

5 Flora and Fauna

5.1 Introduction

This chapter of the Environmental Impact Statement describes the existing environment in relation to Flora and Fauna in the area of the proposed development, predicts the impacts on flora and fauna arising from the proposed development and, where considered appropriate, mitigation measures have been specified. It is divided into the following sub-sections:

5.1 Introduction

5.2 Methodology

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5.3 Receiving Environment

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5.4 Flora and Fauna Impact Assessment

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5.2 Methodology

The ecological assessment was prepared in accordance with legislative requirements, including *Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment* and amended by *Council Directive 97/11/EC of 3 March 1997 and as amended by Directive 2003/35/EC*. These directives were transposed into Irish law by the Statutory Instruments (S.I. No. 349 of 1989) - *European Communities (Environmental Impact Assessment) Regulations, 1989*; (S.I. No. 351 of 1998) - *European Communities (Environmental Impact Assessment)(Amendment) Regulations 1998*; S.I. No. 92 of 1999 - *Local Government (Planning and Development) Regulations, 1999* and S.I. No. 93 of 1999 - *European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999*; (S.I. No. 450 of 2000) - *European Communities (Environmental Impact Assessment)(Amendment) Regulations 2000*; (S.I. No. 538 of 2001) - *European Communities (Environmental Impact Assessment)(Amendment) Regulations 2001*; (S.I. No. 539 of 2001) - *European Communities (Planning and Development)(Amendment) Regulations 2001* and (S.I. No. 659 of 2006) - *European Communities (Environmental Impact Assessment)(Amendment) Regulations 2006*”

This assessment was also conducted in accordance with the *Guidelines on the Information to be contained in Environmental Impact Statements* (Environmental Protection Agency, 2002), *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements* (Environmental Protection Agency, 2003), *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2006) and the *Guidelines for Ecological Impact Assessment* (Institute of Ecology and Environmental Management (IEEM)).

5.2.1 Desktop Study

The desk study comprised consultation with relevant authorities and encompassed a wider area up to 10 km from the site boundary. Figure 5.1 *Conservation Designated Sites in a 10 km Radius of the Site* illustrates the survey area and the designated conservation sites within 10 km of the site. The Department of the Environment, Heritage and Local Government (DEHLG), the Eastern Regional Fisheries Board (ERFB) and the local conservation officer (NPWS) were consulted in relation to the flora and fauna present in the area, and with particular reference to any potential impacts on flora and fauna arising from the proposed development.

The National Parks and Wildlife Service (NPWS) database was also researched to determine if any protected species occur on or in the vicinity of the site. The Eastern Fisheries Board website was consulted to assess the importance of the Yellow River in terms of its fisheries value. Ordnance Survey (OS) Map 48 and OS aerial photographs were also considered.

Other sources of information included:

- National Parks and Wildlife Service (NPWS) website (www.npws.ie) and local NPWS conservation rangers;
- Curtis and McGough, (1988) *The Irish Red Data Book*;
- Clabby, K.J., Lucey, J., McGarrigle, M.L. (2004) *Interim Report on the Biological Survey of River Quality - Results of the 2003 Investigations*. Environmental Protection Agency, Wexford;

- McGinnity, P., Gargan, P., Roche, W., Mills, P. and McGarrigle, M., (2003) *Quantification of the freshwater salmon habitat asset in Ireland. Irish Freshwater Fisheries Ecology and Management Series No. 3*, Central Fisheries board, Dublin, Ireland;
- O'Connor W. (2006) *A survey of juvenile lamprey populations in the Boyne Catchment. Irish Wildlife Manuals, No. 24*. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland; and
- O'Reilly, P. (2004) *Rivers of Ireland – A Flyfisher's Guide*. 5th Ed. Merlin Unwin Books.

Aerial photography of the site was examined to identify areas of potential use by bats, and previous records for bat species in *Exploring Irish Mammals* (Hayden and Harrington, 2000) were examined for the Derrygreenagh area. The Bat Conservation Ireland (BCI) website (www.batconservationireland.org) was accessed for bat records for the area, and the NPWS website was accessed to determine if any conservation sites designated for bats are present in or near the study area.

5.2.2 Habitat and Flora Survey

A habitat and flora survey was conducted on the 29th January 2008 and on the 9th and 10th of June 2008. Figure 5.2 *Habitat Map* illustrates the survey area. Habitats present were classified according to *A Guide to Habitats in Ireland* (Fossitt, 2000) and in accordance with *Draft Habitat Survey Guidelines: a Standard Methodology for Habitat Survey and Mapping in Ireland* (Heritage Council, 2005). Habitats within the survey area were mapped and the extent of each habitat was determined. The habitats or species of ecological interest are indicated on the habitat map by “target notes”, denoted by T, e.g. T1 – target note 1.

The flora present within the different habitats encountered are listed under the habitat category and Latin names are used at first mention. Flora listed in the Flora Protection Order (1999) and by Curtis and McGough (1988) in the *Irish Red Data Book* are of high conservation importance and, when encountered, the following records are made:

- sketches illustrating the location of the species are drawn;
- GPS co-ordinates recorded where possible;
- Description of the population including an estimate of population size; and
- Habitat description qualifying the habitat extent, management regime and threats.

5.2.3 Aquatic Survey

The aquatic habitats in the survey areas along the Yellow River were assessed to determine the baseline ecological status of the river at this location and its suitability for fish and macroinvertebrates. The survey site (Target Note T4) is illustrated in Figure 5.2 *Habitat Map*. The site was rated for its suitability for macroinvertebrate production based on physical attributes of the habitat and these are described in Table 5.1 *Physical Habitat Assessment of Streams*, which is adapted from Barbour and Stribling (1991).

Table 5.1: Physical Habitat Assessment of Streams

Score	Optimal	Suboptimal	Marginal	Poor
	20	15	10	5
<i>Bottom substrate</i>	More than 60% of bottom is gravel, cobble, and boulders. Even mix of substratum size classes.	30-60% of bottom is cobble or boulder substrata. Substrate may be dominated by one size class.	10-30% of substrata consist of large materials. Silt or sand accounts for 70-90% of bottom.	Substrate dominated by silt and sand. Gravel, cobble and larger substrate sizes <10%.
<i>Habitat complexity</i>	A variety of types and sizes of material form a diverse habitat.	Structural types or sizes of material are less than optimum but adequate cover still provided.	Habitat dominated by only one or two structural components. Amount of cover is limited.	Monotonous habitat with little diversity. Silt and sand dominate and reduce habitat diversity and complexity.
<i>Pool quality</i>	25% of the pools are as wide or wider than the mean stream width and area >1m deep.	<5% of the pools are >1m deep and wider than the mean stream width.	<1% of the pools are >1m deep and wider than the mean stream width. Pools present may be very deep or very shallow. Variety of pools or quality is fair.	Majority of pools are small and shallow. Pools may be absent.
<i>Bank stability</i>	Little evidence of past bank failure and little potential for future mass wasting into channel.	Infrequent or very small slides. Low future potential of slides.	Mass wasting moderate in frequency and size. Raw spots eroded during high floods.	Frequent or large slides. Banks unstable and contributing sediment to the stream.
<i>Bank protection</i>	Over 80% of stream bank surfaces are covered by vegetation, boulders, bedrock, or other stable materials.	50-80% of the stream banks covered with vegetation, cobble, or larger material.	25-50% of the stream bank is covered by vegetation.	<25% of the stream bank is covered by vegetation or stable materials.
<i>Canopy</i>	Vegetation of various heights provides a mix of shade and filtering light to water surface.	Discontinuous vegetation provides areas of shade alternating with areas of full exposure. Or filtering shade occurs <6h/day.	Shading is complete and dense. Or filtering shade occurs <3h/day.	Water surface is exposed to full sun nearly all day long.

