Intended for
Dun Laoghaire / Rathdown County Council

Document type
Technical Note

Date
July 2021

AST IMPLEMENTATION PLAN
DEANSGRANGE ROUTE OPTIONS REPORT

Bright ideas. Sustainable change.

AST IMPLEMENTATION PLAN
DEANSGRANGE ROUTE OPTIONS REPORT

Project name	**Active School Travel – Paramics Traffic Modelling**
Project no.	**1620010428-001**
Recipient	**Dun Laoghaire - Rathdown County Council**
Document type	**Technical Note**
Version	**F0**
Date	**19th July 2021**
Prepared by	**Tim Parris**
Checked by	**Nigel Roberts**
Approved by	**Steve Chewins**
Document Reference	**DLR-RAM-TP-TN-001**

Ramboll
1 Broad Gate
The Headrow
Leeds
LS1 8EQ
United Kingdom

T +44 113 245 7552
https://uk.ramboll.com

Ramboll UK Limited
Registered in England & Wales
Company No: 03659970
Registered office:
240 Blackfriars Road
London
SE1 8NW

CONTENTS

1. INTRODUCTION

Ramboll have been commissioned by Dun Laoghaire-Rathdown County Council to develop a local Paramics traffic model to assess a number of walking and cycling interventions which form part of the Active School Travel project. The purpose of the modelling is to inform the decision making process in relation to active travel routes and to understand what affect the interventions would have for the movement of people in and around the vicinity of Deansgrange Road, Abbey Road and Kill lane in the South East of Dublin County.

The objective of the modelling report is to comply with one of DLRCC's recommendations as detailed in the published Report on Submission & Executive's Recommendations which is available online at: https://www.dlrcoco.ie/sites/default/files/atoms/files/submissions_and_executives_recommendations_-_full_detailed_report.pdf

The recommendation noted '*that the original proposal and 2 alternative routes at Deansgrange Road and Kill Lane are reviewed. The proposal which best facilitates the objectives of the Active School Travel initiative shall be implemented. This will include an analysis of traffic impacts through modelling.*'

A Paramics modelling exercise has been developed to focus on the impacts and benefits to local motor vehicle traffic. This approach has been adopted as the modelling exercise is focused on determining the relative benefits and disbenefits of each alternate option against each other. The proposed interventions are sought to be implemented as pilot measures, seeking to support children and parents in returning to school. The analysis is informed by the best available data and is intended to give an indication of the comparative scale of relative change in network performance in each of the 'Do Something' scheme options. The 'do nothing' or baseline model is built using data from May 2019, in a pre-COVID-19 scenario and was developed based on parameters that were made to make the flows similar to May 2019.

It is noted that the Paramics traffic modelling undertaken for the proposed measures on and around Deansgrange Road derives the relative impacts of each intervention on motor vehicles only. Impacts on people walking or cycling cannot be assessed within the Paramics model. This has therefore been assessed separately as part of a qualitative Multi-Criteria Analysis within the report.

As a result, the modelling will not show any modal shift or consequent reduction in motor vehicle volumes as result of the proposed measures. The impact on motor vehicle traffic is therefore evaluated as if no person driving today would change mode of transport as a result of the new infrastructure for walking and cycling put in place. This would be the worst-case scenario as in reality some people are likely to make this switch; this is supported by the results of the public consultation process which shows that 68% of the respondents would consider walking and cycling more often as a result of these measures.

2. PLANNING CONTEXT

The following documents set out the transport planning policy framework on a national, regional and local level. The overarching emphasis of these documents is to promote and encourage sustainable modes while reducing unnecessary car trips.

2.1 National Policy

2.1.1 Smarter Travel – A Sustainable Transport Future

This document sets out the transport policy for Ireland and was last updated in July 2020. It identifies a target for reducing work-related commuting by cars from its current modal share of 65% to 45% by 2020. The document acknowledges that the targets were ambitious and may need to be adjusted in light of improving knowledge and changing trends.

2.1.2 National Cycle Policy Framework

The National Cycle Policy Framework outlines the national policy for cycling, in order to create a stronger cycling society, and a friendlier environment for cycling.

The policy document sets a target of 10% of all trips by bicycle and equally recognises the need of promoting and integrating cycle networks.

2.2 Regional Policy

2.2.1 Transport Strategy for the Greater Dublin Area

The NTA's Transport Strategy for the Greater Dublin Area was adopted in April 2016.

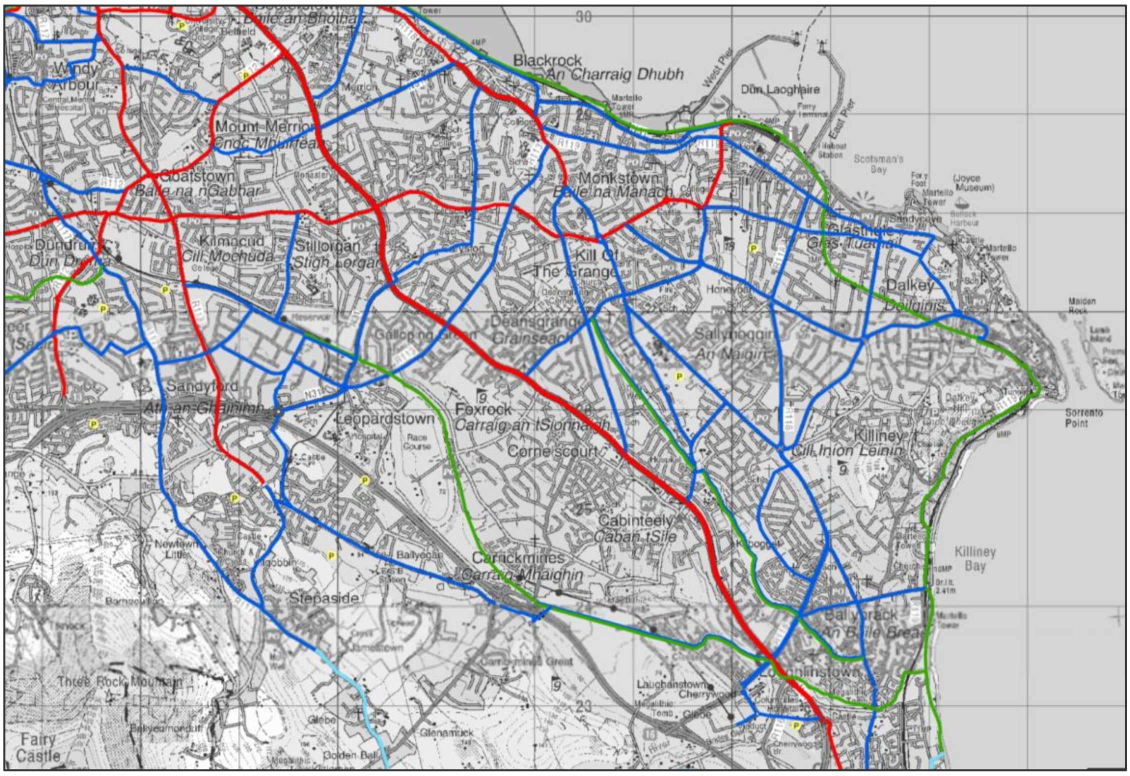
The strategic purpose of the document is '*to contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods.'*

2.2.2 Greater Dublin Area Cycling Network Plan

The NTA published the 'Greater Dublin Area Cycle Network Plan' in December 2013, which describes both the existing cycle network and the planned cycle route provision for future years.

The Plan proposes a number of upgrades to the cycling network in line with the GDA Cycling Network Plan and specifically at Deansgrange develops the identified Secondary Cycle Route for Dublin Metropolitan Area (Sheet CN2), extracted below in Figure 2.1

Figure 2.1 – proposed Cycle Network in the GDA for Deansgrange.



2.3 Local Policy

2.3.1 Dún Laoghaire-Rathdown County Development Plan (2016-2022)

Dún Laoghaire-Rathdown County Council has adopted its Development Plan, over the period from 2017 to 2022. This plan sets out a shared vision that will shape the future growth in the County over the 6-year period.

The plan outlines various transport related policies and objectives to be implemented during the period of the Plan. The policies and objectives relevant to this proposal are described below:

Policy ST5: Walking and Cycling
It is Council policy to secure the development of a high-quality walking and cycling network across the County in accordance with relevant Council and National policy and guidelines.

Policy ST6: Footways and Pedestrian Routes
The Council will continue to maintain and expand the footway and pedestrian route network to provide for accessible pedestrian routes within the County in accordance with best accessibility practice.

Policy ST7: County Cycle Network
It is Council policy to secure improvements to the County Cycle Network in accordance with the Dún Laoghaire-Rathdown Cycle Network Review whilst supporting the NTA on the development and implementation of the Cycle Network Plan for the Greater Dublin Area.

The proposed scheme is also in accordance with the objectives of the **'Dún Laoghaire-Rathdown County Council Climate Change Action Pan 2019-2024'**, including Actions T4, T6, T7, T8, T11 and T13.

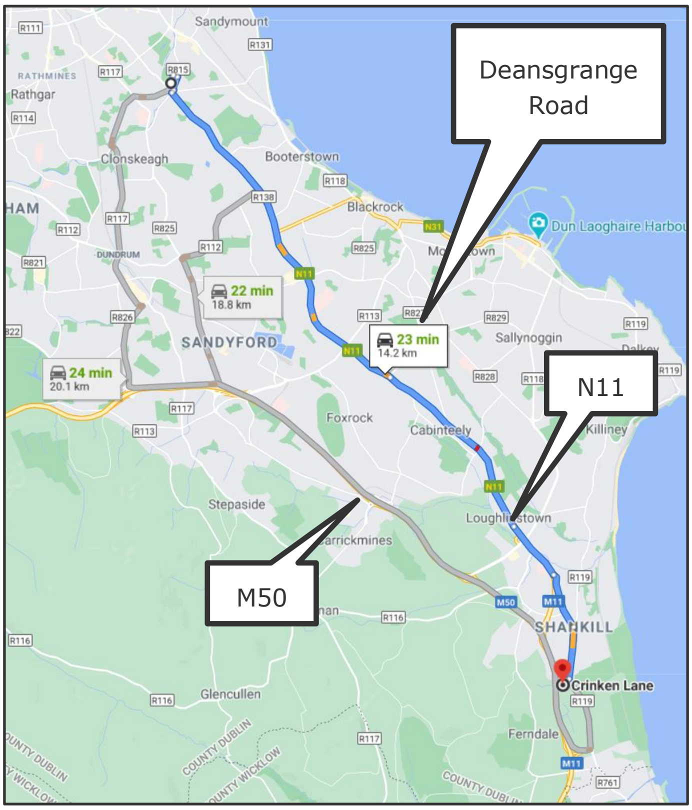
3. BASE MODEL

In order to meaningfully test the three 'Do Something' scheme options, a realistic base model must first be established against which to compare any changes. The base model must reflect observed motor vehicle traffic conditions and provide genuine alternative routes for vehicles using the roads of interest to re-route in reaction to the changes to be modelled.

