Inverclyde council

AGENDA ITEM NO: 7

Report To:	**Environment and Regeneration Committee**	**Date:**	**14 March 2024**
Report By:	**Head of Physical Assets**	**Report No:**	**ENV018/24/EM**
Contact Officer:	**Eddie Montgomery**	**Contact No:**	**01475 714800**
Subject:	**Kirn Drive, Gourock – One-way Study Findings**		

1.0 PURPOSE AND SUMMARY

1.1 ☒For Decision ☒For Information/Noting

1.2 The purpose of this report is to inform Committee of a study undertaken to consider the impact of making Kirn Drive in Gourock one-way. The study was commissioned following a petition created in January 2020 and heard by the Petitions Committee on 19 March 2020.

1.3 The report also seeks approval to take forward a non-statutory consultation on the proposals to progress the traffic management recommended by the study and to the introduction of traffic calming on the sections of one-way roads on Kirn Drive and Staffa Road.

2.0 RECOMMENDATIONS

2.1 It is recommended that the Committee:

- note the findings of the modelling study for Kirn Drive;
- agree to a non-statutory consultation on the proposed scheme with the outcome subject to a further report to this Committee.

Eddie Montgomery
Head of Physical Assets

3.0 BACKGROUND

3.1 A petition was created on the Council's website on 12 January 2020 calling on the Council to make Kirn Drive, Gourock a one-way system running east to west (westbound). The petition gathered in excess of 100 signatures within the publication period and was heard by the Petitions Committee on 19 March 2020 for consideration.

3.2 The Petitions Committee supported the petition and remitted it to the Corporate Director Environment, Regeneration & Resources to submit a report to a future meeting of the Environment & Regeneration Committee with recommendations on the matter. This report addresses this action.

3.3 Inverclyde Council appointed Atkins in October 2022 to undertake a transport model to consider the effect of making Kirn Drive one-way from east to west. This study built on an earlier Paramics model prepared by SIAS in 2015.

3.4 Traffic surveys were undertaken in March 2023 to collect traffic data on the study network. This data included junction turning counts, automated traffic counts (ATC) and parking surveys. The ATC data shows that there are approximately 50% more vehicles travelling westbound on Kirn Drive than there are eastbound.

3.5 The updated model added additional links and junctions to the model to make it more robust. Bus route data was updated to reflect the current timings and frequencies. The updated model also takes account of current parking behaviour on the network in order to replicate on-site traffic conditions where parked vehicles cause constraint on part of the network including Kirn Drive.

3.6 Once the model was built it was subject to a calibration and validation exercise which found it meets the appropriate standard to show that the existing traffic characteristics are captured within the model prior to any option testing.

3.7 The model was then used to test the impact of making Kirn Drive one-way eastbound between Arran Road and Divert Road. The model also tested the option of making Staffa Street one-way southbound due to the constrained nature of the road with bends and parked vehicles on one side of the road.

3.8 The report produced for the study is provided in Appendix 1 which provides a journey time comparison and traffic volume comparison for the existing routing of vehicles against the following options:

Option 1 – Kirn Drive one-way eastbound
Option 2 – Kirn Drive one-way westbound
Option 3 – Kirn Drive one-way eastbound and Staffa Street one-way southbound
Option 4 – Kirn Drive one-way westbound and Staffa Street one-way southbound

3.9 The report finds Kirn Drive and Staffa Street could be turned one-way without significant adverse impact on the wider road network. It also notes that speeds on one-way roads are likely to increase as drivers know that they will not meet vehicles travelling in the opposite direction.

3.10 Following consideration of the report findings the Roads Service recommend that a TRO be promoted to make Kirn Drive one-way westbound between Arran Road and Divert Road as well as Staffa Street southbound between Ivy Crescent and Kingsway East.

4.0 PROPOSALS

4.1 Following consideration of the report findings the Roads Service recommend that a TRO be promoted to make Kirn Drive one-way westbound between Arran Road and Divert Road as well as Staffa Street southbound between Ivy Crescent and Kingsway East.

4.2 Prepare design proposals for the one-way and the traffic calming.

4.3 Undertake a non-statutory public consultation on the proposed scheme and report back to this committee on the outcome of the consultation.

4.4 The estimated costs to deliver the project are summarised in the table below:

Estimated Project Costs	**Amount £m**
Design of passing places	0.008
Kirn Drive one-way modelling	0.036
Design of proposed scheme	0.020
Consultation	0.002
Road markings, signs and buildouts	0.035
Traffic calming measures	0.125
Roads Professional Fees	0.018
Total	**0.244**

5.0 IMPLICATIONS

5.1 The table below shows whether risks and implications apply if the recommendations are agreed:

SUBJECT	**YES**	**NO**
Financial	x	
Legal/Risk	x	
Human Resources		x
Strategic (Partnership Plan/Council Plan)		x
Equalities, Fairer Scotland Duty & Children/Young People's Rights & Wellbeing	x	
Environmental & Sustainability		x
Data Protection		x

5.2 **Finance**

One off Costs

Cost Centre	**Budget Heading**	**Budget Years**	**Proposed Spend this Report £000**	**Virement From**	**Other Comments**
Capital Programme	Kirn Drive Passing Places	2019/25	200		Part expended on fees and studies to date.
External Funding	CWSR	2024/25	44		

Annually Recurring Costs/ (Savings)

Cost Centre	Budget Heading	Budget Years	Proposed Spend this Report £000	Virement From	Other Comments
-	-	-	#3		Maintenance of road markings, signs and traffic calming.
-	-	-	#1		Lighting of signs.

Will be contained within existing budgets.

5.3 **Legal/Risk**

Subject to the outcome of the non-statutory consultation and further report to Committee, in order to introduce any one-way restrictions, it would be necessary to promote a TRO. The Traffic Regulation Order procedures approved by the Environment & Regeneration Committee in January 2021 will be used when promoting the Order. A TRO would be promoted in accordance with the terms of the Local Authorities' Traffic Order (Procedure) (Scotland) Regulations 1999 and Traffic Regulation Order procedures approved in January 2021.

5.4 **Human Resources**

None.

5.5 **Strategic**

None.

5.6 **Equalities and Fairer Scotland Duty**

(a) Equalities

This report has been considered under the Corporate Equalities Impact Assessment (EqIA) process with the following outcome:

X	YES – Assessed as relevant and an EqIA is required.
	NO – This report does not introduce a new policy, function or strategy or recommend a substantive change to an existing policy, function or strategy. Therefore, assessed as not relevant and no EqIA is required. Provide any other relevant reasons why an EqIA is not necessary/screening statement.

(b) Fairer Scotland Duty

If this report affects or proposes any major strategic decision:-

Has there been active consideration of how this report's recommendations reduce inequalities of outcome?

Report will be prepared after the detailed design is completed.

X	YES – A written statement showing how this report's recommendations reduce inequalities of outcome caused by socio-economic disadvantage has been completed.
	NO – Assessed as not relevant under the Fairer Scotland Duty for the following reasons: Provide reasons why the report has been assessed as not relevant.

(c) Children and Young People

Has a Children's Rights and Wellbeing Impact Assessment been carried out?

	YES – Assessed as relevant and a CRWIA is required.
X	NO – Assessed as not relevant as this report does not involve a new policy, function or strategy or recommends a substantive change to an existing policy, function or strategy which will have an impact on children's rights.

5.7 **Environmental/Sustainability**

Summarise any environmental / climate change impacts which relate to this report.

Has a Strategic Environmental Assessment been carried out?

	YES – assessed as relevant and a Strategic Environmental Assessment is required.
X	NO – This report does not propose or seek approval for a plan, policy, programme, strategy or document which is like to have significant environmental effects, if implemented.

5.8 **Data Protection**

Has a Data Protection Impact Assessment been carried out?

	YES – This report involves data processing which may result in a high risk to the rights and freedoms of individuals.
X	NO – Assessed as not relevant as this report does not involve data processing which may result in a high risk to the rights and freedoms of individuals.

6.0 CONSULTATION

6.1 An initial consultation will be necessary with Police Scotland who are the enforcing authority of moving traffic offences such as speeding and travelling the wrong way on a one-way road. If Police Scotland are in agreement with the proposed TRO a public consultation exercise will require to be undertaken for the promotion of the TRO and if traffic calming is proposed.

7.0 BACKGROUND PAPERS

7.1 A report entitled “Make Kirn Drive One Way” was considered by the Petitions Committee on 19 March 2020 and agreed the Corporate Director of Environment, Regeneration & Resources to submit a report to a future meeting of the Environment & Regeneration Committee with recommendations on the matter. This report fulfils this requirement.

AtkinsRéalis

5218600/002

Inverclyde Council

October 2023

KIRN DRIVE GOUROCK PARAMICS MODELLING

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This document has 32 pages including the cover.

Document history

Document title: 5218600/002
Document reference: 5218600/002

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Draft	RG	-	KF	KF	26/10/2023
1.1	Final	RG	EM	KF	KF	29/11/2023
1.2	Final Issue	RG	EM	KF	KF	30/11/2023
1.3	Updated reporting	JW		KF	KF	02/12/2023
1.4	Final Report	EM		KF	KF	15/12/2023
1.5	Final Issue	EM		KF	KF	08/02/24

Client signoff

Client	Inverclyde Council
Project	Kirn Drive Gourock Paramics modelling
Job number	5218600
Client signature/date	

Contents

Figures

Appendix A – Additional Figures

1. Introduction

1.1 Background

1.1.1 Atkins were commissioned to prepare a Paramics microsimulation model of the Kirn Drive area in Gourock, building on a previous study undertaken by SiAS in 2015. The model was originally developed in S-Paramics and used to test a range of traffic management interventions in the Kirn Drive area to improve traffic flow in the area.