Based on the results of the physical habitat survey, the habitat class present at the site was assessed for suitability for spawning, nursery, rearing and foraging habitats for salmonids, lampreys and other fish species, and a habitat rating index was applied for each habitat class as described in Table 5.2 *Habitat Rating Index (HRI) and Description of Habitat Quality*.

Table 5.2: Habitat Rating Index (HRI) and Description of Habitat Quality

HRI	Value Habitat Description
1	Unsuitable
2	Poor
3	Satisfactory
4	Good
5	Excellent

The Environmental Protection Agency (EPA) developed a biological rating system for river water quality based on the presence, quantity and diversity of different macroinvertebrates present in rivers. The species present reflect the water quality within the river and they are divided into five indicator groups, based on their sensitivity/tolerance to pollution: sensitive forms; less sensitive forms; tolerant forms; very tolerant forms; and most tolerant forms. Based on the biological information collected, a five-point Q rating system is used to describe the river in terms of pollution. The Q rating system and river water quality class system (McGarrigle *et al*, 2002) are presented in Table 5.3 *Biological River Quality Classification and River Water Quality Class System*.

Table 5.3: Biological River Quality Classification and River Water Quality Class System

'Q' value	Community Diversity	Water Quality	Condition*	Status	Quality
Q5	High	Good	Satisfactory	Unpolluted	Class A
Q4	Reduced	Fair	Satisfactory	Unpolluted	Class A
Q3-4	Much Reduced	Doubtful	Unsatisfactory	Slightly Polluted	Class B
Q3	Low	Doubtful	Unsatisfactory	Moderately Polluted	Class C
Q2-3	Low	Doubtful	Unsatisfactory	Moderately Polluted	Class C
Q2	Very low	Poor	Unsatisfactory	Seriously Polluted	Class D
Q1	Very Low	Bad	Unsatisfactory	Seriously Polluted	Class D

* 'Condition' refers to the likelihood of interference with beneficial or potential beneficial use.

Benthic macroinvertebrate sampling, using the standard kick sampling method, was undertaken at the proposed outfall location and representative riffle, glide and pool habitats were sampled. Macroinvertebrates present within each sample were identified and the Quality Rating (Q) System (McGarrigle *et al*, 2002) was used to obtain a water quality rating for each site. The use of this particular biotic index allows the comparison with data published by the EPA. The higher the biological diversity and the greater the abundance of invertebrate species sensitive to organic pollution, the higher the water quality is assumed to be, and the higher the 'Q value' assigned to that sampling station.

A Biological Monitoring Working Party (BMWP) score was also used to deduce a biotic index of water quality, based on the macroinvertebrates identified. The macroinvertebrates are identified to family level and each family is assigned a score. The BMWP score is the sum of the individual family scores for a site. The scoring system is presented in Appendix 3A *Biological Monitoring Working Party Score Sheet*.

In order to assess the community structure at each the site, functional group analysis was conducted which is based on different macroinvertebrate feeding techniques (Shredders, Collectors, Scrapers or Predators). The "P/R ratio" is the ratio of scrapers to total collectors + shredders; and acts as a surrogate for the ratio of gross Primary Production to Community Respiration (Rabenil *et al*, 2005). This illustrates the sustainability of the aquatic system, based on its ability to produce the required food inputs from within the system, i.e. its degree of heterotrophy. This is in contrast to autotrophy, where the dominant organisms are reliant on inputs from outside the system. This is based on a P/R threshold ratio where a ratio of > 0.75 is deemed autotrophic.

No seasonal limitations were encountered during the course of the study.

5.2.4 Fauna

(i) Mammals

The *Wildlife Act, 1976* and *Wildlife (Amendment) Act, 2000* give legal protection to a number of mammalian species, including bats, otters and badgers. It is an offence to wilfully interfere with or destroy the breeding or resting place of these species, however, there are exemptions. Surveys were conducted to identify mammal species protected by the Wildlife Acts (1976 and 2000), which would be expected to occur on the site.

The survey for mammals was carried out by means of a search within the site and the immediate locality. Occasionally mammals are observed, however the presence of mammals, such as badgers and otters, is usually determined by evidence of droppings, the presence of tracks, dwellings, hairs caught in wires etc.

A visual inspection of the existing buildings at the Derrygreenagh site was conducted during the daytime for any signs of bats or evidence of bat activity. Each building was visually examined in detail during the daytime for bats, signs of bats or evidence of bat activity. Tight crevices and confined spaces were viewed with powerful L.E.D torches. Such spaces included those in joints where sheet metal was overlapped and spaces in block work and woodwork. Some dense growths of ivy were also checked in detail where accessible from the ground. The ivy on the outside of the boiler house was checked at ground level and also at roof level from the embankment. The wooden framed hostel structure was checked extensively, as this was considered to have the greatest potential for bats.

Bat droppings were searched for on floors, window boards, shelves, any flat surfaces and beneath any locations where bats may have been considered to be roosting or flying. Dead bats, including skeletal remains were also looked for in all buildings. Areas of the buildings considered likely to be used by bats and possible access/exit points to buildings were closely inspected for urine staining, and other signs of bat activity. Where height restrictions prevented close examination for staining, close focusing binoculars were used to view possible points of passage in detail. All droppings were collected, stored in glass bottles and identified in the laboratory using the Bat Conservation Trust bat identification key (Gillespie, 2006).

Monitoring for emerging and active bats was aided by the use of two Bat Box Duet Frequency Division/Heterodyne bat detectors. These detectors were tuned to the 45 kHz range for most of the survey, as the calls of most bat species sweep through this frequency. This frequency was lowered to 25 kHz when Leisler's bat activity was noted in the field. Bat species were identified in real time in the field using the heterodyne detectors. After dusk, the surveyors teamed up and walked the site with the heterodyne detectors to monitor for bat activity surrounding the buildings.

An Anabat SD1 CF Bat Detector was deployed *in situ* at the old wooden hostel at 21.30. Housing for the Anabat detector was secured to the outside of the hostel along the northern face (long elevation) of the building and the Anabat detector was installed inside this casing. The position of the Anabat detector was such that bats at the front (northern side) of the building would be detected. This building was selected for the deployment of the Anabat detector as it was isolated from the main building complex and also it was considered to have the best bat roosting potential on the site. Records from the Anabat detector were analysed using the Anabook software program.

(ii) Birds

Most bird species are protected under the *Wildlife Act, 1976* and *Wildlife (Amendment) Act, 2000*, except those regarded as pest species and those considered as game species (where they may be hunted under specified conditions). It is an offence to interfere with the breeding place of protected species, though there are exemptions for developments, such as road construction and building works. For the generally common species, best practice is to limit the removal of vegetation and nesting habitat during the breeding season. Bird species observed during the survey were recorded.

(iii) Reptiles and Amphibians

The common lizard, the common frog and the smooth newt are all protected species under the *Wildlife Act, 1976*. It is standard good practice to ensure protection of breeding sites where these have been identified and to make provision for maintenance of the species if possible. An assessment of any habitat that may have the potential to support reptiles and amphibians was undertaken.