3.1 Model Extent

Some trips between Dublin city and the south may involve a choice between the M50 and N11, as illustrated in the Google Maps routing suggestion shown in Figure 3.1.

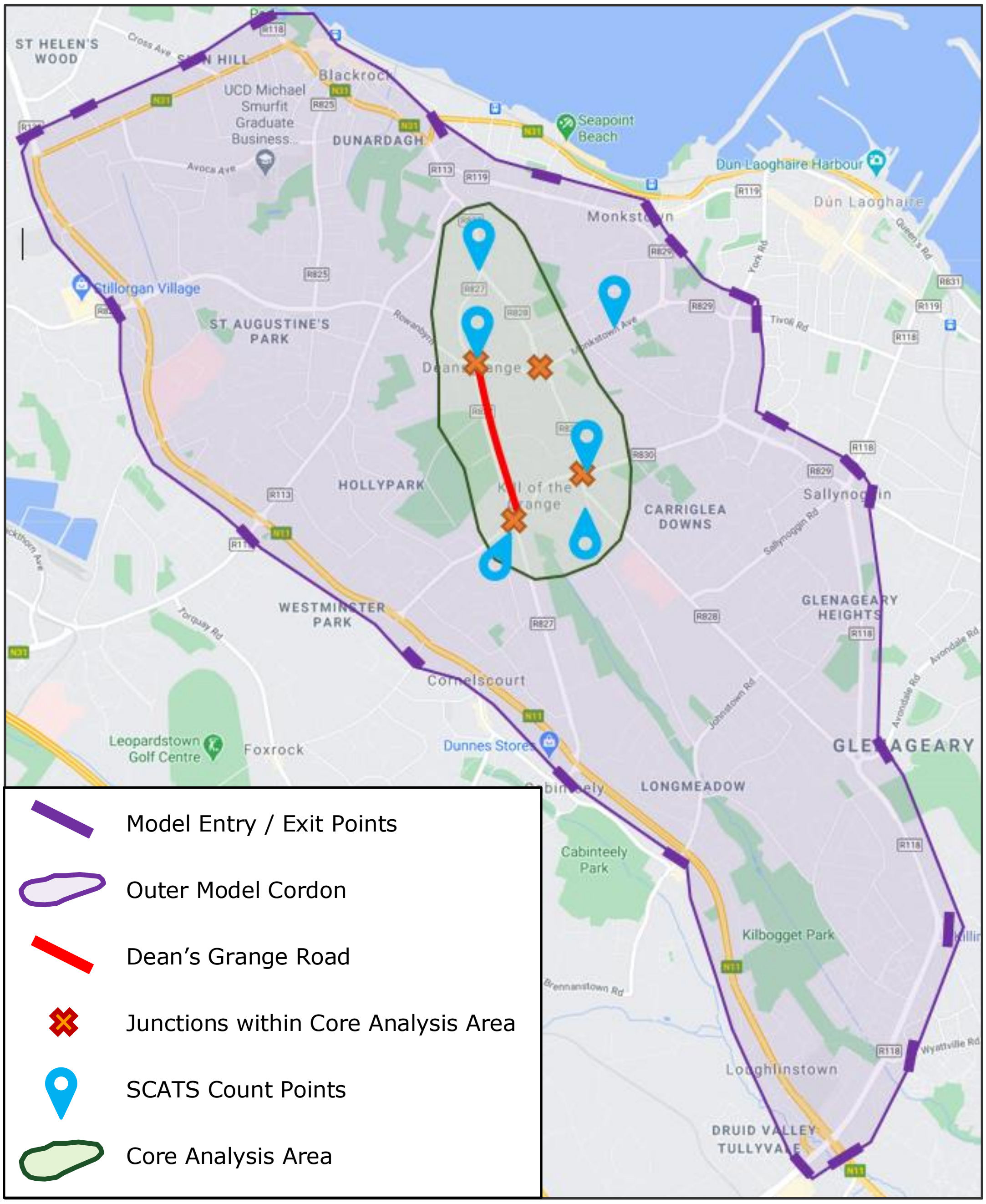
Figure 3.1 – Google Maps Route Suggestions Between Dublin City Centre and the South



It is considered, however, that motor vehicle traffic impacts of changes to Deansgrange Road are unlikely to cause sufficient impact on the N11 that any element of existing N11 trips would be persuaded to move to the M50. As such, the M50 is excluded from the model.

Acknowledging that Deansgrange Road is used as a link for journeys between the city centre and destinations to the south; the model will need to capture any redistributive effects on motor vehicle traffic due to changes on Deansgrange Road. The traffic data available to inform the modelling has been configured according to the illustration in Figure 3.2.

Figure 3.2 – Paramics Model Extent, Configuration and Data Sources



- **Outer Model Cordon** – A 'skeleton' model comprises primary links only. Realistic motor vehicle traffic movements are coded with appropriate estimated lane widths, priorities, visibility, gap acceptance etc. The purpose of the outer model is to provide a network which realistically represents the alternative choices vehicles have, to using Deansgrange Road. The model objective will be that the vehicle 'cost' (a function of time, distance, complexity, congestion etc.) of using the alternative links will be realistic, even if the modelled spatial configuration is not absolute.

- **Model Entry / Exit Points** – Additional minor road entry/exit points to the outer model cordon not indicated as an entry and exit point are discounted for simplicity although any motor vehicle traffic demand incoming from these links **is** captured in the Live Traffic database[1] data (described below) and assigned to the nearest 'major' link.

- **Core Analysis Network** – The approximate rectangle of roads formed by Deansgrange Road, Kill Lane, Abbey Road and Monkstown Link Road/ Stradbrook Close.

- **SCATS Count Points** – Traffic detector vehicle counts are available from the Council's Sydney Coordinated Adaptive Traffic System (SCATS) system. Counts are available in 15-minute intervals over 24 hours for any date. As such, the counts provide incoming motor vehicle traffic flows on each arm of a junction, not turning movement counts.

- **Detailed Model Area** – The network is coded to a high accuracy of e.g. link locations, lengths, widths, lane geometries etc. Reasonable estimates of signalised junction timings have been made, with phase configurations informed by extracts from the SCATS system.

A screengrab of the Paramics base model is attached as Appendix 1.

3.2 Motor Vehicle Traffic Demand

For the modelling to provide meaningful results it is essential to accurately assign vehicle origins and desired destinations. Origin-destination matrices have been extracted from the Live Traffic database according to the following spatial specification:

1. **Inside the Core Analysis Network** – Detailed zoning reflecting realistic trip origin-destination according to the available network of roads, illustrated in Figure 3.3.

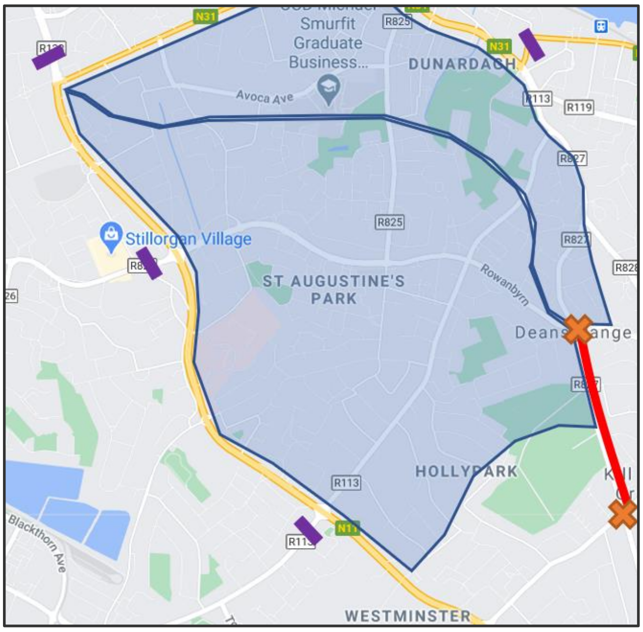
Figure 3.3 – Origin-Destination Zone Specification for Core Analysis Network

2. **Remainder of Area Inside Outer Model Cordon** – Sliced zoning captures all trips with origin or destination within the model cordon but simplified to capture the correct approach

[1] The Live Traffic Database data is sourced from Tom-Tom which accumulates traffic information from a variety of GPS sources to generate the industry's largest historical and live traffic database. The system illustrates traffic patterns over the last 10+ years – and in real time – to anticipate and respond to road network conditions.

link to the Core Analysis Network areas on which the trip would originate or terminate. An example is shown in Figure 3.4.

