An Rannóg Forbartha
Geilleagrach agus Pleanála
Economic Development
and Planning

Limerick
CITY & COUNTY
COUNCIL

Ms. Eva Babiarczyk,
P.O. Box 3000,
Johnstown,
Castle Estate,
Co. Wexford.

10th June, 2014.

Your Ref: WOO82-03

Our Ref: P.A. 13/300 Greenstar Environmental Services Ltd. (In Receivership)

Dear Eva,

As per telephone request to this office, please find enclosed 2 copies of the Traffic Impact Assessment, 2 copies of Noise Assessment and 2 copies of Flood Risk Assessment appendices also attached area 2 copies of the planners reported dated 23rd October, 2014.
Kind Regards,
Yours sincerely,

Joan O'Brien, Staff Officer,
Economic Development & Planning.

7/8 Sráid Phádraig, Luimneach
7/8 Patrick's Street, Limerick.
t: 061 407210
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Limerick County Council

File No:	**13/300**
Applicant:	**Greenstar Environmental Services Ltd (In Receivership)**
Location:	**existing Materials Recovery Facility, Ballykeeffe, Dock Road**
Development Description:	**Permission for an increase in the amount of waste accepted annually to 130,000 tonnes. The proposed increase does not require the construction/provision of any new buildings or structures (The development will require a revision of the Waste Licence granted by the Environmental Protected Agency, also, this application is accompanied by an Environmental Impact Statement (EIS))**

A request for further information issued and the following response was received:

> *The applicant is requested to submit a water main layout for the proposed development.*
> *Response received sets out that "the location of the water main is shown on Drawing No 004. The proposed development does not involve either alteration to or new connection to the water main".*

The response was referred to the Water Services Department and a report was received which sets out that subject to condition the above is acceptable.

> *The developer has indicated their intention to lay a sewer through adjoining lands and into Bunlicky Wastewater Treatment Plant, the applicant has not submitted details of their legal entitlement to lay this sewer. Accordingly the applicant is requested to submit a copy of the signed legal agreement.*

Response received outlines that discussions have taken place with John O' Shaughnessy SEE Water Services and the report is formulated on the outcome of these discussions. The response sets out that *"it is the intention of the landowner of the applicant's site (and not the applicant in this instance) to lay a new sewer through adjoining lands and into Bunlicky Wastewater Treatment Plant. The response further states that there are discussions taking place with the Economic Development Department of Limerick City Council in relation to granting this wayleave to the sewer. The report concludes that these talks are at an advanced stage. As no letters of consent have been submitted for these works it is considered that following discussion with the Water Services Section and the Environment Section that clarification should be sought and details of the agreement should be submitted.*

> *The applicant has indicated in correspondence with the authority and it's partner companies that they intend to increase the discharge from the foul network from 0.5m3/ day to 60m3/day, the applicant is requested to substantiate this information and to indicate its intentions as to current and future foul loadings from the development.*

Response received has been assessed by the Water Services Section and a report has been received setting out *"that they intend to increase the discharge from the foul network from 0.5m3/day to 60m3/day, the applicants reasoning for this is that they*

intend to eliminate their current discharge license for the discharge of waste run off from the paved areas to the adjoining receiving water (Licence reg no W0082-02) and discharge all foul sewer, the Water Services Authority does not approve of this practice. The report recommends that clarification is sought to provide for a roofed area overhead the area where the spoiled material will be provided. In this way the run off should not be contaminated.

Response received sets out that "the Greenstar and Cussen facilities generate sanitary wastewater, total staff numbers are 22 full time and 15 part time staff. At present the only discharge to the wastewater treatment unit on the applicant's site is the sanitary wastewater from the Greenstar and Cussen facilities. On-site flow measurements indicate that the current discharge rate to the treatment unit generally does not exceed 1m3 day. The proposed development will not result in any increase in staff numbers at either facility and therefore, there should not be any increase in the volume of sanitary wastewater. The report goes on to state that Following connection to the foul sewer it is proposed to restart truck washing and wheel cleaning at the applicants site. It is estimated that this will generate approximately 5m3 of wash water daily. It is proposed to divert surface water run –off from the open yard areas where waste are stored to the foul sewer. It is estimated that the volume of run-off will on average depending on rainfall, range from 50-55m3/day. The report concludes that the BOD and COD levels are significantly below those currently authorized under the Waste Licence. The information has been assessed by the Environment Section and a report has been received setting out that further information is required.

> *It should be demonstrated that there is the assimilative capacity in the open drain adjacent to the site to accept the stormwater discharge from Greenstar Environmental Services Ltd. The assimilative capacity should be based on adjusted background concentration in accordance with "Guidance, Procedures and Training on the Licensing of Discharges to Surface Waters and Groundwaters, Volume 1 (Local Authority Services National Training Group 2011)".*
>
> *The assessment of assimilative capacity should consider the biological oxygen demand and nutrient conditions of the stormwater discharge and receiving waters (BOD (mg O2/l), Total Ammonia (mg N/l), Dissolved Inorganic Nitrogen (mg N/l), Molybdate Reactive Phosphorous (mg P/l)). Although an environmental quality standard has not been set for Total Suspended Solids in the EC Environmental Objectives (Surface Waters) Regulations, 2009, consideration should also be given to this parameter in the assimilative capacity assessment.*

The response received to the above identifies the means and conditions which are required to allow for the specified testing. These tests were not carried out on site as the report concludes that "*it was not possible to arrange for the measurements to be taken before the break in the weather. As an alternative, the applicants proposed to stop the discharge of stormwater from the paved yards that are subject to regular traffic movements and where wastes are stored and divert it to the foul sewer, which will connect to the Bunlickey Wastewater Treatment Plant. Roof water and run off from the paved areas where waste are not stored will continued to be discharged to the drain*". The Water Services report received on this file does not agree with the

discharge of surface water to the Treatment Plant. A report has been received from the Environment Section seeking further information.

This work should be carried out by a suitably qualified person.

It is noted that following the submission of further information a report has been received from the EPA which identifies that all treatment of effluent on site takes place to the existing treatment plant. The report makes reference to the effectiveness and appropriateness of the existing facility on site.

Part V
Not applicable

Recommendation:
It is recommended that the following clarification of further information issues on application 13/300:

1. The Planning Authority note the response to the further information request and you are advised that they are not favourable towards surface water and storm water discharging to the sewer network. You are invited to submit details, including letters of agreement as appropriate, securing the proposed connection of effluent from the site to the sewer network.

2. The proposed truck/wheel wash should be a zero discharge system. You are invited to provide details of a recycling system, ensuring that there will be no discharge of vehicle wash effluent to the sewer network, from the truck/wheel wash.

3. The Planning Authority have concerns with regard to the proposal to increase the discharge from the foul network from 0.5m3/day to 60m3/day by discharge of the waste run off from the paved areas to the adjoining receiving water and discharge all to the foul sewer. Accordingly the applicant is invited to increase the roof coverage on site to reduce the impact of surface water mixing with ~~residential~~ residual debris from processing. Therefore any area of the site directly involved in the process which may be susceptible to surface water run off must be covered by a roof with the uncontaminated run off being discharged to the river. The applicant should submit appropriate drawings. Please be advised that these works are considered significant and will require you to re-advertise your proposal.(standard re-advertisement).

Signed: Noreen O' Connell
Noreen O' Connell

Signed:
Stephane Duclot

Date: 23/10/13

Date: 23/12/2013

An 13/300

Appendix 8

Noise Survey

DixonBrosnan

noise & ecology specialists

dixonbrosnan.com

Project	2012 waste licence noise compliance survey at Greenstar waste management facility, Dock Road, Limerick EPA waste licence W0082-02
Client	O'Callaghan Moran & Associates

Project no	No pages	Client reference	©DixonBrosnan 2012
1148	10	W0082-02	v150911

DixonBrosnan Shronagreehy Kealkil Bantry Co Cork
Tel 086 813 1195 | damian@dixonbrosnan.com | www.dixonbrosnan.com

Report no	Date	Edit	Prepared by	Chkd
1148.2.1	02.07.12	Release 1	Damian Brosnan	CD

1 Introduction

1.1 DixonBrosnan was instructed by O'Callaghan Moran & Associates, on behalf of their client Greenstar, to undertake the 2012 annual environmental noise survey at the latter's waste management facility at Dock Road, Limerick. The survey is a requirement of waste licence W0082-02 issued by the Environmental Protection Agency (EPA) in respect of the facility. Several noise conditions attached to the licence are presented in **appendix 1**.

1.2 The noise survey was carried out on Thursday 24.05.12 at four stations specified in licence W0082-02 and shown in **appendix 2**. As the facility does not currently operate by night, the survey was confined to daytime hours. Survey methodology, equipment specifications and weather conditions are outlined in **appendix 3**.

1.3 Operations proceeded at the Greenstar facility throughout the survey. Noise emissions arose from the following sources:

- Front end loader in buildings.
- Clamp truck x2 in buildings and on yards.
- Tracked excavator with grab in limited use on yard.
- Cardboard baler and associated conveyor.
- Skips being manoeuvred onsite.
- Occasional truck movements onsite.
- Tracked excavator in almost continuous use near northeast corner associated with temporary onsite construction works.

2 Results

2.1 Noise data recorded are presented in **appendix 4**. $L_{Aeq\ 30\ min}$ levels measured at the three onsite stations NI1, NI2 and NI3, were 57, 61 and 54 dB respectively. Facility operations dominated the noise environment at all three although only at NI2 was the $L_{Aeq\ 30\ min}$ level considered entirely representative of site emissions. At NI1 and NI3, extraneous noise sources such as traffic and bird calls contributed to the $L_{Aeq\ 30\ min}$ level. The contribution attributable to site operations was estimated at 55 dB at NI1 and 53 dB at NI3.

2.2 Greenstar emissions were not audible at the only offsite station, NI4, situated at the junction of Dock Road and the commercial park roadway which serves several premises including Greenstar. Site emissions were therefore significantly lower than the 70 dB $L_{Aeq\ 30\ min}$ level which was derived entirely from road traffic noise.

2.3 Schedule C.1 of waste licence W0082-02 specifies a daytime noise emission limit of 55 dB at the measurement stations. Most waste licences currently issued by the EPA state that specified noise limits are to apply to noise sensitive locations (NSLs) only. As there are no NSLs in proximity to the Greenstar facility, it is considered impractical to enforce limits at the site boundary. The absence of NSLs outside the facility boundary is evident in **appendix 2**. Furthermore, the facility's location in an industrial area adjacent to a busy urban roadway results in relatively high ambient noise levels, regardless of Greenstar operations. It is therefore considered that W0082-02 noise limits are relevant to offsite NSLs only, and that levels measured are not relevant to limits set out in schedule C.1 of the licence.

2.4 During the survey, brief inspections were carried out at the nearest NSLs to the facility, consisting of a halting site 460 m to the east, a farmhouse 520 m to the south, and dwelling clusters approximately 1200 m to the north and northeast. No emissions were audible from the Greenstar facility at these receptors, and ambient levels were dominated by local and distant road traffic. Greenstar emissions are highly unlikely to have breached the 55 dB daytime noise limit at these or any other NSLs. It is therefore considered that site emissions were satisfactory and in compliance with applicable noise limits.

2.5 Condition 5.6 of licence W0082-02 prohibits any clearly audible tones or impulses at NSLs. None were noted at the receptors described in **paragraph 2.4**. Tones detected in the 25 and 1600 Hz bands at NI1, and in the 1600 Hz band at NI2, were traced to onsite operations. These tones were not audible offsite. F requency spectra are presented in **appendix 5**.

3 Conclusions

3.1 $L_{Aeq\ 30\ min}$ levels measured at the three onsite stations were 54-61 dB, and dominated by site emissions. At the fourth station offsite, where Greenstar emissions were inaudible, the $L_{Aeq\ 30\ min}$ level was 70 dB. The 55 dB daytime limit specified in waste licence W0082-02 is not considered relevant to these stations due to the absence of sensitive receptors here.

3.2 Noise limits set out in the waste licence are considered applicable to NSLs. An inspection of the nearest NSLs during the survey indicated that facility operations were not audible, and thus lower than the 55 dB daytime noise limit.

3.3 No tones or impulses were noted at offsite NSLs, thus complying with condition 5.6 of the licence.

1.6. Waste Acceptance Hours and Hours of Operation

The facility may operate and accept waste on a twenty-four hour basis, seven days per week.

5.6 There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations.

C.1 Noise Emissions: (Measured at the monitoring points indicated in Table D.1.1).

Day dB(A) L_{Aeq}(30 minutes)	Night dB(A) L_{Aeq}(30 minutes)
55	45

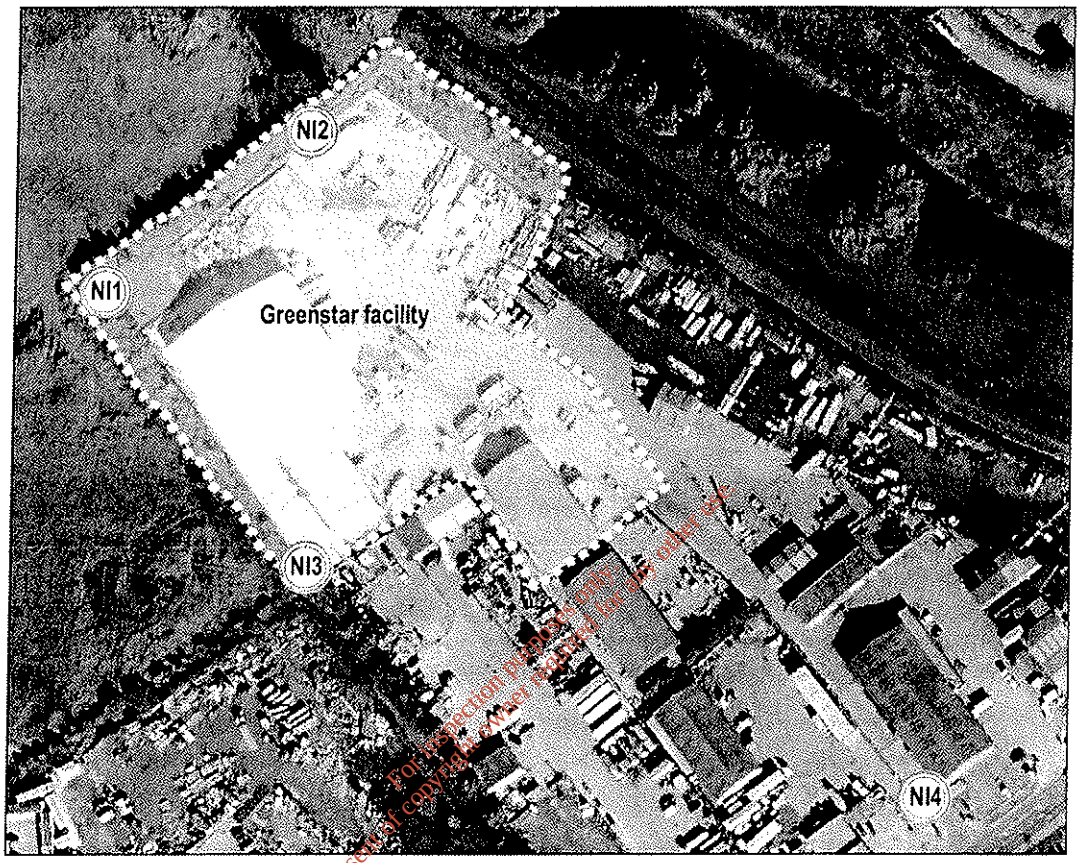
Table D.1.2 Emissions to Atmosphere Monitoring Locations

DUST STATIONS	NOISE STATIONS
DM1	NI1
DM2	NI2
DM3	NI3
	NI4

Table D.3.1 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
$L(A)_{EQ}$ [30 minutes]	Annual	Standard Note 1
$L(A)_{10}$ [30 minutes]	Annual	Standard Note 1
$L(A)_{90}$ [30 minutes]	Annual	Standard Note 1
Frequency Analysis(1/3 Octave band analysis)	Annual	Standard Note 1

Note 1: "International Standards Organisation. ISO 1996. Acoustics - description and Measurement of Environmental noise. Parts 1, 2 and 3."



Appendix 3: Survey details

File	Project ref.	1148
	Client	O'Callaghan Moran & Associates
	Location	Greenstar, Dock Road, Limerick
	Stations	NI2 NI4
	Purpose	2012 waste licence compliance survey
	Comment	Facility operating **SLM x2 used**
Event	Date	24.05.12
	Day	Thursday
	Time	0815-1015
	Operator	Damian Brosnan BSc MIOA MIEI MIEnvSc
Conditions	Cloud cover	20 %
	Precipitation	0 mm
	Temperature	16 ^{0}C
Wind	Direction	SE
	Speed	0-1 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2566594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband
	Max input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound Field correction	Free-field
	UKAS calibration	17.01.12
	Calibration certificate	Available on request
Onsite calibration	Time	24/05/2012 08:23:27
	Calibration type	External
	Sensitivity	47.92 mV/Pa
	Post measurement check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	16.01.12
	Calibration certificate	Available on request
Methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-
	Intervals	30 min

File	Project ref.	1148
	Client	O'Callaghan Moran & Associates
	Location	Greenstar, Dock Road, Limerick
	Stations	NI1 NI3
	Purpose	2012 waste licence compliance survey
	Comment	Facility operating **SLM x2 used**
Event	Date	24.05.12
	Day	Thursday
	Time	0815-1015
	Operator	Damian Brosnan BSc MIOA MIEI MIEnvSc
Conditions	Cloud cover	20 %
	Precipitation	0 mm
	Temperature	16 °C
Wind	Direction	SE
	Speed	0-1 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250-L
	Instrument serial no.	2566801
	Microphone serial no.	2571655
	Application	BZ7130 Version 2.0
	Bandwidth	Broadband
	Max input level	142.66 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA1404 outdoor kit
	Sound Field correction	Free-field
	UKAS calibration	14.10.10
	UKAS calibration certificate	Available on request
Onsite calibration	Time	24/05/2012 08:16:21
	Calibration type	External
	Sensitivity	41.78 mV/Pa
	Post measurement check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	16.01.12
	UKAS calibration certificate	Available on request
Methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-
	Intervals	30 min

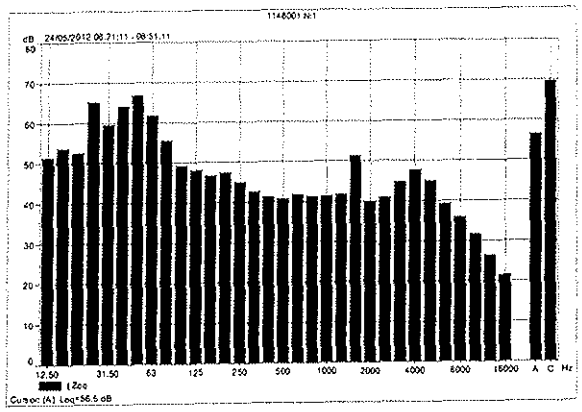
Appendix 4: Noise data

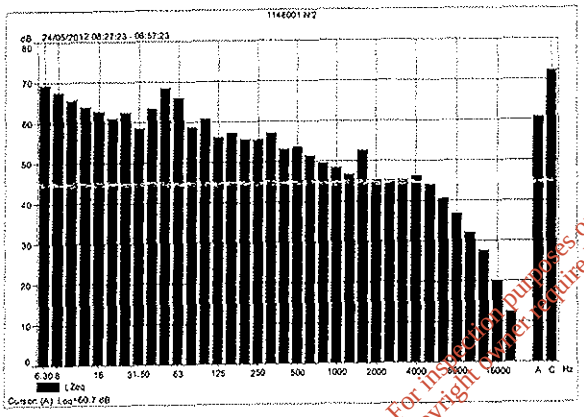
Survey date: 24.05.12

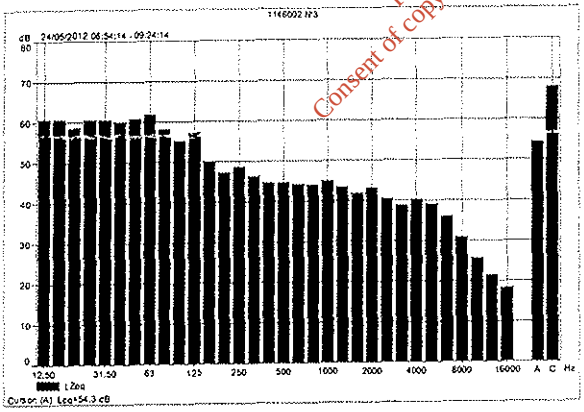
Station	Time	$L_{Aeq\ 30\ min}$ dB	$L_{AF10\ 30\ min}$ dB	$L_{AF90\ 30\ min}$ dB	Specific level* dB	Noise audible
NI1	0821-0851	57	58	48	55	Occasional loader and clamp truck movements audible at low level in main yard. Loader also slightly audible when in building. Loader dominant on sporadic occasions when entering N yard area. Starlings on NW boundary continuously dominant. Road traffic to E continuously significant in background.
NI2	0827-0857	61	62	50	61	Loader and clamp truck operations dominant around yard and in building. Tracked excavator on construction activity near NE corner slightly audible continuously, significantly screened by intervening structures. Tracked excavator with grab operating at 40 m from 0853. Bird calls and offsite road traffic significant.
NI3	0854-0924	54	56	51	53	Clamp truck operating almost continuously in main yard audible at low level. Baler and conveyor in nearest corner of building also continuously audible at low level. Distant road traffic to SW continuously audible at low level. Bird song/calls and rustling vegetation.
NI4	0933-1003	70	73	61	<<61	No site emissions audible, apart from sporadic trucks using access road. Dock Road traffic continuously intrusive. No other noise audible.

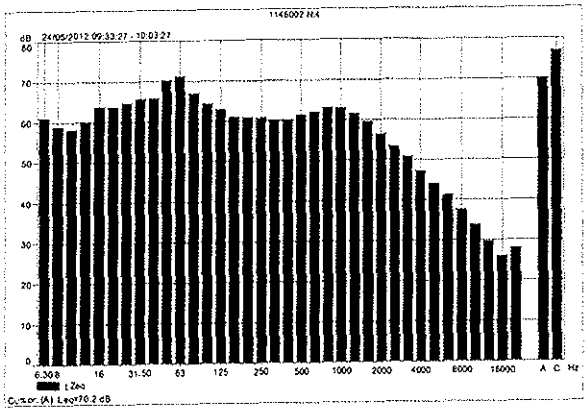
*Specific level: Sound pressure level contribution considered attributable to facility, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, near field correction if applicable, and other parameters.

Appendix 5: Frequency spectra









Appendix 6: Glossary

Ambient	Total noise environment at a location, including all sounds present.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq\,T}$, $L_{AF10\,T}$, etc.
Background level	$L_{AF90\,T}$. A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T.
Decibel	Shortened to dB. Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. **Throughout this report noise levels are presented as decibels relative to 20 µPa**. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10\,T}$, $L_{AF90\,T}$, etc.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz	Shortened to Hz. Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval	Time period T over which noise monitoring is conducted. Denoted by T in $L_{Aeq\,T}$, $L_{AF90\,T}$, etc.
$L_{Aeq\,T}$	Equivalent continuous sound level during interval T, effectively representing average A-weighted noise level.
L_{AF}	Sound pressure level averaged over one second, and changing each second in fluctuating noise environment.
$L_{AF10\,T}$	Sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90\,T}$	Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
$L_{Req\,T}$	Rating noise level, derived from $L_{Aeq\,T}$ plus specified adjustments for tonal and impulsive characteristics. Equivalent to $L_{Ar\,T}$ used by EPA.
Near field	Noise levels recorded near walls or other surfaces, artificially increased due to reflections. Levels near walls may be increased by up to 3 dB, and up to 6 dB near corners. Free field conditions may be achieved by maintaining separation distance of at least 3.5 m from walls.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Residual level	Noise level remaining when specific source is absent or does not contribute to ambient.
Specific level	Sound pressure level contribution arising from specific noise source, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale.

Appendix 4

Flood Risk Assessment

FLOOD RISK ASSESSMENT

GREENSTAR ENVIRONMENTAL SERVICES

DOCK ROAD

LIMERICK

Prepared For: -

Greenstar Environmental Services Ltd,
Dock Road,
Limerick.

Prepared By: -

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork.

March 2013

Project	Flood Risk Assessment GES Limerick			
Client	GES			
Report No.	**Date**	**Status**	**Prepared By**	**Reviewed By**
12-4802202	25th March	Draft	Sean Moran, M.Sc. P.Geol	Jim O'Callaghan, MSc , CEnv
	4th April	RevA		

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APPENDICES

1 INTRODUCTION

Greenstar Environmental Services Ltd (GES) intends to apply to for planning permission for its existing waste recovery and transfer facility in the townland of Ballykeefe, County Limerick whose location is shown on Figure 1. At a pre-application meeting with Limerick County Council, the Council requested that a flood risk assessment be prepared. GES commissioned O'Callaghan Moran & Associates (OCM) to prepare the assessment.

1.1 Methodology

The Flood Risk Assessment was undertaken in accordance with "The Planning System and Flood Risk Management" Guidelines published by the Department of the Environment, Heritage and Local Government in November 2009

The Office of Public Works is currently working on the Shannon Catchment and Flood Risk Assessment and Management Study (CFRAM) which involves the production of Flood Maps. The study is due to be completed by 2015, with the Flood Maps produced by December 2103 that will identify all areas that are likely to be inundated at some point during a flood event.

The maps have not yet been produced and, pending their publication, the assessment was based on information contained in the Southern Environs Local Area Plan 2011-2017 (SELAP), Ordnance Survey of Ireland (OSI) historic maps, the OPW Flood Maps and information contained in a Preliminary Flood Risk Assessment Report prepared by Tobin Consulting Engineers for the Oil Depot on the lot to the south of the GES site.

2 SITE CONTEXT

2.1 Location

The site is located in the townland of Ballykeefe on lands that were reclaimed in the 1970's. It is in an industrially zoned area and is bounded to the south, southeast and southwest by industrial premises. To the east and north is the Ballinacurra Creek, which is where the Ballynaclough River joins the Shannon. The lands north of the Ballinacurra and between it and the Shannon are undeveloped. The Limerick City Council wastewater treatment plant is to the west of the site and separated from it by an open field. Further west is Bunlickey Lake.

2.2 Site Layout

The facility is approximately 120m off the Dock Road and is accessed by a common access road serving the facility and other occupiers of the industrial estate. The site occupies an area of 1.8ha. There are two adjoining waste handling buildings, a separate office building and adjoining vehicle and plant maintenance workshop and an onsite sanitary wastewater treatment plant. The open yards are paved. The only unpaved area is in the vicinity of the on-site wastewater treatment plant.

The surface water and foul water drainage layout and site levels is shown on Drawing No IE 580-002A. Surface water run-off is generated by rainfall on the roof of the offices and workshop building, the waste handling buildings and the paved open yard areas. The run-off from the paved yards is collected and discharged to a perimeter man made drain at the north eastern site boundary via 2 No. three chamber oil interceptors.

Run-off from the roofs of the main buildings discharges to a manmade perimeter drain along the western boundary. The perimeter drains also receive run-off from other lots to the south of the GES site, but there are no other discharge points downstream of the site. Both perimeter drains connect to Bunlickey Lake. Foul water is treated in an on-site wastewater treatment plant and discharged to ground.

2.3 Hydrology

The facility is in the catchment of the Ballinaclough River, which rises to the south east of the site and flows northwest to confluence with the River Shannon via the Ballinacurra Creek. Both the Ballincurra Creek and the Shannon are tidally influenced. There are embankments along the southern bank of the Shannon and along western and eastern banks of the Ballinacurra Creek/Ballinaclough, extending from Rosbrien to its confluence with the Shannon.

Surface water run-off at the facility discharges to Bunlickey Lake, which is a man made feature. The lake covers an area of approximately 50ha and has an estimated catchment of approximately 257ha.

The lake was originally a borrow pit for alluvial clays used in the manufacture of cement at the Irish Cement Ltd plant in Castlemungret and was formed by the discharge of groundwater pumped from the quarry at the cement plant and surface water run-off from the plant into the worked out areas. The water in the lake discharges to the Shannon River Estuary via valves and sluices that prevent tidal inflow.

3 PREDICTIVE FLOOD ZONE MAPS

In 2010 Limerick County Council commissioned flood risk assessments based on predictive flood mapping to identify the flood risk zones as defined in the Planning System and Flood Risk Management Guidelines, which are.

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Flood Zone B - where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and

Flood Zone C - where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

It is important to note that Flood Zone Map was prepared at a strategic scale using an automated mapping process ('bare earth' Digital Terrain Model), and minor or local features such as embankments, bridges, culverts, weirs and sluices are not explicitly modelled. The SELAP recognises that the Map is intended for guidance purposes and does not provide details for individual properties

The zones for the Southern Environs are shown on Map No 7 Predictive Flood Zone Map in the SELAP. The GES facility is located in an area designated as Flood Zone A, where the probability of flooding is greater than 1% for river flooding or 0.5% for coastal flooding. .

