Appendix 10

Customer Farmer Assessment Form

BALLINROBE BIOGAS

The information accumulated, is for the purpose of calculating the Customer Farmer's capacity to utilise Digested Manure as fertilizer in accordance with the Code for Agricultural Good Practice and no other Purpose

Customer Farmer Name	
Address	
Telephone No	
Mobile No	

Land Holdings Acres/Hectares		Ac/Ha		
REPS	Yes		NO	
If Yes Planners Contact Details			Tel:	
Maximum Chemical P Permitted on the Farm			Kgs	
Figure obtained from REPS PLAN				
Land Holding Map	Yes		NO	
Area Aid Map or Parcel Number				
Soil Analysis	Yes		NO	

TYPE	Number
Dairy Cow	
Suckler Cow	
Cattle (0-1 Year Old)	
Cattle (1-2 Year Old)	
Cattle(>2Year Old)	
Mountain Ewe & Lambs	
Lowland Ewe & Lambs	
Mountain Hogget	
Lowland Hogget	
Horse (>3 Year Old)	
Horse (<3 Year Old)	
Horse (1-2 Year Old)	
Horse Foal (<1 Year old)	
Donkey / Small Pony	

Land Usage and Croping	
% Grazing	
% Hay/Silage	
Arable % Maize	
% Cereals	
% Other	

Notes :

Appendix 11

Manure Production Calculations

TYPE	MATED VO	KGS N/M3	KGS P/M3
	M3		
PIG MANURE	14,280	4.2	0.8
Household	100	5.5	1
Poultry dung	250	11	6
Dairy Flotation sludge	5,000	5.5	1
Bread	200	4	0.005
Mash/draff (brewery)	250	4.5	1
Vegetable waste	500	4.5	1
Fat trap waste	200	5	
Paunch cows	5,000	5.5	3.7
Mill Residude	50	4	0.05
TOTALS	**25,830**	**4.9**	**1.7**
VOLUME REDUCTION DUE TO GAS EXTRACTION @ 10%	**2583**		
ACTUAL VULUME DIGESTATE PRE SEPERATION	**23,247**	**5.5**	**1.9**

PROPOSED SEPERATION PROCESS TO REMOVE MIN 80% P & 20% N WITH FIBRE

TYPE	ESTIMATED VOLUME M3	KGS N/M3	KGS P/M3
PRESEPERATION	**23,247**	**5.5**	**1.9**
LIQUID DIGESTATE	**20,922**	**4.85**	**0.4**
FIBEROUS DIGESTATE	**2,325**	**10.9**	**15.1**

LIQUID DIGESTATE FOR LAND APPLICATION AS FERTILIZER		TOTAL KGS
VOLUME M3	**20,922**	
KGS P/M3	**0.42**	**8,787**
KGS N/M3	**4.85**	**20,927**

FIBEROUS DIGESTATE FOR USE OFF SITE		TOTAL KGS
VOLUME M3	**3087**	
KGS P/M3	**15.08**	**46544**
KGS N/M3	**10.92**	**33705**

Appendix 12

Response Proceedure

JOHN SHERIDAN PIG FARM
Levally Ballinrobe Co Mayo

AS PART OF ENVIRONMENTAL MANAGEMENT, THERE IS A REQUIREMENT TO INFORM THE AGENCY OF THE FOLLOWING

- **Incidents that effect the normal operation of the activity, and which may create an environmental risk.**
- **Emergency situations that develop on site**
- **Malfunctions of any continuos monitors**
- **Any malfunction or breakdown of control equipment or monitoring equipment**
- **Any release to atmosphere or emission that does not comply with the requirements of the license.**

DATE OF INCIDENT **DAY** _____ **MONTH** _____ **YEAR** _____

DESCRIPTION OF INCIDENT

_____

_____

_____

_____

_____

DESCRIPTION OF ACTION TAKEN

_____

_____

_____

_____

_____

AUTHORITIES CONTACTED **NAME** **NUMBER** **DATE**

_____

_____

_____

JOHN SHERIDAN PIG FARM
Levally Ballinrobe Co Mayo

CORRECTIVE ACTION PROCEDURE

IN THE EVENT OF A REPORTED NON COMFORMITY, RESPONSIBILITY AND AUTHORITY FOR INITATING FURTHER INVESTIGATION AND CORRECTIVE ACTION SHALL FOLLOW THE FOLLOWING STEPS

1. **DETERMINE THE REASONS WHY THE SPECIFIED REQUIREMENTS WERE NOT MET.**

2. **DRAW UP A PLAN OF ACTION TO CORRECT THE NON-COMFORMITY WITH THE SPECIFIED REQUIREMENT**

3. **IMPLEMENT PREVENTITIVE ACTIONS TO A LEVEL CORRESPONDING TO THE RISK ENCOUNTERED**

4. **APPLY CONTROLS TO ENSURE THAT CORRECTIVE ACTIONSARE TAKEN AND THAT THEY ARE EFFECTIVE**

5. **IMPLEMENT AND RECORD ANY CHANGES IN ROCEDURES RESULTING FROM CORRECTIVE ACTION.**

6. **PROVIDE SUCH APPROPRIATE TRAINING OR RETRAINING AS MAY BE NECESSARY.**

EMERGENCY RESPONSE PROCEEDURES

IN THE EVENT OF THE AN EMERGENCY SITUATION WHICH MAY CREATE AN ENVIRONMENTAL RISK PLEASE CONTACT THE FOLLOWING :

Doctor:	**Dr**
Gardai :	**Ballinrobe 094 954 1002**
County Council :	
Environment Section	**094 9024444**
Regional Fisheries Board:	**(096) 22788**
Digger :	**Michael Crishel, (094)9540263**
(094)9540263	
Structural/ Environmental	**M & J Mc Eniry 052 67151 086 2500332**

Appendix 13

Waste Management Plan

WASTE MANAGEMENT PLAN

John Sheridan

Levalley

Ballinorbe

Co Mayo

Prepared by: M.McEniry BE CIWM

NRGE
Nutrient Recovery to Generate Electricity

Mooresfort, Lattin, Co Tipperary,
Tel 062 55385 Fax 062 55483 E-mail info@nrge.ie

1 Introduction

NRGE Ltd has prepared a Waste Management Plan of the Pig Breeding and Fattening Facility with an Anaerobic Digester to process the pig manure from the Pig unit and co – digest it with imported biomass at Levally Ballinrobe Co Mayo by John Sheridan. The purpose of this WMP is to ensure that wastes arising from the operation of the pig farm and the Biogas plant are managed, reused, recovered or disposed of by a method that ensures the provisions of the Waste management Acts 1996 – 2007 and associated regulations are complied with. It also ensures that the optimum levels of waste reduction , re-use and recycling are achieved.

Waste management priorities of this Project are based on the principle of the EU waste management hierarchy as illustrated in the figure1 below.

Figure 1

Solid Waste Management Hierarchy

	Most
Source Reduction and Reuse	Preferred
Recycling/Composting	
Combustion with Energy Recovery	
	Least
Landfilling and Incineration without energy recovery	Preferred

In accordance with the EU Waste Hierarchy, the following Waste Management priorities have been established with respect of this Facility.

1. Prevent material wastage
2. Minimise the quantity of waste
3. Reuse of site materials
4. Recycling of waste
5. Energy recovery
6. Disposal

2 Description of the Process

The facility produces Pigs to slaughter weight (approx 100kgs). The production process starts with serving 13/14 breeding animals per week, mainly by artificial insemination. The farrowing rate success of 87%, results in an average of 12 farrowings per week. The young are born in the farrowing rooms which have supplementary heat via water heated "heat-pads". Presently piglets remain suckling on the sows for 26 days. Creep feeding is introduced in minute quantities, after the second week. The sow is weaned back into the service area where she is fed ad lib until she returns to cycle at approximately 5-7 days. Gestation period being 114-115 days, the pre-farrowing sow is moved to the farrowing rooms 4-5 days before parturition. The weaned pigs are moved into fully slatted heated rearing rooms, stocked at 0.21m2. They are fed top quality creep feed and grow to approx. 18 Kg over a four week period, consuming five Kg of creep, five Kg of Link feed and six Kg of bulk weaner diet. They are then transferred to the cold rearing rooms. Again these are fully slatted and stocking rates are 0.35m 2.per animal. The pigs are fed bulk weaner pellets and grow to 32 / 34 Kg over a five week period. Transfer to finishing accommodation occurs at this weight. They are stocked at 0.72 1 0.74 m2 and grow to 90 kg over a ten week period. They are kept on fully slatted concrete floors and again fed ad labium on a finisher pig pelleted diet.

The Biogas plant will accept an additional 11,500 tonnes of organic material per annum to co-digest with the pig manure to increase the efficiency of the proposed Anaerobic Digester. This organic material will be added directly to the mixing tank and will be green crop (maize, grass, oil seed or corn), or alternatively will be belly grass material (digestive tract contents separated from the digestive tract) from adjacent meat factories, Dairy Floatation sludge from adjacent dairy processing plants, fish waste (Subject to approval by Dept of Communications, Marine, and Natural Resources), and Animal By Products (Subject to approval by Dept of Agriculture & Food). It is proposed to primarily target organic materials that are currently being land spread, as this process will greatly reduce current environmental impacts, in accordance with current land spreading directives. The approval of the Environmental Protection Agency, Mayo County Council and the Department of Agriculture will have to be granted, to permit the treatment of other waste types at this proposed anaerobic digester

This organic material will be imported onto the site on a needs basis only. It will be delivered directly into the relevant pre mix tanks. The high fibre material will be transferred directly into the underground pre mix tanks, and liquid material will be pumped into the sealed storage tanks on site. Waste material will only be accepted on site from approved facilities, to be delivered by approved contractors. All deliveries will be recorded on site, and this register will be available for inspection.

3 Details of the Wastes Produced

The waste streams produced on the farm are set out in the table on the following page. The predominant waste streams are

Veterinary medicine containers for vaccines, antibiotics and supplemental iron equates to approximately 700 bottles (100cc) annually. Syringes varying in size from 2cc - 20cc amount to circa 1,000 per annum.

Bulbs (infra-red/florescent) on the facility are small and these are accumulated and stored on the farm until the annual visit Chemcar to the area

Building materials Concrete & Stone reused on farm roadways, Timber cut/chopped and burned in domestic fire –wood

Electric motors/fans- Metals- Metals accumulated in the compound Area for reuse or to have sufficient quantities for a Metals collection contractor

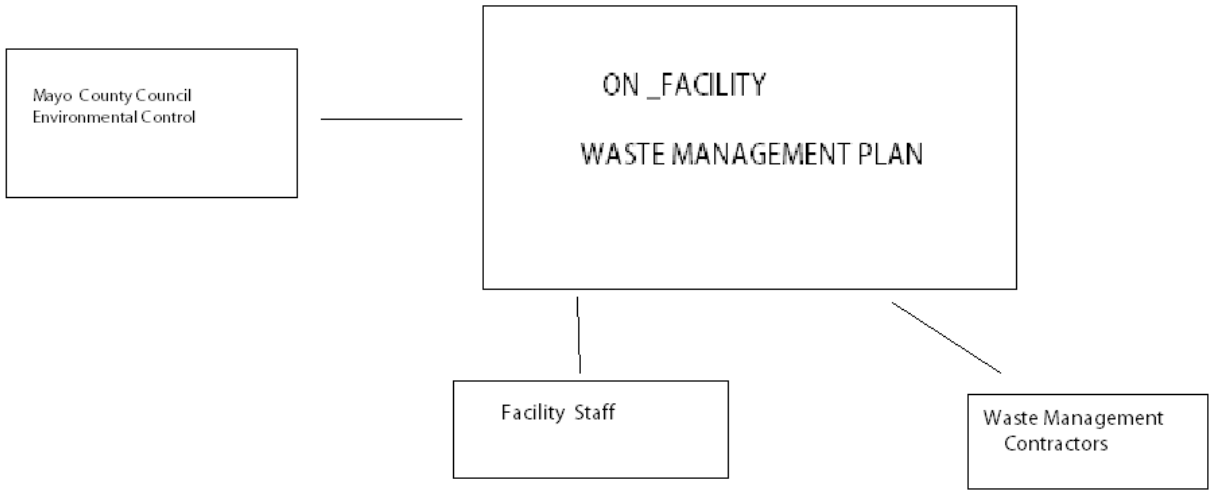
Waste Type	EWC Code	Quantities P.A	Management Method	Permit Reference
Carcass And Animal Tissue Material	02 01 02	7626kg	Collected for Rendering by J&K Greene	Dept of Ag Permit reference JK
Veterinary Wastes	18 01 01	<100 kg	Collected by Initial Healthcare	CW 151
Flu recent Tubes	20 01 21	<100 kg	Annual delivery to Chemcar	
Domestic Wastes	20 03 01	250Kg	Ballinrobe Waste	WCP-MO-09-0640
Metals	17 04 05	<1000kgs	Accumulated on Site to have sufficent quantities to jusitfy a visit from a metal's collection contractor, some reused for on-site maintenance & Repairs	Contractor to be appointed

Concrete	17 01 01	<2500kgs	Broken/Crushed -reused and utilised for Farm Road repairs	
Timber	17 02 01	<1000kgs	Cut / Chopped and utilised for domestic firewood	

4 Proposed Waste Management Plan

Waste will be segregated on site. See Figure 1 for an indicative representation of the Waste Storage Area (WSA). The WSA will have skips and or receptacles for all recyclable wastes. The appointed waste contractor will collect and transfer the recyclable wastes as receptacle as refilled. The non-recyclable waste, will be transferred by an authorised waste collector to an appropriate facility. Numerous waste contractors in the Region carry out this operation. A successful Waste Management Plan is largely dependent on how readily it can be integrated in to normal site operations by the person responsible It is recognised that the plan should not be obstructive to site operations and normal facility management. By placing the responsibility of waste management with the Manager, all reuse, recycling, wastage and necessary disposal can be monitored as close to the source as possible. The scale of the operations and the quantities of wastes involved are sufficiently small that the facility manager will not have to delegate the responsibility.

Figure 1



5 Record Keeping

Samples of the Registers which are kept on the facility are attached in Appendix 1.

Addendum

In accordance with EU legislation, Pig Manure is "**NOT WASTE**" if recovered on agricultural land, in accordance with nutrient requirement, and on clearly defined parcels of land. Each individual farmer, is required to record details of volumes recovered on his farm, and to operate in compliance with Nitrate Directive regulations (S.I. No 378 of 2006 and S.I. No 101 of 2009). The recovery of pig manure from this facility complies with those regulations. This facility is entitled to supply manure to any local farmer who wants it, and is obliged to record all dispatches from the holding and the farmers acquiring manure are obliged to record all consignments acquired and to use it in compliance with the regulations. Manure will not be supplied to customer farms between 13th October and 15th January in any year except with the consent of the local authority, or any other relevant authority. Outside that period, manure will be supplied from the site to a customer farmer, only in response to an order. Managed and used in this way, manure produced at this facility will not have any adverse impact on environmental parameters either inside or outside the site.