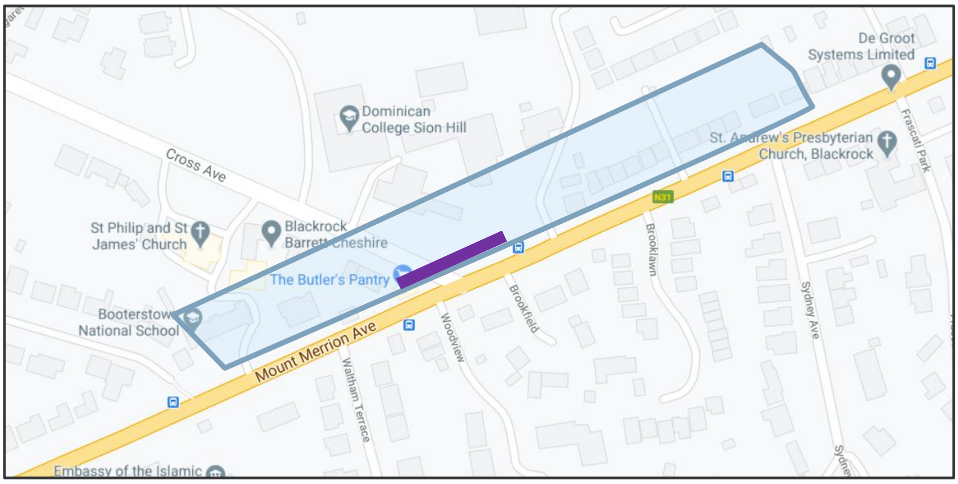
Figure 3.4 – Example Origin-Destination Zone Specification for Remainder of Area Inside Outer Model Cordon



Any interaction of trips to / from this zone with the Core Analysis Network area, would be via Brookville Park/Rowanbyrn arm of the junction at the northwest corner of Core Analysis Network area.

3. **Model cordon** – 'Cordon' zones capture **all** vehicular traffic entering/exiting the model area to/from external areas. In this way any 'through' trips are captured. Zones are extended to capture trips entering from minor links not specified as model entry/exit points. An example is shown in Figure 3.5.

Figure 3.5 - Example Extended Cordon Zone Specification to Capture Minor Road Traffic



The 'Cordon' zone captures motor vehicle traffic entering the network from the north on minor links not covered by primary cordon (purple line). A screengrab of the Live Traffic Database zones used to extract traffic demand data is attached as Appendix 2.

The origin-destination matrices extracted were filtered to include only motor vehicle traffic which passed through Core Analysis Network area (zones 1, 2 or 3) at any point during their journeys. In this way, the model focusses on creating an accurate model of the Core Analysis Network area without unnecessarily increasing the complexity of the model by enabling it to facilitate traffic which does not interact with it.

3.3 Model Time Periods

A three-hour block is the minimum time period for which Live Traffic Database data is available. As such, the model runs:

- AM Peak 07:00 – 10:00; and
- PM Peak 16:00 – 19:00.

The central one hour 'measurement' peak hour within each is used for model calibration/validation and subsequent 'Do Something' options comparison. The inclusion of the 'shoulder' peak hours ensures the model is fully populated with motor vehicle traffic and can include analysis of journeys starting within the peak hour but concluding after its end. In this way the model is considered to be performing with a consistently realistic level of traffic during the measurement hour.

SCATS data is used to calibrate the model, to validate that observed motor vehicle traffic conditions are replicated. As such, the Live Traffic Database and SCATS data were extracted to cover exactly the same time periods. These were Tuesdays, Wednesdays and Thursdays between 30 April 2019 and 30 May 2019 inclusive. These dates represent pre-COVID-19 traffic volumes. This is considered a representative[2] period for traffic measurement.

Journey Time data has also been extracted from the Live Traffic Database for the same dates and peak hour periods as the OD demand matrices for:

- 'Journeys of interest' between two points which could use Deansgrange Road or an alternative for use as baselines for comparison in the 'Do Something' analysis; and

- Journeys between nodes in the outer model area, to allow these links to be calibrated to represent their real-world performance.

For both motor vehicle traffic flow and journey time observations, the mean average hourly values across the representative date range were taken. Checks were carried out that mean average values were reasonably representative values for model validation within day to day fluctuations. For only two links, alternative values were taken which better represented the observed conditions:

- 15th percentile traffic flow on the Monkstown Farm approach to the junction of Monkstown Avenue with Monkstown Farm was more representative due to irregular spikes in motor vehicle traffic; and

- 85th percentile traffic flow on the Kill Lane (West) approach to the junction of Dean's Grange Road, Kill Lane and Clonkeen Road was more representative due to irregular troughs in motor vehicle traffic.

[2] In line with Department for Transport guidance on surveys: 'neutral', or representative, periods are usually Mondays to Thursdays, avoiding holiday periods, school holidays and other abnormal traffic periods. Recommended periods are late March and April (excluding Easter), May (excluding Bank Holiday weekends), June, September (excluding return to school weeks) and October.

3.4 Model Calibration / Validation

The goal of calibration / validation is to ensure the model performs realistically and to give meaningful results once the 'Do Something' scenarios are tested. The following calibration / validation tests were undertaken:

- **Link flows validation** – Modelled link vehicle count flows on approaches to the six junctions for which SCATS data has been extracted, during the two peak hour model periods, are compared to the corresponding SCATS counts; and

- **Journey times validation** – Modelled journey times are compared to those extracted from the Live Traffic Database data to ensure features of the outer model are coded realistically. A diagram of the journey times considered is attached as Appendix 3.

The GEH statistical comparison[3] was used to compare the simulated outputs from Paramics Discovery to the observed SCATS counts. The comparison is a form of Chi-Squared comparison statistic which considers both relative and absolute motor vehicle traffic movement values, calculated as:

$$GEH = \sqrt{\frac{(M-C)^2}{0.5 \times (M+C)}}$$

M = Modelled Flow
C = Observed Flow

A lower GEH value indicates a closer match between the modelled and observed measurement, and vice versa. Guidance states that 85% of the validation tests should have a GEH value of less than 5. Journey times were compared between the modelled and Live Traffic Database data, with the validation test passed if a modelled journey time falls within 60 seconds or 15% of the observed journey time.

Calibration and validation was an iterative process during which appropriate adjustments were made to various features of the Paramics model, including:

- **Road Hierarchy** - The network was built as observed, with dual and single carriageway links modelled accordingly. Settings were modified slightly for some links so that the model better reflects observed motor vehicle traffic behaviour, e.g. 'look through' and 'signpost distance' settings;

- **Junction Geometry** – The model was built to replicate the conditions of junctions as observed, for example, stop line positions, lane use settings and visibility. Such features were then checked and adjusted as necessary during the calibration process;

- **Vehicle Speeds** – Speed limits as observed were input to the model. Through the iterative calibration process, highway link speeds were adjusted as necessary so the model better reflects observed motor vehicle traffic behaviour;

- **Driver Behaviour** – Driver lane changing and gap acceptance behaviour can affect junction capacity. Default Paramics lane usage, gap acceptance and link headway settings were amended where appropriate to better represent observed conditions;

[3] The term GEH is an acronym for Geoffrey E. Havers, the developer of the GEH statistical test for traffic flows.

- **Vehicle Release Profiles** – Vehicle release profiles control the rates of vehicles that are released onto the network during the simulation. Traffic demand is defined at a constant rate;

- **Vehicle Type Proportions** – The proportions of each type of vehicle within the total motor vehicle traffic demand were estimated as:

    - Car – 90.00%
    - Light Goods Vehicle – 6.00%
    - Medium Goods Vehicle – 1.75%
    - Heavy Goods Vehicle – 1.75%
    - Coach – 0.50%

- **Vehicle Routing** – Whilst the model network is relatively simple, there are some origin-destination pairs between which there is a choice of route. In these cases, route choices are driven by the generalised cost equation. Generalised cost parameters are used in Paramics to represent each traveller's value of time and distance. If the distance value is high, low cost routes will be those which minimise distance; conversely if the time value is high, low cost routes will be those that minimise the travel time;

- **Familiarity** – Familiarity settings affect how modelled vehicles perceive different route choices: unfamiliar drivers perceive minor roads as a higher cost whereas familiar drivers do not. As such, familiar drivers are more likely to use 'rat run' alternative routes. Guidance advises that sensible values for familiarity are in the range of 30-70% for light vehicles and 0-40% for heavy vehicles. As such, the familiarity was set to:

    - 60% for cars and light goods vehicles; and
    - 30% for medium goods vehicles, heavy goods vehicles, and coaches;

- **Perturbation** – Perturbation settings allow for some random variation of route choices, within predefined limits. To account for such real-life variation, perturbation was set at 5% for all vehicle types; and

- **Link settings** – Features such as road type / category and link cost factors were also amended where appropriate.

3.4.1 Matrix Estimation

Using the Live Traffic Database extracted origin-destination traffic demand matrices as a starting point, several iterative rounds of Matrix Estimation (ME) were undertaken to improve the model accuracy as compared to the observed traffic measurements.

Matrix Estimation is a process by which an input origin-destination demand matrix is adjusted to allow the model to which the demand is applied to better represent the observed traffic conditions.

During Matrix Estimation, constraints were set on several flow values due to the Live Traffic Database data having yielded unrealistically high numbers of vehicles accessing e.g. Deansgrange Cemetery.

3.4.2 Simulation Methodology

Paramics is microsimulation software, with variation built into vehicle behaviour to represent natural variation in human behaviour and response times. This allows traffic conditions in a model to better represent real-world conditions. As such, each model run produces slightly different output.

At each stage of the calibration process, the model was run ten times and the results examined to ensure the ten simulations were broadly consistent. Values used were the average of ten simulations; this was found to minimise the influence of any unusually high or low outlier simulation values.

3.4.3 Model Calibration / Validation Results

Table 3.1 summarises the GEH comparison of traffic flows for the AM peak and PM peak. Table 3.2 summarises the comparison of journey times for the AM peak and PM peak. A complete set of results is attached as Appendix 4.