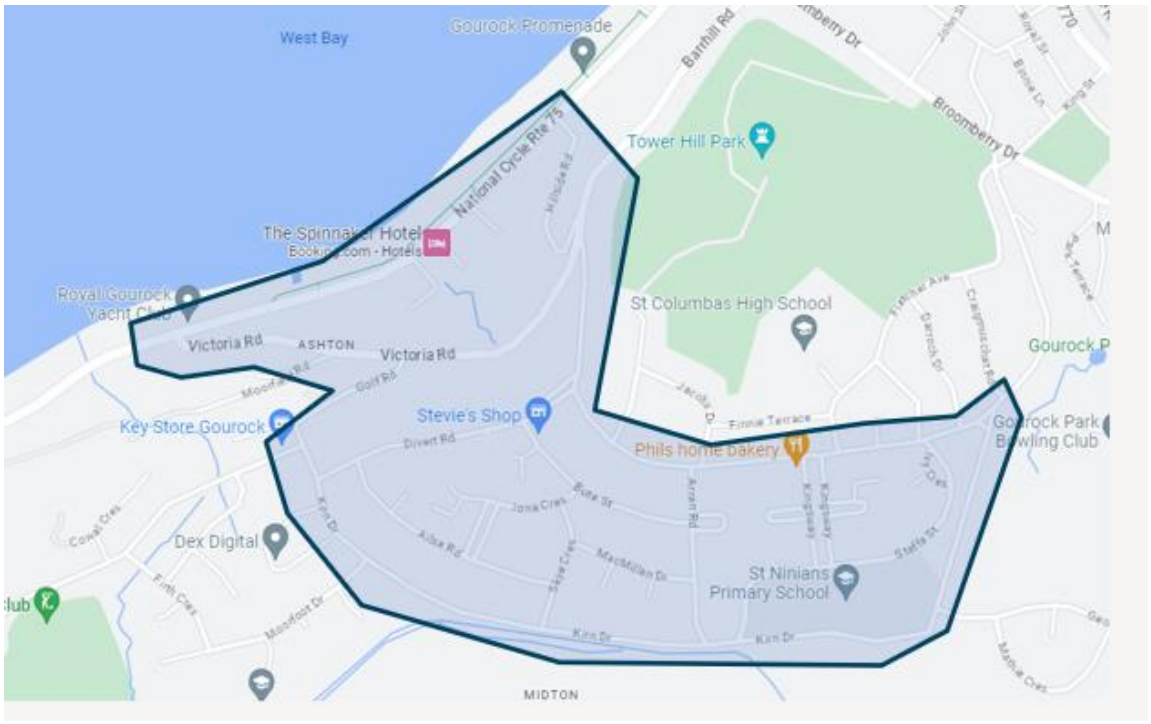
1.2 Report Purpose

1.2.1 This study looked to update the previous model into the latest Paramics Discovery software, and at the same time update and extend the traffic data in the model. The model would continue to be used to test traffic management changes in the Kirk Drive area, but included additional roads to the west, connecting through to the A770 Ashton Road.

1.3 Study area

1.3.1 Figure 1 shows the study extents, which includes Kirn Drive and surrounding streets.

Figure 1 - Study Area



2. Traffic Surveys

2.1 Survey Programme

2.1.1 In order to update the model it was necessary to gather new and updated traffic flow data. Since the original modelling work was undertaken, St Ninian's Primary School has changed location. Therefore, there was a need to understand the resulting changes in the traffic patterns and ensure they are reflected in the model.

2.1.2 Traffic surveys were undertaken at the locations shown in Figure 2 and listed below in March 2023:

- Junction Turning Counts (JTCs)
    - Fully classified
    - 16 junctions
    - Between 7am and 7pm on the 18th March 2023
- Automatic Traffic Counts (ATCs)
    - Bi-directional classified counts
    - 6 locations
    - Between 7am and 7pm on 18th and 19th of March 2023
- Parking Surveys which include parking occupancies by time and location on:
    - Kirn Drive
    - Staffa Street
    - Drumshantie Road
    - Tower Drive
    - Kingsway

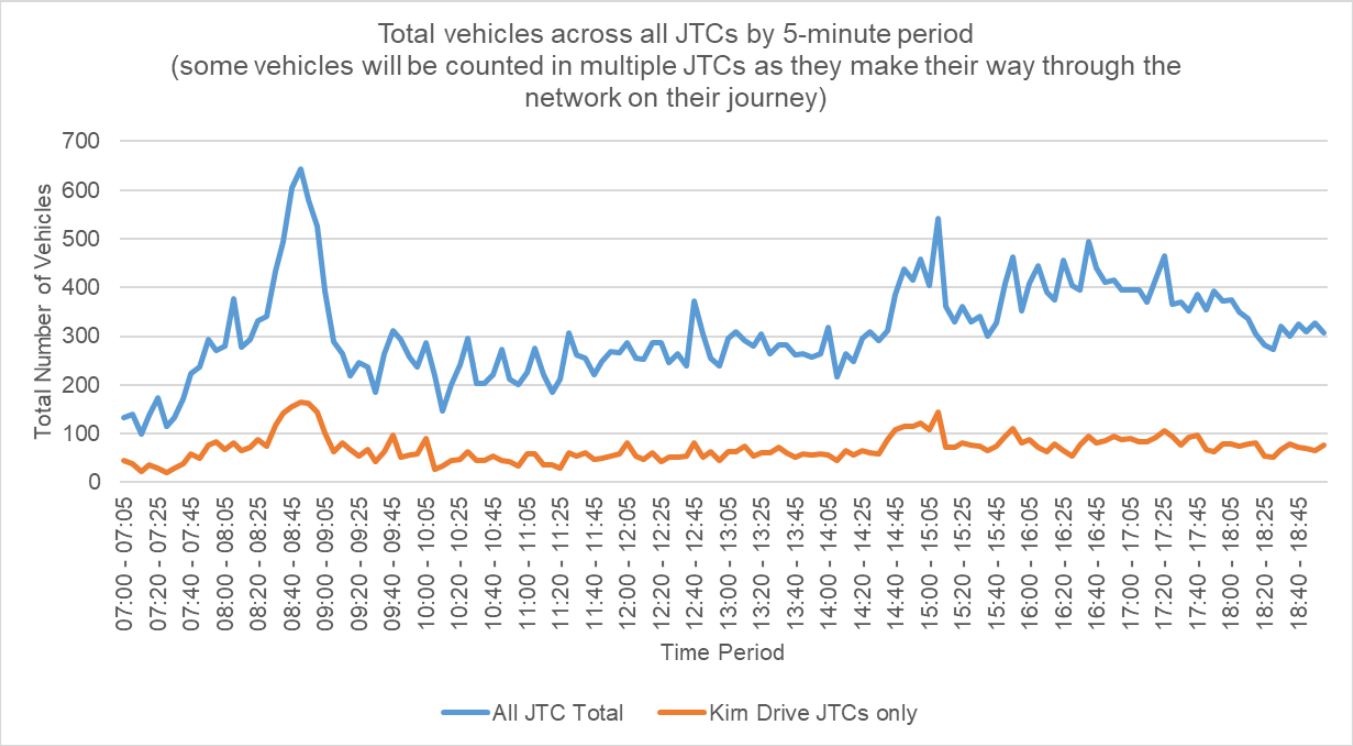
Figure 2 – Traffic Count Locations

2.2 Turn Count Surveys

2.2.1 The detail of the traffic surveys informed the base demands within the updated model, with a summary of the total observed traffic flows across the network provided in Figure 3 below. This showed that there is a marked peak on the network in the AM period with a lesser, more dispersed peak in the PM period. Copies of AM and PM peak traffic survey data is provided within Appendix A at the rear of this report.

2.2.2 The network traffic flow patterns were mirrored by the Kirn Drive traffic, with similar peaks observed on this key route, illustrating the marked AM Peak and more dispersed PM Peak.

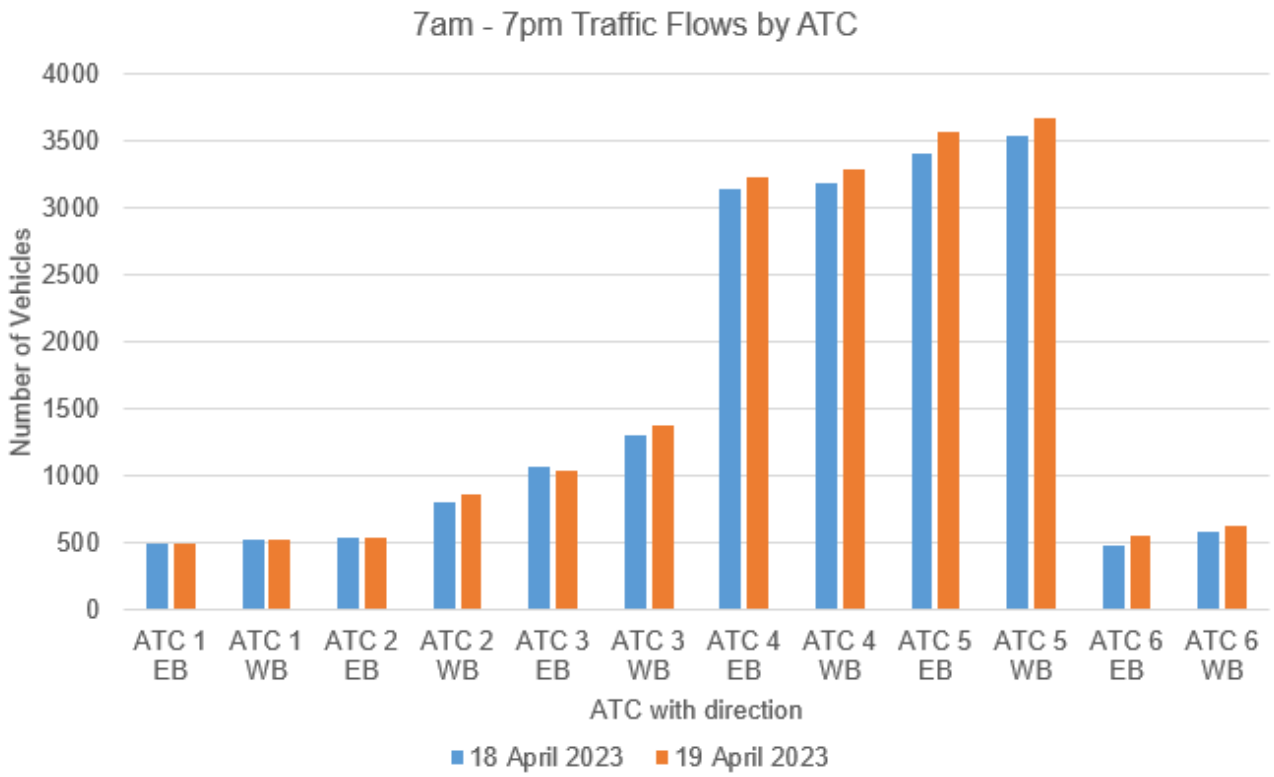
Figure 3 - JTC Summary



2.3 Automatic Traffic Counts (ATC)

2.3.1 As set out above alongside the junction turn count data, a number of automated traffic counts were also gathered. These record the traffic data over a 24hr period. Figure 4 summarises the total number of vehicles at each ATC during the busiest period of the day, 7am – 7pm.

Figure 4 - ATC Comparisons



2.4 Video Drive Through

2.4.1 As well as the traffic surveys a site visit was conducted on the 16th May 2023, which involved recording dashcam footage during school drop off and pickup, as well as making further observations on foot.

2.4.2 Observations showed that there was on street parking on most roads, and local residents have highlighted issues on Kirn Drive and Victoria Road. In general, the area was observed to have relatively low traffic flows, and no delays were observed at drop off or pick up around school.

