Appendix E1

Tables E.1 (ii) Main emissions to atmosphere
Tables E.1 (iii) Main emissions to atmosphere

TABLE E.1 (ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	AEP1
Source of Emission:	Gas Utilisation Engine 1
Location :	Waste reception building
Grid Ref. (12 digit, 6E,6N):	251118,250579
Vent Details Diameter: Height above Ground(m):	 0.34 15
Date of commencement:	Plant not yet in operation

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day	72000m^3/d	Maximum/day	72000m^3/d
Maximum rate/hour	3000m^3/h	Min efflux velocity	15.2216m.sec^{-1}
(ii) Other factors			
Temperature	°C(max)	°C(min)	°C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	☒ dry.	5 %O_2

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365day/yr

TABLE E.1 (ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	AEP2
Source of Emission:	Gas Utilisation Engine 2
Location :	Waste reception building
Grid Ref. (12 digit, 6E,6N):	251118, 250590
Vent Details Diameter: Height above Ground(m):	 0.34m 15
Date of commencement:	Plant not yet in operation

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day	72000m^3/d	Maximum/day	72000m^3/d
Maximum rate/hour	3000m^3/h	Min efflux velocity	15.2216$m.sec^{-1}$
(ii) Other factors			
Temperature	°C(max)	°C(min)	°C(avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	☒ dry.	5 %O_2

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365day/yr

TABLE E.1 (ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	AEP3
Source of Emission:	Odour control unit
Location :	Waste reception building
Grid Ref. (12 digit, 6E,6N):	251093 250590
Vent Details Diameter: Height above Ground(m):	 0.98m 15
Date of commencement:	Plant not yet in operation

Characteristics of Emission :

(i) Volume to be emitted:			
Average/day	m^3/d	Maximum/day	m^3/d
Maximum rate/hour	41064?Am^3/h	Min efflux velocity	15.1226m.sec^{-1}
(ii) Other factors			
Temperature	°C(max)	°C(min)	°C(avg)
For Combustion Sources: Volume terms expressed as :	☒ wet.	☐ dry.	_____20.9___%O_2

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365day/yr

TABLE E.1 (iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: ________**AEP1**__________________

Parameter	Prior to treatment[1]				Brief description of treatment	As discharged[1]					
	mg/Nm³		kg/h			mg/Nm³		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Carbon monoxide (CO)		1400		4.20012							
Oxides of Nitrogen(NOx as NO_2)		500		1.50012							
Sulphur Dioxide (SO_2)		150		0.45							
Total particulates		130		0.38988							
Total non-methane volatile organic compounds		50		0.15012							

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0°C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: **AEP2**

Parameter	Prior to treatment[1]				Brief description of treatment	As discharged[1]					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Carbon monoxide (CO)		1400		4.20012							
Oxides of Nitrogen(NOx as NO_2)		500		1.50012							
Sulphur Dioxide (SO_2)		150		0.45							
Total particulates		130		0.38988							
Total non-methane volatile organic compounds		50		0.15012							

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0°C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise

Appendix E2

Dispersion Modelling Assessment

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DISPERSION MODELLING ASSESSMENT OF EMISSIONS FROM PROPOSED ANAEROBIC DIGESTION FACILITY TO BE LOCATED IN BIO AGRIGAS LTD, NEWDOWNS, THE DOWNS, MULLINGAR, CO. WESTMEATH.

PERFORMED BY ODOUR MONITORING IRELAND ON THE BEHALF OF ORS CONSULTING LTD.

REPORT PREPARED BY:	Dr. Brian Sheridan
REPORT VERSION:	Document Ver.1
ATTENTION:	Mr Damien Collins
DATE:	11th May 2011
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REVIEWERS:	

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Document Amendment Record

Client: ***ORS Consulting Ltd***

Title: Dispersion modelling assessment of emissions from proposed anaerobic digestion facility, to be located in Bio Agrigas Ltd, Newdowns, The Downs, Mullingar, Co. Westmeath.

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EXECUTIVE SUMMARY

Odour Monitoring Ireland was commissioned by ORS Consulting Ltd to perform a dispersion modelling assessment of exhaust gas emissions from the proposed operation of an anaerobic digestion facility to be located in Bio Agrigas Ltd, Newdowns, The Downs, Mullingar, co. Westmeath. Emission limit values of specific compounds namely Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Total particulates, Total non methane Volatile organic compounds, odour and source characteristics (of emission points) were inputted into the dispersion modelling to allow for the assessment of air quality in the vicinity of the proposed emissions points when in operation.

Dispersion modelling assessment was performed utilising AERMOD Prime (09292) dispersion model. Five years of hourly sequential meteorological data from Clones (2002 to 2006 inclusive) was used within the dispersion model. The dispersion modelling assessment was performed in accordance with requirements contained in AG4 – Irish EPA Guidance for dispersion modelling. The total proposed mass limit emission rate of each pollutant was inputted with the source characteristics into the dispersion model in order to assess the maximum predicted ground level concentrations of each pollutant in the vicinity of the facility. This was then compared with statutory and guideline ground level concentration limit values for such pollutants.

The following conclusions are drawn from the study:

1. The assessment was carried out to provide information in line with standard information to be provided to the EPA and regulatory bodies for such projects.

2. Specific dispersion modelling was performed for Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Particulate matter, TNMVOC as Benzene and Odour.

3. With regards to Carbon monoxide, the maximum GLC+Baseline for CO from the operation of the facility is 1,441 $\mu g\ m^{-3}$ for the maximum 8-hour mean concentration at the 100th percentile. When combined predicted and baseline conditions are compared to the Irish guideline/limit values and EU Limit values set out in SI 271 of 2002 and Directive 2008/50/EC, this is 14.41% of the impact criterion. In addition, the predicted ground level concentration of Carbon monoxide at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

4. With regards to Oxides of nitrogen, the maximum GLC+Baseline for NO_2 from the operation of the facility is 98.20 $\mu g\ m^{-3}$ for the maximum 1-hour mean concentration at the 99.79th percentile. When combined predicted and baseline conditions are compared to SI 271 of 2002 and Directive 2008/50/EC, this is 49.10% of the impact criterion. An annual average was also generated to allow comparison with values contained in SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 35.10 $\mu g/m^3$. When compared the annual average NO_2 air quality impact criterion is 87.75% of the impact criterion. In addition, the predicted ground level concentration of Oxides of nitrogen at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

5. With regards to Sulphur dioxide, the maximum GLC+Baseline for SO_2 from the operation of the facility is 62.60 and 43.10 $\mu g\ m^{-3}$ for the maximum 1-hour and 24 hr mean concentration at the 99.73th and 99.18th percentile respectively. When combined predicted and baseline conditions are compared to SI 271 of 2002 and Directive 2008/50/EC, this is 17.87 and 34.50% of the set target limits established for the 1 hour and 24 hour assessment criteria. An annual average was also generated to allow comparison with SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 11.80

μg/m³. When compared the annual average SO_2 air quality impact criterion is 59.51% of the impact criterion. In addition, the predicted ground level concentration of Sulphur dioxide at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

6. With regards to Particulate matter, the maximum GLC+Baseline for Particulate matter 10μm from the operation of the facility is 46.90 and 41.90 μg m^{-3} for the maximum 24-hour mean concentration at the 98.08th and 90.40th percentile, respectively. When combined predicted and baseline conditions are compared to Directive 2008/50/EC, this is 93.76 and 83.74% of the impact criterion. An annual average was also generated to allow comparison with the SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 29.80 μg/m³. When compared, the annual average Particulate matter air quality impact is 74.75 % of the impact criterion. An annual average was also generated for $PM_{2.5}$ to allow comparison with Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 16.80 μg/m³. When compared, the annual average $PM_{2.5}$ air quality impact is 67.12% of the impact criterion. In addition, the predicted ground level concentration of Particulate matter at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

7. With regards to the results from the assessment of TNMVOC as Benzene ground level concentrations, the results indicate that the ambient ground level maximum annual average concentrations anywhere in the vicinity of the facility could be up to 80.20% of the impact criterion (assuming all TNMVOC is Benzene which will not be the case). In addition, the predicted ground level concentration of TNMVOC as Benzene at each of the 41 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

8. With regards to odour, it is predicted that odour plume spread is in a north westerly south easterly direction of approximately 30 to 50 metres from the emission points with no sensitive receptors impacted by the plume. All resident locations in the vicinity of the proposed facility operations will perceive an odour concentration less than 1.50 Ou_E/m^3 at the 98th percentile of hourly averages for worst case meteorological year Clones 2004. In accordance with odour impact criterion presented in *Table 2.1*, and in keeping with currently recommended odour impact criterion in this country, no long-term odour impacts will be generated by receptors in the vicinity of the proposed facility operations. In addition, the predicted ground level concentration of Odour at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1.* A number of key mitigation measures as outlined in Section 4.1.6 will need to be implemented into the design of the odour containment, capture and treatment system to ensure compliance.

9. The overall modelling indicates that the facility will not result in any significant impact on air quality in the surrounding area with all ground level concentrations of pollutants well within their respective ground level concentration limit values.

1. Introduction and scope

1.1 Introduction

Odour Monitoring Ireland was commissioned by ORS Consulting Ltd to perform a dispersion modelling assessment of proposed emission limit values for a range of pollutants which could potentially be emitted from the proposed anaerobic digestion facility to be located in Bio Agrigas Ltd, Newdowns, The Downs, Mullingar, Co. Westmeath.

The assessment allowed for the examination of proposed short and long term ground level concentrations (GLC's) of compounds as a result of the operation of proposed emission points – Gas utilisation engine 1 (AEP1), Gas utilisation engine 2 (AEP2), Odour control unit 1 to 3 (AEP3). The main compounds assessed included Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Total particulates, total non methane volatile organic compounds (as Benzene) and Odour.

Predicted dispersion modelling GLC's were compared to proposed regulatory / guideline ground level limit values for each pollutant.

The materials and methods, results, discussion of results and conclusions are presented within this document.

1.2 Scope of the work

The main aims of the study included:

- Air dispersion modelling assessment in accordance with AG4 guidance of proposed mass emission limits of specified pollutants to atmosphere from the anaerobic digestion facility to be located in Bio Agrigas Ltd, Newdowns, The Downs, Mullingar, Co. Westmeath.
- Assessment whether the predicted ground level concentrations of pollutants are in compliance with ground level concentration limit values as taken from SI 271 of 2002 – Air Quality Regulations, CAFE Directive 2008/50/EC, AG4 guidance document and Environment Agency H4 Guidance documents Parts 1 and 2.

The approach adopted in this assessment is considered a worst-case investigation in respect of emissions to the atmosphere from proposed emission points AEP1 to AEP3. These predictions are therefore most likely to over estimate the GLC's that may actually occur for each modelled scenario. These assumptions are summarised and include:

- Emissions to the atmosphere from the emission points – AEP1 to AEP3 process operations were assumed to occur 24 hours each day / 7 days per week over a standard year at 100% output.
- Five years of hourly sequential meteorological data from Clones 2002 to 2006 inclusive was screened to assess worst case dispersion year which will provide statistical significant results in terms of the short and long term assessment. This is in keeping with current national and international recommendations. The worst case year Clones 2004 was used for data presentation.
- Maximum GLC's + Background were compared with relevant air quality objects and limits;
- All emissions were assumed to occur at maximum potential emission concentration and mass emission rates for each scenario.
- AERMOD Prime (09292) dispersion modelling was utilised throughout the assessment in order to provide the most conservative dispersion estimates.
- Five years of hourly sequential meteorological data from Clones 2002 to 2006 inclusive was used in the modelling screen which will provide statistical significant results in terms of the short and long term assessment. The worst case year for Clones met station was 2004 and was used for contour plot presentation. This is in keeping with current national and international recommendations (EPA Guidance AG4

and EA Guidance H4). In addition, AERMOD incorporates a meteorological pre-processor AERMET PRO. The AERMET PRO meteorological preprocessor requires the input of surface characteristics, including surface roughness (z0), Bowen Ratio and Albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of Albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10km from the meteorological station for Bowen Ratio and Albedo and to a distance of 1km for surface roughness in line with USEPA recommendations.

- All building wake effects on all applicable emission points were assessed within the dispersion model using the building prime algorithm (e.g. all buildings / structures / tanks were included).

2. Materials and methods

This section describes the materials and methods used throughout the dispersion modelling assessment.

2.1 Dispersion modelling assessment

2.1.1 Atmospheric dispersion modelling of air quality: What is dispersion modelling?

Any material discharged into the atmosphere is carried along by the wind and diluted by wind turbulence, which is always present in the atmosphere. This process has the effect of producing a plume of air that is roughly cone shaped with the apex towards the source and can be mathematically described by the Gaussian equation. Atmospheric dispersion modelling has been applied to the assessment and control of emissions for many years, originally using Gaussian form ISCST 3. Once the compound emission rate from the source is known, (g s^{-1}), the impact on the vicinity can be estimated. These models can effectively be used in three different ways:

- Firstly, to assess the dispersion of compounds;
- Secondly, in a "reverse" mode, to estimate the maximum compound emissions which can be permitted from a site in order to prevent air quality impact occurring;
- And thirdly, to determine which process is contributing greatest to the compound impact and estimate the amount of required abatement to reduce this impact within acceptable levels (McIntyre et al. 2000).

In this latter mode, models have been employed for imposing emission limits on industrial processes, control systems and proposed facilities and processes (Sheridan et al., 2002).

Any dispersion modelling approach will exhibit variability between the predicted values and the measured or observed values due to the natural randomness of atmospheric environment. A model prediction can, at best, represent only the most likely outcome given the apparent environmental conditions at the time. Uncertainty depends on the completeness of the information used as input to the model as well as the knowledge of the atmospheric environment and the ability to represent that process mathematically. Good input information (emission rates, source parameters, meteorological data and land use characteristics) entered into a dispersion model that treats the atmospheric environment simplistically will produce equally uncertain results as poor information entered into a dispersion model that seeks to simulate the atmospheric environment in a robust manner. It is assumed in this discussion that pollutant emission rates are representative of maximum emission events, source parameters accurately define the point of release and surrounding structures, meteorological conditions define the local atmospheric environment and land use characteristics describe the surrounding natural environment. These conditions are employed within the dispersion modelling assessment therefore providing good confidence in the generated predicted exposure concentration values.

2.1.2 Atmospheric dispersion modelling of air quality: dispersion model selection

The AERMOD model was developed through a formal collaboration between the American Meteorological Society (AMS) and U.S. Environmental Protection Agency (U.S. EPA). AERMOD is a Gaussian plume model and replaced the ISC3 model in demonstrating compliance with the National Ambient Air Quality Standards (Porter et al., 2003) AERMIC (USEPA and AMS working group) is emphasizing development of a platform that includes air turbulence structure, scaling, and concepts; treatment of both surface and elevated sources; and simple and complex terrain. The modelling platform system has three main components: AERMOD, which is the air dispersion model; AERMET, a meteorological data pre-processor; and AERMAP, a terrain data pre-processor (Cora and Hung, 2003).

AERMOD is a Gaussian steady-state model which was developed with the main intention of superseding ISCST3 (NZME, 2002). The AERMOD modeling system is a significant departure from ISCST3 in that it is based on a theoretical understanding of the atmosphere rather than depend on empirical derived values. The dispersion environment is characterized by turbulence theory that defines convective (daytime) and stable (nocturnal) boundary layers instead of the stability categories in ISCST3. Dispersion coefficients derived from turbulence theories are not based on sampling data or a specific averaging period. AERMOD was especially designed to support the U.S. EPA's regulatory modeling programs (Porter at al., 2003)

Special features of AERMOD include its ability to treat the vertical in-homogeneity of the planetary boundary layer, special treatment of surface releases, irregularly-shaped area sources, a three plume model for the convective boundary layer, limitation of vertical mixing in the stable boundary layer, and fixing the reflecting surface at the stack base (Curran et al., 2006). A treatment of dispersion in the presence of intermediate and complex terrain is used that improves on that currently in use in ISCST3 and other models, yet without the complexity of the Complex Terrain Dispersion Model-Plus (CTDMPLUS) (Diosey et al., 2002).

Input data from stack emissions, and source characteristics will be used to construct the basis of the modelling scenarios.

2.2 Air quality impact assessment criteria

The predicted air quality impact from the operation of proposed emission points AEP1 to AEP3 for each scenario is compared to relevant air quality objectives and limits. Air quality standards and guidelines referenced in this report include:

- SI 271 of 2002 – Air Quality Standards Regulations 2002.
- EU limit values set out in the Directives on Air Quality 2008/50/EC.
- Horizontal guidance Note, IPPC H4: Parts 1 and 2, UK Environment Agency.
- AG4 guidance document on dispersion modelling, Environmental Protection Agency.

Air quality is judged relative to the relevant Air Quality Standards, which are concentrations of pollutants in the atmosphere, which achieve a certain standard of environmental quality. Air quality Standards are formulated on the basis of an assessment of the effects of the pollutant on public health and ecosystems.

In general terms, air quality standards have been framed in two categories, limit values and guideline values. Limit values are concentrations that cannot be exceeded and are based on WHO guidelines for the protection of human health. Guideline values have been established for long-term precautionary measures for the protection of human health and the environment. European legislation has also considered standard for the protection of vegetation and ecosystems.

The relevant air quality standards for proposed emission sources AEP1 to AEP3 are presented in *Table 2.1*.

2.2.1 Air Quality Guidelines value for air pollutants

Table 2.1 illustrates the guideline and limit values for air quality pollutants in Ireland.

Table 2.1. EU and Irish Limit values set out in the SI 271 of 2002, CAFÉ directive 2008/50/EC, H4 Guidance documents Parts 1 and 2 and AG4 guidance document.

POLLUTANT	Objective				TO BE ACHIEVED BY[4]
	Concentration[2]	Maximum No. Of exceedences allowed[3]	Exceedence expressed as percentile[3]	Measured as	
Nitrogen dioxide and oxides of nitrogen	300 μg m^{-3} NO_2 200 μg m^{-3} NO_2 40 μg m^{-3} NO_2	18 times in a year 18 times in a year --	99.79th percentile 99.79th percentile --	1 hour mean 1 hour mean Annual mean	19 Jul 1999[4] 1 Jan 2010 1 Jan 2010
Particulates (PM_{10}) (2008/50/EC)	50 μg m^{-3} 40 μg m^{-3} 20 μg m^{-3}	35 times in a year None None	90.40th percentile -- --	24 hour mean Annual mean Annual mean	1 Jan 2010[6] 1 Jan 2005 1 Jan 2010[6]
Particulates ($PM_{2.5}$) (2008/50/EC)	25 μg m^{-3} – Stage 1 20 μg m^{-3} – Stage 2	None None	-- --	Annual mean Annual mean	1 Jan 2015 1 Jan 2020
Carbon monoxide (CO)	10 mg m^{-3}	None	100th percentile	Running 8 hour mean	31st Dec 2003
Sulphur dioxide (SO_2)	350 μg m^{-3} 125 μg m^{-3} 20 μg m^{-3}	24 times in a year 3 times in a year --	99.73th percentile 99.18th percentile --	1 hour mean 24 hour mean Annual mean and winter mean (1st Oct to 31st March	1st Jan 2005 1st Jan 2005 19th Jul 2001[5]
Total non-methane VOC's as Benzene	5 μg m^{-3}	None	--	Annual mean	---
Odour	<1.50 Ou_E/m^3	175 times in a year	98th percentile	1 hour mean	--

2.3 Existing Baseline Air Quality

The EPA has been monitoring national Air quality from a number of sites around the country. This information is available from the EPA's website. The values presented for PM_{10}, SO_2, NO_2, and CO give an indication of expected rural imissions of the compounds listed in *Table 2.1*. *Table 2.2* illustrates the baseline data expected to be obtained from rural areas for classical air pollutants. Since the proposed facility is located in a rural area, it would be considered located in a Zone D area according to the EPA's classification of zones for air quality. Traffic and industrial related emissions would be medium.

The results of $PM_{2.5}$ monitoring at Station Road in Cork City in 2007 (EPA, 2007) indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.53 while monitoring in Heatherton Park in 2008 (EPA, 2008) indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.60. Based on this information, a conservative ratio of 0.60 was used to generate a background $PM_{2.5}$ concentration in 2008 of 9.0 $\mu g/m^3$ with a value of 10 $\mu g/m^3$ recorded in 2010 (*see Table 2.2*)

Table 2.2. Baseline air quality data used to assess air quality impact criterion in a number of Zone D region – Navan and Kilkitt.

Reference air quality data – Source identity	Sulphur dioxide-SO_2 ($\mu g\ m^{-3}$)	Nitrogen dioxide-NO_x as NO_2 ($\mu g\ m^{-3}$)	Particulate matter-PM_{10} ($\mu g\ m^{-3}$)	Carbon monoxide – CO ($mg\ m^{-3}$)	Details
Navan – annual mean (Zone D)	4.20	16.90	23	-	Measured 2008
Navan – 98%ile & mean 24 hr value (Zone D)	9.60	-	23	-	Measured 2008
Navan – 8 hr max (Zone D)	-	-	-	1.04	Measured 2008
Zone B - Heatherton Park – Annual mean $PM_{2.5}$	-	-	9.0 ($PM_{2.5}$) (Heatherton Park)	-	Measured 2008
Kilkitt – annual mean (Zone D)	4.0	8.0 (Castlebar)	8.0		Measured 2009
Kilkitt – 8 hr max (Zone D)				0.40 (Newbridge zone C)	Measured 2009
Zone C - Ennis – Annual mean $PM_{2.5}$	-	-	10	-	Measured 2009
Zone C – Newbridge Benzene Annual mean	-	-	1.40 (Benzene)	-	Measured 2009

Notes: [1] denotes taken from Air quality monitoring report 2008 and 2009, www.epa.ie.

2.4 Meteorological data

Five years of hourly sequential meteorological data was chosen for the modelling exercise (i.e. Clones 2002 to 2006 inclusive). A schematic wind rose and tabular cumulative wind speed and directions of all seven years are presented in *Section 7*. All five years of met data was screened to provide more statistical significant result output from the dispersion model. This is in keeping with national and international recommendations on quality assurance in operating dispersion models and will provide a worst case assessment of predicted ground level concentrations based on the input emission rate data. Surface roughness, Albedo and Bowen ratio were assessed and characterised around each met station for AERMET Pro processing.

2.5 Terrain data

Topography effects were accounted for within the dispersion modelling assessment Individual sensitive receptors were inputted into the model at their specific height in order to take account of any effects of elevation on GLC's at there specific locations. Topographical data was inputted into the model utilising the AERMAP algorithm.

2.6 Building wake effects

Building wake effects are accounted for in modelling scenarios through the use of the Prime algorithm (i.e. all building features located within the facility) as this can have a significant effect on the compound plume dispersion at short distances from the source and can significantly increase GLC's in close proximity to the facility.

3. Results

This section describes the results obtained for the dispersion modelling exercise. All input data and source characteristics were developed in conjunction with engineering drawings and documentation supplied to OMI for the development.

3.1. Dispersion model input data – Source characteristics

Table 3.1 illustrates the source characteristics utilised within the dispersion model. Grid reference location, stack height (A.G.L), maximum volume flow and temperature of the emission point are presented within this table for reference purposes.

Table 3.1. Source characteristics for proposed emission points AEP1 to AEP3**.**

Parameter	Emission point AEP1 – Gas Engine 1[1]	Emission point AEP2–Gas engine 2[1]	Emission point AEP3–OCU 1 to 3[2]
X coordinate	251118	251118.9	251093.1
Y coordinate	250579.1	250580.4	250590.2
Elevation (A.O.D) (m)	96.67	96.67	96.67
Stack height (m)	15	15	15
Orientation	Vertical	Vertical	Vertical
Temperature (K)	453	453	303
Efflux velocity (m/s)	15.2216	15.2216	15.12226
Max volume flow (Nm^3/hr)	3,000	3,000	41,064 Am^3/hr
Stack tip diameter (m)	0.34	0.34	0.98
Max building height (m)	12.50	12.50	12.50
Building ground level (m)	96.67	96.67	96.67

Notes: [1] denotes referencing conditions for emission point AEP1 to AEP2 are 273.15K, 101.3KPa, dry gas, 5% O_2.
[2]denotes referencing conditions for emission point AEP3 is 303K, 101.3KPa, wet gas, 20.9% O_2.

3.2 Process emissions - Volume flow rate and flue gas concentration guarantees

The input mass emission rate data used in the dispersion model for each emission point is presented in *Tables 3.2, 3.3 and 3.4* for each scenario. All source characteristics and location are reported in *Table 3.1*. These will be utilised as process guarantees for the operating process emission point so as to ensure compliance with the stated guideline limits

Table 3.2. Emission values from exhaust stack of the emission source AEP1.

Parameters – Exhaust stack AEP 1	Conc. Limit Values	Units	Volume flow (Nm^3/hr ref 5% O_2)	Mass emission rate (g/s)
Carbon monoxide (CO)	1,400	mg/Nm^3 5% O_2	3,000	1.1667
Oxides of nitrogen (NOx as NO_2)	500	mg/Nm^3 5% O_2	3,000	0.4167
Sulphur dioxide (SO_2)	150	mg/Nm^3 5% O_2	3,000	0.1250
Total particulates	130	mg/Nm^3 5% O_2	3,000	0.1083
Total non methane Volatile organic compounds	50	mg/Nm^3 5% O_2	3,000	0.0417

Table 3.3. Emission values from exhaust stack of the emission source AEP2.

Parameters – Exhaust stack AEP 2	Conc. Limit Values	Units	Volume flow (Nm^3/hr ref 5% O_2)	Mass emission rate (g/s)
Carbon monoxide (CO)	1,400	mg/Nm^3 5% O_2	3,000	1.1667
Oxides of nitrogen (NOx as NO_2)	500	mg/Nm^3 5% O_2	3,000	0.4167
Sulphur dioxide (SO_2)	150	mg/Nm^3 5% O_2	3,000	0.1250
Total particulates	130	mg/Nm^3 5% O_2	3,000	0.1083
Total non methane Volatile organic compounds	50	mg/Nm^3 5% O_2	3,000	0.0417

Table 3.4. Emission values from exhaust stack of the emission source AEP3.

Parameters – Exhaust stack AEP3	Conc. Limit Values	Units	Volume flow (Am^3/hr)	Mass emission rate (Ou_E/s)
Odour control units 1 to 3	1,000	Ou_E/m^3	41,064	11,407

3.3 Dispersion modelling assessment

AERMOD Prime (09292) was used to determine the overall ground level impact of proposed emission points AEP1 to AEP3 to be located in the anaerobic digestion facility Bio Agrigas Ltd, Newdowns, The Downs, Mullingar, Co. Westmeath. These computations give the relevant GLC's at each 50-meter X Y Cartesian grid receptor location that is predicted to be exceeded for the specific air quality impact criteria. Individual receptor elevations were established at their specific height above ground and also included a 1.80 m normal breathing zone. A total Cartesian + individual receptors of 1,722 points was established giving a total grid coverage area of 4.0 square kilometres around the emission point.

Five years of hourly sequential meteorological data from Clones (Clones 2002 to 2006 inclusive) and source characteristics (*see Table 3.1*), including emission date contained in *Tables 3.2 to 3.4* were inputted into the dispersion model.

In order to obtain the predicted environmental concentration (PEC), background data was added to the process emissions. In relation to the annual averages, the ambient background concentration was added directly to the process concentration. However, in relation to the short-term peak concentrations, concentrations due to emissions from elevated sources cannot be combined in the same way. Guidance from the UK Environment Agency advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum short-term concentration due to emissions from the source to twice the annual mean background concentration.

3.4 Dispersion model Scenarios

AERMOD Prime (USEPA ver. 09292) was used to determine the overall air quality impact of the five combined emission points while in operation at 100% capacity for named air pollutants.

Impacts from the five stack emission points were assessed in accordance with the impact criterion contained in Directive 2008/50/EC, SI 271 of 2002, H4 guidance and AG4 guidance documents.

Twelve scenarios were assessed within the dispersion model examination for each of the classical air pollutants.

The dispersion modelling is carried out in line with the requirements of guidance document AG4- Dispersion modelling.

The output data was analysed to calculate the following:

Ref Scenario 1: Predicted cumulative ground level concentration of Carbon monoxide emission contribution of cumulative emissions for the 100th percentile of 8 hour averages for Clones meteorological station year 2004 for a Carbon monoxide concentration of less than or equal to 100 µg/m^3 assuming 24 hr operation (*see Figure 6.2*).

Ref Scenario 2: Predicted cumulative ground level concentration of Oxides of nitrogen emission contribution of cumulative emissions for the 99.79th percentile of 1 hour averages for Clones meteorological station year 2004 for an Oxides of nitrogen concentration of less than or equal to 58 µg/m^3 assuming 24 hr operation (*see Figure 6.3*).

Ref Scenario 3: Predicted cumulative ground level concentration of Oxides of nitrogen emission contribution of cumulative emissions for the Annual average for Clones meteorological station year 2004 for an Oxides of nitrogen concentration of less than or equal to 11 µg/m^3 assuming 24 hr operation (*see Figure 6.4*).

Ref Scenario 4: Predicted cumulative ground level concentration of Sulphur dioxide emission contribution of cumulative emissions for the 99.73th percentile of 1 hour averages for Clones meteorological station year 2004 for an Sulphur dioxide concentration of less than or equal to 35 µg/m^3 assuming 24 hr operation (*see Figure 6.5*).

Ref Scenario 5: Predicted cumulative ground level concentration of Sulphur dioxide emission contribution of cumulative emissions for the 99.18th percentile of 24 hour averages for Clones meteorological station year 2004 for an Sulphur dioxide concentration of less than or equal to 10 µg/m^3 assuming 24 hr operation (*see Figure 6.6*).

Ref Scenario 6: Predicted cumulative ground level concentration of Sulphur dioxide emission contribution of cumulative emissions for the Annual average for Clones meteorological station year 2004 for an Sulphur dioxide concentration of less than or equal to 2 µg/m^3 assuming 24 hr operation (*see Figure 6.7*).

Ref Scenario 7: Predicted cumulative ground level concentration of Total particulates as PM_{10} emission contribution of cumulative emissions for the 98.08th percentile of 24 hour averages for Clones meteorological station year 2004 for an Total particulates as PM_{10} concentration of less than or equal to 10 µg/m^3 assuming 24 hr operation (*see Figure 6.8*).

Ref Scenario 8: Predicted cumulative ground level concentration of Total particulates as PM_{10} emission contribution of cumulative emissions for the 90.40th percentile of 24 hour averages for Clones meteorological station year 2004 for an Total particulates as PM_{10} concentration of less than or equal to 10 µg/m^3 assuming 24 hr operation (*see Figure 6.9*).

Ref Scenario 9: Predicted cumulative ground level concentration of Total particulates as PM_{10} emission contribution of cumulative emissions for the Annual average for Clones meteorological station year 2004 for an Total particulates as PM_{10} concentration of less than or equal to 4.0 µg/m^3 assuming 24 hr operation (*see Figure 6.10*).

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Ref Scenario 10: Predicted cumulative ground level concentration of Total particulates as $PM_{2.5}$ emission contribution of cumulative emissions for the Annual average for Clones meteorological station year 2004 for an Total particulates as $PM_{2.5}$ concentration of less than or equal to 4.0 µg/m^3 assuming 24 hr operation (*see Figure 6.11*).

Ref Scenario 11: Predicted cumulative ground level concentration of TNMVOC as Benzene emission contribution of cumulative emissions for the Annual average for Clones meteorological station year 2004 for an TNMVOC as Benzene concentration of less than or equal to 1.0 µg/m^3 assuming 24 hr operation (*see Figure 6.12*).

Ref Scenario 12: Predicted cumulative ground level concentration of Odour emission contribution of cumulative emissions for the 98th percentile of hourly averages for Clones meteorological station year 2004 for an Odour concentration of less than or equal to 1.0 Ou_E/m^3 assuming 24 hr operation (*see Figure 6.13*).

4. Discussion of results

This section will present the results of the dispersion modelling.

AERMOD GIS Pro Prime (Ver. 09292) was used to determine the overall named air pollutant air quality impact of the proposed emission points AEP1 to AEP3 during operation.

Various averaging intervals were chosen to allow direct comparison of predicted GLC's with the relevant the relevant air quality assessment criteria as outline in *Section 2.2.1*. In particular, 1-hour, 24 hour, percentile and annual average GLC's of the specified pollutants were calculated at 50 metres distances from the site over a fine and coarse grid extent of 9.0 kilometres squared. Relevant percentiles of these GLC's were also computed for comparison with the relevant pollutant Air Quality Standards to include SI 271 of 2002, Directive 2008/50/EC and AG4 guidance document.

In modelling air dispersion of NOx from combustion sources, the source term should be expressed as NO_2, e.g., NOx mass (expressed as NO_2). Some of the exhaust air is made up of NO while some is made up of NO_2. NO will be converted in the atmosphere to NO_2 but this will depend on a number of factors to include Ozone and VOC concentrations. In order to take account of this conversion the following screening can be performed.

Use the following phased approach for assessment:

Worse case scenario treatment

35% for short-term and 70% for long-term average concentration should be considered to assess compliance with the relevant air quality objective.

This is in accordance with recommendations from the Environmental Agency UK for the dispersion modelling of NO_2 emissions from combustion processes, www.environmentagency.gov.uk

Table 4.1 illustrates the tabular results obtained from the assessment for Clones meteorological station for:

- Worse case scenario treatment as detailed above (for NO_x only).

Maximum predicted GLC's are presented within this table to allow for comparison with Directive 2008/50/EC and SI 271 of 2002. In addition, the predicted ground level concentrations at the selected residential receptors are presented in the Discussion of Results section of the document for all pollutants. A total of 41 individual sensitive receptors were included within the dispersion model and the location of same is presented in *Figure 6.1*. Illustrative contour plots for information purposes only are presented in *Section 6* of this report for each modelled scenario.

Table 4.1. Predicted ground level concentrations for various averaging periods for proposed emission points AEP1 to AEP3 for each pollutant at or beyond the boundary of the facility.

Averaging period	Maximum ground level conc (GLC)
Carbon monoxide - 8 hr maximum GLC (µg/m^3)	401
Oxides of nitrogen - 1 hr max 99.79th percentile (µg/m^3)	64.40
Oxides of nitrogen - Max Annual average (µg/m^3)	18.20
Sulphur dioxide - 1 hr Max 99.73th percentile (µg/m^3)	54.60
Sulphur dioxide - 24 hr Max 99.18th percentile (µg/m^3)	35.13
Sulphur dioxide – Max annual average (µg/m^3)	7.83
Total particulates - 24 hr Max 98.08th percentile (µg/m^3)	23.88
Total particulates - 24 hr Max 90.40th percentile (µg/m^3)	18.87
Total Particulates as PM_{10} - Max annual average (µg/m^3)	6.78
Total Particulates as $PM_{2.5}$ - Max annual average (µg/m^3)	6.78
TNMVOC as benzene – Max Annual average	2.61

Table 4.2 presents the comparison between model predictions for air quality impacts, baseline air quality concentrations for the compounds and the percentage impact of the air quality impact criterion anywhere in the vicinity of the facility.

