SUBLITTORAL SURVEY OF A SELECT AREA OF YOUGHAL HARBOUR, CO. CORK

NOVEMBER 2005

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Report to

SWS ENERGY SERVICE

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1.0 INTRODUCTION

Aqua-Fact International Services Ltd. was commissioned by SWS Energy Services to carry out a sublittoral survey in the vicinity of a proposed outlet pipe in Youghal Harbour, Co Cork (Figure 1.1). It is proposed to output approximately 5.5m^3/hour of waste water from this outlet and this study was designed to determine the community type of the receiving environment in the vicinity of the outfall with reference to any biological species sensitive to any substance within the proposed emission.

The Blackwater estuary, in which the outfall is located, is a candidate Scientific Area of Conservation (cSAC site code 2170), proposed National Heritage Area (NHA site code 72) and Special Protected Area (SPA site code 4028). The area has been selected for alluvial wet woodlands and Yew Wood, both priority habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for floating river vegetation, estuaries, tidal mudflats, Salicornia mudflats, Atlantic salt meadows, Mediterranean salt meadows, perennial vegetation of stony banks and old oak woodlands, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter and the plant, Killarney Fern. Site synopsis for the cSAC and SPA are included as Appendix I.

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2.0 MATERIALS AND METHODS

The sublittoral survey was carried out on 30th November 2005. Weather conditions on the day were good comprising of a bright day with moderate southeasterly winds.

The proposed outfall site (51° 58.536N, 7° 51.235W see Figure 2.1) is located at the mouths of the Blackwater River and Tourig River where turbidity levels in the water column surrounding the outfall are naturally high. Consequently, it was not possible to photograph the seafloor in the normal manner with an underwater camera and flash unit. Therefore, in order to examine the nature of the seafloor in these poor visibility conditions, Sediment Profile Imagery (SPI) was employed. The SPI camera differs from other underwater cameras in that it effects a vertical profile of the sediment water interface and obtains a photographic image of that profile. Since the SPI camera obtains images of the undisturbed sediment *in situ*, it delivers information on benthic processes, which is not readily available using many conventional sampling tools. Furthermore, as the object being photographed is directly against the face-plate of the camera assembly, water turbidity is never a limiting factor. The camera was deployed a minimum of two times at nine stations in the vicinity of the site (see Figure 2.1 for station locations). These stations were chosen to give a good representation of the sublittoral environment that would be receiving the waste water . Station positions were recorded by means of DGPS.

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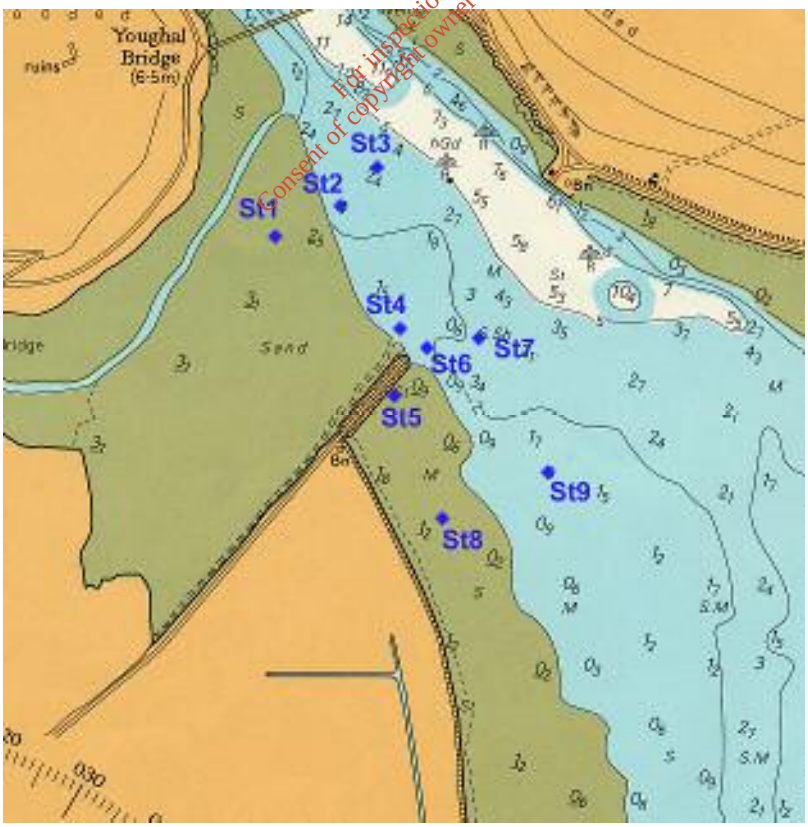

Figure 2.1 Station Locations in Youghal Harbour, November 2005

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Analysis was carried out on two SPI images per station. SPI can remotely identify the successional status of the seafloor and also has the potential to document its maintenance, development and/or destruction over time. With experience, both the physical and biological forces responsible for maintaining or driving a succession (*e.g.* bottom erosion or deposition, changes in substratum type, relative changes in levels of dissolved oxygen, organic decomposition processes *etc*.) can also be detected with confidence. This also applies to chemical driving forces where sensing probes are used in conjunction with the SPI instrument. A great deal of information about benthic processes is available from sediment profile images and while certain features (*e.g*. deep-living infaunal forms) may escape direct observation on the SPI images, their presence can typically be inferred from their impacts on the sediment structure.

The SPI images were developed and analysed using a dedicated image analyses system. The SPI parameters measured from each image include:

1) – **sediment type** measured from the upper 5 cm sediment layer.