Appendix 1

Copies of Contracts and Collection Agreements

V.A.T. No.: IE 4766010L

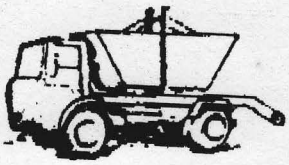
JOHN AND KEVIN GREENE

Licensed Hauliers

Collection Service for Animals, Offals & Fats.

LOWVILLE, AHASCRAGH, BALLINASLOE.

Tel.: (0905) 88606/88830



6th March 2002

This is to confirm that we, the above named have a service in place to collect dead Pigs from John Sheridan, Drumhill, Ballinrobe

Anne Greene

Initial
Healthcare

Initial Healthcare
Rentokil Initial Limited.
47 Terenure Road East Dublin 6

SERVICE AGREEMENT

Mr M. SWEENEY T/A

Invoice Name JOHN SHERIDAN

Address LEVALLY
BALLINROBE
Co MAYO

Postcode

Order No.

Commencement date 10/4/08

VAT rate

VAT exempt No (attach copy)

PRODUCT/SERVICE	QUANTITY	COST PER ~~WEEK~~	COST PER ANNUM	SERVICE FREQUENCY
SHARPS	2 P.A	135.00		2 SERVICES P.A.

1. The client agrees to pay a one off installation charge of € —— plus an annual charge of 135 —. All payments are subject to VAT at the appropriate rate. Initial charges are due on commencement of the agreement and subsequent payments annually in advance. In the event of late payment, interest may accrue, at the sole discretion of Rentokil Initial Limited, at a rate of 10% per month until payment is received. All payments are to be made to Rentokil Initial Limited at 47 Terenure Road East, Dublin 6, where this agreement shall be deemed to have been made. Rentokil Initial Limited reserves the right to increase charges following expiry of the first year.
2. This agreement may only be terminated or service deleted on an anniversary of the commencement date, provided that written notification is given by the party terminating it to the other at least 3 months prior to such anniversary date. Addition of a new service to this agreement automatically extends the anniversary date by 12 months after the addition date.
3. The person signing this agreement warrants that he/she has the authority of the client to make this contract on the clients behalf.

I clearly understand that this service agreement is for a minimum of 1 year.

Signed for client John Sheridan

Name in block capitals JOHN SHERIDAN

Position OWNER

Date 10/4/08

Signed for RENTOKIL INITIAL LIMITED

Rose Cunningham

Top Copy - Branch. Bottom Copy - Client

HC7(120301)

Ballinrobe Waste

Ballinrobe, Co. Mayo
Tel: 094 9541847 - 087 2478596
Fax: 094 9521836
Email: brobewaste@eircom.net
VAT Reg: IE 6341620M
Waste Collection Permit: WCP-MO-09-0640-01

John Sheridan
Drumhill
Ballinrobe
Co. Mayo

Customer: **10002724**
Ref: 33100
Date: 09-May-11
Location:

Item	Quantity	Value
240 Litre Bin B	**1**	**135.00**

Refuse Collection Balance Due 2011

SUMMARY

THIS BILL **135.00**

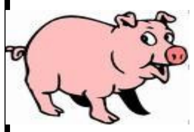
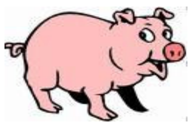
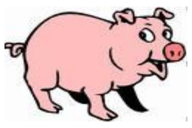
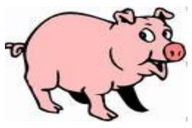
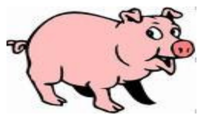
You may now pay your waste charges in any Post Office
Simply bring this invoice along with your payment to your local Post Office

Payment is due on or before: 17/Jun/2011

Appendix 2

Registers

TABLE OF CONTENTS

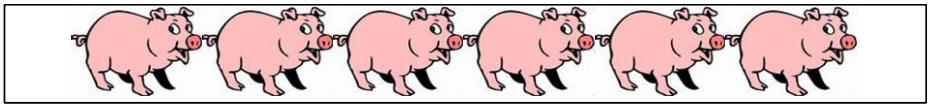






JOHN SHERIDAN

COMPLAINTS RECORD 2010

Date Complaint Received	Name of Complainant	Nature of Complaint	Detail of Complaint checked by	Action Taken	Is Corrective action Required

LICENSEE **John Sheridan**
LOCATION **Levalley, Ballinrobe Co Mayo**

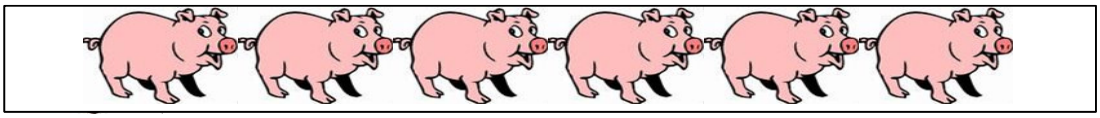


WASTE MANAGEMENT REGISTER

WASTE: **FLUORESCENT TUBES (Code No 20 01 21)**
DESTINATION:

DATE	VOLUME	DELIVERED BY

LICENSEE **John Sheridan**
LOCATION **Levalley, Ballinrobe Co Mayo**

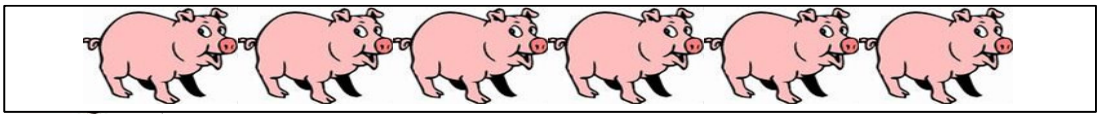


WASTE MANAGEMENT REGISTER

WASTE: **VETERINARY WASTE (Code No 18 02 01)**
CONTRACTOR: **HEALTHCARE INITIAL**
DESTINATION: **STERILE TECHNOLOGIES IRL**

DATE	VOLUME	COLLECTED BY

LICENSEE **John Sheridan**
LOCATION **Levalley, Ballinrobe Co Mayo**

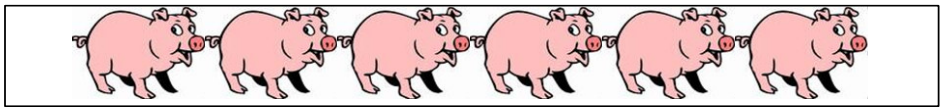


WASTE MANAGEMENT REGISTER

WASTE: **ANIMAL CARCASSES (Code No 02 01 02)**
CONTRACTOR: **J&K Greene**
DESTINATION: **PREMIER PROTIENS Ballinasloe**

DATE	VOLUME	COLLECTED BY

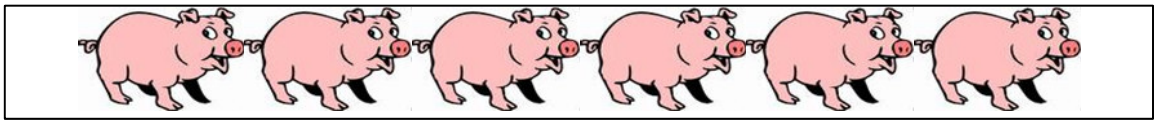
LICENSEE **John Sheridan**
LOCATION **Levalley, Ballinrobe Co Mayo**



VERMIN CONTROL REGISTER

DATE	INSPECTION POINT	COMMENTS

LICENSEE **John Sheridan**
LOCATION **Levalley, Ballinrobe Co Mayo**



WASTE MANAGEMENT REGISTER

WASTE: **DOMESTIC WASTES**
CONTRACTOR: **Ballinrobe Waste**
DESTINATION: **MAYO CO. COUNCIL LAND-FILL**

DATE	VOLUME	DELIVERED BY

Appendix 2

Waste Storage Location map

Appendix 14

Traffic Report

Client

Mr Sheridan

Project

Levally Biogas Facility

Ballinrobe, County Mayo

Report Title

TRAFFIC AND TRANSPORT ASSESSMENT REPORT

Document Control

Project Title: Levally Biogas Facility, Ballinrobe, County Mayo

Project Number: 112098

Report Ref: 112098-Rep-001 Final

Author: Pierre Clarke

Date: November 2011

Distribution:	NREG (Michael McEniry)	eCopy
	DBFL Consulting Engineers (Dublin)	File Copy

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Revision	Issue Date	Description	Prepared	Reviewed	Approved
1st Draft	14/11/11	Initial Client Review	PC	DR	DR
Final	15/11/11	For Planning	PC	DR	DR

CONTENTS

APPENDICES

APPENDIX A Figures

APPENDIX B Drawings

APPENDIX C PICADY Output Data

1.0 INTRODUCTION

1.1 Background

1.1.1 DBFL Consulting Engineers have been commissioned by Mr Sheridan to undertake a Traffic and Transport Assessment (previously referred to as Traffic Impact Assessment) for a proposed development on a site located in the Townsland of Levally as located to the northeast of Ballinrobe, County Mayo. The general location of the site is illustrated on **Figure 1** as included in Appendix A.

1.1.2 The subject development proposals promote;

a) The extension of an existing on-site Pig Farm, and

b) The implementation of a Biogas facility within the same site.

1.1.3 During the development of this report, traffic turning count survey data has been analysed, with the objective of providing background information relating to existing traffic movement patterns across the local road network. This information has been supplemented with data obtained from site audits of the local road network, subsequently enabling the identification of existing local travel characteristics and an appreciation of the local receiving environment from a transportation perspective.

1.2 Scope

1.2.1 The purpose of this TTA is to quantify the existing transport environment and to detail the results of assessment work undertaken to identify the potential level of any transport impact generated as a result of the proposed development. The scope of the assessment covers transport and related sustainability issues including means of vehicular access, pedestrian, cyclist and local public transport connections. The principal objective of the report is to quantify any level of impact across the local road network and subsequently ascertain both the existing and future operational performance of the local road network.

1.3 Methodology

1.3.1 Our approach to the study accords with policy and guidance both at a national and local level. Accordingly the adopted methodology responds to best practices, current and emerging guidance, exemplified by a series of publications, all of which advocate this method of analysis. Key publications consulted include;

- '*Traffic and Transport Assessment Guidelines*' (September 2007) National Road Authority
- '*Traffic Management Guidelines*' Dublin Transportation Office & Department of the Environment and Local Government (May 2003);
- '*Guidelines for Traffic Impact Assessments*' The Institution of Highways and Transportation;

1.3.2 Our methodology incorporated a number of key inter-related stages, including;

- **Site Audit**: A site audit was undertaken to quantify existing road network issues and identify local infrastructure characteristics, in addition to establishing the level of accessibility to the site in terms of walking, cycling and public transport. An inventory of the local road network was also developed during this stage of the assessment.
- **Traffic Counts**: Junction turning counts were analysed with the objective of establishing local traffic characteristics in the immediate area of the proposed developments site access junction with the Regional Road Network.
- **Trip Generation**: A trip generation exercise has been carried out to establish the potential level of vehicle trips generated by the proposed pig farm extension / Biogas facility development.

- **Trip Distribution:** Based upon existing traffic characteristics and the anticipated routing of commercial vehicles travelling to / from the proposed development, a distribution exercise has been undertaken to assign site generated vehicle trips across the local road network.

- **Network Impact:** Ascertain the specific level of influence generated by the proposed development upon the local road network.

- **Network Assessment**: Drawing upon the findings of the previous stages, an operational assessment of the local road network has been undertaken to evaluate the operational performance of the R331 Regional Road / L56391 / L5646 junction following the implementation of the proposed development.

1.4 Structure of Report

1.4.1 As introduced above, this TTA seeks to clarify the potential level of influence generated by the proposed development upon the local road network and subsequently ascertain the existing and future operational performance of the local transport system. The structure of the report responds to the various stages of this exercise including the key tasks summarised below.

1.4.2 **Chapter Two** outlines the key information pertaining to the local receiving environment and the sites characteristics in relation to site accessibility levels.

1.4.3 **Chapter Three** outlines the key information pertaining to the proposed development and of specific relevance to this transport appraisal.

1.4.4 In **Chapter Four** a summary of the vehicle trip generation, vehicle distribution, and network assignment exercise is detailed, in addition to quantifying the potential level of impact, as generated by the subject proposals, upon key junctions across the local road network.

1.4.5 The operational performance of R331 junction for a range of different development / traffic scenarios following the commissioning of the proposed development are investigated and reported within **Chapter five**.

1.4.6 Finally a summary of our appraisal together with the main conclusions of the assessment are provided in **Chapter Six**.

2.0 RECEIVING ENVIRONMENT

2.1 Site Location

2.1.1 As illustrated in Figure SK001 (Appendix A) the subject development site is located approximately 3.25km northeast of Ballinrobe and 820m north of the R344 regional road corridor.

2.2 Sustainable Transport Framework

Pedestrian Environment

2.2.1 The site audit revealed that there is little demand for dedicated pedestrian facilities in this rural location. Accordingly no dedicated infrastructure facilities are provided across the local / regional road network.

2.2.2 Nevertheless the local third class roads (particularly the L56391 that services the subject site) are so lightly trafficked pedestrians could safely use these links should a demand other than a leisurely walk for local residents ever arise.

Pedestrian Environment

2.2.3 The audit established that there are currently no dedicated cycle facilities in the area of the proposed development.

Public Transport

2.2.4 Whilst Bus Eireann operate bus services in a north / south orientation through both Ballinrobe and Claremorris, no service operates along the R331 corridor between this two urban centres. Accordingly the subject site does not benefit from public transport connections which is not unusual for a site in such a rural location in Ireland.

2.3 Local Road Network

2.3.1 The site audit established that the local road network is subject to the default 80kph speed regulations which respecting the rural location does not benefit from street lighting. The characteristics of the R331 corridor at its junction with

the L56391 (road link to the subject site) and the L5646 are illustrated in Photographs 1 to 3 below.

Photograph 1

On-Site Access Road Linking L56391 with existing on-site Pig Farm facilities.

Photograph 2

R331/L56391 junction looking southwest towards Ballinrobe from minor arm (L56391).

Photograph 3

R331/L56391 junction looking northesat towards Hollymount from minor arm (L56391).

2.3.2 With the objective of quantifying the existing traffic movements across the local road network junction traffic counts were undertaken at the four arm cross road junction between the R331 / L56391 / L5646 during the weekday peak periods. These traffic counts were carried on Thursday 3rd November 2011 with the objective of ensuring that the most heavily traffic period (Ballinrobe Mart) is investigated.

2.3.3 An analysis of the recorded survey data established the peak AM and PM traffic flows as the basis for this TTA. The weekday AM peak was found to be between 08:00 and 09:00 and the weekday PM peak was found to be between 17:00 and 18:00 as detailed in Figure SK002 in Appendix A.

2.3.4 As illustrated in Figure SK001 the subject site is located approximately 1km (via access road) north of the R331 / L56391 / L5646 four arm crossroad junction. Vehicles travelling between the development site and the R331 corridor can avail of the L56391 third class road. With the exception of a single dwelling house, the existing on-site Pig Farm is the only premises that utilises the L56391. The site access junction with the L56391 third class road is located approximately 600m north along the L56391 from its junctions with the R331 regional road corridor. From this position an on-site access road approximately 470m in length connects the existing on-site facility with the L56391.

