5.2 TERRESTRIAL ECOLOGY

5.2.1 FLORA

5.2.1.1 Context

Biosphere Environmental Services was commissioned by McGill Planning Town Planners to carry out an assessment of impacts on ecological interests (terrestrial) along a section of the River Dargle where a flood defence scheme is proposed. A constraints study for the scheme had been carried out (BES 2006), as well as an Option Appraisal Study (BES 2007).

The study area is the stretch of the river between Bray Harbour and a point at the N11 road just above the La Vallee apartments. It includes the river and its banks but widens to include the People's Park on the north bank of the river and a substantial area of undeveloped land on the south side.

The work carried out is in accordance with guidelines recommended by the EPA (2002) - *Guidelines on the Information to be contained in Environmental Impact Statements*.

5.2.1.2 Methodology

The information on the habitats and flora was collated following a desk study and a walk-over site survey on 20th July 2006. The survey was by Dr Tom Curtis. The main sources consulted were Brunker (1950), Curtis (1973), Carvill and Curtis (1974), Curtis (1989) and Bradley (1989), as well as the archive on flora of the area collected by T. Curtis over the last 30 years. In addition, information on designated areas was provided by the National Parks and Wildlife Service of the Department of the Environment, Heritage and Local Government.

Habitat types are described according to the classification scheme used by Fossitt (2000). Nomenclature for vascular plants follows Scannell and Synnott (1987) and for cultivated species Griffiths (1994).

There were no special seasonal constraints in regard to the habitat and flora survey as it was carried out within the optimum period for botanical survey.

5.2.1.3 Description of Receiving Environment

5.2.1.3.1 *Designated sites for conservation*

No part of the study area is covered by a conservation designation. However, there are a number of such sites in the general Bray area, including along other sections of the Dargle system.

The geographically-closest designated area, the **River Dargle Valley proposed Natural Heritage Area** (code 01754), to the Study Area lies just a short distance upstream from the N11. Here, the river descends rapidly through a series of gorges along the sides of which are the extensive stretches of oak woodland for which the site has been selected. The rare yellow archangel is also found here.

Along the Cookstown (Glencullen) River, which is a tributary of the River Dargle, lies the **Knocksink Wood candidate Special Area for Conservation** (code 0725). This site has been selected for Alluvial woodlands and Petrifying Springs. A number of rare plants are found within the site including yellow archangel *Lamiastrum galeobdolon* and bird's nest orchid *Neottia nidus-avis*.

In a wider context, the River Dargle rises in Liffey Head Bog, which is included within the **Wicklow Mountains candidate Special Area for Conservation** (code 02122).

The **Bray Head candidate Special Area for Conservation** (code 0714) is listed for Sea cliffs and for Dry heath, whilst the **proposed Natural Heritage Area** there has been designated for its areas of coastal heath, woodlands and calcareous grassland. A number of rare and threatened plants occur. Bray Head is also a **proposed Special Protection Area** for seabirds.

5.2.1.3.2 *General ecological description of study area*

The Dargle River, due to its relatively short course from source to sea, can increase in volume very quickly after significant rainfall. As a consequence it can be termed a 'spate' river, which floods regularly and which necessitates flood protection measures in the vicinity of populated areas. These have been carried out along the course of the Study Area on several occasions, notably following the disastrous floods of 1905 and that which followed 'Hurricane Charlie' in August 1986. Therefore, where damage has occurred to the banks during flooding, the banks have been reinstated. The types of measures used have included the replacement of riverbanks by walls, the placing of large boulders, and the siting of gabions of cage-filled stones at strategic areas. In addition, weirs have been removed in places and the bed of the river has been much reduced in level. All of this has had significant impacts on the habitats and flora in the past within the Study Area and they can now be classed as derivative or very recent with very little of the original wild vegetation or plants remaining. As a consequence of past disturbance, colonisation of alien and weedy species has been a feature of the Study Area compounded by the addition of garden plants, originating upstream in Powerscourt Demesne, most notably the Giant Hogweed, which is a dangerous weed.

Recently, some remedial measures have been undertaken for fishery reasons and a weir to assist the fisheries potential was put in place between the railway bridge and the main bridge.

With respect to the habitats and flora within the river channel, these are necessarily poor due to the overall water quality, which is typical of acid rivers originating in granitic uplands dominated by blanket bog. pH values are typically between 6.5-7.5 (Bradley 1989) which are low acid to neutral, and the nature of the substrate, which is very stony and lacking fine muds and clays, precludes the development of a diverse flora and vegetation. The spate-driven nature of the water body, which results in highly fluctuating levels, is also a very difficult environment within which vegetation can colonise and flourish. In general, macrophytes are very rare and any plant growth consists of water mosses and algae.

5.2.1.3.3 *Description of habitats, vegetation and flora within study area*

Within the study area, past management practices have reduced the diversity of the habitats and species, especially within the immediate corridor of the river and its banks. Consequently, aquatic vegetation, which is always limited in nutrient poor rivers such as this, is completely absent. Any residual riverine vegetation is confined to the margins and the banks. Disturbance has advanced the spread of alien species along the banks and approximately 50% of the vegetation cover, in the areas closely adjacent to the river, is alien in nature. These species are principally traveller's joy *Clematis vitalba,* butterfly bush *Buddleja davidii*, Mexican fleabane *Erigeron karvinskianus,* giant hogweed *Heracleum mantegazzianum*, and Japanese knotweed *Reynoutria japonica*. The last two species are noxious weeds. To this assemblage can be added the coarse native elements of nettle *Urtica dioica*, dandelion *Taraxacum officinale* and blackberry *Rubus fruticosus*. This is the type of vegetation, which occurs especially along the mid section of the Study Area between Bray Bridge and the western end of People's Park.

