

Appendix 10. Traffic

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10.1. Falling Weight Deflectometer Testing Report

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**Structural Evaluation
Of
Local Road from R733 to Great Island**

**Falling Weight Defectometer Testing
Level 1 & 2 Analysis**



October 22, 2009

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Introduction

Falling Weight Deflectometer (FWD) testing was carried out on a Local Road Section from R733 to Great Island in Co. Wexford by Pavement Management Services on behalf of Mott MacDonald Ireland in October 2009. The section tested runs Westbound for 5000 metres. Testing was carried out in both carriageway lanes at 50 metre intervals, staggered in adjacent lanes.

Description of Deflection Testing Equipment

The equipment used to carry out the deflection survey was a Dynatest Model 8081 Falling Weight Deflectometer (FWD). The Falling Weight Deflectometer works on the same principle as all deflection devices; a load of known magnitude is imparted to the pavement, and the resulting deflections of the pavement are measured. For this project, interest centred on deflections under typical HCV wheel loads of 40 kN. There is a deflection-measuring sensor built into the centre of the load plate to measure the maximum deflection (D1), and a series of further sensors are also placed on the pavement surface to measure deflections at radial distances from the load application. In the testing done in Ireland, the standard 300mm spacing is used, with sensors (D2 to D7) at 300, 600, 900, 1200, 1500 and 1800 mm from the centre of the load plate.

FWD Test Results

Table 1 for the section shows the physical identifiers along each section length. Chainage referred to in all subsequent tables is in the direction shown in Table 1, i.e. Westbound. Appendix A shows the D1 deflection, Surface Curvature Index (SCI) and D7 deflection results at each point on each carriageway lane tested. In all cases, the lowest D1 results are the best from a structural viewpoint. The SCI (D1-D2) results indicate the condition of the upper pavement layers. Low SCIs (less than 250 microns) indicate good quality upper pavement layers. The D7 deflections are a good indicator of the subgrade. As with the D1 deflections, the lower the D7 deflections, the better the subgrade support.

Tables 2a to 2c for the section compares the overall carriageway results to typical results on similar roads. **Figures 1 to 3** show the D1, SCI and D7 results along the section length.

Based on the deflection results, the pavement lanes are divided into homogeneous segments on the basis of deflection. **Table 3** shows these homogeneous segments ranked based on average deflection.

The D1 deflections are very high throughout the section, generally indicating poor or very poor overall pavement conditions with failure occurring in many locations particularly on the Eastbound Carriageway.

SCI values are significantly high with values in excess of 250 microns throughout most of the section indicating very poor load spreading ability of the upper pavement layers.

The D7 deflections are generally low indicating very good subgrade conditions for the most part. The D7s are very high however from Chainage 2250 to 2800 indicating the presence of peat or some other highly compressible subgrade material along this stretch.

Pavement Construction

Pavement Coring & DCP Testing was carried out by PMS Pavement Management Services Ltd. to determine the as-constructed thicknesses of the existing pavement layers. Results from the coring investigation showed that the existing surface layer consists of a thin bituminous layer or surface dressing varying between 25 and 90 mm thick, but generally less than 50 mm. This layer is of insufficient thickness to be treated as a distinct structural layer, providing additional strength, in the pavement analysis. Analysis of the DCP data shows that a relatively thin granular layer (generally 100 to 200 mm) lies underneath the surface layer at most locations.

Backcalculation of Layer Moduli

Using FWD testing, a 40kN load can be applied to the pavement, and the actual deflections at given distances from the centre of the load plate are measured. We now have pavement thicknesses, and displacements resulting from application of a 40 kN load. It is then possible to deduce what the elastic moduli of the pavement layers must be in order to have produced the deflection basin measured by the FWD device. This process is known as BACKCALCULATION of pavement layer moduli.

In practice, it is not easy to backcalculate layer moduli. A set of moduli is assumed, and the resulting deflections are calculated. These resulting deflections are compared to the actual measured deflections, and adjustments made to the original assumed moduli. These adjusted moduli are then used with the analytical software, and a new set of resulting deflections are calculated and compared with the actual measured deflections. The iterative process continues until the actual deflections and calculated deflections are sufficiently close, and the pavement is then characterised by this last set of pavement moduli.

Having characterised the pavement, the analysis can then proceed as in the case of a new pavement, with stresses and strains at the critical design locations being calculated, and number of axles to failure being calculated. If the number of axles to failure for the existing pavement is less than that desired (i.e. if the strains are excessively high), then an overlay layer can be designed to reduce the critical strains to the appropriate design level.

Application of Analytical Design Methods

With the existing pavement structure defined in terms of thicknesses, and a set of deflections available from the FWD testing, it was possible to use a backcalculation procedure as described in the previous section to obtain the pavement layer moduli from multilayer elastic analysis. For the purposes of backcalculation an effective upper granular layer thickness of 200 mm was assumed for the section.

Based on the deflection results, the pavement lanes were divided into homogeneous segments and design deflections were calculated based on the 85th percentile in each class. A pavement overlay design is then performed using the existing pavement structure at the design locations for each segment, and variable thicknesses of hot-mix or wet-mix overlay.

Traffic Requirements

Table 4 shows the design traffic and the cumulative number of standard axles over a 20 year design period. This was calculated using the existing traffic projected over a 20 year period using an annual growth rate of 3.5% and the traffic generated by proposed developments at the site.

Information received from Mott MacDonald Ireland indicates that the current AADT and HGV content are estimated as 831 and 3.4%, respectively. During construction phase, the development will generate a peak of 400 car trips and 20 HGV trips to and from the site each day. This peak construction traffic will occur during the year 2012. During the operational phase, it is expected that additional an 30 cars and six HGVs will be generated by the development.

As the existing road width is narrow, HGV traffic generally tend to use the full width when travelling along the length of the section tested. Therefore, it has been assumed that all HGV traffic will straddle both carriageways and this has been taken into account when calculating the cumulative design traffic shown in Table 4.

Structural Requirements

DEHLG guidelines specify that where SCIs are greater than 250 microns, a hot-mix only overlay is not suitable. Taking into account the design traffic requirement and the fact that the SCIs along the length of each carriageway are generally well in excess of 250 microns, a Clause 804/wet-mix macadam overlay was deemed to be more appropriate than an hot-mix overlay. **Table 5** shows the Clause 804/Wet-mix

macadam overlay requirements by segment for the section based on Non-National Road models (50th% failure curve).

A minimum thickness of 150 mm of wet-mix macadam is specified in the DEHLG guidelines for strengthening of Non-National roads. The wet-mix/Clause 804 overlay layer should be double surface dressed to seal the unbound material. The thicknesses shown may be superseded by construction requirements.

It should be noted that the overlay requirements shown in Table 5 are estimated using the traffic data provided by the client and shown in Table 4. If significantly higher HGV traffic volumes than those shown are anticipated, an overlay consisting hot-mix surface layer over a wet-mix/Clause 804 layer would be more appropriate.

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Local Road from R733 to Great Island

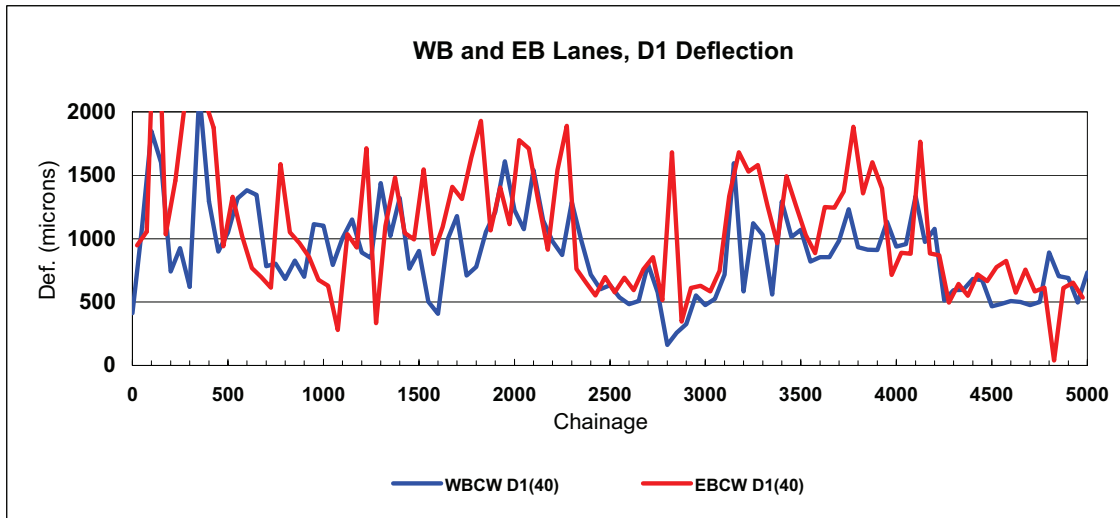


Figure 1: D1 Deflection Plots

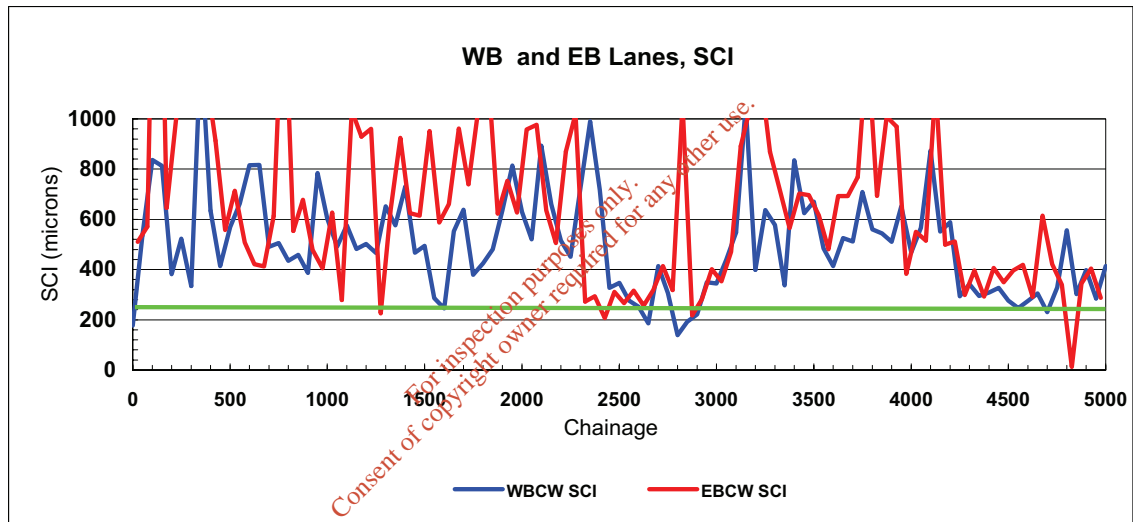


Figure 2: SCI Plots

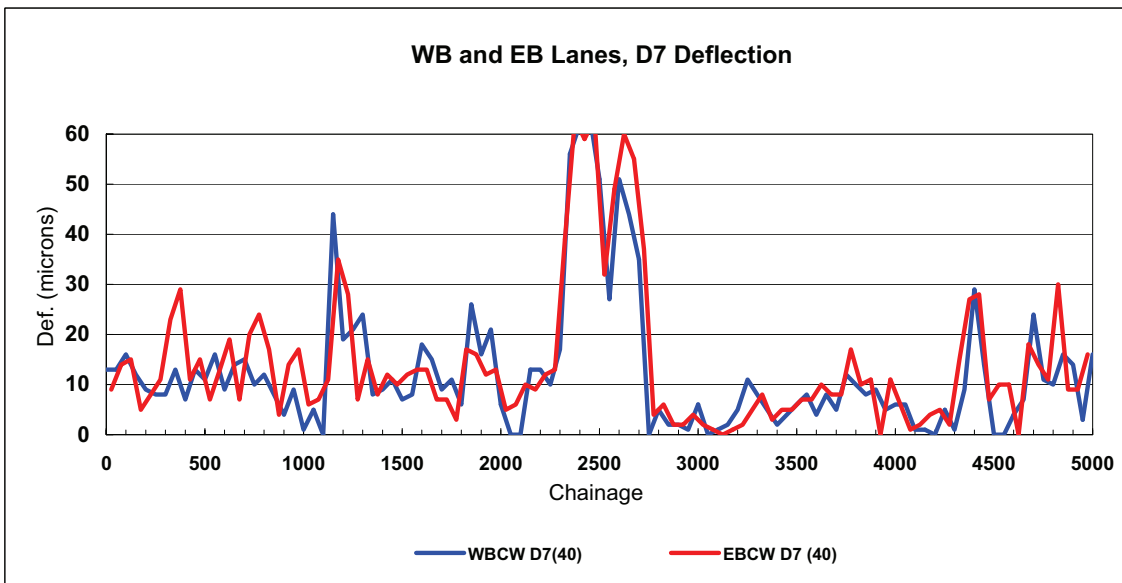


Figure 3: D7 Deflection Plots

CHAINAGE (metres)	Physical Identifier Westbound Direction
0	Started at horizontal white line at Junction with R733
400	17m West of centre white line of entrance to Cherry Grove on RHS
900	20m East of entrance to white bungalow with tiled roof on RHS
1100	13m West of centre of Junction LHS
1400	10m West of centre of Junction LHS
2000	32m West of centre of Junction RHS
3050	Opposite centre of Junction RHS on sharp bend Left
3750	16m East of centre of Junction LHS
4450	7m West of entrance to small bungalow tiled roof green gates on RHS
4800	20m West of centre of rail bridge
5000	Finished 8m East of gate to ESB

Table 1: Physical Locations by Chainage

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Local Road from R733 to Great Island Average Deflections	County Road D1 Deflection Criterion
	< 450 microns - Very Good 450 to 600 microns - Good 600 to 800 microns - Fair
WBCW = 890 microns	800 to 1000 microns - Poor
EBCW = 1079 microns	1000 to 1300 microns - Very Poor
	> 1300 microns - Failed

Table 2A: Classification of Section Based on Overall Average D1

Local Road from R733 to Great Island Average SCIs	Surface Curvature Index (SCI) Indicating Condition of Upper Layers
	< 150 microns - Very Good 150 to 250 microns - Good 250 to 400 microns - Poor
WBCW = 506 mic., EBCW = 654 mic.	> 400 microns - Very Poor

Table 2B: Classification of Section Based on Overall Average SCI

Local Road from R733 to Great Island Average D7 Deflection	D7 Deflection Criterion Indicating Condition of Subgrade
	< 5 microns - Rock/Substantial Depths of Fill
WBCW = 12 mic., EBCW = 14 mic.	5 to 15 microns - Very Good
	15 to 20 microns - Good 20 to 30 microns - Fair 30 to 40 microns - Poor 40 to 50 microns - Very Poor > 50 microns - Peat

