MAYO

ROSCOMMON

GALWAY

CLARE

TIPPERARY

Knockbrack

Cappaghoosh

Lettermuckoo

SA - Strategic Areas

AP - Acceptable in Principle

Water Abstraction Sites

NATURE

Surface water abstraction point

Groundwater abstraction point

Source Protection Areas

SPA

Inner Zone

Outer Zone

AquiferBed

Type

Regionally Important

Locally Important

Poor

Unclassified

0 5 10 20

Kilometres

DATE: 20/10/11	*SCALE: 1:400,000*	**FIGURE 4.8: GROUND WATER RISK**	**minogue & associates** Tuamgraney, County Clare T: 061 640667 **ERA-MAPTEC** 40 Lwr. O'Connell St. Dublin 1 www.era.ie
REF: WES/xx	*SIZE: A3*	Galway County Council Wind Energy Strategy	
DRAWN: EV	*APPROVED: RM*		

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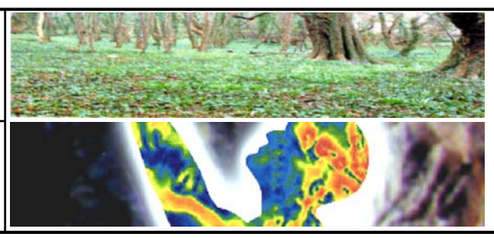
Cappaghoosh

Knockbrack

Lettermuckoo

SA - Strategic Areas
AP - Acceptable in Principle
Freshwater SAC
Salmonid Water
Fresh Water Pearl Mussels Areas
Nutrient Sensitive Rivers
Nutrient Sensitive Lakes

0 5 10 20
Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.9: FRESH WATER HABITATS**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
DRAWN: EV	APPROVED: RM		

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MAYO

ROSCOMMON

OFFALY

TIPPERARY

CLARE

Cappaghoosh

Knockbrack

Lettermuckoo

Coole

Gort

BlueFlag Beach

Bathing Areas

Shellfish Areas Polygon

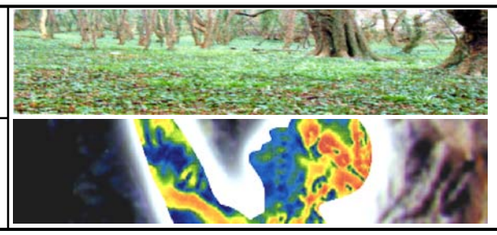
SA - Strategic Areas

AP - Acceptable in Principle

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.10: COASTAL WATERS**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
DRAWN: EV	APPROVED: RM		



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Two main water quality problems relating to agriculture have been identified; these are enrichment of water by nutrients (phosphorus and nitrogen) and organic pollution from animal slurry/manure and silage effluent. A third, pesticides, is covered under dangerous substances. Agriculture is the principal land use activity in the eastern part of the Western District, with 67% of land used for this purpose. Estimates of nutrient input into waters in the Western District indicate that agriculture produces over 45% of the yearly phosphorus load and 80% of the nitrogen load but this is spread in a diffuse manner over the entire basin.

Wastewater from Unsewered Properties
In rural areas many houses and businesses are not connected to public systems that collect, treat and dispose of wastewater, and they rely mainly on on-site systems (conventional septic tanks or proprietary systems) via soil percolation areas, which if not designed, installed or operated properly can result in water pollution. Two of the four counties with the highest percentage of one-off housing in Ireland are in the WRBD; Galway (52%) and Roscommon (43%). In addition, the ever increasing number of holiday homes being constructed in the coastal counties (Galway, Mayo, Sligo and Clare) and their associated septic tanks pose a potential problem to the District's waters. As many properties are spread over wide areas, provision of public sewerage systems, especially ahead of new development, is very difficult and often very costly.

Forestry
Forest cover now accounts for just over 10% of Ireland's land area, with an objective to expand cover to 17% in the next 30 years. Forestry in the Western District covers about 10% of the land area. Forests can have both positive and negative impacts on the environment. Negative impacts are largely related to poor management or to planting on unsuitable soils. Some forested areas in the District are located in sensitive catchments with habitat protected species such as the freshwater pearl mussel, salmon and trout spawning areas. Many of the current water problems associated with afforestation are a legacy of old practices, which have been subsequently amended.

Discharge of Dangerous Substances
Some dangerous substances can be toxic to aquatic plants and animals. They can persist in waters and sediments, and slowly build up in the bodies of aquatic organisms, poisoning them and causing problems higher up the food chain or interfering with natural breeding processes.

Physical Modifications
Physical modifications can impact waterways by directly affecting habitats, or by indirectly changing natural processes through altering plant and animal communities, by reducing their variety or numbers. Land drainage, overgrazing, de-forestation and cattle access can have an indirect effect, changing how much and how fast water drains off the land, resulting in an increased risk of property flooding. There have been a number of large-scale schemes in the Western District involving physical modifications. Stretches of the drained river systems need to be dredged from time to time removing silt build-up to reduce flooding risk and ensure that the system is navigable. In addition, widespread development on the floodplains in the basin and in particular the potential effects on water quality and flooding behaviour as a result of the physical modifications to flood plains are of concern. Localised drainage by landowners can also lead to local flood problems.

Climate Change
The impact of climate change is difficult to predict, however there is the potential for heavier winter rainstorms to cause more flash flooding, resulting in an increase in diffuse pollution loads from soil runoff and increasing demand for flood controls. Summer droughts are considered likely and recent reports have indicated that the effects of climate change in Ireland will have serious consequences for water resources, resulting in a potential 40% reduction in drinking water supplies. Also, temperature changes may give invasive alien species a competitive advantage.

Local Issues
Excessive nutrients in natural waters can lead to the growth of algae and weeds. This enrichment of water is called eutrophication and it is recognised as a major threat to the quality of Irish waters. Algal blooms and weeds can disrupt the normal functioning of an ecosystem, causing a variety of problems. They reduce the value of the affected waters for fishing, swimming and boating and can also interfere with the treatment of drinking water. Increased algal growth has been observed around the shores of Lough Corrib and algal blooms have occurred on Lough Carra, Carrowmore and other western lakes.

Alien Species - Three particular species of concern in the Western RBD are the Zebra Mussel (*Dreissena polymorpha),* Japanese knotweed (*Fallopia japonica)* and Curly Leaf Pondweed (*Lagarosiphon)*. Japanese knotweed out competes local species such as sea grasses and kelp for space and light and is found in coastal waters of the Western RBD. Curly leaf pondweed has been identified in the Upper Lough Corrib basin. Originally from South Africa it has become a serious nuisance, colonising entire bays and building up in dense mats dramatically altering the natural ecology of an area.

Insufficient water and wastewater treatment (see also section on Population and human health)

4.3.8 Likely Evolution of Water Resources in the absence of the WES

In the absence of the strategy, there will remain some interest for wind energy developments in certain areas of the county as evidence by the planning applications in recent years. Should these be addressed on a case by case basis it will be difficult to identify adequate protection measures for water quality.

4.3.9 Environmental Problems in neighbouring counties.

Galway City -Key challenges for Galway City include balancing growth with preventing the deterioration of water quality and delivering physical infrastructure to meet population projection targets. The development of wastewater infrastructure has improved the quality of water in Galway Bay. The next stage of improvement works need to be progressed in order to maintain and enhance water quality. Other water issues include providing a safe and secure water supply and maintaining and enhancing the city beaches blue flag status. Water conservation measures, the polluter pays principle, and the promotion of SUDS also play an important role in the management of water resources.
The issue of water quality in the Bay and the Western River Basin District and source protection are issues concerning Galway City and adjacent Local authorities: Local authority areas upstream can also contribute to impacts on water quality in the River Corrib and Galway Bay. The principal

contributions arise from forestry and agriculture. The primary water source of the city's water supply, the Terryland River, feeds from Lough Corrib and the Corrib basin, the bulk of which lies outside the city's boundary.

Mayo – The current challenges facing water quality are pressures from urban wastewater and water treatment plant discharges, Section 4 discharges and those from Section 16 licensed and IPPC licensed facilities. Risks from agricultural lands and farm holdings are a very real threat, runoff from forestry lands and peat bogs may contribute dissolved nutrients to water bodies, in addition to suspended solids. Other problems include:

- Habitat loss, invasive species and drinking water abstraction.

Roscommon -Housing development and agriculture are the main sources of impact on waterbodies within the County.

Offaly -There are severe environmental problems in County Offaly with regard to water quality which have the potential for significant adverse impact upon biodiversity and flora and fauna, drinking water supplies and human health.
The majority of river catchments (most of which are located closest to the largest settlement centres) are classified as being either (1a) at significant risk or (1b) probably at significant risk of failing to achieve the WFD's objectives by 2015

Tipperary - the potential for significant adverse impact upon human health, drinking water supplies and biodiversity and flora and fauna. Water quality of rivers in North Tipperary River varies from Q5 to Q2. Lough Derg and a number of rivers in the County are classified as being (1a) At Significant Risk. Some ground waters underlying the Plan area and rivers are probably at significant risk of failing to achieve the WFD's objectives of good status by 2015.

Clare The Shannon International River Basin District Management Plan SEA Environmental Report identifies the following threats to both surface and groundwater and includes:

- point and diffuse sources including wastewater and industrial discharges, landfills, quarries, mines and contaminated sites, wastewater from unsewered properties, forestry, and discharge of dangerous substances
- physical modifications,
- climate change
- and other local issues.

4.3.9 Likely Evolution of Water in the absence of the WES

In the absence of the strategy, there will remain some interest for wind energy developments in certain areas of the county as evidenced by the planning applications in recent years. Should these be addressed on a case by case basis it will be difficult to identify adequate protection measures for water quality. In addition, the SEA and HDA of the WES has highlighted particular sensitivities for the WES areas, such as Freshwater Pearl Mussel.

The overall objective for water quality in Galway and the rest of Ireland is to achieve the good status of water quality by 2015 under the Water Framework Directive. Meeting this

target is considered a challenge for a range of water bodies. The existing policies in the CDP will continue to guide development for wind energy to certain areas of the county that are no longer considered suitable for large wind energy development in light of environmental considerations. The new framework provided by the WES and the detailed provision of development management and mitigation measures will strengthen overall water quality protection and management.

In addition, impacts associated with climate change such as increased extreme weather events and increased plankton blooms will increase and continue in the absence of a supporting policy for wind energy development in appropriate areas in the County.

4.4 Soil and Geology

4.4.1 Soil

Soil can be considered as a non-renewable natural resource because it develops over very long timescales. It is an extremely complex, variable and living medium and performs many vital functions including: food and other biomass production, storage, filtration and transformation of many substances including water, carbon, and nitrogen. Soil has a role as a habitat and gene pool, serves as a platform for human activities, landscape and heritage and acts as a provider of raw materials. Such functions of soil are worthy of protection because of their socio-economic as well as environmental importance. Soils in any area are the result of the interaction of various factors, such as parent material, climate, vegetation and human action.

Although the EU has produced a Thematic Strategy for Soil Protection, the proposed Framework Directive for Soils has not been established in law and hence not being transposed into national legislation yet.

Figure 4.11 shows the soil map for the County. The area of the County to the west of Lough Corrib is generally covered by blanket bog with upland areas in Connemara and areas close to the coast covered by acid mineral soils. The principal soil type within the WES areas is peat of varying depths.

4.4.2 Bedrock Geology

The basic rock formation of County Galway varies between the eastern and western half of the County. The bedrock geology of the County to the east of Lough Corrib consists of limestone which was laid in the carboniferous period, around 280 to 345 million years ago.

To the west of Lough Corrib, the bedrock geology type generally differs either side of a line stretching from Glinsk to Oughterard. To the north of this line in areas such as the Connemara Uplands, the bedrock geology is new red sandstone while to the south of this line in coastal and more low-lying areas the bedrock geology is granite. Figure 4.12 shows simplified geology of the County. Figure 4.13 shows geological p NHAs and quarries in the County.

MAYO

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GALWAY

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TIPPERARY

Knockbrack

Cappaghoosh

Lettermuckoo

SA - Strategic Areas

AP - Acceptable in Principle

Soils

Type

- Aeolian
- Alluvium
- Beach sand and gravels
- Deep poorly drained mineral
- Deep well drained mineral
- Lake
- Made/Built land
- Marine/ Estuarine sediments
- Peat
- Poorly drained mineral soils with peaty topsoil
- Reed Swamp/Marsh
- Scree
- Shallow poorly drained mineral
- Shallow well drained mineral
- Shallow, lithosolic-podzolic type soils potential*

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.11: SOILS**	minogue & associates Tuamgraney, County Clare T: 061 640667 **ERA-MAPTEC** 40 Lwr. O'Connell St. Dublin 1 www.era.ie
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SA - Strategic Areas
AP - Acceptable in Principle

ROCKUNIT

DESCRIPT

- Basalts & other Volcanic rocks
- Cambrian Metasediments
- Devonian Kiltorcan-type Sandstones
- Devonian Old Red Sandstones
- Dinantian (early) Sandstones, Shales and Limestones
- Dinantian Dolomitised Limestones
- Dinantian Lower Impure Limestones
- Dinantian Mixed Sandstones, Shales and Limestones
- Dinantian Mudstones and Sandstones (Cork Group)
- Dinantian Pure Bedded Limestones
- Dinantian Pure Unbedded Limestones
- Dinantian Sandstones
- Dinantian Shales and Limestones
- Dinantian Upper Impure Limestones
- Granites & other Igneous Intrusive rocks
- Namurian Sandstones
- Namurian Shales
- Namurian Undifferentiated
- Ordovician Metasediments
- Ordovician Volcanics
- Permo-Triassic Mudstones and Gypsum
- Permo-Triassic Sandstones
- Precambrian Marbles
- Precambrian Quartzites, Gneisses & Schists
- Silurian Metasediments and Volcanics
- UNKNOWN
- Westphalian Sandstones
- Westphalian Shales

0 5 10 20
Kilometres

DATE: 20/10/11	*SCALE: 1:400,000*	**FIGURE 4.12: SOLID GEOLOGY**	
REF: WES/xx	*SIZE: A3*	Galway County Council Wind Energy Strategy	
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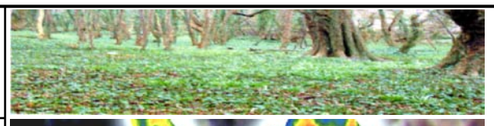

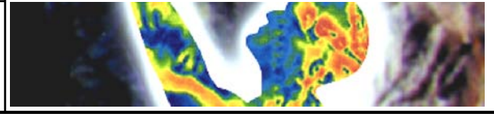

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Esker complex

Esker complex

planation surface

planation surface

solutional lake

Dawros Peridotite; chromite, tourmaline (Tully Cross to Letterfrack - this is included in Dawros locality)

Gowlaun Conglomerates and Lettergesh Formation turbidites. Basal schist breccia seen adjacent to Connemara schists

Ice contact delta

waterfall

Important site for understanding assemblage of terranes

Galena and scheelite

Galena and scheelite

Gneissic layering

Peridotite, chromite, tourmaline

Esker, with flanking fans

Granite contact with hornfels and skarn

Connemara Marble Quarry

Disused Marble Quarry

Disused Marble Quarry

Lake Marble Formation

Zn-Pb vein deposit

Graphitic marble

Py, Cu, Mo, W

andalusite; cordierite

Sulphide Locality, Copper Base Metal

garnetite

beach material composed of coral-like material from the seaweed Lithothamnion

Marble quarry

cordierite migmatitic Dalradian schists

Late Devonian dyke

Late Devonian dyke.

Good exposures in mine workings. [Ag, Pb, Zn, Ba, Fluorite] green fidorite; octahedral sulphur

Tertiary plug

Ordovician orthogneisses

Ordovician ultramafic - silica plutonic emulsion

Bedrock tor, palaeosols with Pliocene pollen, saprolite

beach system with dunes, sandy isthmus and tombolo

Bedrock tor, palaeosols with Pliocene pollen, saprolite

Late Devonian dyke.

Molybdenite, chalcopyrite, pyrite mineralisation

Molybdenite, chalcopyrite, pyrite mineralisation

Section through magma-mingling zone

Lower Carboniferous

uraninite, monazite; thorite, garnets (spessarine)

High heat production granite

Mixing of diorite and granite

Drumlin swarm

Drumlin swarm

Esker complex, with flanking fans, deltas, moraines and sandur

Waulsortian mudbank

[Pb, Zn, Ag, Cu]

Interglacial Peat

Interglacial lake sediment

Alteration horizon

pellets

Esker complex, with flanking fans, deltas, moraines and sandur

Holocene lake with 14 tephra layers

pNHA (Geology)

SA - Strategic Areas

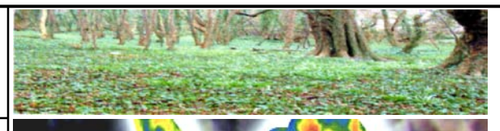
Quarries(Active)

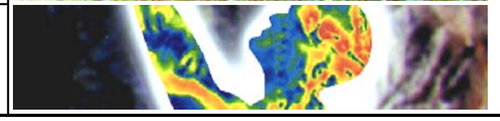
AP - Acceptable in Principle

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.13: QUARRIES AND GEOLOGICAL HERITAGE SITES**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
DRAWN: EV	APPROVED: RM		





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4.4.3 Key Environmental Problems

West Galway supports some extensive areas of blanket bog and associated habitats, a number of which are afforded legal protection. Outside of these sites, activities can impact on the hydrology of the peat habitat and system. Development works whether through access roads for afforestation or wind energy developments can have a deleterious effect on the bog hydrology and the functions of the peat soil.

The EPA[1] has identified the main pressures on soil resources nationally to be:

- intensive agriculture and organic waste disposal
- Forestry
- Industry
- Peat extraction and
- urbanisation and infrastructure development.

Such activities can contribute to soil degradation including loss of organic matter, declining soil fertility, loss of soil stability, soil compaction, contamination, loss of biodiversity and loss of soil to buildings and infrastructure. Because of the complex interrelationship between water, air and soil, declining soil quality can contribute to negative or declining water or air quality and function. In all areas identified as strategic/acceptable in principle, forestry, some peat extraction and infrastructure development would be the key threats. An additional trend in these areas would also be removal of rough grazing on upper slopes and foothills due to declining agricultural activity.

Hydrogeological issues especially in relation to extensive peat areas and deep peat soils remain an issue that requires sophisticated modeling and sound technical investigations in order to minimse potential impacts. In particular, hydrogeological problems can arise beyond the site and impact on wide areas for all developments on such soils.

Climate change impacts may also impact considerably upon soil in terms of extreme rainfall events. This may have implications for slope stability and landslide susceptibility. This may have implications for slope stability and landslide susceptibility. There have also been incidences of landslides on peat soils, of the 6 known landslides in County Galway, five occurred on peat soil[2]. *Figure 4.14* shows known historical landslides in County Galway. In addition, wind farm construction activities in other counties, most notably Galway and Mayo have contributed to landslides in recent years. It is important to highlight the problems associated with activities on peat soils, and these are discussed in more detail in *Chapter Seven, Likely Significant Effects.*

Extraction of sand, gravel or rock in an area ultimately leads to the total removal of a resource within a given area and can lead to localized environmental problems

The identification of geological NHAs and County sites of interest will assist in the development appropriate management regimes for these sites, either through avoidance or mitigation measures.

[1] EPA discussion document "Towards setting environmental quality objectives for soil: developing a soil protection strategy, 2002.

[2] Geological Survey of Ireland. Landslides in Ireland, Appendix 5, 2006.

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Joyces Country

addergoole more

Slieve

Kilmore

Knockbrack

Cappaghoosh

Lettermuckoo

Derrybrien

Loughatorick North

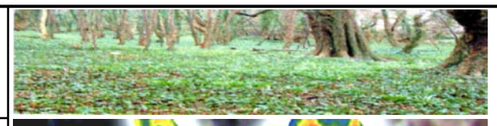
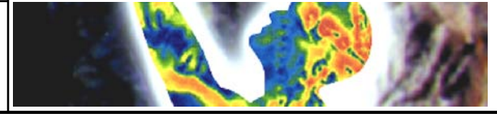
Landslides

SA - Strategic Areas

AP - Acceptable in Principle

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.14: KNOWN LANDSLIDES**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
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4.4.4 Environmental Problems in neighbouring counties.

Galway City -Development of greenfield sites affects soil conservation by depleting the soil resources and changing the soil character where it remains. The proposed Soil Directive encourages the use of brownfield sites for development, which reduces pressure for greenfield development. Brownfield development also ensures the best use of existing services, such as public transport and waste management, and assists in economic and social regeneration of areas. There are a number of brownfield/redevelopment sites within the city. Redevelopment of these sites would contribute to achieving sustainable and balanced development.
Soil contamination cases have been identified within the city and are being addressed through individual risk assessments. The DEHLG *Quarry Guidelines (2004)* identify potential environmental effects of quarrying, including impacts on air quality, water supplies, groundwater, noise and vibration, traffic, heritage and landscape and on waste management.
Soil erosion can be caused by construction activities. Erosion results in a loss of nutrients in the upper layers of the soils and also leads to reduced water-holding capacity, erosion can also impact on surface water quality. The EPA's Report *Irelands Environment (2008)* highlights that climate change is likely to increase soil erosion, as a result of higher rainfall intensity and possible loss of organic matter, which will result in reduced structural stability**.**

Mayo – in addition to the pressures already identified, the limited protection afforded to soil and geological resources other than natural heritage designations means that peat can be exploited; in addition peat is a natural filter, water storage and carbon sink**.**

Roscommon During the period of the current plan there has been increasing pressure to exploit eskers for sand and gravel. These eskers are irreplaceable unique habitats both from an ecological and geological perspective.

Offaly -Generally, development in County Offaly is not significantly impacting upon raised bog sites which are found within a number of designated ecological sites (see Section 3.2). However, raised bogs outside these sites have experienced significant depletion since the introduction of industrial peat harvesting halfway through the twentieth century. The development of extractive industry at certain locations in County Offaly has led to the depletion of both subsoils, the material which has been quarried, and topsoil, which has been removed in order to obtain the subsoil.

North Tipperary -Greenfield development involves the building upon and thereby sealing off of soil thus representing an environmental problem. Soil has the potential to be polluted and contaminated as a result of pollution from development which is not serviced by appropriate waste water infrastructure and from agricultural sources.
Soil erosion due mainly to surface erosion resulting from construction works and agricultural / forestry operations has major potential to impact on water quality and fishery resources.

Clare A number of blanket peats in the upland areas are afforded legal protection. Outside of these sites, activities can impact on the hydrology of the peat habitat and system. Development works whether through access roads for afforestation or wind

energy developments can have a deleterious effect on the bog hydrology and the functions of the peat soil.

Hydrogeological issues especially in relation to extensive peat areas and deep peat soils remain an issue that requires sophisticated modeling and sound technical investigations in order to minimse potential impacts. In particular, hydrogeological problems can arise beyond the site and impact on wide areas for all developments on such soils

4.4.5 Likely Evolution of Soil and Geology Resources in the absence of the WES

In the absence of draft WES there will continue to be a conversion for agriculture to afforestation in many locations as forestry remains an attractive financial option for farmers and the soil capability of these areas is generally poor. Milled and cutover peat extraction was noted in areas of Ben Dash, north of Kilrush, and Sliabh Aughties. However government policy is attempting to purchase these turbary rights over time, so this activity may decline over the proposed lifetime of this Strategy. Infrastructural activities may increase in relation to afforestation and clearfelling.