As the habitats in the study area have been so highly modified, their precise classification can be difficult but they contain elements of the following categories of Fossitt (2000):-

- Stone walls and other stonework BL1
- Tidal Rivers CW2
- Re-colonising bare ground ED3
- Eroding upland rivers FW1
- Depositing lowland rivers FW2
- Tall-herb swamps FS2

- Improved agricultural grassland GA1
- Amenity grassland (improved) GA2
- (Mixed) broadleaved woodland WD1
- Scattered trees and Parkland WD5
- Riparian woodland WN5
- Scrub WS1
- Ornamental/non-native shrubs WS3

The People's Park contains a mixture of **Amenity grassland (improved) GA2** and **Scattered trees and Parkland WD5** with many fine specimen trees of horse chestnuts, maples and planes.

The most natural stretch of habitat and vegetation occurs along the banks of the river between the western end of the People's Park and La Vallee. From the former as far as the Old Conna apartments (formerly Dargle Laundry) the banks are lined by **Riparian woodland WN5** dominated by alder *Alnus glutinosa,* and the grey and crack willows *Salix atrocinerea* and *S. fragilis* occur with **Tall-herb swamps FS2**. The swamp vegetation has such species as hairy willowherb *Epilobium hirsutum*, water dropwort *Oenanthe crocata*, creeping buttercup *Ranunculus repens*, reed canary grass *Phalaris arundinacea* and creeping bent *Agrostis stolonifera*.

The stretch of river adjacent to the Lower Dargle Road west of the Old Conna Apts has a stretch of **Amenity grassland (improved) GA2** on the north bank whilst on the opposite side the top of the riverbank has **Scrub WS1** of gorse *Ulex europaeus* and broom *Cytisus scoparius* dominating. The grassland behind (F4 on town map) belongs to **Improved agricultural grassland GA1**. (**Mixed) broadleaved woodland WD1** occurs along the banks from the western end of the grassland to the end point of the Study Area at La Vallee apartments. This woodland, which includes sycamore *Acer pseudoplatanus*, ash *Fraxinus excelsior* and grey willow, is part of the larger and extensive area of the habitat that occurs in Killarney Glen.

The river margins on both sides in the vicinity of Dargle Vale House are quite bare with a low vegetation cover, which is a result of disturbance and the very poor soil conditions.

Below Bray Bridge, an area of (**Mixed) Broadleaved woodland WD1** and **Ornamental/non-native shrub WS3** occurs on the south bank. Species here include cherry laurel *Prunus laurocerasus*, sycamore, beech *Fagus sylvatica*, elder *Sambucus nigra* and the shrubs privet *Ligustrum vulgare* and berberis *Berberis darwinii*. The river margins contain **Riparian woodland WN5** with some **Tall herb swamps FS2.** The remainder of the bank as far as the

sewage treatment plant is dominated by **Scrub WS1,** principally gorse *Ulex europaeus* and young sycamore *Acer pseudoplatanus*. The north bank, above the weir has a reduced **Riparian woodland WN5** area with some **Tall herb swamp FS2.** Below the weir the water is brackish and the habitat is assignable to **Tidal rivers CW2.**

Detailed, area specific, descriptions of the habitats found within the study area, together with any notable features, are presented in Appendix B1 (table and accompanying map).

Notable flora species

One notable plant species, Greater Yellow-cress *Rorippa sylvestris,* was first discovered in 1966 at the south bank of the Dargle (Bray) River, adjacent to the sewage plant and is still extant there. This is the only location for the species in county Wicklow though it is known from other parts of the country from lake margins in the north, west and south-east.

5.2.1.3.4 *Overview of conservation value of habitats and flora species*

The part of the river within the study area is not part of, or adjoins, any area designated for conservation. The habitats in the study area in general have been compromised by past disturbance and the existing habitats are not considered of any particular conservation value. At most, the habitats have Low to Moderate local value.

There are no protected or Red-listed species of flora (as in Curtis & McGough 1988) found within the area. However, the occurrence of greater yellow-cress is of some note as this is the only known population in county Wicklow and hence is of importance to the biodiversity of the county.

5.2.1.4 Potential Impacts

5.2.1.4.1 *Character and significance of impacts*

Habitats and vegetation

The proposed works will be highly disruptive to existing habitats, vegetation and flora, with complete clearance of vegetation along substantial stretches of the river corridor.

The removal and disturbance of habitats is considered a negative impact of Minor significance as the habitats in the study area are not of any particular conservation value. As described, there is a high degree of past disturbance and a large proportion of the vegetation is of non-native species, including noxious weeds. In-stream macrophytic vegetation is poorly developed, reflecting both the natural character of the river and past management. Bankside and marginal vegetation is generally poor, though some sections have elements of riparian

woodland and tall herb swamp vegetation, such as at C7 Glenwood Excavation, D1 Coburg Estate Wall, D7 Killarney Glen Sheetpile, and E2 Excavate South Bank. With appropriate re-instatement, the impact could be reduced to Neutral in the medium to long term. It is noted that bare and disturbed surfaces will be vulnerable to invasion by alien species, notably Japanese knotweed and giant hogweed. Should measures be taken to control and, in the long-term, eradicate the various alien species, this would be a Positive impact.