Table 2C: Classification of Section Based on Overall Average D7

Lane	Chainage	Description	Average D1 (microns)	Average SCI (microns)	Average D7 (microns)
WBCW	0 to 700	Very Poor	1191	629	12
WBCW	700 to 950	Fair	759	455	10
WBCW	950 to 1450	Very Poor	1068	587	14
WBCW	1450 to 1850	Fair	780	436	11
WBCW	1850 to 2400	Very Poor	1180	664	16
WBCW	2400 to 3150	Good	525	337	23
WBCW	3150 to 4250	Very Poor	1008	595	6
WBCW	4250 to 5000	Good	595	324	10
EBCW	0 to 625	Failed	1604	977	13
EBCW	625 to 1125	Poor	812	606	14
EBCW	1125 to 2325	Very Poor	1298	794	12
EBCW	2325 to 3125	Fair	703	360	30
EBCW	3125 to 4175	Failed	1303	785	6
EBCW	4175 to 5000	Fair	635	370	13

Table 3: Ranking Based on Average D1 of Design Segments

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	Design Period	AADT	% Heavy Goods Vehicles	Standard Axles per Vehicle	Cumulative no. of Standard Axles
Existing Traffic	20 years	831	3.4	1	300,000
Construction Traffic	1 year	420	4.8	9	70,000
Operational Traffic	20 years	36	16.7	3	130,000
Total Design Traffic					500,000

Table 4: Traffic Design Parameters

Lane	Chainage	Non-national Models
		Overlay Requirements (Wet-mix/Cl. 804)
WBCW	0 to 700	200 mm
WBCW	700 to 950	150 mm
WBCW	950 to 1450	175 mm
WBCW	1450 to 1850	150 mm
WBCW	1850 to 2400	200 mm
WBCW	2400 to 3150	150 mm
WBCW	3150 to 4250	150 mm
WBCW	4250 to 5000	150 mm
EBCW	0 to 625	200 mm
EBCW	625 to 1125	150 mm
EBCW	1125 to 2325	175 mm
EBCW	2325 to 3125	150 mm
EBCW	3125 to 4175	200 mm
EBCW	4175 to 5000	150 mm

Table 5: Wet-mix or Clause 804 Overlay Requirements by Segment

APPENDIX A

D1, SCI and D7 Results

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Local Road from R733 to Great Island			
Westbound Carriageway			
Chainage (metres)	D1(40) (microns)	SCI (microns)	D7 (microns)
0	413	177	13
50	1092	535	13
100	1849	837	16
150	1600	813	12
200	740	382	9
250	926	523	8
300	622	334	8
350	2150	1290	13
400	1294	635	7
450	899	414	13
500	1048	569	11
550	1317	663	16
600	1382	815	9
650	1346	817	14
700	783	491	15
750	803	506	10
800	681	435	12
850	827	458	8
900	699	387	4
950	1115	734	9
1000	1102	604	1
1050	792	492	5
1100	1004	576	0
1150	1151	482	44
1200	890	502	19
1250	846	466	21
1300	1438	652	24
1350	1021	576	8
1400	1320	731	9
1450	763	467	11
1500	904	494	7
1550	502	286	8
1600	407	245	18
1650	995	553	15
1700	1178	638	9
1750	710	379	11
1800	779	425	6
1850	1053	481	26
1900	1210	636	16
1950	1609	814	21
2000	1224	630	6
2050	1076	520	0
2100	1540	893	0
2150	1144	660	13
2200	979	515	13
2250	870	451	10
2300	1289	717	17
2350	991	990	56
2400	717	717	62
2450	601	327	64
2500	633	347	51

Local Road from R733 to Great Island			
Westbound Carriageway			
Chainage (metres)	D1(40) (microns)	SCI (microns)	D7 (microns)
2550	538	276	27
2600	484	251	51
2650	508	186	44
2700	800	414	35
2750	577	306	0
2800	163	139	5
2850	257	192	2
2900	326	222	2
2950	553	349	1
3000	476	344	6
3050	524	438	0
3100	716	548	1
3150	1594	1055	2
3200	583	399	5
3250	1121	637	11
3300	1028	577	8
3350	559	337	5
3400	1293	835	2
3450	1014	625	4
3500	1069	671	6
3550	819	485	8
3600	854	414	4
3650	854	525	8
3700	985	512	5
3750	1232	709	12
3800	933	560	10
3850	912	544	8
3900	911	510	9
3950	1133	652	5
4000	937	468	6
4050	956	566	6
4100	1334	873	1
4150	975	552	1
4200	1078	588	0
4250	514	294	5
4300	594	342	1
4350	596	295	9
4400	681	309	29
4450	673	327	14
4500	467	276	0
4550	487	247	0
4600	507	275	4
4650	501	305	7
4700	475	231	24
4750	501	328	11
4800	892	557	10
4850	705	302	16
4900	689	398	14
4950	497	285	3
5000	734	414	16

Local Road from R733 to Great Island			
Eastbound Carriageway			
Chainage (metres)	D1(40) (microns)	SCI (microns)	D7 (microns)
25	948	511	9
75	1055	571	14
125	3291	2502	15
175	1035	645	5
225	1457	1019	8
275	2074	1282	11
325	2120	1320	23
375	2110	1182	29
425	1874	913	11
475	941	558	15
525	1331	714	7
575	1017	508	13
625	769	421	19
675	698	413	7
725	614	614	20
775	1588	1587	24
825	1050	554	17
875	965	678	4
925	855	478	14
975	675	405	17
1025	627	627	6
1075	279	279	7
1125	1035	1034	11
1175	930	929	35
1225	1713	960	28
1275	334	226	7
1325	1100	639	15
1375	1483	924	8
1425	1046	625	12
1475	995	615	10
1525	1545	952	12
1575	879	587	13
1625	1092	661	13
1675	1408	962	7
1725	1312	740	7
1775	1640	1034	3
1825	1929	1203	17
1875	1066	623	16
1925	1404	754	12
1975	1115	627	13
2025	1777	958	5
2075	1710	977	6
2125	1301	636	10
2175	913	506	9
2225	1541	870	12
2275	1889	1020	13
2325	760	273	39
2375	652	294	63
2425	553	207	59
2475	696	311	63
2525	576	267	32

Local Road from R733 to Great Island			
Eastbound Carriageway			
Chainage (metres)	D1(40) (microns)	SCI (microns)	D7 (microns)
2575	691	316	49
2625	593	257	60
2675	758	319	55
2725	854	414	37
2775	516	319	4
2825	1680	1060	6
2875	347	218	2
2925	611	281	2
2975	628	401	4
3025	584	353	2
3075	746	471	1
3125	1334	891	0
3175	1681	1055	1
3225	1529	1186	2
3275	1581	869	5
3325	1260	720	8
3375	964	565	3
3425	1493	702	5
3475	1257	697	5
3525	1027	616	7
3575	887	481	7
3625	1248	693	10
3675	1244	693	8
3725	1373	768	8
3775	1882	1302	17
3825	1358	694	10
3875	1602	1009	11
3925	1397	969	0
3975	715	383	11
4025	888	550	6
4075	882	516	1
4125	1765	1132	2
4175	884	500	4
4225	869	512	5
4275	495	299	2
4325	642	397	15
4375	550	292	27
4425	719	407	28
4475	664	350	7
4525	775	397	10
4575	825	419	10
4625	575	291	0
4675	755	615	18
4725	585	421	14
4775	614	340	11
4825	40	13	30
4875	610	344	9
4925	653	404	9
4975	536	288	16

Appendix 11. Noise and Vibration

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11.1. Construction Plant Teams and Associated Sound Power Levels

Phase 1

Construction Activity	Plant Items Used	Associated Sound Power Level (dBA)
Site Clearance	Lorry	105
	Dozer	116
	Loader	115
	Dump Truck	110
Grading	Grader	112
	Dozer	116

Phase 2

Construction Activity	Plant Items Used	Associated Sound Power Level (dBA)
Excavation	Lorry x 2	105
	Dozer x 2	116
	Tracked Excavator x 2	116
Pouring Foundations	Concrete Pump x 2	109
	Bored Piling Rig x 2	112
	Compressor	100
	Poker Vibrator x 2	102
	Diesel Generator	92

Phase 3

Construction Activity	Plant Items Used	Associated Sound Power Level (dBA)
Backfilling	Dump Truck	110
	Dozer	116
Excavation	Lorry	105
	Dozer	116
	Tracked Excavator	116
Structural Steelwork	Crane	112
	Compressor	100
	Generator	98

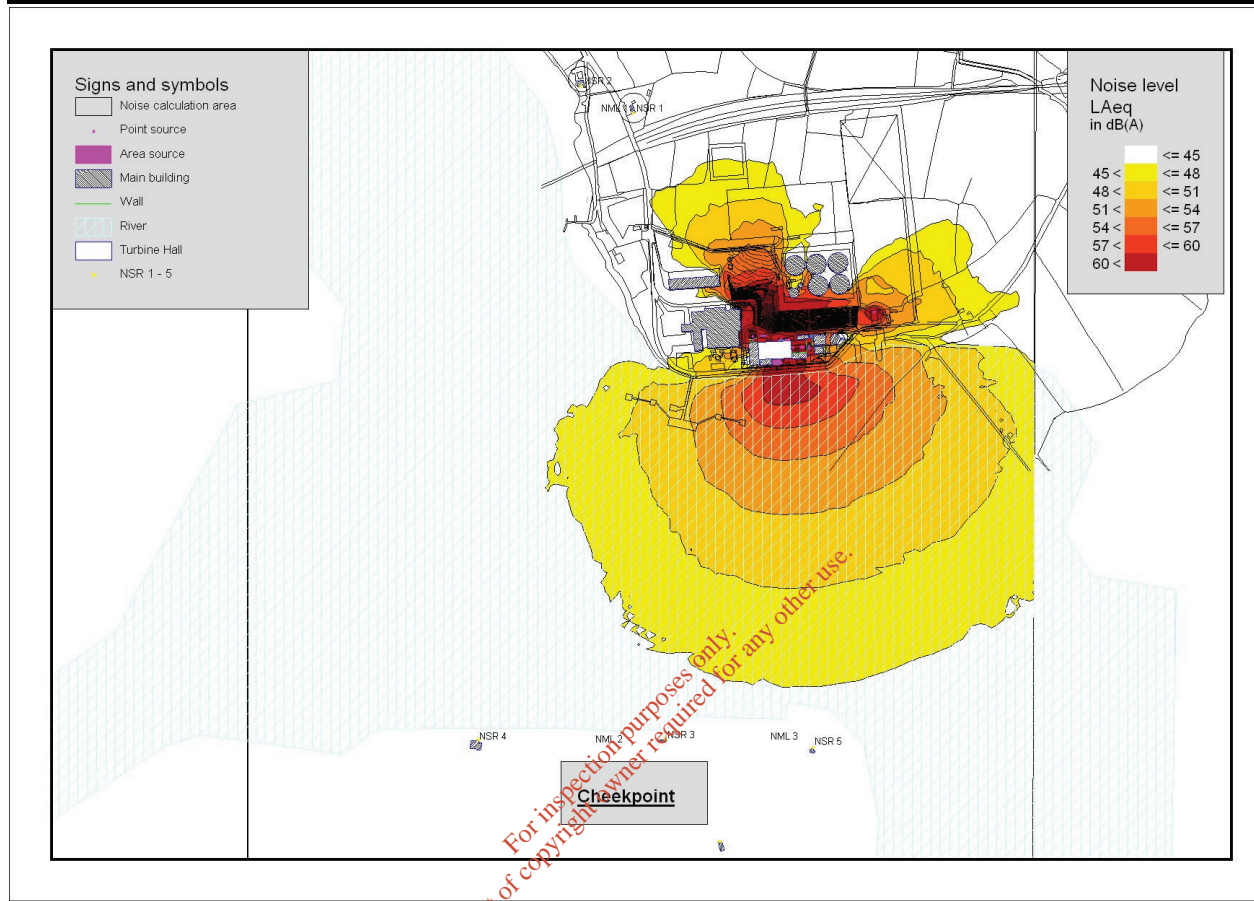
11.2. Operational Plant, Noise Source Levels used in Noise Prediction Model

CCGT Plant Component	31	63	125	250	500	1K	2K	4K	8K	dB (A)
Inlet Filter Face	69.6	88.8	91.9	93.4	96.8	98.0	104.2	91.0	86.9	106.4
Stack Exit 90 degree directivity correction	71.6	91.8	100.9	99.4	89.8	90.0	76.2	67.0	57.9	103.9
Stack breakout	64.6	85.8	91.9	90.4	77.8	73.0	53.2	41.0	33.9	94.9
HRSB inlet	74.6	89.8	99.9	98.4	89.8	91.0	85.2	68.0	48.9	103.1
HRSB body	66.6	85.8	95.9	92.4	83.8	85.0	77.2	60.0	40.9	98.2
HRSB Accessories	66.6	83.8	92.9	94.4	90.8	90.0	79.2	70.0	60.9	98.6
Turbine Compartment Vent Fans	62.6	75.8	93.9	92.4	94.8	95.0	95.2	99.0	93.9	103.8
Exhaust Compartment Vent Fans	63.6	77.8	93.9	93.4	95.8	96.0	91.2	92.0	86.9	102.0
Transformers X 5	65.6	80.8	90.9	95.4	100.8	98.0	94.2	89.0	79.9	104.3
Fin fan coolers X 15	64.1	75.3	83.4	90.9	83.3	83.5	76.7	70.5	61.4	93.0
AGI										93.0
Turbine Hall internal noise level										85.0

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11.3. Noise Contours Normal Operation at 1.8m height

Figure 11.1 Noise Contours Normal Operation at 1.8m height



Appendix 12. Flora and Fauna

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12.1. Designated Conservation Sites - Site Synopses

SITE NAME: BARROW RIVER ESTUARY

SITE CODE: 000698

This site comprises the lower and upper tidal reaches of the river Barrow before it enters Waterford Harbour. It extends from St. Mullins in Co. Carlow to Cheek Point in Co. Waterford (approximately 20-25 kilometres) and includes both sides of the river.

The tidal river and estuary supports populations of the protected (EU Habitats Directive 92/43/EEC) Twaite Shad (*Alosa fallax fallax*) which spawn in selected areas.

At the northern and south western sections of the site the very steep valley sides are rocky and support deciduous woodland with Oak (*Quercus* sp.), Ash (*Fraxinus excelsior*) or Hazel (*Corylus avellana*) alternatively dominant. There is a healthy under storey composed of abundant Holly (*Ilex aquilinum*) and a ground layer of ferns (*Dryopteris* and *Polystichum* spp.), Bluebell (*Hyacinthoides non-scripta*), Violet (*Viola riviniana*), Wood Sorrel (*Oxalis acetosella*) and Ivy (*Hedera helix*).

There is also a narrow band of wet woodland at the base of the steep slopes and along old embankments. They are Willow (*Salix* spp.) dominant with occasional Alder (*Alnus glutinosa*), Birch (*Betula* sp) and some Oak (*Quercus* sp.) - possibly on drier areas of the embankments.

Along the mid and southern side of the estuary, saltmarshes and saltmeadows have developed on the sediment which has accumulated at the mouths of incoming streams and inlets. Being far from the open sea, the saline influence is somewhat restricted and rather grassy communities have developed with an abundance of Red Fescue (*Festuca rubra*), some Hard Grass (*Parapholis strigosa*), and sea sedges (*Carex distans* and *C. extensa*). Other species seen include Sea couch (*Elymus pycnanthus*), Sea Aster (*Aster tripolium*), Sea arrowgrass (*Triglochin maritima*) and Sea Club-rush (*Scirpus maritimus*).