2.4.3 In discussion, parents did say that Staffa Street is usually busier than observed. Most school traffic was observed on Drumshantie Road, both on the street and at the car park opposite. Generally, use of bus services was observed to be very low.

2.5 TomTom Data

2.5.1 In order to gather information on journey times through the study network TomTom data was gathered along a number of routes, shown in Figure 5 overleaf.

Figure 5 – Journey Time Routes

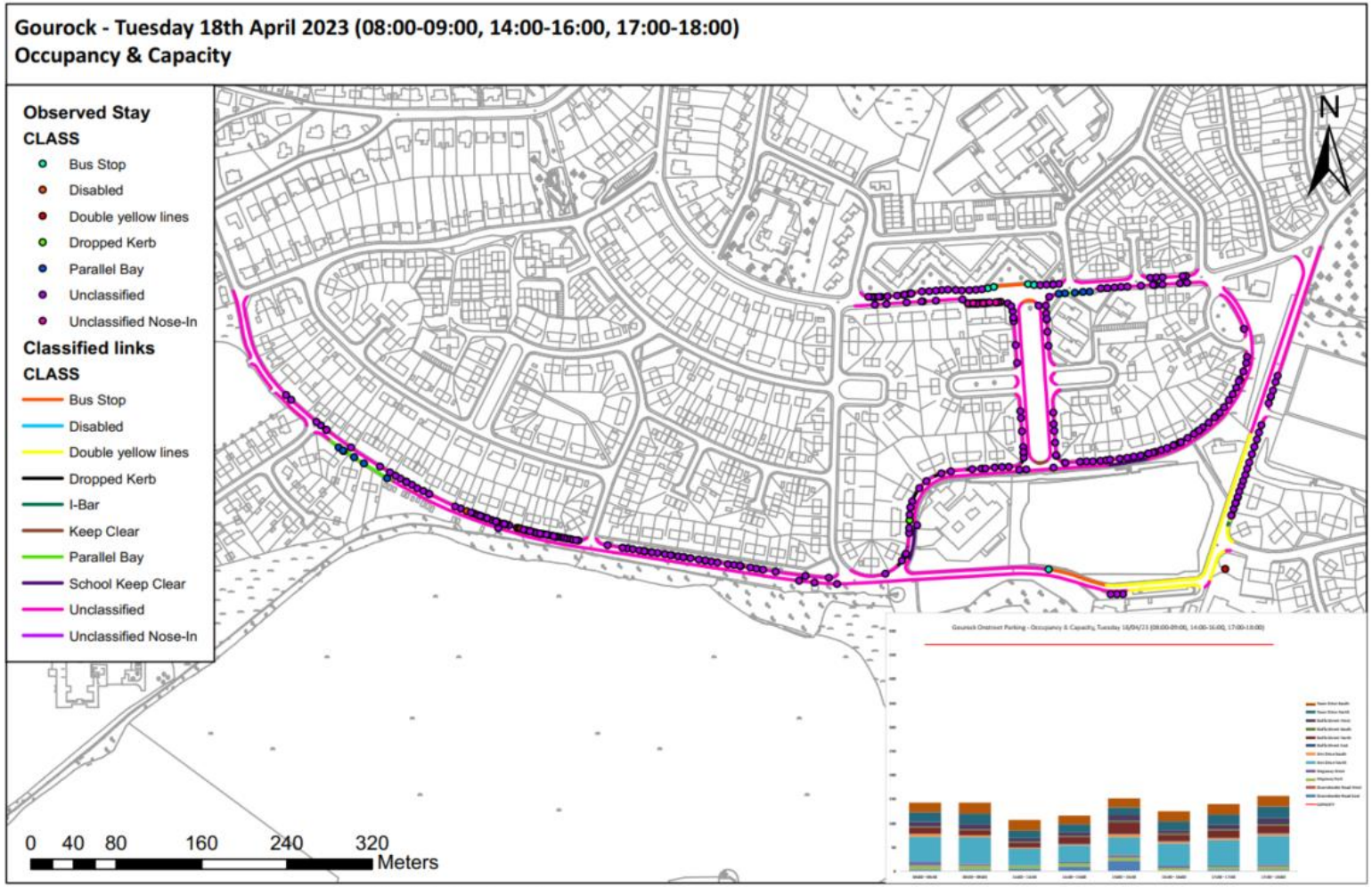
Route	Direction
Kim_Drive_Eb	EB
Kim_Drive_Wb	WB
Divert_Road_Eb	EB
Divert_Road_Wb	WB
Tower_Drive_West_Nb	NB
Tower_Drive_West_Sb	SB
Drumshantie_Road_Nb	NB
Drumshantie_Road_Sb	SB
Arran_Road_Nb	NB
Arran_Road_Sb	SB
Victoria_Road_Uphill	EB
Victoria_Road_Downhill	WB
A770_Eb	EB
A770_Wb	WB
Tower_Drive_East_EB	EB
Tower_Drive__East_WB	WB
Golf_Road_Nb	NB
Golf_Road_Sb	SB

2.5.2 The use of TomTom data allows a significant volume of data across a month to be gathered to provide representative average journey times across the routes. The travel times and calibration are discussed in more detail within the next section of the report.

2.6 Parking Surveys

2.6.1 As well as the traffic surveys data was gathered to record the locations and occupancy of parking within the area as these directly influence traffic flows along Kirn Drive and the surrounding roads. The parking surveys were undertaken during the same times and dates as the traffic surveys with the following area surveyed and the mapping showing (Figure 6 overleaf and larger scale in Appendix A) the levels of parking occupation across the surveyed period.

Figure 6 - Parking Survey Mapping

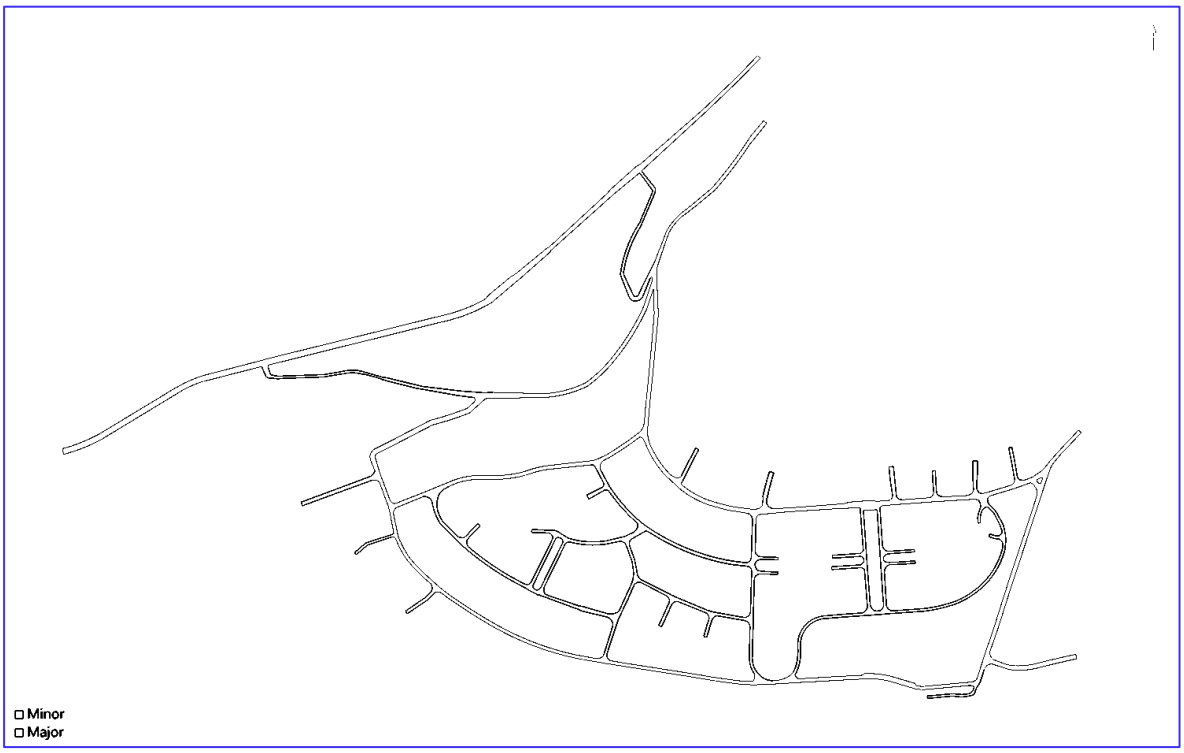


3. Model Update

3.1 Model Structure

3.1.1 The model required to be extended and updated to the latest Paramics Discovery software which is the latest version of the modelling software. As part of the update additional links and junctions were added to the original study network from 2015. The updated road network is shown in Figure 7 below.

Figure 7 - Link road class



3.2 Model Parameters

3.2.1 These were carried forward from the original model and reflect current best practice with visibility of 30m and 'GA look next' criteria toggled within the model (meaning that traffic looks beyond the adjacent link in the model) for any short links at priority junctions to replicate real life driver behaviour looking along the road to accept gaps in traffic.

3.3 Public Transport

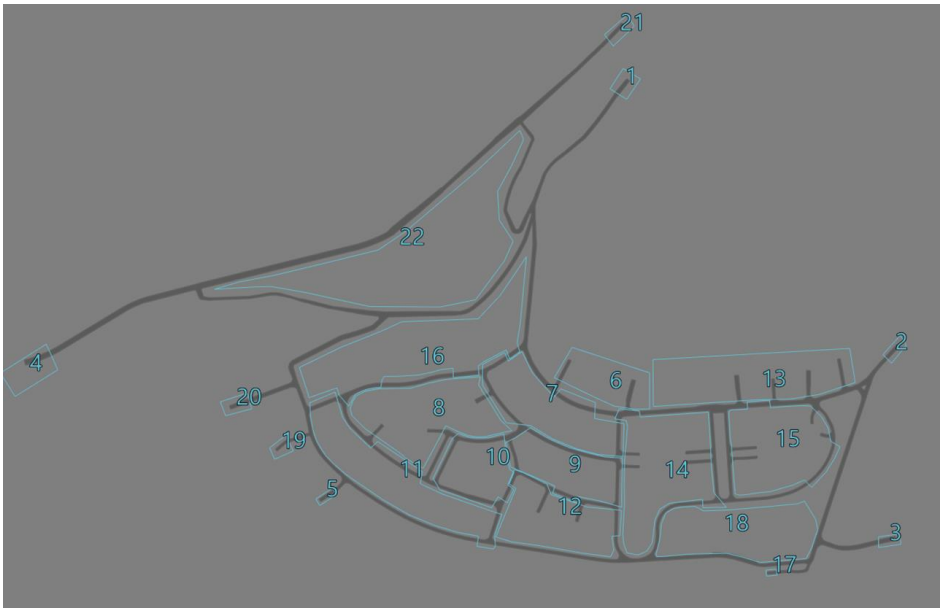
3.3.1 Bus routes were coded in the original model and these were updated to reflect current service timing and frequency.