Greater yellow cress

It appears that the population of greater yellow cress at the location of the Seapoint Court defences will be lost. As this is the only known location for the species, this will represent a serious loss of biodiversity for the county. Without mitigation, this is considered a negative impact of Moderate significance.

5.2.1.5 Mitigation Measures

5.2.1.5.1 *Habitat and vegetation reinstatement*

It is highly desirable from an ecological point of view to plant and/or re-instate native tree and shrub species along the disturbed banks of the River Dargle. The following programme will be carried out:-

1. It is essential to have a qualified ecologist advise on the suitability of certain planting combinations at the individual locations being proposed for landscaping at the time of planning and planting.

2. Mitigation measures are required in construction areas to protect from disturbance mature trees remaining in situ, especially along the stretch of the south riverbank between Glenwood, through Killarney Glen and up to the Dargle Bridge along the N11. Trees badly damaged or in poor health should be replaced with specimens of the same species.

3. With regard to the planting of suitable trees along the margins of the river, these should be restricted to true native, marginal species, which already grow there. These should include the native alder *Alnus glutinosa,* crack willow *Salix fragilis* and grey willow *Salix atrocinerea*. White willow, *Salix alba*, is not a native of Ireland and should not be used. Suitable shrubs include hawthorn *Crataegus monogyna,* broom *Cytisus scoparius* and gorse *Ulex europaeus.*

4. Swamp or reedbed vegetation is not a feature of the river as such vegetation requires relatively calm water conditions with a peat or mud substrate and neutral to base-rich water. The River Dargle is subject to flash flooding, has a stony substrate and acid water. The current absence from the River of wetland species such as the common reed *Phragmites australis* or common club rush

Schoenoplectus lacustris is a direct consequence of the unsuitable ecological conditions for their growth.

Where it is proposed to establish wetland vegetation, suitable species include reed canary grass *Phalaris arundinacea*, hemp agrimony *Eupatorium cannabinum*, water dropwort *Oenanthe crocata*, and water forget-me-not *Myosotis scorpioides*.

5.2.1.5.2 *Treatment of alien species*

Currently, serious problems exist along the river with the occurrence of alien species, some of which are classified as noxious weeds. The main species are Japanese knotweed *Reynoutria japonica*, giant hogweed *Heracleum mantegazzianum*, traveller's joy *Clematis vitalba* and butterfly bush *Buddleja davidii.* Disturbed surfaces will be particularly vulnerable to invasion by such species following the completion of works. It is recommended that measures should be put in place to minimise this through a programme of physical removal followed by careful herbicide application. Herbicide application will have to be carried out with the care normally required by the Fisheries Boards when spraying adjacent to a water body.

If such a programme is followed through, the overall ecological value of the riparian vegetation would be increased.

5.2.1.5.3 *Greater yellow cress*

The transplantation, storage and translocation of the Greater Yellow Cress *Rorippa sylvestris* from its current location along the south bank of the River adjacent to Seapoint Court will need to be carried out. The species can be collected as seedling and/or mature plants during the autumn of 2007 or preferable spring of 2008 and maintained at a suitable (and safe) location for the duration of the project. It can subsequently be re-located to a site as close as possible to its current one on the completion of the works. It is noted that in addition to the A5 (Seapoint Court defences) location, suitable conditions at A6 (Abattoir defences) could be made available for *Rorippa sylvestris* as it formerly occurred here.

The advice of a plant ecologist familiar with the species will be retained to oversee this programme.

5.2.1.6 Residual Impacts

Taking into account the existing low conservation interests in the study area, and assuming that the mitigation measures will be successfully implemented and especially for the population of greater yellow cress, it is considered that the residual impacts by the scheme will be at most Minor negative, and probably Neutral, in the medium to long term.

5.2.1.7 The Do Nothing Scenario

Without the proposed works, the existing conditions would be expected to remain more or less stable (assuming no other influencing developments take place or significant flood events).

However, future flood events (either a 1:100 Year River Flood Event or 1:200 Year Tidal Flood Event) would alter the existing physical conditions within the river valley, which would result in habitat change through erosion, soil exposure and tree death, followed by re-colonisation, initially mostly of weedy, invasive species including the alien Japanese knotweed.

There would also be the probable loss of the small population of Greater yellow cress on the south side of the river adjacent to the sewerage treatment works.

5.2.1.8 The Worst Case Scenario

The worse case scenario would be

(i) if mitigation measures fail to re-establish the population of greater yellow cress in the study area.

(ii) if vegetation reinstatement is not successfully carried out.

(ii) if alien species were to increase further due to the disturbance created by the scheme.

5.2.1.9 Positive impacts

Positive ecological impacts could accrue from appropriate vegetation re-instatement and from proactive control of noxious alien species such as Japanese knotweed and giant hogweed.

5.2.1.10 Reinstatement

The reinstatement of vegetation is dealt with in the mitigation section.

5.2.1.11 Monitoring

From a botanical perspective, the principal interest in the study area is the presence of greater yellow cress. The success of mitigation measures that might be implemented to retain its presence along the Dargle would need to be closely monitored, from the time of its removal to its reinstatement and subsequent progress over a number of years.

In general, the recovery of bankside vegetation after construction works will be monitored for a 2-3 year period.

