

7.0 ECOLOGY

7.1 Introduction

7.1.1 This section first provides an assessment of the ecological value of Kinsale Marsh and describes in detail the habitats, vegetation, bird and mammal fauna and drainage features in and adjoining the areas affected by the proposed development. The report then assesses potential ecological impacts from the proposed development and provides recommendations for mitigation measures to minimise these impacts.

7.1.2 This report is based upon the results of ecological surveys carried out for this assessment and for previous projects in this area (RPS Cairns, 1994, 1996, 1997a, 1997b, 1997c).

7.1.3 Scientific names of plants and animals mentioned in the text are listed in the various sections of Appendix C.

7.2 Study Elements

7.2.1 Vegetation, birds and mammals have been surveyed in detail. Data on aquatic invertebrates from Galvin (1992) and Aquafact (see section 1) have been reviewed.

7.3 Existing Environment – Kinsale Marsh

Hydrology and Water Quality

7.3.1 Kinsale Marsh comprises a brackish lagoon surrounded by swamp, wet grassland and Alder carr (Figure 7.1). It is cut off from the River Bandon estuary by a causeway carrying the Inishannon road. The marsh is divided by remnant embankments into three main compartments: a western compartment, an eastern compartment and a northern compartment. In addition, a field of marshy grassland occurs adjoining the northeastern corner of the northern compartment, and a strip of Alder woodland occurs along the eastern edge of the northern and eastern compartments. The western and eastern compartments hold substantial areas of open water, while the northern compartment comprises swamp and Alder carr. Several small streams/ditches enter the marsh at various points (see Figure 7.1) and two sluices allow exchange of water across the road causeway.

7.3.2 The streams/ditches enter the northern compartment at four locations and the eastern compartment at one location. There is no obvious freshwater inflow to the western compartment, although seepage from the adjoining fields undoubtedly occurs. Consequently, the bulk of the freshwater inflow appears to enter the northern compartment and is buffered by a substantial area of swamp before it can reach the open water lagoons in the western and eastern compartments. The embankments forming the western and southern border of the northern compartment appear to hold the water table at a higher level within this compartment compared to the southern and eastern compartment.

- 7.3.3 The sluices result in the marsh being subject to varying degrees of tidal influence. In addition, at high tide sea water percolates through the causeway (MW&P, 1997). However, water levels in the marsh do not always strictly reflect the tidal cycle in the adjacent estuary. Thus, under some conditions (presumably heavy rainfall and/or high spring tides) water levels remain high throughout the tidal cycle with no mud exposed at low tide. Conversely, under other conditions extensive mud can be exposed at low tide and some mud can remain exposed at high tide.
- 7.3.4 New sluice gates were installed in 1989; prior to this water levels apparently varied more on a seasonal basis than on a diurnal (tidal) basis (Collins, 1991). However, by late 1996 the sluices were no longer functioning well and water levels in the marsh appeared to be reflecting recent rainfall levels rather than the tidal state. The malfunctioning of the sluices was apparently due to shellfish intrusions (MW&P, 1997). In late 1997, the sluices were cleaned out. Subsequently, water levels in the marsh have been substantially lower with extensive areas of mud remaining exposed throughout the tidal cycle, and this is reflected in the development of a community of annual plants colonising this mud.
- 7.3.5 Results of water quality analysis in November 1996 (RPS Cairns, 1996; see Appendix C1) indicate that the lagoon waters are brackish at about 25% full strength sea water, indicating a significant tidal influence. The likelihood is that this level of salinity may vary seasonally or in response to spring neap tidal cycles. Thus, during periods of heavy run-off during the winter the salinities may be at their lowest whereas in late summer they may be higher in the absence of freshwater dilution from the catchment. The salinity regime within the lagoon is also likely to have changed substantially following the cleaning of the sluice pipes. The water quality analyses also indicate that the marsh is nutrient enriched from high nitrate levels with phosphorus levels limiting productivity.

Habitats and Vegetation

- 7.3.6 The following main semi-natural habitats of interest are present:
- ♦ Brackish lagoon.
 - ♦ Alder carr (swamp wood, i.e. with the water-table above the surface) at the northern end of the marsh.
 - ♦ Dryer Alder woodland (i.e. with the water-table below the surface) along the eastern side of the marsh (referred to hereafter as 'dry Alder wood').
 - ♦ Marshy grassland along the western side of the marsh and in the field adjoining the northeast corner of the marsh.
 - ♦ Swamp mainly dominated by Grey Club-Rush/Sea Club-Rush at the northern end of the marsh.
 - ♦ Various marginal plant communities along the edges of the lagoon including species-rich freshwater/brackish transition vegetation in the southeast corner.
 - ♦ Saltmarsh along the southwestern shore of the western lagoon.

- ♦ Inundation grassland of Creeping Bent along the eastern edge of the marsh.
- ♦ Dense scrub including Rusty Willow, Bramble, Blackthorn and Gorse along the southeastern edge of the marsh.

- 7.3.7 A detailed vegetation survey of the marsh was carried out in August 1997 (RPS Cairns, 1997c) with various sections re-surveyed in June 1998. These surveys found four notable plant taxa. Three of these, Dotted Sedge, Chaffweed and Yellow Bartsia, occur on the southeastern shoreline of the marsh in a narrow belt of transitional freshwater/brackish marsh. This habitat occurs in the only area where a freshwater inflow comes into direct contact with the brackish lagoon and comprises a species-rich plant community of high botanical interest. Dotted Sedge is a nationally rare plant species and the population at Kinsale Marsh represents the most easterly known extant population. Chaffweed and Yellow Bartsia are of very local occurrence in Ireland.
- 7.3.8 The fourth notable plant taxa, Pink-Flowered Hedge Bindweed, was recorded on the western side of the marsh. This is one of only two known populations in Mid-Cork. Pink-Flowered Hedge Bindweed is locally distributed around the Irish coast.
- 7.3.9 It is considered likely that the plant communities of Kinsale Marsh have undergone substantial changes in recent decades due to changes in the hydrological regime associated with the operational condition of the sluice. A nationally protected plant species, Borrer's Saltmarsh-Grass, which is listed in the Irish Red Data Book (Curtis and McGough, 1988), was recorded from Kinsale Marsh in the 1950s. However, this species was not recorded in the recent survey (RPS Cairns, 1997c and this study) and it is considered that conditions are no longer suitable for it. In recent years (at least since 1993), Sea Club-Rush/Grey Club-Rush swamp appears to have been invading the northern sections of the lagoon (RPS Cairns, 1997c).

