pathway.

Required pathway excavations would be relatively shallow and the use of vacuum extraction of ground materials can allow for the retention of tree root systems and allow for the installation of tree pits with engineered material under the pathway. The installation of root barrier membranes in both a vertical line along the path edge and also in a horizontal line under the pathway can reduce root lift of the pavement and reduce compression impacts on the tree roots.

The retention of tree roots, the installation of structurally solid tree pits and the use of root barriers and root deflectors can allow for the construction of the pathway in close proximity to existing trees whilst retaining these trees and allowing them to develop naturally. Similar methodologies were successfully employed during the construction of the Luas Cross City project in Dublin City centre.

This methodology becomes limited where structural roots (large / thick roots) are already established in close proximity to the proposed pathway. Whilst the extent of large, thick structural roots (which cannot be deflected) is unknown at this time, further surveys will be undertaken by an arboriculturalist to determine this. The design of the scheme has been developed to avoid mature native trees and as such the potential for the scheme to interact with large structural roots is very limited. However, in some instances, there may be occasional loss of roadside landscape feature trees and a comprehensive landscape design will allow for like for like replacement of landscaping features where required.