2) – **prism penetration depth** which gives an indication of relative sediment compaction,

3) – **sediment boundary roughness** which indicates the degree of physical disturbance or biotic activity at the sediment water boundary,

4) - **depth of dredge material**, assesses the depth of dredge material covering the natural bottom.

5) – **sediment apparent redox potential discontinuity depth (ARPD),** assesses the depth of oxygenated sediment on the bottom

6) – **infaunal successional status** which qualifies the type of animals living in the bottom.

7) – **additional parameters** such as the presence of mud clasts, epifauna (surface living animals), infaunal burrows and tubes, outgassing of sediments (due to production of hydrogen sulphide and ammonia as by-products of anaerobic metabolism) *etc*. were also assessed,

8) – calculation of a **mean sediment organism index** (OSI value) which integrates the information gained from the other parameters measured into a single index which is indicative of the health status of the location under investigation.

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In addition to SPI, grab samples were taken from each of the stations by means of a 0.025m^2 stainless steel Van Veen grab. Each sample was washed on a 1mm stainless sieve and fixed and preserved in a 10% buffered formalin solution. On return to the lab, each sample was sorted under a binocular microscope and flora and fauna removed and identified to species level.

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3. RESULTS

3.1 Sediment Profile Imagery

Representative SPI photographs taken at each of the stations are presented in Appendix II while a mean of each of the parameters measured from the images are detailed in Table 3.1.

Station	Sed.Mode (mm)	Penetration (cm)	S.B.Rf.	Mean Redox (cm)	Succession	OSI
1	0.062-0.125	9.20	0.43	>5	II	8
2	≤0.062	22.01	1.32	6.13	II	7
3	0.125-0.25	19.55	0.25	>10	III	10
4	0.062-0.125	5.00	2.34	1.23	II	5
5	0.062-0.125	17.63	2.95	3.07	I-II	4
6	0.125-0.25	15.33	0.92	4.50	II	7
7	0.125-0.25	8.89	0.35	>9	III	10
8	0.125-0.25	14.57	0.79	>9	III	10
9	0.125-0.25	20.09	0.89	>10	III	10

Table 3.1. Mean values of the parameters measured by SPI analysis from the images taken in Youghal Harbour, November 2005.

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Sediment Type

The sediment type at all stations consisted of fine sand with varying amounts of silt/clay, Station 2 having the highest content.

Mean Prism Penetration Depth

The mean prism penetration depth reflects both the grain size composition and compactness of the bottom deposits. Prism penetration was relatively deep at the majority of the stations reflecting the finer nature of the bottom type. Relatively low prism penetration at station 4 (5.00 cm) was due to the presence coarse material under the upper sediment layer.

Surface Boundary Roughness

Surface boundary roughness is an indication of the unevenness of the sediment surface resulting from either bioturbation (animals in the sediment) or physical disturbance. This value was relatively low at all stations indicating an even sediment surface. A slightly higher value was recorded at Stations 4 and 5 due to coarse material on the surface and sand waves, respectively.

Apparent Redox Potential Discontinuity (ARPD).

The apparent redox potential discontinuity (ARPD) depths (depth of aerated sediment) varied from station to station although, in general, were high reflecting low organic input within this area.

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Infaunal Successional Stage

Apart from Station 3, there was no evidence of the presence of infaunal species or biological processes at any of the stations. However, relatively deep redox depths with low organic input determined that the majority of stations were allocated a successional stage of either Stage II or Stage III. A burrow, probably from the activity of a polychaete, is imaged at Station 3. Station 5 had a higher organic content with relatively lower redox depth compared to the other stations and was allocated a stage I-II status.

Organism Sediment Index

Organism Sediment Index (OSI) is the sum of a series of weighted values allocated to the various physical/chemical and biological SPI parameters measured. The OSI values have a potential range of -6 to +11.

Habitat quality is defined relative to the two end-member standards of OSI values. The lowest value is given to bottom types, which have (low or no dissolved oxygen in the overlying bottom water), no apparent macrofaunal life and methane gas present in the sediment. The SPI OSI value for such a condition is -6. At the other end of the scale, an aerobic bottom with a deeply depressed APRD, evidence of a mature macrofaunal assemblage and no apparent methane gas bubbles at depth will have an SPI OSI value of +11. From experience of mapping with this parameter values of +7 to +11 are indicative of high quality habitats. In dealing with areas which are subject to organic enrichment OSI values in the range +6 to +1 generally indicate an increased input of organic material. Index values, which fall in the range +1 to - 6, identify varying degrees of habitat degradation.

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OSI values at the stations are strongly associated with the redox depths and successional status at each station and again reflect the deep APRD at the individual stations and the amount of organic input.

3.2 Biological Samples

The faunal analysis of the grab samples reported 17 different taxa including 1 cnidarian, 8 polychaetes, 1 oligochaete, 2 crustaceans, 4 bivalves and 1 bryozoan (see table below).

The infaunal species identified from the samples are typical of intertidal and shallow sublittoral muddy sands and muds of estuarine areas where low salinities and organic enrichment occur. The most abundant species recorded in the samples was the tubificid oligochaete *Tubificoides benedii*. The presence of this oligochaete is the best indication of sediment enrichment by decaying organic material, particularly at station 4 and station 9 where the highest counts were obtained. The polychaete *Nephtys hombergii* and the bivalves *Cerastoderma glaucum*, *Macoma balthica* and *Abra alba* were also recorded being very common species found in soft muds and muddy sands in estuaries and tidal flats that are subject to

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fluctuating salinity. *Spio filicornis*, *Spio martinensis*, *Glycera celtica* and *Magelona mirabilis* were more abundant in the outer stations where compact sand was predominant. None of the species recorded can be regarded as rare or endagered and they are regularly found in this type of substrate in estuarine areas throughout Ireland.