4.1 Assessment of air quality impacts for pollutants from proposed emission points AEP1 to AEP3

Predictive air dispersion modelling was used to ascertain the maximum ground level concentrations at or beyond the boundary of the facility of selected worst case pollutant concentration to allow for comparison with the ground level limit values contained in *Table 2.1*. *Table 4.2* illustrates the results of the dispersion modelling assessment for each pollutant and comparison with the air quality guideline and limit values contained in *Table 2.1*.

Table 4.2. Comparison between predicted GLC's + baseline national air quality data and limit values contained in *Table 2.1*.

Identity	Predicted %ile GLC - (μg m^{-3})	Baseline concentration value (μg m^{-3})[1]	Baseline + Maximum predicted GLC (μg m^{-3})	Impact criterion (μg m^{-3})[2]	% of Criterion
Carbon monoxide - 8 hr maximum GLC (μg/m^3)	401	1,040	1,441.0	10,000	14.41
Oxides of nitrogen - 1 hr max 99.79th percentile (μg/m^3)	64.40	33.80 (Twice annual mean as per EA)	98.2	200	49.10
Oxides of nitrogen - Max Annual average (μg/m^3)	18.20	16.90	35.1	40	87.75
Sulphur dioxide - 1 hr Max 99.73th percentile (μg/m^3)	54.60	8.0 (Twice annual mean as per EA)	62.6	350	17.89
Sulphur dioxide - 24 hr Max 99.18th percentile (μg/m^3)	35.13	8.0	43.1	125	34.50
Sulphur dioxide – Max annual average (μg/m^3)	7.83	4.0	11.8	20	59.15
Total particulates - 24 hr Max 98.08th percentile (μg/m^3)	23.88	23	46.9	50	93.76
Total particulates - 24 hr Max 90.40th percentile (μg/m^3)	18.87	23	41.9	50	83.74
Total Particulates as PM_{10} - Max annual average (μg/m^3)	6.78	23	29.8	40	74.45
Total Particulates as $PM_{2.5}$ - Max annual average (μg/m^3)	6.78	10.0	16.8	25	67.12
TNMVOC as benzene	2.61	1.40	4.0	5.0	80.20

Notes: [1] denotes based on data presented in *Tables 3.1, 3.2, 3.3, 3.4 and 4.1,*
[2] denotes for impact criterion *see Table 2.1.*

As can be observed in *Table 4.2*, the predicted maximum averaging ground level concentration and baseline concentration are presented as a % of the impact criterion contained in *Tables 2.1*.

4.1.1 Carbon monoxide – Ref Scenario 1

The results for the potential air quality impact for dispersion modelling of CO based on process guaranteed emission rates in *Tables 3.2 to 3.4* are presented in *Tables 4.1 and 4.2.* Results are presented for the maximum predicted percentile emission regime. As can be observed in *Tables 4.1 and 4.2,* the maximum GLC+Baseline for CO from the operation of the facility is 1,441 $\mu g\ m^{-3}$ for the maximum 8-hour mean concentration at the 100^{th} percentile. When combined predicted and baseline conditions are compared to the Irish guideline/limit values and EU Limit values set out in SI 271 of 2002 and Directive 2008/50/EC, this is 14.41% of the impact criterion.

In addition, the predicted ground level concentration of Carbon monoxide at each of the 41 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

4.1.2 Oxides of nitrogen – Ref Scenario 2 and 3

The results for the potential air quality impact for dispersion modelling of NO_X as NO_2 based on process guaranteed emission rates in *Tables 3.2 to 3.4* are presented in *Tables 4.1 and 4.2.* Results are presented for the maximum predicted percentile emission regime. As can be observed in *Tables 4.1 and 4.2,* the maximum GLC+Baseline for NO_2 from the operation of the facility is 98.20 $\mu g\ m^{-3}$ for the maximum 1-hour mean concentration at the 99.79^{th} percentile. When combined predicted and baseline conditions are compared to SI 271 of 2002 and Directive 2008/50/EC, this is 49.10% of the impact criterion.

An annual average was also generated to allow comparison with values contained in SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 35.10 $\mu g/m^3$. When compared the annual average NO_2 air quality impact criterion is 87.75% of the impact criterion.

In addition, the predicted ground level concentration of Oxides of nitrogen at each of the 41 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

4.1.3 Sulphur dioxide – Ref Scenario 4, 5 and 6

The results for the potential air quality impact for dispersion modelling of SO_2 based on process guaranteed emission rates in *Tables 3.2 to 3.4* are presented in *Tables 4.1 and 4.2.* Results are presented for the maximum predicted percentile emission regime. As can be observed in *Tables 4.1 and 4.2,* the maximum GLC+Baseline for SO_2 from the operation of the facility is 62.60 and 43.10 $\mu g\ m^{-3}$ for the maximum 1-hour and 24 hr mean concentration at the 99.73^{th} and 99.18^{th} percentile respectively. When combined predicted and baseline conditions are compared to SI 271 of 2002 and Directive 2008/50/EC, this is 17.87 and 34.50% of the set target limits established for the 1 hour and 24 hour assessment criteria.

An annual average was also generated to allow comparison with SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 11.80 $\mu g/m^3$. When compared the annual average SO_2 air quality impact criterion is 59.51% of the impact criterion.

In addition, the predicted ground level concentration of Sulphur dioxide at each of the 41 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

4.1.4 Particulate matter – Ref Scenario 7, 8, 9 and 10

The results for the potential air quality impact for dispersion modelling of Particulate matter based on process guaranteed emission rates in *Tables 3.2 to 3.4* are presented in *Tables 4.1 and 4.2.* Results are presented for the maximum predicted percentile emission regime. As can be observed in *Tables 4.1 and 4.2,* the maximum GLC+Baseline for Particulate matter 10μm from the operation of the facility is 46.90 and 41.90 μg m^{-3} for the maximum 24-hour mean concentration at the 98.08^{th} and 90.40^{th} percentile, respectively. When combined predicted and baseline conditions are compared to Directive 2008/50/EC, this is 93.76 and 83.74% of the impact criterion.

An annual average was also generated to allow comparison with the SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 29.80 μg/m^3. When compared, the annual average Particulate matter air quality impact is 74.45 % of the impact criterion.

An annual average was also generated for $PM_{2.5}$ to allow comparison with Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 16.80 μg/m^3. When compared, the annual average $PM_{2.5}$ air quality impact is 67.12% of the impact criterion.

In addition, the predicted ground level concentration of Particulate matter at each of the 41 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

4.1.5 TNMVOC as Benzene – Ref Scenario 11

The results for the potential air quality impact for dispersion modelling of TNMVOC as Benzene based on process guaranteed emission rates in *Tables 3.2 to 3.4* are presented in *Tables 4.1 and 4.2*. TNMVOC as Benzene modelling results indicate that the ambient ground level annual average concentrations could be up to 80.20% of the impact criterion (assuming all TNMVOC is Benzene which will not be the case).

In addition, the predicted ground level concentration of TNMVOC as Benzene at each of the 41 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

4.1.6 Odour – Ref Scenario 12

The results for the potential air quality impact for dispersion modelling of Odour based on the process guaranteed emission rates in *Tables 3.5 to 3.6* are presented in *Table 4.3 and Figure 6.13*. Odour modelling results indicate that the ambient ground level concentrations are below the relevant guideline odour air quality guideline value.

As can be observed in *Figure 6.13*, it is predicted that odour plume spread is in a north westerly south easterly direction of approximately 30 to 50 metres from the emission point with no sensitive receptors impacted by the plume. All resident locations in the vicinity of the proposed facility operations will perceive an odour concentration less than 1.50 Ou_E/m^3 at the 98^{th} percentile of hourly averages for worst case meteorological year Clones 2004. In accordance with odour impact criterion presented in *Table 2.1*, and in keeping with currently recommended odour impact criterion in this country, no long-term odour impacts will be generated by receptors in the vicinity of the proposed facility operations.

In addition, the predicted ground level concentration of Odour at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

A number of key mitigation measures will need to be implemented into the design of the odour containment, capture and treatment system to include:

1. All buildings should be fitted with a high integrity building fabric with a leakage rate of no greater than 3 $m^3/m^2/hr$.
2. The facility buildings should be capable of attaining a negative pressure value of at least 10 Pa when ventilation is applied and the facility is in operation.
3. All sumps, tanks etc. should be sealed with tight fitting high containment efficiency covers so as to prevent the release of odours from such processes.
4. All mechanical processes within the pre-treatment building should be placed under appropriate negative pressure so as to ensure no significant odour release to the headspace of the building.
5. All building should be fitted with appropriate roller doors / access points of sealed nature (max leakage rate of 10 $m^3/m^2/hr$).
6. All buildings / processes holding or processing material with the potential to generate odours shall be placed under negative ventilation with all odourous air ducted to an appropriate odour control system for treatment. The odour control system shall be capable of providing treatment of odourous air to a level of less than or equal to 600 Ou_E/m^3 in the treated exhaust air stream.
7. All process specifications shall be independently processed proved including odour control system performance, building integrity testing (leakage rate, smoke integrity testing and applied absolute pressure testing) so as to ensure the containment, capture and treatment systems installed at the facility are functioning adequately. This shall be only carried out by personnel experienced in this method of testing.
8. An odour management plan shall be developed for the operating facility so as to ensure adequate operation of all odour management systems on a day to day basis.

Table 4.3. Predicted ground level concentration (excluding baseline) of each pollutant at each identified sensitive receptor locations Rec 1 to Rec 24 for Scenarios 1 to 8 (*see Section 4 and Figure 6.1*).

Receptor identity	X coord (m)	Y coord (m)	Scen 1 - ($\mu g/m^3$)	Scen 2 - ($\mu g/m^3$)	Scen 3 - ($\mu g/m^3$)	Scen 4 - ($\mu g/m^3$)	Scen 5 - ($\mu g/m^3$)	Scen 6 - ($\mu g/m^3$)	Scen 7 - ($\mu g/m^3$)	Scen 8 -($\mu g/m^3$)
R1	251652	249621.8	40.5	16.2	0.3	4.6	1.1	0.1	0.7	0.31
R2	251731.6	249753.7	28.8	16.2	0.4	4.6	1.1	0.1	0.8	0.36
R3	251716.7	249855.6	30.8	17.7	0.4	5.1	1.2	0.1	0.9	0.40
R4	251662	249890.4	35.2	20.8	0.5	5.9	1.3	0.1	1.0	0.46
R5	251617.2	249920.3	39.8	23.7	0.5	6.3	1.4	0.2	1.2	0.50
R6	251430.7	249984.9	79.7	35.7	0.7	8.9	2.1	0.2	1.5	0.68
R7	251373.5	249997.4	58.6	48.4	0.7	11.6	2.1	0.2	1.4	0.78
R8	251316.3	250029.7	58.2	53.0	0.7	13.3	2.2	0.2	1.8	0.75
R9	251164.6	250042.1	87.3	56.6	0.7	15.4	2.5	0.2	1.8	0.69
R10	251055.1	250119.2	75.5	74.1	0.7	21.5	2.7	0.2	1.8	0.79
R11	251010.4	250141.6	95.1	71.5	0.7	18.5	2.7	0.2	1.9	0.62
R12	251002.9	250164	109.9	69.7	0.7	19.8	2.8	0.2	2.0	0.70
R13	250629.9	250400.3	96.4	87.5	1.0	25.2	3.2	0.3	2.0	1.09
R14	250570.2	250395.3	88.3	78.2	0.9	23.1	3.1	0.3	1.7	0.95
R15	250535.3	250492.3	156.3	78.2	0.7	20.8	2.1	0.2	1.4	0.77
R16	250254.3	250815.6	33.4	22.8	0.3	5.4	1.2	0.1	0.8	0.24
R17	250271.7	250922.6	39.0	17.8	0.3	5.0	1.2	0.1	0.7	0.28
R18	250279.2	250994.7	19.5	16.5	0.2	4.6	0.9	0.1	0.6	0.23
R19	250284.2	251069.3	21.2	14.2	0.2	4.1	0.8	0.1	0.5	0.23
R20	250411	251004.6	23.9	18.9	0.3	5.1	0.9	0.1	0.7	0.34
R21	250331.4	251138.9	21.1	15.3	0.2	4.3	0.8	0.1	0.6	0.22
R22	250445.8	251134	26.7	19.1	0.3	5.1	1.0	0.1	0.7	0.27
R23	250490.6	251129	29.3	20.9	0.3	5.6	1.0	0.1	0.7	0.30
R24	250522.9	251124	28.4	24.3	0.3	6.3	1.0	0.1	0.7	0.31

Table 4.3 continued. Predicted ground level concentration (excluding baseline) of each pollutant at each identified sensitive receptor locations Rec 1 to Rec 24 for Scenarios 9 to 12 (*see Section 4 and Figure 6.1*).

Receptor identity	X coord (m)	Y coord (m)	Scen 9 - ($\mu g/m^3$)	Scen 10 - ($\mu g/m^3$)	Scen 11 - ($\mu g/m^3$)	Scen 12 - ($\mu g/m^3$)
R1	251652	249621.8	0.08	0.08	0.03	0.046
R2	251731.6	249753.7	0.10	0.10	0.04	0.052
R3	251716.7	249855.6	0.11	0.11	0.04	0.064
R4	251662	249890.4	0.12	0.12	0.05	0.069
R5	251617.2	249920.3	0.13	0.13	0.05	0.071
R6	251430.7	249984.9	0.17	0.17	0.07	0.104
R7	251373.5	249997.4	0.18	0.18	0.07	0.108
R8	251316.3	250029.7	0.19	0.19	0.07	0.114
R9	251164.6	250042.1	0.18	0.18	0.07	0.103
R10	251055.1	250119.2	0.19	0.19	0.07	0.095
R11	251010.4	250141.6	0.18	0.18	0.07	0.085
R12	251002.9	250164	0.19	0.19	0.07	0.085
R13	250629.9	250400.3	0.27	0.27	0.10	0.137
R14	250570.2	250395.3	0.23	0.23	0.09	0.101
R15	250535.3	250492.3	0.18	0.18	0.07	0.084
R16	250254.3	250815.6	0.07	0.07	0.03	0.041
R17	250271.7	250922.6	0.08	0.08	0.03	0.042
R18	250279.2	250994.7	0.06	0.06	0.02	0.040
R19	250284.2	251069.3	0.06	0.06	0.02	0.036
R20	250411	251004.6	0.08	0.08	0.03	0.049
R21	250331.4	251138.9	0.06	0.06	0.02	0.036
R22	250445.8	251134	0.07	0.07	0.03	0.042
R23	250490.6	251129	0.08	0.08	0.03	0.044
R24	250522.9	251124	0.08	0.08	0.03	0.044

Table 4.3 continued. Predicted ground level concentration (excluding baseline) of each pollutant at each identified sensitive receptor locations Rec 25 to Rec 42 for Scenarios 1 to 8 (*see Section 4 and Figure 6.1*).

Receptor identity	X coord (m)	Y coord (m)	Scen 1 - (μg/m^3)	Scen 2 - (μg/m^3)	Scen 3 - (μg/m^3)	Scen 4 - (μg/m^3)	Scen 5 - (μg/m^3)	Scen 6 - (μg/m^3)	Scen 7 - (μg/m^3)	Scen 8 -(μg/m^3)
R25	250545.3	251124	29.7	24.8	0.3	6.5	1.1	0.1	0.7	0.31
R26	250570.2	251124	35.5	25.9	0.3	6.6	1.2	0.1	0.7	0.32
R27	250610	251186.2	48.1	21.8	0.3	6.1	1.0	0.1	0.8	0.27
R28	250644.8	251109.1	45.9	30.8	0.4	7.1	1.5	0.1	0.9	0.36
R29	250669.6	251188.7	44.0	23.7	0.4	6.6	1.4	0.1	0.8	0.34
R30	250716.9	251186.2	55.8	32.5	0.5	8.5	1.4	0.1	1.0	0.42
R31	250769.1	251181.2	62.4	36.5	0.5	10.6	1.6	0.2	1.1	0.54
R32	250813.9	251161.3	53.5	50.5	0.6	13.5	1.7	0.2	1.2	0.60
R33	250838.8	251161.3	70.6	55.8	0.7	14.9	1.9	0.2	1.3	0.73
R34	250910.9	251156.3	68.1	50.9	0.8	13.6	2.5	0.3	1.8	0.77
R35	251174.5	251074.3	76.1	83.2	1.8	22.8	3.9	0.5	2.6	1.39
R36	251229.2	251007.1	80.6	89.0	2.5	24.4	4.0	0.7	3.2	1.82
R37	251448.1	251141.4	77.3	68.9	1.8	19.2	3.2	0.5	2.4	1.40
R38	251542.6	251096.6	59.7	60.9	1.6	15.0	2.6	0.5	2.0	1.15
R39	251895.8	250741	46.2	36.9	0.8	10.6	1.4	0.2	1.1	0.58
R40	251647	250188.9	63.8	42.4	1.0	11.9	2.1	0.3	1.6	0.93
R41	251746.5	250069.5	59.4	31.9	0.7	7.3	1.4	0.2	1.1	0.63
R42	251127.9	250358.2	220.5	116.5	2.3	33.3	7.7	0.7	5.5	1.96

Table 4.3 continued. Predicted ground level concentration (excluding baseline) of each pollutant at each identified sensitive receptor locations Rec 25 to Rec 42 for Scenarios 9 to 12 (*see Section 4 and Figure 6.1*).

Receptor identity	X coord (m)	Y coord (m)	Scen 9 - (μg/m^3)	Scen 10 - (μg/m^3)	Scen 11 - (μg/m^3)	Scen 12 - (μg/m^3)
R25	250545.3	251124	0.08	0.08	0.03	0.044
R26	250570.2	251124	0.09	0.09	0.03	0.045
R27	250610	251186.2	0.08	0.08	0.03	0.047
R28	250644.8	251109.1	0.10	0.10	0.04	0.054
R29	250669.6	251188.7	0.10	0.10	0.04	0.058
R30	250716.9	251186.2	0.12	0.12	0.05	0.070
R31	250769.1	251181.2	0.14	0.14	0.05	0.089
R32	250813.9	251161.3	0.17	0.17	0.06	0.105
R33	250838.8	251161.3	0.18	0.18	0.07	0.108
R34	250910.9	251156.3	0.22	0.22	0.08	0.149
R35	251174.5	251074.3	0.47	0.47	0.18	0.274
R36	251229.2	251007.1	0.64	0.64	0.25	0.337
R37	251448.1	251141.4	0.48	0.48	0.18	0.198
R38	251542.6	251096.6	0.42	0.42	0.16	0.176
R39	251895.8	250741	0.20	0.20	0.08	0.100
R40	251647	250188.9	0.27	0.27	0.10	0.145
R41	251746.5	250069.5	0.19	0.19	0.07	0.100
R42	251127.9	250358.2	0.59	0.59	0.23	0.529

5. Conclusions

Odour Monitoring Ireland was commissioned by ORS consulting Ltd to perform a dispersion modelling study of a new proposed anaerobic digestion facility to be located in Bio Agrigas Ltd, Newdowns, The Downs, Mullingar, Co. Westmeath. Following a detailed impact and dispersion modelling assessment, it was demonstrated that no significant environmental impact will exist if the source characteristics and emission limit value in the waste gases are achieved.

The following conclusions are drawn from the study:

1. The assessment was carried out to provide information in line with standard information to be provided to the EPA and regulatory bodies for such projects.

2. Specific dispersion modelling was performed for Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Particulate matter, TNMVOC as Benzene and Odour.

3. With regards to Carbon monoxide, the maximum GLC+Baseline for CO from the operation of the facility is 1,441 $\mu g\ m^{-3}$ for the maximum 8-hour mean concentration at the 100^{th} percentile. When combined predicted and baseline conditions are compared to the Irish guideline/limit values and EU Limit values set out in SI 271 of 2002 and Directive 2008/50/EC, this is 14.41% of the impact criterion. In addition, the predicted ground level concentration of Carbon monoxide at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

4. With regards to Oxides of nitrogen, the maximum GLC+Baseline for NO_2 from the operation of the facility is 98.20 $\mu g\ m^{-3}$ for the maximum 1-hour mean concentration at the 99.79^{th} percentile. When combined predicted and baseline conditions are compared to SI 271 of 2002 and Directive 2008/50/EC, this is 49.10% of the impact criterion. An annual average was also generated to allow comparison with values contained in SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 35.10 $\mu g/m^3$. When compared the annual average NO_2 air quality impact criterion is 87.75% of the impact criterion. In addition, the predicted ground level concentration of Oxides of nitrogen at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

5. With regards to Sulphur dioxide, the maximum GLC+Baseline for SO_2 from the operation of the facility is 62.60 and 43.10 $\mu g\ m^{-3}$ for the maximum 1-hour and 24 hr mean concentration at the 99.73^{th} and 99.18^{th} percentile respectively. When combined predicted and baseline conditions are compared to SI 271 of 2002 and Directive 2008/50/EC, this is 17.87 and 34.50% of the set target limits established for the 1 hour and 24 hour assessment criteria. An annual average was also generated to allow comparison with SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 11.80 $\mu g/m^3$. When compared the annual average SO_2 air quality impact criterion is 59.51% of the impact criterion. In addition, the predicted ground level concentration of Sulphur dioxide at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

6. With regards to Particulate matter, the maximum GLC+Baseline for Particulate matter 10μm from the operation of the facility is 46.90 and 41.90 $\mu g\ m^{-3}$ for the maximum 24-hour mean concentration at the 98.08^{th} and 90.40^{th} percentile, respectively. When combined predicted and baseline conditions are compared to Directive 2008/50/EC, this is 93.76 and 83.74% of the impact criterion. An annual average was also generated to allow comparison with the SI 271 of 2002 and Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 29.80 $\mu g/m^3$. When compared, the annual average Particulate matter air

quality impact is 74.75 % of the impact criterion. An annual average was also generated for $PM_{2.5}$ to allow comparison with Directive 2008/50/EC. The maximum predicted annual average ground level concentration in the vicinity of the facility was 16.80 $\mu g/m^3$. When compared, the annual average $PM_{2.5}$ air quality impact is 67.12% of the impact criterion. In addition, the predicted ground level concentration of Particulate matter at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

7. With regards to the results from the assessment of TNMVOC as Benzene ground level concentrations, the results indicate that the ambient ground level maximum annual average concentrations anywhere in the vicinity of the facility could be up to 80.20% of the impact criterion (assuming all TNMVOC is Benzene which will not be the case). In addition, the predicted ground level concentration of TNMVOC as Benzene at each of the 41 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1*.

8. With regards to odour, it is predicted that odour plume spread is in a north westerly south easterly direction of approximately 30 to 50 metres from the emission points with no sensitive receptors impacted by the plume. All resident locations in the vicinity of the proposed facility operations will perceive an odour concentration less than 1.50 Ou_E/m^3 at the 98^{th} percentile of hourly averages for worst case meteorological year Clones 2004. In accordance with odour impact criterion presented in *Table 2.1*, and in keeping with currently recommended odour impact criterion in this country, no long-term odour impacts will be generated by receptors in the vicinity of the proposed facility operations. In addition, the predicted ground level concentration of Odour at each of the 42 sensitive receptors is presented in *Table 4.3*. As can be observed, all predicted ground level concentrations are well within the ground level concentration limit values contained in *Table 2.1.* A number of key mitigation measures as outlined in Section 4.1.6 will need to be implemented into the design of the odour containment, capture and treatment system to ensure compliance.

9. The overall modelling indicates that the facility will not result in any significant impact on air quality in the surrounding area with all ground level concentrations of pollutants well within their respective ground level concentration limit values.

6. *Appendix I* - Air dispersion modelling contour plots (Process contributions and illustrative purposes only).

These contour maps are for illustrative purposes only.

6.1 Site layout drawing and location of proposed facility and nearby residences

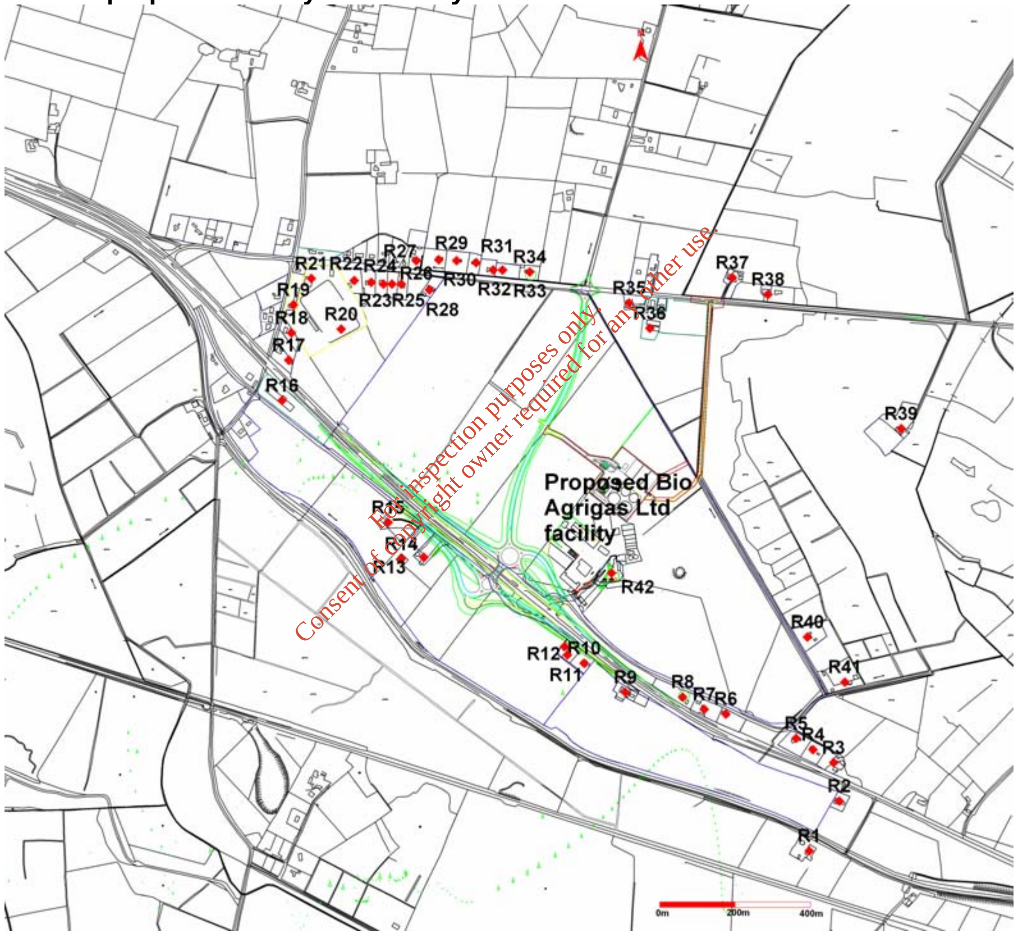

Figure 6.1. Plan view facility layout drawings for Bio Agrigas anaerobic digestion facility including specific location of nearest sensitive receptors Rec 1 to Rec 42.

6.2. Dispersion modelling contour plots for Scenarios 1 to 12 – Worst case meteorological year Clones 2004

6.2.1 Scenario 1 - Carbon monoxide

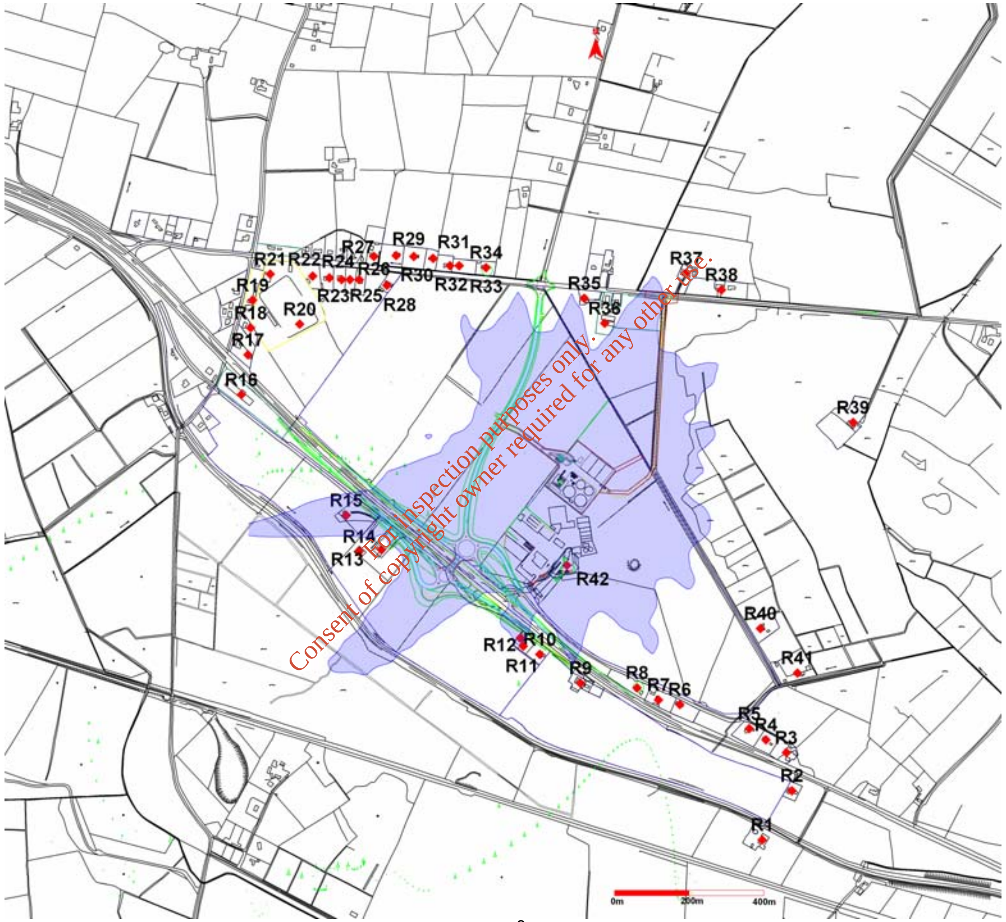

Figure 6.2. Predicted 8 hr average CO ground level concentration of 100 µg/m^3 ( ) for cumulative emissions from emission points AEP1 to AEP3 for Scenario 1 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

6.2.2 Scenario 2 and 3 - Oxides of nitrogen

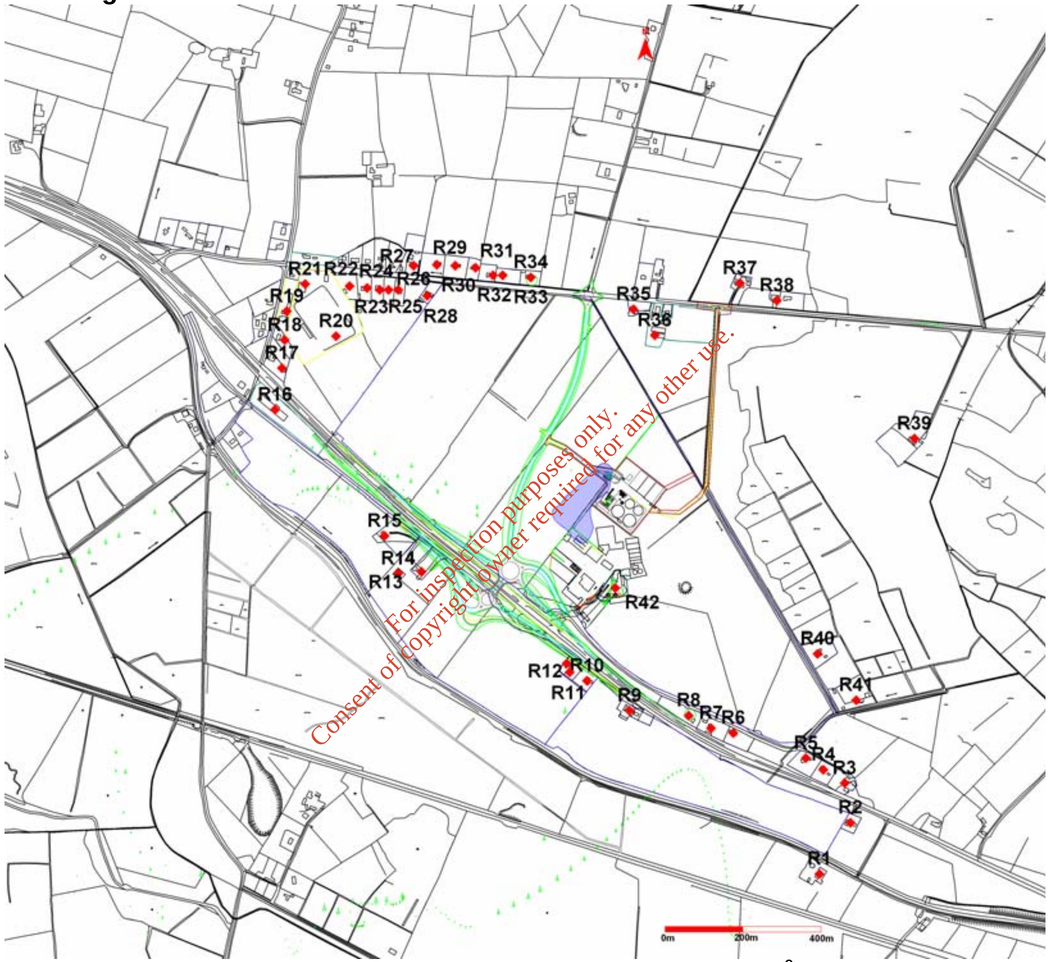

Figure 6.3. Predicted 99.79th percentile of 1 hr averages for NO_2 ground level concentration of 58 $\mu g/m^3$ (▬) for cumulative emission for Scenario 2 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