The Flood Risk Assessment completed as part of the SELAP states that in the case of the previously developed industrial zoning in Mungret the existing' limiting factors' (flood defences) assisted in the preventing water reaching development and one of the main mitigating factors in this location is Bunlickey Lake, which is a flood water receptor.

4 FLOOD RISK ASSESSMENT

4.1 Flood Data

Given its location, the site is potentially at risk of river and coastal flooding. The OS historic 6 "inch map shows the embankments along the southern bank of the Shannon and on western and eastern banks of the Ballinacurra Creek/Ballinaclough River, stretching from Rosbrien to the confluence with the Shannon.

The embankments were constructed to prevent flooding of the adjoining lands, primarily associated with tidal movements. The lands occupied by the facility are not identified on the map as being liable to flooding.

It is understood that following tidal floods in 1961 the height of the embankments was raised to 5.5m OD along the Shannon and to 4.96mOD between Bawney's Bridge on the N69 and Ballinacurra Bridge to the east.

The OPW Flood Zone Maps (Appendix 1) show that the site is not in an area designated as benefiting lands, i.e. lands that are subject to either flooding or poor drainage, which would benefit from drainage works. There is no record of any flooding either within the site boundary, or on the lands immediately adjoining the site.

There are no hydrometric stations on the Ballinaclough River and therefore flow data is not available. There is an OPW Hydrometric Station at Ball's Bridge on the River Shannon, approximately 4km north east of the site, where the flow data records extend back to 1957. The maximum water level recorded was 7.03 m AOD-Poolbeg (4 .37mOD-Malin Head) in 1961 and is attributed to a tidal peak.

The Preliminary Flood Risk Assessment prepared by Tobin Consulting Engineers for the Oil Depot on the lot immediately to the south of the GES site, estimates a 200 year tidal level of 4.80mOD and a 1000 year tidal level of 5.15mOD (Malin Head).

4.2 Surface Water Run-Off

Current Volumes

The buildings and paved areas site occupy an area of approximately 18,000m^2. In a rain fall event of 50mm/hr (one in 100 year return), the maximum discharge to the perimeter drains would be 250 litres/second (l/sec).

Future Volumes

The planning application relates solely to increasing the amount of waste that can be accepted at the facility and does not involve the construction of any new buildings, the alteration of any structures, provision of additional paving or changes to the existing drainage layout. This means there will be no encroachment into or reduction of the active flood plain.

There will be no reduction in the rainfall infiltration areas and no short to medium increase in the volume of surface water run-off from the facility. In the longer term (30-50 years), the amount of run-off may increase in response to climate change.

The OPW's draft guidance document 'Assessment of Potential Future Scenario for Flood Risk Management' (2009) recommends that the potential impacts of climate change be assessed using the Sensitivity Based Approach for two potential future scenarios, which are referred to as the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS).

The MRFS represents a 'likely' future scenario, based on the wide range of predictions available and with the allowances for increased rainfall events, sea level rise, landuse changes. within the bounds of widely accepted projections. The HEFS represents a more extreme potential future scenario, but one that is not significantly outside the range of accepted predictions available and. at the upper the bounds of widely accepted projections.

For 1:100 year rainfall events the MRFS for increase in rainfall is 20% and the HEFS is 30%. This would result in the run-off in a 1 in 100 year rainfall ranging between 300l/sec to 325l/sec. There are no other discharge points to the drain downstream of the GES facility

5 CONCLUSIONS

5.1 Conclusions

The site is in the catchment of the Ballinaclough River. The surface water drainage from the site enters perimeter drains that surround the Industrial Estate. These outfall to Bunlickey Lake, which connects to the River Shannon via sluices designed to prevent tidal inflow.

The site and surrounding lots are in Flood Zone A and are potentially at risk from coastal and river flooding. However, the area is extensively developed and there are existing 'limiting factors' including Bunlickey Lake and the flood embankments along the Ballinacurra Creek. There are no historic records that either the site, or the adjoining lands are liable to and have experienced flooding.

The proposed changes do not involve the provision of any additional hard surfaces that would increase the volume of rainfall run-off from the site and therefore will not increase the flood risk either within or outside the site boundaries.

Appendix 1

OPW Flood Risk Map

OPW *National Flood Hazard Mapping*

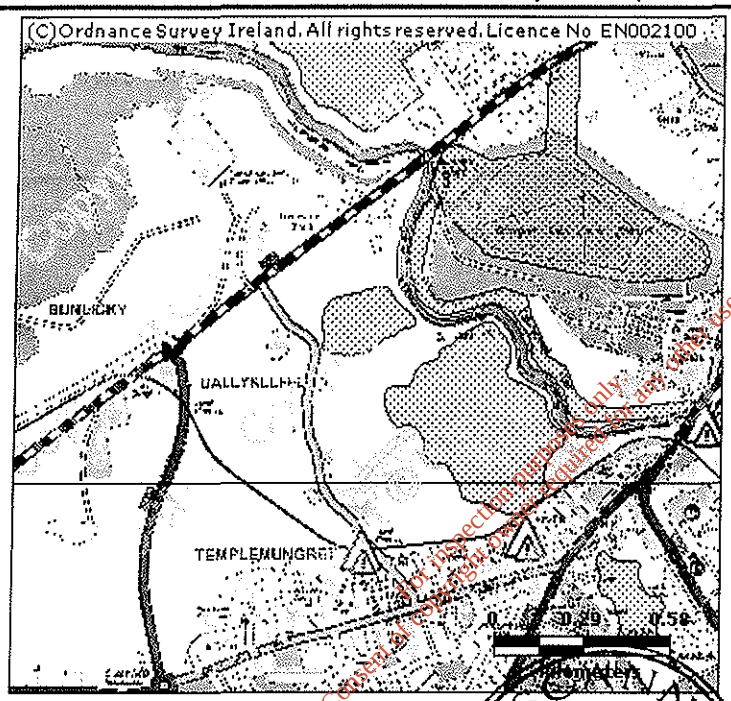
Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Limerick

NGR: R 552 550



Map Scale 1:24,220

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

20 Results

1. Shannon Dock Road Limerick Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (5) Press Archive (1) More Mapped Information

2. Shannon Westfields Limerick Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (3) Press Archive (2) More Mapped Information

3. Shannon Adjacent Dock Road Limerick Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (3) Press Archive (1) More Mapped Information

4. Greenfield Road Rossbrien Dec 1999 — Start Date: 25/Dec/1999
County: Limerick — Flood Quality Code:2
Additional Information: Reports (3) Press Archive (1) More Mapped Information

5. Shannon Condell Road Limerick Feb 2002 — Start Date: 11/Feb/2002
County: — Flood Quality Code:3

Report Produced: 25-Mar-2013 8:54

Appendix 2

OPW Hydrometric Data Ball's Bridge

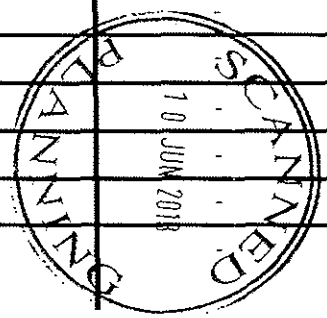
Office of Public Works

GENERAL STATION DETAILS

Station Name: Ball's Bridge	Station No: 25061	Watercourse: Abbey Estuary	NGR: R 582 578
Catchment Area (km^2): -	Catchment: Shannon	Gauge Type: L	Datum: Poolbeg

HYDROMETRIC YEAR[1]	WATER LEVEL (mAOD Poolbeg)	S.G. READING (m)	ESTIMATED FLOWS (m^3/s)	RELIABLE LIMIT[2] (m^3/s)	DATE	COMMENTS / NOTES
1957	6.02	4.16	-	-	**08/01/1958**	
1958	6.31	4.45	-	-	**12/12/1958**	
1959	6.57	4.71	-	-	**29/12/1959**	
1960	6.42	4.67	-	-	**02/11/1960**	Levels are Tidal peaks
1961	7.03	5.28	-	-	**22/10/1961**	Levels are Tidal peaks
1962	6.12	4.37	-	-	**09/12/1962**	Levels are Tidal peaks
1963	6.39	4.64	-	-	**18/11/1963**	Levels are Tidal peaks
1964	6.66	4.91	-	-	**17/01/1965**	Levels are Tidal peaks
1965	6.41	4.66	-	-	**09/12/1965**	Levels are Tidal peaks
1966	6.27	4.52	-	-	**01/12/1966**	Levels are Tidal peaks
1967	6.33	4.58	-	-	**01/11/1967**	Levels are Tidal peaks
1968	6.50	4.75	-	-	**22/12/1968**	Levels are Tidal peaks
1969	6.27	4.52	-	-	**07/02/1970**	Levels are Tidal peaks
1970	-	-	-	-	-	
1971	6.20	4.45	-	-	**02/02/1972**	Levels are Tidal peaks
1972	6.27	4.52	-	-	**20/01/1973**	Levels are Tidal peaks
1973	6.54	4.79	-	-	**11/01/1974**	Levels are Tidal peaks
1974	6.62	4.87	-	-	**30/01/1975**	Levels are Tidal peaks
1975	6.65	4.90	-	-	**01/01/1976**	Levels are Tidal peaks

1976	6.38	4.63	-	-	**21/01/1977**	Levels are Tidal peaks
1977	6.61	4.85	-	-	**11/11/1977**	Levels are Tidal peaks
1978	6.15	4.40	-	-	**27/03/1979**	Levels are Tidal peaks
1979	6.35	4.60	-	-	**06/10/1979**	Levels are Tidal peaks
1980	6.37	4.62	-	-	**08/03/1981**	Levels are Tidal peaks
1981	6.57	4.82	-	-	**14/12/1981**	Levels are Tidal peaks
1982	6.71	4.96	-	-	**31/01/1983**	Levels are Tidal peaks
1983	6.36	4.61	-	-	**21/01/1984**	Levels are Tidal peaks
1984	6.08	4.33	-	-	**23/11/1984**	Levels are Tidal peaks
1985	6.15	4.40	-	-	**11/01/1986**	Levels are Tidal peaks
1986	6.53	4.78	-	-	**01/01/1987**	Levels are Tidal peaks
1987	6.55	4.80	-	-	**09/02/1988**	Levels are Tidal peaks
1988	6.36	4.61	-	-	**09/03/1989**	Levels are Tidal peaks
1989	6.65	4.90	-	-	**27/02/1990**	Levels are Tidal peaks
1990	6.77	5.02	-	-	**05/01/1991**	Levels are Tidal peaks
1991	6.45	4.70	-	-	**17/12/1991**	Levels are Tidal peaks
1992	6.67	4.92	-	-	**26/10/1992**	Levels are Tidal peaks
1993	6.59	4.84	-	-	**12/01/1994**	Levels are Tidal peaks
1994	6.63	4.88	-	-	**17/01/1995**	Levels are Tidal peaks
1995	6.31	4.56	-	-	**28/09/1996**	Levels are Tidal peaks
1996	5.95	4.20	-	-	**10/02/1997**	Levels are Tidal peaks
1997	6.45	4.70	-	-	**07/09/1998**	Levels are Tidal peaks
1998	6.55	4.80	-	-	**02/01/1999**	Levels are Tidal peaks
1999	6.11	4.36	-	-	**25/12/1999**	Levels are Tidal peaks
2000	6.05	4.30	-	-	**28/03/2001**	Levels are Tidal peaks
2001	-	-	-	-	**01/01/1900**	Station removed 08/10/2001 to 07/08/2002 due to canal restoration



						works
2002	6.57	3.82	-	-	**01/12/2002**	Levels are Tidal peaks. Logger installed 16/09/02
2003	6.24	3.48	-	-	**19/03/2004**	Levels are Tidal Peaks
2004	6.39	3.63	-	-	**08/01/2005**	Levels are Tidal peaks
2005	6.47	3.72	-	-	**30/03/2006**	Levels are Tidal peaks
2006	6.41	3.67	-	-	**08/10/2006**	Levels are Tidal peaks
2007	6.49	3.74	-	-	**11/03/2008**	Levels are Tidal peaks
2008	6.21	3.46	-	-	**20/08/2009**	Levels are Tidal peaks
2009	6.37	3.62	-	-	**06/12/2009**	Levels are Tidal peaks
2010	6.31	3.56	-	-	**20/02/2011**	Levels are Tidal peaks
2011	-	-	-		**01/01/1900**	Levels are Tidal peaks

Note 1 : These are the highest recorded water levels or estimated flows in each available hydrometric year of record. A hydrometric year runs from 1st October in the given year to the 30th September the following year, *i.e.*, the hydrometric year 2000 runs from 1st October 2000 to 30th September 2001.

Note 2 : Limit of Reliable Rating: Estimated flows greater than the values given have been derived from an extrapolation of the rating and should be treated with caution

O'Callaghan Moran & Associates

Proposed Intensification of Existing Waste Management Facility,
Dock Road, Co. Limerick

Traffic Impact Assessment

February 2013
Revision A

TOBIN CONSULTING ENGINEERS

TOBIN
Patrick J. Tobin & Co. Ltd.

TOBIN
Patrick J. Tobin & Co. Ltd.

REPORT

PROJECT: **Proposed Intensification of Existing Waste Management Facility, Dock Road, Co. Limerick**

Traffic Impact Assessment

CLIENT: **O'Callaghan Moran & Associates,**
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Title:	**Traffic Impact Assessment**

PROJECT NUMBER: 7097			DOCUMENT REF: TR01-TIA	
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Revision	Description & Rationale	Originated/Date	Checked/Date	Authorised/Date
		TOBIN Consulting Engineers		

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1 INTRODUCTION

1.1 INTRODUCTION

TOBIN Consulting Engineers Ltd has been appointed by Greenstar Environmental Services Ltd. to prepare a Traffic Impact Assessment Report for proposed intensification of an existing waste management facility at Dock Road, Limerick.

In preparing this report, TOBIN Consulting Engineers has made reference to

- The Limerick County Development Plan 2010 - 2016;
- NRA 'Traffic and Transport Assessment Guidelines';
- NRA DMRB TD 41-42;
- NRA DMRB TA 79;
- NRA Project Appraisal Guidelines Unit 5.5: Link-Based Traffic Growth Forecasting
- The UK DETR "Guidance on the Use of Tactile Paving Surfaces";
- Department of Transport "Traffic Management Guidelines";
- TRL RR67.

1.2 OBJECTIVES

The objective of this report is to assess the impact the proposed development will have on the existing road network. This report will calculate the expected volume of traffic that will be generated by the proposed development and assess the impact that this traffic will have on the operational capacity of the road network in the vicinity of the development. The junction to be analysed as part of this report is the existing site access junction on the N69.

1.3 STRUCTURE OF THE REPORT

This report is divided into seven chapters:

- Chapter 1 includes this introduction
- Chapter 2 describes the proposed development, and its location.
- Chapter 3 provides an overview of the existing and proposed traffic conditions, explaining how this information was obtained.
- Chapter 4 outlines the assumptions that have been made in the calculation of traffic generated by the development and the factors used to forecast the future road network traffic.
- Chapter 5 explains the methodology used and the results of the analysis performed on the nominated junction. An investigation into link capacity is also dealt with in this chapter.
- Chapter 6 addresses issues relating to road safety, parking provision, pedestrians & cyclists and access for people with disabilities.
- Chapter 7 concludes the report.

2 PROPOSED DEVELOPMENT

2.1 SITE LOCATION

The site is located along the N69 Dock Road, to the southwest of Limerick City. The proposed site is located adjacent to a proposed oil depot and Paddy Dore Commercials. Figure 2.1 below outlines the location of the existing waste management facility.

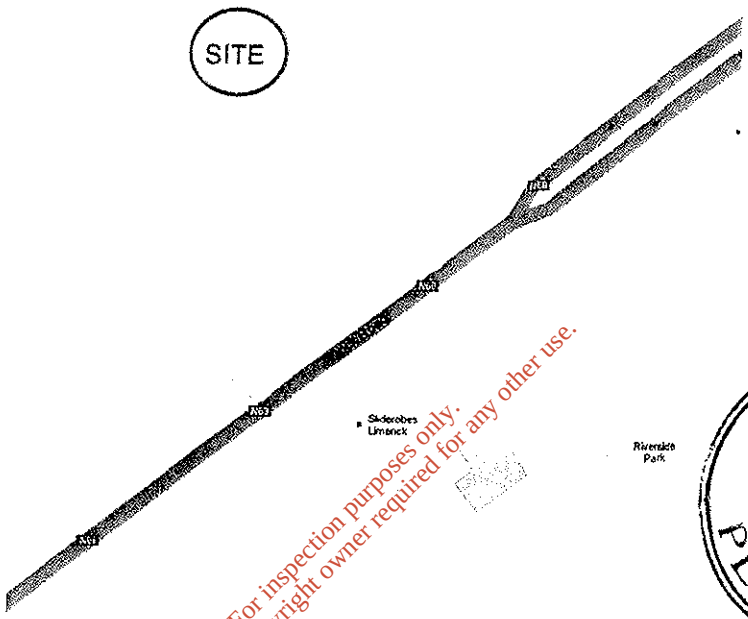


Fig 2.1: Site Location

2.2 DESCRIPTION OF PROPOSED DEVELOPMENT

It is proposed that the existing Waste Management Facility will increase its authorised annual tonnage allowance of non-hazardous wastes from 90,000 tonnes to 130,000 tonnes. Staff levels at the facility are not expected to increase despite the proposed increase in materials accepted.

Access to the site is proposed to continue through the existing priority junction on the N69 Dock Road.

2.3 COMMITTED DEVELOPMENT

Planning approval has recently been granted for a proposed Oil Depot located to the west of the subject site. In order to ensure a robust assessment of the road network, it has been assumed for the purposes of this report that the proposed Oil Depot will be operational by the year of opening of the development.

While planning approval has yet to be obtained (under Planning Reference 12373), in order to ensure a robust assessment of the road network, it has been assumed for the purposes of this report that the proposed Petrol Station, located adjacent to the Oil Depot, will be operational by the year of opening of the development.

While no major planning applications have recently been granted permission in the vicinity of the development which will significantly affect the operational capacity of the proposed site access junction, a significant amount of industrial-zoned lands are located in the area. While these zoned lands will be subject to individual planning applications, it was considered appropriate to assess the road network in the event that such zoned lands were to be developed. For the purposes of this report, it has been assumed that 30,000m^2 of industrial lands will be constructed by the proposed year of opening, 2013.

3 EXISTING AND PROPOSED TRAFFIC CONDITIONS

3.1 TRAFFIC SURVEY

In order to determine the magnitude of the existing traffic flows, the results of a two-way automated classified traffic survey was used. This traffic survey was carried out by Abacus Transportation Surveys on Wednesday 17th January 2013 between the hours 07:00 and 19:00 on the N69 Dock Road / existing Waste Management Facility priority access junction. This survey distinguished between cars, light good vehicles, buses and heavy good vehicles. The traffic count data is included in Appendix A of this report.

The results of this survey indicated that the peak traffic levels through this junction occurred between the hours of 08:15 and 09:15 and between 16:45 and 17:45.

In order to undertake an analysis of the junction, it was necessary first to convert the raw traffic survey data, which consisted of cars and heavy vehicles, into a common index known as passenger car units (PCU's). This was undertaken by applying a factor to all surveyed traffic movements to take account of the composition of the different types of vehicle. This factoring calculation assumes 1 car / light vehicle = 1 PCU, 1 heavy vehicle (type OGV1) = 1.5 PCU's, 1 heavy vehicle (type OGV2) = 2.3 PCU's and 1 bus = 2 PCU's in accordance with TRL RR67.

3.2 EXISTING ROAD NETWORK

The existing site entrance is located in a 60km/h speed limit. The N69 has a carriageway width of approximately 11.3m in the vicinity of the proposed site access junction, with a grass margin fronting the southern side of the carriageway. A ghost island with dedicated right-turning lane for vehicles wishing to access the existing Waste Management Facility is also located at this point, however these road markings have experienced deterioration. Street lighting is provided in the vicinity of the site. No pedestrian or cyclist facilities are currently provided in the vicinity of the site.

3.3 PROPOSED NETWORK IMPROVEMENTS

No major infrastructural improvements are currently planned in the immediate vicinity of the site which will have a significant impact on traffic movements in the area.

4 TRIP DISTRIBUTION AND GENERATION

4.1 TRIP GENERATION

The volume of traffic expected to be generated during the AM and PM peak hours for the proposed development was derived from the results of the traffic count carried out at the existing site access junction.

Trip Rates for the development have been determined based on the existing authorised annual tonnage allowance for the waste management facility. These trip rates for the AM and PM peak hours are shown below in Tables 4.1 and 4.2 respectively.

TRIP GENERATION RATE FOR DEVELOPMENT FOR AM PEAK HOUR					
Development Type	Existing Authorised Annual Tonnage	Existing Arrivals	Arrivals per 1,000 Tonnes	Existing Departures	Departures per 1,000 Tonnes
Waste Management Facility	90,000	23	0.256	21	0.233

Table 4.1: Trip Generation Rate for Development for AM Peak Hour

TRIP GENERATION RATE FOR DEVELOPMENT FOR PM PEAK HOUR					
Development Type	Existing Authorised Annual Tonnage	Existing Arrivals	Arrivals per 1,000 Tonnes	Existing Departures	Departures per 1,000 Tonnes
Waste Management Facility	90,000	27	0.300	40	0.444

Table 4.2: Trip Generation Rate for Development for PM Peak Hour

The volume of traffic expected to be generated by the development for the proposed additional tonnage allowance for the AM and PM peak hours is shown below in Tables 4.3 and 4.4 respectively.

EXPECTED TRIP GENERATION FOR PROPOSED DEVELOPMENT FOR AM PEAK HOUR					
Development Type	Additional Tonnage	Arrivals per 1,000 Tonnes	Total Arrivals	Departures per 1,000 Tonnes	Total Departures
WMF	40,000	0.256	10	0.233	9
Total			**10**		**9**

Table 4.3: Expected Trip Generation for Proposed Development for AM Peak Hour

EXPECTED TRIP GENERATION FOR PROPOSED DEVELOPMENT FOR PM PEAK HOUR					
Development Type	Additional Tonnage	Arrivals per 1,000 Tonnes	Total Arrivals	Departures per 1,000 Tonnes	Total Departures
WMF	40,000	0.300	12	0.444	18
Total			**12**		**18**

Table 4.4: Expected Trip Generation for Proposed Development for PM Peak Hour

Generated traffic for both the AM and PM peak hours for the proposed Oil Depot and Petrol Station developments have been obtained from the planning documents submitted in support of the application, and are outlined below in Tables 4.3 and 4.4. Trips rates have been determined for the industrial zoned lands for weekdays, to coincide with the maximum levels of existing traffic on the adjacent road network. The volume of traffic expected to be generated by the zoned lands for the AM and PM peak hours are shown below in Tables 4.5 and 4.6 respectively. The TRICS database outputs are contained in Appendix C of this report.

EXPECTED TRIP GENERATION FOR COMMITTED DEVELOPMENT FOR AM PEAK HOUR					
Development Type	GFA	Arrivals per 100m² GFA	Total Arrivals	Departures per 100m² GFA	Total Departures
Oil Depot	-	-	8	-	2
Petrol Station	-	-	64	-	62
Industrial Zoned Lands	30,000	0.450	135	0.178	53
Total			**207**		**117**

Table 4.5: Expected Trip Generation for Committed Development for AM Peak Hour

EXPECTED TRIP GENERATION FOR COMMITTED DEVELOPMENT FOR PM PEAK HOUR					
Development Type	GFA	Arrivals per 100m² GFA	Total Arrivals	Departures per 100m² GFA	Total Departures
Oil Depot	-	-	2	-	8
Petrol Station	-	-	65	-	65
Industrial Zoned Lands	30,000	0.115	35	0.378	113
Total			**37**		**121**

Table 4.6: Expected Trip Generation for Committed Development for PM Peak Hour

4.2 TRIP DISTRIBUTION

It has been assumed for the purposes of this report that traffic distributions will mirror existing distribution patterns.

The distribution of development-generated traffic for the AM and PM peak hours is shown below in Figures 4.1 and 4.2 respectively.

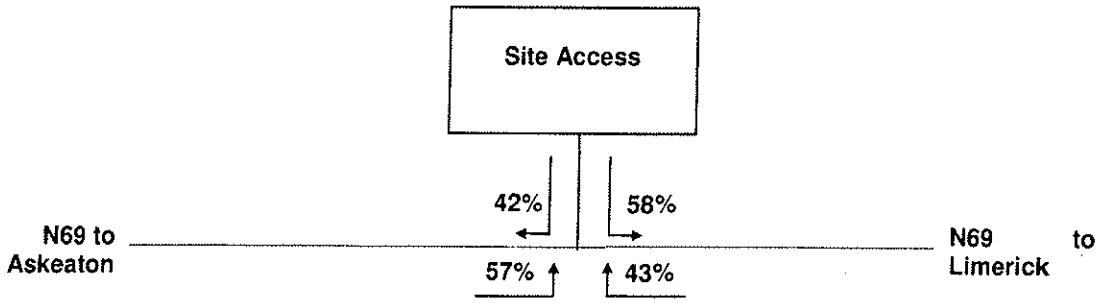


Fig 4.1: Generated Traffic Distribution for AM Peak Hour

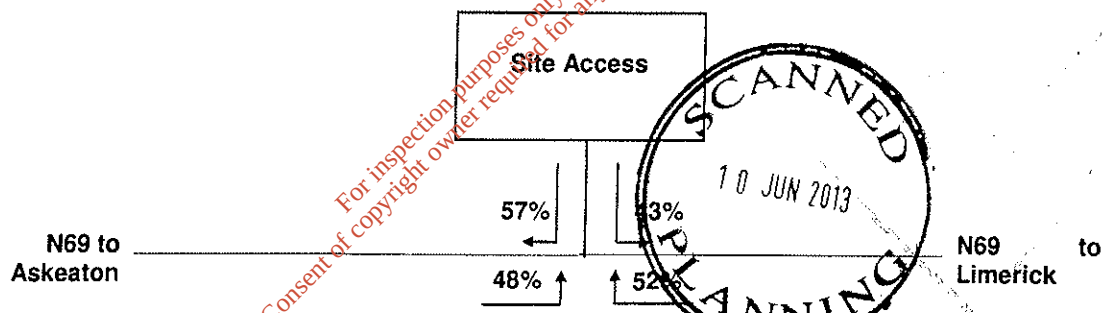


Fig 4.2: Generated Traffic Distribution for PM Peak Hour

The traffic generated by the proposed development for the AM and PM peak hours is shown below in Figures 4.3 and 4.4 respectively (All figures are in PCU's).

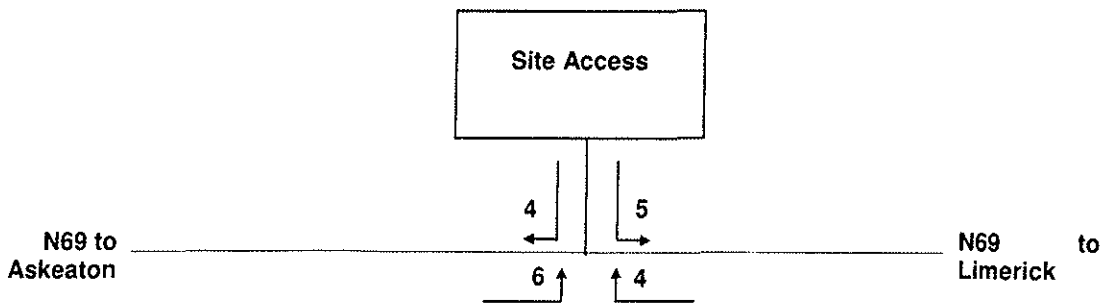


Fig 4.3: Generated Traffic for AM Peak Hour

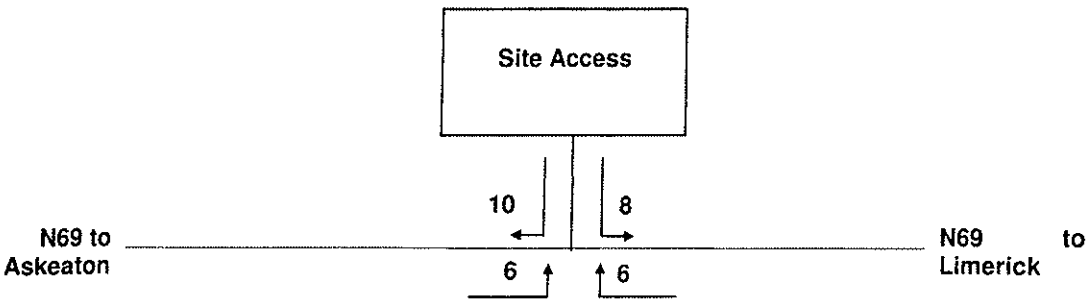
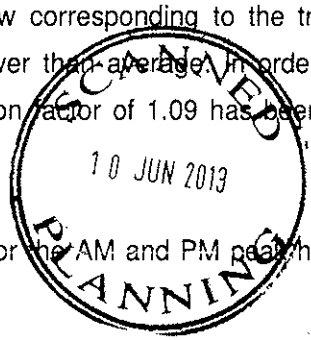


Fig 4.4: Generated Traffic for PM Peak Hour

4.3 SEASONAL ADJUSTMENT

In order to undertake an analysis of a junction, it may be necessary to apply a correction factor to convert the surveyed PCU values into seasonally adjusted traffic flows to take account of the seasonal variation that is experienced with traffic surveys (i.e. traffic count data). These seasonally adjusted conversion factors were calculated using data taken from a fixed automatic traffic counter located on Limerick Dock Road East (NRA counter N18-18) in 2011. Traffic flows in January were found to experience lower than average traffic flows due to significantly lower flows in the early part of the month. To get a more accurate picture of flows at the point in January the count was undertaken, the weekly flow corresponding to the traffic count was considered which also revealed that flows were lower than average. In order to convert the surveyed traffic flows to seasonal flows, a conversion factor of 1.09 has been applied to the surveyed traffic.