Bird Populations

- 7.3.10 Kinsale Marsh is an important site for wintering waterfowl. It is one of the main high tide roosts in the Bandon Estuary (Collins, 1992). In the mid-1980s, the Bandon Estuary held nationally important populations of Black-Tailed Godwit and Redshank (Sheppard, 1993; see Appendix C3). In 1991/92, nationally important numbers of Oystercatcher, Curlew, Black-Tailed Godwit and Redshank were recorded in Kinsale Marsh (Collins, 1992; see Appendix C3). Nationally important numbers of Black-Tailed Godwit were also recorded in the marsh in 1996 and in 1997 (Appendix C3). Ideally, assessment of a site's importance should be based upon good count data for several recent years. Although this is not available for Kinsale Marsh, the information available suggests that the site is nationally important as a high tide roost for at least Black-Tailed Godwit and Curlew.
- 7.3.11 Kinsale Marsh is especially valuable as a high tide roost because its shallow water and exposed mud during many high tides allows waders to continue feeding when other intertidal habitat is not available. The availability of feeding sites which

waders can exploit at high tide has an important influence on the number of birds that an estuary can support (Davidson and Evans, 1986). In contrast to Kinsale Marsh, many other high tide roosts in County Cork do not provide suitable habitat for feeding waders at high tide.

- 7.3.12 Most species of waterfowl use the marsh primarily at high tide. However, on 12 December 1997, large numbers of waders were observed on the marsh at low tide (Appendix C3). Significant numbers of Grey Heron, Mallard, Teal and Snipe use the marsh throughout the tidal cycle. The winter population of Snipe may be in the order of 100 birds (Appendix C3) which would represent quite a high concentration in this relatively small site.
- 7.3.13 The majority of the roosting waders use the section of the marsh west of the central embankment. When water levels are high, waders roost on the embankment itself. Flocks of Oystercatcher, Black-Tailed Godwit and Curlew have been observed feeding on fields surrounding the marsh, including those within the Hollycourt site. The Teal and Snipe generally occur in the swamp and marginal vegetation surrounding the marsh, including the eastern side and these habitats also support small numbers of Moorhen, Water Rail and Woodcock.
- 7.3.14 Kinsale Marsh is a well known and popular birdwatching site (Hutchinson, 1994) due to the ease of viewing of large concentrations of waterfowl at high tide. It has a reputation for attracting rare vagrants and its list of rarities in recent years includes Blue-Winged Teal, Pacific Golden Plover, American Golden Plover, Least Sandpiper, White-Rumped Sandpiper, Lesser Yellowlegs and Wilson's Phalarope.

Other Fauna

- 7.3.15 Saline lagoons can support unusual assemblages of aquatic plants and invertebrates (Davidson et al., 1991). While Kinsale Marsh is of artificial origin, the naturalness of a saline lagoon is not necessarily a good guide to its ecological value (JNCC, 1996). The aquatic fauna of Kinsale Marsh includes specialist lagoonal species (Galvin, 1992) and Kinsale Marsh may represent a good example of an artificial lagoon. However, in a study of 13 lagoonal sites (natural and artificial) in Counties Cork and Wexford, Galvin (1992) ranked it as only ninth most important. It is known, also, that there has been significant variation in the hydrological regime in Kinsale Marsh in recent years due to repair of the sluice in 1989 (Collins, 1992) and apparent recent malfunctioning of the sluice (see paragraph 7.3.4). The ecological interest of saline lagoons is very sensitive to changes in hydrological regime (JNCC, 1996). Therefore, the large changes in the hydrological regime which have occurred at least recently in Kinsale Marsh might have limited the interest of its lagoonal flora and fauna.
- 7.3.16 Coastal lagoons are listed on Annex I of the Habitats Directive (92/43/EEC) as a priority habitat which requires designation of Special Areas of Conservation for its protection. However, the published criteria (EC DGXI, 1996) refer to lagoons 'separated from the sea by sand banks or shingle, or less frequently, by rocks' and, thus, would appear to refer primarily to natural lagoons and not to Kinsale Marsh.

- 7.3.17 The wetland habitats within Kinsale Marsh are considered to represent habitats of potential value for riparian and marsh invertebrates (J. Good, personal communication).
- 7.3.18 Kinsale Marsh is considered to be of local importance for Otters utilising the lower tidal reaches of the Bandon Estuary (RPS Cairns, 1997c; see Section 7.4 below).

Status

- 7.3.19 Up to 1997, Kinsale Marsh was not included in the list of sites which have been proposed for designation as Natural Heritage Areas. It is listed in the South Cork Development Plan (Cork County Council, 1996) as a Feature of Scientific (High Amenity) Importance as follows:

Item Number: D52
Townland: Cappagh/Commoge
Item: Wildfowl habitat, Kinsale
Interest: Ornithological
Value: Local

- 7.3.20 In a review of the 1986 version of the Development Plan, Shorten (1992) proposed that the site be upgraded to national importance.
- 7.3.21 Parts of Kinsale Marsh (the eastern and northern compartments) have been managed as a nature reserve by IWC Birdwatch Ireland under management agreement with the landowners. However, the current status of these agreements is not known.
- 7.3.22 Given the ornithological and botanical importance of Kinsale Marsh documented above, and the general ecological interest of the marsh, the lack of inclusion of the marsh in the list of sites proposed for designation as Natural Heritage Areas was notable. The site would appear to qualify for designation as a NHA and should be treated as such in a planning context. The National Parks and Wildlife Service are now intending to include Kinsale Marsh (as part of a much larger NHA covering the lower Bandon Estuary) in the list of sites which are being proposed for designation as NHAs (letter from Peadar Caffrey, NPWS to John Coveney, Birdwatch Ireland, 14.02.1997).

7.4 Existing Environment - Wastewater Treatment Works, Pipeline Routes and Access Road

Introduction

- 7.4.1 This section provides a detailed ecological description of the wastewater treatment works site and adjoining section of the marsh, and of the areas which will be affected by installation of the access road and pipelines.

