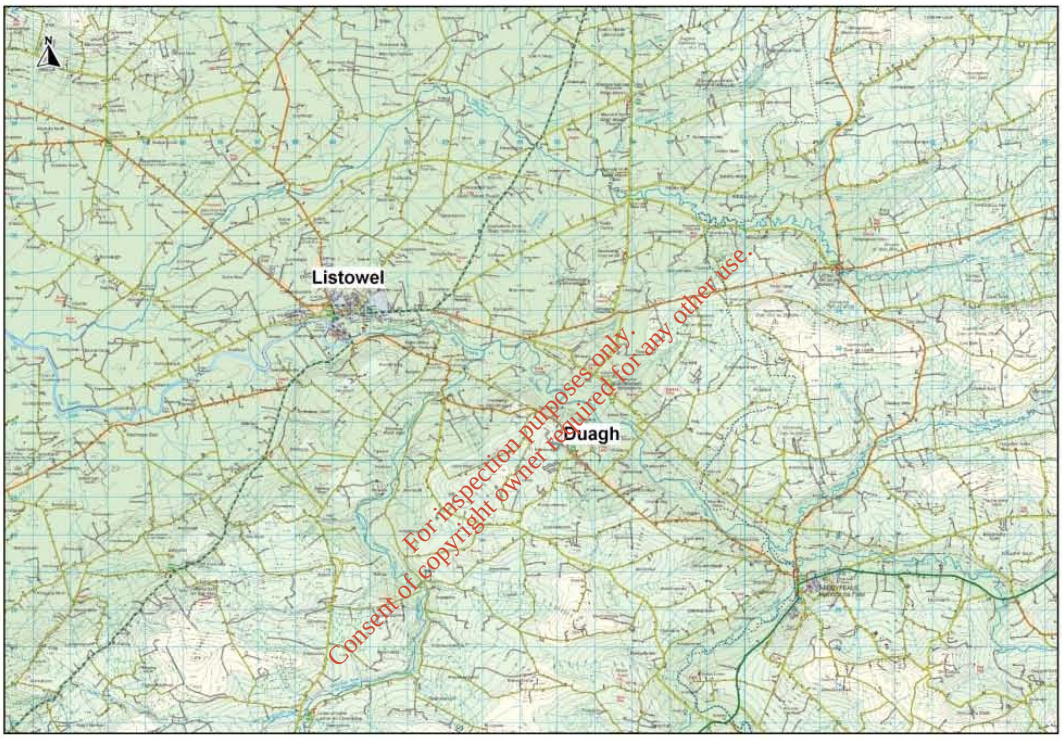
10. DUAGH

10.1 INTRODUCTION

Duagh is a small village in north Kerry, located on the R555, approximately 9km southeast of Listowel.

The village provides a range of services for the area, including two shops, a shop/service station, hardware store, and three public houses. Social facilities provided in the village include a community hall/heritage centre, a GAA club, a church, and a primary school. The village also has a FAS resource/employment centre.

Figure 10.1: Location Map



10.2 EXISTING SYSTEM

10.2.1 Existing Network

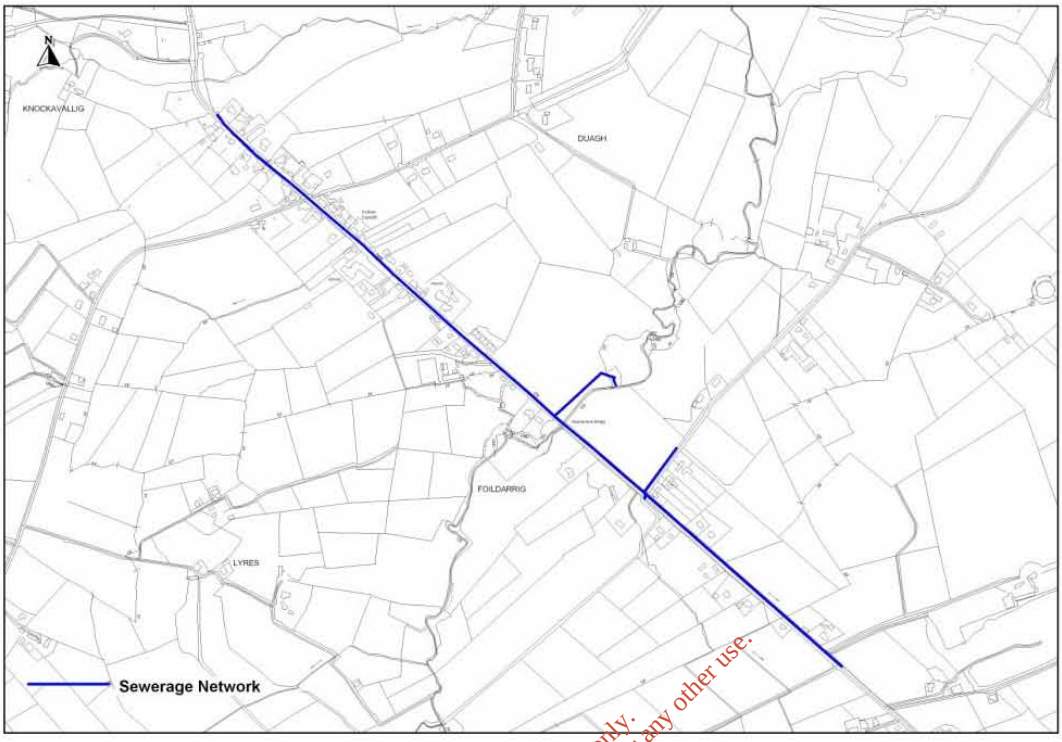
The existing sewerage network in the village dates from 1962.The network includes approximately 1,057 of 100mm to 225mm diameter sewers that gravitate to a treatment facility located to the southwest of the village on the banks of the Glasha River, a tributary of the River Feale.

A further 900m of 150mm diameter sewer serves land outside the development plan boundary to the east of the Glasha River, and this sewer also gravitates to the treatment plant site.

The system acts as a combined system with no separate provision for storm water runoff.

The existing network layout is shown on Figure 10.2.

Figure 10.2: Existing Collection System



10.2.2 Existing Wastewater Treatment Plant

The current treatment plant includes a bar screen, a 2-sided overflow manual, grit channels, and a 4.4m sided square Imhoff tank.

The tank has an estimated settlement volume of 9m³, suggesting a design capacity of 250pe.

The tank provides primary treatment, before discharging treated effluent through a 15m long, 225mm diameter outfall to the local watercourse, a tributary of the River Feale. There are sludge drying beds at the plant, but these are no longer used.

Kerry County Council report that the plant is currently overloaded.

10.3 FUTURE POPULATION & DRAINAGE AREAS

10.3.1 Population Projections

The 2008 An Post Geodirectory shows 75 residential units within the development area established by the Local Area Plan for the village. In addition, there are an estimated further 30 residential units served by the existing collection system on the R551 to the east of the village development boundary. At an assumed occupancy rate of 2.75, the estimated current population served by the scheme is ((75 + 30) x 2.75 =) 289 people.

The projected future (2028) population within the Duagh Development boundary is 271(Ref. Appendix 1 – Population Forecast). At an assumed future occupancy rate of 2.4, there will be 113 permanent residential served by the scheme, and increase of 38 over the current figure.

There are proposals to extend the existing network further east along the R555 towards Coolaneelig to serve an additional 25 properties and a 22-bed nursing home. In addition there are 7 properties on the local road north from the village centre within or close to the adopted development boundary, which are not currently served by the scheme.

An assessment of the assimilative capacity of the Glasha River completed in Section 10.5 suggests that it has insufficient flows and capacity to cater for future discharges from Duagh. Consequently it is proposed to provide a new treatment plant near Duagh Bridge, discharging to the River Feale. An additional 14 properties could be served from the proposed new trunk sewer to the treatment plant.