3.4 Zone System

3.4.1 As the modelled area was extended it was also necessary to update the zone system from the 2015 model to include additional zones to the western end of the model area. The zones were structured to reflect the key residential zones within the study area with multiple minor routes and access points serving zones allowing traffic to travel to varying destinations within identified zones (in effect replicating people travelling to various homes and parking at different locations on a given street). The original 2015 S-Paramics structure and the updated zone structure are illustrated below.

Figure 8 – 2015 S-Paramics Model (19 Zones)

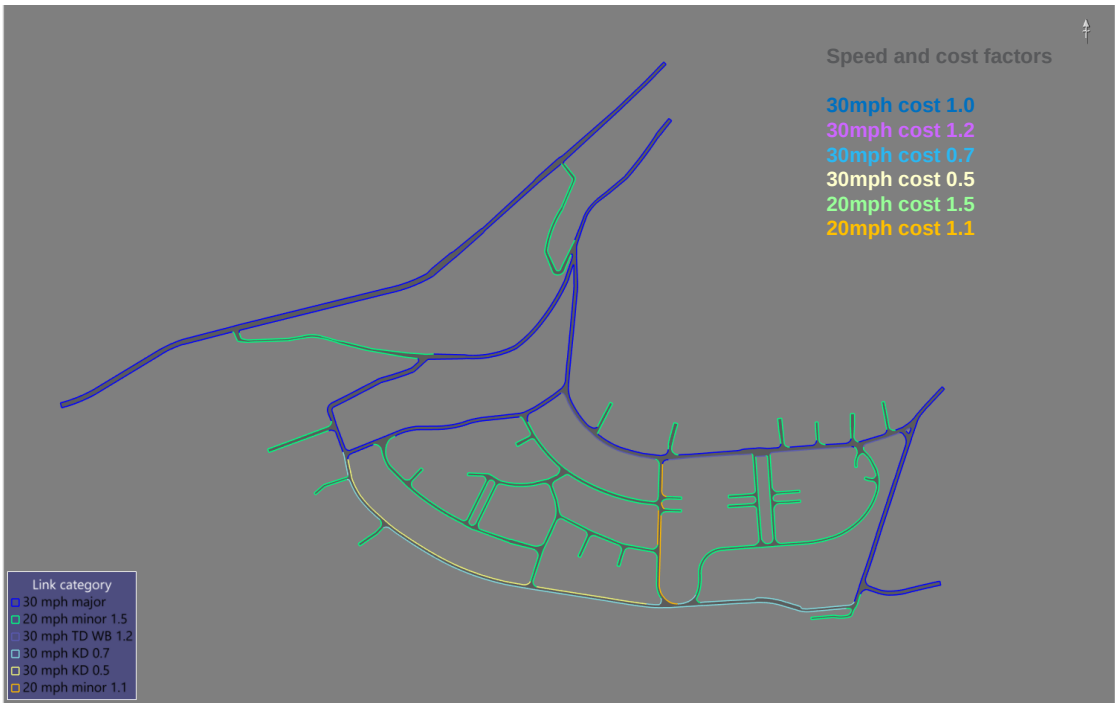
Figure 9 – 2023 Paramics Discovery Model (22 Zones)



3.5 Route Choice Methodology

3.5.1 The modelling software allows vehicles to make a journey using a choice of available routes to travel through the network. This is influenced by a number of factors within the network coding with the primary influences the classification of the links in the modelled network and the cost of journeys based on the time and distance of any route. The classification of the links within the network is illustrated below with the major links in blue and green and minor links in orange, yellow and purple. Those vehicles which are considered too be 'familiar' to the area (circa 85% of traffic) i.e. travelling to or from internal zones are not affected by the classification of the routes and will see no difference between major and minor links as familiar drivers will choose their route based solely on distance and journey time with no additional cost penalty. This reflects local drivers using the roads they wish to and not following directional signage or obviously higher class roads when making local journeys.

Figure 10 - Link road speed coding and cost factors



3.5.2 In addition to the general model structure the model also included the cost factors indicated above for the link types within the study area, to ensure the model replicated observed driver behaviour. The application of these factors in effect reinforces vehicles travelling through the area choosing to follow the main roads within the local area rather than minor links or residential roads.

3.6 Replication of On-Site Traffic Conditions

3.6.1 Within the model the key local factor that influenced driver behaviour during the site visits and observation of the traffic survey videos was the presence of parked cars throughout the network which reduce the available road width and result in 'give and take' behaviours for vehicles to pass. Within the model it was possible to use the parking survey data to include section of parked cars to replicate this observed behaviour. The updated Paramics Discovery software is better able to replicate this behaviour than the previous 2015 model which require to use a combination of car parks, traffic signals and loops to represent these road width constraints, and as a result concentrated solely on Kirn Drive and the area around St Ninian's Primary School . The modelling of the on-street parking in the Paramics Discovery model update is much more straightforward and as a result was able to replicate

parking across the network with the updated coding illustrated below (with the numbers on the zoomed in section indicating the length (m) of parking at each location).

Figure 11 – On Street Parking – overview

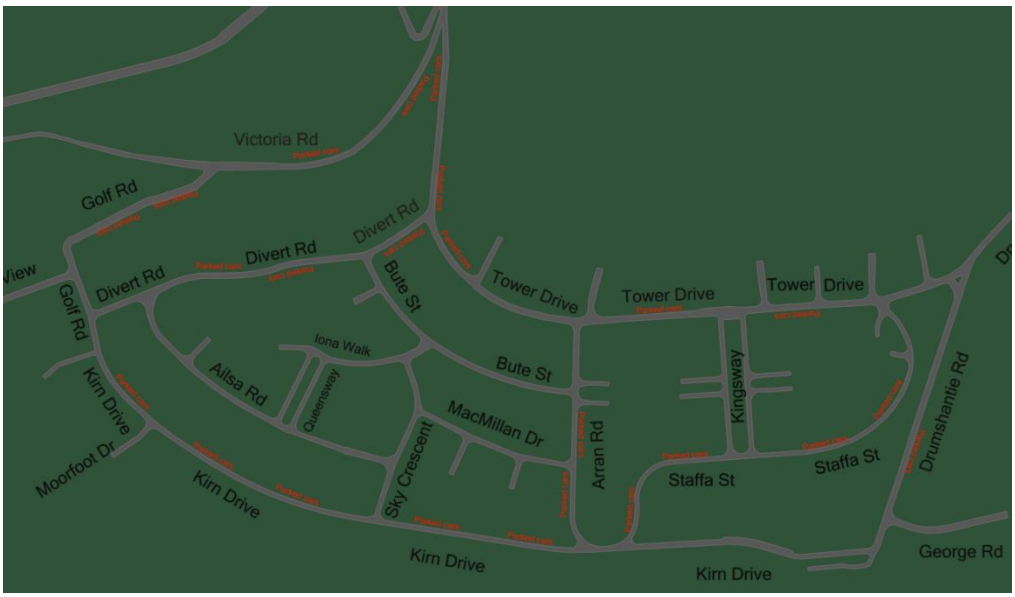
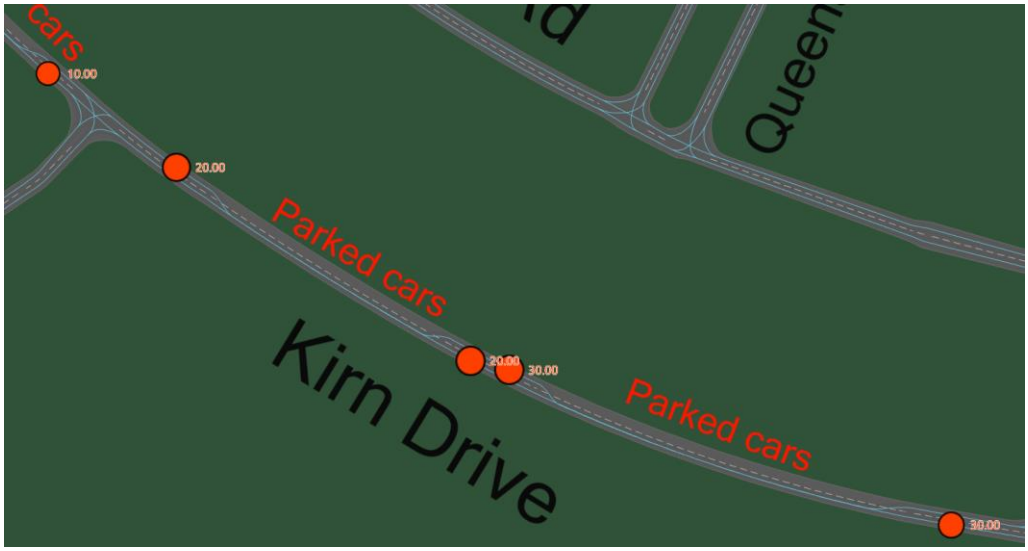


Figure 12 – On Street Parking – Kirn Drive zoomed in



4. Trip Matrix Development

4.1 Introduction

4.1.1 The previous model used 3 different demand matrices for light and heavy goods vehicles and a specific 'school' demand matrix. This was retained within the updated structure. The demand matrices assign traffic across the network to various origins and destinations either within the study network or on the surrounding external road network.

4.2 Prior Matrix Construction Summary

4.2.1 Matrix Estimation As the model was an update of a previous study it was possible to use the existing trip matrix as a prior matrix to estimate the origins and destinations of trips from the junction turn count information gathered through the updated traffic surveys.

4.2.2 These prior matrices were extended and the assignment to the new zones to the west disaggregated based upon the observed traffic movements.

4.3 Traffic Demand Profiling

4.3.1 As with the matrix estimation the original traffic profiles were reviewed and updated against the traffic data gathered recently, both junction turning counts and Automated Traffic Count data were used to develop up to date profiles across the study period.

5. Model Calibration & Validation

5.1 Standards

5.1.1 Guidance on the calibration of traffic models is set out within the TAG (Transport Assessment Guidance) Unit M3.1 (Highway Assignment Modelling, DfT May 2020) which advises that for link flows and turning counts the calibration should consider:

- The absolute and percentage differences in modelled and observed flows: and
- The GEH statistic – this is a form of chi squared statistic that includes both relative and absolute errors defined

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

where: GEH is the GEH statistic

M is the modelled flow

C is the observed flow

below.

5.1.2 The criteria and guidelines for the validation of the data extracted from Table 2 of the TAG guidance are shown below.