Habitats and Vegetation

- 7.4.2 A habitat survey of the site was carried out on 28 May 1998 and a detailed vegetation survey was carried out on 7 June 1998. Habitats were classified according to Phase 1 methodology (JNCC, 1993). Species lists were made of the vegetation associated with the major habitat-types on the site (see Appendix C2). Hedgerows were surveyed using the Hedgerow Evaluation and Grading System methodology (HEGS; Clements and Toft, 1992).
- 7.4.3 The areas surveyed can be broadly divided into the following zones:
- ♦ The fields which comprise the area potentially affected by the proposed waste water treatment plant ("treatment plant site").
 - ♦ The area of marsh within the County Council landholding through which the outfall pipe will be laid ("western compartment of the marsh").
 - ♦ The fields to the north and east of the marsh through which the storm sewer and foul sewer pipelines and access road will be constructed.
 - ♦ The section of Alder wood through which the storm sewer and foul sewer pipelines will be laid.
 - ♦ The south-eastern corner of the marsh through which the storm sewer and foul sewer pipelines will be constructed.
- 7.4.4 The habitats present on the site are shown in Figure 7.1 and detailed in Figure 7.2

Treatment Plant Site

- 7.4.5 Of the two agricultural fields the Treatment Works will occupy, one is currently used as a hay meadow, while the second is a derelict old meadow which was formerly part-seeded with both Perennial Rye-Grass and Italian Rye-Grass, but which is now totally infested with weed species such as Creeping Thistle, Spear Thistle, Smooth Sow-Thistle and Prickly Sow-Thistle, etc. The native Rough Meadow-Grass is abundant here, with a little Meadow Foxtail in the southern hedgerow margin bordering the marsh.
- 7.4.6 The eastern hedgebank holds little of botanical interest, but one massive Horse-Chestnut is present midway up the fields. This hedgerow was graded as of high ecological importance, while the other hedgerows were graded as being of moderately high ecological importance (according to the HEGS methodology; Clements and Toft, 1992). The western boundary is formed by a double treeline with tall, mature Ash and Sycamore, and an understorey of Hawthorn, Blackthorn, Common Dog Rose, Bramble and Common Elder.

Western Compartment of Marsh

- 7.4.7 This section of the marsh includes a strip of marshy grassland which runs along the western side of the compartment from the Innishannon road up to the northern corner of the marsh and is separated from the lagoon by a belt of swamp vegetation dominated by Grey Club-Rush. A stone and earth embankment separates the western lagoon from the eastern lagoon. A section of this compartment has been infilled and is occupied by a disused factory and associated ruderal vegetation.
- 7.4.8 The marshy grassland bears a typical, varied, marshland flora. Some degradation of this marginal habitat has already occurred, given the high infiltration of perennial weed species (such as Creeping Thistle and Broad-Leaved Dock) - a legacy of long-continued cattle/horse access to this part of the meadow down the years. Despite the close proximity of the tidal lagoon, halophyte species are virtually absent in the meadow. The marshy grassland is generally dominated by Soft Rush and/or Hard Rush with Creeping Bent, Yorkshire Fog, False Fox-Sedge, Sharp-Flowered Rush, Yellow Iris, Glaucous Sedge, Cuckooflower, Greater Bird's-Foot-Trefoil, etc. Where the rushes are absent, patches of shorter vegetation occur with Ragged Robin, Marsh Orchids, Common Spike-Rush, Lesser Stitchwort, etc. At the northern end of this meadow a large patch of Yellow Iris dominated vegetation occurs with an understorey of Fool's Water-Cress, Creeping Buttercup, Creeping Bent, Rough Meadow-Grass, etc. Small patches of Fool's Water-Cress swamp below north-south hedgelines are probably associated with seepage lines into the marsh from adjoining fields. Where the meadow narrows to a strip behind the infilled areas, its western edge is being invaded by Bramble and is generally species-poor and dominated by Creeping Buttercup and Creeping Bent.
- 7.4.9 The central stone-and-earth embankment virtually divides the lagoon into two sections, and provides an ecological micro-habitat which is otherwise absent on-site. Here, the mud-exposed margins of the tidal lagoon provide an ideal home for small annuals, such as the halophyte, Frog Rush and for marginal swards of Sea Arrow-Grass and Saltmarsh Rush, etc., while the embankment itself is home to many neutral grassland species, such as Wild Carrot, Common Bird's-Foot-Trefoil, Red Clover and Common Vetch, etc. The halophyte, Danish Scurvy-Grass, is frequent here, in its only on-site habitat. Occasional saplings of Blackthorn and Alder occur.

Pipeline Route - Fields

- 7.4.10 Most of the fields through which the pipelines will be constructed are improved or poor semi-improved grasslands of negligible botanical interest. One of the fields through which the storm sewer and foul sewer pipelines will be constructed is, however, of significant ecological interest. This is the field which lies between the northeast corner of the marsh and the school site (the 'School Meadow'). This old marshy meadow is now railed off from the school grounds. The marsh flora is very varied (halophytes are totally absent here), but with a dominance of typical 'western fen-meadow' (see RSPB et al, 1997) species such as Soft Rush, Sharp-Flowered Rush, Yorkshire Fog, Greater Bird's-Foot-Trefoil, Marsh Bedstraw and

Carnation Sedge. The meadow gently slopes downhill from east to west and the wetter, western section is the more species-rich. A narrow strip along the northern edge of the meadow has been disturbed and this rutted ground provides a barish, water-filled micro-habitat for the diminutive annual, Bristle Club-Rush, which otherwise could not compete with the dense, tall, meadow vegetation. The arboreal element is largely confined to the bordering hedgebanks, though Alder has established itself throughout the western section of the site. This meadow also holds a few plants of the Greater Tussock Sedge. A Marsh Orchid is locally frequent in this meadow, though its precise identity has yet to be determined.

Pipeline Route - Hedgerows

- 7.4.11 The majority of the hedgerows affected are stone-and-earth hedge banks which were graded as being of moderately high to high ecological value. They generally bear a scattering of tree and shrub species, while they are somewhat base-rich, as they support base-demanding species such as Greater Burnet-Saxifrage, Grey Sedge, Hart's-Tongue and Soft Shield-Fern. Southern Polypody, a calcium-requiring fern, finds a habitat on the mortar of an old gate wall.
- 7.4.12 The 'woodland' component of such hedge banks includes Pedunculate Oak, Ash, Sycamore, Elder and Hawthorn, together with Broad Buckler-Fern, Common Dog Violet, Ground Ivy, Herb Robert and Herb Bennet, etc. Alder is common along damp sections of some hedgerows. Most of the hedgerow trees are multi-stemmed coppice or pollards. However, the old track along the southern edge of the School Meadow holds a double treeline of mature Lime and Alder.