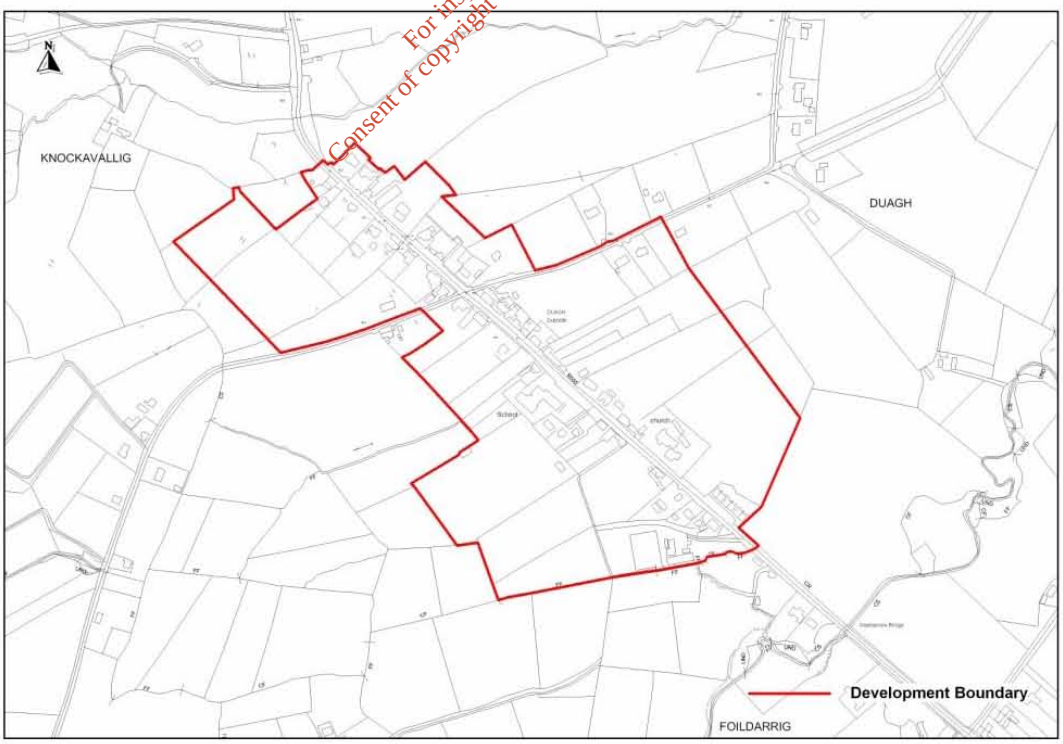
Hence in total, it is estimated that there will be (30 existing + 25 + 7 + 14 =) 76 residential properties served by the scheme outside of the current development boundary. At an assumed future occupancy rate of 2.4, these could house (76 x 2.4=) 182 people. Hence the future (2028) population served by the scheme is estimated as (271 + 182=) 453.

Allowing 20% of the domestic population as the contribution from non-domestic connections results in a design population of (453 x 1.2 =) 544pe. An additional allowance of 22pe should be made for the 22-bed nursing home to giver a future (2028) design population equivalent for Duagh (544 + 22=) 566, **say 570pe.**

10.3.2 Development Area

The North Kerry Settlements Local Area Plan identifies a development area of 24.5Ha for Duagh, the boundary of which is shown in Figure 10.3. It also provides a number of sites for residential development, totalling 10.17Ha.

Figure 10.3: Duagh Development Boundary



Guidelines for Planning Authorities on Residential Density" published by the DEHLG states that *"In greenfield sites or those sites for which a Local or Action Plan is appropriate, public open space should be provided at a minimum rate of 15% of the total site area. This allocation should be in the form of useful open spaces within residential developments and, where appropriate, larger neighbourhood parks to serve the wider community".* Hence it is assumed that 15% of the areas detailed above will be provided for open/amenity space.

14.17Ha are zoned for residential development at an unspecified density. Allowing 15% for amenity/open space leaves (10.17/1.15=) 8.8Ha available for development. The Local Area Plan for the village stipulates that certain areas of residential zoned land are to be developed at low density. Hence, assuming an average development density of 10 units/Ha, this could provide an additional 88 permament residences.

The capacity of the lands zoned for residential development in Duagh to accommodate the projected population growth within the development boundary to 2028 is assessed in Table 10.1

Table 10.1: Capacity of Zoned Residential Land in Duagh to Accommodate Projected Growth

Projected future permanent population (Within Dev. Boundary)	A	271	Persons
Current permanent housing stock (Within Dev. Boundary)	B	75	Units
Assumed future occupancy rate	C	2.4	Persons/unit
Future population to reside in current housing stock	D=BxC	180	Persons
Future population for which new housing is required	E=A-D	91	Persons
Additional houses required at assumed future occupancy rate	F=E/C	38	Units
Additional houses available from full development of zoned land	G	88	Units
Redundancy Factor	H=G/F	**2.3**	

Table 10.1 shows that the current area of land zoned for residential development has over 3.2 times the capacity required to provide for the projected population growth within the development boundary (65 people) to 2028.

10.4 PROPOSED NETWORK

10.4.1 Introduction

The proposed upgrades to the existing network in Duagh are described under the following general headings:-

- Upsizing and upgrade of the existing foul network.
- Extension of the foul network to serve proposed development land and additional rural areas.
- Construction of a new gravity trunk sewer to a proposed treatment plant near Duagh Bridge.

- Construction of a pumping station, rising main, and associated modifications to the existing network, to forward flows from the western side of Glashamore bridge to the head of the proposed gravity trunk main to the treatment plant.

10.4.2 Foul Sewer Network

The existing network includes some 100mm and 150mm diameter pipes, which are generally deemed inadequate in a public system. In addition, the existing system is believed to be in poor condition, and suffers from high levels of infiltration, creating additional loading on the treatment plant. Consequently it is proposed to replace 1,258m of the existing collection system, only retaining the 520m section that extend east towards Kilcarra.

As detailed in Section 10.5 following, it is proposed to construct a new treatment plant near Duagh Bridge, discharging to the River Feale. The following works are proposed in order to transfer flows from the village forward for treatment:-

- Construct approximately 1,300m of 225mm diameter gravity trunk sewer to the proposed treatment plant site.

- Construct a pumping station at the head of the 225mm diameter trunk main to the existing treatment plant, to forward all foul flows from the existing scheme catchment to the head of the new gravity trunk sewer. The pumping station will include stormwater storage of 2 hours at 3DWF, with a screened overflow to the Glasha River.

- Construct approximately 330m of 100mm diameter rising sewer from the proposed pumping station to the head of the proposed gravity trunk sewer.

Within the village development boundary it is proposed to extend the gravity foul system along the road entering the village from the west to cater for an area of land zoned for low-density residential development in the Local Area Plan. (135m of 225mm diameter sewer).

There are a number of the local road north from the village centre to the cemetery that are within or close to the adopted development boundary, but are not currently served by the scheme. As the topography of the area falls away from the existing collection system, the following works are proposed:-

- Construct approximately 440m of 225mm diameter gravity trunk sewer, discharging to a package pumping station.

- Install a package pumping station to forward foul flows to the gravity system.

- Construct approximately 440m of 80mm diameter rising sewer from the proposed pumping station to the gravity system.

The Local Area Plan for the village zones an area of land to the east of the main street for residential development. This area naturally drains away from both the existing collection system and public roads, towards the existing treatment plant site. The Local Area Plan proposes that these lands should be developed in conjunction with the construction of a new road that will provide access to them.

Consequently, it is proposed that these zoned lands will be serviced via a new gravity sewer constructed in conjunction with the access road by the developer(s). The gravity sewer can either be continued to the head of the treatment works via a wayleave through private lands, or a pumping station can be constructed within the development area to which the gravity sewer can discharge flows for forwarding to the public gravity system.

In the interim, if individual pockets of land are developed ahead of the construction of the access road, then the developers may have to construct individual pumping stations and rising main to the public gravity system to service the developments in the short-term.