The results of the seasonally-adjusted traffic count for the AM and PM peak hours are shown below in Figures 4.5 and 4.6.

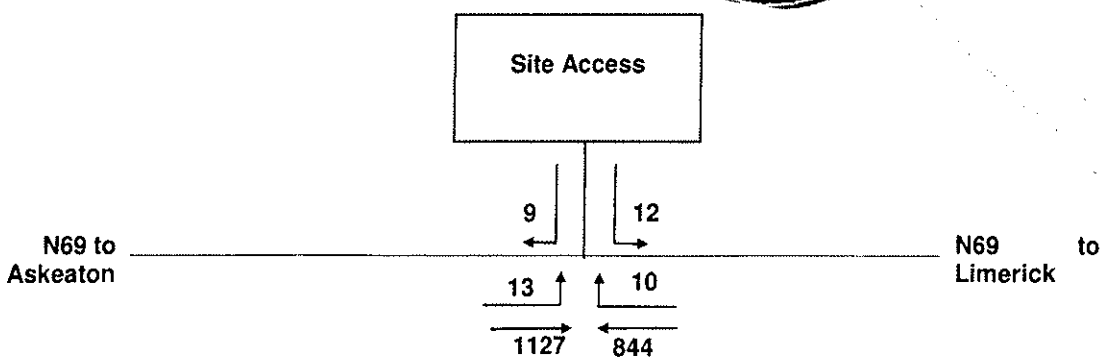


Fig 4.5: Seasonally Adjusted Surveyed Traffic AM Peak

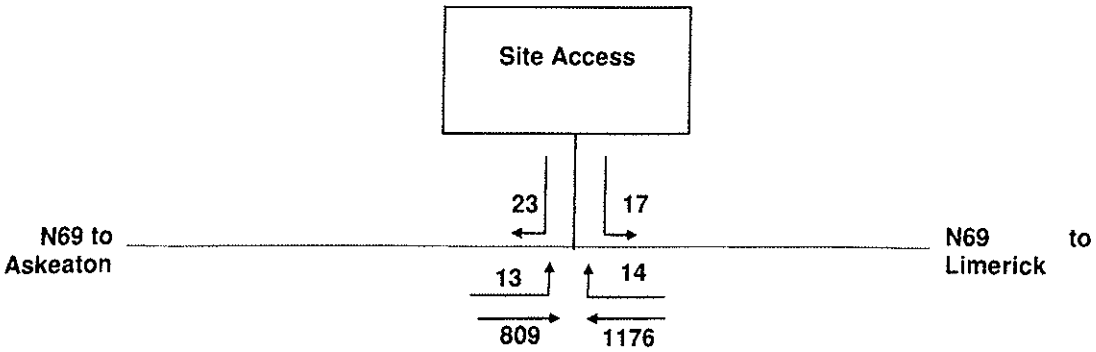


Fig 4.6: Seasonally Adjusted Surveyed Traffic PM Peak

4.4 TRAFFIC GROWTH

The background traffic growth factors used in the analysis in this report were established from the NRA's Project Appraisal Guidelines – Unit 5.5 Link-Based Traffic Growth Forecasting guidance document. In order to ensure a robust assessment of the road network, the high growth scenario for Region 7 was used in the analysis. These resulted in growth factors of:

- 1.32 growth factor from 2013 to 2028 (15 years beyond year of opening)

The baseline plus generated traffic (with both committed and proposed development) for the year of opening 2013, and the design year 2028 for both the AM and PM peak hours are shown below in Figures 4.7 to 4.10 (All figures are in PCU's).

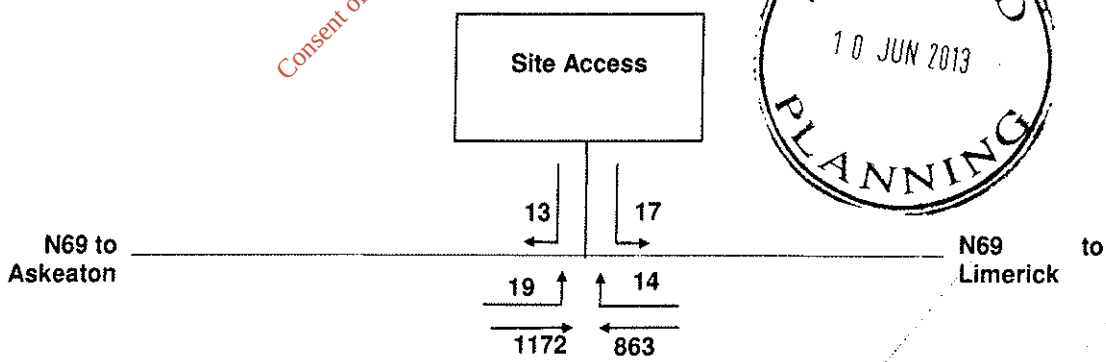


Fig 4.7: Baseflow Plus Generated Traffic 2013 AM Peak

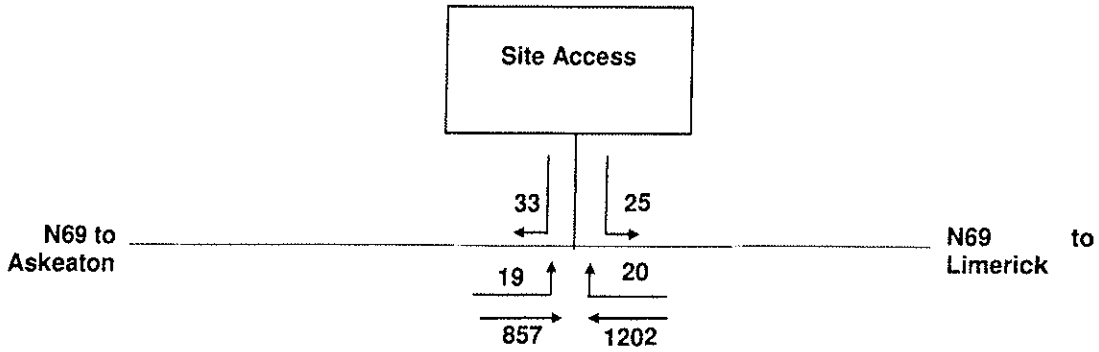


Fig 4.8: Baseflow Plus Generated Traffic 2013 PM Peak

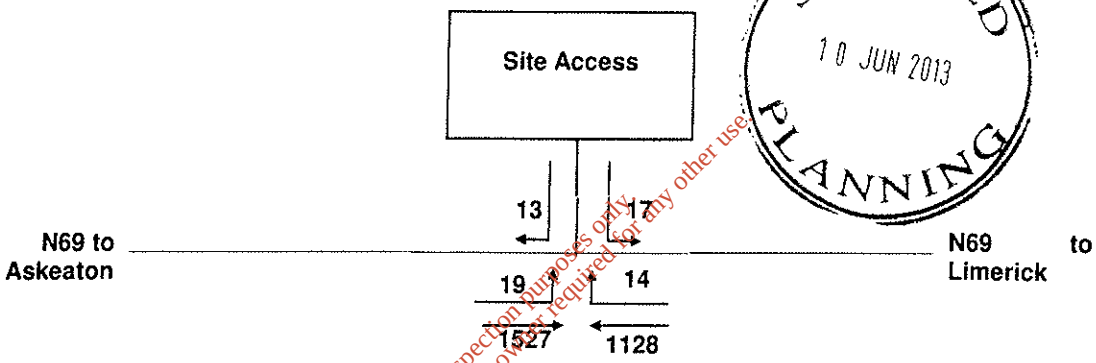


Fig 4.9: Baseflow Plus Generated Traffic 2028 AM Peak

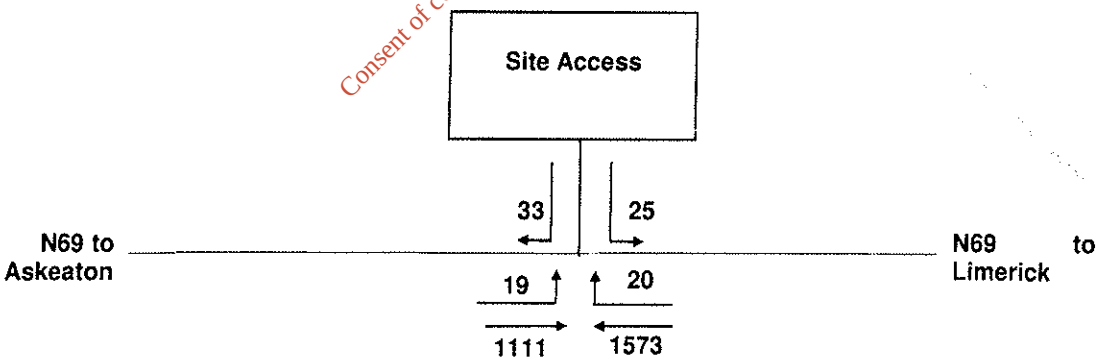


Fig 4.10: Baseflow Plus Generated Traffic 2028 PM Peak

5 ROAD IMPACT

5.1 JUNCTION ANALYSIS

5.1.1 *Introduction and Methodology*

The proposed site access junction has been analysed using the Transport Research Laboratory (TRL) computer program, PICADY, a widely accepted tool used for the analysis of priority junctions.

The performance of the junction has been analysed for the critical AM and PM peak hours, for the surveyed traffic, expected year of opening, 2013, and the design year 2028, 15 years beyond the year of opening.

The key parameters examined in the results of the analysis are the Ratio of Flow to Capacity Value (RFC value – desirable value should be no greater than 0.85 for PICADY – values over 1.00 indicate the approach arm is over capacity), the maximum queue length on any approach to the junctions and the average delay for each vehicle passing through the junction during the modelled period.

PICADY requires the following input data:

- Basic modelling parameters (usually peak hour traffic counts synthesised over a 90 minute model period)
- Geometric parameters (including lane numbers & widths, visibility, storage provision etc)
- Traffic demand data (usually peak hour origin/destination table with composition of heavy goods vehicles input*)

* For the purpose of this report, adjustments for varying vehicle types were made to the traffic figures prior to input. Traffic volumes input into PICADY were in PCU's and, accordingly, commercial vehicle composition was set to zero and car composition was set to 100% in the input.

The results of the PICADY analysis are presented in section 5.1.3. The origin/destination traffic demand tables for all the different scenarios tested for the analysed junctions are provided in the Appendix B of this report.

5.1.2 *Assessment Years*

The performance of the junction has been analysed for the critical AM peak hour (08:15 – 09:15) and PM peak hour (16:45 – 17:45). This analysis was carried out for both the expected year of opening of the development, expected to be 2013, and the design year of the development 2028, 15 years beyond full completion of the development in accordance with the NRA "Traffic and Transport Assessment Guidelines".

5.1.3 *Analysis Results*

A summary of the analysis results for the proposed site access junction for the AM and PM peak hours are provided below in Table 5.1. Full outputs from PICADY are included in Appendix D.

PICADY RESULTS: SITE ACCESS JUNCTION AM & PM PEAK HOURS							
Year & Time	Arm A – N69 to Askeaton		Arm B – Development		Arm C – N69 to Limerick		Average Delay (min/veh)
	RFC Value	Max Queue Length	RFC Value	Max Queue Length	RFC Value	Max Queue Length	
Existing AM	-	-	0.057	0.06	0.024	0.02	0.0
Existing PM	-	-	0.128	0.15	0.029	0.03	0.0
2013 AM + Dev	-	-	0.089	0.10	0.034	0.04	0.0
2013 PM + Dev	-	-	0.199	0.24	0.042	0.04	0.0
2028 AM	-	-	0.141	0.16	0.029	0.03	0.0
2028 PM	-	-	0.257	0.33	0.032	0.03	0.0
2028 AM + Dev	-	-	0.250	0.32	0.042	0.04	0.0
2028 PM + Dev	-	-	0.435	0.072	0.047	0.05	0.0

Table 5.1: PICADY Results: Site Access Junction AM & PM Peak Hours

The above results indicate that the proposed site access junction will operate below the maximum desirable 0.85 RFC up to and including the design year of 2028 with the inclusion of development-generated traffic.

5.2 LINK CAPACITY

A link capacity assessment for the Dock Road was undertaken using TA/ 79/99. TA 79/99 gives a means of estimating the link capacity of existing urban roads and this document was used for calculating the capacities of this road.

For the purposes of classification of Road Type, the Dock Road has been classified as UAP3 (Variable standard road carrying mixed traffic with frontage access, side roads, bus stops and at-grade pedestrian crossings). Existing carriageway widths are approximately 11m and there are 2-3 lanes giving a capacity estimate of 1620 PCU/hr in one direction. Of the scenarios analysed, the maximum one way flow expected occurs during the PM peak in 2028 with a flow of 1618 PCU expected. This suggests the road will operate just below capacity by the design year of 2028.

6 OTHER ROAD ISSUES

6.1 ROAD SAFETY

Visibility splays of 3.0 x 120 metres in accordance with the NRA DMRB TD 41-42 are required at the site access junction, and are achievable in both directions. It is recommended that the required sightlines at the site access junction be provided, maintained and kept free of all vegetation and other obstacles, such as signage, which may cause a visual obstruction.

It is further recommended that the existing right-turn lane along Dock Road be utilised for vehicles wishing to access the site from Limerick City. It is recommended that road markings be consistent with other access points along Dock Road. It is further recommended that all road markings in the vicinity of the site be reinstatement where marking deterioration is evident.

Accident data made available by the Road Safety Authority on www.rsa.ie has been reviewed and no accident cluster is recorded along the N69 in the vicinity of the entrance.

6.2 PARKING PROVISION

Due to the nature of the application, no additional car parking is required.

6.3 PEDESTRIANS & CYCLISTS

Due to the nature and rural location of the development, no pedestrian or cyclist facilities are currently provided fronting the site, nor are the provision of such facilities considered appropriate at this stage.

6.4 PUBLIC TRANSPORT

Due to the nature of the development, it is considered that the development will have no impact on public transport in the area, no limited modal shift anticipated from private car to public transport.

6.5 ACCESS FOR PEOPLE WITH DISABILITIES

It is recommended that dished kerbing and tactile paving slabs be installed at all internal crossing points, in accordance with "Guidance On The Use of Tactile Paving Slabs".

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The conclusions to this report are as follows:

- The proposed site access junction will operate below the desired 0.85 RFC up to and including the design year of 2028, with the inclusion of committed and proposed development-generated traffic.
- The proposed development can be accommodated by the existing road network.
- 3.0 x 120 metre visibility splays are available in both directions at the site access junction.
- Due to the rural location, no pedestrian or cyclist facilities are considered appropriate fronting the development.

7.2 RECOMMENDATIONS

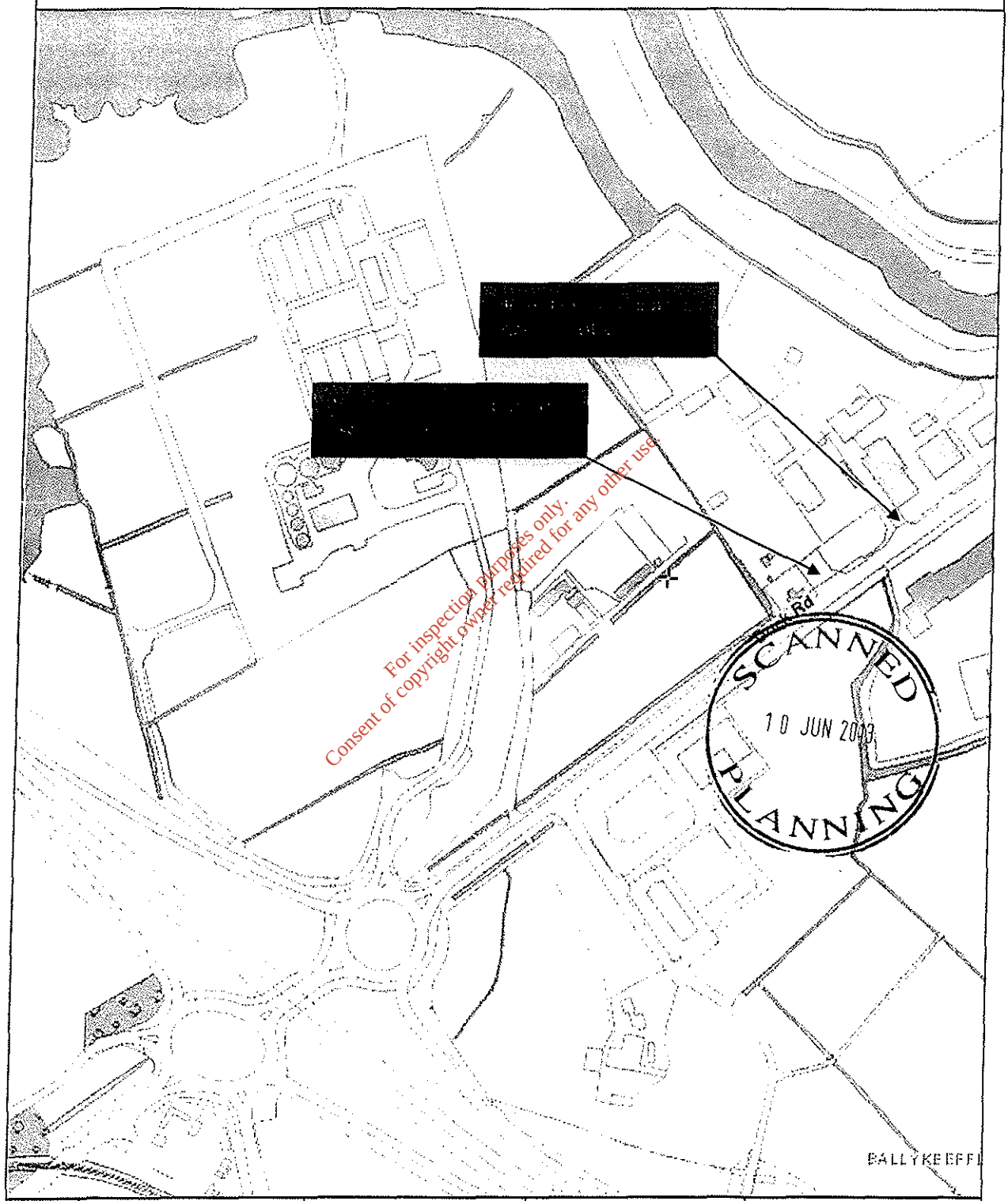
This report recommends that:

- Site access junction visibility splays be kept free of all restrictions including signage.
- The existing right-turn lane along Dock Road be modified, reinstated and utilised for vehicles wishing to access the site from Limerick City.
- Drop kerbing and tactile paving be provided at all internal pedestrian crossing points

APPENDIX A

Traffic Survey Results

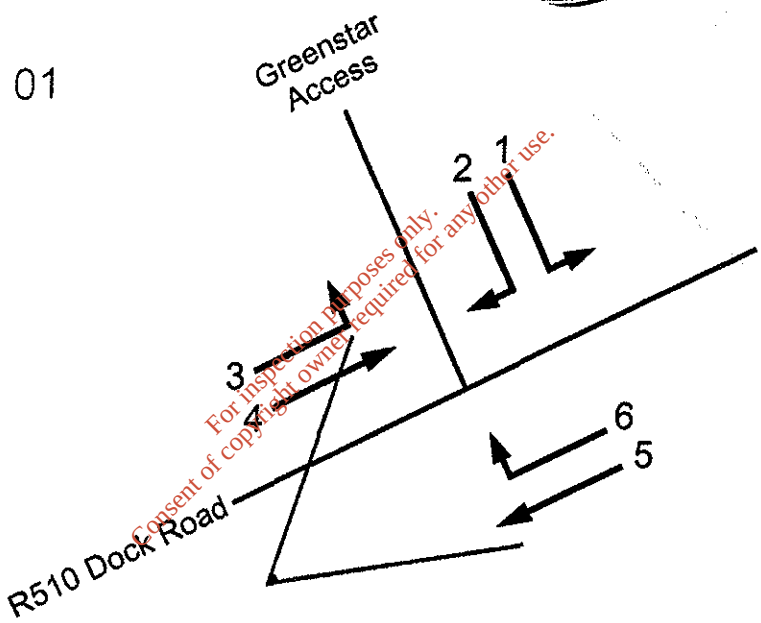
Site Location



Job number: ATH/13/002	Job date: 17th January 2013	Drawing No: ATH/13/002-1	abacus Transportation Surveys
Client: Tobin	Job day: Thursday	Author: SPW	

Movement Numbers & Directions

SITE 01



Job number: ATH/13/002	Job date: 17th January 2013	Drawing No: ATH/13/002-2	abacus Transportation Surveys
Client: Tobin	Job day: Thursday	Author: SPW	

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT
MANUAL CLASSIFIED JUNCTION COUNT

JANUARY 2013
ATH/13/002

SITE: 01

DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works

DAY: Thursday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	0	0	2	0	0	2	3	1	1	4	1	0	7	10	3	2	0	0	0	5	5
07:15	0	0	3	1	0	4	7	0	0	4	0	0	4	6	0	0	0	0	0	0	0
07:30	0	0	0	1	0	1	2	0	0	0	0	0	0	0	1	0	1	1	0	3	5
07:45	1	0	2	0	0	3	4	0	0	2	0	0	2	3	0	0	0	0	0	0	0
H/TOT	1	0	7	2	0	10	16	1	1	10	1	0	13	19	4	2	1	1	0	8	10
08:00	1	0	0	0	0	1	1	0	0	1	1	0	2	4	1	1	0	2	0	4	7
08:15	0	1	2	0	0	3	4	0	0	0	1	0	1	2	1	0	0	0	0	1	1
08:30	0	1	1	0	0	2	3	0	0	1	0	0	1	2	3	0	0	0	0	3	3
08:45	1	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	1	2	0	5	8
H/TOT	2	2	3	0	0	7	9	0	0	2	2	0	4	8	7	1	1	4	0	13	19
09:00	1	0	0	1	0	2	3	0	0	1	1	0	2	4	0	0	0	0	0	0	0
09:15	0	2	2	0	0	4	5	0	0	0	0	0	0	0	1	1	1	2	0	5	8
09:30	1	0	0	0	0	1	1	0	0	0	1	0	1	2	0	1	0	0	0	1	1
09:45	1	0	0	0	0	1	1	1	0	1	0	0	2	3	0	0	0	2	0	2	3
H/TOT	3	2	2	1	0	8	10	1	0	2	2	0	5	9	1	2	1	4	0	8	12
10:00	0	0	0	1	0	1	2	1	0	0	0	0	1	1	0	1	1	0	0	2	3
10:15	1	1	0	0	0	2	2	1	0	1	0	0	2	3	1	2	2	0	0	5	6
10:30	0	0	0	0	0	0	0	0	0	1	1	0	2	4	0	0	0	0	0	0	0
10:45	2	1	1	0	0	4	5	1	2	0	1	0	4	6	2	0	0	1	0	3	4
H/TOT	3	2	1	1	0	7	9	3	2	2	2	0	9	13	3	3	3	1	0	10	13
11:00	1	1	1	0	0	3	4	0	0	1	0	0	1	2	0	2	0	0	0	2	2
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	3
11:30	0	1	1	0	0	2	3	0	2	0	0	0	2	2	1	3	2	1	1	8	11
11:45	1	3	4	1	0	9	12	0	1	0	2	0	3	6	0	0	3	1	0	4	7
H/TOT	2	5	6	1	0	14	18	0	3	1	2	0	6	9	1	6	6	2	1	16	23
12:00	0	0	2	0	0	2	3	1	0	3	0	0	4	6	2	0	1	0	0	3	4
12:15	1	1	0	0	0	2	2	0	0	1	0	0	1	2	1	0	0	0	0	1	1
12:30	2	0	1	0	0	3	4	1	1	0	1	0	3	4	0	0	0	0	0	0	0
12:45	0	2	1	0	0	3	4	0	1	1	0	0	2	3	0	1	1	0	0	2	3
H/TOT	3	3	4	0	0	10	12	2	2	5	1	0	10	14	3	1	2	0	0	6	7

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT
MANUAL CLASSIFIED JUNCTION COUNT

JANUARY 2013
ATH/13/002

SITE: 01

DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works

DAY: Thursday

	MOVEMENT 1							MOVEMENT 2							MOVEMENT 3						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	3	2	0	1	0	6	7	0	0	0	0	0	0	0	0	0	1	1	0	2	4
13:15	0	2	1	0	0	3	4	0	0	2	0	0	2	3	1	0	0	0	0	1	1
13:30	0	0	0	0	0	0	0	0	0	0	2	0	2	4	1	0	1	0	0	2	4
13:45	0	0	0	0	0	0	0	1	0	1	0	0	2	3	0	0	0	1	0	1	2
H/TOT	3	4	1	1	0	9	11	1	0	3	2	0	6	10	2	0	2	2	0	6	11
14:00	1	1	1	1	0	4	6	0	0	0	1	0	1	2	1	0	3	0	0	4	6
14:15	1	2	1	0	0	4	5	0	1	1	1	0	3	5	0	2	0	0	0	2	3
14:30	0	2	1	1	0	4	6	1	0	0	0	0	1	1	0	0	0	2	0	2	6
14:45	0	0	0	0	0	0	0	1	1	0	0	0	2	2	0	1	1	0	0	2	3
H/TOT	2	5	3	2	0	12	16	2	2	1	2	0	7	10	1	3	4	2	0	10	18
15:00	0	2	0	0	0	2	2	1	0	2	0	0	3	4	0	0	0	1	0	1	2
15:15	2	0	2	0	0	4	5	3	1	1	1	0	6	8	1	1	2	1	0	5	8
15:30	4	0	0	2	0	6	8	2	2	1	0	0	5	6	0	1	2	0	0	3	6
15:45	2	1	0	0	0	3	3	2	0	0	0	0	2	2	0	0	0	2	0	2	4
H/TOT	8	3	2	2	0	15	18	8	3	4	1	0	16	19	1	2	4	4	0	11	18
16:00	0	0	0	0	0	0	0	3	0	2	0	0	5	6	0	0	1	0	0	1	2
16:15	1	0	1	0	0	2	3	2	0	0	0	0	2	2	0	0	1	0	0	1	2
16:30	1	0	0	0	0	1	1	0	0	0	2	0	2	5	1	0	0	0	0	1	1
16:45	1	1	1	0	0	3	4	2	0	0	1	0	3	4	0	1	0	0	0	1	1
H/TOT	3	1	2	0	0	6	7	7	0	2	3	0	12	17	1	1	2	0	0	4	5
17:00	2	1	2	0	0	5	6	2	2	0	0	0	4	4	0	0	2	0	0	2	3
17:15	1	0	0	0	0	1	1	2	2	1	1	0	6	8	0	0	2	2	0	4	8
17:30	4	1	0	0	0	5	5	2	1	1	0	0	4	5	0	0	0	0	0	0	0
17:45	1	0	1	0	0	2	3	4	0	1	0	0	5	6	0	0	1	0	0	1	2
H/TOT	8	2	3	0	0	13	15	10	5	3	1	0	19	22	0	0	5	2	0	7	12
18:00	3	0	0	0	0	3	3	1	1	0	0	0	2	2	0	0	0	0	0	0	0
18:15	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	1	1
18:30	1	0	0	0	0	1	1	2	0	1	0	0	3	4	0	0	1	1	0	2	4
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H/TOT	4	0	0	0	0	4	4	4	1	1	0	0	6	7	1	0	1	1	0	3	5
P/TOT	42	29	34	10	0	115	145	39	19	36	19	0	113	156	25	21	32	23	1	102	149