The habitat encountered can be broadly described as Shallow sublittoral muds, extending from the extreme lower shore into the subtidal in variable salinity (estuarine) conditions. **SS.SMU.SmuVS** in the inner stations changing to Infralittoral muddy sands as more exposed conditions were encountered according to the main biotope types described by Connor *et al.*(2004). These habitats typically support communities characterised by polichaetes and oligochaetes such as *Nephtys hombergii* and *Tubificoides benedii*.

This habitat lies also within the category of **Infralittoral muddy sands SS2** and **Infralittoral muds SS3** according to Fossit (2000). This category covers sandy muds and soft muds where conditions vary from fully marine to estuarine with weak tidal streams. These habitats are characterised by communities of polychates and oligochaetes alongside bivalve molluscs such as *Abra* sp. In estuarine conditions such as the ones encountered in the area surveyed, this habitat typically supports important oligochaete (*Tubificoides* spp.) and polychaete (*Aphelochaeta marioni*, *Nephtys hombergii*) communities.

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Species	St 1	St 2	St 3	St 4	St 5	St 6	St 7	St 8	St 9
Hydrozoa sp.		Present							
Eteone longa				3				1	2
Glycera celtica			2						
Nephtys hombergii	3		1	1			1		2
Spio filicornis							1		
Spio martinensis				2			1	5	
Magelona mirabilis							1		
Psammodrilidae sp.			1						
Melinna palmata				1					
Tubificoides benedii		3	6	260	6	4	4	2	60
Gastrosaccus spinifer						2			
Bathyporeia pelagica							2		
Modiolula phaseolina		1		1					
Cerastoderma glaucum									5
Macoma balthica	1								2
Abra alba				3					
Membranipora membranacea		Present			Present				

Table 3.2. Infaunal species recorded in the subtidal sediment samples taken in Youghal Harbour, November 2005.

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4. Conclusions

The results of the sublittoral survey reveal that the seafloor environment in the vicinity of the proposed outfall is both poor in species numbers and diversity. No unusual or rare species were recorded from any of the stations analysed.

Sediment Profile Images of the bottom indicated that the seafloor is predominantly composed of fine sand with varying amounts of silt/clay. The stations located towards the centre of the channel had lower levels of organic material incorporated into the sediment and reflect the higher water currents experienced in this area.

5. References

Connor, D. W., Brazier, D.P., Hill, T.O. & Northen, K.O. 1997. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 1. Littoral biotpes biotopes. Version 97.06. *JNCC Report*, No. 229.

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Fossitt, J.A., 2000. *A guide to habitats in Ireland*. An Chomhairle Oidhreachta/The Heritage Council. Dublin.

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APPENDIX I - BLACKWATER RIVER AND ESTUARY SITE SYNOPSES

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Blackwater River (Cork/Waterford) (002170)
SITE NAME: Blackwater River (Cork/Waterford)

cSAC SITE CODE: 002170

The River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and five ranges of mountains. In times of heavy rainfall the levels can fluctuate widely by more than 12 feet on the gauge at Careysville. The peaty nature of the terrain in the upper reaches and of some of the tributaries gives the water a pronounced dark colour. The site consists of the freshwater stretches of the River Blackwater as far upstream as Ballydesmond, the tidal stretches as far as Youghal Harbour and many tributaries, the larger of which includes the Licky, Bride, Flesk, Chimneyfield, Finisk, Araglin, Awbeg (Buttevant), Clyda, Glen, Allow, Dalua, Brogeen, Rathcool, Finnow, Owentaraglin and Awnaskirtaun. The extent of the Blackwater and its tributaries in this site, flows through the counties of Kerry, Cork, Limerick, Tipperary and Waterford. Towns along, but not in the site, include Rathmore, Millstreet, Kanturk, Banteer, Mallow, Buttevant, Doneraile, Castletownroche, Fermoy, Ballyduff, Rathcormac, Tallow, Lismore, Cappoquin and Youghal.

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The Blackwater rises in boggy land of east Kerry, where Namurian grits and shales build the low heather-covered plateaux. Near Kanturk the plateaux enclose a basin of productive Coal Measures. On leaving the Namurian rocks the Blackwater turns eastwards along the northern slopes of the Boggeraghs before entering the narrow limestone strike vale at Mallow. The valley deepens as first the Nagles Mountains and then the Knockmealdowns impinge upon it. Interesting geological features along this stretch of the Blackwater Valley include limestone cliffs and caves near the villages and small towns of Killavullen and Ballyhooly; the Killavullen caves contain fossil material from the end of the glacial period. The associated basic soils in this area support the growth of plant communities which are rare in Cork because in general the county?s rocks are acidic. At Cappoquin the river suddenly turns south and cuts through high ridges of Old Red Sandstone. The Araglin valley is predominantly underlain by sandstone, with limestone occurring in the lower reaches near Fermoy.

The site is a candidate SAC selected for alluvial wet woodlands and Yew Wood, both priority habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for floating river vegetation, estuaries, tidal mudflats, Salicornia mudflats, Atlantic salt meadows, Mediterranean salt meadows, perennial vegetation of stony banks and old oak woodlands, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter and the plant, Killarney Fern.