Pipeline Route - Alder Wood

- 7.4.13 The foul and storm sewer pipelines will pass through a narrow belt of Alder woodland which occurs on gently sloping land to the west of the fields and forms a buffer zone for the marsh. This Alder woodland comprises mainly rather open semi-mature coppice regrowth but with mature Alder trees along the boundary banks.
- 7.4.14 The western portion of Alder wood has a swamp-like substrate, bearing a typical paludal flora, which includes Creeping Bent, Creeping Buttercup, Greater Bird's-Foot-Trefoil, Ribwort Plantain, Self-Heal, Common Sorrel, Yorkshire Fog, Clustered Dock and Soft Rush, etc.
- 7.4.15 The eastern boundary embankment holds a single Beech tree among the mature Alders, along with Beech, Rusty Willow, Soft Shield-Fern, Hard Fern and Broad Buckler-Fern, etc, while Remote Sedge occurs here abundantly.
- 7.4.16 The remaining section of woodland varies from dry-floored to wet-floored: the drier ground being dominated by Bramble thickets and Honeysuckle, the wetter sites with a range of paludal species which include Ragged Robin, Great Willowherb, Common Spike-Rush, Hard Rush, Marsh Thistle and Water Mint. The northern two-thirds of the western edge of the woodland behind the boundary embankment was flooded in December 1997.

- 7.4.17 The western embankment separating the woodland from the lagoon holds Privet, Alder, Soft Rush, Remote Sedge (in abundance), Ivy, Hard Rush and Hedge Bindweed, etc.

Pipeline Route - Southeastern Corner of the Marsh

- 7.4.18 The storm and foul sewer pipelines will cross the southeastern corner of the eastern compartment of Kinsale Marsh. A freshwater stream enters the lagoon at this point, creating a complex ecological habitat with a mixture of freshwater and brackish paludal species. As a consequence, the flora is varied and holds three nationally/regionally rare species.
- 7.4.19 In the stream bed itself, the understorey is dominated by Water-cress, Fool's Water-Cress, Floating Sweet-Grass and Creeping Bent, the dominant tall species being Hemlock Water-Dropwort, Greater Reedmace and Grey Club-Rush. By contrast, the narrow ribbon of marginal marsh vegetation running northwards from here is dominated by low-growing species, both annuals and perennials, such as Marsh Pennywort, Brookweed, Jointed Rush, Greater Bird's-Foot-Trefoil and Common Spike-Rush. Of interest is the abundance of Yellow Bartsia here, associated with a few plants of Dotted Sedge. Yellow Bartsia is of local occurrence in County Cork (and Ireland generally), while Dotted Sedge is nationally rare. In August 1997, four scattered clumps of Dotted Sedge were found here (RPS Cairns, 1997c) while in June 1998, seven clumps were found. The differences in the numbers of clumps found may reflect seasonal variation in the apparency of this species (which is very similar in vegetative form to the much commoner False Fox-Sedge). Alternatively it may reflect annual variation: according to David (1981), 'individual plants [of this species] are short-lived but seed prolifically, so that whole colonies are liable to vanish while new ones spring up nearby'.
- 7.4.20 In June 1998, a substantial area of mud was exposed along this shoreline. This mud had been colonised by small annuals including the nationally scarce Chaffweed, as well as Frog Rush, Bristle Club-Rush and Slender Club-Rush.
- 7.4.21 The upper section of the marsh bears a taller, coarser flora which includes Meadowsweet, Marsh Thistle, Water Figwort, False Oat-Grass, Wild Carrot and Great Willowherb, while the backing scrub holds Rusty Willow, Alder, Gorse and Honeysuckle.

Birds

- 7.4.22 Species observed during the present study are listed in Appendix C3.
- 7.4.23 The treatment works site and pipeline fields are of generally low ornithological interest. Various common farmland species occur in the hedgerows, while, at the time of the survey, the rank growth in the fields provided cover for Meadow Pipits and Skylarks. In winter, the fields are likely to be used, at times, by waders

associated with Kinsale Marsh (especially Oystercatcher, Black-Tailed Godwit and Curlew). The school meadow is likely to support some Snipe during winter.

- 7.4.24 The western compartment of the marsh is the area of highest ornithological interest within the marsh. This is due to the western shore of the lagoon being the favoured area for feeding and roosting waders (see paragraph 7.3.13). The marshy grassland in this area is of lower interest, though it does support some Snipe during winter.
- 7.4.25 The Alder woodland zone supports a typical assemblage of common woodland birds (see Appendix C3), although its species richness is probably limited by the relatively small total extent of woodland.
- 7.4.26 The south-eastern corner of the lagoon is generally not used by many waterfowl, probably due to its proximity to the existing road. Some Mallard and Teal, however, regularly occur in this area along with a few Redshank, while Snipe occur in the marginal vegetation.

Mammals

- 7.4.27 This section is based upon the collation of the results of surveys carried out at various times for previous RPS reports (RPS Cairns, 1993, 1997c, 1998).
- 7.4.28 Four species of terrestrial mammals have been recorded, namely Rabbit, Brown Rat, Fox and Otter (see Appendix C4). The Kinsale Marsh area provides temporary resting areas for Otters utilising the tidal reaches of the Bandon River and can be considered locally important for this species. However, no Otter holts (permanent underground resting sites used by Otters for breeding) have been recorded in any of the areas surveyed. A further three species are considered likely to occur: Hedgehog, Pygmy Shrew and Wood Mouse. The habitat requirements for Badgers are generally not present and this species is considered unlikely to occur. Various species of bats may also occur.
- 7.4.29 Otter, Hedgehog, Pygmy Shrew and Wood Mouse are protected by the provisions of the Wildlife Act, 1976. Otter is also listed on Annex 2 of the Habitats Directive (92/43/EEC) and is, consequently, protected by the provisions of the European Communities (Natural Habitats) Regulations, 1997 (SI/94/97).
- 7.4.30 The habitats present can be broadly divided into three types: farmland, Alder woodland and marsh.
- 7.4.31 The farmland affected comprises improved grassland and hedgerows with one field of marshy grassland (the 'School Meadow'). The improved grasslands are of little importance for mammals. The hedgerows vary from low to moderate quality for mammals, with the best being the three overgrown double hedgerows (including that forming the southwestern boundary of the treatment works site). The School Meadow includes a 5-10 m band of marginal scrub which is likely to be good habitat for mammals, especially the smaller species.

7.4.32 There is an existing drainage ditch running parallel to the Alder woodland which acts as a minor barrier to localised small mammal movements. The Alder wood itself has a relatively good understorey of Bramble and is relatively dry underfoot. It is of moderate size and is comprised predominately of young trees. The large stone wall between the Alder wood and marsh acts as a further barrier to mammal movement. Notwithstanding, this area is subject to low levels of human disturbance and access is difficult in places. The area provides shelter belts and some habitat requirements of mammals and can be considered of moderate importance overall. The Alder wood continues south of the pipeline route along the eastern margins of the marsh but is not extensive in size.

7.4.33 The section of marsh along the route of the proposed outfall pipe is quite exposed with water-saturated ground levels throughout. The vegetation is dominated by rushes and various grass species with a hedgerow margin incorporating Bramble scrub and relatively few mature trees. The area is of little importance to mammals, excepting perhaps Otters and Foxes.