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT **JANUARY 2013**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/13/002**

SITE: 01 DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works DAY: Thursday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
07:00	41	5	6	2	1	55	62	48	15	1	1	0	65	67	1	0	0	0	0	1	1
07:15	63	11	10	3	1	88	98	66	11	1	5	0	83	90	2	1	0	0	0	3	3
07:30	86	15	3	6	2	112	120	78	17	5	5	0	105	114	0	0	0	0	0	0	0
07:45	111	24	14	8	0	157	174	102	25	6	9	1	143	159	2	1	1	0	0	4	5
H/TOT	301	55	33	19	4	412	452	294	68	13	20	1	396	430	5	2	1	0	0	8	9
08:00	194	30	5	8	0	237	250	95	20	6	5	0	126	136	1	0	3	0	0	4	6
08:15	249	27	2	5	0	283	291	117	14	7	5	2	145	157	0	1	1	0	0	2	3
08:30	159	22	5	1	0	187	191	160	16	9	7	2	194	210	1	1	0	0	0	2	2
08:45	231	21	9	4	1	266	277	128	33	8	6	5	170	187	0	0	0	0	0	0	0
H/TOT	833	100	21	18	1	973	1008	500	73	30	23	9	635	689	2	2	4	0	0	8	10
09:00	184	44	5	15	3	251	276	138	32	6	12	7	195	221	2	2	0	0	0	4	4
09:15	160	31	4	5	1	201	211	109	26	8	4	3	150	162	0	0	1	0	0	1	2
09:30	149	31	12	8	0	200	216	89	27	7	6	2	131	144	1	1	0	1	0	3	4
09:45	122	26	6	1	1	158	164	101	25	7	9	1	143	159	1	1	0	0	0	2	2
H/TOT	615	132	29	29	5	810	867	437	110	28	31	13	619	686	4	4	1	1	0	10	12
10:00	107	32	12	7	0	158	173	78	26	7	6	0	117	128	1	0	0	0	0	1	1
10:15	117	31	6	5	0	159	169	84	20	12	7	0	123	138	0	1	0	0	0	1	1
10:30	93	26	5	3	0	127	133	90	32	4	9	1	136	151	1	1	2	0	0	4	5
10:45	106	27	8	6	2	149	163	94	25	7	6	2	134	147	0	2	1	0	0	3	4
H/TOT	423	116	31	21	2	593	638	346	103	30	28	3	510	564	2	4	3	0	0	9	11
11:00	102	25	5	11	2	145	164	97	21	9	11	2	140	161	0	0	0	1	0	1	2
11:15	88	32	6	7	0	133	145	99	32	9	6	0	146	158	0	0	1	1	0	2	4
11:30	96	18	6	13	0	133	153	90	25	5	10	1	131	148	0	1	1	0	0	2	3
11:45	95	32	3	6	0	136	145	99	30	10	7	3	149	166	1	1	2	0	0	4	5
H/TOT	381	107	20	37	2	547	607	385	108	33	34	6	566	633	1	2	4	2	0	9	14
12:00	105	25	6	10	1	147	164	93	24	5	6	2	130	142	0	0	0	0	0	0	0
12:15	85	19	8	8	0	120	134	106	29	4	8	0	147	159	1	1	1	0	0	3	4
12:30	103	34	2	11	0	150	165	147	24	9	11	0	191	210	1	3	0	0	0	4	4
12:45	109	22	4	2	1	138	144	140	23	7	9	3	182	200	1	0	1	1	0	3	5
H/TOT	402	100	20	31	2	555	607	486	100	25	34	5	650	712	3	4	2	1	0	10	12

ABACUS TRANSPORTATION SURVEYS

DOCK ROAD TRAFFIC COUNT **JANUARY 2013**
MANUAL CLASSIFIED JUNCTION COUNT **ATH/13/002**

SITE: 01 DATE: 17th January 2013

LOCATION: Dock Road/Greenstar Works DAY: Thursday

	MOVEMENT 4							MOVEMENT 5							MOVEMENT 6						
TIME	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU	CAR	LGV	OGV1	OGV2	BUS	TOT	PCU
13:00	113	28	7	3	0	151	156	140	29	6	3	0	178	185	0	0	1	0	0	1	2
13:15	94	22	3	6	3	128	140	159	26	8	4	0	197	206	1	1	0	0	0	2	3
13:30	97	25	7	6	0	135	146	149	16	9	6	0	180	192	0	1	0	0	0	1	2
13:45	13	32	3	6	2	56	67	122	16	7	6	2	153	166	5	1	1	0	0	7	8
H/TOT	317	107	20	21	5	470	512	570	87	30	19	2	708	758	6	3	2	0	0	11	15
14:00	101	22	9	7	2	141	157	125	19	4	5	4	157	170	1	2	0	0	0	3	5
14:15	121	17	8	8	1	155	170	156	28	4	6	2	196	208	0	1	2	0	0	3	4
14:30	115	29	8	4	1	157	167	132	24	6	6	0	168	179	0	0	1	2	0	3	6
14:45	107	17	7	5	0	136	146	114	22	7	6	3	152	166	1	1	4	0	0	6	8
H/TOT	444	85	32	24	4	589	640	527	93	21	23	9	673	722	2	4	7	2	0	15	23
15:00	103	22	7	5	3	140	153	157	25	7	7	6	202	221	0	1	4	1	0	6	9
15:15	133	16	10	9	1	169	187	182	24	5	5	1	217	237	1	2	0	0	0	3	3
15:30	105	24	6	5	1	141	152	165	31	11	6	2	215	236	0	0	0	0	0	0	0
15:45	112	31	10	1	2	156	169	182	26	9	5	2	224	247	0	0	1	2	0	3	5
H/TOT	453	93	33	20	7	606	656	686	106	32	23	11	858	915	1	3	5	3	0	12	18
16:00	134	22	9	4	1	170	181	153	27	12	3	0	195	205	0	0	2	0	0	2	3
16:15	118	26	5	1	1	151	156	143	32	4	4	1	184	192	0	0	0	1	0	1	2
16:30	147	23	8	8	1	187	202	177	27	9	2	2	217	226	1	0	2	0	0	3	4
16:45	138	25	7	6	0	176	187	196	23	7	3	2	231	240	1	0	2	0	0	3	4
H/TOT	537	96	29	19	3	684	726	669	109	32	12	5	827	864	2	0	6	1	0	9	13
17:00	155	23	7	3	1	189	197	232	30	5	3	1	271	278	1	1	0	0	0	2	2
17:15	147	16	5	5	0	173	182	233	28	5	1	1	268	273	0	0	0	1	0	1	2
17:30	138	15	6	6	0	165	176	253	26	3	0	2	284	288	1	2	1	0	0	4	5
17:45	124	17	3	4	0	148	155	206	17	4	2	0	229	234	0	0	0	0	0	0	0
H/TOT	564	71	21	18	1	675	710	924	101	17	6	4	1052	1072	2	3	1	1	0	7	9
18:00	117	16	1	0	1	135	137	214	27	2	3	0	246	251	0	0	1	0	0	1	2
18:15	120	23	1	4	0	148	154	202	26	3	2	0	233	237	0	0	0	0	0	0	0
18:30	113	10	3	1	0	127	130	154	11	0	3	1	169	174	0	0	0	0	0	0	0
18:45	113	12	0	2	0	127	130	118	14	2	3	1	138	144	0	0	0	0	0	0	0
H/TOT	463	61	5	7	1	537	550	688	78	7	11	2	786	806	0	0	1	0	0	1	2
P/TOT	5733	1123	294	264	37	7451	7978	6512	1136	298	264	70	8280	8842	30	31	37	11	0	109	142

APPENDIX B

Traffic Calculations

Existing Traffic Count - January 2013 AM

Vehicle Numbers converted to PCU ~ 1 lv = 1pcu, 1hgv = 2.3pcu

Site Access

Route	A	B	C
A		12	1034
B	8		11
C	774	9	

Seasonally Adjusted Factor
NRA Counter N18
AADT 2011 higher than Jan 2011 figures

18783
20494
1.09

Seasonally adjusted Factor = 1.09

Oil Depot Junction

Route	A	B	C
A		13	1127
B	9		12
C	844	10	

Existing Traffic Count - June 2012 PM

Vehicle Numbers converted to PCU ~ 1 lv = 1pcu, 1hgv = 2.3pcu

N84 Junction

Route	A	B	C
A		12	742
B	21		16
C	1079	13	

Seasonally Adjusted Factor
NRA Counter N18
AADT 2011 higher than Jan 2011 figures

18783
20494
1.09

Seasonally adjusted Factor = 1.09

N84 Junction

Route	A	B	C
A		13	809
B	23		17
C	1176	14	

Traffic Calculations for Waste Management Facility, Dock Road, Co. Limerick

Site Access Priority Junction

At Present AM Peak (08:15 - 09:15)

Seasonally Adjusted 2013

National Traffic Growth Forecasts
Region 7 (High Growth)

2013 - Year of Opening

	LV
Yearly Growth Factor	*2.20%*
No Years	*0*

2012 - 2013 Growth Factor ***100.00%***

2028 - Design Year

	LV
Yearly Growth Factor	*2.20%*
No Years	*12*
Yearly Growth Factor	*1.70%*
No Years	*3*

2013 - 2028 Growth Factor ***131.50%***

Route	A	B	C
A		13	1127
B	9		12
C	844	10	

Route	A	B	C
A		13	1127
B	9		12
C	844	10	

Route	A	B	C
A		13	1482
B	9		12
C	1109	10	

[redacted]

With Other Proposed Committed Developments AM Peak (08:15 - 09:15)

Other Committed Development Only

Route	A	B	C
A		0	45
B	0		0
C	19	0	

2013 With other Committed Development

Route	A	B	C
A		13	1172
B	9		12
C	863	10	

2028 With other Committed Development

Route	A	B	C
A		13	1527
B	9		12
C	1128	10	

[redacted]

With Proposed Development AM Peak (08:15 - 09:15)

2028 With Development

Route	A	B	C
A		19	1172
B	13		17
C	863	14	

2028 With Development

Route	A	B	C
A		19	1527
B	13		17
C	1128	14	

Traffic Calculations for Waste Management Facility, Dock Road, Co. Limerick

Site Access Priority Junction

At Present PM Peak (16:45 - 17:45)

Seasonally Adjusted 2013

National Traffic Growth Forecasts
Region 7 (High Growth)

2013 - Year of Opening

	LV
Yearly Growth Factor	*2.20%*
No Years	*0*

2012 - 2013 Growth Factor ***100.00%***

2028 - Design Year

	LV
Yearly Growth Factor	*2.20%*
No Years	*12*
Yearly Growth Factor	*1.70%*
No Years	*3*

2013 - 2028 Growth Factor ***131.50%***

Route	A	B	C
A		13	809
B	23		17
C	1176	14	

Route	A	B	C
A		13	809
B	23		17
C	1176	14	

Route	A	B	C
A		13	1064
B	23		17
C	1547	14	

With Other Proposed Committed Developments PM Peak (16:45 - 17:45)

Other Committed Development Only

Route	A	B	C
A		0	47
B	0		0
C	26	0	

2013 With other Committed Development

Route	A	B	C
A		13	856
B	23		17
C	1202	14	

2028 With other Committed Development

Route	A	B	C
A		13	1111
B	23		17
C	1573	14	

With Proposed Development PM Peak (16:45 - 17:45)

2028 With Development

Route	A	B	C
A		19	856
B	33		25
C	1202	20	

2028 With Development

Route	A	B	C
A		19	1111
B	33		25
C	1573	20	

APPENDIX C

TRICS DATA

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 02 - EMPLOYMENT
Category : D - INDUSTRIAL ESTATE

VEHICLES

Selected regions and areas:

03	**SOUTH WEST**		
	CW	CORNWALL	1 days
	WL	WILTSHIRE	1 days
04	**EAST ANGLIA**		
	CA	CAMBRIDGESHIRE	1 days
	NF	NORFOLK	1 days
	SF	SUFFOLK	2 days
05	**EAST MIDLANDS**		
	DS	DERBYSHIRE	1 days
	LN	LINCOLNSHIRE	1 days
	NT	NOTTINGHAMSHIRE	1 days
06	**WEST MIDLANDS**		
	ST	STAFFORDSHIRE	1 days
	WM	WEST MIDLANDS	1 days
07	**YORKSHIRE & NORTH LINCOLNSHIRE**		
	KH	KINGSTON UPON HULL	1 days
	NY	NORTH YORKSHIRE	1 days
	WY	WEST YORKSHIRE	2 days
08	**NORTH WEST**		
	CH	CHESHIRE	1 days
	LC	LANCASHIRE	1 days
	MS	MERSEYSIDE	1 days
09	**NORTH**		
	CB	CUMBRIA	1 days
	DH	DURHAM	1 days
	NB	NORTHUMBERLAND	1 days
	TW	TYNE & WEAR	1 days
11	**SCOTLAND**		
	DG	DUMFRIES & GALLOWAY	1 days
	EA	EAST AYRSHIRE	1 days
	ER	EAST RENFREWSHIRE	2 days
15	**GREATER DUBLIN**		
	DL	DUBLIN	3 days

Main parameter selection:

Parameter: Gross floor area
Range: 552 to 234115 (units: sqm)

Date Range: 01/01/99 to 07/09/08

Selected survey days:

Monday	3 days
Tuesday	9 days
Wednesday	6 days
Thursday	4 days
Friday	7 days

Selected survey types:

Manual count	28 days
Directional ATC Count	1 days

Selected Locations:

Edge of Town Centre	2
Suburban Area (PPS6 Out of Centre)	7
Edge of Town	18
Free Standing (PPS6 Out of Town)	2

Selected Location Sub Categories:

Industrial Zone	18
Residential Zone	2
Built-Up Zone	2
Out of Town	1
No Sub Category	6

LIST OF SITES relevant to selection parameters

1	**CA-02-D-01**	**IND. ESTATE, PETERBOROUGH**	**CAMBRIDGESHIRE**
	STURROCK WAY		
	BRETTON		
	PETERBOROUGH		
	Total Gross floor area:	4300 sqm	
2	**CB-02-D-03**	**INDUSTRIAL ESTATE, BRAMPTON**	**CUMBRIA**
	CARLISLE ROAD		
	BRAMPTON		
	Total Gross floor area:	13700 sqm	
3	**CH-02-D-02**	**INDUSTRIAL EST., NORTHWICH**	**CHESHIRE**
	MANCHESTER ROAD		
	WINCHAM		
	NORTHWICH		
	Total Gross floor area:	22000 sqm	
4	**CW-02-D-02**	**INDUSTRIAL ESTATE, CAMBORNE**	**CORNWALL**
	DRUIDS ROAD		
	CAMBORNE		
	Total Gross floor area:	6515 sqm	
5	**DG-02-D-01**	**BUSINESS PARK, NEAR DUMFRIES**	**DUMFRIES & GALLOWAY**
	A75(T)		
	CARGENBRIDGE		
	NEAR DUMFRIES		
	Total Gross floor area:	5980 sqm	
6	**DH-02-D-01**	**INDUSTRIAL ESTATE,NR CONSETT**	**DURHAM**
	PARKWAY		
	ANNFIELD PLAIN		
	NEAR CONSETT		
	Total Gross floor area:	12025 sqm	
7	**DL-02-D-01**	**INDUSTRIAL ESTATE, DUBLIN**	**DUBLIN**
	SWORDS ROAD		
	SANTRY		
	DUBLIN		
	Total Gross floor area:	83000 sqm	
8	**DL-02-D-02**	**INDUSTRIAL ESTATE, DUBLIN**	**DUBLIN**
	GRANGE ROAD		
	BALDOYLE		
	DUBLIN		
	Total Gross floor area:	100000 sqm	
9	**DL-02-D-03**	**INDUSTRIAL ESTATE, DUBLIN**	**DUBLIN**
	CLOVERHILL ROAD		
	DUBLIN		
	Total Gross floor area:	120000 sqm	
10	**DS-02-D-01**	**IND. ESTATE,SOUTH NORMANTON**	**DERBYSHIRE**
	BERRISTOW LANE		
	SOUTH NORMANTON		
	Total Gross floor area:	92286 sqm	
11	**EA-02-D-02**	**INDUSTRIAL EST., KILMARNOCK**	**EAST AYRSHIRE**
	JAMES LITTLE STREET		
	KILMARNOCK		
	Total Gross floor area:	552 sqm	
12	**ER-02-D-01**	**INDUSTRIAL ESTATE, BARRHEAD**	**EAST RENFREWSHIRE**
	MURIEL STREET		
	BARRHEAD		
	Total Gross floor area:	7211 sqm	

LIST OF SITES relevant to selection parameters (Cont.)

13 **ER-02-D-02** **INDUSTRIAL EST.,NEAR GLASGOW** **EAST RENFREWSHIRE**
SPIERSBRIDGE AVENUE
THORNLIEBANK
NEAR GLASGOW
Total Gross floor area: 4233 sqm

14 **KH-02-D-02** **INDUSTRIAL ESTATE, HULL** **KINGSTON UPON HULL**
BOULEVARD STREET

KINGSTON UPON HULL
Total Gross floor area: 2220 sqm

15 **LC-02-D-04** **INDUSTRIAL ESTATE, GARSTANG** **LANCASHIRE**
GREEN LANE WEST

GARSTANG
Total Gross floor area: 4555 sqm

16 **LN-02-D-01** **INDUSTRIAL ESTATE, GRANTHAM** **LINCOLNSHIRE**
BELTON LANE

GRANTHAM
Total Gross floor area: 5347 sqm

17 **MS-02-D-05** **INDUSTRIAL ESTATE, ST HELENS** **MERSEYSIDE**
BROADOAK ROAD

ST HELENS
Total Gross floor area: 11700 sqm

18 **NB-02-D-01** **INDUSTRIAL ESTATE, HEXHAM** **NORTHUMBERLAND**
A695

HEXHAM
Total Gross floor area: 10525 sqm

19 **NF-02-D-02** **INDUSTRIAL ESTATE, DEREHAM** **NORFOLK**
RASHES GREEN
BRECKLAND
DEREHAM
Total Gross floor area: 51000 sqm

20 **NT-02-D-01** **IND. ESTATE, SUTTON-IN-ASHFLD** **NOTTINGHAMSHIRE**
B6028 STONEYFORD ROAD
STANTON HILL
SUTTON-IN-ASHFIELD
Total Gross floor area: 26400 sqm

21 **NY-02-D-01** **INDUSTRIAL ESTATE, SHERBURN** **NORTH YORKSHIRE**
AVIATION WAY

SHERBURN IN ELMET
Total Gross floor area: 1197 sqm

22 **SF-02-D-01** **INDUSTRIAL ESTATE, IPSWICH** **SUFFOLK**
RAPIER STREET
STOKE
IPSWICH
Total Gross floor area: 17500 sqm

23 **SF-02-D-02** **INDUSTRIAL ESTATE, IPSWICH** **SUFFOLK**
HADLEIGH ROAD
WESTBOURNE
IPSWICH
Total Gross floor area: 102000 sqm

24 **ST-02-D-04** **INDUSTRIAL ESTATE, LICHFIELD** **STAFFORDSHIRE**
BURTON OLD ROAD
BOLEY PARK
LICHFIELD
Total Gross floor area: 40905 sqm

LIST OF SITES relevant to selection parameters (Cont.)

25	**TW-02-D-06**	**INDUSTRIAL ESTATE, N. SHIELDS**	**TYNE & WEAR**
	NORHAM ROAD		
	WEST CHIRTON		
	NORTH SHIELDS		
	Total Gross floor area:	23000 sqm	
26	**WL-02-D-01**	**IND. ESTATE, WOOTTON BASSETT**	**WILTSHIRE**
	MARLBOROUGH ROAD		
	WOOTTON BASSETT		
	Total Gross floor area:	7050 sqm	
27	**WM-02-D-01**	**INDUSTRIAL EST., BIRMINGHAM**	**WEST MIDLANDS**
	MELCHETT ROAD		
	KINGS NORTON		
	BIRMINGHAM		
	Total Gross floor area:	2510 sqm	
28	**WY-02-D-01**	**INDUSTRIAL ESTATE, LEEDS**	**WEST YORKSHIRE**
	PARK HOUSE WEST		
	LEEDS		
	Total Gross floor area:	4225 sqm	
29	**WY-02-D-02**	**INDUSTRIAL EST., HUDDERSFIELD**	**WEST YORKSHIRE**
	A629 WAKEFIELD ROAD		
	TANDEM		
	HUDDERSFIELD		
	Total Gross floor area:	20824 sqm	

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE

VEHICLES

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

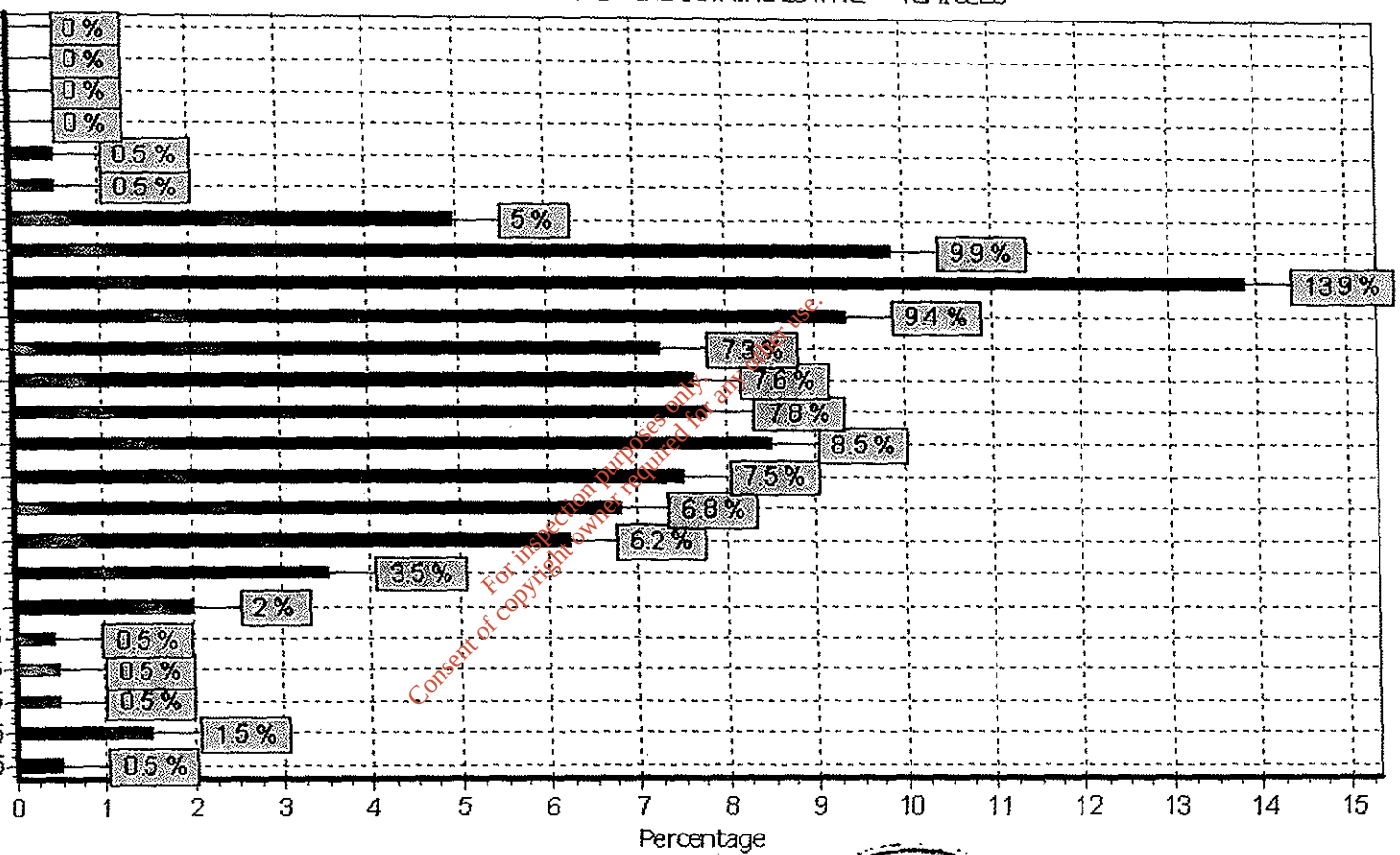
Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 00:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
00:30 - 01:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
01:00 - 01:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
01:30 - 02:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
02:00 - 02:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
02:30 - 03:00	1	5980	0.000	1	5980	0.017	1	5980	0.017
03:00 - 03:30	1	5980	0.000	1	5980	0.000	1	5980	0.000
03:30 - 04:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
04:00 - 04:30	1	5980	0.017	1	5980	0.000	1	5980	0.017
04:30 - 05:00	1	5980	0.000	1	5980	0.000	1	5980	0.000
05:00 - 05:30	1	5980	0.000	1	5980	0.017	1	5980	0.017
05:30 - 06:00	1	5980	0.017	1	5980	0.000	1	5980	0.017
06:00 - 06:30	3	5808	0.075	3	5808	0.040	3	5808	0.115
06:30 - 07:00	3	5808	0.086	3	5808	0.046	3	5808	0.132
07:00 - 07:30	28	28580	0.116	28	28580	0.051	28	28580	0.167
07:30 - 08:00	28	28580	0.204	28	28580	0.064	28	28580	0.268
08:00 - 08:30	29	27681	0.220	29	27681	0.083	29	27681	0.303
08:30 - 09:00	**29**	**27681**	**0.230**	29	27681	0.095	**29**	**27681**	**0.325**
09:00 - 09:30	29	27681	0.177	29	27681	0.098	29	27681	0.275
09:30 - 10:00	29	27681	0.127	29	27681	0.113	29	27681	0.240
10:00 - 10:30	29	27681	0.115	29	27681	0.116	29	27681	0.231
10:30 - 11:00	29	27681	0.121	29	27681	0.116	29	27681	0.237
11:00 - 11:30	29	27681	0.120	29	27681	0.123	29	27681	0.243
11:30 - 12:00	29	27681	0.128	29	27681	0.133	29	27681	0.261
12:00 - 12:30	29	27681	0.127	29	27681	0.155	29	27681	0.282
12:30 - 13:00	29	27681	0.126	29	27681	0.155	29	27681	0.281
13:00 - 13:30	29	27681	0.132	29	27681	0.155	29	27681	0.287
13:30 - 14:00	29	27681	0.144	29	27681	0.129	29	27681	0.273
14:00 - 14:30	29	27681	0.128	29	27681	0.127	29	27681	0.255
14:30 - 15:00	29	27681	0.116	29	27681	0.127	29	27681	0.243
15:00 - 15:30	29	27681	0.112	29	27681	0.129	29	27681	0.241
15:30 - 16:00	29	27681	0.109	29	27681	0.141	29	27681	0.250
16:00 - 16:30	29	27681	0.108	29	27681	0.175	29	27681	0.283
16:30 - 17:00	29	27681	0.094	29	27681	0.212	29	27681	0.306
17:00 - 17:30	29	27681	0.068	**29**	**27681**	**0.224**	29	27681	0.292
17:30 - 18:00	29	27681	0.047	29	27681	0.154	29	27681	0.201
18:00 - 18:30	28	28580	0.039	28	28580	0.083	28	28580	0.122
18:30 - 19:00	28	28580	0.027	28	28580	0.050	28	28580	0.077
19:00 - 19:30	2	6596	0.000	2	6596	0.015	2	6596	0.015
19:30 - 20:00	2	6596	0.015	2	6596	0.023	2	6596	0.038
20:00 - 20:30	2	6596	0.008	2	6596	0.015	2	6596	0.023
20:30 - 21:00	2	6596	0.008	2	6596	0.015	2	6596	0.023
21:00 - 21:30	2	6596	0.008	2	6596	0.008	2	6596	0.016
21:30 - 22:00	2	6596	0.008	2	6596	0.008	2	6596	0.016
22:00 - 22:30	1	5980	0.017	1	5980	0.017	1	5980	0.034
22:30 - 23:00	1	5980	0.033	1	5980	0.000	1	5980	0.033
23:00 - 23:30	1	5980	0.017	1	5980	0.017	1	5980	0.034
23:30 - 24:00	1	5980	0.000	1	5980	0.033	1	5980	0.033
Total Rates:			3.244			3.279			6.523