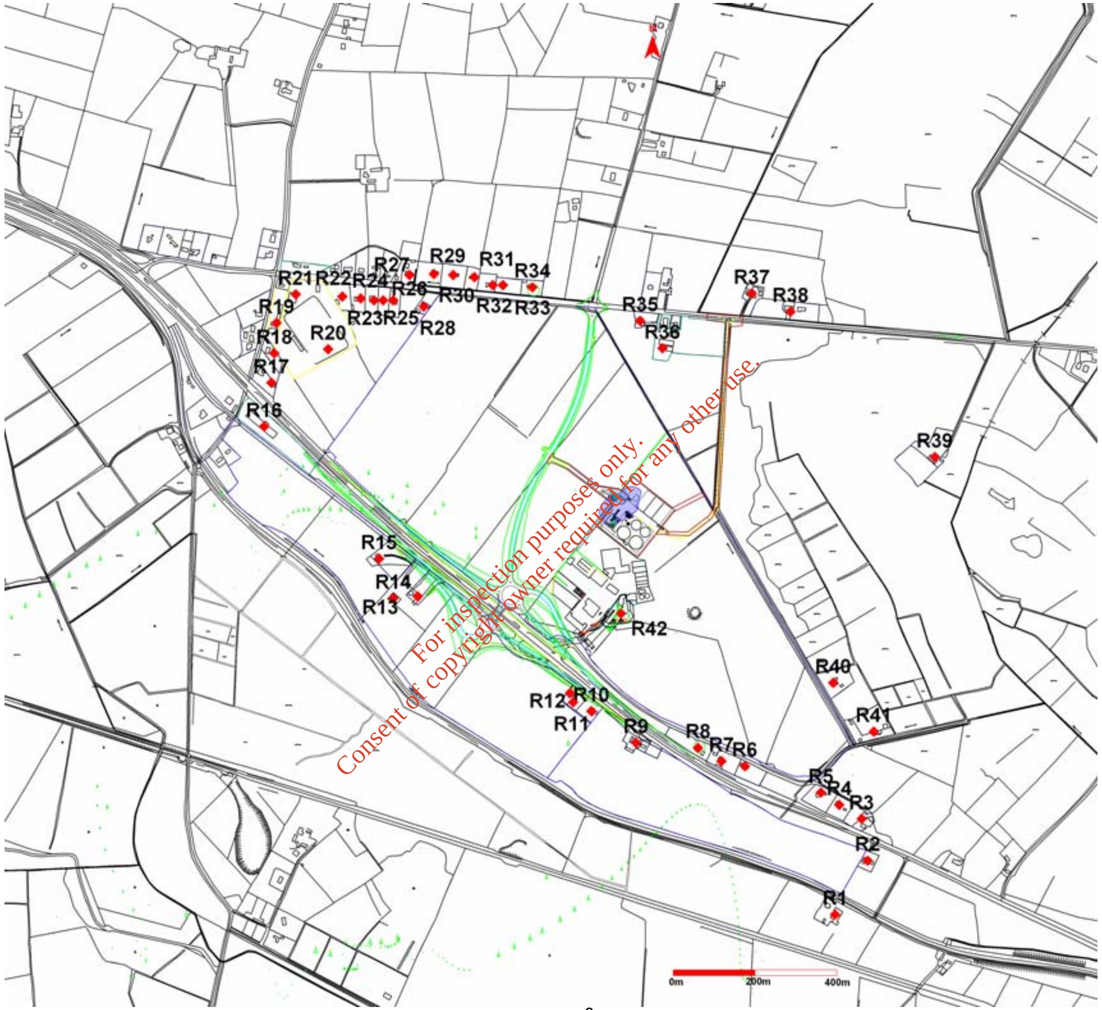

Figure 6.4. Predicted annual average NO_2 ground level concentration of 11 $\mu g/m^3$ ( ) for cumulative emissions for Scenario 3 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

6.2.3 Scenario 4, 5 and 6 - Sulphur dioxide

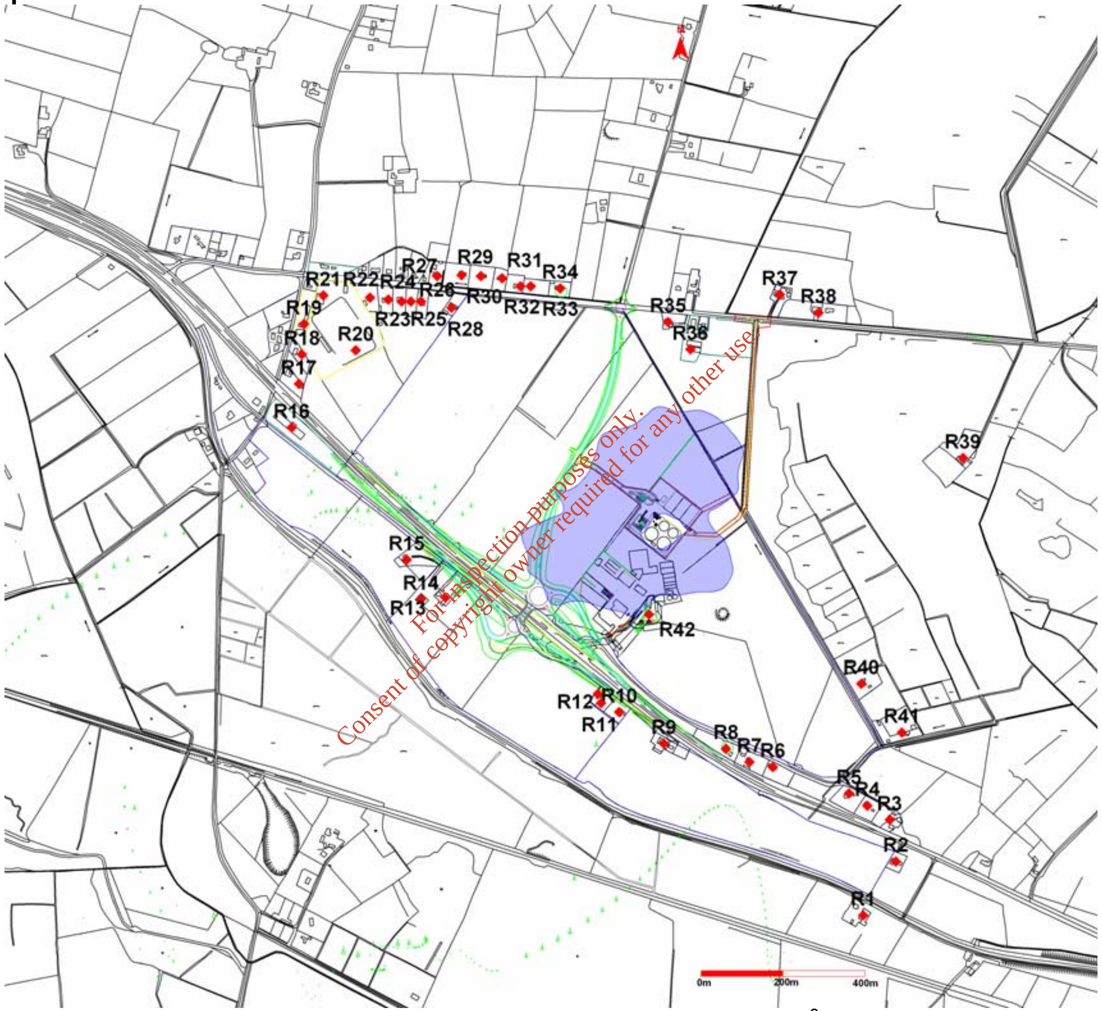

Figure 6.5. Predicted 99.73th percentile of 1 hr averages for SO_2 ground level concentration of 35 μg/m^3 ( ) for cumulative emission for Scenario 4 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

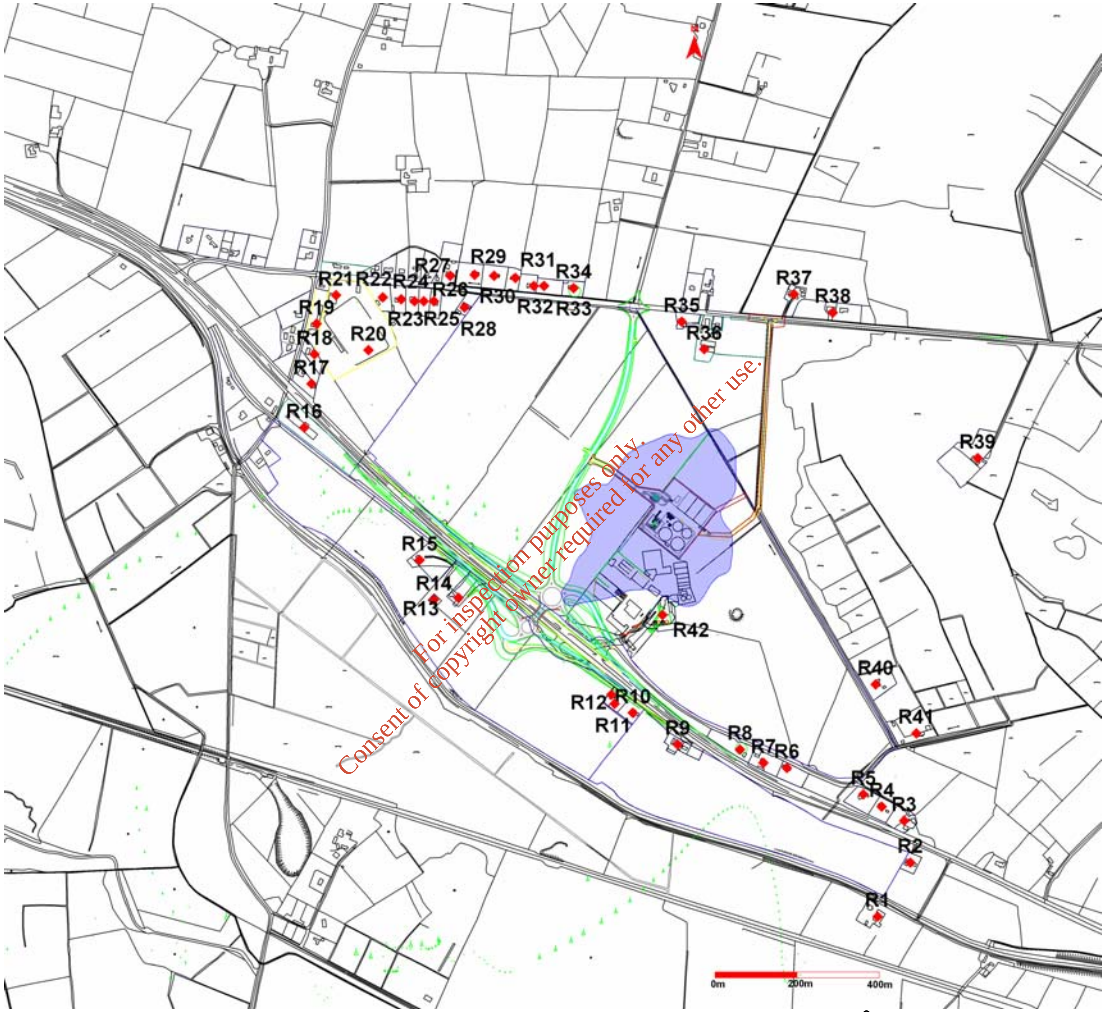

Figure 6.6. Predicted 99.18th percentile of 24 hr averages for SO_2 ground level concentration of 10 µg/m^3 (▬) for cumulative emission for Scenario 5 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

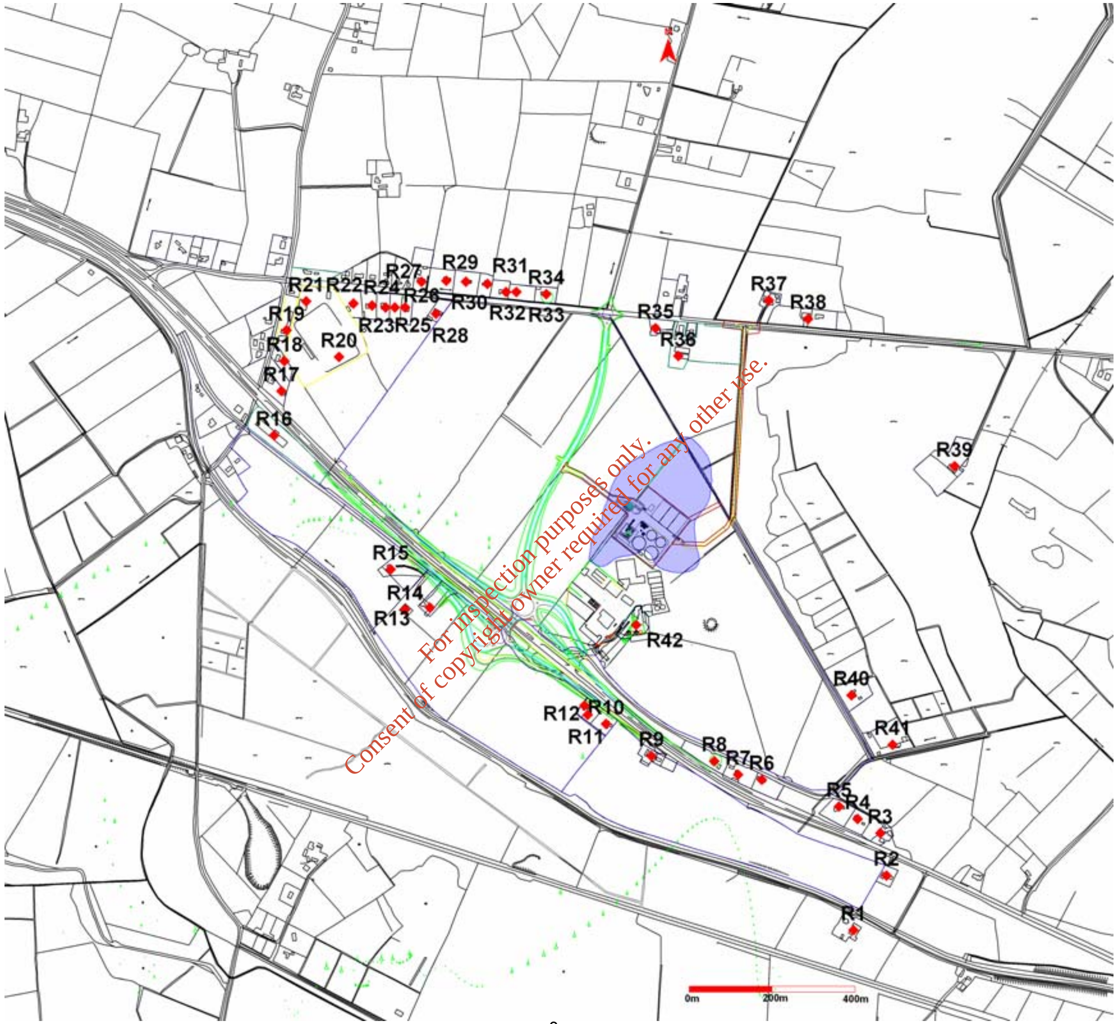

Figure 6.7. Predicted annual average SO_2 ground level concentration of 2 $\mu g/m^3$ (▬) for cumulative emissions for Scenario 6 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

6.2.4 Scenario 7, 8, 9 and 10 - Total particulates

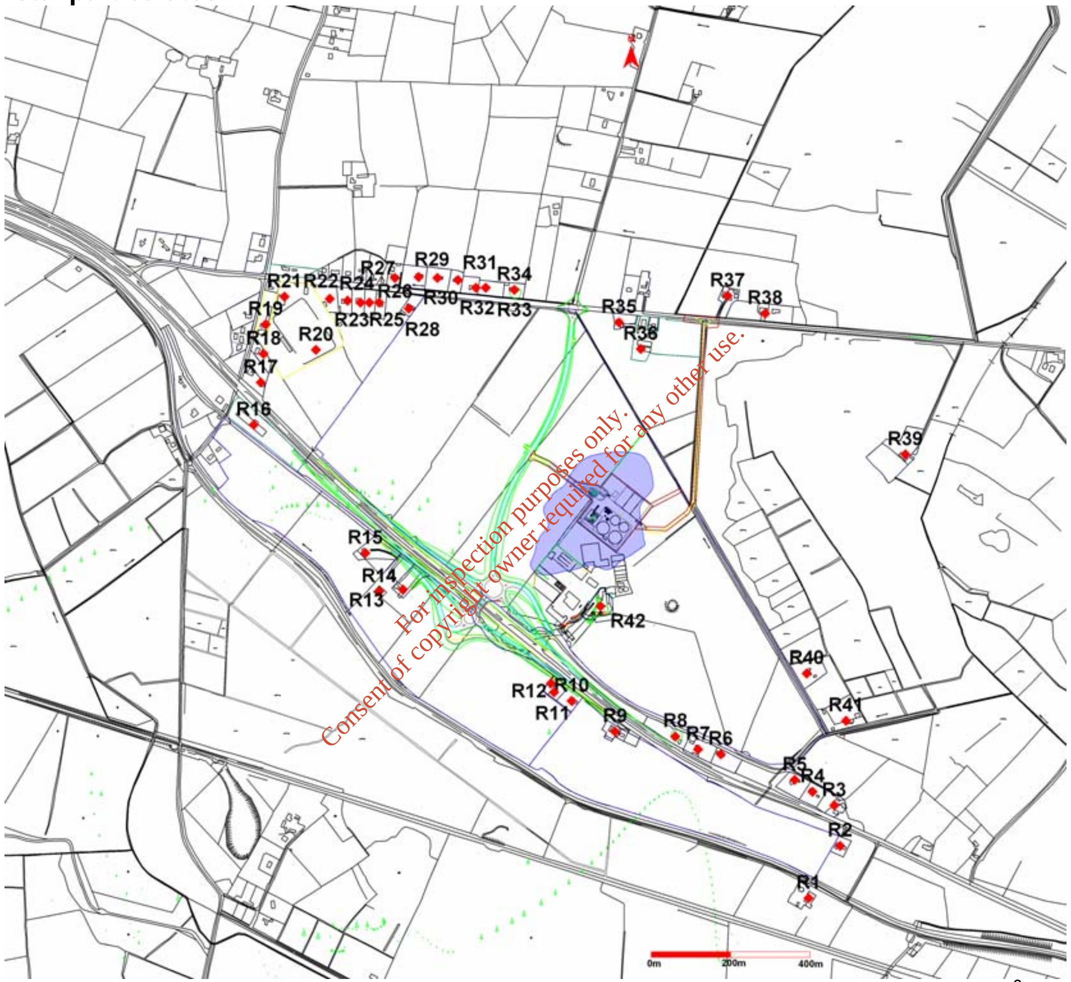

Figure 6.8. Predicted 98.08th percentile of 24 hr averages for Total particulates ground level concentration of 10 μg/m^3 (▬) for cumulative emission for Scenario 7 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

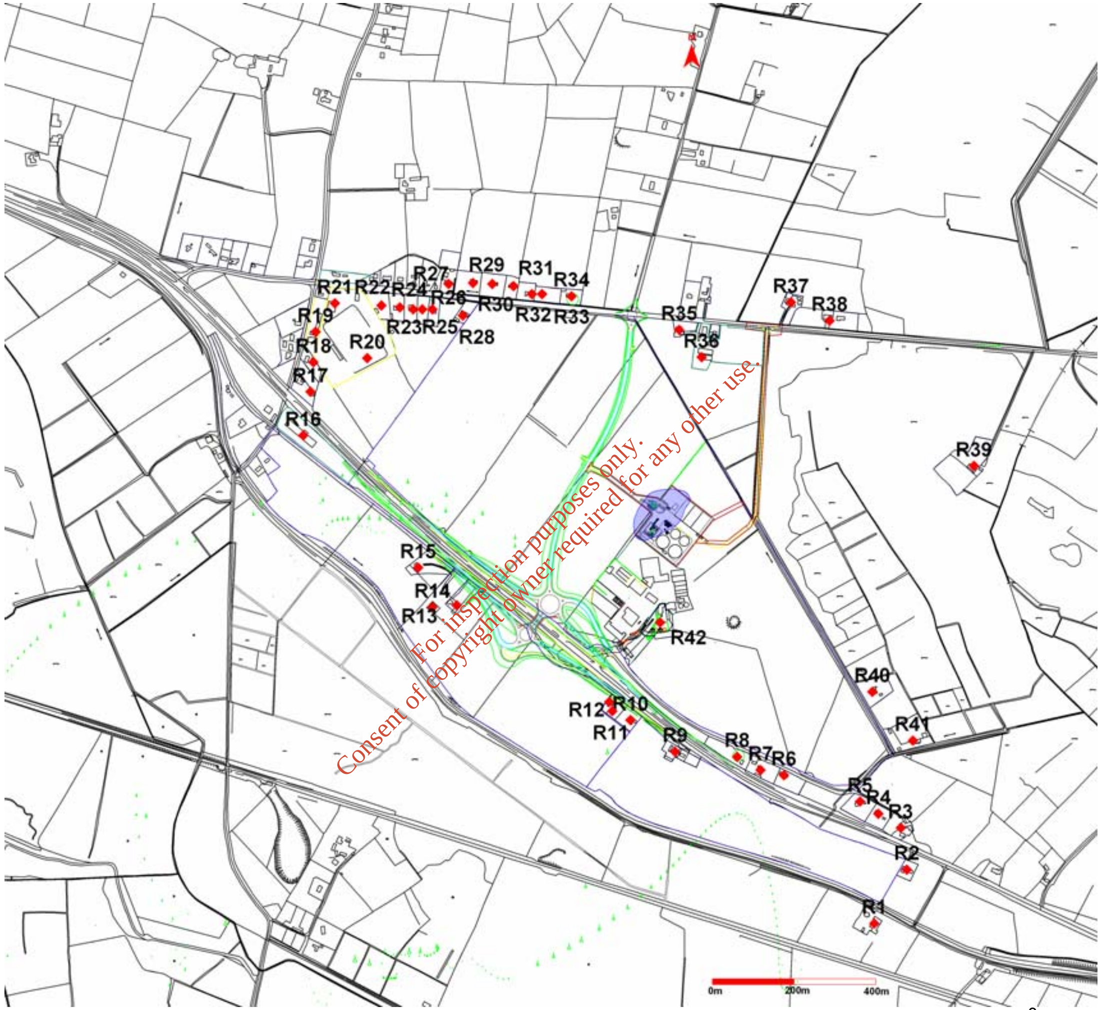

Figure 6.9. Predicted 90.40th percentile of 24 hr averages for Total particulates ground level concentration of 10 μg/m^3 (▬) for cumulative emission for Scenario 8 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

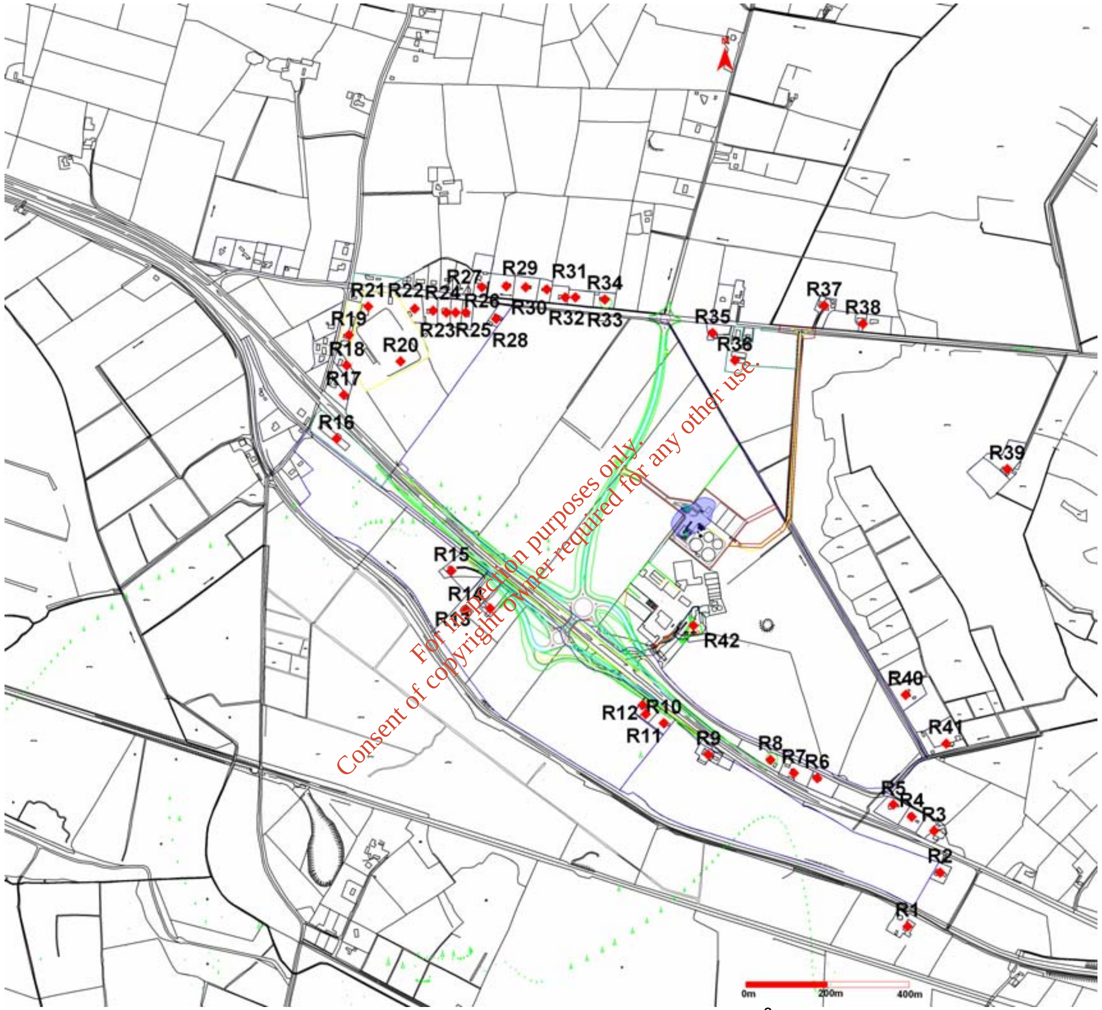

Figure 6.10. Predicted annual average Total particulates ground level concentration of 4.0 μg/m^3 (blue line) for cumulative emissions for Scenario 9 for Clones meteorological station (worst case year 2024) - 24 hr plant operation.

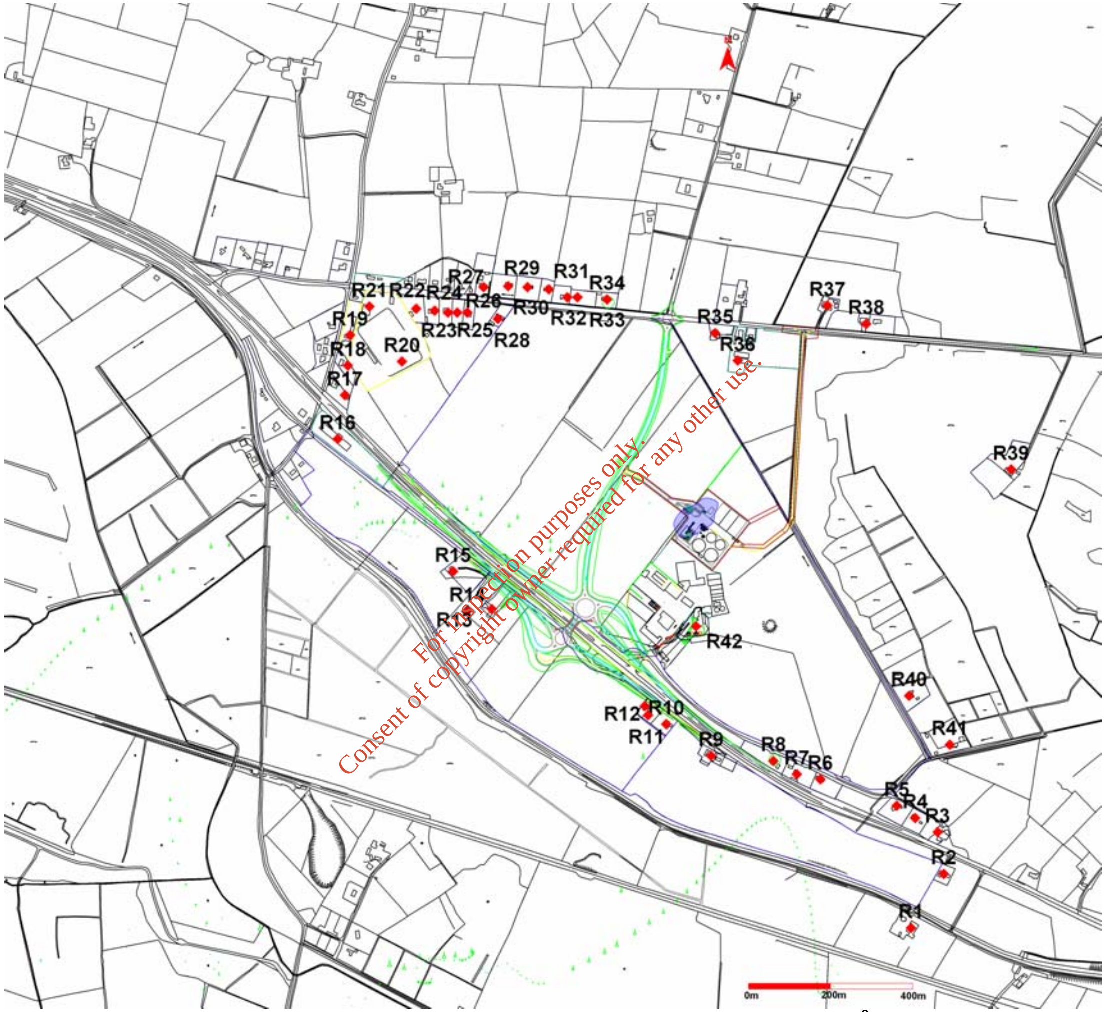

Figure 6.11. Predicted annual average Total particulates as $PM_{2.5}$ ground level concentration of 4.0 $\mu g/m^3$ ( ) for cumulative emissions for Scenario 10 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

6.2.5 Scenario 11 – TNMVOC as Benzene

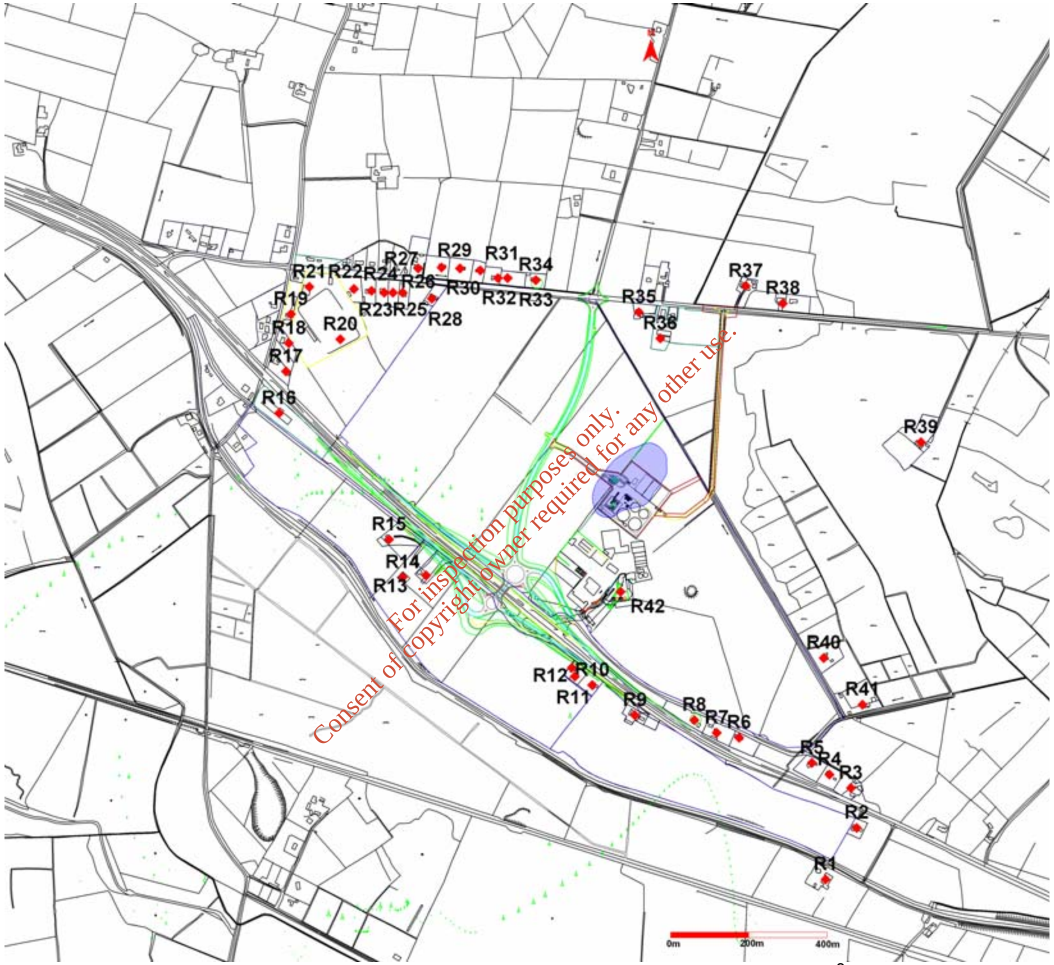

Figure 6.12. Predicted annual averages for TNMVOC as Benzene ground level concentration of 1.0 µg/m^3 (▬) for cumulative emission for Scenario 11 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

6.2.6 Scenario 12 – Odour

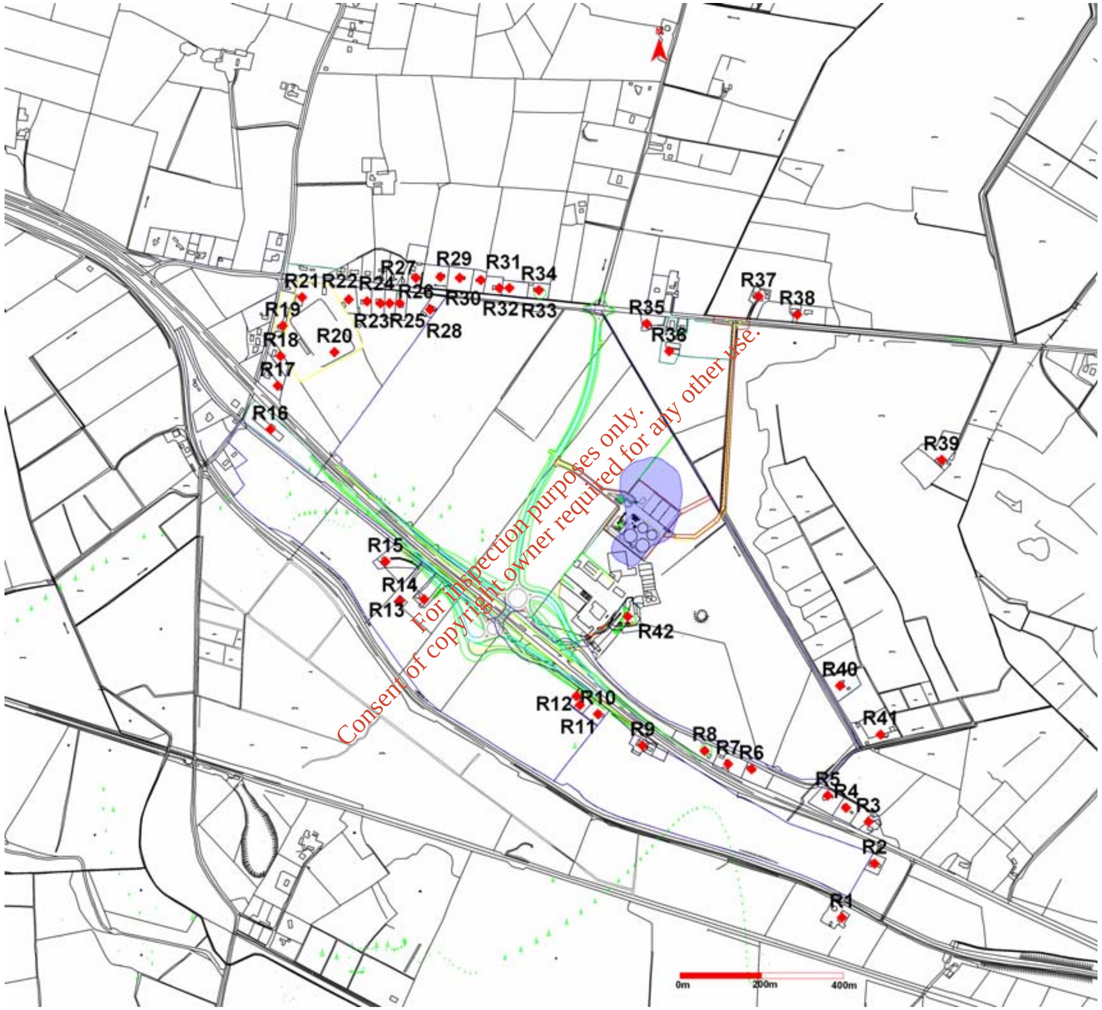

Figure 6.13. Predicted 98th percentile of 1 hr averages for an Odour ground level concentration of less than or equal to 1.0 Ou_E/m^3 (▬) for cumulative emission for Scenario 13 for Clones meteorological station (worst case year 2004) - 24 hr plant operation.