It is known that Kerry County Council have been approached by local residents to extend the existing foul network southeast along the R555, where a significant amount of one-off housing has developed in a linear nature. An allowance is made in the cost estimates to extend the network as proposed (2,000m of 225mm diameter gravity sewer).

Consideration could be given to the use an alternative collection system such as vacuum collection sewer or a Septic Tank Discharge System (STEDS), which can be appropriate for use in small rural communities with low development density, where there is little or no existing infrastructure. Vacuum systems operate on the basis of generating negative pressures to draw wastewater through the network. STEDS collection systems operate by gravity, pressure, or a combination of both.

The main advantage that the alternative systems offers over a conventional gravity pressure system is that they can be laid at shallow depths to follow the natural topography (i.e. significantly smaller minimum gradients required) and that they utilise smaller diameter pipes. The disadvantage is that they have higher operating and maintenance costs.

Given the level and density of the existing development in Duagh, it is not considered that STEDS would be suitable. However, the existing sewer network in the village could be replaced and extended with a vacuum sewer system. Smaller bore sewers could be laid at shallower depth to follow the natural gradient. A single vacuum station could be constructed at the head of the proposed gravity trunk sewer to the new treatment plant to replace the two pumping station proposed as part of the conventional collection system described above.

However, for the purpose of this assessment it is assumed that a conventional gravity collection system will be provided .

10.4.3 Storm Sewer Network

Section 5.3(f) of the Brief identifies the need to “provide for foul sewage and storm drainage collection systems as separate systems to the greatest extent practicable“. Solely providing a foul network will not meet this criterion and will in time, it is suggested, result in a combined system.

As a consequence, it is proposed to provide a separate storm network to cater for runoff from impermeable areas within the development boundary.

The following Lloyd Davies formula was used to calculate the run off from the area in question.

Q = 2.78 Ap I

Where: Q =run off in litres/sec
Ap=impervious area in hectares.
I = rainfall intensity in mm/hr.

A rainfall intensity of 50mm/hr was applied, and an impermeability factor of 0.35 was assumed.

The area enclosed by the development plan boundary for Duagh is approximately 24.5ha, and the calculated run off using the above formula is calculated to be 1,197l/s. To cater for this runoff, the following storm collection system is required.

Table 10.2: Proposed Storm Sewer Network

Pipe Diameter (mm)	Location	Length (m)
300	Road	300
450	Road	300
600	Road/Field	324
Total Length		**924**

10.5 PROPOSED TREATMENT WORKS

10.5.1 Introduction

The existing treatment plant in Duagh discharges to the Glasha River. A detailed assessment of the assimilative capacity of the river was not possible due to lack of recorded water quality data, but an assessment of the available dilution was possible based on the following:-

Catchment Area to discharge point, from OS 1:50,000 mapping:	8.3km²
Estimated Specific 95-percentile Run-Off:	2 l/km²/s
Estimated 95-percentile flow: (8.3 x 2=)	16.6/s
Proposed future (2028) DWF from WWTP*:	1.1l/s
Available Dilution: (16.6/1.1=)	15.1

*excludes flow collected by proposed trunk sewer to proposed new WwTP location

This is less than the recommend dilution factor of 25 required to limit the downstream increase in BOD concentration to less than 1mg/l.

As a result it is proposed that treated effluent will be discharged to the River Feale near Duagh Bridge.

Consequently, it is proposed to provide a new treatment plant for Duagh near Duagh Bridge, to cater for a future (2028) design population of **570pe.**

10.5.2 Wastewater Treatment Load

The design criteria for the proposed treatment plant in Duagh are set out in Table 10.3 below.

Table 10.3: Design Criteria for Proposed Treatment Plant

Parameter	Unit	Design Criteria
Population Equivalent	nr	570
Per capita flow	l/c/d	180
Dry Weather Flow	m^3/d	103
Flow to Full Treatment 3DWF	m^3/d	309
BOD Load per Capita	kg/c/d	0.06
BOD Load per Day	kg/d	34.2

10.5.3 Details of Proposed Wastewater Treatment Plant

It is proposed to provide a new WwTP near Duagh Bridge, discharging to the River Feale. The plant will incorporate a treatment process that will produce effluent quality in compliance with current statutory regulations. The following legislation was considered in establishing the proposed discharge standards from the WwTP:-

- The River Feale downstream of Finuge Bridge is designated "sensitive" under the Third Schedule to the Urban Waste Water Treatment Regulations 2001. This is approximately 18km downstream of the proposed discharge from Duagh. The Regulations specify that discharges from agglomerations with a population equivalent of less than 2,000 to sensitive waters shall be subject to "appropriate treatment". This is defined as " treatment of urban waste by any process and or disposal system, which after discharge allows the receiving water to meet the relevant quality objectives and the relevant provisions of the directive and of other community directives"

- The Local Government (Water Pollution) Act, 1977 (Water Quality Standards For Phosphorus) Regulations, 1998 (SI No. 258 of 1998) oblige local authorities to maintain or improve the water quality of rivers by 2007 by reference to the Q-Rating (biotic index) or the concentration of molydbate reactive phosphate (MRP). These Regulations apply to the proposed discharge.

- The River Feale is a designated salmonid river under the EC (Quality of Salmonid Waters) Regulations 1988 (SI No. 293 of 1988) and so these regulations should apply to the proposed discharge.

- The River Feale is not a designated bathing water under the Quality of Bathing Waters Regulations 1992 (SI No. 155 of 1992) and subsequent amendments – (SI No. 145 of 1994, SI No. 230 of 1996, SI No. 177 of 1988 and SI No. 22 of 2001).

- The EC (Quality of Shellfish Waters) Regulations 2006 (S.I. No. 268 of 2006) do not apply to the proposed discharge.

In order determine the suitability of the River Feale for discharges from the new WwTP it will be necessary to complete a waste assimilative capacity assessment at the proposed point of discharge. This requires water quality data, which is currently unavailable. Consequently we will complete an assessment based on available dilution at the 95-percentile flow.

There is no flow data available for the River Feale at Duagh Bridge. The nearest hydrometric station is station 23006 at Abbeyfeale, approximately 6.7km upstream, where the EPA give an estimated 95-percentile flow of 0.52m³/s. This is however upstream of the confluence of two significant tributaries, the Allaghaun River and Oolagh River.

The nearest hydrometric station to the confluence of the Allaghaun River and River Feale is station 23005, where the EPA give an estimated 95-percentile flow of 0.05m³/s. The nearest hydrometric station to the confluence of the Oolagh River and River Feale is station 23007, where the EPA give an estimated 95-percentile flow of 0.04m³/s. Hence, the 95-percentile flow of the River Feale downstream of the confluences of these tributaries is conservatively estimated as 0.61m³/s, or 610l/s.

The 2028 design DWF from the proposed treatment plant is 1.2l/s. The available dilution at 95-percentile flow at the proposed discharge point is 610/1.2 = 508, which is substantially greater than the 25 required to limit the increase in BOD in the receiving water to less than 1mg/l.

Based on the available dilution, it is proposed to provide secondary treatment to cater for existing and future wastewater discharges from Duagh to meet the 25/35 discharge standards as prescribed in Part 2 of the Second Schedule to the Urban Waste Water Treatment Regulations. It is assumed that there is no requirement for incorporating specific nutrient removal into the process, given the available dilution factor, although this can only be stated with certainty following an assessment of the assimilative capacity of the water body based on current water quality data.

The European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003), giving effect to the EU Water Framework Directive 2000/60/EC, require public authorities to establish an integrated monitoring and management system for all waters, to develop a dynamic programme of management measures and to produce a River Basin Management Plan. This requirement is being implemented through the establishment of river basin management projects for River Basin Districts, of which there are eight in Ireland. The River Feale is within the Shannon International River Basin District (SHIRBD). The Management System for SHIRBD is currently under development and no standards have yet been prescribed.