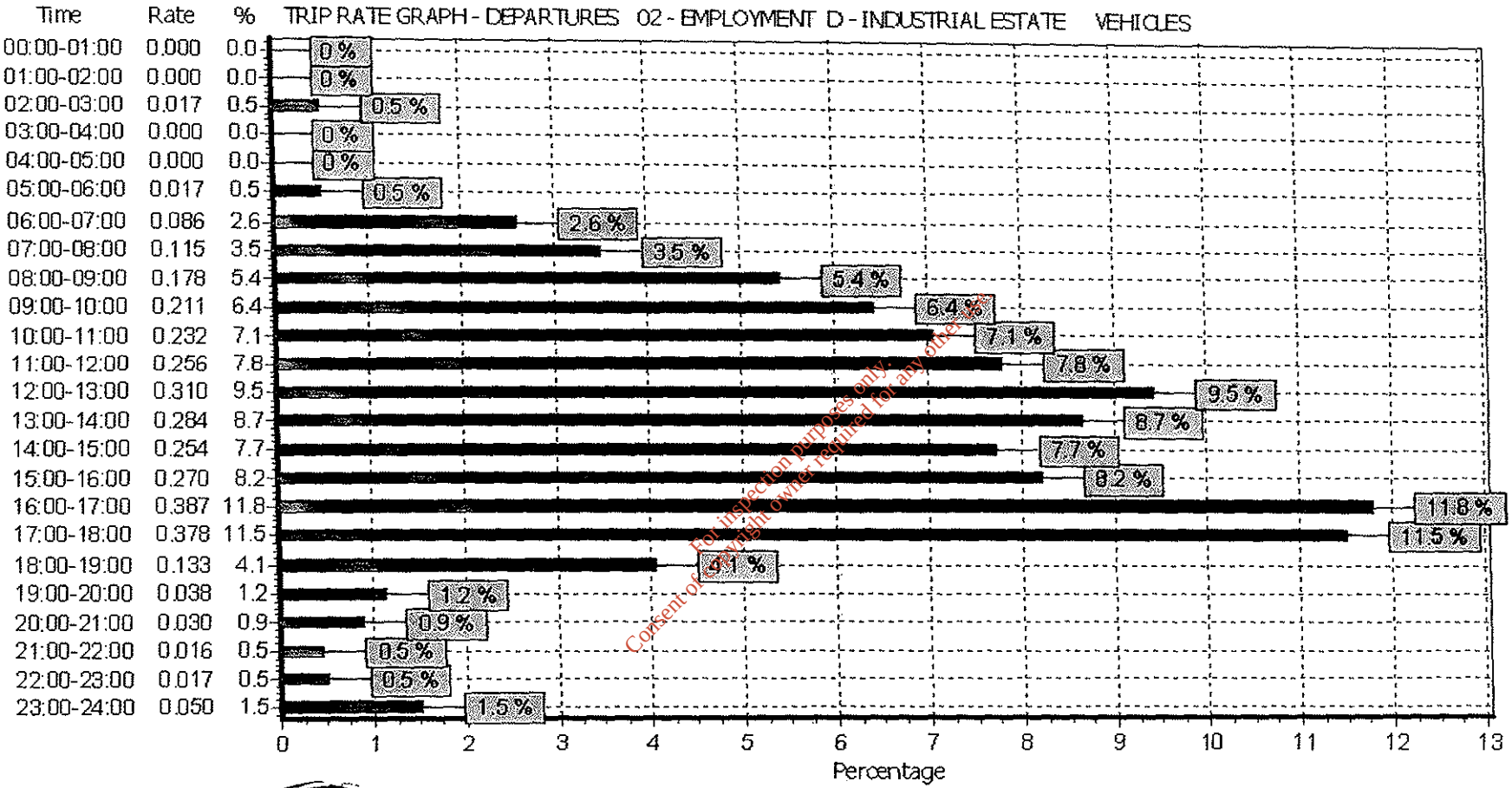
Parameter summary

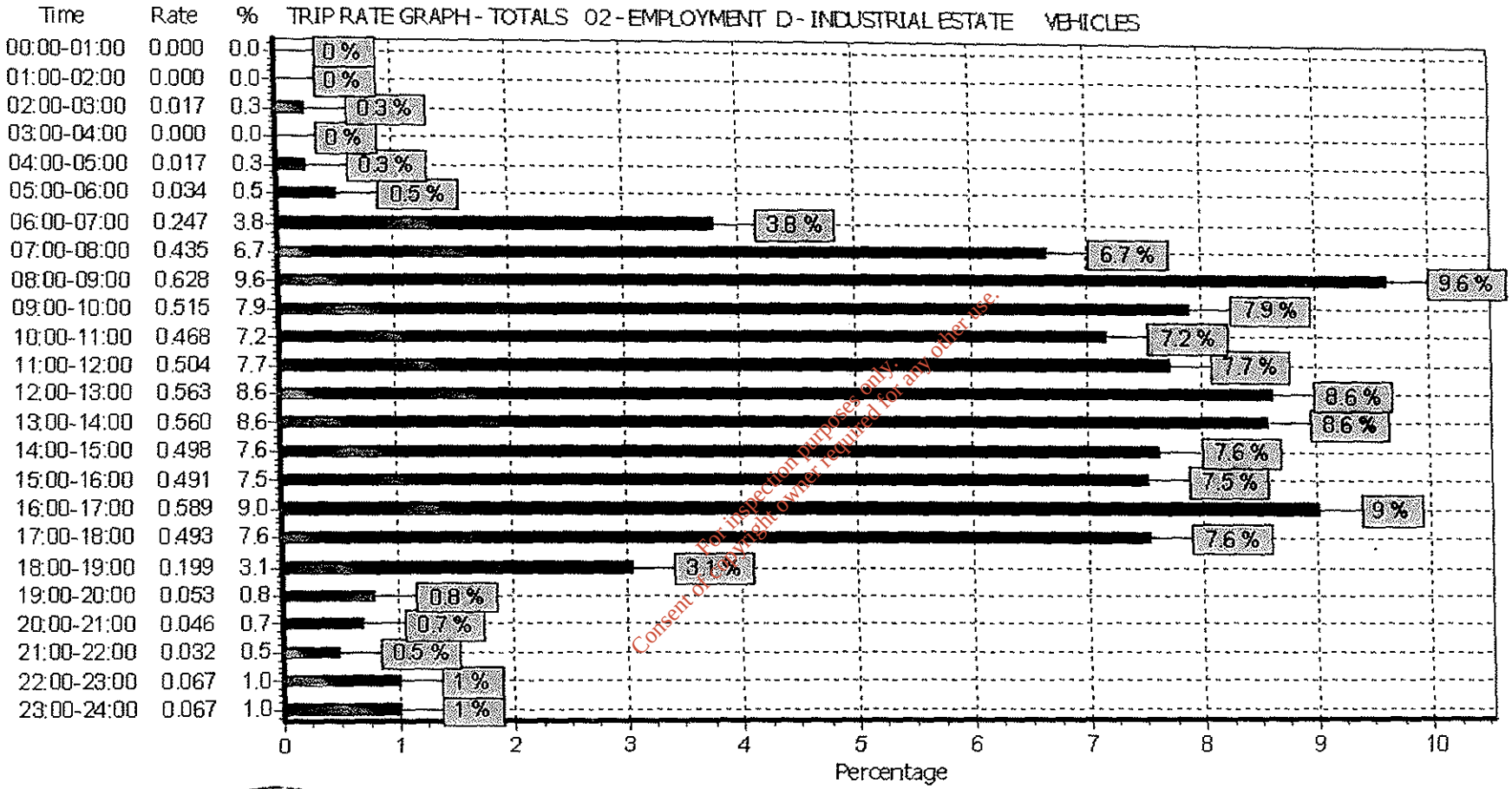
Trip rate parameter range selected:	552 - 234115 (units: sqm)
Survey date date range:	01/01/99 - 07/09/08
Number of weekdays (Monday-Friday):	33
Number of Saturdays:	0
Number of Sundays:	0
Optional parameters used in selection:	NO
Surveys manually removed from selection:	0

TRIP RATE GRAPH - ARRIVALS 02 - EMPLOYMENT D - INDUSTRIAL ESTATE VEHICLES

Time	Rate	%
00:00-01:00	0.000	0.0
01:00-02:00	0.000	0.0
02:00-03:00	0.000	0.0
03:00-04:00	0.000	0.0
04:00-05:00	0.017	0.5
05:00-06:00	0.017	0.5
06:00-07:00	0.161	5.0
07:00-08:00	0.320	9.9
08:00-09:00	0.450	13.9
09:00-10:00	0.304	9.4
10:00-11:00	0.236	7.3
11:00-12:00	0.248	7.6
12:00-13:00	0.253	7.8
13:00-14:00	0.276	8.5
14:00-15:00	0.244	7.5
15:00-16:00	0.221	6.8
16:00-17:00	0.202	6.2
17:00-18:00	0.115	3.5
18:00-19:00	0.066	2.0
19:00-20:00	0.015	0.5
20:00-21:00	0.016	0.5
21:00-22:00	0.016	0.5
22:00-23:00	0.050	1.5
23:00-24:00	0.017	0.5







APPENDIX D

PICADY OUTPUTS

PICADY

GUI Version: 5.00 AC
Analysis Program Release: 3.0 INTERIM (MAR 2006)

For sales and distribution information, program advice and maintenance, contact:

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Wokingham, Berks.
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Web: www.trlsoftware.co.uk

Run Analysis

Parameter	Values
File Run	W:\Projects\7097 - TIA Limerick WMF\05-Design\01-Calculations\PICADY\7097-AM.vpi
Date Run	12 February 2013
Time Run	11:59:00
Driving Side	Drive On The Left

Arm Names and Flow Scaling Factors

Arm	Arm Name	Flow Scaling Factor (%)
Arm A	N69 to Askeaton	100
Arm B	Development	100
Arm C	N69 to Limerick	100

Stream Labelling Convention

Stream A-B contains traffic going from A to B etc.

Run Information

Parameter	Values
Run Title	7097-Dock Road
Location	Limerick
Date	08 February 2013
Enumerator	Brendan Ward [DUB-35LJ52J-BW]
Job Number	7097
Status	TIA
Client	Greenstar
Description	-

Errors and Warnings

Parameter	Values
Warning	No Errors Or Warnings

Geometric Data

Geometric Parameters

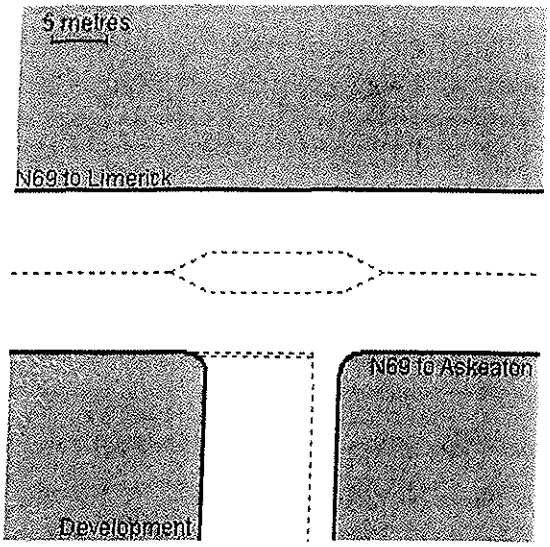
Parameter	Minor Arm B
Major Road Carriageway Width (m)	11.20
Major Road Kerbed Central Reserve Width (m)	0.00
Major Road Right Turning Lane Width (m)	3.80
Minor Road Width 0m Back from Junction (m)	10.00
Minor Road Width 5m Back from Junction (m)	8.00
Minor Road Width 10m Back from Junction (m)	6.00
Minor Road Width 15m Back from Junction (m)	3.00
Minor Road Width 20m Back from Junction (m)	3.00
Minor Road Derived Flare Length (PCU)	2.000
Minor Road Visibility To Right (m)	0
Minor Road Visibility To Left (m)	0
Major Road Right Turn Visibility (m)	100
Major Road Right Turn Blocks Traffic	No

Slope and Intercept Values

Stream	Intercept for Stream B-A	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	439.579	0.062	0.157	0.099	0.224
B-C	573.963	0.068	0.172	-	-
C-B	741.905	0.222	0.222	-	-

Note: Streams may be combined in which case capacity will be adjusted
These values do not allow for any site-specific corrections

Junction Diagram



Demand Data

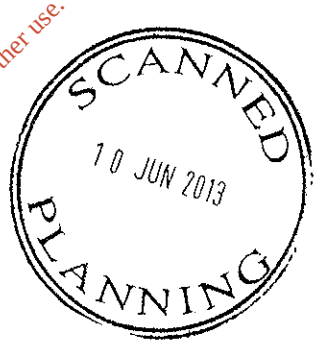
Modelling Periods

Parameter	Period	Duration (min)	Segment Length (min)
First Modelling Period	08:00-09:30	90	15

ODTAB Turning Counts

Demand Set: Existing AM
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	1127.0
Arm B	9.0	0.0	12.0
Arm C	844.0	10.0	0.0



Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	1172.0
Arm B	13.0	0.0	17.0
Arm C	863.0	14.0	0.0

Demand Set: AM 2028
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	1482.0
Arm B	9.0	0.0	12.0
Arm C	1109.0	10.0	0.0

Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	1527.0
Arm B	13.0	0.0	17.0
Arm C	1128.0	14.0	0.0

ODTAB Synthesised Flows

Demand Set: Existing AM
Modelling Period: 08:00-09:30

Arm	Rising Time	Rising Flow (veh/min)	Peak Time	Peak Flow (veh/min)	Falling Time	Falling Flow (veh/min)
Arm A	08:15	14.250	08:15	21.375	08:45	14.250
Arm B	08:15	0.262	08:15	0.394	08:45	0.262
Arm C	08:15	10.675	08:15	16.013	08:45	10.675

Heavy Vehicles Percentages

Demand Set: Existing AM
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: AM 2028
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

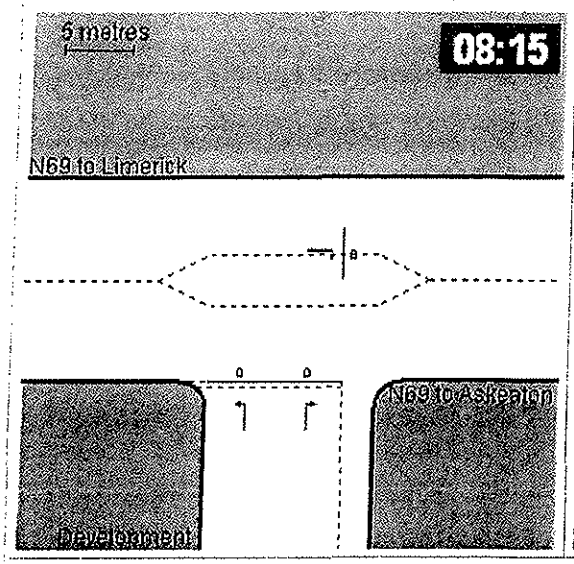
Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