5.2.5 Evaluation of Habitats

The existing ecological conditions are described and evaluated according to the NRA (2006) and in accordance with standard guidelines (EPA, 2002; IEEM, 2006). Table 5.4 *Site Evaluation Criteria* details the NRA evaluation scheme (NRA, 2006).

Table 5.4: Site Evaluation Criteria

Rating	Qualifying Criteria
A	<p>Internationally Important</p> <p>Sites designated (or qualifying for designation) as an SAC* or SPA* under the EU Habitats or Birds Directives.</p> <p>Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive 92/43/EC.</p> <p>Major salmon river fisheries.</p> <p>Major Salmonid (salmon, trout or char) lake fisheries.</p>
B	<p>Nationally Important</p> <p>Sites or waters designated or proposed as an NHA* or Statutory Nature Reserve.</p> <p>Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive 92/43/EC).</p> <p>Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive 92/43/EC or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000.</p> <p>Major trout river fisheries.</p> <p>Water bodies with major amenity fishery value.</p> <p>Commercially important coarse fisheries.</p>
C	<p>High Value, Locally Important</p> <p>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species.</p> <p>Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive 92/43/EC or Annex I species under the EU Birds Directive.</p> <p>Large water bodies with some coarse fisheries.</p>
D	<p>Moderate Value, Locally Important</p> <p>Sites containing some semi-natural habitat or locally important for wildlife.</p> <p>Small water-bodies with some coarse fisheries value or some potential salmonid habitat.</p> <p>Any water body with unpolluted water (Q-value 4-5).</p>
E	<p>Low Value, Locally Important</p> <p>Artificial or highly modified habitats with low species diversity and low wildlife value.</p> <p>Water bodies with no current fisheries and no significant potential fisheries value.</p>

Source: *Guidelines for Assessment of Ecological Impacts in National Road Schemes* (NRA, 2006)

*SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area.

5.2.6 Impact Assessment

The significance of the potential impacts on the receiving environment are assessed according to the NRA (2006) - *Criteria for assessing significance of impacts*, and detailed in Table 5.5 *Impact Assessment Matrix* and Table 5.6 *Criteria for assessing impact significance on aquatic sites*. Mitigation measures are then proposed to avoid, reduce or compensate for the impacts identified and any residual impacts are discussed.

Table 5.5: Impact Assessment Matrix

Impact Level	A Sites Internationally Important	B Sites Nationally Important	C Sites High Value, Locally Important	D Sites Moderate Value, Locally Important	E Sites Low Value, Locally Important
Severe Negative	Any permanent impacts	Permanent impacts on a large part of a site.	-	-	-
Major Negative	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	-	-
Moderate Negative	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	-
Minor Negative	-	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site
Neutral	No Impacts	No Impacts	No Impacts	No Impacts	Permanent impacts on a small part of a site
Minor Positive	-	-	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site
Moderate Positive	-	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site	-
Major Positive	-	Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site	-	-

Source: *Guidelines for Assessment of Ecological Impacts in National Road Schemes* (NRA, 2006)

Table 5.6: Criteria for assessing impact significance on aquatic sites

A sites	Temporary	Short-term	Medium-term	Long-term
Extensive	Major	Severe	Severe	Severe
Localised	Major	Major	Severe	Severe
B sites	Temporary	Short-term	Medium-term	Long-term
Extensive	Major	Major	Severe	Severe
Localised	Moderate	Moderate	Major	Major
C sites	Temporary	Short-term	Medium-term	Long-term
Extensive	Moderate	Moderate	Major	Major
Localised	Minor	Moderate	Moderate	Moderate
D sites	Temporary	Short-term	Medium-term	Long-term
Extensive	Minor	Minor	Moderate	Moderate
Localised	Not significant	Minor	Minor	Minor
E sites	Temporary	Short-term	Medium-term	Long-term
Extensive	Not significant	Not significant	Minor	Minor
Localised	Not significant	Not significant	Not significant	Not significant

Note: The site classifications A-E are according to the NRA guidelines as described in Table 5.4 *Site Evaluation Criteria*.

5.3 Receiving Environment

5.3.1 Desktop Study

(i) Flora

According to the NPWS database, and following consultation with the NPWS, there are no rare or protected plant species recorded on the site.

(ii) Aquatic Ecology

The Yellow River is a tributary of the River Boyne and rises to the north of Daingean, Co. Offaly, flowing in an easterly direction for approximately 22 km before entering the River Boyne. The Yellow River contains good stocks of trout and in a recent survey conducted in the Boyne catchment, lamprey species which are protected under Annex II of the EU Habitats Directive 92/43/EC were present in the Yellow River. During the same survey, minnow, stone loach, salmon and brown trout were also recorded (O' Connor, 2006). White-clawed crayfish, which are also protected under the EU Habitats Directive 92/43/EC, were not detected during this study.

The EPA has been sampling the Yellow River in the vicinity of the proposed outfall location, and further downstream along the river, for over two decades. The results of these assessments are presented in Table 5.7 *EPA Biological Quality Ratings (Q Values) for the Yellow River*.

Table 5.7: EPA Biological Quality Ratings (Q Values) for the Yellow River

Station no.	Station location	1976	1981	1985	1990	1994	1997	2000	2003
0060	Nr Derryarkin	-	-	-	-	4	4	4	3
0100	Garr Br	-	3-4	4	3-4	4	3-4	3	3-4
0300	Clongall Br	4-5	4-5	4	4	4	4	4	4

Upstream of the proposed outfall location, water quality has deteriorated in recent years and the EPA has noted that intensive agriculture could be responsible for the decrease in quality in the upper reaches (0060, 0070) of the Yellow River. At the time of the biological survey in 2003, the lower river (0300) had been recently dredged, and as a result algal crops had not been re-established, but macroinvertebrate populations had recovered sufficiently to indicate the likelihood of satisfactory water quality at this location.

The Mongagh River rises near Tyrrellspass and Rochfortbridge and flows for c. 18 km in an easterly direction before joining with the Yellow River near Castlejordan. This river is known to hold a good stock of small brown trout, with some larger fish up to 2 lb (O'Reilly, 2004). No EPA sampling station data is available for the Mongagh River upstream of the sampling location of this study. However there is a station on the Castlejordan River (07/C/04), which the Mongagh River becomes known as downstream of Baltinoran Bridge. The EPA sampling point on the Castletown River at Rahinine is upstream of it's confluence with the Mongagh River, while the additional stations are downstream of the confluence, where the Mongagh and Castlejordan rivers are considered as one. The water quality of this river was found to be unsatisfactory and may be the result of sewage discharges from Rochfortbridge. The EPA historical monitoring data is presented in Table 5.8 *EPA Biological Quality Ratings (Q Values) for the Castlejordan River*.