Wet woodlands are found where river embankments, particularly on the River Bride, have broken down and where the channel edges in the steep-sided valley between Cappoquin and Youghal are subject to daily inundation. The river side of the embankments was often used for willow growing in the past (most recently at

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Cappoquin) so that the channel is lined by narrow woods of White and Almond-leaved Willow (Salix alba and S. triandra) with isolated Crack Willow (S. fragilis) and Osier (S. viminalis). Grey Willow (S. cinerea) spreads naturally into the sites and occasionally, as at Villierstown on the Blackwater and Sapperton on the Bride, forms woods with a distinctive mix of woodland and marsh plants, including Gypsywort (Lycopus europaeus), Guelder Rose (Viburnum opulus), Bittersweet (Solanum dulcamara) and various mosses and algae. These wet woodlands form one of the most extensive tracts of the wet woodland habitat in the country.

Marshes and reedbeds cover most of the flat areas beside the rivers and often occur in mosaic with the wet woodland. Common Reed (Phragmites australis) is ubiquitous and is harvested for thatching. There is also much Marsh Marigold (Caltha palustris) and, at the edges of the reeds, the Greater and Lesser Pond-sedge (Carex riparia and C. acutiformis). Hemlock Water-dropwort (Oenanthe crocata), Wild Angelica (Angelica sylvestris), Reed Canary-grass (Phalaris arundinacea), Meadowsweet (Filipendula ulmaria), Nettle (Urtica dioica), Purple Loosestrife (Lythrum salicaria), Marsh Valerian (Valeriana officinalis), Water Mint (Mentha aquatica) and Water Forget-me-not (Myosotis scorpioides).

At Banteer there are a number of hollows in the sediments of the floodplain where subsidence and subterranean drainage have created isolated wetlands, sunk below the level of the surrounding fields. The water rises and falls in these holes depending on the watertable and several different communities have developed on the acidic or neutral sediments. Many of the ponds are ringed about with Grey Willows, rooted in the mineral soils but sometimes collapsed into the water. Beneath the densest stands are woodland herbs like Yellow Pimpernel (Lysimachia nemorum) with locally abundant Starwort (Callitriche stagnalis) and Marsh Ragwort (Senecio palustris). One of the depressions has Silver Birch (Betula pendula), Ash (Fraxinus excelsior), Crab Apple (Malus sylvestris) and a little Oak (Quercus robur) in addition to the willows.

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Floating river vegetation is found along much of the freshwater stretches within the site. The species list is quite extensive and includes Pond Water-crowfoot (Ranunculus peltatus), Water-crowfoot (Ranunculus spp.), Canadian Pondweed (Elodea canadensis), Broad-leaved Pondweed (Potamogeton natans), Pondweed (Potamogeton spp.), Water Milfoil (Myriophyllum spp.), Common Club-rush (Scirpus lacustris), Water-starwort (Callitriche spp.), Lesser Water-parsnip (Berula erecta) particularly on the Awbeg, Water-cress (Nasturtium officinale), Hemlock Water-dropwort, Fine-leaved Water-dropwort (O. aquatica), Common Duckweed (Lemna minor), Yellow Water-lily (Nuphar lutea), Unbranched Bur-reed (Sparganium emersum) and the moss Fontinalis antipyretica.

The grassland adjacent to the rivers of the site is generally heavily improved, although liable to flooding in many places. However, fields of more species-rich wet grassland with species such as Yellow-flag (Iris pseudacorus), Meadow-sweet, Meadow Buttercup (Ranunculus acris) and rushes (Juncus spp.) occur occasionally. Extensive fields of wet grassland also occur at Annagh Bog on the Awbeg. These fields are dominated by Tufted Hair-grass (Deschampsia cespitosa) and rushes.

The Blackwater Valley has a number of dry woodlands; these have mostly been managed by the estates in which they occur, frequently with the introduction of Beech

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(Fagus sylvatica) and a few conifers, and sometimes of Rhododendron (Rhododendron ponticum) and Laurel. Oak woodland is well developed on sandstone about Ballinatray, with the acid Oak woodland community of Holly (Ilex aquifolium), Bilberry (Vaccinium myrtillus), Greater Woodrush (Luzula sylvatica) and Buckler Ferns (Dryopteris affinis, D. aemula) occurring in one place. Irish Spurge (Euphorbia hyberna) continues eastwards on acid rocks from its headquarters to the west but there are many plants of richer soils, for example Wood Violet (Viola reichenbachiana), Goldilocks (Ranunculus auricomus), Broad-leaved Helleborine (Epipactis helleborine) and Red Campion (Silene dioica). Oak woodland is also found in Rincrew, Carrigane, Glendine, Newport and Dromana. The spread of Rhododendron is locally a problem, as is over-grazing. A few limestone rocks stand over the river in places showing traces of a less acidic woodland type with Ash, False Brome (Brachypodium sylvaticum) and Early-purple Orchid (Orchis mascula).

In the vicinity of Lismore, two deep valleys cut in Old Red Sandstone join to form the Owenashad River before flowing into the Blackwater at Lismore. These valleys retain something close to their original cover of Oak with Downy Birch (Betula pubescens), Holly and Hazel (Corylus avellana) also occurring. There has been much planting of Beech (as well as some of coniferous species) among the Oak on the shallower slopes and here both Rhododendron and Cherry Laurel (Prunus laurocerasus) have invaded the woodland.

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The Oak wood community in the Lismore and Glenmore valleys is of the classical upland type, in which some Rowan (Sorbus aucuparia) and Downy Birch occur. Honeysuckle (Lonicera periclymenum) and Ivy (Hedera helix) cover many of the trees while Greater Woodrush, Bluebell (Hyacinthoides non-scripta), Wood Sorrel (Oxalis acetosella) and, locally, Bilberry dominate the ground flora. Ferns present on the site include Hard Fern (Blechnum spicant), Male Fern (Dryopteris filix-mas), Buckler Ferns (D. dilatata, D. aemula) and Lady Fern (Athyrium felix-femina). There are many mosses present and large species such as Rhytidiadelphus spp., Polytrichum formosum, Mnium hornum and Dicranum spp. are noticeable. The lichen flora is important and includes 'old forest' species which imply a continuity of woodland here since ancient times. Tree Lungwort (Lobaria spp.) is the most conspicuous and is widespread.

