



Clare County Council

KILLALOE BYPASS, SHANNON BRIDGE CROSSING AND R494 IMPROVEMENT

RESPONSE TO REQUEST FOR FURTHER INFORMATION FROM AN BORD PLEANÁLA



North Tipperary County Council



25th May 2012



Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement

**Response to Request for Further Information from An Bord
Pleanála (letter ref 03.HA0038, dated 4th May 2012)**

25th May 2012

Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement

Response to Request for Further Information from An Bord Pleanála (letter ref 03.HA0038, dated 4th May 2012)

Contents

ABP Item No. 1	Sustainable Drainage Systems	1
ABP Item No. 2	Pollution Control	12
ABP Item No. 3	Design and Method Statements	14
ABP Item No. 4	Mammal Passage at Watercourse	19
ABP Item No. 5	Extent of Salmon and Lamprey Habitat.....	21
ABP Item No. 6	Vibration Impact	23
ABP Item No. 7	Cumulative Effects	27
ABP Item No. 8	Derogation Licences.....	31
ABP Item No. 9	Wet Woodland Habitat	32
ABP Item No. 10	Loss of Linear Features.....	41

Appendix A – Figures

Appendix B – Derogation Licence

ABP Item No. 1

Sustainable Drainage Systems

“It is stated that a sustainable drainage system is proposed to be installed on the road (page 7/31 of the Environmental Impact Statement and page 24 of the Natura Impact Statement) and that this system will prevent significant pollution to surface receiving waters. Some details of the proposed water quality and treatment methods proposed are detailed in 3.6.5 of the EIS, (page 3/13) and it is noted that 3.6.5 of the EIS states that ‘many factors affect the selection of appropriate pollution control facilities including soil characteristics, traffic flows and the sensitivity of the receiving environment and the expected constituents of runoff’. Further information regarding the proposed sustainable drainage system and the type of system proposed at each location is required having regard to the potential for differing types of system to impact on receiving waters and potentially impact on identified Natura 2000 sites and to support the conclusion contained in the NIS of no adverse impact on the conservation objectives of the cSAC. Cross referencing of any statements contained in the NIS with relevant sections of the EIS and submitted additional material on foot of this further information request is required”.

1.1 Response

This response seeks to provide clarification regarding the information reported in the following sections of the Environmental Impact Statement (EIS) and the Natura Impact Statement (NIS);

EIS Section 3.6.5 (EIS page 3/13) – Water Quality and Treatment

EIS Section 7.2.5 (EIS page 7/30 & 7/31) – Mitigation within the SAC (*bullet points 7 & 8*)

EIS Section 7.5.8 (EIS page 7/99, 7/100 & 7/101) – Mitigation Measures, Road Runoff (*Hydraulic & Hydrochemical Impacts*)

NIS Section 3.3 (NIS page 7 & 8) – Road Drainage System (*Water Quality and Treatment*)

NIS Section 9.3 (NIS page 24) – Mitigation Measures (*Mitigation within SAC*)

1.2 Proposed Sustainable Road Drainage Systems

The road drainage for the Killaloe Bypass, Shannon Bridge Crossing and the R494 Improvement will include a number of sustainable road drainage systems. These systems will prevent significant pollution to surface receiving waters and in particular the River Shannon cSAC. There is one direct outfall to the River Shannon with all other outfalls to tributary streams or rivers of the River Shannon. The drainage systems proposed to be constructed are as follows:

- Attenuation Ponds/Constructed Wetlands
- Filter Drains
- Open Ditches/Over the Edge Drainage
- Kerb, Gully & Carrier Pipe Systems
- Petrol Interceptors

Further details of these drainage systems are outlined below. The proposed drainage system will achieve the percentage pollution reductions in runoff as noted in **Table 1.1** below. These figures are reported on page 24 of the NIS and page 7/31 of the EIS.

Pollutant	% Removal
Total Suspended Solids	85%
Heavy metals	50 – 80%
Chemical Oxygen Demand	50%
Hydrocarbons	90%

Table 1.1 – Pollutant Percentage Removal

Soil conditions on the scheme generally comprise a thick glacial overburden of firm to very stiff clays and granular deposits which overlay the rock in the region (Refer EIS, pages 7/103 to 7/105). These soil characteristics are not considered a major issue in terms of selection of sustainable drainage systems. The use of a combination of filter drains, kerb and gully solutions and over the edge/open ditch solutions can be used along the scheme.

In terms of traffic flows, it is predicted that the traffic in the 2032 Design Year will vary between 3,100 and 7,500 Annual Average Daily Traffic (AADT). It is anticipated that the build up of pollutants from these traffic levels will be low however due to the sensitive nature of the receiving environment, road runoff will be treated to achieve the removal rates as noted in **Table 1.1** above.

In terms of accidental spillage, the risk of such an event occurring is deemed low, considering the predicted traffic volumes. Notwithstanding this, pollution control storage for 50,000l (50m³) will be provided at all outfall points along this scheme.

1.2.1 Constructed Wetland /Attenuation Ponds

Constructed Wetland /Attenuation Ponds will be provided at the outfalls as shown on EIS Figures 3.1 to 3.18 and on the attached drainage drawings (**Appendix A - Figures RFI-1.6 to 1.14**). The proposed ponds/wetlands will form the main treatment for road runoff in the removal of suspended solids, hydrocarbons and associated heavy metals through the physical processes of settlement and filtration in conjunction with open ditches, filter drains and bypass interceptors. These arrangements all facilitate the sedimentation process which will significantly reduce the pollutant load discharging to the nearby Natura 2000 sites.

The wetlands will be designed to contain water at all times and will be constructed with a shape and layout to reflect the overall pattern and scale of the surrounding landscape as indicated on **Plates 1.1 and 1.2** below. Geometric shapes and steep uniform banks will be avoided with gently sloping side slopes.. The ponds will be planted with appropriate vegetation such as mace reed, pond weeds, flote-grass and other locally found species. A treatment forebay will be provided at the inlet and suitably planted to promote the removal of contaminants as indicated on **Plate 1.3** below. Road surface water runoff will pass from the forebay to the main body of the pond via infiltration through a soil layer and filter material. These vegetated forebay areas will be sized to cater for 10% of the peak flow from a five year storm. The wetland areas will provide substantial aesthetic value and encourage the establishment of wildlife habitat. The construction of wetlands will be in accordance with the 'DMRB HA 103/06 Vegetated Drainage Systems for Highway Runoff'. These pollution control measures will ensure clean water discharge to the sensitive receiving waters of the Natura 2000 sites. Typical pollutant removal rates for constructed wetlands are indicated in **Table 1.2** below.

Pollutant	Removal (%)
Total Suspended Solids	60-85
Copper	50-80
Hydrocarbons	50-85

Table 1.2 – Pollutant Removal Rates (Constructed Wetlands)
Sources: *Greater Dublin Strategic Drainage Study (GSDSDS), Mudge & Ellis (2001), Bruen et al (2006)*

In terms of storm water storage, the wetlands will be designed to accommodate a storm with a minimum return period of one in fifty years. The discharge of the proposed road drainage system to receiving water courses will be attenuated to ensure that the peak flow within the water course is not increased. Flows from the wetland/treatment ponds will be restricted to existing green-field runoff rates. The layout of a typical pond/wetland is indicated on **Plate 1.3** below.



Plates 1.1 & 1.2 – Typical Constructed Wetlands/Attenuation Ponds

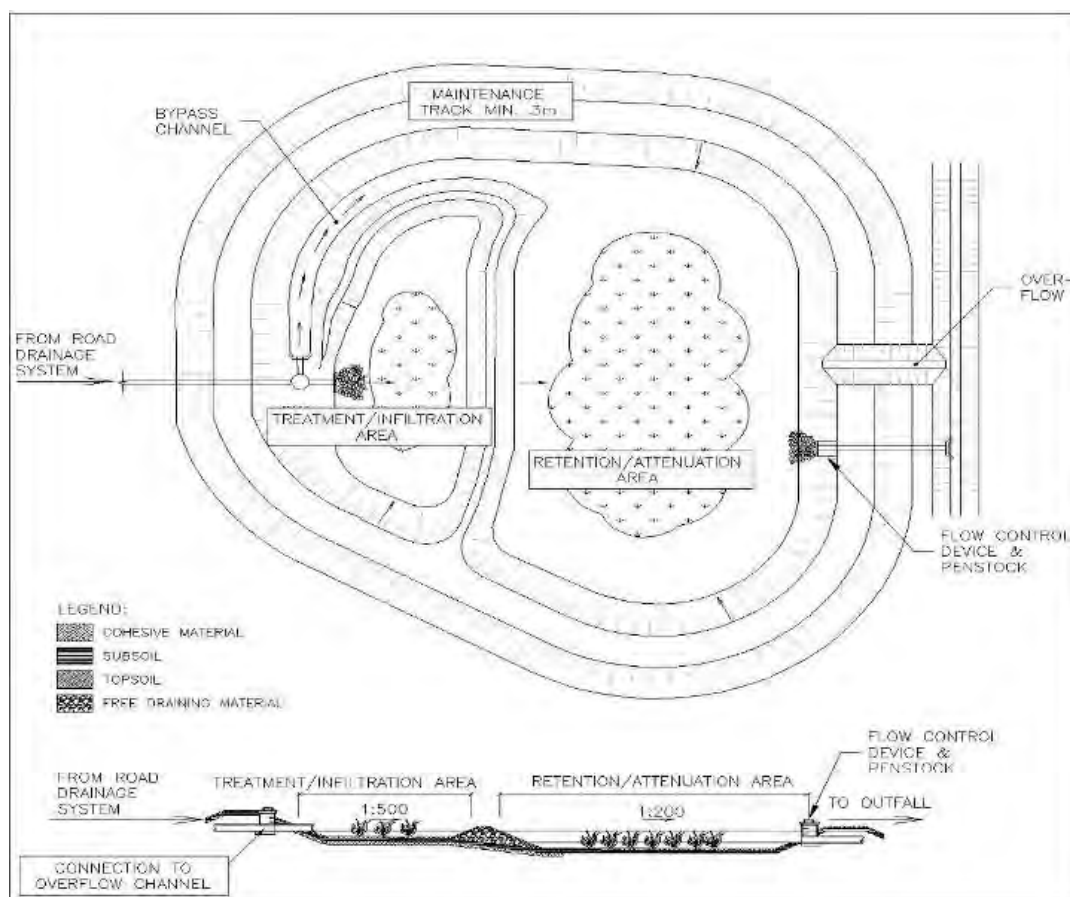


Plate 1.3 - Typical Layout of a Constructed Wetland/Attenuation Pond

1.2.2 Filter Drains

Filter drains are proposed to be constructed along the Killaloe Bypass and sections of the R494 Improvement where the road fronts onto agricultural lands. A filter drain is a gravel filled trench (as shown below on **Plate 1.4**), generally with a perforated pipe at the base which conveys runoff to a drain or watercourse.



Plate 1.4 – Typical Filter Drain

A typical cross section through a filter drain is indicated on **Plate 1.5** below.

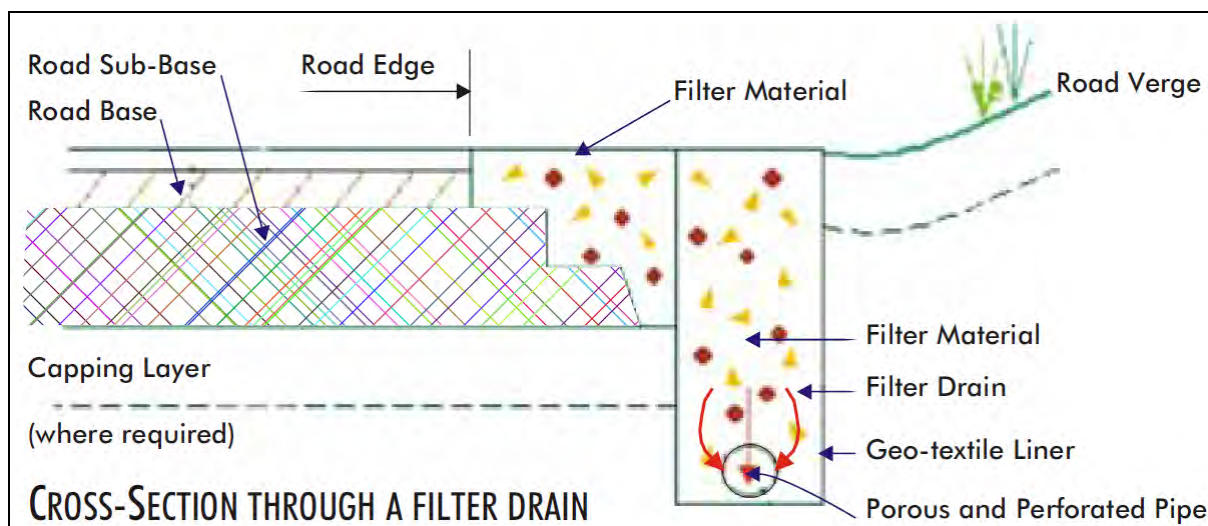


Plate 1.5 – Typical Cross Section through Filter Drain

Filter drains provide attenuation and also trap sediment. Filter drains will provide treatment of road run-off and will form the first component of the treatment train. They can also act as an infiltration system with pollutants being filtered out or broken down by bacteria as the groundwater is recharged. Typical pollutant removal rates for filter drains are indicated in **Table 1.3** below.

Pollutant	Removal (%)
Total Suspended Solids	85-90
Total Lead	80-90
Total Zinc	70-90
Hydrocarbons	70-90
COD	60

Table 1.3 – Pollutant Removal Rates (Filter Drains)

Sources: GSDS, Mudge & Ellis (2001), Bruen et al (2006), Pollution of Groundwater and Soil by Road and Traffic Sources Dispersal Mechanism, Pathways and Mitigation Measures 2002 (POLMIT)

Where the road is drained by a filter drain, flows shall pass through a petrol interceptor and a treatment/attenuation pond prior to discharging to the receiving watercourse.

1.2.3 Over the Edge Drainage/Interceptor Ditches

A combination of over the edge drainage with interceptor ditches at the toe of embankments will be used along the R494 where the road fronts onto agricultural lands. An interceptor ditch will be constructed similar to that shown on **Plates 1.6 & 1.7** below with appropriate planting. An open ditch can be made act as a swale by slowing down the flows by use of a baffle. This form of road drainage slows down the rate of runoff and thereby encourages the settlement and removal of suspended solids from the road runoff. Typical pollutant removal rates are indicated in Table 1.4 below.

Pollutant	Removal (%)
Total Suspended Solids	60-90
Metals	50-80
Hydrocarbons	70-90
Total Organic Content	50-60

Table 1.4 – Pollutant Removal Rates (Interceptor Ditches/Swales)
Sources: GSDS, POLMIT (2002), Schueler et al (1992)



Plate 1.6 & 1.7 – Typical Planted Open Ditches (Over the Edge Drainage)

1.2.4 Kerb, Gully & Carrier Pipe System

A sealed kerb and gully system with a carrier pipe is proposed to be constructed along the sections of the scheme adjacent to residential properties and junctions and in areas traversing the Lower Shannon cSAC (Ref. EIS Section 7.5.8, page 7/101). All gullies will incorporate a ‘gullypot’, a small sump permanently full of water, intended to trap sediment as indicated on **Plate 1.8** below.

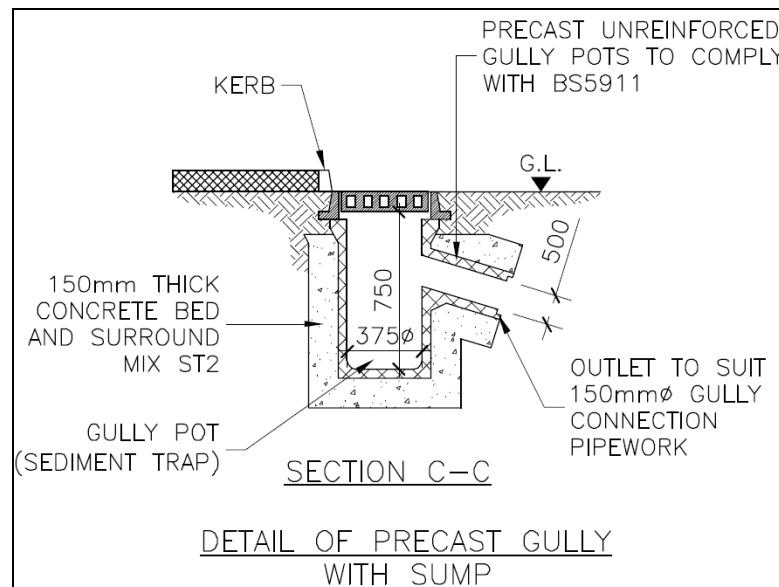


Plate 1.8 – Gully with Sediment Trap

Typical pollutant removal rates for a kerb and gully system are indicated in **Table 1.5** below. Where provided, a kerb and gully system will act as the first component of the water treatment train and combined with a constructed wetland will be effective in the removal of pollutants from road runoff.

Pollutant	Removal (%)
Total Suspended Solids	10-30
Metals	10-30
Hydrocarbons	10-30
COD	20

Table 1.5 – Pollutant Removal Rates (Kerb, Gully & Carrier Pipe System)
Sources: POLMIT, 2002 & Bruen et al (2006)

1.2.5 Bypass Interceptor/Downstream Defender

A Class 2 bypass interceptor will be constructed at all outfalls along the scheme similar to that shown on **Plates 1.9 & 1.10** below (Ref. Page 26 of NIS & Page 3/13 EIS). The bypass interceptor will be located downstream of all constructed wetlands/attenuation ponds and will fully treat the majority of all normal rainfall events. Where attenuation is not required, a Downstream Defender will be provided in conjunction with the bypass interceptor. A Downstream Defender is a hydrodynamic separator designed to remove sediment, floatables and associated pollutants from storm water. A downstream defender can remove 80% removal of grits and silts down and light oils. A typical cross section through a Downstream Defender is indicated on **Plate 1.11** below.



Plate 1.9 – Pollution Bypass Separator
(Example at N59 in Connemara adjacent to Derrylea Lake SAC)



Plate 1.10 – Bypass Separator

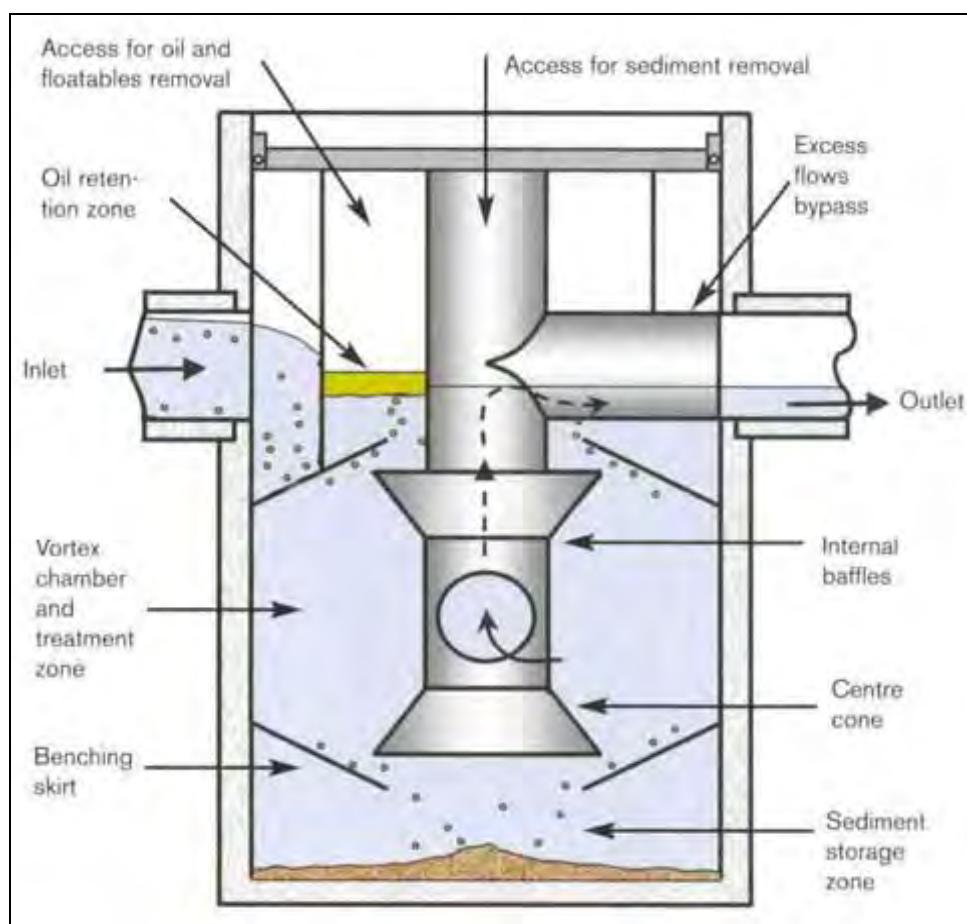


Plate 1.11 – Downstream Defender

1.3 Proposed Outfalls and Catchments

1.3.1 Killaloe Bypass

Outfall Number OA1 - Catchment A

This outfall is at a tributary stream of the River Shannon and is located at the northern end of the Killaloe Bypass at Kincora Junction. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment A extends between Ch. 0+000 K and Ch. 0+660 K of the Killaloe Bypass. The majority of this section of the Killaloe Bypass will be drained by a filter drain system however a sealed kerb and gully system will be constructed along the first 60m of the catchment between Ch. 0+600 K and Ch. 0+660 K to protect the underlying aquifer. The extent of Catchment A is indicated on **Figure RFI-1.1**. The location of Outfall OA1 is indicated on **Figure RFI-1.6**. Both drawings are included in **Appendix A** of this report.

Outfall Number OA2 - Catchment B

This outfall is at a tributary stream of the River Shannon and is located at the southern end of the Killaloe Bypass at Ch. 1+750 K. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment B extends between Ch. 0+660 K and Ch. 1+800 K of the Killaloe Bypass. The first 240m (Ch.0+660 K and Ch. 0+900 K) of this catchment will be drained by a sealed kerb and gully system to protect the underlying aquifer. The remaining section, between Ch. 0+900 K and Ch. 1+800 K, will be drained using a filter drain system. The extent of Catchment B is indicated on **Figure RFI-1.2**. The location of Outfall OA2 is indicated on **Figure RFI-1.7**. Both drawings are included in **Appendix A** of this report.