2.3.5 Whilst the L56391 third class road only benefits from a carriageway in the order of 3.0m to 3.75m in width a total of four (4) pass-by bays as illustrated in Figure SK001 enable two way vehicle movements along this quite lightly trafficked link.

2.3.6 The existing on-site facility which employs 4 people currently operates two shifts. The first of these shifts runs between 0800 to 1630 and the second shift from 0930 to 1800 / 1830 depending upon when the last load leaves the site.

2.3.7 Further to the peak hour network flows established by the traffic surveys at the R331 junction Table 1 below summarises the level of traffic generation (as provided by NRGE) that the existing on-site Pig Farm currently generates.

Table 1 Existing Pig Farm Traffic Generation

Category	Vehicle Type	Annual Trips[1]	Weekly Trips[1]	AM Peak Hour[2]	PM Peak Hour[2]
Staff	Car / LGV	676	13	1	1
Feed Deliveries	Rigid HGV	104	2.5	0	0
Fat Pigs to Factory	Rigid HGV	50	1 to 2	0	0
Carcasses to Rendering	Rigid HGV	26	1 max	0	0
Facility Service Inspectors	Car / LGV	208	4	0	1
Manure to Customers	HGV / Tractor	320	10	0	0

Notes: (1) One Way Trip estimation provided by NRGE (2) Corresponding DBFL Two-Way Trips

2.4 Safety Record of Local Network

2.4.1 The accident statistics on the Road Safety Authority (RSA) Website have been reviewed in order to ascertain the safety record of the local road over the most recent five year period. This includes information for the years 2005 to 2009 inclusive and indicates basic information on all reported accidents.

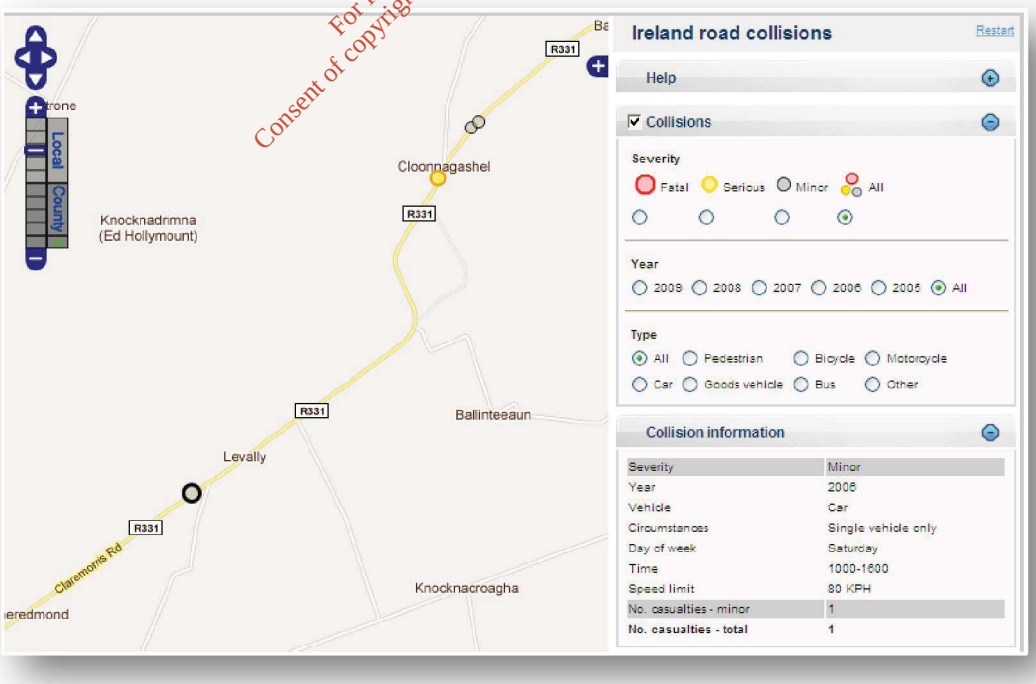


Figure 1 Road Accidents 2005 to 2009 (Source www.rsa.ie)

2.4.2 The RSA records detail only those occasions were the incident was officaly recorded such as the Garda being present to formally record details of the incident.

2.4.3 Only a single incident is noted within the RSA records. This incident in 2006 seems to have occurred approximately over 100m west of the R331 / L56391 / L5646 and involved a single vehicle on a Saturday morning in daylight conditions between 10:00 and 16:00.

2.4.4 The analysis reveals, as graphically summarisied in Figure 1 above, that there is no record of any incident trends or notable safetly issues acorss the local road network that will serve the subject development proposals.

2.5 R331 Junction Characteristics

2.5.1 The layout of this existing junction is illustrated in NRGE drawing as included in Appendix B. Following a site audit and review of the junction layout in NRGE's drawing DBFL confirm that visibility splays from a vehicle (car drivers perspective) waiting to exit the L56391 minor road of approximately 70m from an 'X' distance of 2.4m can be achieved. Whilst greater distances to approaching vehicles (e.g. middle of approaching traffic lane) can be achieved the existing 'car' based visibility splays are restricted by low level boundary walls along the northern side of the regional corridor either side of the L56391 minor arm.

2.5.2 Nevertheless, from a HGV drivers perspective, the vehicle category which represents the vast majority of vehicle calling at the subject development proposals; the available visibility splays to approaching vehicles is significantly enhanced as such HGV drivers can easily see over these adjoining low level boundary walls.

3.0 CHARACTERISTICS OF THE PROPOSALS

3.1 Background of Existing On-Site Activities

3.1.1 Mr. Sheridan was granted planning permission for a 200 sow integrated unit at this site in 1987. He has built it up over the last fifteen of years into a financially viable pig farm operating as a 200 sow fully integrated unit and granted planning permission 2011 for Planning Permission for retention of existing pig production unit, initiated in 1962 and fully established in 1989.

3.2 Proposed Development

3.2.1 The subject development proposals promote;

a) The extension of the existing on-site Pig Farm, and

b) The implementation of a Biogas facility within the same site.

3.2.2 The development will occupy a landscaped site of approximately 2.35 hectares (5.81 acres). The proposed development consists of a of Extension to Existing Farrowing House 5(N), Extension to Fattening House 12(N), New Farrowing House 6, New Dry Sow Houses 8(N) ,9(N), New Weaner House 15 new Fattening Houses 13, 14, a manure collection tank, 5 Additional Feed Bins, demolition of Weaner House 6 and 2 manure tanks, a Biogas Plant consisting of 2 no digester tanks, 2 geomembrane lined manure storage basins, 1 no fibre store, 3 No Feed Tanks, Reception Building, Reception Bays, Plant Building, Pasturisation Tanks, Weighbridge and associated site works to produce renewable energy and fertilizer.

3.2.2 The proposed works will reduce net emissions from the adjacent facility, with the proposed Anaerobic Digester, which will require fresh delivery of manure from the pig houses. This proposal will also provide compliance with the new E.C. Regulations on Animal Welfare, Nitrate Directives, and incorporates emission reduction measures, as required by IPPC license conditions.

Staff Numbers

3.2.3 The pig farm currently gives direct employment to 4 full time staff and indirectly provides employment amounting to a total of 35 full time jobs. The proposed expansion will lead to 8 staff members employed in total on the farm and Biogas Plant with indirect employment 45 full time jobs in pig meat processing, milling, waste and biomass collection sectors.

Manure Storage Capacity

3.2.4 Annual, neat pig slurry production and extraneous water (10%) is 14280m3. Underground storage amounts to 3460m3 (net of free-board reduction of 200mm for gasses accumulation under slat) equivalent to 13 weeks manure storage capacity. Slurry storage in excess of 29 weeks is provided on site.

Land Spreading Areas

3.2.5 The spreadlands are situated in the Ballinrobe / Hollymount area of south east Mayo. There is a total of 1841 hectares of tested usable area in the landbank. The bedrock in the region is limestone in origin, containing a regionally important aquifer. Sheridan Pig Farm have with the consent of his neighbours supplied the nutrients for crop growth on 52 farms in the customer farmer list. There are 8 reserve farms should nutrients build up or a recipient withdraw from the scheme. Formal nutrient plans have been devised for all farms in this application.

3.2.6 The existing facility is entitled to supply manure to any local farmer who wants it, and is obliged to record all dispatches from the holding and the farmers acquiring manure are obliged to record all consignments acquired and to use it in compliance with the regulations. Manure will not be supplied to customer farms between 15th October and 15th January in any year except with the consent of the local authority, or any other relevant authority. Outside that period, manure will be supplied from the site to a customer farmer, only in response to an order. Managed and used in this way, manure produced at this facility will not have any adverse impact on environmental parameters either inside or outside the site.

3.2.7 It is planned to import an additional 11,500 tonnes of organic material per annum to mix with the pig manure to increase the efficiency of the proposed

Anaerobic Digester. This organic material will be added directly to the mixing tank and will be green crop (maize, grass, oil seed or corn), or alternatively will be belly grass material (digestive tract contents separated from the digestive tract) from adjacent meat factories, Dairy Floatation sludge from adjacent dairy processing plants, fish waste (Subject to approval by Dept of Communications, Marine, and Natural Resources), and Animal By Products (Subject to approval by Dept of Agriculture & Food).

3.2.8 It is proposed to primarily target organic materials that are currently being land spread, as this process will greatly reduce current environmental impacts, in accordance with current land spreading directives. The approval of the Environmental Protection Agency, Mayo County Council and the Department of Agriculture will have to be granted, to permit the treatment of other waste types at this proposed anaerobic digester.

3.2.9 This organic material will be imported onto the site on a needs basis only. It will be delivered directly into the relevant pre mix tanks. The high fibre material will be transferred directly into the underground pre mix tanks, and liquid material will be pumped into the sealed storage tanks on site. Waste material will only be accepted on site from approved facilities, to be delivered by approved contractors.

4.0 TRAFFIC GENERATION AND DISTRIBUTION

4.1 Overview

4.1.1 The following paragraphs present the process by which the potential level of vehicle trips associated with the proposed development, have been generated and subsequently assigned across the local road network.

4.2 Traffic Generation

4.2.1 The following table outlines that level of traffic that could be generated on-site following the implementation of the subject development proposals. The traffic numbers include the baseline vehicle movements as generated by the existing on-site operation. The net difference (between existing and proposed scenarios) in traffic generation can be established by comparing Table 1 and Table 2 data.

Table 2 Post Development Traffic Generation

Category	Vehicle Type	Annual Trips[1]	Weekly Trips[1]	AM Peak Hour[2]	PM Peak Hour[2]
Staff	Car / LGV	1040	20	2	2
Feed Deliveries	Rigid HGV	104	2.5	0	0
Fat Pigs to Factory	Rigid HGV	350	7	0	0
Carcasses to Rendering	Rigid HGV	26	1 max	0	0
Facility Service Inspectors	Car / LGV	208	4	0	1
Manure (liquid digestate) to Customers	HGV / Tractor	320	10	0	0
Imported Organic Biomass	HGV	1170	22.5	1	1
	Total	3,218	67	3	3

Notes: (1) One Way Trip estimation provided by NRGE (2) Corresponding DBFL One-Way Trips

4.2.2 In terms of vehicle trip generation the principal impact will be generated by the additional staff numbers (Car / LGV's) and the imported Organic Biomass (HGV's). In response to the operational shifts on-site and the opportunity to

receive deliveries throughout the entire working days this nominal level of additional vehicle movements will not be focused into a specific period of the day.

4.2.3 Furthermore the potential occurrence and frequency of opposing vehicles meeting whilst travelling over the 600m length of the site access road (L56391) between the R331 corridor and the entrance to the site is relatively small considering staff will be undertaking one-way trips to / from the site (inbound only in the AM and outbound only in the PM) movement) and the potential additional 5 HGV movements (10 two-way) will be distributed over the entire 10 hour working day (0800 to 1800) resulting in one trip every 60 minutes on average.

4.2.4 The potential additional 67 weekly trips (one-way) that could be generated in a worst case post development scenario (including existing traffic) results in a total of 14 number one-way trips on any weekday on average. This quantum of vehicle trips (28 two-way) over a ten hour working day should not adversely impact the same operation of the 600m long L56391 link between the R331 corridor and the entrance to the subject site.

4.3 Traffic Distribution

4.3.1 All traffic accessing and exiting the subject site will in the post development scenario continue to utilise the R331 / L56391 junction. The distribution of traffic through this key node during the AM and PM peak hour is illustrated in Figure SK003 in Appendix A.

4.4 Future Traffic Growth

4.4.1 The 'operational' impact of traffic on the network within the area of influence is normally assessed for the predicted "Opening Year" which DBFL have assumed to be something in 2012. In accordance with best practice the corresponding design year is 15 years thereafter. As a result we have adopted a "Design Year" of 2027 as the basis of this assessment. This 16 year period will also enable

sufficient time for the proposed development to reach its full permitted capacity.

4.4.2 To obtain predicted background traffic flows for the road network within the vicinity of the proposed site, the National Roads Authority (NRA) "Future Traffic Forecasts 2002-2040" document has been referenced. Applying the following NRA growth factors, for non-national classified links, to the 2011 network survey data the corresponding baseline flows were calculated for the 2027 Design Year.

- 2011 to 2027: 15.25%

4.5 Impact of Proposals

4.5.1 The Institution of Highways and Transportation document 'Guidelines for Traffic Impact Assessments' states that the impact of a proposed development upon the local road network is considered material when the level of traffic it generates surpasses 10% and 5% on normal and congested networks respectively. When such levels of impact are generated a more detailed assessment should be undertaken to ascertain the specific impact upon the networks operational performance.

4.5.2 In accordance with the IHT guidelines we have undertaken an assessment to establish the potential level of impact upon the junction of the local road network. To enable this calculation to be undertaken we have based the analysis upon the 2011 baseline traffic scenario. The analysis has demonstrated that the proposed development could generate the following impacts at the R344 / L56391 junction during the AM and PM peak hour periods.

Table 4.8 – Network Impact

Junction/ Location	AM Peak	PM Peak
Site Access / Maudlintown Road	2.5%	1.54%

4.5.3 The analysis demonstrates that the proposed development will generate a sub-threshold impact of no more than 2.5% at the off-site R331 junction.

4.5.4 In accordance with the IHT 'Guidelines for Traffic Impact Assessments', the level of impact recorded at the site access junction does not necessary require a more detailed assessment. Nevertheless with the objective of providing a comprehensive assessment we have undertaken a detailed investigation of the operational performance of this key node as part of this TTA.

4.6 Construction Activities Potential Impact

4.6.1 All construction activities will be governed by a Construction Traffic Management Plan (CTMP) the details of which will be agreed with the local roads authority prior to the commencement of construction activities on-site. The principal objective of the CTMP is to ensure that the impacts of all building activities generated during the construction of the proposed mixed use development upon both the public (off-site) and internal (on-site) workers environments, are fully considered and proactively managed / programmed respecting key stakeholders requirements thereby ensuring that both the public's and construction workers safety is maintained at all times, disruptions minimised and undertaken within a controlled hazard free / minimised environment. The impact of the construction works will be temporary in nature.