There is likely to remain some interest in siting wind energy developments in these areas due to the viable wind speeds, proximity to the grid and low population densities, therefore certain soil and geological issues could continue to be addressed at planning application and site level though without the strategic avoidance or mitigation measures advanced through the SEA process.

Finally, hydrogeological issues may not be adequately addressed for wind energy developments in the absence of the draft WES and cumulative impacts may not be adequately investigated if development is permitted on ad hoc basis.

4.5 Population and Human Health

4.5.1 Population

The population of the County (all the areas outside of Galway City) was estimated at 159,052 during 2006. This is an increase of 11% on the 2002 Census figure of 143,245. In the same 2002 to 2006 period Galway City experienced a 9.3% increase in population, from 209,077 persons in 2002 to 231,035 persons in 2006. Galway County is predominantly rural with only around 15% of the population living in towns of more than 1,500 people. The largest towns located in east Galway - namely Ballinasloe, Tuam, Athenry, Gort - followed by Clifden in Connemara, west Galway.

The eastern part of the County saw the greatest increase in populations in the period 2002 to 2006; the greatest number of District Electoral Divisions (DEDs) which saw the largest population declines are in the western part of the Country.

County Galway[1] has undergone rapid change in the nature of employment of inhabitants. The origin of employment has shifted dramatically from a situation in 1986 where agriculture accounted for 35% of employment in the County. By 2002 this had dropped to 11.2% and it was the sectors of Manufacturing, Commerce, Professional

[1] Source: Economic Development Strategy 2009 -2013, Galway County Council

Services and Other Industries that are providing the majority of employment in the County. These sectors are also providing the strongest employment growth rates. Tourism is also key industry in Galway, both County and City. The County has moved from a producer economy to a service economy in a relatively short period.

The County has a predominately dispersed rural population with only three centres of population large enough to be categorised towns at a national level. The County is undergoing significant change. Migration towards Galway City and its rural hinterland is placing an increasing demand on infrastructure and services, while some remote rural areas are experiencing decline and depopulation. In 2002, 76 % of the popualtion lived in rural areas, towns and villages of less than 500 people

Overall[2], the West Region (.8) is in the middle range of the overall affluence to deprivation spectrum, and so is County Galway. The relative position on the affluence to disadvantage spectrum of Galway has slightly improved over the past fifteen years from a score of -.1 in 1991 to .9 in 2006.

- Within Galway, there exist a moderate difference with regard to the relative affluence of the two Partnership areas. Galway Rural Partnership generally covers a more affluent area, whilst the Connemara Partnership area is generally more disadvantaged.
- The ten most disadvantaged rural EDs are exclusively situated in the Connemara Partnership area. The five most disadvantaged are Gorumna (-35.6), Owengowla (-35.5), Turlough (-29.5), Skannive (-29.3), and Camus (-27.7).

There are 25,221 people unemployed across County Galway in July, up 932 (3.8%) from the June figure of 24,289 and an increase of 802 (3.3%) on July 2009. Outside of the city, towns such as Tuam, Loughrea and Ballinasloe are jobs blackspots.

Figure 4.15 shows settlements and population data for the western half of the County.

4.5.2 Human Health

With regard to human health, impacts relevant to the SEA are those which arise as a result of interactions with environmental vectors (i.e. environmental components such as air, water or soil through which contaminants or pollutants, which have the potential to cause harm, can be transported so that they come into contact with human beings). Human health has the potential to be impacted upon by environmental vectors including water, soil and air. Hazards or nuisances to human health can arise as a result of exposure to these vectors arising from incompatible adjacent landuses, for example.

In terms of health impacts, the outbreak of *Crytosporidium* in 2007 has received the greatest attention. *Crytosporidium* was detected in Galway City, with elevated levels detected in the water supply and a huge increase in the number of cases of cryptosporidiosis in the Galway City, and environs, region. While it is likely that there were multiple sources of the parasite in Lough Corrib the reason the outbreak occurred was due to insufficient water treatment, hence the ooycsts of the parasite in Lough Corrib directly entered the water supply in Galway. In total, the residences of Galway City were subjected to a boil water notice for over 5 months, while 242 people were

[2] Source: Key Profile for County Galway, Trutz Haase Economic and Social Consultants

Louisburgh
Ballyhauni
Ballin
Claremorris
MAYO
Clontuskert
Lanesborough
Ballindine
Ballinrobe
Roscommon
Dunmore
ROSCOMMON
Kilmaine
Cong
Shrule
Tuam
Ballygar
Clifden
Moylough
Mount Bellew
Cappaghoosh
Headford
Oughterard
Athlone
Knockbrack
Roundstone
Ahascragh
Cloonboo
Monivea
Moycullen
Claregalway
Ballinasloe
Athenry
Lettermuckoo
Carraroe
Galway
Oranmore
Furbo
Shannonbridge
OFFALY
Spiddle
Belmont
Clarinbridge
Craughwell
Loughrea
Eyrecourt
Banagher
Killimor
Kinvara
Kilronan
Ballyvaughan
Birr
Portumna
Coole
Gort
Gort
Woodford
Lisdoonvarna
TIPPERARY
CLARE
Kilfenora
Borrisokane
Shinrone
Liscannor
Lahinch
Corofin
Whitegate
Cloughjordan
Ennistymon
Feakle
Scarriff
Portroe

City Limits

Settlements

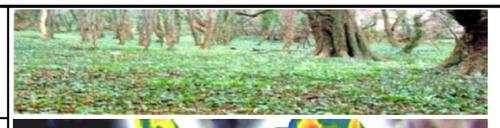
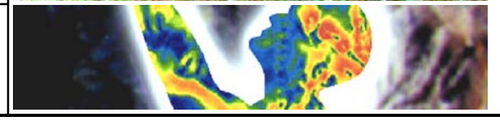
SCALE

- Town
- Minor Town
- Village

SA - Strategic Areas

AP - Acceptable in Principle

0 5 10 20
Kilometres

DATE: 20/10/11	*SCALE: 1:400,000*	**FIGURE 4.15: SETTLEMENTS**	 
REF: WES/xx	*SIZE: A3*		
DRAWN: EV	*APPROVED: RM*	Galway County Council Wind Energy Strategy	

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officially affected by the parasite (although the actual figure is likely to be over 1,000). In response to this the EPA identified a number of water treatment plans in need of remedial action and Galway counts a number of these.

4.5.3 Key Environmental Problems

Certain environmental vectors within the County area - such as air, water or soil - have the potential to transport and deposit contaminants or pollutants, which have the potential to cause harm and adversely impact upon the health of the County‟s population.

Population

It is recognised both nationally and locally, the severe economic constraints facing Ireland. In some of the draft wind energy areas, the challenge is to offer alternative means of economic opportunities to facilitate viable populations remaining in these areas, and to offer an alternative income stream to agriculture and forestry.

Human health

Detailed information about human health in County Galway is not readily available. The most recent data covers the West region and dates from 2007[1]. In terms of health problems in the West region (encompassing counties Galway, Mayo and Roscommon), back pain (9%), asthma (7%) and arthritis (4%) are the most prevalent health conditions diagnosed by doctors in this region. Asthmatics and persons with lung conditions may be considered to be more sensitive to air pollution derived from burning of fossil fuels,

Epileptics are another group that may be more sensitive to issues associated with wind energy development such as shadow flicker and the same survey identified no confirmed epileptics in the west region, although this is probably due to the surveys small sample size.

In terms of human health, impacts associated with wind energy developments are site specific and if not adequately designed and mitigated can impact on human health through noise impacts, electromagnetic effects or shadow flicker.

4.5.4 Environmental Problems in neighbouring counties.

Galway City – Key issues in the development of Galway as a gateway city are balancing the development of a critical mass with protecting the environment and delivering social and physical infrastructure along with development, in particular transport, water and waste water infrastructure, recreation and community facilities. Pressures from development can also provide an opportunity for improvement, for example, the development of recreational and tourism infrastructure for residents and visitors can promote and positively take advantage of Galway's natural assets. Development can also improve the quality of the urban environment through good urban design, which can foster a sense of identity, legibility, accessibility and a safe environment.

County Mayo – continued dispersal of populations into rural areas increase car dependency and may contribute to declining water quality due to unmanaged

[1] Health Status and Health Service Utilisation
Quarterly National Household Survey
Quarter 3 2007

wastewater systems, in addition, loss of Greenfield land associated with rural housing and potential requirement for lands for biofuels and wind energy developments

County Roscommon - Drinking water quality problems have the potential to impact upon human health. The absence of ambient air quality monitoring data for the county means that it is difficult to assess the impact of air quality on human health. Similarly the absence of data on the location and presence of unregulated sites throughout the county means that it is difficult to assess the impact, if any, of waste management activities on human health.

County Offaly Environmental problems - such as the contamination of drinking water - arising out of insufficient and untimely provision of waste water treatment infrastructure have the potential to impact upon the health of the County's population.

County Clare It is recognised both nationally and locally, the severe economic constraints facing Ireland. In some of the draft wind energy areas, the challenge is to offer alternative means of economic opportunities to facilitate viable populations remaining in these areas, and to offer an alternative income stream to agriculture and forestry.

North Tipperary Certain environmental vectors within the Plan area - such as air, water or soil - have the potential to transport and deposit contaminants or pollutants, which have the potential to cause harm and adversely impact upon the health of the area's population

4.5.5 Likely Evolution of Population and human health in the absence of the WES

Current population trends and location settlements are unlikely to be impacted in the absence of the WES. However, in the absence of implementing the Strategy, there will continue to be a focus on attracting inward investment to the County and generating employment in other areas. The County may lose out on opportunities associated with the wind energy sector compared to other counties with significant wind resources and infrastructure. In addition, there may be economic costs associated with not implementing the strategy through increased carbon taxes for County Galway if the county fails to meet renewable energy targets.

In terms of human health, in the absence of the implementation of the strategy, air quality issues through burning of fossil fuels may increase or remain at a similar level currently and impacts on sensitive receptors such as asthmatics may remain an environmental issue.

4.6 Landscape

The most valuable and sensitive landscapes in the County are found to the west of Lough Corrib - especially in the uplands of Connemara and in coastal areas. Landscapes of lesser value and sensitivity - with the exception of areas including the coast of the County from Clarinbridge to Gort, the Lower Burren, water bodies and their banks and some upland areas in the Slieve Aughty Mountains - generally occur in the eastern half of the County.

Landscapes are areas which are perceived by people and are made up of a number of layers: landform, which results from geological and geomorphological history; landcover, which includes vegetation, water, human settlements, and; human values which are a result of historical, cultural, religious and other understandings and interactions with landform and landcover. Human interaction with the natural heritage has produced a variety of characteristic landscapes and landscape features. The natural diversity of the landscapes of the County coupled with cultural features such as the archaeological monuments, stonewalls, hedgerows, woodlands, field patterns, settlements and buildings has given the County its distinctive character.

County Galway is richly endowed with a variety of landscape types ranging from the quartzite mountain ranges and blanket bogs of Conamara to the fertile patchwork of farmland in east Galway and the bare karst pavements of the Aran Islands and South Galway. West Galway is a rugged landscape with mountains, bogs, rivers and lakes. Galway is bounded to the west by an extensive and varied Atlantic coastline, which ranges from cliffs to sand dunes and rocky shores to salt marshes..

The County is dissected by many rivers and lakes with Lough Corrib, Ireland‟s second largest lake at its centre. A multitude of dry stone walls typifies the landscape of the Aran Islands. Seascapes vary from the steep cliffs of the Aran Islands to sandy beaches and the famous Coral Strand, west of Carraroe, to the long fjord-like inlet of Killary harbour.

The importance of landscape and visual amenity and the role of its protection are recognised in the Planning and Development Act 2000, which requires that Development Plans include objectives for the preservation of the landscape, views and the amenities of places and features of natural beauty.

The increasing development pressure of recent years has caused changes in the national landscape, which are unprecedented in scale and nature. The DEHLG have set out guidelines for landscape assessment in order to help ensure that landscapes are maintained in a sustainable manner, while at the same time enabling a proactive approach to development. Galway County Council has prepared a Landscape Character Assessment for the County which classifies the different landscapes of the County in relation to their different characteristics and values and their degree of sensitivity to various kinds of development.

The WES areas are located primarily within four Landscape Character Areas as follows, and shown in Figure 4.16; this figure also shows views/prospects in the Galway CDP 2009 -2015.

WES Areas	**LCA**	**Summary**
Strategic	LCA 10, LCA 11 in west of County	**Area 10-East Connemara Mountains (Moycullen, Recess to Glinsk)** The landscape is largely mountainous with slopes covered with coniferous forestry. The lower areas comprise rocky out crops and areas of rough grassland around the many small loughs and turloughs. The landscape is scenic although not remarkable **Area 11-Lough Corrib and environs.** Lough Corrib is a wide, dramatic expanse of water including many islands supporting deciduous woodland. The land around the northern part of the Lough is undulating

		heath, bog and coniferous forestry where as the land surrounding the southern section is flat, open grassland. The landscape of the Lough and its surrounds is highly scenic and includes many facilities for visitors
Knockbrack AP	LCA 10, 12, 16 & 17 in west of County	**Area 10-East Connemara Mountains (Moycullen, Recess to Glinsk)** The landscape is largely mountainous with slopes covered with coniferous forestry. The lower areas comprise rocky out crops and areas of rough grassland around the many small loughs and turloughs. The landscape is scenic although not remarkable **Area 12-South foothills of east Connemara Mountains.** The landscape of the foothills is undulating heath and scrubland with regular rocky outcrops. The area is generally undeveloped and has expansive views in a southerly direction across Galway Bay towards County Clare **Area 17-Carraroe (Cashla Bay to Glencoh**). This area is flat, open and exposed. The landscape comprises wetland and rocky outcrop in-between the many scattered residential dwellings. The landscape is developed yet not spoilt and the overall setting of the coastal inlet and Kilkieran Bay is quite scenic.
Cappaghoosh	LCA 10, 12, 16 & 17 in west of County	**Area 10-East Connemara Mountains (Moycullen, Recess to Glinsk)** The landscape is largely mountainous with slopes covered with coniferous forestry. The lower areas comprise rocky out crops and areas of rough grassland around the many small loughs and turloughs. The landscape is scenic although not remarkable **Area 12-South foothills of east Connemara Mountains.** The landscape of the foothills is undulating heath and scrubland with regular rocky outcrops. The area is generally undeveloped and has expansive views in a southerly direction across Galway Bay towards County Clare **Area 16-West foothills of east Connemara Mountains. (Glenicmurrin Lough environs).** This landscape is flat to undulating, open with little vegetation and comprises lakes and bog land. There is very little development in this area yet it is not of high scenic value **17-Carraroe (Cashla Bay to Glencoh).** This area is flat, open and exposed. The landscape comprises wetland and rocky outcrop in-between the many scattered residential dwellings. The landscape is developed yet not spoilt and the overall setting of the coastal inlet and Kilkieran Bay is quite scenic.

Lettermuckoo	LCA 10, 12, 16 & 17 in west of County	**Area 10-East Connemara Mountains (Moycullen, Recess to Glinsk)** The landscape is largely mountainous with slopes covered with coniferous forestry. The lower areas comprise rocky out crops and areas of rough grassland around the many small loughs and turloughs. The landscape is scenic although not remarkable **Area 12-South foothills of east Connemara Mountains.** The landscape of the foothills is undulating heath and scrubland with regular rocky outcrops. The area is generally undeveloped and has expansive views in a southerly direction across Galway Bay towards County Clare **Area 16-West foothills of east Connemara Mountains. (Glenicmurrin Lough environs).** This landscape is flat to undulating, open with little vegetation and comprises lakes and bog land. There is very little development in this area yet it is not of high scenic value **Area 17-Carraroe (Cashla Bay to Glencoh).** This area is flat, open and exposed. The landscape comprises wetland and rocky outcrop in-between the many scattered residential dwellings. The landscape is developed yet not spoilt and the overall setting of the coastal inlet and Kilkieran Bay is quite scenic.

4.6.1 Key Environmental Problems

Figure 4.17 shows amenity areas, scenic routes etc in County Galway.
A number of environmental problems are associated with the landscapes of the County and in particular, the more elevated areas that have been identified as strategic/acceptable in principle. Particular landscape issues in the more elevated areas are commonly associated with afforestation, and associated infrastructure, wind energy developments, other tall structures such as mobile phone masts, declining land management and dereliction of houses. In addition, visual impacts and impacts on tourist areas must also be considered.

It is acknowledged that wind energy developments do have a visual impact and can impact on landscape character and quality. However, the informed selection of lower impact areas, careful siting and careful design can minimise the landscape impact and the challenge is to identify areas of lower landscape sensitivity that can accommodate wind energy developments whilst conserving landscapes of higher sensitivity.

SA - Strategic Areas
AP - Acceptable in Principle

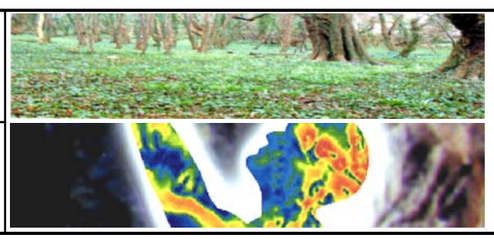
MAYO
ROSCOMMON
OFFALY
TIPPERARY
CLARE

Knockbrack
Cappaghoosh
Lettermuckoo

Landscape Character Areas

1 - North East Galway
2 - Shannon & Suck River Valley
3 - East Central Galway
4 - Southeast Galway
5 - Northeast Galway
6 - Slieve Aughty Mountains
7 - Northwest Lough Derg
8 - Lower Burren
9 - Inveran to Galway City
10 - East Connemara Mountains
11 - Lough Corrib & Environs
12 - South Foothills of east Connemara Mountains
13 - East Galway Bay
14 - West Connemara
15 - Lettermore & Gorumna Islands
16 - West Foothills of east Connemara Mountains
17 - Carraroe
18 - Bertraghboy Bay
19 - West Coast - Gorteen Bay
20 - West Coast - Clifden
21 - Killary Harbour
22 - Connemara National Park
23 - Joyces Country
24 - Aran Islands
25 - Lough Rea

0 5 10 20
Kilometres

DATE: 20/10/11	*SCALE: 1:400,000*	**FIGURE 4.16: LANDSCAPE CHARACTER AREAS**	
REF: WES/xx	*SIZE: A3*	Galway County Council Wind Energy Strategy	
DRAWN: EV	*APPROVED: RM*		

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MAYO

ROSCOMMON

GALWAY

CLARE

TIPPERARY

Cappaghoosh

Knockbrack

Lettermuckoo

SA - Strategic Areas

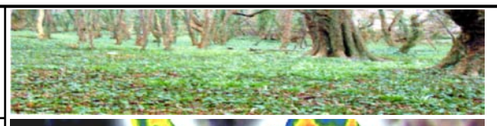
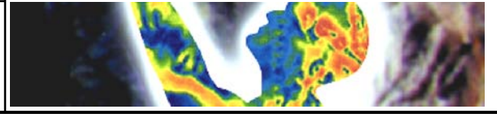
AP - Acceptable in Principle

Scenic Routes

Viewsheds

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.17 SCENIC VIEWS**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
DRAWN: EV	APPROVED: RM		

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4.6.2 Environmental Problems in Neighbouring Counties

Galway City - Landscape is an important contributor to quality of life for people in the city. It is a resource to be used and managed in a sustainable manner in the development process so that it can be conserved and protected. Landscape can accommodate change and sustainable development, having regard to its sensitivity and character.

The built heritage and sites covered by ecological designations form important components of the city's landscape. The green network approach in the Development Plan supports a network of natural heritage areas and wildlife corridors and features of the natural landscape in the city.

Through the development of parks and greenways, the green network will enhance features of the natural landscape in the city. In doing this, the challenge is to conserve areas of heritage value while enhancing the city's landscape and recreational assets. There is also pressure to develop in areas with protected views, which can erode landscape assets.

County Mayo – visual impacts on scenic routes and vulnerable landscapes in addition to cumulative impacts plus climate change impacts on coastal areas in particular.

County Roscommon -• The monotony and sterility of some new housing estates in villages and towns, • New buildings do not integrate well with the surrounding area,• The quality of architecture and position of new buildings in scenic areas was an issue of concern

• The need to retain hedgerows and stone walls,• The visual impact of quarrying in esker regions was seen as a significant issue, • A positive attitude towards the visual appearance of wind farms in the landscape

County Offaly Since the industrialisation of peat harvesting in the 1950s County Offaly's raised bog landscape has been significantly changed loosing ecological, aesthetic and recreational values. This loss of value has resulted in a decreased sensitivity, increasing the ability of these new landscapes to accommodate further change or intervention without suffering unacceptable effects to their new character and reduced values.

In the past, the development of pits for sand and gravel extraction has impacted upon the esker landscape of the County and its various geomorphological, scientific, historical, recreational and amenity values.

An environmental problem with regard to the environmental component of landscape is the visual impact which occurs in sensitive landscapes, such as those in upland areas, as a result of developments such as one off houses.

County Clare. Particular landscape issues in the more elevated areas are commonly associated with afforestation, and associated infrastructure, wind energy developments, other tall structures such as mobile phone masts, declining land management and dereliction of houses.

North Tipperary: The development of pits for sand and gravel extraction has impacted upon the landscape of the Plan area and its various geomorphological, scientific, historical, recreational and amenity values.

4.6.3 Likely Evolution of Landscape in the absence of the WES

If the strategy is not implemented, wind energy developments could be addressed on a case by case basis and cumulatively the landscape impacts could be considerable as they may be scattered across the county and not clustered around strategically important areas. In addition, associated infrastructure for wind energy such as access routes, and substations could cumulatively detract from landscape character across a variety of landscapes in the County.

The impacts on neighbouring counties, in particular Mayo, Roscommon and Clare could be significant as they would not be adequately considered or mitigated through the SEA process.

4.7 Air Quality and Climate

4.7.1 Air Quality[1]

EU legislation on air quality requires that member states divide their territory into zones for the assessment and management of air quality. County Galway is located in Zone D, whilst Galway City is located in Zone C.

The air quality for Zone D (July, 2009) is classified as 'Good' (Mace Head, near Carna, Co. Galway). While ozone target values are currently being achieved, long term objectives for this parameter are not being achieved due to weather fluctuations and fluctuations of ozone being transported across the Atlantic.

While air quality is generally of good quality in Zone C and D, localized areas of pollution are likely to occur throughout the West Region, especially in areas of traffic congestion, especially along national routes intersections and where demolition and construction is taking place.

The air quality in each zone is assessed and classified with respect to upper and lower assessment thresholds based on the measurements over the previous five years. Upper and lower assessment thresholds are prescribed in the legislation for each pollutant. The number of monitoring locations required is dependent on population size and whether ambient air quality concentrations exceed the upper assessment threshold, are between the upper and lower assessment thresholds, or are below the lower assessment threshold. The following emissions/pollutants have implications for both human health and the environment. The following information is sourced from EPA (2008) *Air Quality in Ireland 2007 – KeyIndicators of Ambient Air* Quality.