Table 3.1 – GEH Statistical Traffic Flows Comparison

	GEH	8:00 - 9:00
8:00 - 9:00	GEH ≤ 5	100%
	5 < GEH ≤ 10	0%
	GEH > 10	0%
AM Peak Link Validation		PASS

	GEH	17:00 - 18:00
17:00 – 18:00	GEH ≤ 5	100%
	5 < GEH ≤ 10	0%
	GEH > 10	0%
PM Peak Link Validation		PASS

Table 3.2 – Journey Times Validation Test

Journey Time Within 60 Seconds or 15% of Observed		
8:00 - 9:00	Pass	27
	Fail	6
	% Pass	82%

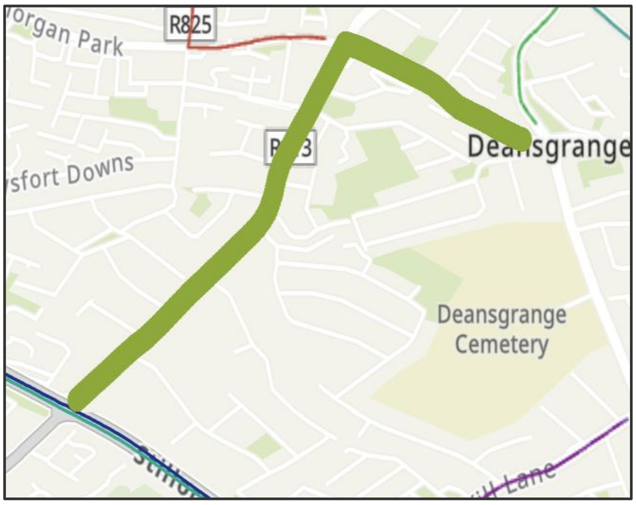
17:00 – 18:00	Pass	29
	Fail	4
	% Pass	88%

Journey paths 26, 35 and 36 are excluded from the journey times validation test. This is due to no vehicles using these paths in the final model:

- Path 26 is an indirect route between the N11 and the Core Analysis Network area, using Newtownpark Avenue and Rowanbyrn, as illustrated in Figure 3.6. This link passed the validation test during model development when journeys other than those passing through the Core Analysis Network area were tested. This would not be an obvious route for motor vehicle traffic on a journey which passes through the Core Analysis Network area and so it is not considered surprising that no vehicles have taken this route in the final model (once traffic demand applied to the model comprises only journeys passing through the Core Analysis Network area); and

- Paths 35 and 36 are the northbound and southbound journeys entirely on the N11 within the model extent. These links passed the validation test during model development when journeys other than those passing through the Core Analysis Network area were tested. Since motor vehicle traffic on a journey passing through the Core Analysis Network area would not use the whole length of the N11 it is not considered surprising that no vehicles have taken this route in the final model (once traffic demand applied to the model comprises only journeys passing through the Core Analysis Network area).

Figure 3.6 – Validation Journey Path 26



The small number of paths which fail the validation test are due to greater congestion and, therefore, longer queues on some of the approaches to the Core Analysis Network area than in the observed data. This is a result of the simplified way in which demand is applied to the Core Analysis Network area approach links in the model, i.e. all motor vehicle traffic ultimately reaching the Core Analysis Network area is applied directly to each single approach link at the arbitrary point at which the demand zone is defined. This very focussed release of traffic to an extent overwhelms the link resulting in the increased congestion and higher journey times. In reality, there are many side roads from which local and residential traffic can join in a more dispersed fashion.

It is not considered that the links failing the journey time validation test are cause for concern. The purpose of the journey time validation is to ensure the model recreates motor vehicle traffic conditions sufficiently realistically to capture any redistributive effects on traffic due to changes on Deansgrange Road in the 'Do Something' scenarios. The links failing the journey time validation test are considered unlikely to affect such redistributive decision making by vehicles.

3.5 Summary of Base Model Build, Validation and Performance

In order to meaningfully test the three 'Do Something' scheme options, a realistic base model has been established against which to compare any changes. The base model has been calibrated and validated to observed data in line with best practice:

- **Link flows validation** – 100% of modelled vehicle count flows on approaches to the six junctions have a GEH value of less than 5 in both the AM and PM peak hours, exceeding the WebTAG guidance that 85% of tests should have a GEH value of less than 5; and

- **Journey times validation** – Modelled journey times pass the standard test of being within 60 Seconds or 15% of the observed values for 82% of journeys in the AM peak and 88% of journeys in the PM peak. Whilst lower than 85%, the AM peak pass rate is considered adequate, given the explainable nature of the failures which are considered unlikely to adversely impact testing of the 'Do Something' scenarios.

The overall level of base model calibration and validation achieved gives confidence that the modelled conditions closely reflect the observed motor vehicle traffic. As such, the model is considered fit for the purpose of subsequent testing of the 'Do Something' scenarios.

The base model shows a congested urban network, in which queues of varying severity form during both the AM and PM peak hours. In addition to the good validation results, anecdotal reports suggest the modelled conditions are realistic and comparable to those observed.

The levels of congestion mean that motor vehicle traffic is able to traverse the network with some delay, although the model is sensitive to factors such as signal timings or variation in total demand. Parts of the network are close to capacity such that small changes can cause the model to 'gridlock' completely, particularity given that the demand side of the model remains as worst case, i.e. pre-COVID-19 traffic demand and no modal shift.

It is important to note that the model illustrates that approximately 75% of all motor vehicle traffic along Deansgrange Road does not have an origin or destination within the model extents, i.e. the vast majority of motor vehicle traffic within the Core Analysis Network area is commuting through the area but not stopping within it. It can therefore be reasonably concluded that the majority of motor vehicle traffic generating the local congestion is not local traffic and could therefore be transferred to the arterial National road network if appropriate mitigations could be implemented.

4. 'DO SOMETHING' MODELS

Three 'Do Something' models were built using the validated base model as a starting point:

- **Option A** – Deansgrange Road is converted to a one-way southbound travel only for motor vehicles between the crossroads with Kill Lane at the southern end and the junction with Grange Grove at the northern end, close to the crossroads with Brookville Park / Rowanbyrn. This allows for a two-way segregated cycle track to be installed along the entire section between Brookville Park and Kill Lane. The pedestrian crossing on Deansgrange Road is unsignalised since the street will be much easier to cross;

- **Option B** – Deansgrange Road is retained as a two-way road but with narrower lanes than in the 'Do Nothing' scenario for the section between Brookville Park and St. Fintan's Villas. The section south of St. Fintan's Villas is unchanged. This allows for a two-way segregated cycle track to be installed for the north part between Brookville Park and St. Fintan's Villas. For the section between St. Fintan's Villas and Kill Lane people cycling are directed to use St. Fintan's Park instead. The existing pedestrian crossing is retained and new crossings are added close to the southern junction with St. Fintan's Villas and on Kill Lane, close to the SuperValu junction. Pedestrian / Toucan crossings were simulated as being on red to motor vehicle traffic for 40 seconds out of every two minutes, to model an estimated rate of pedestrian/cyclist call; and

- **Option C** – Deansgrange Road is retained as a two-way road but is significantly narrowed, with stretches of on-street parking such that the road becomes effectively single track with passing places. This allows for a two-way segregated cycle track to be installed along the entire section between Brookville Park and Kill Lane. The pedestrian crossing on Deansgrange Road is unsignalised since the street will be much easier to cross.

Option A and C are expected to have a higher potential to shift trips from motor vehicles to active modes due to these options providing direct and segregated infrastructure for walking and cycling along the whole length of Deansgrange Road between Brookville Park and Kill Lane compared to the more circuitous route that people would have to take with via St Fintan's Park with option B. However, this potential modal shift or its impact on motor traffic volumes was not included in the traffic modelling.

Each model build was informed by sketch drawings of the potential schemes to achieve an accurate model representation of each proposal.

For simplicity, and given any scheme is likely to be implemented without significant delay, no background motor vehicle traffic growth was estimated. Nor was any estimated reduction in overall vehicular traffic demand included, to account for any potential modal shift away from motorised vehicles. That is to say: **identical** vehicular traffic demand was applied to the Do Something models as to the base model, i.e. the assessment year is the same as the base year with the demand side of the model remaining as worst case, i.e. pre-COVID-19 traffic demand and no modal shift.

There follows a description of the performance of each model plus queue length comparisons between the 'Do Something' and base models on the approaches to the Core Analysis Network. (Note recall that the analysis gives an indication of the comparative scale of **relative** change in congestion at each junction but does not provide an accurate forecast of absolute levels of congestion.)

4.1 Option A

This configuration performs with similar levels of overall congestion to the base model at 2019 traffic volumes.

Some signal timing adjustments were required to avoid the model saturating with motor vehicle traffic, particularly at Abbey Road / Kill Avenue / Lane crossroads to accommodate the traffic increase on the western arm. This is not unexpected; as a normal measure, signal timings are altered to account for changes in traffic movements.

In order to refine network performance to similar levels of overall congestion as the 2019 base model, a link cost reduction on primary alternative routes to Deansgrange Road was applied. This means a proportion of vehicles are more likely to select alternative routes for through traffic, as illustrated in Figure 4.1.

It is proposed that this behaviour will be facilitated in real life through the implementation of variable messaging signage at key routing points which would include variable journey time messaging. Essentially, traffic that currently 'rat runs' through Deansgrange would be encouraged to stay on the National Primary Dual Carriageway network. This would be encouraged by real time messaging signs as would normally be used for road works type scenarios.

Figure 4.1 – Alternative Routes to Deansgrange Road Between Dublin City and the South East

Whilst the model performs with similar levels of overall congestion as the base model, it is noted that the model is built, calibrated and validated such that Core Analysis Network area accurately recreates observed conditions.

4.2 Option B

This option effectively represents minimal change to the existing road layout for motorised traffic at 2019 traffic volumes. As such, the model runs very similarly to the base scenario, with perhaps minor delay to journeys via Deansgrange Rd depending on how often the new crossing is called.

4.3 Option C

In initial testing, large vehicles such as coaches and HGVs did not have enough space between some of the areas of parking to pass each other, causing the model to 'gridlock'. In reality there may be space for such vehicles to pass very slowly with care, or by special arrangement, but it was necessary to restrict motor vehicle traffic to light vehicles only in the model in order for traffic to use the simulated passing places and flow in both directions on Deansgrange Road.

Even with this restriction in place, the model frequently failed at 2019 traffic volumes due to the vehicles still attempting to use the newly single track Deansgrange Road in preference to a diversionary route. It was only possible to avoid 'gridlock' by setting parameters which caused unrealistically efficient vehicle 'negotiations' on entry to each of the single-track sections.

As a result, Option C was not further advanced in this assessment.

4.4 Relative Queuing Length Comparison

Table 4.1 and Table 4.2 show a summary of the maximum queue lengths (maximum number of vehicles at any point during the measurement hour) in the AM peak and PM peak respectively. It is noted that the queue lengths in the model will not predict queue lengths in real life but are solely to compare the performance of the alternatives relative to one another and to give an indication of where to expect an increase or decrease in vehicle queuing compared to the base model.