4.6.2 As parking will be provided on-site construction traffic will consist of the following two principal categories:

- Private vehicles owned and driven by site construction staff and by full time supervisory staff.
- Excavation plant and dumper trucks involved in site development works and material delivery vehicles for the following: granular fill materials, concrete pipes, manholes, reinforcement steel, readymix concrete and mortar, concrete blocks, miscellaneous building materials, etc.

4.6.3 On-site employees will generally arrive before 08:00, thus avoiding the morning peak hour traffic. These employees will generally depart after 18:00. It should be noted that a large proportion of construction workers would arrive in shared transport. Deliveries would arrive at a steady rate during the course of the day.

4.6.4 Based upon experience, a development of this scale would at a maximum necessitate approximately 4 staff on site at any one time, subsequently

generating no more than 6 two-way vehicle trips during the peak AM and PM periods over the period of the construction works.

4.6.5 It is anticipated that the generation of HGV during this same construction period will be evenly spread throughout the day and as such will not impact significantly during the peak traffic periods. For this scale of development we do not expect HGV vehicle movements to exceed 2 vehicles per hour during the busiest period of construction works.

5.0 TRAFFIC ASSESSMENT

5.1 Overview

5.1.1 The following paragraphs summarise the results of detailed assessments, which have been undertaken to investigate the operational performance of the proposed development upon the local road network. This analysis considers the the L56391 link road in addition to the four arm crossroads between the R331 / L56391 / L5646.

Design Year

5.1.2 In accordance with NRA best practice guidance the network has been assessed for a future design year (a period of 15 years after opening). In this case it is expected that the proposed development may be completed sometime in 2012. Accordingly DBFL have adopted 2027 as the future design year.

Assessment Periods

5.1.3 As introduced previously the AM and PM peak hour flows have been identified as occurring between 0800 to 0900 and 1700 to 1800 respectively for a typical neutral weekday scenario.

5.2 Regional Road Junction

5.2.1 Prior to dissipating across the external off-site road network this junction will be subject to the greatest level of potential impact as generated by the implementation of the subject Pig Farm Extension / Biomass Facility development. Accordingly it is prudent that the operational performance of this key junction is quantified to ensure that no adverse implications, in terms of congestion and associated delays, are generated as a result of vehicles travelling through this junction on route to / from the site.

5.2.2 The assessment has been undertaken using the Transport Research Laboratory (TRL) computer package PICADY. This off-line programme uses geometric and traffic information to assess whether the junction has sufficient capacity to accommodate the predicted traffic levels.

5.2.3 When considering roundabouts a Ratio of Flow to Capacity (RFC) or Degree of Saturation (DoS) of greater than 85% (0.85) would indicate that a junction is operating at or over capacity as the performance of the junction above this Ratio of Flow to Capacity (RFC) value deteriorates quickly resulting in the generation of congestion, vehicle queues and additional delay.

5.2.4 For the 2027 peak hour models, a 90-minute period has been simulated. Traffic flows were entered using an Origin-Destination table for the PM peak hour. This method ensures that the model accounts for vehicles already on the network at the outset of the peak hour under consideration. A copy of the, PICADY model output files is contained in **Appendix C.** The 2027 peak hour network flows for both the post development AM and PM scenarios are illustrated in Figure SK003.

TABLE 3 : R331 Junction – 2027 AM Peak Hour PICADY Results

Junction Arm	RFC	Vehicle Queue	Vehicle Delay
A – R331 (East)	0.003	0.0	0.00
B – L5646 (South)	0.002	0.0	0.13
C – R331 (West)	0.009	0.01	0.10
D –L56391 (North)	0.007	0.01	0.13

TABLE 4 : R331 Junction – 2027 PM Peak Hour PICADY Results

Junction Arm	RFC	Vehicle Queue	Vehicle Delay
A – R331 (East)	0.000	0.0	0.00
B – L5646 (South)	0.009	0.01	0.13
C – R331 (West)	0.023	0.02	0.14
D –L56391 (North)	0.006	0.01	0.13

5.2.5 In Table 3 and Table 4 above the principal PICADY simulation model results are summarised for the 2027 AM and PM peak hour post construction Do-Something scenarios respectively. The results demonstrate that the operational

performance of this key junction will continue with a notable level of reserve capacity (e.g. maximum RFC of 0.023 is less than 0.85) even with the construction of the subject development. Accordingly the capacity of the road network at this node will not prove to be a constraint to the delivery / implementation of the Pig Farm Extension / Biomass Facility.

5.3 L56391 Link Road

5.3.1 Previously in Chapter 4 it has been established that the potential occurrence and frequency of opposing vehicles meeting whilst travelling over the 600m length of the site access road (L56391) between the R331 corridor and the entrance to the site is relatively small. Considering staff will be undertaking one-way trips to / from the site (inbound only in the AM and outbound only in the PM) movement) and the potential additional 5 HGV movements (10 two-way) will be distributed over the entire 10 hour working day (0800 to 1800) resulting in one trip every 60 minutes.

5.3.2 The potential 67 weekly trips (one-way) that could in a worst case post development scenario (including existing traffic) result in a total of 14 number one-way trips on any given weekday. This quantum of vehicle trips (28 two-way) over a ten hour working day should not adversely impact the same operation of the 600m long L56391 link between the R331 corridor and the entrance to the subject site. In the rare occasion that two opposing vehicles should meet whilst travelling along the 600m of the L56391 the presence of the existing four (4) pass-by bays should provide sufficient opportunity for these opposing vehicles to safely pass.

5.4 Mitigation Measures

5.4.1 Notwithstanding the minimual impact that the subject proposals may generate upon the local transport network the following measures are proposed to ensure that the safe operation of the local network continues in the post development scenario.

a) STOP Road markings and corresponding minor arm central lane markings should be provided on the L56391 at its junction with the R331 corridor. This will ensure that any vehicles waiting to exit the minor arm do not block the ability for a vehicle on the R331 carriageway from turning off the main road and entering (seeking access) the L56391.
b) Additional high visibility advanced warning signs indicating 'junction ahead' should be provided on the R331 approach to the crossroads.
c) Appropriate signage at each of the L56391 pass-by bays should be provided to advise vehicle drivers to yield to approaching vehicles.

6.0 SUMMARY AND CONCLUSIONS

6.1 Summary

6.1.1 DBFL Consulting Engineers have been commissioned by Mr Sheridan to undertake a Traffic and Transport Assessment for a proposed development on a site located in the Townsland of Levally as located to the northeast of Ballinrobe, County Mayo. The proposals seek approval to extend an existing Pig Farm facility in addition to the implementation of a Biogas Facility.

6.1.2 Our methodology for undertaking this TTA incorporated a number of key inter-related stages, including;

- Site Audit,
- Analysis of Traffic Surveys,
- Trip Generation, Distribution and Assignment,
- Network Impact, and
- Network Assessment.

6.1.3 The principal findings that can be drawn from this TTA are as follows:;

a) The site accommodates a commercial agricultural based industry in the form of a Pig Farm which currently generates a number of vehicle movements between the site and the local road network.
b) An analysis of recent Road Safety Authority's road incident data reveals that the existing on-site commercial activities have not contributed to any safety concerns.
c) The site access road (L56391) that connects the subject site with the regional road network only services two premises namely the existing Pig Farm and one residential dwellings (as located to the northeast of the Pig Farm).
d) This access road, whilst narrow, benefits from 4 number informal pass-by bays which permits two-way traffic movements on the rare occasion that opposing vehicles meet along the 600m section between the site access and the regional Road corridor.

e) The proposals will result in the generation of only a small number of additional vehicles which have been quantified as being only 2 addition one-way trips in the weekday peak hour periods or approximately 30 one-way trips over 5.5 working days.

f) The impact upon the R331 junction will be sub-threshold. The operation of the key junction will continue to operate with a significant amount of reserve capacity following the construction of the proposed developments.

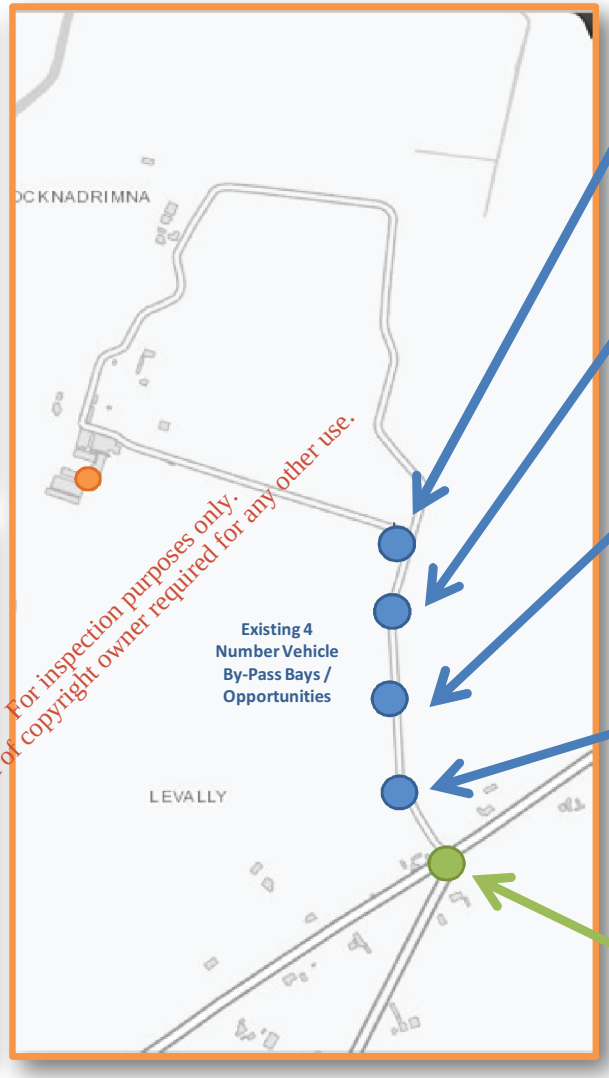
6.2 Conclusion

6.2.1 In conclusion, it is considered that the impact on the surrounding road network, as a result of the subject proposals will be nominal. This is based on the anticipated levels of traffic generated by the proposed development, the characteristics of the road infrastructure and the information and analysis summarised in the above report.

6.2.2 It is concluded that there are no traffic or transportation related reasons that should prevent the granting of planning permission for the proposed development.

APPENDIX A

Figure



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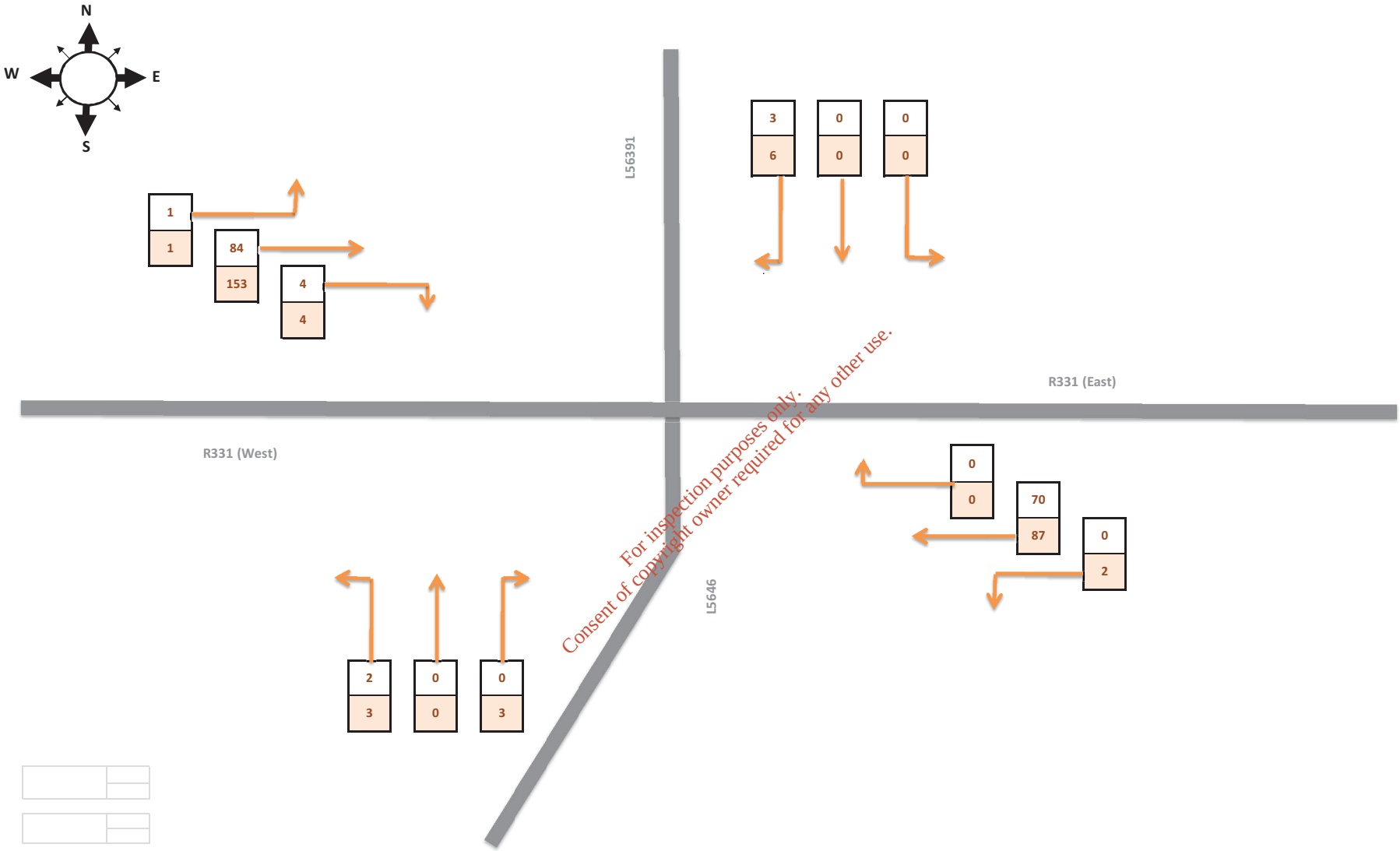
KEY :

Project
Levally Biogas Facility

Figure Title
Site Location

Scale :	Drn / Chk By:	Figure Number
N.T.S.	PC / DR	**112098/SK001**
File Ref. 112098 Figures	Date 11/11/2011	



KEY :