 Sulphur Dioxide (SO2) is formed when fuel (mainly coal and oil) containing sulphur is burned at power plants and homes etc. Depending on concentrations, the gas can have health implications for asthmatics, can aggravate existing cardiovascular disease, respiratory illness and alter the lungs' defences. Sulphur dioxide and nitrogen oxides are

[1] This section is taken from the SEA ER of the West Regional Planning Guidelines 2010 -2022

the major precursors to acidic deposition (acid rain), which is associated with the acidification of soils, lakes and streams and the accelerated corrosion of buildings and monuments (EPA, 2007, p.2).

 Oxides of Nitrogen (NOx) include two pollutants nitric oxide (NO) and nitrogen dioxide (NO2). Power- generation plants and motor vehicles are the principal sources through high temperature combustion. It contributes to the formation of acid rain and is also a recognised ozone precursor. Short term exposure to NO2 is associated with reduced lung function and airway responsiveness and increased reactivity to natural allergens. Long term exposure is associated with increased risk of respiratory infection in children (EPA, 2007, p. 4).

 Particulate Matter35 (PM10) is derived from the combustion of solid fuels and road traffic, in particular emissions from diesel engines. Other particulates include dust from roads, industrial emissions and natural substances such as windblown sea salt. The matter is very small and can penetrate deep into the respiratory tract and increase the risk, frequency and severity of respiratory and cardiopulmonary disorders (EPA, 2007, p. 6).

 Black Smoke consists of fine particles suspended in air which mainly arise from the incomplete burning of fossil fuels, such as coal, oil and peat, in domestic, industrial or transport sectors. Open fires in dwelling houses are a major source of the smoke. The particulates affect the respiratory system and remain there for long periods of time (EPA, 2007, p. 8).

 Airborne Lead (Pb) levels have dramatically reduced since the introduction of lead- free petrol. Excessive exposure to lead may cause neurological impairments, cause damage to the nervous system of foetuses and young children. It may be a factor in high blood pressure and heart disease; and it can also be deposited on the leaves of plants, presenting a hazard, through ingestion, to grazing animals and subsequently humans.
 Road traffic is the major source of **Benzene** (C6H6) in Ireland. Benzene is emitted from burning coal and oil, petrol services stations, motor- vehicle exhaust and cigarette smoke. Acute (short- term) inhalation exposure may cause drowsiness, dizziness, headaches, as well as eye, skin and respiratory tract irritation and, at high levels, unconsciousness. Chronic (long- term) inhalation has caused various disorders in the blood and is also a carcinogen (EPA, 2007, p.12).

 Carbon Monoxide (CO) is a colourless and odourless gas, formed when carbon in fuel is not burned completely. It is a component of motor- vehicle exhaust, which accounts for most of the CO emissions nationwide and concentrations are generally higher in areas with heavy traffic congestion. It reduces oxygen delivery to the body's organs and tissue and is a serious health threat to suffers of cardiovascular disease. It can be poisonous and result in visual impairment, reduced work capacity, reduced manual dexterity; poor learning ability and difficulty in performing complex tasks are all associated with exposure to elevated CO levels.

 Ground- level Ozone is a secondary pollutant formed from the interaction of NOx, CO and various volative organic compounds (VOCs) in the presence of sunlight. It is present in air masses and is transported from Atlantic and European regions. It occurs naturally in the stratosphere and provides a protective layer high above the Earth which

filters dangerous UV radiation. Higher concentrations of ozone in the air have adverse implications for human health with potential to affect the respiratory system, crops and other vegetation

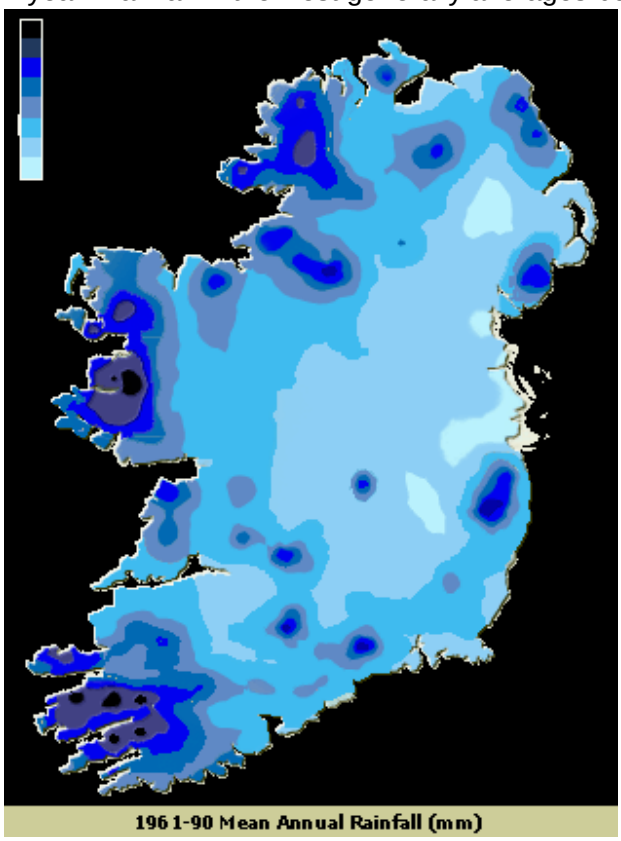
 An EPA (2007) Report 'Dioxin Levels in the Irish Environment: Fifth Assessment (Summer 2007) Based on Levels in Cow's Milk' indicates that **dioxin levels** are below EU limits. Dioxins are of toxicological significance and are sourced from accidental fires, burning of household waste, cement kilns, copper production, forest fires, incineration, production of steel, traffic etc.

4.7.2 Integrated Prevention Pollution Control (IPPC)

IPPC licenses aim to prevent or reduce emissions to air, water and land, reduce waste and use energy/resources efficiently. An IPPC license is a single integrated license which covers all emissions from the facility and its environmental management. All related operations that the license holder carries in connection with the activity are controlled by this license. Before a license is granted, the EPA must be satisfied that emissions from the activity do not cause a significant adverse environmental impact. There are eleven IPPC licensed facilities located within the Galway County Council area with two licensed sites located with the Galway City Council area. Industries for which licenses have been granted include those relating to wood treatment, metal manufacturing, chemical manufacture, animal carcass and animal waste recycling/disposal, energy production from combustion, pesticide formulation, electroplating operations and the manufacture or use of coating materials.
The locations of IPPC licensed facilities in the County and City are mapped on Figure 4.18

4.7.3 Climate

Most of the eastern half of the country gets between 750 and 1000 (mm) of rainfall in the year. Rainfall in the west generally averages between 1000 and 1400 mm. In many mountainous districts rainfall exceeds 2000mm per year. The wettest months, in almost all areas are December and January. April is the driest month generally across the country. However, in many southern parts, June is the driest. Hail and snow contribute relatively little to the precipitation measured. The figure below from Met Eireann shows the mean annual temperatures for Ireland from 1961 to 1990.



4.7.4 Climate Change

A recent publication from the EPA (2009) 'Climate Change –

MAYO

ROSCOMMON

OFFALY

TIPPERARY

CLARE

Earrai Coillte Chonnacht Teoranta

Cappaghoosh

Knockbrack

Lettermuckoo

Medtronic Vascular Ltd.

Dun Aengus Oil Storage

Harbour Enterprise Park Oil Storage

APW Ltd.

Byrne-Mech Ltd.

Hygeia Chemicals Ltd.

Cold Chon Ltd.

Heiton Buckley

Thermo King Ireland

Boston Scientific

Murray Timber Products Ltd.

John English

Premier Proteins Ltd.

Sperrin Galvanisers Ltd.

Tynagh Energy Ltd.

Green Isle Foods Ltd.

Sean Duffy Ltd.

Facilities with Integrated Pollution Prevention Control Licences

Seveso II

SA - Strategic Areas

AP - Acceptable in Principle

0 4.5 9 18

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.18: IPPC and SEVESO II Facilities**	minogue & associates Tuamgraney, County Clare T: 061 640667 ERA-MAPTEC 40 Lwr. O'Connell St. Dublin 1 www.era.ie
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
DRAWN: EV	APPROVED: RM		

the end of this century. Climate change refers to changes in climatic conditions whether through natural variations or as a result of anthropogenic influences. It is expected that temperature in Ireland will rise, with drier summers, wetter winters and more variable precipitation patterns and temperature in the coming years. It is explained that the changes likely to be experienced are due to the increasing amounts of CO_2 and other greenhouse gases in the atmosphere which are continually risingIt is estimated that global temperature change by 2100 will be 1.8 – 4°C. Mean annual temperatures in Ireland rose by 0.7°C over the past century. It is expected that mean temperatures will rise by 1.4 – 1.8°C by 2050 and by over 2°C by 2100. Summer and autumn temperatures will warm more quickly than winter and spring. Winter rainfall is projected to increase by 10% by 2050 and 11-17% by 2080. Reductions in summer rainfall of 12-17% by 2050 and 20-28% by 2080 are expected and there will be a likelihood of longer heat waves, fewer days of frost, longer rainfall events in winter and more intense downpours in summer, and increased likelihood of summer drought (EPA, 2009).

4.7.5 Key Environmental Problems relating to Air Quality and Climate

Generally as a rural county with prevailing westerly winds the County does not have air quality problems. However, localized air quality issues are likely to be present in traffic hotspots or where there is significant construction activity.
Climate change also presents significant challenges and predictions on changing weather patterns must be considered in particular. The European Commission has recently presented a White Paper laying out a European framework for action to improve Europe's resilience to climate change, emphasising the need to integrate adaptation into all key European policies and enhance co-operation at all levels of governance. Complementing the White Paper, the report "Adapting to climate change: the challenge for European agriculture and rural areas" summarises the main impacts of climate change on EU agriculture, examines adaptation needs, describes the implications for the CAP and explores possible orientations for future action. It aims at further engaging Member States and the farming community into a debate and action on adaptation needs that result from climate pressures.

4.7.6 Key Environmental Problems in neighbouring Local Authorities

Galway City Air quality in the city is good. However, high levels of traffic congestion can generate emissions and noise. Possible impacts of climate change are unpredictable, diverse and subject to continued scientific study. The River Corrib, in conjunction with high tides, wet weather, low pressure and driving winds can cause flooding in the city centre. The lake or the River Corrib can on their own cause flooding, as may coastal conditions such as tide, atmospheric pressure, wind direction and weather severity. There are also a number of turloughs within the city, which are an identified flood risk.

County Mayo – emissions from road traffic, power and heat generation; emissions from uncontrolled burning, intensification of existing environmental problems from climate change resulting in more extreme and unstable weather conditions, storms and floods and coastal erosion**.**

County Roscommon - There are no significant environmental problems with regard to air in County Roscommon.

County Clare - Whilst Ireland generally does not have a significant outdoor air quality problem the biggest threat is emissions from road traffic. Air pollution can impact on the health of sensitive populations or groups and eco systems. Climate change also presents significant challenges and predictions on changing weather patterns must be considered in particular.

Offaly - It is considered that in general air quality in the County does not pose a problem and that exceedences of particulate matter 10 (PM10) in Ferbane are being dealt with by the EPA with an appropriate response.

North Tipperary Ireland's current emissions are exceeding targets agreed in the peer review of Ireland's 2006 submission to the United Nations Framework Convention on Climate Change. It is unlikely that Ireland will meet these targets and it is likely therefore that financial penalties will be incurred. Transport related emissions continue to be the dominant growth sector. Changes in the occurrence of severe rainfall events as a result of climate change could adversely impact upon the area's human beings, its biodiversity and its economy.

4.7.7 Likely Evolution of Air Quality and Climate in the absence of the WES

In the absence of the draft WES, there is likely to be only moderate reductions in greenhouse gases in the County. It is difficult to extrapolate the impact of this on national targets for greenhouse gas reductions or renewable energy targets. However, essentially the County will not be contributing to achieving these overall national targets.

In addition, the climate change predictions detailed in the previous section, can be assumed to come to fruition in the event of a do-nothing scenario.

4.8 Cultural Heritage – archaeology and built heritage

4.8.1 Archaeological Heritage

County Galway contains significant cultural heritage resources. Built heritage ranges from national monuments such as Glinsk Castle to ringforts, stone circles, towerhouses, gates and bridges. There are a range of categories under the National Monuments Acts 1934 to 2004. These are:

- National monuments in the ownership or guardianship of the Minister or a
- Local Authority or national monuments which are subject to a preservation
- order;
- Historic monuments or archaeological areas recorded in the Register of
- Historic Monuments; or
- Monuments or places recorded in the Record of Monuments and Places.

In the western half of the County clusters of monuments are found near the banks of Lough Corrib, within and surrounding Oughterard and in coastal areas to the east of Connemara. A high proportion of monuments are to be found on the Aran Islands.

Upland areas and peat soil may support a variety of archaeological features notably ritual archaeological sites such as megalithic tombs. In addition, vernacular architecture, field patterns and enclosures all contribute to distinctive cultural landscapes which create

a local sense of place. In particular the stone walls and field patterns of Connemara are considered highly distinctive and characteristic of the area.

In many of the areas identified as strategic or acceptable in principle there has been extensive afforestation which has disguised at landscape level some of these features. However, the potential for archaeological finds associated with wind farm construction needs to be recognized. The section below presents the number of recorded monuments within the Strategic and Acceptable in Principle Areas. This information is considered relevant as frequently impacts on archaeological resources are at site level. Figure 4.19 presents this information, whilst the table below presents further detail.

WES Area	Number of SMRs
Strategic	3
Knockbrack	7
Cappaghoosh	0
Lettermuckoo	0

4.8.2 Architectural Heritage

The Planning and Development Act (2000) allows for the listing of important structures in County Development Plans in order to provide protection to these structures which must be of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. Details of protected structures are entered by the authority in its Record of Protected Structures, which is part of the Development Plan.. Figure 4.21 shows protected structures within 5km of the strategic and acceptable in principle areas.. The number of protected structures within a 5km buffer of the the strategic and acceptable in principle areas are detailed below.

WES area	No. of Protected Structures within 5km
Strategic	198
Knockbrack	31
Lettermuckoo	11
Cappaghoosh	4

Finally, legislation is provided for Architectural Conservation Areas (ACA). Figure 20 shows the ACAs in the County. ACAs may be used to protect the following:
a) Groups of structures of distinctiveness or visual richness or historical importance;
b) The setting and exterior appearance of structures that are of special interest, but the interiors of which do not merit protection;
c) The setting of a Protected Structure where this is more extensive than its curtilage;
d) Designed landscapes where these contain groups of structures as in, for example, urban parks, the former demesnes of country houses and groupings of archaeological or industrial remains;
e) Groups of structures which form dispersed but unified entities but which are not within the attendant grounds of a single dominant Protected Structure.

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TIPPERARY

CLARE

Cappaghoosh

Knockbrack

Lettermuckoo

Coole

Gort

Recorded Sites & Monuments

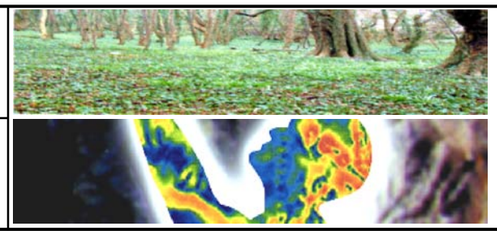
SA - Strategic Areas

AP - Acceptable in Principle

0 5 10 20

Kilometres

DATE: 12/04/11	SCALE: 1:400,000	**FIGURE 4.19: ARCHAEOLOGICAL SITES**
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy
DRAWN: EV	APPROVED: RM	



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Clifden

Cappaghoosh

Knockbrack

Oughterard

Headford

Tuam

Lettermuckoo

Bearna

Oranmore

Clarinbridge

Athenry

Craughwell

Loughrea

Ballinasloe

Gort

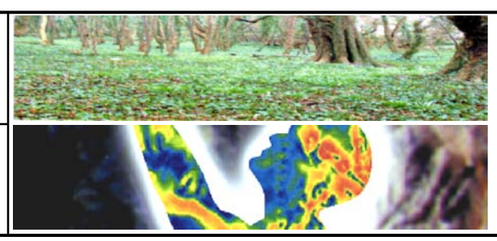
Portumna

Architectural Conservation Areas

SA - Strategic Areas

AP - Acceptable in Principle

0 5 10 20
Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4:20: ARCHITECTURAL CONSERVATION AREAS**	
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Knockbrack

Lettermuckoo

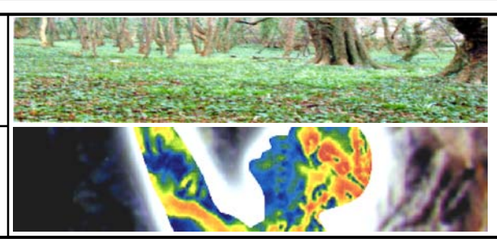
Record of Places and Structures

SA - Strategic Areas

AP - Acceptable in Principle

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4:21: RECORD OF PLACES AND STRUCTURES**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
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In addition to these Protected Structures, there are nine Architectural Conservation Areas (ACAs) adopted in the current County Development Plan. These ACAs are found in the following settlements:

Oughterard; Headford; Tuam;Oranmore; Athenry; Clarinbridge; Loughrea; Gort; and Portumna.

4.8.3 Key Environmental Problems

Archeology
The archaeological and architectural heritage of the County is afforded protection through legislation. However, the cultural heritage of the County can still be impacted upon through development. Development on sites or land adjacent to protected sites can impact upon the context, if not mitigated. Previously unknown archaeology can be damaged as a result of development.

Another consideration relates to archaeological landscapes and potential environmental problems associated with wind energy developments on upland sites. Such upland sites may suffer from reduced visibility due to such developments with upland bogs and drumlins of particular significance. Additional subsurface archaeology may be located within peat soils but appropriate mitigation measures should assist in avoiding impacts.

Architectural Heritage
The setting of ACAs and protected structures is another consideration and insensitive or inappropriate developments that negatively impact on these resources may be another potential threat. As stated, there are no ACAS within the strategic/acceptable in principle areas nonetheless the impact of wind energy developments on the setting of these areas should be considered.

4.8.4 Environmental Problems in neighbouring local authorities

Galway City Galway has a unique and valuable built and architectural heritage, including a strong medieval architectural and archaeological legacy. Development affecting protected structures can pose a challenge, however, there have been successful examples of restoration and reuse within the city that both enhance the value of the property and its surrounds. Unauthorised development can have a negative impact on protected structures and the character of ACA's. There has also been a low uptake in conservation grants available for protected structures, partly because of the onerous application procedure. The continued promotion of the Irish language, for example through the naming of new roads, residential place names, signage on shop-fronts and commercial development should be reflected in the policies of the Development Plan.

County Mayo – visual impacts on sensitive/vulnerable landscapes and scenic routes, cumulative impacts and climate change.

County Roscommon - In the event that an archaeological find is discovered then a licence from the DoEHLG, Heritage Section is required to conduct works in the area.

County Offaly Development on sites adjoining protected monuments, places or structures can adversely impact upon the context of these cultural heritage items in both townscapes and landscapes if unmitigated against. Previously unknown archaeology can be damaged as a result of development which causes ground disturbance. Development which involves material alteration or additions to protected structures can detract from the special character of the structure and its setting, and have the potential to result in the loss of features of architectural or historic interest and the historic form and structural integrity of the structure are retained.

North Tipperary -The cumulative accommodation of large scale development in North Tipperary has the potential to cumulatively impact upon the cultural heritage of the Plan area. Archaeology can be previously unknown but can be damaged through development causing ground disturbance
County Clare

4.9 Material Assets – transport, waste management, noise, energy use, water services, flooding *and Seveso II sites*

4.9.1 Transport

Airports
Galway Airport has up to 5 daily commuter flights to Dublin. In addition the islands of Inis Mór, Inis Meáin and Inis Oírr have an airstrip. Development Plans for the airport at Carnmore include an extension to the runway to facilitate 100 seater planes and provide international air access.

The international Airports in Shannon and Knock are within one hours drive from County Galway. Access times to these Airports are continuing to reduce with the improvement of the Road and Public Transport network.

Sea
Galway Port has regular shipping traffic for both coal and oil. The port authority is also developing opportunities for other bulk products e.g. Steel; Liquid bitumen. The Authority has also recently developed an enterprise park in the port area of 40 acres, and plans are in place to increase this by an additional 32 acres. Ships of up to 10,000 dwt can be catered for in the harbour where there are up to 11 berths available.

There are over 240 piers and harbours in Galway. The county has five main fishing ports: Ros A' Mhíl, Kilronan, Cleggan, Kilkerrin and Kinvara. Ros A' Mhíl is one of the top five passenger and fish landing harbours in the Country. Ferries to the Aran Islands operate from Ros A' Mhíl, carrying 150,000 passengers annually. Galway and Cleggan Ports also serve the offshore islands. There are plans to expand the ferry berth and deepen the harbour at Ros A' Mhíl as part of a €25 million development of the harbour.

Road
A High Quality Dual carriageway/motorway between Dublin and Galway (N6) is now operational. Further improvements to the N17 north to Sligo and the N18 south to Limerick are progressing.

The Galway City Outer Bypass has received planning permission for part of the route, whilst the final decision is before the European Commission in relation to the HDA.

The existing N6 runs from Galway City in the west to Kinnegad, County Westmeath in the east, where it joins the existing N4 and continues along this route to Dublin City.The overall length of the existing N6 is 154 kilometres. The section covered by this Scheme is 21.4 kilometres in length and forms an outer bypass for Galway City. The Scheme, partly in Galway County and partly in Galway City, extends from the R336 Regional Road west of Galway City and links up with the proposed N6 Galway to Ballinasloe Scheme east of the city.The N59 runs from Clifden to Oughterard and is the main National Road within the WES areas. There are proposed improvements[1] to this road as follows:

The proposed scheme is from the eastern side of Clifden to the western side of Oughterard and includes a 3.9km section under construction at Derrylea. The scheme is proposed as a pilot scheme for the new Type 3 Single Carriageway road type. It is expected that the scheme will be primarily on-line widening with some isolated off line sections where the existing alignment is particularly poor.

Two Regional Roads traverse west Galway and are of relevance to the WES areas, these are:
R336
R340
Figure 4.22 shows the main transport routes in the County.

Rail
Galway City has up to 7 trains daily to/from Dublin. It is proposed to increase the frequency of the service to Dublin. There is also an early morning and late evening commuter service between Athlone and Galway. The Rail link between Ennis and Limerick is now operational.

Waste Management

The Connacht Region Waste Management Replacement Plan has been developed by the local authorities of Galway City and County, Leitrim, Mayo, Roscommon and Sligo and covers the period from 2005 to 2010. The 2001 Plan adopted a regional approach to integrated waste management based on the waste hierarchy established in the EU Framework Directive on Waste and set the following targets for 2013 for municipal waste in the Region:

Recycling 48%	Energy Recovery 33%	Residual Waste Disposal 19%

Progress in Plan Implementation
Significant progress has been made towards the regional municipal recycling target by reaching a municipal recycling rate of 29% in 2004. This can be attributed to the expansion of segregated collection of dry recyclables, the provision of additional bring banks and the increased network of recycling centres. The achievements in waste prevention, minimisation and recycling have improved since the appointment of Environmental Awareness Officers by the local authorities.