The Araglin valley consists predominantly of broadleaved woodland. Oak and Beech are joined by Hazel, Wild Cherry (Prunus avium) and Goat Willow (Salix caprea). The ground flora is relatively rich with Pignut (Conopodium majus), Wild Garlic (Allium ursinum), Garlic Mustard (Alliaria petiolata) and Wild Strawberry (Fragaria vesca). The presence of Ivy Broomrape (Orobanche hederae), a local species within Ireland, suggests that the woodland, along with its attendant Ivy is long established.

Along the lower reaches of the Awbeg River, the valley sides are generally cloaked with mixed deciduous woodland of estate origin. The dominant species is Beech, although a range of other species are also present, e.g. Sycamore (Acer pseudoplatanus), Ash and Horse-chestnut (Aesculus hippocastanum). In places the alien invasive species, Cherry Laurel, dominates the understorey. Parts of the woodlands are more semi-natural in composition, being dominated by Ash with Hawthorn (Crataegus monogyna) and Spindle (Euonymus europaea) also present. However, the most natural areas of woodland appear to be the wet areas dominated by

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Alder and willows (Salix spp.). The ground flora of the dry woodland areas features species such as Pignut, Wood Avens (Geum urbanum), Ivy and Soft Shield-fern (Polystichum setiferum), while the ground flora of the wet woodland areas contains characteristic species such as Remote Sedge (Carex remota) and Opposite-leaved Golden-saxifrage (Chrysosplenium oppositifolium).

In places along the upper Bride, scrubby, semi-natural deciduous woodland of Willow, Oak and Rowan occurs with abundant Great Woodrush in the ground flora.

The Bunaglanna River passes down a very steep valley, flowing in a north-south direction to meet the Bride River. It flows through blanket bog to heath and then scattered woodland. The higher levels of moisture here enable a vigorous moss and fern community to flourish, along with a well-developed epiphyte community on the tree trunks and branches.

At Banteer a type of wetland occurs near the railway line which offers a complete contrast to the others. Old turf banks are colonised by Royal Fern (Osmunda regalis) and Eared Willow (Salix aurita) and between them there is a sheet of Bottle Sedge (Carex rostrata), Marsh Cinquefoil (Potentilla palustris), Bogbean (Menyanthes trifoliata), Marsh St. John's-wort (Hypericum elodes) and the mosses Sphagnum auriculatum and Aulacomnium palustre. The cover is a scrub with characteristic species like Marsh Willowherb (Epilobium palustre) and Marsh Orchid (Dactylorhiza incarnata).

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The soil high up the Lismore valleys and in rocky places is poor in nutrients but it becomes richer where streams enter and also along the valley bottoms. In such sites Wood Speedwell (Veronica montana), Wood Anemone (Anemone nemorosa), Enchanter's Nightshade (Circaea lutetiana), Barren Strawberry (Potentilla sterilis) and Shield Fern occur. There is some Wild Garlic, Three-nerved Sandwort (Moehringia trinervia) and Early-purple Orchid (Orchis mascula) locally, with Opposite-leaved Golden-saxifrage, Meadowsweet and Bugle in wet places. A Hazel stand at the base of the Glenakeeffe valley shows this community well.

The area has been subject to much tree felling in the recent past and re-sprouting stumps have given rise to areas of bushy Hazel, Holly, Rusty Willow (Salix cinerea subsp. oleifoila) and Downy Birch. The ground in the clearings is heathy with Heather (Calluna vulgaris), Slender St John's-wort (Hypericum pulchrum) and the occasional Broom (Cytisus scoparius) occurring.

The estuary and the other Habitats Directive Annex I habitats within it form a large component of the site. Very extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. The main expanses occur at the southern end of the site with the best examples at Kinsalebeg in Co. Waterford and between Youghal and the main bridge north of it across the river in Co. Cork. Other areas occur along the tributaries of the Licky in east Co. Waterford and Glendine, Newport, Bride and Killahaly Rivers in Waterford west of the Blackwater and large tracts along the Tourig River in Co. Cork. There are narrow bands of intertidal flats along the main river as far north as Camphire Island. Patches of green algae (filamentous, Ulva species and Enteromorpha sp.) occur in places,

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while fucoid algae are common on the more stony flats even as high upstream as Glenassy or Coneen.

The area of saltmarsh within the site is small. The best examples occur at the mouths of the tributaries and in the townlands of Foxhole and Blackbog. Those found are generally characteristic of Atlantic salt meadows. The species list at Foxhole consists of Common Saltmarsh-grass (Puccinellia maritima), small amounts of Greater Sea-spurrey (Spergularia media), Glasswort (Salicornia sp.), Sea Arrowgrass (Triglochin maritima), Annual Sea-blite (Suaeda maritima) and Sea Purslane (Halimione portulacoides) - the latter a very recent coloniser - at the edges. Some Sea Aster (Aster tripolium) occurs, generally with Creeping Bent (Agrostis stolonifera). Sea Couch-grass (Elymus pycnanthus) and small isolated clumps of Sea Club-rush (Scirpus maritimus) are also seen. On the Tourig River additional saltmarsh species found include Lavender (Limoniun spp.), Sea Thrift (Armeria maritima), Red Fescue (Festuca rubra), Common Scurvy-grass (Cochlearia officinalis) and Sea Plantain (Plantago maritima). Oraches (Atriplex spp.) are found on channel edges.