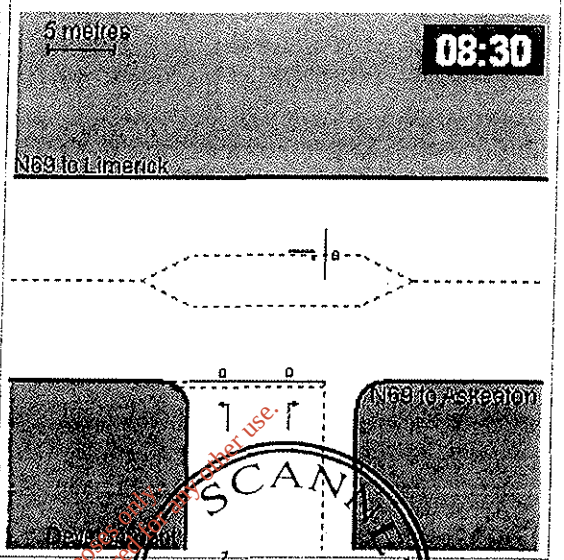
Queue Diagrams

Demand Set: Existing AM
Modelling Period: 08:00-09:30
View Extent: 40m

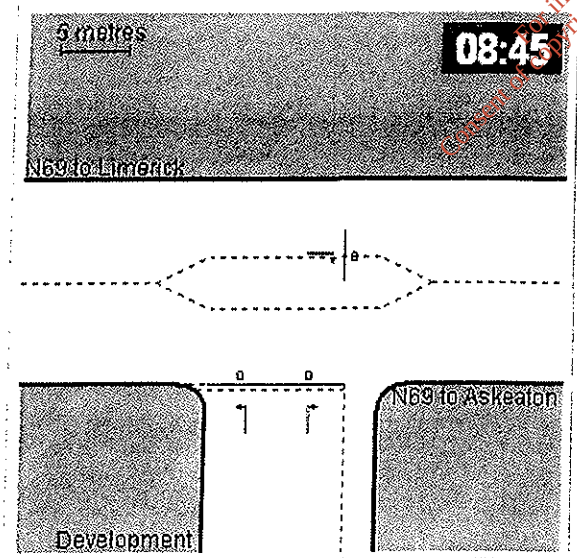
Queue Interval 1: 08:00-08:15



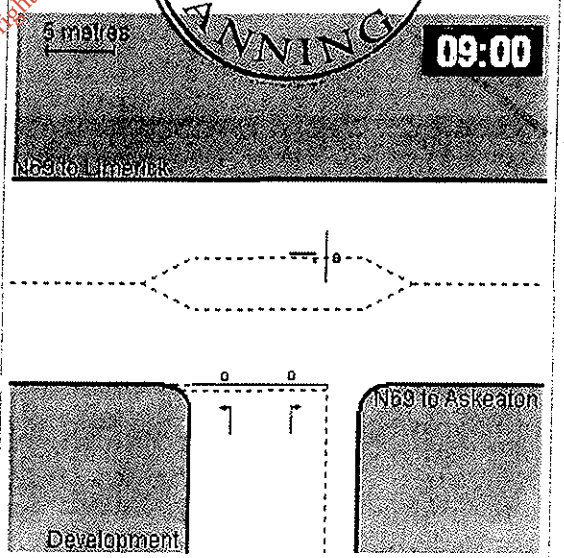
Queue Interval 2: 08:15-08:30

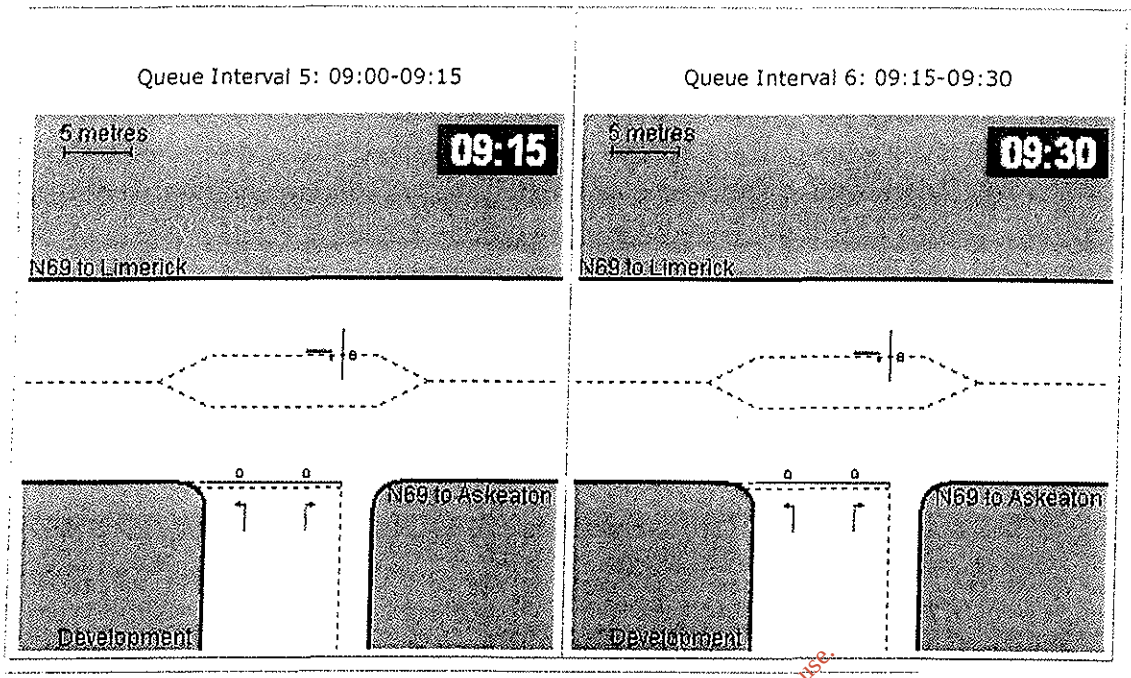


Queue Interval 3: 08:30-08:45



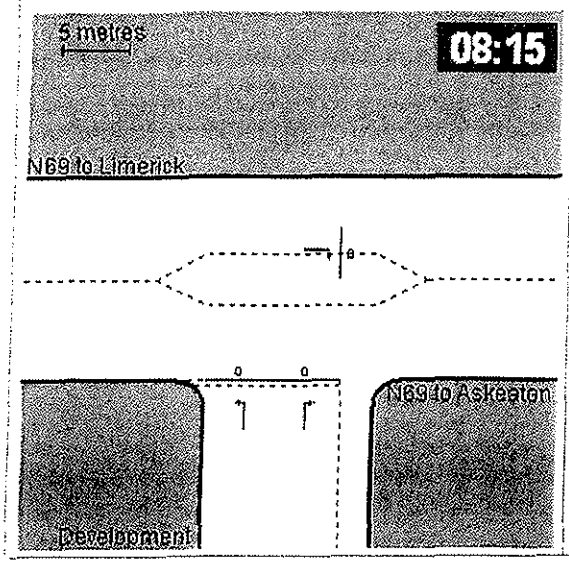
Queue Interval 4: 08:45-09:00



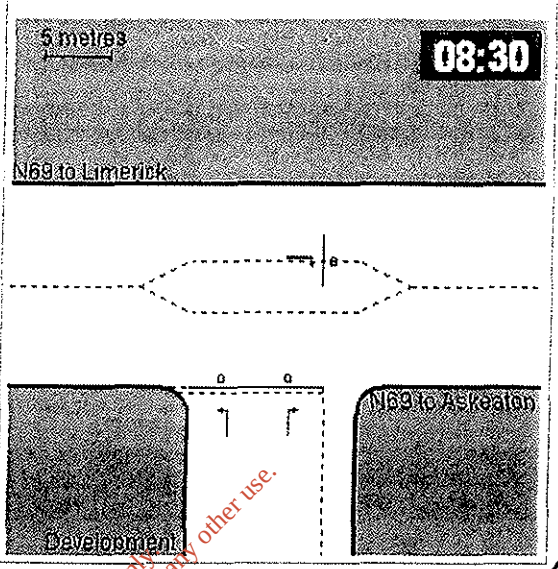


Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30
View Extent: 40m

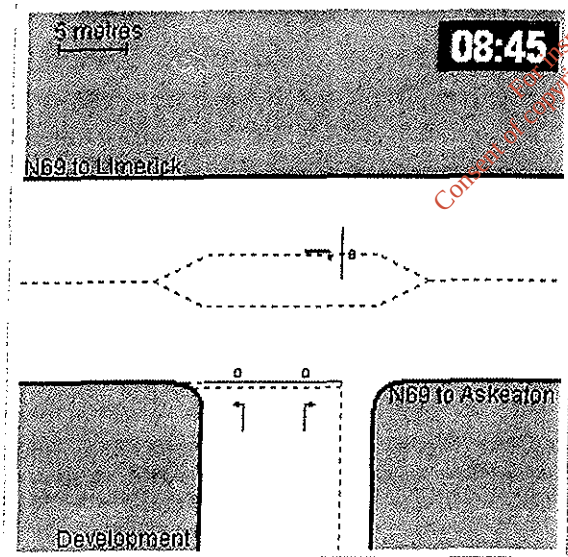
Queue Interval 1: 08:00-08:15



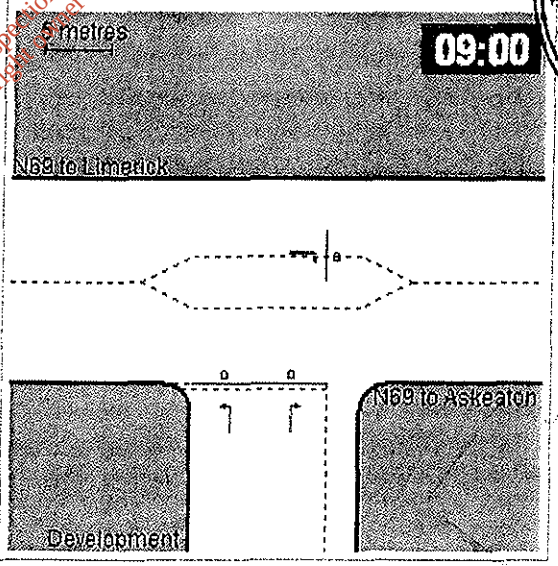
Queue Interval 2: 08:15-08:30



Queue Interval 3: 08:30-08:45

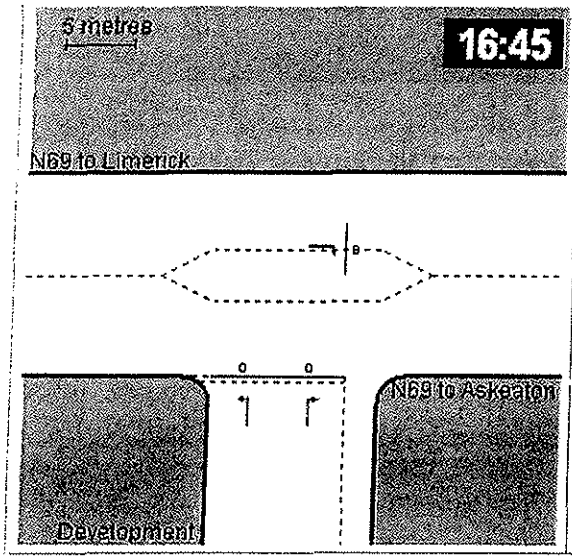


Queue Interval 4: 08:45-09:00

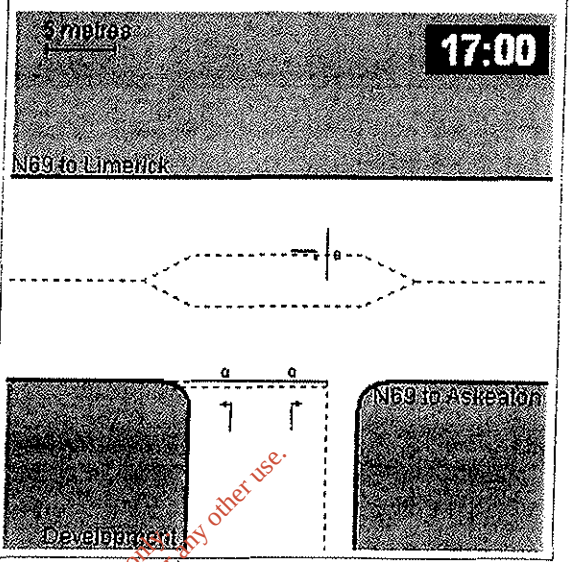


Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00
View Extent: 40m

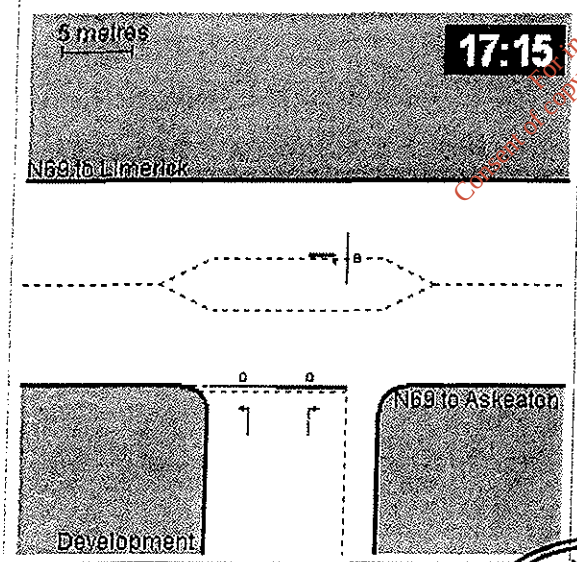
Queue Interval 1: 16:30-16:45



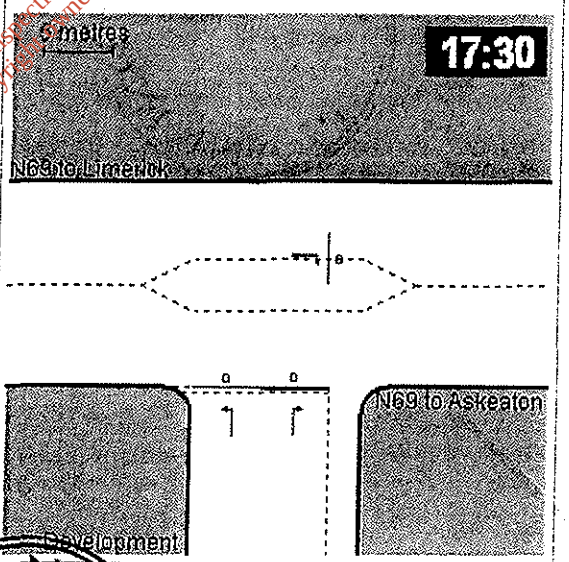
Queue Interval 2: 16:45-17:00

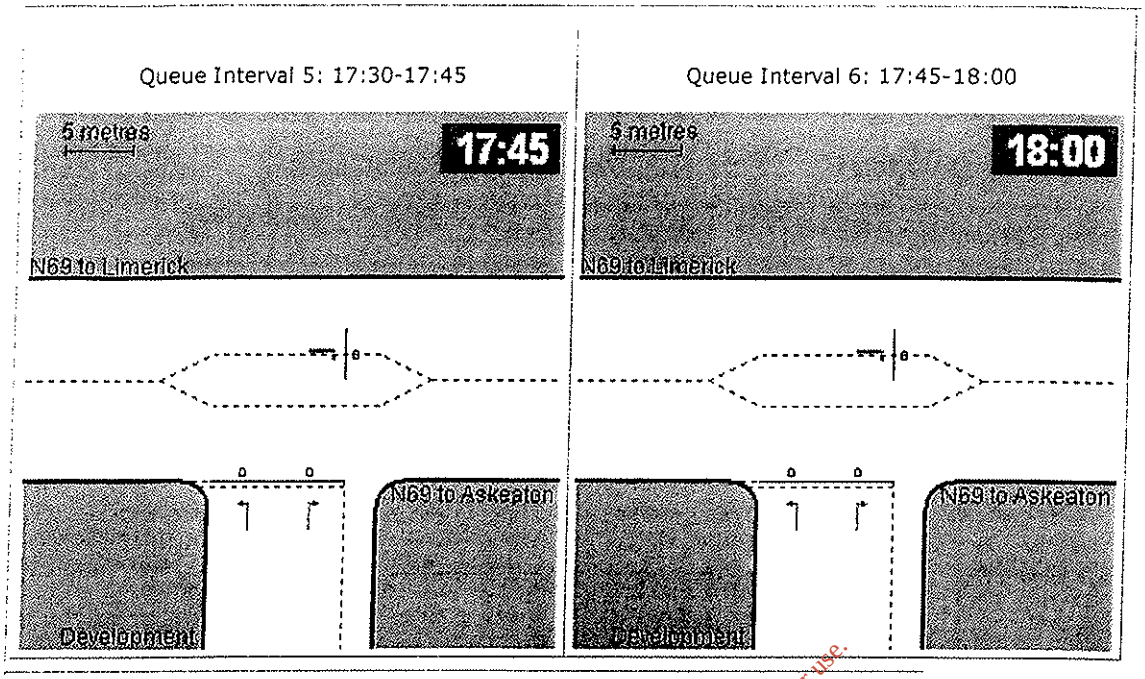


Queue Interval 3: 17:00-17:15



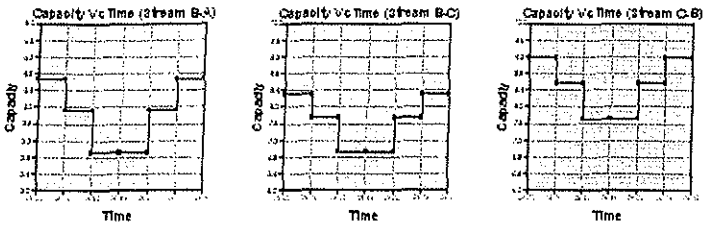
Queue Interval 4: 17:15-17:30



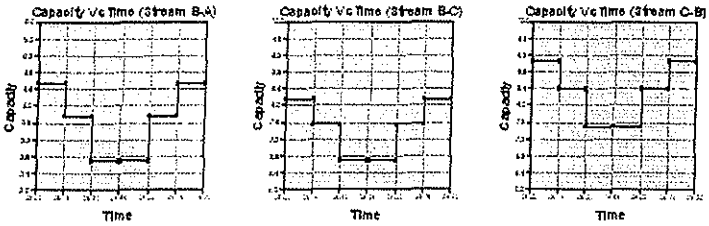


Capacity Graph

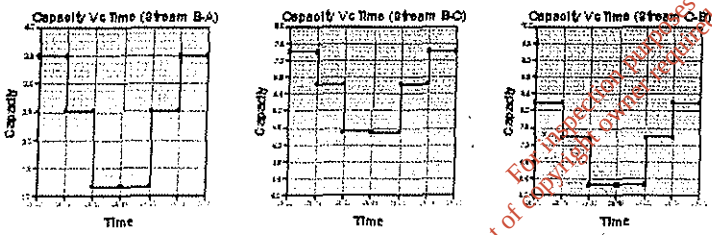
Demand Set: Existing AM
Modelling Period: 08:00-09:30



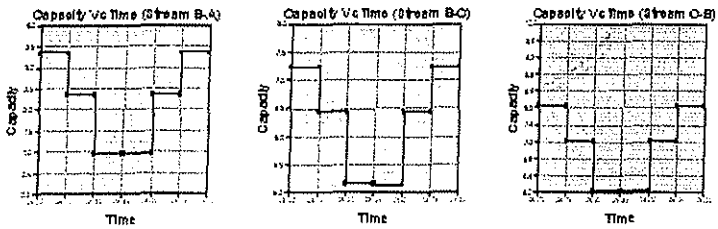
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

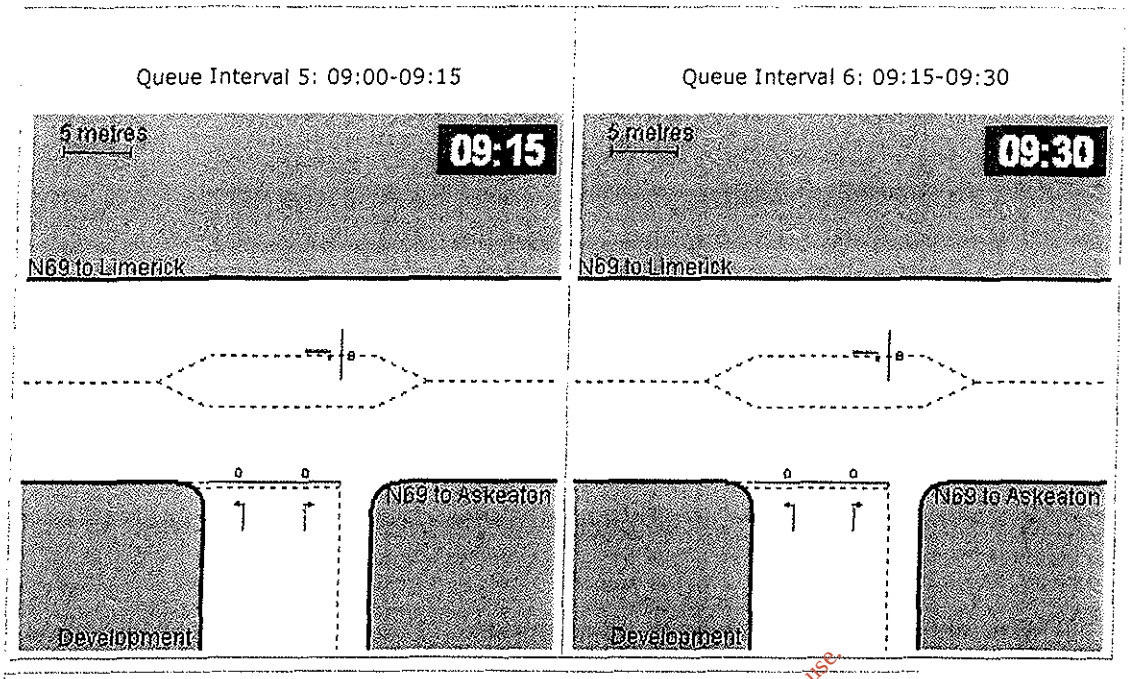


Demand Set: AM 2028
Modelling Period: 08:00-09:30



Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

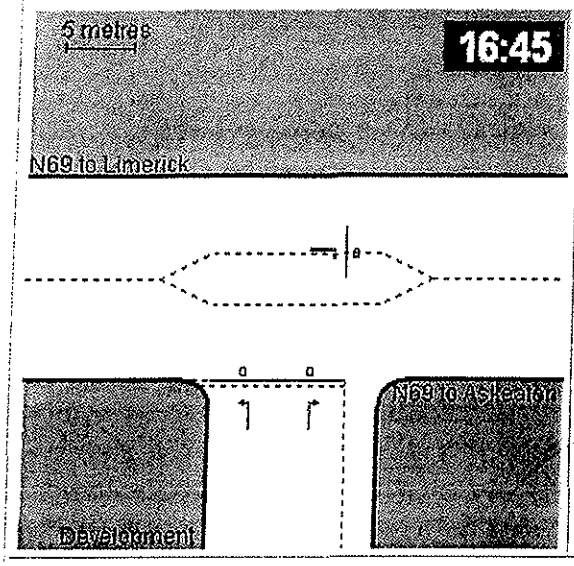




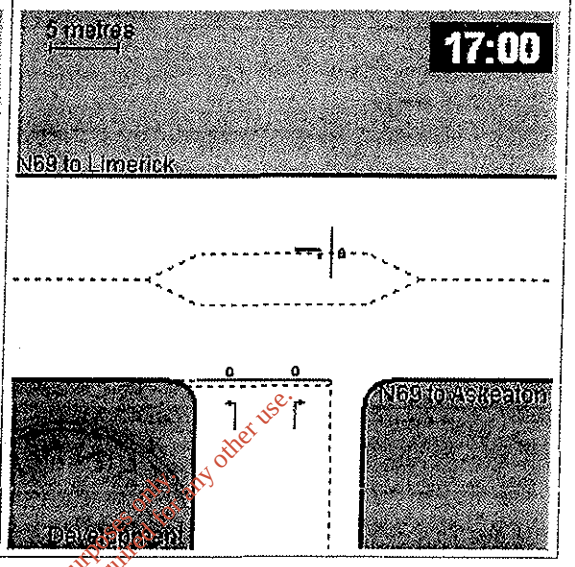
Queue Diagrams

Demand Set: Existing PM
Modelling Period: 16:30-18:00
View Extent: 40m

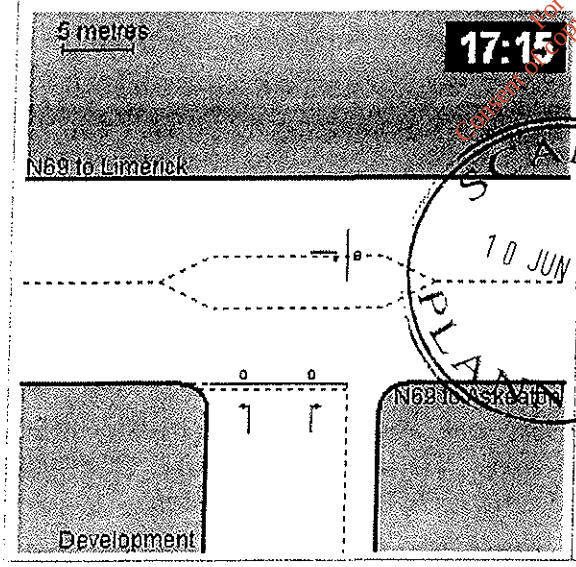
Queue Interval 1: 16:30-16:45



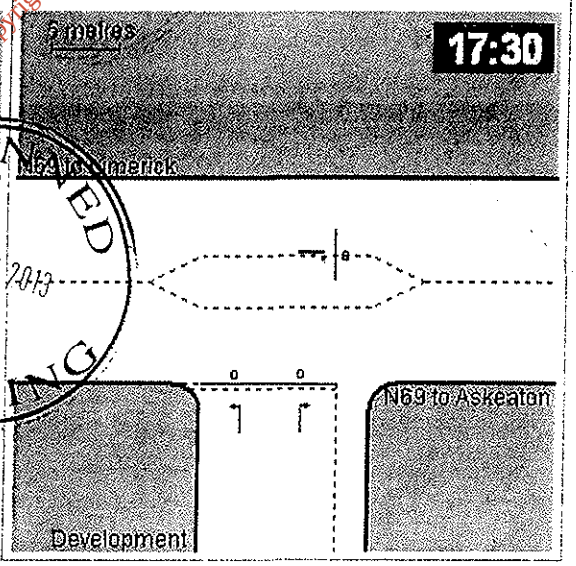
Queue Interval 2: 16:45-17:00

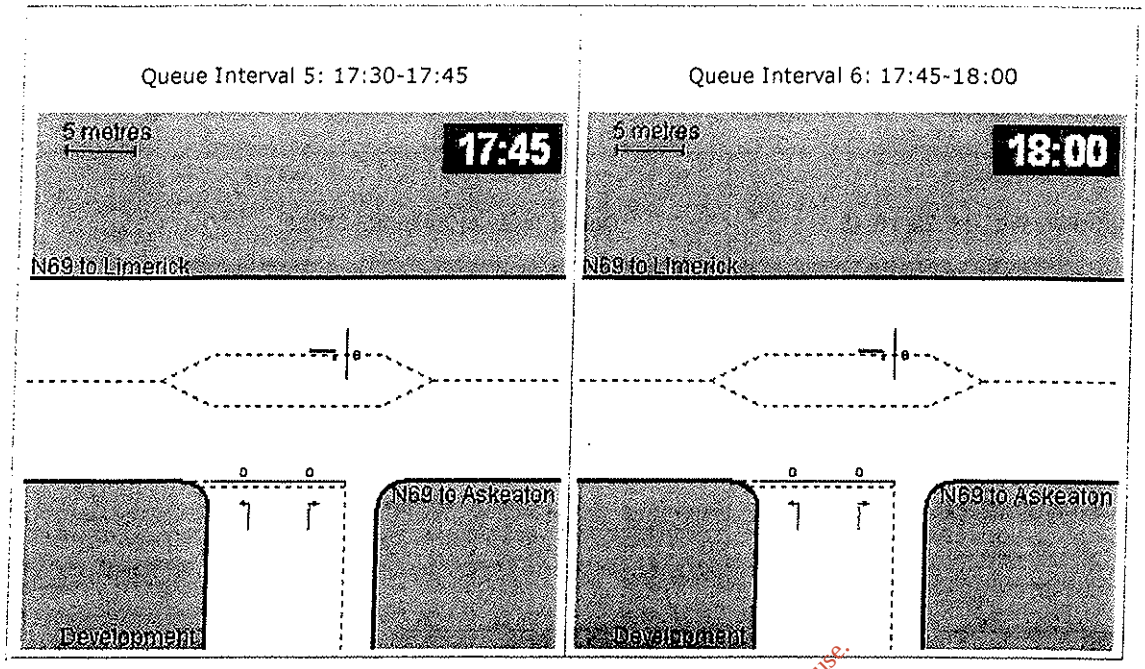


Queue Interval 3: 17:00-17:15



Queue Interval 4: 17:15-17:30





Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: PM 2028
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	856.0
Arm B	33.0	0.0	25.0
Arm C	1202.0	20.0	0.0

Demand Set: PM 2028
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	1064.0
Arm B	23.0	0.0	17.0
Arm C	1547.0	14.0	0.0

Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	19.0	1111.0
Arm B	33.0	0.0	25.0
Arm C	1573.0	20.0	0.0

ODTAB Synthesised Flows

Demand Set: Existing PM
Modelling Period: 16:30-18:00

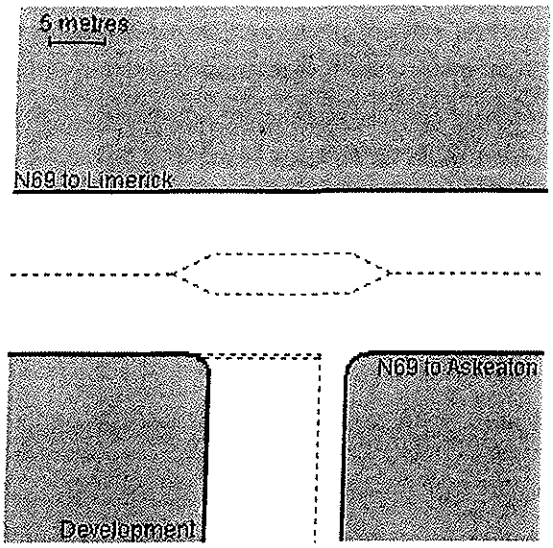
Arm	Rising Time	Rising Flow (veh/min)	Peak Time	Peak Flow (veh/min)	Falling Time	Falling Flow (veh/min)
Arm A	16:45	10.275	16:45	15.412	17:15	10.275
Arm B	16:45	0.500	16:45	0.750	17:15	0.500
Arm C	16:45	14.875	16:45	22.313	17:15	14.875

Heavy Vehicles Percentages

Demand Set: Existing PM
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	-	0.0	0.0
Arm B	0.0	-	0.0
Arm C	0.0	0.0	-

Junction Diagram



Demand Data

Modelling Periods

Parameter	Period	Duration (min)	Segment Length (min)
First Modelling Period	16:30-18:00	90	15

ODTAB Turning Counts

Demand Set: Existing PM
Modelling Period: 16:30-18:00

From/To	Arm A	Arm B	Arm C
Arm A	0.0	13.0	809.0
Arm B	23.0	0.0	17.0
Arm C	1176.0	14.0	0.0

Errors and Warnings

Parameter	Values
Warning	No Errors Or Warnings

Geometric Data

Geometric Parameters

Parameter	Minor Arm B
Major Road Carriageway Width (m)	11.20
Major Road Kerbed Central Reserve Width (m)	0.00
Major Road Right Turning Lane Width (m)	3.80
Minor Road Width 0m Back from Junction (m)	10.00
Minor Road Width 5m Back from Junction (m)	8.00
Minor Road Width 10m Back from Junction (m)	6.00
Minor Road Width 15m Back from Junction (m)	3.00
Minor Road Width 20m Back from Junction (m)	3.00
Minor Road Derived Flare Length (PCU)	2.000
Minor Road Visibility To Right (m)	0
Minor Road Visibility To Left (m)	0
Major Road Right Turn Visibility (m)	100
Major Road Right Turn Blocks Traffic	No

Slope and Intercept Values

Stream	Intercept for Stream B-A	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
B-A	439.579	0.062	0.157	0.099	0.224
B-C	573.963	0.068	0.172	-	-
C-B	741.905	0.222	0.222	-	-

Note: Streams may be combined in which case capacity will be adjusted
These values do not allow for any site-specific corrections

PICADY

GUI Version: 5.00 AC
Analysis Program Release: 3.0 INTERIM (MAR 2006)

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Web: www.trlsoftware.co.uk

Run Analysis

Parameter	Values
File Run	W:\Projects\7097 - TIA Limerick WMF\05-Design\01-Calculations\PICADY\7097-PM.vpi
Date Run	12 February 2013
Time Run	12:04:42
Driving Side	Drive On The Left

Arm Names and Flow Scaling Factors

Arm	Arm Name	Flow Scaling Factor (%)
Arm A	N69 to Askeaton	100
Arm B	Development	100
Arm C	N69 to Limerick	100

Stream Labelling Convention

Stream A-B contains traffic going from A to B etc.

Run Information

Parameter	Values
Run Title	7097-Dock Road
Location	Limerick
Date	08 February 2013
Enumerator	Brendan Ward [DUB-35LJ52J-BW]
Job Number	7097
Status	TIA
Client	Greenstar
Description	-

Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	17.9	11.9	12.8	0.7	12.8	0.7
B-C	23.4	15.6	4.0	0.2	4.0	0.2
C-A	1552.6	1035.1	-	-	-	-
C-B	19.3	12.8	2.9	0.1	2.9	0.1
A-B	26.2	17.4	-	-	-	-
A-C	2101.8	1401.2	-	-	-	-
All	**3741.1**	**2494.1**	**19.7**	**0.0**	**19.7**	**0.0**

Delay is that occurring only within the time period.
Inclusive delay includes delay suffered by vehicles which are still queuing after the end of the time period.
These will only be significantly different if there is a large queue remaining at the end of the time period.

PICADY 5 Run Successful

Overall Queues & Delays

Queueing Delay Information Over Whole Period

Demand Set: Existing AM
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	12.4	8.3	3.5	0.3	3.5	0.3
B-C	16.5	11.0	2.2	0.1	2.2	0.1
C-A	1161.7	774.5	-	-	-	-
C-B	13.8	9.2	1.7	0.1	1.7	0.1
A-B	17.9	11.9	-	-	-	-
A-C	1551.2	1034.2	-	-	-	-
All	**2773.5**	**1849.0**	**7.4**	**0.0**	**7.4**	**0.0**

Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	17.9	11.9	5.5	0.3	5.5	0.3
B-C	23.4	15.6	3.3	0.1	3.3	0.1
C-A	1187.9	791.9	-	-	-	-
C-B	19.3	12.8	2.4	0.1	2.4	0.1
A-B	26.2	17.4	-	-	-	-
A-C	1613.2	1075.4	-	-	-	-
All	**2887.7**	**1925.2**	**11.2**	**0.0**	**11.2**	**0.0**

Demand Set: AM 2028
Modelling Period: 08:00-09:30

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	12.4	8.3	7.1	0.6	7.1	0.6
B-C	16.5	11.0	2.7	0.2	2.7	0.2
C-A	1526.5	1017.6	-	-	-	-
C-B	13.8	9.2	2.0	0.1	2.0	0.1
A-B	17.9	11.9	-	-	-	-
A-C	2039.9	1359.9	-	-	-	-
All	**3626.9**	**2417.9**	**11.8**	**0.0**	**11.8**	**0.0**

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.24	0.95	0.250	-	0.09	0.30	-	3.8	1.35
	B-C	0.31	5.16	0.060	-	0.04	0.06	-	0.9	0.21
	C-A	20.70	-	-	-	-	-	-	-	-
	C-B	0.26	6.06	0.042	-	0.03	0.04	-	0.6	0.17
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	28.02	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.24	0.95	0.250	-	0.30	0.32	-	4.6	1.40
	B-C	0.31	5.14	0.061	-	0.06	0.06	-	1.0	0.21
	C-A	20.70	-	-	-	-	-	-	-	-
	C-B	0.26	6.06	0.042	-	0.04	0.04	-	0.7	0.17
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	28.02	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.19	2.34	0.083	-	0.32	0.09	-	1.6	0.47
	B-C	0.25	6.43	0.040	-	0.06	0.04	-	0.6	0.16
	C-A	16.90	-	-	-	-	-	-	-	-
	C-B	0.21	7.21	0.029	-	0.04	0.03	-	0.5	0.14
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	22.88	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.16	3.34	0.049	-	0.09	0.05	-	0.8	0.32
	B-C	0.21	7.24	0.029	-	0.04	0.03	-	0.5	0.14
	C-A	14.15	-	-	-	-	-	-	-	-
	C-B	0.18	8.05	0.022	-	0.03	0.02	-	0.3	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.16	-	-	-	-	-	-	-	-

Entry capacities marked with an '(X)' are dominated by a pedestrian crossing in that time segment.
In time segments marked with a '(B)', traffic leaving the junction may block back from a crossing so impairing normal operation of the junction.
Delays marked with '##' could not be calculated.

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.13	2.51	0.054	-	0.16	0.06	-	1.0	0.42
	B-C	0.18	6.63	0.027	-	0.04	0.03	-	0.4	0.16
	C-A	16.62	-	-	-	-	-	-	-	-
	C-B	0.15	7.38	0.020	-	0.03	0.02	-	0.3	0.14
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	22.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.11	3.48	0.032	-	0.06	0.03	-	0.5	0.30
	B-C	0.15	7.40	0.020	-	0.03	0.02	-	0.3	0.14
	C-A	13.92	-	-	-	-	-	-	-	-
	C-B	0.13	8.19	0.015	-	0.02	0.02	-	0.2	0.12
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	18.60	-	-	-	-	-	-	-	-

Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.16	3.34	0.049	-	0.00	0.05	-	0.7	0.31
	B-C	0.21	7.24	0.029	-	0.00	0.03	-	0.4	0.14
	C-A	14.15	-	-	-	-	-	-	-	-
	C-B	0.18	8.05	0.022	-	0.00	0.02	-	0.3	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.16	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.19	2.34	0.083	-	0.05	0.09	-	1.2	0.46
	B-C	0.25	6.44	0.040	-	0.03	0.04	-	0.6	0.16
	C-A	16.90	-	-	-	-	-	-	-	-
	C-B	0.21	7.21	0.029	-	0.02	0.03	-	0.4	0.14
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	22.88	-	-	-	-	-	-	-	-

Demand Set: AM 2028
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.11	3.49	0.032	-	0.00	0.03	-	0.5	0.30
	B-C	0.15	7.40	0.020	-	0.00	0.02	-	0.3	0.14
	C-A	13.92	-	-	-	-	-	-	-	-
	C-B	0.13	8.19	0.015	-	0.00	0.02	-	0.2	0.12
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	18.60	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.13	2.51	0.054	-	0.03	0.06	-	0.8	0.42
	B-C	0.18	6.64	0.027	-	0.02	0.03	-	0.4	0.15
	C-A	16.62	-	-	-	-	-	-	-	-
	C-B	0.15	7.38	0.020	-	0.02	0.02	-	0.3	0.14
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	22.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.17	1.17	0.141	-	0.06	0.15	-	2.0	0.98
	B-C	0.22	5.51	0.040	-	0.03	0.04	-	0.6	0.19
	C-A	20.35	-	-	-	-	-	-	-	-
	C-B	0.18	6.26	0.029	-	0.02	0.03	-	0.4	0.16
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	27.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.17	1.17	0.141	-	0.15	0.16	-	2.3	0.99
	B-C	0.22	5.50	0.040	-	0.04	0.04	-	0.6	0.19
	C-A	20.35	-	-	-	-	-	-	-	-
	C-B	0.18	6.26	0.029	-	0.03	0.03	-	0.4	0.16
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	27.20	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.24	2.69	0.089	-	0.05	0.09	-	1.3	0.41
	B-C	0.31	6.70	0.047	-	0.03	0.05	-	0.7	0.16
	C-A	15.84	-	-	-	-	-	-	-	-
	C-B	0.26	7.50	0.034	-	0.03	0.04	-	0.5	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	21.51	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.24	2.69	0.089	-	0.09	0.10	-	1.4	0.41
	B-C	0.31	6.69	0.047	-	0.05	0.05	-	0.7	0.16
	C-A	15.84	-	-	-	-	-	-	-	-
	C-B	0.26	7.50	0.034	-	0.04	0.04	-	0.5	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	21.51	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.19	3.76	0.052	-	0.10	0.06	-	0.9	0.28
	B-C	0.25	7.55	0.034	-	0.05	0.04	-	0.5	0.14
	C-A	12.93	-	-	-	-	-	-	-	-
	C-B	0.21	8.40	0.025	-	0.04	0.03	-	0.4	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	17.56	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.16	4.53	0.036	-	0.06	0.04	-	0.6	0.23
	B-C	0.21	8.16	0.026	-	0.04	0.03	-	0.4	0.13
	C-A	10.83	-	-	-	-	-	-	-	-
	C-B	0.18	9.04	0.019	-	0.03	0.02	-	0.3	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.71	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:00-09:15	B-A	0.13	3.93	0.034	-	0.06	0.04	-	0.6	0.26
	B-C	0.18	7.74	0.023	-	0.03	0.02	-	0.4	0.13
	C-A	12.65	-	-	-	-	-	-	-	-
	C-B	0.15	8.57	0.017	-	0.02	0.02	-	0.3	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	16.89	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
09:15-09:30	B-A	0.11	4.67	0.024	-	0.04	0.03	-	0.4	0.22
	B-C	0.15	8.31	0.018	-	0.02	0.02	-	0.3	0.12
	C-A	10.59	-	-	-	-	-	-	-	-
	C-B	0.13	9.18	0.014	-	0.02	0.02	-	0.2	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	14.14	-	-	-	-	-	-	-	-

Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.16	4.54	0.036	-	0.00	0.04	-	0.5	0.23
	B-C	0.21	8.16	0.026	-	0.00	0.03	-	0.4	0.13
	C-A	10.83	-	-	-	-	-	-	-	-
	C-B	0.18	9.04	0.019	-	0.00	0.02	-	0.3	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.71	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.19	3.76	0.052	-	0.04	0.05	-	0.8	0.28
	B-C	0.25	7.55	0.034	-	0.03	0.03	-	0.5	0.14
	C-A	12.93	-	-	-	-	-	-	-	-
	C-B	0.21	8.40	0.025	-	0.02	0.03	-	0.4	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	17.56	-	-	-	-	-	-	-	-

Queues & Delays

Demand Set: Existing AM
Modelling Period: 08:00-09:30

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:00-08:15	B-A	0.11	4.67	0.024	-	0.00	0.02	-	0.3	0.22
	B-C	0.15	8.31	0.018	-	0.00	0.02	-	0.3	0.12
	C-A	10.59	-	-	-	-	-	-	-	-
	C-B	0.13	9.18	0.014	-	0.00	0.01	-	0.2	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	14.14	-	-	-	-	-	-	-	-