Outfall Number OA3 - Catchment C

This outfall to a tributary stream of the River Shannon and is located at the southern end of the Killaloe Bypass at Ch. 2+029 K. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment C extends between Ch. 1+800 K and Ch. 2+029 K of the Killaloe Bypass. This section of the Killaloe Bypass will be drained by a filter drain system. The extent of Catchment C is indicated on **Figure RFI-1.2**. The location of Outfall OA3 is indicated on **Figure RFI-1.7**. Both drawings are included in **Appendix A** of this report.

1.3.2 Shannon Bridge Crossing

Outfall Number OB1 - Catchment D

This outfall is at a tributary stream of the River Shannon and is located at Ch. 0+130 S along the Shannon Bridge Crossing section of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment D comprises the entire length of the Shannon Bridge Crossing (Ch. 0+000 S and Ch. 0+870 S). The Shannon Bridge Crossing will be drained by a kerb and gully system while a proprietary kerb bridge drainage system will be used on the bridge section protecting both the underlying aquifer (between Ch. 0+750 S and Ch. 0+860 S) and the Lower River Shannon SAC. The extent of Catchment D is indicated on **Figure RFI-1.3**. The location of Outfall OB1 is indicated **Figure RFI-1.8**. Both drawings are included in **Appendix A** of this report.

1.3.3 R494 Improvement

Outfall Number OC1 - Catchment E

This outfall to the River Shannon is located at Ch. 0+250 R along the R494 Improvement of the scheme. The catchment area is approximately 0.8 hectares and given the proximity and comparative size of the River Shannon no attenuation is proposed at this location. Catchment E is proposed to be drained by a kerb, gully and carrier pipe system. Prior to discharging to the River Shannon, road runoff will pass through a class 2 bypass interceptor and a downstream defender. Further treatment will be provided in the form of an open ditch between the treatment system and River Shannon. The extent of Catchment E is indicated on **Figure RFI-1.3**. The location of Outfall OC1 is indicated on **Figure RFI-1.9**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC2 - Catchment F

This outfall is at a tributary stream of the River Shannon and is located at Ch. 1+000 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment F extends between Ch. 0+480 R and Ch. 1+150 R of the R494 Improvement. This section of the road will be drained by a combination of kerb and gully, open ditch and filter drains. The extent of Catchment F is indicated on **Figure RFI-1.3**. The location of Outfall OC2 is indicated on **Figure RFI-1.10**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC3 - Catchment G

This outfall is at a tributary stream of the River Shannon and is located at Ch. 1+150 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor is proposed to be constructed at this location to remove pollutants from road runoff. Catchment G extends between Ch. 1+150 R and Ch. 1+400 R of the R494 Improvement. This section of the road will be drained by a combination of kerb and gully, open ditch and filter drains. The extent of Catchment G is indicated on **Figure RFI-1.3**. The location of Outfall OC3 is indicated on **Figure RFI-1.10**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC4 - Catchment H

This outfall is at a tributary stream of the River Shannon and is located at Ch. 1+750 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment H extends between Ch. 1+400 R and Ch. 1+720 R of the R494 Improvement. This section of the road will be drained by a combination of kerb and gully, open ditch and filter drains. The extent of Catchment H is indicated on **Figure RFI-1.3**. The location of Outfall OC4 is indicated on **Figure RFI-1.11**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC5a - Catchment I

This outfall is at a tributary stream of the River Shannon and is located at Ch. 1+975 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment I extends between Ch. 1+720 R and Ch. 1+990 R of the R494 Improvement. This section of the road will be drained by a combination of kerb and gully, open ditch and filter drains. The extent of Catchment I is indicated on **Figure RFI-1.3**. The location of Outfall OC5a is indicated on **Figure RFI-1.11**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC5b - Catchment J

This outfall is at a tributary stream of the River Shannon and is located at Ch. 1+975 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment J extends between Ch. 1+990 R and Ch. 2+300 R of the R494 Improvement. This section of the road will be drained by a combination of kerb and gully, open ditch and filter drains. The extent of Catchment J is indicated on **Figure RFI-1.4**. The location of Outfall OC5b is indicated on **Figure RFI-1.11**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC6 - Catchment K

This outfall is at a tributary stream of the River Shannon and is located at Ch. 2+300 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment K extends between Ch. 2+300 R and Ch. 2+680 R of the R494 Improvement. This section of the road will be drained by a combination of kerb and gully, open ditch and filter drains. The extent of Catchment K is indicated on **Figure RFI-1.3**. The location of Outfall OC6 is indicated on **Figure RFI-1.12**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC7 - Catchment L

This outfall at the Kilmastulla River is located at Ch. 2+650 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment L extends between Ch. 2+680 R and Ch. 2+950 R of the R494 Improvement. This section of the road will be drained by a kerb, gully and carrier pipe system. The extent of Catchment L is indicated on **Figure RFI-1.5**. The location of Outfall OC7 is indicated on **Figure RFI-1.13**. Both Figures are included in **Appendix A** of this report.

Outfall Number OC8 - Catchment M

This outfall is at a tributary stream of the River Shannon is located at Ch. 3+250 R along the R494 Improvement of the scheme. A constructed wetland/attenuation pond and class 2 bypass interceptor are proposed to be constructed at this location to remove pollutants from road runoff. Catchment M extends between Ch. 2+950 R and Ch. 3+300 R of the R494 Improvement. This section of the road will be drained by a combination of kerb and gully, open ditch and filter drains. The extent of Catchment M is indicated on **Figure RFI-1.5**. The location of Outfall OC7 is indicated on **Figure RFI-1.14**. Both Figures are included in **Appendix A** of this report.

ABP Item No. 2

Pollution Control

“On the basis of similar considerations as set out in Item 1, further details regarding the type of pollution control system proposed for the River Shannon crossing and the Kilmastulla Bridge are required such as would enable the conclusions contained in the NIS regarding the impact on qualifying interest of the cSAC to be supported and verified”.

The type of pollution control measures for road runoff adjacent to the Shannon Bridge Crossing and the Kilmastulla Bridge Crossing are noted in ABP Item No. 1 above. Further detail regarding the road drainage catchments and the strategy for management and control of accidental spillage events are noted below.

2.1 River Shannon Crossing – (Outfall OB1)

The Shannon Bridge Crossing is located within Catchment D of the scheme as indicated on **Figure RFI-1.2**. This catchment drains the entire length of the Shannon Bridge Crossing, draining the section of new road between Roolagh Junction and Shantraud Junction. The highest point of the catchment is at Ch. 0+872 S (Roolagh Junction) and from this point road runoff flows west along the new bridge to the catchment low point at Ch. 0+250 S. As runoff passes along the bridge no flows will be permitted to discharge to the River Shannon. At Ch. 0+250 S runoff from the bridge crossing is treated and attenuated before discharging to a stream at Ch. 0+130 S. It is noted that there is no direct outfall to the River Shannon along the Shannon Bridge Crossing section of this scheme.

In terms of accidental spillage, a pollution control valve is proposed to be constructed on the outlet of wetland/pond no. OB1. In the event of an emergency, this valve will be closed with the pollutants from any spillage confined within the pond. After the emergency event these pollutants will be pumped out and disposed of at a licensed facility by the local authority. The storage volume of wetland/pond no. OB1 is approximately 330m³ therefore no issues in terms of capacity is anticipated.

2.2 Kilmastulla River Crossing - Outfall OC7

The Kilmastulla Bridge Crossing is located within Catchment K of the scheme as indicated on **Figure RFI-1.4** and **Figure RFI-1.5**. This catchment drains the section of the R494 Improvement between Ch. 2+300 R and Ch. 2+680 R which includes the Kilmastulla River crossing. The highpoint of this catchment is at Ch. 2+680 R and the road drains in northerly direction along the Kilmastulla Bridge to the low point of the catchment at Ch. 2+300 R. As runoff passes along the bridge no flows will be permitted to discharge to the Kilmastulla River. The treated and attenuated flows outfall to a local stream at Ch 2+300 R. The pond/wetland at this location, which will have a storage capacity of 140m³, will be constructed with a pollution control valve to prevent pollutants from discharging to the local stream during an accidental spillage event.

Catchment L is located south of Catchment K between Ch. 2+680 R and Ch. 2+950 R. The road runoff from this catchment outfalls to the Kilmastulla River. Before outfalling to the river, all runoff from the road will be treated and attenuated within attenuation pond/constructed wetland no. OC7. This pond, which will have a storage capacity of 98m³, will be constructed with a pollution control valve to prevent pollutants from discharging to the Kilmastulla River during an accidental spillage event.

It is noted that all constructed wetland/attenuation ponds along other sections of the scheme will be constructed with a pollution control valve fitted on the outlet to control and manage accidental spillage events.

ABP Item No. 3

Design and Method Statements

"It is noted that as part of the mitigation measures contained in the EIS and NIS it is stated that design and construction method statements will be submitted to Inland Fisheries Ireland and National Parks and Wildlife Service for approval prior to commencement of construction'. Concerns have been expressed by the NPWS regarding the adequacy of this form of mitigation as it requires further assessment after the decision to approve the scheme thereby indicating that the full range of potential effects are not known at consent stage. The board notes the outline construction methodology for the Kilmastulla River, the railway and the Shannon River Crossing outlined in 3.7.4 of the EIS (page 3/16) however notwithstanding these details the Board consider that such an approach is not consistent with the requirements of the Habitats Directive. The applicant is requested to provide a more detailed assessment of the type of mitigation which would be included in the design and method statements and to assist in determining whether the proposed development would or would not have an adverse impact on the integrity of the cSAC and its conservation objectives."

3.1 Introduction

The scheme design aims to minimise the impact on the environment by firstly designing out any potential impact.

3.2 Scheme Design

Design of the scheme to minimise impact on the Lower River Shannon includes the following:

- The bridge will cross the River Shannon at the proposed location identified in the EIS, where the river is approximately 143m wide. The bridge will consist of a slender reinforced concrete deck supported by secondary steel beams connected to primary steel arches. The Structure is supported on four reinforced concrete piers in the River Shannon and two reinforced concrete abutments at the river banks. The locations of piers is fixed and identified in EIS Figures 3.6 and 4.10.
- The road drainage system will be provided as outlined in Item 1 and 2 of this report and Chapter 3.6 of the EIS. The design of the road drainage system will comply with the mitigation requirements identified in the EIS and NIS.
- Bridge and Culvert design will ensure passage of mammals as outlined in Item 4 of this report and will comply with the requirement of Inland Fisheries Ireland and OPW.
- The construction design is outlined in Chapter 3.7 of the EIS. This design identifies the working area and the location of the main compound within the CPO to ensure no impact on the Lower River Shannon SAC. The EIS states that within the Lower River Shannon SAC no works will be permitted outside the CPO.

In addition to mitigation by avoidance, extensive mitigation measures are specified within the EIS to ensure the protection of the Lower River Shannon SAC. These measures are set out in Chapter 7.2.5 and Chapter 7.5.8 of the EIS. These mitigation measures will form part of the contract documentation for the contract agreement during construction.

3.3 Mitigation Measures included in the EIS for the Protection of Lower River Shannon SAC (Chapter 7.2.5)

3.3.1 Mitigation within the SAC (EIS Pg 7/30)

- There will be no works permitted outside the identified landtake area within the SAC;
- Where site investigation (including archaeological works) is required in the vicinity of or adjacent to the SAC and outside of the identified landtake these works will be supervised by a qualified ecologist and mitigation will apply as outlined in this EIS;
- The site boundary will be defined at that outset of construction using rigid timber or equivalent robust fencing. Within the site boundary fence earth bunds will be constructed to contain surface water runoff and channel it to a silt trap before discharge. This will entail measures to ensure that suspended solids in any runoff into the River Shannon from the construction area, machinery access routes or any other source does not exceed 25mg/l. Among other measures this will require isolating the area where works are carried out from the river and pumping all runoff to sediment removal facilities;
- Prior to construction commencing, a detailed survey of the river bank in the vicinity of the proposed works will be undertaken to determine the status of identified otter holt and couch locations and to check for any future potential features. Appropriate mitigation will be put in place under licence from the NPWS for encountered holts or couches. Artificial holts will be provided in the vicinity of both the Shannon and Kilmastulla crossings at locations and to specifications agreed with the designated site ecologist;
- An emergency operating plan shall be established to deal with incidents or accident during construction that may give rise to pollution within the Lower River Shannon SAC. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants;
- The location of instream piers minimises damage or disturbance to potential pollan spawning habitat in the vicinity of the bridge and will not deviate from these existing proposed locations;
- Road Runoff shall be channelled through a spill containment facility and hydrocarbon interceptor prior to discharge to the river.
- A sustainable drainage system will be installed on the new road which will prevent significant pollution to surface receiving waters. The system installed will have a proven capability of achieving and sustain a least the following percentage of pollution reduction in runoff:

Total Suspended Solids	85%
Heavy Metals	50 – 80%
Chemical Oxygen Demand	50%
Hydrocarbons	90%
- The design of lighting will avoid unnecessary light spill onto the river and adjacent river banks in order to minimise disturbance to fish, mammals and bats. Lighting will be cowled.

3.3.2 Mitigation for Otters (EIS Pg 7/41)

- Provision of safe passage along all watercourses will be achieved by the incorporation of suitable mammal passage facilities within all culvers in conjunction with otter-proof fencing along the road networks to prevent animals from accessing the carriageway. See also Item 4;

- The potential otter holt on the island at chainage 0+640 S and the couch on the Kilmastulla River at chainage 2+620 R will be examined pre-construction of signs for activity and if active, will be excluded during the appropriate season under derogation from the NPWS. Consultation with the NPWS will be required to define the exclusion process;
- Artificial holts will be provided in the vicinity of both the Shannon and Kilmastulla crossings in locations and according to designs agreed with the NPWS and in accordance with NRA guidance.

3.3.3 Invasive Alien Species (EIS Pg 7/40)

- All soil imported for landscaping purposes will be screened and verified as free of noxious weeds and invasive, non-native species such as Japanese Knotweed, Himalayan Balsam and Giant Hogweed. Due care will be applied to ensure invasive alien species of plant and animal are not inadvertently spread during the landscaping works;
- In accordance with NRA guidelines a pre-construction survey for noxious weeds will be prepared detailing the various species distribution along the scheme, the treatment required during site clearance works, methods of disposal of all material arising and an assessment of the risk of re-infestation from the surrounding land. Monitoring of the effectiveness of control measures will be undertaken post construction in accordance with NRA guidelines;
- Monitoring of the effectiveness of control measures will be undertaken post construction in accordance with the NRA guidelines.

3.3.4 Aquatic Habitats (EIS Pg 7/42)

- All design, construction and associated operations will be carried out in accordance with the Guidelines for the Crossing of Watercourse during the Construction of national Road Scheme (NRA, 2006);
- The storage of oils, hydroaulic fluids will be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005).
- The pouring of concrete, the sealing of joints or the application of water-proofing paint or protective systems, curing agents, etc will be completed in the dry to avoid pollution of the freshwater environment,
- All machinery operating in stream will be steam cleaned in advance of works and routinely checked to ensure that no leakage of oils and lubricants occur. All refuelling of machinery will be undertaken on dry land.
- Instream work will be undertaken during the period of 1st of May to 30th of September; this avoids the pollan spawning as well as that for salmon and reduces the risk of accidental damage to spawning beds;
- A class 2 bypass interceptor is to be provided at each outfall;
- Road runoff will go through a silt trap to ensure that suspended solids to settle out
- All pollution control facilities and attenuation areas will be fitted with a penstock or similar restriction at the outfall to the receiving channel to contain pollutants in the event of an accidental spillage
- Measures to avoid the transfer of zebra mussels will be enforced during construction to ensure accidental spread does not occur on machinery or materials on site
- Preservation of stream flows for movement of fish by ensuring a minimum depth of water will be maintained in the streams.

- Prior to instream works being undertaken, the stretches of of watercourses to be impacted will be surveyed for protected aquatic species (lamprey, crayfish) and appropriate salvage measures employed under licence from NPWS.
- A continuous bund will be built 10m from the stream and its inflow to control any suspended soils contained in runoff from construction
- Sediment collection mats will be placed in streams outflow in order to reduce the potential for discharge of silt laden runoff water to the streams
- Work near surface water features will be carried out during drier months where possible.

3.3.5 Construction Phase (EIS Pg 7/95 – 7/97)

- Any borrow pits will be >200m from a watercourse
- Interceptor drains will be installed upslope of the construction footprint in order to intercept and divert clean runoff water away from exposed soils in the construction area.
- Water that falls directly on the exposed earth material will flow to the lowest topography of excavations. This water needs to be collected into a receptor drainage to a series of catch pits and settlement ponds and soakaways
- The outfall will not directly discharge to any drains, stream or rivers but indirectly through a percolation area following retention in catch pits and settlement ponds,
- In order to ensure no direct discharge to receptor waterway, the outfall from construction phase drainage will be placed no closer that 50m from receiving waterways including drains
- To ensure that discharge waters from the construction footprint are not causing loading of receptor waterways by suspended solids, a sampling programme of Total Suspended Solids including Nutrients (phosphorous, nitrate) and Total Petroleum Hydrocarbons will be set up at locations where the road scheme is proximal to sensitive waterways. The results taken at both low and high flow will be checked against regulatory limits for compliance. Pollution controls measures will comply with HA102 of UK DMRB.
- If above-ground tanks are proposed for refuelling of plant equipment fuel stations will require bunding to 110% volume capacity for fuels stored at the site. The bunded area will be drained by an oil interceptor and this drainage will be controlled by a penstock valve that will be opened to discharge storm water from the bund. A qualified management company will take responsibility for management and maintenance of the oil interceptor and associated drainage on a regular basis including decommissioning at the end of the construction phase.
- Alternatively plant equipment can be refuelled by a mobile browser which will refuel the plant near the area in which it is operating. This will eliminate the environmental, health and safety risk of hydrocarbon storage in above ground tanks but will require operational vigilance to ensure there are no leakage incidents during transfer. If a mobile browser is used, refuelling will take place on in-situ, unexcavated ground that is covered with vegetation and is >100m away from any waterways or drainage.
- There is also the risk of leakage from vehicles and plant equipment during construction activity as opposed to refuelling. The plant equipment used on site will require regular mechanical checks and audits to prevent spillage of hydrocarbons on the exposed ground during construction. This will be part of the site environmental management system.

- All plant equipment will have a stock of synthetic absorbent mats or spill dry sand in their cabins to contain and clean up minor spillages from plant equipment during re-fuelling or mechanical leakages.
- Larger spillages or leakages of hydrocarbons will be reported to the environmental manager for immediate clean up.
- If a significant hydrocarbon spillage does occur, the environmental manager must have an approved and certified clean-up contractor available on 24-hour notice to contain and clean-up spill. The faster the containment or clean-up starts, the greater the success rate, the lower the damage caused and the lower the cost for the clean-up.
- Monitoring of the receiving watercourse will be conducted during the construction phase and will be in line with the Water Framework Directive monitoring recommendations.

3.4 Additional Mitigation Measures not currently included in the EIS

In addition to the above mitigation measures the following measure will be included in the Schedule of commitments for the EIS so as to ensure proper methodology is used during the construction phase of the Shannon Bridge:

- Piling works within the channel of the River Shannon will be carried out from barge mounted plant which will be surrounded by a geotextile curtain suspended from a floating boom; this will limit movement of any sediment displaced from the river bed.
- Piling works will be carried out by vibratory techniques or rotary methods only, pile driving using impact hammers will not be permitted for use.

3.5 Conclusion

The above mitigation measures in such approvals as may be granted will be included in the contract documentation to ensure that there is no significant impact on the Lower River Shannon SAC and further assessment is not required. It is concluded that the provision for submission of method statements for approval to NPWS can be omitted from the mitigation measures (in the Schedule of Commitments).

In the case of the Inland Fisheries Board (IFI), it is generally a requirement that they be consulted prior to commencement of construction and be afforded the opportunity to review method statements. Due to this requirement of the IFI the proposal to supply Method Statements to the IFI will remain.

ABP Item No. 4

Mammal Passage at Watercourse

“The applicant is requested to submit a cross section plan of the Kilmastulla River Bridge demonstrating how it is proposed to ensure that otter movement within the cSAC will be facilitated post construction. The applicant shall also provide further details of the proposed culvert designs demonstrating how safe otter / mammal passage will be facilitated.”

4.1 OTTER/MAMMAL PASSAGE AT WATERCOURSES

It is proposed to provide otter/mammal passes at all watercourse crossings where required. Ledges shall be at least 500mm wide, constructed at least 150mm above the 1 in 5 year flood event, and allow at least 600mm headroom. The ledges proposed for this scheme will be made of wooden or metal planks bolted onto the structure's sides as indicated on Photo 16 below. Where it is not possible to achieve the clearances or widths as noted above (due to the culvert size), a separate underpass for mammals will be provided parallel to the watercourse culvert.



Photo 16 – Otter Ledge (Steel)

Drawings showing typical cross sections through the Kilmastulla River Bridge and a typical box culvert are included in Appendix B of this paper. All works adjacent to watercourses and pre-construction otter surveys will be carried out in accordance with the Guidelines for The Treatment of Otters Prior to the Construction of National Road Schemes as published by the National Roads Authority.

The following mammal passage at watercourse will be provided (See EIS Volume 3 Figures 3.1 – 3.11 for location of each crossing):

- Shannon River Crossing: East Bank: 4m setback from bank under bridge
- Shannon River Crossing: West Bank: 4m setback from bank under bridge
- Kilmastulla River: 1.5m setback from bank under bridge
- Culverts No KBP CA1: Separate Mammal Underpass

- Culvert No KBP CA2: Separate Mammal Underpass
- Culvert No KBP CB1: Separate Mammal Underpass
- Culvert No R494 CC1: Mammal Ledge
- Culvert No R494 CC2: Mammal Ledge
- Culvert No R494 CC2A: Mammal Ledge
- Culvert No R494 CC3: Mammal Ledge
- Culvert No R494 CC3A: Mammal Ledge
- Culvert No R494 CC4: Mammal Ledge
- Culvert No R494 CC5: Mammal Ledge

ABP Item No. 5 Extent of Salmon and Lamprey Habitat

“It is noted that the NIS makes reference to spawning habitat downstream of Cool Bridge (page 16 of NIS), however the NIS and EIS do not explicitly state or indicate the extent of salmon and brook lamprey habitat downstream of this proposed crossing point. In support of the mitigation measures proposed and to facilitate assessment of the potential impact on the cSAC qualifying interests and adequacy of mitigation proposed, the applicant is requested to provide further information regarding the extent of these habitats in this location.”