Table 5.8: EPA Biological Quality Ratings (Q Values) for the Castlejordan River

Station No.	Station Location	1976	1981	1985	1990	1994	1997	2000	2003
0060	SE Rahinine	-	-	-	3-4	2-3	2-3	3	-
0100	Baltinoran Br	-	4-5	3-4	4	3-4	3-4	4	3
0190	Castlejordan Br	-	-	-	4	3-4	3-4	4	3
0200	0.5km d/s Castlejordan	4-5	4	3-4	-	-	-	-	-

(iii) Fauna

Following consultation with the NPWS conservation rangers for Offaly and Westmeath, it was ascertained that otters are present along the Yellow River. However, no details of holt locations are known for this area. There is evidence of bats and badgers also in the area. There have been unconfirmed reports of red squirrel in the wider area (Farthingstown). There is anecdotal evidence that hen harriers have been seen in the area in the past and it is most likely that they are migratory birds which fly through the area (NPWS, pers. comm.). There have been local reports of mink along the Yellow River and pine martens have been observed in the general area.

Following consultation with the Eastern Regional Fisheries Board (ERFB), it was confirmed that the Rochfortbridge Stream, which joins the Mongagh River to the north of the site, has salmonid spawning potential and adult salmon and salmon redds have been observed in the Rochfortbridge Stream. Lampreys have been recorded from the Yellow River and the Mongagh River during the Boyne Catchment Survey conducted in 2005.

The nearest BCI record of bats is from Killlaskillen crossroads in County Meath, almost 10 km from Derrygreenagh. Amongst the species recorded at this location were the common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Leisler's bat (*Nyctalus leisleri*) and brown long-eared bat (*Plecotus auritus*). There is no designated site, either NHA or SAC, for bats within 10 km of the Derrygreenagh site. Previously recorded bat species, from Hayden and Harrington, 2000, in the 20 km grid square in which the Derrygreenagh site is located, are presented in Table 5.9 *Bat species previously recorded in 20 km grid*.

Table 5.9: Bat species previously recorded in 20 km grid

Species		Indication of population	Level of protection under Irish and EU legislation
Common name	Scientific name		
Leisler's bat	<i>Nyctalus leisleri</i>	Widely distributed throughout Ireland	Wildlife Act, Irish Red Data Book 'Internationally important', Annex IV of the EU Habitats Directive 92/43/EC and Appendix II of the Bern Convention.
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	Found throughout Ireland	Wildlife Act, Irish Red Data Book 'Internationally important', Annex IV of the EU Habitats Directive 92/43/EC and Appendix II of the Bern Convention.
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	Found throughout Ireland	Wildlife Act, Irish Red Data Book 'Internationally important', Annex IV of the EU Habitats Directive 92/43/EC and Appendix II of the Bern Convention.

(iv) Designated Conservation Sites

The proposed development site is not contained within a designated conservation area. The closest designated conservation area is located to the north of the site – Milltownpass Bog NHA. Designated conservation areas within a 10 km radius include:

- Milltownpass Bog NHA – Site Code: 002323
- Raheenmore Bog pNHA and SAC – Site Code: 000582
- Grand Canal pNHA – Site Code: 002104

- Black Castle Bog NHA – Site Code: 000570

Site synopses of these four designated areas are presented in Appendix 3B *Site Synopses*.

5.3.2 Survey Results

(i) Derrygreenagh Site

Buildings and Artificial Surfaces (BL3)

The site at Derrygreenagh is largely a brownfield site located on a mineral island, with Bord na Móna offices, workshops and yards on the site.

Ecological evaluation: E-Low Value, Locally Important.

Dry Meadows and Grassy Verges (GS2)

The south of the Derrygreenagh site comprises an area of unmanaged grassland, which is calcareous in parts with a diverse range of species. A list of species is presented in Table 5.10 *Species Composition of Dry Meadows and Grassy Verges (GS2)*. Yorkshire fog and creeping bent were the dominant grass species present. The area of grassland to the south west of the site was particularly calcareous, with the most diversity of species present at Target Note 2, T2 on Figure 5.2 *Habitat Map*, including orchid species such as the common spotted orchid.

Ecological evaluation: Unmanaged grassland is an important habitat for invertebrates and small mammals. The area of grassland at T2 is of high value and locally important (C rating) with the remainder of the grassland being of moderate value and locally important (D rating).

Table 5.10: Species Composition of Dry Meadows and Grassy Verges (GS2)

Common Name	Latin Name	DAFOR*	Common name	Latin name	DAFOR
Common birdsfoot trefoil	<i>Lotus corniculatus</i>	A	Oyeye daisy	<i>Leucanthemum vulgare</i>	O
Tormentil	<i>Potentilla erecta</i>	A	Rosebay willowherb	<i>Chamerion angustifolium</i>	F
Lesser stitchwort	<i>Stellaria graminea</i>	O	Common poppy	<i>Papaver rhoeas</i>	R
Common chickweed	<i>Stellaria media</i>	A	Cowslip	<i>Primula veris</i>	R
Bramble	<i>Rubus fruticosus</i>	F	Common milkwort	<i>Polygala vulgaris</i>	O
Wild strawberry	<i>Fragaria vesca</i>	O	Common spotted orchid	<i>Dactylorhiza fuchsia</i>	R
Creeping buttercup	<i>Ranunculus repens</i>	A	Field horsetail	<i>Equisetum arvense</i>	F
Meadow buttercup	<i>Ranunculus acris</i>	F	Yorkshire fog	<i>Holcus lanatus</i>	D

Common Name	Latin Name	DAFOR*	Common name	Latin name	DAFOR
Germander speedwell	<i>Veronica chamaedrys</i>	O	Creeping bent	<i>Agrostis stolonifera</i>	D
Tufted vetch	<i>Vicia cracca</i>	A	Timothy	<i>Phleum pratense</i>	A
Common vetch	<i>Vicia sativa</i>	A	Red fescue	<i>Festuca rubra</i>	F
Ribwort plantain	<i>Plantago lanceolata</i>	A	Crested dogstail	<i>Cynosurus cristatus</i>	O
Black medick	<i>Medicago lupulina</i>	F	Meadow foxtail	<i>Alopecurus pratensis</i>	O
Colt's-foot	<i>Tussilago farfara</i>	O	Sweet vernal grass	<i>Anthoxanthum odoratum</i>	F
White clover	<i>Trifolium repens</i>	A	Quaking grass	<i>Briza media</i>	O
Great willowherb	<i>Epilobium hirsutum</i>	F	Cocksfoot	<i>Dactylis glomerata</i>	A
Daisy	<i>Bellis perennis</i>	F	Yarrow	<i>Achillea millefolium</i>	F
Spear thistle	<i>Cirsium vulgare</i>	F			
Scarlet pimpernel	<i>Anagalis arvensis</i>	O			
Dandelion	<i>Taraxacum agg.</i>	F			

* DAFOR - Dominant, Abundant, Frequent, Occasional, Rare

Wet Grassland (GS4)

Areas of wet grassland are present to the north and east of the site. Species composition is dominated by grass, sedge and rush species, with abundant wet grassland herbs, including meadowsweet and silverweed. A list of species is presented in Table 5.11 *Species Composition of Wet Grassland (GS4)*. Areas of exposed peat are present throughout the grassland and merge with areas of recolonising bare ground. The wet grassland present at the site is of local value and locally important in general. The area of wet grassland associated with the immature woodland and heath, near T3 on Figure 5.2 *Habitat Map*, is of moderate value (rating D), as it is better developed than the remainder of the site and will provide cover and foraging areas for small mammals and birds.