7. *Appendix II* - Meteorological data used within the Dispersion modelling study.

Meteorological file Clones 2002 to 2006 inclusive

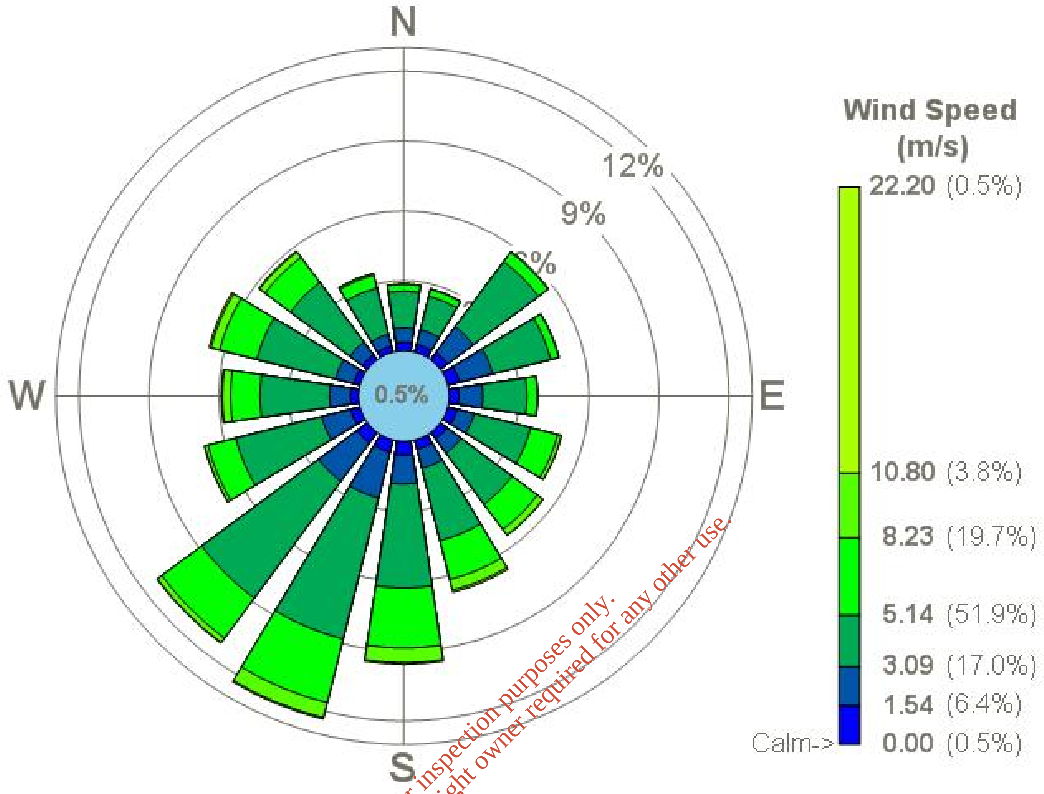

Figure 7.1. Schematic illustrating windrose for meteorological data used for atmospheric dispersion modelling, Clones 2002 to 2006 inclusive.

Table 7.1. Cumulative wind speed and direction for meteorological data used for atmospheric dispersion modelling Clones 2002 to 2006 inclusive.

Cumulative Wind Speed Categories							
Relative Direction	**> 1.54**	**>3.09**	**>5.14**	**>8.23**	**> 10.80**	**< 10.80**	**Total**
0	0.36	0.62	1.57	0.30	0.02	0.00	2.87
22.5	0.34	0.65	1.49	0.31	0.02	0.00	2.79
45	0.39	1.36	3.49	0.50	0.03	0.00	5.77
67.5	0.52	1.47	2.56	0.35	0.01	0.00	4.90
90	0.41	1.04	1.89	0.44	0.02	0.00	3.79
112.5	0.40	0.76	2.51	1.20	0.16	0.00	5.02
135	0.35	0.75	2.74	1.34	0.30	0.02	5.50
157.5	0.40	0.84	3.20	1.72	0.47	0.09	6.73
180	0.59	1.24	4.45	2.58	0.63	0.06	9.56
202.5	0.53	2.03	6.24	2.82	0.67	0.06	12.35
225	0.55	2.06	6.24	2.14	0.24	0.03	11.26
247.5	0.41	1.29	3.80	1.23	0.14	0.01	6.88
270	0.35	0.90	2.98	1.27	0.35	0.05	5.89
292.5	0.26	0.81	3.48	1.65	0.39	0.08	6.67
315	0.27	0.67	3.20	1.34	0.29	0.05	5.81
337.5	0.26	0.51	2.05	0.56	0.08	0.01	3.48
Total	**6.39**	**17.00**	**51.87**	**19.74**	**3.80**	**0.47**	**99.28**
Calms	--	-	-	-	-	-	0.48
Missing	-	-	-	-	-	-	0.24
Total	**-**	**-**	**-**	**-**	**-**	**-**	100.00

8. *Appendix III* - Checklist for EPA requirements for air dispersion modelling reporting

Table 8.1. EPA checklist as taken from their air dispersion modelling requirements report.

Item	Yes/No	Reason for omission/Notes
Location map	Section 6	-
Site plan	Section 6	-
List of pollutants modelled and relevant air quality guidelines	Yes	-
Details of modelled scenarios	Yes	-
Model description and justification	Yes	-
Special model treatments used	Yes	-
Table of emission parameters used	Yes	-
Details of modelled domain and receptors	Yes	-
Details of meteorological data used (including origin) and justification	Yes	-
Details of terrain treatment	Yes	-
Details of building treatment	Yes	-
Details of modelled wet/dry deposition	N/A	-
Sensitivity analysis	Yes	Five years of hourly sequential data screened from nearest valid met station- Clones 2002 to 2006.
Assessment of impacts	Yes	Pollutant emissions assessment from process identified.
Model input files	No	DVD will be sent upon request. Files are a total of 3.1 GB in size.

Appendix E3

Table E.2 (i) Main emissions to surface water

Table E.2 (ii) Main emissions to surface water

TABLE E.2 (i): EMISSIONS TO SURFACE WATERS
(One page for each emission)

Emission Point:

Emission Point Ref. Nº:	SW1
Source of Emission:	Pipe from attenuation tank on site
Location :	North East of site
Grid Ref. (10 digit, 5E,5N):	251331 250653
Name of receiving waters:	Riverstown river
Flow rate in receiving waters:	________________$m^3.sec^{-1}$ Dry Weather Flow ____________________$m^3.sec^{-1}$ 95%ile flow
Available waste assimilative capacity:	kg/day

Emission Details:

(i) Volume to be emitted			
Normal/day	m^3	Maximum/day	m^3
Maximum rate/hour	m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	______min/hr ______hr/day ______day/yr

All emissions will be fully quantified once final design has been completed on the surface water system.

TABLE E.2 (ii): EMISSIONS TO SURFACE WATERS - Characteristics of the emission (1 table per emission point)

Emission point reference number : *SW1*

Parameter	Prior to treatment				As discharged				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	

All emissions will be fully quantified once final design has been completed on the surface water system.

Appendix E4

Table E.4 (i) Main emissions to ground water

TABLE E.4 (i): EMISSIONS TO GROUNDWATER (1 Page for each emission point)

Emission Point or Area:

Emission Point/Area Ref. Nº:	GW1
Emission Pathway: (borehole, well, percolation area, soakaway, landspreading, etc.)	Percolation area
Location :	North East boundary
Grid Ref. (10 digit, 5E,5N):	251094 250677
Elevation of discharge: (relative to Ordnance Datum)	96.2 OD
Aquifer classification for receiving groundwater body:	Locally important Aquifer-moderately productive only in local Zone classification
Groundwater vulnerability assessment (including vulnerability rating):	Moderately Vulnerable
Identity and proximity of groundwater sources at risk (wells, springs, etc):	GSI well data march 2011 indicates no wells in immediate vicinity of site
Identity and proximity of surface water bodies at risk:	N/A

Emission Details:

(i) Volume to be emitted			
Normal/day	.72m^3	Maximum/day	.72m^3
Maximum rate/hour	.03m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	______min/hr ______hr/day ______day/yr

Periods of emission to vary depending on number of people on site.

Appendix E5
Dust monitoring Proposals

Engineering a Sustainable Future

ORS Consulting Engineers / ORS Building / Marlinstown Office Park / Mullingar, Co. Westmeath / Ireland

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Environmental Dust Monitoring
Proposed Bio-Energy Facility
Newdown, The Downs,
Co. Westmeath

November 14th 2011

Client	Revision	Date	Compiled	Checked	Approved
Bio Agrigas Ltd	**A**	**14/11/2011**	**MOC**		
Thomas Flynn **Newdown** **The Downs** **Mullingar** **Co. Westmeath**					

Index

Executive Summary

Dust deposition will be monitored in accordance with Planning File ref 11/5055, F.I part 5. There will be four monitoring locations on site as shown in drawing 111_001_821.

1 Scope

ORS Environmental Consultants will carry out environmental dust monitoring at the proposed Bioenergy site in Newdown, The Downs, Mullingar, Co. Westmeath. Monitoring is required as part of the F.I conditions as per planning permission no. 11/5055 condition no.5.

The dust deposition monitors will be installed and left in situ for 31 days. Dust is a natural occurring product of the environment with typical background levels in the region of <70mg/m^2/ day (source: TA Luft VDI 2119 guidelines). Human activities will generally increase this level due to the creation of hard standing areas, vehicle movements and dust associated with the reduction of dampened areas.

Possible causes of dust generation within the site will be from traffic movements, rock cutting, material movement and general day to day activities. Dust monitoring will be carried out at the site boundaries to ascertain the potential dust leaving the site.

2 Monitoring Locations

Environmental dust deposition monitoring was carried out at the predetermined locations on the Boienergy site, D1, D2, D3 and D4. These monitoring locations are detailed below in Table 1 and presented in drawing # 111_001_821.

Monitoring Locations	Description
D1	Located to the north west of the site
D2	Located to the east of the site
D3	Located to the south of the site
D4	Located to the south west of the site

3 Activities on Site

Various activities on the sites contribute to the generation of dust. These may include the entering / exiting of heavy vehicles from the site via the site entrance, loading of material, rock cutting, stock piling material and general vehicle movements within the site.

4 Methodology

The standard method used for monitoring dust deposition is VDI 2119 *'Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method)'*, (EPA Guidance Notes). With this method, atmospheric deposits are collected in vessels over a 30-day period ± 2 days. The collected samples are then concentrated and the residue subjected to gravimetric weight analysis.

Collecting jars with a volume of 1.5 litres will be placed in deposition stands. The top of the jar will be positioned 1.5 metres above ground level.

On completion of the collection period the jars were removed and immediately sealed air tight and transported directly to the laboratory.

Sample preparation and analysis was carried out in accordance with the VDI 2119 standard.

5 Calculations

After a drying off period, the remaining dust particles will be weighed and inputted into an equation where their exact weight can be determined.

Once this is completed for all monitoring points, the results will be evaluated to see if there is a problem with dust dispersion from the site.

6 Conclusion

From the results above, it can then be determined what action, if any, needs to be taken on-site to reduce the dispersion of dust to the surrounding areas.

Appendix E6

Traffic and transport report

Engineering a Sustainable Future

ORS Consulting Engineers / ORS Building / Marlinstown Office Park / Mullingar, Co. Westmeath / Ireland

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Traffic and Transport Assessment
Proposed Bio Energy Facility
The Downs
Mullingar

May 12th 2011

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Executive Summary

This Traffic and Transport Assessment Report examines existing and proposed traffic conditions and transport activity to determine the effects on the local road network attributable to a proposal by Bio-Agrigas to construct an Anaerobic Digestion Facility to produce electricity from organic feedstock. Existing and collected traffic data have been used to enable accurate assessments of the prevailing existing conditions and predicted future conditions.

Established empirical data have been used to anticipate future traffic generation resulting from the introduction of the proposal and to develop a model of flow conditions following the commencement of the proposed development.

The proposed access arrangements have been analysed using these anticipated flow parameters by means of recognised junction capacity assessment techniques. These analyses have confirmed that the access junction will accommodate anticipated traffic conditions and will comfortably operate within levels of acceptable capacity without undue detrimental effects on the existing road network.

The report also analyses the proposed access junction in accordance with the NRA's DMRB guidelines to ensure that the developments access complies with all existing standards.

1. Introduction

The purpose of this report is to address the traffic and transport related issues that arise in relation to the proposal by Bio-Agrigas to construct an Anaerobic Digestion Facility. ORS Consulting Engineers has been commissioned to undertake a Traffic and Transport Assessment so as to examine the traffic activity arising from the proposed development.

Recommendations contained within this Traffic and Transport Assessment are based on site observations, recorded traffic survey data, interpretation of collected data and information and consultations with the relevant Authorities and interested parties.

Accordingly, the report will assess:

- The prevailing traffic conditions and programmed road upgrading measures that may influence those conditions.
- The effect on the local road network of the anticipated volume of traffic generated by the proposal.
- The proposed access arrangements associated with the site area.
- The parking and servicing characteristics of the proposed development.
- The relationship with neighbouring developments, if any.
- The level of public transport provision associated with the development, if any.

This report is therefore concerned with the assessment of the accessibility of the development with particular regard to how the traffic generated by the development would be accommodated at the existing access and by the surrounding road network. The report will also comment on the suitability of internal traffic flow operation of the proposed development in relation to the relevant design standards and safety requirements.

The objective of this report is to examine the traffic implications associated with the proposed development in terms of how it can integrate with existing traffic in the area. The report will determine and quantify the extent of additional trips generated by the development, and the impact on the operational performance of such trips on the local road network and junctions.

In so doing, this report will follow the principles set out in the 'Traffic and Transport Assessment Guidelines' by the NRA 2007.

2. Structure of Report

The transportation report shall be structured as follows:

- Section 3 outlines the methodology taken to produce the reports findings.
- Section 4 provides information on the proposed project.
- Section 5 and 6 provide overviews of the existing traffic conditions and proposals for the local road network, identifying issues related to traffic flow or road infrastructure.
- Section 7 sets out the analysis based on the methodology above, so as to report how the proposed traffic generated will impact upon the surrounding road network.
- Section 8 addresses the road safety aspects of the proposal.
- Section 9 outlines the environmental impact of the scheme.
- Section 10 describes the internal road layout and site access of the proposed development.
- Section 11 Sustainable Transport, Public Transport Provision for the development.
- Section 12 assesses the accessibility and integration of the development.
- Section 13 sets out the conclusions of the report.

3. Methodology

3.1 A comprehensive traffic survey for the N4/R156 interchange was carried out by Nationwide Data Collection. This survey was carried out on Friday 4th March 2011 over the period 07:00-19:00 hrs using video surveillance. The counts were taken on a typical day of the week, which was chosen as a Friday. Using the NRA "Traffic Growth Forecast figures" a factored traffic 12 hour count for 2012 was derived. On the same date ORS Consulting Engineers carried out a traffic survey of the junction of the N4 and Thomas Flynn's site access to Flynn Feeds.

3.2 A spreadsheet format traffic model was then created using the 2011 base year traffic data so that capacity assessments of relevant or proposed junctions could be undertaken for future year scenarios using recognised capacity analysis programmes.

3.3 Inherent in this approach was the application of applicable national growth forecast values to incorporate the perceived growth of traffic on the network and consideration of programmed road infrastructure measures that may influence flow conditions.

3.4 The assessment of future traffic volumes arising from the proposal has been undertaken by examining traffic generation characteristics for the types of vehicles expected to visit the facility and any ancillary trips to service the development. The facility will be operational 24 hours a day, 7 days a week so a linear traffic profile is predicted for the facility.

3.5 The impact of the change in traffic conditions following the opening of the development has then been determined and the operational performance of the access junction on the adjacent network analysed. This has therefore enabled the parameters of the access junction to be known and to ensure that it can accommodate the resultant flows and movements.

3.6 Pre-Planning meetings were held to discuss the scope of the Traffic and Transport Assessment and EIS with Westmeath County Council and the NRA. A meeting was held with Mr Vincent Mulry of Westmeath

County Council Mullingar Area Office on 21st February 2011 and with Mr. Ambrose Clarke of the Westmeath NRDO office on 2nd March 2011. A further meeting was held with Ruth Holton of Westmeath County Council, Mullingar Area Office on 30th March 2011.

4. The Development Proposal

4.1. The applicant's proposal is to construct a Bio Energy plant on their existing lands at 'The Downs', Mullingar, Co.Westmeath.

4.2. The plant will consist of an anaerobic digestion facility that will possess up to a maximum of 20,000 tonnes of organic feedstock and produce electricity to use at the existing Tom Flynn Feed's facility and to sell any excess to the national grid.

4.3. The waste material will be primarily taken from existing sources, such as the adjacent pig farm and silage produced from the surrounding lands. Approximately less than half the material required will be delivered by vehicles using the public road network.

4.4. A site location map of the proposed development is shown in figure 4.1 of the report.

Figure 4.1 – Location of Proposed Development

5. Existing Traffic Conditions

5.1 Existing Traffic Flows

5.1.1 As part of the Traffic and Transport Assessment, traffic flows have been collected to ascertain current traffic conditions and to define representative traffic levels for a base year scenario. The base year provides the basis for all subsequent assessment and operational testing of the relevant junctions.

5.1.2 As previously stated, a comprehensive traffic count was carried out to determine the traffic levels on the N4 and R156 Killucan Road. Details of these counts are outlined in Section 3 of this report.

5.2 Existing Road Network

5.2.1 The proposed site is located between the N4 dual carriageway and the R156 Killucan Road on the applicants land. The N4 dual carriageway lies to the south of the proposed site.

5.2.2 The N4 national primary route is the main inter-city route between Dublin to Sligo.

5.2.3 The R156 runs to the north of the site. The R156 and N4 connect at the N4 'The Downs' at-grade junction. It is proposed to close off this at-grade junction along with eight others and construct a new grade separated junction to improve the safety and capacity of the junctions along the N4.

5.2.4 It is proposed that the access into the proposed development will access the road network via the new link road between the proposed N4 Grade Separated Junction and the R156. If the proposed N4 scheme is not completed before the bio-gas plant, then an alternative access will be provided via upgrading an existing farm access on the R156. Full details of this access will be outlined in Chapter 7 & 10 of this report.

6. Future Road and Transport Proposals for Public Road Network.

6.1 Road and Transport Network Improvements

6.1.1 As part of the Government's National Development Plan and the Transport 21, it is proposed to re-design the N4/R156 junction to a Grade Separated Junction. The N4 'The Downs' grade separation development proposes the closure of the existing N4/R156 Killucan Road junction, the construction of a new grade separated junction located approximately 700m east of the existing N4/R156 junction, the construction of a single carriageway road to connect the new grade separated junction to the existing R156.

6.1.2 The nine existing central reserve openings along the N4 between Clongawny and Newdown will be closed. The existing N4 junctions with local roads L1703 at Clongawny, LS05026 at Newdown, Old N4 at Newdown and LT56031 at Newdown and the combined access to two properties at Clongawny will be closed.

6.1.3 The grade separated junction will be a dumb-bell style grade separated junction comprising two roundabouts at the top of slip roads and an overbridge. A 745m reduced single carriageway connector road will be constructed from the northern roundabout of the grade separated junction to an existing R156/LS05603 junction. A roundabout will be constructed at this junction. The local roads LT56031 at

Newdown and the old N4 at Newdown will be re-aligned for 230m and 350m respectively to tie in to the roundabouts at the new grade separated junction. A 480m access road will be constructed from the re-aligned old N4 at Newdown to provide access to three properties. A 350m access road will be constructed at Clongawny to provide local access for two properties to the L1703.

6.1.4 The reconstruction scheme described above is currently at tender stage for a design build contract. Depending on contract arrangements, it is reasonable to assume that the works would be completed by the end of 2012/ early 2013.

6.1.5 Based on the phasing of the proposed Anaerobic Digestion Plant it is proposed that the site access would be via the new link road between the grade separated junction and the roundabout on the R156. If this is not the case then an alternative access is also proposed.

6.1.6 In order to assess the potential transportation impact on the surrounding road network this report examines in detail both access locations for the two scenarios outlined in 6.1.5.

7. Trip Generation and Distribution

7.1 Traffic Generation

7.1.1 An evaluation of the traffic impact of this new proposal has been undertaken by first using recorded data of existing traffic flows on the existing R156 which include any traffic generated from the land uses currently taking place on the subject site and the adjoining or adjacent lands. Reference has then been made to established database information to ascertain vehicular movements associated with developments similar to that proposed in this case. For the purpose of testing the proposed site access junction, the busiest hours in a typical week have been identified and used.

7.1.2 This assessment makes use of the series of traffic counts as identified in Section 3 of this report since it was necessary to obtain a sufficiently comprehensive set of data to formulate a traffic model of this area. A summary of the recorded information is included in Appendix B.

7.1.3 The passing traffic flows on the R156 were also factored to take account of future traffic growth on the network. The NRA projected traffic growth rates for national routes were used to increase the passing flows for the future assessment scenarios.

7.1.4 The 5th Paragraph of 5.1 "Evaluation of the Assessment" by the 'Traffic and Transport Assessment Guidelines" by the NRA 2007 states, "**The preferred source of trip generation data using the comparison method would be from local existing developments however there is generally a lack of such data. In order to evaluate adequately the traffic and transports submitted it is necessary for local authorities in Ireland to have access to local trip generation data. The measured existing trip generation of a similar development in the same town or nearby will give a generally acceptable estimate of the generated trips from any site."**

7.1.5 In this case additional count data information supplied by the applicant will be used to prepare a trip rate profile from the site. The projected trip rates will also be validated against any relevant survey data obtained from the TRICS database to ensure that the level of traffic anticipated by the proposed development is realistic and representative of this nature of business.

7.1.6 The TRICS (Trip Rate Information Computer System) was established in the UK and is a substantial source of validated empirical data which contains information on arrival and departure rates for a range of differing types and sizes of development in a variety of locations. TRICS also contains information specific to an Irish development context and is used increasingly in Ireland as the preferred method of determining traffic generation.

7.1.7 As the proposed development is quite unique, there are no suitable existing profiles of an Anaerobic Digestion facility in the TRICS database. In order to produce a robust set of traffic generation figures suitable for this type of development, the traffic profiles shall be developed over first principles based on data obtained from the applicant.

7.1.8 The nature of the operation of an AD power generation facility is that it produces electricity from the processes of breaking down organic feedstock primarily from food production companies and breweries. The process is not labour intensive and staff operates on a shift basis to operate the plant and processes of the plant.

7.1.9 In order to prepare the traffic generation for the development, a number of assumptions were made based on the information supplied by the applicant.

7.1.10 In order to produce the amount of electricity contracted to be supplied to the national grid a maximum of 20,000 tonnes of organic feedstock is required per annum. Table 7.1 illustrates the initial base assumptions made:

Traffic Generation Data for Anerobic Digestion Power Generation Facility
Maximum 20,000 Tonnes of Non Hazardous Food Waste Material required per Annum
Assumptions based on information from Applicant Delivery of Material Via 20 tonne Roll on Roll off Skip trucks. Deliveries over a period of 5.5 days a week, 50 weeks a year (Maximum). Operation of Facility to be over 24 hours a day, 365 days a year. Facility to be operated by approximate 10 staff over three shifts. (10,000 Tonnes to be sourced locally. This material to be pumped overland.)
Above information implies the following:
Facility to take deliveries 275 days over the year. 3 Staff over three shifts (08:00-18:00 - 18:00-02:00- 02:00-10:00)

Table 7.1- Traffic Generated Data- Initial Base Assumptions.

7.1.11 The facility shall be operated over three shifts with the organic feedstock delivered throughout the day shift. Table 7.2 details the number of daily deliveries of organic feedstock from 20 tonne trucks.

Assuming Baseline Data obtained by applicant	Arrivals	Departures
Truck Deliveries		
Maximum demand (10,000 tonnes) delivered with 20 tonne trucks 500 truck Deliveries per annum	500	500
Deliveries Per Day (Assuming 275 days of deliveries)	1.18 say 2	1.18 say 2
including 10% sensitivity loading on deliveries (Per Day) (All data rounded up)	3	3

Table 7.2- Delivery of organic feedstock to AD facility.

7.1.12 The second type of traffic that will be generated by the development will be the staff traffic profile. As the electricity generating process is an automated process a minimum staff profile will be required. Table 7.3 outlines the staff trip profile element. Table 7.3 also contains additional trip rates associated with the site based on ancillary trips to and from the site.

Assuming Baseline Data obtained by applicant Staff Traffic Generation	Arrivals (Per Shift)	Departures (Per Shift)
Maximum 10 staff 3 staff per shift(1 staff per private vehicle)	3	3
Assuming additional traffic movements (Errands, Lunch, Etc)	3	3
Total Staff Movements per Shift	6	6
Ancillary Trips to and From the Site	**Arrivals (Per Shift)**	**Departures (Per Shift)**
Include Post, Visitors, Maintenance, etc	5	5

Table 7.3- Associated staff traffic levels generated by the proposed development.

7.1.13 From the above data, the total daily trip rates are calculated in table 7.4. In order to find a reasonable daily trip profile for the development, the peak shift time (i.e during the day shift) was multiplied by a factor of two to take account of the traffic on the other shifts. This is a reasonable assumption given that it is projected that all the delivery of the organic feedstock will take place during normal day time hours.

Total Traffic Generation for AD Facility as from first principles	Arrivals (Per Shift)	Departures (Per Shift)
Assume Maximum traffic during (08:00-18:00 shift) NB: No deliveries of waste materials anticipated during night time shifts.		
Delivery of Waste Material	3	3
Staff	6	6
Ancillary Trips	5	5
Total Traffic Generation per Shift	14	14
Total traffic generation per shift multiplied by a factor of 2 for total traffic generation over 24 hours.		
Total Traffic Generation per Day	24	24

Table 7.4- Proposed total daily traffic generated by the development.

7.1.14 In order to compare the daily trip rates with the peak times on the public road network (R156), an AM and PM peak profile rate is required. As the trip profile rates illustrated by the above table indicate that the daily trip rates associated with this development is low, a % of the daily trip rates can be applied to get a robust AM and PM peak rate. 30% of the total daily traffic profile has been estimated to illustrate a potential worst case scenario for the AM and PM peak periods. Table 7.5 illustrate the AM and PM peak traffic generation periods associated with the proposed development.

7.1.15 As can be noted from the traffic generation profile carried out above, there is no particular peak of traffic generated by the development, save for the times when staff arrive and depart from work at the beginning and end of the shift work. In this case, it is reasonable to assume that this would coincide with the peak times on the public road network.

Peak Times on Proposed R156 is between the hours of (08:00-09:00) and (17:00-18:00)		
	Arrivals	Departures
Deliveries shall be evenly distributed throughout the day Worst Case Scenario is to assume: 30% of trip rates between morning AM Peak 40% of trip rates througout the remainder of the day 30% of trip rates between Evening PM Peak		
AM Peak Flow (@30% Daily total)	7.2 say 8 8	7.2 say 8 8
PM Peak Flow (@30% Daily total)	7.2 say 8 8	7.2 say 8 8
Of the total hourly trip rates 30% of total is large 20 Tonne Delivery Vehicles	3	3

Table 7.5- Assumptions based to calculate AM and PM Peak flows from development.

Traffic Generation Data Summary	Arrivals	Departures
AM Peak (08:00-09:00)		
Cars and LGV's	5	5
HGV's	3	3
PM Peak (17:00-18:00)		
Cars and LGV's	5	5
HGV's	3	3

Table 7.6- Break down of vehicular types for peak hour traffic.

7.1.16 The tables above indicate that the proposed traffic generated by the development will average 48 two-way movements per day. This figure is based on the maximum amount of organic feedstock the facility can take and the predicted level of staff required to operate the facility. The facility has a very specific use and as such it is reasonable to assume that the above method of analysis is accurate. Even with a 50% loading on the two-way figures above would give approximate 72 vehicles accessing the site per day, which is well below accepted indicators for new developments which would trigger analysis for potential impact on the road network.

7.1.17 As part of the Anaerobic Digestion process, the by-product or digestate material also has to be removed from the site. This material will be used as a fertilizer in the agricultural industry. This will be taken away under contract to companies that distribute the fertilizer. This material will be stored on site and removed over a 7 month period throughout the year, as it is prohibited to spread the fertilizer over the winter months. It is proposed to remove this material via 10 tonne tanker trucks evenly over the 7 months. Table 7.7 outlines the traffic generated by the removal of this material.

Traffic Generation Data for Anerobic Digestion Power Generation Facility
20,000 Tonnes of Digestate Material to be removed from site (Removal of material over a period of 7 months)
Assumptions based on information from Applicant Removal of material via 10 tonne liquid tank trucks. Removed over a period of 5.5 days a week, approximately 30 weeks a year (over 7 month period).
Above information implies the following: Removal of liquid material over 165 days per annum 20,000/10 tonnes= 2000 movements 2000/165 days= 13 daily removal trips 13x2= 26 two-way trips movements a day

Peak Hour Trips for Digestate Material		
Assume 30% AM and PM traffic distribution as previously assumed for worst case scenario.		
8 vehicles two-way movements per AM and PM Peak hour	Arrivals	Departures
AM Peak Hour	4	4
PM Peak Hour	4	4

Table 7.7- Trip rate for Traffic digestate material from facility.

7.1.18 In terms of a worst case scenario, the total AM and PM peak figures, including the digestate material are outlined in table 7.8.

Total Generated Traffic Summary		
Traffic Summary assuming 'Worst Case Scenario' including 7 month removal period.		
	Arrivals	Departures
Total Daily Trip Rate	37	37
AM Peak (08:00-09:00)		
Cars and LGV's	5	5
HGV's/ 20 Tonne/ 10 tonne trucks	7	7
PM Peak (17:00-18:00)		
Cars and LGV's	5	5
HGV's/ 20 Tonne/ 10 tonne trucks	7	7

Table 7.8- Total 'Worst Case Scenario' traffic generated from proposed development.

7.1.19 In summary, the trip rate profile for the proposed development has been interpreted from first principles and has been sufficiently loaded to reflect a 'worst case scenario'. The trip rates are relevant given the type of development and the type of use. The trips found indicate that the level of traffic activity associated with this type of development is extremely small and when compared to the passing traffic levels on the R156, is negligible. The figures derived from the above first principles analysis are very robust and assume all material required by the development other than the pumped piggery waste will come by road. In fact, a significant proportion of the organic feedstock will also come from within the applicants land holding which surrounds the proposed development. Internal roads and access ways through fields will reduce the requirement to use the public road at all. As a 'worst case scenario', the total daily 2-way trips expected from the development is 74.

7.2 Traffic Impact

7.2.1 The next step in the process of assessing the impact of the proposal is to apply the various characteristics and values to the flow conditions prevailing when the development is operational. To do this it is first necessary to consider how the network will change as a consequence of traffic growth and other local factors that would influence flow conditions on this part of the network. With the benefit of recorded and representative traffic data for the immediate road network and a justifiable appraisal of the anticipated level of traffic generation that will affect that network, it is possible to assess the resultant impact.

7.2.2 The well established method of calculating capacity using TRL capacity software, illustrates results as expressed in terms of a ratio of flow to capacity (RFC) on each approach and the maximum queue length on that approach during the period tested. If the RFC value approaches 1.0 then queuing and delay can be expected to increase. It is normal practice to ensure that the RFC is below 0.85 to achieve a theoretical reserve capacity of greater than 15%, although a value of 0.85 can be marginally exceeded in a future design year situation without any detrimental effect on the satisfactory and safe operation of the junction. Clearly if this level of reserve cannot be achieved it is normal practice to investigate ways of modifying the junction layout, such as, for example, widening the approaches so as to improve capacity and accordingly reduce the RFC values.

7.2.3 In accordance with the NRA "Traffic and Transport Assessment" guidelines, it is normal practice to test the access junction and other junctions susceptible to capacity problems at the year of opening, 5 years in the in the future and a future design horizon of 15 years. In the case of this development, the design years for testing purposes are 2013, 2018 & 2028.

7.2.4 As outlined in the previous chapters, it is proposed and preferred by the applicant that the site access will link onto the public road network, via the proposed N4 Grade separated junction and associated link roads. However if it is the case that this road improvement scheme has not been constructed, an alternative access on the R156 is proposed to serve the Anaerobic Digestion facility.

7.2.5 For the purposes of testing the various junctions and scenarios, the capacity tests have been carried out as follows:

7.2.6 Scenario no.1 of the report tests the proposed direct access off the existing R156 for all design horizons for the AM and PM peak times. The proposed access onto the R156 is an existing access lane. In order to facilitate the type of development, this laneway will be upgraded to provide direct two-way movement. Full design drawings and details are submitted as part of the application. Table 7.9 shows the results of the RFC values for the proposed access.

Junction Capacity for T-Junction on R156 to Proposed Development (Scenario 1)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.022	97.8	OK
to N4 (R156)	0.014	98.6	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK

Table 7.9- Capacity Test Results for Scenario 1.

7.2.7 As can be noted from the above analysis, as the RFC values are so low, the resultant normal increase in passing traffic on the R156 does not have any impact on the available capacity on the network and the minor road junction access (Proposed Site Access). The results indicate that the traffic levels generated by the development are extremely low and do not pose any impact on the surrounding road network.

7.2.8 The preferred access option (direct access onto the proposed link road between the N4 Grade separated junction and R156 roundabout) for the proposed development has also been tested as scenario 2. In order to fully assess the proposed developments potential impact on the road network, the roundabout off the R156 and the roundabout as part of the grade separated junction were also tested for all times and future design horizons.

7.2.9 Table 7.10 outlines the RFC test results from the PICADY analysis. As can be noted, the traffic generation levels are so low compared to the passing traffic levels, the RFC values indicate that the capacity on the network is over 97% for all tests. These test results are consistent with the previous scenario and show negligible impact on the existing and future public road network.

Junction Capacity for Proposed New Roundabout on R156 with Proposed Development (Scenario 2)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.132	86.8	OK
to Proposed Development and N4	0.084	91.6	OK
R156	0.027	97.3	OK
L5603	0.006	99.4	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.079	92.1	OK
to Proposed Development and N4	0.136	86.4	OK
R156	0.017	98.3	OK
L5603	0.004	99.6	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.140	86	OK
to Proposed Development and N4	0.089	91.1	OK
R156	0.029	97.1	OK
L5603	0.007	99.3	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.084	91.6	OK
to Proposed Development and N4	0.144	85.6	OK
R156	0.018	98.2	OK
L5603	0.004	99.6	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.152	84.8	OK
to Proposed Development and N4	0.098	90.2	OK
R156	0.031	96.9	OK
L5603	0.008	99.2	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.092	90.8	OK
to Proposed Development and N4	0.157	84.3	OK
R156	0.020	98.0	OK
L5603	0.004	99.6	OK

Table 7.10- Capacity test results for proposed junctions, Scenario 2.