5.2.2 FAUNA

5.2.2.1 Context

Biosphere Environmental Services was commissioned by McGill Planning Town Planners to carry out an assessment of impacts on ecological interests (terrestrial) along a section of the River Dargle where a flood defence scheme is proposed. A constraints study for the scheme had been carried out (BES 2006), as well as an Option Appraisal Study (BES 2007).

The study area is the stretch of the river between Bray Harbour and a point at the N11 road just above the La Vallee apartments. It includes the river and its banks but widens to include the People's Park on the north bank of the river and a substantial area of undeveloped land on the south side.

The work carried out is in accordance with guidelines recommended by the EPA (2002) - *Guidelines on the Information to be contained in Environmental Impact Statements*.

5.2.2.2 Methodology

5.2.2.2.1 *Mammals, amphibians and reptiles*

Assessment of terrestrial fauna (other than birds) in the study area was conducted by Dr. Chris Smal, faunal specialist, and Mr. Conor Kelleher, bat specialist.

Field survey was undertaken on July 13th 2006 in good weather conditions: sunny and warm during the day and mild in the evening. There was no rain or wind.

The survey corridor was largely restricted to the Dargle River and its banks and also vegetated areas in the immediate vicinity - effectively a narrow corridor of survey along the river. Search of garden areas was not included. Waders were used to access most of the banks along the river corridor, though areas where the river was deeper could not be accessed, mainly along the eastern section near the People's Park.

Presence of mammals is indicated principally by their signs, such as dwellings, feeding signs or droppings - though direct observations are also occasionally made. The nature and type of habitats present are also indicative of the species likely to be present; the suitability of the habitats for mammals was assessed in general accordance with techniques adopted for the Badger & Habitat Survey of Ireland (Smal 1995). The field survey was supplemented by evaluation of relevant literature and existing information. Additional information was supplied by local residents met with during surveys.

Survey for bats was carried out by means of search along the Dargle River. Presence of bats is indicated principally by their signs, such as dwellings, feeding signs or droppings - though direct observations are also occasionally made. Potential bat roosting sites were surveyed in daytime and an evening survey was conducted with the use of heterodyne bat detectors (BATBOX Duet and Bat MkIIa Magenta Electronics).

Survey constraints

The corridor of survey was limited to the river and immediately adjoining areas. Garden areas frequent along portions of the route were not entered and were not included in the survey. Whilst most of the river was searched from within the river, using waders, and banksides checked for otter signs, deeper portions of the river (with depth to c.1.5m) could not be accessed in this way and access to the banks was restricted by dense scrub in some portions.

Badger surveys are best conducted in winter (December to April, with optimum period mid-January to mid-April). Vegetational cover in summer is high and is a severe constraint with regard to finding badger setts. Signs of badger activity are also obscured by vegetation and high growth of grass and weeds in summer; at this season, badger feeding behaviour and territorial behaviour also contribute to difficulty in badger surveys undertaken in summer.

Otter droppings (spraints) can be found at any season and are a good indicator of otter presence. Otter holts can be difficult to find at any season, but especially so when vegetational cover is high – as at time of this summer survey.

In addition, areas that might be affected by construction activities will include access routes for construction traffic, areas for storage of excavated materials, site materials storage areas, site depots and etc. These have not been detailed in present proposals for the various flood relief scheme options, and will require survey at a later stage.

There were no seasonal constraints in regard to bat survey.

5.2.2.2.2 ***Birds***

Information on the birds associated with the study area was collated by desk review and field survey. In addition, both Brian Madden and Tom Curtis have much previous experience of the area (over several decades).

A visit was made to part of the site on 16th May, with a complete survey carried out on 30th June. Observations on birds were also made during the botanical survey (20th July) and mammal survey (12th July). The entire river was surveyed, either from along the banks or instream.

Winter survey was not considered necessary as there are no species of conservation importance or significant waterbird populations known to occur in the study area.

5.2.2.3 Description of the Receiving Environment

5.2.2.3.1 *Mammals, amphibians and reptiles*

A list of mammalian species observed on site or likely to occur in the locality is given in Appendix B2, with observations of signs of species of principal ecological interest shown on Figure 1.

Common species

The site includes a variety of habitats and a range of common species are present. The area is confined in large part by urban development which restricts the species that occur, or might be expected to occur, on site.

Signs and observations of brown rat *Rattus norvegicus* were frequent. The house mouse *Mus musculus* is certainly present as it is frequent in urban areas. The long-tailed fieldmouse *Apodemus sylvaticus* is common in urban areas and in open countryside. The bank vole *Clethrionomys glareolus* is absent from this part of Ireland. Other species that will be present on site and in the vicinity include the hedgehog *Erinaceous europaeus* and the pygmy shrew *Sorex minutus,* the latter expected to be common.

Fox *Vulpes vulpes* signs were encountered at the south-west and will forage in portions of the urban areas also. The Irish stoat *Mustela erminea hibernica* might occur in some portions of the site - but densities are expected to be very low.

Rabbits *Oryctolagus cuniculus* were not observed, nor active burrows, but the species will be present on occasion and may have been more plentiful in the past. The Irish hare *Lepus timidus hibernicus* was not observed; it is known to occur in the general locality, and may occur on occasion on Bray Golf Course.

The pine marten *Martes martes* has increased its range and is present in Co. Wicklow. No martens are expected on site however. The mink *Mustela vison* is becoming scarce on Irish waterways; it is known in Co. Wicklow, and may occur on site occasionally, but no signs were found.