It is intended that a Draft River Basin Management Plan be released for public consultation in 2008, but to date this has not been published. When agreed, the Plan and its associated Programme of Measures may have an impact on the eventual discharge standards specified for a proposed WwTP at Duagh.

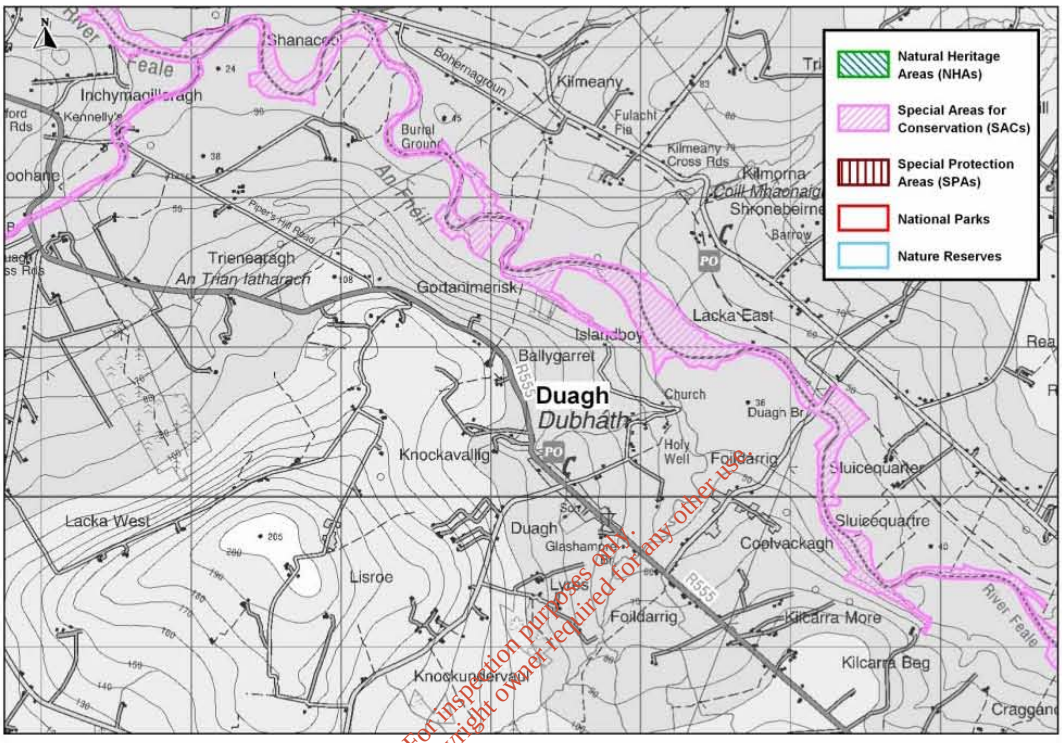
10.5.4 Sludge

It is proposed to incorporate a sludge thickener into the treatment process, which will assist the sludge to thicken to 3% dry solids. The sludge production from the proposed 570 pe extended aeration plant is estimated as **1.1m³/day** based on a 95% BOD removal efficiency and 1 Kg of dry solids /kg BOD removed

10.5.5 Special Area of Conservation

As can be seen from Figure 10.4 the River Feale forms part of the Lower River Shannon Special Area of Conservation (Site Code 002165).

Figure 10.4: Special Area of Conservation near Duagh



10.6 COSTS

With reference to the preceding sections the costs of the recommended works is summarised in Table 10.4 as follows:-

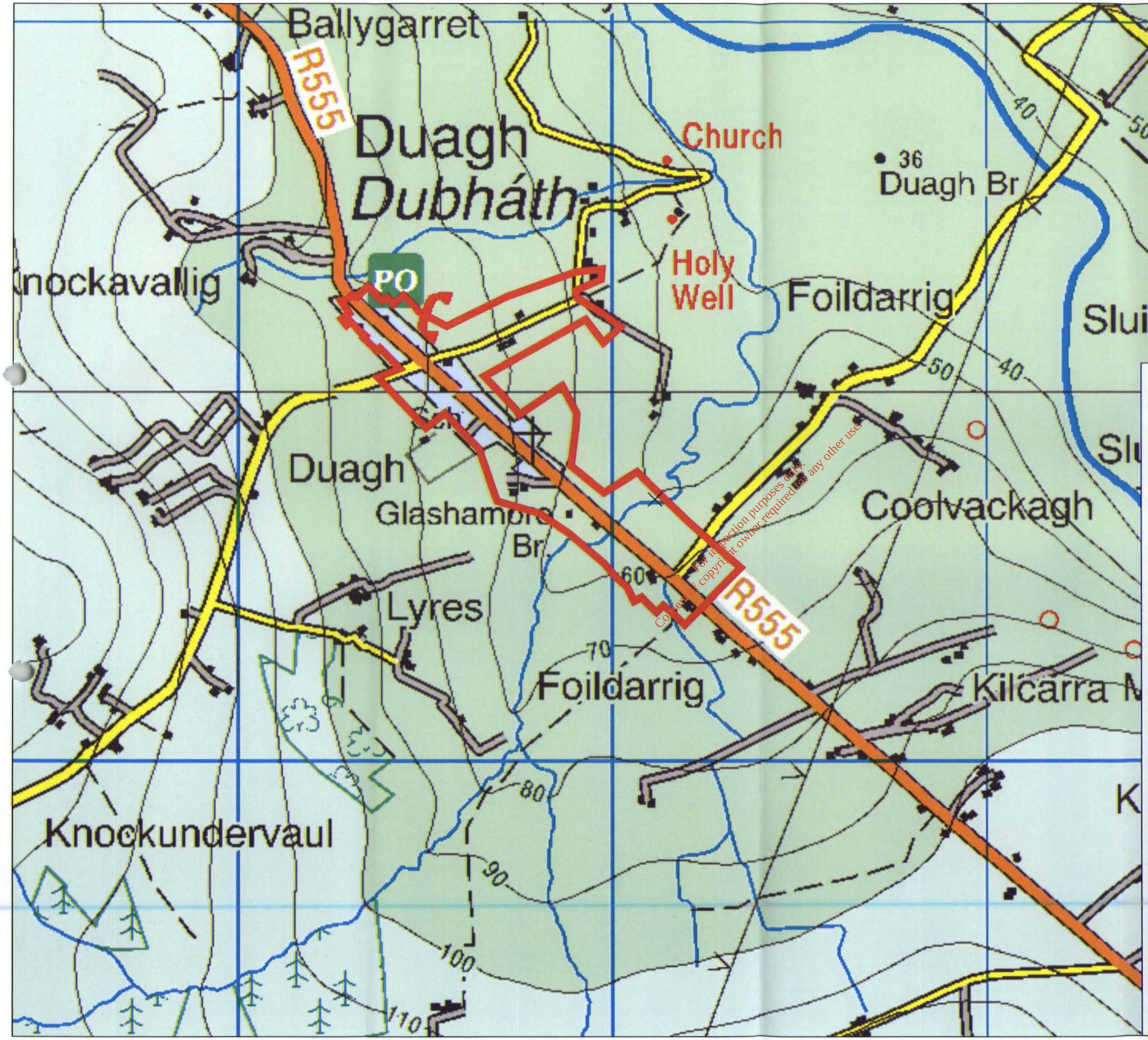
Table 10.4: Summary of Estimated Costs

Description					Estimated Costs (€)
Foul Collection Network					
Pipe size	**Location**	**Length**	**Cost/meter**	**Total cost**	
80	Road	440	€100	€44000	1,043,160.00
100	Road	330	€150	€49,500	
225	Road	4998	€170	€849,660	
Pumping Station		2 No	€50,000	€100,000	
Total foul collection system cost				€1,043,160	
Storm Collection Network					
Pipe size	**Location**	**Length**	**Cost/meter**	**Total cost**	185,280.00
300	Road	300	€180	€54,000	
450	Road	300	€200	€60,000	
600	Road	324	€220	€71,280	
Total Storm collection system cost				€185,280	
Sub-Total					**1,228,440.00**
WwTP (570 pe)					456,000.00
Sub-Total					**1,684,440.00**
Preliminaries (15%)					252,666.00
Sub-Total					**1,937,106.00**
VAT @ 13.5%					261,509.31
Estimated Total Contract Cost					**2,198,615.31**
Non Contract Costs (15%)					329,792.30
Land Acquisition Costs					110,000.00
Estimated All In Capital Costs					**2,638,407.61**

The estimated all-in capital cost for the proposed scheme is **€2,638,407.** This equates to a unit cost of €2,638,407/105= €25,128 per existing domestic connection and €2,638,407/189 = €13,960 per projected 2028 domestic connection.