Note all values are PUC's

111 — 2011 AM Peak Hour

222 — 2011 PM Peak Hour

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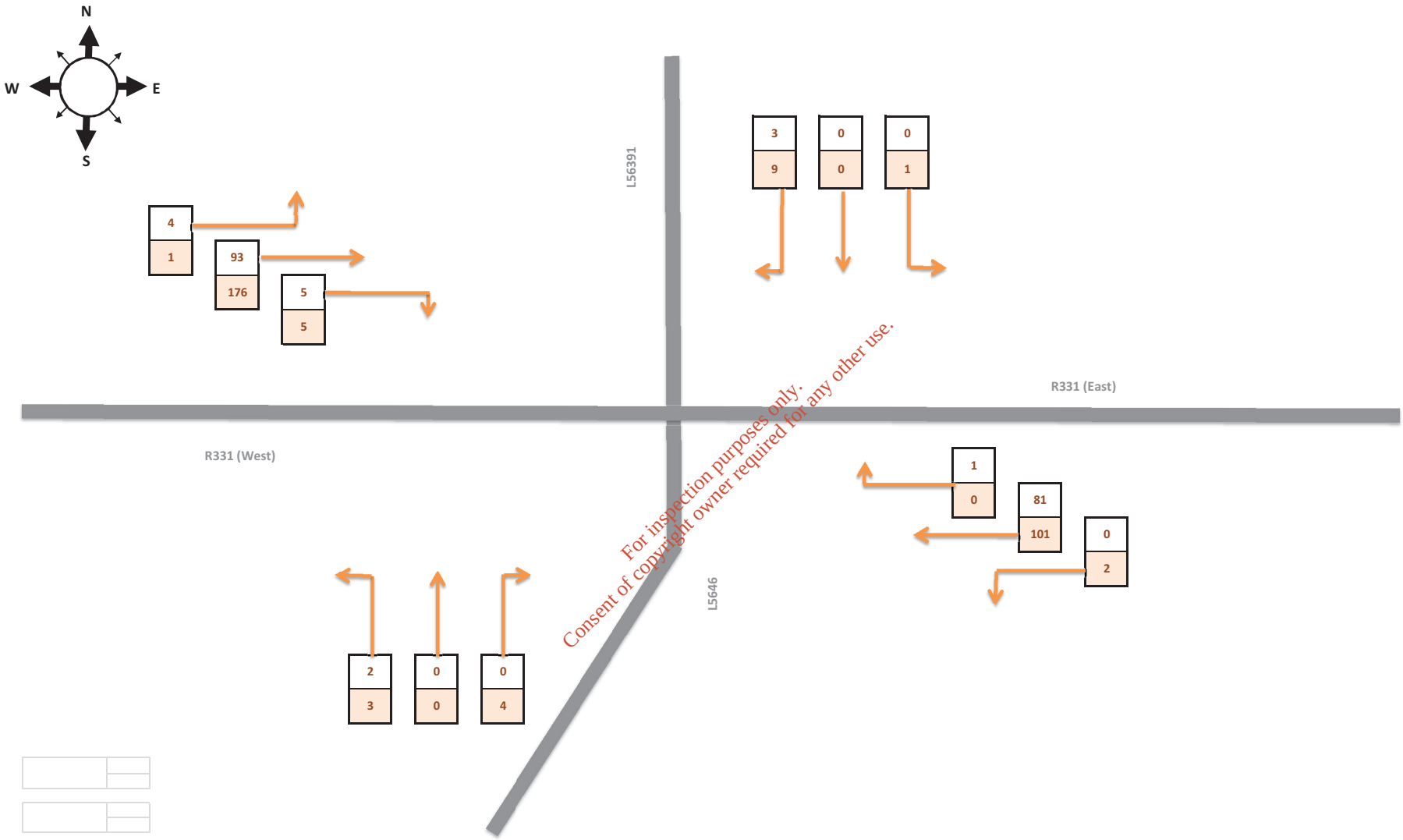
Project	Levally Biogas Facility
Figure Title	2011 Network Flows
Scale :	N.T.S.
Drn / Chk By:	PC / DR
File Ref.	112098 Figures
Date	14/11/2011
Figure Number	112098/SK002



KEY :

Note all values are PUC's

111 — 2027 AM Peak Hour

222 — 2027 PM Peak Hour

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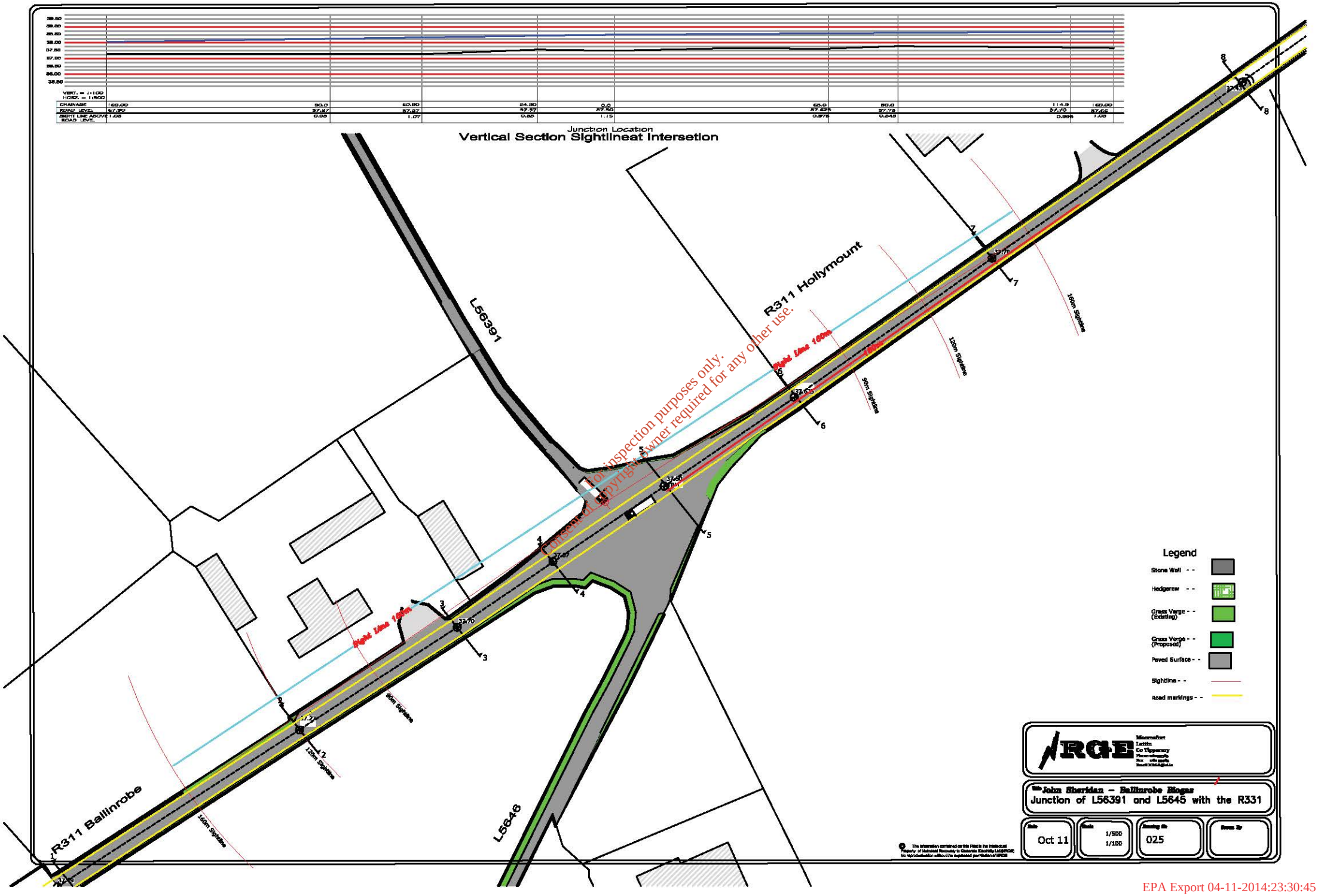
Project	Levally Biogas Facility
Figure Title	2027 'Do-Something Scenario' Network Flows
Scale : N.T.S.	Drn / Chk By: PC / DR
File Ref. 112098 Figures	Date 14/11/2011
Figure Number	112098/SK003

APPENDIX B

Drawings



APPENDIX C

PICADY Output Data

TRL LIMITED

CAPACITIES, QUEUES, AND DELAYS AT 3 OR 4-ARM MAJOR/MINOR PRIORITY JUNCTIONS

PICADY 5.0 ANALYSIS PROGRAM
RELEASE 3.0 (JUNE 2006)

ADAPTED FROM PICADY/3 WHICH IS CROWN COPYRIGHT
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FOR SALES AND DISTRIBUTION INFORMATION,
PROGRAM ADVICE AND MAINTENANCE CONTACT:
TRL SOFTWARE BUREAU
TEL: CROWTHORNE (01344) 770758, FAX: 770864
EMAIL: SoftwareBureau@trl.co.uk

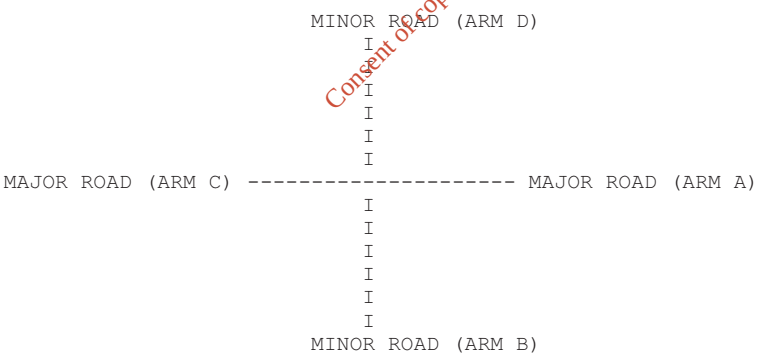
Run with file:- "G:\2011\p112098\calcs\picady\R334 Junction DS 2027 AM.vpi" (drive-on-the-left) at 14:44:30 on Monday, 14

RUN INFORMATION
****

RUN TITLE: Ballinrobe Biogas Facility - 2027 AM DS
LOCATION:
DATE: 14/11/11
CLIENT:
ENUMERATOR: jenningst [PC101-WD]
JOB NUMBER: 112098
STATUS: TIA
DESCRIPTION:

.MAJOR/MINOR JUNCTION CAPACITY AND DELAY
****

INPUT DATA



ARM A IS R334 East
ARM B IS L5646 (south)
ARM C IS R334 West
ARM D IS L56391 (North)

STREAM LABELLING CONVENTION

STREAM A-B CONTAINS TRAFFIC GOING FROM ARM A TO ARM B

STREAM B-AC CONTAINS TRAFFIC GOING FROM ARM B TO ARM A AND TO ARM C

ETC.

GEOMETRIC DATA

DATA ITEM	MINOR ROAD B	MINOR ROAD D
TOTAL MAJOR ROAD CARRIAGEWAY WIDTH	(W) 6.00 M.	(W) 6.00 M.
CENTRAL RESERVE WIDTH	(WCR) 0.00 M.	(WCR) 0.00 M.
MAJOR ROAD RIGHT TURN - WIDTH	(WC-B) 2.20 M.	(WA-D) 2.20 M.
- VISIBILITY	(VC-B) 160.0 M.	(VA-D) 0.0 M.
- BLOCKS TRAFFIC	YES	NO
MINOR ROAD - VISIBILITY TO LEFT	(VB-C) 40.0 M.	(VD-A) 40.0 M.
- VISIBILITY TO RIGHT	(VB-A) 50.0 M.	(VD-C) 13.0 M.
- LANE 1 WIDTH	(WB-C) -	(WD-A) -
- LANE 2 WIDTH	(WB-A) -	(WD-C) -
- WIDTH AT 0 M FROM JUNC.	10.00 M.	10.00 M.
- WIDTH AT 5 M FROM JUNC.	10.00 M.	10.00 M.
- WIDTH AT 10 M FROM JUNC.	10.00 M.	8.00 M.
- WIDTH AT 15 M FROM JUNC.	8.00 M.	2.30 M.
- WIDTH AT 20 M FROM JUNC.	6.00 M.	2.20 M.
- LENGTH OF FLARED SECTION	DERIVED: 3 PCU	DERIVED: 2 PCU

.SLOPES AND INTERCPET

(NB:Streams may be combined, in which case capacity

will be adjusted)

B-C Stream

Intercept For Stream B-C	Slope For Opposing Stream A-C	Slope For Opposing Stream A-B
602.92	0.23	0.09

D-A Stream

Intercept For Stream D-A	Slope For Opposing Stream C-A	Slope For Opposing Stream C-D
581.49	0.23	0.09

B-A Stream

Intercept For Stream B-A	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream D-A	Slope For Opposing Stream D-B
473.93	0.22	0.22	0.22	0.22

Slope For Opposing Stream A-B	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream D-C
0.09	0.14	0.31	0.11

D-C Stream

Intercept For Stream D-C	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream B-C	Slope For Opposing Stream B-D
457.09	0.21	0.21	0.21	0.21

Slope For Opposing Stream C-D	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream B-A
0.08	0.13	0.30	0.11

C-B Stream

Intercept For Stream C-B	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D
666.62	0.26	0.37

A-D Stream

Intercept For Stream A-D	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B
573.96	0.26	0.32

B-D Stream From Left Hand Lane

Intercept For Stream B-D	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream A-B	Slope For Opposing Stream C-B
473.93	0.22	0.22	0.09	0.31

Slope For Opposing Stream C-A	Slope For Opposing Stream C-D
0.14	0.14

B-D Stream From Right Hand Lane

Intercept For Stream B-D	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream A-B	Slope For Opposing Stream C-B
473.93	0.22	0.22	0.09	0.31

Slope For Opposing Stream C-A	Slope For Opposing Stream C-D
0.14	0.14

D-B Stream From Left Hand Lane

Intercept For Stream D-B	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream D-C	Slope For Opposing Stream A-D
457.09	0.21	0.21	0.08	0.30

Slope For Opposing Stream A-C	Slope For Opposing Stream A-B
0.13	0.13

D-B Stream From Right Hand Lane

Intercept For Stream D-B	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream C-D	Slope For Opposing Stream A-D
457.09	0.21	0.21	0.08	0.30

Slope For Opposing Stream A-C	Slope For Opposing Stream A-B
0.13	0.13

TRAFFIC DEMAND DATA

ARM	FLOW SCALE(%)
A	100
B	100
C	100
D	100

Demand set: Ballinrobe Biogas Facility - 2027 AM DS

TIME PERIOD BEGINS 07.45 AND ENDS 09.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	1.02	1.54	1.02
ARM B	15.00	45.00	75.00	0.03	0.04	0.03
ARM C	15.00	45.00	75.00	1.27	1.91	1.27
ARM D	15.00	45.00	75.00	0.04	0.06	0.04

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TIME	FROM/TO	ARM A	ARM B	ARM C	ARM D
07.45 - 09.15	ARM A	0.000	0.000	0.988	0.012
		0.0	0.0	81.0	1.0
		(0.0)	(10.0)	(10.0)	(10.0)
	ARM B	0.000	0.000	0.000	1.000
		0.0	0.0	0.0	2.0
		(10.0)	(0.0)	(10.0)	(10.0)
	ARM C	0.912	0.049	0.000	0.039
		93.0	5.0	0.0	4.0
		(10.0)	(10.0)	(0.0)	(10.0)
	ARM D	0.000	0.000	1.000	0.000
		0.0	0.0	3.0	0.0
		(10.0)	(10.0)	(10.0)	(0.0)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA

DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

FOR COMBINED DEMAND SETS
AND FOR TIME PERIOD 1

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
07.45-08.00									
B-CD	0.01	8.83	0.001		0.00	0.00	0.0		0.11
B-AD	0.01	7.95	0.002		0.00	0.00	0.0		0.13
A-B	0.00								
A-C	1.02								
A-D	0.01	8.41	0.001		0.00	0.00	0.0		
D-AB	0.00	10.51	0.000		0.00	0.00	0.0		0.00
D-BC	0.04	7.73	0.005		0.00	0.00	0.1		0.13
C-ABD	0.06	9.83	0.006		0.00	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.00-08.15									
B-CD	0.01	8.72	0.002		0.00	0.00	0.0		0.11
B-AD	0.01	7.85	0.002		0.00	0.00	0.0		0.13
A-B	0.00								
A-C	1.21								
A-D	0.01	8.35	0.002		0.00	0.00	0.0		
D-AB	0.00	10.45	0.000		0.00	0.00	0.0		0.00
D-BC	0.04	7.63	0.006		0.00	0.01	0.1		0.13
C-ABD	0.07	9.78	0.008		0.01	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.15-08.30									
B-CD	0.02	8.58	0.002		0.00	0.00	0.0		0.12
B-AD	0.02	7.73	0.002		0.00	0.00	0.0		0.13
A-B	0.00								
A-C	1.49								
A-D	0.02	8.27	0.002		0.00	0.00	0.0		
D-AB	0.00	10.36	0.000		0.00	0.00	0.0		0.00
D-BC	0.06	7.50	0.007		0.01	0.01	0.1		0.13
C-ABD	0.09	9.71	0.009		0.01	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.30-08.45									
B-CD	0.02	8.58	0.002		0.00	0.00	0.0		0.12
B-AD	0.02	7.73	0.002		0.00	0.00	0.0		0.13
A-B	0.00								
A-C	1.49								
A-D	0.02	8.27	0.002		0.00	0.00	0.0		
D-AB	0.00	10.36	0.000		0.00	0.00	0.0		0.00
D-BC	0.06	7.50	0.007		0.01	0.01	0.1		0.13
C-ABD	0.09	9.71	0.009		0.01	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
08.45-09.00									
B-CD	0.01	8.72	0.002		0.00	0.00	0.0		0.11
B-AD	0.01	7.85	0.002		0.00	0.00	0.0		0.13
A-B	0.00								
A-C	1.21								
A-D	0.01	8.35	0.002		0.00	0.00	0.0		
D-AB	0.00	10.45	0.000		0.00	0.00	0.0		0.00
D-BC	0.04	7.63	0.006		0.01	0.01	0.1		0.13
C-ABD	0.07	9.78	0.008		0.01	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
09.00-09.15									
B-CD	0.01	8.83	0.001		0.00	0.00	0.0		0.11
B-AD	0.01	7.95	0.002		0.00	0.00	0.0		0.13
A-B	0.00								
A-C	1.02								
A-D	0.01	8.41	0.001		0.00	0.00	0.0		
D-AB	0.00	10.51	0.000		0.00	0.00	0.0		0.00
D-BC	0.04	7.72	0.005		0.01	0.00	0.1		0.13
C-ABD	0.06	9.83	0.006		0.01	0.01	0.1		0.10

QUEUE FOR STREAM B-CD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUE FOR STREAM B-AD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUE FOR STREAM A-D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUE FOR STREAM D-AB

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUE FOR STREAM D-BC

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUE FOR STREAM C-ABD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

STREAM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
B-CD	1.4	0.9	0.2	0.11	0.2	0.11
B-AD	1.4	0.9	0.2	0.13	0.2	0.13
A-B	0.0	0.0				
A-C	111.5	74.3				
A-D	1.4	0.9	0.2	0.12	0.2	0.12
D-AB	0.0	0.0	0.0	0.00	0.0	0.00
D-BC	4.1	2.8	0.5	0.13	0.5	0.13
C-ABD	6.9	4.6	0.7	0.10	0.7	0.10
ALL	260.1	173.4	1.8	0.01	1.8	0.01

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD .
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

========== end of file ==========

[Printed at 14:45:25 on 14/11/2011]

TRL LIMITED

CAPACITIES, QUEUES, AND DELAYS AT 3 OR 4-ARM MAJOR/MINOR PRIORITY JUNCTIONS

PICADY 5.0 ANALYSIS PROGRAM
RELEASE 3.0 (JUNE 2006)

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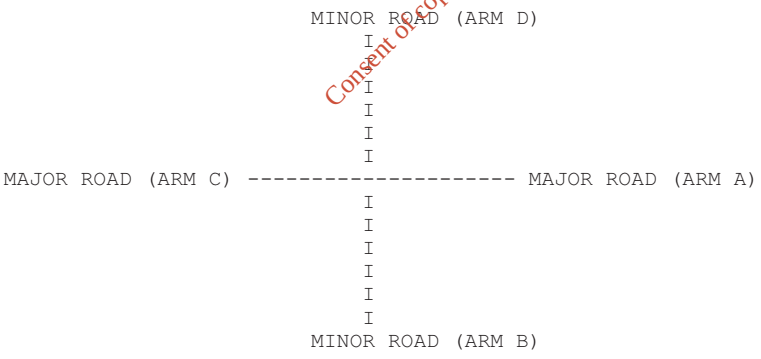
Run with file:- "G:\2011\p112098\calcs\picady\R334 Junction DS 2027 PM.vpi" (drive-on-the-left) at 14:49:04 on Monday, 14

RUN INFORMATION
****

RUN TITLE: Ballinrobe Biogas Facility - 2027 PM DS
LOCATION:
DATE: 14/11/11
CLIENT:
ENUMERATOR: jenningst [PC101-WD]
JOB NUMBER: 112098
STATUS: TIA
DESCRIPTION:

.MAJOR/MINOR JUNCTION CAPACITY AND DELAY
****

INPUT DATA



ARM A IS R334 East
ARM B IS L5646 (south)
ARM C IS R334 West
ARM D IS L56391 (North)

STREAM LABELLING CONVENTION

STREAM A-B CONTAINS TRAFFIC GOING FROM ARM A TO ARM B

STREAM B-AC CONTAINS TRAFFIC GOING FROM ARM B TO ARM A AND TO ARM C

ETC.

GEOMETRIC DATA

DATA ITEM		MINOR ROAD B		MINOR ROAD D
TOTAL MAJOR ROAD CARRIAGEWAY WIDTH	(W)	6.00 M.	(W)	6.00 M.
CENTRAL RESERVE WIDTH	(WCR)	0.00 M.	(WCR)	0.00 M.
MAJOR ROAD RIGHT TURN - WIDTH	(WC-B)	2.20 M.	(WA-D)	2.20 M.
- VISIBILITY	(VC-B)	160.0 M.	(VA-D)	0.0 M.
- BLOCKS TRAFFIC		YES		NO
MINOR ROAD - VISIBILITY TO LEFT	(VB-C)	40.0 M.	(VD-A)	40.0 M.
- VISIBILITY TO RIGHT	(VB-A)	50.0 M.	(VD-C)	13.0 M.
- LANE 1 WIDTH	(WB-C)	-	(WD-A)	-
- LANE 2 WIDTH	(WB-A)	-	(WD-C)	-
- WIDTH AT 0 M FROM JUNC.		10.00 M.		10.00 M.
- WIDTH AT 5 M FROM JUNC.		10.00 M.		10.00 M.
- WIDTH AT 10 M FROM JUNC.		10.00 M.		8.00 M.
- WIDTH AT 15 M FROM JUNC.		8.00 M.		2.30 M.
- WIDTH AT 20 M FROM JUNC.		6.00 M.		2.20 M.
- LENGTH OF FLARED SECTION	DERIVED:	3 PCU	DERIVED:	2 PCU

.SLOPES AND INTERCPET

(NB:Streams may be combined, in which case capacity

will be adjusted)

B-C Stream

Intercept For Stream B-C	Slope For Opposing Stream A-C	Slope For Opposing Stream A-B
602.92	0.23	0.09

D-A Stream

Intercept For Stream D-A	Slope For Opposing Stream C-A	Slope For Opposing Stream C-D
581.49	0.23	0.09

B-A Stream

Intercept For Stream B-A	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream D-A	Slope For Opposing Stream D-B
473.93	0.22	0.22	0.22	0.22

Slope For Opposing Stream A-B	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream D-C
0.09	0.14	0.31	0.11

D-C Stream

Intercept For Stream D-C	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream B-C	Slope For Opposing Stream B-D
457.09	0.21	0.21	0.21	0.21

Slope For Opposing Stream C-D	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream B-A
0.08	0.13	0.30	0.11

C-B Stream

Intercept For Stream C-B	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D
666.62	0.26	0.37

A-D Stream

Intercept For Stream A-D	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B
573.96	0.26	0.32

B-D Stream From Left Hand Lane

Intercept For Stream B-D	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream A-B	Slope For Opposing Stream C-B
473.93	0.22	0.22	0.09	0.31

Slope For Opposing Stream C-A	Slope For Opposing Stream C-D	Slope For Opposing	Slope For Opposing
0.14	0.14		

B-D Stream From Right Hand Lane

Intercept For Stream B-D	Slope For Opposing Stream A-C	Slope For Opposing Stream A-D	Slope For Opposing Stream A-B	Slope For Opposing Stream C-B
473.93	0.22	0.22	0.09	0.31

Slope For Opposing Stream C-A	Slope For Opposing Stream C-D	Slope For Opposing	Slope For Opposing
0.14	0.14		

D-B Stream From Left Hand Lane

Intercept For Stream D-B	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream D-C	Slope For Opposing Stream A-D
457.09	0.21	0.21	0.08	0.30

Slope For Opposing Stream A-C	Slope For Opposing Stream A-B	Slope For Opposing	Slope For Opposing
0.13	0.13		

D-B Stream From Right Hand Lane

Intercept For Stream D-B	Slope For Opposing Stream C-A	Slope For Opposing Stream C-B	Slope For Opposing Stream C-D	Slope For Opposing Stream A-D
457.09	0.21	0.21	0.08	0.30

Slope For Opposing Stream A-C	Slope For Opposing Stream A-B	Slope For Opposing	Slope For Opposing
0.13	0.13		

TRAFFIC DEMAND DATA

ARM	FLOW SCALE(%)
A	100
B	100
C	100
D	100

Demand set: Ballinrobe Biodag Faciity - 2027 PM DS

TIME PERIOD BEGINS 16.45 AND ENDS 18.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	NUMBER OF MINUTES FROM START WHEN TOP OF PEAK IS REACHED	NUMBER OF MINUTES FROM START WHEN FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	RATE OF FLOW (VEH/MIN) AT TOP OF PEAK	RATE OF FLOW (VEH/MIN) AFTER PEAK
ARM A	15.00	45.00	75.00	1.29	1.93	1.29
ARM B	15.00	45.00	75.00	0.09	0.13	0.09
ARM C	15.00	45.00	75.00	2.28	3.41	2.28
ARM D	15.00	45.00	75.00	0.13	0.19	0.13

TURNING PROPORTIONS
TURNING COUNTS (VEH/HR)
(PERCENTAGE OF H.V.S)

TIME	FROM/TO	ARM A	ARM B	ARM C	ARM D
16.45 - 18.15	ARM A	0.000	0.019	0.981	0.000
		0.0	2.0	101.0	0.0
		(0.0)	(10.0)	(10.0)	(10.0)
	ARM B	0.571	0.000	0.429	0.000
		4.0	0.0	3.0	0.0
		(10.0)	(0.0)	(10.0)	(10.0)
	ARM C	0.967	0.027	0.000	0.005
		176.0	5.0	0.0	1.0
		(10.0)	(10.0)	(0.0)	(10.0)
	ARM D	0.100	0.000	0.900	0.000
		1.0	0.0	9.0	0.0
		(10.0)	(10.0)	(10.0)	(0.0)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA

DEFAULT PROPORTIONS OF HEAVY VEHICLES ARE USED

QUEUE AND DELAY INFORMATION FOR EACH 15 MIN TIME SEGMENT

FOR COMBINED DEMAND SETS
AND FOR TIME PERIOD 1

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
16.45-17.00									
B-CD	0.04	10.74	0.004		0.00	0.00	0.1		0.09
B-AD	0.05	8.28	0.006		0.00	0.01	0.1		0.12
A-B	0.03								
A-C	1.27								
A-D	0.00	8.18	0.000		0.00	0.00	0.0		
D-AB	0.01	10.20	0.001		0.00	0.00	0.0		0.10
D-BC	0.11	7.42	0.015		0.00	0.02	0.2		0.14
C-ABD	0.06	9.77	0.006		0.00	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.00-17.15									
B-CD	0.04	10.67	0.004		0.00	0.00	0.1		0.09
B-AD	0.06	8.13	0.007		0.01	0.01	0.1		0.12
A-B	0.03								
A-C	1.51								
A-D	0.00	8.08	0.000		0.00	0.00	0.0		
D-AB	0.01	10.08	0.001		0.00	0.00	0.0		0.10
D-BC	0.13	7.27	0.019		0.02	0.02	0.3		0.14
C-ABD	0.07	9.70	0.008		0.01	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.15-17.30									
B-CD	0.06	10.57	0.005		0.00	0.01	0.1		0.10
B-AD	0.07	7.92	0.009		0.01	0.01	0.1		0.13
A-B	0.04								
A-C	1.85								
A-D	0.00	7.94	0.000		0.00	0.00	0.0		
D-AB	0.02	9.90	0.002		0.00	0.00	0.0		0.10
D-BC	0.17	7.06	0.023		0.02	0.02	0.3		0.14
C-ABD	0.09	9.61	0.010		0.01	0.01	0.1		0.11

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.30-17.45									
B-CD	0.06	10.57	0.005		0.01	0.01	0.1		0.10
B-AD	0.07	7.92	0.009		0.01	0.01	0.1		0.13
A-B	0.04								
A-C	1.85								
A-D	0.00	7.94	0.000		0.00	0.00	0.0		
D-AB	0.02	9.90	0.002		0.00	0.00	0.0		0.10
D-BC	0.17	7.06	0.023		0.02	0.02	0.4		0.14
C-ABD	0.09	9.61	0.010		0.01	0.01	0.1		0.11

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
17.45-18.00									
B-CD	0.04	10.67	0.004		0.01	0.00	0.1		0.09
B-AD	0.06	8.13	0.007		0.01	0.01	0.1		0.12
A-B	0.03								
A-C	1.51								
A-D	0.00	8.08	0.000		0.00	0.00	0.0		
D-AB	0.01	10.07	0.001		0.00	0.00	0.0		0.10
D-BC	0.13	7.27	0.019		0.02	0.02	0.3		0.14
C-ABD	0.07	9.70	0.008		0.01	0.01	0.1		0.10

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)	AVERAGE DELAY PER ARRIVING VEHICLE (MIN)
18.00-18.15									
B-CD	0.04	10.74	0.004		0.00	0.00	0.1		0.09
B-AD	0.05	8.28	0.006		0.01	0.01	0.1		0.12
A-B	0.03								
A-C	1.27								
A-D	0.00	8.18	0.000		0.00	0.00	0.0		
D-AB	0.01	10.20	0.001		0.00	0.00	0.0		0.10
D-BC	0.11	7.42	0.015		0.02	0.02	0.2		0.14
C-ABD	0.06	9.77	0.006		0.01	0.01	0.1		0.10

QUEUE FOR STREAM B-CD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.0
17.15	0.0
17.30	0.0
17.45	0.0
18.00	0.0
18.15	0.0