The shingle spit at Ferrypoint supports a good example of perennial vegetation of stony banks. The spit is composed of small stones and cobbles and has a well developed and diverse flora. At the lowest part, Sea Beet (Beta vulgaris), Curled Dock (Rumex crispus) and Yellow-horned Poppy (Glaucium flavum) occur with at a slightly higher level Sea Mayweed (Tripleurospermum maritimum), Cleavers (Galium aparine), Rock Samphire (Crithmum maritimum), Sandwort (Honkenya peploides), Spear-leaved Orache (Atriplex prostrata) and Babington?s Orache (A. glabriuscula). Other species present include Sea Rocket (Cakile maritima), Herb Robert (Geranium robertianum), Red Fescue (Festuca rubra) and Kidney Vetch (Anthyllis vulneraria). The top of the spit is more vegetated and includes lichens and bryophytes (including Tortula ruraliformis and Rhytidiadelphus squarrosus).

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The site supports several Red Data Book plant species, i.e. Starved Wood Sedge (Carex depauperata), Killarney Fern (Trichomanes speciosum), Pennyroyal (Mentha pulegium), Bird?s-nest Orchid (Neottia nidus-avis, Golden Dock (Rumex maritimus) and Bird Cherry (Prunus padus). The first three of these are also protected under the Flora (Protection) Order 1999. The following plants, relatively rare nationally, are also found within the site: Toothwort (Lathraea squamaria) associated with woodlands on the Awbeg and Blackwater; Summer Snowflake (Leucojum aestivum) and Flowering Rush (Butomus umbellatus) on the Blackwater; Common Calamint (Calamintha ascendens), Red Campion (Silene dioica), Sand Leek (Allium scorodoprasum) and Wood Club-rush (Scirpus sylvaticus) on the Awbeg.

The site is also important for the presence of several Habitats Directive Annex II animal species, including Sea Lamprey (Petromyzon marinus), Brook Lamprey (Lampetra planeri), River Lamprey (L. fluviatilis), Twaite Shad (Alosa fallax fallax), Freshwater Pearl-mussel (Margaritifera margaritifera), Otter (Lutra lutra) and Salmon (Salmo salar). The Awbeg supports a population of White-clawed Crayfish (Austropotamobius pallipes). This threatened species has been recorded from a number of locations and its remains are also frequently found in Otter spraints, particularly in the lower reaches of the river. The freshwater stretches of the Blackwater and Bride Rivers are designated salmonid rivers.

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The Blackwater is noted for its enormous run of salmon over the years. The river is characterised by mighty pools, lovely streams, glides and generally, a good push of water coming through except in very low water. Spring salmon fishing can be carried out as far upstream as Fermoy and is very highly regarded especially at Careysville. The Bride, main Blackwater upstream of Fermoy and some of the tributaries are more associated with grilse fishing.

The site supports many of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Pine Marten, Badger and Irish Hare. The bat species Natterer?s Bat, Daubenton?s Bat, Whiskered Bat, Brown Long-eared Bat and Pipistrelle, are to be seen feeding along the river, roosting under the old bridges and in old buildings.

Common Frog, a Red Data Book species that is also legally protected (Wildlife Act, 1976), occurs throughout the site. The rare bush cricket, Metrioptera roselii (Orthoptera: Tettigoniidae), has been recorded in the reed/willow vegetation of the river embankment on the Lower Blackwater River. The Swan Mussel (Anodonta cygnea), a scarce species nationally, occurs at a few sites along the freshwater stretches of the Blackwater.

Several bird species listed on Annex I of the E.U. Birds Directive are found on the site. Some use it as a staging area, others are vagrants, while others use it more regularly. Internationally important numbers of Whooper Swan (average peak 174, 1994/95-95/96) and nationally important numbers Bewick's Swan (average peak 35, 1994/95-95/96) use the Blackwater Callows. Golden Plover occur in regionally important numbers on the Blackwater Estuary (average peak 885, 1984/85-86/87) and on the River Bride (absolute max. 2141, 1994/95). Staging Terns visit the site annually (Sandwich Tern (>300) and Arctic/Common Tern (>200), average peak 1974-1994). The site also supports populations of the following: Red Throated Diver, Great Northern Diver, Barnacle Goose, Ruff, Wood Sandpiper and Greenland White-fronted Goose. Three breeding territories for Peregrine Falcon are known along the Blackwater Valley. This, the Awbeg and the Bride River are also thought to support at least 30 pairs of Kingfisher. Little Egret now breed at the site (12 pairs in 1997, 19 pairs in 1998) and this represents about 90% of the breeding population in Ireland.

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The site holds important numbers of wintering waterfowl. Both the Blackwater Callows and the Blackwater Estuary Special Protection Areas (SPAs) hold internationally important numbers of Black-tailed Godwit (average peak 847, 1994/95-95/96 on the callows, average peak 845, 1974/75-93/94 in the estuary). The Blackwater Callows also hold Wigeon (average peak 2752), Teal (average peak 1316), Mallard (average peak 427), Shoveler (average peak 28), Lapwing (average peak 880), Curlew (average peak 416) and Black-headed Gull (average peak 396) (counts from 1994/95-95/96). Numbers of birds using the Blackwater Estuary, given as the mean of the highest monthly maxima over 20 years (1974-94), are Shelduck (137 +10 breeding pairs), Wigeon (780), Teal (280), Mallard (320 + 10 breeding pairs), Goldeneye (11-97), Oystercatcher (340), Ringed Plover (50 + 4 breeding pairs), Grey Plover (36), Lapwing (1680), Knot (150), Dunlin (2293), Snipe (272), Black-tailed Godwit (845), Bar-tailed Godwit (130), Curlew (920), Redshank (340), Turnstone (130), Black-headed Gull (4000) and Lesser Black-backed Gull (172). The greatest numbers (75%) of the wintering waterfowl of the estuary are located in the

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Kinsalebeg area on the east of the estuary in Co. Waterford. The remainder are concentrated along the Tourig Estuary on the Co. Cork side.