7.2.10 In addition to the tests outlined in table 7.10, additional ARCADY tests were carried out for the proposed roundabouts that will form part of the N4 "The Downs" upgrade scheme. The results of these tests which include the proposed development traffic are outlined in table 7.11 & 7.12.

Junction Capacity for Proposed T-Junction from Proposed Development to New N4 Grade Separate (Scenario 2)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.022	97.8	OK
to N4	0.013	98.7	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK

Table 7.11- Capacity test results for proposed junctions, Scenario 2.

Junction Capacity for Roundabount on New N4 Grade Separate with Proposed Development (Scenario 2)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.012	98.8	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.072	92.8	OK
to R156/Proposed Development	0.114	88.6	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.011	98.9	OK
N4 Off Ramp	0.124	87.6	OK
to R156/Proposed Development	0.069	93.1	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.009	99.1	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.076	92.4	OK
to R156/Proposed Development	0.120	88	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.131	86.9	OK
to R156/Proposed Development	0.073	92.7	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.010	99	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.013	98.7	OK
N4 Off Ramp	0.082	91.8	OK
to R156/Proposed Development	0.131	86.9	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.013	98.7	OK
N4 Off Ramp	0.142	85.8	OK
to R156/Proposed Development	0.080	92	OK

Table 7.12- Capacity test results for proposed junctions, Scenario 2.

7.2.11 The above results indicate that the proposed development has no effect on the operational efficiency of the proposed junctions associated with the N4 “The Downs” grade separated junction.

7.2.12 In order to compare the operational efficiency of the proposed N4 “The Downs” scheme without the proposed development traffic added, a ‘Do Nothing’ scenario was introduced. The results of these tests are summarised in table 7.13 & 7.14. As can be noted the test results show that by incorporating the proposed development traffic on the network there is no reduction in capacity for every scenario tested.

Junction Capacity for Proposed New Roundabout on R156 with No Development (Scenario 3)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.128	87.2	OK
to Proposed Development and N4	0.080	92.0	OK
R156	0.027	97.3	OK
L5603	0.006	99.4	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.076	92.4	OK
to Proposed Development and N4	0.132	86.8	OK
R156	0.016	98.4	OK
L5603	0.004	99.6	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.136	86.4	OK
to Proposed Development and N4	0.085	91.5	OK
R156	0.028	97.2	OK
L5603	0.007	99.3	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.080	92.0	OK
to Proposed Development and N4	0.140	86.0	OK
R156	0.017	98.3	OK
L5603	0.004	99.6	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.148	85.2	OK
to Proposed Development and N4	0.094	90.6	OK
R156	0.030	97.0	OK
L5603	0.008	99.2	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.088	91.2	OK
to Proposed Development and N4	0.153	84.7	OK
R156	0.018	98.2	OK
L5603	0.004	99.6	OK

Table 7.13- Capacity test results for proposed junctions, Scenario 3 (Do Nothing).

Junction Capacity for Roundabout on New N4 Grade Separate with No Development (Scenario 3)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.009	99.1	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.010	99	OK
N4 Off Ramp	0.070	93	OK
to R156/Proposed Development	0.110	89	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.010	99	OK
N4 Off Ramp	0.122	87.8	OK
to R156/Proposed Development	0.066	93.4	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.009	99.1	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.011	98.9	OK
N4 Off Ramp	0.074	92.6	OK
to R156/Proposed Development	0.117	88.3	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.010	99	OK
N4 Off Ramp	0.129	87.1	OK
to R156/Proposed Development	0.069	93.1	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.010	99	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.080	92	OK
to R156/Proposed Development	0.128	87.2	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.011	98.9	OK
N4 Off Ramp	0.140	86	OK
to R156/Proposed Development	0.077	92.3	OK

Table 7.14- Capacity test results for proposed junctions, scenario 3 (Do Nothing Scenario)

7.2.13 From assessing the total trip rates during the peak times against the AM and PM peak times on the road network, the proposed traffic generated by the development will account for 1-2% of the total traffic on the network. This figure is comfortably under the accepted thresholds to assess whether a traffic and transport assessment is required as identified in the **DoT "Traffic Management Guidelines"** and the NRA **"Traffic and Transport Assessment Guidelines 2007"**.

7.2.14 To summarise, the traffic generated data calculated for the proposed development is significantly below recognised capacity thresholds and as such indicates that the proposed maintenance facility will have negligible impact in transportation terms on the surrounding road network. All the tests carried out conclude that the proposed traffic generated by the development will be minimal and not impact on the existing and proposed operational capacity on the public road network.

8. Road Safety

8.1 Road safety and the integration of the development into the public road network is of primary importance to the success of the scheme. It is proposed that the development will access the public road network via the proposed new link road between the M4 'The Downs" grade separated junction and the R156. If the proposed development is constructed before the completion of the upgraded N4 scheme, then an alternative access directly off the R156 will be provided.

8.2 The alternative access proposed will access the development off the R156 via an existing access lane. This lane will require upgrading to ensure that it is as safe as possible for vehicles expected to arrive and depart the site. This laneway is currently marked via a public road sign on the R156. The lane way is along a straight stretch of road and sightlines in the order of 2.4m x 160m are achievable.

8.3 In order to improve safety at the access, two-way vehicle movements will be facilitated by increasing the width of the minor road access and the gradient into the site will also be revised.

8.4 The future redevelopment of the M4 'The Downs' interchange junction is scheduled to be constructed by the end of 2012 or early 2013. This will significantly increase the general road safety in the area. A future link road between the national road N4 interchange and the R156 will be constructed through the applicants land holding. It is the applicant's intention to re-configure the site access and connect to the proposed link road when it is suitable to do so.

8.5 As the anaerobic digestion development and the N4 road scheme are separate projects with different phasing and timelines for completion it is the intention of the applicant to ensure a suitable access can be provided for the scheme off the R156 which is independent from the M4 scheme. When the M4 scheme is operational, a re-configured site access will link to the proposed link road. If the N4 scheme is constructed before the Bio-Gas plant it is the applicant's preference to connect onto the link road directly.

8.6 It is the applicant's intention whichever access is proposed, that it will meet the latest safety standards and requirements and will adhere to any planning authorities requirements for the suitability of the access.

8.7 Both site access options have been detailed and submitted as part of the planning application for the proposed development.

8.8 In the case of the proposed site access off the R156, the access is an upgrading of an existing and established access. There is numerous access points along the R156 in the vicinity of the proposed access location, so in road safety terms motorists along the R156 are generally familiar with vehicles entering and leaving the road along this area.

9. Environmental Impact

9.1 As part of the overall planning application for the development, an EIS (Environmental Impact Statement) has been carried out. In transportation terms, the level of traffic projected to visit the site is extremely low and no evidence of potential adverse environmental impact on the area has been established.

10. Internal Road Layout and Site Access

10.1 The main functions of the internal road layout are to provide a safe and efficient circulatory system that reduces the potential for conflicting movements, which accommodates the anticipated volume of arrivals and departures without detriment to the operation of the public highway to which the site connects. The intention of the internal layout is to facilitate a logical system of delivery and exit serving the service yard and staff area.

10.2 The applicant intends to generate electricity from the digestion processes of organic material primarily from the agricultural industry. This will involve some of the material being delivered on the public road network in 20 tonne skip type lorries. The internal layout of the development will allow for full movement of delivery vehicles unloading, turning, parking etc and will be segregated from the staff parking at all times. All traffic projected to visit the site will be able to enter and leave the site in forward gear. The site compound area is situated a comfortable distance from the existing and future road network and as such will not pose any impact on the general public.

10.3 Full plans of the proposed internal site layout, Autotrack movements, signage and road lining details has been indicated on submitted as part of this planning application.

10.4 The designer of the scheme will provide adequate signage to provide information and warning to the customer and to ensure that they park in the designated area. All internal traffic movements will be kept a significant distance from the public road network. Please refer to site layout drawings indicating the circulation areas and the main areas for delivery and staff/ visitor traffic.

10.5 Accordingly, this assessment has not reviewed the detailed assignment of parking provision or assessed the parking demand arising from the specific development plots within the site. Nonetheless, the assessment has identified a likely level of traffic arrival and departure during peak hours from the traffic generated from the site. It is reasonable to conclude that the internal layout is designed to effectively accommodate these levels of flow and accumulation within the site area and hence without detriment to the operation of the internal layout.

10.6 As the proposed development will be constructed in the vicinity of the proposed N4 “The Downs” grade separated junction, the public road network will be changed over the medium term. The proposed junction scheme and link roads will improve the traffic capacity and safety of the overall network in the area.

10.7 It is the intention off the applicant to connect to the proposed link road between the N4 grade separated junction and the R156 when it is constructed. The site will access this road approximately half way between the interchange access and the roundabout on the R156. The access road junction will be constructed in accordance with the DoE ‘Recommendations for Site Development works’ document. The access way will ensure that the two-way traffic can safely be accommodated and all sightline provisions will be in accordance with the Westmeath development control standards outlined in the current

Westmeath County Development Plan.

10.8 This access location has been discussed with both Westmeath County Council and the NRA and agreed in principle as the future permanent access for the development.

10.9 It has been highlighted by the NRA that the proposed link road will not be their responsibility once completed. However, as it is part of the overall N4 'The Downs' scheme, the road may not be constructed before the completion of the Anaerobic Digestion facility, thereby leaving no access to the proposed development.

10.10 While the proposed timeline for the construction of the Anaerobic Digestion facility, its licensing obligations and the time taken to bring the facility to operational functionality is likely to push the completion of the plant beyond the completion date of the road scheme. However, at this stage of the application process, a definite date for completion of the N4 'The Downs' separation has not been determined by the NRA.

10.11 In order to facilitate an access to the proposed development in the case that the N4 'The Downs' is not completed, an alternative access onto the R156 has been proposed.

10.12 The alternative access proposal includes the upgrading of the existing access lane onto the R156. Consent has been sought from the applicant to the landowner to allow all upgrading measures necessary to provide an access capable of accommodating the projected type and quantity of vehicles to the proposed development. All consent letters are included in the planning submission.

10.13 The proposed access onto the R156 will be widened and include works to increase the access road level to allow at grade connection to the R156 and to allow vehicles to wait to enter the R156 at an acceptable gradient. Sightlines will be improved at the existing access to ensure compliance with the standards set down in the Westmeath County Council's current county development plan. Existing signage indicating the access will be replaced with new signs to highlight the access.

10.14 When the opportunity to develop the site access off the proposed link road exists, the intention of the applicant is to re-direct its traffic onto the new access. The upgraded access off the R156 will be left for the existing traffic already using the access lane for the bog and access to surrounding farm lands.

10.15 Full detailed access drawings of both site access points proposed have been provided as part of this application. Only one access will be used by the proposed development at all times.

10.16 It is proposed that a priority 'simple T-junction' type access will be proposed for both access locations. It is determined that a priority access will be suitable for the proposed access to the following development based on the following points:

- The total daily traffic anticipated for the development as a 'worst case scenario' is 74 two way trips. This figure when compared to the passing AADT of the R156 is negligible. The 12 hour traffic counts give a two-way traffic volume on the R156 of 3293. When this is converted to AADT, this increases to approximately 4500. The total traffic generated by the development is approximately 1.64% of the passing traffic.

- According to the NRA DMRB TD 41-42/09 "Geometric Design of Major/Minor Priority Junctions and Vehicular Access to National Roads", chapter 2.23 states "*Simple junctions are appropriate for* *most minor junctions on single carriageway roads, on dual carriageways simple junctions must be restricted to left in/ left out only. For new rural junctions they shall be used when the design flow in the minor road is not expected to exceed about 300 vehicles 2-way AADT, and that on the major road is not expected to exceed 13,000 vehicles 2-way AADT."* As can be noted from the analysis to date, the figures proposed on the minor road and the actual figures on the R156 (major road) are significantly less than the accepted thresholds outlined in the NRA DMRB. In fact, the total two-way trips projected by the development is approximately less than 4 times the accepted level of traffic permitted on the minor road. The level of traffic on the R156 is approximately 3 times less than the 13,000 AADT permitted on the major road.

- The figures quoted above will be even less on the new link road, as this will only bring traffic currently on the R156 to the N4. There is a level of traffic on the R156 that does not continue onto the N4 which passes the proposed direct alternative access on the R156. This includes traffic using the local shop and school for example.

- There are a number of existing direct accesses onto the R156 in relative close proximity to the alternative access on the R156 which the passing traffic are familiar with. It is recognised internationally as best practice in terms of road safety that accesses along a particular road should be similar in composition and form.

- The proposal for the access point on the R156 is to improve an existing established access. There is no potential further development proposed in the area that would require provision for increase measures at the access point.

- The R156 is a regional road with the speed limit of 80kph. Simple T-junctions are the most common type of access onto these types of roads. The parameters laid out in the NRA DMRB TD41-42/09 are intended to assist designers to consider alternative junction types on national secondary and primary roads. Speed limits on these types of roads are usually 100kph in rural locations. In this regard, it is reasonable to assume given the level of traffic proposed by the development and the traffic volumes on the R156 that a simple-T-Junction is the most suitable and practical junction at this location.

- In relation to the future proposed access onto the proposed link road, the same design parameters quoted above can be used to assess the type of access suitable there. When the analysis is taken into account, a simple T-junction is the most suitable access.

- The PICADY analysis carried out for the above future year scenarios all indicate that a direct simple T-junction access is comfortably within acceptable capacity test limits. Please refer to Section 7 and Appendix E for full test details and results.

11. Sustainable Transport, Public Transport Provision

11.1 While there is some public transport provision in the area, the type of development proposed does not require public transport provision to be operational. All vehicles intended to visit the proposed development will be via private vehicle.

11.2 As the facility will be operated on a shift basis by minimal staff, the public transportation provision for the town of Mullingar may not be suitable.

11.3 All staff vehicles and visitors to the facility will be comfortably accommodated by the car park within the site and thus the provision of public transport will not be needed.

11.4 In terms of sustainable transport, approximately half of the material required by the Anaerobic Digestion facility will be from the adjoining land. This reduces the transportation requirements for the development by approximately half and as such is a significant factor in the overall sustainability of the development.

12. Conclusions

12.1 This traffic and transport assessment has been prepared to assess the proposal by Bio-Agrigas to develop an anaerobic digestion power generation facility at 'The Downs', Co.Westmeath. The proposed development will be served by an access off the future link road between the N4 'The Downs' interchange and the R156.

12.2 An alternative access has been proposed onto the R156 in the event of the primary proposed access cannot be provided in time for the opening of the AD facility.

12.3 ORS Consulting Engineers have undertaken detailed traffic analysis and investigation into the likely impact the proposed development may have. Current and future traffic flows were established on the surrounding road network.

12.4 The prepared site access was subjected to analysis to examine the potential traffic levels generating from the site and the existing road network. The proposed site access and alternative access were tested for AM and PM peak conditions for baseline, potential year of opening and future design horizons. All tests revealed that the existing site access will operate comfortably under accepted capacity limits.

12.5 Both site accesses assessed would operate efficiently and within capacity limit for all design scenarios and future design years.

12.6 The proposed development is comfortably under the accepted thresholds to assess whether a traffic and transport assessment is required as identified in the DoT "Traffic Management Guidelines" and the NRA "Traffic and Transport Assessment" guidelines.

12.7 The internal road network has been designed to provide a safe and efficient circulatory system that reduces the potential for conflicting movements within the site. The internal layout will ensure that employee traffic and delivery traffic must be segregated as much as possible. All signage and safety measures possible will be implemented to ensure maximum safety in the site.

12.8 Therefore in transportation terms, the proposed development does not provide any negative impact on the existing local road network and will not affect any future transport proposals in the area.

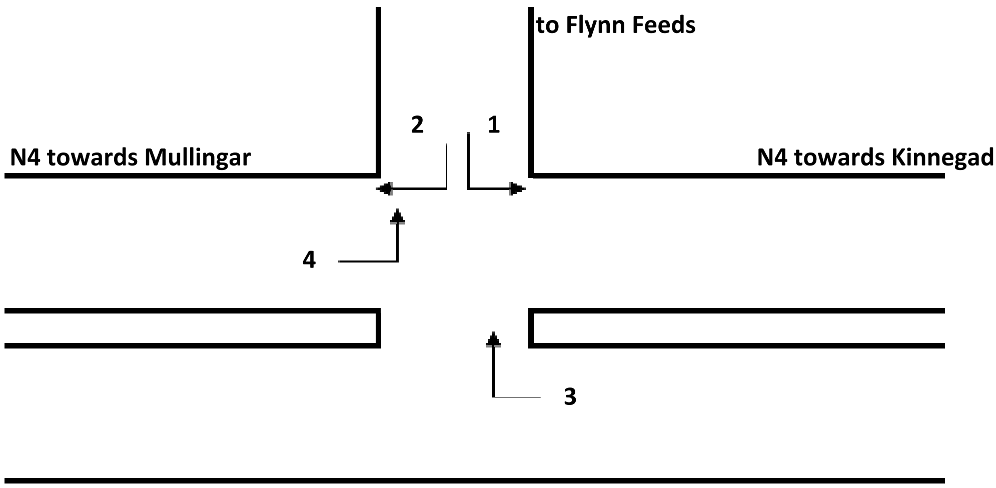
Appendix A – Proposed Plans

Please refer to the E.I.S (Environmental Impact Statement) of this application for plans of the proposed development.

Appendix B – Traffic Survey Information

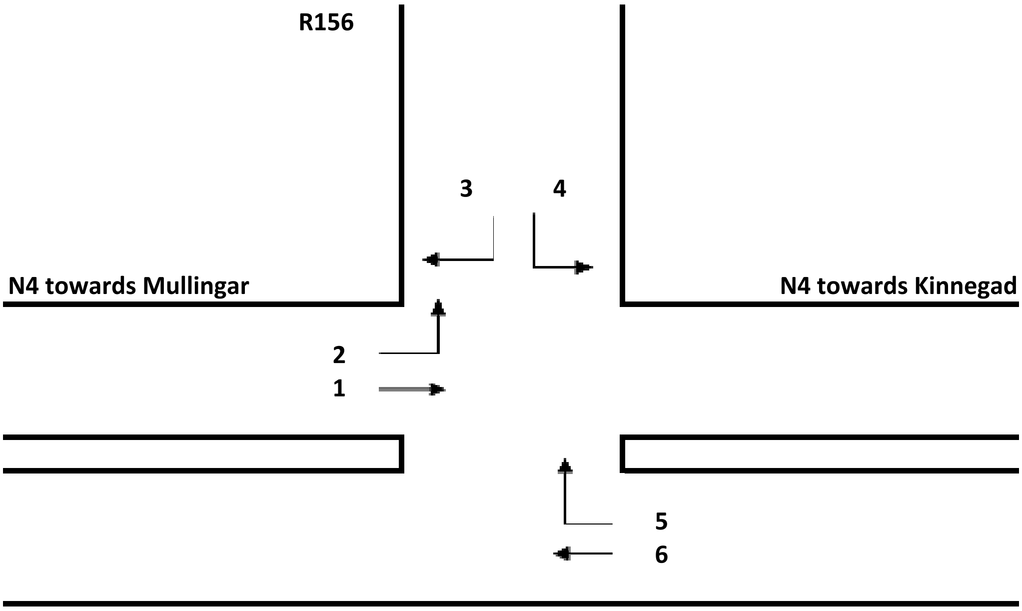
Manual Classified Traffic Count

Location: Junction at N4/Flynn Feeds, The Downs, Mullingar.
Date: 11th March 2011



	Movement 1				Movement 2				Movement 3				Movement 4			
Time	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total	Car	LGV	HGV	Total
08:00	1	0	0	1	0	0	0	0	1	0	0	1	1	2	0	3
08:15	0	0	0	0	2	0	0	2	0	0	0	0	0	1	0	1
08:30	1	0	0	1	3	3	2	8	4	1	0	5	4	1	0	5
08:45	3	0	1	4	2	0	0	2	3	0	0	3	7	0	1	8
Total	5	0	1	6	7	3	2	12	8	1	0	9	12	4	1	17
17:00	5	0	0	5	3	0	0	3	4	0	0	4	5	0	0	5
17:15	4	0	0	4	3	0	0	3	0	0	0	0	6	0	0	6
17:30	7	0	0	7	5	0	0	5	2	0	1	3	5	0	0	5
17:45	6	0	0	6	2	0	0	2	2	0	0	2	1	0	0	1
Total	22	0	0	22	13	0	0	13	8	0	1	9	17	0	0	17

Junction at N4/R156, The Downs, Mullingar.



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ORS CONSULTING ENGINEERS
N4 THE DOWNS
TRAFFIC SURVEY

SURVEY REPORT
MARCH 2011

PROJECT NO.	1172
CHECKED	P. MURRAY
DATE	08/03/2011
CONTACT	A.CHAMBERS
REVISION	

Email: enquiries@nationwidedatacollection.ie
Website: www.nationwidedatacollection.ie

Registered Office:
6 Bridge Court, City Gate,
St. Augustine Street, Dublin 8
Company Reg. No. 444096
VAT Reg. No. IE 9664307L

CONTENTS

INTRODUCTION

Nationwide Data Collection (NDC) was instructed by ORS Consulting Engineers to undertake a Junction Turning Count in Co. Westmeath.

A general location plan is given in Diagram 1172-01

JUNCTION TURNING COUNT

A Junction Turning Count was undertaken at the following site:

Site No.	Location.	Day / Date
1	R156 / N4(NW) / N4(SE)	Friday 4th March 2011

The site was surveyed using a telescopically mounted video camera from which the information was subsequently extracted. Details of the observed movements are given in Drawing 1172-01

The survey was carried out with survey hours of 07:00 to 19:00. All information was collected in 15 minute intervals and has been tabulated with both hourly and period totals.

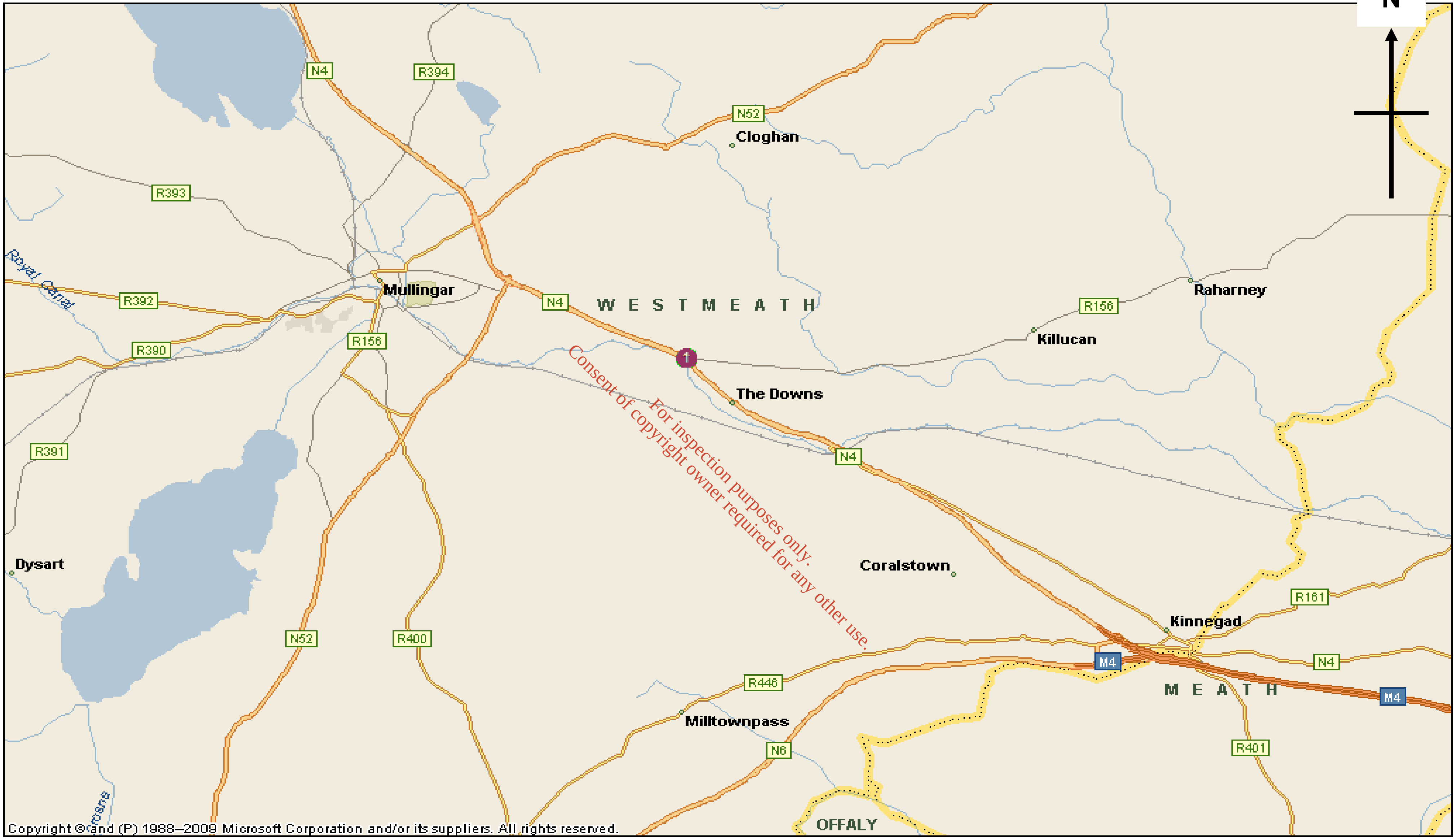
Vehicles were classified into the following categories:

- Light Vehicles (**LV**),
- Heavy Vehicles (**HV**),

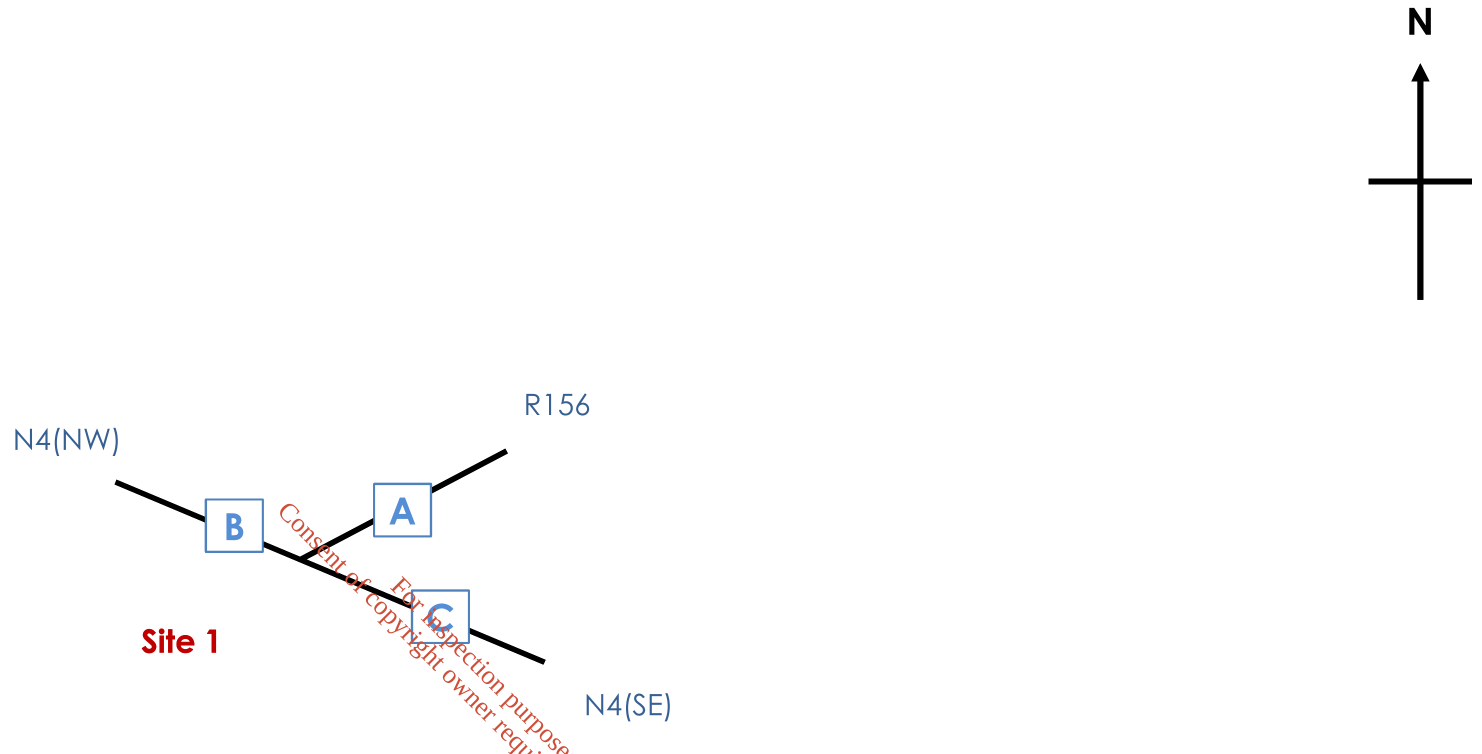
A detailed description of the vehicles included in each category is provided in Appendix A.

SITE REPORT

Weather	Friday 4th March 2011 – Overcast and Foggy in the morning but some sunny spells in the afternoon.
Accidents	None.
Roadworks	None.
Queues	Not recorded.
Pedestrians	Not recorded.



Site / Location:	1 / N4 The Downs	Project No:	1172	Diagram No:	1172-01	Drawn By:	AC
Survey Date:	Friday 4th March 2011	Project Name:	N4 THE DOWNS				
Survey Times:	07:00 to 19:00	Diagram Title:	General Location Plan				



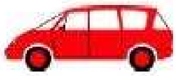
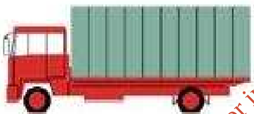
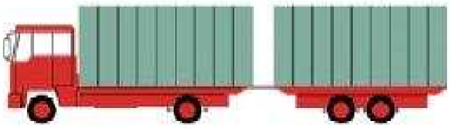
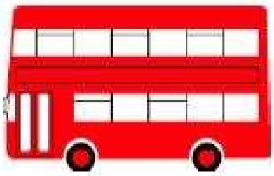
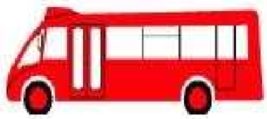
Site / Location:	1 / N4 The Downs	Project No:	1172	Drawing No:	1172-01	Drawn By:	AC
Survey Date:	Friday 4th March 2011	Project Name:	N4 THE DOWNS				
Survey Times:	07:00 to 19:00	Drawing Title:	Site Layout and Observed Movements				

NDC NATIONWIDE DATA COLLECTION

APPENDIX A

VEHICLE CATEGORIES

VEHICLE CATEGORIES

LIGHT VEHICLES (LV)	 SALOON  ESTATE  PEOPLE CARRIER  CAR TOWING CARAVAN / TRAILER
	 VAN  <3.5 TONNES – single rear tyres  PICK-UP
HEAVY VEHICLES (HV)	 > 3.5 TONNES – twin rear tyres  2-AXLES RIGID  2-AXLES RIGID  3 AXLES-RIGID
	 4 OR MORE AXLES RIGID  3-AXLES ARTIC  4 OR MORE AXLES ARTIC  OTHER GOODS VEHICLE WITH TRAILER
	 DOUBLE DECK BUS  SINGLE DECK BUS OR COACH

VEHICLE CATEGORIES

Definition of Categories

The various components of traffic have different characteristics in terms of operating costs, growth and occupancy. For the purpose of this survey vehicles types are defined as follows:

Cars and Light Goods Vehicles are grouped together as Light Vehicles (**LV**). All other Goods Vehicles, Buses and Coaches are defined as Heavy Vehicles (**HV**).

Cars (CARS)

Including taxis, estate cars, 'people carriers' and other passenger vehicles (for example, minibuses and camper vans) with a gross vehicle weight of less than 3.5 tonnes, normally ones which can accommodate not more than 15 seats. Three-wheeled cars, motor invalid carriages, Land Rovers, Range Rovers and Jeeps and smaller ambulances are included. Cars towing caravans or trailers are counted as one vehicle unless included as a separate class.

Light Goods Vehicles (LGV)

Includes all goods vehicles up to 3.5 tonnes gross vehicle weight (goods vehicles over 3.5 tonnes have sideguards fitted between axles), including those towing a trailer or caravan. This includes all car delivery vans and those of the next larger carrying capacity such as transit vans. Included here are small pickup vans, three-wheeled goods vehicles, milk floats and pedestrian controlled motor vehicles. Most of this group is delivery vans of one type or another.

Other Goods Vehicles (OGV 1)

Includes all rigid vehicles over 3.5 tonnes gross vehicle weight with two or three axles Includes larger ambulances, tractors (without trailers), road rollers for tarmac pressing, box vans and similar large vans. A two or three axle motor tractive unit without a trailer is also included.

Other Goods Vehicles (OGV 2)

This category includes all rigid vehicles with four or more axles and all articulated vehicles. Also included in this class are OGV1 goods vehicles towing a caravan or trailer.

Buses and Coaches (PSV)

Includes all public service vehicles and works buses with a gross vehicle weight of 3.5 tonnes or more, usually vehicles with more than 16 seats.