[1] Source: National Roads Authority http://www.nra.ie/RoadSchemeActivity/GalwayCountyCouncil/

Water Supply and Waste Water

Galway County Council provides a broad range of services and arguably two of the most important are the provision of a potable water supply and the collection and safe disposal of wastewater. As well as planning for the future, the Council operates 46 public water supply schemes and 26 sewerage schemes. As part of our programme for the provision of new facilities the Council proposes to rationalise and renew these existing facilities. There are also 177 Group Water Schemes taking a supply from public water supply schemes serving 15% of the population and a further 454 schemes serving 27.6% of the population using a variety of private supplies.

Energy Use

The County is served through the national grid providing supplies at 10/20 KV; 38 KV; 110 KV and at 220 KV. Plans are in place to upgrade and further improve supplies within the County. A new power station, powered by natural gas, was commissioned in 2006. It is operated by Tynagh Energy Ltd.

Noise

Traffic hotspots within some of the County′s towns are likely to have elevated levels of air pollution and noise due to traffic congestion. These hotspots are located along the main road routes - especially at intersections - and provide for a harsh sensory environment which may impact upon human health. Streets in low lying areas that have high traffic counts as well as enclosing taller buildings are likely to have harsh sensory environments with regard to noise levels. Localised noise pollution is likely to occur when demolition/construction takes place and when traffic is queuing for long periods of time. In addition, there are localised noise sources which include air conditioning equipment, marine traffic, port activities, train movements and night clubs. Certain parts of the County lie below the approaches to Carnmore Airport and are subjected to intermittent levels of noise from that source. The Noise Directive requires Galway County Council to produce a noise map and to reduce noise levels to acceptable noise dose levels

Flooding

County Galway is vulnerable to adverse effects from changes in the occurrence of severe rainfall events and associated flooding of the County′s rivers combined with small changes in sea level. Much of the flooding in the County occurs during adverse weather conditions whereby heavy rainfall causes high river flows. Local conditions within the County including bridges and culverts - which restrict high flows -, debris - which cause blockages - and land use changes can also increase the risk of flooding.

East Galway is generally more liable to flooding due to topography and shallow gradient of a number of rivers including the Clare River. In the areas under discussion, the regional roads R336 and R340 are identified as subject to flood events due to high tides and storm surges (particularly around the coastal areas) and also heavy rain and run off from bogs.

Seveso II Sites[2]

[2] This section was included following a submission from the Health and Safety Authority

The Seveso II Directive defines major-accident hazard sites (Upper & Lower Tier, depending on a specified threshold). The Health and Safety Authority acts as the competent authority under the EC (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2006. The HAS advices planning authorities in terms of certain distances and proposed development in relation to such sites. Within County Galway there are no Seveso II sites; within Galway City function area there are two such sites, within the docks at Irish Shell Galway Terminal and Leeside Oil Terminal. These are not within 300m of any proposed wind energy designations so are not considered a potential environmental sensitivity.

Croagh Patrick
Strokestown House
MAYO
ROSCOMMON
OFFALY
CLARE
TIPPERARY
Mweelrea
Ben Gorm
Delphi Adventure Centre
Kylemore Abbey
Cappaghoosh
Knockbrack
Rossaveel Port
Lettermuckoo
Galway Port
Galway Regional Airport
Turoe Stone
Clonmacnoise
Kilronan Port
Dún Aenghus
Aillwee Caves
Burren Interpretive Centre
Cliffs of Moher
Coole Park
Coole
Gort

Transport Nodes

CATEGORY

- Airport
- Sea Port

Main Roads

TYPE

- N Road
- R Road
- Motorway
- Primary Route
- SA - Strategic Areas
- AP - Acceptable in Principle

0 5 10 20
Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.22: TRANSPORT NETWORK**	**minogue & associates** Tuamgraney, County Clare T: 061 640667 **ERA-MAPTEC** 40 Lwr. O'Connell St. Dublin 1 www.era.ie
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MAYO

ROSCOMMON

OFFALY

TIPPERARY

CLARE

Cappaghoosh

Knockbrack

Lettermuckoo

Coole

Gort

Waste Water Treatment

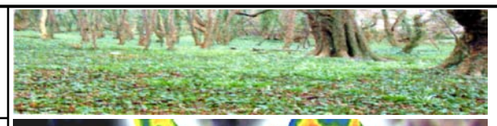
SA - Strategic Areas

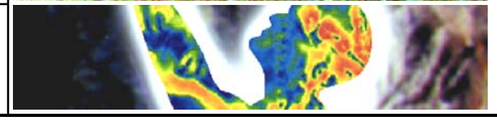
AP - Acceptable in Principle

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.23: WASTE WATER TREATMENT POINTS**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
DRAWN: EV	APPROVED: RM		





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Knockbrack

Lettermuckoo

Coole

Gort

Flood Points

Flood Areas

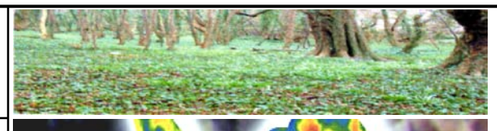
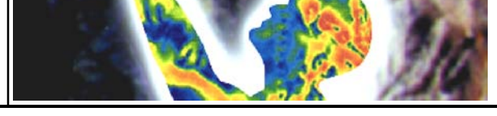
Nov 2009 Flooding

SA - Strategic Areas

AP - Acceptable in Principle

0 5 10 20

Kilometres

DATE: 20/10/11	SCALE: 1:400,000	**FIGURE 4.24: FLOODING**	
REF: WES/xx	SIZE: A3	Galway County Council Wind Energy Strategy	
DRAWN: EV	APPROVED: RM		

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4.9.2 Key Environmental Problems in neighbouring local authorities

Galway City

A key challenge for the Development Plan is to balance growth with protecting the environment and delivering physical infrastructure to meet population projection targets. The development of waste water infrastructure has improved the quality of water in Galway Bay. Providing a safe and secure water supply to serve the city is a key priority. Integrated waste management, waste minimisation and prevention, which provides the highest level of environmental protection, remains a significant challenge.
Infrastructure proposals, such as proposed developments at Galway Port will also have to consider environmental impacts, including impacts on the conservation status of designated areas. Major accident sites (Seveso II) may have a significant impact on human health and the environment.

County Mayo - areas prone to flooding identified in RES SEA ER. No areas identified as subject to particular noise problems,

County Roscommon –none identified

County Offaly County Offaly has experienced relatively large growth in recent years and there are certain areas whereby development has exceeded infrastructural development, for example where construction of development has preceded waste water treatment infrastructure or exceeded existing waste water treatment infrastructure capacity.

North Tipperary There are a number of waste water treatment shortfalls in the County. The overloading of waste water treatment plants, low levels of treatment and discharge of outflow to water bodies at risk has significant potential to harm human health - through contamination and pollution of drinking water - and biodiversity and contribute to failing Water Framework Directive objectives if unmitigated.
If new development was not accompanied by appropriate waste water infrastructure /capacity then it is likely that adverse impacts upon a number of environmental components would arise.
In order to provide sufficient water supply to existing and new populations, water abstraction will need to increase. Projects providing for such increases could have adverse impacts upon the integrity of waterbodies and the life that they support.

County Clare

Transport routes within the Strategic/acceptable in principle areas are composed of a number of regional roads on the perimeter of the upland area and a small network of tertiary roads through these areas. Transport associated with wind energy developments can be a key consideration particularly in terms of transporting long turbine towers to the sites. In addition, there may be multiple trips associated with construction of wind farms in strategic areas, in terms of bringing construction materials on site.

There is some evidence of fly tipping and dumping in the upland areas of the county due to their remote location. Otherwise there is little available information on waste management or waste problems in these areas.

Clare County could exceed the 2010 Kyoto limit by 490,000 tonnes of CO_2. Increased efficiencies of energy usage, fuel transfer from oil to gas and greater use of renewable energy are key trends identified in the LCEA Climate Change Strategy

4.9.3 Likely Evolution of Material Assets in the absence of the WES

In the absence of the Strategy, wind energy developments with potential implications for tertiary or new roads may not be adequately addressed in terms of cumulative impacts and may miss out on opportunities to share road resources for construction and access.

Waste management associated with Windfarm construction would be addressed on a case by case basis and without the strategic viewpoint, opportunities to minimise or improve waste management regimes associated with such developments may not occur.

In the absence of the Strategy, County Galway may not fully utilise in a sustainable manner the significant wind resources of the county and would not promote renewable energy as a means of offsetting carbon outputs and carbon levies.

The noise levels of the strategic/acceptable in principle areas are likely to remain broadly unchanged, although wind energy developments may still be granted in these areas. The issue of cumulative noise impacts from wind energy developments may be less easily assessed in the absence of the draft WES.

4.10 Interaction of Environmental Parameters

The interrelationship between the SEA environmental topics is an important consideration for environmental assessment. *Table 4x* highlights the key interrelationships identified in this Environmental Report. These potential interrelationships will be taken into account in the assessment of the different alternatives A primary relationship exists between water resources and biodiversity, human health and population.
Climate change and climatic factors is another key parameter that has impacts on biodiversity, water, soil, human health and population, landscape, cultural heritage and transport.

Table 4: Key Interrelationships of environmental parameters

Topic										
Biodiversity	√	√	√	√		√	√	√	√	√
Water	√		√	√	√	√	√	√	√	√
Soil	√	√		√	√	√	√	√	√	√
Landscape	√		√		√	√	√	√	√	√
Cultural Heritage			√	√		√	√			√
Population	√	√	√	√	√		√	√	√	√
Human health	√	√	√			√		√	√	√
Air	√	√	√	√		√	√		√	√

Climatic Factors	√	√	√	√	√	√	√	√		√
Material Assets	√	√	√	√	√	√	√	√	√	
	Biodiversity	**Water**	**Soil**	**Landscape**	**Cultural Heritage**	**Population**	**Human health**	**Air**	**Climatic factors**	**Material Assets**

5 Chapter Five: Environmental Protection Objectives

5.1 Introduction

This overall aim of the SEA is to facilitate environmental protection and to allow the integration of environmental considerations into the development of the Draft WES. To that end, the SEA process assesses the Draft Strategy as it evolves in terms of its environmental impacts, positive, negative, neutral, cumulative and synergistic and also in terms of duration ie: short, medium, long term, temporary, permanent, and secondary effects. This process highlights how improvements can be integrated into the Draft WES to increase its environmental performance and maintain environmental resources.

A series of environmental objectives are presented in this chapter and are developed into a monitoring programme in the form of targets and indicators which are presented in more detail in *Chapter Nine Monitoring Programme*.

5.2 Environmental Protection Objectives

Establishing environmental objectives is a key element of SEA as it allows the assessment of the Strategy as it is implemented over time. The development of such objectives has been undertaken with regard for international, national, regional policies, the SEA guidelines and consultation.

SEA Objectives are different to objectives detailed in the Draft WES, however, they are used to assess the development strategies of the Wind Energy Strategy and allow its evaluation and identification of where conflicts may occur. This forms the basis of the environmental assessment of the Draft Wind Strategy, which is presented in *Chapter Seven.*

Table 5 **below presents the Environmental Protection Objectives for each environmental topic.**

Table 5 Environmental Protection Objectives

Environmental Protection Objectives
Biodiversity, Flora & Fauna
B1:Protect diversity and integrity of designated habitats and species and maintain wildlife corridors B 2:Protect aquatic environment B3 Avoid significant adverse impacts (direct, cumulative and indirect) to protected habitats, species or their sustaining resources in designated sites by development within or adjacent to these sites.
Soil and Geology
SG 1:Maintain soil quality and function in defined areas SG 2:Demonstrate best practice modeling for landslide susceptibility and risk assessment SG 3: Minimise damage to peat and mineral soils SG 4:Encourage reuse and recycling of soil /bedrock associated with wind farm developments
Water
W 1:Protect and enhance the quality of aquatic systems and their associated functions by maintaining high water quality standards W 2:Minimise run off and pollutants from clearfelling and site clearance to water W 3:Prevent pollution and contamination of groundwater W 4:To prevent pollution of surface waters (including coastal and estuarine***)*** from wind energy developments
Population and Human Health
PH1:Ensure local and neighbouring communities benefit economically from wind energy developments in the defined areas PH 2:To protect human health from hazards or nuisances arising from wind energy developments specifically noise, shadow flicker, visual impacts and temporary construction impacts
Landscape
L1: To protect the county's unique and special landscapes, from negative wind energy development impacts L2: Minimise visual impacts of wind farm developments through appropriate design and siting
Cultural Heritage
CH1:Protect and conserve archaeology resources in relation to wind energy developments CH 2:To preserve and protect the special interest and character of the county's architectural heritage in relation to wind energy developments
Air Quality and Climate
AQ 1: Increase energy from renewable resources in particular wind energy developments in appropriate sites AQ 2: Decrease greenhouse gas emissions
Material Assets
MA 1: Maximise use of land zoned for wind farm development MA 2:Transport: facilitate sharing of access roads for wind energy developments in defined areas MA 3: Waste: minimise waste production and operate sustainable waste management practices MA 4 Demonstrate best practice in reuse and recycling of construction and demolition waste MA 5:Promote energy efficiency in construction associated with wind energy developments MA 6: Noise – minimise negative noise impacts associated with construction and operation of wind energy developments MA 7: Ensure new energy infrastructure is connected to the national grid in a sustainable manner MA 8: Ensure that renewable energy developments do not impact negatively on existing wastewater treatment plans MA 9: Prevent development on lands that pose a significant flood risk

6 Chapter Six Consideration of Alternatives

6.1 Introduction

This section describes the alternatives considered in the development of the Draft WES. The consideration of alternatives and the evaluation of their likely environmental impacts is a key function of the SEA process. Each alternative was assessed against the Environmental Protection Objectives and are presented in *Table 6a*. In addition to the broad alternative scenarios, the emerging areas were also subject to refinement as the SEA and HDA processes identified potential significant impacts, these areas in turn were avoided or mitigation measures advanced, as detailed in *Chapter Eight, Mitigation Measures*. A summary of the areas that were subject to alteration throughout the SEA process to date are presented at the end of this chapter in *Table 6b*.

Option 1 – Do Nothing Scenario

This option would involve retaining the existing wind farm zonings in the GCDP to guide planning of wind farm developments in the County. The existing zonings do not adequately reflect EU and national legislation, technological changes, policy changes and updated planning guidelines for wind farm development that are now available. Particularly in light of the proposed timeframe of this WES, the current strategy of the GCDP 2009-2015 does not adequately reflect recent legislation and policy.

Option 2 – Ad-hoc Planning for Wind Farm Development

This option would result in wind energy applications being addressed on a case-by-case basis without an overall strategic framework to guide wind energy development in County Galway. This is not in line with existing planning guidance for wind energy development and would not facilitate an evaluation of cumulative impacts associated with wind farm development. In addition, the lack of a strategic evaluation of this land use would not be in keeping with the SEA Directive.

Option 3 – Alternative Renewable Energy Sources

This option would involve planning for alternative renewable energy sources such as biomass or tidal power in seeking to achieve a target that reflects the national target of 40% renewable energy production by 2020. Whilst other renewable energies can and will contribute to this target, in practice County Galway has a significant wind resource and at national level Ireland has experience in planning and managing this technology. Wind energy technology is currently the most established and experienced renewable technology in this country hence the focus for the lifetime of this strategy (2011 to 2020) remains on wind energy planning. Thus, while this option was not considered a realistic alternative to wind energy development, it is being pursued by Galway County Council in conjunction with the WES.

Option 4 – Offshore Wind Energy Development

This scenario would see the direction of wind farms to the offshore areas of County Galway as a means of achieving renewable energy targets. It is unlikely that the County could achieve significant renewable energy production from this offshore wind energy development within the timeframe envisaged for the WES. In addition, SEAI has recently issued the draft SEA for offshore renewable energy development plan (OREDP) that has identified potential areas for offshore renewable around Ireland. Within this draft plan, County Galway, along with Mayo and Clare is called the West Assessment Area. At this three county level, the SEA identifies negligible environmental impacts upto 300mw of fixed offshore production, but also highlights the need for more detailed baseline research on the marine environment. Should recommendations arise from the finalised OREDP, these will be considered by GCC. Thus, while this option was not considered a realistic alternative to onshore wind energy development, it has been considered as part of the overall WES for County Galway.

Option 5 – Onshore and Offshore Wind Energy Development

This scenario would direct wind energy developments to both on shore and offshore areas in and around County Galway as a means of achieving renewable energy targets. It is unlikely that the County could achieve significant renewable energy production from off shore wind energy within the timeframe envisaged for this WES, however, there may be potential for a certain amount of off shore wind energy development and the WES has accordingly retained the flexibility to allow for offshore wind farm developments.

Option 6 – Alternative Targets and Alternative Timeframes

This scenario would assess different renewable energy targets and timeframes as a means of achieving a 2020 renewable energy target of 40% electricity production from renewable energy resources. The target of 500 MW has been developed in consideration of the technical, physical and environmental constraints facing wind energy development and in consultation with a number of agencies and represents a realistic target that can potentially be achieved over the lifetime of the WES.

Option 7 – Strategic Approach to Wind Energy Development

This is the approach taken by GCC in undertaking this work and SEA. It recognises where the principal wind resources are and matches them to existing infrastructure – two critical considerations for wind energy development. In addition, the identification of Strategic Areas and Acceptable in Principle Areas permits a comprehensive assessment of environmental resources within and close to these areas, facilitating a more robust SEA and HDA process that informs the WES development. It allows for a medium term view of wind energy developments in the County and encourages clustering or sharing of infrastructure associated with wind energy development such as access roads.

In summary, the significant environmental and energy benefits would be as follows:

- Facilitates a strategic and plan-led approach to wind energy development in the County.
- In turn, this permits the more accurate analysis of existing environmental resources, potential impacts and identification of mitigation measures where necessary.

- Facilitates the avoidance of particularly sensitive resources where necessary.
- Allows for a cumulative assessment of wind energy developments within the County.
- Allows the County and potential investors a means to progress wind energy developments within robust strategic areas in the County, assisting the County in increasing renewable energy.

Once the initial Option 7 was selected as the most appropriate and strategic option for the draft WES, a spatial analysis of options was undertaken. The aim of this was to further refine the areas for wind energy development and permitted closer scrutiny of the different areas in the county once the approach in Option 7 was applied. Essentially the options below are 'sub-options' of the preferred option. These are summarized below and are also assessed in Table 6a.

Spatial Wind Energy Options

The SEA also assessed a number of spatial alternatives for wind energy development and these are presented below.

Option 7A – Concentrate Wind Energy Development in the West of the County

The west of the County has the greatest wind resource but also has more limited electricity transmission infrastructure and significantly greater constraints in terms of Natura 2000 sites, NHAs and scenic landscapes. It is unlikely that the County could achieve sufficient renewable energy production solely from wind energy in the west within the timeframe envisaged for this WES, however, there is potential for a significant amount of wind energy development in the west of the County and the WES has accordingly incorporated this as part of the strategy.

Option 7B – Concentrate Wind Energy Development in the East of the County

The east of the County has the lowest wind resource but also has greater electricity transmission infrastructure and significantly lesser constraints in terms of Natura 2000 sites, NHAs and scenic landscapes. It is unlikely that the County could achieve significant renewable energy production solely from wind energy in the east within the timeframe envisaged for this WES, however, there is potential for a certain amount of wind energy development in the east of the County and the WES has accordingly incorporated this as part of the strategy.

Option 7C – Concentrate/Consolidate Wind Energy Development in a single large cluster

This option would allow for the clustering of wind farm developments in a large cluster in the County based on strategic analysis of the most suitable area in terms of wind resources and environmental, landscape and other factors. This approach would limit the dispersal and widespread impact of wind farms but would potentially lead to significant effects in a single particular location.

Option 7D – Disperse Wind Energy Development throughout County

This option would allow for the dispersal of wind farm developments throughout the County within potentially suitable areas. This approach would not realise opportunities for clustering wind farm developments in the most strategic locations and would result in widespread environmental and visual impacts around the County.

Option 7E – Larger Wind Farm Clusters in Suitable Areas and Smaller Wind Farm Developments in Potentially Suitable Areas

This option would allow for the concentration of larger wind farm developments in the most suitable areas together with smaller wind farms or groupings of wind farms in other acceptable areas, subject to environmental and visual assessment. This option would have the greatest potential to meet the wind energy targets for the County whilst limiting the extent of environmental, visual and amenity impacts.

Alternative Considered	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
Option 1 – Do Nothing Scenario This option would involve retaining the existing wind farm zonings in the GCDP to guide planning of wind farm developments in the County	MA2	MA6 AQ2	B1, B3 W1, W2 AQ1, MA7	B2,SG3,SG4 W3,W4,PH1,PH2 L1,L2,CH1,CH2 MA3, MA4 MA8, MA9	SG1 SG2 AQ2 MA1	
This option will facilitate the development of wind energy within the existing defined areas in the current CDP 2009 -2015. The potential significant negative impacts relate primarily to biodiversity and soil and geology as the current zonings do not take account of recent natural heritage designations, in particular in the Sliabh Aughties. *Careful scrutiny of potential impacts and understanding of different risks associated with construction on peat soils is now more advanced than when the CDP was developed and this option does not reflect recent scientific studies and emerging best practice from both Ireland and elsewhere. In summary, this option would be unlikely to promote sufficient wind energy to meet the proposed target and would generate impacts on designated sites and habitats.*						
Alternative Considered	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
Option 2 – Ad-hoc Planning for Wind Farm Development This option would result in wind energy applications being addressed on a case-by-case basis without an overall strategic framework to guide wind energy development in County Galway.		AQ2	B1, B2, B3 SG2 W1, W2, W3, W4 PH1 MA1, MA2	SG4 PH2 L1, L2 CH1, CH2 MA3, MA4 MA9	AQ1 MA6 MA7 Ma8	SG1 SG3

This option emerges as generating a significant number of negative impacts, particularly in relation to biodiversity including ecological corridors and protected habitats and species. The lack of a strategic approach to wind energy planning in the county would also weaken the assessment of cumulative impacts and cross boundary impacts in areas such as water quality, biodiversity, and landscape.
In addition, in the absence of clear direction and guidance to potential applicants, this option is unlikely to promote wind energy development at a viable scale or production within the county.
Finally, material assets such as promoting the sharing of infrastructure associated with wind energy development such as access roads would not be facilitated as the planning response would be based on an ad hoc basis.

Alternative Considered	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
Option 3 – Alternative Renewable Energy Sources This option would involve planning for alternative renewable energy sources such as biomass or tidal power in seeking to achieve a target that reflects the national target of 40% renewable energy production by 2020.	SG1,SG4 W4,PH1,PH2 L1, L2, CH1, CH2, AQ1, MA1, MA2, MA5, MA6	AQ2		B1, B2, SG1 SG3 W1, W2, W3, MA7,MA8, MA9	B3 MA4	SG2

Alternative renewable energy can also generate significant impacts both positive and negative depending on the type of alternative energy proposed. This evaluation assumed biomass and tidal energy production. As can be seen from the above table, a high number of impacts from such energy development are unlikely to interact with the EPOs, principally because the EPOs concerned specifically address wind energy development. Notwithstanding that, a number of impacts are identified for such energy developments but would be likely mitigated including biodiversity impacts, water and material assets. Biomass production would likely be concentrated on the more arable soils of the eastern part of the County whilst tidal power would clearly be based off the Galway coast and may impact on the natural heritage associated with islands and the marine habitats. Although tidal energy is becoming more viable and subject to ongoing research, within the lifetime of the proposed WES it is unlikely to be fully developed, operational and hence contribute to meeting national renewable energy targets.