Figure 13 – TAG Calibration Criteria

Table 2 Link Flow and Turning Movement Validation Criteria and Guidelines

Criteria	Description of Criteria	Guideline
1	Individual flows within 100 veh/h of counts for flows less than 700 veh/h	> 85% of cases
	Individual flows within 15% of counts for flows from 700 to 2,700 veh/h	
	Individual flows within 400 veh/h of counts for flows more than 2,700 veh/h	
2	GEH < 5 for individual flows	> 85% of cases

5.1.3 In addition to the traffic data calibration it is also possible to calibrate the model against journey times on key routes through the network. The guidance sets out that for journey times the measure which should be used is the percentage difference between modelled and observed journey times, subject to an absolute maximum difference. Modelled journey times are expected to be within 15% (or 1 minute) for 85% of routes within any study network.

5.2 Traffic Flow Comparison

5.2.1 In line with the recommended approach a comparison was made between the observed and modelled flows within the network with the results shown in Figure 15 below.

Figure 14 – Traffic Flow Calibration

$$GEH = \sqrt{\frac{(M-O)^2}{(M+O)/2}}$$

GEH < 5 for individual flows
> 85% of case

	All Vehicles																	
	07:00:00			08:00:00			14:00:00			15:00:00			16:00:00			17:00:00		
		97			100			96			97			96			100	
		97			96			95			94			93			99	
GEH<5		100%			96%			99%			97%			97%			99%	
<3	88	91%		85	85%		86	90%		85	88%		80	83%		87	87%	
<4	95	98%		94	94%		91	95%		92	95%		89	93%		96	96%	
<5	97	100%		96	96%		95	99%		94	97%		93	97%		99	99%	
<6	97	100%		100	100%		96	100%		97	100%		95	99%		100	100%	
<7	97	100%		100	100%		96	100%		97	100%		96	100%		100	100%	
<8	97	100%		100	100%		96	100%		97	100%		96	100%		100	100%	
<9	97	100%		100	100%		96	100%		97	100%		96	100%		100	100%	
<10	97	100%	0	100	100%	0	96	100%	0	97	100%	0	96	100%	0	100	100%	0

5.2.2 The assessment clearly shows that the model achieves the required level of calibration across the key study periods, AM Peak, school peak and PM peak with GEH < 5 observed across 93% or more of the links. This confirms that the model is reflecting the observed traffic movements and indicates the demand matrices are fit for purpose.

5.3 Journey Time Comparisons

5.3.1 Having confirmed the calibration of the traffic volumes within the model it is also necessary as part of the validation process to check the journey times within the model against the observed journey times. As outlined previously TomTom data was gathered for neutral weekdays over the previous 6 month period to allow the journey times through the network to be assessed. The journey time data was compared across the 9 defined routes within the model with the output presented in Figure 15.

5.3.2 The assessment shows that the model achieves full compliance of journey time calibration throughout the study period again a further indication that the model is replicating the observed traffic behaviour within the study network.

Figure 15 – Journey Time Validation

Journey Time Validation Criterion and Acceptability Guideline	
Criteria	**Acceptability Guideline**
Modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%)	>85% of routes

TomTom data taken from neutral weekdays over the past 6 months (road closure periods excluded)

Route	Direction	AM Journey Time (s)																PM Journey Time (s)													
		07:00:00					08:00:00					14:00:00					15:00:00					16:00:00					17:00:00				
		OBS	MOD	DIFF (s)	DIFF (%)	PASS	OBS	MOD	DIFF (s)	DIFF (%)	PASS	OBS	MOD	DIFF (s)	DIFF (%)	PASS	OBS	MOD	DIFF (s)	DIFF (%)	PASS	OBS	MOD	DIFF (s)	DIFF (%)	PASS	OBS	MOD	DIFF (s)	DIFF (%)	PASS
Kirn_Drive_Eb	EB	98	114	16	16%	PASS	158	132	-26	-17%	PASS	131	127	-4	-3%	PASS	143	125	-18	-13%	PASS	144	128	-16	-11%	PASS	136	119	-17	-13%	PASS
Kirn_Drive_Wb	WB	108	102	-6	-6%	PASS	119	101	-18	-15%	PASS	111	98	-13	-12%	PASS	121	102	-19	-16%	PASS	108	97	-11	-10%	PASS	120	94	-26	-21%	PASS
Divert_Road_Eb	EB	47	54	7	15%	PASS	85	54	-31	-36%	PASS	55	53	-2	-4%	PASS	59	54	-5	-8%	PASS	54	53	-1	-2%	PASS	53	53	0	0%	PASS
Divert_Road_Wb	WB	65	45	-20	-31%	PASS	64	49	-16	-24%	PASS	53	47	-6	-12%	PASS	56	47	-9	-16%	PASS	54	47	-7	-13%	PASS	54	47	-7	-14%	PASS
Tower_Drive_West_Nb	NB	30	30	0	0%	PASS	34	31	-3	-9%	PASS	35	30	-5	-14%	PASS	38	31	-7	-19%	PASS	37	30	-7	-18%	PASS	36	31	-5	-15%	PASS
Tower_Drive_West_Sb	SB	28	30	2	7%	PASS	29	31	2	6%	PASS	24	31	7	28%	PASS	27	32	5	17%	PASS	26	31	5	20%	PASS	24	30	6	26%	PASS
Drumshantie_Road_Nb	NB	54	29	-26	-47%	PASS	56	35	-22	-38%	PASS	34	32	-2	-7%	PASS	36	31	-5	-15%	PASS	29	34	5	18%	PASS	37	29	-8	-20%	PASS
Drumshantie_Road_Sb	SB	25	39	14	55%	PASS	50	37	-13	-26%	PASS	35	42	6	19%	PASS	36	40	4	11%	PASS	30	42	12	40%	PASS	34	35	1	2%	PASS
Arran_Road_Nb	NB	70	32	-38	-54%	PASS	46	34	-12	-25%	PASS	42	34	-9	-20%	PASS	45	34	-11	-25%	PASS	48	32	-16	-33%	PASS	42	33	-9	-22%	PASS
Arran_Road_Sb	SB	31	33	2	7%	PASS	42	35	-7	-16%	PASS	49	34	-15	-31%	PASS	60	35	-26	-43%	PASS	60	35	-25	-42%	PASS	47	34	-13	-28%	PASS
Victoria_Road_Uphill	EB	73	83	10	14%	PASS	86	84	-2	-2%	PASS	93	82	-11	-12%	PASS	105	83	-22	-21%	PASS	94	91	-3	-3%	PASS	98	79	-19	-19%	PASS
Victoria_Road_Downhill	WB	92	98	6	7%	PASS	104	102	-2	-2%	PASS	97	100	3	3%	PASS	105	99	-6	-6%	PASS	99	108	8	9%	PASS	99	97	-2	-2%	PASS
A770_Eb	EB	62	63	1	1%	PASS	66	63	-3	-5%	PASS	70	63	-7	-10%	PASS	69	63	-6	-8%	PASS	68	63	-5	-7%	PASS	67	63	-4	-6%	PASS
A770_Wb	WB	61	65	4	7%	PASS	63	64	1	2%	PASS	67	66	-1	-1%	PASS	67	66	-2	-2%	PASS	68	67	-1	-2%	PASS	66	66	0	1%	PASS
Tower_Drive_East_EB	EB	64	67	3	4%	PASS	121	70	-51	-42%	PASS	81	68	-13	-16%	PASS	83	71	-12	-14%	PASS	79	68	-11	-13%	PASS	81	68	-13	-16%	PASS
Tower_Drive__East_WB	WB	66	99	33	50%	PASS	105	72	-33	-31%	PASS	74	66	-9	-11%	PASS	77	66	-11	-14%	PASS	71	67	-4	-6%	PASS	73	61	-12	-17%	PASS
Golf_Road_Nb	NB	34	31	-3	-9%	PASS	42	32	-10	-24%	PASS	44	32	-12	-26%	PASS	44	34	-11	-24%	PASS	45	33	-12	-27%	PASS	47	33	-14	-30%	PASS
Golf_Road_Sb	SB	41	39	-3	-6%	PASS	48	41	-7	-15%	PASS	50	40	-10	-20%	PASS	49	41	-8	-17%	PASS	45	40	-5	-11%	PASS	42	40	-2	-5%	PASS
					Count	18				Count	18				Count	18				Count	18				Count	18				Count	18
					PASS	100%				PASS	100%				PASS	100%				PASS	100%				PASS	100%				PASS	100%
					FAIL	0%				FAIL	0%				FAIL	0%				FAIL	0%				FAIL	0%				FAIL	0%

6. Option Testing

6.1 Introduction

6.1.1 The main purpose of the modelling update was to allow Inverclyde Council to test the impact of changes to traffic management in the area to address local concerns raised about the effect of parked vehicles on traffic flow and movement, particularly on Kirn Drive. Following discussion with Inverclyde Council and a review of the traffic survey data it was agreed that this testing should consider Kirn Drive becoming one-way in both eastbound and westbound directions only between Divert Road and Arran Road, consideration should also be given to a test of making Staffa Street one-way southbound only.

6.1.2 Moving forward the options assessed were categorised as follows:

- Option 1 – Kirn Drive One-way Eastbound
- Option 2 – Kirn Drive One-way Westbound
- Option 3 – Kirn Drive One-way Eastbound and Staffa Street One-way Southbound
- Option 4 – Kirn Drive One-way Westbound and Staffa Street One-way Southbound

6.2 Kirn Drive One-way Assessment

6.2.1 The base traffic network was updated to in effect close off the restricted roads illustrated below for the various scenarios. Option 1 modelled the Kirn Drive one-way eastbound without the changes to Staffa Street and Option 2 has the reciprocal westbound test applied over the same sections of road.

Figure 16 – One-way Network Coding (Eastbound Options 1 & 3)

Figure 17 – One-way Network Coding (Westbound Options 2 & 4)

6.2.2 The effect of the one-way system eastbound means that traffic travelling west through the network from Drumshantie Road towards Victoria Road would need to find alternative routes, with Tower Drive / Divert Road being the primary road network links that provide for the alternative route. Similarly for the westbound test traffic travelling from Victoria Road towards Drumshantie Road would reroute to follow an alternative route, typically along Tower Drive and Divert Road, though some traffic also reroutes along Arran Road and Bute Street, particularly as a result of the one-way Staffa Street operation.

6.2.3 The traffic flow data shows the westbound flow along Kirn Drive is higher in the baseline conditions so the eastbound options would require more traffic to reroute through the local network, with the modelling results discussed in more detail in the next sections of the report.

Traffic Volume Comparison

6.2.4 The model was run with the various changes in place and a comparison between the traffic flows on each of the key routes was made and is presented in Figures 18 and 19. Again to clarify Option 1 and 2 tests look solely at the one-way operation on Kirn Drive and Options 3 and 4 include the additional Staffa Street one-way section.