5.1 Response:

Potentially suitable spawning habitat for both salmon and lamprey species extends intermittently downstream of Cool Bridge for a distance of approx. 200m. The habitat consists of riffle-glide sequences with extensive areas of suitable gravels (see Plate 5.1). Thereafter the gradient reduces and the river has been realigned in sections up to where it historically joined the River Shannon approx 2km further downstream. At this point the river has been redirected along a canal parallel to the Shannon for a further c2km to a point below the Parteen Weir.



Plate 5.1 - Kilmastulla River showing potentially suitable salmon and lamprey spawning habitat downstream of Cool Bridge.

While spawning by either species has not been confirmed in the stretch of the river downstream of Cool Bridge, in view of the suitability of the habitat, a comprehensive suite of mitigation measures has been incorporated into the scheme design to avoid direct or indirect impacts on the spawning habitat. Salmon are a qualifying interest for

the Lower River Shannon cSAC which extends to approximately 1.5km upstream of Cool Bridge and therefore any impacts on the spawning habitat or fry of the species would constitute a potentially significant impact on the Natura 2000 site. In recognition of this fact, the bridge design for the Kilmastulla crossing is a clear-span structure which will retain the river banks intact (See **Figure RFI-4.1**). A suite of mitigation measures has been specified within the EIS (Section 7.2.5 and 7.5.8) aimed at ensuring there are no direct or indirect impacts on the river water quality or instream habitats during both the construction and operational phases. This specifically includes measures to avoid any silt laden run-off during construction works which could result in clogging of spawning gravels, as well as the treatment of surface run-off during the operation phase to avoid all forms of pollution.

The Kilmastulla River was rated of unsatisfactory ecological condition in 2008, Q3-4 at all monitoring locations along the river (Source: Nenagh Water Management Unit Action Plan – SRBD). The lack of sensitive macroinvertebrate fauna, heavy siltation and compaction of substratum indicated ecological disruption from the upper reaches downstream to Cool Bridge (Station 1000). In the upper reaches of the catchment, the most likely causes are sewage and agriculture, while in the lower reaches agriculture and seepage/runoff from a nearby tailings area may be the most likely sources of pollution. There is no more recent water quality data available for the river but it appears to have a similar Q3-4 index in the vicinity of Cool Bridge.

ABP Item No. 6

Vibration Impact

“The applicant is requested to provide an estimate (to be shown in map form) of the predicted zone of vibration influence of the proposed piling on the benthos of the river with the influence to be assessed in terms of significantly increased mortality of lamprey ammocoetes. The applicant is also requested to indicate whether there is any suitable spawning habitat for salmon or lamprey located within the predicted zone of vibration.”

6.1 Estimate of Zone of Vibration

In order to determine the intensity of ground-borne vibrations due to piling and the attenuation of the vibrations relative to distance from the source various sources have been used:

- Ciria Technical Note 142 Ground-borne vibrations arising from piling;
- BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration;
- Discussions with piling specialists;
- Various academic papers; and
- Historical records of vibration due to piling from previous projects.

It is clear from the above sources that pile driving using impact hammers produces considerable noise and vibration and, as such, will not be used during the construction phase of this scheme. For the purposes of this investigation, it is assumed that the pile casing for the piers will be installed using vibratory driving techniques. This system is generally suitable for saturated soils. It is also suitable for the contractor to use other piling methods that reduce impact on the surrounding environment (including vibration). One other method is rotary driving, which produces less vibration than vibratory driving and could be suitable for this location. Should rock sockets be required following detailed design, it should be noted that historical data shows that rotary coring for the construction of rock sockets typically creates less vibration than pile driving.

Ciria Technical Note 142 provides a number of equations of similar form relating the energy developed by the piling machine, the ground conditions, the plan distance from the piling rig, and the vibrations in terms of peak particle velocity. A review of historical records and modern equipment has shown that an upper-bound value of energy for use in this investigation is 4500 Joules. Based on this energy and Ciria Equation 2.9, the vibrations at 10m centres from the nearest foundation or substructure were calculated and are indicated on the attached **Figure RFI-6.1**, Map of predicted zone of vibration influence.

Historical records from the various sources cited above show that the values calculated using Equation 2.9 provide an upper-bound of the anticipated vibration due to piling and its subsequent attenuation.

6.2 Spawning Habitat:

There is no spawning habitat for salmon and lamprey in vicinity of the proposed bridge structure. No suitable spawning habitat occurs from Lough Derg downstream to Moys where the river again widens into a lacustrine environment. The river channel downstream of Killaloe Bridge is approximately 150m in width with a depth ranging between 3 and 7m. The flow is generally swift glide though along the eastern bank there are areas of slack flow with accumulated soft sediments. The

preferred spawning habitat for salmon and lamprey species are areas of riffle or swift glide (often at the tail end of pools) where well-aerated gravels are present, within which the various species excavate shallow depressions (known as redd's) into which they lay their eggs. In depths of less than approximately 5m of water, all hard substrates are heavily coated with the alien invasive zebra mussel (see **Plate 6.1**). Upstream of Killaloe Bridge, the river is lacustrine in nature and totally unsuited to spawning by salmon or lamprey. The nearest spawning grounds upstream of Killaloe is the Annacarriga River approximately 5km upstream of the proposed bridge location. The absence of spawning habitat in the vicinity reduces the potential for the occurrence of lamprey ammocoetes in the area of the proposed bridge though it does not rule it out entirely. An electro-fishing survey undertaken by EirEco Environmental Consultants in 2010 at a marina site approximately 1km upstream of Killaloe Bridge recorded only roach, perch, bream, pike and eel. Soft sediments in the inner part of the marina were assessed for lamprey ammocoetes though none were found.



Plate 6.1 - Zebra mussels in the vicinity of the proposed River Shannon bridge

6.3 Vibration Impacts:

While Salmonid ova have been shown to be susceptible to mechanical shock which may lead to mortality at a critical stage in their development (Jensen and Alderdice, 1989), there is no data available to suggest that lamprey ammocoetes are similarly susceptible to vibration. Dr Jervis Good (Regional Ecologist with the NPWS) identified concerns that vibration will either cause ammocoete larvae to escape the refuge of the substrate and be subject to elevated levels of predation, or that there will be high levels of siltation of the habitat.

After hatching from eggs laid amongst gravels in shallow riffle areas (similar to those used by salmonids), the young elongate larvae, known as ammocoetes, swim or are washed downstream by the current to areas of sandy silt in still water where they burrow and spend the next few years in tunnels. These ammocoetes feed by creating

a current that draws organic particles (coated with bacteria) and minute plants (and algae such as diatoms) into the pharynx.

Larval nursery beds are at the edges of streams and rivers, well away from the main current, and the current over them is often not only very slow (typically in the region of 8–10 cm s⁻¹) but is actually a backwater in reverse of the main current (Maitland, 2003). While ammocoete larvae can swim quite fast for short distances, they are unable to maintain themselves in open water for long periods against strong currents. Swimming speeds are between 0.1 and 0.3 m s⁻¹ and while larvae can swim short distances when disturbed or when seeking out better food resources, most of their distribution results from passive downstream migration.

In the event that pile driving activities would give rise to disturbance to the ammocoete larvae, they are capable of relocating beyond the zone of potential disturbance. Their ability to move and re-bury themselves is inherent in their passive downstream migration. The level at which vibration would give rise to disturbance in ammocoetes is not known but **RFI Figure 6.1** demonstrates the likely levels of vibration associated with pile driving activities during pier construction. It is not uncommon for background levels of vibration in an urban environment to be in the region of 0.5mm s⁻¹. Though they could be expected to be less in the vicinity of the proposed bridge location, ammocoetes occur in urban environments and so can be expected to be tolerant to at least 0.5mm s⁻¹. From **Figure RFI-6.1** it can be seen that vibration impact would reach this level at c150m from the pile driving works. However, a higher degree of tolerance is expected in ammocoetes and conservatively this is expected to be in the region of 1mm s⁻¹. Using this figure, the zone of disturbance is reduced to c80m from source. In reality, as ammocoetes are buried within sediments often amongst the roots of aquatic macrophytes, the level of vibration experienced will be buffered and disturbance is likely to occur over a much smaller zone of influence.

Displacement of ammocoetes as a result of pile driving activity will potentially expose them to a higher level of predation during the period they are swimming or not buried within the sediments. The principle predators are likely to be fish species such as salmonids, pike and perch, along with avian predators including cormorant, kingfisher and terns. It could be assumed that should pile driving be sufficient to result in disturbance to ammocoetes within the sediments, then it is likely to result in some level of disturbance to potentially predatory fish and birds. In any event, the movement of ammocoetes would not be likely to attract a large number of predators and thus result in a high level of mortality. While some mortality cannot be ruled out, either by predation or directly through the driving of a pile should ammocoetes not be disturbed from the sediment by the piling activity itself, the significance of this loss would be considered to be minor on the basis that comparable areas of potentially suitable habitat extend over several hundred meters along the eastern river bank in the vicinity of the proposed bridge.

In their letter of 29th March 2012, the Development Applications Unit noted that “*adverse effects not likely to occur on the cSAC*” on the basis that:

- a) the likelihood that the land-locked river lamprey population in this part of the Shannon is not relict (i.e. unique) but due to the recent construction of Parteen Weir and Ardnacrusha Dam;
- b) the likelihood that suitable juvenile habitat occurs extensively in the Shannon upstream of Parteen Weir;
- c) the construction effects are temporary and limited to one year;

- d) that juveniles can be removed from affected habitat prior to construction, and that there will be minimal direct loss of juvenile habitat in the long-term; and
- e) that spawning habitat is not stated to occur in the construction zone.

ABP Item No. 7

Cumulative Effects

"It is noted that section 10.1 of the NIS is headed Cumulative Impacts. It is considered however that this section does not address in sufficient detail the potential for cumulative impacts with other plans and projects. The applicant is requested to provide further details in the regard and should have regard inter alia to the potential impacts arising from other plans and projects, including those referenced in the NPWS observations on the proposed development."

7.1 Introduction

The Natura Impact Statement requires consideration of the proposed road development in combination with other plans or projects, which may give rise to cumulative impacts affecting the cSAC. Plans and projects in place or proposed for the study area are identified below in 7.2 of this report.

7.2 Clare County Development Plan 2011 – 2017

This document is a strategic plan in the context of development plans for County Clare. The high level nature of the plan providing a strategic framework for land use and development means it does not indicate the location type or extent of likely effects of future development. Due to the level of hierarchy and absence of project level detail the plan identifies the requirement for further Habitats Directive Assessment of Local Area plans to prevent adverse affect on Natura 2000 sites in the plan area.

The assessment notes that any planned road development coming forward will be subject to a Habitat Directive Assessment where appropriate. Mitigation and best practice will be required to ensure that the construction and operation of these roads will not impact on Natura 2000 sites. Continuous compliance with relevant environmental standards will also be required.

The following identifies planned roads in the county with the potential to affect the Lower River Shannon SAC: -

- Northern Limerick Distributor Road (Knockalisheen) providing linkage and access to UL campus between Coonagh and the N18 and the R445 (former) Dublin road.

This scheme is currently at route selection stage of development. The planned bridge is at least 18km from the proposed Shannon Bridge at Killaloe/Ballina. Given the distance between the two bridges, the requirements for both bridges to undergo EIS and Habitats Directive Assessment and the provision of detailed mitigation measures for the proposed scheme at Killaloe in order to ensure no significant impact on the SAC or water quality, it is considered that there will be no cumulative impact between these developments.

7.3 North Tipperary County Development Plan

A HDA screening report was carried out for the North Tipperary County Development Plan, which includes the Shannon Bridge Crossing, in order to evaluate the Plan to see if it needs to be the subject of a Stage Two HDA. The report found that the Plan has been formulated to ensure that uses, developments and effects arising from permissions based upon the Plan (either individually or in combination with other plans or projects) shall not give rise to significant effects on the integrity of any Natura 2000 sites. The plan identifies the need for further assessment at Local Area and Project phase of development.

7.4 East Clare Local Area Plan

The East Clare Local Area Plan includes as part of the planning process a habitat Directive Assessment for the Plan. This assessment examines the potential impact of the policy and objectives of the plan along with zoning of lands throughout the area. In terms of impact on the Lower River Shannon SAC recreation zoning at Moys which lies within the SAC, the plan makes a requirement of the project at planning stage to carry out a Habitats Directive Assessment and appropriate mitigation provided to avoid impact on species or loss of habitat. In the case of Tourism Zoning at Clarisford/Killestry which relates to lands outside the Lower River Shannon SAC, the plan has recognised that any development here must not directly impact or damage any of the rare or important habitats for site designation. The habitats directive has identified that any Marina and Berthing Facilities are not acceptable use of land at this location. In addition a Local Area Plan states that a Habitats Directive Assessment for any development must be carried out and must satisfy that there will be no significant impact on the SAC.

The objectives of this Habitat Directive Assessment, through the East Clare Local Area Plan and Clare County Development Plan, are to protect all Natura 2000 sites within the plan area (including the 15km boundary), and where possible to enhance these sites. These will be achieved through the action plans of the Shannon River Basin Management Plan and the Western River Basin Management Plan.

7.5 Moys Sports Pitch Complex

Moys/Clarisford Recreation Area has been identified for the future development of recreation and amenity facilities for both local residents and visitors to Killaloe/Ballina and planning has been approved for the site. The Development Plan recognises that the lands are in proximity to the Lower River Shannon SAC and a Natura Impact Statement was carried out as part of the planning application for the scheme. The scheme consists of the following:

- Two full sized playing pitches
- A mini soccer training pitch
- Astroturf training pitch
- Partially floodlit rugby training pitch
- A club house
- A scouts cabin
- A temporary wastewater treatment system
- Footpaths and Cycling trains
- Replace of existing timber boardwalk and construction of timber pontoon
- Car Parking facilities

The following ecological issues were identified and mitigation proposed:

Activity	Impact	Mitigation	Residual Impact	In combination with proposed scheme
Production of Sewage	Impact on water quality of SAC	Temporary sewage treatment system will	Residual Impacts are Negligible	none

Activity	Impact	Mitigation	Residual Impact	In combination with proposed scheme
		comply with EPA standards. Long-term: connection to mains sewer.		
Lighting Disturbance	Disturbance to bats/mammals	Low light spillage directional flood lights only Street lighting will be low level Floodlights in winter months only No lighting focussed on ecologically sensitive areas	Residual Impacts are Negligible	none
Land take	Habitat of improved agricultural land and wet grassland only	No qualifying interest impacted	Residual Impacts are Negligible	none
Land take	Loss of woodland habitat though loss of individual trees	Tree survey to be carried out Retain as many trees as possible	Residual Impacts are Negligible	none
Construction works	Suspended solids runoff	Create buffer between watercourses and development Fencing of site to minimise site footprint	Residual Impacts are Negligible	none
Construction works	Hydrocarbon spillage	Regular maintenance of machinery, bunding of refuelling area, absorbent spill	Residual Impacts are Negligible	none

Activity	Impact	Mitigation	Residual Impact	In combination with proposed scheme
		kits		
Construction	Disturbance to fauna	No works within 10m of badger sets Provision of bat and bird boxes to offset loss of habitat due to tree removal	Residual Impacts are Negligible	none
Construction	Spread of Invasive Species	Treatment programme with herbicide prior to works No removal of soil during construction Clean all machinery Ongoing maintenance programme	Residual Impacts are Negligible	none

7.6 Bridge Crossings at University of Limerick

Two bridges have been constructed within the University of Limerick located over 20km downstream of Killaloe/Ballina. The UL Pedestrian Living Bridge was constructed in 2007 with a road bridge constructed in 2004. Both bridges have been subject to intensive monitoring post construction which has determined that no significant impact has occurred as a result of the schemes. It can therefore be concluded that no there will be no cumulative impacts as a result of the proposed bridge at Killaloe/Ballina and the two bridges at University of Limerick, taken in combination.

7.7 Conclusion

It is considered that the proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement Scheme will not have a significant adverse impact on any qualifying species or habitats of the lower River Shannon SAC. In addition it is considered that there will be no significant adverse impacts from any known plans or projects in proximity of the scheme or along the River Shannon. As such it is concluded that no significant impact will arise as a consequence of any in-combination effects on any of the qualifying species or habitats.

ABP Item No. 8

Derogation Licences

“The applicant shall provide details of any derogation licences applied for and / or granted and any additional conditions that are relevant to the overall mitigation of the proposed scheme.”

Derogation licences granted for bats and otters are attached in **Appendix 2**

ABP Item No. 9

Wet Woodland Habitat

“Areas of wet willow-alder-ash woodland (Ref. WN6 on drawings) are recorded at a number of locations along the proposed route and that the EIS/NIS determined that these areas do not comprise habitat that would come within the scope of Annex I priority alluvial woodland habitat. Full justification for the conclusion that the woodland does not comprise Annex I habitat has not been provided and in this regard the applicant is requested to provide botanical and ecological information to support the determination made in relation to the woodland type present.”

9.1 Introduction

Areas of wet woodland habitat (using the Heritage Council classification (Fossitt, 2000)) have been recorded in the line of the proposed route at the western side of the River Shannon (chainage 0+520 S to 0+620 S); on the eastern side of the Shannon at chainage 0+800 S and between chainage 0+250 S and 0+330 S, and east of the R463 opposite Ballyvally Estate. These are rated of county importance.

Strips of wet woodland also occur along either side of the Kilmastulla River (chainage 2+600 R- 2+630 R) which are rated of International Importance as it is within the Lower River Shannon cSAC.

A description of the woodland at each location is given below which provides the justification for the evaluation assigned to these habitats and their non-conformity with the Annex I priority habitat Alluvial Woodland with *Alnus glutinosa* and *Fraxinus excelsior* (91E0). Alluvial woodland is a qualifying interest for the Lower River Shannon cSAC.

9.2 Western side of the River Shannon (chainage 0+520 S to 0+620 S):

The extent of this Wet Woodland (WN6) in the vicinity of the scheme at Ch.0+520 S to 0+620 S is shown in **Plate 9.1 below**. As described within Section 7.2.3 of the EIS, this woodland is separated from the canal by an elevated ridge which supports a tree-line of mature beech (*Fagus sylvatica*), with a small number of isolated alder (*Alnus glutinosa*) and willow (*Salix* spp.) occurring along the canal bank in association with occasional sycamore (*Acer pseudoplatanus*) and pheasant berry (*Leycesteria formosa*). This woodland strip effectively corresponds to Mixed Broadleaved Woodland (WD1).

To the west of the bank, the ground drops and a block of wet woodland extends westwards along the line of the proposed route for approximately 80m to the rear of a garden. In the vicinity of the proposed road the canopy is dominated by alder with some willow, but is heavily infested with cherry laurel (*Prunus laurocerasus*) extending to c12m in height and resultantly has virtually no understorey vegetation (see **Plate 9.2**). Due to the heavily modified structure and composition of the woodland along the line of the proposed route, this woodland does not conform to the Annex I Habitat type Alluvial Woodland and is not within the cSAC.

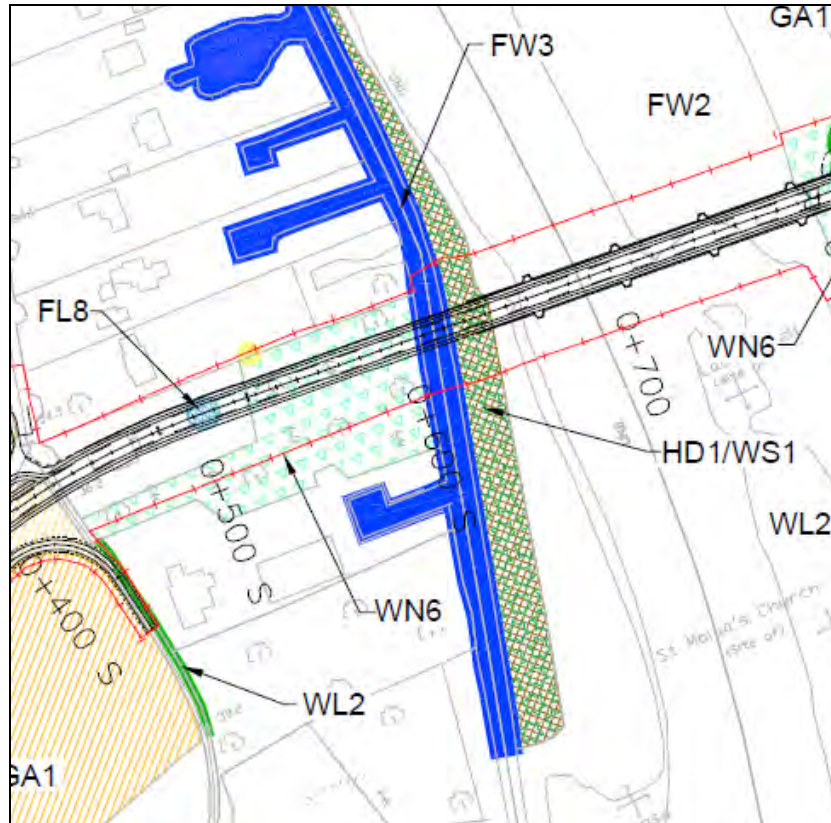


Plate 9.1 - Extract from EIS Figure 7.2.3 showing location of WN6



Plate 9.2 - WN6 on line of proposed route

To the south of the proposed road alignment, the woodland is not infested by cherry laurel and supports a rich and typical ground flora for wet woodland (see **Plate 9.3**). The canopy is dominated by alder and there are numerous pools. The ground flora is diverse and includes remote sedge (*Carex remota*), creeping bent (*Agrostis stolonifera*), branched bur-reed (*Sparganium erectum*), common reed (*Phragmites australis*), lady fern (*Dryopteris felix-femina*), angelica (*Angelica sylvestris*), mint (*Mentha aquatica*), creeping buttercup (*Ranunculus repens*), marsh bedstraw (*Galium palustre*), forget-me-not (*Myosotis* sp.), nettle (*Urtica dioica*) and occasional briar (*Rubus fruticosus* aggr.). While this habitat does not occur on alluvial soils subject to periodic inundation from the river, it is subject to seasonal flooding and is therefore considered to conform to the Annex I priority habitat Alluvial Woodland.