Grey squirrels *Sciurus carolinensis* are present on site and have been reported by local residents and a roadkill was observed next to the mature deciduous woodland at the south-west in October 2006. Red squirrels *Sciurus vulgaris* are believed to be now absent from this area.

No signs of deer were observed on site whilst deer of various species are present in north-east Co. Wicklow.

The common frog *Rana temporaria* is certain to forage on parts of the site. No ponds were seen within the corridor of survey, but potential breeding sites would be present in adjacent areas and sometimes in gardens. Smooth newts *Triturus vulgaris* were not observed during the survey and no breeding pond was identified. The species is relatively widespread in Ireland but is of conservation interest (Marnell 1998). The common lizard *Lacerta vivipara* is a common species and difficult to observe; it occurs in a range of habitats, especially on moors and rocky places, but also within woodlands and grassland areas; it is potentially present on undeveloped portions of the site.

Species of principal conservation interest

Otter

Otters *Lutra lutra* use all of the Dargle River on site – with signs present at several locations along the river from the Harbour at Bray to the south-west near the N11 (Figure 1). Many signs were fresh; feeding areas were observed as were fresh otter prints – these were present even at Bray Bridge. Otters are often present in urban areas where larger rivers flow through them.

No holts were found (seasonal constraints were noted earlier) but there will be one or more holts present along the river or its small tributary streams. Holts are also likely to be present upstream of the N11 and, certainly, otters will make use of the upper portions of the Dargle River also.

Otters occur on almost all rivers and streams in Ireland and utilise even small drains as corridors to foraging grounds. Whilst their main prey items are fish, they also feed selectively on frogs and target this species in spring. They have extensive ranges, with territory size varying from c.3 km of river to as much as 30 km or more (mean of c. 15-20 km). The number of individual otters using the Dargle River is likely to be one or two, with family groups likely in summer.

Badger

No definite badger signs were found within the narrow corridor of survey conducted during summer. Badgers are believed to be present on the south side of the Dargle River, and one observation was reported by a local resident. There is potential foraging area at the south-west of the site and badgers do forage in gardens also. The extent of pasture grassland is relatively limited, however.

Survey at appropriate season and in wider corridor of search may reveal presence of setts and signs pertaining to at most one badger social group. Badgers have large territories, averaging c. 80 ha, but territory size may vary from c.15 ha to over 150 ha.

Bats

On-site, the most important features for bat use are the woodlands and river. The wooded areas include deciduous and mixed woodland areas. Mature trees within these woods show potential to act as refuges for bats as many are covered with ivy growth, have raised or loose bark, cracks, crevices, hollows and storm damage. The woodlands also include dead trees which further enhance their appeal to bats as roosting sites.

The over-hanging, mature, trees along the river offer roosting and foraging areas for bats. The river is well vegetated and attracts insects as bat prey. Giving sheltered areas for insects to accumulate they encourage bat use of the river environs. Bats may also roost within some of the older buildings along this stretch of the Dargle River.

The existing river walls and main town bridge were investigated for potential as bat roosting sites. Both structures are poor as they offer limited potential for bat use. No detailed examinations of buildings on site were undertaken as none will be affected by the proposals but there are many opportunities for roosting sites within the structures near to the scheme. Various of the buildings may well serve as both permanent and temporary roosts sites for more than one species as stone walls and slated roofs offer a range of bat-friendly access points.

Bat activity during the evening survey was high. The survey was undertaken at the optimum time of year for maximum bat numbers on the wing as the young have been weaned and are abroad for their first flights. Three species were recorded hunting or commuting within the survey area. The tree-lined river banks offer commuting and foraging areas for bats and species diversity is expected to be high. Several of Ireland's known bat species can be expected on site (O'Sullivan, 1994; Richardson, 2000).

Several individuals, of three species of bats: common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus,* and Daubenton's *Myotis daubentonii* were observed on the night of the survey (Figure 1). The most common bat present was the soprano pipistrelle which was seen and heard along the river. Daubenton's bat was seen feeding along the river in numbers.

Brown long-eared *Plecotus auritus* and Leisler's bat *Nyctalus leisleri* can be expected to occur in the area as they are widespread in Ireland. The former species is extremely difficult to detect and so may be overlooked.
Other species which may occur in the area include Natterer's, whiskered and Brandt's bats. These species' preferred habitat is woodland edge. They latter two cannot be separated by detector.

Another species that may be expected to be present, apart from those recorded on detector, is Nathusius' pipistrelle *Pipistrellus nathusii* (Richardson,

2000). More records of this species are now being found countrywide and it may be in the area.

The lesser horseshoe bat *Rhinolophus hipposideros* does not occur in the area as its known distribution range is along the western Atlantic seaboard counties.

5.2.2.3.2 *Birds*

The study area supports a good riparian avifauna. Of highest conservation importance is nesting kingfisher *Alcedo atthis,* a species listed on Annex I of the EU Birds Directive. It is certain that one pair nested in the low clay cliffs on the south side of the river just downstream of the recent La Vallee complex (see Figure 1) (it is possible that a second pair nested in the same stretch of cliff but such proximity would be unusual and it is more likely that one pair may have had an alternative nest site). This pair bred successfully, as up to 3 birds were seen together along the mid section of the river in late June. An observation on 12th July of a bird near the harbour carrying food was probably an adult carrying food for a fledged bird from the pair upstream.