Alternative Considered	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
Option 4 – Offshore Wind Energy Development This scenario would see the direction of wind farms to the offshore areas of County Galway as a means of achieving renewable energy targets	SG1, SG2, SG3, SG4 MA1, MA2 MA8 MA9			PH1, PH2 CH1, CH2 MA3, MA4 MA5, MA6 MA7,	B1, B2, B3 L1, L2 AQ1, AQ2	
Under this option, a number of EPOs are unlikely to interact with the option due to their specific terrestrial as opposed to off shore requirements. Information on the offshore environment is emerging but is not as detailed as information on the terrestrial environment. The Sustainable Energy Agency of Ireland has published the Draft Offshore Renewable Energy Development Plan which has provided greater information relating to offshore renewable energy production, including fixed offshore wind farms. County Galway lies within the West Region (Assessment Area 5) where offshore wind and tidal have been identified as having potential. In turn, the level and significance of impacts for offshore wind depends on the scale of development, the accompanying SEA to the OREDP assesses impacts as negligible up to 300 MW, whilst more serious impacts are identified above this threshold. *Galway supports an open, complex and expansive coastline so impacts could be significant in this scenario, with accompanying impacts on population and health; in turn, the marine environment also supports significant numbers of protected species and marine habitats, some of which are strictly protected and designate. Therefore to develop offshore wind energy for the County within the lifetime of the plan could give rise to significant impacts on biodiversity, water, cultural heritage, landscape and population. Moreover, it is unlikely that such development could be processed through the planning system within the proposed lifetime of the strategy. Hence this would result in EPOs AQ1 and AQ2 not being met.*						

Alternative Considered	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
Option 5 – Onshore and Offshore Wind Energy Development This scenario would direct wind energy developments to both on shore and offshore areas in and around County Galway as a means of achieving renewable energy targets		AQ1, AQ2		B1, SG1, SG2, SG3, SG4 W2, W3 PH1, PH2, L2 CH1, CH2, MA1, MA2, MA3, MA4 MA5, MA7, MA8, MA9	B2, B3 W1, W4 L1, MA6	
The key consideration under this scenario would be the cumulative and in combination effects of directing wind energy to both on shore and offshore sites. For the reasons stated for Option 4, there are likely to be a range of impacts if offshore wind energy was developed above 300Mw for the 3 counties including Galway in the OREDP SEA. There could also be a range of cumulative impacts on biodiversity, water, landscape and archaeology, although to what extent would be uncertain. Again, it is unlikely that this alternative would see adequate wind energy development over the county within the lifetime of the draft WES.						

Alternative Considered	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
Option 6 – Alternative Targets and Alternative Timeframes This scenario would assess different renewable energy targets and timeframes as a means of achieving a 2020 renewable energy target of 40% electricity production from renewable energy resources. The scale of development envisaged would be different depending on the targets established. For the purposes of this evaluation matrix a low target of 200 Mw (197.5 MW is already approved in the county) and an upper target of 800 Mw is assessed						
Target of 200 Mw			MA1, MA2	B1, B2, B3, SG1, SG2, SG3, SG4, W1, W2, W3, W4		AQ1, AQ2

				PH1, PH2, L1, L2, CH1, CH2, MA3, MA4, MA5, MA6, MA7, MA8, MA9		
Target of 800 Mw		AQ1, AQ2 MA1, MA2	B3, SG3 PH2	SG1, SG2, SG4, W2, W3, W4 PH1, L1, L2 CH1, CH2 MA3, MA4, MA5,MA6, MA7, MA8, MA9	B1, B2, W1	
As the above table illustrates, this lower option is likely to have no interaction as it essentially freezes most wind energy development in the County. This is due to the fact that in addition to the existing 71.25mw already being generated from wind energy developments, a further 197mw has been approved for planning permission. Therefore in this scenario no further development is facilitated as the target is already or likely to be achieved shortly. *The higher threshold would see a considerable amount of wind energy development to achieve a target of 800 MW, and many of the EPOs could be mitigated at site level. Nonetheless, the cumulative impacts of this target on the environmental resources could be significant due to the scale and pace of development envisaged and the potential in combination effects of such developments around the county, especially on Natura 2000 sites and ecological corridors.* *This is problematic and generates significant uncertainty as to how the EPOs would be achieved. In addition, the purpose of the Draft WES is tied to the legislation for County Development Plans and variations; therefore the adjustable timetable is not a viable consideration.*						
Alternative Considered	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
Option 7 – Strategic Approach to Wind Energy Development This approach recognises where the principal wind resources are and matches them to existing infrastructure – two critical		B1, B2, B3 SG1, SG2, SG3, SG4 W1, W2,W3, W4, PH1, PH2 L2, CH2		L1, CH1, MA7		

considerations for wind energy development. In addition, the identification of Strategic Areas and Acceptable in Principle Areas permits a comprehensive assessment of environmental resources within and close to these areas, facilitating a more robust SEA and HDA process that informs the WES development. It allows for a medium term view of wind energy developments in the County and encourages clustering or sharing of infrastructure associated with wind energy development such as access roads.		AQ1, AQ2 MA1, MA2, MA3, MA4, MA5, MA6, MA8,MA9				
This is the approach taken by GCC in undertaking this work and SEA. It recognises where the principal wind resources are and matches them to existing infrastructure – two critical considerations for wind energy development. In addition, the identification of Strategic Areas and Acceptable in Principle Areas permits a comprehensive assessment of environmental resources within and close to these areas, facilitating a more robust SEA and HDA process that informs the WES development. It allows for a medium term view of wind energy developments in the County and encourages clustering or sharing of infrastructure associated with wind energy development such as access roads.						
Sub -options of Alternative 7						
	No likely interaction with EPOs	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
Option 7A – Concentrate Wind Energy Development in the West of the County The west of the County has the greatest wind resource but also has more limited electricity transmission infrastructure and significantly greater constraints in terms of Natura 2000 sites, NHAs and scenic landscapes.		AQ1, AQ2	MA7	B1, B2, B3, SG1, SG2, SG3, SG4, W1, W2, W3, W4, PH1, PH2, L1, L2, CH1, CH2, MA1, MA2, MA3, MA4, MA5, MA6, MA8, MA9		

By concentrating the wind energy development in the west of the county the strategy would prioritise wind speeds above other resources and would require considerable transmission infrastructure and additional supporting development. In addition, concentrating wind energy where the greatest wind speeds are (around the coast and Connemara) would result in a number of impacts in terms of biodiversity, flora and fauna and landscape. In addition, it is unlikely that the County could achieve sufficient renewable energy production solely from wind energy in the west within the timeframe envisaged for this WES. However, there is potential for wind energy development in parts of the west of the County and the WES has accordingly incorporated this as part of the strategy. The exclusion of designated sites and habitats from this WES offers further protection to biodiversity resources.

Alternative Considered	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
Option 7B – Concentrate Wind Energy Development in the East of the County The east of the County has the lowest wind resource but also has greater electricity transmission infrastructure and significantly lesser constraints in terms of Natura 2000 sites, NHAs and scenic landscapes.			AQ1, AQ2 L1, MA1	B1, B2, B3, SG1, SG2,SG3, SG4, W1, W2, W3, W4 PH1,CH1, MA2, MA3, MA4, MA5, MA6, MA7, MA8, MA9	PH2, CH2	

It is unlikely that the County could achieve significant renewable energy production solely from wind energy in the east within the timeframe envisaged for this WES, however, there is potential for a certain amount of wind energy development in the east of the County, and the WES has accordingly incorporated this as part of the strategy. Due to the denser population and more extensive settlements within the East of the County, mitigation measures in relation to population and human health will be required and the landscape and visual impacts are likely to be greater due to the generally lowlying and flat topography of much of this area.

Alternative Considered	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
Option 7C – Concentrate/Consolidate Wind Energy Development in a Single Large Cluster This option would allow for the clustering of new wind farm developments in a single location in the County based on strategic analysis of the most suitable area in terms of wind resources and environmental, landscape, and other factors.		L1, MA2	B3, W1, W2	B1, B2, SG2, SG4, PH1, PH2, L2, CH2, MA1, MA3, MA4, MA5, MA6, MA7, MA8, MA9	SG1, SG3, W3, W4, CH1, AQ1, AQ2	

This approach would limit the dispersal and widespread impact of wind farms but would potentially lead to significant effects in a particular location, particularly in terms of landscape and environmental impacts. By concentrating wind energy into one area, there would likely be inadequate space for appropriate buffers to protect water course and habitats this generating impacts on a number of EPOs such as W1 and B3. The cumulative impacts on resources such as soil may also be significant. In addition, it is also unlikely that this option would be capable of achieving the wind energy targets set out in the WES given the constrained nature of any single strategic location available in the County and this would mean EPOs AQ1 and AQ2 are unlikely to achieved of the lifetime of the WES.

Alternative Considered	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
Option 7D – Disperse Wind Energy Development throughout County This option would allow for the dispersal of wind farm developments throughout the County within potentially suitable areas..			B1, B3, MA2	SG2, SG4, W1, W2, CH1, MA1, MA3, MA4,MA5,MA7,	B2, SG1, SG3, W4, PH1, PH2, L1, L2, CH2, AQ1, AQ2, MA8, MA9	

This option would generate a range of impacts arising from the dispersed nature of the development activity and accompanying cumulative impacts on a range of parameters. In particular, the cumulative impacts of wind energy in a wide dispersed pattern is likely to impact on the ecological integrity of resources in particular habitats and mobile species. This option also gives rise to a range of uncertain impacts, as in certain areas tallers turbines would probably result to maximise the wind speed, this being most probable in the eastern parts of the county – this in turn would generate wide visual and landscape impacts. Ultimately, this approach would not realise opportunities for clustering wind farm developments in the most strategic locations and would result in widespread environmental and visual impacts around the County.						
Alternative Considered	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
Option 7E – Larger Wind Farm Clusters in Suitable Areas and Smaller Wind Farm Developments in Potentially Suitable Areas This option would allow for the concentration of larger wind farm developments in the most suitable areas together with smaller wind farms or groupings of wind farms in other acceptable areas, subject to environmental and visual assessment.		B1, B3, SG4, W2, W3, W4, PH1, PH2, L1, L2, CH1, CH2, AQ1, AQ2, MA1, MA2, MA3, MA4, MA5, MA6, MA8, MA9	B2, SG1, SG2, SG3, W1, MA7			
This option would have the greatest potential to meet the wind energy targets for the County whilst limiting the extent of environmental, visual and amenity impacts.						

The concentration of the assessment on a number of areas also ensures that the most appropriate mitigation measures can be developed based on the environmental resources and sensitivities of each area; this assists in managing environmental resources, whilst promoting wind energy in appropriate areas. Finally, the cumulative impacts can be assessed in a meaningful manner building on the best available information for these areas and guiding appropriate scaled wind energy to each area.

6. 2 Conclusion

In conclusion, Option 7*e* would accordingly be considered the preferred option for the development of wind energy in County Galway. This option provides for a strategic, plan-led approach to the development of wind energy in appropriate locations and scales that would have the greatest potential to meet the wind energy targets for the County whilst avoiding significant environmental, landscape and amenity impacts.

Table 6b presents an overview of areas of interest for the WES and outlines why these areas were excluded on the basis of spatial analysis and the SEA and HDA.

Table 6b: Influence of Spatial Analysis, SEA and HDA on WES

Areas and Criteria	Reasons for Exclusion
Natura 2000 – SPAs & SACs, variable wind speeds	The HDA could not state that adverse impacts would not arise due to the implementation of the WES on the conservation objectives of SPAs and SACs. Therefore such sites were not proposed as strategic, acceptable in principle or open for consideration.
Islands – high wind speeds, remote	These areas are not suitable for wind farm development due to natural heritage designations, landscape value and sensitivity, the importance of cultural, tourism and recreational resources and their distance from the electricity grid. Small-scale wind energy developments for use by local communities or autoproducers may be considered in these areas subject to environmental and landscape factors and appropriate location, siting and design.
Lough Corrib & Environs – low to medium wind speeds	The extensive number of natural heritage designations including SPAs and SACs, the high landscape value and sensitivity and the importance of recreational and tourism resources in these areas.
Coastline – high wind speeds, some parts remote, not close to grid	The extensive number of natural heritage designations including SPAs and SACs, the high landscape value and sensitivity, the importance of recreational and tourism resources, and the concentration of intensive settlement in parts of these areas.
Sliabh Aughties – low to medium wind speeds	Concern about cumulative impacts of wind farms in this area. The HDA could not state that adverse impacts would not arise due to the implementation of the WES on the conservation objectives of the SPA. Therefore this area was not proposed as strategic, acceptable in principle or open for consideration. In addition, a number of steep slopes indicating potential landslide susceptibility.
Killary Harbour, North and West Connemara – high or variable wind speeds, parts remote, not close to grid	The extensive number of natural heritage designations including SPAs and SACs, the very high landscape value and sensitivity, the importance of recreational and tourism resources, and the remoteness of these areas from the electricity grid. Spectacular landform and scenic qualities and current and potential tourism and recreation.

7 Chapter Seven: Likely Significant Effects of draft WES

7.1 Introduction

The purpose of this section of the Environmental Report is to predict and evaluate as far as possible the environmental effects of this Draft WES.

SEA is an iterative process and the new policies developed for the Draft WES have taken consideration of environmental issues raised during the scoping process. These issues have been incorporated into draft policies and the principal purpose of this chapter is to assess these policies in more detail. However to commence this chapter and set the context for the evaluation, the first section discusses the common elements associated with wind energy developments and discusses potential impacts on different environmental parameters in the absence of mitigation measures in relation to same.

7.2 Effects of implementing the draft WES

In assessing the significant environmental impacts associated with wind energy developments, the following discussion presents potential significant impacts on the environmental parameters. This serves to highlight potential impacts if mitigation measures are not highlighted at the strategy level and inform the policy development.

7.3 Overview

In 2002, Galway City and County imported 95% of their energy requirements (including electricity), with peat and a 2.8MW wind farm at Inverin contributing the remainder (GCDB, 2002; Galway City Development Board, 2002).
Presently, Galway has a total installed wind energy capacity of 71.125 MW in four wind farms located around the County.

In 2008, Galway County needed around 1,160 GWh of electricity every year to support its general economy and society and Galway City needed around 530 GWh, resulting in a combined total energy consumption of around 1,690 GWh of electricity (over 4.6 million units of electricity every day). By 2020, the County's demand for electricity is expected to increase to approximately 1,230 GWh and the City's to around 560 GWh, or a total of around 1,790 GWh (around 4.9 million units of electricity every day).

Electricity is supplied to the County by numerous sources on the electricity transmission and distribution network (the grid). The County, in keeping with national policy and EU targets, wishes to source/generate its electricity generation from renewable resources. The degree to which County Galway can meet its electricity requirements from low carbon renewable resources will underpin its energy security and enable the County to establish a low carbon centre of commerce.

If the target of 500 MW of electricity from wind is achieved, it will generate around 1,314

GWh of electricity, sufficient to power over 236,000 homes, and will reduce energy related CO_2 emissions in Galway by over 750,000 tonnes. In order to achieve the proposed target of 500Mw planned wind energy developments in the County, an understanding of the existing and planned wind energy developments area helpful.

Table 7b below lists the wind farms currently operating in Galway:

Table 7b: Wind Farms Operating in County Galway, 2011[1]

Wind Farm	Wind Turbines	Nominal Power	Total Power	Connection Year
Indreabhán (Inverin) 1 & 2 Wind Farm, An Spidéal	5 Vestas V47/660	660 kW	3.3 MW	4 in 1999 1 in 2002
Inis Meáin Wind Farm, Oileáin Árann	3 Vestas V27/225	225 kW	0.675 MW	2002
Sonnagh Old Wind Farm, Kilchreest, Loughrea	9 Vestas V52/850	850 kW	7.65 MW	2004
Derrybrien Wind Farm	70 Vestas V52/850	850 kW	59.5 MW	2005
Total	**87**	**–**	**71.125 MW**	**–**

Since 1996, there have been planning applications for a total of 12 wind farms in County Galway that are either built, permitted or pending a decision (this excludes applications for single wind turbines not associated with other wind turbines or wind farms, applications that have been refused, withdrawn or have expired and permissions superseded by other decisions). There is the potential for a total of 361.825 MW of wind energy to be produced in Co. Galway as a result of the existing, permitted and pending wind farm applications should these be granted. *Table 7c* below shows the breakdown of these applications.

Table 7c : Wind Farm Planning Applications, 1996-2011

Planning Applications for Wind Farms	No. of Wind Farms	No. of Wind Turbines	Total Power Output
Planning Permission Granted and Wind Farm Constructed	4	87	71.125 MW
Planning Permission Granted and Wind Farm Not Yet Constructed	6	113	197.5 MW
Decision Pending for New Wind Farm	2	34	86.3 MW
Decision Pending for New Wind Turbine/s in Existing or Permitted Wind Farms	(1)	3	6.9 MW
Total Potential Wind Farm Developments	**12**	**237**	**361.825 MW**

Source: GCC Planning Application Records, January 2011

In addition to planning applications, developers of wind energy projects are required to apply to the Commission for Energy Regulation (CER) under the Gate process to connect into the national grid. This is currently undertaken on a first come first served basis and planning permission is not required to apply for a connection.

[1] Source: IWEA, SEAI and GCC

Table 7d lists the node assignments in the current round of applications called Gate 3, as of April 2010. Should all of these applicants receive planning permission, this would allow for a total of 349.59 MW of additional renewable energy capacity to be installed in the County.

Table 7d : Gate 3 Node Assignments for County Galway, 2010

Project Name	Generation	Connection
Clifden (1)	3 MW	New 110kV node 'Screeb' tailed to new 110kV connected to Salthill and Galway 110kV Stations
Doolick (1) (Offshore)	100.8 MW	New 110kV node 'Screeb' tailed to new 110kV connected to Salthill and Galway 110kV Stations
Lealetter (1)	22.5 MW	New 110kV node 'Salthill' looped into Cashla – Galway 110kV Line
Leitir Guingaid & Doire Chrith 1 & 2 merge	18.4 MW	New 110kV node 'Salthill' looped into Cashla – Galway 110kV Line
Seecon (1)	105 MW	New Seecon 110kV node connected to Salthill and Galway 110kV Stations
Ugool (1)	64 MW	New Seecon 110kV node connected to Salthill and Galway 110kV Stations
Clochar na Lara (1)	24 MW	New Seecon 110kV node connected to Salthill and Galway 110kV Stations
Sonagh Old (2)	0.85 MW	Somerset 110kV Station
Sonagh Old (3)	11.04 MW	Somerset 110kV Station
Total Capacity (if all developed)	**349.59 MW**	–

Source: Eirgrid, Gate 3 Node Assignments, 30th April 2010

Planning permission has already been granted or is pending for a total of 234.6 MW in proposed wind farms in a number of the above Gate 3 areas. There is therefore a potential for a further 114.99 MW of wind energy capacity that could to be granted planning permission under the Gate 3 allocations. In summary, therefore, the existing, permitted, pending and potential wind energy development in Galway is as follows:

Table 7e : Potential Wind Energy Development in Galway

Wind Energy Potential	No. of Wind Farms	No. of Wind Turbines	Total Power Output
Installed Wind Energy Capacity (WEC)	4	87	71.125 MW
Permitted Wind Energy Capacity (excluding Installed WEC)	6	113	197.5 MW
Pending Wind Energy Capacity (undecided planning applications for new wind farm)	2	34	86.3 MW
Pending Wind Energy Capacity (undecided planning application for new wind turbines in permitted wind farm)	(1)	3	6.9 MW
Additional Gate 3 Wind Energy Capacity (excluding Permitted and Pending WEC)	NA	NA	114.99 MW
Total Potential Wind Farm Developments	**–**	**–**	**476.815 MW**

Source: GCC Planning Application Records, December 2010; EirGrid, Gate 3 Node Assignments, 30th April 2010

Estimating the amount of land required to deliver the overall target of 500mw is difficult to state with confidence as the site specifics will inform turbine size and number. In addition, technological trends are toward taller turbines with greater MW generation. However, a crude estimation is based on information from the Irish Wind Energy Association which states that a typical wind farm of 4-5 3mw turbines might extend over an area of 1 square kilometer (=100 hectares), although the actual footprint may only be approximately 1% of this total. Other data[2] suggests habitat loss associated with wind farm developments typically results in 2-5% of the total site area (Fox *et al,* 2006).

Based on the data in Table 7e, permitted wind energy in the county amounts to 197.5mw. Operational wind energy currently stands at 71.125mw. Therefore an additional figure of 2231.37mw would be required to achieve the target of 500 Mw. Utilising the hectares in the preceding paragraph, a crude estimation would be that a further 77 x 3mw turbines would be required to achieve the 500 mw target. Again, extrapolating the above guide, where 5 turbines equates to approximately 100hectares, each turbine can assume to require 20ha . Therefore 77additional turbines may require 1540 hectares. In terms of habitat loss associated with such developments, taking the higher figure of 5% of total site area from Fox et al, this would amount of 77 of the 1540 hectares.

However, it must be stressed that this estimate is extremely crude and takes no account of detailed design at site level, or indeed specific site considerations at project level.

7.4 Typical elements associated with wind energy developments

Wind farm developments are commonly composed of a number of activities and elements. Often the critical environmental impacts are associated with the construction stage of the development. Through careful siting and design, informed by environmental constraints mapping, there is considerable scope to avoid impacts, in particular whilst the overall site of a windfarm may cover a number of hectares, the actual site footprint can be quite small. The following section discusses significant environmental impacts that can occur in relation to wind energy developments. This presumes a 'worst case scenario' and establishes the context for mitigation measures that are developed as part of the draft WES policies and recommendations. It is worth noting that many impacts are site specific and difficult to quantify at strategic level. *Table 7f* below briefly describes the key activities and elements associated with wind energy developments

2

Table 7f Common elements and activities associated with Wind Energy Developments

Component	Details
Construction Compound	A wind farm construction compound can vary in size from 50x50m to 100x100m. The compound generally consists of storage space, construction equipment and amenity area for construction staff. Construction compounds are generally temporary structures and habitats/vegetation is reinstated following development of the wind farm.
Site Development	During site development large scale construction activity will be undertaken within the proposed development site.
Site drainage	Site drainage and silt/settlement ponds, peat storage in certain areas, disposal areas and haul routes are part of a typical project.
Site Access	Site access tracks are necessary to access the various turbine locations of a wind farm as well as the sub-station and control building. Access tracks are also required during construction, turbine delivery and for ongoing operation and maintenance of the wind farm.
Cable Trenching	Cable trenches will typically follow the site access routes. These trenches are dug for the laying of electric cables linking the turbines to the site sub-station.
Borrow Pits/Quarries/extraction areas	Where suitable construction material is located on site, borrow pits or quarries are installed to provide rock and aggregate for the construction of wind farms.
Turbine Foundations including transformers and crane pads	Turbine foundations have to be founded on rockhead which requires the excavation of mineral soils and peat where present. Once excavation is complete the turbines are generally secured by piled or rock anchored platforms. With recent increases in the size of wind turbines the required area for both platforms and crane pads have increased and can reach up to 50x50m[3] per turbine, with varying depths depending on soil type and depth to bedrock. While reinstatement of vegetation post construction will reduce the area of hard-standing to that occupied by the turbine platform, the area of ground effected by base excavations and crane hardstanding can amount to considerable areas Where the site is located on wet bog or heath excavated areas may require pumping and the installation of settlement ponds.
Grid Extensions and Connections	The majority of wind farm sites will require the extension of existing, or installation of new electricity power lines linking the Wind Farm to the National Grid. Connection lines can be installed over-head or underground.
Sub-Station & Control Building	A sub-station is required to convert the electricity generated by wind turbines to transmission voltage suitable to connect into the National Grid system. The sub-station typically includes all necessary ancillary equipment such as control room, voltage and current transformers and circuit breakers for the control and protection of the sub-station. The substation would be surrounded by hard-standing for vehicle parking and equipment.
Forest Clearance	Many wind farms are developed within or adjacent to plantation forestry. A requirement for forest clearance is typically associated with clearance for

[3] Dargie, T (2004). Windfarm impacts on blanket peat habitats in Scotland. In: F. Maxwell (ed.) Renewable Energy: is it ecologically friendly? Proceedings of the 19th Conference of the Institute of Ecology and Environmental Management, pp. 43-51. London 18 May 2004. IEEM, Winchester.

	wind turbines, access tracks and substations. “Turbulence clearance” may also be necessary. The latter refers to wind turbulence generated by trees which can reduce wind speeds and have a negative effect on electricity generation[4]. Edge effects on habitats and species using the forest and how they may be impacted on through forest clearance is a consideration. Replanting/replacement planting in other areas may be a requirement on grant aided forestry, which may be cleared to facilitate a wind energy development; this may cause impacts on other areas.
Decommissioning	Wind turbines have a typical life expectancy of 20 – 25 years. The current trend in the industry is to replace older wind energy projects by upgrading older equipment with more efficient turbines. However if upgrading does not take place the wind farm will be decommissioned. The decommissioning of a wind farm will involve: • All turbines, including the blades, nacelles and towers will be disassembled, and transported off site. • All of the transformers will also be transported off-site for reuse or reclamation. • All underground infrastructure at shallow depths will be removed. • Areas where subsurface components are removed will be graded to match adjacent contours, stabilized with an appropriate seed mix, and allowed to re-vegetate naturally. • All road materials will be allowed to remain on-site.