At Alderton the saltmarsh grades into freshwater swamp with some trees, mostly Willows (*Salix* spp.). Common Meadow-rue (*Thalictrum flavum*) and Water Dropwort (*Oenanthe fistulosa*) are among the more interesting species.

The Rare plant species Divided Sedge (*Carex divisa*) was considered extinct in Ireland until 1990 when it was recorded from several sites along the Barrow estuary.

Borrer's Salt-marsh Grass (*Puccinellia fasciculata*), a species legally protected under the Flora Protection Order 1987, is found at several locations in this site. This tufted perennial grass of salt marshes and estuaries is restricted to southern and eastern Ireland. Another Rare and protected species, Meadow Barley (*Hordeum secalinum*), occurs at several locations on this site. The overall distribution of this species is declining due to reclamation and embankment of lands fringing estuaries. At the northern end of the site the legally protected Nettle-leaved bellflower (*Campanula trachelium*) is found in two locations. This species is confined to the river valleys of the Barrow and Nore where it is found in grassy patches below damp woodland. It is declining due to amenity pressures along river banks where it was found.

The Lower River Barrow is a regionally important site for wintering wildfowl and waders resulting in the following numbers: Shelduck 39; Wigeon 64; Teal 114; Oystercatcher 127; Golden Plover 300; Lapwing 859; Dunlin 720; Curlew 296; Redshank 132 (all counts average peaks in one season 1984/85-86/87).

Peregrine falcon (*Falco peregrinus*), a species listed in Annex 1 of the EU Birds Directive and in the Red Data Book as being threatened in Ireland, breeds within the site (West side). Phenomenal populations of Swallow, roost in the reed beds at Stokestown below New Ross.

The saltmarshes and salt meadows are under threat from agricultural improvement. Some have been extensively improved and are excluded from the site while others, though improved, still support pockets where the rare and protected species occur. This site is important because environmental factors have allowed plant communities to develop here that are found nowhere else in the country. Three legally protected plant species are found, and another rare species (*Carex divisa*) has its only known Irish station here. The presence of Rare, Red Data Book fish and of Peregrine Falcon is also notable.

19.12.1995

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SITE NAME: RIVER BARROW AND RIVER NORE

SITE CODE: 002162

This site consists of the freshwater stretches of the Barrow/Nore River catchments as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlinton, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also runs through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

The site is a candidate SAC selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, 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, Nore Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter, Desmoulin's Whorl Snail *Vertigo moulinsiana* and the Killarney Fern.

Good examples of Alluvial Forest are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Grey Willow (*S. cinerea*), Crack Willow (*S. fragilis*), Osier (*S. viminalis*), with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*). Three rare invertebrates have been recorded in this habitat at Murphy's of the River. These are: *Neoascia obliqua* (Diptera: Syrphidae), *Tetanocera freyi* (Diptera: Sciomyzidae) and *Dictya umbrarum* (Diptera: Sciomyzidae).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the EU Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Cratoneuron commutatum* var. *commutatum* and *Eucladium verticillatum*, have been recorded.

The best examples of old Oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland.

Historical records show that Park Hill has been continuously wooded since the sixteenth century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides*. It has a typical bird fauna including Jay, Long-eared Owl and Raven. A rare invertebrate, *Mitostoma chrysomelas*, occurs in Abbeyleix and only two other sites in the country. Two flies *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by Oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Birch (*Betula pubescens*) with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*) Wood Rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore about 5 km west of New Ross, in County Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of a relatively undisturbed, relict Oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown a small, mature Oak-dominant woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Cow-wheat (*Melampyrum* spp.) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broad-leaved woodland in very good condition. There is quite a high degree of natural re-generation of Oak and Ash through the woodland. At the northern end of the estate Oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly Oak species. The woods have a well established understorey of Holly (*Ilex aquifolium*), and the herb layer is varied, with Brambles abundant. Whitebeam (*Sorbus devoniensis*) has also been recorded.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (*Filipendula ulmaria*), Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places.

Floating River Vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include Water Starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), Milfoil (*Myriophyllum* spp.), *Potamogeton x nitens*, Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and Crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry Heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken (*Pteridium aquilinum*) and Gorse (*Ulex europaeus*) species with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*),

Foxglove (*Digitalis purpurea*), Common Sorrel (*Rumex acetosa*) and Bent Grass (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobancha rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry (*Vaccinium myrtillus*) and Wood Rush (*Luzula sylvatica*) are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of Clover species including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry Heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabriskey, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather (*Calluna vulgaris*), Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Saltmeadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites*) beds, and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) (Flora Protection Order, 1987) are found. The very rare Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Sea Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Salicornia and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places is over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polycats and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, Willow herb (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs. This area supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

The dunes which fringe the strand at Duncannon are dominated by Mar ram grass (*Haemophilia are aria*) towards the sea. Other species present include Wild Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift (*Armeria maritima*), Rock Sapphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reed swamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge (*Carex divisa*), Clustered Clover (*Trifolium glomeratum*), Basil Thyme (*Acinos arvensis*), Hemp nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh Grass (*Puccinellia fasciculata*), Meadow Barley (*Hordeum secalinum*), Opposite-leaved Pondweed (*Groenlandia densa*), Autumn Crocus (*Colchicum autumnale*), Wild Sage (*Salvia verbenaca*), Nettle-leaved Bellflower (*Campanula trachelium*), Saw-wort (*Serratula tinctoria*), Bird Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Broomrape (*Orobanche hederæ*) and Greater Broomrape (*Orobanche rapum-genistæ*). Of these the first nine are protected under the Flora Protection Order 1999. Divided Sedge (*Carex divisa*) was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge (*Carex strigosa*), Field Garlic (*Allium oleraceum*) and Summer Snowflake (*Leucojum aestivum*). Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria*. The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of EU Habitats Directive Annex II animal species including Freshwater Pearl Mussel (*Margaritifera margaritifera* and *M. m. durrovensis*), Freshwater Crayfish (*Austropotamobius pallipes*), Salmon (*Salmo salar*), Twaite Shad (*Alosa fallax fallax*), three Lamprey species, Sea (*Petromyzon marinus*), Brook (*Lampetra planeri*) and River (*Lampetra fluviatilis*), the marsh snail *Vertigo moulinsiana* and Otter (*Lutra lutra*). This is the only site in the world for the hard water form of the Pearl Mussel *M. m. durrovensis* and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (*Myotis daubentoni*), Badger (*Meles meles*), Irish Hare (*Lepus timidus hibernicus*) and Frog (*Rana temporaria*). The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater Mussel species, *Anodonta anatina* and *A. cygnea*.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country.

Landuse at the site consists mainly of agricultural activities – many intensive, principally grazing and silage production. Slurry is spread over much of this area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of Habitats Directive Annex II animal species within the site. 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 main rivers and their 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. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

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, overgrazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

Overall, the site 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. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Pearl Mussel which is limited to a 10 km stretch of the Nore, add further interest to this site.

6.10.2006

SITE NAME: LOWER RIVER SUIR

SITE CODE: 002137

This site consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The Suir and its tributaries flow through the counties of Tipperary, Kilkenny and Waterford. Upstream of Waterford city, the swinging meanders of the Suir criss-cross the Devonian sandstone rim of hard rocks no less than three times as they leave the limestone-floored downfold below Carrick. In the vicinity of Carrick-on-Suir the river follows the limestone floor of the Carrick Syncline. Upstream of Clonmel the river and its tributaries traverse Upper Palaeozoic Rocks, mainly the Lower Carboniferous Visean and Tournaisian. The freshwater stretches of the Clodiagh River in Co. Waterford traverse Silurian rocks, through narrow bands of Old Red Sandstone and Lower Avonian Shales before reaching the carboniferous limestone close to its confluence with the Suir. The Aherlow River flows through a Carboniferous limestone valley, with outcrops of Old Red Sandstone forming the Galtee Mountains to the south and the Slievenamuck range to the north. Glacial deposits of sands and gravels are common along the valley bottom, flanking the present-day river course.

The site is a candidate SAC selected for the presence of the priority habitats on Annex I of the E.U. Habitats Directive - alluvial wet woodlands and Yew Wood. The site is also selected as a candidate SAC for floating river vegetation, Atlantic salt meadows, Mediterranean salt meadows, old oak woodlands and eutrophic tall herbs, 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 and Otter.

Alluvial wet woodland is declining habitat in Europe as a result of drainage and reclamation. The best examples of this type of woodland in the site are found on the islands just below Carrick-on-Suir and at Fiddown Island. Species occurring here include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Grey Willow (*S. cinerea*), Osier (*S. viminalis*), with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Angelica (*Angelica sylvestris*), Pendulus Sedge (*Carex pendula*), Meadowsweet (*Filipendula ulmaria*) and Valerian (*Valeriana officinalis*). The terrain is littered with dead trunks and branches and intersected with small channels which carry small streams to the river. The bryophyte and lichen floras appear to be rich and require further investigation. A small plot is currently being coppiced and managed by National Parks and Wildlife. In the drier areas the wet woodland species merge with other tree and shrub species including Ash (*Fraxinus excelsior*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*). This adds further to the ecological interest of this site.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (*Filipendula ulmaria*), Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*).

Old oak woodlands are also of importance at the site. The best examples are seen in Portlaw Wood which lies on both sides of the Clodiagh River. On the south-facing side the stand is more open and the Oaks (mainly *Quercus robur*) are well grown and spreading. Ivy (*Hedera helix*) and Bramble (*Rubus fruticosus*) are common on the ground, indicating relatively high light conditions. Oak regeneration is dense, varying in age from 0-40 years and Holly (*Ilex aquifolium*) is fairly

common but mostly quite young. Across the valley, by contrast, the trees are much more closely spaced and though taller are poorly grown on average. There are no clearings; large Oaks extend to the boundary wall. In the darker conditions, Ivy is much rarer and Holly much more frequent, forming a closed canopy in places. Oak regeneration is uncommon since there are as yet few natural clearings. The shallowness of the soil on the north-facing slope probably contributes to the poor tree growth there. The acid nature of the substrate has induced a "mountain" type Oakwood community to develop. There is an extensive species list present throughout including an abundance of mosses, liverworts and lichens. The rare lichen *Lobaria pulmonaria*, an indicator of ancient woodlands, is found.

Inchinquillib Wood consists of three small separate sloping blocks of woodland in a valley cut by the young Multeen River and its tributaries through acidic Old Red Sandstone, and Silurian rocks. Two blocks, both with an eastern aspect, located to the north of the road, are predominantly of Sessile oak (*Quercus petraea*) and Hazel, with Downy Birch (*Betula pubescens*), Ash and Holly. The ground flora is quite mixed with for example Wood sedge (*Carex sylvatica*), Bluebell (*Hyacinthoides non-scriptus*), Primrose (*Primula vulgaris*), Wood-sorrel (*Oxalis acetosella*), Pignut (*Conopodium majus*) and Hard fern (*Blechnum spicant*). The base poor nature of the underlying rock is, to some extent masked by the overlying drift. The third block, to the south of the road, and with a northern aspect, is a similar although less mature mixture of Sessile Oak, Birch and Holly, the influence of the drift is more marked, with the occurrence of Wood anemone (*Anemone nemorosa*) amongst the ground flora.

Floating river vegetation is evident in the freshwater stretches of the River Suir and along many of its tributaries. Typical species found include Canadian Pondweed (*Elodea canadensis*), Milfoil (*Myriophyllum* spp.), Fennel Pondweed (*Potamogeton pectinatus*), Curled Pondweed (*P. crispus*), Perfoliate Pondweed (*P. perfoliatus*), Pond Water-crowfoot (*Ranunculus peltatus*), other Crowfoots (*Ranunculus* spp.) and the moss *Fontinalis antipyretica*. At a couple of locations along the river, Opposite-leaved Pondweed (*Groenlandia densa*) occurs. This species is protected under the Flora (Protection) Order, 1999.

The Aherlow River is fast-flowing and mostly follows a natural unmodified river channel. Submerged vegetation includes the aquatic moss *Fontinalis antipyretica* and Stream Water-crowfoot (*Ranunculus pencillatus*), while shallow areas support species such as Reed Canary-grass (*Phalaris arundinacea*), Brooklime (*Veronica beccabunga*) and Water Mint (*Mentha aquatica*). The river bank is fringed in places with Alder (*Alnus glutinosa*) and Willows (*Salix* spp.).

The Multeen River is fast flowing, mostly gravel-bottomed and appears to follow a natural unmodified river channel. Water Crowfoots occur in abundance and the aquatic moss *Fontinalis antipyretica* is also common. In sheltered shallows, species such as Water-cress (*Rorippa nasturtium-aquaticum*) and Water-starworts (*Callitriche* spp.) occur. The river channel is fringed for most of its length with Alder, Willow and a narrow strip of marshy vegetation.

Salt meadows occur below Waterford City in old meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing rivers below Little Island. There are very narrow, non-continuous bands of this habitat along both banks. More extensive areas are also seen along the south bank at Ballynakill, the east side of Little Island, and in three large salt meadows between Ballynakill and Cheekpoint. The Atlantic and Mediterranean sub types are generally intermixed. The species list is extensive and includes Red Fescue (*Festuca rubra*), Oraches (*Atriplex* spp.), Sea Aster (*Aster tripolium*), Sea Couch Grass (*Elymus pycnanthus*), frequent Sea Milkwort (*Glaux maritima*), occasional Wild Celery (*Apium graveolens*), Parsley Water-dropwort (*Oenanthe lachenalii*), English Scurvygrass (*Cochlearia anglica*) and Sea Arrowgrass (*Triglochin maritima*). These species are more representative of the Atlantic sub-type of the habitat. Common Cord-grass (*Spartina anglica*), is rather frequent along

the main channel edge and up the internal channels. The legally protected (Flora (Protection) Order, 1999) Meadow Barley (*Hordeum secalinum*) grows at the landward transition of the saltmarsh. Sea Rush (*Juncus maritimus*), an indicator of the Mediterranean salt meadows, also occurs.

Other habitats at the site include wet and dry grassland, marsh, reed swamp, improved grassland, coniferous plantations, deciduous woodland, scrub, tidal river, stony shore and mudflats. The most dominant habitat adjoining the river is improved grassland, although there are wet fields with species such as Yellow Flag (*Iris pseudacorus*), Meadow Sweet (*Filipendula ulmaria*), Rushes (*Juncus* spp.), Meadow Buttercup (*Ranunculus acris*) and Cuckoo Flower (*Cardamine pratensis*).

Cabragh marshes, just below Thurles, lie in a low-lying tributary valley into which the main river floods in winter. Here there is an extensive area of Common Reed (*Phragmites australis*) with associated marshland and peaty fen. The transition between vegetation types is often well displayed. A number of wetland plants of interest occur, in particular the Narrow-leaved Bulrush (*Typha angustifolia*), Bottle Sedge (*Carex rostrata*) and Blunt-flowered Rush (*Juncus subnodulosus*). The marsh is naturally eutrophic but it has also the nutritional legacy of the former sugar factory which discharged into it through a number of holding lagoons, now removed. Production is high which is seen in the size of such species as Celery-leaved Buttercup (*Ranunculus sceleratus*) as well as in the reeds themselves.