A single sighting of a dipper *Cinclus cinclus* was made near the La Vallee complex in May but there were no subsequent sightings. Dippers have nested along the section of the Dargle in the study area in the past, and birds occur regularly on the Dargle/Cookstown rivers to the west of the N11. At times, birds would travel downstream towards Bray.

Several nesting pairs of mallard *Anas platyrhynchos*, moorhen *Gallinula chloropus,* and grey wagtail *Motacilla cinerea* occur in the survey area, as well as a pair of mute swan *Cygnus olor.* A substantial flock of mallard occur in the lowermost section of the river, with 60+ (post breeders and non-breeders) present in July. Some hybrid or feral waterfowl (ducks and geese) are resident on the river, including a long-present mandarin duck *Aix galericulata*.

Grey heron *Ardea cinerea* is a regular visitor to the study area and nests further upstream (west of N11). Gulls, mainly black-headed gull *Larus ridibundus* and herring gull *L. argentatus*, may be found regularly (often in hundreds), but especially during winter, along the stretch of river towards the harbour.

In recent years, an important flock of mute swans has built up within Bray Harbour and these frequent the area of the river as far as the Bray town bridge. The swans are present throughout the year and since 2001 numbers have exceeded in each year the threshold for national importance (i.e. 100 or more) (Merne 2006). They feed on weed within the river and increasingly on bread and other food from local residents. The swans also commute to other feeding sites, such as the Kilcoole marshes.

The wooded stretch at the western end of the survey corridor supports a diversity of woodland birds, with blackcap *Sylvia atricapilla* as well as ubiquitous

species such as blackbird *Turdus merula*, song thrush *Turdus philomelos*, great tit *Parus major*, coal tit *Parus ater*, goldcrest *Regulus regulus*, chaffinch *Fringilla coelebs* and woodpigeon *Columba palumbus.* Jay *Garrulus glandarius* has been seen in the woods on the higher slopes above the river corridor.

5.2.2.3.3 *Overview of conservation value of fauna*

Mammals, amphibians and reptiles

The study area supports, on a regular or occasional basis, a range of widespread mammal species. Many of these receive legal protection under the Wildlife Act (1976) and Wildlife [Amendment] Act (2000) – these include the badger, pygmy shrew, Irish stoat, hedgehog, all bat species, the common frog and common lizard.

Of particular conservation significance is the occurrence of the otter, as this species is listed under Annex II and Annex IV of the EU Habitats Directive. However, otters are relatively common in Ireland (a European stronghold for this species) and they do occur on most rivers and waterbodies in this country.

Birds

The principal bird species of conservation importance in the study area is the kingfisher as this species is listed in Annex I of the Birds Directive. The Dargle is a traditional site for nesting kingfisher and it is obvious that conditions are still suitable despite degradation of the riverine habitat in recent decades. The presence of good clay cliffs is crucial for this species.

The study site also supports a range of other riparian species, though these are all fairly widespread species. The presence of a substantial population of mute swan is of interest (considered of national importance), especially as Irish mute swans have recently been recognised as a distinct biogeographic population.

5.2.2.4 Potential Impacts

The proposed development will remove breeding and foraging habitat for a range of common mammal species, as well as the common frog (though no breeding ponds were recorded in the survey corridor) and the common lizard (which is potentially present). However, these are widespread species of the countryside and will continue to occur in undeveloped areas adjacent to the site and would be expected to recolonise disturbed areas in the short to medium term. The impacts on such species may be considered as Negligible or Minor Negative. The general mitigation measures proposed for habitats and for the species of conservation importance discussed below will minimise impacts on these species.

5.2.2.4.1 *Otters*

The survey showed that otters use all of the Dargle River. Whilst no holts were found (seasonal constraints were noted earlier), there is likely to be one or more holts present along the river or its small tributary streams. Otters are protected under the Irish Wildlife Acts and are also listed under Annex II and Annex IV of the EU Habitats Directive. The following are the principal potential impacts:

- Otters are sensitive to disturbance and any works within, along or immediately adjacent to the Dargle River will cause disturbance to otters foraging along the river.

- Otters would be particularly affected by vegetation clearance and bank disturbance near holts. Direct impact on a holt would be a negative impact of major significance and mitigation is necessary.

- Sedimentation of the Dargle River through bank disturbance and/or instream works may cause temporary reduction in fish stocks, and hence prey for otters. Such will impact on otter use of the river until recovery of fish stocks takes place and could affect breeding success.

- Otters require free access along the river and its tributaries. Culverts at the Bray bridge, and at any other tributary stream which presently allows access to otters, will need to be otter passable.

In the long-term, and providing mitigation measures are implemented, the impact of the proposed scheme on the otter population is likely to be minor.

5.2.2.4.2 *Badgers*

No definite badger signs were found within the narrow corridor of survey conducted during summer, though badgers are believed to be present on the south side of the Dargle. Survey at appropriate season and in a wider search corridor of search may reveal presence of setts and signs pertaining to at most one badger social group. The badger is protected under the Wildlife Act (1976) and Wildlife [Amendment] Act (2000). The following are the principal potential impacts:

- Badgers are not especially sensitive to disturbance provided works do not directly impact on badger setts or come close to them. Setts may be present at various locations that will be impacted by the scheme including storage areas, access roads for construction traffic, site depots etc. Regrading works may require entry of machinery via banks and adjacent lands in which setts might be present. Should a sett be found where disturbance will occur, appropriate mitigation measures will be necessary.