7.4.34 The shoreline along the southeastern corner of the marsh provides broad and extensive shelterbelts incorporating Gorse and Bramble scrub and ferns and rushes. Temporary resting sites for Otters were noted in this area during two separate surveys and the area is ranked as of moderate to high importance for mammals.

7.5 Ecological Evaluation

Fields

7.5.1 The fields of improved grassland comprising the bulk of the area affected by the proposed developments are of low ecological value, although they do provide some feeding habitat for waders using Kinsale Marsh.

7.5.2 The school meadow field is an attractive marshy meadow which is botanically species-rich and with encroaching scrub which provides some good mammal habitat. Although slightly disjunct from the main area of the marsh, this meadow provides an added component of habitat diversity to the marsh through the occurrence of a distinctive wetland plant community.

Hedgerows

7.5.3 The hedgerows in the treatment works site and along the pipeline routes were generally graded as of moderately high to high ecological value according to the HEGS methodology (Clements and Toft, 1992). However, these hedgerows are probably fairly typical of the area (although there is no detailed baseline data with which a comparison can be made) and possessed no outstanding features.

Alder Woodland

7.5.4 The Alder woodland forms part of the overall wetland complex of Kinsale Marsh and contributes to the high habitat diversity of the marsh. It also forms a buffer

zone for the main wetland area. However its vegetation is species-poor and appears to lack notable species. This woodland is considered to be of moderate local importance for mammals.

Western Compartment of Marsh

- 7.5.5 The section of the western compartment of the marsh through which the outfall pipe will be laid is of rather low intrinsic ecological value. It comprises rather species-poor, and in places disturbed, vegetation without any notable species and is not considered to be of high value for either birds or mammals. However, it does form part of the overall wetland complex of Kinsale Marsh and contributes to the high habitat diversity of the marsh.

Southeastern Corner of Marsh

- 7.5.6 The southeastern margin of the brackish lagoon holds a narrow belt of transitional freshwater/brackish marsh with an exceptional botanical diversity. This is the habitat for Yellow Bartsia, Chaffweed and Dotted Sedge. Yellow Bartsia and Chaffweed are of local occurrence in Ireland. The Dotted Sedge is nationally rare. It is known from 55 sites in Ireland, of which 32 were known to be extant between 1970-1981 (David, 1981). It is largely restricted to West Cork (from Glandore westwards) and South Kerry. The population at Kinsale Marsh represents the most easterly known extant population in Ireland with the possible exception of a population recorded in 1965 in Waterford (but which has not been seen recently). However, the Dotted Sedge and Yellow Bartsia are not legally protected or listed in the Irish Red Data Book (Curtis and McGough, 1988).
- 7.5.7 The direct contact of freshwater with the brackish lagoon creates unusual environmental conditions in the southeastern corner of the marsh. The exact nature of these conditions is likely to fluctuate over time-scales ranging from days-weeks to years-decades reflecting the influence of rainfall on the freshwater inflow to the marsh and the influences of changes in the operating conditions of the sluice on tidal conditions and salinity in the lagoon. These fluctuating conditions create a dynamic and unstable environment, as indicated by the frequency of annual plants, which may prevent the development of vegetation overwhelmingly dominated by a few species (as which occurs in most of the rest of the marsh) due to different species being favoured under different conditions. Consequently it is likely that this is a dynamic plant community with the relative abundance of species changing over time.
- 7.5.8 This section of the marsh is also important for Otters, a species listed on Annex 2 of the Habitats Directive (92/43/EEC).
- 7.6 **Impact**
- 7.6.1 Impacts have been assessed on a six point scale ranging from no change-imperceptible-slight-moderate-substantial-profound (see Appendix C5).

Impacts on Habitats

7.6.2 The habitats affected by the various elements of the proposal are listed in Table 7.1. In calculating the amounts of habitats affected the following assumptions have been made:

- ♦ The widths of the construction corridors for the pipeline routes are 10 m.
- ♦ The common section of the foul sewer and storm sewer will have a combined construction corridor of 10 m.
- ♦ The section of the foul sewer running parallel to the access road (i.e. from F399 to F402) will be kept clear of the adjoining tree-lined bank which forms the boundary of the marsh.

7.6.3 The duration of impact, as listed in Table 7.1, refers to the duration of direct physical interference with the habitat. It should not be assumed, however, that habitats listed as affected by 'temporary' impacts will necessarily completely recover.

TABLE 7.1. Habitats affected by the various elements of the wastewater treatment works proposals.

Proposal	Habitat Affected	Amount Affected (approx.)	Duration
Wastewater treatment works	Improved grassland	2.5 ha	Permanent
	Hedgerow	75 m	Permanent
Access road	Improved grassland	0.1 ha	Permanent
	Hedgerow	10 m	Permanent
Outfall pipeline	Marshy grassland	0.4 ha	Temporary
	Hedgerow	10 m	Temporary
Foul/storm sewer	Marshy grassland	0.06 ha	Temporary
	Alder woodland	0.1 ha	Temporary
	Scrub	0.05 ha	Temporary
	Marginal vegetation	0.005 ha	Temporary
	Lagoon	0.05 ha	Temporary
	Hedgerow	70 m	Temporary
	Poor semi-improved grassland	0.5 ha	Temporary
	Improved grassland	0.5 ha	Temporary

Improved Grassland

7.6.4 Improved grassland is a habitat which is generally of negligible intrinsic ecological value, as it supports a highly artificial, species-poor plant assemblage which generally provides little habitat potential for any associated fauna. In areas adjoining wetland sites, however, improved grassland may provide feeding habitat for waterfowl and the fields adjoining Kinsale Marsh are known to be used by feeding Oystercatcher, Curlew and Black-Tailed Godwit. The loss of the improved grassland affected by the present site will reduce the extent of feeding habitat for these species. However, there is a large amount of such habitat in this area and the fields affected by the proposed development do not appear to be of any special value for these species. Therefore, the loss of this amount of

improved grassland can be considered to be an imperceptible impact (although complete loss of all the improved grassland in the vicinity of Kinsale Marsh could have a significant negative impact on these species).

Hedgerows

- 7.6.5 The affected hedgerows are of moderately high to high ecological value, but these hedgerows are probably typical of the area and lack any outstanding features. Loss of these hedgerows will, therefore, be a slight negative ecological impact.

Marshy Grassland - Western Compartment of Marsh

- 7.6.6 This area will be affected by construction of the outfall pipeline in a 10 m wide strip running from the treatment works to the Innishannon road. The pipeline will run along the landward edge of the grassland through mainly species-poor wet neutral grassland which appears to have already been subject to some disturbance. In the short term, the affected area will be colonised by ruderal vegetation while after a few years similar vegetation to that currently present is likely to develop providing the existing ground levels are maintained.