Throughout the Lower River Suir site are small areas of woodland other than those described above. These tend to be a mixture of native and non-native species, although there are some areas of semi-natural wet woodland with species such as Ash and Willow. Cahir Park Woodlands is a narrow tract of mixed deciduous woodland lying on the flat-lying floodplain of the River Suir. This estate woodland was planted over one hundred years ago and it contains a large component of exotic tree species. However, due to original planting and natural regeneration there is now a good mix of native and exotic species. About 5km North West of Cashel, Ardmayle pond is a long, possibly artificial water body running parallel to the River Suir. It is partly shaded by planted Lime (*Tilia* hybrids), Sycamore (*Acer pseudoplatanus*) and the native Alder. Growing beneath the trees are shade tolerant species such as Remote sedge (*Carex remota*).

The site is of particular conservation interest for the presence of a number of Annex II animal species, including Freshwater Pearl Mussel (*Margaritifera margaritifera* and *M. m. durrovensis*), Freshwater Crayfish (*Austropotamobius pallipes*), Salmon (*Salmo salar*), Twaite Shad (*Alosa fallax fallax*), three species of Lampreys - Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*) and River Lamprey (*Lampetra fluviatilis*) and Otter (*Lutra lutra*). This is one of only three known spawning grounds in the country for Twaite Shad.

The site also supports populations of several other animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (*Myotis daubentoni*), Natterer's Bat (*M. nattereri*), Pipistrelle (*Pipistrellus pipistrellus*), Pine Marten (*Martes martes*), Badger (*Meles meles*), the Irish Hare (*Lepus timidus hibernicus*), Smelt (*Osmerus eperlanus*) and the Frog (*Rana temporaria*). Breeding stocks of Carp are found in Kilsheelan Lake. This is one of only two lakes in the country which is known to have supported breeding Carp. Carp require unusually high summer water temperatures to breed in Ireland and the site may therefore support interesting invertebrate populations.

Parts of the site have also been identified as of ornithological importance for a number of Annex I (EU Birds Directive) bird species, including Greenland White-fronted Goose (10), Golden Plover (1490), Whooper Swan (7) and Kingfisher. Figures given in brackets are the average maximum counts from 4 count areas within the site for the three winters between 1994 and 1997. Wintering populations of migratory birds use the site. Flocks are seen in Coolfinn Marsh and also along the reedbeds and saltmarsh areas of the Suir. Coolfinn supports nationally important numbers of

Greylag Geese on a regular basis. Numbers between 600 and 700 are recorded. Other species occurring include Mallard (21), Teal (159), Widgeon (26), Tufted Duck (60), Pintail (4), Pochard (2), Little Grebe (2), Black-tailed Godwit (20), Oystercatcher (16), Lapwing (993), Dunlin (101), Curlew (195), Redshank (28), Greenshank (4) and Green Sandpiper (1). Nationally important numbers of Lapwing (2750) were recorded at Faithlegg in the winter of 1996/97. In Cabragh marshes there is abundant food for surface feeding wildfowl which total at 1,000 or so in winter. Widgeon, Teal and Mallard are numerous and the latter has a large breeding population - with up to 400 in summer. In addition, less frequent species like Shoveler and Pintail occur and there are records for both Whooper and Bewick's swans.

Kingfisher, a species that is listed on Annex I of the EU Birds Directive, occurs along some of the many tributaries throughout the site.

Landuse at the site consists mainly of agricultural activities including grazing, silage production, fertilising and land reclamation. The grassland is intensively managed and the rivers are therefore vulnerable to pollution from run-off of fertilisers and slurry. Arable crops are also grown. Fishing is a main tourist attraction on stretches of the Suir and some of 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. The Aherlow River is a designated Salmonid Water under the EU Freshwater Fish Directive. Other recreational activities such as boating, golfing and walking are also popular. Several industrial developments, which discharge into the river, border the site including three dairy related operations and a tannery.

The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitat Alluvial Forest. The site also supports populations of several Annex II animal species and a number of Red Data Book animal species. The presence of two legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the river add further to the ecological interest of this site.

6.10.2006

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SITE NAME: BALLYKELLY MARSH

SITE CODE: 000744

This site combines an arable field with a high quality wetland site. The arable field contains a rare arable weed community including the protected flora species *Fuckria elatine*. Adjacent to this field is a small species rich lake and fen area. Such small wetlands are characteristic of the South-East of Ireland but are decreasing rapidly due to drainage and land reclamation.

15th February, 1995. □

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SITE NAME: LOUGH CULLIN

SITE CODE: 000406

Lough Cullin is the only natural lake in south Kilkenny and occupies a low-lying depression 6km north of Waterford. Streams enter the basin from the NW, NE and SE and cause considerable flooding in most winters. The outflow is sluggish towards Dunkitt and the Suir though here and elsewhere there has been work to deepen the channel.

Although formerly peat-filled, at least in parts, there is now little evidence of peat in the area except in the soil and some fen vegetation on the eastern side of the lake and in the frequent use of bog oak in the fences. Generally the area consists of wet grassland made up of Creeping Bent (*Agrostis stolonifera*) with Tufted Hair Grass (*Deschampsia cespitosa*), marsh Ragwort (*Senecio aquaticus*) and Creeping Buttercup (*Ranunculus repens*). Where peat remains there is often a component of sedges (*Carex panicea*, *C. nigra*, *C. demissa*) as well as Meadowsweet (*Filipendula ulmaira*), Reed Fescue (*Festuca arundinacea*) and Devilsbit (*Succisa pratensis*). Cinquefoils (*Potentilla palustris*, *P. reptans*) and rushes (*Juncus acutiflorus*, *J. bulbosus*) are occasional.

Most of the fields within the site are grazed though some are cut for silage and, rarely, tilled for cereals despite the winter flooding. The only area of semi-natural vegetation occurs east of the lake and within the lake itself. The fens here include much Reed Fescue as well as Loosestrifes (*Lythrum salicaria*, *Lysimachia nemorum*), Meadowsweet and Wild Angelica (*Angelica sylvestris*), Bottle Sedge (*Carex rostrata*) and Reed (*Phragmites australis*) grow near drains and around the lakeshore where they are joined by Narrow-leaved Bulrush (*Typha angustifolia*) in its only Kilkenny station, by Bur Reeds (*Sparganium erectum*, *S. minimum*) and by Bur Marigold (*Bidens cernua*).

The main interest of the site lies in its flowering plants some of which are rare in the Kilkenny and Waterford region. There is also a high population of snipe in winter as well as smaller numbers of curlew, lapwing and mallard. In summer sedge warbler and reed bunting breed.

15th February, 1995. Roger Goodyllie.

SITE NAME: KING'S CHANNEL

SITE CODE: 001702

King's Channel is an offshoot of the Suir Estuary below Waterford which surrounds the triangular Little Island. It is relatively deep and at low water retains a broad channel between mudbanks. The channel itself is not of significant interest except to a few cormorant and other seabirds but the southern shore is lined in places by a flat saltmarsh. Parts of this, for example at Ballynakill, Knockboy and Ballycanvan have been reclaimed but some remains intact today, despite its proximity to Waterford.

The saltmarsh is best developed in Grantstown NE of St. Thomas's Church where there is a nice sequence of communities up from the channel. Saltmarsh Grass (*Puccinellia maritima*), Red Fescue (*Festuca rubra*) and Saltmarsh Rush (*Juncus gerardii*) are important on the sea side with Sea Spurrey (*Spergularia media*, *S. marina*) and Sea Milkwort (*Glaux maritima*). Above this zone Sea Rush (*J. maritimus*) becomes dominant including between its tufts much Parsley Water Dropwort (*Oenanthe lachenalii*), Scurvy Grass (*Cochlearia officinalis*) and Wild Celery (*Apium graveolens*). Finally Reed (*Phragmites australis*) and Sea Clubrush (*Bolboschoenus maritimus*) take over where land water is ponded at the base of a slope. Tasselweed (*Rupia spiralis*) occurs in a pool here. A point of interest in the middle zone is the occurrence of a few clumps of the rare and protected (Flora Protection Order, 1987) Meadow Barley (*Hordeum secalinum*) which has disappeared from the great majority of grazing marshes elsewhere. It also occurs on the shore north of Belmont House which is the other main part of this site. The latter site has Strawberry Clover (*Trifolium fragiferum*), Reed Fescue (*Festuca arundinacea*) and Fox sedge (*Carex otrubae*) in addition.

These sites lie below areas being developed for housing, offering either an asset or a liability depending on the circumstances.

13 February, 1995.

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SITE NAME: BALLYHACK

SITE CODE: 000695

Ballyhack is situated at the mouth of the River Suir, 1km west of Arthurstown in Co.Wexford. Old Red Sandstone underlies this hillside site and a number of interesting plant communities grow among the rock outcrops.

A small area of dry heath, a habitat listed on Annex I of the EU Habitats Directive, which is dominated by Gorse (*Ulex europaeus*), occurs on the site. Patches of lowland dry grassland are also present, these support a number of Clover species including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*. Furthermore, the bedrock shore is of geological interest and is used by geologists for teaching.

Ballyhack encompasses, in a small area, a variety of habitats which are not frequent in south-east Ireland. The site is also rich in species and contains one of only two stations known for the Clustered Clover in the country.

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SITE NAME: DUNCANNON SANDHILLS

SITE CODE: 001738

This site is one of a series of sites on the estuary of the River Barrow which demonstrates a variety of coastal types. The Duncannon Sandhills site comprises Duncannon Strand and the freshwater marsh in the valley to the east in Shanacloon Townland.

The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift (*Armeria maritima*), Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

The dunes which fringe the strand are dominated by Marram grass (*Ammophila arenaria*) towards the sea. Other species present include Wild Sage (*Salvia verbenaca*), a rare species listed in the Irish Red Data Book.

The marsh to the east is situated in a narrow valley and is dominated by Common Reed (*Phragmites australis*) which gives way to areas of Soft Rush (*Juncus effusus*) and Tufted Hair-grass (*Deschampsia cespitosa*). Two notable components of the marsh are the sedges, Greater Pond-sedge (*Carex riparia*) and Greater Tussock-sedge (*Carex paniculata*).

16.2.1995

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SITE NAME: BELLE LAKE

SITE CODE: 000659

The south east of Ireland has comparatively few lakes; Belle Lake is one of the larger of them. It is an attractive lake which lies at about 50m above sea level, 7 km south east of Waterford city. The water of the lake is clear and quite rich in calcium, which makes the occurrence of two rare aquatic plant species; Quillwort, (*Isoetes lacustris*) and Waterwort (*Elatine hexandra*) all the more notable - these are species more normally associated with acidic, calcium deficient lakes. A wide variety of other aquatic plants also grow in the lake including at least 4 species of Pondweed (*Potamogeton* spp.). The north end of the lake is rocky and the shore slopes steeply, here the low growing species; Shore weed (*Littorella uniflora*) and Spike rush are the main emergent species. However there are patches of tall emergent swamp on the east shore, and a thick zone of reedswamp on the less steeply sloping, more sheltered, muddy shore typical of the west of the lake. This is mainly of Common reed (*Phragmites australis*), but also includes stands of the rare Lesser Reedmace (*Typha angustifolia*). This reed fringe is continuous with a large reedbed to the south of the lake which has occasional Willows (*Salix* spp.) throughout, and an Alder (*Alnus glutinosa*) and Willow woodland at its western end. The inclusion of a small Ash (*Fraxinus excelsior*) and Oak (*Quercus* sp.) woodland on the northeastern shore adds to the diversity of habitats represented on site. As for any substantial lake and reedbed this is an important site for birds. In particular the lake is used by regionally important numbers of Whooper swan. This is one of the few extensive water bodies in south east Ireland and as such is of great importance within the region. It has a varied aquatic and wetland flora that is of scenic as well as scientific interest.

13 February, 1995

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SITE NAME: WATERFORD HARBOUR

SITE CODE: 000787

The estuary of the Rivers Barrow, Nore and Suir discharge below Passage East into what is known as Waterford Harbour. Structurally it is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

This site is of conservation importance for the extensive and good quality intertidal sand and mudflats, a habitat listed under Annex I of the EU Habitats Directive. These flats have developed on a linear shelf on the western side, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*.

The shore itself is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here into which willows (*Salix* spp.) are slowly spreading. At the edges a tall fen, dominated by sedges (*Carex* spp.), Meadowsweet (*Filipendula ulmaria*), Willowherb (*Epilobium* spp.) and rushes (*Juncus* spp.), extends for some distance, especially along the northern side. Wet woodland also occurs, dominated by Alder (*Alnus glutinosa*) and willow, grading into Ash (*Fraxinus excelsior*), Oak (*Quercus* sp.) and Blackthorn (*Prunus spinosa*) on drier ground. This area supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail. A more open marsh occurs at the south end of the site behind Fornaght Strand. Here there remains a saline influence and Sea Club-rush (*Scirpus maritimus*) is the dominant species, merging into Meadowsweet and Hair-grass (*Deschampsia* sp.) around the margin.

The intertidal habitats are used by important numbers of wading birds during winter, as well as by small numbers of wildfowl. The populations of Oystercatcher (939), Lapwing (2,141) and Bar-tailed Godwit (216) are of national importance (figures are for winter 1994/95 to 1996/97). Other species which occur include Golden Plover, Sanderling, Dunlin, Black-tailed Godwit, Curlew and Redshank. At high tide, species such as Cormorant and Red-breasted Merganser feed in the shallow waters. The occurrence of Bar-tailed Godwit and Golden Plover is of note as these species are listed on Annex I of the EU Birds Directive.

16.2.2000

SITE NAME: BOLEY FEN

SITE CODE: 000699

Boley Fen is located at Rathumney, approximately 5 km east of Campile. It comprises of intermediate fen with wet grassland and tall sedge (*Carex* spp.) communities with encroaching scrub, mainly willows (*Salix* spp.). Areas of the site have been afforested.

The site is of interest due to its location; fens are uncommon in south-east Ireland. More importantly, it is noted as nationally important for the following rare species of Diptera (flies): *Anasimyia lunulata*, *Psacadina zernyi*, *Parhelophilus consimilis*, *Pteromicra angustipennis* and *Tetanocera punctifrons*.

15 February, 1995

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SITE NAME: TRAMORE DUNES AND BACKSTRAND

SITE CODE: 000671

This composite coastal site lies at the head of Tramore Bay, east of Tramore, County Waterford. The Tramore dunes (Burrow) are the result of a classic inshore process - the growth of a spit of shingle and sand across a shallow bay. Behind the spit lies the Back Strand which dries out at low tide and is connected to the open sea by narrows at Rinneshark. The Burrow has a narrow neck and expands eastwards. Longshore drift is from the west so any loose material accumulates at the tip, which is hooked, and on the opposing spit at Bass Point.

The dunes here are well-developed and contain several habitats listed on Annex I of the EU Habitats Directive, including the priority habitat fixed dune. There are high ridges and valleys, old stabilised surfaces and new foredunes at shore level. Consequently all the major vegetation types are found from the strand flora, through mobile embryonic and marram dunes to stable fixed dunes, with saltmarsh on the northern fringe and slacks at Bass Point.