7.5 Cumulative / in combination impacts

In addition to the activities associated with project level wind energy development, there are other plans and programmes relevant to County Galway that should be considered in tandem with the WES. Chapter Three of this SEA ER highlights the principal plans/policies and programmes of relevance, Grid 25 and the upgrading of the Screebe 110kv line are pertinent to this area and their development activities are presented below, these will be considered as part of the cumulative impacts.

7.5.1 Transmission Upgrade: Screebe 110kv line[5]

This involves the upgrading of the Screeb 38kV Substation in the townland of Glencoh to an 110kV/38kV substation and to erect a new 110kV overhead electricity distribution line from the townland of Lenabower (west of Galway City) to Screeb substation. The 110kV overhead powerline is required to establish a connection to Screeb substation from the Salthill 110kV substation which recently received planning permission (Galway City Council Ref: 07604). The first 4km from Salthill substation to Lenabower will be underground cable and is exempt from the planning process under the Planning and

[4] Forestry Commission (Scotland), (2002).Guidance Note 21. Wind Farm Policies and Proposals Impacting on Forests and Woods.

[5] Source: Non Technical Summary of EIS for Screebe 110kv upgrade http://connemara110kvproject.ie/Documents/Environmental%20Impact%20Statement%20-%20R%C3%A1iteas%20Tionchair%20Timpeallachta/Non%20Technichal%20Summary%20-%20Achoimre%20neamhtheicni%C3%BAil.pdf

Development Act 2006. The first 380 metres of the line in the townlands of Cappagh and Lenabower is in the jurisdiction of Galway City Council, planning permission for this section was granted in 2006 – An Bord Pleanála ref: PL61.210778

The 110kV distribution line is a linear development and will consist of three overhead wires supported by double wood pole structures, whose poles are 5 metres apart and of average height of 20 metres. For approximately the last 2.8km into Screeb substation, the line will consist of three overhead wires and two overhead shieldwires. Where the line changes direction, lattice steel towers of average height 15 metres and with an average base area of 5 metres square will be used. For slight direction changes of 25 degrees or less a braced woodpole may be utilised depending on design conditions. The average distance between structures will be approximately 170 metres. The total length of the proposed line is 48km.

The line crosses limited lengths of internationally designated sites of ecological importance and limited lengths of the boundary areas of nationally designated sites of ecological importance. Habitat loss due to the footprint of the line is not significant in either its extent or in the value of the habitats lost and mitigation is proposed to minimise loss of and disturbance to habitat and wildlife due to the construction and operation of the line.
No significant effects are predicted in relation to sites designated for their nature conservation value, protected species or species of high conservation value.

Any potential impact to watercourses will be avoided by careful management of the construction sites. Potential impacts on water can occur through construction activity associated with the line establishment, clearfelling of forest corridors and the site preparation. The main potential impact is pollution of watercourses through sediment loss.

7.6 Potential Impacts of wind energy developments and ancillary developments

7.6.1 Significant Biodiversity, Flora and Fauna Impacts

The main potential impacts on habitats that can result in the reduction, or loss, of biodiversity are:

- Direct loss of habitat to the developments' infrastructure, including turbine foundations, buildings, roads, quarries and borrow pits. This can be a permanent impact
- Direct loss of habitat within the footprint is a permanent impact; indirect impacts may be long term and permanent. Impacts include loss of area of habitat and of typical or rare species, and loss of structure and function.
- Loss or deterioration of habitat can result in direct or indirect loss of species of flora or fauna, or reduction in populations, displacement of fauna or introduction and spread of non native species.
- Degradation of habitats through alteration or disturbance, in particular arising from changes to hydrology that may alter the surface or groundwater flows and levels, and drainage patterns critical in peatlands and river headwaters; this can be a permanent direct or secondary impact

- Fragmentation of habitats and increased edge effects; this can be a short to long term impact depending on the regeneration capabilities of the habitats
- Edge effects for species/habitats using the forest in relation to forest clearance may also be a long term impact.
- Degradation and loss of habitats outside the development site, especially wetland habitats that may arise from pollution, siltation and erosion originating from within the development site. This can be a long term impact.
- High flying bats/aerial feeding bats colliding with turbine blades, Wind turbines sited along migratory routes, Impacts on tree roosting bats, wind turbines cited too close to foraging and commuting habitats and Nathusius pipistrelles, common pipistrelle, soprano pipistrelle and Leislers Bat considered to be potentially affected by wind turbines

- The potential for increased soil erosion and surface run off from forestry clearance is another impact that can be temporary to permanent.
- Where replanting or new planting is required to replace forestry cleared to facilitate wind energy development, this may impact on other areas.

Due to the proximity of some AIPs to watercourses associated with this Freshwater Pearl Mussel catchment, ***nationally important salmonid fisheries***[6] ~~and~~ the over-riding peat nature of the soil substrates in these AIPs, wind energy developments in these location will have the potential to adversely affect the water quality of adjacent streams, rivers and lakes.

Adverse affects on the water quality of this catchment could arise as a result of:

- Increases in sediment loading to watercourses and subsequent movement of sediment throughout the catchment and settlement onto river beds resulting the clogging of clean gravel and pebble beds.
- Changes in watercourse nutrient status. With regard to wind energy developments this impact is most likely to occur where developments require the clear-felling of adjacent stands of plantation forestry.

Pollution events associated with the migration of toxic substances associated with the construction phase of wind energy development to watercourses

Birds

The extent to which birds will be impacted by wind energy developments will vary depending on species, season and location, and these impacts may be temporary or permanent. Those species groups considered to be most at risk are raptors, Swans, Geese, Divers, breeding waders and concentrations of waterfowl. Potential impacts on migratory birds and local bird movements between breeding, feeding and roosting areas require careful consideration.

The main potential impacts to birds from wind energy developments have been identified as:

• Disturbance during the construction and operational phases leading to the temporary or permanent displacement of birds from the development site and its environs;

[6] This was inserted following a submission from Inland Fisheries Ireland

• Collision mortality. This is a permanent impact,
• Barrier to movement. This can be a short to long term impact depending on the species and season; and
• Direct loss or degradation of habitats for breeding, feeding and/or roosting purposes, particularly in wetland sites. This can be long term or permanent impact.

Other Species

In addition to the impacts identified for bird species, other species such as bats or otters could be subject to temporary to permanent impacts associated with habitat disturbance, loss of feeding grounds, declining water quality or damage to riparian zones.

7.6.2 Significant Water Impacts

Potential impacts on water relate in particular to surface and groundwater as it is not proposed to permit developments along on the coastline or in the estuary. Again, water impacts are most likely to occur at construction stage, though hydrogeological impacts can occur post construction during the lifetime of the wind farm operation. Such impacts could be negative and temporary or permanent in duration depending on the extent and significance of the impact at the site level. Significant potential impacts on water are as follows:

- Short to medium term surface water pollution arising from drainage works, construction machinery, forestry clearance, inadequate silt traps, siltation, poor management of peat soils
- Medium term ground water contamination due to pollution incidents from construction machinery, inadequate handling and storage of construction materials, inadequate waste storage and handling
- Long term hydrogeological impacts particularly on peat soils resulting in degradation of bog system
- Surface water pollution associated with run off from construction activities
- Water impacts can include impacts to aquatic and wetland habitats and aquatic species
- Synergistic impacts can result due to the complex relationship between water quality, biodiversity, soil function and ecological processes.

7.6. 3 Significant Soil and Geology Impacts

Impacts on these parameters can occur in particular at construction stage. Again the duration and severity would be site specific but common significant impacts would include:

- Soil pollution due to inadequate waste management, storage, spills from machinery or run off from clearfelling or agricultural activities
- Soil erosion can result from improperly managed construction works, clear felling, or poor management and treatment of excavated soils
- Quarrying and borrow pits are associated with wind farm developments at construction stage and need to be carefully and sensitively managed to minimise impacts such as soil and water pollution and run off to water resources

- Run off from soils being eroded in turn can create negative impacts on water quality and the aquatic ecosystem through increased nutrient inputs to the aquatic environment. This can lead to eutrophication of rivers and lakes.
- Peat extraction can lead to localised water problems including silt nutrient release from areas
- Clearfelling to facilitate wind energy developments may result in release of phosperous locked into soils and this can impact on water quality.
- Landslides have occurred in recent years in relation to wind energy developments including Derrybrien 2003, Stacks Mountains 2008 and Corrie Mountain 2008[7]. Such landslides or bog bursts can result not only in habitat destruction but impacts on drinking water, juvenile fish and the wider aquatic environment. These can occur on peat or mineral soils, though 5 of the 6 historical landslide events in the county occurred on peat soils.
- ***Increased erosion of peat due to drying out of peat during construction activities and infrastructure provision***[8]

7.6. 4 Significant Landscape impacts

Landscape impacts associated with wind energy could include permanent impacts associated with access roads, and visual impacts associated with poorly sited and highly visible wind turbines. Significant environmental impacts could be short term such as temporary construction compounds or long term in the case of poorly sited turbines:

- Negative impacts on landscape character and visual amenity derived from poorly screened access roads
- Conversely positive visual impacts may arise with well sited wind energy developments located within an area that has seen positive community engagement and community buy in of a project
- Negative visual impact associated with construction site works
- Negative landscape impact due to disjointed turbine design and different turbine heights
- Negative impacts associated with new pylon construction or highly visible overhead lines
- Cumulative impacts on landscape character

7.6 5 Significant Cultural Heritage Impacts

Archaeology

Impacts on archaeological resources could be long term or permanent if a site is wholly or partly destroyed by construction activities. Indirect impacts could occur if blasting or groundworks are undertaken without adequate geotechnical investigation of subsurface archaeological resources. Permanent impacts on the archaeological landscape of an area may occur again if archaeology is not adequately assessed initially.

Architecture

Architectural heritage impacts can be associated with negative long term impacts on the setting of protected structures or construction damage to protected structures such as piers, or stone cut bridges from construction machinery. In the context of County

[7] Source: IPPC SEA Scoping Submission
[8] This was inserted following a submission from An Taisce

Galway, the straightening of roads or removal of stone walls could also be a permanent impact. The setting of architectural conservation areas may be negatively impacted on by poorly designed wind farms.

7.6. 6 Population and Human Health

There may be positive short term impacts on population through employment opportunities associated with the construction phase of wind farms. In addition, the leasing of land for wind farms may also bring positive benefits to owners of land utilised for wind energy developments. Positive impacts could also be associated with reduced costs of carbon taxes for the county.

Human Health

There may be short term construction impacts associated with construction traffic and activities including dust, noise from machines and traffic, widening or construction of access roads. Long term impacts on human health could arise from poorly sited wind farms and subsequent negative noise, shadow flicker and visual impacts. Conversely, positive impacts can arise due to reduced greenhouse gas emissions and improved air quality.

7. 6. 7 Air Quality and Climate

Construction activities could negatively impact in the short term on local air quality due to machinery and traffic. More positive long term impacts could arise from a reduction in burning fossil fuels, reduction in greenhouse gases and improved air quality.

Climatic factors

Impacts associated with wind energy development for this parameter are likely to be long term or permanent and positive, and are all associated with an increase in renewable energy production arising from wind energy developments. The issue of constructing wind farms on peat lands and peats role as carbon sinks must be carefully considered over the lifetime of the proposed wind energy development.

7.6. 8 Material assets – transport, waste management, energy use, noise, transmission network, wastewater and floodrisk

Again impacts associated with construction may be short term due to transport as these impacts will principally relate to construction traffic, transporting turbines to site and transporting construction materials on site and waste materials off site. Proper design and loading of access tracks is also important as a potential impact could arise with poor loading for construction vehicles on access roads to and from a site.

Waste management is very site specific and is very difficult to assess at strategic level. Careful storage and treatment of excavated soils can mean their reinstatement post construction which contributes to a neutral impact. In addition, proper waste management on site during construction and operation is important to avoid pollution incidents and cumulative impacts associated with litter and water and soil impacts from inadequate storage of materials on site.

Energy impacts could be associated in the short term with the energy use involved in the construction and transport of the wind energy development which may be negative. However over the lifetime of the wind energy development it is considered that the energy balance payback for wind energy developments is a long term positive impact.

Noise impacts associated with construction may be short term but if a wind energy development were not properly designed and sited, noise impacts on residents can become an issue if turbines are located within 500m of a residence.

Wastewater impacts could arise again in relation to construction activities if provision and management of same is inadequate. Private wastewater systems such as sceptic tanks or biocycle units could be impacted by development but are likely to be avoided through planning, design and consultation with residents.

As much of the soil within the proposed wind energy areas is composted of peat of varying depths that retains water well, there is likely to be little flood risk. However, flood risk may arise in relation to areas where roads are known to be subject to localised flooding.

7.6.9 Cumulative Impacts

Cumulative impacts could arise in relation to impacts on water quality and subsequent impacts on biodiversity, soil and population. In addition, if not monitored over the lifetime of the WES, there could be cumulative impacts arising on landscape resource through the concentration of wind energy developments within particular areas. In order to address this, a number of specific mitigation measures have been developed to promote and ensure monitoring of environmental impacts associated with the implementation of the WES.

7.10 Trans boundary Impacts[9]

Trans boundary impacts could arise in relation to water quality and subsequent impacts on biodiversity and fisheries, soil and population. Trans boundary impacts could also arise in relation to landscape given the height of turbines and clustering of same. Therefore mitigation measures relating to consultation on trans boundary issues are developed in Chapter Eight.

7. 7 Detailed Evaluation of Draft WES Policies against Environmental Protection Objectives

Significant environmental effects of the plan have been predicted to determine whether the plan has negative, positive, uncertain or neutral effects. The context of this analysis was set out in the baseline information in *Chapter Four, Environmental Baseline*.

Table 7a below assesses the draft WES policies against the EPOs which were presented in Chapter Five of this ER. Particular issues or impacts are highlighted in *Table 7a*, and in turn form the basis for developing particular mitigation measures that are presented in *Chapter Eight, Mitigation Measures*. Such measures should prevent, reduce or compensate for any negative effects of implementing the Strategy.

[9] This was inserted following a submission by Clare County Council

Table 7a Evaluation of draft WES Policies against Environmental Protection Objectives							
	Wind Energy Policies	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE1	**Development of Renewable Energy Generation** Ensure the security of energy supply by supporting, in principle and in appropriate scales and locations, the development of wind energy resources in County Galway.		AQ1, AQ2 MA1		B1,B2, B3, SG1, SG2, SG3, SG4 W1, W2,W3, W4, PH1, PH2, L1,L2 CH1, CH2, MA2, MA3, MA4,MA5, MA6, MA7		
WE2	**Development of Low Carbon Economy** Seek to promote County Galway as moving towards becoming a low carbon County by 2020 as a means of attracting inward investment to the County and the wider West Region.		PH1 AQ1 AQ2				All other EPOS
WE3	**County Partnership Approach** Seek to promote wind energy in appropriate sites in the County and work with agencies such as the Galway County Development Board, Galway Energy Agency, Údaras na Gaeltachta, IDA and Enterprise Ireland to encourage investment in research and technology associated with wind farms and other renewable energy technology.	B1,B2, B3, SG1, SG2, SG3, SG4 W1, W2,W3, W4, PH2, L1,L2 CH1, CH2, MA2, MA3, MA4,MA5, MA6, MA7	AQ1 AQ2 MA1 PH1				
WE4	**National and Local Targets** The White Paper on Energy has set a target of 40% of electricity to be generated from renewable sources by 2020. In		AQ1, AQ2 MA1		B1,B2, B3, SG1, SG2, SG3, SG4 W1, W2,W3, W4, PH1, PH2, L1,L2		

	support of this national target, County Galway will aim to achieve a total minimum overall target of 500 MW from existing, installed and permitted wind energy by 2020.				CH1, CH2, MA2, MA3, MA4,MA5, MA6, MA7		
	Wind Energy Policies	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE5	**Wind Energy Infrastructure** Proposals for the development of infrastructure for the production, storage and distribution of electricity through the harnessing of wind energy will be considered in appropriate sites and locations, subject to relevant policy, legislation, environmental, landscape and amenity considerations and the guidance in the WES. This will include, *inter alia*, requirements and considerations in relation to landscape, heritage and the environment, Natura 2000 sites and the Habitats Directive, electricity infrastructure, settlement patterns and wind energy potential		B1, B3 PH1, PH2 AQ1, AQ2 L1, MA1		B2, SG1,SG2, SG3,SG4,W1, W2, W3, W4, L2 CH1, CH2, MA2, MA3, MA4, MA5, MA6,MA7, MA8, MA9		

	Wind Energy Objectives	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
WE1	**Strategic Areas (SA)** These key areas are considered to be most suitable for wind farm development and are of strategic importance due to the following: • generally good / excellent wind resources • access to grid • distance from properties • outside any Natura 2000 sites or NHAs • outside Landscape Sensitivity Class 4 and 5 Wind energy projects within these areas must: • Demonstrate conformity with existing and approved wind farms to avoid visual clutter. • Be developed in line with the *Planning Guidelines for Wind Energy Development* (DoEHLG 2006) in terms of siting, layout and environmental assessment. • Be accompanied by a HDA under Article 6 of the Habitat Directive where they may result in adverse effects on any Natura 2000 site. • Be developed in a comprehensive manner avoiding the piecemeal		B1, B3, AQ1, AQ2, PH1, PH2, L1		B2, SG1,SG2, SG3,SG4,W1, W2, W3, W4, L2 CH1, CH2, MA2, MA3, MA4, MA5, MA6,MA7, MA8, MA9		

	development of the land designated as Strategic Areas. Suitably manage land use and infrastructure development within these areas to protect their scope for wind energy projects. The indicative target for wind energy generation from Strategic Areas is 250 MW.						
This policy supports wind energy development in a defined area that has been selected on the above stated criteria. A number of impacts are identified for EPOs relating to water, soil and geology, landscape							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE2	**Acceptable in Principle Areas (AP)** These areas are considered suitable for wind farm development due to the following: • sufficient wind speeds • distance from properties, and • outside any Natura 2000 sites or NHAs • outside Landscape Sensitivity Class 4 and 5 Wind energy projects within these areas must: • Demonstrate conformity with any existing and approved wind farms to avoid visual clutter.		B1, B3, AQ1, AQ2, PH1, MA1, MA2,PH2, L1		B2, SG1,SG2, SG3,SG4,W1, W2, W3, W4, L2 CH1, CH2, MA3, MA4, MA5, MA6,MA7, MA8, MA9		

	• Be developed in line with the *Planning Guidelines for Wind Energy Development* (DoEHLG 2006) in terms of siting, layout and environmental assessment. • Be accompanied by a HDA under Article 6 of the Habitat Directive where they may result in adverse effects on any Natura 2000 site. Suitably manage land use and infrastructure development within these areas to protect their scope for wind energy projects. The indicative target for wind energy generation from Acceptable in Principle areas is 100 MW.						
Biodiversity EPOs should be improved from the implementation of this policy as it avoids all designated sites and has been selected using a range of criteria to avoid the most sensitive areas whilst still supporting viable wind speeds and infrastructure. In addition, the directing of wind energy towards these areas should enhance MA1 and MA2 including sharing road access. *Many potential impacts are identified for a range of parameters including water, soil, landscape that should be mitigated through SEA /development management measures.*							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE3	**Open to Consideration Areas (OC)** Wind energy applications in these areas will be evaluated on a case by case basis subject to viable wind speeds,	MA1 MA2	AQ1, AQ2		B1,B2,B3, W3, SG1,SG2, SG3,SG4,W1, W2, W3, W4,		

	environmental resources and constraints and amenity, safety and cumulative impacts. The indicative target for wind energy generation from Open to Consideration Areas is 30 MW.				PH1, PH2 L1, L2 CH1, CH2, MA3, MA4, MA5, MA6,MA7, MA8, MA9		
This policy will result in impacts likely to be mitigated through development management/SEA measures as they will likely be site specific impacts. It is difficult to assess the level of development activity within this area hence the relatively low setting of a target of 30mw that could be achieved with the development of 10 turbines across this area.							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE4	**Not Normally Permissible Areas (NP)** These areas are not considered suitable for wind farm development due to their overall sensitivity and constraints arising from landscape, ecological, recreational, settlement, infrastructural and/or cultural and built heritage resources. The HDA and SEA process in particular helped to inform the identification of these areas. Future wind farm developments will accordingly be discouraged in these areas, unless project level HDA and EIA can demonstrate to the satisfaction of the planning authority that environmental and other impacts can be successfully avoided, minimised and/or mitigated.	SG1, SG2, SG3, SG4 W2,W3, W4 PH1, PH2, L2 CH1, CH2 AQ1, AQ2 MA1, MA2, MA3, MA4,MA5, MA6, MA7, MA8, Ma9,	B1, B2, B3, W1 L1,				