Marshy Grassland - the School Meadow

- 7.6.7 This area of species-rich marshy grassland will be affected by the construction of the storm and foul sewer pipelines through its northern corner. This will involve the excavation of a 10 m wide strip through the northern edge of the meadow where it is being invaded by Alder scrub. In the short term this strip will be colonised by ruderal vegetation. While wet meadow-type vegetation is likely to develop in the medium term, it is unlikely to be equivalent to the original vegetation. The latter has been undisturbed for a long period, and, in general, the diversity and value of grassland vegetation increases with its age. Moreover, the pipelines will have localised impacts on sub-surface drainage which will also affect the re-colonising vegetation. The pipeline construction through this meadow may, therefore, have long-term negative impacts on its ecological value, although because of the small area affected these impacts would be moderate at worst.

Alderwood

- 7.6.8 The Alder wood which would be affected by the storm and foul sewer pipelines comprises about 10% of the total extent of this habitat (dry Alder wood) in Kinsale Marsh. While this area appears to possess no outstanding features, it has some intrinsic value as a representative example of a semi-natural habitat and is of moderate importance to mammals. Moreover, it forms part of the wetland complex of Kinsale Marsh and acts as a buffer zone to the more ecologically interesting habitats of the marsh proper.

- 7.6.9 The pipeline construction will involve the clearing of a 10 m wide strip through the southeastern corner of the wood involving the removal of a considerable number of mainly semi-mature Alder trees. In the short term this strip would probably be colonised by ruderal species with Bramble thickets developing in a few years and Alder regeneration eventually occurring over a period of 10-20 years.
- 7.6.10 The pipeline construction will result in some temporary loss of habitat for mammals and birds. However, no notable plant species occur in the area affected and the affected strip is not wide enough to physically sever the habitat; indeed, a 10 m wide strip can be considered to be analogous to a woodland ride, and the latter is often a valuable habitat feature of woodlands. Therefore, the impact of pipeline construction on the Alder woodland can be considered to be at most a slight negative impact.

Southeast Corner of the Marsh

- 7.6.11 The southeast corner of the marsh will be affected by the construction of the storm and sewer and outfall pipelines. This habitat is of high botanical interest and, consequently, any impacts are of potential significance. The pipelines will be crossing through in a 10 m wide strip perpendicular to the shoreline. The total extent of this habitat is around 150 m of shoreline. Therefore, around 7% of this habitat will be affected by the pipeline construction. One nationally rare plant species, the Dotted Sedge, occurs in this area. Depending on the exact location of the pipeline, one of the seven clumps of this species may be affected.
- 7.6.12 Pipeline construction in this area will have moderate to substantial negative impacts in the short term. However, the ecological characteristics of the vegetation in this habitat suggest that it is not a stable community and it may already be subject to disturbance resulting from the variable hydrological regime. Therefore, following construction vegetation should re-colonise the affected areas and a similar type of plant community should develop providing that the existing ground levels are maintained. If complete recovery of the vegetation occurs, and if the Dotted Sedge population is not affected, the pipeline will have no long term impacts. It is not possible to predict the long-term impact with certainty, however.
- 7.6.13 Construction of the pipelines across the southeast corner of the lagoon will result in the removal of a very small portion of bottom habitat associated bottom-dwelling (benthic) fauna and the generation of a local increase in suspended solids. A previous study of the flora and fauna of the lagoon (Galvin 1992) indicated that this general area of the lagoon contained medium to high densities of oligochaet worms and low to medium densities of chironomid midge larvae. In addition, net sweeps in the area revealed small numbers of a broad range of more mobile pelagic groups such as water boatmen, prawns, shrimps, water beetles etc. The very local loss of the benthic fauna and the temporary dispersal of mobile pelagic (open-water, swimming) species, which will result from the pipe-laying operation, constitutes a very minor and temporary impact on the lagoon as a whole. The benthic fauna would be expected to recover through re-colonisation within one to two seasons, whereas the pelagic species would move back into the

affected corner of the lagoon as soon as the suspended solids dropped to background levels, which is likely to happen immediately that the pipes are laid.

Hydrological Impacts

- 7.6.14 A large amount of land has been zoned for housing development. If run-off from all these lands following development was allowed to discharge directly to the marsh, the peak discharge to the marsh following development would be increased by 22.3% (MW&P, 1997, see section 1). The storm sewer network has been designed to intercept this run-off and discharge all these flows directly to the Bandon Estuary. This has the advantage of avoiding potential water quality impacts from urban run-off to the marsh. This does mean, however, that following development of the zoned lands, the normal flows into the marsh will decrease by 18.2%, although some overflow into the marsh will still occur during certain combinations of rainfall events and tidal conditions (MW&P, 1997). The reduced flow from the catchment into the marsh will reduce the freshwater input to the marsh, and this could be expected to have some ecological consequences. However, the relative contribution of freshwater and saltwater inputs to the lagoon have presumably changed substantially over recent years as a result of changes to the operational condition of the sluice (see paragraph 7.3.4). In this context, it is unlikely, therefore, that there are any particularly sensitive ecological features which depend upon maintenance of a precise salinity regime.
- 7.6.15 The access road and pipelines will cut across the various ditches which provide freshwater inflows to the marsh (with the exception of the inflow in the southeast corner). If these inflows were, consequently, eliminated or reduced, some ecological consequences could, again, be expected. In particular, the section of foul sewer running parallel to the access road may interfere with the ditch which runs along the back of the marsh boundary at this point.

7.7 Mitigation

- 7.7.1 The mitigation proposals are shown on Figure 7.3. These proposals include both measures designed to mitigate specific impacts from the development, and measures designed to enhance the ecological value of the marsh.
- 7.7.2 Ecological considerations have already been taken into account in the design of the scheme, and this process has resulted in relocation of the access road to avoid interference with the marsh.

Landscape Planting

- 7.7.3 The landscape master-plan (Section 6.4, Figures 6.5 and 6.6) has been designed by integrating ecological considerations with the requirements to screen the visual impact of the development. In particular, the marsh side of the treatment works and access road will be screened by planting Alder woodland. This will create a belt of Alder woodland across the top of the marsh.

- 7.7.4 Gaps in hedgerows and tree-lines created by laying pipelines should be replanted with appropriate species (see Figure 7.3).
- 7.7.5 Generally, any hedgerow and tree plantings should use material derived from locally indigenous genetic material following the principles of the Flora Locale Draft Technical Guidance Notes (<http://www.naturebureau.co.uk/pages/floraloc/guidenot.htm>). It is not necessary to carry out any plantings of Bramble or Gorse as these species will naturally colonise the planted hedgerows.