Plate 9.3 - WN6 to the south of the proposed route

In order to avoid impacting on the adjacent wet woodland habitat between Ch.0+430 S and the canal, the following specific requirements will be adhered to in addition to mitigation measures as outlined in Section 7.2.5 of the EIS:

- All pre-construction ground investigations and archaeological investigations in this area will be confined to the within the CPO line and carried out under supervision of a suitably qualified ecologist.
- The minimum required area for construction works within the CPO line will be defined at the outset of construction using rigid timber or equivalent robust fencing under supervision of the project ecologist.
- Within the site boundary fence, earth bunds will be constructed to contain surface water run-off and channel it to a silt trap before discharge. This will entail measures to ensure that suspended solids in any runoff do not exceed 25mg/l.
- No movement of construction plant will be permitted outside of the site boundary at this area.
- The number of trees to be removed will be minimised and all trees to be retained will be afforded protection in accordance with the NRA *Guidelines on*

the Protection of Trees on National Road Schemes (NRA 2006) and Trees in Relation to Construction – Recommendations (BS 5837 2005).

- The loss of any habitat in this area will be mitigated in the landscape design using native alder and willow species along the foot of the embankments, grading to dry woodland on the embankment in accordance with the NRA *Guide to Landscape Treatments on National Road Schemes (NRA, 2006)*.

9.2 Eastern side of the Shannon between chainage 0+800 S:

A narrow band of Wet Woodland occurs along the eastern side of the River Shannon in the vicinity of Ch.0+800 S (see **Plate 9.4**). The land east of the river drops moderately steeply from a field of pasture adjacent to the R494 to the river edge. The field boundary is flanked by a treeline of mature ash and oak. Between the treeline and the river the vegetation is comprised of a scrub-woodland with occasional semi-mature oak, ash and frequent willow. A linear depression in the vegetation forms a damp hollow and in conjunction with the abundant willow has led to its classification as wet woodland. However, overall the majority of the vegetation indicates dry conditions. The canopy includes blackthorn, elder (*Sambucus niger*), holly (*Ilex aquifolium*), gorse (*Ulex europaeus*), sycamore (*Acer pseudoplatanus*) and abundant briar. The herb layer is not well developed due to the scrubby nature of the vegetation but includes abundant briar, ivy, tutsan (*Hypericum androsaemum*), bracken and other ferns (*Dryopteris* spp. and *Phyllitis scolopendrium*). The river bank is steep and flanked by dense blackthorn.

The woodland is not subject to periodic flooding and does not conform to the Annex I priority habitat Alluvial Woodland.

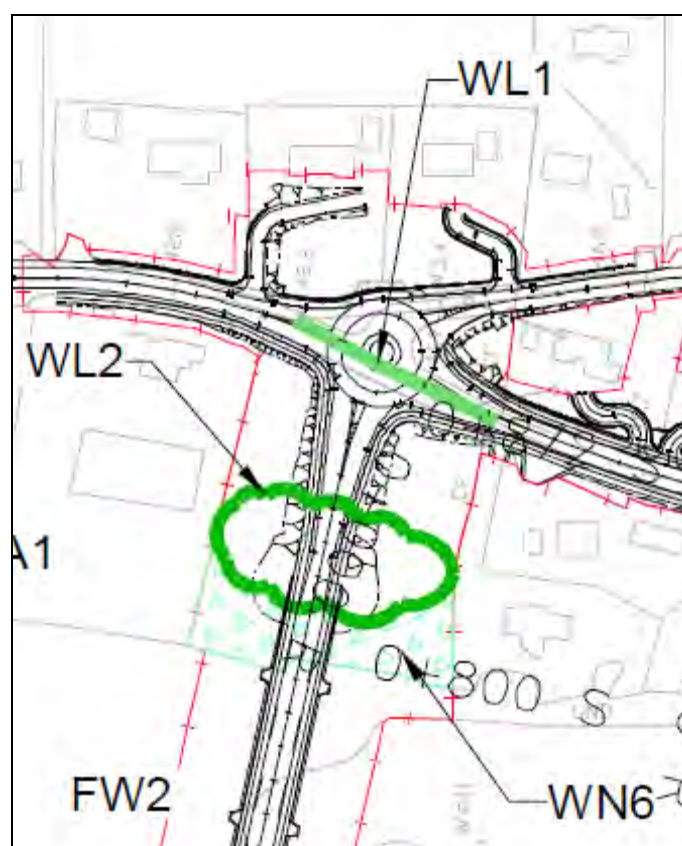


Plate 9.4 - Extract from EIS Figure 7.2.3 showing location of WN6.

9.3 Eastern side of the Shannon between chainage 0+250 S and 0+330 S:

On the eastern side of the Shannon between chainage 0+250 S and 0+330 S an area of woodland occurs on sloping ground between the R494 and the river (see **Plate 9.5** below). The woodland is ash dominated with frequent alder and willow (WN6) in the lower and wetter part of the woodland closer to the river, which is well removed from the scheme CPO line. In the upper section near the road (and in the vicinity of the CPO line, there are a number of exotics including occasional beech and sycamore. Some Japanese knotweed (*Fallopia japonica*) occurs at the northern end of the woodland adjacent to the public park. The understorey in the upper section consists of a typical suite of dry woodland species including ivy (*Hedra helix*), lesser celandine (*Ranunculus ficaria*) and hogweed (*Heracleum sphondylium*). Further down slope the understorey is dominated by ferns (*Dryopteris* spp.).

The woodland is on elevated ground well removed from the flood zone of the river and is classified as wet woodland (WN6) as the canopy is dominated by ash, alder and willow. It is not subject to periodic inundation of flooding and does not qualify as the Annex I priority habitat Alluvial Woodland.



Plate 9.5 - Extract from EIS Figure 7.2.3 showing location of WN6.

9.4 East of the R463 opposite Ballyvally Estate:

A plantation of alder occurs to the east of the R463 opposite Ballyvally Estate (see **Plate 9.6**). The woodland has not been recently managed and has some natural regeneration of willow and occasional birch (*Betula pubescens*). It appears to be developing towards wet willow-alder-ash woodland (WN6), which occurs on lower ground further east.

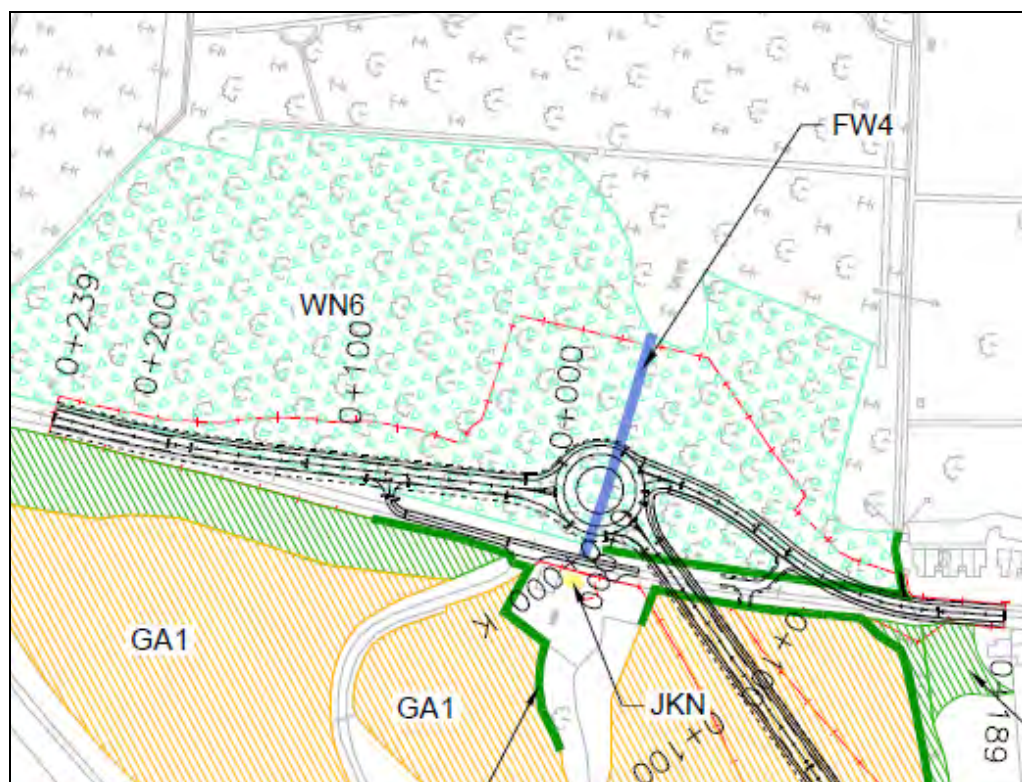


Plate 9.6 - Extract from EIS Figure 7.2.2 showing location of WN6

There are occasional semi-mature and early mature ash, sycamore, beech, spruce and Scots pine along the road edge. A drainage ditch from the Ballyvally Estate emerges into the woodland from under the R463 (see **Plate 9.7**). The understorey includes abundant briar, bracken (*Pteridium aquilinum*), willow herb (*Epilobium* sp.), pendulous sedge (*Carex pendula*), ferns (*Dryopteris* sp.) and ivy, with regenerating saplings of ash, sycamore, elder and willow. Around the drainage ditch which spreads out under the road opposite-leaved golden saxifrage (*Chrysplenium oppositifolium*), angelica (*Angelica sylvestris*), horsetail (*Equisetum* sp.), meadowsweet (*Filipendula ulmaria*) and mosses (including *Calliergon cordifolium*) occur. These species become more plentiful as the ground slopes to the east towards the river, but outside of the CPO line.

There is an access gate to the plantation to the east of the proposed roundabout where there has been some dumping of spoil in the past. There are a number of alien invasive species present at this location including Himalayan knotweed (*Persicaria wallichii*), montbretia (*Crocsmia x crocosmiflora*), buddleia (*Buddleja davidii*) and staghorn sumac (*Rhus typhina*).

The woodland in the vicinity of the CPO at this location is an artificial plantation of alder which has a number of additional naturally colonized canopy species. The woodland is locally wet in the vicinity of the proposed roundabout as a drainage

channel flows into it. Further east and outside of the CPO the groundwater table is higher as the land slopes towards the river and the understorey becomes more characteristic of wet woodland. The CPO line at this location extends east of the proposed roundabout to include for an attenuation pond which will also serve to treat road run-off. The lands around this feature will be landscaped with a suite of wet woodland species as detailed in Figure 8.1 of the EIS.

Within the CPO line the woodland is an unmanaged alder plantation which is classified as Wet Woodland (WN6) due to its dominant canopy composition and the locally wet ground conditions. Further east and outside of the CPO line, the habitat may conform to the Annex I priority habitat Alluvial Woodland where periodic inundation from the river is likely.



Plate 9.7 - Wet woodland east of the R463 opposite Ballyvally Estate.

9.5 Kilmastulla River (chainage 2+600 R- 2+630 R):

Wet woodland (WN6) occurs in a narrow fringe along either side of the Kilmastulla River (chainage 2+600 R- 2+630 R). The woodland strip is widest along the western river bank upstream of the existing Cool Bridge where it extends to approximately 12m at its widest (see **Plate 9.8**). The river banks at this location are approximately 1m in height and the woodland occurs on sloping ground rising to the adjacent pasture. The trees overhang the river (see Plate 9.9) and the lower part of the woodland would be subject to occasional flooding during spate flows. Along the eastern bank the woodland forms a very narrow strip of c5m. The canopy consists of semi-mature ash, willow, blackthorn and hawthorn with occasional elder and elm (*Ulmus* sp.). Briar is abundant, especially along the eastern river bank. The understorey consists of abundant ivy with lesser celandine, hogweed, nettle, herb Robert (*Geranium robertianum*) and various ferns (*Dryopteris* spp. and *Phyllitis scolopendrium*).

The woodland has been classified as Wet Woodland on account of the presence of ash and willow species and the likelihood of occasional flooding along its lower fringe. However, flooding would be limited to a very narrow band as the ground rises quite steeply and the majority of the canopy is comprised of dry woodland species. The woodland does not therefore conform to the Annex I priority habitat Alluvial Woodland.

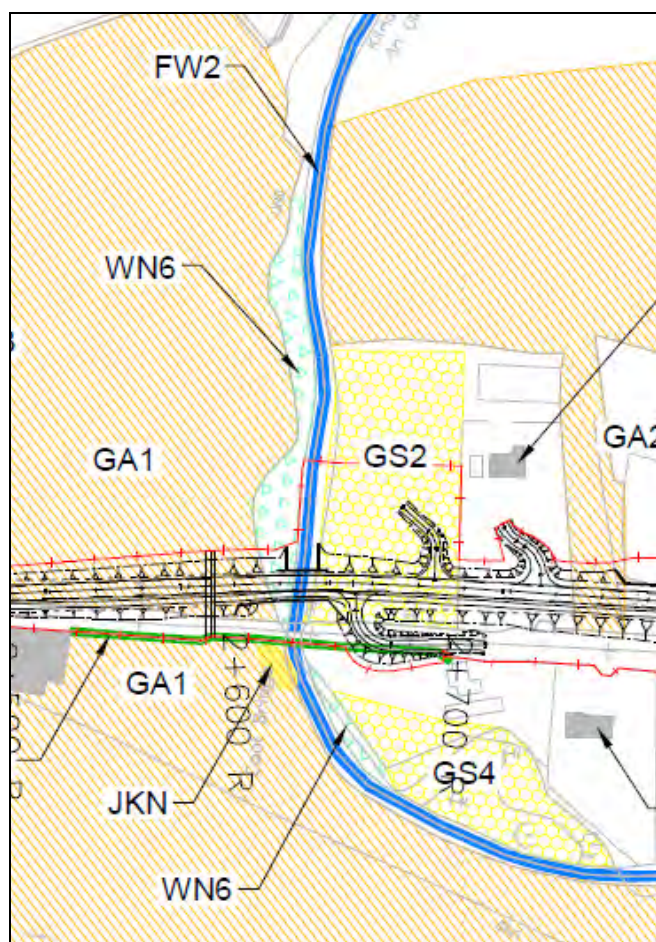


Plate 9.8 - Extract from EIS Figure 7.2.5 showing location of WN6.



Plate 9.9 - View upstream from Cool Bridge showing woodland fringe.

ABP Item No. 10

Loss of Linear Features

“Section 7.2 of the EIS contains information regarding the loss of hedgerows and roadside vegetation and proposals for mitigation including reconnection of severed linear habitat features. The application is requested to provide further clarification regarding the net loss of such linear habitat arising from the proposed development when regard is had to proposed mitigation and to give assessment of the residual effects on habitats arising from the net loss arising from the development.”

- Proposed estimate of woodland / scrub loss: 2.5 Ha
- Proposed estimate of hedgerow loss: 8.7 km
- Proposed planting of woodland / Scrub 8.4 Ha
- Proposed planting hedgerow 7.2 km

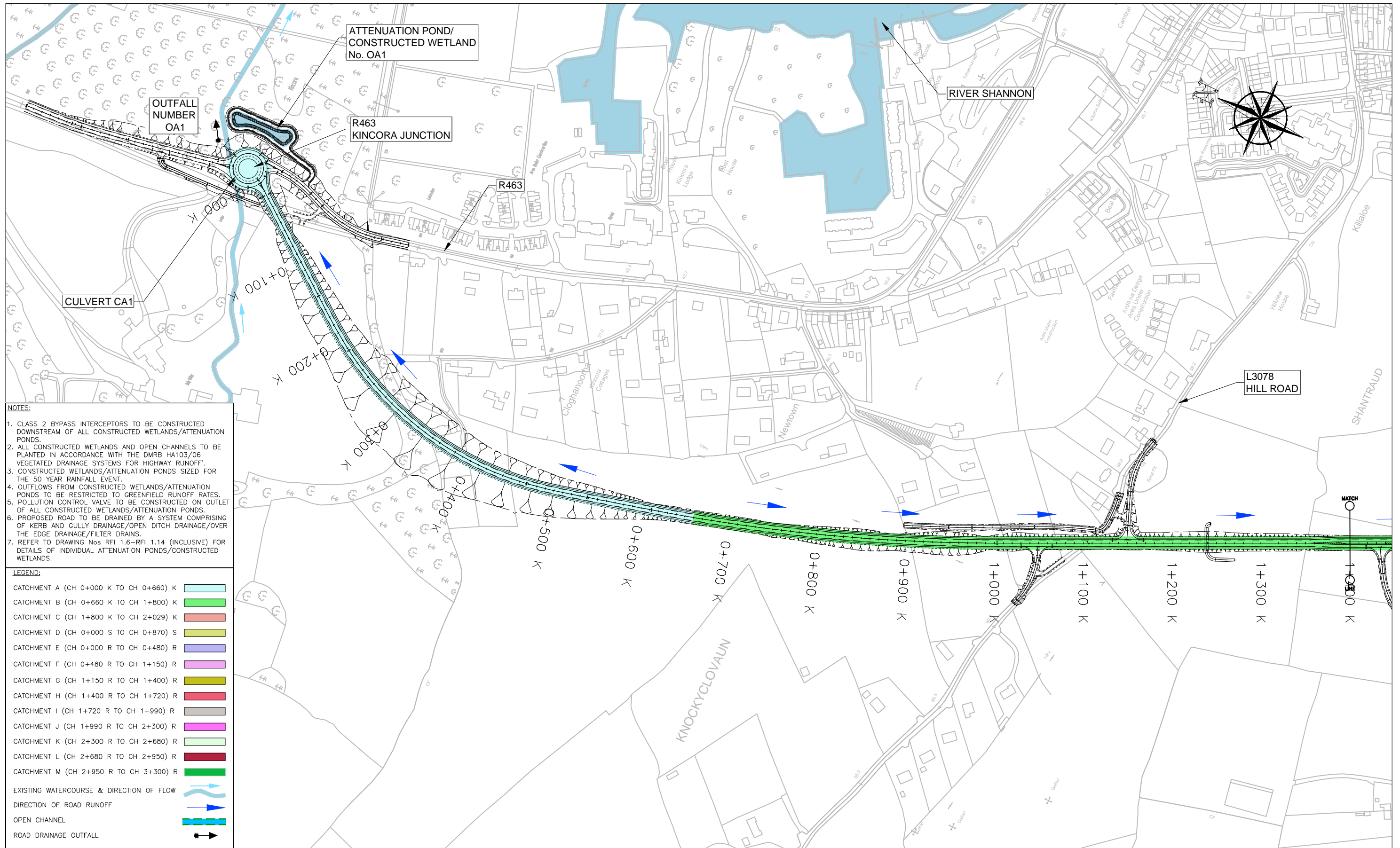
Approximately 8.7km of hedgerows will be removed as a result of the proposed scheme with approximately 2.5ha of woodland and scrub to be removed. This however will be replaced and enhanced by planting of approximately 8.4 ha of woodland and scrub and 7.2 km of hedgerow.

This proposal will replace lost hedgerows/woodland/scrub with similar plant mixes as currently exists along upgraded sections of roadway. In addition along the entire length of the Killaloe Bypass planting will be in the form of hedgerows or woodland mixes. In some cases hedgerow will be replaced with woodland planting/screening. Where severed hedgerows or woodland occur these linear features will be tied into the proposed new road.

Overall there will be an increased area of woodland features provided as a result of the scheme in the long term. As severed hedgerows will be joined to new features there will be a minimal impact as a result of severance of wildlife corridors. Where wildlife underpasses are provided suitable vegetation will be planted in order to encourage use. While a loss of linear features is identified, it will be sufficiently compensated by planting of additional habitat. Mitigation measures are provided in Chapter 8 of the EIS to ensure proper establishment of landscaping measures.

Appendix A

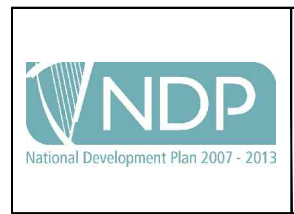
Figures



- NOTES:**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 4. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 5. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 6. PROPOSED ROAD TO BE DRAINED BY A SYSTEM COMPRISING OF KERB AND GULLY DRAINAGE/OPEN DITCH DRAINAGE/OVER THE EDGE DRAINAGE/FILTER DRAINS.
 7. REFER TO DRAWING Nos RFI 1.6-RFI 1.14 (INCLUSIVE) FOR DETAILS OF INDIVIDUAL ATTENUATION PONDS/CONSTRUCTED WETLANDS.