This policy will result in no likely interaction with EPOs as it directs wind energy developments away from these areas due to environmental or infrastructural sensitivities amongst others. It will likely improve the status of a number of biodiversity EPOs and Landscape EPOs again due to the lack of development activity associated with areas designated as not normally permissible.							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE5	**Low Wind Speed Areas (LW)** These areas are generally not considered suitable for wind farm development due to the lower wind speeds and in many cases also due to their overall sensitivity and constraints arising primarily from amenity, settlement, infrastructural, recreational and/or cultural and built heritage resources. Any applications received for wind energy developments in these areas will be evaluated on a case by case basis subject to viable wind speeds, environmental resources and constraints and amenity, safety and cumulative impacts	SG1, MA1, MA2			SG2,SG4, PH1, PH2, L2, CH1, CH2, MA3, MA4, MA5, MA6	SG3,W2, L1, AQ1, AQ2	B1, B2, B3, W1, W3,W4,
This policy generates a number of uncertain to neutral impacts on the EPOS. This is because due to the low windspeeds and environmental considerations, wind energy development is unlikely to occur at any significant scale within these areas over the lifetime of the WES. As any wind energy applications will be assessed on a case by case basis and the anticipated sites of such developments are unknown, predicting impacts for this policy is difficult, hence the generation of a number of uncertain to neutral impacts. In turn where wind energy applications arise, impacts for example relating to archaeology are likely to be mitigated through development management and relevant guidelines.							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE6	**Wind Energy Development and Guidance** Facilitate wind energy developments and		B1, B3 SG1, SG2, SG3, SG4,		B2, W1, W2,W3,W4, MA2, MA3, MA4,		

	necessary support infrastructure in appropriate sites and locations, subject to relevant policy, legislation, environmental, landscape and amenity considerations. This shall include the guidance in this WES and other relevant guidance where applicable, including, *inter alia*, the *Guidelines for Planning Authorities on Wind Energy Development* (DoEHLG, 2006), the *Best Practice Guidelines for the Irish Wind Energy Association* (IWEA & SEI, 2008), the *European Best Practice Guidelines for Wind Energy Development* (EWEA, 2002) and the *Guidance Document: Wind Energy Developments and Natura 2000* (EC, 2010).		PH1, PH2, CH1, CH2 L1, L2, AQ1, AQ2, MA1, MA6		MA5, MA7, MA8, MA9		
This policy will impact positively on a range of EPOS as it supports all current guidance and best practice to facilitate wind energy developments in the appropriate areas and using the best available guidance at national and EU level. Where impacts are identified for certain EPOs for example around water quality and material assets, mitigation measures developed through the SEA process will assist in addressing such impacts at site level.							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE7	**Wind Energy Development Projects** Planning applications for wind energy developments will be guided by, and assessed in accordance with, the wind energy policies and objectives in this section, the landscape capacity considerations in Section 4 and the		B1, B3 SG1, SG2, SG3, SG4, PH1, PH2, CH1, CH2, AQ1, AQ2, MA1, MA2,		B2, W1, W2,W3,W4, L1, L2, MA3, MA4, MA5, MA7, MA8, MA9		

	development management considerations, guidelines and standards outlined in Section 5. Where appropriate, planning applications for wind energy developments will also need to consider the landscape, environmental and amenity impacts on the areas of adjoining Local Authorities.		MA6				
The cross referencing to other policies, landscape and development management guidelines strengthens this policy and should assist in supporting a number of EPOS around biodiversity, wildlife corridors, soil and geology and certain material assets such as sharing road access. Furthermore, this policy highlights the need to consider impacts on neighbouring local authorities which will strengthen cross boundary protection and management.							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE8	**Small-Scale and Micro Generation Wind Energy Projects** Facilitate, where appropriate, small scale wind energy development projects by autoproducers, in urban areas and for small community-based proposals to help meet the immediate needs of the development being provided and/or to reduce their reliance on fossil fuels, and subject to the following criteria being met: • In the case of autoproducers, the energy will be primarily generated to be used on the site and within the site boundary.		AQ1, AQ2 PH1		B1, B2, B3, SG1,SG3,SG4 W1, W3, W4, PH2, L1, L2 CH1, CH2, MA3, MA4, MA5, MA6, MA7, MA8, MA9		**SG2, W2, MA1, MA2**

	• Noise and visual impacts including shadow flicker will not be significant on nearby residents. • If located within or close to a SPA or SAC, a HDA /EIA may be required. Any cumulative effects of single and/or small scale wind energy projects on the landscape will need to be assessed.						
There are positive impacts associated with this policy in terms of promoting renewable energy around auto producers and in appropriate sites for small community based projects. In addition, it is considered that most impacts can be mitigated through SEA and development management measures. The highlighting of cumulative impacts should there be a significant uptake of such development around the county will assist in protecting landscape resources.							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE9	**Electricity Infrastructure** Support the development and expansion of infrastructure for the generation, storage, transmission and distribution of wind energy in suitable locations in County Galway. In particular, support the extension and increased capacity of the electricity transmission and distribution grid, including the development of new lines, pylons and substations as required, to support the development of the Strategic Areas as a first priority followed by the Acceptable in Principle Areas in the County. Suitably manage development within and along existing and potential		PH1, AQ1, AQ2, MA1, MA7		B1,B2, B3, SG1, SG2, SG3, SG4, W1, W2, W3, W4, PH2, L1, L2, CH1, CH2, MA3, MA4, MA8, MA9		**MA2**

	strategic infrastructure corridors to protect their scope for development.						

Grid 25 and the construction of the 110kv Screeb line will enhance the transmission network within and around Galway. A number of impacts will be defined and addressed through route selection processes and be subject to EIA at project level. This policy will enhance the EPOs relating to air quality and climate. Allying the infrastructural improvements with the wind energy areas also increases both existing and future capacity and assists in achieving a number of EPOs relating to material assets, namely MA1 and MA7.

	Wind Energy Objectives	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs	Neutral Impacts with EPOs
WE10	**Offshore Wind Energy Development** Support the facilitation of offshore wind energy developments in appropriate locations and scales and with appropriate onshore support infrastructure, including landing locations for land-sea connections, subject to relevant policy, legislation, environmental, landscape, amenity, seascape and technical considerations. This shall include consideration of the *Ocean Renewable Energy Development Plan* prepared by the DoCENR and any future Marine Spatial Plan prepared by the DoEHLG.		AQ1, AQ2		SG1, SG2, SG3, SG4, W1, W2, W3, W4, PH1, PH2, L2 CH1, CH2, MA3, MA4, MA5, MA6, MA7, MA8 MA9	B1, B2, B3, L1	**MA1** **MA2**

A number of impacts are identified as uncertain in relation to this policy subject to the finalization of the Ocean Renewable Energy Development Plan. The draft plan highlights the need for additional research relating to the marine environment and particular species and indeed the coastal landscape which is quite sensitive around much of County Galway. However a number of other impacts are likely to be addressed through development control and mitigation measures

developed as part of the offshore renewable energy plan and at project level							
	Wind Energy Objectives	**No likely interaction with EPOs**	**Likely to improve status of EPOs**	**Probable conflict with EPOs – unlikely to be mitigated**	**Potential conflict with EPOs – likely to be mitigated**	**Uncertain interactions with EPOs**	**Neutral Impacts with EPOs**
WE11	**Habitats Directive Assessment** Having regard to the provisions of the Habitats Directive (92/43/EEC), where a proposed development will give rise to significant adverse direct, indirect or secondary impacts on Natura 2000 sites, (either individually or in combination with other plans or projects), permission will only be granted where there is no alternative solution and where there are imperative reasons of overriding public interest in favour of granting permission, including those of a social or economic nature		AQ1, AQ2	B1, B3	B2, SG1, SG2,SG3,SG4, W1, W2,W3, W4 PH1, PH2, L1 L2, CH1, CH2 MA3, MA4, MA6 MA7, MA8, MA9	MA1, MA2	
This policy essentially addresses Article 6.4 of the EU Habitats Directive where development may be allowed if it is proved to be overriding public interest and no alternative solution exists. In the event of such a development, being permitted by the European Commission this could result in adverse impacts on Natura 2000 sites. As all Natura 2000 sites have been excluded from the hierarchy of wind energy policies in the WES it is unlikely that a wind energy development could give rise to this issue; however, developments associated with renewable energy infrastructure may do so, and individual projects may also, hence the provision of this policy.							

From the above evaluation table, it is clear that certain environmental parameters are identified as potentially conflicting with EPOs likely to be mitigated, whilst other EPOs are likely to be improved by the implementation of the Draft WES.

The principal policies identified as potentially conflicting with the SEOs primarily concern potential impacts on biodiversity, flora and fauna, soil and geology, water, landscape, humans and cultural heritage. However, for all of these resources, avoidance of the most sensitive sites has been incorporated into the strategy and there exist a number of best practice management measures that can greatly assist in minimising these impacts.

Conversely, the EPOs that address air quality and climate are generally found to be enhanced through the implementation of the Draft WES.

Chapter Eight, Mitigation Measures presents the identified mitigation measures for each environmental parameter in more detail.

8 Chapter Eight Mitigation Measures

8.1 Introduction

This chapter outlines the mitigation measures that will prevent, reduce, and offset as much as possible any significant adverse effects on the environment of the county resulting from the implementation of the Draft WES.

Section (g) of Schedule 2B of the SEA Regulations requires
'The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the Plan'

Mitigation involves ameliorating significant negative effects. Where the environmental assessment identifies significant adverse effects, consideration is given in the first instance to preventing such impacts or where this is not possible, to lessening or offsetting those effects. Mitigation measures can be generally divided into those that:

• Avoid effects;
• Reduce the magnitude or extent, probability and/or severity of effect;
• Repair effects after they have occurred;
• Compensate for effects, by balancing out negative impacts with positive ones.
In addition, many impacts will be more adequately identified and mitigated at project and EIA level.

During the development of the Draft WES, avoidance of all natural heritage designations was a criteria used to identify strategic sites. In this way, direct impacts on these sites are avoided. However, in relation to habitats and Natura 2000 sites, there is potential for indirect or secondary impacts and these are addressed in detail in the HDA Report.
All Natura 2000 sites and NHAs were also excluded from the Acceptable in Principle designations Again, whilst avoidance assists in reducing potential direct impacts on these habitats, secondary or indirect impacts may also arise, and hence the provision of more detailed mitigation measures for biodiversity, flora, and fauna, soil and water in the following sections.

Finally, the majority of NHAs were excluded from Open to Consideration Areas; three NHAs are partly included within this category and they are as follows:

- Connemara Bog Complex NHA
- Oughterard District Bog NHA, and
- Moycullen Bog NHA.

Specific mitigation measures have been developed to highlight to potential applicants the particular sensitivities associated with these bog habitats.

A number of policies and guidelines for example the 2006 Guidelines for Wind Energy Developments (DoEHLG) and the Water Framework Directive Management Plans provide mitigation measures to minimise environmental impacts. In addition, many impacts will be more adequately identified and mitigated at project and EIA level. A reference list of best practice guidelines is referred to in the Draft WES and Chapter Five also presents a substantial number of mitigation measures under a range of themes. Therefore the mitigation measures proposed below take cogniscence of these measures but add or strengthen them where significant potential impacts have been identified.

There are also a small number of policies that are identified as potentially generating significant adverse impacts on the environment, and suggested rewording of these policies is put forward for consideration.

The mitigation measures detailed in the following section will assist in the development management process. Such mitigation measures could be useful to potential applicants as they provide guidance on the key environmental issues to be addressed.

8.2 Mitigation Measures – Suggested Rewording of Existing Draft Policies

Table 8a proposes a number of changes to the draft policies in order to strengthen protection of environmental resources. These have been informed by both the SEA and the HDA process.

Table 8a: Mitigation Measures for policies.

MM	Existing Policy	Suggested Rewording	Reason
MM1	**WE 6** **Wind Energy Infrastructure** Proposals for the development of infrastructure for the production, storage and distribution of electricity through the harnessing of wind energy will be considered in appropriate sites and locations, subject to relevant policy, legislation, environmental, landscape and amenity considerations and the guidance in the WES. This will include, *inter alia*, requirements and considerations in	**Wind Energy Infrastructure** Proposals for the development of infrastructure for the production, storage and distribution of electricity through the harnessing of wind energy will be considered in appropriate sites and locations, subject to relevant policy, legislation, environmental, landscape and amenity considerations and the guidance in the WES. This will include, *inter alia*, requirements and considerations in relation to landscape, heritage and the environment, Natura 2000 sites and the Habitats Directive, ***the objectives of the WRBD River Basin Management Plan***, electricity infrastructure, settlement patterns and wind	The inclusion of specific reference to the requirements of the Western River Basin District management plan highlights at policy level the Water Framework Directive. In addition, it direct applicants to the information and management objectives for water bodies within the principal draft WES areas.

	relation to landscape, heritage and the environment, Natura 2000 sites and the Habitats Directive, electricity infrastructure, settlement patterns and wind energy potential		
MM2	**Objective WE 7 Wind Energy Development Projects** Planning applications for wind energy developments will be guided by, and assessed in accordance with, the wind energy policies and objectives in this section, the landscape capacity considerations in Section 4 and the development management considerations, guidelines and standards outlined in Section 5. Where appropriate, planning applications for wind energy developments will also need to consider the landscape, environmental and amenity impacts on the areas of adjoining Local Authorities.	**Wind Energy Development Projects** Planning applications for wind energy developments will be guided by, and assessed in accordance with, the wind energy policies and objectives in this section, the landscape capacity considerations in Section 4 and the development management considerations, guidelines and standards outlined in Section 5. Where appropriate, planning applications for wind energy developments will also need to consider the landscape, ***biodiversity/ecological receptors***, environmental and amenity impacts on the areas	The inclusion of reference to biodiversity and ecological receptors will better capture potential cross boundary impacts on species or habitats in neighbouring counties. This would be of particular relevance to mobile species such as birds and fish species.
	Existing Policy	**Suggested Rewording**	**Reason**
MM3	**Objective WE 8 Small-Scale and Micro Generation Wind Energy Projects** Facilitate, where appropriate, small scale wind energy development projects by autoproducers, in urban areas and for small community-based proposals to help meet the immediate needs of the development being provided and/or to reduce their reliance on fossil fuels, and subject	**Small-Scale and Micro Generation Wind Energy Projects** Facilitate, where appropriate, small scale wind energy development projects by autoproducers, in urban areas and for small community-based proposals to help meet the immediate needs of the development being provided and/or to reduce their reliance on fossil fuels, and subject to the following criteria being met: • In the case of autoproducers, the energy	The purpose of this rewording is to clarify the position regarding the Habitats Directive. Habitats Directive Assessment Screening is required for development activities in a Natura 2000 site; for developments close to such sites, it is good practice to undertake a screening exercise.

	to the following criteria being met: • In the case of autoproducers, the energy will be primarily generated to be used on the site and within the site boundary. • Noise and visual impacts including shadow flicker will not be significant on nearby residents. • If located within or close to a SPA or SAC, a HDA /EIA may be required. Any cumulative effects of single and/or small scale wind energy projects on the landscape will need to be assessed.	will be primarily generated to be used on the site and within the site boundary. • Noise and visual impacts including shadow flicker will not be significant on nearby residents. • If located within **or close to a SPA or SAC, *a HDA Screening will be required and an EIA may be required*.** Any cumulative effects of single and/or small scale wind energy projects on the landscape ***and other environmental resources*** will need to be assessed.	
MM4	**Objective WE11** Having regard to the provisions of the Habitats Directive (92/43/EEC), where a proposed development will give rise to significant adverse direct, indirect or secondary impacts on Natura 2000 sites, (either individually or in combination with other plans or projects), permission will only be granted where there is no alternative solution and where there are imperative reasons of overriding public interest in favour of granting permission, including those of a social or	***"Having regard to the provisions of the Habitat Directive, (92/43/EEC), ensure that:*** • ***All activities derived from the adoption of the Wind Energy Strategy that may give rise to significant adverse direct, indirect or secondary impacts on the qualifying interests and conservation objectives of Natura 2000 sites, (either individually or in combination with other plans and projects), will be subject to Habitats Directive Article 6 assessments; and*** • ***Permission will only be granted where project level Article 6***	It is noted that in the case of priority habitats imperative reasons of overriding public interest cannot include those of a social or economic nature with only issues of human health or public safety, beneficial consequences of primary importance for the environment or further to an opinion from the Commission being allowed to form part of the consideration. With regard to the Draft WES and the SACs assessed under Stage 2 Appropriate Assessment this point is of significance as most of these SACs support priority listed habitats which include turloughs, active raised bog, active blanket bog and limestone habitats. A priority

	economic nature.	***Assessments conclude that no likely signficant effects are likely to occur***	habitat type is one which is in danger of disappearance and for whose conservation EU Member states have a special responsibility by reason of the proportion of the habitat's natural range that falls within the European Community.

8.3 Additional Mitigation Measures based on particular environmental sensitivities

Chapter 5 Development Management Guidelines of the Draft WES presents an extensive number of development management measures which essentially aim to address key environmental impacts. Many of these mitigation measures were developed by GCC during the preparation of the predraft WES. In turn, the SEA process has considered the predraft mitigation measures and has identified some additional mitigation measures. The following section presents all the mitigation measures prepared through the WES, SEA and HDA process. In order to identify where the SEA or HDA has informed additional mitigation measures, these measures are presented in blue and bold font. All such new mitigation measures are now included in the draft WES. ***Additional mitigation measures arising from the consultation periods are presented in bold, italic font with a footnote stating the originator of the submission.***

Assessment of Environmental Impacts

- **MM5 - Early and meaningful consultation with GCC and statutory agencies will assist in identifying environmental sensitivities and considerations during the preparation of a planning application**

- The current requirement for EIA for wind energy developments is for installations with more than 5 turbines or having a total output greater than 5MW. GCC may require the preparation of an EIA for sub-threshold development.
- All wind energy developments, including those sub-threshold for EIS, will require HDA screening, and may require a full HDA where appropriate, under Article 6 of the Habitats Directive. All wind energy developments that are located within a Natura 2000 site or which may adversely affect the integrity of such sites will be required to submit a Natura Impact Statement (NIS).
- All wind energy developments should prepare an environmental constraints map to identify the most and least sensitive environmental resources on the site. This constraints map will assist in informing the size, layout and design of the wind energy development.
- An ecological impact assessment may be required where considered appropriate for those developments that are sub-threshold for EIA.
- GCC may require, as appropriate, the preparation and implementation of an Environmental Management Plan (EMP) for wind energy developments. This

would incorporate measures in relation to a range of environmental issues, such as surface water, groundwater protection, slope stability, flood risk potential, waste generation and management, ecology and protection of natural heritage and habitat restoration and management. ***Annual Monitoring of designated sites or species may also be a requirement of these plans***[10].

- ***Where an Environmental Management Plan, Surface Water Management Plan and Inspection and Maintenance Plan are requested, these should be submitted as part of the Environmental Impact Statement***[11]***.***

Biodiversity, Flora and Fauna

Biodiversity is protected under a range of Irish Legislation, most notably:
1999 Flora Protection Order
Wildlife Acts 1976 -2000
Habitat Regulations (S.I.No.94 of 1997)[12]***.***

Birds

- Wind farm developments must consider the potential impacts on birds in terms of collision, disturbance and any other impacts. It will be particularly important to assess effects in relation to breeding areas, roosting grounds and flight-lines in consultation with an appropriate authority.
- Construction works should be timed and designed so as not to disturb breeding birds and site specific advice should be sought from a qualified and experienced ecologist.
- Yearly monitoring of wind farm developments associated with wind energy areas identified in the strategy should be undertaken by professional ecologists and funded by the relevant wind energy developer. The methodology, responsibility and rationale for this approach should be clearly outlined by the NPWS to assist developers.
- Where nesting hen harriers or merlins are recorded within close proximity to turbines, appropriate mitigation measures may be required to avoid any potential risks to displaying birds and newly fledged birds. Advice should be sought from a qualified and experienced ecologist.
- Wind turbines will not be permitted within the known flight path of migratory wild fowl.

Bats

A number of measures have been identified to ensure that any remaining adverse impacts to ***all bat species including the***[13] lesser horseshoe bats are avoided and mitigated. These measures are listed below.

[10] This was inserted following a submission by the West Regional Authority
[11] This was inserted following a submission by An Taisce
[12] This was inserted following a submission by the West Regional Authority
[13] This was inserted following a submission by An Taisce

- Construction works should be timed and designed so as not to disturb breeding bats.
- Buffer zones will be established in areas identified as lesser horseshoe bat foraging habitats. These buffer zones will adhere to current guidance with regard to avoiding and/or minimising impacts to this species and will be implemented in consultation with relevant authorities.

Peat

- Applications must have regard to the guidance in the *Planning Guidelines for Wind Energy Development for Planning Authorities 2006* (including Section 5.3 and Appendix 4) in order to mitigate against potential impacts on natural heritage, slope stability and carbon output.
- The careful siting of tracks, construction compounds, cable trenches, etc. should be carried out so that areas of deep/wet peat are avoided. Where deep/wet peat cannot be avoided, floating roads will be used to reduce the adverse effects associated with the construction and operation of such structures.
- During construction works, the enforcement of standard pollution control measures should be undertaken to prevent potential polluting substances from entering drains and having the potential to affect water quality further downstream from wind farm areas.

- **MM 6 -The following NHAs are included partly within the Open to Consideration Areas, and developments proposed for these sites will have be subject to detailed hydrological and ecological assessment to ensure their integrity is not significantly compromised by wind energy development.**
  In addition, certain activities within these sites such as removal of peat or excavation of borrow pits may require ministerial or local authority consent as they can be considered as notifiable actions under the NHA Statutory Orders. Please see www.npws.ie/farerslandsowners/notifiableactions.ie[14]
  - Connemara Bog Complex NHA
  - Oughterard District Bog NHA, and
  - Moycullen Bog NHA.

Section 8.3.4 includes additional guidance in relation to peatlands.

Buffer Areas

- Buffer areas may be required for wind energy developments close to Natura 2000 ***and other protected*** sites in the County. The extent of the buffer areas will be dependent on the habitat type and species present. Buffer areas should be developed in consultation with GCC ***in the first instance, and*** the NPWS and ~~where fisheries protection is concerned,~~ Inland Fisheries Ireland (IFI) ***as appropriate***[15] at the pre-planning stage of wind energy projects.
- Where a development is proposed close to a Natura 2000 site, the applicant should determine, in consultation with GCC, if a HDA is required. ***Noting that***

[14] This was inserted following a submission by the West Regional Authority
[15] This was inserted following a submission by the West Regional Authority

the individual project may impact on a Natura 2000 site or it may impact on a Natura 2000 site in combination with other plans or projects (as identified in Section 5.2.12 Cumulative Impacts of Wind Farms in WES)[16].

- Where a development is proposed close to or within a NHA, further ecological or geological surveys should be undertaken by suitably qualified ecologists and/or geologists as appropriate.

Habitat Restoration

- A habitat restoration and management plan should be developed as part of the EIS, and the EMP where appropriate, to address reinstatement of mineral and peat soils and allow for positive ecological impacts associated with the development. Such plans should be developed in consultation with GCC.

Biodiversity

- The protection of non-designated habitats, species and local biodiversity features should be promoted through site design and landscape management plans.
- Habitat mapping (including wetlands) and ecological impact assessment may be required for wind energy applications. This habitat mapping should be undertaken at an appropriate scale and in accordance with agreed national Habitat Mapping Methodology. The habitat map should be overlaid with the emerging development to highlight sensitive habitats and help assess potential impacts. The applicant shall consult with GCC and NPWS in this regard.