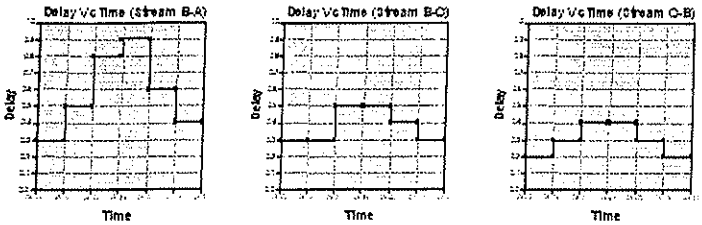
Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:15-08:30	B-A	0.13	3.93	0.034	-	0.02	0.03	-	0.5	0.26
	B-C	0.18	7.74	0.023	-	0.02	0.02	-	0.3	0.13
	C-A	12.65	-	-	-	-	-	-	-	-
	C-B	0.15	8.57	0.017	-	0.01	0.02	-	0.3	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	16.89	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:30-08:45	B-A	0.17	2.91	0.057	-	0.03	0.06	-	0.8	0.36
	B-C	0.22	6.93	0.032	-	0.02	0.03	-	0.5	0.15
	C-A	15.49	-	-	-	-	-	-	-	-
	C-B	0.18	7.71	0.024	-	0.02	0.02	-	0.4	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	20.68	-	-	-	-	-	-	-	-

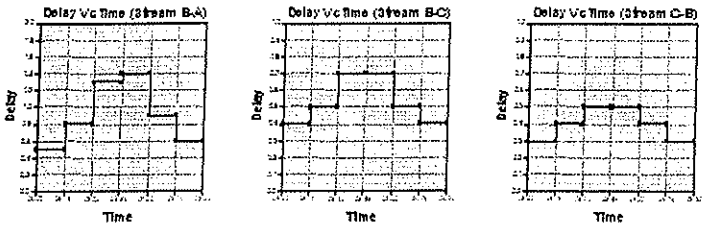
Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
08:45-09:00	B-A	0.17	2.91	0.057	-	0.06	0.06	-	0.9	0.36
	B-C	0.22	6.93	0.032	-	0.03	0.03	-	0.5	0.15
	C-A	15.49	-	-	-	-	-	-	-	-
	C-B	0.18	7.71	0.024	-	0.02	0.02	-	0.4	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	20.68	-	-	-	-	-	-	-	-

Delay Graph

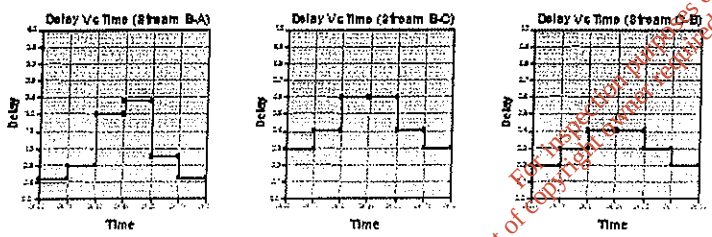
Demand Set: Existing AM
Modelling Period: 08:00-09:30



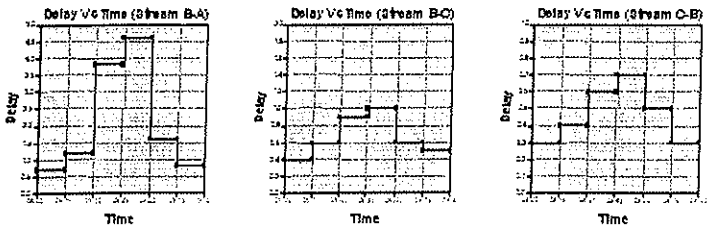
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30



Demand Set: AM 2028
Modelling Period: 08:00-09:30

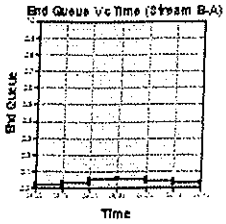


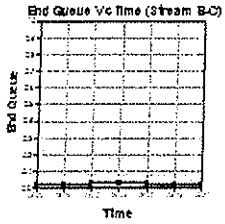
Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

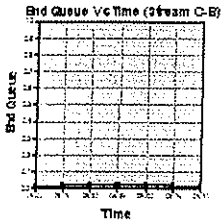


End Queue Graph

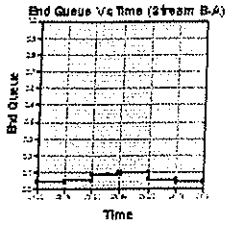
Demand Set: Existing AM
Modelling Period: 08:00-09:30

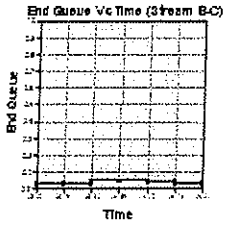


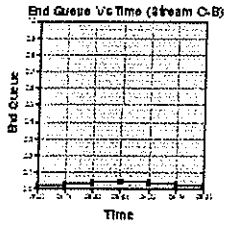




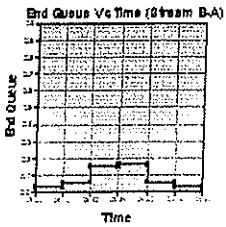
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30

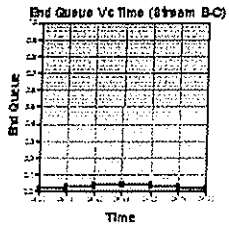


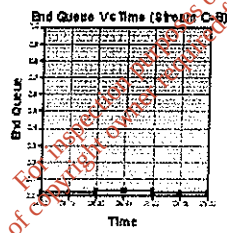




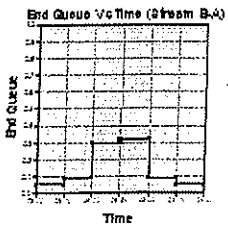
Demand Set: AM 2028
Modelling Period: 08:00-09:30

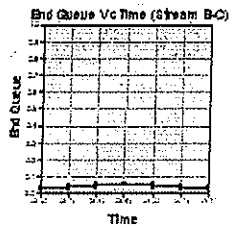


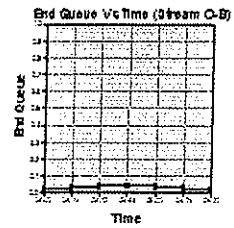




Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

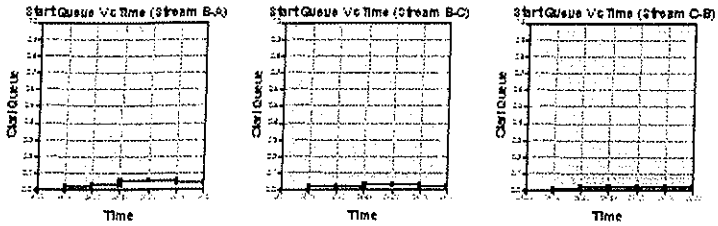




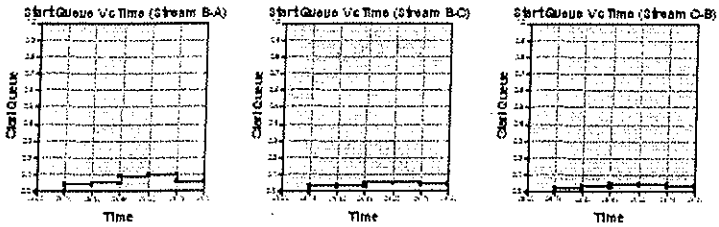


Start Queue Graph

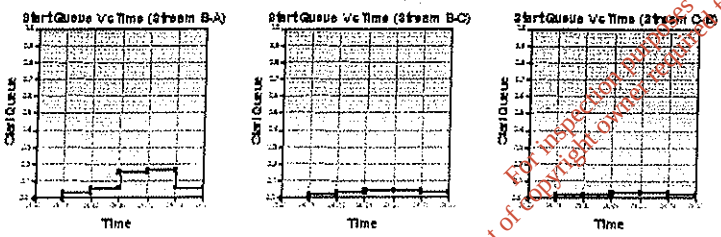
Demand Set: Existing AM
Modelling Period: 08:00-09:30



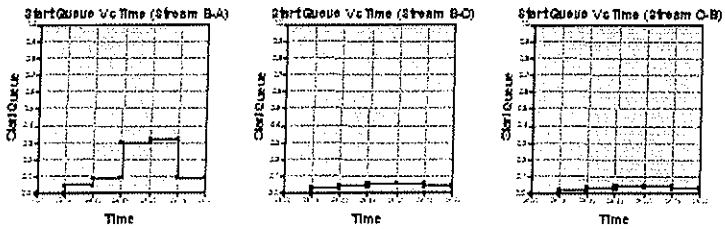
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30



Demand Set: AM 2028
Modelling Period: 08:00-09:30



Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30



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Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	45.4	30.3	29.9	0.7	29.9	0.7
B-C	34.4	22.9	5.2	0.2	5.2	0.2
C-A	2165.1	1443.4	-	-	-	-
C-B	27.5	18.4	3.4	0.1	3.4	0.1
A-B	26.2	17.4	-	-	-	-
A-C	1529.2	1019.5	-	-	-	-
All	**3827.8**	**2551.9**	**38.5**	**0.0**	**38.5**	**0.0**

Delay is that occurring only within the time period.
Inclusive delay includes delay suffered by vehicles which are still queuing after the end of the time period.
These will only be significantly different if there is a large queue remaining at the end of the time period.

PICADY 5 Run Successful

Overall Queues & Delays

Queueing Delay Information Over Whole Period

Demand Set: Existing PM
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	31.7	21.1	8.7	0.3	8.7	0.3
B-C	23.4	15.6	2.9	0.1	2.9	0.1
C-A	1618.7	1079.1	-	-	-	-
C-B	19.3	12.8	2.1	0.1	2.1	0.1
A-B	17.9	11.9	-	-	-	-
A-C	1113.5	742.4	-	-	-	-
All	**2824.4**	**1883.0**	**13.6**	**0.0**	**13.6**	**0.0**

Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	45.4	30.3	14.1	0.3	14.1	0.3
B-C	34.4	22.9	4.4	0.1	4.4	0.1
C-A	1654.5	1103.0	-	-	-	-
C-B	27.5	18.4	3.0	0.1	3.0	0.1
A-B	26.2	17.4	-	-	-	-
A-C	1178.2	785.5	-	-	-	-
All	**2966.2**	**1977.5**	**21.6**	**0.0**	**21.6**	**0.0**

Demand Set: PM 2028
Modelling Period: 16:30-18:00

Stream	Total Demand (veh)	Total Demand (veh/h)	Queueing Delay (min)	Queueing Delay (min/veh)	Inclusive Delay (min)	Inclusive Delay (min/veh)
B-A	31.7	21.1	15.8	0.5	15.8	0.5
B-C	23.4	15.6	3.3	0.1	3.3	0.1
C-A	2129.3	1419.6	-	-	-	-
C-B	19.3	12.8	2.3	0.1	2.3	0.1
A-B	17.9	11.9	-	-	-	-
A-C	1464.5	976.3	-	-	-	-
All	**3686.1**	**2457.4**	**21.3**	**0.0**	**21.3**	**0.0**

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.61	1.39	0.435	-	0.22	0.68	-	8.6	1.19
	B-C	0.46	6.02	0.076	-	0.05	0.08	-	1.2	0.18
	C-A	28.87	-	-	-	-	-	-	-	-
	C-B	0.37	7.75	0.047	-	0.04	0.05	-	0.7	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	20.39	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.61	1.39	0.435	-	0.68	0.72	-	10.5	1.26
	B-C	0.46	5.93	0.077	-	0.08	0.08	-	1.2	0.18
	C-A	28.87	-	-	-	-	-	-	-	-
	C-B	0.37	7.75	0.047	-	0.05	0.05	-	0.7	0.14
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	20.39	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.49	2.71	0.182	-	0.72	0.23	-	3.9	0.46
	B-C	0.37	7.36	0.051	-	0.08	0.05	-	0.8	0.14
	C-A	23.57	-	-	-	-	-	-	-	-
	C-B	0.30	8.60	0.035	-	0.05	0.04	-	0.6	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	16.65	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.41	3.67	0.113	-	0.23	0.13	-	2.1	0.31
	B-C	0.31	8.06	0.039	-	0.05	0.04	-	0.6	0.13
	C-A	19.74	-	-	-	-	-	-	-	-
	C-B	0.25	9.21	0.027	-	0.04	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	13.94	-	-	-	-	-	-	-	-

Entry capacities marked with an '(X)' are dominated by a pedestrian crossing in that time segment.
In time segments marked with a '(B)', traffic leaving the junction may block back from a crossing so impairing normal operation of the junction.
Delays marked with '##' could not be calculated.

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.34	2.92	0.118	-	0.33	0.14	-	2.2	0.39
	B-C	0.25	7.64	0.033	-	0.05	0.03	-	0.5	0.14
	C-A	23.18	-	-	-	-	-	-	-	-
	C-B	0.21	8.78	0.024	-	0.03	0.02	-	0.4	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	15.94	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.29	3.85	0.075	-	0.14	0.08	-	1.3	0.28
	B-C	0.21	8.24	0.026	-	0.03	0.03	-	0.4	0.12
	C-A	19.41	-	-	-	-	-	-	-	-
	C-B	0.18	9.36	0.019	-	0.02	0.02	-	0.3	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	13.35	-	-	-	-	-	-	-	-

Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.41	3.67	0.113	-	0.00	0.12	-	1.7	0.31
	B-C	0.31	8.07	0.039	-	0.00	0.04	-	0.6	0.13
	C-A	19.74	-	-	-	-	-	-	-	-
	C-B	0.25	9.21	0.027	-	0.00	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	13.94	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.49	2.71	0.182	-	0.12	0.22	-	3.0	0.45
	B-C	0.37	7.39	0.051	-	0.04	0.05	-	0.8	0.14
	C-A	23.57	-	-	-	-	-	-	-	-
	C-B	0.30	8.60	0.035	-	0.03	0.04	-	0.5	0.12
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	16.65	-	-	-	-	-	-	-	-

Demand Set: PM 2028
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.29	3.85	0.075	-	0.00	0.08	-	1.1	0.28
	B-C	0.21	8.25	0.026	-	0.00	0.03	-	0.4	0.12
	C-A	19.41	-	-	-	-	-	-	-	-
	C-B	0.18	9.36	0.019	-	0.00	0.02	-	0.3	0.11
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	13.35	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.34	2.92	0.118	-	0.08	0.13	-	1.8	0.39
	B-C	0.25	7.65	0.033	-	0.03	0.03	-	0.5	0.14
	C-A	23.18	-	-	-	-	-	-	-	-
	C-B	0.21	8.78	0.024	-	0.02	0.02	-	0.4	0.12
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	15.94	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.42	1.65	0.257	-	0.13	0.32	-	4.3	0.80
	B-C	0.31	6.67	0.047	-	0.03	0.05	-	0.7	0.16
	C-A	28.39	-	-	-	-	-	-	-	-
	C-B	0.26	7.97	0.032	-	0.02	0.03	-	0.5	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.52	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.42	1.64	0.257	-	0.32	0.33	-	4.9	0.82
	B-C	0.31	6.65	0.047	-	0.05	0.05	-	0.7	0.16
	C-A	28.39	-	-	-	-	-	-	-	-
	C-B	0.26	7.97	0.032	-	0.03	0.03	-	0.5	0.13
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	19.52	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.61	3.04	0.199	-	0.14	0.24	-	3.4	0.41
	B-C	0.46	7.53	0.061	-	0.05	0.06	-	0.9	0.14
	C-A	22.06	-	-	-	-	-	-	-	-
	C-B	0.37	8.79	0.042	-	0.03	0.04	-	0.6	0.12
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	15.71	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.61	3.04	0.199	-	0.24	0.24	-	3.6	0.41
	B-C	0.46	7.52	0.061	-	0.06	0.06	-	1.0	0.14
	C-A	22.06	-	-	-	-	-	-	-	-
	C-B	0.37	8.79	0.042	-	0.04	0.04	-	0.6	0.12
	A-B	0.35	-	-	-	-	-	-	-	-
	A-C	15.71	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.49	4.06	0.122	-	0.24	0.14	-	2.2	0.28
	B-C	0.37	8.25	0.045	-	0.06	0.05	-	0.7	0.13
	C-A	18.01	-	-	-	-	-	-	-	-
	C-B	0.30	9.45	0.032	-	0.04	0.03	-	0.5	0.11
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	12.83	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.41	4.80	0.086	-	0.14	0.10	-	1.5	0.23
	B-C	0.31	8.74	0.036	-	0.05	0.04	-	0.6	0.12
	C-A	15.08	-	-	-	-	-	-	-	-
	C-B	0.25	9.92	0.025	-	0.03	0.03	-	0.4	0.10
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	10.74	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:30-17:45	B-A	0.34	4.27	0.081	-	0.15	0.09	-	1.4	0.26
	B-C	0.25	8.47	0.030	-	0.04	0.03	-	0.5	0.12
	C-A	17.62	-	-	-	-	-	-	-	-
	C-B	0.21	9.63	0.022	-	0.03	0.02	-	0.3	0.11
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	12.12	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:45-18:00	B-A	0.29	4.98	0.058	-	0.09	0.06	-	1.0	0.21
	B-C	0.21	8.91	0.024	-	0.03	0.02	-	0.4	0.12
	C-A	14.76	-	-	-	-	-	-	-	-
	C-B	0.18	10.07	0.017	-	0.02	0.02	-	0.3	0.10
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	10.15	-	-	-	-	-	-	-	-

Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.41	4.80	0.086	-	0.00	0.09	-	1.3	0.23
	B-C	0.31	8.75	0.036	-	0.00	0.04	-	0.5	0.12
	C-A	15.08	-	-	-	-	-	-	-	-
	C-B	0.25	9.92	0.025	-	0.00	0.03	-	0.4	0.10
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	10.74	-	-	-	-	-	-	-	-

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.49	4.06	0.122	-	0.09	0.14	-	2.0	0.28
	B-C	0.37	8.26	0.045	-	0.04	0.05	-	0.7	0.13
	C-A	18.01	-	-	-	-	-	-	-	-
	C-B	0.30	9.45	0.032	-	0.03	0.03	-	0.5	0.11
	A-B	0.28	-	-	-	-	-	-	-	-
	A-C	12.83	-	-	-	-	-	-	-	-

Queues & Delays

Demand Set: Existing PM
Modelling Period: 16:30-18:00

Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:30-16:45	B-A	0.29	4.98	0.058	-	0.00	0.06	-	0.9	0.21
	B-C	0.21	8.91	0.024	-	0.00	0.02	-	0.4	0.11
	C-A	14.76	-	-	-	-	-	-	-	-
	C-B	0.18	10.07	0.017	-	0.00	0.02	-	0.3	0.10
	A-B	0.16	-	-	-	-	-	-	-	-
	A-C	10.15	-	-	-	-	-	-	-	-

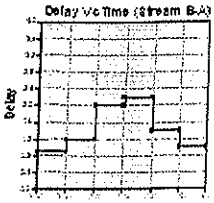
Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
16:45-17:00	B-A	0.34	4.27	0.081	-	0.06	0.09	-	1.2	0.25
	B-C	0.25	8.47	0.030	-	0.02	0.03	-	0.5	0.12
	C-A	17.62	-	-	-	-	-	-	-	-
	C-B	0.21	9.63	0.022	-	0.02	0.02	-	0.3	0.11
	A-B	0.19	-	-	-	-	-	-	-	-
	A-C	12.12	-	-	-	-	-	-	-	-

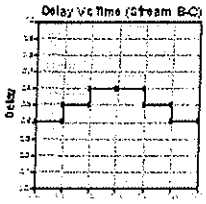
Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:00-17:15	B-A	0.42	3.29	0.128	-	0.09	0.14	-	2.0	0.35
	B-C	0.31	7.83	0.040	-	0.03	0.04	-	0.6	0.13
	C-A	21.58	-	-	-	-	-	-	-	-
	C-B	0.26	9.01	0.029	-	0.02	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.85	-	-	-	-	-	-	-	-

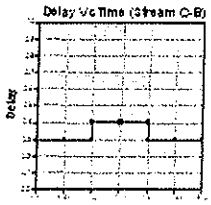
Segment	Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh.min/ segment)	Delay (veh.min/ segment)	Mean Arriving Vehicle Delay (min)
17:15-17:30	B-A	0.42	3.29	0.128	-	0.14	0.15	-	2.2	0.35
	B-C	0.31	7.83	0.040	-	0.04	0.04	-	0.6	0.13
	C-A	21.58	-	-	-	-	-	-	-	-
	C-B	0.26	9.01	0.029	-	0.03	0.03	-	0.4	0.11
	A-B	0.24	-	-	-	-	-	-	-	-
	A-C	14.85	-	-	-	-	-	-	-	-

Delay Graph

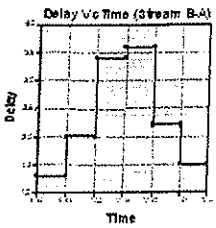
Demand Set: Existing PM
Modelling Period: 16:30-18:00

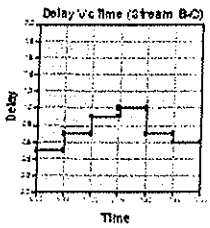


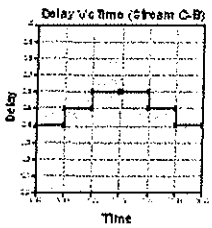




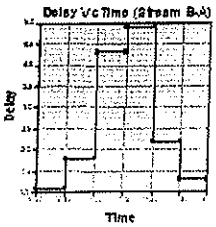
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

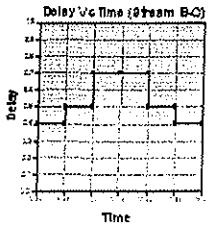


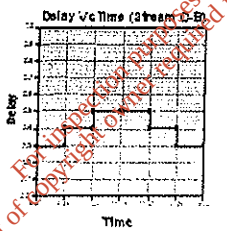




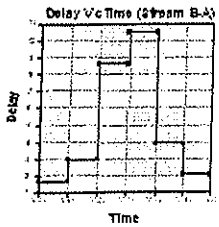
Demand Set: PM 2028
Modelling Period: 16:30-18:00

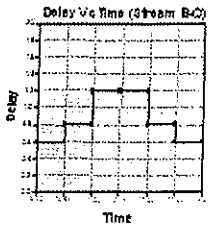


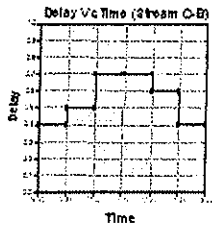




Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

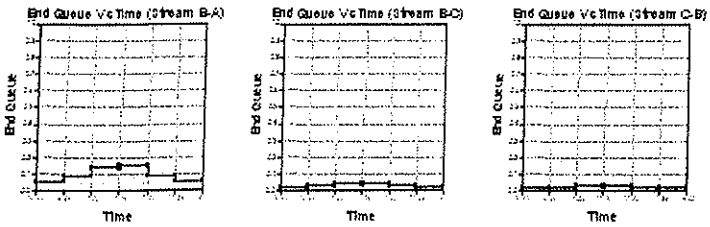




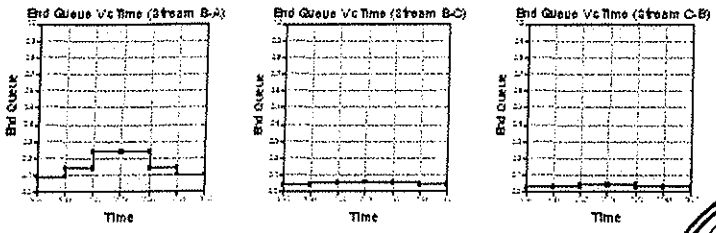


End Queue Graph

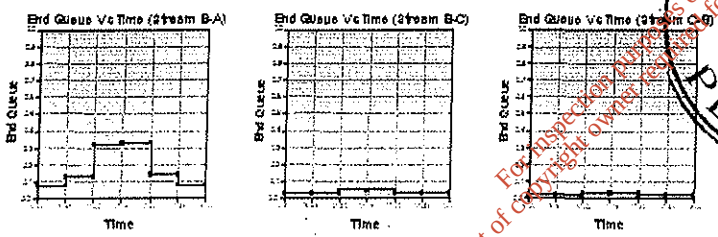
Demand Set: Existing PM
Modelling Period: 16:30-18:00



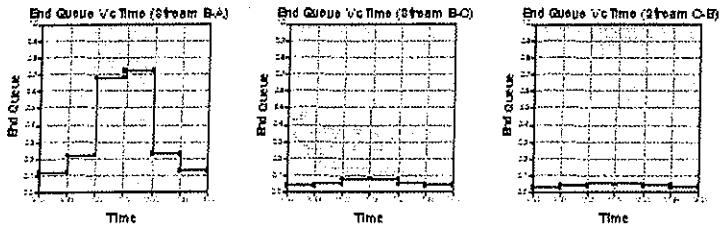
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00



Demand Set: PM 2028
Modelling Period: 16:30-18:00

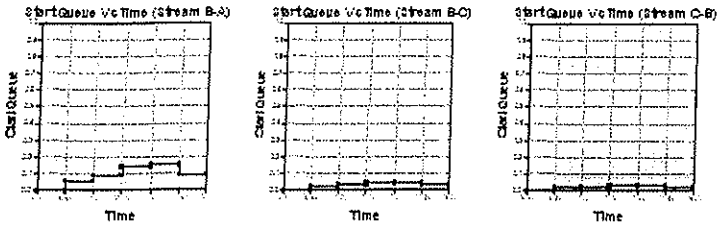


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

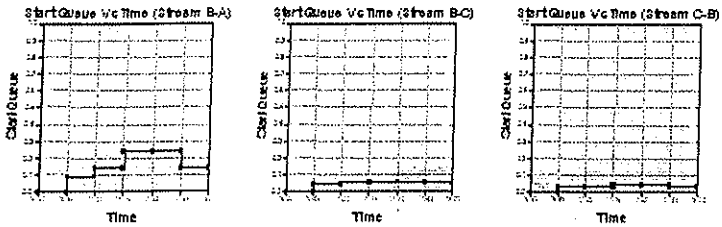


Start Queue Graph

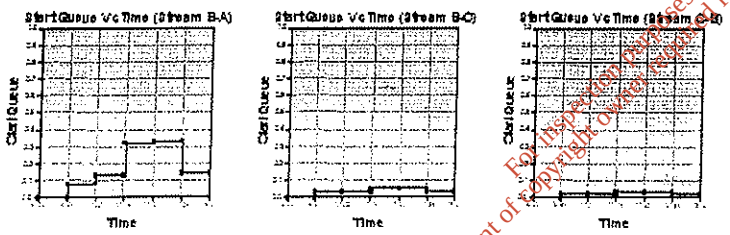
Demand Set: Existing PM
Modelling Period: 16:30-18:00



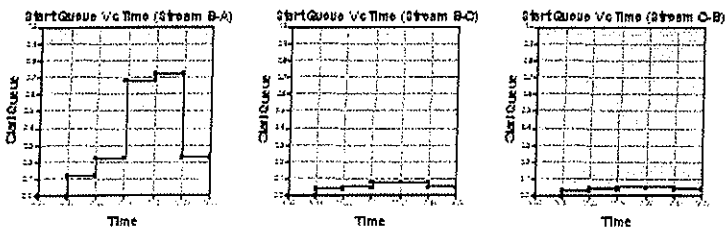
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00



Demand Set: PM 2028
Modelling Period: 16:30-18:00

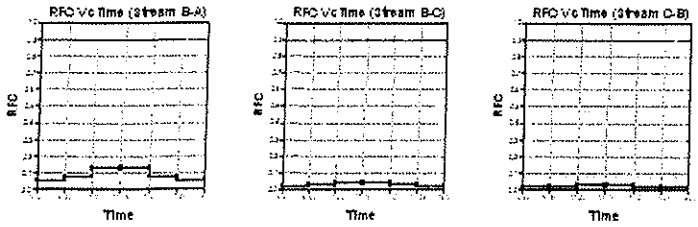


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

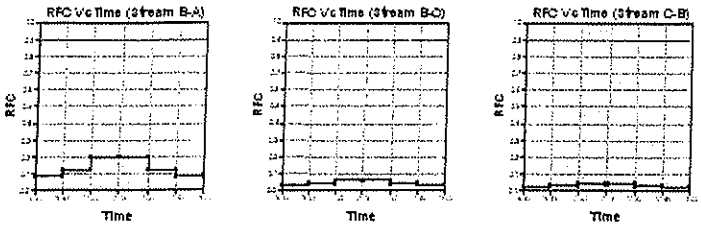


RFC Graph

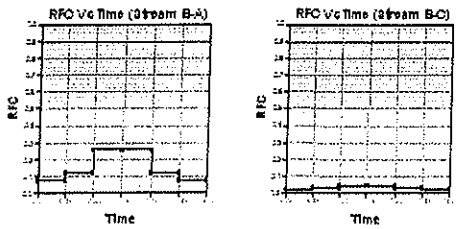
Demand Set: Existing PM
Modelling Period: 16:30-18:00