- Loss of feeding habitat will cause reduction in overall foraging area available to badgers in the area. However, the proposed works along the Dargle River would affect a relatively small amount of potential feeding habitat and this impact would be of minor significance.

5.2.2.4.3 *Bats*

The river and associated woodland provide suitable habitat for bats. All bats are listed in Annex IV of the Habitats Directive. All Irish bat species are also protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). The following are the principal potential impacts:

- Removal of vegetation along the Dargle River and adjoining areas will reduce foraging habitat for bats in the short to medium term. Mitigation is required to replace this vegetation.

- There are potential bat roosts in several mature trees in the area; felling of these trees could affect a number of bat roosts. Mitigation measures are required to minimise impacts on potential bat roosts in trees.

5.2.2.4.4 *Kingfisher and riparian species*

Instream and bankside works will affect a range of riparian bird species. Of principal concern is the impact on kingfisher as this species is listed in Annex I of the EU Birds Directive. The principal impacts are as follows:

- As it appears that an active nest site will be removed, this will, without mitigation, be a negative impact of major significance.

- Removal of bankside vegetation will affect foraging behaviour of the kingfishers in the short to medium term.

- Sedimentation of the Dargle River through bank disturbance and instream works may cause temporary reduction in fish stocks, and hence prey for kingfishers. Such will impact on kingfisher use of the river until recovery of fish stocks takes place and could affect breeding success.

The impact on other riparian species will be minor, assuming that active nests are not destroyed. Instream works between Bray bridge and the harbour will remove aquatic weed on which the herd of mute swans feed, though this is a temporary impact and also the swans have a range of other food items available.

In the long-term, and providing mitigation measures are successfully implemented, the impact of the proposed scheme on the kingfisher population and on other birds is likely to be minor.

5.2.2.5 Mitigation Measures

5.2.2.5.1 *Otters*

Pre-construction survey
Prior to any works commencing, a pre-construction survey for otter holts shall be conducted by experts at appropriate season (winter). If a holt(s) is found, appropriate mitigation will be required, which may include the construction of artificial holts to replace loss of natural holts. Such work would be carried out under licence from the National Parks & Wildlife Service.

Duration of works
Any works along or immediately adjacent to the Dargle River will cause disturbance to otters foraging along the river. Where practical, mitigation measures would aim to reduce impact on otters by limiting duration of works on site to daylight hours to allow otters to forage along the watercourses at dawn, dusk and during the night.

Culverts
Otters require continued free access to all parts of the river system that they presently utilise. Adequate bridges and culverts should thus be provided.

At the Bray bridge, it is noted that there is existing shingle/sand banks usually present on the sides of the river. When dredged, the river may not offer these sandy banks for otters to use as a dry passage under the bridge. It would be best to include otter ledges as part of the revised bridge structure. Such a ledge will be put into the new archway, or alternatively added to one of the existing piers of the bridge. The ledge(s) should allow otters access onto them by means of inclines downwards to the river at each end. Normally, an otter ledge serves to provide a continuum with the river banks, and this would be preferable but may not be the best option at the Bray Bridge - because it might be expected that children and others will use the ledges provided as an amenity area, and this might be a safety hazard. Providing ledges on the southern side of the new arch (box culvert) or on existing piers will allow otters places to rest and to mark with spraints, but, as above, must have ramps to allow otters to get onto them.

Expert advice should be sought where culverts are proposed for tributary streams. All the above requirements will be included in the detailed design of this culvert.

Water quality
Sedimentation of the Dargle River may cause temporary reduction in fish stocks, and hence prey for otters. It is essential to ensure water quality in the long-term. Measures proposed in the aquatic study will suffice for otter interests.

Re-instatement of vegetation

It is important to re-establish bankside vegetation at disturbed areas as soon as possible so as to maintain suitable foraging conditions for otters. Measures proposed in the habitat section of this report will suffice for otter interests.

5.2.2.5.2 ***Badgers***

Badger setts may be present at various locations that will be impacted by the scheme including storage areas, access roads for construction traffic, site depots etc. Prior to any works commencing, a pre-construction badger survey will be conducted by experts at appropriate season (winter). This will concentrate on those areas which are considered to have potential for badgers, especially C7 The Glenwood Excavation; D8 Rehills Land (south bank); R2 River Regrading 2 – the Slang; R3 River Regrading 3 – the Slang/Killarney Glen/People's Park; E2 Excavate South Bank; R1 River Regrading 1 – upstream of La Vallee.

The evacuation and removal of affected badger setts (if present) will be conducted by specialists under licence from National Parks & Wildlife Service. Mitigation measures may also include a requirement for the creation of artificial setts, subject to the advice of the National Parks and Wildlife Service.

5.2.2.5.3 ***Bats***

Roosts

Bat roosts may be present in mature or ivy-covered trees present on site. Any such trees that require felling will be felled under supervision of a bat specialist. Trees which are to be removed should first be assessed for likely bat roosting opportunities by a bat specialist and then felled during the spring months of March, April, May or autumn months of September, October or November (felling during the spring or autumn months avoids the periods when the bats are most active). Note that the bird breeding season will need to be considered during the spring period.

If any buildings require demolition then each structure will be subject to pre-construction survey by a bat specialist.

A bat box scheme will be put in place to off-set loss of any bat roosts potentially present in mature or ivy-covered trees that require felling. About 5–10 'Schwegler' bat boxes of the 2F design would suffice; these may be placed on selected deciduous trees in the locality due for preservation. Such bat boxes if required will be erected *before* works commence.