Figure 18 – One-way Flow Comparison (total vehicles) Options 1&2

			08:00:00					16:00:00				
			AM PEAK					PM PEAK				
Link	Description	Direction	Base	Option 1	Option 2	Option 1 - Base	Option 2 - Base	Base	Option 1	Option 2	Option 1 - Base	Option 2 - Base
Kirn Drive	Between Divert Road and Arran Road	EB	85	123	0	38	-85	66	86	0	20	-66
Kirn Drive	Between Divert Road and Arran Road	WB	138	0	158	-138	19	151	0	165	-151	14
Kirn Drive	Between Staffa Street and Drumshantie Road	EB	200	214	180	15	-20	106	112	84	6	-21
Kirn Drive	Between Staffa Street and Drumshantie Road	WB	226	175	231	-51	5	185	144	187	-40	3
Arran Road	South of Macmillan Drive	NB	63	134	58	70	-5	43	143	38	100	-5
Arran Road	South of Macmillan Drive	SB	99	75	172	-25	73	39	23	88	-16	49
Arran Road	North of Bute Street	NB	60	89	64	29	3	24	73	27	49	3
Arran Road	North of Bute Street	SB	33	28	68	-5	35	63	58	78	-6	14
Staffa Street	West Of Kingsway	**NB**	**52**	**59**	**55**	**7**	**3**	**9**	**11**	**8**	**2**	**-2**
Staffa Street	West Of Kingsway	**SB**	**38**	**27**	**41**	**-11**	**3**	**21**	**14**	**21**	**-6**	**0**
Kirn Drive	East of Staffa Street	WB	226	175	231	-51	5	185	144	187	-40	3
Kirn Drive	East of Staffa Street	EB	200	214	180	15	-20	106	112	84	6	-21
Divert Road	West of Tower Drive	EB	70	64	104	-7	34	40	30	62	-9	22
Divert Road	West of Tower Drive	WB	42	111	37	70	-5	51	124	52	73	0
Divert Road	East of Kirn Drive	EB	78	48	152	-30	74	50	29	100	-21	50
Divert Road	East of Kirn Drive	WB	50	163	25	113	-25	52	160	32	108	-20
Bute Street	West of Arran Road	EB	22	15	56	-8	34	17	14	45	-4	28
Bute Street	West of Arran Road	WB	4	34	3	30	-1	11	47	9	35	-3
MacMillan Drive	Between Skye Crescent and Arran Road	EB	56	50	66	-6	10	13	7	23	-5	10
MacMillan Drive	Between Skye Crescent and Arran Road	WB	14	29	13	15	0	27	46	28	19	1
Ailsa Road	Between Divert Road and Queensway	EB	10	8	22	-2	12	11	8	20	-3	9
Ailsa Road	Between Divert Road and Queensway	WB	8	18	10	10	2	9	18	8	9	-1
Kingsway	West Carriageway between Staffa St and Tower Dr	NB	50	57	52	7	3	10	13	11	3	1
Kingsway	West Carriageway between Staffa St and Tower Dr	SB	26	24	28	-2	2	8	8	11	0	3
Kingsway	East Carriageway between Staffa St and Tower Dr	NB	51	62	52	10	0	22	24	21	2	-2
Kingsway	East Carriageway between Staffa St and Tower Dr	SB	53	55	55	2	2	28	29	28	1	0
Drumshantie Road	North of George Road	NB	179	219	168	40	-12	225	264	215	39	-10
Drumshantie Road	North of George Road	SB	120	98	133	-21	13	150	143	160	-7	10
Tower Drive	Between Drumshantie Road and Staffa Street	EB	196	181	217	-15	20	82	75	101	-7	19
Tower Drive	Between Drumshantie Road and Staffa Street	WB	110	157	105	46	-5	147	189	144	42	-3
Tower Drive	Between Divert Road and Arran Road	EB	75	54	121	-21	46	32	21	61	-11	29
Tower Drive	Between Divert Road and Arran Road	WB	53	147	42	94	-11	40	136	31	96	-9
Victoria Road	East of Golf Road	EB	155	138	161	-18	6	52	47	55	-5	3
Victoria Road	East of Golf Road	WB	23	37	14	14	-10	42	61	34	19	-9
Victoria Road	West of Golf Road	EB	60	60	59	0	-1	44	43	41	-1	-2
Victoria Road	West of Golf Road	WB	40	34	41	-6	1	57	53	57	-3	0
Hillside Road	North of Victoria Road	NB	17	16	18	0	1	21	20	22	-1	1
Hillside Road	North of Victoria Road	SB	29	34	26	5	-3	26	29	25	2	-1
Golf Road	West of Victoria Road	EB	158	124	161	-33	4	96	71	100	-25	3
Golf Road	West of Victoria Road	WB	45	50	31	5	4	73	75	63	1	-11

Figure 19 – One-way Flow Comparison (total vehicles) Options 3&4

			08:00:00					16:00:00				
			AM PEAK					PM PEAK				
Link	Description	Direction	Base	Option 3	Option 4	Option 3 - Base	Option 4 - Base	Base	Option 3	Option 4	Option 3 - Base	Option 4 - Base
Kirn Drive	Between Divert Road and Arran Road	EB	85	122	0	37	-85	66	88	0	22	-66
Kirn Drive	Between Divert Road and Arran Road	WB	138	0	161	-138	23	151	0	166	-151	15
Kirn Drive	Between Staffa Street and Drumshantie Road	EB	200	235	431	36	231	106	125	106	19	0
Kirn Drive	Between Staffa Street and Drumshantie Road	WB	226	170	219	-56	-7	185	142	184	-42	0
Arran Road	South of Macmillan Drive	NB	63	184	96	121	33	43	152	52	109	9
Arran Road	South of Macmillan Drive	SB	99	73	166	-27	67	39	21	96	-18	57
Arran Road	North of Bute Street	NB	60	138	244	78	184	24	81	38	57	14
Arran Road	North of Bute Street	SB	33	28	65	-5	32	63	58	81	-5	18
Staffa Street	West Of Kingsway	**NB**	**52**	**0**	**0**	**-52**	**-52**	**9**	**0**	**0**	**-9**	**-9**
Staffa Street	West Of Kingsway	**SB**	**38**	**53**	**65**	**15**	**26**	**21**	**29**	**35**	**8**	**14**
Kirn Drive	East of Staffa Street	WB	226	170	219	-56	-7	185	142	184	-42	0
Kirn Drive	East of Staffa Street	EB	200	235	431	36	231	106	125	106	19	0
Divert Road	West of Tower Drive	EB	70	68	107	-2	37	40	34	64	-6	25
Divert Road	West of Tower Drive	WB	42	107	37	65	-5	51	122	50	71	-2
Divert Road	East of Kirn Drive	EB	78	51	152	-27	74	50	30	100	-20	50
Divert Road	East of Kirn Drive	WB	50	165	24	114	-26	52	161	37	109	-15
Bute Street	West of Arran Road	EB	22	13	52	-9	30	17	12	53	-5	36
Bute Street	West of Arran Road	WB	4	37	2	33	-2	11	46	9	35	-2
MacMillan Drive	Between Skye Crescent and Arran Road	EB	56	49	68	-7	12	13	7	29	-6	16
MacMillan Drive	Between Skye Crescent and Arran Road	WB	14	29	12	15	-1	27	47	35	19	8
Ailsa Road	Between Divert Road and Queensway	EB	10	7	22	-3	12	11	9	21	-2	10
Ailsa Road	Between Divert Road and Queensway	WB	8	18	10	10	2	9	18	9	9	0
Kingsway	West Carriageway between Staffa St and Tower Dr	NB	50	32	22	-18	-28	10	11	7	1	-3
Kingsway	West Carriageway between Staffa St and Tower Dr	SB	26	31	32	5	6	8	11	13	3	4
Kingsway	East Carriageway between Staffa St and Tower Dr	NB	51	49	96	-2	45	22	24	27	2	5
Kingsway	East Carriageway between Staffa St and Tower Dr	SB	53	59	55	6	2	28	32	32	4	4
Drumshantie Road	North of George Road	NB	179	242	194	63	14	225	269	221	44	-3
Drumshantie Road	North of George Road	SB	120	91	127	-29	8	150	132	147	-18	-3
Tower Drive	Between Drumshantie Road and Staffa Street	EB	196	190	230	-6	33	82	76	99	-5	18
Tower Drive	Between Drumshantie Road and Staffa Street	WB	110	161	114	51	3	147	189	148	42	2
Tower Drive	Between Divert Road and Arran Road	EB	75	58	124	-16	49	32	23	63	-9	31
Tower Drive	Between Divert Road and Arran Road	WB	53	144	40	91	-13	40	135	30	95	-10
Victoria Road	East of Golf Road	EB	155	138	166	-17	10	52	46	56	-6	4
Victoria Road	East of Golf Road	WB	23	38	13	15	-10	42	63	33	20	-9
Victoria Road	West of Golf Road	EB	60	61	60	0	0	44	42	42	-1	-2
Victoria Road	West of Golf Road	WB	40	35	41	-5	1	57	54	58	-3	1
Hillside Road	North of Victoria Road	NB	17	17	17	0	1	21	22	22	1	1
Hillside Road	North of Victoria Road	SB	29	33	29	4	-1	26	29	24	3	-2
Golf Road	West of Victoria Road	EB	158	125	164	-33	6	96	70	101	-26	5
Golf Road	West of Victoria Road	WB	45	49	30	4	-15	73	75	62	2	-11

6.2.5 As would be expected the impact of the one-way system on Kirn Drive results in all traffic either westbound or eastbound being removed from the network resulting in a net reduction in flows on Kirn Drive.

6.2.6 Across the network there are changes to traffic flows on both Divert Road and Tower Drive with an overall increase in traffic using these routes as a result of the introduction of one-way controls with greater flows in Options 1 and 3 as more traffic has to divert from Kirn Drive (a reflection of the higher westbound flows in the base). The results show an additional 100 or so vehicles on Tower Drive and Divert Road as result of the diversion of westbound trips from Kirn Drive, compared to around 50 additional trips when eastbound trips are diverted.

6.2.7 The Option 3 and 4 tests with additional one-way on Staffa Street shows higher impacts as more traffic needs to divert around the network. The greatest impact on any route occurs with the westbound trips and one-way Staffa Street with an additional 231 on Kirn Drive at its eastern end due to all traffic heading north on Staffa St rerouting to Drumshantie Road. In addition the impacts on Arran Road in particular are higher in Options 3 and 4 as a result of traffic shifting from Staffa Street to use other routes. Beyond the immediate environs of Staffa Street none of the other roads have a significant difference to the one-way Kirn Drive alone. Reducing the extent of the one-way operation of Staffa Street to the section south of Kingsway would likely still improve traffic management past the school as the direct link from Kirn Drive past the school would be removed but with lower levels of diverted traffic impacts on other parts of the road network.