Table 5.11: Species Composition of Wet Grassland (GS4)

Common name	Latin name	DAFOR	Common name	Latin name	DAFOR
Tormentil	<i>Potentilla erecta</i>	A	Creeping buttercup	<i>Ranunculus repens</i>	A
Silverweed	<i>Potentilla anserina</i>	A	Ragged robin	<i>Lychnis flos-cuculi</i>	O
Lesser stitchwort	<i>Stellaria graminea</i>	O	Creeping bent	<i>Agrostis stolonifera</i>	D
Common chickweed	<i>Stellaria media</i>	F	Yorkshire fog	<i>Holcus lanatus</i>	D
Field horsetail	<i>Equisetum arvense</i>	F	Tufted hair grass	<i>Deschampsia cespitosa</i>	F
Meadowsweet	<i>Filipendula ulmaria</i>	F	Common sedge	<i>Carex nigra</i>	A
Common vetch	<i>Vicia sativa</i>	F	Carnation sedge	<i>Carex panacea</i>	F
Ribwort plantain	<i>Plantago lanceolata</i>	A	Toad rush	<i>Juncus bufonius</i>	A
Marsh thistle	<i>Cirsium palustre</i>	F	Purple moor grass	<i>Molinia caerulea</i>	F
Cuckoo flower	<i>Cardamine pratensis</i>	O			

Amenity Grassland (GA2)

Amenity grassland is present to the west of the site at either side of the main entrance to the site. The grass was mown on the day of survey and individual grass species were not identifiable. Amenity grassland is of low ecological value, having a rating of E.

Spoil and Bare Ground (ED2)

Areas of spoil and bare ground are present to the north and east of the workshops. The area to the north of the workshops is generally gravelled and used for tractor and machinery storage, and the area to the east of site consists of exposed soils due to the movement of tractors and vehicles to and from the cutover bog to the east of the site. The areas of bare ground are of low value, locally important and rated as E.

Recolonising Bare Ground (ED3)

The area of recolonising bare ground contains grass species including Yorkshire fog, creeping bent and cocksfoot, with abundant creeping buttercup, dandelion and other weed species. This habitat is of low value, locally important and rated as E.

Drainage Ditches (FW4), Dense Bracken (HD1), scrub (WS1) and wet heath (HH3)

A drainage ditch is present to the east of the site and the ditch verge to the west is composed of dense bracken. The verge to the east is composed of ling (*Calluna vulgaris*), willow (*Salix* sp.), hawthorn, ash and dog rose (*Rosa canina*). Understorey species include bramble (*Rubus fruticosus*), creeping bent (*Agrostis stolonifera*), cocksfoot (*Dactylis glomerata*) and soft rush (*Juncus effusus*).

A drainage ditch is also present to the north east of the site and vegetation surrounding the ditch is composed of wet heath vegetation and dominated by ling (*Calluna vulgaris*). Other species present included bell heather (*Erica cinerea*), soft rush (*Juncus effusus*), field woodrush (*Luzula campestris*), tufted hair grass (*Deschampsia cespitosa*), silverweed (*Potentilla anserina*), sheep's sorrel (*Rumex acetosa*) and willow saplings (*Salix* sp.).

The drainage ditch to the north of the site contained willow and gorse scrub along the banks. Standing water was present on the day of survey, and water plantain (*Alisma plantago-aquatica*) was present along the margins of the standing water.

Drainage ditches act as wildlife corridors, and those present within the site are of low value, moderately important for flora and fauna and are evaluated as D.

Treelines (WL2)

Treelines along the roadside consist of Pine species (*Pinus* spp.). Treelines to the north of site are composed of birch (*Betula* sp.) and ash (*Fraxinus excelsior*).

Ecological Evaluation: D - Moderate Value, Locally Important, as they provide foraging for birds and bat species in the area.

Hedgerows (WL1)

A hedgerow is present to the south of the site, and is composed of hawthorn (*Crataegus monogyna*) and occasional ash (*Fraxinus excelsior*) and alder (*Alnus glutinosa*). Bramble (*Rubus fruticosus* agg.) and ivy (*Hedera helix*) form the majority of the undergrowth. The hedgerow is mature but in poor condition, with many gaps throughout. Towards the south west of the site trees predominate, and this section of treeline forms the boundary of the site with the R400 road. This treeline was identified as having potential for Leisler bat roosts and provides foraging routes areas for bats.

Ecological Evaluation: C - High Value, Locally Important for bird and bat species, as they provide commuter and foraging routes and may provide roosting sites for Leisler's bats.

(ii) Pipeline Route

The proposed pipeline to the Yellow River will be constructed around the southern edge of Derrygreenagh Hill and will follow the old railway line to the east of the Derryarkin Bog. The old railway line is overgrown and the habitat is classified as Dry Meadows and Grassy Verges (GS2). Part of the pipeline route will cut across the bog and some pockets of regenerating vegetation. The grassy verges have a diverse range of species in parts, including the common spotted orchid.

Buildings and Artificial Surfaces (BL3), Dry Meadows and Grassy Verges (GS2), Cutover Bog (PB4)

The pipeline route to the Yellow River will be constructed around the southern edge of Derrygreenagh Hill, the grassy bank of an old railway line and will then cut across an area of cutover bog with pockets of regenerating scrub. The pipeline will then follow the grassy bank of the old railway line, south west towards the Yellow River.

Species occurring along the grassy bank vary between wet grassland and scrub species in parts, to dry calcareous species towards the south east of the pipeline. Species present include timothy (*Phleum pratense*), Yorkshire fog (*Holcus lanatus*), cocksfoot (*Dactylis glomerata*), giant fescue (*Festuca gigantea*), tufted hair grass (*Deschampsia cespitosa*), common sedge (*Carex nigra*), soft rush (*Juncus effusus*), gorse (*Ulex europaeus*), ling (*Calluna vulgaris*), bracken (*Pteridium aquilinum*), tormentil (*Potentilla erecta*), silverweed (*Potentilla anserina*), willow saplings (*Salix* sp.), wild strawberry (*Fragaria vesca*), columbine (*Aquilegia vulgaris*), bird's foot trefoil (*Lotus corniculatus*) and common spotted orchid (*Dactylorhiza fuchsia*). The habitat along the proposed pipeline route is evaluated as being of moderate value and locally important (D rating).

Depositing / Lowland Rivers (FW2)

The Yellow River is present to the south west of the site, adjacent to Derryarkin Bog. The Yellow River had a moderate flow on the day of survey, slightly faster than that of the Mongagh, and is approximately 4 m wide. The banks are steeply angled with grasses and gorse vegetating the banks. The general characteristics of the river are presented in Table 5.12 *General Characteristics of the Yellow River*.

Table 5.12: General Characteristics of the Yellow River

Characteristic	Yellow River
Grid reference	IN 49706 36488
Wetted width (cm)	400
Mean depth (cm)	25
Maximum depth (cm)	80
Riffle (%)	50
Glide (%)	25
Pool (%)	25
Rock (%)	25
Cobble (%)	30
Gravel (%)	30
Fine (%)	15
Shade (%)	0
Canopy (%)	0
Instream vegetation (%)	90%, the majority of which was submerged algal growth. Reed canary grass and floating sweetgrass comprised ca.5% cover.
Bank height (m)	4 to 5
Bank slope (°)	80-90
Bank cover (%)	100

The site sampled on the Yellow River was dominated by a riffled section downstream of a bridge with the peatland complex managed by Bord na Móna. The surrounding land is used for peat production.