APPENDIX B

SURVEY RESULTS
JUNCTION TURNING COUNT

Site No. 1
Location R156 / N4(NW) / N4(SE)
Date Friday 04 March 2011

Time	A to C - R156 to N4(SE)		Veh. Total	A to B - R156 to N4(NW)		Veh. Total
	LV	HV		LV	HV	
07:00	0	0	0	4	1	5
07:15	1	1	2	3	0	3
07:30	1	0	1	23	0	23
07:45	2	0	2	28	4	32
Hour	4	1	5	58	5	63
08:00	3	0	3	33	2	35
08:15	2	0	2	36	3	39
08:30	3	0	3	45	0	45
08:45	10	0	10	56	1	57
Hour	18	0	18	170	6	176
09:00	8	1	9	44	3	47
09:15	2	0	2	31	0	31
09:30	1	1	2	48	1	49
09:45	3	0	3	41	1	42
Hour	14	2	16	164	5	169
10:00	5	1	6	35	1	36
10:15	2	0	2	29	2	31
10:30	0	0	0	28	3	31
10:45	2	1	3	24	0	24
Hour	9	2	11	116	6	122
11:00	0	1	1	28	3	31
11:15	4	0	4	27	1	28
11:30	2	0	2	24	3	27
11:45	4	0	4	23	3	26
Hour	10	1	11	102	10	112
12:00	1	1	2	19	0	19
12:15	1	0	1	18	1	19
12:30	5	0	5	29	1	30
12:45	1	0	1	31	1	32
Hour	8	1	9	97	3	100
13:00	0	1	1	18	1	19
13:15	5	1	6	27	1	28
13:30	6	0	6	38	0	38
13:45	10	0	10	37	1	38
Hour	21	2	23	120	3	123
14:00	1	0	1	37	2	39
14:15	5	0	5	27	0	27
14:30	5	0	5	29	3	32
14:45	14	1	15	53	4	57
Hour	25	1	26	146	9	155
15:00	9	0	9	23	3	26
15:15	2	0	2	38	2	40
15:30	5	0	5	36	1	37
15:45	2	1	3	35	0	35
Hour	18	1	19	132	6	138
16:00	1	0	1	32	1	33
16:15	3	1	4	32	3	35
16:30	5	1	6	24	0	24
16:45	9	2	11	25	0	25
Hour	18	4	22	113	4	117
17:00	4	1	5	20	0	20
17:15	5	0	5	22	1	23
17:30	2	0	2	26	1	27
17:45	5	1	6	28	0	28
Hour	16	2	18	96	2	98
18:00	5	0	5	30	0	30
18:15	5	0	5	28	0	28
18:30	1	0	1	21	0	21
18:45	5	0	5	32	0	32
Hour	16	0	16	111	0	111
Total	177	17	194	1425	59	1484

Site No. 1
Location R156 / N4(NW) / N4(SE)
Date Friday 04 March 2011

Time	B to A - N4(NW) to R156		Veh. Total	B to C - N4(NW) to N4(SE)		Veh. Total
	LV	HV		LV	HV	
07:00	7	0	7	123	11	134
07:15	9	0	9	142	14	156
07:30	13	0	13	127	15	142
07:45	11	1	12	139	14	153
Hour	40	1	41	531	54	585
08:00	10	1	11	128	14	142
08:15	24	0	24	149	9	158
08:30	19	3	22	123	3	126
08:45	38	0	38	127	9	136
Hour	91	4	95	527	35	562
09:00	31	0	31	129	11	140
09:15	21	1	22	108	19	127
09:30	15	1	16	90	8	98
09:45	15	0	15	108	18	126
Hour	82	2	84	435	56	491
10:00	17	6	23	88	16	104
10:15	21	2	23	99	13	112
10:30	18	0	18	98	14	112
10:45	19	1	20	102	16	118
Hour	75	9	84	387	59	446
11:00	25	1	26	94	18	112
11:15	22	1	23	80	15	95
11:30	32	1	33	95	16	111
11:45	27	2	29	126	13	139
Hour	106	5	111	395	62	457
12:00	23	0	23	96	20	116
12:15	34	2	36	116	22	138
12:30	24	0	24	124	18	142
12:45	24	1	25	115	19	134
Hour	105	3	108	451	79	530
13:00	39	0	39	121	24	145
13:15	31	3	34	109	15	124
13:30	38	2	40	112	12	124
13:45	34	1	35	99	15	114
Hour	142	6	148	441	66	507
14:00	34	1	35	103	17	120
14:15	33	3	36	135	11	146
14:30	37	1	38	113	13	126
14:45	43	6	49	142	16	158
Hour	147	11	158	493	57	550
15:00	32	3	35	158	21	179
15:15	35	7	42	119	14	133
15:30	32	0	32	133	14	147
15:45	45	1	46	171	15	186
Hour	144	11	155	581	64	645
16:00	41	2	43	149	15	164
16:15	37	1	38	172	12	184
16:30	30	3	33	154	9	163
16:45	29	0	29	127	11	138
Hour	137	6	143	602	47	649
17:00	46	0	46	186	19	205
17:15	42	1	43	153	6	159
17:30	35	1	36	177	7	184
17:45	43	3	46	174	6	180
Hour	166	5	171	690	38	728
18:00	39	0	39	143	14	157
18:15	34	0	34	147	9	156
18:30	16	11	27	123	3	126
18:45	33	1	34	123	12	135
Hour	122	12	134	536	38	574
Total	1357	75	1432	6069	655	6724

Site No.	1
Location	R156 / N4(NW) / N4(SE)
Date	Friday 04 March 2011

Time	C to B - N4(SE) to N4(NW)		Veh. Total	C to A - N4(SE) to R156		Veh. Total
	LV	HV		LV	HV	
07:00	32	12	44	1	0	1
07:15	43	17	60	0	0	0
07:30	65	10	75	2	0	2
07:45	92	14	106	2	0	2
Hour	232	53	285	5	0	5
08:00	101	22	123	1	2	3
08:15	138	14	152	1	0	1
08:30	130	12	142	4	1	5
08:45	128	15	143	9	1	10
Hour	497	63	560	15	4	19
09:00	105	15	120	6	0	6
09:15	106	16	122	1	1	2
09:30	111	19	130	2	1	3
09:45	125	8	133	2	0	2
Hour	447	58	505	11	2	13
10:00	100	15	115	2	1	3
10:15	119	21	140	2	1	3
10:30	98	13	111	2	2	4
10:45	104	15	119	3	0	3
Hour	421	64	485	9	4	13
11:00	106	17	123	2	2	4
11:15	115	11	126	1	0	1
11:30	144	13	157	2	0	2
11:45	116	16	132	1	1	2
Hour	481	57	538	6	3	9
12:00	125	14	139	3	1	4
12:15	97	17	114	3	1	4
12:30	130	13	143	4	1	5
12:45	118	18	136	4	0	4
Hour	470	62	532	14	3	17
13:00	143	6	149	3	0	3
13:15	154	14	168	3	0	3
13:30	138	14	152	6	0	6
13:45	175	16	191	7	0	7
Hour	610	50	660	19	0	19
14:00	154	14	168	5	0	5
14:15	206	10	216	5	0	5
14:30	183	13	196	8	0	8
14:45	191	11	202	1	1	2
Hour	734	48	782	19	1	20
15:00	192	11	203	4	0	4
15:15	218	14	232	2	0	2
15:30	189	8	197	3	0	3
15:45	237	9	246	7	0	7
Hour	836	42	878	16	0	16
16:00	246	16	262	6	0	6
16:15	255	9	264	2	0	2
16:30	258	15	273	4	0	4
16:45	285	9	294	6	1	7
Hour	1044	49	1093	18	1	19
17:00	304	18	322	4	1	5
17:15	296	10	306	4	0	4
17:30	255	9	264	5	0	5
17:45	283	5	288	2	1	3
Hour	1138	42	1180	15	2	17
18:00	302	10	312	2	0	2
18:15	248	6	254	2	1	3
18:30	242	8	250	8	1	9
18:45	226	13	239	2	0	2
Hour	1018	37	1055	14	2	16
Total	7928	625	8553	161	22	183

Site No. 1
Location R156 / N4(NW) / N4(SE)
Date Friday 04 March 2011

Time	To Arm A - R156		Veh. Total	From Arm A - R156		Veh. Total
	LV	HV		LV	HV	
07:00	8	0	8	4	1	5
07:15	9	0	9	4	1	5
07:30	15	0	15	24	0	24
07:45	13	1	14	30	4	34
Hour	45	1	46	62	6	68
08:00	11	3	14	36	2	38
08:15	25	0	25	38	3	41
08:30	23	4	27	48	0	48
08:45	47	1	48	66	1	67
Hour	106	8	114	188	6	194
09:00	37	0	37	52	4	56
09:15	22	2	24	33	0	33
09:30	17	2	19	49	2	51
09:45	17	0	17	44	1	45
Hour	93	4	97	178	7	185
10:00	19	7	26	40	2	42
10:15	23	3	26	31	2	33
10:30	20	2	22	28	3	31
10:45	22	1	23	26	1	27
Hour	84	13	97	125	8	133
11:00	27	3	30	28	4	32
11:15	23	1	24	31	1	32
11:30	34	1	35	26	3	29
11:45	28	3	31	27	3	30
Hour	112	8	120	112	11	123
12:00	26	1	27	20	1	21
12:15	37	3	40	19	1	20
12:30	28	1	29	34	1	35
12:45	28	1	29	32	1	33
Hour	119	6	125	105	4	109
13:00	42	0	42	18	2	20
13:15	34	3	37	32	2	34
13:30	44	2	46	44	0	44
13:45	41	1	42	47	1	48
Hour	161	6	167	141	5	146
14:00	39	1	40	38	2	40
14:15	38	3	41	32	0	32
14:30	45	1	46	34	3	37
14:45	44	7	51	67	5	72
Hour	166	12	178	171	10	181
15:00	36	3	39	32	3	35
15:15	37	7	44	40	2	42
15:30	35	0	35	41	1	42
15:45	52	1	53	37	1	38
Hour	160	11	171	150	7	157
16:00	47	2	49	33	1	34
16:15	39	1	40	35	4	39
16:30	34	3	37	29	1	30
16:45	35	1	36	34	2	36
Hour	155	7	162	131	8	139
17:00	50	1	51	24	1	25
17:15	46	1	47	27	1	28
17:30	40	1	41	28	1	29
17:45	45	4	49	33	1	34
Hour	181	7	188	112	4	116
18:00	41	0	41	35	0	35
18:15	36	1	37	33	0	33
18:30	24	12	36	22	0	22
18:45	35	1	36	37	0	37
Hour	136	14	150	127	0	127
Total	1518	97	1615	1602	76	1678

Site No. 1
Location R156 / N4(NW) / N4(SE)
Date Friday 04 March 2011

Time	To Arm B - N4(NW)		Veh. Total	From Arm B - N4(NW)		Veh. Total
	LV	HV		LV	HV	
07:00	36	13	49	130	11	141
07:15	46	17	63	151	14	165
07:30	88	10	98	140	15	155
07:45	120	18	138	150	15	165
Hour	290	58	348	571	55	626
08:00	134	24	158	138	15	153
08:15	174	17	191	173	9	182
08:30	175	12	187	142	6	148
08:45	184	16	200	165	9	174
Hour	667	69	736	618	39	657
09:00	149	18	167	160	11	171
09:15	137	16	153	129	20	149
09:30	159	20	179	105	9	114
09:45	166	9	175	123	18	141
Hour	611	63	674	517	58	575
10:00	135	16	151	105	22	127
10:15	148	23	171	120	15	135
10:30	126	16	142	116	14	130
10:45	128	15	143	121	17	138
Hour	537	70	607	462	68	530
11:00	134	20	154	119	19	138
11:15	142	12	154	102	16	118
11:30	168	16	184	127	17	144
11:45	139	19	158	153	15	168
Hour	583	67	650	501	67	568
12:00	144	14	158	119	20	139
12:15	115	18	133	150	24	174
12:30	159	14	173	148	18	166
12:45	149	19	168	139	20	159
Hour	567	65	632	556	82	638
13:00	161	7	168	160	24	184
13:15	181	15	196	140	18	158
13:30	176	14	190	150	14	164
13:45	212	17	229	133	16	149
Hour	730	53	783	583	72	655
14:00	191	16	207	137	18	155
14:15	233	10	243	168	14	182
14:30	212	16	228	150	14	164
14:45	244	15	259	185	22	207
Hour	880	57	937	640	68	708
15:00	215	14	229	190	24	214
15:15	256	16	272	154	21	175
15:30	225	9	234	165	14	179
15:45	272	9	281	216	16	232
Hour	968	48	1016	725	75	800
16:00	278	17	295	190	17	207
16:15	287	12	299	209	13	222
16:30	282	15	297	184	12	196
16:45	310	9	319	156	11	167
Hour	1157	53	1210	739	53	792
17:00	324	18	342	232	19	251
17:15	318	11	329	195	7	202
17:30	281	10	291	212	8	220
17:45	311	5	316	217	9	226
Hour	1234	44	1278	856	43	899
18:00	332	10	342	182	14	196
18:15	276	6	282	181	9	190
18:30	263	8	271	139	14	153
18:45	258	13	271	156	13	169
Hour	1129	37	1166	658	50	708
Total	9353	684	10037	7426	730	8156

Site No.	1
Location	R156 / N4(NW) / N4(SE)
Date	Friday 04 March 2011

Time	To Arm C - N4(SE)		Veh. Total	From Arm C - N4(SE)		Veh. Total
	LV	HV		LV	HV	
07:00	123	11	134	33	12	45
07:15	143	15	158	43	17	60
07:30	128	15	143	67	10	77
07:45	141	14	155	94	14	108
Hour	535	55	590	237	53	290
08:00	131	14	145	102	24	126
08:15	151	9	160	139	14	153
08:30	126	3	129	134	13	147
08:45	137	9	146	137	16	153
Hour	545	35	580	512	67	579
09:00	137	12	149	111	15	126
09:15	110	19	129	107	17	124
09:30	91	9	100	113	20	133
09:45	111	18	129	127	8	135
Hour	449	58	507	458	60	518
10:00	93	17	110	102	16	118
10:15	101	13	114	121	22	143
10:30	98	14	112	100	15	115
10:45	104	17	121	107	15	122
Hour	396	61	457	430	68	498
11:00	94	19	113	108	19	127
11:15	84	15	99	116	11	127
11:30	97	16	113	146	13	159
11:45	130	13	143	117	17	134
Hour	405	63	468	487	60	547
12:00	97	21	118	128	15	143
12:15	117	22	139	100	18	118
12:30	129	18	147	134	14	148
12:45	116	19	135	122	18	140
Hour	459	80	539	484	65	549
13:00	121	25	146	146	6	152
13:15	114	16	130	157	14	171
13:30	118	12	130	144	14	158
13:45	109	15	124	182	16	198
Hour	462	68	530	629	50	679
14:00	104	17	121	159	14	173
14:15	140	11	151	211	10	221
14:30	118	13	131	191	13	204
14:45	156	17	173	192	12	204
Hour	518	58	576	753	49	802
15:00	167	21	188	196	11	207
15:15	121	14	135	220	14	234
15:30	138	14	152	192	8	200
15:45	173	16	189	244	9	253
Hour	599	65	664	852	42	894
16:00	150	15	165	252	16	268
16:15	175	13	188	257	9	266
16:30	159	10	169	262	15	277
16:45	136	13	149	291	10	301
Hour	620	51	671	1062	50	1112
17:00	190	20	210	308	19	327
17:15	158	6	164	300	10	310
17:30	179	7	186	260	9	269
17:45	179	7	186	285	6	291
Hour	706	40	746	1153	44	1197
18:00	148	14	162	304	10	314
18:15	152	9	161	250	7	257
18:30	124	3	127	250	9	259
18:45	128	12	140	228	13	241
Hour	552	38	590	1032	39	1071
Total	6246	672	6918	8089	647	8736

Appendix C – Traffic Generation Information

Traffic Generation Data for Anerobic Digestion Power Generation Facility

Maximum 20,000 Tonnes of Organic Feedstock required per Annum

Assumptions based on information from Applicant

Delivery of Material Via 20 tonne Roll on Roll off Skip trucks.
Deliveries over a period of 5.5 days a week, 50 weeks a year (Maximum).
Operation of Facility to be over 24 hours a day, 365 days a year.
Facility to be operated by approximate 10 staff over three shifts.

(10,000 Tonnes to be sourced locally.
This material to be pumped overland.)

Above information implies the following:

Facility to take deliveries 275 days over the year.
3 Staff over three shifts (08:00-18:00 - 18:00-02:00- 02:00-10:00)

Assuming Baseline Data obtained by applicant	Arrivals	Departures
Truck Deliveries		
Maximum demand (10,000 tonnes) delivered with 20 tonne trucks 500 truck Deliveries per annum	500	500
Deliveries Per Day (Assuming 275 days of deliveries)	1.18 say 2	1.18 say 2
including 10% sensitivity loading on deliveries (Per Day) (All data rounded up)	3	3

Assuming Baseline Data obtained by applicant Staff Traffic Generation	Arrivals (Per Shift)	Departures (Per Shift)
Maximum 10 staff 3 staff per shift(1 staff per private vehicle)	3	3
Assuming additional traffic movements (Errands, Lunch, Etc)	3	3
Total Staff Movements per Shift	6	6

Ancillary Trips to and From the Site	Arrivals (Per Shift)	Departures (Per Shift)
Include Post, Visitors, Maintenance, etc	5	5

Total Traffic Generation for AD Facility as from first principles	Arrivals (Per Shift)	Departures (Per Shift)
Assume Maximum traffic during (08:00-18:00 shift) **NB: No deliveries of waste materials anticipated during night time shifts.**		
Delivery of Waste Material	3	3
Staff	6	6
Ancillary Trips	5	5
Total Traffic Generation per Shift	14	14
Total traffic generation per shift multiplied by a factor of 2 for total traffic generation over 24 hours.		
Total Traffic Generation per Day	24	24

Peak Times on Proposed R156 is between the hours of (08:00-09:00) and (17:00-18:00)	Arrivals	Departures
Deliveries shall be evenly distributed throughout the day Worst Case Scenario is to assume: 30% of trip rates between morning AM Peak 40% of trip rates througout the remainder of the day 30% of trip rates between Evening PM Peak		
AM Peak Flow (@30% Daily total)	7.2 say 8 8	7.2 say 8 8
PM Peak Flow (@30% Daily total)	7.2 say 8 8	7.2 say 8 8
Of the total hourly trip rates 30% of total is large 20 Tonne Delivery Vehicles	3	3

Traffic Generation Data Summary	Arrivals	Departures
AM Peak (08:00-09:00)		
Cars and LGV's	5	5
HGV's	3	3
PM Peak (17:00-18:00)		
Cars and LGV's	5	5
HGV's	3	3

Traffic Generation Data for Anerobic Digestion Power Generation Facility

20,000 Tonnes of Digestate Material to be removed from site
(Removal of material over a period of 7 months)

Assumptions based on information from Applicant

Removal of material via 10 tonne liquid tank trucks.
Removed over a period of 5.5 days a week, approximately 30 weeks a year (over 7 month period).

Above information implies the following:

Removal of liquid material over 165 days per annum
20,000/10 tonnes= 2000 movements
2000/165 days= 13 daily removal trips
13x2= 26 two-way trips movements a day

Peak Hour Trips for Digestate Material

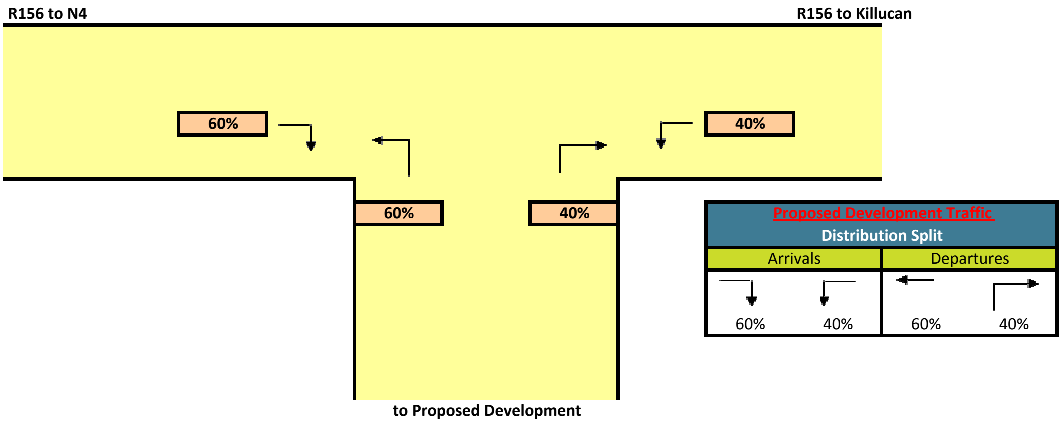
Assume 30% AM and PM traffic distribution as previously assumed for worst case scenario.

8 vehicles two-way movements per AM and PM Peak hour	Arrivals	Departures
AM Peak Hour	4	4
PM Peak Hour	4	4

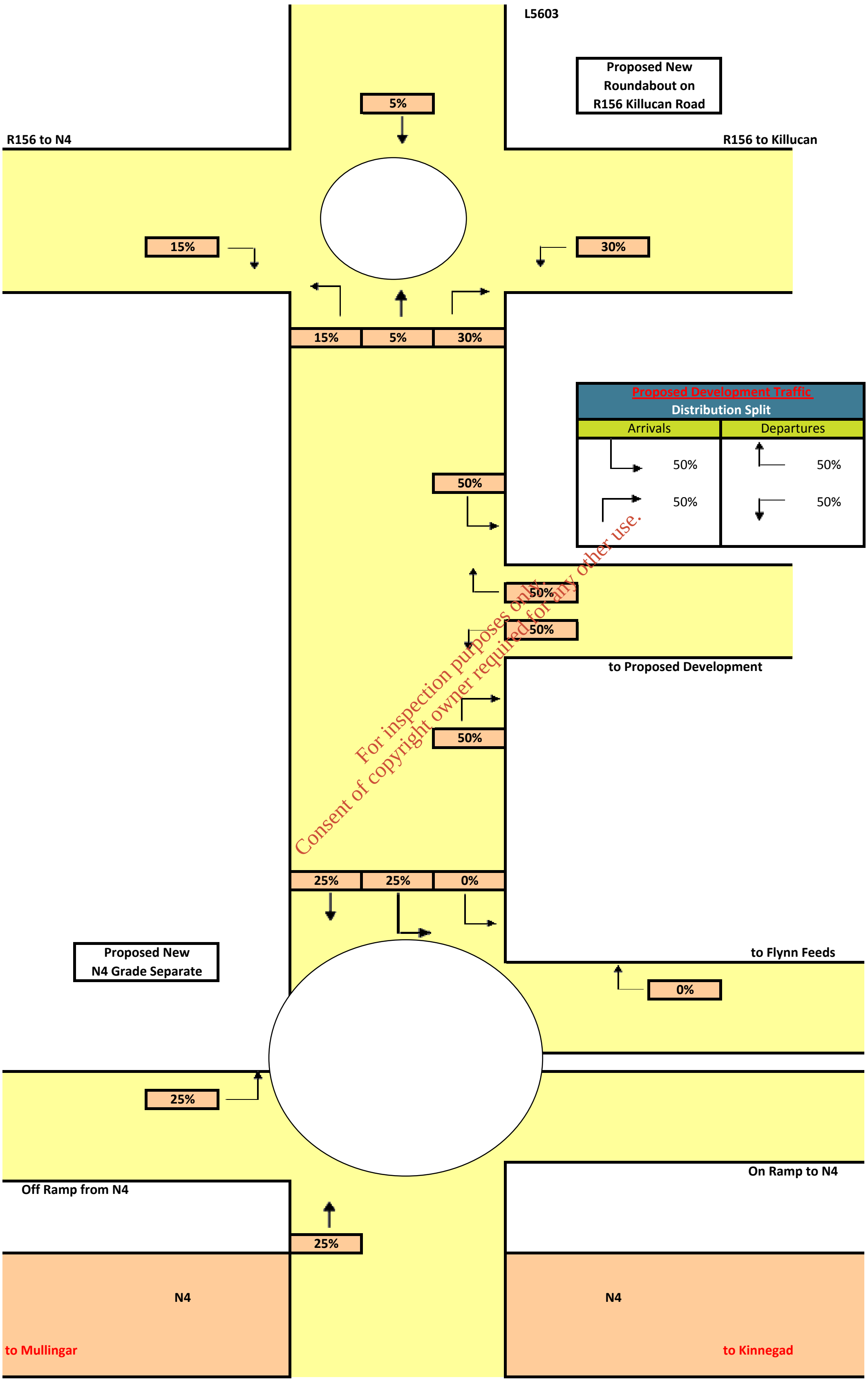
Total Generated Traffic Summary		
Traffic Summary assuming 'Worst Case Scenario' including 7 month removal period.		
	Arrivals	Departures
Total Daily Trip Rate	37	37
AM Peak (08:00-09:00)		
Cars and LGV's	5	5
HGV's/ 20 Tonne/ 10 tonne trucks	7	7
PM Peak (17:00-18:00)		
Cars and LGV's	5	5
HGV's/ 20 Tonne/ 10 tonne trucks	7	7