Table 4.1 – Maximum Number of Vehicles in model Queue (AM Peak)

Junction	Arm	08:00-09:00 (No. of Cars Queuing)				
		Base	Option A	(vs Base)	Option B	(vs Base)
Brookville Park Crossroads	Stradbrook North	**14**	**12**	**-2**	**15**	**1**
	Stradbrook Close	**22**	**13**	**-9**	**20**	**-2**
	Dean's Grange Road	**40**	**5**	**-35**	**40**	**0**
	Monkstown Ring Road	**168**	**87**	**-80**	**164**	**-3**
Dean's Grange Crossroads	Dean's Grange Road	**23**	**20**	**-3**	**24**	**1**
	Kill Lane (E)	**26**	**29**	**3**	**32**	**6**
	Clonkeen Road	**22**	**101**	**78**	**24**	**1**
	Kill Lane (W)	**29**	**59**	**30**	**32**	**2**
Abbey Road Crossroads	Abbey Road	**21**	**70**	**48**	**21**	**0**
	Kill Avenue	**21**	**110**	**89**	**20**	**-1**
	Rochestown Avenue	**22**	**10**	**-12**	**21**	**-1**
	Kill Lane	**29**	**59**	**30**	**32**	**2**

Table 4.2 – Maximum Number of Vehicles in model Queue (PM Peak)

Junction	Arm	17:00-18:00 (No. of Cars Queuing)				
		Base	Option A	(vs Base)	Option B	(vs Base)
Brookville Park Crossroads	Stradbrook North	**17**	**30**	**12**	**19**	**2**
	Stradbrook Close	**35**	**15**	**-20**	**36**	**1**
	Dean's Grange Road	**27**	**5**	**-22**	**32**	**5**
	Monkstown Ring Road	**91**	**16**	**-75**	**90**	**-1**
Dean's Grange Crossroads	Dean's Grange Road	**24**	**95**	**70**	**26**	**2**
	Kill Lane (E)	**29**	**38**	**9**	**38**	**9**
	Clonkeen Road	**15**	**26**	**11**	**15**	**0**
	Kill Lane (W)	**32**	**53**	**21**	**32**	**0**
Abbey Road Crossroads	Abbey Road	**23**	**83**	**60**	**23**	**0**
	Kill Avenue	**24**	**101**	**77**	**24**	**0**
	Rochestown Avenue	**20**	**12**	**-9**	**20**	**-1**
	Kill Lane	**32**	**53**	**21**	**32**	**0**

The maximum queue length modelling confirms the conditions observed for each of the Do Something options:

- **Option A** – Congestion is decreased at the Brookville Park Crossroads, due to vehicles taking alternative routes which divert completely away from Deansgrange Road (e.g. as illustrated in Figure 4.1); vehicles still using Core Analysis Network Area mean there is increased congestion at Deansgrange Road Crossroads and Abbey Road Crossroads. Signal timings were updated in the model to ameliorate this effect and refinements are likely to yield further improvements. St. Fintan's Park and Foxrock Avenue preform similarly in Option A to the Base model.

  Option A operates successfully at 2019 traffic volumes, when drivers are encouraged to select the designated routes for through traffic, e.g. by advance signage, use of variable journey time messaging etc or implement infrastructure which would be capable of sustaining a modal shift away from motorised vehicles; and

- **Option B** – This effectively represents no change to the existing road layout for motorised traffic.

For both options, the relative change in queue length severity (note the model forecasts are relative to observed base levels of congestion and not absolute forecasts) does not suggest queuing would reach unacceptable levels e.g. result in blocking other junctions, or cause gridlock. Whilst the delay to individual journeys and routes may increase or decrease depending on junctions used, it does not appear the aggregate overall travel time impact would be considerable. Note that the baseline conditions are already congested and measures to reduce the car trip modal share, or use of more appropriate national routes, should be encouraged. Again, it is important to note that 75% of vehicles are using this route to drive straight through. If the route becomes less attractive in terms of journey times there is a strong likelihood that vehicles would choose alternative routes or modes as the advantage of this route no longer exists. The model assumes that this is not the case and if people continue to use this area then it can be accommodated within the network.

4.5 Traffic Impact Summary

Three 'Do Something' models were built using the validated base model as a starting point:

- **Option A** – Deansgrange Road converted to one-way southbound only for motor vehicles allowing for a two-way segregated cycle track to be installed along the entire section between Brookville Park and Kill Lane;

- **Option B** – Deansgrange Road is retained as a two-way but with narrower lanes and additional pedestrian / cycle crossing facilities allowing for a two-way segregated cycle track to be installed north of St. Fintan's Villas but directing people cycling south of St. Fintan's Villas to use St. Fintan's Park instead; and

- **Option C** – Deansgrange Road converted to effectively single track with passing places, allowing for a two-way segregated cycle track to be installed along the entire section between Brookville Park and Kill Lane.

Option A and C are expected to have a higher potential to shift trips from motor vehicles to active modes due to these options providing direct and segregated infrastructure for walking and cycling along the whole length of Deansgrange Road between Brookville Park and Kill Lane compared to the more circuitous route that people would have to take with via St Fintan's Park with option B.

This potential modal shift and its impact on motor traffic volumes was not included in the traffic modelling but is considered as part of the viable option multi-criteria analysis presented in the next section.

4.5.1 Option A

This configuration performs with similar levels of overall congestion to the base model at 2019 traffic volumes, although the locations of most acute congestion change:

- Congestion is decreased at the Brookville Park Crossroads, due to vehicles taking alternative routes which divert completely away from Deansgrange Road; and

- There is increased congestion at Deansgrange Road Crossroads and Abbey Road Crossroads, although it is noted that signal timing adjustments were made in the model to reduce this congestion and its is expected that further refinements are likely to yield further improvements.

Option A operates successfully at 2019 traffic volumes, when drivers are encouraged to select alternative routes for through traffic, e.g. by advance signage, use of variable journey time messaging etc. or implement infrastructure which would be capable of sustaining a modal shift away from motorised vehicles.

4.5.2 Option B

This option represents a minimal change to the existing road layout for motorised traffic at 2019 traffic volumes. As such, the model runs very similarly to the base scenario, with perhaps additional minor delay to journeys via Deansgrange Road and Kill Avenue depending on how often the new crossings are called.

4.5.3 Option C

In all vehicle behaviour configurations, except with the most unrealistically co-operative settings, the model reaches total 'gridlock' at 2019 traffic volumes and it is recommended this option is discounted from further consideration as being unviable.

This option is therefore not taken forward in this assessment.

4.6 Options Appraisal

The Traffic Modelling identifies that Options A and B are viable, with Option C determined as unworkable. In line with the recommendations of the public consultation a multi-criteria analysis will be completed on Options A and B to determine which option best facilitates the objectives of the Active School Travel initiative and as such which option shall be implemented.

5. MUTLI-CRITERIA ANALYSIS OF VIABLE OPTIONS

The Paramics Traffic modelling concludes that options A and B present viable interventions in regard to traffic impact.

In view of that modelling a multi-criteria analysis of Options A & B has been completed to evaluate each option against the scheme specific objectives. The framing of scheme specific objectives was undertaken in consideration of the guidance provided in the TII Project Appraisal Guideline and the Common Appraisal Framework to support the Policy Context identified in Section 2 of this report.

Guidance documents include recommendations that project specific objectives are established based on each of the following criteria:

- Economy;
- Safety;
- Environment;
- Accessibility & Social Inclusion;
- Integration; and
- Physical Activity (if applicable).

The objectives which are presented in Table 6.1 are intended to allow a focused definition of options which can be examined qualitatively against a series of required outcomes.

Table 6.1: Scheme Specific Objectives

Criteria	Scheme Specific Objective
Economy	• Improve the local economic capacity of Deansgrange Village to support localisation of the economy; and • Generate positive local economic benefits to businesses and consumers by: ○ Enabling an increase of footfall within the village; ○ Removing unnecessary commuting motor vehicle traffic that currently does not engage economically; and ○ Encouraging a space were children and adults feel comfortable and confident to economically engage.
Safety	• Improve safety for all road users, including vulnerable user groups; • Meet the safety needs of children and their parents when it comes to active travel
Environment	• To reduce CO_2 emissions and particulate emissions through a reduction in fuel consumption; • To secure the development of a high-quality walking and cycling network across the County in accordance with relevant Council and National policy and guidelines. • To secure improvements to the County Cycle Network in accordance with the Dún Laoghaire-Rathdown Cycle Network Review whilst supporting the NTA on the development and implementation of the Cycle Network Plan for the Greater Dublin Area. • To manage noise impacts in populated areas.

Criteria	Scheme Specific Objective
Accessibility and Social Inclusion	• To provide a route that will encourage and support investment in the wider area in alignment with current investment plans on a County, Regional and National level; • To improve multi-modal transport journey time and multi-modal journey time reliability for active transport modes; • To expand the footway and pedestrian route network to provide for accessible pedestrian routes within the County in accordance with best accessibility practice. • To enable social equity by enabling people to choose a variety of travel options and active travel modes in particular; and • To achieve the objective of national, regional and local planning policy, as outlined at the start of this report.
Integration	• To improve connectivity to the existing cycle and walking networks; and • To provide continuity of network type for active modes through existing motorised vehicular dominated junctions;
Physical Activity	• To encourage active mobility as a mean of improving human health through physical activity.

5.1 Multi-Criteria Analysis (MCA)

A qualitive analysis comparing how each option addresses the Scheme Specific Objectives, identified in Table 6.1 above, is detailed in the sections below.

A table summarising the assessment in provided in section 6.3. Alignment with the objectives is compared between the two viable options and presented as a score of high, medium or low.

5.1.1 Economy

5.1.1.1 Option A

Option A routes the proposed interventions through Deansgrange Village and along Deansgrange Road, as a result this option provides an opportunity to reduce unnecessary vehicle congestion in form of commuting trips or through traffic.

The intervention would route cyclists and pedestrians through the village generating opportunities for existing local businesses to develop additional economic trading areas or additional trading frontage areas. As shown in other areas across Europe[4], the provision of improved cycling infrastructure delivered alongside reductions in vehicle dominance on adjacent roads/streets, coupled with public realm improvements has resulted in significant growth in revenue to local businesses.