List of Drawing Numbers

EPA No	Description	Ref
B.1-D01	Duagh Agglomeration (Discovery)	Section B1
B.1-D02	Duagh Agglomeration (Vector)	Section B1
B.1-D03	Waste Water Works	Section B1
B.2-D04	Location of Waste Water Treatment Plant	Section B2
B.2-D05	Layout of Waste Water Treatment Plant	Section B2
B.3-D06	Location of Primary Discharge	Section B3
C.1-D07	Layout of Waste Water Treatment Plant	Section C1
C.1-D08	Flow Diagram of Waste Water Treatment Plant	Section C1



LEGEND:

Agglomeration Boundary

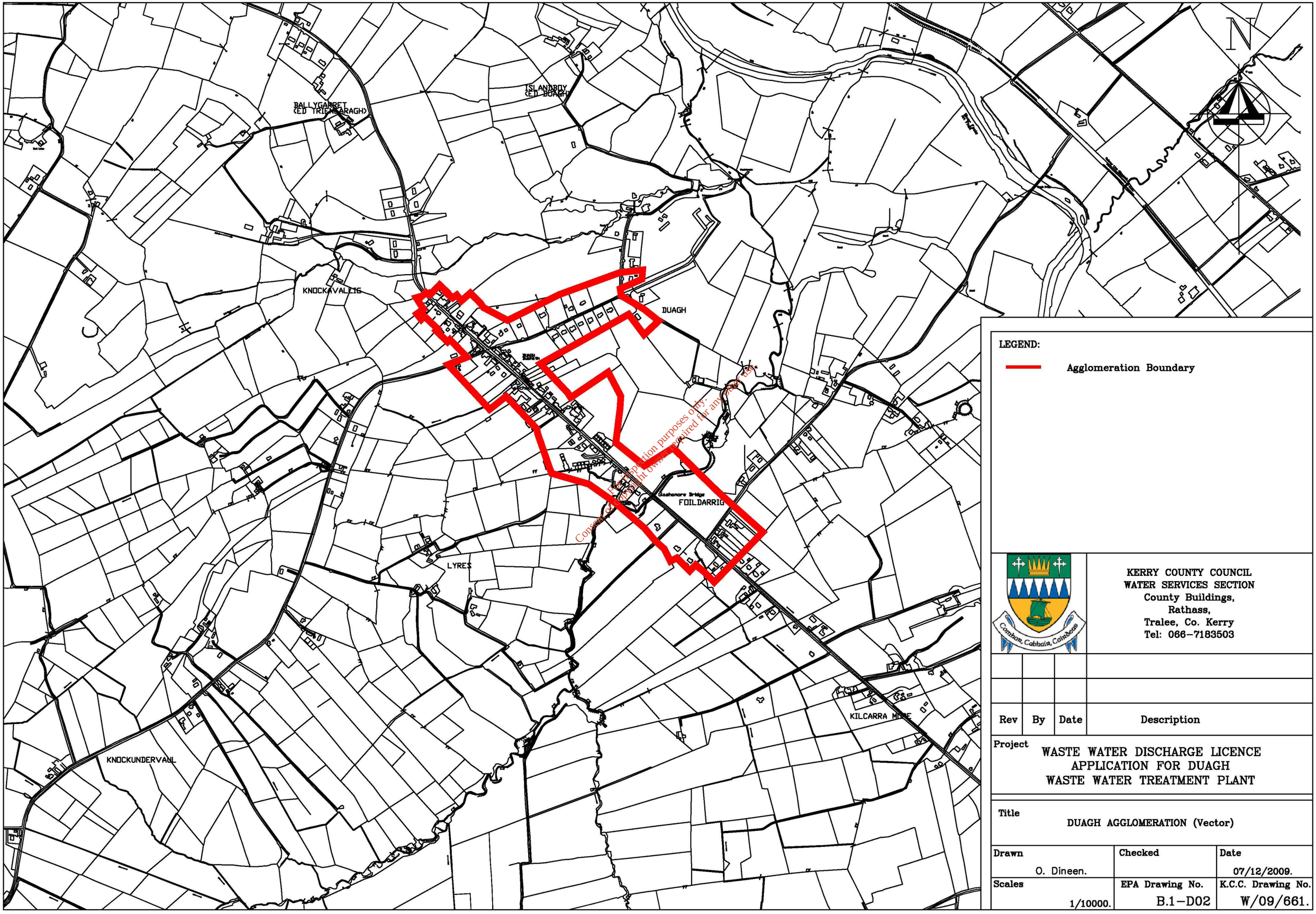
KERRY COUNTY COUNCIL
WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066–7183503

Rev	By	Date	Description

Project: WASTE WATER DISCHARGE LICENCE APPLICATION FOR DUAGH WASTE WATER TREATMENT PLANT

Title: DUAGH AGGLOMERATION (Discovery)

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
1/10000.	B.1–D01	W/09/662.



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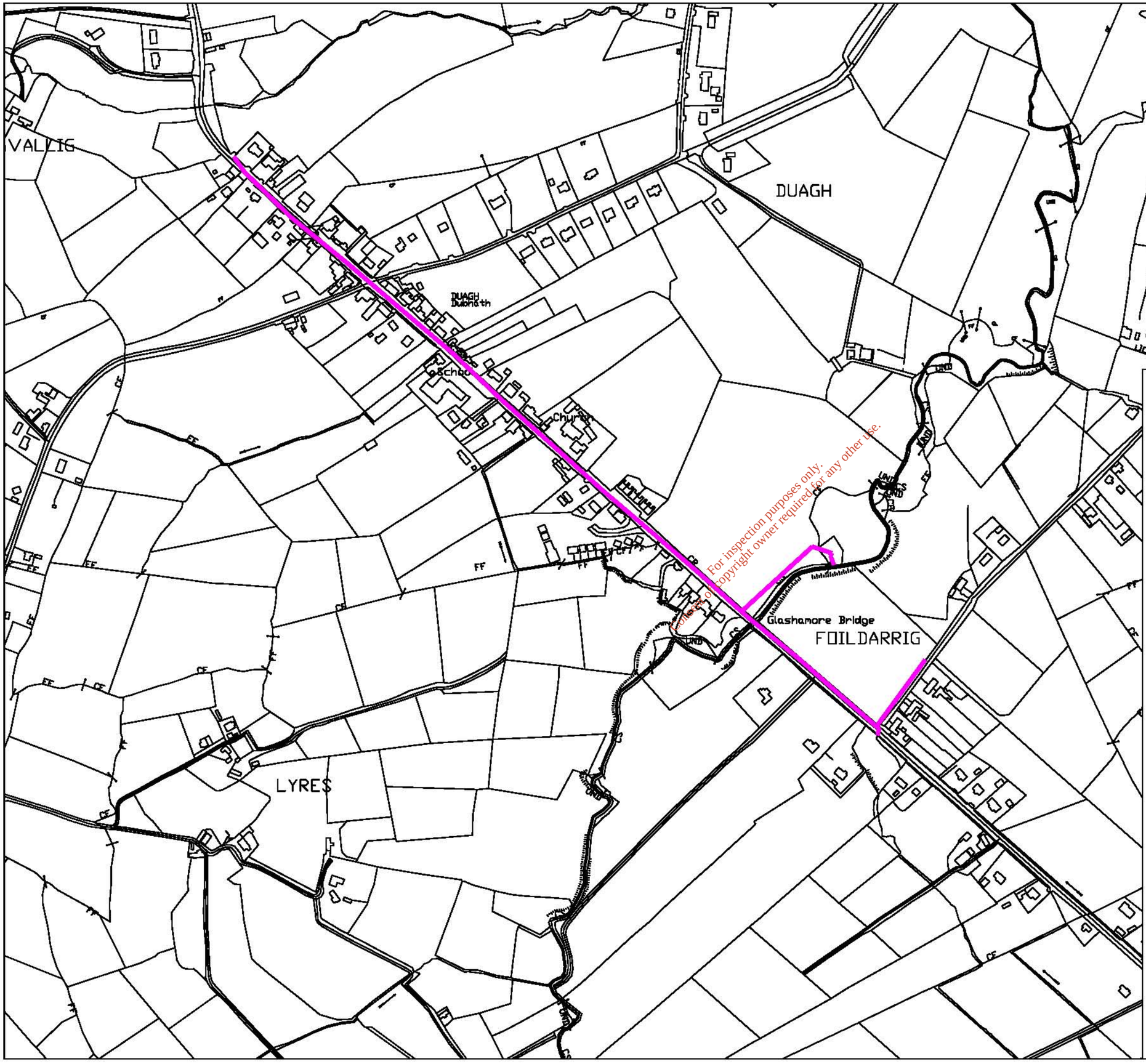
WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066-7183503