LEGEND:

CATCHMENT A (CH 0+000 K TO CH 0+660) K	
CATCHMENT B (CH 0+660 K TO CH 1+800) K	
CATCHMENT C (CH 1+800 K TO CH 2+029) K	
CATCHMENT D (CH 0+000 S TO CH 0+870) S	
CATCHMENT E (CH 0+000 R TO CH 0+480) R	
CATCHMENT F (CH 0+480 R TO CH 1+150) R	
CATCHMENT G (CH 1+150 R TO CH 1+400) R	
CATCHMENT H (CH 1+400 R TO CH 1+720) R	
CATCHMENT I (CH 1+720 R TO CH 1+990) R	
CATCHMENT J (CH 1+990 R TO CH 2+300) R	
CATCHMENT K (CH 2+300 R TO CH 2+680) R	
CATCHMENT L (CH 2+680 R TO CH 2+950) R	
CATCHMENT M (CH 2+950 R TO CH 3+300) R	
EXISTING WATERCOURSE & DIRECTION OF FLOW	
DIRECTION OF ROAD RUNOFF	
OPEN CHANNEL	
ROAD DRAINAGE OUTFALL	



An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

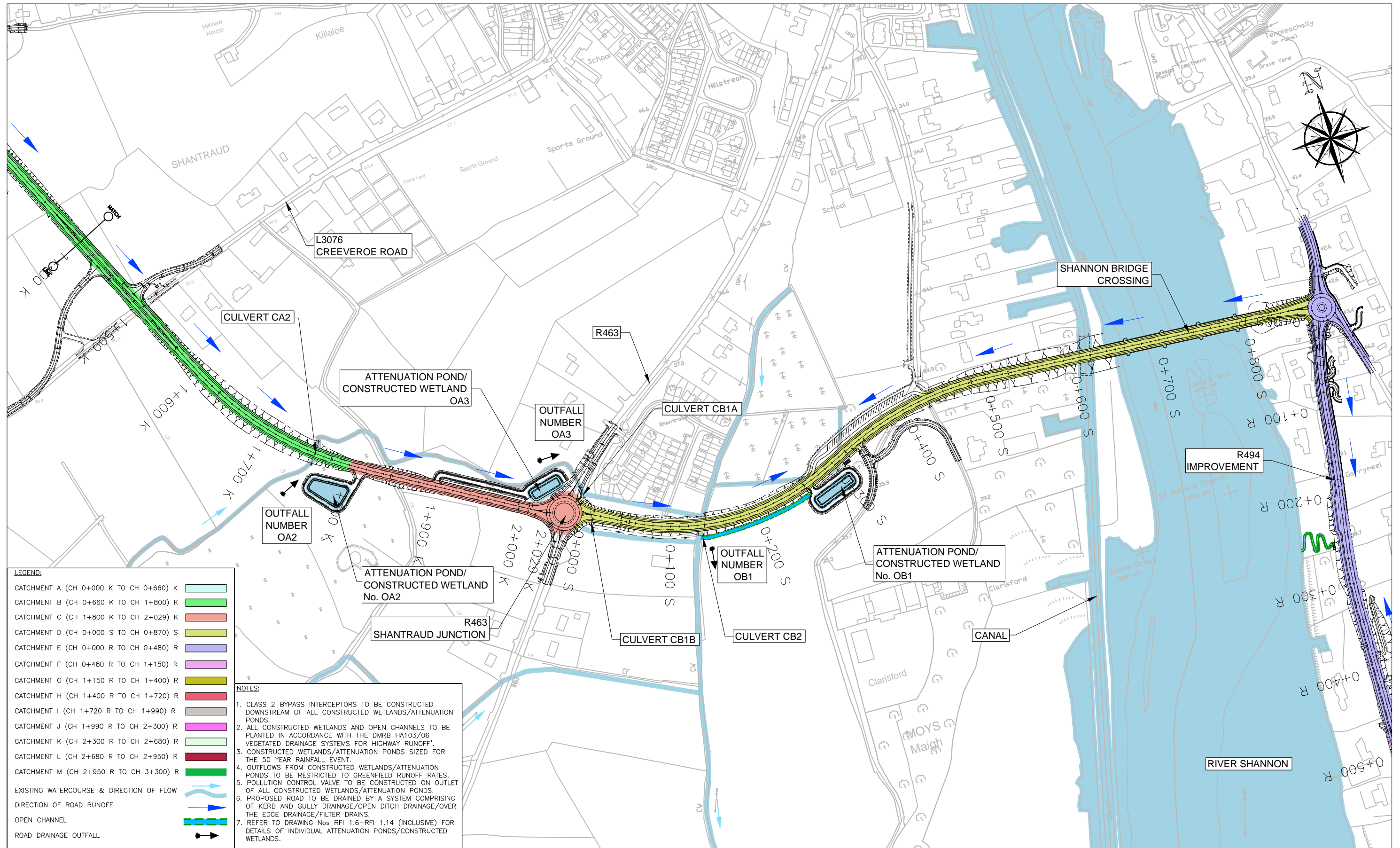
REQUEST FOR FURTHER INFORMATION



Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

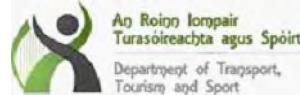
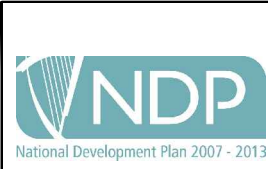
Drawing Title KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT ROAD DRAINAGE CATCHMENTS			
Drawn: SP	Job No: 07.527	Drawing No: RFI-1.1	Rev:
Scale: 1:2000 (A1)	Date: MAY 2012		



LEGEND:

CATCHMENT A (CH 0+000 K TO CH 0+660) K	
CATCHMENT B (CH 0+660 K TO CH 1+800) K	
CATCHMENT C (CH 1+800 K TO CH 2+029) K	
CATCHMENT D (CH 0+000 S TO CH 0+870) S	
CATCHMENT E (CH 0+000 R TO CH 0+480) R	
CATCHMENT F (CH 0+480 R TO CH 1+150) R	
CATCHMENT G (CH 1+150 R TO CH 1+400) R	
CATCHMENT H (CH 1+400 R TO CH 1+720) R	
CATCHMENT I (CH 1+720 R TO CH 1+990) R	
CATCHMENT J (CH 1+990 R TO CH 2+300) R	
CATCHMENT K (CH 2+300 R TO CH 2+680) R	
CATCHMENT L (CH 2+680 R TO CH 2+950) R	
CATCHMENT M (CH 2+950 R TO CH 3+300) R	
EXISTING WATERCOURSE & DIRECTION OF FLOW	
DIRECTION OF ROAD RUNOFF	
OPEN CHANNEL	
ROAD DRAINAGE OUTFALL	

- NOTES:**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA103/06 'VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF'.
 3. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 4. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 5. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 6. PROPOSED ROAD TO BE DRAINED BY A SYSTEM COMPRISING OF KERB AND GULLY DRAINAGE/OPEN DITCH DRAINAGE/OVER THE EDGE DRAINAGE/FILTER DRAINS.
 7. REFER TO DRAWING Nos RFI 1.6-RFI 1.14 (INCLUSIVE) FOR DETAILS OF INDIVIDUAL ATTENUATION PONDS/CONSTRUCTED WETLANDS.



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION



Consulting Engineers
Civil - Structural - Transportation - Environmental

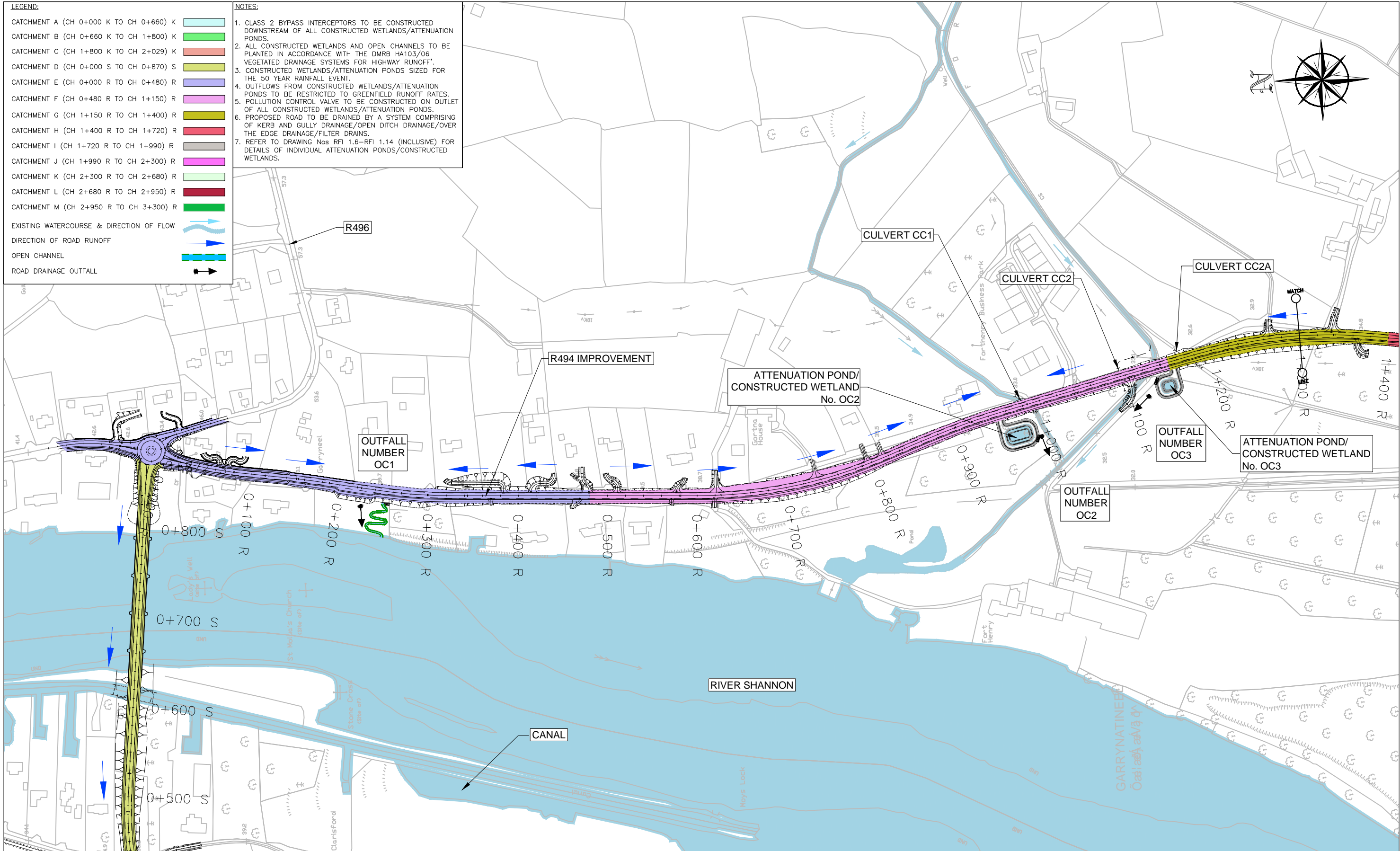
Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Drawing Title			
KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT ROAD DRAINAGE CATCHMENTS			
Drawn: SP	Job No: 07.527	Drawing No: RFI-1.2	Rev:
Scale: 1:2000 (A3)	Date: MAY 2012		

LEGEND:

CATCHMENT A (CH 0+000 K TO CH 0+660) K	[Light Blue Box]
CATCHMENT B (CH 0+660 K TO CH 1+800) K	[Light Green Box]
CATCHMENT C (CH 1+800 K TO CH 2+029) K	[Light Orange Box]
CATCHMENT D (CH 0+000 S TO CH 0+870) S	[Light Yellow Box]
CATCHMENT E (CH 0+000 R TO CH 0+480) R	[Light Purple Box]
CATCHMENT F (CH 0+480 R TO CH 1+150) R	[Light Pink Box]
CATCHMENT G (CH 1+150 R TO CH 1+400) R	[Light Red Box]
CATCHMENT H (CH 1+400 R TO CH 1+720) R	[Light Orange Box]
CATCHMENT I (CH 1+720 R TO CH 1+990) R	[Light Purple Box]
CATCHMENT J (CH 1+990 R TO CH 2+300) R	[Light Pink Box]
CATCHMENT K (CH 2+300 R TO CH 2+680) R	[Light Green Box]
CATCHMENT L (CH 2+680 R TO CH 2+950) R	[Light Orange Box]
CATCHMENT M (CH 2+950 R TO CH 3+300) R	[Light Purple Box]
EXISTING WATERCOURSE & DIRECTION OF FLOW	[Blue Arrow]
DIRECTION OF ROAD RUNOFF	[Blue Arrow]
OPEN CHANNEL	[Blue Dashed Line]
ROAD DRAINAGE OUTFALL	[Black Arrow]

- NOTES:**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 4. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 5. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 6. PROPOSED ROAD TO BE DRAINED BY A SYSTEM COMPRISING OF KERB AND GULLY DRAINAGE/OPEN DITCH DRAINAGE/OVER THE EDGE DRAINAGE/FILTER DRAINS.
 7. REFER TO DRAWING Nos RFI 1.6-RFI 1.14 (INCLUSIVE) FOR DETAILS OF INDIVIDUAL ATTENUATION PONDS/CONSTRUCTED WETLANDS.



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

Roughan & O'Donovan

Consulting Engineers
Civil - Structural - Transportation - Environmental

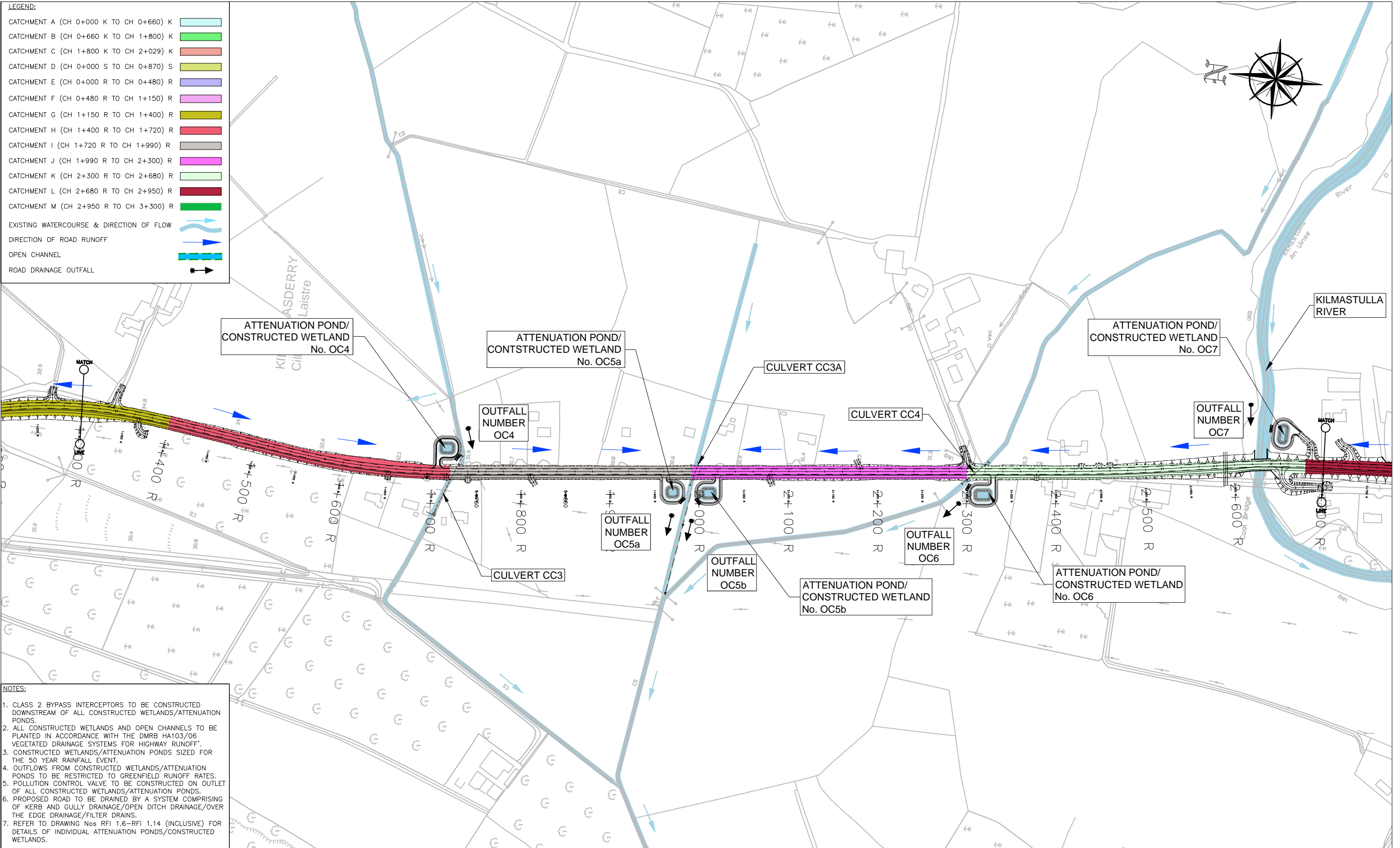
Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

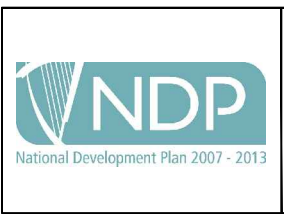
Drawing Title KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT ROAD DRAINAGE CATCHMENTS			
Drawn: SP	Job No: 07.527	Drawing No: RFI-1.3	Rev:
Scale: 1:2000 (A8)	Date: MAY 2012		

LEGEND:

CATCHMENT A (CH 0+000 K TO CH 0+660) K	
CATCHMENT B (CH 0+660 K TO CH 1+800) K	
CATCHMENT C (CH 1+800 K TO CH 2+029) K	
CATCHMENT D (CH 0+000 S TO CH 0+870) S	
CATCHMENT E (CH 0+000 R TO CH 0+480) R	
CATCHMENT F (CH 0+480 R TO CH 1+150) R	
CATCHMENT G (CH 1+150 R TO CH 1+400) R	
CATCHMENT H (CH 1+400 R TO CH 1+720) R	
CATCHMENT I (CH 1+720 R TO CH 1+990) R	
CATCHMENT J (CH 1+990 R TO CH 2+300) R	
CATCHMENT K (CH 2+300 R TO CH 2+680) R	
CATCHMENT L (CH 2+680 R TO CH 2+950) R	
CATCHMENT M (CH 2+950 R TO CH 3+300) R	
EXISTING WATERCOURSE & DIRECTION OF FLOW	
DIRECTION OF ROAD RUNOFF	
OPEN CHANNEL	
ROAD DRAINAGE OUTFALL	



- NOTES:**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 4. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 5. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 6. PROPOSED ROAD TO BE DRAINED BY A SYSTEM COMPRISING OF KERB AND GULLY DRAINAGE/OPEN DITCH DRAINAGE/OVER THE EDGE DRAINAGE/FILTER DRAINS.
 7. REFER TO DRAWING Nos RFI 1.6-RFI 1.14 (INCLUSIVE) FOR DETAILS OF INDIVIDUAL ATTENUATION PONDS/CONSTRUCTED WETLANDS.



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

Roughan & O'Donovan

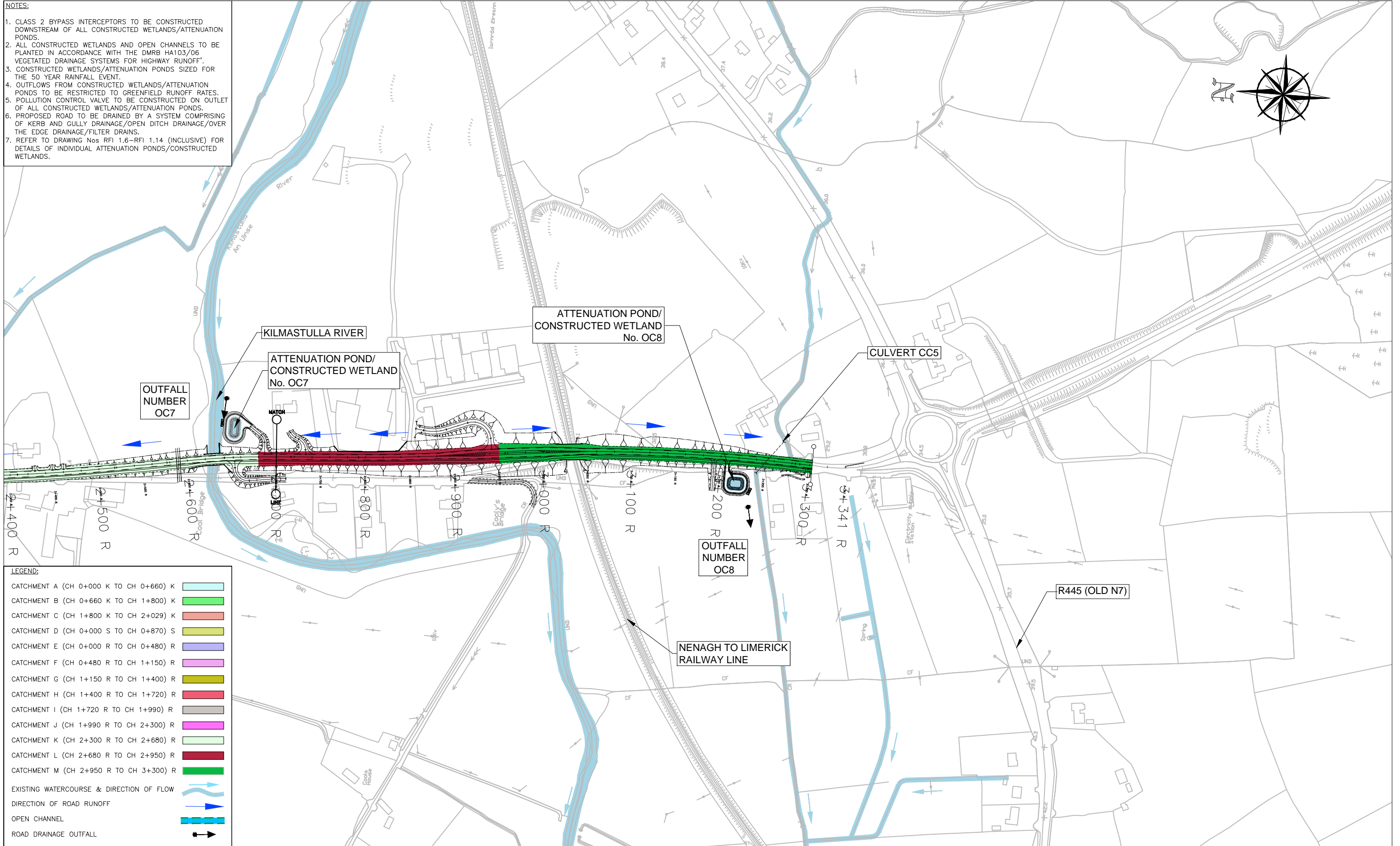
Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

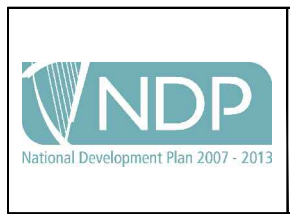
Drawing Title KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT ROAD DRAINAGE CATCHMENTS			
Drawn: SP	Job No: 07.527	Drawing No: RFI-1.4	Rev:
Scale: (A1) 1:2000	Date: MAY 2012		

- NOTES:**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 4. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 5. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 6. PROPOSED ROAD TO BE DRAINED BY A SYSTEM COMPRISING OF KERB AND GULLY DRAINAGE/OPEN DITCH DRAINAGE/OVER THE EDGE DRAINAGE/FILTER DRAINS.
 7. REFER TO DRAWING Nos RFI 1.6-RFI 1.14 (INCLUSIVE) FOR DETAILS OF INDIVIDUAL ATTENUATION PONDS/CONSTRUCTED WETLANDS.