Option A would result in Deansgrange road becoming a one-way system which, based on the traffic modelling, may marginally affect motorised vehicle access from the south. It is important to note that the traffic analysis highlights that 75% of all motor traffic along Deansgrange Road does not have an origin or destination within the model extents, i.e. the vast majority of motor traffic within the modelling is commuting through the area but not stopping within it.

Option A presents a **High** compliance with the economic objectives of the project and this should be monitored throughout any trial period with the local businesses.

5.1.1.2 Option B

Option B routes the proposed interventions through St. Fintan’s Villas, a largely resident space. This option provides an opportunity to reduce unnecessary congestion in form of commuting or through trips completed by motor vehicle but transfers the centre of the modal shift away from Deansgrange village.

The existing road space in front of the local businesses on Deansgrange Road is retained as space for motorised vehicles and does not facilitate opportunity for development of the existing urban environment to facilitate a growth in economic opportunity for these traders.

Option B would retain access to the village for motorised vehicles through the village from both directions. As noted above, the traffic analysis highlights that 75% of all motor traffic along Deansgrange Road does not have an origin or destination within the model extents.

Option B presents a **Low** compliance with the economic objectives of the project and this should be monitored throughout any trial period with the local businesses.

[4] https://content.tfl.gov.uk/walking-cycling-economic-benefits-summary-pack.pdf

5.1.2 Safety

5.1.2.1 Option A

Option A would upgrade cycling and walking infrastructure provision along the existing Deansgrange road, through the Deansgrange/Kill Lane junction and along Kill Avenue to the entrance to the Park. This would be implemented as fully segregated network separating walking, cycling from motorised modes which would meet the safety needs of children and parents undertaking active travel. Option A caters for the people that are classed as 'interested but concerned' with regards active travel and therefore presents the opportunity to cater for everyone willing and able to use active modes.

Option A would reduce the road width along Deansgrange Road making crossing for pedestrians along Deansgrange road safer. Access to the cemetery and business within Deansgrange Village would experience reduce motorised conflicts and interactions improving the safety of the existing streets. Commuting traffic would be encouraged to utilise the more appropriate national/regional routes via Variable Messaging Signage which would improve safety within Deansgrange Road area.

As a result of the routing of Option A infrastructure upgrades are proposed to improve vulnerable user access and safety at the junction of Kill Lane/Deansgrange Road.

Option A presents a **High** compliance with the safety objective of the project.

5.1.2.2 Option B

Option B would upgrade cycling and walking provision along the northern extend of Deansgrange road between Brookville Park and St. Fintan's Villas meeting the safety needs of children and parents for that section of the street. For the section between St. Fintan's Villas and Kill Lane users following the route are directed to use St. Fintan's Park, where they would use the existing infrastructure, consisting of segregated footways and a carriageway with on-street cycling. Mixing with vehicles may discourage less confident cyclists from this route (or force them onto footways which is a safety risk). The crossings on Kill Lane and on Deansgrange Road (between the Cemetery and St Fintans Villas) would be upgraded to facilitate this movement. The section south of St. Fintan's Villas would remain unchanged.

Option B would maintain the road width along Deansgrange Road, with Deansgrange road retaining broadly the existing volume of motor vehicle traffic. No significant safety benefit is expected under this option for this section.

The circuitous nature and alignment of Option B may result in users not following the signed active travel route and continuing along Deansgrange Road. This would mean that existing issues restricting cycling would persist along Deansgrange Road.

Option B presents a **Low** compliance with the safety objective of the project.

5.1.3 Environment

5.1.3.1 Option A

Option A would discourage commuting / through traffic from utilising Deansgrange road in the AM peak with this traffic being encouraged to utilise the more appropriate national/regional routes via Variable Messaging Signage.

Traffic modelling illustrates that this would result in additional queuing in the short term which would have an adverse local environmental impact. In the longer-term motorised traffic would be encouraged to use more appropriate sections of the motorised traffic network which would reduce congestion locally. As the noise and emission impacts in populated areas are linked to the motorised traffic impacts, long term Option A would consequently have positive environmental impacts.

The direct and segregated infrastructure for walking and cycling along the whole length of Deansgrange Road between Brookville Park and Kill Lane facilitate people to shift from driving to more active travel.

Option A will secure delivery of an identified County Cycle Network described in the GDA Cycle Network Plan, while implementing high-quality walking and cycling provision along a route which is a critical link.

In the short term, Option A presents a **Medium** compliance with the environmental objectives of the project. It is noted that Option A presents a **High** compliance with environmental objectives of the project in the longer-term.

5.1.3.2 Option B

Option B would retain the traffic impacts broadly in line with current conditions. Traffic Modelling illustrates that the current motorised traffic network is close to capacity and generating noise and air quality pollution which are negatively impacting human health.

Option B does not deliver of an identified County Cycle Network described in the GDA Cycle Network Plan. The circuitous nature and alignment of Option B may result in users not following the signed active travel route and makes it less likely for people to shift from driving to more active travel compared to a more direct alternative.

Option A presents a **Low / Medium** compliance with the environmental objective of the project.

5.1.4 Accessibility and Social Inclusion

5.1.4.1 Option A

Option A will facilitate an improvement in journey time and journey time reliability for active transport modes through Deansgrange Road. The intervention will facilitate improvements in vulnerable user access and safety, particularly for footway and pedestrian networks, including the junction of Kill Lane/Deansgrange Road.

Option A enables social equity by providing people with a variety of travel options and specifically enabling them to use active travel modes, levelling access to a cheaper, reliable and environmentally friendly transport mode, both on a network level and on a local level for destinations along Deansgrange Rd.

Option A seeks to achieve the objectives of national, regional and local planning policy as identified in Section 2 of this report.

Option A presents a **High** compliance with the Accessibility and Social Inclusion objective of the project.

5.1.4.2 Option B

Option B will facilitate an improvement in journey time and journey time reliability for active transport modes. The intervention will facilitate improvements in vulnerable user access and safety.

Option B enables social equity by providing people with a variety of travel options and specifically enabling them to use active travel modes, levelling access to a cheaper, reliable and environmentally friendly transport mode on a network level. However, these effects are only partly seen on a local level as under Option B destinations along Deansgrange Road see no improvement in accessibility for active modes and do not meet the safety needs for children and parents when it comes to active travel and cycling in particular.

Option B seeks to achieve the objectives of national, regional and local planning policy as identified in Section 2 of this report.

Option B presents a **Low / Medium** compliance with the Accessibility and Social Inclusion objective of the project.

5.1.5 Integration

5.1.5.1 Option A

Option A will facilitate an improvement in network integration for active transport modes. The intervention will facilitate improvements in vulnerable user access and safety.

The intervention will facilitate improvements in network integration for active modes, including specific upgrades to the junction of Kill Lane/Deansgrange Road.

Option A presents a **High** compliance with the integration objective of the project.

5.1.5.2 Option B

Option B will facilitate an improvement in network integration for active transport modes. The intervention will facilitate improvements in vulnerable user access and safety on a network level. The intervention will facilitate improvements in network integration for active modes, however introduce an additional number (4) of uncontrolled junctions to be negotiated while mixing with traffic as well as on road cycling.

Option B raises some concerns in regard to network compliance, the circuitous nature of Option B may result in pedestrians and cyclists less concerned about safety continuing to use Kill Lane and Deansgrange Road.

Option A presents a **Medium** compliance with the integration objective of the project.

5.1.6 Physical Activity

5.1.6.1 Option A

Option A will facilitate an opportunity for modal shift from motor vehicular modes to active modes. Live traffic data has identified approximate 17% of all trips through Deansgrange Road are shorter than 4km. The public consultation process identified that 68% of respondents would be willing to walk or cycle more often when the published interventions would be implemented.

This shows a significant potential in the area for trips to shift from motor vehicles to active modes resulting in more physical activity on a daily basis.

Option A presents a **High** compliance with the physical activity objective of the project.

5.1.6.2 Option B

Even though live traffic data has identified approximate 17% of all trips through Deansgrange Road are shorter than 4km, the circuitous nature and longer travel distance of Option B makes it less attractive for active travel compared to a more direct alternative. As such option B has a lower potential to encourage people to choose active travel in the first place and increase their physical activity on a daily basis.

Option B presents a **Medium** compliance with the physical activity objective of the project.

5.2 Summary

A summary of compliance with the overall Scheme Specific Objectives for each of the options is described in Table 6.2 below.

Table 6.2: Option Compliance with the Scheme Specific Objectives

Criteria	Option A	Score*	Option B	Score*
Economy	High	**3**	Low	**1**
Safety	High	**3**	Low	**1**
Environment	Medium (High long term)	**2**	Low/Medium	**2**
Accessibility and Social Inclusion	High	**3**	Low/Medium	**2**
Integration	High	**3**	Medium	**1**
Physical Activity	High	**3**	Medium	**1**
Overall (Total)	High	**17**	Medium	**8**

*Score: Where High =3; Medium = 2; Low =1.

6. CONCLUSION

A base traffic model has been built, calibrated and validated to a level which gives confidence the model closely reflects observed vehicular traffic conditions. As such, the base model is considered fit for the purpose of subsequent testing of 'Do Something' scenarios.

The modelling has been undertaken to understand the impacts on motor vehicle traffic associated with a number of walking and cycling interventions which form part of the Active School Travel project. The modelling has been sought following a substantive public consultation and local engagement process to help define how pilot cycling and walking provision would affect the movement of people in and around the vicinity of Deansgrange Road, Abbey Road and Kill lane in the South East of Dublin County.

The modelling process was undertaken using 2019 pre-COVID traffic volumes and no reduction in motor vehicle traffic has been applied. The current pandemic shows a variety of people working more flexible hours or working from home more often. This change in travel behaviour may persist even after the pandemic and as such lower motor vehicle volumes can be expected when the proposed measures would be implemented than has been reflected in the modelling outputs.

The modelling does not include any modal shift as result of the proposed measures. Live traffic data has identified approximate 17% of all trips through Deansgrange Road are shorter than 4km. The public consultation process identified that 68% of respondents would be willing to walk or cycle more often when the published interventions would be implemented. As a result, there is approximate capacity of 12% of current trips which could shift mode if the measure were implemented. The more direct and attractive the infrastructure for walking and cycling is, the more likely it would facilitate the potential for people to shift from driving to more walking or cycling.