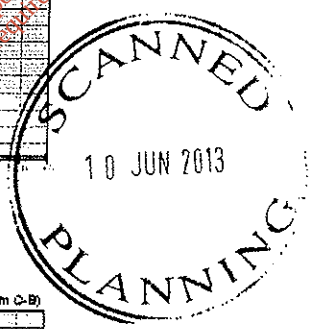


Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

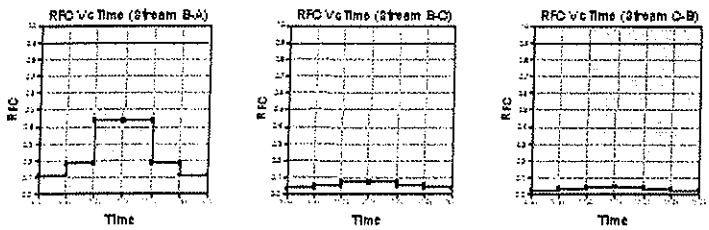


Demand Set: PM 2028
Modelling Period: 16:30-18:00



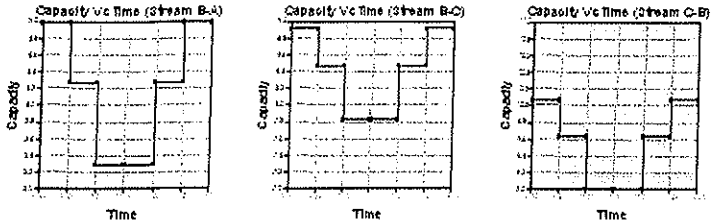


Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00

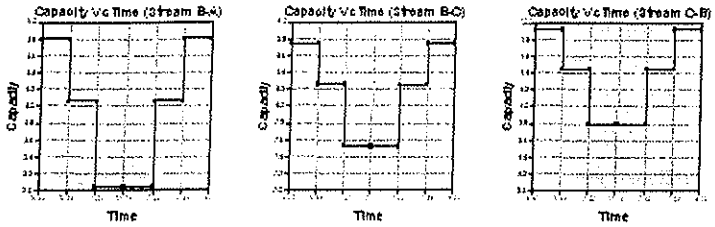


Capacity Graph

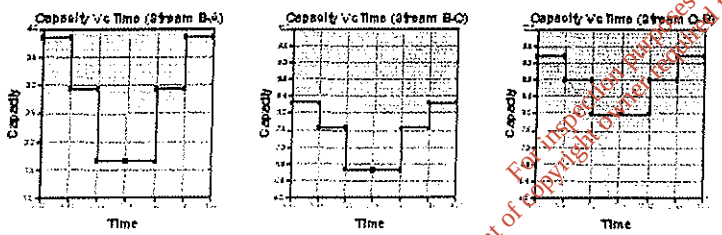
Demand Set: Existing PM
Modelling Period: 16:30-18:00



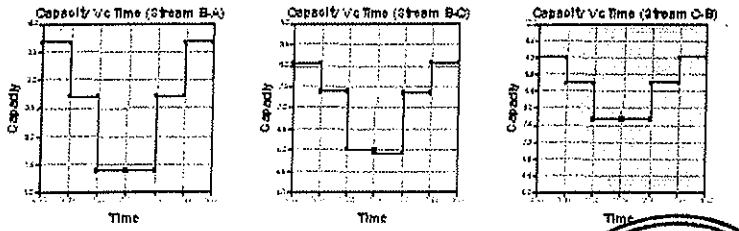
Demand Set: PM 2013 + Dev
Modelling Period: 16:30-18:00

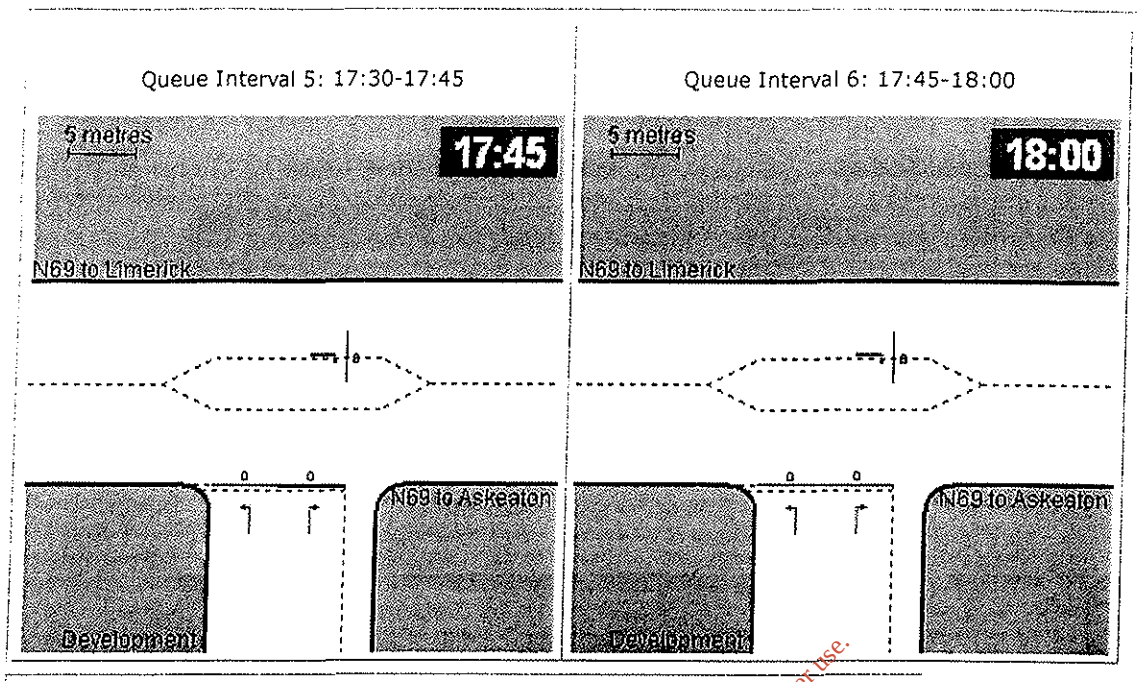


Demand Set: PM 2028
Modelling Period: 16:30-18:00

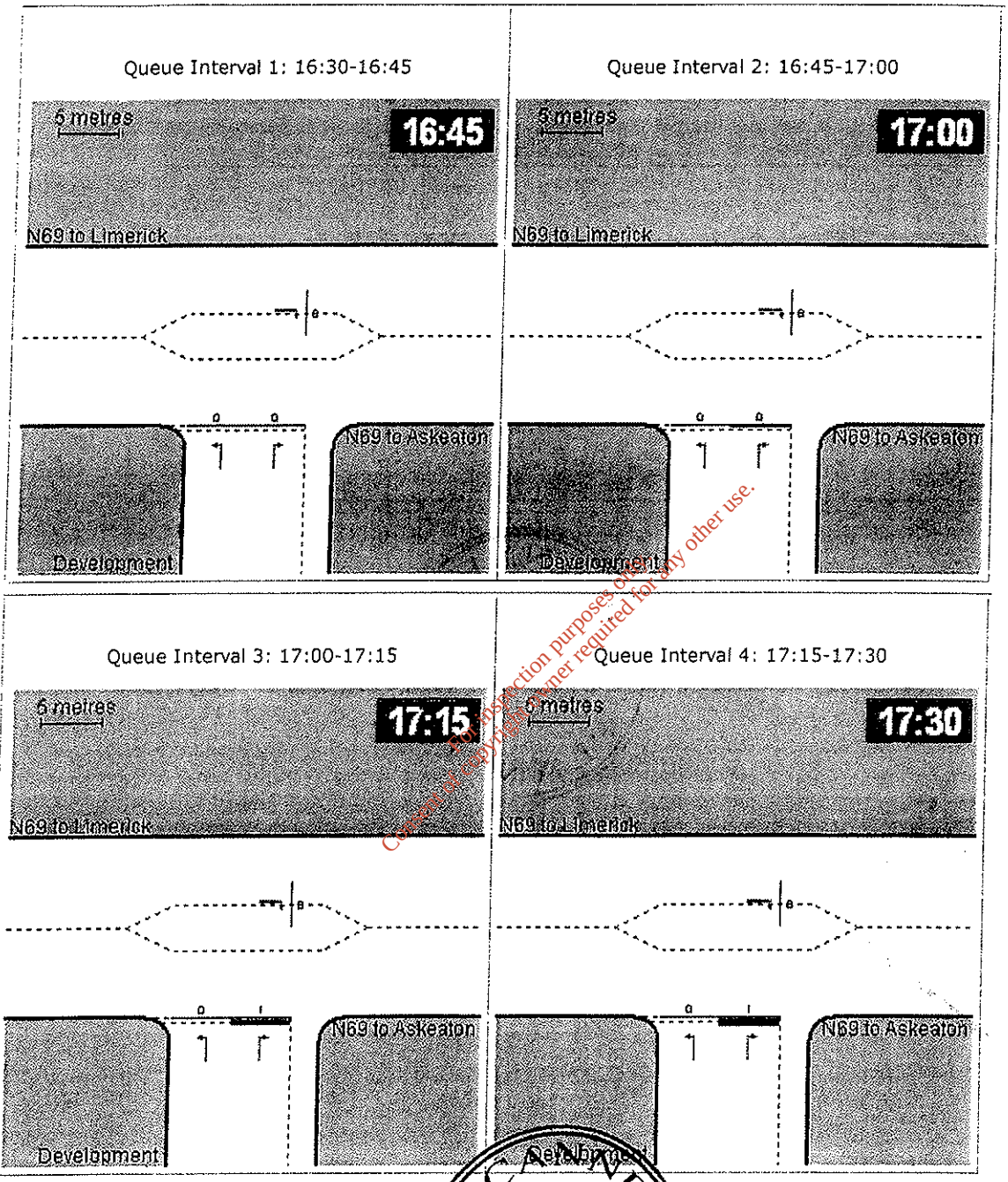


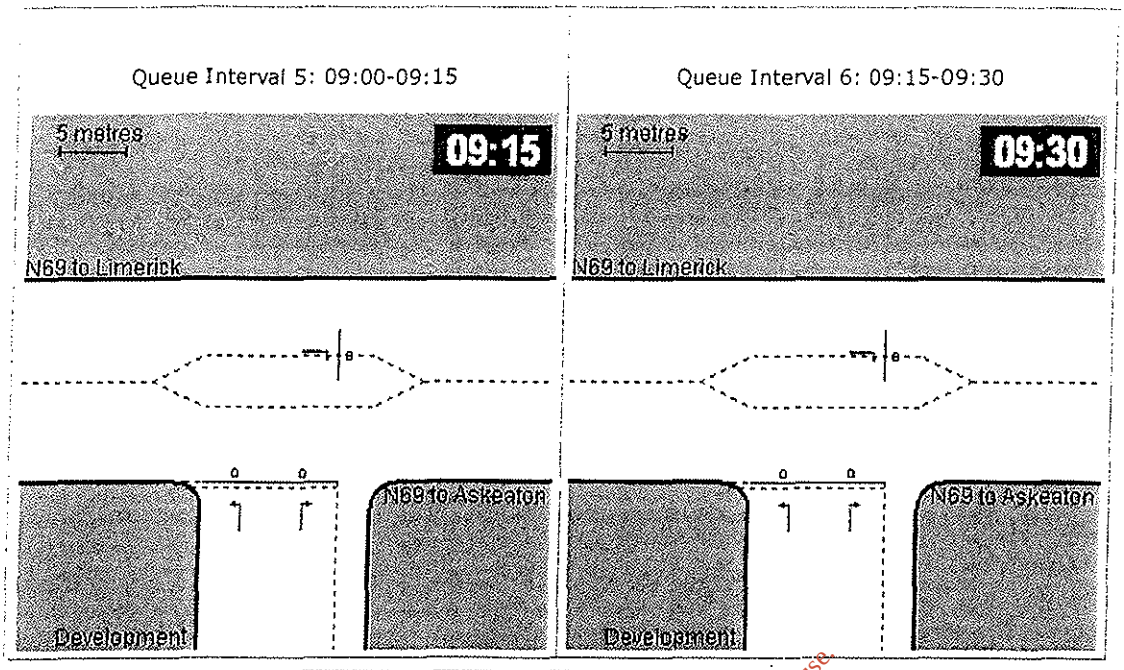
Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00





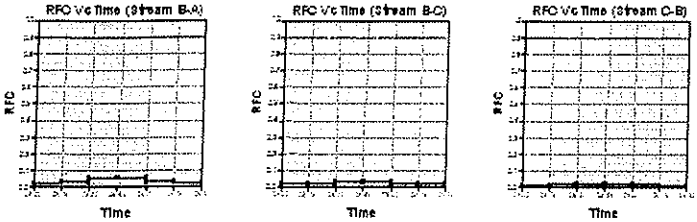
Demand Set: PM 2028 + Dev
Modelling Period: 16:30-18:00
View Extent: 40m



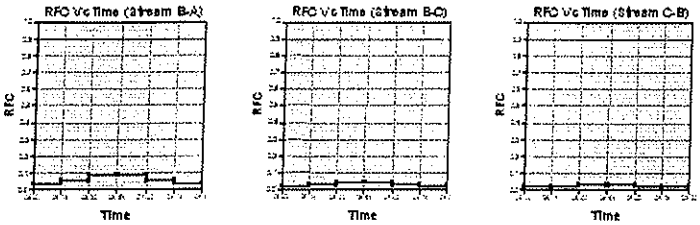


RFC Graph

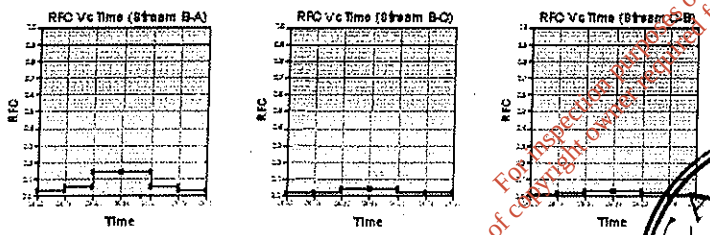
Demand Set: Existing AM
Modelling Period: 08:00-09:30



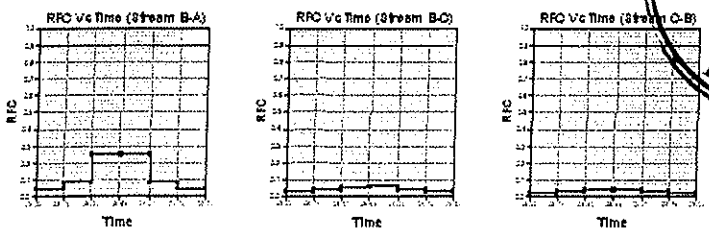
Demand Set: AM 2013 + Dev
Modelling Period: 08:00-09:30



Demand Set: AM 2028
Modelling Period: 08:00-09:30

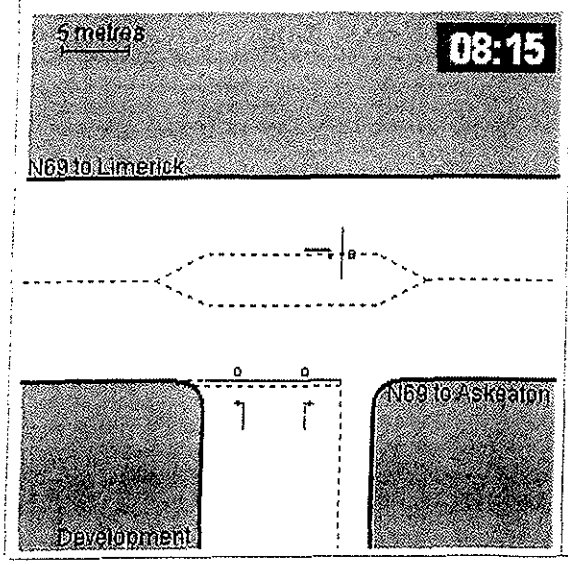


Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30

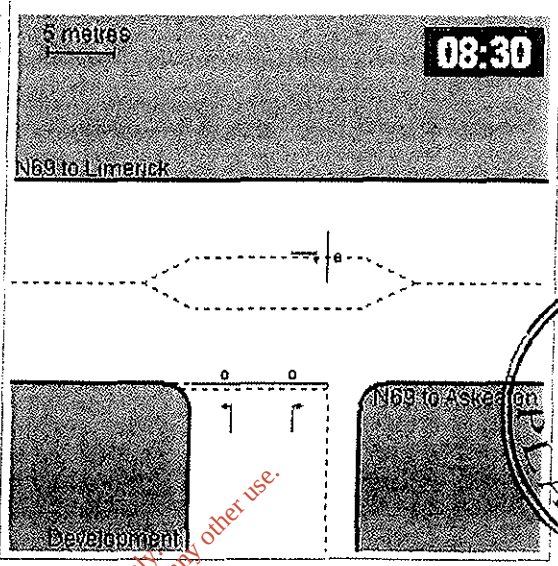


Demand Set: AM 2028
Modelling Period: 08:00-09:30
View Extent: 40m

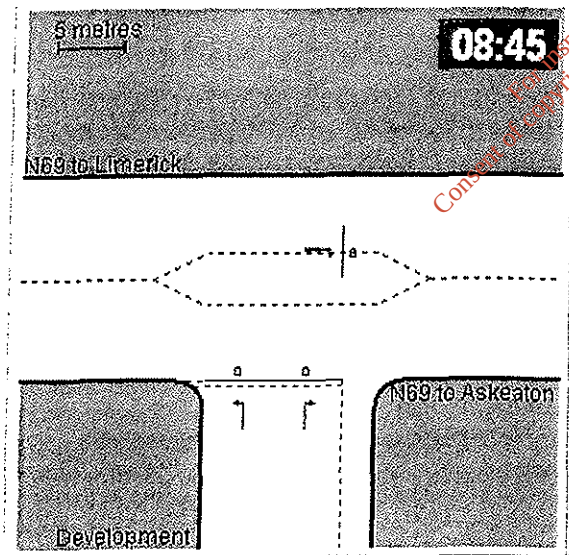
Queue Interval 1: 08:00-08:15



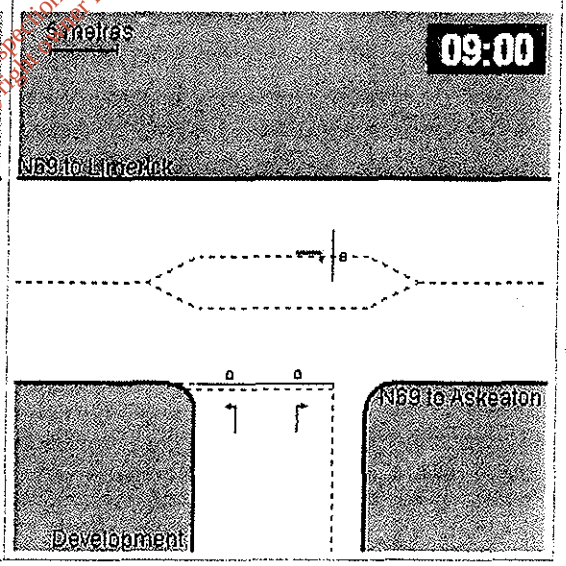
Queue Interval 2: 08:15-08:30

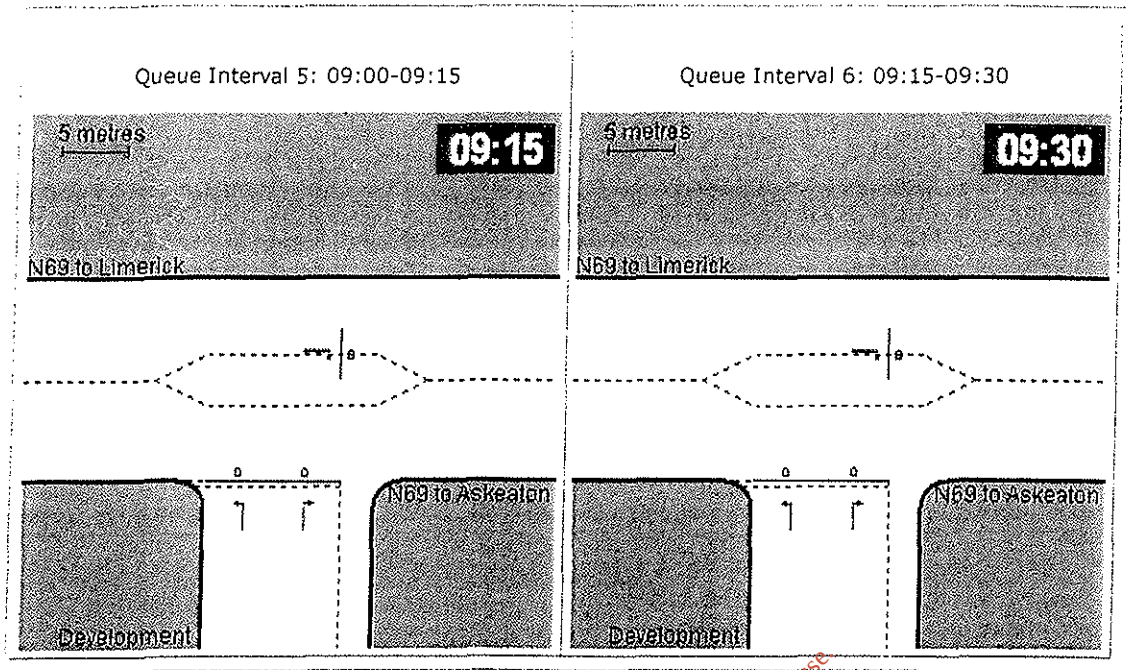


Queue Interval 3: 08:30-08:45



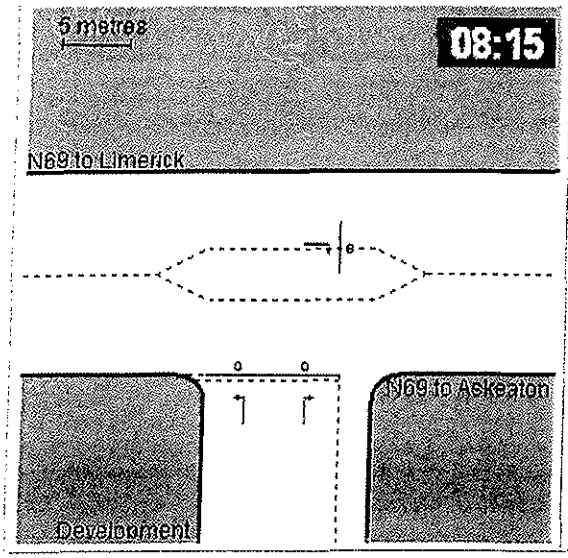
Queue Interval 4: 08:45-09:00



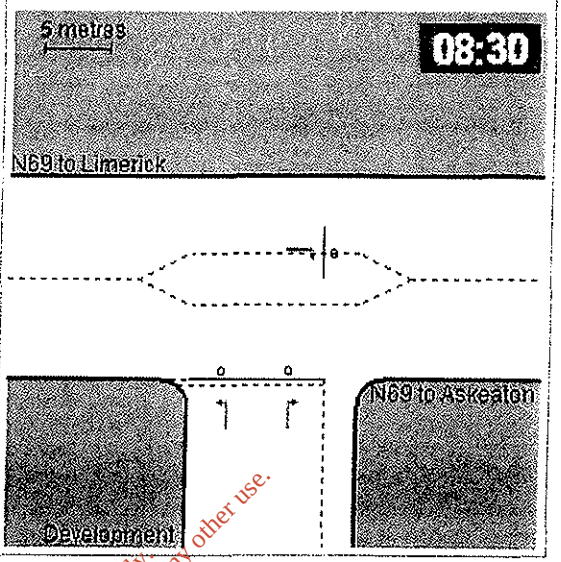


Demand Set: AM 2028 + Dev
Modelling Period: 08:00-09:30
View Extent: 40m

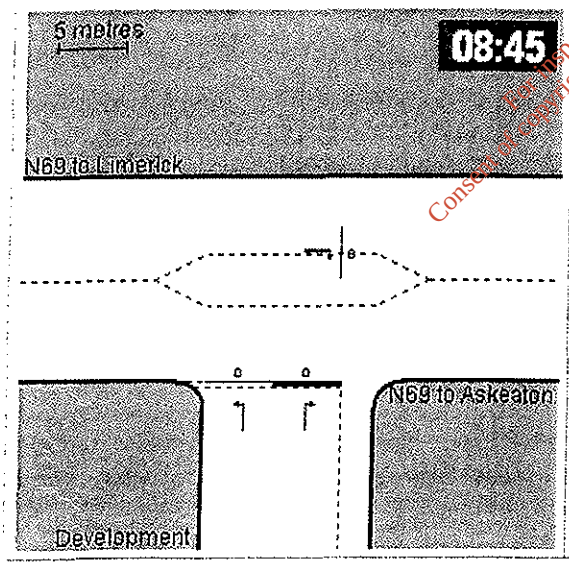
Queue Interval 1: 08:00-08:15



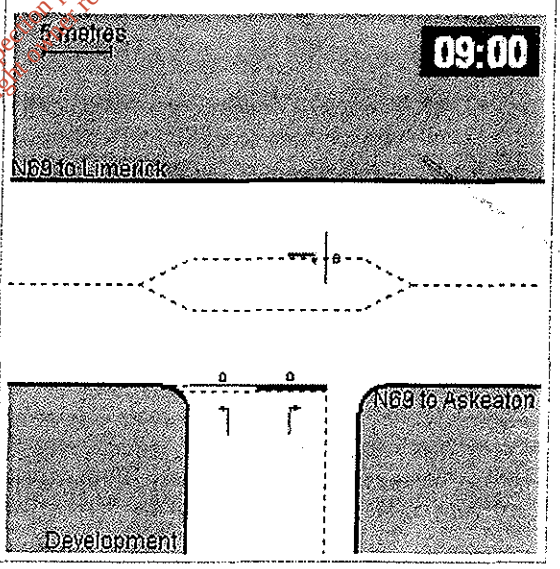
Queue Interval 2: 08:15-08:30

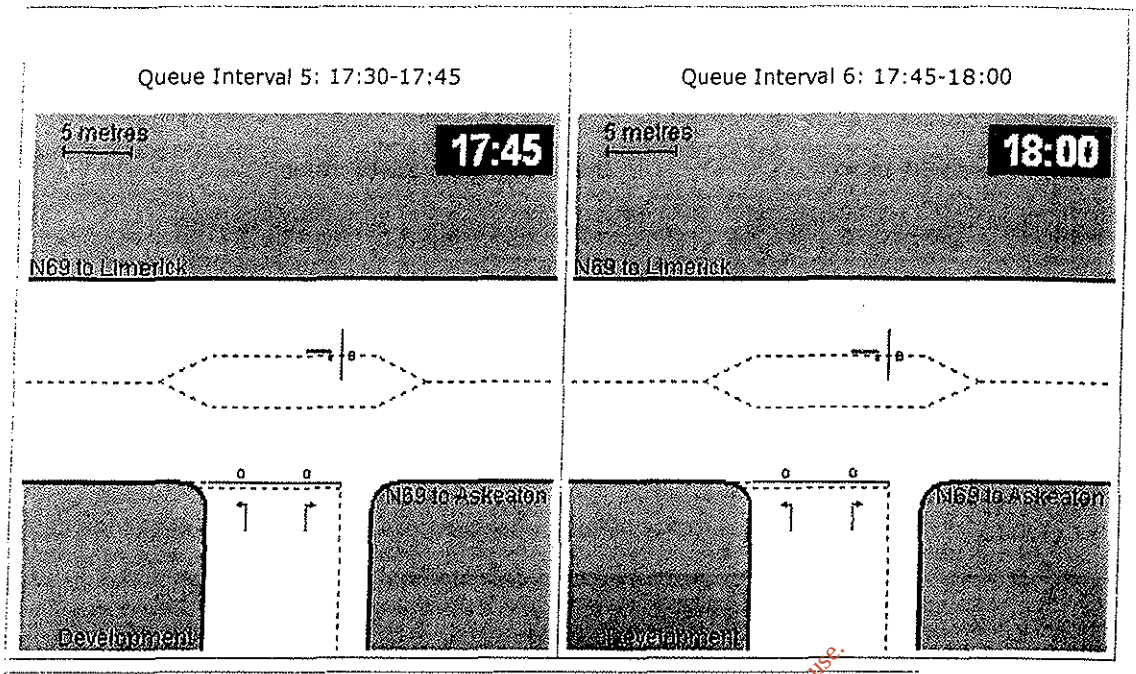


Queue Interval 3: 08:30-08:45



Queue Interval 4: 08:45-09:00





Demand Set: PM 2028
Modelling Period: 16:30-18:00
View Extent: 40m