A total of 23 macroinvertebrate taxa/groups were recorded at this site. The results of the biological assessment of the Yellow River found that this stretch is deemed to be Class B Slightly Polluted (Q3-4). Table 5.13 *Macroinvertebrates recorded during the kick sampling survey of the Yellow River* lists the abundance of each taxa/group present in the Yellow River on the day of survey and details their pollution sensitivity and functional group.

Table 5.13: Macroinvertebrates recorded during the kick sampling survey of the Yellow River

Group/organism	Pollution sensitivity group	Functional group	Yellow River	
			No.	Relative abundance
MAYFLIES (Uniramia, Ephemeroptera)				
Heptageniidae				
Yellow may dun <i>Heptagenia sulphurea</i>	A	Scraper & gathering Collector	4	**
Baetidae				
Large dark olive <i>Baetis rhodani</i>	C	Scraper & gathering collector	10	***
Iron blue dun <i>Baetis muticus</i>	B	Scraper & gathering collector	9	***
Spiny crawler mayflies (Ephemerellidae)				
Blue-winged olive <i>Ephemerella ignita</i>	C	Gathering collector	41	*****
STONEFLIES (Order Plecoptera)				

Group/organism	Pollution sensitivity group	Functional group	Yellow River	
			No.	Relative abundance
Needleflies (Leutridae)				
<i>Leutra inermis</i>	B	Shredder	8	***
CASED CADDIS FLIES (Tricoptera)				
Northern caddisflies (Limnephilidae)				
<i>Halesus digitatus</i>	B	Shredder	3	**
<i>Halesus radiatus</i>	B	Shredder		
Cinnamon sedge <i>Limnephilus lunatus</i>	B	Shredder	2	**
Goeridae				
<i>Goera pilosa</i>	B	Scraper	4	**
Primitive caddisflies (Sericostomatidae)				
Black caperer <i>Sericostoma personatum</i>	B	Shredder	2	*
CASELESS CADDIS FLIES (Trichoptera)				
Grey flags (Hydropsychidae)				
<i>Hydropsyche siltalai</i>	C	Filtering Collector	14	****
Trumpet-net caddisflies (Polycentropodidae)				
<i>Polycentropus kingi</i>	C	Filtering collector	6	***
Green sedges (Rhyacophilidae)				
The sandfly <i>Rhyacophila dorsalis</i>	C	Predator	54	*****
TRUE FLIES (Diptera)				
Blackfly (Simuliidae)	C	Filtering collector	408	*****
Craneflies (Tipulidae)	C	Shredder		
<i>Dicronata sp.</i>	C	Shredder	4	**
Chironomidae				
Bloodworm <i>Chironomus sp.</i>	E	Filtering collector	2	*
Green chironomid	C	Filtering collector	11	***
Epididae				
<i>Clinocera sp.</i>	C	Gathering collector	4	**
MUSSELS (Mollusca, Lamellibranchiata)				
Orb/Pea Mussels (Sphaeriidae)				
<i>Pisidium sp.</i>	D	Filtering Collector		
CRUSTACEANS (Crustacea)				
Amphipods (Gammaridae)				
Freshwater shrimp <i>Gammarus deubeni</i>	C	Shredder	87	*****
Isopods, Asellidae				
<i>Asellus aquaticus</i>	D	Shredder	7	**
SEGMENTED WORMS (Annelida, Clitellata)				
Aquatic earthworm (Lumbricidae)	D	Collector	1	*
Aquatic earthworm (Lumbriculidae)	D	Collector	4	**
BEEPLES (Coleoptera)				
Whirligig beetle larvae (Gyrinidae)	C	Predator		

Group/organism	Pollution sensitivity group	Functional group	Yellow River	
			No.	Relative abundance
Common whirligig beetle <i>Gyrinus substriatus</i>	C	Predator		
Diving beetles (Dytiscidae)				
Sub family Colymbetinae	C	Predator		
Sub family Hydroporinae	C	Predator	17	****
Riffle beetle (Elmidae)				
<i>Helmis maugei</i>	C	Predator	3	**
Indeterminate riffle beetle larvae	C	Predator		
Marsh beetle larvae (Helodidae)	C	Predator		
LEECHES (Hirudinae)				
Glossiphonidae				
<i>Glossiphonia complanata</i>	D	Predator		
Number of different groups/taxa			23	
Q value			3-4	
Q rating			Slightly Polluted	
Quality class			B	
BMWP score			119.4	
BMWP category			Very good	
BMWP interpretation			Unpolluted, unimpacted	

*Present, **Scarce/Few, ***Small Numbers, ****Fair Numbers, *****Common, *****Numerous, *****Dominant, *****Excessive.

The section of the river at the proposed outfall point is categorised as a riffle and the BMWP score for this section of the river was 119.4, which corresponds to the classification 'unpolluted' - refer to Appendix 3A *Biological Monitoring Working Party Score Sheet*. The functional group analysis found that the Yellow River is autotrophic, reliant on outside inputs. Q-values recorded by the EPA in 2003, further downstream of the sampling location, were a Q value of 3-4 at Garr Bridge and Q value of 4 further downstream at Clongall Bridge.

One Brook/River Lamprey was recorded from the sampling location on the Yellow River. This stretch of the Yellow River has limited spawning habitat for salmonids and lamprey, but a small area of suitable spawning habitat was present at T5. However, suitable silt-bed habitat for lamprey ammocete life stages was recorded from this section of the river. This section of the Yellow River is evaluated as C - High Value, Locally Important, due to the known presence of salmonids and lamprey in the river.

5.3.3 Adjacent Lands

To the north and east of the site is Drumman Bog, with Derryarkin Bog located to the southwest. Both of these are areas of cutaway bog and peat production has not taken place here for approximately 10 years. In general, habitats associated with pockets or the margins of the bog include willow and birch scrub, wet grassland and regenerating vegetation which may be classified as poor flush. Reed canary grass, soft rush and sedges are abundant with pockets of wet heath. Large areas of the bog consist of bare peat.

Ecological Evaluation: taken as a whole, adjacent lands are rated D. Areas of regenerating vegetation are moderately important, compared to the expansive areas of cutaway bog, which are of lower ecological value.

(i) Fauna

Badgers

During the habitat survey signs of badgers were searched for, such as tracks, hair caught in wire and snuffle holes. Badgers are protected at all times under the Wildlife Act, 1976. A badger crossing of the hedgerow at Target Note 1 on Figure 5.2 *Habitat Map* was observed. However, no badger setts were present within the site.

Irish Hare

Hares (*Lepus timidus hibernicus*) were noted during the survey in the cutover bogs adjacent to the site, and also on the Derrygreenagh site during the bat survey.

Common (Smooth) Newt and Common Frog

No newts or frogs were recorded from the site on the day of survey. However, suitable habitat occurs along the margins of the cutover bog to the north, south and east of the site to support these species.

Common Lizard

No common lizards (*Lacerta vivipara*) were observed during the walkover and it is unlikely that they would use this site, due to the lack of exposed rock or sand within the site. However, suitable habitat does occur in the wider area.

Otter

Otters (*Lutra lutra*) were not observed in or around the site. However, an otter spraint was observed at the Yellow River, by the bridge, and contained crayfish remains. No holts were identified on the day of survey in the vicinity of the sampling location.