Journey time Comparison

6.2.8 Moving on to consider the impacts on journey times on the network Average and Maximum observed journey times have been considered and the comparison with the base model are presented in the Figures 20 through to 23. The journey times quoted are for journeys along the full length of the roads identified within the tables, with the appropriate direction of travel also indicated.

6.2.9 The most striking journey time impact of the proposed one-way system occurs on Kirn Drive in Option 1 for the now unopposed eastbound traffic, with around a 50% improvement in maximum journey times and 35% in average journey times observed across both peaks for the eastbound one-way test. In the westbound one-way test (Option 2) around 20% reductions in journey time are observed. This is likely to be indicative of the traffic travelling eastbound on Kirn Drive in the current situation most often having to give way and having unreliable journey times. The biggest increase in journey times with the eastbound one-way operation occur on Tower Drive and Divert Road, likely to be as a direct result of the increase in two-way traffic flows along these roads and the resulting need for more drivers to give way to one another at parked cars. Similarly with the westbound situation Arran Drive has slightly longer journey times, again associated with additional traffic having to give way on that route.

6.2.10 The total time saved on eastbound journeys on Kirn Drive in Options 1 and 3 is almost a minute as an average compared to the saving for westbound one-way traffic in Options 2 and 4 of 15-20 seconds, again an indication that eastbound traffic is most affected by the existing parking and road narrowing on Kirn Drive. The increase in westbound journey time in Options 1 and 2 is likely to be around 3-4 seconds (sum of Tower Drive and Divert Road delays) compared to existing journey times suggesting an overall benefit to the network when considered alongside the eastbound journey time gains. Options 3 and 4 show lower levels of journey time changes with minor benefits on Kirn Drive and minor impacts on alternate routes suggesting little material change in conditions. Again there is little difference between the model runs with the one-way operation of Staffa Street but journey times are generally higher in Option 3 and 4 tests.

6.2.11 Journey time comparisons can be seen in Figures 19 through to 22.

Figure 20 – One-way Average Journey Time Comparison (journey time in seconds) Options 1 & 2

Route	Direction	Modelled Path Length (m)	Average Journey Time (s) 08:00:00					Average Journey Time (s) 16:00:00				
			Journey_times_Base_am	Journey_times_Opt1_am	Journey_times_Opt2_am	Option 1 - Base	Option 2 - Base	Journey_times_Base_pm	Journey_times_Opt1_pm	Journey_times_Opt2_pm	Option 1 - Base	Option 2 - Base
			Base	Option 1	Option 2	DIFF (s)	DIFF (s)	Base	Option 1	Option 2	DIFF (s)	DIFF (s)
Kirn_Drive_Eb	EB	1,015	137	85	0	-53		131	86	0	-46	
Kirn_Drive_Wb	WB	1,016	104	0	86		-19	101	0	85		-16
Divert_Road_Eb	EB	418	48	54	47	7	-1	47	50	47	3	1
Divert_Road_Wb	WB	417	49	50	51	1	2	47	47	48	1	1
Tower_Drive_West_Nb	NB	260	33	33	33	0	0	32	32	32	0	0
Tower_Drive_West_Sb	SB	260	32	35	32	2	-1	33	34	33	2	1
Drumshantie_Road_Nb	NB	349	33	32	34	-1	1	32	32	32	0	0
Drumshantie_Road_Sb	SB	349	34	35	34	1	0	37	36	37	-1	0
Arran_Road_Nb	NB	269	36	34	37	-1	2	32	32	33	0	1
Arran_Road_Sb	SB	268	34	34	34	0	0	33	33	32	0	-1
Victoria_Road_Uphill	EB	744	84	85	84	1	0	85	84	83	-1	-2
Victoria_Road_Downhill	WB	747	103	97	103	-6	0	91	104	101	13	10
A770_Eb	EB	808	63	63	63	0	0	63	63	63	0	0
A770_Wb	WB	809	65	65	65	0	0	66	66	66	0	0
Tower_Drive_East_EB	EB	660	68	71	67	3	-1	68	70	71	2	4
Tower_Drive__East_WB	WB	661	78	70	78	-8	0	69	71	68	2	-1
Golf_Road_Nb	NB	284	34	35	34	1	0	35	35	34	0	0
Golf_Road_Sb	SB	279	37	36	38	-1	1	36	35	36	-1	0

Figure 21 – One-way Average Journey Time Comparison (journey time in seconds) Options 3 & 4

Route	Direction	Modelled Path Length (m)	Average Journey Time (s) 08:00:00					Average Journey Time (s) 16:00:00				
			Journey_times_Base_am	Journey_times_Opt3_am	Journey_times_Opt4_am	Option 3 - Base	Option 4 - Base	Journey_times_Base_pm	Journey_times_Opt3_pm	Journey_times_Opt4_pm	Option 3 - Base	Option 4 - Base
			Base	Option 3	Option 4	DIFF (s)	DIFF (s)	Base	Option 3	Option 4	DIFF (s)	DIFF (s)
Kirn_Drive_Eb	EB	1,015	137	85	0	-53		131	86	0	-45	
Kirn_Drive_Wb	WB	1,016	104	0	86		-19	101	0	85		-16
Divert_Road_Eb	EB	418	48	54	46	6	-1	47	54	47	7	0
Divert_Road_Wb	WB	417	49	50	51	1	3	47	47	48	1	1
Tower_Drive_West_Nb	NB	260	33	33	33	0	0	32	32	32	0	0
Tower_Drive_West_Sb	SB	260	32	35	32	2	0	33	34	33	2	0
Drumshantie_Road_Nb	NB	349	33	32	34	0	1	32	31	32	-1	0
Drumshantie_Road_Sb	SB	349	34	36	35	2	1	37	38	37	1	0
Arran_Road_Nb	NB	269	36	35	38	-1	3	32	32	33	0	0
Arran_Road_Sb	SB	268	34	37	36	3	2	33	33	32	0	-1
Victoria_Road_Uphill	EB	744	84	84	84	1	0	85	86	85	1	0
Victoria_Road_Downhill	WB	747	103	99	105	-4	2	91	94	102	3	11
A770_Eb	EB	808	63	63	63	0	0	63	63	63	0	0
A770_Wb	WB	809	65	65	64	0	0	66	66	66	0	0
Tower_Drive_East_EB	EB	660	68	71	67	3	-1	68	71	71	3	3
Tower_Drive__East_WB	WB	661	78	73	80	-6	2	69	71	69	3	0
Golf_Road_Nb	NB	284	34	35	34	0	0	35	35	34	0	0
Golf_Road_Sb	SB	279	37	37	38	0	1	36	35	36	-1	0

Figure 22 – One-way Maximum Journey Time Comparison (journey time in seconds) Options 1&2

Route		Modelled Path Length (m)	Max Journey Time (s) 08:00:00					Max Journey Time (s) 16:00:00				
			Journey_times_Base_am	Journey_times_Opt1_am	Journey_times_Opt2_am	Option 1 - Base	Option 2 - Base	Journey_times_Base_pm	Journey_times_Opt1_pm	Journey_times_Opt2_pm	Option 1 - Base	Option 2 - Base
			Base	Option 1	Option 2	DIFF (s)	DIFF (s)	Base	Option 1	Option 2	DIFF (s)	DIFF (s)
Kirn_Drive_Eb	EB	1,015	248	104	0	-144		199	107	0	-93	
Kirn_Drive_Wb	WB	1,016	145	0	111		-34	145	0	117		-28
Divert_Road_Eb	EB	418	71	81	60	10	-12	61	53	67	-7	6
Divert_Road_Wb	WB	417	62	72	65	10	3	57	73	59	15	2
Tower_Drive_West_Nb	NB	260	44	46	46	2	2	40	42	42	1	2
Tower_Drive_West_Sb	SB	260	51	61	50	10	-1	70	74	79	4	8
Drumshantie_Road_Nb	NB	349	54	53	54	-1	0	46	46	44	0	-1
Drumshantie_Road_Sb	SB	349	48	48	48	0	0	58	55	58	-4	-1
Arran_Road_Nb	NB	269	54	54	62	-1	8	38	44	40	6	2
Arran_Road_Sb	SB	268	51	47	52	-4	1	43	39	42	-4	-1
Victoria_Road_Uphill	EB	744	96	102	98	6	2	86	84	83	-2	-3
Victoria_Road_Downhill	WB	747	108	101	110	-8	2	91	104	101	13	10
A770_Eb	EB	808	101	98	100	-3	-1	99	100	99	1	0
A770_Wb	WB	809	119	118	119	-1	0	119	119	119	1	1
Tower_Drive_East_EB	EB	660	87	98	87	11	-1	97	95	112	-1	16
Tower_Drive__East_WB	WB	661	131	139	135	8	5	113	138	105	25	-8
Golf_Road_Nb	NB	284	43	42	42	-1	-1	45	44	43	-1	-2
Golf_Road_Sb	SB	279	55	53	53	-2	-2	48	46	45	-2	-3

Figure 23 – One-way Maximum Journey Time Comparison (journey time in seconds) Options 3&4

Route	Direction	Modelled Path Length (m)	Max Journey Time (s) 08:00:00					Max Journey Time (s) 16:00:00				
			Journey_times_Base_am	Journey_times_Opt3_am	Journey_times_Opt4_am	Option 3 - Base	Option 4 - Base	Journey_times_Base_pm	Journey_times_Opt3_pm	Journey_times_Opt4_pm	Option 3 - Base	Option 4 - Base
			Base	Option 3	Option 4	DIFF (s)	DIFF (s)	Base	Option 3	Option 4	DIFF (s)	DIFF (s)
Kirn_Drive_Eb	EB	1,015	248	109	0	-139		199	111	0	-88	
Kirn_Drive_Wb	WB	1,016	145	0	116		-29	145	0	118		-27
Divert_Road_Eb	EB	418	71	84	59	13	-12	61	60	65	0	4
Divert_Road_Wb	WB	417	62	76	62	14	0	57	68	55	10	-2
Tower_Drive_West_Nb	NB	260	44	48	45	4	1	40	43	42	3	2
Tower_Drive_West_Sb	SB	260	51	62	50	11	-1	70	73	79	3	8
Drumshantie_Road_Nb	NB	349	54	51	57	-3	3	46	47	43	1	-2
Drumshantie_Road_Sb	SB	349	48	49	51	1	3	58	59	57	0	-2
Arran_Road_Nb	NB	269	54	55	68	0	14	38	44	40	6	2
Arran_Road_Sb	SB	268	51	56	66	5	15	43	39	43	-3	1
Victoria_Road_Uphill	EB	744	96	102	97	5	1	86	87	85	1	-1
Victoria_Road_Downhill	WB	747	108	106	112	-2	4	91	95	104	4	13
A770_Eb	EB	808	101	100	100	-1	-1	99	99	99	0	0
A770_Wb	WB	809	119	118	118	-1	-1	119	119	119	0	1
Tower_Drive_East_EB	EB	660	87	96	85	8	-2	97	99	110	3	13
Tower_Drive__East_WB	WB	661	131	140	136	9	5	113	138	109	25	-4
Golf_Road_Nb	NB	284	43	40	43	-3	0	45	43	44	-2	-1
Golf_Road_Sb	SB	279	55	53	56	-2	1	48	46	47	-2	-1

Other considerations

6.2.12 The modelling has shown overall there may be a benefit in terms of overall traffic efficiency through the network. There are some other considerations of the one-way system being introduced which are discussed below.