Rev	By	Date	Description

Project: WASTE WATER DISCHARGE LICENCE APPLICATION FOR DUAGH WASTE WATER TREATMENT PLANT

Title: DUAGH AGGLOMERATION (Vector)

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
1/10000.	B.1-D02	W/09/661.



LEGEND:

Sewer Network

KERRY COUNTY COUNCIL
WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066-7183503

Rev	By	Date	Description

Project

WASTE WATER DISCHARGE LICENCE
APPLICATION FOR DUAGH
WASTE WATER TREATMENT PLANT

Title

WASTE WATER WORKS

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
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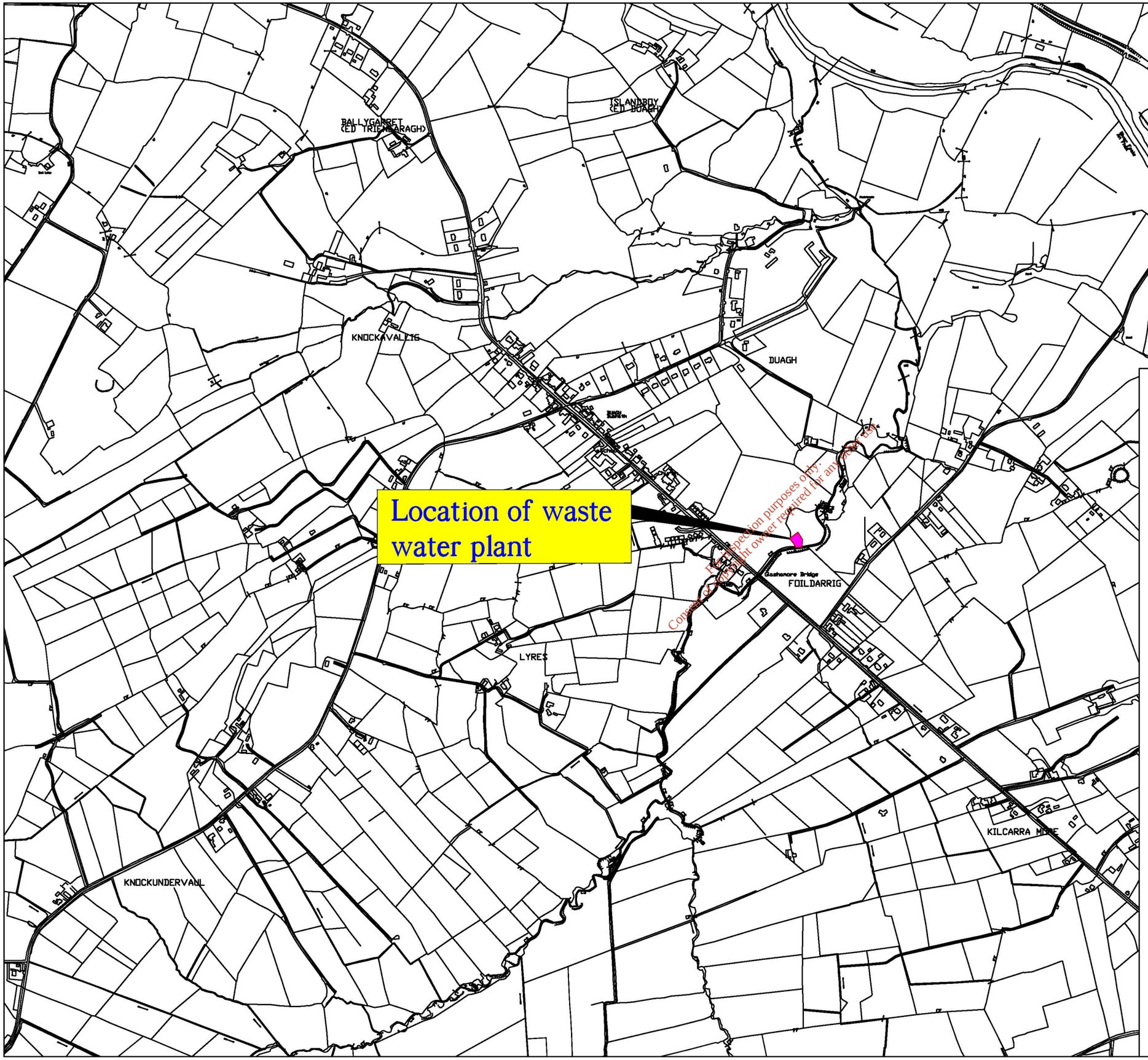


LEGEND:

Site Boundary

KERRY COUNTY COUNCIL
WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066-7183503