LEGEND:

CATCHMENT A (CH 0+000 K TO CH 0+660) K	
CATCHMENT B (CH 0+660 K TO CH 1+800) K	
CATCHMENT C (CH 1+800 K TO CH 2+029) K	
CATCHMENT D (CH 0+000 S TO CH 0+870) S	
CATCHMENT E (CH 0+000 R TO CH 0+480) R	
CATCHMENT F (CH 0+480 R TO CH 1+150) R	
CATCHMENT G (CH 1+150 R TO CH 1+400) R	
CATCHMENT H (CH 1+400 R TO CH 1+720) R	
CATCHMENT I (CH 1+720 R TO CH 1+990) R	
CATCHMENT J (CH 1+990 R TO CH 2+300) R	
CATCHMENT K (CH 2+300 R TO CH 2+680) R	
CATCHMENT L (CH 2+680 R TO CH 2+950) R	
CATCHMENT M (CH 2+950 R TO CH 3+300) R	
EXISTING WATERCOURSE & DIRECTION OF FLOW	
DIRECTION OF ROAD RUNOFF	
OPEN CHANNEL	
ROAD DRAINAGE OUTFALL	



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

Roughan & O'Donovan

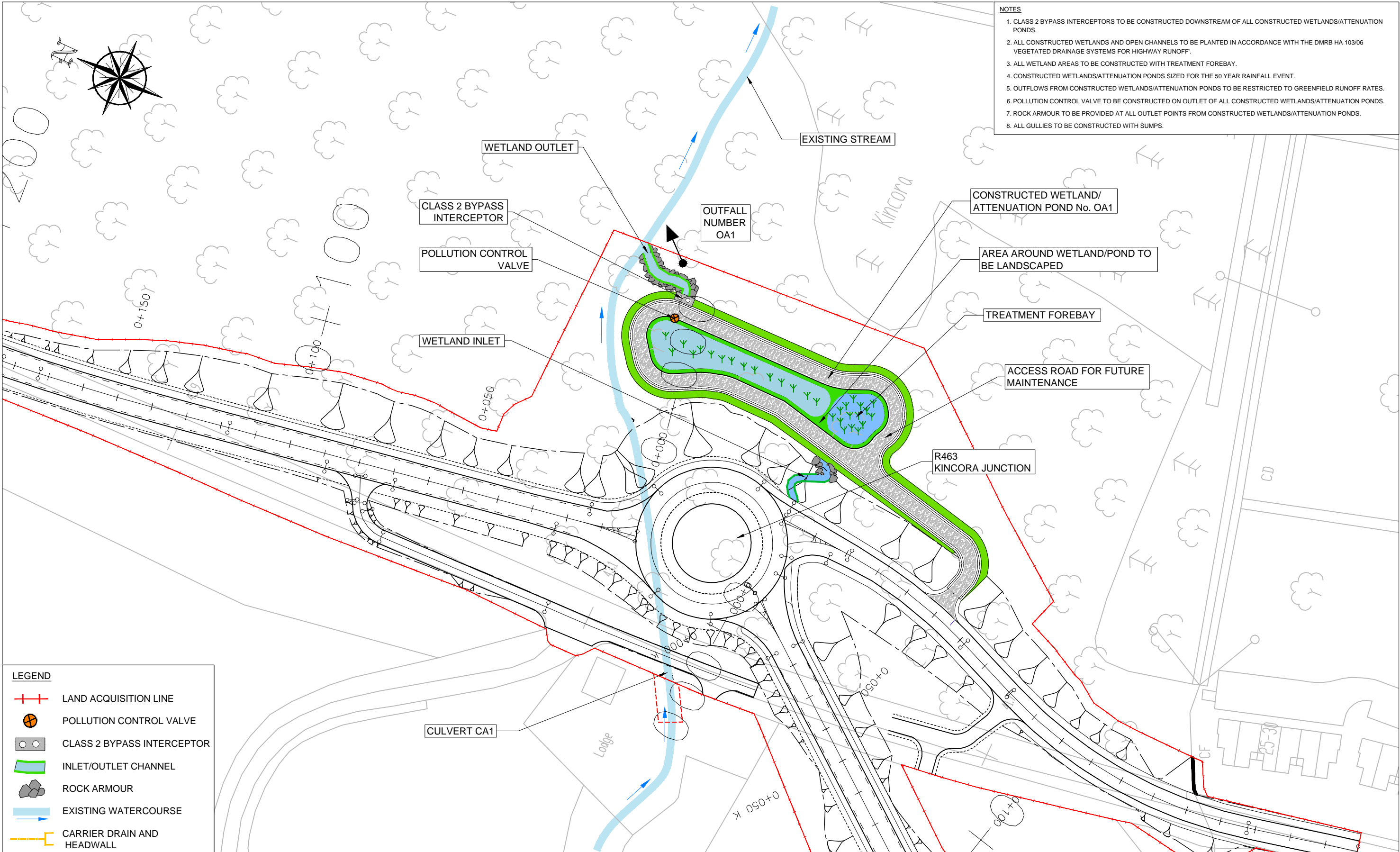
Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

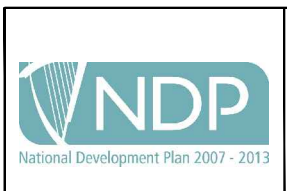
Drawing Title KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT ROAD DRAINAGE CATCHMENTS			
Drawn: SP	Job No: 07.527	Drawing No: RFI-1.5	Rev:
Scale: 1:2000 (A1)	Date: MAY 2012		

- NOTES**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
 4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



LEGEND

	LAND ACQUISITION LINE
	POLLUTION CONTROL VALVE
	CLASS 2 BYPASS INTERCEPTOR
	INLET/OUTLET CHANNEL
	ROCK ARMOUR
	EXISTING WATERCOURSE
	CARRIER DRAIN AND HEADWALL



An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

DEC 08 MC

REQUEST FOR FURTHER INFORMATION

Roughan & O'Donovan

Arena House, Arena Road, Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

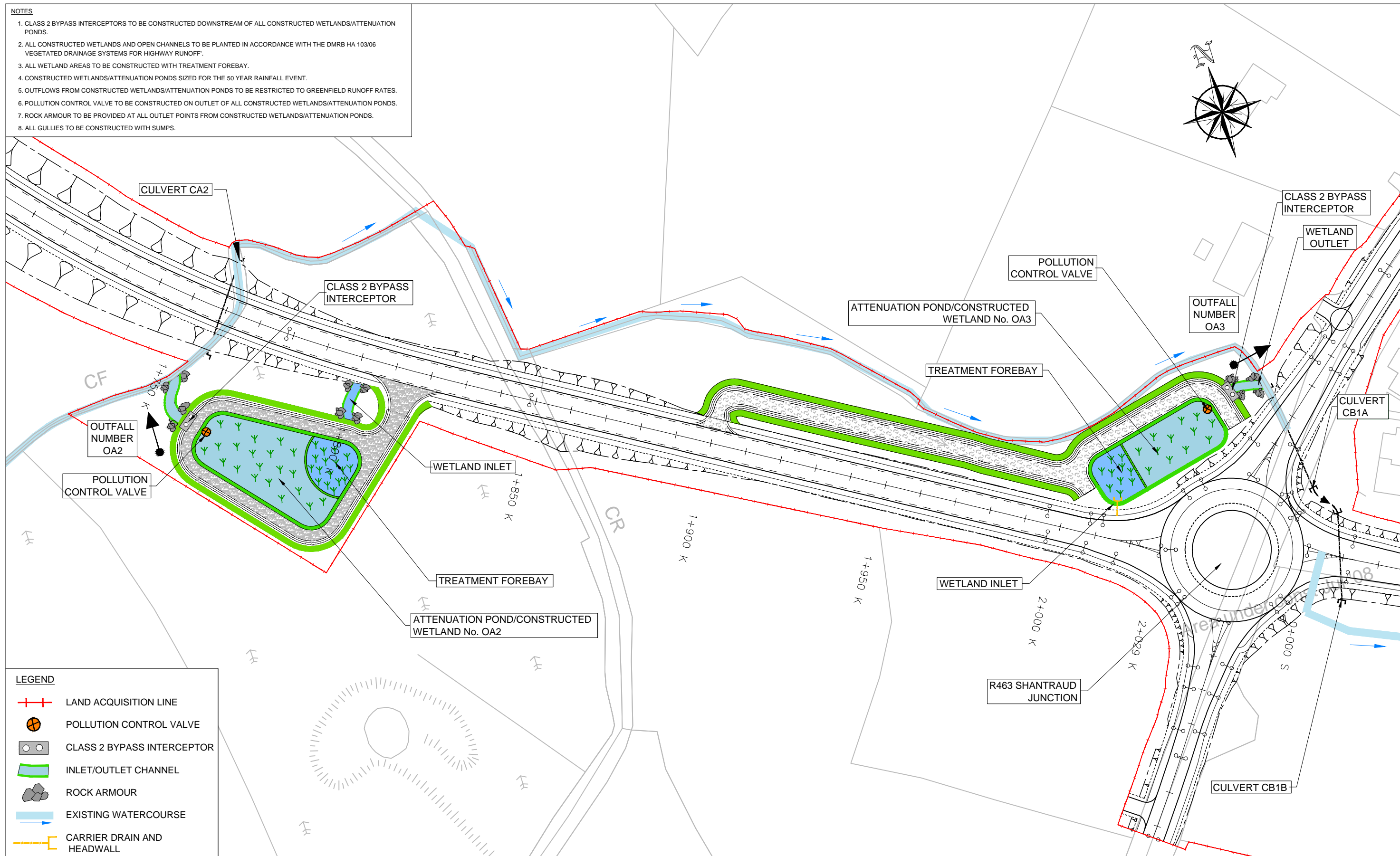
Consulting Engineers
Civil - Structural - Transportation - Environmental

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

Drawing Title			
KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT			
CONSTRUCTED WETLAND/ATTENUATION POND No. OA1			
Drawn: PC	Job No: 07.527	Drawing No: RFI-1.6	Rev:
Scale: 1:500 (A3)	Date: MAY 2012		

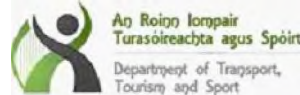
NOTES

1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



LEGEND

- + + LAND ACQUISITION LINE
- POLLUTION CONTROL VALVE
- CLASS 2 BYPASS INTERCEPTOR
- INLET/OUTLET CHANNEL
- ROCK ARMOUR
- EXISTING WATERCOURSE
- CARRIER DRAIN AND HEADWALL



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION



Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

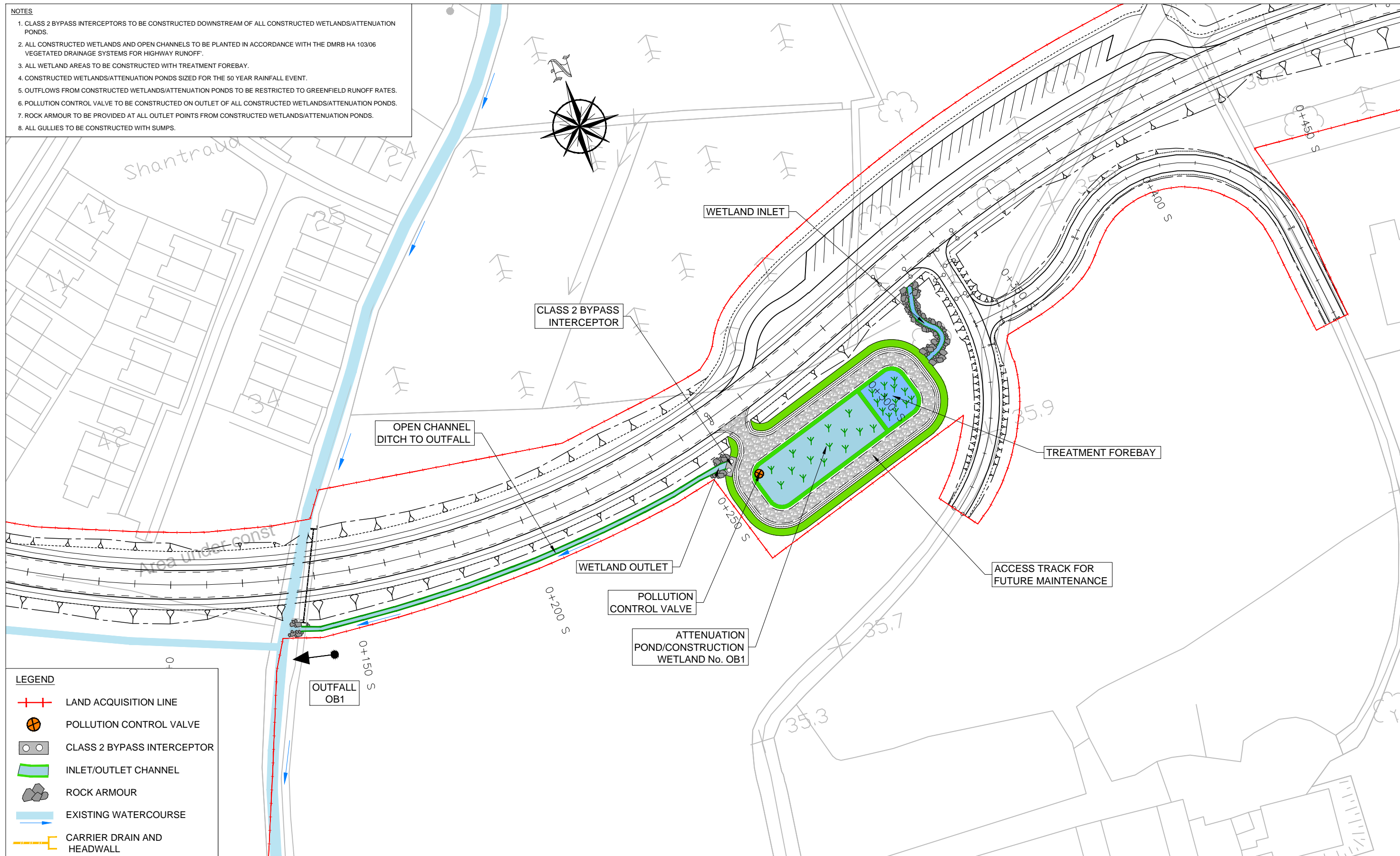
Drawing Title
**KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT
CONSTRUCTED WETLAND/ATTENUATION
POND No. OA2 & No. OA3**

Designed: KB	Checked: RTP	Approved: MC	Status: EIS	Drawn: PC	Job No: 07.527	Drawing No: RFI-1.7	Rev:
				Scale: 1:500 (A8)	Date: MAY 2012		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

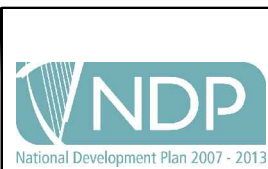
NOTES

1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 'VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF'.
3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



LEGEND

- LAND ACQUISITION LINE
- POLLUTION CONTROL VALVE
- CLASS 2 BYPASS INTERCEPTOR
- INLET/OUTLET CHANNEL
- ROCK ARMOUR
- EXISTING WATERCOURSE
- CARRIER DRAIN AND HEADWALL



An Roinn Iompair
Turasoireachta agus Spóirt
Department of Transport,
Tourism and Sport

**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
& R494 IMPROVEMENT**

REQUEST FOR FURTHER INFORMATION

Roughan & O'Donovan

Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

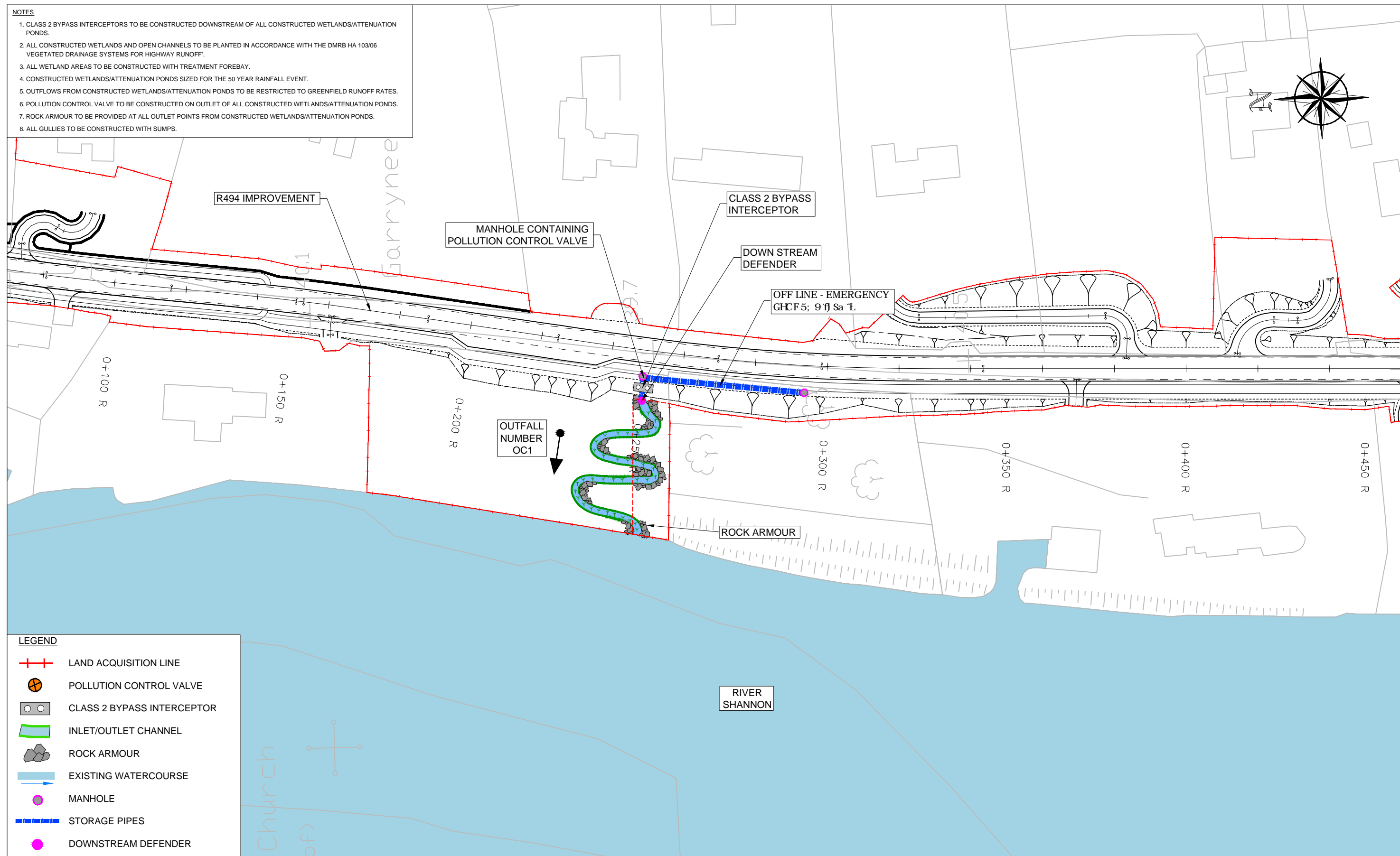
Drawing Title
**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
& R494 IMPROVEMENT
CONSTRUCTED WETLAND/ATTENUATION POND No. OB1**

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

Drawn: PC	Job No: 07.527	Drawing No: RFI-1.8	Rev:
Scale: (A3) 1:500	Date: MAY 2012		

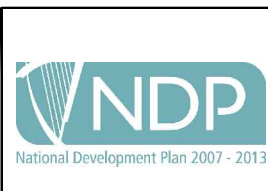
NOTES

1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



LEGEND

- LAND ACQUISITION LINE
- POLLUTION CONTROL VALVE
- CLASS 2 BYPASS INTERCEPTOR
- INLET/OUTLET CHANNEL
- ROCK ARMOUR
- EXISTING WATERCOURSE
- MANHOLE
- STORAGE PIPES
- DOWNSTREAM DEFENDER



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

Roughan & O'Donovan

Consulting Engineers
Civil - Structural - Transportation - Environmental

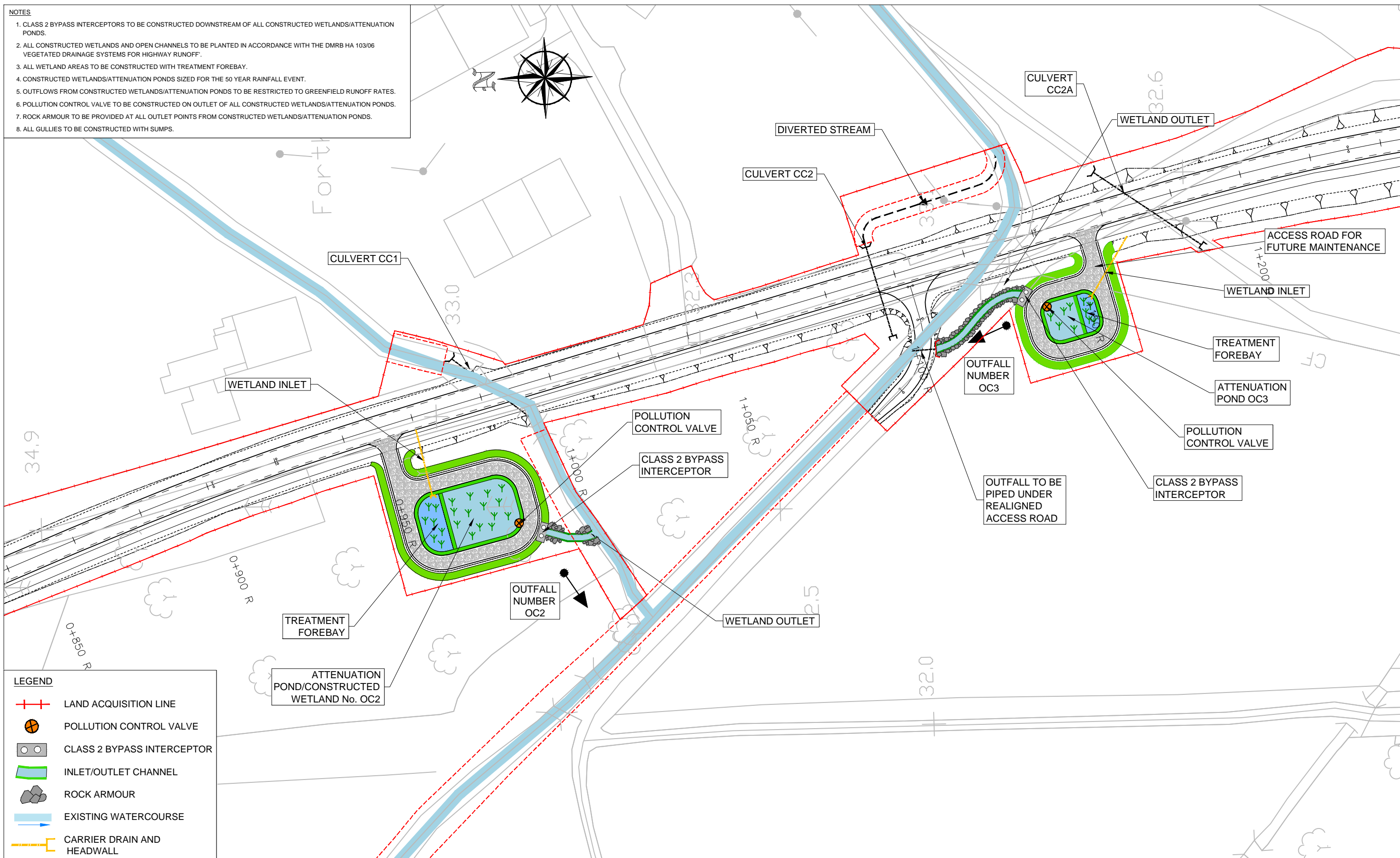
Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