The flora of the fixed dunes is not as species-rich as at other systems, due mainly to the absence of grazing. This has led to the development of tall, rank dune grassland and in places the development of dune scrub. Nevertheless, most of the characteristic dune species of the south-east are found, including Marram (*Ammophila arenaria*), which is dominant over much of the system, Wild Thyme (*Thymus praecox*), Common Bird's-foot-trefoil (*Lotus corniculatus*), Lady's Bedstraw (*Galium verum*), Rest Harrow (*Ononis repens*), Fairy Flax (*Linum catharticum*) and Red Fescue (*Festuca rubra*). The moss *Tortula ruraliformis*, which is characteristic of fixed dune areas, is common in the dune turf. In some areas there is a shrubby community, with Wild Privet (*Ligustrum vulgare*) and Dewberry (*Rubus caesius*) being dominant. Bee Orchid (*Ophrys apifera*), a Red Data Book species, has been recorded recently from the fixed dune grassland, while there are isolated patches of Wild Asparagus (*Asparagus officinalis* ssp. *prostratus*), a species protected under the Flora (Protection) Order 1999.

Salt marsh, another habitat on Annex I of the EU Habitats Directive, is well developed and fairly extensive in the sheltered inner part of the site. It is the lagoon type of salt marsh, which is the rarest type in Ireland. The communities found are characteristic of both Atlantic and Mediterranean salt marshes. The main species include Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Lavender (*Limonium humile*), Sea Plantain (*Plantago maritima*), Sea Aster (*Aster trifolium*), Sea Puslane (*Halimione portulacoides*) and Sea Rush (*Juncus maritimus*). The scarce Hard-grass (*Parapholis strigosa*) occurs and a feature of this salt marsh is the presence of Golden Samphire (*Inula crithmoides*), a species rarely found on salt marshes in Ireland. Glasswort (*Salicornia* spp.) and other annuals such as Sea Blite (*Suaeda maritima*) occur in channels and pans and also onto the mudflats. Cord-grass (*Spartina anglica*) is frequent on parts of the salt marshes and on the mudflats.

The intertidal mud flats and sand flats are another important habitat listed on Annex I of the EU Habitats Directive. The macrofauna is well developed, with Lugworm (*Arenicola marina*), Furrow Shell (*Scrobicularia plana*), Ragworm (*Hediste diversicolor*) and Cockle (*Cerastoderma edule*) being common, and with large patches of Mussel (*Mytilus edulis*) and Periwinkles (*Littorina littorea*) also present. A feature of this habitat is the presence of Eelgrass (*Zostera noltii* and *Z. angustifolia*).

Several rare plants have been recorded from Tramore. It is the only site in the country where the Red Data Book plant Sea Knotgrass (*Polygonum maritimum*) has grown, though it is sporadic in appearance. Other Red Data Book species which have been reported include Lesser Centaury (*Centaureum pulchellum*) and Cottonweed (*Otanthus maritimus*), both of which are listed on the Flora (Protection) Order, 1999, Sharp-leaved Fluellen (*Kickxia elatine*), Sea-kale (*Crambe maritima*) and Spring Vetch (*Vicia lathyroides*).

The Back Strand is an area of great importance for waterfowl on the south coast and is a designated SPA. The following figures are the average counts obtained during three seasons between 1994/95 and 1996/97. Brent Geese (482) occur in numbers which are of international significance. Six further species occur in

Proposed Power Plant at Great Island, Co. Wexford
25755400007N

nationally important numbers: Golden Plover (3,100), Grey Plover (261), Dunlin (1,970), Sanderling (53), Black-tailed Godwit (271) and Bar-tailed Godwit (405). Both Golden Plover and Bar-tailed Godwit are listed on Annex I of the EU Birds Directive.

The main threat to the stability of the dune habitats is from recreational pressures, with heavy usage of the site due to its proximity to Tramore. Already some large blow-outs and areas of bare sand are present. Driftline and shingle vegetation is also under pressure from heavy usage of the beach area. The intertidal and saltmarsh habitats are not under significant threat though possible seepage from the landfill site is a potential threat.

Tramore is of major ecological importance for the range of good quality coastal habitats which occur, including fixed dunes, which are listed as a priority habitat on Annex I of the European Habitats Directive. The site has a remarkably rich flora, featuring a number of rare and protected species, and the intertidal area is important for wintering waterfowl.

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SITE NAME: TRAMORE BACK STRAND SPA

SITE CODE: 004027

This site lies a little east of Tramore town in County Waterford. It comprises a medium sized estuary sheltered from the open sea by a long, shingle spit, with high dunes. The area of the SPA, known as the Back Strand, empties almost completely at low tide. It is connected to the outer bay and sea by narrows at Rinneshark.

The intertidal mud flats and sand flats are an important habitat and are listed on Annex I of the E.U. Habitats Directive. The macrofauna is well developed, with Lugworm (*Arenicola marina*), Furrow Shell (*Scrobicularia plana*), Ragworm (*Hediste diversicolor*) and Common Cockle (*Cerastoderma edule*) being common, and with large patches of Common Mussel (*Mytilus edulis*) and Edible Periwinkles (*Littorina littoralis*) also present. A feature of this habitat is the presence of Eelgrass (*Zostera noltii* and *Z. angustifolia*), an important food item for herbivorous wildfowl.

Salt marsh, another habitat on Annex I of the E.U. Habitats Directive, is well developed and fairly extensive in the sheltered inner part of the site. It is the lagoon type of salt marsh, the rarest type in Ireland. The communities found are characteristic of both Atlantic and Mediterranean salt marshes. The main species include Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Lax-flowered Sea-lavender (*Limonium humile*), Sea Plantain (*Plantago maritima*), Sea Aster (*Aster tripolium*), Sea-purslane (*Halimione portulacoides*) and Sea Rush (*Juncus maritimus*). The scarce Hard-grass (*Parapholis strigosa*) occurs and a feature of this salt marsh is the presence of Golden-samphire (*Inula crithmoides*), a species rarely found on salt marshes in Ireland. Glasswort (*Salicornia* spp.) and other annuals such as Annual Sea Blite (*Suaeda maritima*) occur in channels and pans and also on the mudflats. Common Cord-grass (*Spartina anglica*) is frequent on parts of the salt marshes and on the mudflats.

The Back Strand is an important site for wintering waterfowl, providing both feeding and roosting areas. Counts are available for the 1970s and 1980s and for the 5 winters 1995/96 to 1999/00 (figures given are average peaks for the 90s). Of particular importance is that the site supports an Internationally Important population of Brent Geese (393). A further seven species occur in Nationally Important numbers: Golden Plover (2,924), Grey Plover (299), Lapwing (3,308), Dunlin (1,723), Sanderling (46), Black-tailed Godwit (289) and Bar-tailed Godwit (367). A range of other species also occur in significant numbers, including Wigeon (77), Teal (135), Red-breasted Merganser (18), Oystercatcher (347), Ringed Plover (55), Knot (75), Snipe (83), Curlew (620), Redshank (223), Greenshank (12) and Turnstone (24). In recent times Little Egret has become a regular visitor, with an average peak of six for the period.

The regular occurrence of Little Egret, Golden Plover and Bar-tailed Godwit is of particular note as these are listed on Annex I of the E.U. Birds Directive.

A potential threat to the intertidal habitat is seepage of leachate from a landfill site adjacent to the estuary.

Tramore Back Strand SPA is of high ornithological importance for wintering waterfowl, with one species having a population of International Importance and a further seven species having populations of National Importance. In addition, three of the species are listed on Annex I of the E.U. Birds Directive i.e. Golden Plover, Bar-tailed Godwit and Little Egret.

4.3.2002

SITE NAME: BANNOW BAY

SITE CODE: 000697

Bannow Bay is a relatively large estuarine site, approximately 14 km long, on the south coast of Co. Wexford. Small rivers and streams to the north and south-west flow into the bay and their sub-estuaries from part of the site. The bay contains large areas of mud and sand and the underlying geology is mainly of Ordovician slates with the exception of the areas to the east of Bannow Island which are underlain by Cambrian slates.

Eleven coastal habitats listed on Annex I of the E.U. Habitats Directive occur within the site. The estuary, including the saltmarshes, makes up approximately 83% of the site. At low tide up to 75% of the substrate is exposed. There are mud flats in the narrow northern part and also in the south-west and south-east. The sediments of the inner estuary associated with the Corock and Owenduff Rivers are generally black anoxic mud with some fine sand and broken shell. Mats of green algae (*Enteromorpha* spp.) are present and seaweeds (*Fucus* spp.) have colonised stony substrates, particularly further south.

Salt marshes of exceptional species diversity and rarity are found above the sand and mudflats, particularly at the south of the site. Habitats associated with *Spartina* sp. and *Salicornia* spp. occur in the salt marsh and on its fringes. A diverse range of *Salicornia* spp. has been recorded including *Salicornia pusilla*, *S. ramosissima*, *S. europaea*, *S. fragilis* and *S. dolichostachya*. Narrow shingle beaches up to 30 m wide occur in places along the edge of the estuary. The fringing reed communities are mainly confined to the tributaries and are relatively small in extent. They support Sea Club-rush (*Scirpus maritimus*), Grey Club-rush (*S. tabernaemontani*), Hemlock Water-dropwort (*Oenanthe crocata*) and abundant Common Reed (*Phragmites australis*).

The main areas of saltmarsh are on the islands at Clonmines; at the mouth of the tributary at Clonmines; at the mouth of the tributary at Taulaght; close to Saint Kieran's House; at the north-west of Big Burrow; at the south-east of Bannow Island and at the west of Rabbit Burrow in Fethard Bay. Very small fragmented linear strips of saltmarsh occur in the upper estuary as far north as the confluence of the Corock and Owenduff Rivers and along the other tributaries. The dominant type of saltmarsh present is Atlantic salt meadow although the Mediterranean type is also present; both of these habitats are listed on Annex I of the E.U. Habitats Directive. Typical species of the former include Common Saltmarsh-grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Sea Thrift (*Armeria maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardii*), Sea Arrow-grass (*Triglochin maritima*) and Sea Beet (*Beta maritima*). An abundance of Sea Purslane (*Halimione portulacoides*) is found in the Fethard and in part of the Taulaght saltmarshes. In the larger areas of saltmarsh Sea Rush (*Juncus maritimus*), a species more typical of Mediterranean salt meadows, is found. Other plants recorded are Lax-flowered Sea-lavender (*Limonium humile*) and Common Scurvy-grass (*Cochlearia officinalis*).

Halophilous scrub, another Annex I habitat, occurs in four of the larger saltmarsh areas. It is characterised by the presence of the legally protected plant Perennial Glasswort (*Arthrocnemum perenne*) which occurs in only a few sites in the country.

A mosaic of sand dune habitats which are listed on Annex I of the E.U. Habitats Directive occur in three areas at the edge of the estuary. Embryonic shifting dunes and White dunes are characterised by the presence of Lyme Grass (*Leymus arenarius*), Marram grass (*Ammophila arenaria*), Sea Spurge (*Euphorbia paralias*) and Sea Holly (*Eryngium maritimum*) in both Big Burrow and to the south east of Bannow Island.

The priority habitat fixed grey dunes is also present. Typical species here include Bird's-foot Trefoil (*Lotus corniculatus*), Kidney Vetch (*Anthyllis vulneraria*), Wild Thyme (*Thymus praecox*), Stork's-bill (*Erodium* spp.), Ribwort Plantain (*Plantago lanceolata*), Common Restharrow (*Ononis repens*), Mouse-ear Hawkweed (*Hieracium pilosella*), Field Wood-rush (*Luzula campestris*) and Wild Carrot (*Daucus carota*). Some areas of this dune type contain a carpet of the moss *Tortula ruraliformis* and lichens (*Cladonia* sp.).

There is some Gorse (*Ulex* sp.) present beside the mossy area at the south-east of the site. Bee Orchid (*Ophrys apifera*) and Pyramidal Orchid (*Anacamptis pyramidalis*) have also been recorded. Sharp Rush (*Juncus acutus*) occurs in a dune slack associated with the grey dunes at Big Burrow. At the west of the system east of Bannow Island the dunes are quite high, reaching almost c. 15m. Non-native plant species, including Tree Mallow (*Lavatera arborea*) occur in several parts of the site.

Some freshwater habitats occur at the northern end of the site. These consist mainly of a mosaic of marsh, reedbed and Willow (*Salix* spp.). Species present include Common Reed, with young willows scattered throughout and Hemlock Water-dropwort abundant in the ground layer. In other areas the wetland vegetation consists of a mosaic of *Phragmites* reed bed, patches of Hard Rush (*Juncus inflexus*), Meadowsweet (*Filipendula ulmaria*), Creeping Buttercup (*Ranunculus repens*), Marsh Bedstraw (*Galium palustre*), Greater Tussock-sedge (*Carex paniculata*), Marsh Marigold (*Caltha palustris*) and occasional Bulrush (*Typha latifolia*) along some old drains. The wetland areas generally merge into a narrow band of dense scrub dominated by Blackthorn (*Prunus spinosa*) and Whitethorn (*Crataegus monogyna*) with some Ash (*Fraxinus excelsior*), Willow and Gorse.

Most of the estuary has been designated a Special Protection Area (SPA) under the E.U. Birds Directive, because of its significant bird interest, particularly during the winter. Parts of this area have also been designated a Wildfowl Sanctuary. There are large numbers of wintering wildfowl and waders who feed on the mudflats and sandflats and use the fringing vegetation of reedbed and saltmarsh for roosting and feeding. Populations present include internationally important numbers of Light-bellied Brent Goose (819), and nationally important numbers of Shelduck (475), Pintail (85), Golden Plover (3144), a species listed on Annex I of the E.U. Birds Directive, Lapwing (2,000), Knot (508), Dunlin (3,850), Black-tailed Godwit (697), Bar-tailed Godwit (334) and Redshank (377) (all figures mean peaks 1994/95 to 1997/98).

Important breeding populations found within the site include two species listed on Annex I of the E.U. Birds Directive (Little Tern and Kingfisher), a colony of Sand Martins in the cliffs at the west of the site and a heronry with approximately 15 breeding pairs. The rare Reed Warbler may also breed in the area. Otter and Common Seal occur within the site.

Landuse at the site consists mainly of shellfish farming; approximately 20 ha of the intertidal area is under cultivation. Current annual production of Oysters is approximately 100 tonnes, concentrated mainly on three farms. There are other farms, but these are only in the initial stages of cultivation and current production is negligible. There is evidence of poor farm management in some locations. There are numerous abandoned trestles in the intertidal zone and along the top of the shore. Grading equipment is permanently left on the shore and some areas of saltmarsh are being used as a grading area for Oysters. In some areas damage is caused to the shingle vegetation and to the substrate by tractors accessing the aquaculture farms. Any further increase in aquaculture poses a threat.

Other landuses include shooting, bird watching, conservation management, grazing in some of the dune areas, horse-riding on the beach and Big Burrow sand dunes, picnicing, swimming, sailboarding, jet-skiing, line fishing and bait digging. The removal of sand and beach material also occurs at the site.