QUEUE FOR STREAM B-AD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.0
17.15	0.0
17.30	0.0
17.45	0.0
18.00	0.0
18.15	0.0

QUEUE FOR STREAM A-D

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.0
17.15	0.0
17.30	0.0
17.45	0.0
18.00	0.0
18.15	0.0

QUEUE FOR STREAM D-AB

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.0
17.15	0.0
17.30	0.0
17.45	0.0
18.00	0.0
18.15	0.0

QUEUE FOR STREAM D-BC

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.0
17.15	0.0
17.30	0.0
17.45	0.0
18.00	0.0
18.15	0.0

QUEUE FOR STREAM C-ABD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
17.00	0.0
17.15	0.0
17.30	0.0
17.45	0.0
18.00	0.0
18.15	0.0

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

STREAM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
B-CD	4.1	2.8	0.4	0.09	0.4	0.09
B-AD	5.5	3.7	0.7	0.12	0.7	0.12
A-B	2.8	1.8				
A-C	139.0	92.7				
A-D	0.0	0.0	0.0	0.00	0.0	0.00
D-AB	1.4	0.9	0.1	0.10	0.1	0.10
D-BC	12.4	8.3	1.7	0.14	1.7	0.14
C-ABD	6.9	4.6	0.7	0.10	0.7	0.10
ALL	415.7	277.1	3.7	0.01	3.7	0.01

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD .
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

========== end of file ==========

[Printed at 14:49:12 on 14/11/2011]

Appendix 8

Hydrogeology & Hydrology

geoenvironmental
ENVIRONMENTAL CONSULTANTS

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Email: info@geoenvironmental.ie
Web: www.geoenvironmental.ie

Hydrology and Hydrogeology Sections of Environmental Impact Assessment

For

Proposed expansion of the Pig Farm Facility and the addition of a Anaerobic Digester to the existing piggery facility at Levelly, Ballinrobe, Co. Mayo

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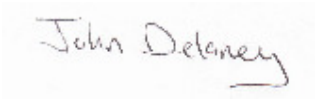
geoenvironmental
ENVIRONMENTAL CONSULTANTS



Report Writing:

John Delaney (MSc; BSc)
Environmental Consultant

Date: **12th November 2011**

geoenvironmental
ENVIRONMENTAL CONSULTANTS

Contents:

1.0 Hydrology and Hydrogeology Section

1.1 INTRODUCTION

This section of the EIS describes the hydrology and hydrogeology of the study area at Levelly, Ballinrobe, Co. Mayo. The site is located within the main Corrib River Catchment of the Western River Basin district. The impact of the proposed development on nearby watercourses and groundwater is discussed and evaluated. Mitigation measures are proposed, and the residual effects are described.

1.2 HYDROLOGY IN THE EXISTING ENVIRONMENT

1.2.1 Surface Water Features

The Robe River which is located 500m west of the proposed biogas plant rises close to Ballyhaunis and flows generally west for 64 kilometres where it discharges into Lough Mask. The Robe discharges into Lough Mask, four kilometres west of Ballinrobe, near Cushlough. It is the longest tributary of Lough Mask and has a catchment area of 320 square kilometres. The catchment area to the study location at Levelly is 261 km^2 (See Appendix B).

1.2.2 Water Supply – Existing Sources on Site

The existing piggery is supplied from the Cregduff Group Scheme, the source is in Cregduff village, The Scheme source is located approximately 2km south of the study location. The scheme has 300+ agricultural and domestic members.

1.2.3 Storm/clean surface water

All clean water from the existing piggery is separated from soiled water. Roof water is collected via galvanised gutters and downpipes and piped underground to a nearby watercourse which confluences with the River Robe . The Robe river is located 250m west of the existing piggery and is located approximately 600m west from the proposed biogas plant. Surface Run-off from the existing pig unit currently discharges to a drain to the east of the site prior to discharging to the Robe River 150m south west of the unit.

1.2.4 Soiled Water

Areas of animal movement within the piggery are the main sources of the soiled water. This soiled water is discharged to the underground storage tanks.

1.3 HYDROGEOLOGY IN THE EXISTING ENVIRONMENT

1.3.1 Aquifer Classification and Vulnerability

In the west of Ireland, groundwater accounts for approximately 22 % of the total public water supply. The figure for Mayo is 18% with a significant proportion of it used for drinking water rather than industrial or agricultural use. The study site is located within the Cong-Robe Groundwater Body (GWB) which is underlain completely by Dinantian Pure Bedded Limestones (DPBL). The bedrock underlying the study area is delineated as a regionally important limestone aquifer (RKc). The bedrock is regarded as a regionally important karsified aquifer which implies that a high proportion of the water bearing capability of the rock is due to due to conduit flow with the bedrock (See Appendix B).

The bedrock in the area is generally devoid of inter-granular permeability (flow within the pore spaces of the rock). Groundwater instead flows mainly through fissures, faults, joints and bedding planes. In pure bedded limestones these openings are enlarged by karstification which significantly enhances the permeability of the rock. Karstification can be accentuated along structural features such as fold axes and faults. Groundwater flow through karst areas is extremely complex and difficult to predict. Rapid groundwater flow velocities indicate that a large proportion of groundwater flow takes place in enlarged conduit systems. Flow path lengths can be up to a several kilometres in length. Overall groundwater flow below the site will be towards the River Robe which confluences with Lough Mask. Due to the highly karstified nature of the bedrock, groundwater flow direction in the area can be highly variable.

Karstification is widespread, and in the area of Cong the limestones are extremely karstified (Drew and Daly, 1993). Recorded karst features number 93, but are considered to represent only a fraction of existing features. Turloughs are particularly prevalent in the vicinity of Hollymount. All but two (classed as turloughs) of the currently known karst features occur to the south of the River Robe. It is likely that this is due to the presence of thicker till north of the Robe. Stream density is far greater to the north of the River Robe.

The risk of groundwater pollution depends on the interaction between the natural vulnerability of the aquifer and it's pollution loading. Groundwater vulnerability is an intrinsic characteristic of an aquifer which is determined by factors such as the type of subsoil and the depth of overburden. Other features such as turloughs, springs, caves, swallow holes and rock outcrops can affect the pollution risk to the aquifer. A

number of turloughs, springs and swallow holes have been recorded in the vicinity of Ballinrobe. There are none recorded close to the study site. The closest turlough recorded by the GSI is located 1.2 km north/west at Knockadoor.

The groundwater vulnerability of the study area is categorised as high-low on the Geological Survey of Ireland (GSI) Website as only an interim study has taken place (See Appendix B). A high vulnerability rating indicates that the subsoil thickness above bedrock in the area is >3m. A low vulnerability only applies to clayey or peaty subsoil where the depth is >10m. Please see Table on Groundwater Vulnerability Mapping Guidelines below for more information on the categories.

Table 1 Vulnerability Mapping Guidelines

	Hydrogeological Conditions				
	Subsoil Permeability (Type and Thickness)			**Unsaturated Zone**	**Karst Features**
Vulnerability Rating	High permeability (sand/gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, clay, peat)	Sand/gravel aquifers only	<30 metre radius
Extreme (E)	0 – 3.0 metres	0 – 3.0 metres	0 – 3.0 metres	0 – 3.0 metres	-
High (H)	>3.0 metres	3.0 – 10.0 metres	3.0 – 5.0 metres	> 3.0 metres	N/A
Moderate (M)	N/A	>10.0 metres	5.0 – 10.0 metres	N/A	N/A
Low (L)	N/A	N/A	>10.0 metres	N/A	N/A

1.3.2 Groundwater Use

There is no record of any boreholes located within 2 kms of the study location. The Specific capacities of the boreholes within the general area where the site is located can vary greatly. There are a number of GSI registred boreholes in the area. These are located at Annefield, Ardkill and Cregduff. The yield class of the first two borehole is quite poor at 27m^3 and 11m^3 per day respectively. The main Spring at Cregduff which supplies the Cregduff Group Wate Scheme has an abstraction rate of 7,000m^3/day and the Ballindine public water supply scheme has an abstraction rate of 3,000m^3/day. As well yields and capacities are dependent mainly on fissure flow. Transmissivity is estimated to range from 1 m^2/d to greater than 250 m^2/d. Many of the spring flows in this area rise and fall quickly in response to rainfall events. Furthermore, during prolonged drought many springs cease to flow and well yields drop significantly.

1.4 WATER QUALITY ANALYSIS

Water samples were taken from upstream and downstream of the stormwater runoff points. Full analyses results from an independent laboratory are included in Appendix A. This south-eastern comer of county Mayo has Lough Mask as its south-western border and is drained by the River Robe flowing westwards to Lough Mask. The latest water quality results for the River Robe are set out in EPA Water Quality Report 2007-2009 (EPA, 2011). The closest biological monitoring point is located 1.5km down stream of the study location just north of Ballinirobe. The results of the latest survey classify the water quality as 'Q4' indicating good status. Water quality status in the eleven lakes of County Mayo are continually monitored. The latest Phosphorous Regulations National Implementation Report, 2001 classifies Lough Mask as being of satisfactory quality, mesotrophic.

Elemental phosphorous is the nutrient associated with surface water pollution. The implementation of the Phosphorus Regulations (S.l. No.258 of 1998) in July 1998 has for the first time established statutory Environmental Quality Standards for Phosphorus. The water quality targets set by the government are ambitious and will require a wide range of abatement measures, focusing on the main sources of pollution sewage, industry and agriculture, further enhanced by European Communities (Good Agricultural Practice for Protection of Waters) Regulations (S.I. 378 of 2006) and European Communities (Good Agricultural Practice for Protection of Waters) Regulations (S.I. 101 of 2009.)

The closest EPA groundwater monitoring point is located 2km south of the study location at Cregduff Spring. The latest 2009 results show that the nitrate, phosphate and ammonia levels are well below the required limit values for these parameters but that the microbiological results are elevated with levels of >100 Faecal Coliforms per 100 ml recorded in the spring.

1.5 LIKELY AND SIGNIFICANT IMPACTS ON SURFACE WATER AND GROUNDWATER

The likely impacts of the proposed development can be divided into those that may occur during the construction phase and those during the operational phase. Likely impacts during the construction and operational phases are detailed in Sections *1.51 and 1.5.3.*

1.51 On Site Impacts During Construction Stage

Soil, waste concrete and toxins in runoff from construction sites or fuels, accidentally spilled during storage or delivery, can enter watercourses. Fine sediments from the bottom or sides of streams can be mobilised during in-stream construction. These pollutants can impact aquatic habitats, plant life, invertebrate and all life stages of fish.

1.5.2 Mitigation Measures

1. Ensure silt is not directly released into watercourses, keep activities away from river and stream banks where possible.
2. Earths works will take place during periods of low rainfall to reduce run-off and potential siltation of nearby drainage channels and watercourses
3. Effective Construction Management to ensure the risk of spillage are minimised. These should include adequate bunding for oil containers, wheel washers, dust suppression on site roads and regular plant maintenance.

1.5.3 On Site Impacts During Operational Stage

Clean surface water will be piped to an existing OPW drain located 200m north of the proposed plant before eventually discharging to the Robe river. The maximum volume of storm water run-off from the proposed biogas plant during an extreme rainfall event (asuming 65mm/hr) would be 300m^3 per hour.

There are no proposed discharges to groundwater from the proposed development. Pig Manure can cause serious water pollution if discharged directly to groundwater or surface waters. The manure will be spread in accordance with the Nitrate Directive Regulations (S.I. No. 101 of 2009) reduces the risk of groundwater contamination. To reduce the risk to groundwater, all pig manure on site will be stored in underground concrete tanks, built to Dept of Agriculture specifications.

A freeboard of 200mm has been allocated to all tanks under slats to contain gasses. There will be no impact from these on surface or ground waters.

There has been no historical contamination of groundwater at this site. This development will minimise the potential impacts at this site, due to the following mitigation measures.

1.5.4 Mitigation Measures

The main potential treat to ground water in the vicinity of the pig farm site is due to the storage of a relatively large volume of animal on the farm. In order to ensure that the proposed development does not impact on the groundwater adjacent to the pig farm site the following measures will be implemented.

1. All tanks are constructed to Department of Agriculture, Food and Rural Development Standards for construction of farm buildings.
2. Pig manure will be abstracted from dedicated abstraction points from the tanks under the pig houses by vacuum tank to reduce any risk of spillage during removal.
3. The provision of a substantial amount of excess manure storage capacity, well above the 6 month minimum requirement will ensure that organic fertilizer is managed to the highest possible standard on the pig farm site. The volume of manure produced per annum is 3378m^3 while there is 6085m^3 of manure storage capacity available.
4. All process and soiled water (pig slurry, imported organic material) will be stored in water tight concrete tanks. There will be no process discharges off-site to ground or surface water. The only discharges to surface water will be from roofs and clean impervious areas of the site.

The proposed development will further reduce the potential impacts at this site, due to the following mitigation measures,

(i) The removal of raw pig manure on a regular basis from the existing storage tanks and channels under the houses will reduce the loading pressure on these tanks.

(ii) All new structures will be provided with leak detection systems which will be visually inspected regularly, and samples analysed quarterly for COD/BOD.

(iii) The application of digestate from the proposed facility, which will replace the current practice of application of raw pig manure, will greatly reduce the risk of nitrate-nitrogen contamination of groundwater, due to the alteration of nitrogen which occurs in the process, rendering it more suitable for plant uptake.

(iv) Anaerobic Digestion of animal manure increases the proportion of nutrients immediately available for uptake by plants, due to the mineralisation of nutrients during the digestion process.