Drawing Title			
KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT			
CONSTRUCTED WETLAND/ATTENUATION POND No. OC1			
Drawn: PC	Job No: 07.527	Drawing No:	Rev:
Scale: (A3) 1:500	Date: MAY 2012	RFI-1.9	

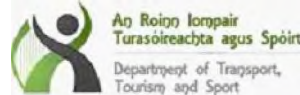
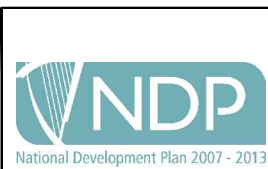
NOTES

1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



LEGEND

- LAND ACQUISITION LINE
- POLLUTION CONTROL VALVE
- CLASS 2 BYPASS INTERCEPTOR
- INLET/OUTLET CHANNEL
- ROCK ARMOUR
- EXISTING WATERCOURSE
- CARRIER DRAIN AND HEADWALL



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

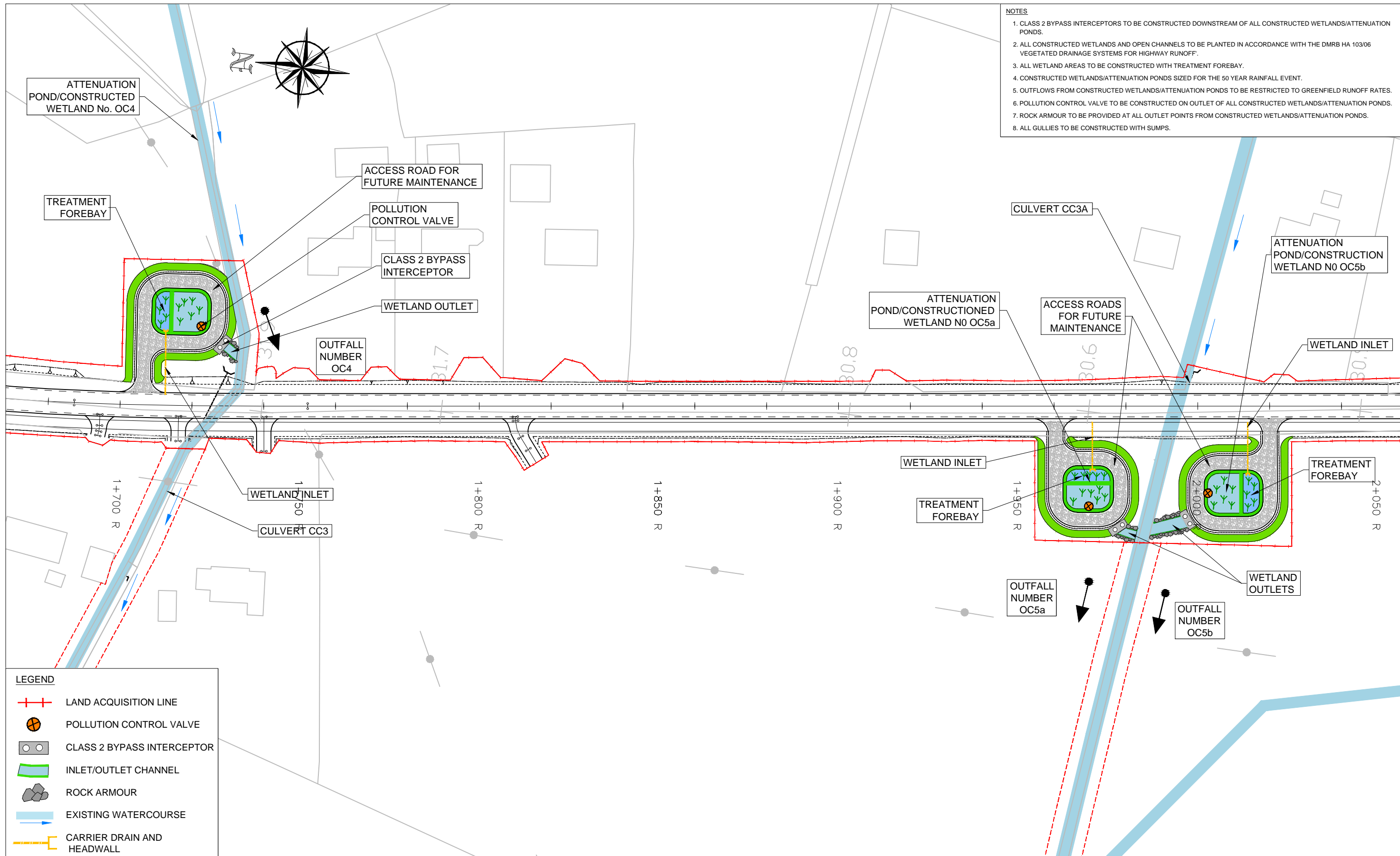


Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Drawing Title
**KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT
CONSTRUCTED WETLAND/ATTENUATION
POND No. OC2 & OC3**

Designed: KB	Checked: RTP	Approved: MC	Status: EIS	Drawn: PC	Job No: 07.527	Drawing No: RFI-1.10	Rev:
--------------	--------------	--------------	-------------	-----------	----------------	----------------------	------



- NOTES**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
 4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.

LEGEND

- LAND ACQUISITION LINE
- POLLUTION CONTROL VALVE
- CLASS 2 BYPASS INTERCEPTOR
- INLET/OUTLET CHANNEL
- ROCK ARMOUR
- EXISTING WATERCOURSE
- CARRIER DRAIN AND HEADWALL



An Roinn Iompair
Turasóireachta agus Spóirt
Department of Transport,
Tourism and Sport

**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
& R494 IMPROVEMENT**

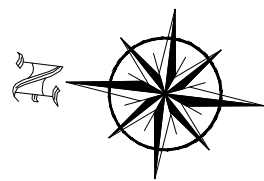
REQUEST FOR FURTHER INFORMATION



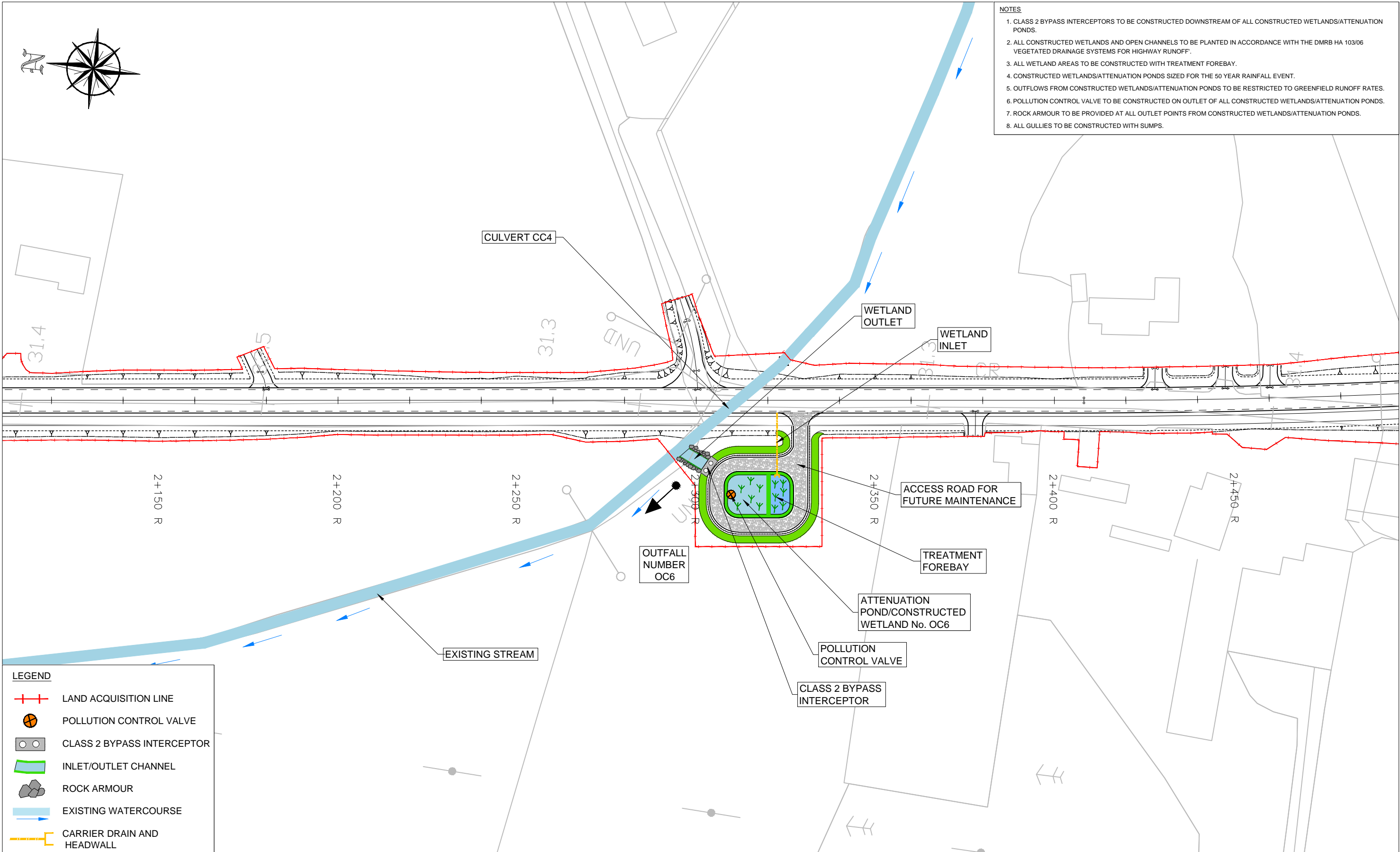
Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

Drawing Title KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT CONSTRUCTED WETLAND/ATTENUATION POND No. OC4 , OC5a & OC5b			
Drawn: PC	Job No: 07.527	Drawing No: RFI-1.11	Rev:
Scale (A3): 1:500	Date: MAY 2012		



- NOTES**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
 4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



- LEGEND**
- LAND ACQUISITION LINE
 - POLLUTION CONTROL VALVE
 - CLASS 2 BYPASS INTERCEPTOR
 - INLET/OUTLET CHANNEL
 - ROCK ARMOUR
 - EXISTING WATERCOURSE
 - CARRIER DRAIN AND HEADWALL



An Roinn Iompair
Turasóireachta agus Spóirt
Department of Transport,
Tourism and Sport

**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
& R494 IMPROVEMENT**

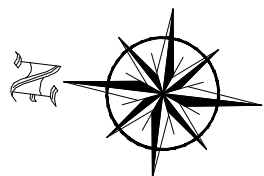
REQUEST FOR FURTHER INFORMATION



Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

Drawing Title KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT CONSTRUCTED WETLAND/ATTENUATION POND No. OC6			
Drawn: PC	Job No: 07.527	Drawing No: RFI-1.12	Rev:
Scale: (A3) 1:500	Date: MAY 2012		



KILMASTULLA RIVER

CLASS 2 BYPASS INTERCEPTOR

POLLUTION CONTROL VALVE

ATTENUATION POND/CONSTRUCTED WETLAND No. OC7

ACCESS ROAD FOR FUTURE MAINTENANCE

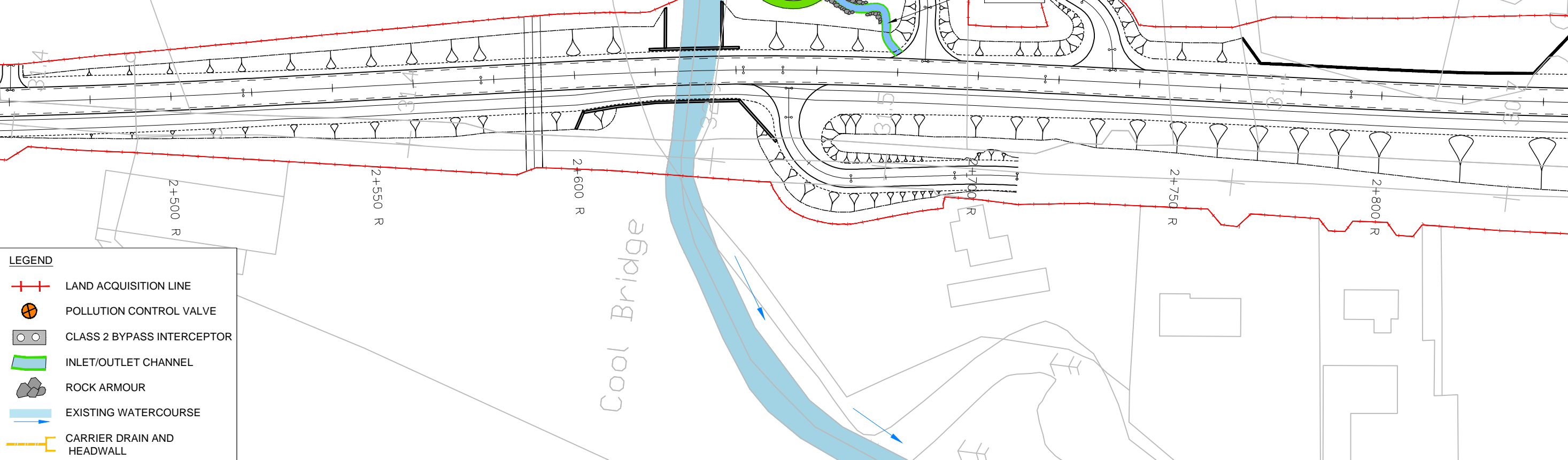
OUTFALL NUMBER OC7

TREATMENT FOREBAY

WETLAND INLET

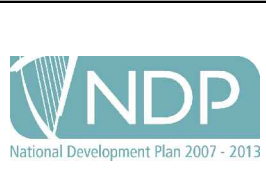
NOTES

1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



LEGEND

- LAND ACQUISITION LINE
- POLLUTION CONTROL VALVE
- CLASS 2 BYPASS INTERCEPTOR
- INLET/OUTLET CHANNEL
- ROCK ARMOUR
- EXISTING WATERCOURSE
- CARRIER DRAIN AND HEADWALL



An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

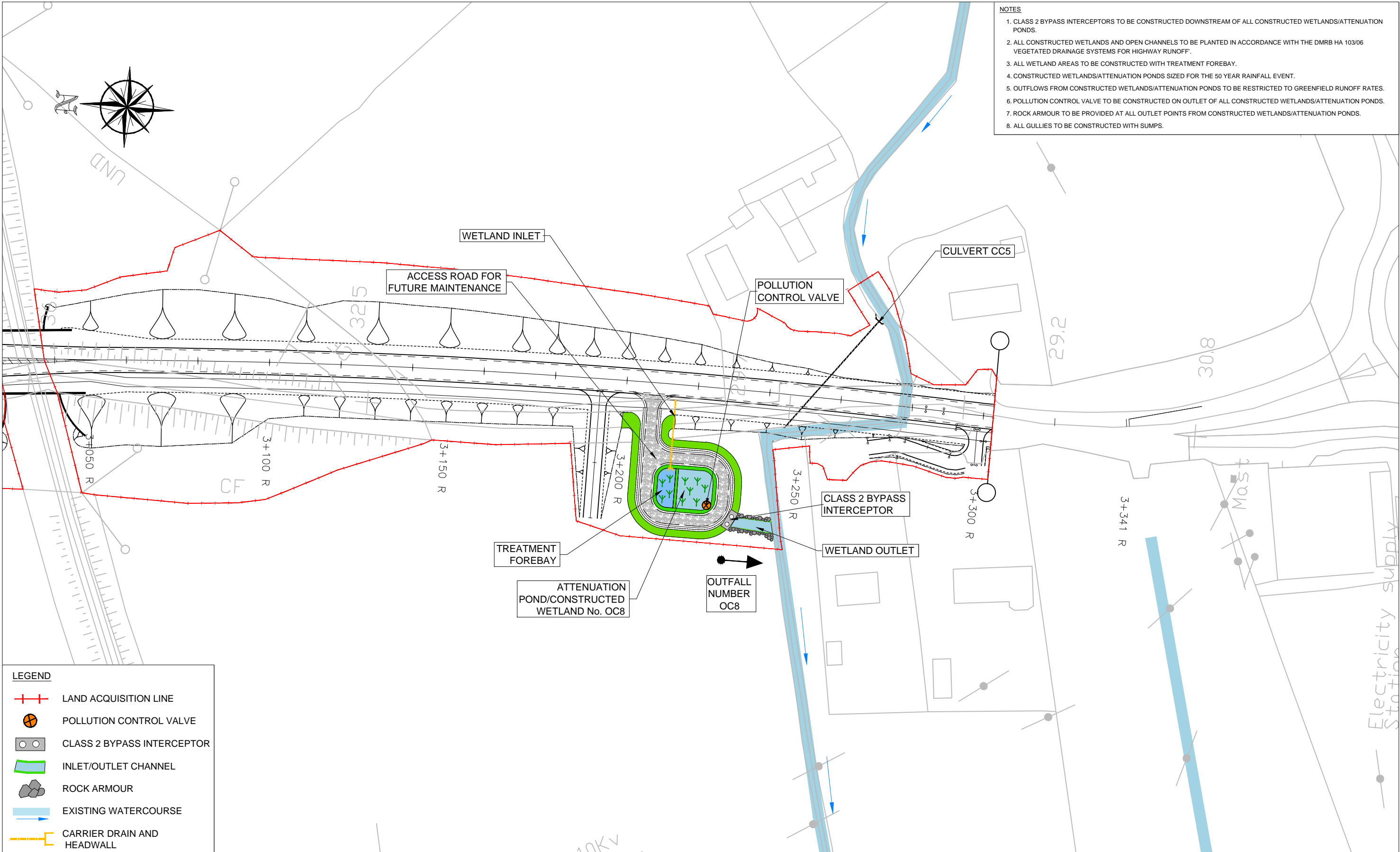
Roughan & O'Donovan

Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

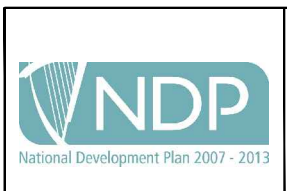
Drawing Title			
KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT			
CONSTRUCTED WETLAND/ATTENUATION POND No. OC7			
Drawn: PC	Job No: 07.527	Drawing No: RFI-1.13	Rev:
Scale: (A3) 1:500	Date: MAY 2012		

- NOTES**
1. CLASS 2 BYPASS INTERCEPTORS TO BE CONSTRUCTED DOWNSTREAM OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 2. ALL CONSTRUCTED WETLANDS AND OPEN CHANNELS TO BE PLANTED IN ACCORDANCE WITH THE DMRB HA 103/06 VEGETATED DRAINAGE SYSTEMS FOR HIGHWAY RUNOFF.
 3. ALL WETLAND AREAS TO BE CONSTRUCTED WITH TREATMENT FOREBAY.
 4. CONSTRUCTED WETLANDS/ATTENUATION PONDS SIZED FOR THE 50 YEAR RAINFALL EVENT.
 5. OUTFLOWS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS TO BE RESTRICTED TO GREENFIELD RUNOFF RATES.
 6. POLLUTION CONTROL VALVE TO BE CONSTRUCTED ON OUTLET OF ALL CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 7. ROCK ARMOUR TO BE PROVIDED AT ALL OUTLET POINTS FROM CONSTRUCTED WETLANDS/ATTENUATION PONDS.
 8. ALL GULLIES TO BE CONSTRUCTED WITH SUMPS.