The site is of considerable conservation significance for the large number of E.U. Habitats Directive Annex I habitats that it contains, including the priority habitat fixed grey dune. The legally protected Red Data Book plant species Perennial Glasswort also occurs. The site is also an SPA because of the important numbers of wintering wildfowl it supports, including an internationally important population of Light-bellied Brent Goose.

7.12.1999

SITE NAME: OAKLANDS WOOD

SITE CODE: 000774

The site is a mixed coniferous and deciduous wood located approximately 2 km south of New Ross.

Oak (*Quercus* spp.) is the dominant species in parts of these woods, although coniferous species have been widely planted. Beech (*Fagus sylvatica*) also occurs and is regenerating. The trees reach about 15 m and create a closed canopy above abundant Holly (*Ilex aquifolium*).

The ground flora includes Bilberry (*Vaccinium myrtillus*) and Great Wood-rush (*Luzula sylvatica*), with a variety of woodland herbs such as Wood-sorrel (*Oxalis acetosella*), Bluebell (*Hyacinthoides non-scriptus*), Sanicle (*Sanicula europaea*), Goldenrod (*Solidago vigaurea*) and Hard Fern (*Blechnum spicant*).

Tree felling coupled with replanting with coniferous species has occurred within the site. If allowed to continue, this will damage the interest of the area.

The site is of interest as it is a representative area of broadleaved woodland and associated flora.

15th February, 1995. Sue Mullinger. □

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SITE NAME: DUNMORE EAST CLIFFS

SITE CODE: 000664

Sandstone cliffs surround Dunmore East harbour rising to 20-30m in places. There are cliffs including an offshore stack at the Black Knob below the Port Authority building, another shorter section about the waterside road in the harbour and a further series below the Park and Kelly's Rocks.

The cliffs have a limited vegetation cover with typical lichens (*Xanthoria*, *Ramalina* spp) on the rock surfaces and plants such as Rock Spurrey (*Spergularia rupicola*), Sea Aster (*Aster tripolium*) and Sea Pink (*Armeria maritima*) where they can get a foothold. These run into Red Fescue (*Festuca rubra*), Kidney Vetch (*Anthyllis vulneraria*) and Birdsfoot Trefoil (*Lotus corniculatus*) as the ground levels out. Where the cliff top soil has been disturbed Sea Mayweed (*Tripleurospermum maritimum*) and Sea Oraches (*Atriplex hastata*, *A. littoralis*) enter the community. The latter is scarce everywhere on the south coast and this is one of its only stations in Waterford. North of the harbour the cliffs are more sheltered and Ivy (*Hedera helix*), Hemp Agrimony (*Eupatorium cannabinum*), Madder (*Rubia peregrina*) and Tree Mallow (*Lavatera arborea*) grow in places.

All these cliffs are listed because they are the nesting colony of a large population of Kittiwake there are between 1000-2000 nests grouped closely on vertical parts of the cliffs and this (in 1970) formed 5% of the Irish total. In 1983/84 there was an average of 1200 pairs present. The colony is very accessible and the birds are accustomed to people and boats in close proximity. This has made research easy to carry out and annual counts of the nests have shown that their breeding numbers fluctuate in line with the herring catch brought in to the port.

13 February, 1995.

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SITE NAME: HOOK HEAD

SITE CODE: 000764

The site of conservation interest at Hook Head comprises an area of marine subtidal reefs to the south and east of the Hook Head Peninsula and includes the sea cliffs from Hook Head to Baginbun and Ingard Point. The peninsula forms the eastern side of Waterford Harbour, while to the east it adjoins the estuary mouth of Bannow Bay. Hook Head itself is composed of Carboniferous limestone overlain by Devonian Old Red Sandstone and is palaeontologically of international importance. The site contains three habitats listed under the EU Habitats Directive, i.e. large shallow inlets and bays, reefs and sea cliffs.

Subtidally the reefs are aligned in a north-east/south-west orientation and are typically strewn with boulders, cobbles and patches of sand and gravel. They are exposed to prevailing winds and swells from the west and tidal streams tend to be moderate but are strong in some areas. There are also a number of isolated reefs that project from a sand plain. The reefs around Hook Head have excellent examples of tideswept communities and species richness is high in both the shallow and deep-water communities. The latter is characterised by cushion sponges, with branching sponges and the rose 'coral' *Pentapora foliacea*. In addition the sponge *Stryphnus ponderosa*, the sea squirts *Sidnyum elegans*, *Distomus variolosus* and *Stolonica socialis* and the brittlestar *Amphiura securigera* are present. These species have a limited distribution in Ireland. The rare red algae *Schizymenia dubyi* also occurs.

The sublittoral sediments within this area consist of exposed, tideswept patches of duned gravel and moderately exposed silty sand with only weak tidal streams. The duned gravel is characterised by the burrowing sea cucumber *Neopendactyla mixta* and the burrowing brittlestar *Amphiura securigera* whilst the silty sand is relatively barren. *Amphiura securigera* in Ireland has only been recorded from the south east, the Kenmare River and in Northern Ireland where it is considered rare.

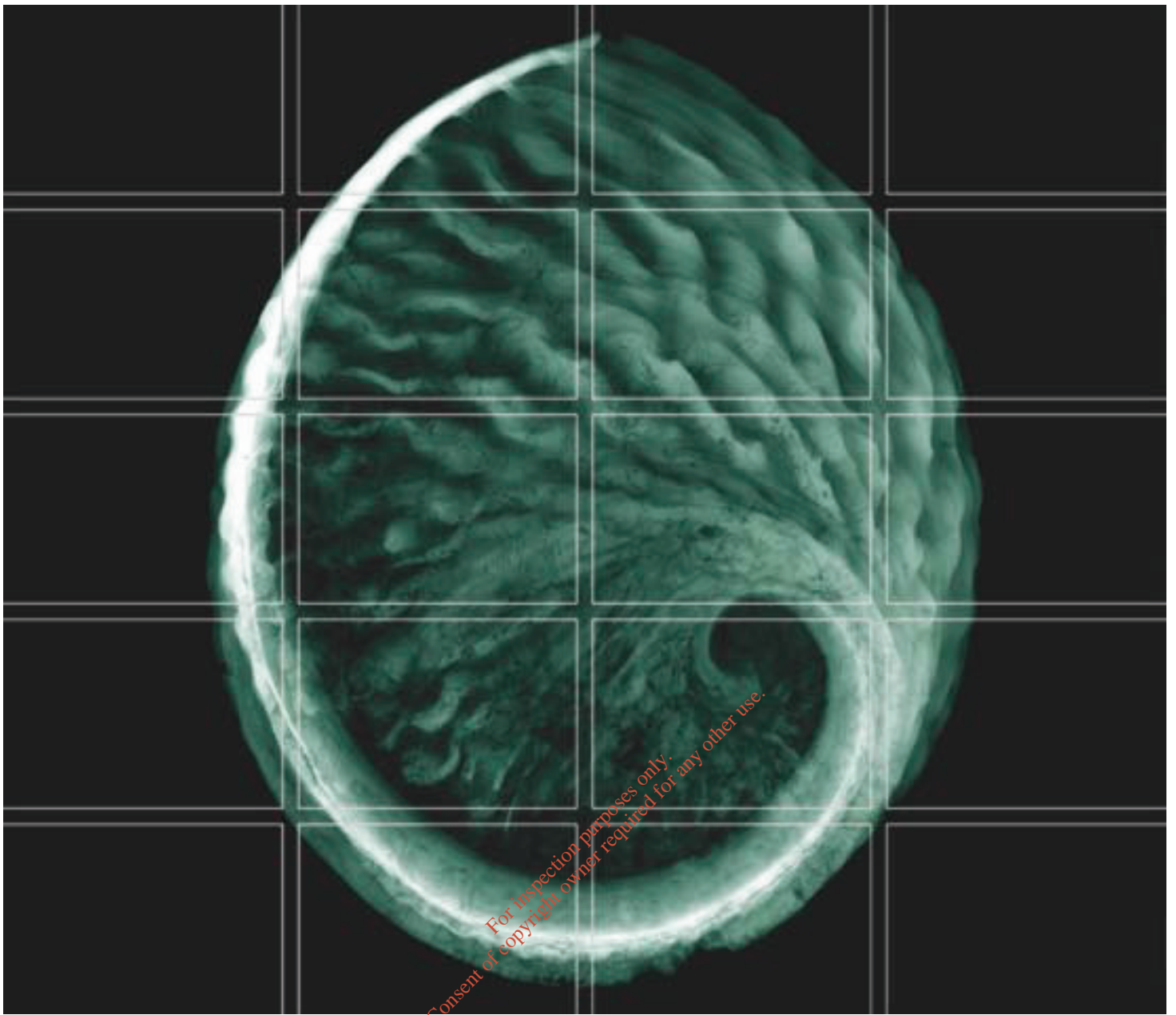
The sea cliffs, which extend for a distance of c. 1.5 km, are mostly low, usually not more than 10 m though they extend up to 30 m near Baginbun Head. Both clay and rock cliffs are represented. The vegetation of the cliffs, as well as the underlying rocky shoreline, is characterised by species such as Thrift (*Armeria maritima*), Rock Samphire (*Crithmum maritimum*), Rock Sea-lavender (*Limonium binervosum*), Sea Plantain (*Plantago maritima*), Buck's Horn Plantain (*Plantago coronopus*), Rock Seaspurrey (*Spergularia rupicola*) and Sea Mayweed (*Matricaria maritima*). The cliffs are also of ornithological interest for breeding Choughs (*Pyrhcorax pyrrhcorax*), Ravens (*Corvus corax*) and Peregrines (*Falco peregrinus*), and there is a small seabird colony, mainly of Guillemots, near Baginbun. The headland is a noted landfall point for migrants.

In summary, this site is of conservation importance for its subtidal reef and shallow bay communities, and their diversity of species, as well as for the vegetated sea cliffs. These habitats are listed under the EU Habitats Directive. The rocky coastline is also important for breeding Ravens, Choughs and Peregrines. The latter two are listed on Annex I of the EU Birds Directive.

07.09.2001

12.2. Appropriate Assessment Screening Report

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Natural Gas Fired CCGT Power Plant Great Island, County Wexford

Appropriate Assessment

Screening Report

November 2009

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Endesa Ireland Ltd.


Natural Gas Fired CCGT Power
Plant Great Island, County
Wexford

Appropriate Assessment
Screening Report

November 2009

For and on behalf of
Environmental Resources Management

Approved by: **Kevin Murphy**

Signed: 

Position: **Partner**

Date: **25th November 2009**

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1 SCREENING REPORT- GREAT ISLAND

1.1 BACKGROUND

In early 2009 Endesa Ireland acquired Great Island Power Plant, Co. Wexford, formerly owned by the Electrical Supply Board (ESB) along with 5 other power generating stations throughout Ireland. Endesa is currently developing an industrial plan for repowering and improving the efficiency of these plants. As part of this initiative Endesa intends to replace the existing power plant at Great Island with a new Combined Cycle Gas Turbine (CCGT). Endesa seeks to improve the efficiency of the current plant by replacing the existing plant with new, cleaner technologies.

A Habitats Directive Assessment (HDA) is the process of assessing the impacts from a proposed development or plan on the surrounding Natura 2000 sites. If the impacts identified at the screening stage of the HDA process indicate likely significant effects on any of the Natura 2000 sites, an Appropriate Assessment (AA) is required. The assessment includes an assessment of the effects in combination with other plans and projects where these could combine to affect a Natura 2000 site.

The first phase of an Appropriate Assessment is the screening phase to determine if an Appropriate Assessment is required.

1.2 AIM OF THIS REPORT

The purpose of the screening phase of an Appropriate Assessment is to determine whether the proposed power plant development is likely to have significant effects on designated Natura 2000 sites, alone or in-combination. This report sets out the findings of the screening process.

1.3 REPORT STRUCTURE

The remainder of the report is structured as follows:

- *Section 2*: The Habitats Directive Assessment and Screening Process;
- *Section 3*: Findings of the Screening Process; and
- *Section 4*: Conclusions.

2.1 CONSENTING PROCESS AND NATURA 2000 SITES

In Ireland, the European Directive on the Conservation of Natural Habitats and Wild Flora and Fauna (92/43/EEC) (known as the Habitats Directive) has been transposed into national law by means of the European Communities (Natural Habitats) Regulations, 1997, as amended.

Article 17 of Chapter IV (prohibition of works, restoration and compensation) of the European Communities (Natural Habitats) Regulations, 1997, as amended states:

'Where an operation or activity is being carried out or may be carried out on—

- (a) a site placed on a list in accordance with Chapter I of this Part, or*
 - (b) a site where consultation has been initiated in accordance with Article 5 of the Habitats Directive, or*
 - (c) a European site,*
- which is neither directly connected with nor necessary to the management of such sites but likely to have a significant effect thereon either individually or in combination with other operations or activities the Minister shall ensure that an appropriate assessment of the implications for the site in view of the site's conservation objectives is undertaken.'*

However, Article 18 of Chapter IV (prohibition of works, restoration and compensation) of the European Communities (Natural Habitats) Regulations, 1997, as amended states:

'Where an operation or activity is being carried out or is proposed to be carried out, on any land that is not within—

- (a) a site placed on a list in accordance with Chapter I of this Part, or*
- (b) a site where consultation has been initiated in accordance with Article 5 of the Habitats Directive, or*
- (c) a European site,*

and is liable to have an adverse effect on the integrity of the site concerned either alone or in combination with other operations or activities the Minister shall ensure that an appropriate assessment of the implications for the site in view of the site's conservation objectives is undertaken.'

Article 18 of the European Communities (Natural Habitats) Regulations, 1997, as amended is applicable to the proposed development as the development site lies outside of the designated Natura 2000 sites. Article 18 therefore demands the requirement for Appropriate Assessment Screening to be carried out.

The process is described further in Section 2.2.

2.2 THE HABITATS DIRECTIVE ASSESSMENT PROCESS

The process is prescribed in Article 6(3) and (4) of Habitats Directive (see Box 2.1).

Article 6(3)

'Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public'.

Article 6(4)

'If in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for overriding public interest, including those of a social or economic nature, the member states shall take all compensatory measures necessary to ensure that overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.

Where the site concerned hosts a priority natural habitat type and/ or priority species, the only considerations which may be raised are those related to human health or public safety, of beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest'.

European guidance on Appropriate Assessment (European Commission Environment Division's *Assessment of plans and projects significantly affecting Natura 2000 sites*, 2001) includes the following staged process:

1. Define the proposal.
2. Establish that the proposal is not necessary to the management of the site for nature conservation purposes.
3. Determine whether the proposal is likely to have a significant effect on the site, by adversely affecting the sites integrity - the approach to this is set out in Section 2.3. This is referred to as the screening process.
4. If a project is likely to have a significant effect, assess the implications of the proposal for the site's Conservation Objectives so as to answer the question "can it be demonstrated that the proposal will not adversely affect the integrity of the site?" This is referred to as the Appropriate Assessment.
5. If the Appropriate Assessment indicates that no adverse effect will occur the competent authority may proceed to grant consent; if not, further steps are required to demonstrate that specific reasons why the development should be permitted apply, before consent may be granted.