Preservation and re-instatement of habitat

Bats forage along the river and foraging habitat will be affected by removal of riparian vegetation and other vegetated habitats.

Retention of riparian vegetation is recommended where feasible. An appropriate landscaping and planting programme is required to restore riparian habitats so as to provide foraging habitat for bats. This should be based on native tree and shrub species, which provide more insect life than foreign varieties. The proposed earth banks would provide an excellent base for such planting. Plants that emit their scent at night could be planted to attract insects during the hours of darkness. The Mitigation Measures in Section 5.2.1 will suffice.

5.2.2.5.4 *Kingfisher*

Nesting site

The present study has established that kingfishers nest in an area to be affected by the proposed works. It is possible that a second pair could nest elsewhere within the study area. It is also noted that birds can move between years and could construct a new nest hole at a different location.

If works are planned during the nesting season (1st March to 31st August), survey will need to establish the exact locations of kingfishers nests and works at active nest sites will be avoided until after the nesting season.

As a known nest site will be destroyed, provision will need to be made to provide an alternative site. This should preferably be in a regraded sand/gravel cliff in the same general location to where the existing nest hole is. Artificial nest tunnels in created sand cliffs have been successfully used by kingfishers elsewhere. Expert advice will be retained in consultation with the National Parks and Wildlife Service.

Retention and re-instatement of vegetation

Retention of riparian vegetation is recommended where feasible. An appropriate habitat re-instatement programme is required to restore riparian habitats so as to provide suitable habitat for kingfisher – this should be based on native tree and shrub species, including willows and alder. The proposals in Section 5.2.1 will suffice.

Water quality

Sedimentation of the Dargle River may cause temporary reduction in fish stocks, and hence prey items for kingfishers. It is essential to ensure water quality in the long-term. Measures proposed in the aquatic study will suffice for kingfisher interests.

5.2.2.5.5 *Other nesting birds*

Section 40 of the Wildlife Act 1976, as amended by Section 46 of the Wildlife (Amendment) Act 2000, restricts the cutting, grubbing, burning or destruction by other means of vegetation growing on uncultivated land or in hedges or

ditches during the nesting and breeding season for birds and wildlife, from 1 March to 31 August (barring those regarded as pest species and for those considered as game species, where they may be hunted under conditions).

[Note that the Wildlife Act (1976) and the Wildlife Amendment Act (2000) allow exemptions for certain types of development [page 32, 2000 Act: "it shall not be an offence for a person - …while constructing a road, or building operation or work of engineering construction, or while constructing or carrying on such other operation or work as may be prescribed, *unintentionally* to kill or injure such an animal or *unintentionally* to destroy or injure the breeding place or resting place of such an animal…"]

If an exemption is required, this should be notified to the National Parks and Wildlife Service.

5.2.2.6 Residual Impacts

While there will be substantial disturbance to various fauna species of conservation importance during the construction phase and for a period afterwards, all should re-establish populations in the study area afterwards providing the recommended mitigation measures are successfully implemented.

It is considered that the residual impacts by the scheme will be Minor negative, and probably Neutral, in the long term.

5.2.2.7 The Do Nothing Scenario

With a 'Do-Nothing' Scenario, it is to be expected that the species recorded on site will persist into the long-term. Occasional flood events could wipe out local populations of some animals but these would be expected to recolonise naturally as animals living in proximity to watercourses are adapted for such events.

It is noted that the present situation may change anyway, as Bray town is expanding and additional development will undoubtedly take place in the vicinity of the proposed scheme. These will have some, probably limited, negative impact on wildlife in the area over time, especially if these developments cause loss of riparian and other vegetated habitats along or near the Dargle River.

5.2.2.8 The Worst Case Scenario

The worse case scenario would be

(i) if mitigation measures fail to maintain the population of otters along the river in the long-term.

(ii) if mitigation measures fail to maintain the diversity and populations of bat species along the river corridor in the long-term.

(iii) if mitigation measures fail to maintain nesting kingfishers on the river in the long-term.

5.2.2.9 Positive impacts

There are no identifiable positive impacts for fauna species. However, if the general ecological condition of the river corridor was improved in the long-term, especially by control and eradication of alien plant species, this would be of benefit to fauna species.

5.2.2.10 Reinstatement

The reinstatement of the kingfisher nest site and possibly otter holts and badger setts is dealt with in the mitigation section, as is reinstatement of vegetation. .

5.2.2.11 Monitoring

Monitoring is required in order to assess the impact of the project on the various fauna species of conservation importance that will be affected by the scheme.

Any mitigation measures incorporated into the development plan will be monitored for effectiveness over the first three years and, based on the results, alterations and/or enhancements will be undertaken as required.

1 The success of any mitigation measures for otters will be assessed over a period of 3 years.
2 Otter activity was recorded on all of the Dargle River downstream of the N11. Otter sprainting sites, recorded during the baseline survey, will be revisited after the completion of engineering works in order assess whether otters are continuing to utilise this section of river.
3 The success of any mitigation measures for badgers will be assessed over a period of 2 years.
4 The success of any mitigation measures for bats will be assessed over a period of 3 years. Bat boxes erected as mitigation will be checked at least two times in the first year and their locations adjusted as necessary to increase usage by bats.
5 The success of mitigation measures for kingfishers, especially the provision of alternative nest sites, will be assessed over a period of 2-3 years.