6.2.13 Buses currently route through the network using the two way streets. The provision of Kirn Drive as a one-way route removes the need for drivers to 'give and take' between parked cars along the route. Eastbound journeys along Kirn Drive experience greater variation in journey time and this variability results in longer times in that direction typically, and as a result an eastbound one-way route shows the greatest benefit from the journey time savings which have been shown above.

6.2.14 The eastbound one-way layout results in a more 'standard' road arrangement and operation for Kirn Drive with parking on the left of through traffic movement (rather than the right in the westbound arrangement) and this eastbound traffic flows would also allow any bus route through here to pick up and drop off passengers on the side where the housing is situated.

6.2.15 It is however recognised that the westbound route has higher flows than the eastbound direction and as result the modelling clearly shows the impact of diverted traffic through the network is less with Kirn Drive operating in a westbound direction with both Divert Road and Tower Drive having lower traffic increases compared to the eastbound one-way Kirn Drive test.

6.2.16 The introduction of a one-way system alleviates the delays experienced by traffic having to operate on a 'give and take' arrangement on Kirn Drive, a consequence of the one-way system would be that drivers would feel more confident driving at a higher speed than currently occurs as they no longer need to anticipate opposing vehicles. Given the residential character of the neighbourhood, higher vehicle speeds are likely. Given the potential numbers of children in the area, with 3 schools in the immediate environs, it is of particular interest to keep vehicle speeds low. Whilst a 20mph speed limit throughout the area would assist with this some drivers will not follow speed limits if there is little or no enforcement, which would likely be the case.

6.2.17 Therefore in the event that the one-way scheme is taken forward there may be a need to complement this with some, traffic calming to lower vehicle speeds. On one-way routes this usually takes the form of measures such as speed bumps, raised tables, or pavement buildouts (to form chicanes). These methods all slow down traffic by making it more difficult to drive at higher speeds, though care would need to be taken they do not adversely impact any bus services.

7. Summary of Findings

7.1 Summary

7.1.1 In summary, an updated model of the road network around Kirn Drive has been developed using new data gathered in 2023. The model has been validated and calibrated against recognised industry criteria and is considered 'fit for purpose' to test future network operation and traffic management proposals.

7.1.2 The model has been used to test the impact of introducing a one-way restriction eastbound on Kirn Drive and also the addition of one-way control on Staffa Street close to St Ninian's Primary School. The modelling has shown that there is a significant improvement to both the average and maximum observed journey times for vehicle travelling east along Kirn Drive and over the whole network with time saving offsets any delay incurred to westbound trips as a result of having to reroute via Tower Drive and Drumshantie Road. The modelled result show little difference in the performance with and without the one-way control on Staffa Street other than a short section of Kirn Drive at the east end approaching Drumshantie Road – reducing the extent of one-way operation to the section south of Kingsway may reduce any significant need for traffic to reroute on the wider network but still assist in managing flows at the school as the direct route from Kirn Drive past the school is removed.

7.1.3 The model shows that the road network will continue to operate satisfactorily with little delay and no congestion predicted to occur – similar to the existing situation but with a lower level of diverted trips and therefore impact on Divert Road and Tower Drive with Kirn Drive operating as a one-way route westbound.

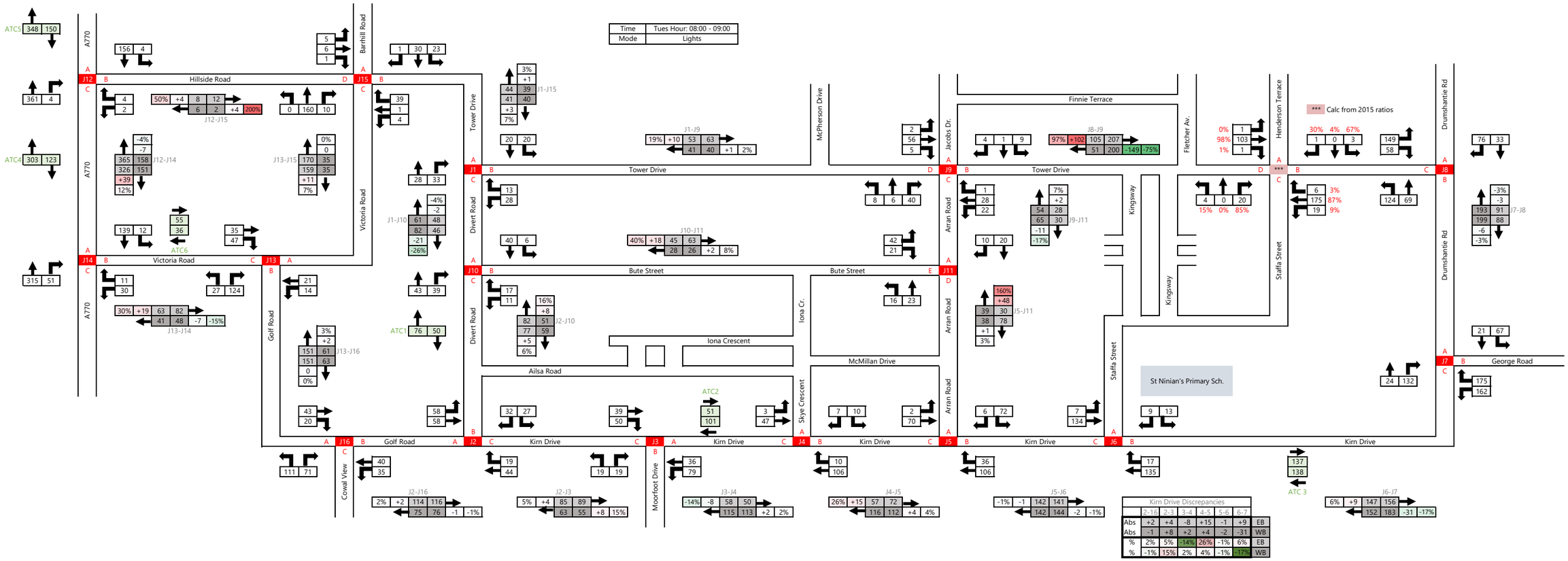
7.2 Conclusion

7.2.1 The modelling has demonstrated that the one-way operation of Kirn Drive could be implemented without having a significant adverse impact on the wider road network. Neither eastbound or westbound options have significant impacts on journey times or flows however the westbound one-way options show lower traffic diverting onto other routes in the area, primarily Tower Drive and Divert Road.

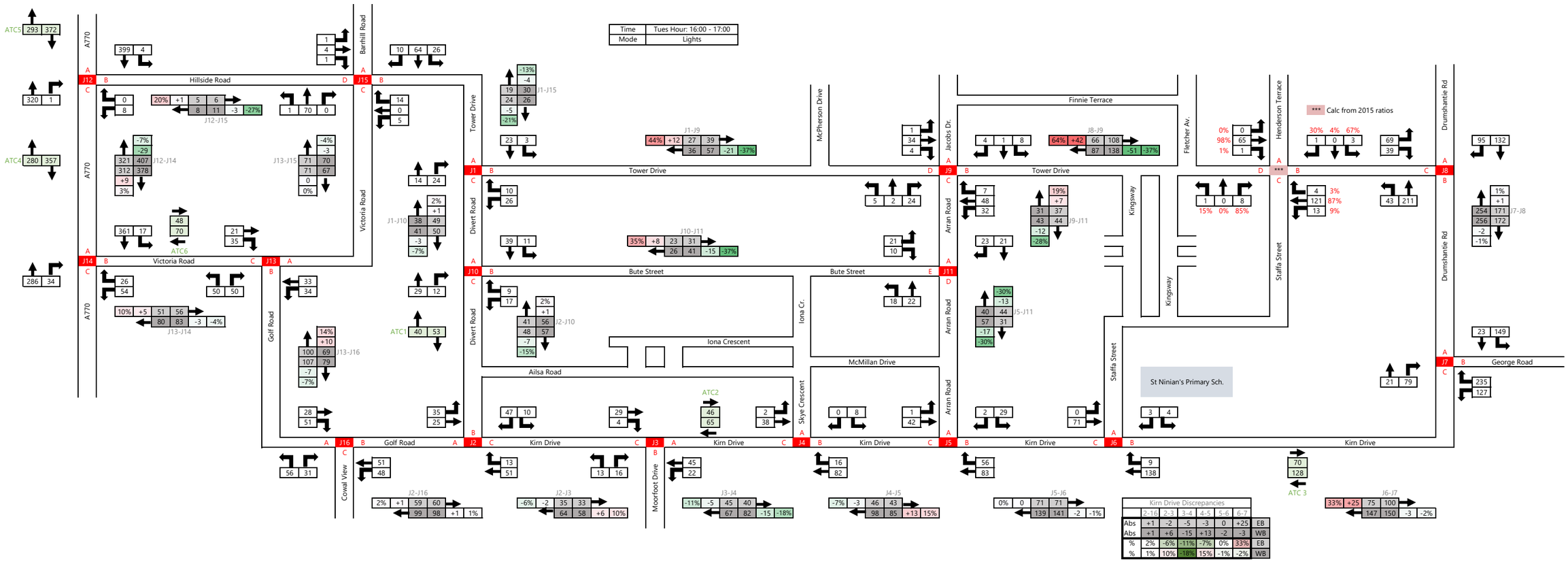
7.2.2 Regardless of the options taken forward there will require to be some further consideration of how to manage vehicle speeds on any one-way section of the road as vehicles no longer have to give way to oncoming traffic and may therefore be more likely to travel at excessive speeds for the residential environment.

Appendix A. Additional Figures

2023 Weekday AM Peak Traffic Survey Data
(0800-0900)



2023 Weekday PM Peak Traffic Survey Data
1600-1700



AtkinsRéalis

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Gourock - Kirn Drive Paramics
Model_v0.5
October 2023