LEGEND

- LAND ACQUISITION LINE
- POLLUTION CONTROL VALVE
- CLASS 2 BYPASS INTERCEPTOR
- INLET/OUTLET CHANNEL
- ROCK ARMOUR
- EXISTING WATERCOURSE
- CARRIER DRAIN AND HEADWALL



KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

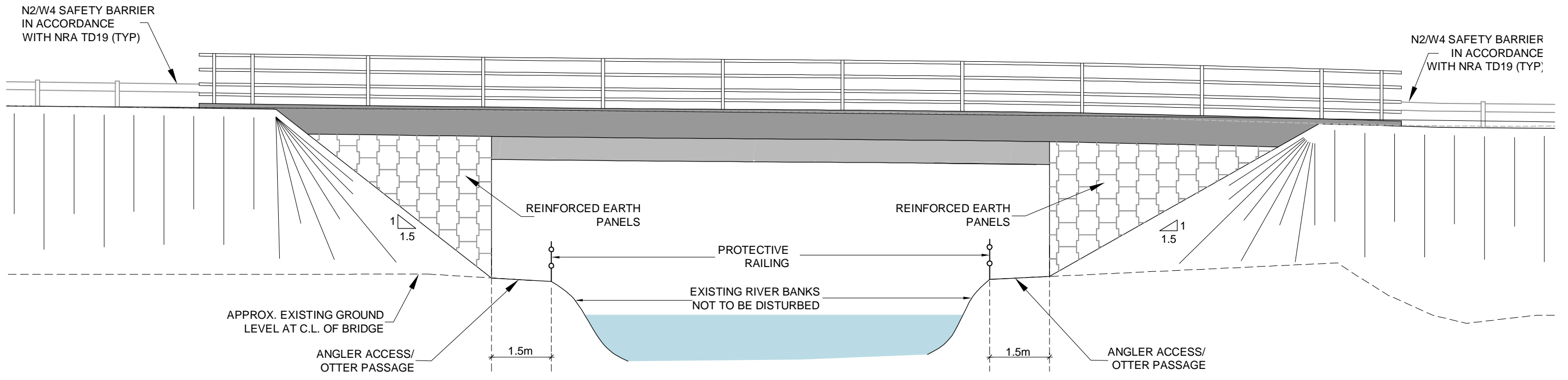
Roughan & O'Donovan

Consulting Engineers
Civil - Structural - Transportation - Environmental

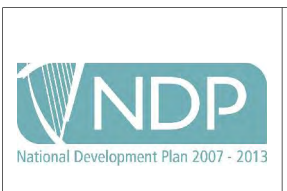
Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Designed: KB	Checked: RTP	Approved: MC	Status: EIS
--------------	--------------	--------------	-------------

Drawing Title KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT CONSTRUCTED WETLAND/ATTENUATION POND No. OC8			
Drawn: PC	Job No: 07.527	Drawing No: RFI-1.14	Rev:
Scale: (A3) 1:500	Date: MAY 2012		



ELEVATION LOOKING EAST
 A1 SCALE 1:50
 A3 SCALE 1:100



An Roinn Iompair
 Turasoireachta agus Spóirt
 Department of Transport,
 Tourism and Sport

**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
 & R494 IMPROVEMENT**

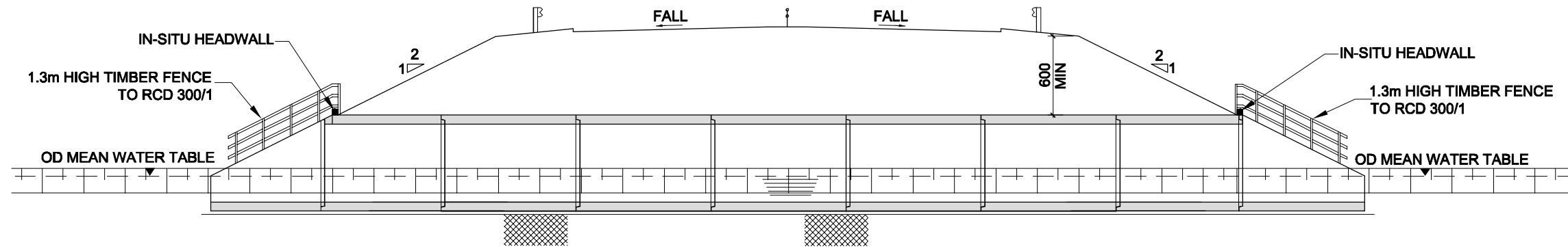
REQUEST FOR FURTHER INFORMATION



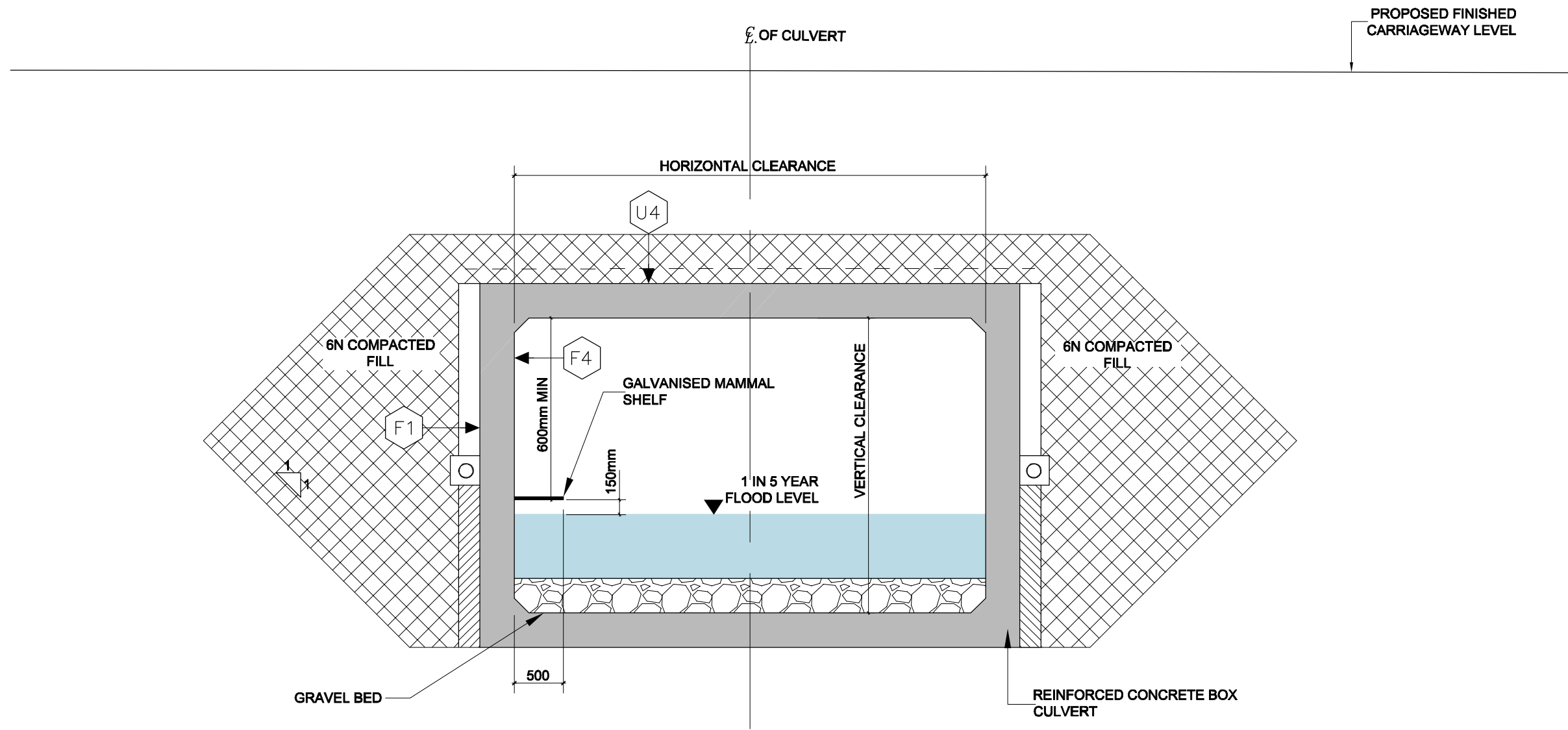
Consulting Engineers
 Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
 Sandyford, Dublin 18.
 Tel : +353 1 294 0800
 Fax : +353 1 294 0820
 e-mail : info@rod.ie
 www.roughanodonovan.com

Drawing Title			
GENERAL ARRANGEMENT KILLMASTULLA BRIDGE			
Drawn: SP	Job No: 07.527	Drawing No:	Rev:
Scale: (A1) AS SHOWN	Date: MAY 2012	RFI-4.1	

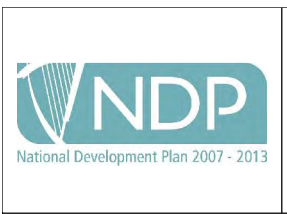


TYPICAL LONG SECTION THROUGH CULVERT



TYPICAL CROSS SECTION THROUGH CULVERT

A1 SCALE 1:25
A3 SCALE 1:50



An Roinn Iompair Turasoireachta agus Spóirt
Department of Transport, Tourism and Sport

KILLALOE BYPASS, SHANNON BRIDGE CROSSING & R494 IMPROVEMENT

REQUEST FOR FURTHER INFORMATION

Roughan & O'Donovan

Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

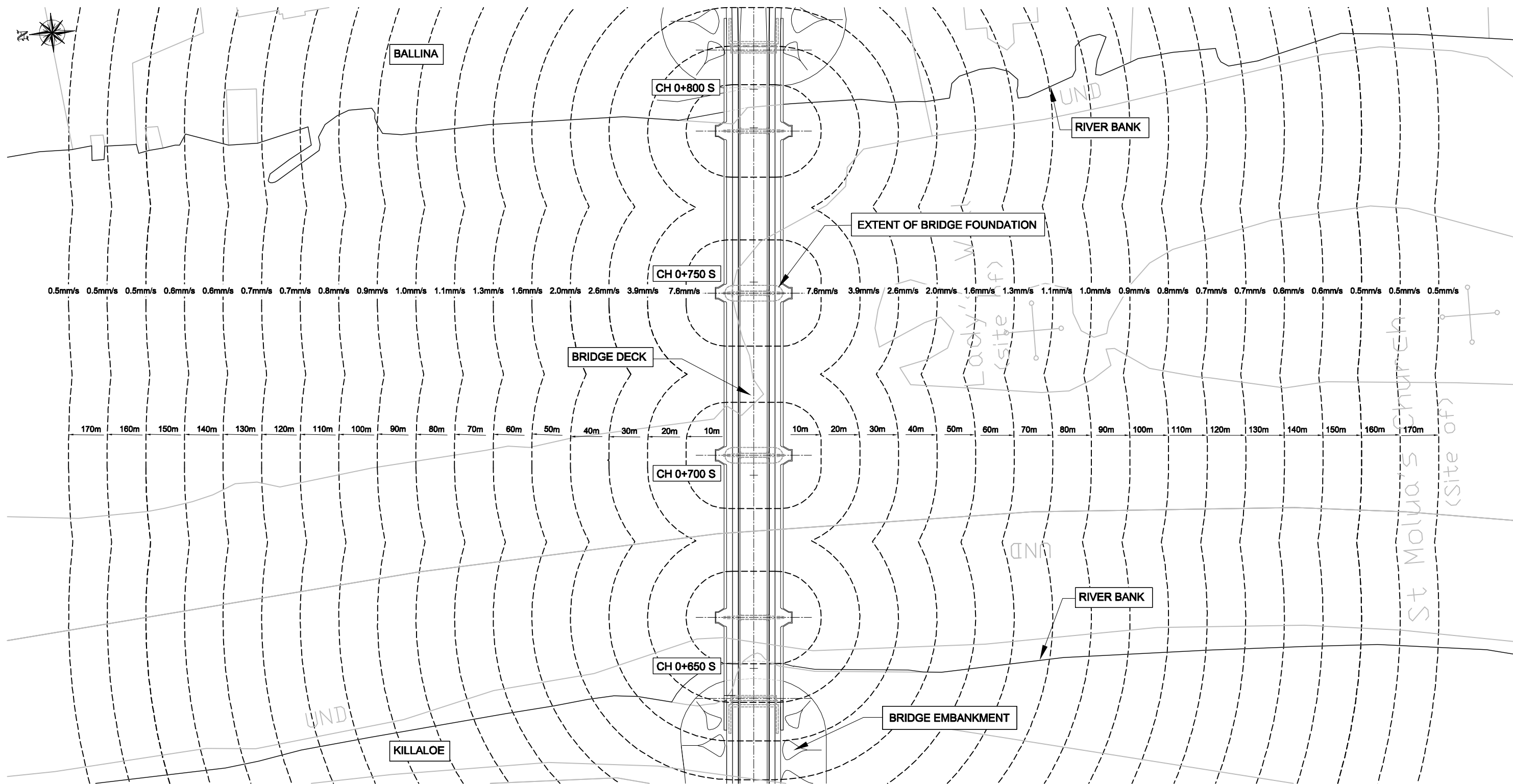
Drawing Title			
TYPICAL MAMMAL PASS IN CULVERT			
Drawn: SP	Job No: 07.527	Drawing No:	Rev:
Scale: (A3) AS SHOWN	Date: MAY 2012	RFI-4.2	

NOTES

1. DIMENSIONS ARE SHOWN IN MILLIMETERS UNLESS OTHERWISE INDICATED.
2. VIBRATIONS INDICATED ARE FOR RESULTANT PEAK PARTICLE VELOCITY (PPV).

LEGEND

----- VIBRATION CONTOURS (DISTANCES SHOWN ARE HORIZONTAL FROM THE NEAREST FOUNDATION OR SUBSTRUCTURE)



PLAN
A1 SCALE 1:500
A3 SCALE 1:1000



An Roinn Iompair
Turasoireachta agus Spóirt
Department of Transport,
Tourism and Sport

**KILLALOE BYPASS, SHANNON BRIDGE CROSSING
& R494 IMPROVEMENT**

REQUEST FOR FURTHER INFORMATION



Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
www.roughanodonovan.com

Drawing Title			
PROPOSED SHANNON BRIDGE, MAP OF PREDICTED ZONE OF VIBRATION INFLUENCE			
Drawn: AHe	Job No: 07.527	Drawing No: RF1-6.1	Rev:
Scale: (A3) AS SHOWN	Date: MAY 2012		

Appendix B

Derogation Licence



*An Roinn
Ealaíon, Oidhreachta agus Gaeltachta*

*Department of
Arts, Heritage and the Gaeltacht*

Licence No.: DER/BAT 2012-03

**EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS
2011 (S.I. No 477 of 2011)**

DEROGATION LICENCE

Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, hereinafter referred to as "the Habitats Regulations".

Introduction

The Minister for Arts, Heritage and the Gaeltacht, (hereinafter referred to as "the Minister"), after obtaining professional advice, is satisfied that: -

- (A) this licence should be granted for the purpose of protecting wild fauna and conserving natural habitats and in the interests of public health and public safety, and
- (B) there is no satisfactory alternative, and the action authorised by this licence will not be detrimental to the maintenance of the population of **BATS** referred to below at a favourable conservation status in their natural range.

Licence

The Minister, in exercise of the powers conferred on him by Regulation 54 of the Habitats Regulations hereby grants to **Clare County Council and North Tipperary County Council** ("the licensees") a licence in respect of **Bat Species**. This licence authorises the following:

- (a) disturbance;
 - (b) damage or destruction of breeding sites or resting places;
- ("the authorised actions").

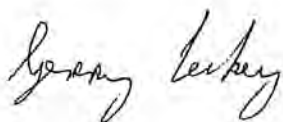
This licence is subject to the terms and conditions set out overleaf.

Terms and Conditions

1. This licence will only become valid when planning permission for the proposed works has been granted.
2. This licence is granted solely in respect of the activities specified in connection with the **proposed construction of a bypass of Killaloe, a new bridge crossing over the River Shannon and improvements to the R494 linking the Shannon River Crossing to the N7 at Birdhill.**
3. The authorised actions shall be carried out on the licensees's behalf by, or under the authorisation of, **Roughan & O'Donovan, Consulting Engineers, Arena House, Arena Road, Sandyford, Dublin 18** ("the scientific agent").
4. All activities authorised by this licence, and all equipment used in connection herewith, shall be carried out, constructed and maintained (as the case may be) so as to avoid unnecessary injury or distress to any species of **BAT**.
5. This licence may be modified or revoked, for stated reasons, at any time.
6. The actions to which this licence authorises shall be completed between the **16th January 2012** and the **31st December 2012.**
7. No agent or servant of the licensees, nor any other person, shall carry out any of the activities to which this licence applies unless authorised in writing by the scientific agent. Any such agent, servant or other person shall make a copy of the written authorisation available for and shall produce it on demand to any member of An Garda Síochána or an authorised officer.
8. This licence is granted subject to the licensees, including their servants and the scientific agent, adhering to the mitigation measures as set out in the survey report carried out by the scientific agent and any additional mitigation measures requested by the National Parks and Wildlife Service.
9. All identified roosts, both confirmed and potential, will be subject to the mitigation measures proposed in the EIA for this scheme.
10. The demolition of the buildings in question shall be done in accordance with the mitigation measures detailed in the EIA for this scheme (draft June 2011).

11. An extensive network of bat boxes will be erected at least 6 months in advance of the buildings being demolished. Number, design and locations of bat boxes to be agreed with local NPWS staff. At least 8 of the bat boxes (i.e. 2 for each roost being demolished) shall be of a type suitable for maternity colonies of the above species.
12. Follow up monitoring, in the summer following works completion, should be conducted by a bat expert to establish extent of usage of the bat boxes and, where necessary, bat boxes will be replaced or moved to maximise the success of the mitigation measures.
13. The relevant NPWS District Conservation Officers Seamus Hassett (065 6822711) and Stefan Jones (067 46323) shall be contacted prior to the commencement of work under the terms of this licence.
14. During the progress of the activities to which this licence applies, the clerk of works, site manager or other suitable representative of the licensees shall make a copy of the licence available for inspection on each site where the activities are taking place, and shall produce it on demand to any member of An Garda Síochána or an authorised officer appointed under Regulation 4 of the Habitats Regulations (hereinafter referred to as "an authorised officer").
15. Within 5 working days of being requested to do so by an authorised officer, the licensees shall provide a report on the progress of the work covered by this licence and of the mitigation measures implemented.
16. The licensees shall, within 14 days of completion of the actions which this licence authorises, submit a written report to the address below, describing the activities carried out and the mitigation measures implemented in pursuance of this licence.
17. The licensees shall provide for and implement a scientific programme (hereinafter referred to as "the scientific programme") of monitoring of any translocated populations and of the operation of the mitigation measures, to investigate and provide data on the effectiveness of the mitigation measures. The scientific programme will provide for supplementary mitigation measures informed by data obtained from this monitoring programme.

18. The licensees shall, within **3 calendar months** of the submission of the report under 16 above, submit to the signatory at the address below an interim report on the continued monitoring under the scientific programme. The licensees shall submit a further report by the **13th (final report)** calendar month after the submission of the report under 16 above, setting out the results of the monitoring carried out over these periods and particulars of any supplementary mitigation measures taken.
19. The reporting requirements under this licence will continue in force after the completion of the actions which it authorises, until their completion and the licensees shall be responsible for ensuring that these requirements are met in full.



Gerry Leckey

(a person authorised by the Minister to sign on his behalf)

16th January 2012

Species Protection Unit,
National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,
7 Ely Place,
Dublin 2.



NOTES (1 to 2).

- This licence is granted for the period specified and subject to compliance with the conditions specified. Anything done other than in accordance with the terms of this licence may constitute an offence.
- This licence applies to **bats** and to no other species.



An Roinn
Ealaíon, Oidhreachta agus Gaeltachta

Department of
Arts, Heritage and the Gaeltacht

Licence No.: DER/OTTER 2012-04

**EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS
2011 (S.I. No 477 of 2011)**

DEROGATION LICENCE

Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, hereinafter referred to as "the Habitats Regulations".

Introduction

The Minister for Arts, Heritage and the Gaeltacht, (hereinafter referred to as "the Minister"), after obtaining professional advice, is satisfied that: -

- (A) this licence should be granted for the purpose of protecting wild fauna and conserving natural habitats and in the interests of public health and public safety, and
- (B) there is no satisfactory alternative, and the action authorised by this licence will not be detrimental to the maintenance of the population of **OTTERS** referred to below at a favourable conservation status in their natural range.

Licence

The Minister, in exercise of the powers conferred on him by Regulation 54 of the Habitats Regulations hereby grants to **Clare County Council and North Tipperary County Council** ("the licensees") a licence in respect of the **Eurasian Otter (*Lutra lutra*)**. This licence authorises the following:

- (a) disturbance;
 - (b) damage or destruction of breeding sites or resting places;
- ("the authorised actions").

This licence is subject to the terms and conditions set out overleaf.

Terms and Conditions

1. This licence will only become valid when planning permission for the proposed works has been granted.
2. This licence is granted solely in respect of the activities specified in connection with the **proposed construction of a bypass of Killaloe, a new bridge crossing over the River Shannon and improvements to the R494 linking the Shannon River Crossing to the N7 at Birdhill.**
3. The authorised actions shall be carried out on the licensees's behalf by, or under the authorisation of, **Roughan & O'Donovan, Consulting Engineers, Arena House, Arena Road, Sandyford, Dublin 18** ("the scientific agent").
4. All activities authorised by this licence, and all equipment used in connection herewith, shall be carried out, constructed and maintained (as the case may be) so as to avoid unnecessary injury or distress to any species of **OTTER**.
5. This licence may be modified or revoked, for stated reasons, at any time.
6. The actions to which this licence authorises shall be completed between the **16th January 2012** and the **31st December 2012**.
7. No agent or servant of the licensees, nor any other person, shall carry out any of the activities to which this licence applies unless authorised in writing by the scientific agent. Any such agent, servant or other person shall make a copy of the written authorisation available for and shall produce it on demand to any member of An Garda Síochána or an authorised officer.
8. This licence is granted subject to the licensees, including their servants and the scientific agent, adhering to the mitigation measures as set out in the survey report carried out by the scientific agent and any additional mitigation measures requested by the National Parks and Wildlife Service.
9. The demolition of the holt in question shall be done in accordance with the mitigation measures detailed in the EIA for this scheme (draft June 2011).
10. An artificial holt shall be installed prior to the demolition of the current holt. Location and design of same to be agreed in advance with NPWS staff.
11. Follow up monitoring, in the summer following works completion, should be conducted by a mammal expert to establish extent of usage of the new holt.

12. The relevant NPWS District Conservation Officer Seamus Hassett (065 6822711) shall be contacted prior to the commencement of work under the terms of this licence.
13. During the progress of the activities to which this licence applies, the clerk of works, site manager or other suitable representative of the licensees shall make a copy of the licence available for inspection on each site where the activities are taking place, and shall produce it on demand to any member of An Garda Síochána or an authorised officer appointed under Regulation 4 of the Habitats Regulations (hereinafter referred to as "an authorised officer").
14. Within 5 working days of being requested to do so by an authorised officer, the licensees shall provide a report on the progress of the work covered by this licence and of the mitigation measures implemented.
15. The licensees shall, within 14 days of completion of the actions which this licence authorises, submit a written report to the address below, describing the activities carried out and the mitigation measures implemented in pursuance of this licence.
16. The licensees shall provide for and implement a scientific programme (hereinafter referred to as "the scientific programme") of monitoring of any translocated populations and of the operation of the mitigation measures, to investigate and provide data on the effectiveness of the mitigation measures. The scientific programme will provide for supplementary mitigation measures informed by data obtained from this monitoring programme.
17. The licensees shall, within **3 calendar months** of the submission of the report under 15 above, submit to the signatory at the address below an interim report on the continued monitoring under the scientific programme. The licensees shall submit a further report by the **13th (final report)** calendar month after the submission of the report under 15 above, setting out the results of the monitoring carried out over these periods and particulars of any supplementary mitigation measures taken.

18. The reporting requirements under this licence will continue in force after the completion of the actions which it authorises, until their completion and the licensees shall be responsible for ensuring that these requirements are met in full.



Gerry Leckey

(a person authorised by the Minister to sign on his behalf)

16th January 2012

Species Protection Unit,
National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,
7 Ely Place,
Dublin 2.



NOTES (1 to 2).

- This licence is granted for the period specified and subject to compliance with the conditions specified. Anything done other than in accordance with the terms of this licence may constitute an offence.
- This licence applies to the **EURASIAN OTTER (*Lutra lutra*)** and to no other species.