The base model illustrates that approximately 75% of all motor traffic along Deansgrange Road does not have an origin or destination within the model extents, i.e. the vast majority of motor traffic within the Core Analysis Network Area is commuting through the area but not stopping within it. It can therefore be reasonably concluded that the majority of motor traffic generating the local congestion is not local traffic and could therefore be transferred to the arterial National road network if appropriate mitigations could be implemented.

The modelling analysis identified that Option C could not be implemented efficiently. Option A and B were advanced to a Multi-Criteria Analysis to determine which proposal which best facilitates the objectives of the Active School Travel initiative shall be implemented. Options A and B were evaluated against the scheme specific objectives. The framing of scheme specific objectives was undertaken in consideration of the guidance provided in the TII Project Appraisal Guideline and the Common Appraisal Framework to support the Policy Context identified in Section 2 of this report.

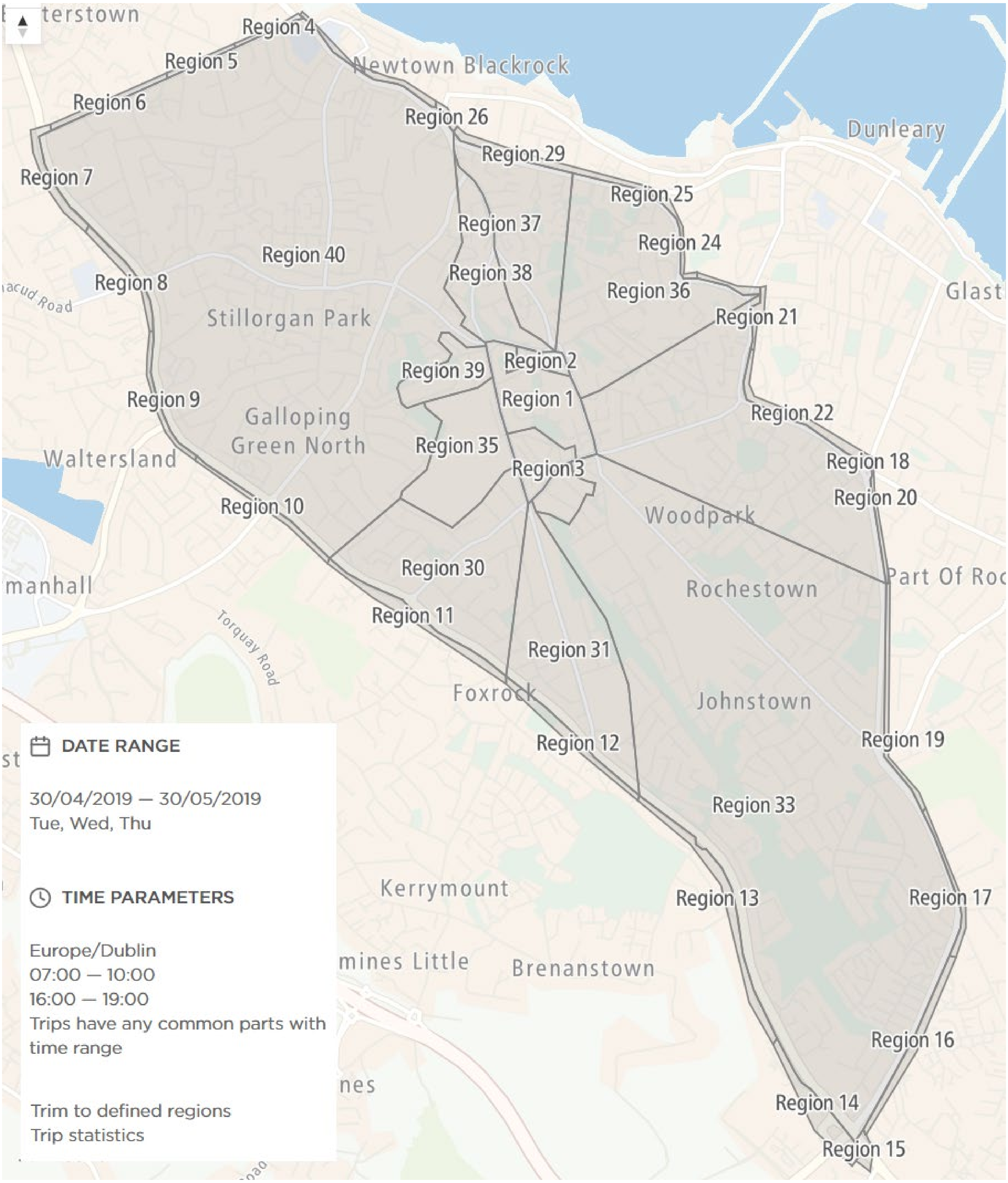
Based on the appraisal presented Option A has been identified as the preferred option in regard to compliance with the scheme specific objectives, offering better compliance in regard to Local Economics, Safety, Environmental benefits, Accessibility and Social Inclusions and Physical Activity.

It is recommended to implement Option A.

APPENDIX 1
PARAMICS BASE MODEL

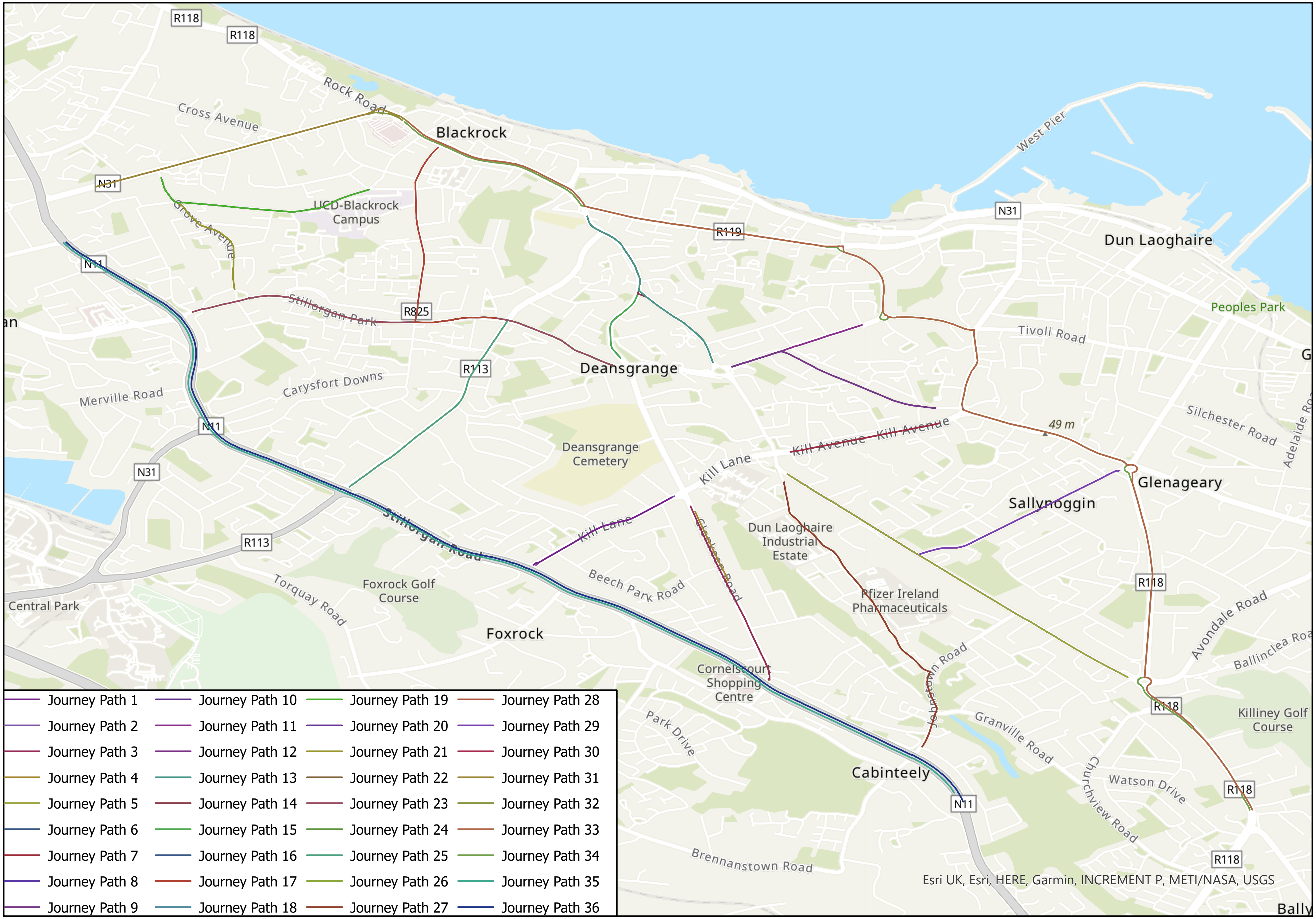
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40

APPENDIX 2
TOM-TOM TRAFFIC ORIGIN-DESTINATION ZONES DEFINITION



Region 4
Region 5
Region 6
Region 7
Region 8
Region 9
Region 10
Region 11
Region 12
Region 13
Region 14
Region 15
Region 16
Region 17
Region 18
Region 19
Region 20
Region 21
Region 22
Region 24
Region 25
Region 26
Region 29
Region 30
Region 31
Region 33
Region 35
Region 36
Region 37
Region 38
Region 39
Region 40
Region 1
Region 2
Region 3
Newtown Blackrock
Dunleary
Stillorgan Park
Galloping Green North
Waltersland
Woodpark
Rochestown
Johnstown
Foxrock
Kerrymount
Brenanstown
Torquay Road
DATE RANGE
30/04/2019 — 30/05/2019
Tue, Wed, Thu
TIME PARAMETERS
Europe/Dublin
07:00 — 10:00
16:00 — 19:00
Trips have any common parts with time range
Trim to defined regions
Trip statistics