Rev	By	Date	Description

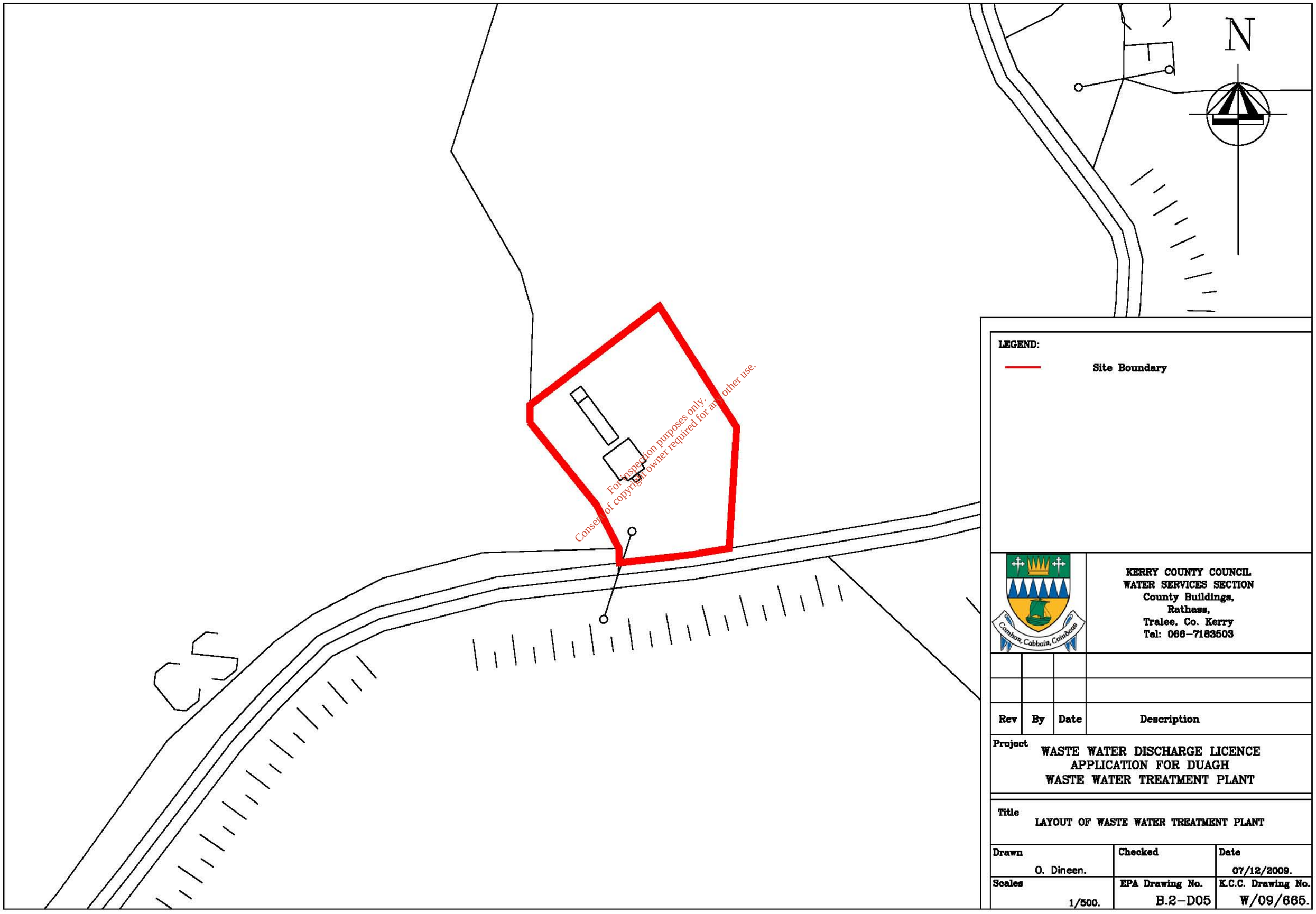
Project

WASTE WATER DISCHARGE LICENCE APPLICATION FOR DUAGH WASTE WATER TREATMENT PLANT

Title

LOCATION OF WASTE WATER TREATMENT PLANT

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
1/10000.	B.2-D04	W/09/664.



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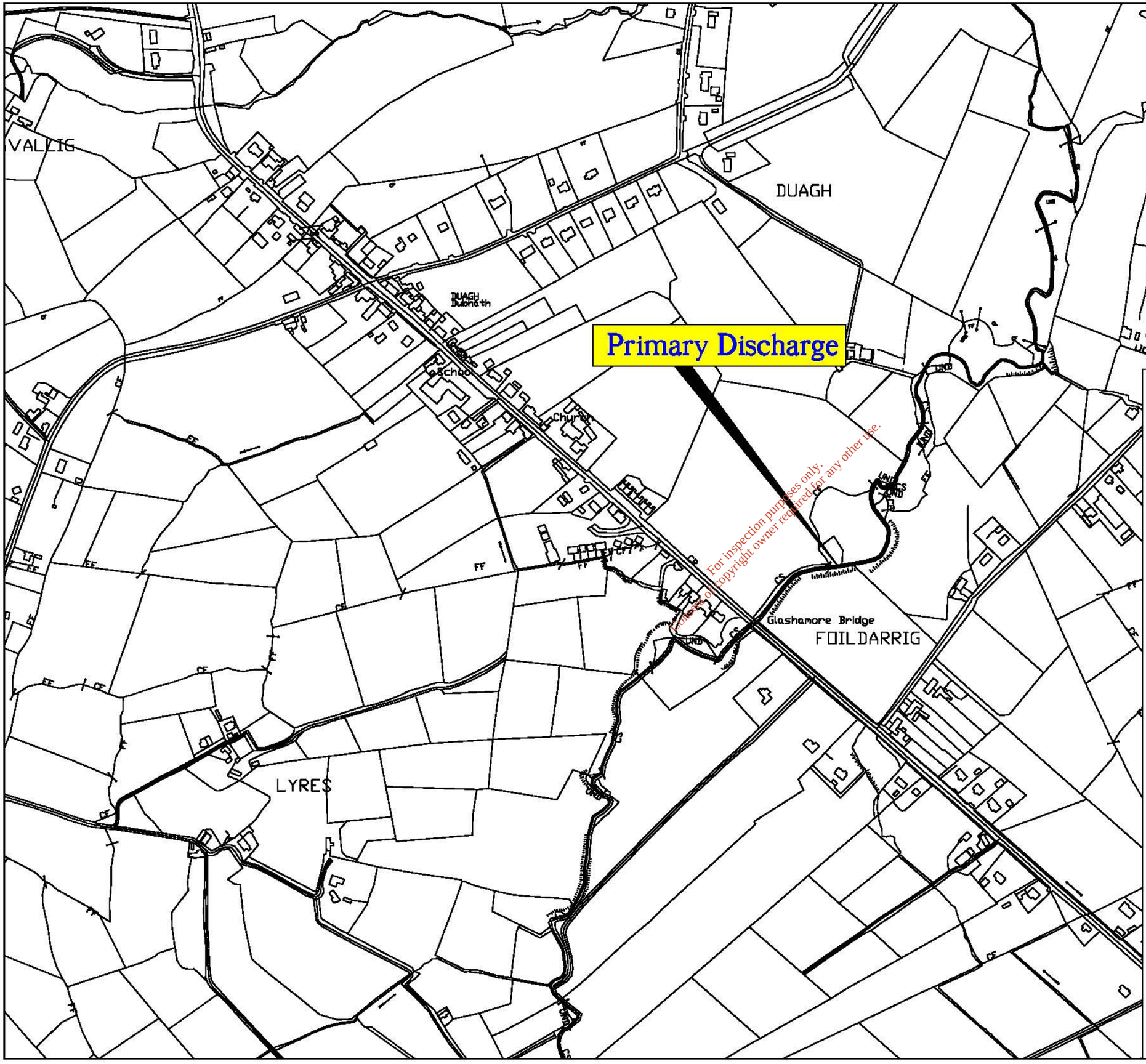
WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066-7183503

Rev	By	Date	Description

Project
WASTE WATER DISCHARGE LICENCE
APPLICATION FOR DUAGH
WASTE WATER TREATMENT PLANT

Title
LAYOUT OF WASTE WATER TREATMENT PLANT

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
1/500.	B.2-D05	W/09/665.



LEGEND:

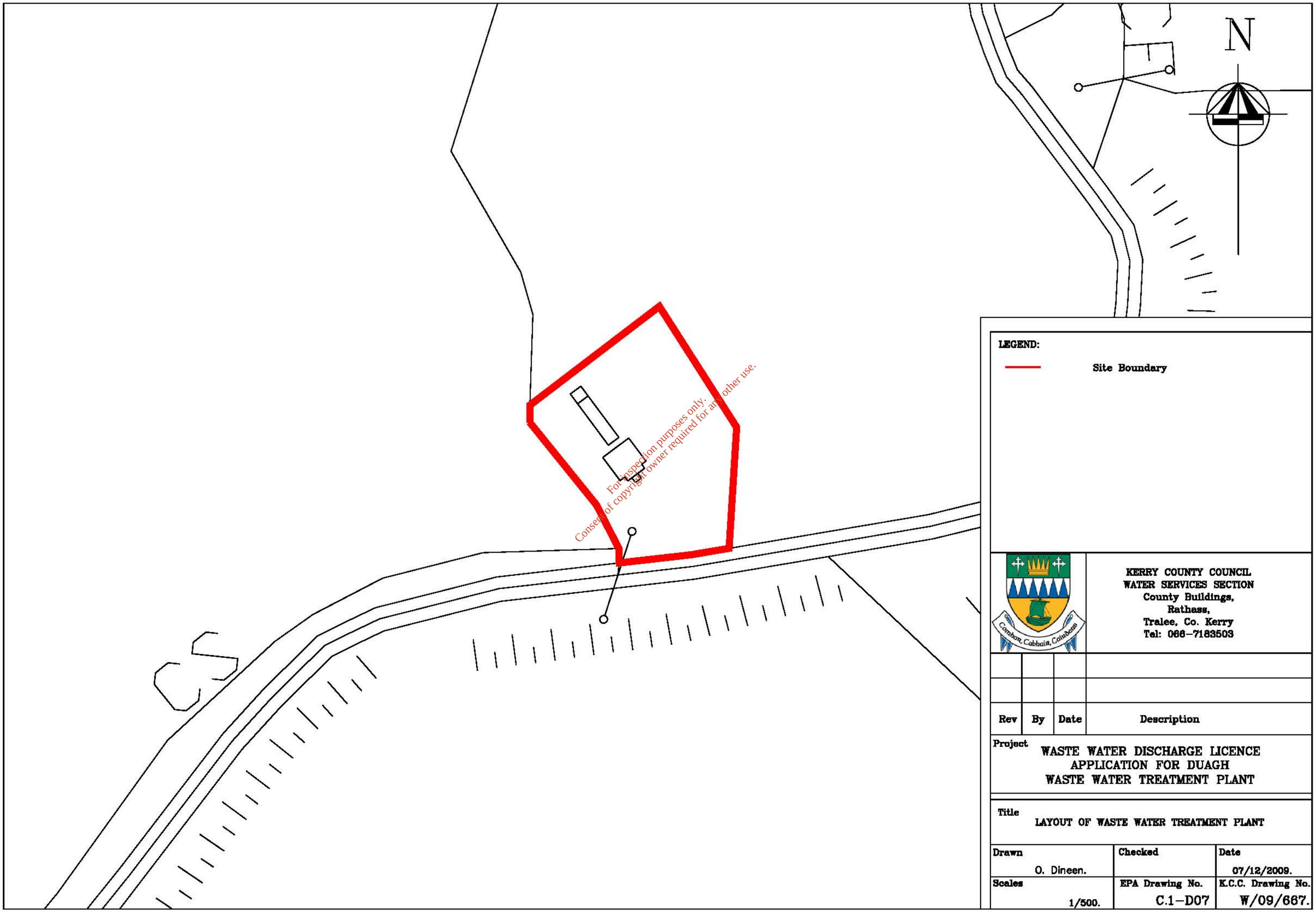
KERRY COUNTY COUNCIL
WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066-7183503

Rev	By	Date	Description

Project
WASTE WATER DISCHARGE LICENCE
APPLICATION FOR DUAGH
WASTE WATER TREATMENT PLANT

Title
LOCATION OF PRIMARY DISCHARGE

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
1/5000.	B.3-D06	W/09/666.



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WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066-7183503

Rev	By	Date	Description

Project
WASTE WATER DISCHARGE LICENCE
APPLICATION FOR DUAGH
WASTE WATER TREATMENT PLANT

Title
LAYOUT OF WASTE WATER TREATMENT PLANT

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
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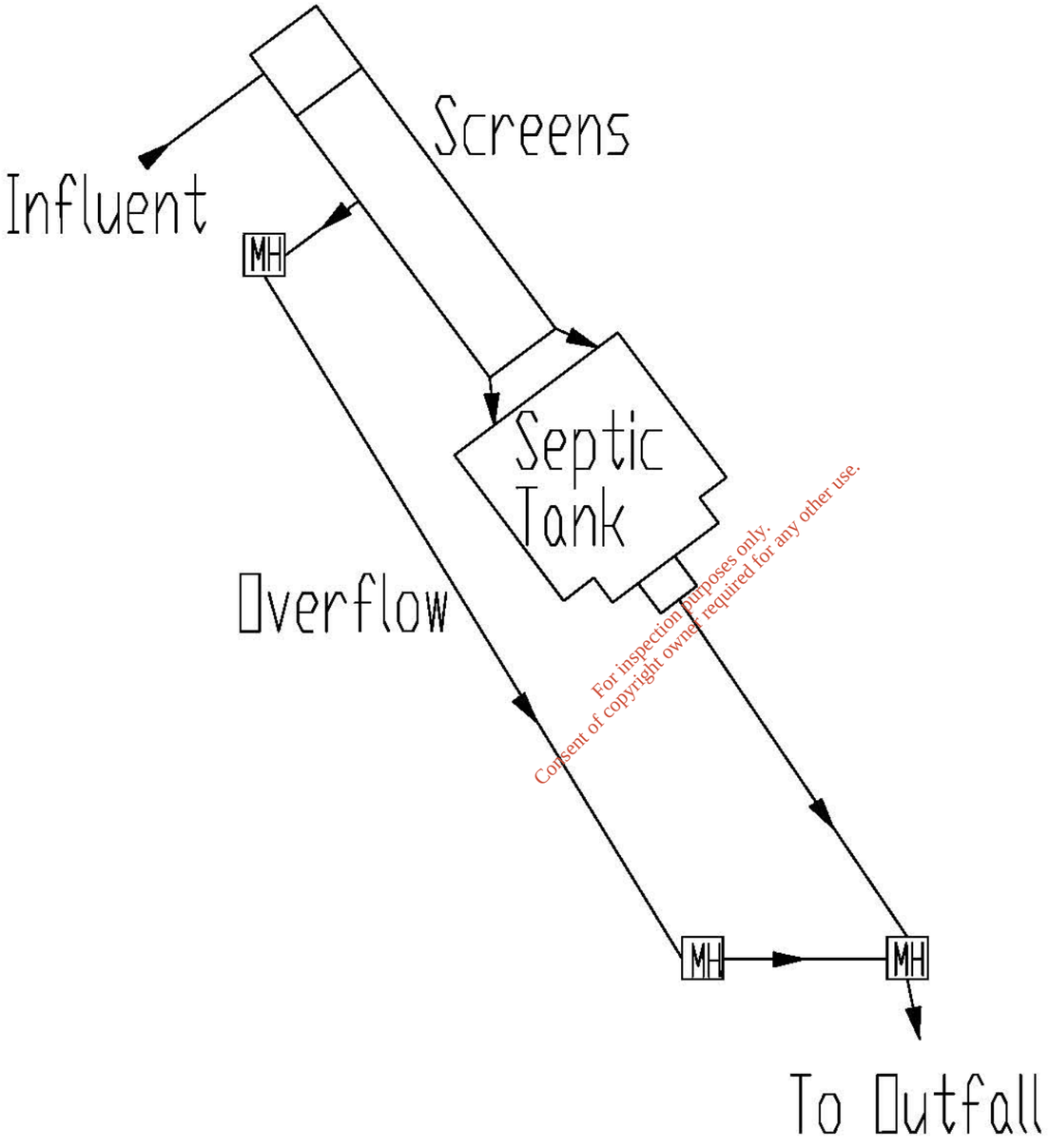

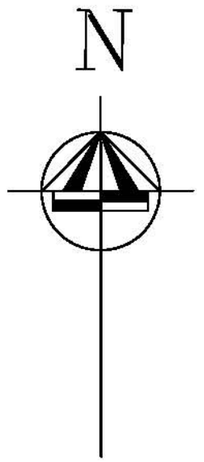

LEGEND:

KERRY COUNTY COUNCIL
WATER SERVICES SECTION
County Buildings,
Rathass,
Tralee, Co. Kerry
Tel: 066–7183503

Rev	By	Date	Description

Project
WASTE WATER DISCHARGE LICENCE
APPLICATION FOR DUAGH
WASTE WATER TREATMENT PLANT

Title
LAYOUT OF WASTE WATER TREATMENT PLANT

Drawn	Checked	Date
O. Dineen.		07/12/2009.
Scales	**EPA Drawing No.**	**K.C.C. Drawing No.**
Not to scale.	C.1–D08	W/09/668.