This screening exercise addresses items 1 to 3 above.

To determine if the proposal is likely to have any significant effects on the designated sites, i.e. liable to have an adverse effect on the integrity of the sites, the following issues are considered:

- could the proposals affect the qualifying interest and are they sensitive to the effect;
- the probability of the effect happening;
- the likely consequences for the site's Conservation Objectives if the effect occurred; and
- the magnitude, duration and reversibility of the effect.

The aim of the Habitats Directive Assessment process is to demonstrate that the proposals will not have an adverse effect on the integrity of the site. Site integrity is defined by the European Communities' *Managing Natura 2000 sites – The provision of Article 6 of the 'Habitats' Directive 92/43/EEC (2000)* as:

“the coherence of its structure and function across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified”.

The decision on whether the site integrity could be adversely affected by the proposals should focus on and be limited to the site's Conservation Objectives.

The assessment has drawn on the following information:

- description of the Natura 2000 sites and the qualifying interest features for which the sites are designated;
- details on the proposed development, highlighting possible effects on the qualifying interest features of the Natura 2000 sites;
- identification and evaluation of impacts on the ecology and nature conservation value of the Natura 2000 sites; and
- the potential for in-combination effects when considered along with other existing and proposed schemes.

This information has been gathered from data held by the National Parks and Wildlife Service (NPWS).

Where any Natura 2000 sites are considered to be subject to likely significant effects, further assessment beyond screening will be required to determine whether it can be demonstrated that the proposals will not have an adverse effect on the integrity of those Natura 2000 sites, in accordance with steps 4 and 5 described above.

The findings of the screening process are detailed in Section 3.

3.1

INTRODUCTION

The proposed development site is located within the existing Great Island power station lands. The proposed development also includes a small area required for traffic mitigation, in the form of a temporary parking bay located approximately 4 km to the north-east of the proposed development site at the Burntschool Cross Rds. junction of the R733. The station grounds are situated at the confluence of the rivers Barrow and Suir on the eastern shore of the Barrow Estuary, within the townland of Great Island, Co. Wexford (OS Grid Reference: E 268907, N 114574) (Figure 3.1). Both the Barrow Estuary and the River Suir represent important nature conservation sites. The nature conservation value of these sites is recognised by the statutory European designations which these sites hold, arising from the European Directive known as the Habitats Directive.

There are no proposed or designated Natura 2000 sites within the boundaries of the proposed development. However, two Natura 2000 sites occur within 10 km of the proposed development, comprising two Special Areas of Conservation (SAC). These are:

- **River Barrow and River Nore SAC** (site no. 002162) which lies which lies directly adjacent to the site boundary; and
- **Lower River Suir SAC** (site no. 002137) which lies approximately 0.5 km west of the development site.

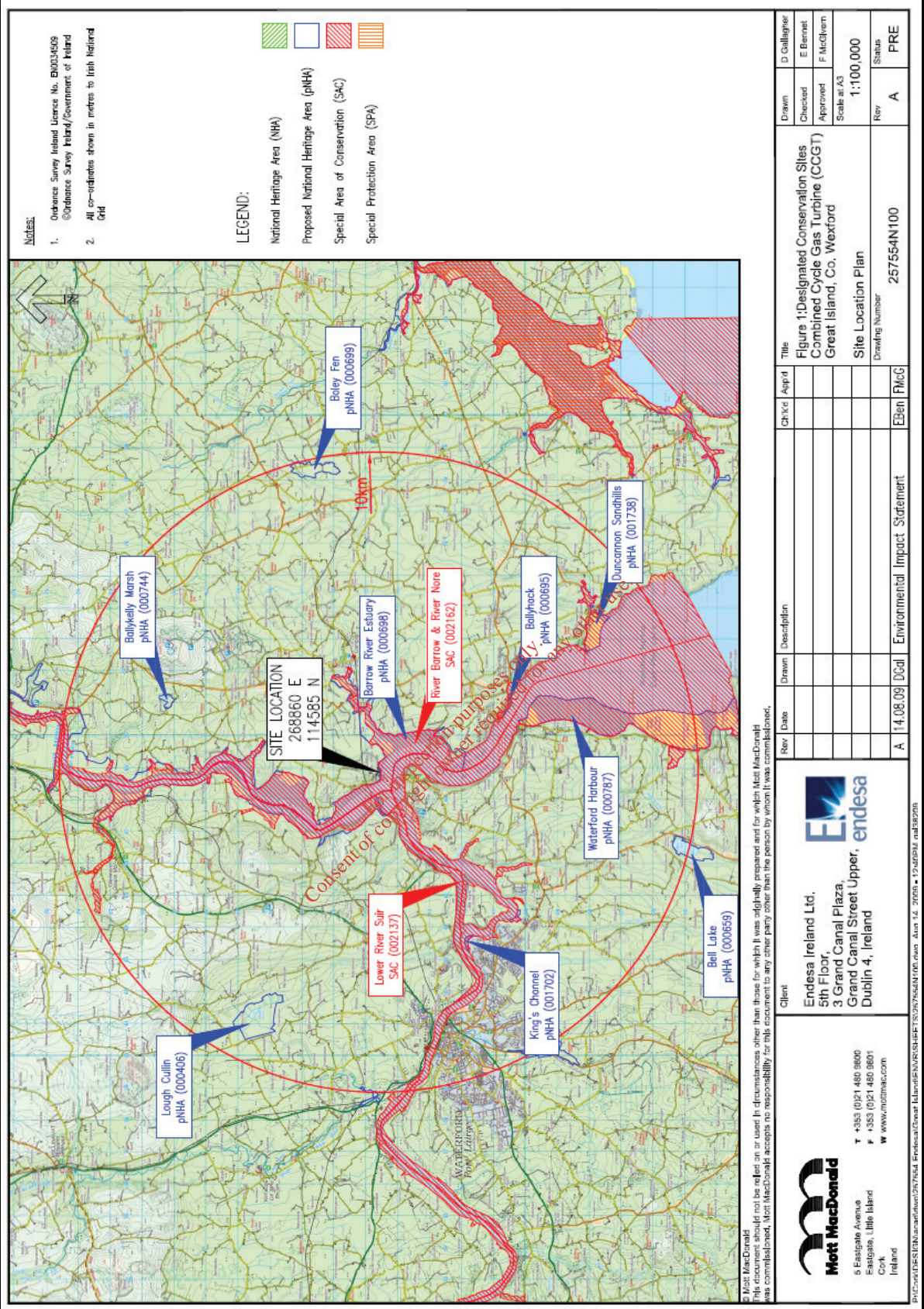
The locations of the proposed development and the locations of the Natura 2000 sites are shown on Figure 3.1. The proposal is not directly connected with, or necessary to, the conservation management of the designated sites listed above.

The features of interest and Conservation Objectives of the Natura 2000 sites, along with an analysis of the potential effects the proposed development may have on these sites, are described in Table 3.2 to Table 3.3.

Conclusions on whether an Appropriate Assessment is required to assess in further detail these potential effects on the Natura 2000 sites are contained in *Chapter 4*.

Figure 3.1

Proposed development and the locations of the Natura 2000 sites



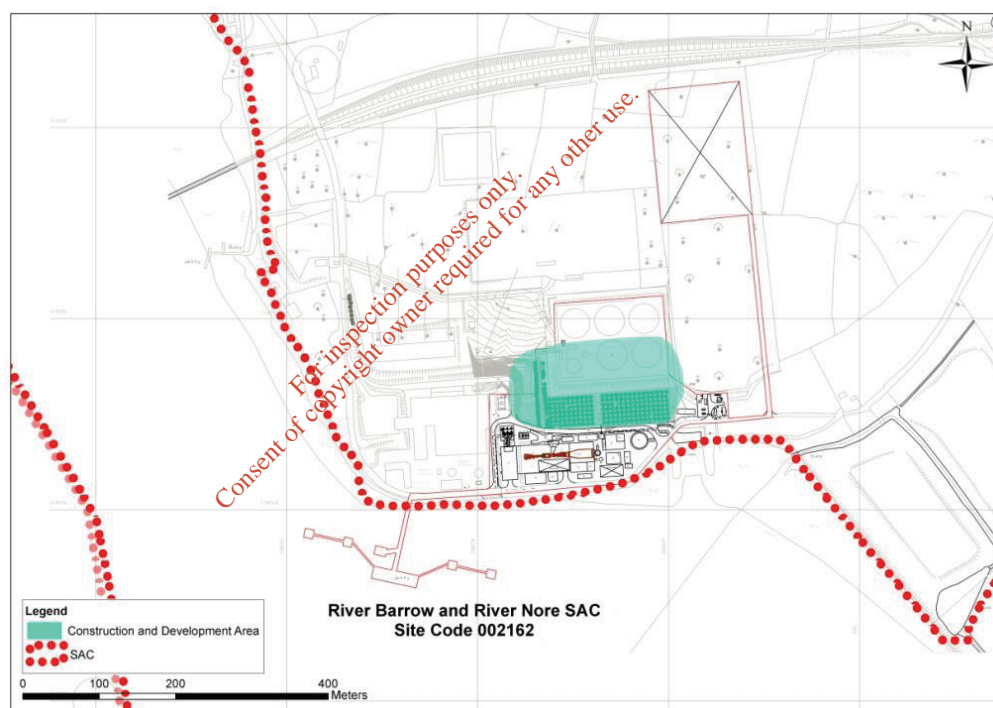
3.1.1

Description of the Proposed Development

Great Island Power Plant, formerly operated by the Electrical Supply Board (ESB) currently operates on Heavy Fuel Oil (HFO) and has a maximum electrical export capacity of 240 MW. The fuel oil is delivered to the Power Plant by vessel.

Great Island Power Plant occupies an area of approximately 58 hectares (143 acres). The proposed development site will occupy approximately 8 hectares (19 acres) and is brown field, located within the confines of the existing operational power plant facility. Additional land take may be required for temporary overtaking bays during the construction phase. Endesa propose to construct natural gas fired Combined Cycle Gas Turbine (CCGT) with a total energy output of 430 MW. The primary fuel source will be natural gas, with distillate oil as a backup fuel. It is widely acknowledged that the proposed switch to gas from HFO is a cleaner form of power generation. Elements of the proposed scheme pertinent to the Appropriate Assessment Screening process are described in this section of the report.

Figure 3.2 Great Island Power Plant Construction and Development Areas and Designated Natura 2000 Sites (SAC and SPA)



The proposed construction activities on site will result in the following impacts:

- increased traffic movement on local roads;
- noise from plant and construction operations on the site;
- visible movement of people and plant on site;
- dust;
- site drainage and surface water run-off; and
- potential fluid spills.

The operation of the proposed development will result in the following impacts:

- emissions to atmosphere;
- noise emissions;
- site drainage and surface run-off; and-
- potential fluid spills.

These impacts are further addressed in Table 3.1 and mitigation measures proposed to reduce or avoid the potential impacts are provided.

Subject to planning permission being granted it is anticipated that construction will commence in the fourth quarter of 2010. Civil, mechanical, electrical works and commissioning of plant are expected to last for approximately 30 months. Construction activities are expected to peak between March 2011 and February 2012.

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Table 3.1 Description of the Project

Description	Construction	Operation
Size, scale, area, landtake	<p>The construction footprint of the development is confined to the southern terrestrial area of the existing Power Plant's site boundary. However, additional land take may be required for temporary overtaking bays during the construction phase. This will not involve any landtake within a Natura 2000 site.</p>	<p>N/A</p>
Physical changes that will flow from the project	<p>On site activities from the presence of vehicles, machinery and general construction will result in dust, noise and vibration and visual disturbance.</p> <p>Research indicates that effects from construction activities that generate dust are generally limited to within 150 - 200 metres of the point of generation and are readily amenable to proven mitigation measures.</p> <p>Refurbishment of the cooling water intake structure and the cooling water outfall will take place inside the existing intake and outfall structures. The intake and outfall structures will be sealed from the marine environment during these activities to prevent impacts to the marine environment.</p>	<p>During operation the power plant will be a source of noise and light. It will also abstract water from the river and return it at a higher temperature. All these operational physical changes are anticipated to be of a similar or lesser magnitude than the currently prevailing situation (see also below).</p>
Resource requirements	<p>Construction has no resource requirements that would impinge on any of the Natura 2000 sites.</p>	<p>The plant will use sea water for cooling purposes, which will be abstracted from the Barrow Estuary via the existing cooling water intake and outlet systems (refurbished as required). Cooling water intake volumes will be reduced from the current demand.</p>
Emissions and waste	<p>During the excavation and removal of soil for construction works, fuel / oil interceptors and silt traps or sedimentation ponds will intercept surface water run-off. This will also reduce the risk of any accidentally spilled material (see below) being discharged from the Project site.</p> <p>The risk of spills from vehicle fuel and lubricant oils onshore during construction may result in contamination resulting from</p>	<p>The existing power plant currently requires the delivery of HFO by vessel. The switch to natural gas will cease the requirement for this fuel source, thus reducing the overall risk of a spillage in the Barrow Estuary. Distillate fuel oil will however be received via the jetty on a single occasion prior to operation for use as a back-up fuel source.</p> <p>Baseline air quality concentrations have been derived from the Irish Environmental Protection Agency annual report and are well below</p>

Description	Construction	Operation
	<p>surface water run-off during construction and potentially impacting Annex II species of the intertidal. It is however expected to be unlikely and volumes of fuel oil possibly involved are expected to be relatively low; additionally machinery will be contained within the site boundaries. The level of risk is substantially lower than existing risks from marine and river vessels.</p> <p>Re-construction of the cooling water intake structure and the cooling water outfall will take place inside the existing intake and outfall structures. The intake and outfall structures will be sealed from the marine environment during these activities to prevent impacts to the marine environment. Therefore increased turbidity in the marine environment will not result from these refurbishment works.</p>	<p>the respective air quality standards within the study area. Overall NOx emissions will remain below these standards or be furthered reduced from the conversion to the gas fuel from heavy fuel oil (HFO) and nitrogen deposition at offsite areas will be decreased as a result.</p> <p>Sulphur emissions will effectively cease. The proposed height of the stacks, 60 metres, will ensure good dispersion of atmospheric emissions and it is expected that most emissions will be below their relevant AQS and nitrogen critical load values. Atmospheric pollutant emissions from the proposed development are expected to be reduced from the current situation.</p> <p>The cooling water intake will include existing screens to exclude living material and debris from the cooling system. Endesa will develop a technical solution in consultation with the relevant authorities and in line with current best practice to ensure that migrating salmon smolts are not impacted and that impacts to smolts and other fish are minimised and the impingement of fish is reduced to a level deemed acceptable.</p> <p>Cooling water will be chlorinated by direct injection of Sodium Hypochlorite solution to control biological fouling of, and damage to, the condensers. Concentrations in the cooling water discharge will be maintained at a maximum concentration of 0.5 mg/l. Potential environmental consequences may result from this introduced levels of chlorine contained in discharges from marine and estuarine power plants. Chlorine decay in seawater depends on the environmental factors including salinity and pH. The current concentration of chlorine discharge appears not to be adversely impacting any of the species in the study area.</p> <p>The volume of cooling water that will be abstracted is relatively small in comparison to the expected volume of each tidal exchange in this part of the estuary and will be significantly reduced as part of the proposed development. Therefore it is anticipated that the concentrations discharged from the outfall will be readily dispersed.</p> <p>The temperatures associated with the thermal plume created from the discharge of cooling water can affect water quality and aquatic</p>

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Description	Construction	Operation
		species. The allowable temperature rise through the cooling water system i.e. the difference between outlet and inlet) will remain unchanged at 12.0°C above estuarine water temperature. However, as the volume of discharge is anticipated to decrease from 50,170m ³ /hr to 20,000m ³ /hr the maximum thermal load is anticipated to decrease from the existing 352 MWth to 291 MWth.
Transport requirements	During construction, traffic movements to the site may potentially be increased and result in disturbance to the designated sites.	During operation, traffic movements to the site are not expected to be increased from current conditions and therefore no impacts are anticipated as a result.
Distance from Natura 2000 sites	The distance of the proposed development from the Natura 2000 sites is described in Section 3.11.	The distance of the proposed development from the Natura 2000 sites is described in Section 3.11.
Cumulative impacts	There are no proposed projects or plans that together with the proposed Great Island Power Plant could impinge on any of the Natura 2000 sites.	There are no proposed projects or plans that together with the proposed Great Island Power Plant could impinge on any of the Natura 2000 sites.