School Meadow

- 7.7.6 While the physical interference in this habitat will be temporary, it is possible that the disturbance of the substrate involved in the pipelaying will result in subsequent re-colonisation by a degraded species-poor flora. This possibility can be minimised by storing the turves removed during laying of the pipeline on polythene in an adjacent field (to minimise handling). Following laying of the pipeline, the turves should be replaced in situ, taking care to reinstate the same ground levels as prior to the pipeline laying.

Southeast Corner of Marsh

- 7.7.7 The following mitigation measures are outline recommendations. A detailed mitigation plan should be drawn up for this area prior to construction.
- 7.7.8 The key issue to mitigate here are any potential impacts to the Dotted Sedge population. It is important to note that the distribution of this species within this area is likely to change over short time-scales due to the ecology of the species. Therefore, this area should be surveyed immediately prior to construction work (but during the period June to August) and the location of any clumps of Dotted Sedge in the vicinity of the proposed pipeline route should be accurately mapped. Should any clumps be within the 10 m wide construction strip, they should be translocated to an appropriate receptor site, following expert ecological advice.
- 7.7.9 The turves removed during laying of the pipeline should be stored on polythene in an adjacent field (to minimise handling). Following laying of the pipeline, the turves should be replaced in situ, taking care to reinstate the same ground levels as prior to the pipeline laying.
- 7.7.10 Impacts to translocated and/or re-instated vegetation and any potential impacts to vegetation from bund construction (see above) should be monitored using standard monitoring techniques (e.g., RSPB et al., 1997).

Hydrology

- 7.7.11 Provision should be made for allowing the continuation of freshwater inflows to the marsh through ditches crossed by the access road and pipelines.

Construction

- 7.7.12 Prior to construction all areas of semi-natural vegetation which have been identified for retention should be fenced off. It should be a condition of any construction contracts that contractors do not impinge upon these areas in any way. It is particularly important to avoid any unnecessary disturbance to the marginal plant communities in the southeast corner of the marsh.
- 7.7.13 During the construction phase, every effort should be made to avoid escapement of silt into the marsh area including the bordering Alder wood. This may best be achieved by carrying out the preliminary earth excavations and foundation laying during the drier months of the year. If this cannot be achieved, and there is evident danger of significant silt levels reaching the marsh, some form of interceptor ditch should be dug with a sump so that silt laden water could be pumped into the storm water pipe which will be laid to the Bandon River.
- 7.7.14 As discussed above (paragraph 7.6.133), laying the pipelines across the southeast corner of the lagoon will result in the generation of a localised increase in suspended solids. In order to minimise this increase, the pipelaying should be carried out in the shortest period possible, and preferably during the winter months when the densities of benthic organisms are at their lowest.

Enhancement

Habitat Creation

- 7.7.15 As proposed previously (RPS Cairns, 1997a), the section of spoil deposition on the County Council's landholding should be removed. This would create an additional area of marsh habitat.
- 7.7.16 This area is approximately 0.3 ha in extent. It is separated from a larger area of spoil deposition outside the Cork County Council landholding by a 1.5 m wide ditch. The area rises 1.5-2 m above the marsh at its south-western end and slopes down to 1-1.5 m above the marsh at its north-eastern end. Therefore, the approximate amount of spoil is around 5,000 m³.
- 7.7.17 The existing vegetation comprises ruderal species such as Cock's-Foot, Broad-Leaved Dock, Winter Heliotrope, Bramble, Butterfly-Bush, Ribwort Plantain, Willowherb and Gorse with patches of Soft Rush, Hard Rush and Creeping Buttercup in the wetter areas. This type of vegetation is of low ecological interest.
- 7.7.18 Depending upon the depth of excavation, the area exposed by removing the spoil would ultimately develop into wet grassland, swamp or brackish lagoon habitat. It will be necessary to decide which of these habitat types is preferred and design the excavation appropriately.
- 7.7.19 Prior to removal of the spoil it will be necessary to determine whether the spoil contains any toxic materials and to find a suitable location to receive the spoil

- 7.7.20 The substrate exposed by removal of the spoil will have to be assessed for its suitability to develop into the type of habitat required. For example, sand would be suitable for the development of brackish lagoon habitat but would be slow to be colonised by vegetation. The nature of the substrate may affect decisions about the type of habitat(s) to be developed, although there are techniques for altering substrates (see Merritt, 1994). However, it is likely that the spoil was simply deposited on top of existing marsh habitats and removal of the spoil will allow these habitats to redevelop.
- 7.7.21 It is unlikely that there will be any need for any planting in this area as vegetation should colonise quickly from the surrounding areas. However, if the area becomes too dry then unwelcome communities of ruderal plants may develop.

Birdwatching Hide

- 7.7.22 The treatment works site would provide a suitable location for provision of a hide for birdwatching. Such a hide could be located along the southeastern boundary of the treatment works site. In this position it would be close to the main area used by roosting waders, and could be screened by the proposed plantings of Alders.
- 7.7.23 Consideration would have to be given to providing access to the hide in such a way as to not encourage access to the marsh itself, and to not create disturbance to roosting waders.

7.8 Residual Impact

- 7.8.1 The permanent above-ground features of the proposed development (the treatment works and the access road) do not affect any features of significant ecological value. The pipelines do run through some habitats of ecological importance. However, the areas affected are small and, in the long term (10+ years), the affected habitats are likely to substantially recover (especially if the mitigation measures described above are fully implemented). There are various subtle hydrological effects which could occur and have ecological consequences; these are difficult to predict but would not necessarily have negative impacts. In any case, the marsh is not a stable hydrological system and past changes in hydrological conditions are likely to have considerably exceeded any changes likely to arise from the proposed developments.
- 7.8.2 The proposed development is, therefore, unlikely to have any significant negative long-term ecological impacts. The proposed habitat creation and landscape planting will have, if correctly implemented, positive ecological impacts.