APPENDIX 3
JOURNEY TIME VALIDATION ROUTES


Blackrock
Dun Laoghaire
Deansgrange
Glenageary
Sallynoggin
Foxrock
Cabinteely
UCD-Blackrock Campus
Deansgrange Cemetery
Dun Laoghaire Industrial Estate
Pfizer Ireland Pharmaceuticals
Foxrock Golf Course
Cornelscourt Shopping Centre
Killiney Golf Course
Central Park
Peoples Park
Rock Road
Cross Avenue
Grove Avenue
Stillorgan Park
Carysfort Downs
Merville Road
Stillorgan Road
Kill Lane
Kill Avenue
Tivoli Road
Silchester Road
Avondale Road
Ballinclea Road
Beech Park Road
Torquay Road
Granville Road
Churchview Road
Watson Drive
Park Drive
Brennanstown Road
Johnstown Road
West Pier
49 m
R118
N31
N11
R825
R113
R119
Journey Path 1
Journey Path 2
Journey Path 3
Journey Path 4
Journey Path 5
Journey Path 6
Journey Path 7
Journey Path 8
Journey Path 9
Journey Path 10
Journey Path 11
Journey Path 12
Journey Path 13
Journey Path 14
Journey Path 15
Journey Path 16
Journey Path 17
Journey Path 18
Journey Path 19
Journey Path 20
Journey Path 21
Journey Path 22
Journey Path 23
Journey Path 24
Journey Path 25
Journey Path 26
Journey Path 27
Journey Path 28
Journey Path 29
Journey Path 30
Journey Path 31
Journey Path 32
Journey Path 33
Journey Path 34
Journey Path 35
Journey Path 36
Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS

APPENDIX 4
GEH STATISTICAL TRAFFIC FLOWS AND JOURNEY TIMES COMPARISONS

MODEL VERSION: BASE v2.3

Junction		Arm	08:00-09:00					17:00-18:00					Note
			Paramics	SCATS	Comparison			Paramics	SCATS	Comparison			
			Total	Total	Diff	% Diff	GEH	Total	Total	Diff	% Diff	GEH	
6172	Rowan Park Road / Stradbrook Road	Stradbrook Road (N)	456	456	0	0%	0.01	674	674	1	0%	0.03	
		Stradbrook Road (E)	512	528	-16	-3%	0.71	471	469	2	0%	0.07	
		Rowan Park	385	387	-2	0%	0.09	215	214	1	0%	0.04	
6104	Brookville Park Crossroads	Stradbrook North	368	379	-12	-3%	0.62	495	512	-18	-4%	0.80	
		Stradbrook Close	414	462	-48	-10%	2.31	446	449	-3	-1%	0.14	
		Dean's Grange Road	944	1,038	-94	-9%	2.99	695	766	-72	-9%	2.65	
		Monkstown Ring Road	472	545	-73	-13%	3.24	626	663	-38	-6%	1.48	
6060	Monkstown Ave / Monkstown Farm	Monkstown Avenue (E)	325	404	-79	-20%	4.15	481	488	-6	-1%	0.29	
		Monkstown Farm	422	487	-65	-13%	3.03	209	207	2	1%	0.16	Unstable observed counts - calibrate to 15th %ile not mean
		Monkstown Avenue (W)	482	522	-40	-8%	1.79	499	504	-6	-1%	0.26	
6054	Dean's Grange Crossroads	Dean's Grange Road	373	397	-24	-6%	1.22	510	490	20	4%	0.91	
		Kill Lane (E)	759	780	-20	-3%	0.73	817	812	5	1%	0.17	
		Clonkeen Road	552	499	54	11%	2.34	380	343	36	11%	1.91	
		Kill Lane (W)	383	361	22	6%	1.12	422	398	24	6%	1.21	Unstable observed counts - calibrate to 85th %ile not mean
6052	Abbey Road Crossroads	Abbey Road	440	471	-31	-7%	1.46	537	533	4	1%	0.17	
		Kill Avenue	491	493	-2	0%	0.07	460	455	5	1%	0.22	
		Rochestown Avenue	508	510	-2	0%	0.10	479	480	-1	0%	0.03	
		Kill Lane	536	549	-14	-3%	0.60	571	591	-21	-4%	0.86	
6053	Baker's Corner	Rochestown Avenue (N)	566	595	-29	-5%	1.20	753	764	-12	-2%	0.43	
		Rochestown Avenue (S)	386	387	-1	0%	0.05	407	400	7	2%	0.32	
		Pottery Road	295	295	0	0%	0.01	313	321	-9	-3%	0.48	

AM

Journey Time Comparison

MODEL VERSION: BASE v2.3

	Journey	Model			Observed			Difference (Avg)		
AM Peak 08:00 -09:00										
Modelled journey times must fall within 60 seconds or 15% of the observed journey time to pass										
		5th %ile	Avg	95th %ile	5th %ile	Avg	95th %ile	Absolute	%	Pass
1	Journey Path 1	93	99	106	52	108	251	-9	-9%	PASS
2	Journey Path 2	95	100	105	56	125	232	-25	-20%	PASS
3	Journey Path 3	88	92	97	83	148	293	-56	-38%	PASS
4	Journey Path 4	88	93	98	136	136	136	-43	-32%	PASS
5	Journey Path 5	237	249	261	167	274	444	-25	-9%	PASS
6	Journey Path 6	291	307	324	180	263	360	44	17%	PASS
7	Journey Path 7	18	19	20	43	86	174	-67	-78%	FAIL
8	Journey Path 8	18	19	20	46	93	207	-74	-80%	FAIL
9	Journey Path 9	481	523	567	99	144	207	379	263%	FAIL
10	Journey Path 10	131	149	178	111	164	218	-15	-9%	PASS
11	Journey Path 11	76	95	124	47	89	172	6	7%	PASS
12	Journey Path 12	77	100	126	49	93	172	7	8%	PASS
13	Journey Path 13	133	140	148	90	128	189	12	9%	PASS
14	Journey Path 14	152	165	180	101	186	418	-21	-11%	PASS
15	Journey Path 15	134	150	168	83	133	202	17	13%	PASS
16	Journey Path 16	139	158	181	89	178	377	-20	-11%	PASS
17	Journey Path 17	421	626	860	221	236	245	390	165%	FAIL
18	Journey Path 18	236	236	236	184	257	443	-21	-8%	PASS
19	Journey Path 19	131	132	133	88	141	213	-9	-7%	PASS
20	Journey Path 20	107	108	109	85	113	179	-5	-5%	PASS
21	Journey Path 21	96	101	105	89	114	151	-13	-12%	PASS
22	Journey Path 22	93	96	99	91	138	232	-42	-30%	PASS
23	Journey Path 23	906	1,236	1,617	200	292	412	944	323%	FAIL
24	Journey Path 24	290	304	318	201	342	598	-38	-11%	PASS
25	Journey Path 25	654	718	779	173	315	663	403	128%	FAIL
27	Journey Path 27	190	201	213	139	211	301	-10	-5%	PASS
28	Journey Path 28	198	208	217	155	215	298	-7	-3%	PASS
29	Journey Path 29	220	232	246	166	273	489	-41	-15%	PASS
30	Journey Path 30	236	248	260	173	235	366	13	5%	PASS
31	Journey Path 31	178	212	251	134	260	470	-48	-18%	PASS
32	Journey Path 32	141	169	185	103	177	365	-8	-4%	PASS
33	Journey Path 33	842	894	951	767	921	1,076	-27	-3%	PASS
34	Journey Path 34	720	769	817	785	785	785	-16	-2%	PASS
									Total Pass:	82%

PM

Journey Time Comparison

MODEL VERSION: BASE v2.3

PM Peak 17:00 -18:00										
Modelled journey times must fall within 60 seconds or 15% of the observed journey time to pass										
Journey		Model			Observed			Difference (Avg)		
		5th %ile	Avg	95th %ile	5th %ile	Avg	95th %ile	Absolute	%	Pass
1	Journey Path 1	93	102	123	53	95	170	7	8%	PASS
2	Journey Path 2	95	100	105	57	107	199	-7	-6%	PASS
3	Journey Path 3	88	92	98	76	108	180	-16	-15%	PASS
4	Journey Path 4	88	93	98	86	86	86	7	8%	PASS
5	Journey Path 5	236	249	264	189	268	391	-19	-7%	PASS
6	Journey Path 6	292	307	324	234	338	474	-31	-9%	PASS
7	Journey Path 7	18	19	20	46	82	151	-63	-77%	FAIL
8	Journey Path 8	18	19	20	46	81	151	-62	-77%	FAIL
9	Journey Path 9	148	216	289	110	163	240	53	33%	PASS
10	Journey Path 10	130	145	171	113	174	259	-29	-17%	PASS
11	Journey Path 11	76	90	111	54	98	167	-8	-8%	PASS
12	Journey Path 12	77	93	115	51	89	166	4	5%	PASS
13	Journey Path 13	134	142	151	94	123	169	19	15%	PASS
14	Journey Path 14	151	165	180	112	170	255	-5	-3%	PASS
15	Journey Path 15	137	156	178	90	135	194	21	16%	PASS
16	Journey Path 16	137	156	183	96	156	227	0	0%	PASS
17	Journey Path 17	222	255	310	177	238	307	17	7%	PASS
18	Journey Path 18	233	233	233	198	264	393	-31	-12%	PASS
19	Journey Path 19	126	127	128	90	122	222	5	4%	PASS
20	Journey Path 20	108	108	109	78	109	207	-1	-1%	PASS
21	Journey Path 21	96	101	106	87	109	141	-8	-8%	PASS
22	Journey Path 22	93	96	100	88	110	186	-14	-12%	PASS
23	Journey Path 23	483	567	663	228	325	443	242	74%	FAIL
24	Journey Path 24	293	305	317	232	319	440	-14	-4%	PASS
25	Journey Path 25	473	532	592	201	287	408	245	85%	FAIL
27	Journey Path 27	191	201	211	147	205	283	-4	-2%	PASS
28	Journey Path 28	199	209	219	158	232	311	-23	-10%	PASS
29	Journey Path 29	220	233	246	194	247	320	-14	-6%	PASS
30	Journey Path 30	238	249	261	167	264	404	-15	-6%	PASS
31	Journey Path 31	180	216	256	145	216	311	0	0%	PASS
32	Journey Path 32	140	167	184	115	167	234	0	0%	PASS
33	Journey Path 33	842	894	951	778	853	892	41	5%	PASS
34	Journey Path 34	720	769	817	824	847	870	-78	-9%	PASS
									Total Pass:	88%