Appendix A: Surface Water Quality Results

Appendix B: Desk Study Maps

SAOTHARLANN CHONAMARA TEORATA
(T/A Connemara Laboratory Services)
Ros Muc Innovation Centre, Connemara, Co.Galway.
Tel: 091 574355
Fax: 091 574356

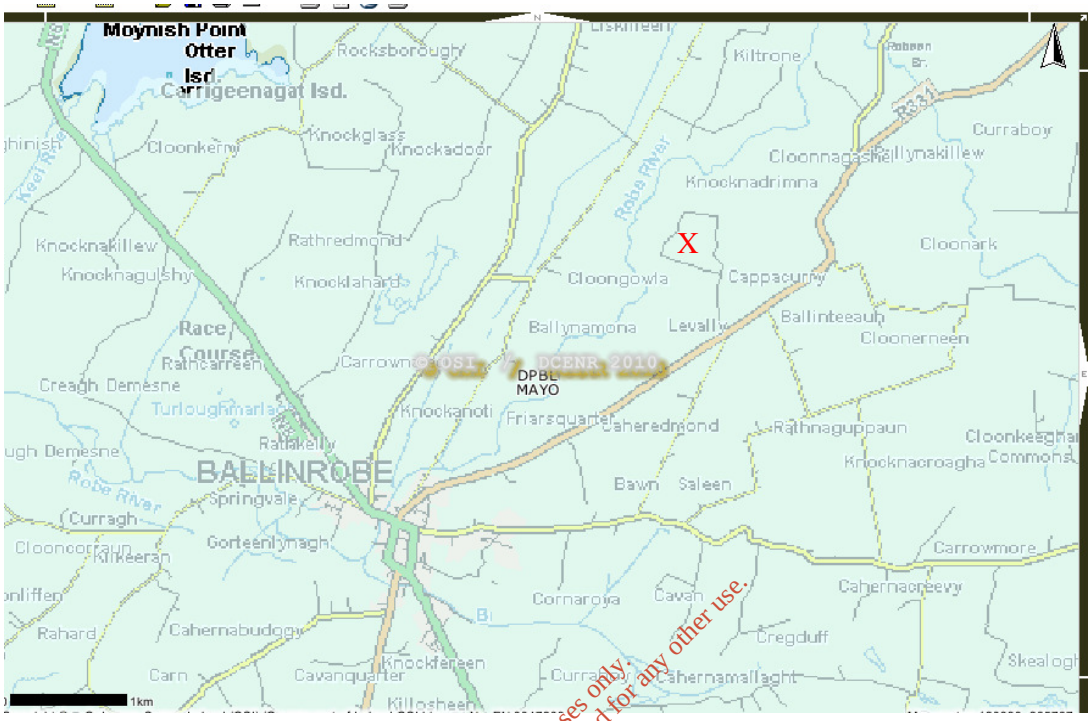
Report No.: 776/02
Client: John Sherridan, Drumhill, Ballinrobe, Co. Mayo.
Report to: John Sherridan.
Sample taken: By P. O'Malley & S. Folan
Date of Arrival: 26/02/02 **Start Date of Analysis:** 26/02/02
Date of Report: 06/03/02 Page 1 of 1

Tests	**Specifications**	**Results**			
		Upstream At Farm	**Downstream At Farm**	**Upstream Of Robe**	**Downstream Of Robe**
Lab sample No.		1916/02	1917/02	1918/02	1919/02
B.O.D.	In Hse Method Based on 5210B	87mg/l	13mg/l	2mg/l	2mg/l
pH	Electrometric Method Based on 4500H⁺	7.5	7.3	7.6	7.6
Suspended Solids	In Hse Method Based on 2540D	52mg/l	9.25mg/l	3.75mg/l	10.5mg/l
Fats, Oils & Greases	Soxhlet Method Based on 5520D	2mg/l	<1mg/l	<1mg/l	<1mg/l
*Nitrate	Chromotropic Acid	1.6mg/l	15.7mg/l	6.3mg/l	6.5mg/l
*Nitrite	Diazotization	1.623mg/l	0.160mg/l	0.024mg/l	0.026mg/l
Ammonium	Salicylate Method	30mg/l	4mg/l	<0.04mg/l	0.09mg/l
* Phosphorus	Acid Persulfate Digestion	1.24mg/l	0.34mg/l	<0.02mg/l	0.05mg/l

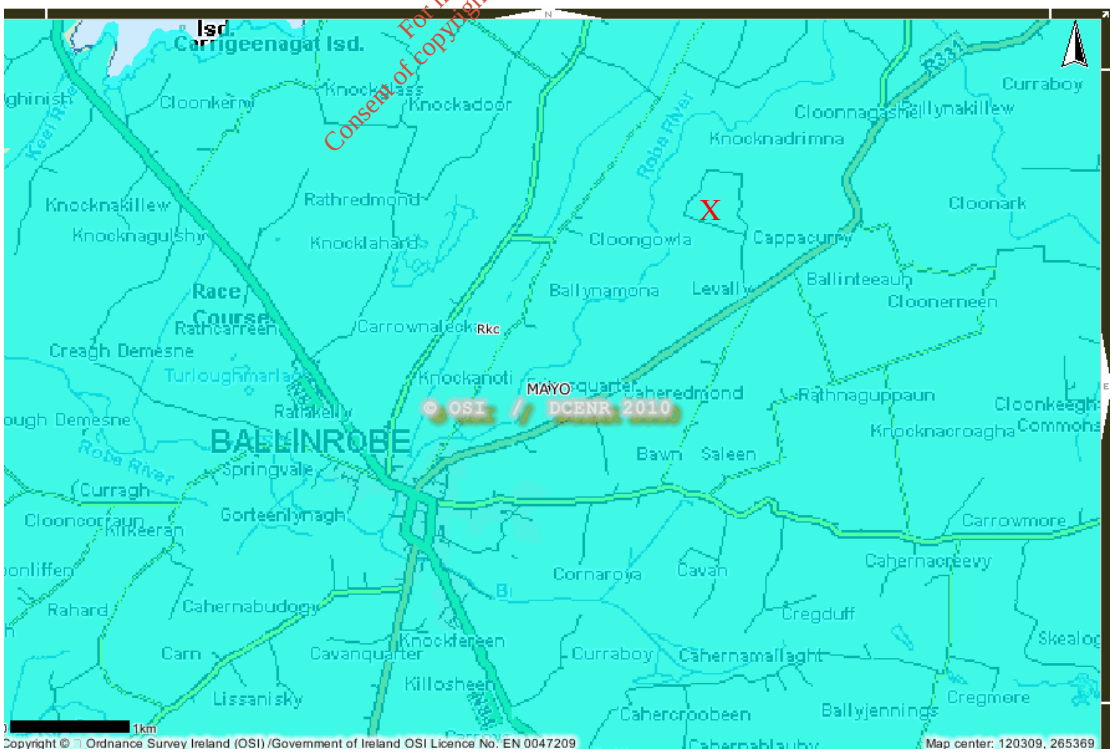
* Those tests shown with an asterix are not ILAB accredited
Reference numbers under specifications refer to standard methods for the examination of water and wastewater 20th edition 1998.

Ken Cannon 6/3/02
Ken Cannon Date
Chief Technician

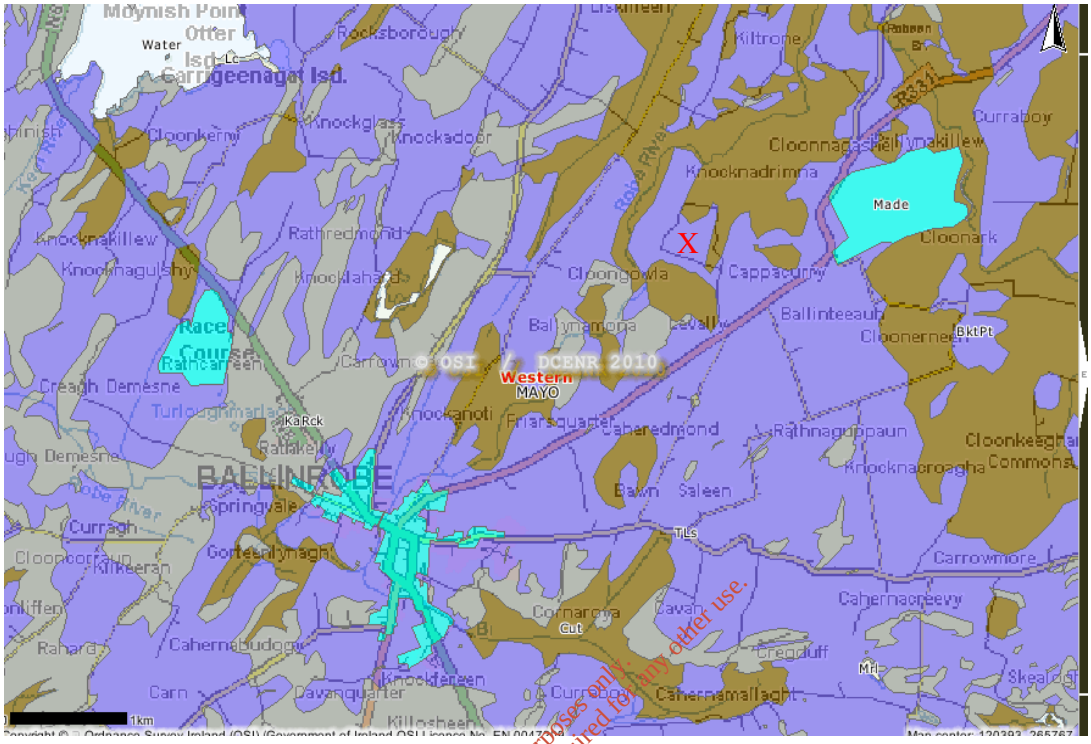
Bedrock Type
Dinantian Pure Bedded Limestones (DPBL)



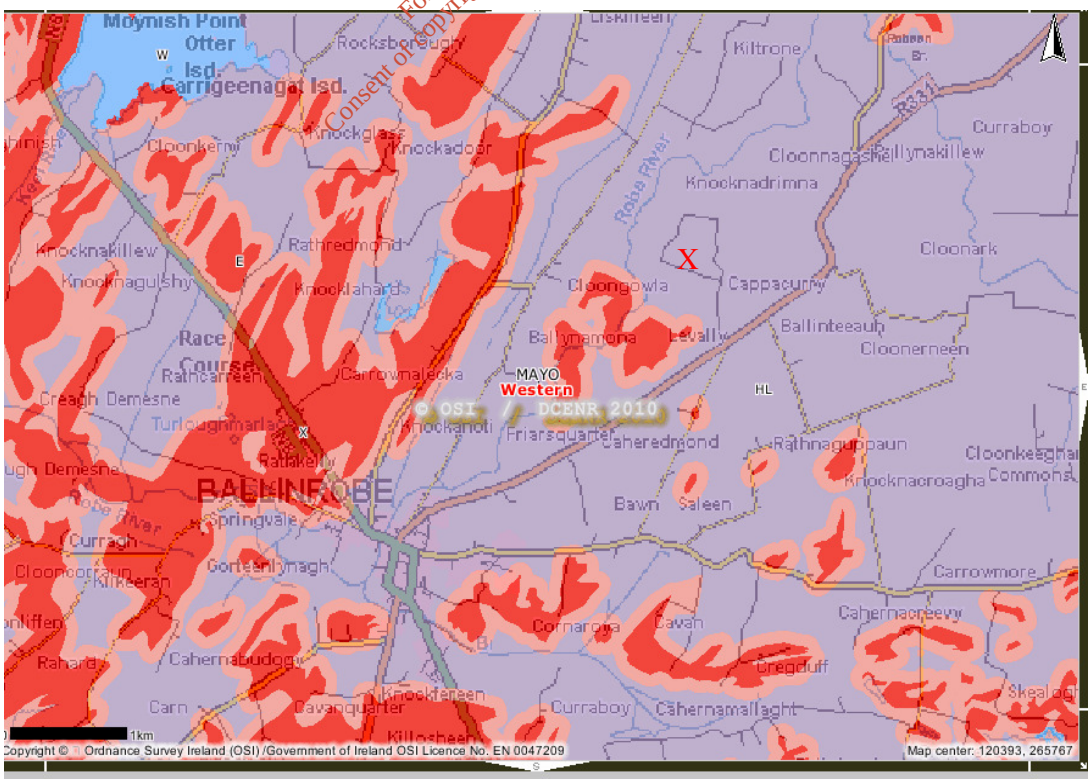
Aquifer Classification
Regionally Important Fissured Aquifer (RKc)



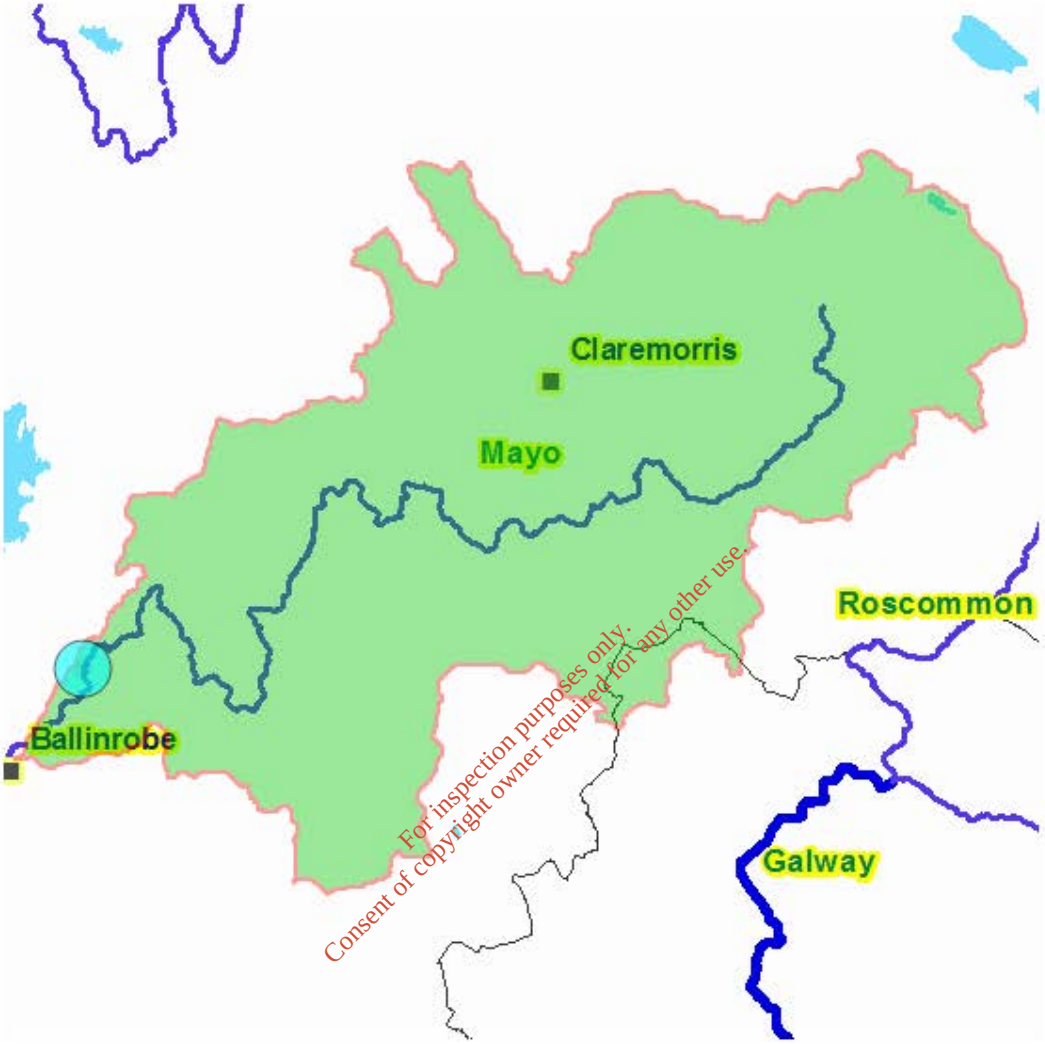
Subsoil Type
Mainly Limestone Till (TLs); Blanket Peat (BktPt) located on eastern boundary



Groundwater Vulnerability
The groundwater vulnerability is delineated as HL (high-low)



Catchment area of Robe River to study location



Appendix 9

Animal Tissue Collection

V.A.T. No.: IE 4766010L

JOHN AND KEVIN GREENE

Licensed Hauliers

Collection Service for Animals, Offals & Fats.

LOWVILLE, AHASCRAGH, BALLINASLOE.

Tel.: (0905) 88606/88830

6th March 2002

To E.P.A. Environmental Planner

This is to confirm that we, the above named have a service in place to collect dead Pigs from John Sheridan, Drumhill, Ballinasloe

Anne Greene