Birds

Grey herons were observed feeding along the river and in the cutover bog on the day of survey, and swans were also present along the river. Bird species in the area include blackbird, wren, coal tit, rook, magpie, chaffinch, stonechat, robin, linnet, snipe, cuckoo and meadow pipit. Swallow nests were present in the large workshop complex and in the old wooden hostel to the south of the site.

Bats

Following the daytime survey, none of the buildings on the site were deemed important for bats and no obvious roosts were recorded. Small numbers of old bat droppings were recorded in the boiler house on site. The droppings were old Pipistrelle droppings, and it is considered that the boiler house is probably only used sporadically by Pipistrelles.

The old wooden hostel structure also contained old droppings. These droppings were tentatively identified as being those of a Leisler Bat. However, they were covered in cobwebs, suggesting that they were old. No staining or other signs of bats were recorded in the hostel building.

No discernible bat roosts were recorded following the daytime building survey, and subsequent activity survey, during a time of year when bats are most active. All bats recorded during the current activity survey, including soprano pipistrelle, common pipistrelle and Leisler's bat, are tolerant of light and are known to roost in both buildings and trees. Parts of some of the buildings were not easily accessible, such as the hostel and outside of the boiler house, and therefore difficult to survey, so some evidence of bats may have been missed.

However, the presence of a significant bat roost, invariably a maternity roost or hibernacula, can normally be determined at any time of year. Roosts by small numbers of bats, as opposed to maternity sites, can be particularly difficult to detect and may require extensive searching (Mitchell-Jones, 2004). After extensive searching, only two sets of bat droppings were recorded. The quantities at which the droppings were found suggest that the bats that deposited them were sporadically using the buildings, and were probably solitary male bats.

The emergence and bat activity survey found Common Pipistrelle activity to the north of the workshop building, along the mature cypress treeline, and a Soprano Pipistrelle and Common Pipistrelle were detected around the area of the boiler house. A Leisler's bat was detected in the open eastern section of the site. The mature cypress treeline, to the north of the site, was found to have the highest level of bat activity on the site.

5.4 Flora and Fauna Impact Assessment

5.4.1 Construction Phase

The primary impact on flora and fauna will be the loss of wet grassland, recolonising bare ground, spoil, wet heath and cut over bog at the Derrygreenagh site. These habitats are generally of low ecological value and the impact of the proposed development is deemed 'minor negative' and permanent - refer to Table 5.5 *Impact Assessment Matrix*. The area of grassy meadow to the south of the site is calcareous in nature and supports orchids and will also be removed as a result of the proposed development. However, due to the relatively small area in which the orchids were found, the impact is not considered significant. The area of dry calcareous heath at Target Note 3 is outside the site boundary and will not be removed as part of the development.

The proposed pipeline route will generally impact on areas of low ecological value including the grassy verges of the old railway line and areas of poor wet grassland, regenerating vegetation and cutover bog. During construction birds and mammals will be temporarily impacted due to the noise and dust associated with the works.

The removal of hedgerows and treelines within the site is considered to be a permanent moderate negative impact on flora and fauna. The mature trees to the south and north of the site provide foraging and commuting routes for bat species and the treeline to the south of the site may provide roosting sites for Leisler's bats. However, it is not proposed to remove any of these trees. In the event of any mature trees being removed from the site the measures specified in Section 5.5 *Mitigation Measures* will mitigate for the removal of these trees.

During construction, increased noise from machinery will deter fauna from the area. This will result in short term minor negative impacts on fauna in the vicinity of the site.

There is potential for significant dust generation during demolition of the existing structures and also during construction of the development. This may adversely affect flora and fauna in the vicinity of the development, resulting in minor negative short-term impacts on flora and fauna. Dust particles can affect soil moisture and chemistry, and therefore may affect flora and the species composition present in the area.

Impacts from construction of the proposed pipeline outfall may potentially affect aquatic macroinvertebrate communities, during both the construction phase and the operation phase. Impacts to water quality, from either elevated suspended solids levels or discharges of pollutants from machinery / oil spills, could potentially affect the macroinvertebrate populations in the receiving watercourse. However, the macroinvertebrate habitat value of the Yellow River is considerably depleted due to the historical and ongoing channelization and management of this river. Following the implementation of mitigation measures, the proposed outfall will not significantly impact the riparian/bank-side habitat and macroinvertebrate communities during the construction period.

The potential loss of fish habitat resulting from the proposed development is considered slight, as there is limited habitat available for salmonids at the discharge location. However, lamprey were recorded from the proposed discharge site on the Yellow River and further mitigation measures will be required in order to protect this species, which is listed in Annex II of the EU Habitats. The potential direct impacts on lamprey, from the installation of the discharge pipe in the Yellow River, will involve habitat removal and the potential loss of spawning substrate and ammocete silt beds. Mitigation for this impact will most likely require that the lampreys be removed from the area using electrical fishing.

A significant potential impact during the construction phase would be the pollution of the selected watercourse with suspended solids, due to runoff of soil during the construction phase, or due to disturbance of sediments in the course of instream works. The potential exists for a range of serious pollutants to enter watercourses during construction. For example, uncured concrete and grouts required during the setting of the discharge pipe; wash down water from site vehicles; fuels, lubricants and hydraulic fluids would all have deleterious effects on macroinvertebrate species and fish species if allowed to enter watercourses. Further removal of bed material for instream works, such as the laying of outfall pipes, may result in the loss of instream vegetation and also the loss of spawning habitat for salmonids, or settlement habitat for lamprey ammocetes which were recorded at the sampling location on the Yellow River.

High levels of suspended solids or sediments in a river can have serious negative impacts on fish, invertebrates and plant life. Suspended solids have the potential to impact on aquatic biota in a variety of ways, both directly and indirectly. Suspended solids in the form of particulate materials, such as angular siliceous material or biologically derived solids, can physically abrade and mechanically disrupt respiratory structures or surfaces, including fish gills, and respiratory epithelia of benthic larval macroinvertebrates. Elevated suspended solids levels would therefore have negative impacts on invertebrate life and also potential for impacts on fish. The high level of fine substrates in the Yellow River infers a greater risk for the disturbance and transport of suspended solids during the construction operations. However, with proper planning and the implementation of mitigation measures, it would be possible to reduce releases of suspended solids and prevent other pollutants entering into the river.

5.4.2 Operational Phase

Operational phase impacts will include increased noise impacting on bats, birds and animals in the area, which may tend to avoid the general area. Increased lighting on site will also deter birds and mammals from using the site.

The discharge of treated process water to the Yellow River will not result in a significant negative impact on macroinvertebrate habitat, as the habitat value of the river has been considerably depleted due to the management of this river in the past.

An indirect impact arising from the proposed development could potentially involve changes in the hydrology of the river, which would result in alterations to peak and minimum flow rates and erosion/deposition patterns, thus impacting on the existing aquatic habitats within the Yellow River. However, the average daily discharge volume was estimated at 250 m³, using a projected operating profile for the CCGT unit of 6,000 hours per annum and 500 hours per annum for the OCGT unit. An alternative scenario, based on the CCGT unit running on natural gas at maximum output (24 hrs/day), whilst the OCGT unit runs on distillate for a period of 6.6 hrs/day, resulted in a discharge rate of 360 m³/day. The risk of significant alterations in the flow patterns in the Yellow River is not considered likely.