Appendix D – Traffic Flow Diagrams

Distribution Split of Proposed Development Traffic for Scenario 1

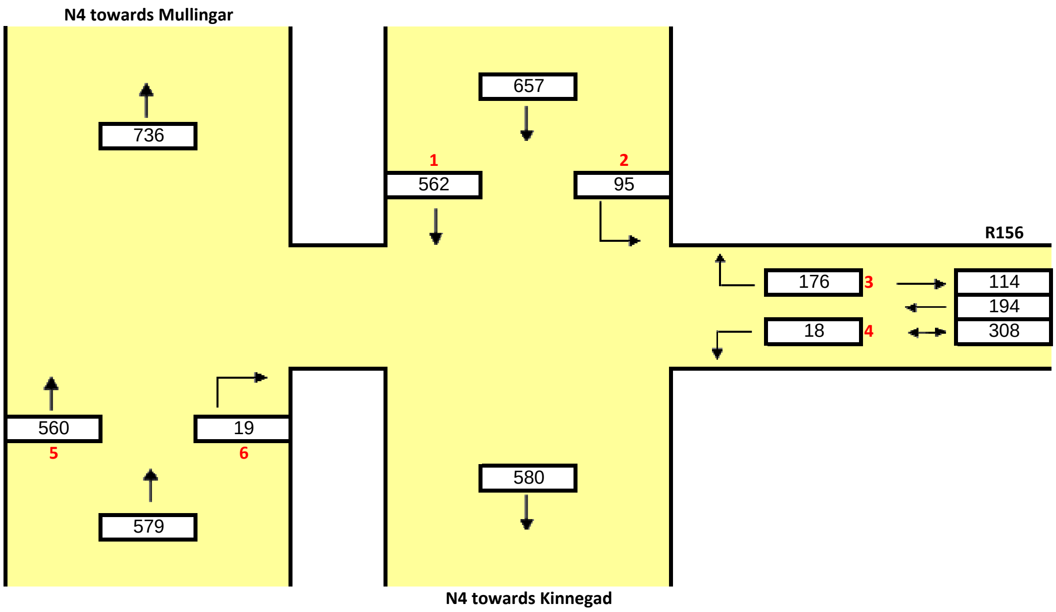


Distribution Split of Proposed Development Traffic for Scenario 2

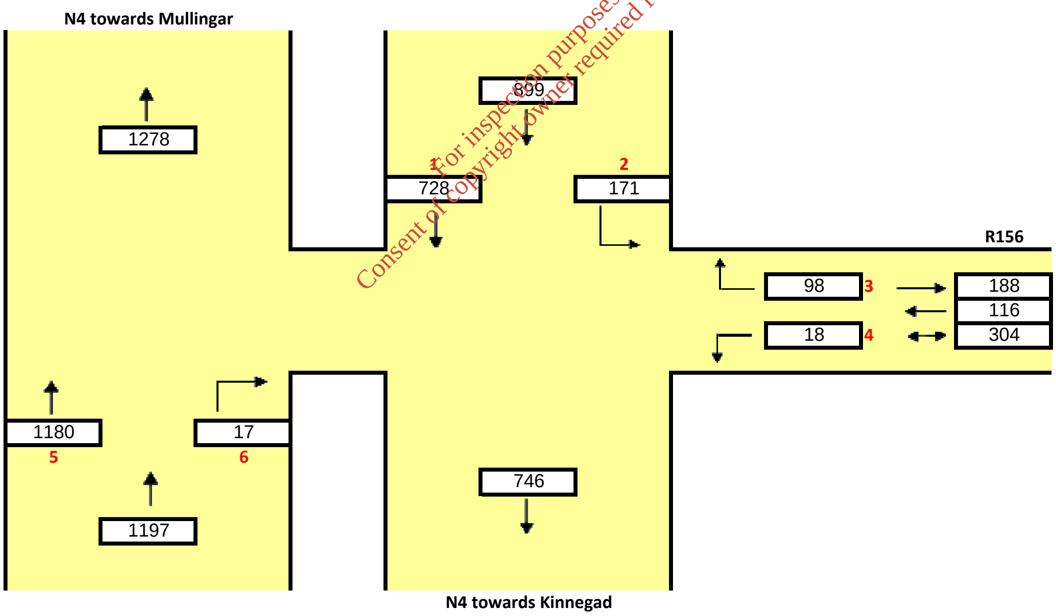


Base Year 2011
AM Peak: 8am-9am

SCENARIO 1



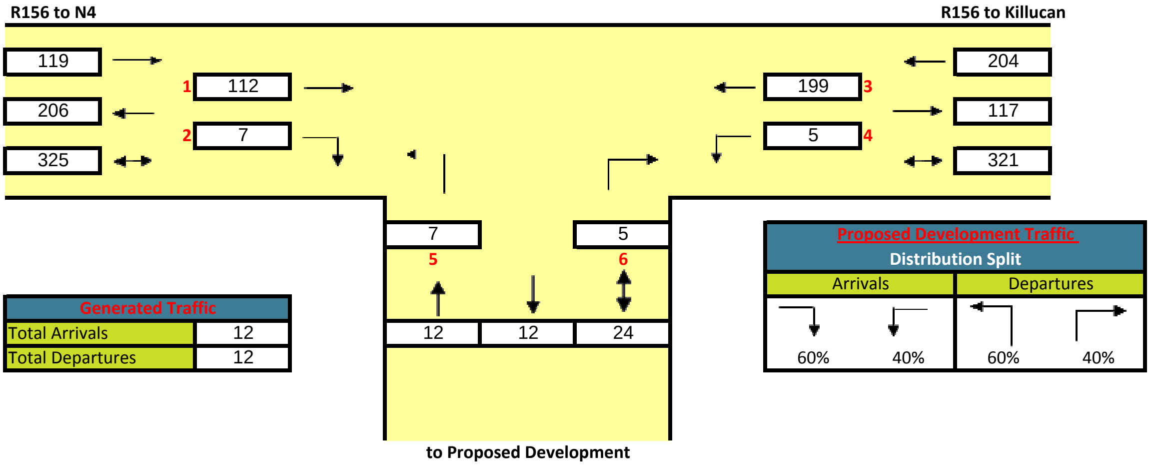
Base Year 2011
PM Peak: 5pm-6pm



2013: Year of Opening with Development

AM Peak: 8am-9am

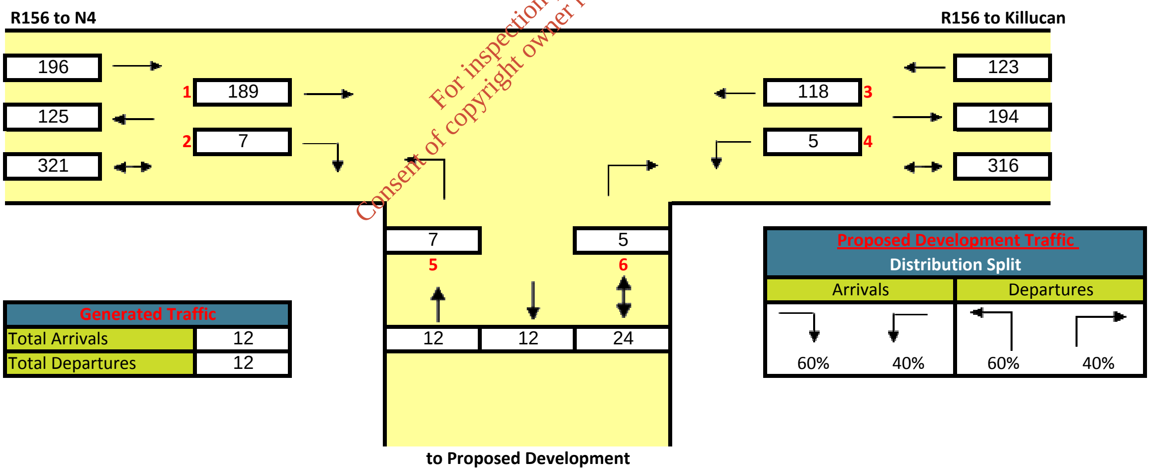
Growth Factor: 3%



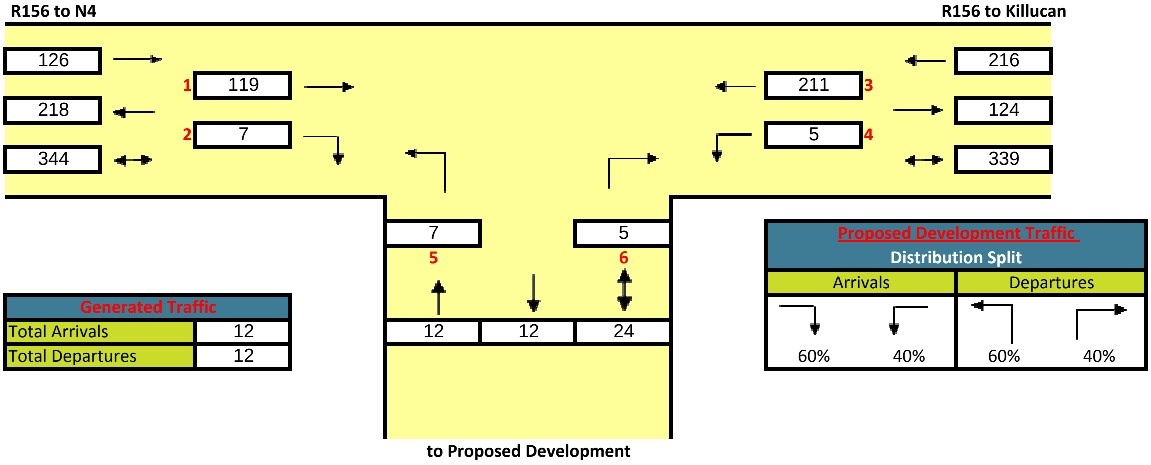
2013: Year of Opening with Development

PM Peak: 5pm-6pm

Growth Factor: 3%

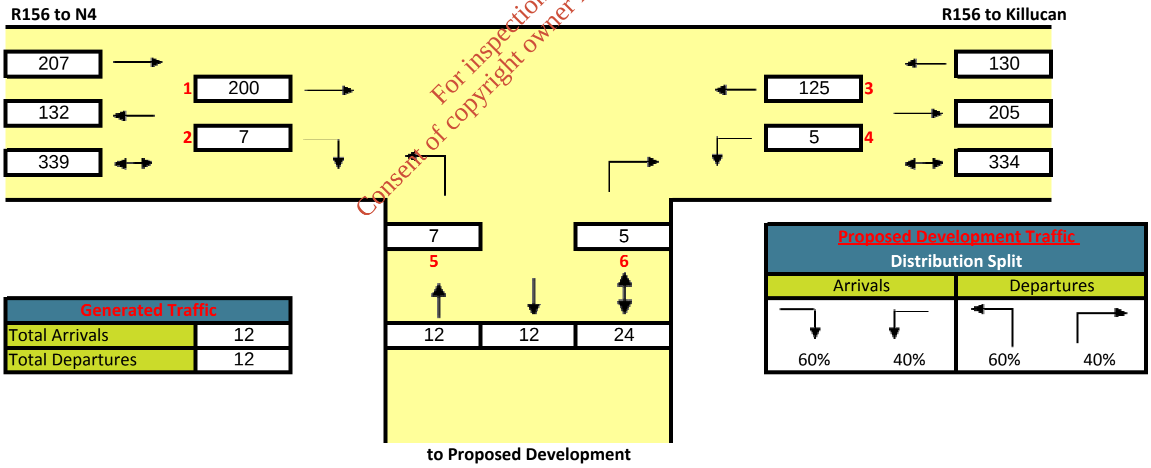


2018: Mid-Term Year with Development
AM Peak: 8am-9am
Growth Factor: 9%



Generated Traffic	
Total Arrivals	12
Total Departures	12

2018: Mid-Term Year with Development
PM Peak: 5pm-6pm
Growth Factor: 9%

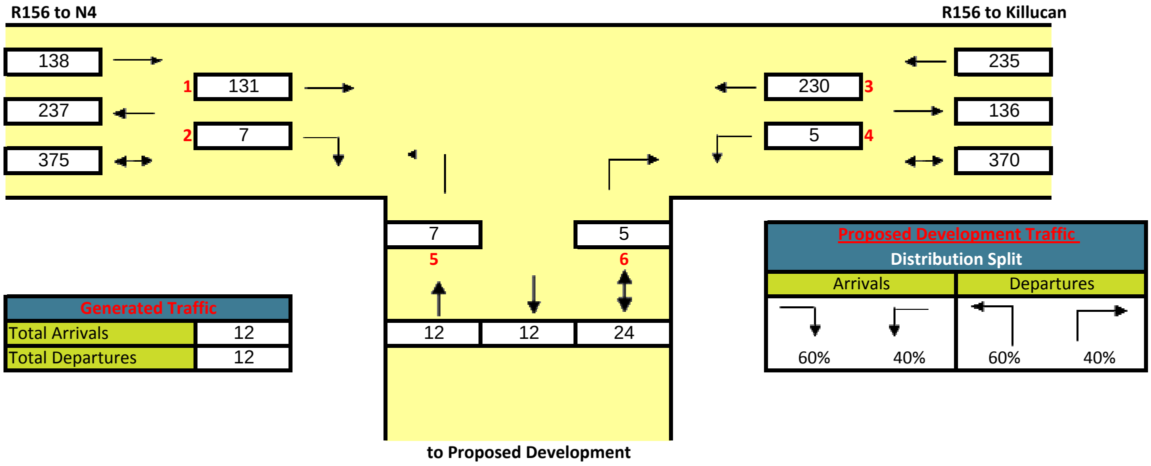


Generated Traffic	
Total Arrivals	12
Total Departures	12

2028: Future Year with Development

AM Peak: 8am-9am

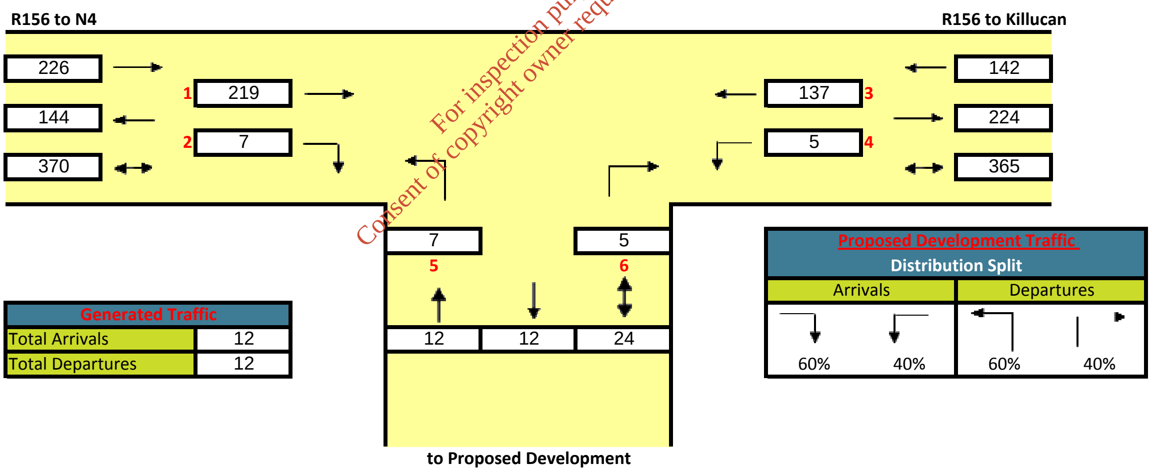
Growth Factor: 19%

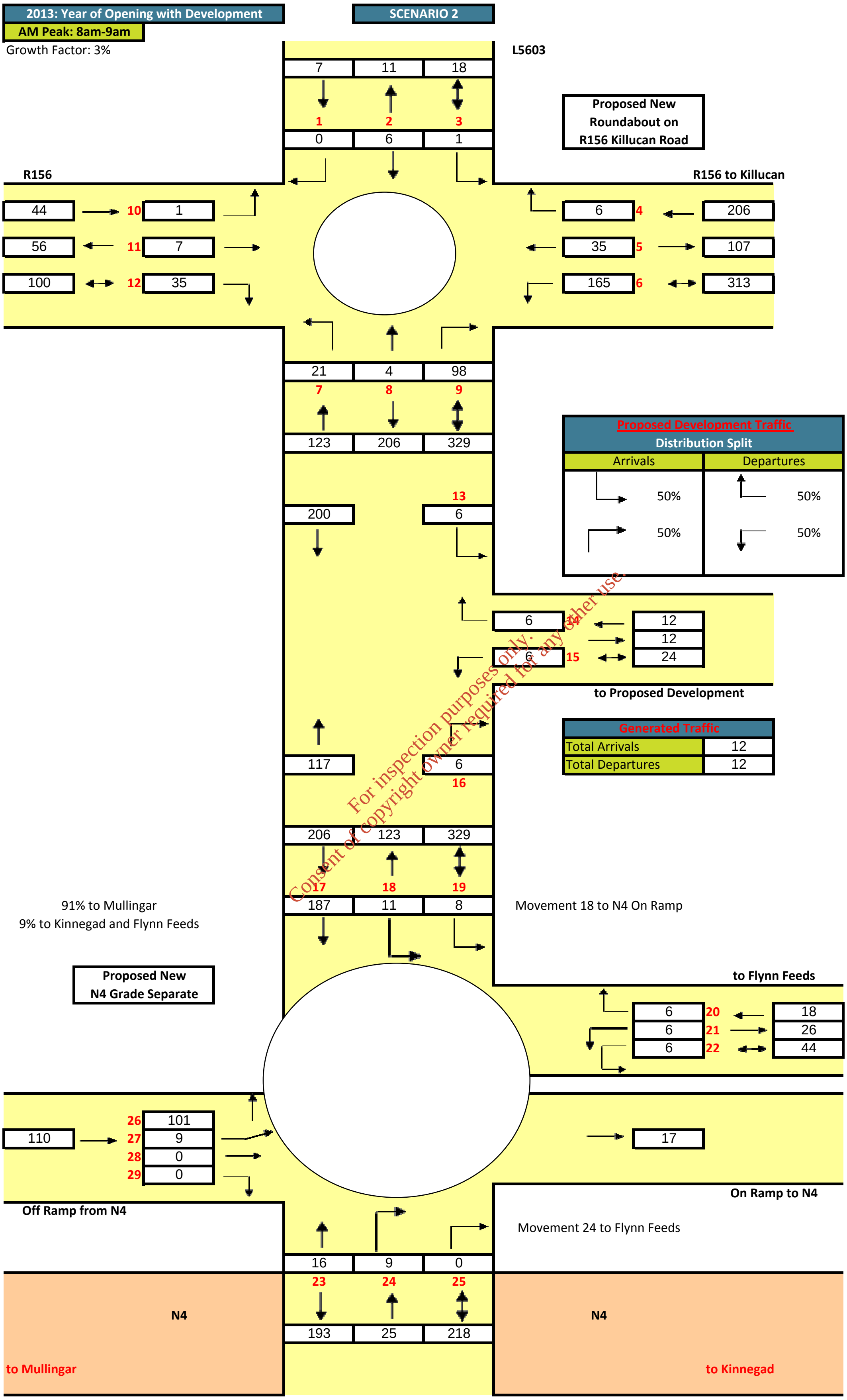


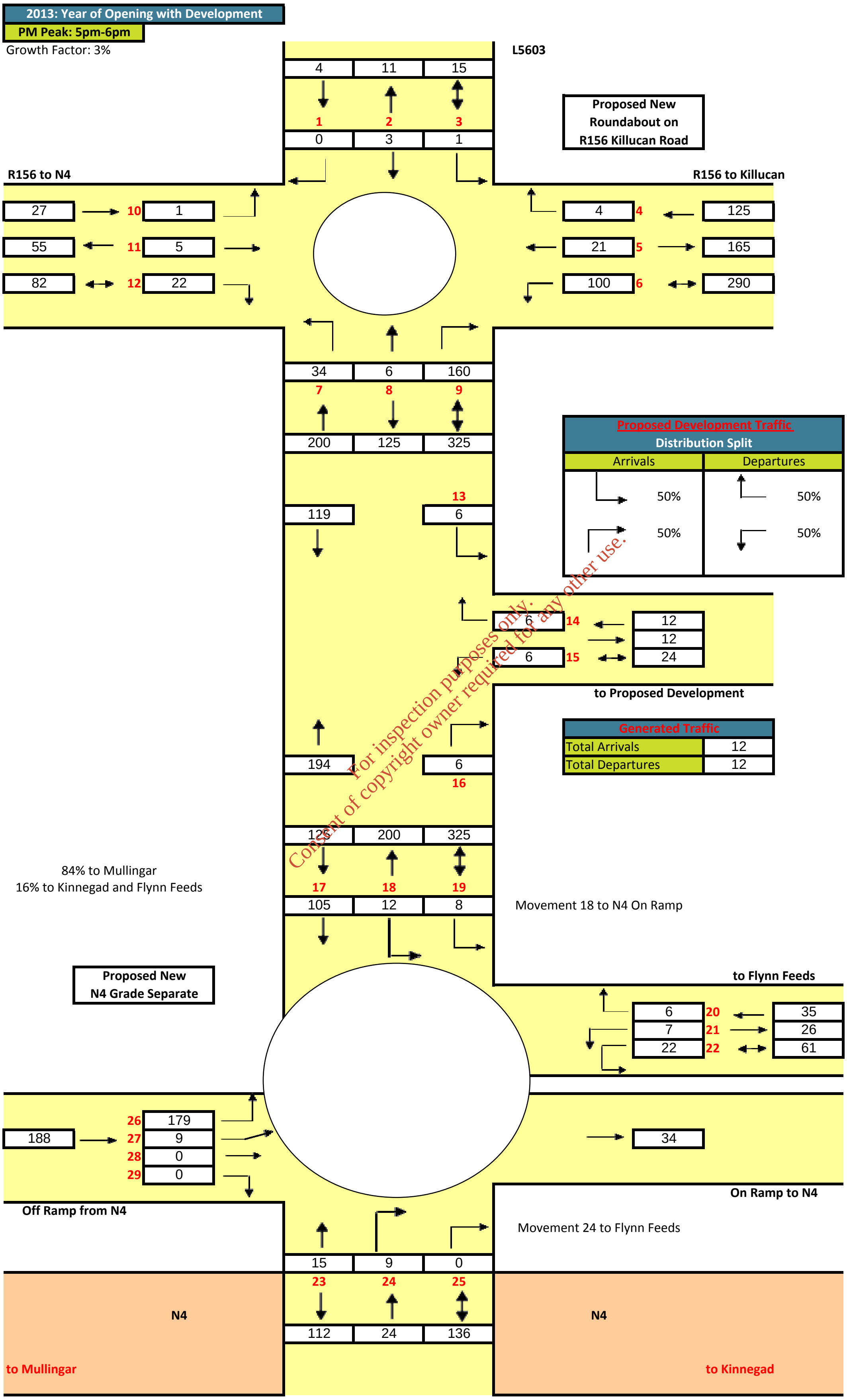
2028: Future Year with Development

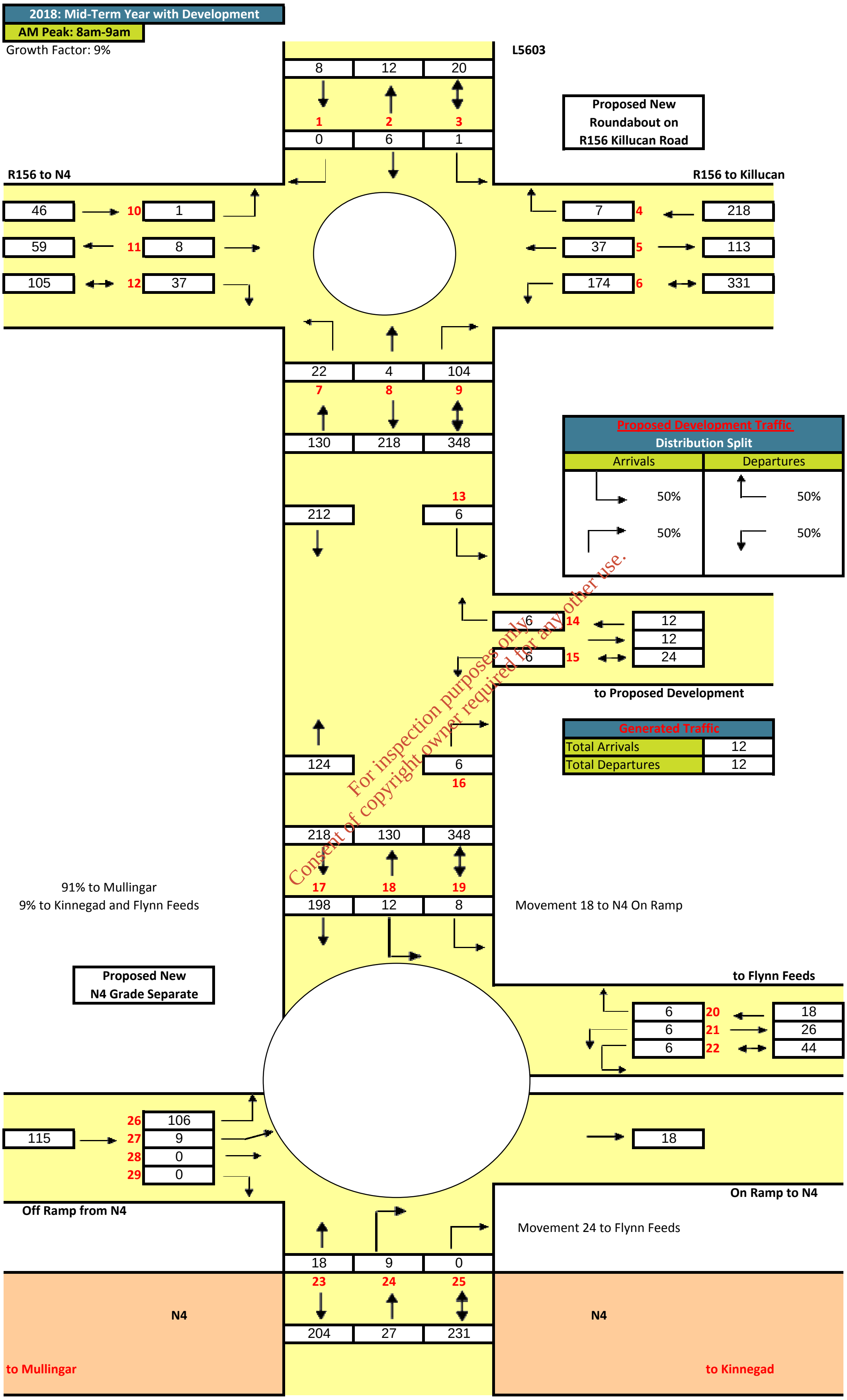
PM Peak: 5pm-6pm

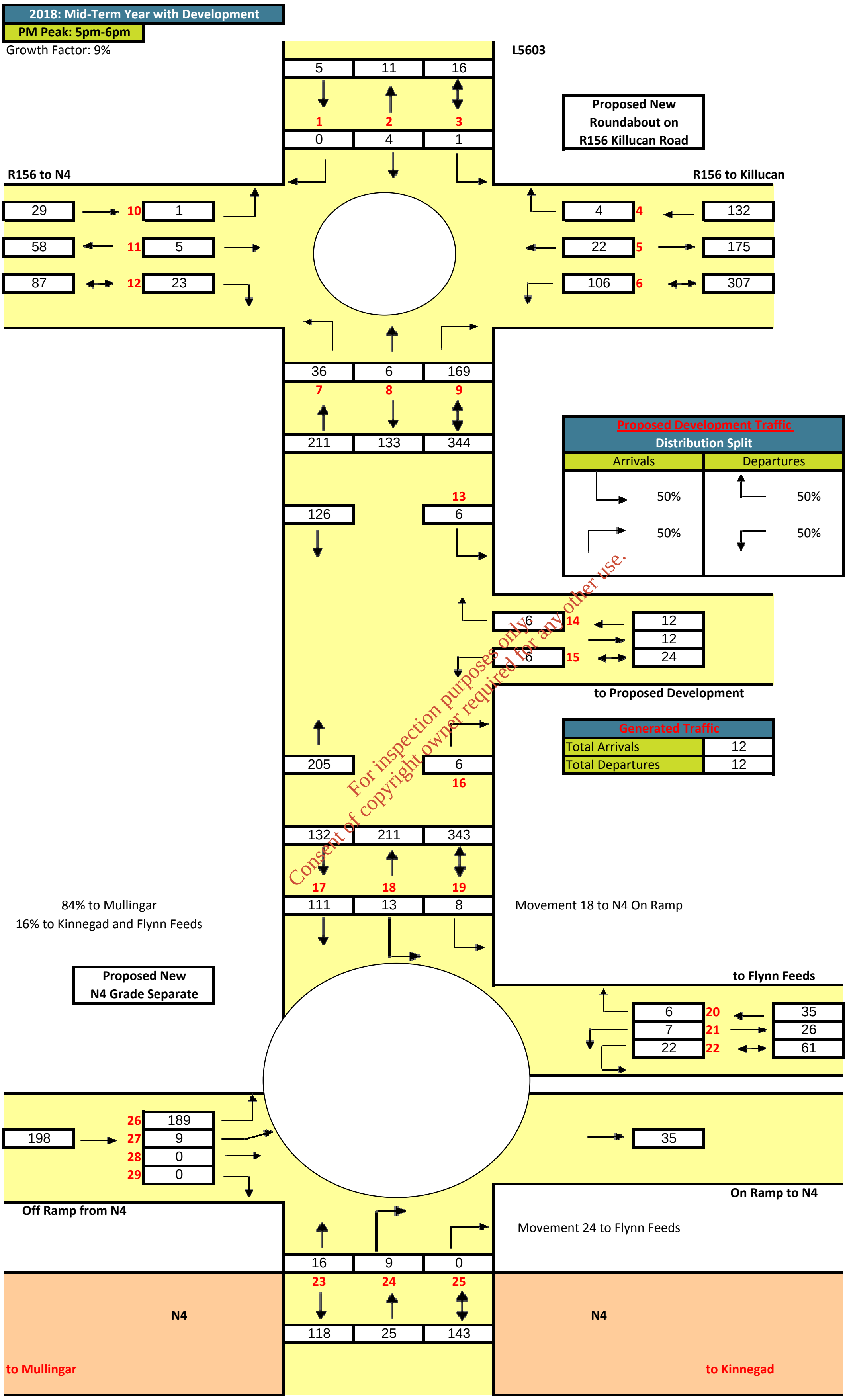
Growth Factor: 19%

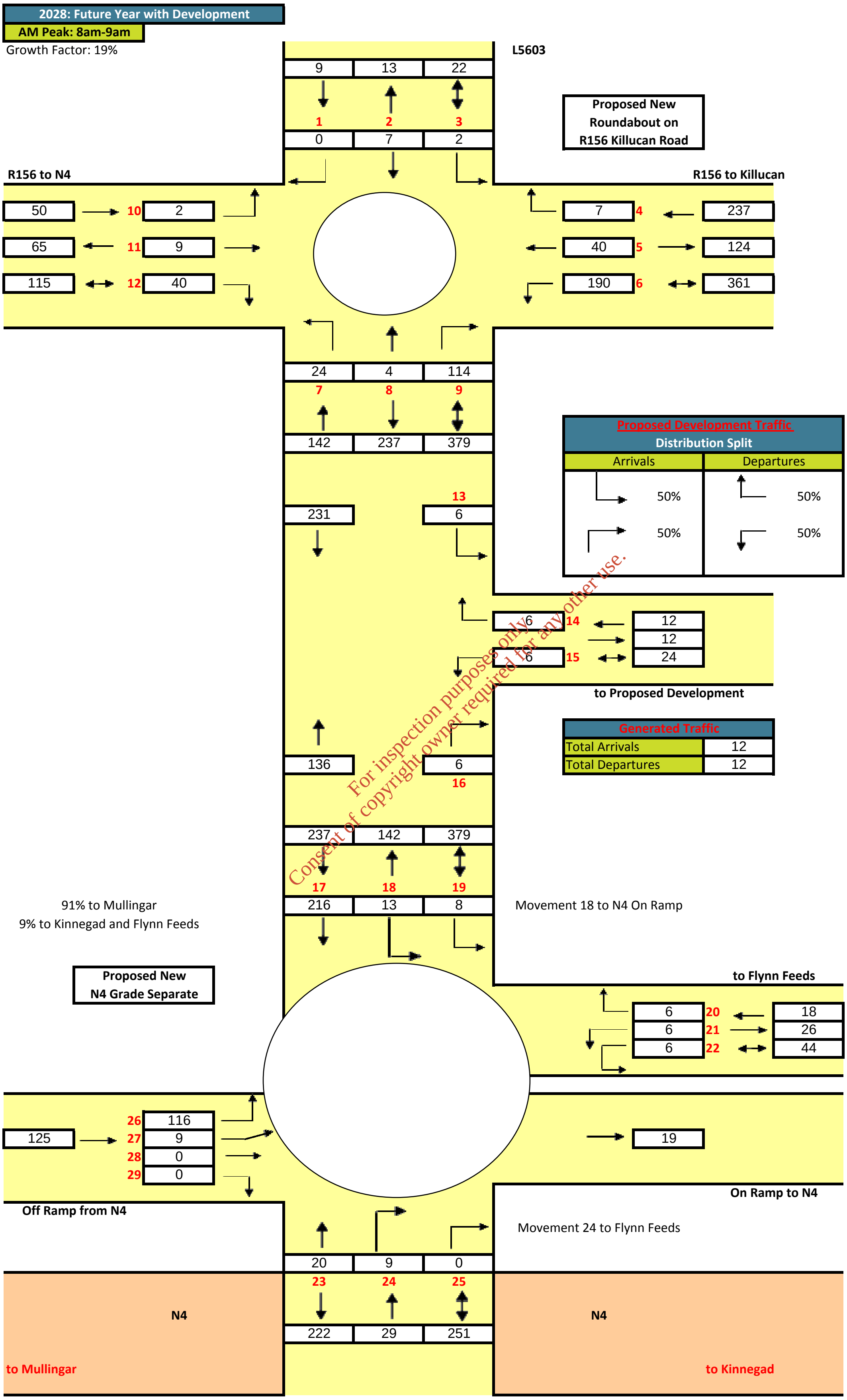


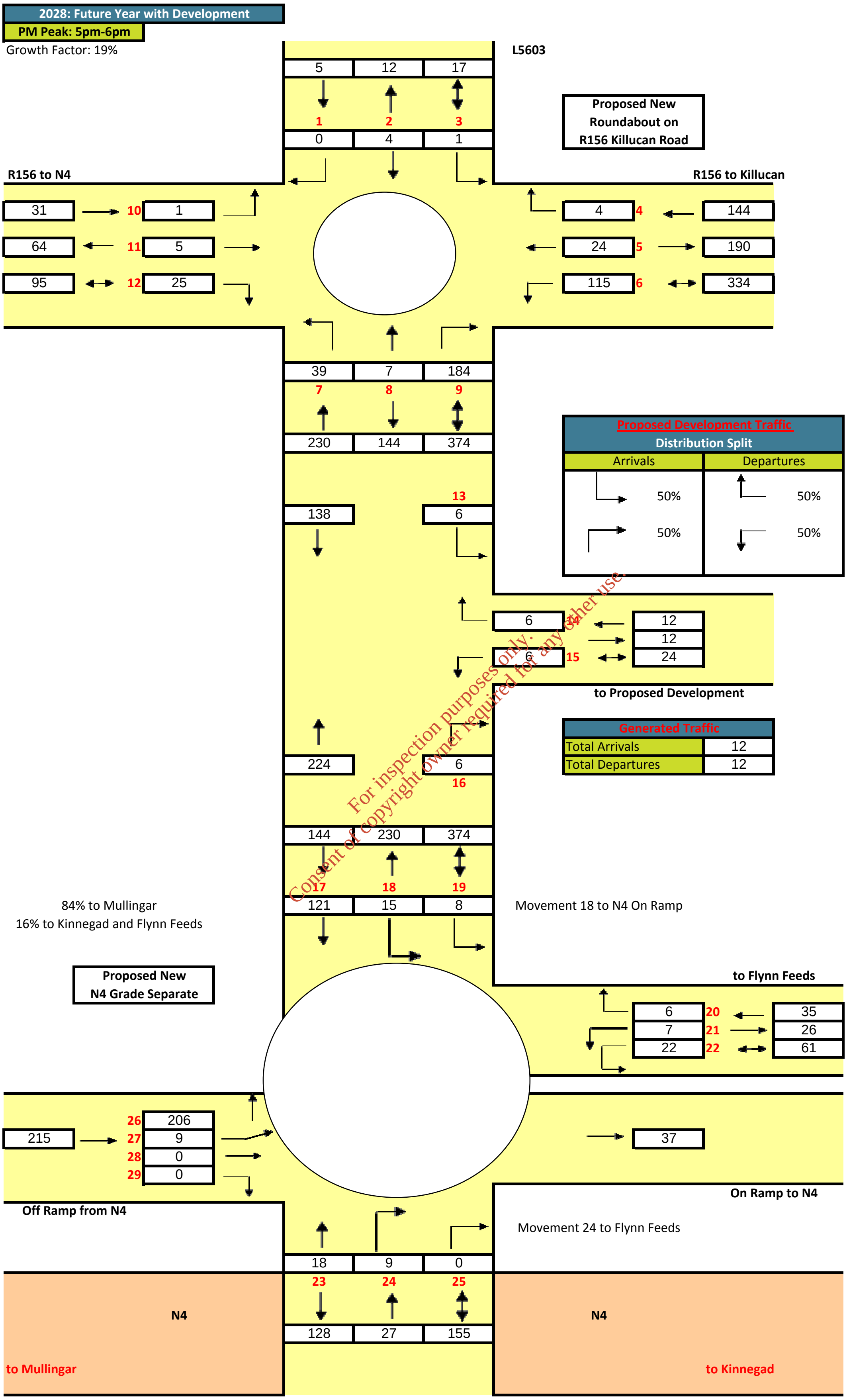

2013: Year of Opening with Development
AM Peak: 8am-9am
Growth Factor: 3%
SCENARIO 2
L5603
7 11 18
1 2 3
0 6 1
Proposed New Roundabout on R156 Killucan Road
R156
R156 to Killucan
44 10 1
56 11 7
100 12 35
6 4 206
35 5 107
165 6 313
21 4 98
7 8 9
123 206 329
Proposed Development Traffic
Distribution Split
Arrivals 50% 50%
Departures 50% 50%
200
13
6
6 14 12
12
6 15 24
to Proposed Development
Generated Traffic
Total Arrivals 12
Total Departures 12
117
6
16
206 123 329
17 18 19
187 11 8
Movement 18 to N4 On Ramp
91% to Mullingar
9% to Kinnegad and Flynn Feeds
Proposed New N4 Grade Separate
to Flynn Feeds
6 20 18
6 21 26
6 22 44
26 101
110 27 9
28 0
29 0
17
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
16 9 0
23 24 25
193 25 218
N4
N4
to Mullingar
to Kinnegad

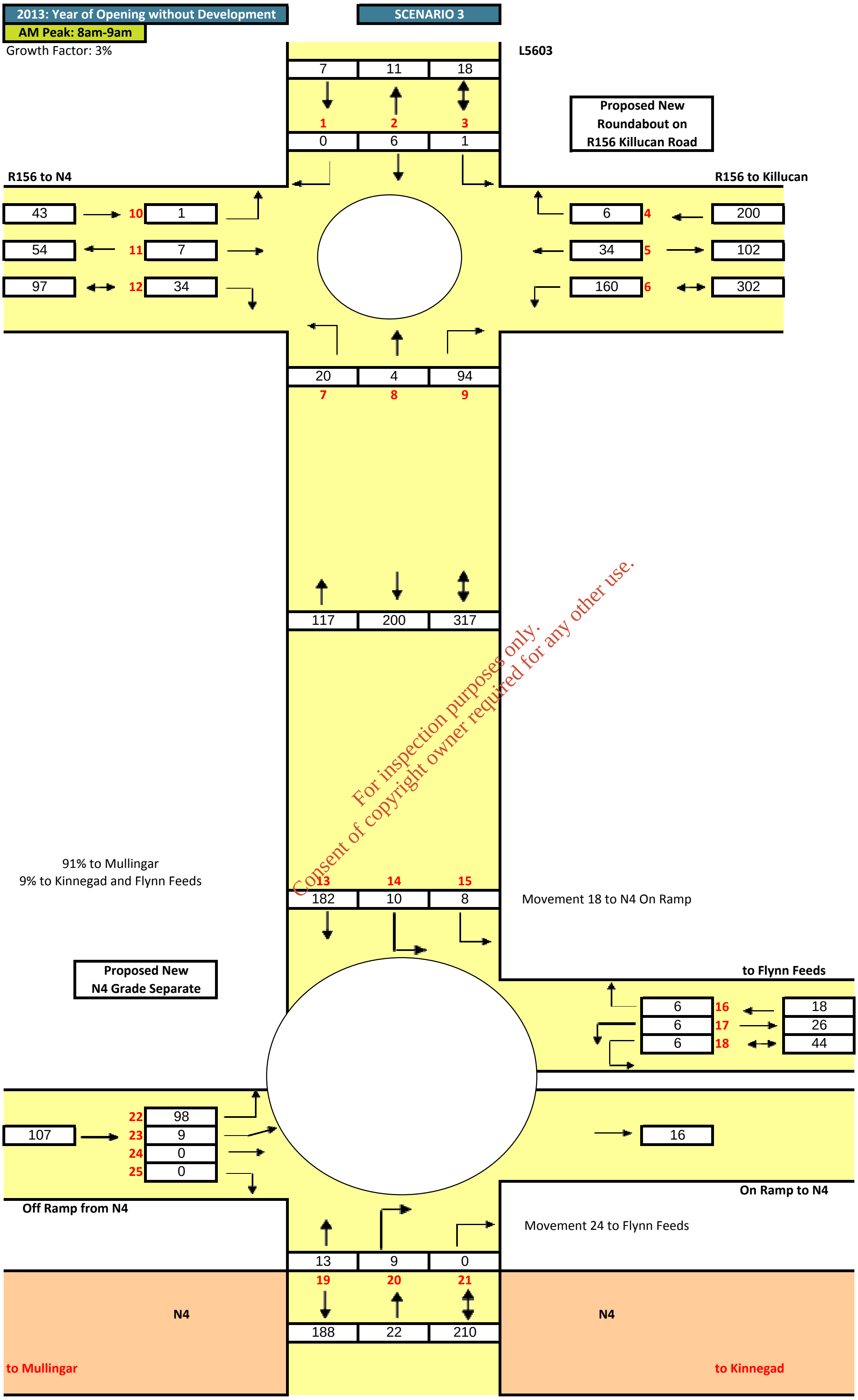

2013: Year of Opening with Development
PM Peak: 5pm-6pm
Growth Factor: 3%
L5603
4 11 15
1 2 3
0 3 1
Proposed New Roundabout on R156 Killucan Road
R156 to N4
R156 to Killucan
27 10 1
55 11 5
82 12 22
4 4 125
21 5 165
100 6 290
34 6 160
7 8 9
200 125 325
Proposed Development Traffic
Distribution Split
Arrivals
Departures
50%
50%
50%
50%
13
119
6
6 14 12
12
6 15 24
to Proposed Development
Generated Traffic
Total Arrivals 12
Total Departures 12
194
6
16
125 200 325
17 18 19
105 12 8
84% to Mullingar
16% to Kinnegad and Flynn Feeds
Movement 18 to N4 On Ramp
Proposed New N4 Grade Separate
to Flynn Feeds
6 20 35
7 21 26
22 22 61
26 179
188 27 9
28 0
29 0
34
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
15 9 0
23 24 25
112 24 136
N4
N4
to Mullingar
to Kinnegad

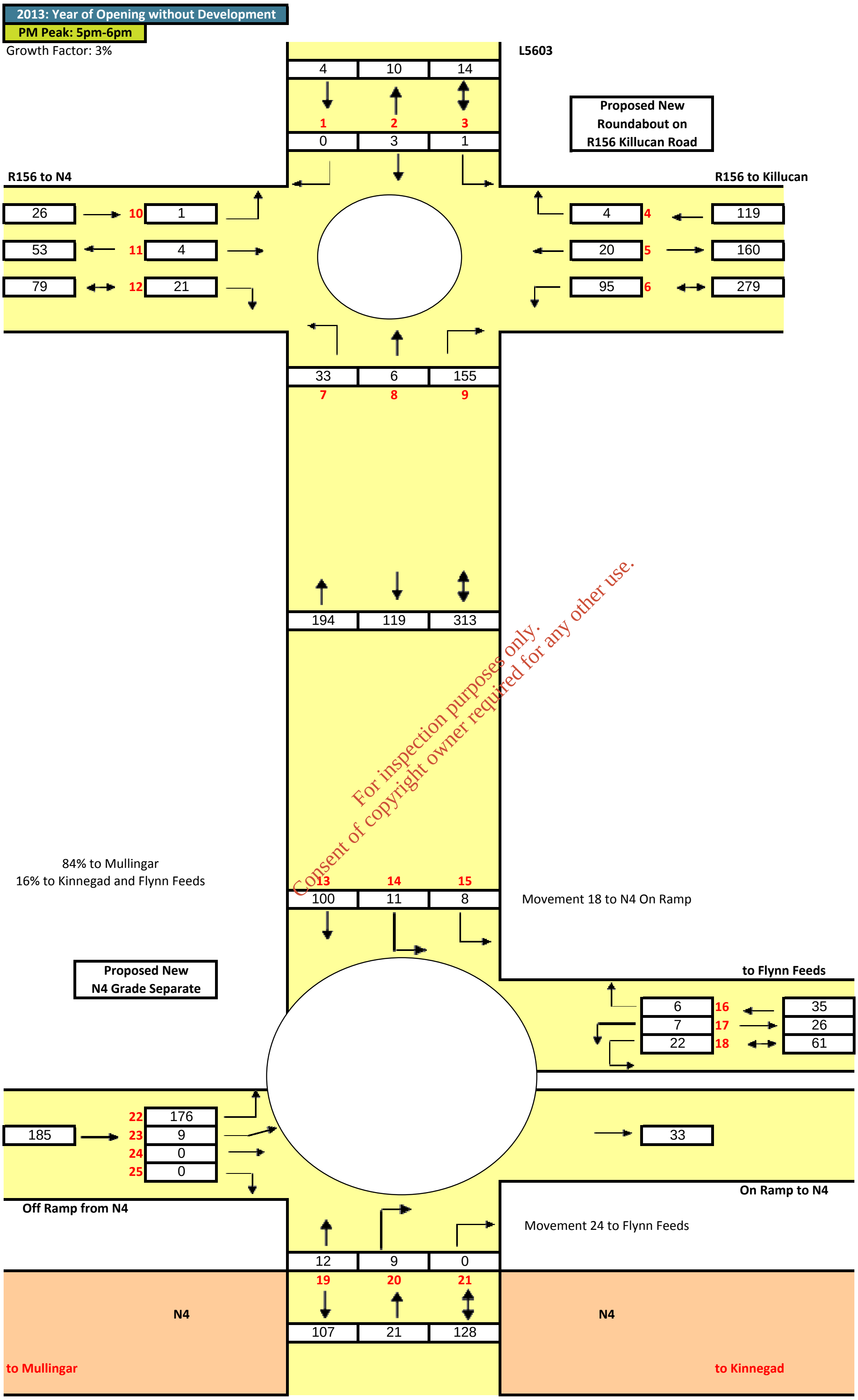

2018: Mid-Term Year with Development
AM Peak: 8am-9am
Growth Factor: 9%
L5603
8 12 20
1 2 3
0 6 1
Proposed New
Roundabout on
R156 Killucan Road
R156 to N4
R156 to Killucan
46 10 1
59 11 8
105 12 37
7 4 218
37 5 113
174 6 331
22 4 104
7 8 9
130 218 348
Proposed Development Traffic
Distribution Split
Arrivals
Departures
50%
50%
50%
50%
13
212
6
6 14 12
12
6 15 24
to Proposed Development
Generated Traffic
Total Arrivals 12
Total Departures 12
124
6
16
218 130 348
17 18 19
198 12 8
91% to Mullingar
9% to Kinnegad and Flynn Feeds
Movement 18 to N4 On Ramp
Proposed New
N4 Grade Separate
to Flynn Feeds
6 20 18
6 21 26
6 22 44
115
26 106
27 9
28 0
29 0
18
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
18 9 0
23 24 25
204 27 231
N4
N4
to Mullingar
to Kinnegad