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Sluice

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School
Meadow

FIGURE 7.1
HABITAT PLAN

0m 88m

Key to habitat plan

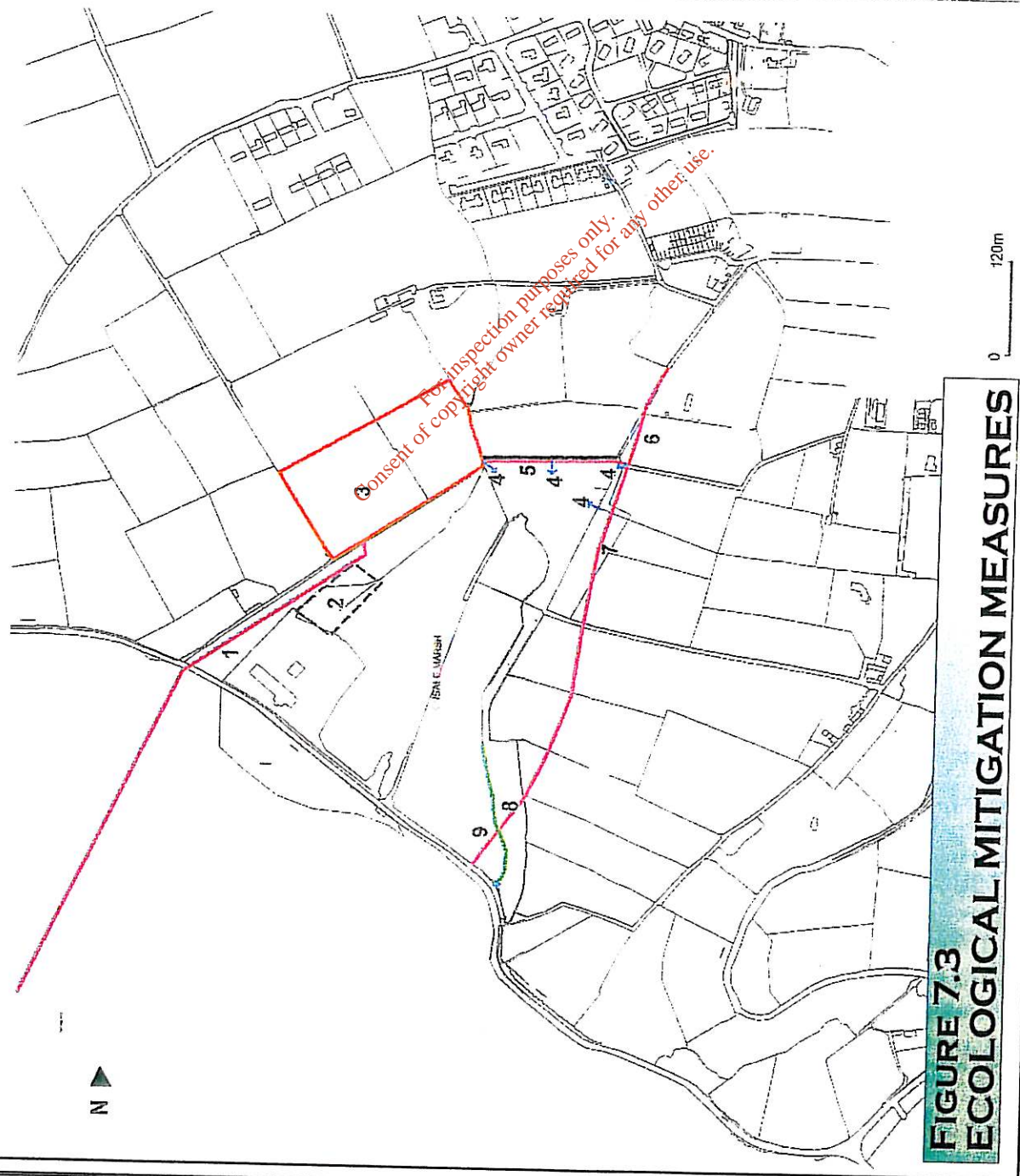
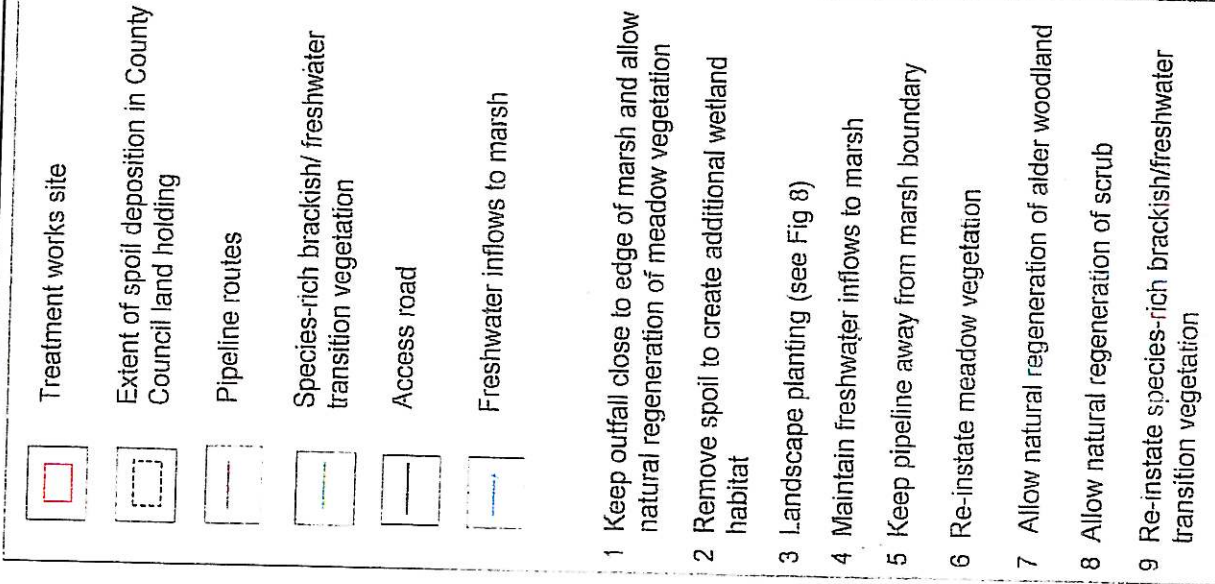


Brackish lagoon
 Grey club rush/ sea club rush swamp
 Freshwater swamp
 Urban
 Ruderal vegetation
 Alder carr
 Dry alderwood/alder scrub
 Bramble
 Dense tall scrub
 Semi-improved neutral grassland
 Inundation grassland
 Marginal vegetation
 Marshy grassland
 Saltmarsh

	Ornamental hedgerow
	Wet ditch with no perceptible flow
	Hedgerow
	Walls/embankment
	Wet ditch/stream and direction of flow
	Dry ditch
	Freshwater inflows to marsh
	Scattered young trees/young shrubs
	Dead Trees
	Conifers
	Broadleaved trees
	Improved grassland
	Poor semi-improved grassland
	Approximate extent of species-rich brackish/freshwater transition vegetation
	Intertidal mudflat

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FIGURE 7.2
HABITAT PLAN



**FIGURE 7.3
ECOLOGICAL MITIGATION MEASURES**