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3.2

SCREENING APPRAISAL

The features of interest and Conservation Objectives of the Natura 2000 sites, along with an analysis of the potential effects the proposed development may have on these sites, are described in Table 3.2 to Table 3.3. The information requirements and assessment criteria of screening specified in the European guidance on Appropriate Assessment (European Commission Environment Division's *Assessment of plans and projects significantly affecting Natura 2000 sites*, 2001) have served as the basis for the following screening appraisal. Measures which will be implemented to reduce or mitigate impacts of the proposed development on the Natura 2000 sites are provided where applicable in the tables below.

The proposal is not directly connected with or necessary to the conservation management of the River Barrow and River Nore SAC or the Lower River Suir SAC.

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Table 3.2 Screening Appraisal of the Implications of the Proposed Great Island Power Plant Development on the River Barrow and River Nore SAC

River Barrow and River Nore SAC Designated Site Description	
<p>Brief description of the designated Natura 2000 site</p>	<p>The River Barrow and River Nore SAC are located adjacent to the Great Island Power Plant development boundary. The SAC comprises of the upper freshwater reaches of the Barrow and Nore rivers as well as the tidal reaches and estuary as far downstream as Creadun Head in Waterford.</p> <p>The SAC is selected for a number of habitats listed in Annex I of the E.U. Habitats Directive including estuary, tidal mudflats, <i>Salicornia</i> mudflats, Atlantic salt meadows, Mediterranean salt meadows. The SAC is designated for a number of estuarine fauna including the following species listed on Annex II of the Habitats Directive; sea lamprey, river lamprey, twaite shad, Atlantic salmon and otter.</p>
<p>Conservation objectives for the Natura 2000 site</p>	<p>Objective 1: To maintain the Annex I habitats for which the SAC has been selected at favourable conservation status: Estuaries; Mudflats and sandflats not covered by seawater at low tide; <i>Salicornia</i> and other annuals colonising mud and sand; Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>); Mediterranean salt meadows (<i>Juncetalia maritimi</i>); Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation; European dry heaths; Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels; Petrifying springs with tufa formation (Cratoneurion); Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in British Isles; Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae).</p> <p>Objective 2: To maintain the Annex II species for which the SAC has been selected at favourable conservation status: <i>Vertigo moulinsiana</i>; <i>Margaritifera margaritifera</i>; <i>Austrocyprina pallipes</i>; <i>Petromyzon marinus</i>; <i>Lampetra planeri</i>; <i>Lampetra fluviatilis</i>; <i>Alosa fallax</i>; <i>Salmo salar</i>; <i>Lutra lutra</i>; <i>Trichomanes speciosum</i>; <i>Margaritifera durrovensis</i>.</p> <p>Objective 3: To maintain the extent, species richness and biodiversity of the entire site.</p> <p>Objective 4: To establish effective liaison and co-operation with landowners, legal users and relevant authorities.</p>
<p>Screening Describe how the project (alone or in-combination) is likely to affect the Natura 2000 site</p>	<p>The potential impacts resulting from the construction phase include:</p> <ul style="list-style-type: none"> • direct and secondary contamination of Annex I habitats and Annex II species. <p>The key phase of the development which has the greatest potential to give rise to effects upon the Lower River Suir SAC is the operational phase. There will be noise, light, emissions to air and abstraction of and discharges to water with the main risks being:</p> <ul style="list-style-type: none"> • direct damage to Annex II fish species and their larvae from impingement on the cooling water intakes. • direct, indirect and secondary effects of the cooling water system on Annex I habitats and Annex II species caused by the intake and discharge of cooling water during the operational phase.

River Barrow and River Nore SAC Designated Site Description

- Secondary effects on qualifying birds from air emissions released from the proposed development are expected to occur during the operational phase.

Explain why the effects are not considered significant

- Construction activity is the period most likely to result in the following identified effects:
- Risk of spillage of fluids onshore during construction may result in contamination of surface water run-off discharged from the site:
 - The level of risk is substantially lower than existing risks from marine and river vessels. In addition, machinery will be contained within the site boundaries. In the unlikely event that vehicle fluids should be accidentally spilled, not contained or cleaned up on site and enter the estuary, they would be small in quantity and would dissipate relatively quickly and would be unlikely to have a lasting impact on the intertidal flora and fauna. The residual risk of spillage is reduced in comparison to the current situation.

Operational activity is the period most likely to result in the following identified effects:

- The inclusion of screens at the cooling water intake may result in impingement or entrainment of Annex II fish species and their larvae:
 - It is anticipated that mortalities of fish eggs and larvae will result from the passage of these through the cooling water system. However, a reduction of the intake rate will result in fewer larval fish and eggs becoming entrained than during the former operation.
- The discharge of cooling water containing anti-fouling chemicals during the operational phase and the thermal influence and hindrance to migration routes from the presence of a thermal plume:
 - The current concentration of chlorine in discharges appears not to be adversely impacting on any of the species in the study area. The volume of cooling water that will be abstracted is relatively small in comparison to the expected volume of each tidal exchange in this part of the estuary and will also be a smaller volume than the current situation. Therefore it is anticipated that the concentrations discharged from the outfall will not be significant in terms of toxic effects on subtidal communities and the favourable status of species and habitats are not expected to be impacted. In addition the rejected heat from the power plant (as a combination of temperature and flow volume) will also be reduced.

Aspects with the potential for impact during operation, such as air emissions will have a reduced magnitude in comparison with the current power generation operation (see Table 3.1) and do not need to be considered further in this screening assessment.

Taking a combination of the proposed mitigation measures (described above and in Table 3.1), the magnitude of impacts and the change from the current situation into account, it is anticipated that the status of the special conservation interests for Annex I habitats or Annex II species for which this SAC is designated will not be compromised, nor will the extent, species richness and biodiversity of the entire site be compromised. Therefore, no impacts which are likely to have an adverse effect on the integrity of the site are expected to occur.

River Barrow and River Nore SAC

Designated Site Description

Is the plan/project likely to have a significant effect on the SAC, either alone or in combination with other plans or projects?

Table 3.3 Screening Appraisal of the Implications of the Proposed Great Island Power Plant Development on the Lower River Suir SAC

Lower River Suir SAC

Designated Site Description

Brief description of the designated Natura site
The Lower River Suir SAC is located approximately 700 m to the west of Great Island Power Plant. This SAC consists of the freshwater stretches of the River Suir and its tributaries south of Thurles and the tidal stretches as far as the confluence with the Barrow/Nore east of Cheekpoint in Co. Waterford.

The Lower River Suir contains excellent examples of a number of Annex I habitats such as Atlantic salt meadows, Mediterranean salt meadows 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 Habitats Directive; sea lamprey, river lamprey, brook lamprey, freshwater pearl mussel, crayfish, twaite shad, Atlantic salmon and otter. This River Suir is one of only three known spawning grounds for twaite shad in Ireland.

Wintering populations of migratory birds use the reedbeds and saltmarsh areas of the site. In addition, the site is important for several important species of mammals which are listed in the Irish Red Data Book including daubenton's bat, natterer's bat, pipistrelle, pine marten, badger and the Irish hare.

Conservation objectives for the designated Natura site

Objective 1: To maintain the Annex I habitats for which the SAC has been selected at favourable conservation status: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*); Old sessile oak woods with *Ilex* and *Blechnum* in British Isles; *Taxus baccata* woods of the British Isles; Atlantic salt meadows (Glauco-Puccinellietalia maritima); Mediterranean salt meadows (*Juncetalia maritimi*); Water courses of plain to montane levels with the *Ranuncion fluitantis* and *Callitriche-Batrachion* vegetation; Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels.

Objective 2: To maintain the Annex II species for which the SAC has been selected at favourable conservation status: *Petromyzon marinus*, *Lampetra planeri*, *Lampetra fluviatilis*, *Alosa fallax*, *Salmo salar*, *Lutra lutra*, *Austropotamobius pallipes*, *Margaritifera margaritifera*.

Objective 3: To maintain the extent, species richness and biodiversity of the entire site.

Lower River Suir SAC

Objective 4: To establish effective liaison and co-operation with landowners, legal users and relevant authorities.

Screening Appraisal

Describe how the project (alone or in-combination) is likely to affect the Natura 2000 site.

The potential impacts resulting from the construction phase include:

- direct and secondary contamination of Annex I habitats and Annex II species.

The key phase of the development which has the greatest potential to give rise to effects upon the Lower River Suir SAC is the operational phase. There will be noise, light, emissions to air and abstraction of and discharges to water with the main risks being:

- direct damage to Annex II fish species and their larvae from impingement on the cooling water intakes.
- direct, indirect and secondary effects of the cooling water system on Annex I habitats and Annex II species caused by the intake and discharge of cooling water during the operational phase.
- Secondary effects on qualifying birds from air emissions released from the proposed development are expected to occur during the operational phase.

Explain why the effects are not considered significant. Construction activity is the period most likely to result in the following identified effects.

- Risk of spillage of fluids onshore during construction may result in contamination of surface water run-off discharged from the site.
 - The level of risk is substantially lower than existing risks from marine and river vessels. In addition, machinery will be contained within the site boundaries. In the unlikely event that vehicle fluids should be accidentally spilled, not contained or cleaned up on site and enter the estuary, they would be small in quantity and would dissipate relatively quickly and would be unlikely to have a lasting impact on the intertidal flora and fauna. The residual risk of spillage is reduced from the current situation.

Operational activity is the period most likely to result in the following identified effects.

- The inclusion of screens at the cooling water intake may result in impingement or entrainment of Annex II fish species and their larvae.
 - It is anticipated that mortalities of fish eggs and larvae will result from the passage of these through the cooling water system. However, a reduction of the intake rate will result in fewer larval fish and eggs will become entrained than during the former operation.
- The discharge of cooling water containing anti-fouling chemicals during the operational phase and the thermal influence and hindrance to migration routes from the presence of a thermal plume.
 - The current concentration of chlorine in discharges appears not to be adversely impacting any of the species in the study area. The volume of cooling water that will be abstracted is relatively small in comparison to the expected volume of each tidal exchange in this part of the estuary and will also be a smaller volume than the current situation. Therefore it is anticipated that the concentrations discharged from the outfall will not be significant in terms of toxic effects on subtidal communities and the favourable status of species and habitats are not expected

Lower River Suir SAC

to be impacted. In addition the rejected heat from the power plant (as a result of reduced thermal load and discharge volume) will also be reduced.

Aspects with the potential for impact during operation, such as air emissions will have a reduced magnitude in comparison with the current power generation operation (see Table 3.1) and do not need to be considered further in this screening assessment.

Taking a combination of the proposed mitigation measures (described above and in Table 3.1), the magnitude of impacts and the change from the current situation into account, it is anticipated that the status of the special conservation interests for Annex I habitats or Annex II species for which this SAC is designated will not be compromised, nor will the extent, species richness and biodiversity of the entire site be compromised. Therefore, no impacts which are likely to have an adverse effect on the integrity of the site are expected to occur.

Is the plan/project likely to have a significant effect on the Natura 2000 sites, either alone or in combination, with other plans or projects?

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The screening process has indicated that the proposed development does have the potential to affect the qualifying features of interest of the two Natura 2000 sites, the River Barrow and River Nore SAC and the Lower River Suir SAC. However, on examination it is clear, that due to combinations of the proposed mitigation measures, the magnitude of impacts and the positive changes from the current situation, the proposed activities will not have an adverse effect on the integrity of the sites or the qualifying features of the conservation objectives of the Natura 2000 sites. Therefore significant impacts are not likely to occur. In summary, the potential impacts considered in screening are as follows.

- *Direct and secondary contamination of qualifying Annex I habitats and Annex II species of the Lower River Suir SAC and the River Barrow and River Nore SAC from spillage of vehicle fluids onshore during construction.* Spillage of fluids onshore during construction or operation is expected to be unlikely and volumes of contaminants possibly involved would be expected to be relatively low; additionally machinery will be contained within the site boundaries. During the excavation and removal of soil for construction works, fuel / oil interceptors and silt traps or sedimentation ponds will intercept surface water run-off, reducing the possibility of such contaminants entering the marine environment.
- *Direct damage to Annex II fish species and their larvae from impingement on the cooling water intakes.* It is anticipated that mechanical damage and mortalities of fish eggs and larvae of Annex II fish species will result from the passage of these through the cooling water system. However, a reduction of the abstraction rate will result in fewer larval fish and eggs will become entrained than during the former operation.
- *Direct and secondary effects of the cooling water system on Annex I habitats and Annex II species caused by the discharge of cooling water during the operational phase.* Potential effects include thermal influence and hindrance to migration routes from the presence of a thermal plume. The current concentration of chlorine discharge appears not to be adversely impacting any of the species in the study area. It is anticipated that the concentrations discharged from the outfall will not be significant in terms of toxic effects on subtidal communities and the heat load (as a combination of discharge temperature and volume flow) to the estuary will be reduced from the current situation.
- *Effects on qualifying birds of the Lower River Suir SAC and the River Barrow and River Nore SAC from air emissions released during the operational phase of the proposed development.* The change from heavy fuel oil to gas will result in reduced pollutant emissions to atmosphere in comparison with the current situation.

The results of the assessment of possible impacts on the conservation objectives from the construction and operation of the proposed development have been presented in Tables 3.2 to 3.3.

The available information, including mitigation measures that the Project is committed to, indicate that the conservation objectives of the SAC features will be maintained. Significant adverse effects on the integrity of these Natura 2000 sites are unlikely to occur from the construction or operational phases of the proposed development. No cumulative or in-combination impacts on the integrity of the sites are predicted from the other projects identified. Therefore, in accordance with the European guidance on

Appropriate Assessment (European Commission Environment Division's *Assessment of plans and projects significantly affecting Natura 2000 sites*, 2001) it is concluded that an Appropriate Assessment (AA) is not required.

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