The river and river margins also support many Heron, non-breeding Cormorant and Mute Swan (average peak 53, 1994/95-95/96 in the Blackwater Callows). Heron occurs all along the Bride and Blackwater Rivers - 2 or 3 pairs at Dromana Rock; c. 25 pairs in the woodland opposite; 8 pairs at Ardsallagh Wood and c. 20 pairs at Rincrew Wood have been recorded. Some of these are quite large and significant heronries. Significant numbers of Cormorant are found north of the bridge at Youghal and there are some important roosts present at Ardsallagh Wood, downstream of Strancally Castle and at the mouth of the Newport River. Of note are the high numbers of wintering Pochard (e.g. 275 individuals in 1997) found at Ballyhay quarry on the Awbeg, the best site for Pochard in County Cork.

Other important species found within the site include Long-eared Owl, which occurs all along the Blackwater River, and Barn Owl, a Red Data Book species, which is found in some old buildings and in Castlehyde west of Fermoy. Reed Warbler, a scarce breeding species in Ireland, was found for the first time in the site in 1998 at two locations. It is not known whether or not this species breeds on the site, although it is known to nearby to the south of Youghal. Dipper occurs on the rivers.

Landuse at the site is mainly centred on agricultural activities. The banks of much of the site and the callows, which extend almost from Fermoy to Cappoquin, are dominated by improved grasslands which are drained and heavily fertilised. These areas are grazed and used for silage production. Slurry is spread over much of this area. Arable crops are grown. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid river and to the populations of Habitats Directive Annex II animal species within it. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the Blackwater and its tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. Other recreational activities such as boating, golfing and walking are also popular. Water skiing is carried out at Villierstown. Parts of Doneraile Park and Anne?s Grove are included in the site: both areas are primarily managed for amenity purposes. There is some hunting of game birds and Mink within the site. Ballyhay quarry is still actively quarried for sand and gravel. Several industrial developments, which discharge into the river, border the site.

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The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, dredging of the upper reaches of the Awbeg, overgrazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel.

Overall, the River Blackwater is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively; furthermore it is of high conservation value for the populations of bird species that use it. Two Special Protection Areas, designated under the E.U. Birds Directive, are also located within the site - Blackwater Callows and Blackwater Estuary.

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Additionally, the importance of the site is enhanced by the presence of a suite of uncommon plant species.

16.05.2005

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Blackwater Estuary SPA (004028)
SITE NAME: Blackwater Estuary SPA

SITE CODE: 004028

The Blackwater Estuary SPA is a moderately-sized, sheltered south-facing estuary, which extends from Youghal New Bridge to the Ferry Point peninsula, close to where the river enters the sea. It comprises a section of the main channel of the River Blackwater. At low tide, intertidal flats are exposed on both sides of the channel. On the eastern side the intertidal channel is included as far as Kinsalebeg and Moord Cross Roads is included, while on the west side the site includes part of the estuary of the Tourig River as far as Rincrew Bridge.

The intertidal sediments are mostly muds or sandy muds reflecting the sheltered conditions of the estuary. Green algae (Enteromorpha spp. and Ulva lactuca) are frequent on the mudflats during summer, and Bladder Wrack (Fucus vesiculosus) occurs on the upper more stony shorelines. The sediments have a macrofauna typical of muddy sands, with polychaete worms such as Lugworm (Arenicola marina), Ragworm (Hediste diversicolor) and the marine bristle worm Nephtys hombergii being common. Bivalves are also well represented, especially Peppery Furrow-shell (Scrobicularia plana), but also Sand Gaper (Mya arenaria), Baltic Tellin (Macoma balthica) and Common Cockle (Cerastoderma edule). Among the brown seaweed on the shoreline, the Shore Crab (Carcinus maenus) and the Rough Periwinkle (Littorina saxatilis) are found. Salt marshes fringe the estuarine channels, especially in the sheltered creeks.

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The Blackwater Estuary is of high ornithological importance for wintering waterfowl, providing good quality feeding areas for an excellent diversity of waterfowl species. At high tide, the birds roost along the shoreline and salt marsh fringe, especially in the Kinsalebeg area. Some birds may leave the site to roost in fields above the shoreline. The site supports an internationally important population of Black-tailed Godwit (934), and has a further eight species with nationally important populations (all figures are average peaks for the five winters 1995/96 to 1999/2000): Shelduck (151), Wigeon (1,232), Golden Plover (2,947), Lapwing (3,988), Dunlin (2,016), Curlew (1,194), Redshank (634) and Greenshank (30). A population of Bar-tailed Godwit (172) is very close to the threshold for national importance.

Other species which occur in significant numbers include Grey Heron (27), Teal (527), Mallard (148), Oystercatcher (508), Grey Plover (53), Knot (50) and Turnstone (56). The site also supports Brent Goose (19), Red-breasted Merganser (8), Shoveler (23), Ringed Plover (29) and Cormorant (60). The site is also notable for supporting large concentrations of gulls in autumn and winter, including Black-headed Gull (549), Common Gull (253), Lesser Black-backed Gull (602), Great Black-backed Gull (227) and Herring Gull (86).