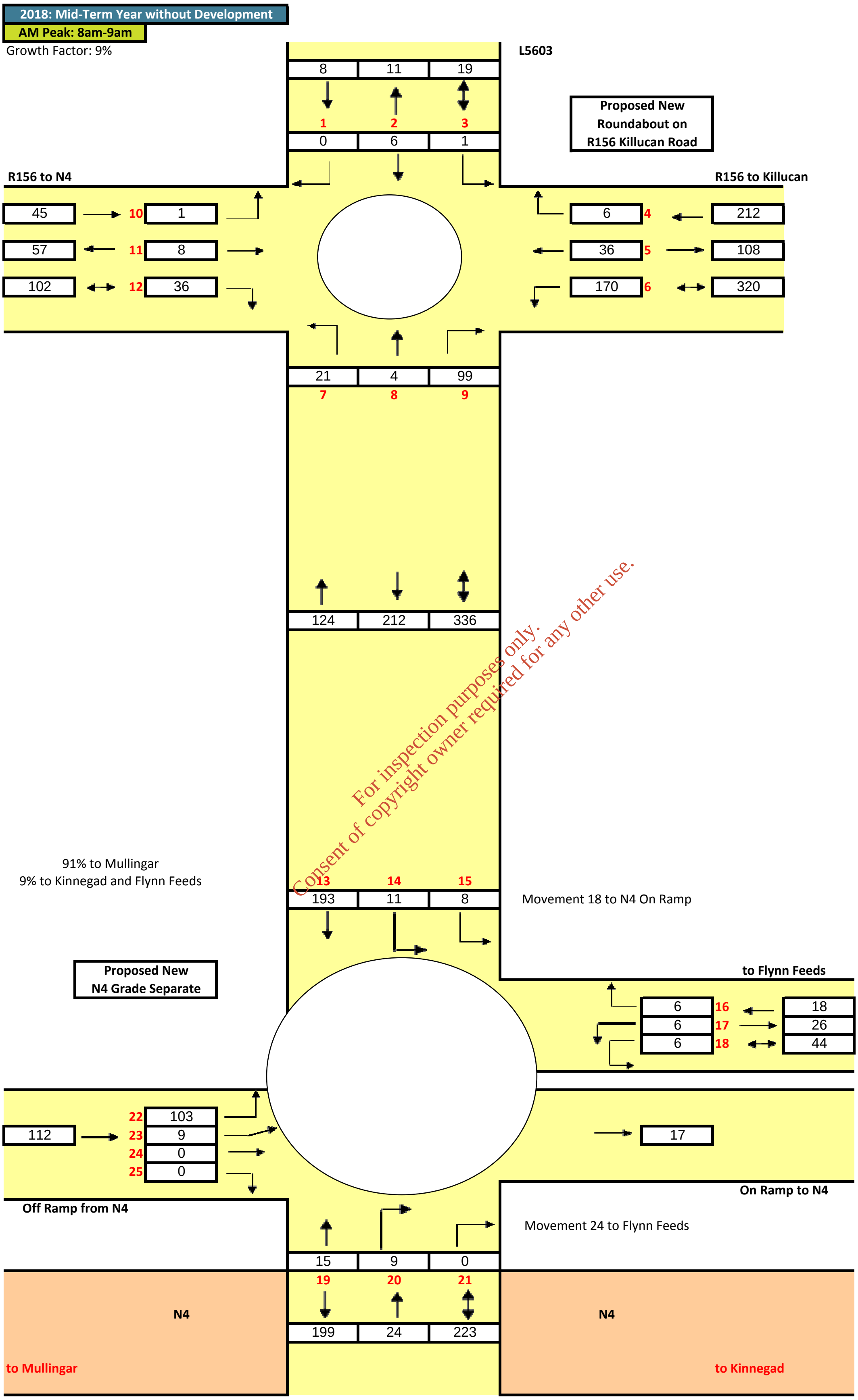

2018: Mid-Term Year with Development
PM Peak: 5pm-6pm
Growth Factor: 9%
L5603
5 11 16
1 2 3
0 4 1
Proposed New Roundabout on R156 Killucan Road
R156 to N4
R156 to Killucan
29 10 1
58 11 5
87 12 23
4 4 132
22 5 175
106 6 307
36 6 169
7 8 9
211 133 344
Proposed Development Traffic
Distribution Split
Arrivals
Departures
50%
50%
50%
50%
126
13
6
6 14 12
12
6 15 24
to Proposed Development
Generated Traffic
Total Arrivals 12
Total Departures 12
205
6
16
132 211 343
17 18 19
111 13 8
84% to Mullingar
16% to Kinnegad and Flynn Feeds
Movement 18 to N4 On Ramp
Proposed New
N4 Grade Separate
to Flynn Feeds
6 20 35
7 21 26
22 22 61
26 189
198 27 9
28 0
29 0
35
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
16 9 0
23 24 25
118 25 143
N4
N4
to Mullingar
to Kinnegad

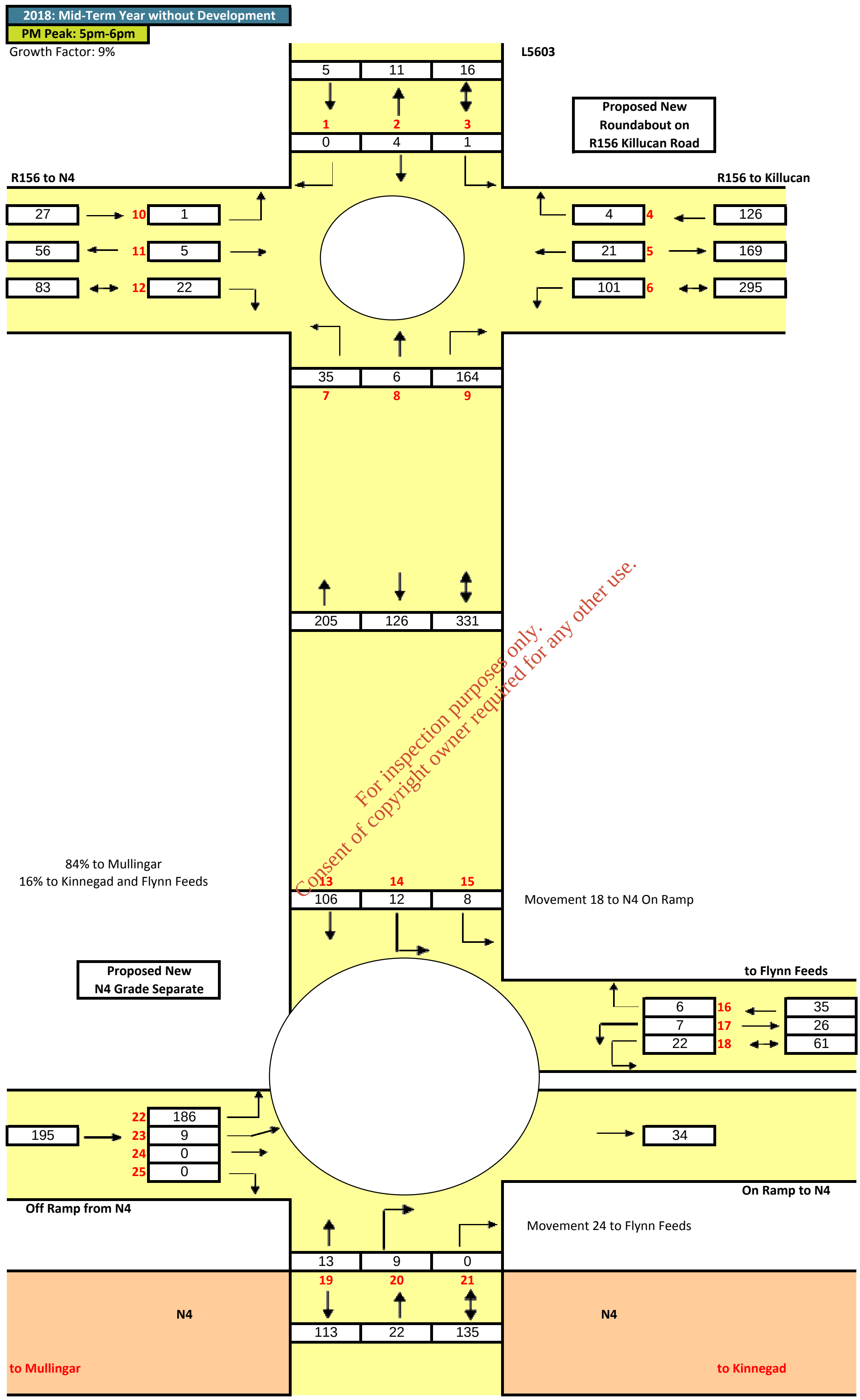

2028: Future Year with Development
AM Peak: 8am-9am
Growth Factor: 19%
L5603
9 13 22
1 2 3
0 7 2
Proposed New Roundabout on R156 Killucan Road
R156 to N4
R156 to Killucan
50 10 2
65 11 9
115 12 40
7 4 237
40 5 124
190 6 361
24 4 114
7 8 9
142 237 379
13
231 6
Proposed Development Traffic
Distribution Split
Arrivals
Departures
50%
50%
50%
50%
6 14 12
12
6 15 24
to Proposed Development
Generated Traffic
Total Arrivals 12
Total Departures 12
136 6
16
237 142 379
17 18 19
216 13 8
91% to Mullingar
9% to Kinnegad and Flynn Feeds
Movement 18 to N4 On Ramp
Proposed New N4 Grade Separate
to Flynn Feeds
6 20 18
6 21 26
6 22 44
26 116
125 27 9
28 0
29 0
19
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
20 9 0
23 24 25
222 29 251
N4
N4
to Mullingar
to Kinnegad

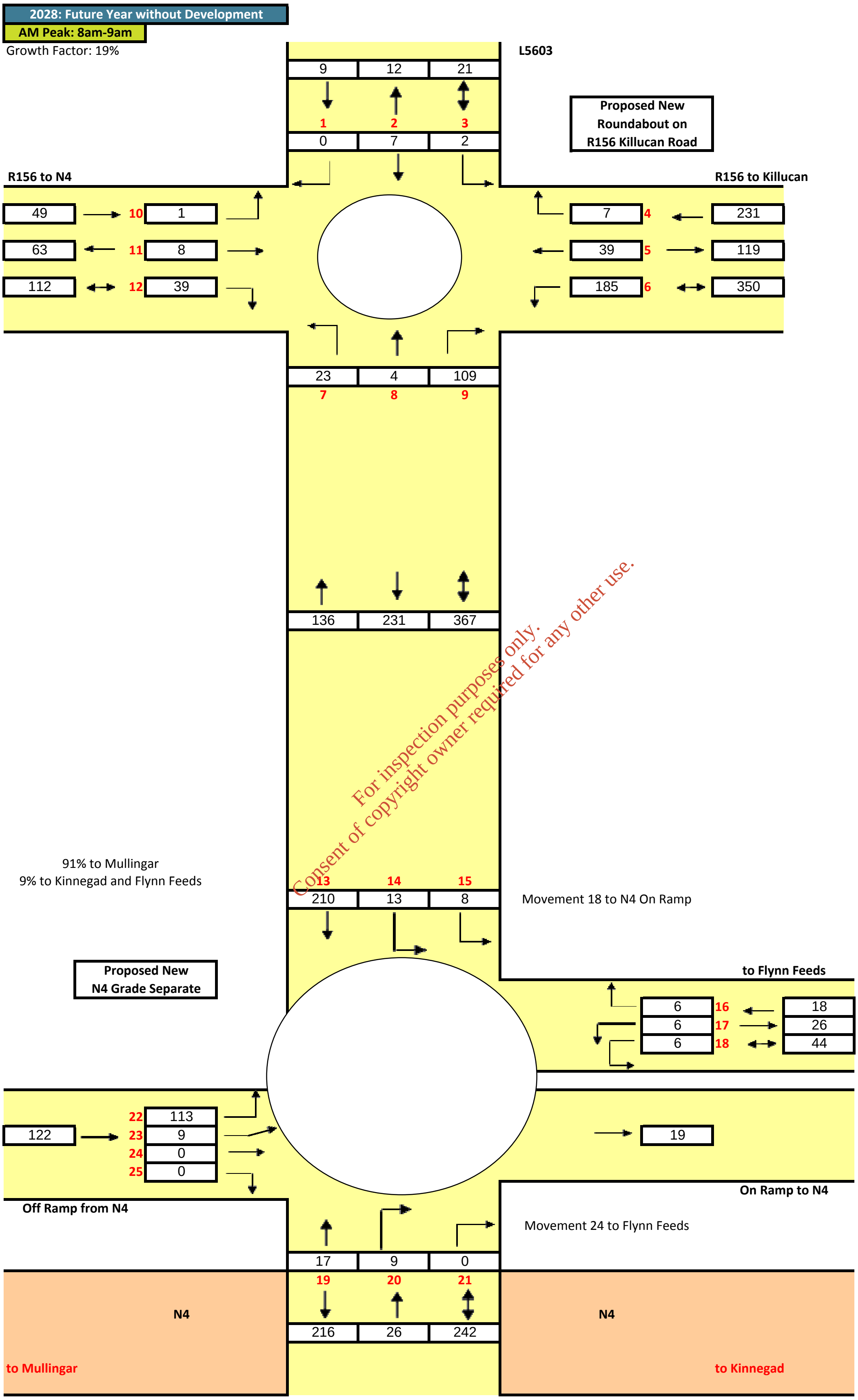

2028: Future Year with Development
PM Peak: 5pm-6pm
Growth Factor: 19%
L5603
5 12 17
1 2 3
0 4 1
Proposed New Roundabout on R156 Killucan Road
R156 to N4
R156 to Killucan
31 10 1
64 11 5
95 12 25
4 4 144
24 5 190
115 6 334
39 7 184
7 8 9
230 144 374
Proposed Development Traffic
Distribution Split
Arrivals
Departures
50%
50%
50%
50%
138
13
6
6 14 12
12
6 15 24
to Proposed Development
Generated Traffic
Total Arrivals 12
Total Departures 12
224
6
16
144 230 374
17 18 19
121 15 8
84% to Mullingar
16% to Kinnegad and Flynn Feeds
Movement 18 to N4 On Ramp
Proposed New N4 Grade Separate
to Flynn Feeds
6 20 35
7 21 26
22 22 61
26 206
215 27 9
28 0
29 0
37
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
18 9 0
23 24 25
128 27 155
N4
N4
to Mullingar
to Kinnegad

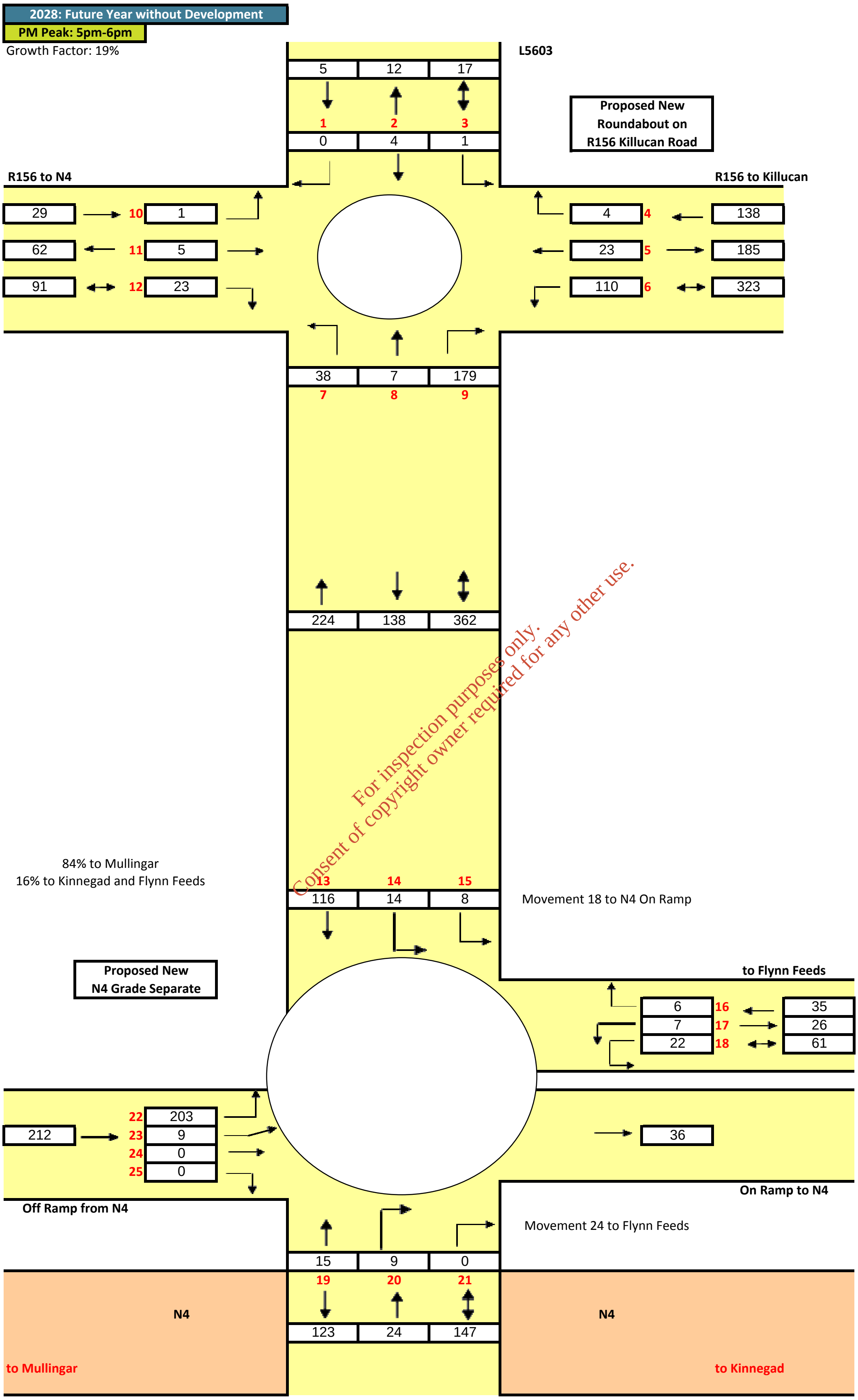

2013: Year of Opening without Development
SCENARIO 3
AM Peak: 8am-9am
Growth Factor: 3%
L5603
7
11
18
1
2
3
0
6
1
Proposed New
Roundabout on
R156 Killucan Road
R156 to N4
R156 to Killucan
43
10
1
54
11
7
97
12
34
6
4
200
34
5
102
160
6
302
20
4
94
7
8
9
117
200
317
91% to Mullingar
9% to Kinnegad and Flynn Feeds
13
14
15
182
10
8
Movement 18 to N4 On Ramp
Proposed New
N4 Grade Separate
to Flynn Feeds
6
16
18
6
17
26
6
18
44
107
22
98
23
9
24
0
25
0
16
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
13
9
0
19
20
21
188
22
210
N4
N4
to Mullingar
to Kinnegad


2013: Year of Opening without Development
PM Peak: 5pm-6pm
Growth Factor: 3%
L5603
4
10
14
1
2
3
0
3
1
Proposed New
Roundabout on
R156 Killucan Road
R156 to N4
R156 to Killucan
26
10
1
53
11
4
79
12
21
4
119
20
5
160
95
6
279
33
6
155
7
8
9
194
119
313
84% to Mullingar
16% to Kinnegad and Flynn Feeds
13
14
15
100
11
8
Movement 18 to N4 On Ramp
Proposed New
N4 Grade Separate
to Flynn Feeds
6
16
35
7
17
26
22
18
61
185
22
176
23
9
24
0
25
0
33
Off Ramp from N4
On Ramp to N4
Movement 24 to Flynn Feeds
12
9
0
19
20
21
107
21
128
N4
N4
to Mullingar
to Kinnegad


2018: Mid-Term Year without Development
AM Peak: 8am-9am
Growth Factor: 9%
L5603
8
11
19
1
2
3
0
6
1
Proposed New
Roundabout on
R156 Killucan Road
R156 to N4
R156 to Killucan
45
10
1
57
11
8
102
12
36
6
4
212
36
5
108
170
6
320
21
4
99
7
8
9
124
212
336
91% to Mullingar
9% to Kinnegad and Flynn Feeds
13
14
15
193
11
8
Movement 18 to N4 On Ramp
Proposed New
N4 Grade Separate
to Flynn Feeds
6
16
18
6
17
26
6
18
44
22
103
112
23
9
24
0
25
0
17
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
15
9
0
19
20
21
199
24
223
N4
N4
to Mullingar
to Kinnegad


2018: Mid-Term Year without Development
PM Peak: 5pm-6pm
Growth Factor: 9%
L5603
5
11
16
1
2
3
0
4
1
Proposed New
Roundabout on
R156 Killucan Road
R156 to N4
R156 to Killucan
27
10
1
56
11
5
83
12
22
4
126
21
5
169
101
6
295
35
6
164
7
8
9
205
126
331
84% to Mullingar
16% to Kinnegad and Flynn Feeds
13
14
15
106
12
8
Movement 18 to N4 On Ramp
Proposed New
N4 Grade Separate
to Flynn Feeds
6
16
35
7
17
26
22
18
61
195
22
186
23
9
24
0
25
0
34
Off Ramp from N4
On Ramp to N4
Movement 24 to Flynn Feeds
13
9
0
19
20
21
113
22
135
N4
N4
to Mullingar
to Kinnegad


2028: Future Year without Development
AM Peak: 8am-9am
Growth Factor: 19%
L5603
9 12 21
1 2 3
0 7 2
Proposed New Roundabout on R156 Killucan Road
R156 to N4
R156 to Killucan
49 10 1
63 11 8
112 12 39
7 4 231
39 5 119
185 6 350
23 4 109
7 8 9
136 231 367
91% to Mullingar
9% to Kinnegad and Flynn Feeds
13 14 15
210 13 8
Movement 18 to N4 On Ramp
Proposed New N4 Grade Separate
to Flynn Feeds
6 16 18
6 17 26
6 18 44
22 113
122 23 9
24 0
25 0
19
On Ramp to N4
Off Ramp from N4
Movement 24 to Flynn Feeds
17 9 0
19 20 21
216 26 242
N4
to Mullingar
N4
to Kinnegad


2028: Future Year without Development
PM Peak: 5pm-6pm
Growth Factor: 19%
L5603
5
12
17
1
2
3
0
4
1
Proposed New
Roundabout on
R156 Killucan Road
R156 to N4
R156 to Killucan
29
10
1
62
11
5
91
12
23
4
4
138
23
5
185
110
6
323
38
7
179
7
8
9
224
138
362
84% to Mullingar
16% to Kinnegad and Flynn Feeds
13
14
15
116
14
8
Movement 18 to N4 On Ramp
Proposed New
N4 Grade Separate
to Flynn Feeds
6
16
35
7
17
26
22
18
61
212
22
203
23
9
24
0
25
0
36
Off Ramp from N4
On Ramp to N4
Movement 24 to Flynn Feeds
15
9
0
19
20
21
123
24
147
N4
N4
to Mullingar
to Kinnegad

Appendix E – Junction Capacity

Junction Capacity for T-Junction on R156 to Proposed Development (Scenario 1)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.022	97.8	OK
to N4 (R156)	0.014	98.6	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.014	98.6	OK
to Proposed Development	0.021	97.9	OK
to N4 (R156)	0.014	98.6	OK

Junction Capacity for Proposed New Roundabout on R156 with Proposed Development (Scenario 2)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.132	86.8	OK
to Proposed Development and N4	0.084	91.6	OK
R156	0.027	97.3	OK
L5603	0.006	99.4	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.079	92.1	OK
to Proposed Development and N4	0.136	86.4	OK
R156	0.017	98.3	OK
L5603	0.004	99.6	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.140	86	OK
to Proposed Development and N4	0.089	91.1	OK
R156	0.029	97.1	OK
L5603	0.007	99.3	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.084	91.6	OK
to Proposed Development and N4	0.144	85.6	OK
R156	0.018	98.2	OK
L5603	0.004	99.6	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.152	84.8	OK
to Proposed Development and N4	0.098	90.2	OK
R156	0.031	96.9	OK
L5603	0.008	99.2	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.092	90.8	OK
to Proposed Development and N4	0.157	84.3	OK
R156	0.020	98.0	OK
L5603	0.004	99.6	OK

Junction Capacity for Proposed T-Junction from Proposed Development to New N4 Grade Separate (Scenario 2)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.022	97.8	OK
to N4	0.013	98.7	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Proposed New Roundabout (R156)	0.013	98.7	OK
to Proposed Development	0.021	97.9	OK
to N4	0.013	98.7	OK

Junction Capacity for Roundabout on New N4 Grade Separate with Proposed Development (Scenario 2)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.012	98.8	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.072	92.8	OK
to R156/Proposed Development	0.114	88.6	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.011	98.9	OK
N4 Off Ramp	0.124	87.6	OK
to R156/Proposed Development	0.069	93.1	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.009	99.1	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.076	92.4	OK
to R156/Proposed Development	0.120	88	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.131	86.9	OK
to R156/Proposed Development	0.073	92.7	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.010	99	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.013	98.7	OK
N4 Off Ramp	0.082	91.8	OK
to R156/Proposed Development	0.131	86.9	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.013	98.7	OK
N4 Off Ramp	0.142	85.8	OK
to R156/Proposed Development	0.080	92	OK

Junction Capacity for Proposed New Roundabout on R156 with No Development (Scenario 3)

2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.128	87.2	OK
to Proposed Development and N4	0.080	92.0	OK
R156	0.027	97.3	OK
L5603	0.006	99.4	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.076	92.4	OK
to Proposed Development and N4	0.132	86.8	OK
R156	0.016	98.4	OK
L5603	0.004	99.6	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.136	86.4	OK
to Proposed Development and N4	0.085	91.5	OK
R156	0.028	97.2	OK
L5603	0.007	99.3	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.080	92.0	OK
to Proposed Development and N4	0.140	86.0	OK
R156	0.017	98.3	OK
L5603	0.004	99.6	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.148	85.2	OK
to Proposed Development and N4	0.094	90.6	OK
R156	0.030	97.0	OK
L5603	0.008	99.2	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Killucan (R156)	0.088	91.2	OK
to Proposed Development and N4	0.153	84.7	OK
R156	0.018	98.2	OK
L5603	0.004	99.6	OK

Junction Capacity for Roundabount on New N4 Grade Separate with No Development (Scenario 3)			
2013 Year of Opening AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.009	99.1	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.010	99	OK
N4 Off Ramp	0.070	93	OK
to R156/Proposed Development	0.110	89	OK
2013 Year of Opening PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.010	99	OK
N4 Off Ramp	0.122	87.8	OK
to R156/Proposed Development	0.066	93.4	OK
2018 Mid-Term Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.009	99.1	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.011	98.9	OK
N4 Off Ramp	0.074	92.6	OK
to R156/Proposed Development	0.117	88.3	OK
2018 Mid-Term Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.010	99	OK
N4 Off Ramp	0.129	87.1	OK
to R156/Proposed Development	0.069	93.1	OK
2028 Future Year AM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.010	99	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.012	98.8	OK
N4 Off Ramp	0.080	92	OK
to R156/Proposed Development	0.128	87.2	OK
2028 Future Year PM Peak	**Maximum RFC Value**	**Reserve Capacity (%)**	**Status**
to Flynn Feeds	0.018	98.2	OK
N4 On Ramp	-	-	OK
to N4 On Ramp towards Mullingar	0.011	98.9	OK
N4 Off Ramp	0.140	86	OK
to R156/Proposed Development	0.077	92.3	OK

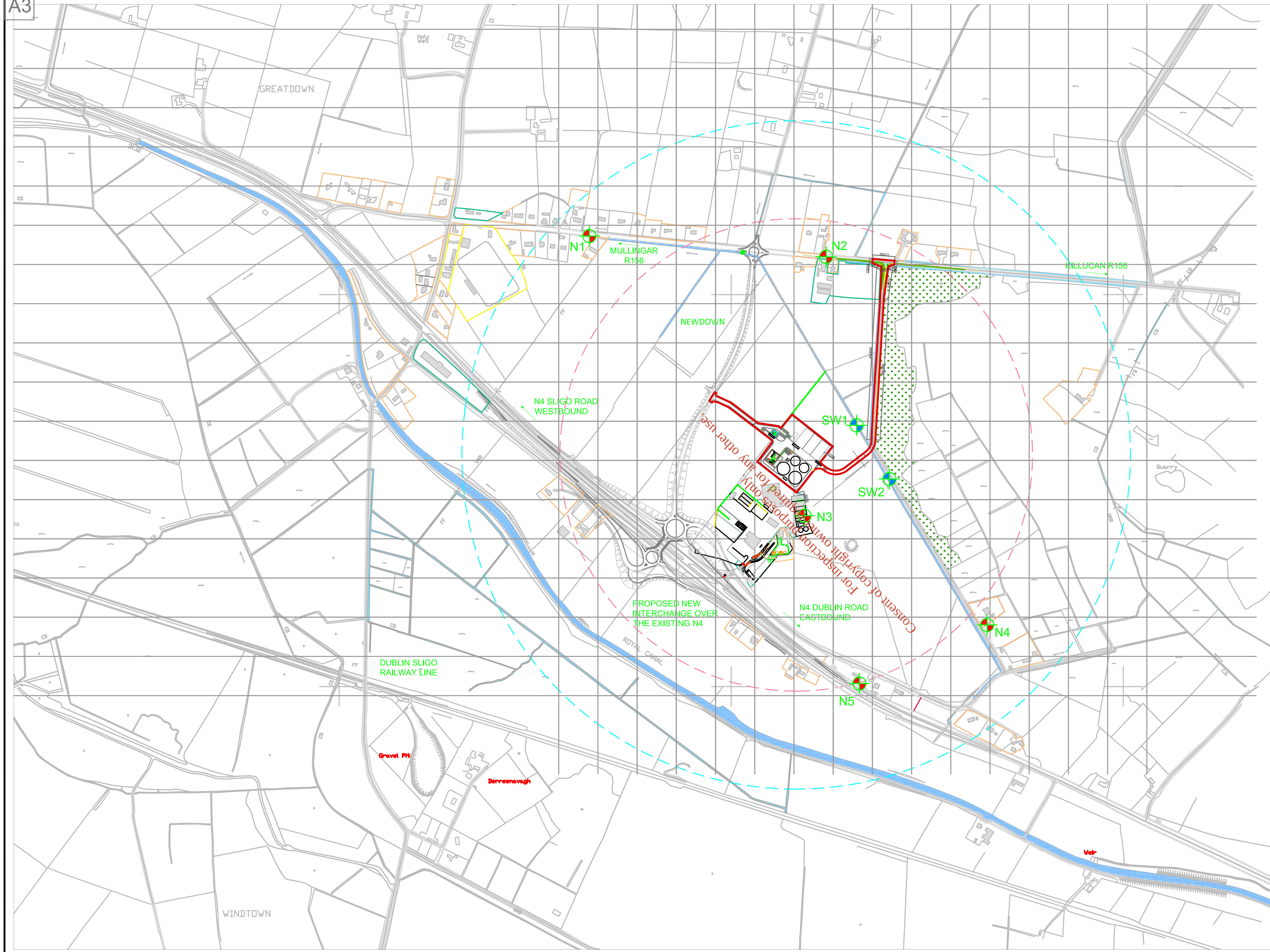
ORS Consulting Engineers

Bio Agrigas Ltd

Appendix E7

Emission Point Monitoring Locations

A3



NOISE MONITORING LOCATIONS	GRID REFERENCE
N1	X= 250660 , Y= 251154
N2	X= 251260, Y= 251092
N3	X= 251160, Y= 250434
N4	X= 251660, Y= 250177
N5	X= 251360, Y= 249977

SURFACE WATER LOCATIONS	GRID REFERENCE
SW1	X= 251342, Y= 250677
SW2	X= 251405, Y= 250527

DRAFT

Figured dimension only to be taken from this drawing.
All dimensions to be checked on site.
Consultants to be informed immediately of any discrepancies before work proceeds.

ON ORIGINAL
0 5 10 15 20 25 30 40 50mm

REV NO:	DATE:	REVISION NOTE:	DWN BY:	CKD BY:
D1	21/05/12	ISSUED FOR APPROVAL	RN	DC

SITE LOCATION

Datum: Malin Head
Grid System: ITM

CLIENT:	THOMAS FLYNN
PROJECT:	PROPOSED BIOENERGY FACILITY AT NEWDOWNS, THE DOWNS, CO. WESTMEATH
TITLE:	NOISE MONITORING LOCATIONS & SURFACE WATER LOCATIONS

DRAWN:	CHECKED:	APPROVED:	DRAWING NO:	REV:
RN	DC		111_001_812	D1
DATE: JULY 2012	SCALE: 1:10000			

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A3

OTHER EMISSIONS LOCATIONS	GRID REFERENCE
A2-1	X= 251122 , Y= 250587
A2-2	X= 251121, Y= 250585
A2-3	X= 251094, Y= 250567

DUST MONITORING LOCATIONS	GRID REFERENCE
D1	X= 251165, Y= 250508
D2	X= 251244, Y= 250614
D3	X= 251160, Y= 250684
D4	X= 251075, Y= 250577

GROUND WATER LOCATIONS	GRID REFERENCE
GW1	X= 251094, Y= 250677

DRAFT

ON ORIGINAL
0 5 10 15 20 25 30 40 50mm

REV NO:	DATE:	REVISION NOTE:	DWN BY:	CKD BY:
D1	21/05/12	ISSUED FOR APPROVAL	RN	DC

SITE LOCATION

Datum: Malin Head
Grid System: ITM

CLIENT:	BIO AGRIGAS LTD
PROJECT:	PROPOSED BIOENERGY FACILITY AT NEWDOWNS, THE DOWNS, CO. WESTMEATH
TITLE:	AIR/EMISSION & DUST MONITORING LOCATIONS & GROUND WATER LOCATION.
DRAWN: RN	CHECKED: DC
APPROVED:	DRAWING NO: 111_001_821
REV: D1	
DATE: JULY 2012	SCALE: AS SHOWN

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