Assimilative capacity calculations were conducted to assess the impact of the process water on the receiving water. The Yellow River has sufficient capacity for BOD, Total Suspended Solids, Total Dissolved Solids and Ammonia. However, the background concentration of Ortho-Phosphate in the Yellow River was found to be elevated. The target Ortho Phosphate median level for the Yellow River is 0.03 mg/l and the median background concentration based on the water quality data received was 0.141 mg/l. The expected increase in ortho-phosphate in the Yellow River as a result of the process water discharge is 0.0007 mg/l, based on a discharge of 360 m³/day. The increase in ortho-phosphate as a result of the process water discharge is not significant when compared with the background concentration in the Yellow River due to other sources. Full details of assimilative capacity calculations are presented in *Chapter 6 Water Quality*.

5.5 Mitigation Measures

The operation of the power plant will adhere to air quality limits set by *Council Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air*. This is in order to protect ecosystems and vegetation from excessive levels of nitrogen oxides or sulphur oxides.

Due to the proximity of the dry calcareous heath and immature woodland at Target Note 3, outside of the site boundary, measures should be put in place to minimise any incursion from machinery or construction workers during the construction phase. The site boundary should be marked with high visibility tape and workers and machinery should not be allowed in this area.

Any removal of trees and scrub should not take place during the bird breeding season, from March 1st to August 31st, in order to protect nesting bird species. Swallows were found nesting in two of the existing buildings, the workshop complex and the wooden hostel, during the survey. The destruction of nests on or in buildings which contain eggs is prohibited in Ireland under the Wildlife Acts 1976 and 2000, and therefore it is recommended that demolition of these structures should take place outside of the bird nesting season, from March 1st to August 31st, to avoid impacting on these nesting birds.

Although no roosts were identified within the site during the current survey, the installation of bat boxes is recommended to offset the loss of potential bat roosting habitat in buildings. Schwegler 'woodcrete' boxes have the highest rates of occupation of all box types. The 75% wood sawdust, concrete and clay mixture allows natural respiration, stable temperature, and durability. They are extremely long lasting and rot- and predator-proof. Six of these bat boxes are deemed sufficient to compensate for loss of buildings. These should be hung from a tree branch near the trunk, or fixed to a tree trunk with a 'tree-friendly' aluminium nail. Two of these boxes should be installed at each of the following locations: (i) the treeline to the north of the main workshop building; (ii) the tree-lined avenue to the east of the boiler house; and (iii) the treeline at the southern boundary of the site. These boxes are readily available from Alana Ecology (www.alanaecology.com) and other suppliers. Bat boxes should be put in place before the demolition of buildings.

Bats are protected under the *EU Habitats Directive 92/43/EC* and in Ireland under the Wildlife Acts 1976 and 2000. While there was suboptimal roosting potential in the buildings contained within the site, the demolition of these buildings will be undertaken so as to minimise the disturbance and the negative impacts on bats as far as is possible. This will involve removal of the contents of buildings prior to demolition, in particular those buildings not being used by Bord na Móna personnel on a daily basis. The disturbance created by removing materials from old buildings would discourage bats, if present, to continue using these buildings and roost elsewhere. While the buildings on site are sub-optimal for roosting, old bat droppings were detected during the surveys. As bats are protected under the Wildlife Act, during demolition of the buildings on site, an appropriately qualified ecologist will be engaged to inspect the buildings immediately prior to demolition to ensure that bat roosts or hibernating bats are not impacted by the works. Any removal of bat roosts or hibernating bats will be done under licence from the NPWS. Where possible, demolition should be carried out outside the bat hibernating season, from November to March, so that any hibernating bats are not disturbed, injured or killed.

During the excavation and removal of soil for construction works, fuel/oil interceptors and silt traps or sedimentation ponds will intercept surface water run-off. The Contractor will establish a maintenance schedule and operational procedure for silt and pollution control measures during the construction period. These will be incorporated into the Construction Environmental Management Plan (CEMP) for the proposed development.

Oil, petrol and other contaminants will be stored in bunded containers. Bund specification should conform to the current best practice for oil storage such as Enterprise Ireland's *Best Practice Guide BPGCS005 Oil Storage Guidelines*. All waste oil, empty oil containers and other hazardous wastes should be disposed of in conjunction with the requirements of the *Waste Management Act 1996-2008*.

Pouring of concrete will take place in designated areas, washings will not be discharged to surface water and poured concrete will be allowed to cure for 48 hours in the dry.

The potential for release of suspended solids to watercourses is greatest during wet weather and therefore it is recommended that works be suspended in the river and on its banks during extreme wet weather. A method statement for all works will be supplied to the Eastern Regional Fisheries Board by the Contractors to specify the method to be used to prevent silt-laden water from discharging directly into the river, and will follow guidance provided by the SRFB (Kilfeather, 2007) and the ERFB (Murphy, 2004).

A dust minimisation plan will be implemented during both the demolition and construction works, in order to prevent dust emissions impacting on the flora and habitats of the surrounding area.

There are no specific mitigation measures required for the timing of works in relation to macroinvertebrate populations. However, as salmonids have been recorded from both watercourses, they must be considered to be salmonid waters and measures must be taken to avoid impacts during the most sensitive periods of the life cycles of these species. For salmonids, the ova and early juvenile stages are most sensitive. Although spawning takes place in winter, fry do not emerge until mid-late May. Therefore, no instream works shall be undertaken in the watercourse during the period October to May.

In addition to salmonid species, the presence of lamprey in the Yellow River requires additional mitigation with regard to the timing of works. Lamprey spawn from late April to early June and the young of each year will settle on fine, silty substrate where they will shelter and develop as ammocetes. These juvenile lamprey remain in the silt throughout the year and will require translocation should their immediate habitat require removal.

The most effective method of mitigating habitat loss is to ensure strict controls aimed at minimising the land take and affected area within the river. Additionally, the creation of new habitat compensates for habitats removed. However, the creation or purposeful retention of riparian habitat at the selected works site is not feasible at this watercourse, given the ongoing maintenance works carried out within the river channel.

However, it is important to note that the silt habitat required by the lamprey ammocetes at the Yellow River site will require specific mitigation measures, to either preserve these silt beds intact, or to transfer the lamprey population at this site to an undisturbed and suitable location. This can only be carried out by a suitably qualified ecologist, under a licence issued by the Department of Communications, Marine and Natural Resources.

The proposed landscaping mitigation specified in Chapter 10 *Landscape and Visual* of this EIS shall use native species of local provenance where possible. The planting of native species, which are present in the general area, will enhance the biodiversity around the perimeter of the site. Any soils excavated from the site during construction should be re-used on site where possible for landscaping. The soils shall be stored in low mounds, to a maximum height of 2 m, and shall be reinstated as soon as possible to minimise adverse impacts on soil structure.

5.6 Residual Impacts

Residual impacts on flora and fauna will be the permanent removal of habitats and flora from the site, and is deemed to be of minor significance due to the low ecological value of the majority of the site. Minor impacts on fauna are anticipated and are principally related to disturbance during construction. There will be a loss of a very small extent of foraging habitat for bat species. However, due to the open nature of the surrounding landscape, the lack of optimal roosting habitat for bat species within the site, and the low level of bat activity detected at the site, this is not considered to be a significant impact. Following the maturation of the trees planted as part of the landscaping mitigation, there will be enhanced bat foraging habitat around the perimeter of the site.

Following the correct implementation of all mitigation measures, no significant residual impacts with respect to flora and fauna are anticipated, as a result of the proposed development.