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Little Egret uses the site regularly during the year as there is a breeding colony upstream. The estuary provides an important feeding area for these birds (15, with a maximum of 26).

The Blackwater Estuary SPA is an internationally important wetland site on account of the population of Black-tailed Godwit it supports. It is also of high importance in a national context, with eight species having populations which exceed the thresholds for national importance. The occurrence of Little Egret, Golden Plover and Bar-tailed Godwit is of particular note as these species are listed on Annex I of the E.U. Birds Directive. The site has been well-studied, with detailed monthly counts extending back to 1974.

1.4.2005

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Appendix II - Sediment Profile Images

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Location:	Youghal Harbour
Station Number:	Station 1
Position:	51° 58.637 N, 7° 51.357 W
Date:	30th November 2005
Main Features:	Compact fine sand bottom. Even surface with low penetration and variable redox depth.

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Location: Youghal Harbour

Station Number: Station 2

Position: 51° 58.651 N, 7° 51.258 W

Date: 30th November 2005

Main Features: Soft fine sand bottom. Even surface with deep penetration and redox depth. Red algae imaged on seabed surface and incorporated into sediment.

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Location:	Youghal Harbour
Station Number:	Station 3
Position:	51° 58.690 N, 7° 51.230 W
Date:	30th November 2005
Main Features:	Fine sand bottom. Even surface with deep penetration and redox depth. Feeding void, probably from polychaete activity, imaged in the centre of the photograph.

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Location:	Youghal Harbour
Station Number:	Station 4
Position:	51° 58.578 N, 7° 51.178 W
Date:	30th November 2005
Main Features:	Compact fine sand bottom. Low penetration and shallow redox depth. A green crab (*Carcinus maenas*) is imaged along with shell and other debris on the surface.

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Location:	Youghal Harbour
Station Number:	Station 5
Position:	51° 58.511 N, 7° 51.210 W
Date:	30th November 2005
Main Features:	Soft fine sand bottom with high organic component. Deep penetration with variable redox depth.

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Location: Youghal Harbour

Station Number: Station 6

Position: 51° 58.546 N, 7° 51.145W

Date: 30th November 2005

Main Features: Compact fine sand bottom. Medium penetration with variable redox depth.

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Location:	Youghal Harbour
Station Number:	Station 7
Position:	51° 58.555N, 7° 51.069 W
Date:	30th November 2005
Main Features:	Compact clean fine sand bottom. Even surface with low penetration and deep redox depth.

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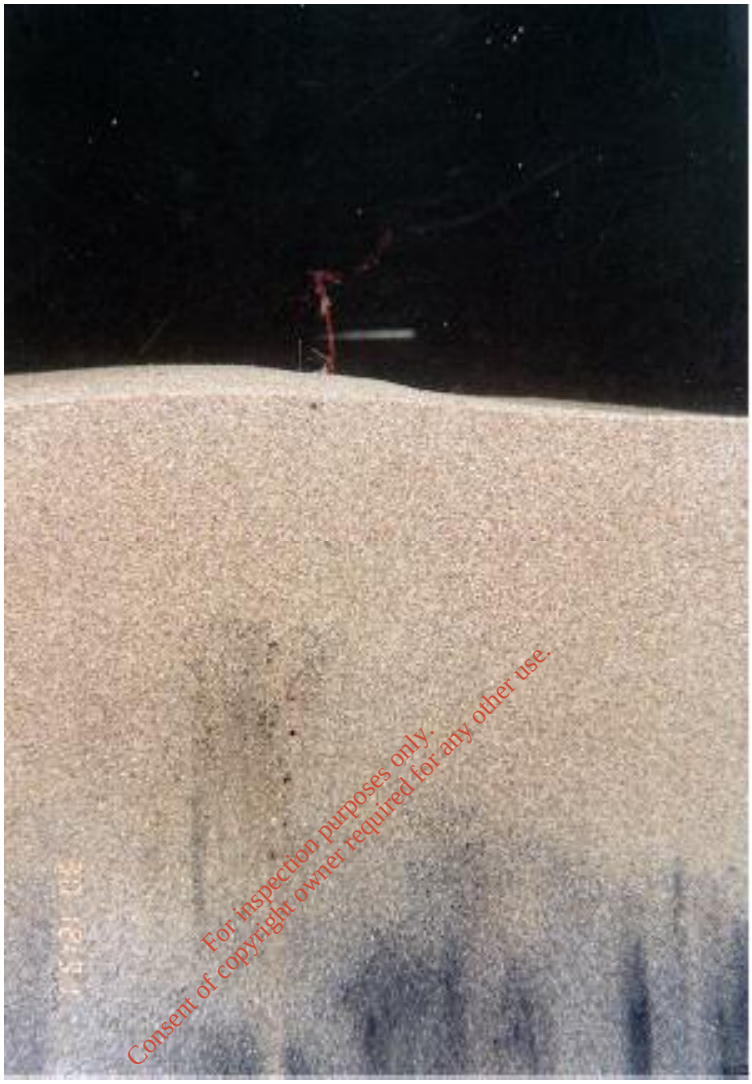

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Location:	Youghal Harbour
Station Number:	Station 8
Position:	51° 58.379 N, 7° 51.153 W
Date:	30th November 2005
Main Features:	Compact fine sand bottom. Good penetration with deep redox depth. Drift red algae on surface.

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Location: Youghal Harbour

Station Number: Station 9

Position: 51° 58.426 N, 7° 50.950 W

Date: 30th November 2005

Main Features: Fine sand bottom. Good penetration with deep redox depth.

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