MM 7 Invasive Species

- The implementation of measures to control and manage alien and invasive species such as Japanese Knotwood (***Fallopia japonica) Giant Rhubarb (Gunnera tinctoria/manicata)*** and noxious weeds such as ragwort may be required as part of the EIS/EMP. In particular, attention should be paid to the potential for construction activities to introduce such species to an area. ***Measures to address the potential for introduction of invasive species should be included in Construction Management Plans. Please also refer to EC (Birds and Natural Habitats) Regulations 2010 (Consultation Draft) which lists Restricted Non Native Species.[17]***

Forestry and Clearfelling

- The applicant should have regard for the *Forest Service Policy on Felling Licenses for Wind Farm Development*. Consideration should also be given to the ecological impacts of replacement planting in other areas that may be required when clearfelling grant aided forestry.

Environmental Monitoring

[16] This was inserted following a submission by An Taisce
[17] This was inserted following a submission by the West Regional Authority

- Environmental monitoring may be required in particular sites where there are concerns in relation to specific environmental matters such as impacts on wildlife or where a specific condition has been attached to a grant of planning permission.

Drainage, Water Quality and Fisheries

Considerations for drainage, water quality and fisheries should take into account the following:

- The applicant shall have regard to the relevant objectives and measures set out in the *Western River Basin Management Plan* (RBMP) *2009-2015* and the *Shannon International RBMP 2009-2015* and associated Programmes of Measures. In particular, works relating to construction and maintenance of wind energy developments should aim to prevent the deterioration and maintain high or good status for surface waters, and limit pollution inputs and prevent deterioration of groundwater.
- To avoid surface water pollution during construction works, the enforcement of standard pollution control measures will be undertaken to prevent potential polluting substances from entering drains and having the potential to affect water quality further downstream from wind farm areas.
- Where construction and maintenance of wind energy developments are proposed close to coastal and estuarine areas, adequate measures for the protection of fisheries/shellfisheries should be developed as part of the EIS/EMP. ***Please refer to the relevant Shellfish Waters Pollution Reduction Programmes – relevant Shellfish Water sites are Kilkieran, Outer Galway Bay , Indreabhan, Clarinbridge/Kinvara, Aughinish and Ballyvaughan/Poulnaclough Bay.***[18]
- Where construction and maintenance of wind energy developments are proposed close to designated salmonid fisheries, sea trout or brown trout spawning and nursery rivers, adequate measures for the protection of same will be required as part of the EIS/EMP (refer to Schedule 2 of Wild Salmon and Sea Trout Tagging Scheme Regulations 2009).
- Where construction and maintenance of wind energy developments are proposed close to freshwater pearl mussel rivers (in particular Owenriff and Dawros Rivers and sub-catchments, refer to First Schedule of European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009), adequate measures for the protection of same will be required as part of the EIS/EMP (refer to relevant Sub-Catchment Plans). **The following measures are provided for WES areas close to Freshwater Pearl Mussel Catchments**. **These mitigation measures may also apply in relation to salmon, sea trout and brown trout spawning rivers as appropriate.**

MM 8 Mitigation Measures for Freshwater Pearl Mussel

MM8.1 Siltation and nutrient loss from potential wind energy developments in AIP areas pose a significant risk to the pearl mussel population of the Owenriff Catchment. Therefore, without the removal of risk to pearl mussel populations wind energy

[18] This was inserted following a submission by the West Regional Authority.

developments will not be permitted in AIP areas occurring within the Owenriff Catchment.

MM 8.2 Any wind energy proposal occurring within the Owenriff Catchment will be accompanied by a detailed Surface Water Management Plan (SWMP). The objective of the SWMP will be to prevent pollution to watercourse and adverse impact to pearl mussels (as well as other Annex and non-Annex listed aquatic fauna). The SWMP will provide sufficient detail to ensure that all activities that could potentially lead to negative impacts on water quality are identified.

The SWMP will be based upon a detailed understanding to the hydrology, hydrogeology and geology within and surrounding proposed wind energy development sites. Peat depth surveys and peat stability assessments will be required for the design of all SWMP for wind energy developments within the Owenriff Catchment. The information to be contained within the SWMP and other relevant mitigation measures for proposed wind energy developments in AIPs occurring within Owenriff Catchment are outlined below. ***Surface Water Management Plans and Peat Depth Surveys must be carried out by experienced ecologists and hydrological experts.***[19]

MM 8.3 Development Layouts and Buffer Zones

Wind energy development layouts will avoid areas of deep peat and active blanket bog. Slopes in excess of 15° will be avoided.

Construction areas will be minimised to reduce the area of exposed ground occurring during the construction phase.

Buffer zones of a minimum of 50m from higher-order streams and 150m from lower-order watercourses will be required. Buffer zones will be maintained in all instances except where watercourse crossings are required along proposed access track routes.

No construction activities will be undertaken at watercourse crossing in wet weather conditions.

All watercourse crossings will use clear span, bottomless, arch or oversize culverts.

MM 8.4 Forest Clear-felling

Forest clear-felling for wind energy developments in the Owenriff catchment will follow the guidance of the Forest Service, NPWS and all relevant provisions for clear-felling outlined in the forthcoming final version of the Owenriff Sub-basin Management Plan.

The Coillte Forest Management Plan for Derradda has not identified felling methods, areas and volumes in this area as an agreed procedure has not yet been established. No clear-felling will be undertaken for wind energy developments prior to the establishment of an agreed felling procedure within the Owenriff Catchment. Subsequent to the establishment of procedures all clear-felling and replanting for wind energy developments will adhere to these procedures.

Where forestry clear-felling is proposed the list of national measures relating to forestry which aim to address pressures impacting on pearl mussels will be followed. These measures are reproduced from Table 6.2 of the Owenriff Sub-basin Management Plan.

MM 8.5 Construction Materials

[19] This was inserted following a submission by the West Regional Authority

Construction materials that resemble the geochemistry of local bedrock will be used in preference of high-carbonate materials such as cement-based products which will be avoided where possible. The avoidance of high carbonate materials will ensure that changes to the predominantly acidic surface and soil water conditions with the Owenriff Catchment are avoided.

Ready-mixed concrete should be used during the construction phase of wind energy developments.

MM 8.6 Site Drainage and Control of Surface Runoff

Disturbance to natural drainage features should be avoided during the construction phase of a wind energy development.

Uncontaminated surface runoff should be diverted away from construction areas through the installation of interceptor drains upgradient of construction areas.

Drainage waters originating in construction areas will be collected in a closed system and treated prior to controlled, diffuse release. A Sustainable Urban Drainage System (SuDS) will be installed prior to the commencement of the main construction activities and suitable prevention measures will be put in place at all times to prevent the release of sediment to drainage waters associated with construction areas and migration to adjacent watercourses.

There will be a minimum of three stages of treatment for surface runoff from construction activities. Steps in treatment will include swales, check dams and detention ponds along with other pollution control measures such as silt fences and silt mats.

The potential for high flow velocities will be attenuated in the drainage network through energy dissipation or multiple outflows to avoid the re-suspension of sediment.

Swales will be used to hold water temporarily and to encourage infiltration/discharge into the ground locally to where the rainfall hits the ground. It is noted that low infiltration rates are associated with peat soils and blanket bog, which dominates the land cover within the Owenriff Catchment.

Check dams will be placed along the swales to settle out silts and reduce flow velocities along with subsequent erosion potential. Regular outflows from the swales in the form of small drains which fan out into the surrounding vegetation with tapering drains will prevent the focusing of increased flows and preserve natural drainage conditions.

Detention ponds will attenuate and treat runoff and will be required for all the turbine locations. these will have permanent open water to minimise the risk of sediment washout. Two ponds (primary and final) will be constructed in series at each location.

Water depth in detention ponds will be kept to a normal depth of 0.3m with a maximum depth of 0.6m.

Detention pond side slopes will be shallow grades such as 1 in 3 side slope.

Site drains will not discharge directly into watercourses.

Runoff from excavations will not be pumped directly into watercourses. Where dewatering of excavations is required, water shall be pumped to the head of a treatment train in order to receive full treatment prior to re-entry to the natural drainage system.

Dust suppression will be undertaken around construction areas during periods of dry weather. Only clean, settled water will be used for dust suppression.

MM 8.7 Responsibilities of Contractors and Sub-contractors

All site personnel will be made aware of their environmental responsibilities through the production of a Method Statement outlining Environmental Requirements for Contractors and Sub-contractors. The Method Statement will include environmental emergency response procedures to deal with spillages should they occur.

MM 8.8 Oils, Fuels and Site Vehicle

Oils and fuels will be stored in designated bunded areas greater than 20m from any surface watercourse.

Storage tanks will be tested to a recognised standard with a secondary containment system to provide at least 110% of the maximum tank capacity.

Designated refuelling points for site-vehicles will be established 50m from any surface watercourse. Drip trays will be used at refuelling points.

Site vehicles and delivery vehicles will not be washed down on site.

Regular inspection of vehicles, tanks and bunds will be undertaken.

Documented emergency procedures to deal with any accidental slippages will be established.

Oil spill protection measures will be provided adjacent to surface watercourses.

MM 8.9 Relevant Guidance

Good Practice Guidance notes proposed by the UK Environment Agency/Scottish Environmental Protection Agency/Northern Ireland Environment Agency will be implemented.

The relevant Guidance Notes to be adhered to will include:

PPG1: General Guide to the Prevention of Pollution

PPG5: Works and Maintenance In, Near or Liable to Affect Watercourses

PPG10: Working at Construction and Demolition Sites

PPG21: Pollution Incident Response Planning

The construction phase and associated drainage will also have regard to the Scottish Natural Heritage guidance Good Practice during Windfarm Construction (2010).

- A buffer zone along water features such as rivers and lakes may be required. These buffer zones represent a corridor for the protection of water quality and habitat. The extent of the buffer zone is site dependant and should be developed in conjunction with GCC and following consultation with Inland Fisheries Ireland.
- The ***leaching of soils and the*** potential for release of phosphorus ***and other nutrients*** during clearfelling and impacts on water quality should be carefully assessed and appropriate ***measures taken to prevent any phosphorous /nutrient enrichment of the local watercourse***[20]. ~~construction management practices adhered to.~~

[20] These were inserted following submissions from the West Regional Authority and An Taisce

- Hydrogeological impacts must be carefully assessed particularly in relation to peat soils. Consultation with the GSI is recommended in relation to modelling. Such modelling must be agreed with the GSI and undertaken by competent and qualified geotechnical persons.
- The developer shall have a responsibility to demonstrate that any proposed development will not have significant impacts upon aquifers.
- Drainage networks should not discharge directly to watercourses or waterbodies but through an appropriate buffering riparian zone.
- Measures should be taken to reduce surface run-off so as to lessen the risk of bank destabilisation and erosion.
- The discharge of solids should be strictly controlled so as to avoid direct impacts on fish feeding, spawning and primary productivity within the river channel.
- Construction activities and on-site storage of fuels and lubricants should be appropriately located and controlled.
- The EIS/EMP should include an emergency response plan in relation to spillages.
- Full consultation with ~~regional~~ ***Inland Fisheries Ireland Regional*** [21] ~~fisheries~~ staff regarding culvert/bridge design and mitigation measures with respect to the requirement of access roads for wind farm developments.
- Proposals should be included to demonstrate that site drainage can be satisfactorily addressed. An Inspection and Maintenance Plan should be developed for the drainage system to monitor and ensure the effectiveness of any drainage lines, silt traps and settlement ponds.
- Any EIS should address the synergistic relationships between water quality, biodiversity, soil function and ecology.

Soils and Geology

- Where construction works are taking place in hydrologically sensitive habitats, works should be confined to the smallest possible area. Minimum removal of vegetation will take place so as to reduce areas of bare peat or soil. When excavations are being undertaken, surface vegetation will be removed in sods that can be stored and later replaced around structures where bare peat/soil exists. This will ensure a more rapid re-vegetation of bare peat/soils and will help to reduce potential soil erosion that could lead to water pollution.
- The indirect impact of construction on peat habitat is generally far greater than the immediate footprint due to impacts on hydrology. EIA undertaken on peatland habitats affected by wind farm development should estimate the permanent loss due to direct and indirect effects.
- Consideration should be given to calculating the carbon output of constructing wind energy developments on peatlands.
- The careful siting of tracks, construction compounds, cable trenches, etc. will be carried out so that areas of deep/wet peat are avoided. Where deep/wet peat cannot be avoided, floating roads will be used to reduce the adverse effects associated with the construction and operation of such structures.
- Landslide susceptibility and risk assessment must be undertaken for all proposed developments, particularly in peat areas, to ensure all factors contributing to slope instability are identified and addressed appropriately. This assessment should incorporate slope stability mapping and groundcover assessment in the

[21] This was inserted following a submission by the West Regional Authority

context of potential cumulative effects arising from multiple developments. Consultation with the GSI is required to undertake best practice landslide susceptibility modelling. Please refer to GSI (2006) *Landslides in Ireland* and IGI (2002) *Geology in EIS: A Guide*.

- The potential impacts on slope stability relating to climate change impacts, most particularly flash floods and changing weather patterns should be considered if possible and adaptation measures should be developed to account for same. Regard shall be given to DoEHLG (2009) *Planning System and Flood Risk Management Guidelines and Technical Appendices*, as these also address climate change impacts.
- The Construction Management Plan (CMP) developed as part of the planning application should address quarrying, borrow pits, soil management including storage, and opportunities for soil reinstatement.
- Particular care and management is required in relation to peat extraction and storage and best practice in construction and management is required for peat areas. A Peatland Conservation and Management Plan (PCMP) should be submitted for developments on peatlands/boglands with details on the conservation, displacement, reinstatement and/or restoration of peatland habitats. This would either form part of any EIS/EMP prepared or should be submitted as a separate report as part of the planning application where an EIS or EMP is not required. ***Please refer to Irish Peatland Conservation Council 'Peatlands 2020 Conservation Plan – Halting the Loss of Biodiversity[22]'***.

Landscape and Visual Impact

Landscape Guidelines

Certain parts of areas identified as Strategic Areas or Acceptable in Principle Areas are designated as of high landscape value in the GCDP. The DoEHLG (2006) *Planning Guidelines for Wind Energy Development for Planning Authorities* (page 15) state that such designations:

"'would not automatically preclude an area from future wind energy development but the inclusion of such objectives in a development plan is a material factor that will be taken into consideration in the assessment of a planning application"

The current GCDP 2009-2015 includes the following objectives in relation to landscape character and sensitivity:

***Objective HL93**: The consideration of Landscape Sensitivity Ratings shall be an important factor in determining development uses in areas of the County. In areas of high Landscape sensitivity, the design and the choice of location of proposed development in the landscape will also be critical considerations.*

***Objective HL94**: Preserve and enhance the character of the landscape where, and to the extent that, in the opinion of the Planning Authority, the proper planning and*

[22] This was inserted following a submission by the West Regional Authority

sustainable development of the area requires it, including the preservation and enhancement, where possible of views and prospects and the amenities of places and features of natural beauty or interest. This shall be balanced against the need to develop key strategic infrastructure to meet the strategic aims of the Plan.

The above objectives will be considered by the Council and balanced with the strategic importance of achieving targets in the National Climate Change Strategy and renewable energy targets. GCC will accommodate wind energy developments in areas designated as Strategic or Acceptable in Principle subject to implementation of best practice in siting and design and assessment of environmental, landscape and other impacts.

Wind energy developers should have regard to the DoEHLG *Planning Guidelines for Wind Energy Development for Planning Authorities 2006*. GCC will seek applications that demonstrate best practice as contained in these Guidelines.

Should specific recommendations arise from the proposed National Landscape Strategy and National Landscape Characterisation, any future applications must take such guidance into consideration.

Landscape Impact Assessment

All wind farm applications should be accompanied by a Landscape Impact Assessment (LIA), either as part of the EIS where appropriate or as a separate report. The LIA should include the following:

- Description of proposed development, including alternatives considered during design process.
- Description of geographic location and landscape context.
- Definition of study area, informed by identifying the Zone of Theoretical Visibility.
- General landscape description of the study area.
- Selection of viewshed reference points from where the proposal is examined in detail.
- Assess the sensitivity of landscape from each viewshed reference point.
- Preparation of photomontages.
- Estimation of likely degree of impact on landscape.
- Recommendation of mitigation measures.
- A landscaping plan should be submitted as part of the application.

The visual linkages between established landmarks, landscape features and views may be considered as part of the landscape and visual impact assessment. Regard must also be given to potential negative landscape impacts in adjoining counties, and the Planning Authority may request that visual impact assessments address this issue. In particular, designated scenic landscapes, views, routes and features of county, regional and local value may be considered and assessed for visual impacts.

Landscape and Visual Mitigation

Methods employed to mitigate the impact of wind turbines in the landscape setting in general will be influenced by the layout and design of the proposed wind farm. In this regard, design criteria that will contribute to effective mitigation include the following:

- Turbine layout pattern to be designed to complement the existing landscape pattern.
- Turbine height to be set to complement the scale of the receiving landscape. This relates to the size or scale of farmed fields or indeed the scale and size of the hills and undulations that define the landscape's topography.
- The number of turbines will be carefully selected to be in scale with the receiving landscape and to avoid cumulative impacts relating to other wind farms in the area.
- In terms of infrastructure, access will ideally be routed in a manner that agrees with the existing topography. Sharp changes in level caused by excavation or the construction of retention structures or walls will be avoided. A minimal approach on earthworks will minimise damage or scarring of the landscape.
- Screen planting to infrastructure will feature native species planting, consistent with the wider landscape setting.

Built and Cultural Heritage

Wind turbines and wind farms should be sited and designed to ensure that they do not unduly dominate or damage architectural and archaeological structures or sites. Adequate assessment and mitigation measures should be included as part of the EIS or as a separate report where appropriate.

Archaeological Heritage

- All planning applications within 30m (or greater where required) from a listed archaeological site on the RMP should be accompanied by an archaeological assessment prepared by a suitably qualified archaeologist detailing the impacts which the proposed development would have on archaeology in the area and any mitigation measures proposed.
- A registered archaeologist should be present during the initial stripping of the topsoil at permitted development sites, within 30m of a listed archaeological site.

- **MM 9 Where developments are proposed close to National Monuments in State ownership or guardianship, and monuments subject to Preservation Orders zones of visual amenity should be defined for them in order to assess potential impacts on the archaeological landscape and setting.**

Architectural Heritage

- Certain applications may be required to undertake an assessment of the impacts of a proposed development on architectural character, particularly in the vicinity of towns or settlements with a rich architectural heritage, reflected in their designation as ACAs. This will also apply to protected structures.
- Assessments should be undertaken by a conservation architect and it is advised that at preplanning stage, the Planning Authority should be contacted to determine if there is a need for such an assessment.

Population and Human Settlement

- Applications must have regard to the thresholds, limits and buffer zone in the *Planning Guidelines for Wind Energy Development for Planning Authorities 2006* in order to mitigate against potential impacts on human health in terms of shadow flicker, visual impact and noise.
- An assessment of the theoretical shadow flicker shall be prepared for all dwellings within 600m of any turbine. A further assessment shall indicate the likely level of shadow flicker based on anticipated meteorological constraints. If required, mitigating measures shall be proposed and agreed with the Planning Authority.
- A Construction Management Plan (CMP) should accompany any EIS that will outline the measures taken to avoid dust impacts and negative impacts from construction traffic.
- A minimum exclusion zone of 500m will generally apply around all towns, urban areas, rural villages and small settlements identified in the settlement strategy of the GCDP. This zone may be increased to 1km in the case of the Galway Gateway and the Tuam Hub. These zones will facilitate the continued growth, development and investment into these existing settlements.
- Wind turbines will generally not be permitted to locate within 500m of any noise sensitive property, including existing or permitted dwelling houses, except where the written consent of those persons affected by this requirement is given and subject to an adequate level of amenity can be achieved in relation to noise, shadow flicker and visual impact. A planning application for a dwelling house will be considered up to a distance of 250m of an existing or permitted turbine.

Air and Climate

- A CMP should accompany any EIS that will outline the measures taken to avoid dust impacts and negative impacts from construction traffic
- Where developments are proposed on peat soils, carbon sinks and outputs associated with the development should be calculated. Reference is also made to discussion on wind energy construction on peat bogs and the BOGLAND project funded by the EPA, in particular Renou-Wilson and Farrell (2009) *Peatland Vulnerability to Energy-Related Developments from Climate Change Policy in Ireland: The Case of Wind Farms*.
- It is recognised that forestry clearance may be necessary in certain sites to facilitate wind energy developments. Consideration should be given to carbon loss from this clearance and alternative approaches such as 'key holing[23]' combined with replacing felled trees with short rotation coppice/low height native woodland or short rotation forestry. Such replacement could be considered as part of the landscaping plan for a wind energy development

Material Assets – Transport, Waste Management, Energy Use and Noise

Transport

[23] Definition of key holing: in this context key holing refers to the minimum removal of trees around proposed turbine locations. This was inserted following a submission by the West Regional Authority

- A Traffic Management Plan (TMP) shall be submitted with applications including details of the road network/haulage routes, the vehicle types to be used to transport materials on and off site and proposals to address impacts on residents in relation to construction activities.
- Where the construction of new roads is required to construct/service wind energy developments, adequate and appropriate drainage measures will be required. The careful siting of tracks, construction compounds, cable trenches, etc. should be carried out so that areas of deep/wet peat are avoided. Where deep/wet peat cannot be avoided floating roads will be used to reduce the adverse effects associated with the construction and operation of such structures. The EPA guidance in relation to floating roads should also be consulted.
- Applications should include sufficient details to demonstrate that adequate access arrangements can be provided to the development site, particularly during the construction phase. This may include, *inter alia*, road condition surveys, Road Safety Audits, auto-track analysis, provision of passing bays, reinstatement works, etc.
- The carrying capacity, operational efficiency, safety and national investments in national roads should be protected in relation to the implementation of the WES and EIAs may be required to demonstrate same. Developments will need to ensure compliance with the *Spatial Planning and National Roads Draft Guidelines* (DoEHLG, 2010), as superseded by any final published version of same.
- There will be a clear presumption in favour of protection of the national road network and direct access onto national roads outside a 50km/h speed limit applies will be restricted.
- Where proposals are located within 300m of existing and proposed Motorways, National Primary and National Secondary Roads, it is recommended that the applicant consult with the NRA, prior to making an application, in order to agree an appropriate setback distance from the road.
- In the case of all other public roads, proposed wind farms within 250m of the road, shall be subject to the agreement of the Council's Roads Department.

Waste Management

- A Waste Management Plan (WMP) should be submitted with applications to address waste management impacts. In addition, please refer to *Best Practice Guidelines in Reuse and Recycling of Construction and Demolition Waste 2007*. The WMP should be in compliance with County policies on construction waste management.

Noise

- In relation to noise, regard should be had to noise assessment, mitigation and thresholds stated in the *Planning Guidelines for Wind Energy Development for Planning Authorities 2006*. Noise impact assessments may also be required for construction activities as part of the EIA.
- Once commissioned, the development will be monitored for noise levels. In the event that the monitoring shows that any turbine is exceeding its projected noise levels and is having a detrimental noise impact, mitigating measures shall be agreed with the Planning Authority.

- During the construction phase of works, regard should be given to the EU Noise Directive (2002/49/EC) and associated national noise regulations and any relevant actions/measures identified in a proposed Noise Action Plan for County Galway when available.

Aviation Safety and Navigation

- Applicants are advised to consult with the Irish Aviation Authority to obtain their comments and recommendations in relation to interference with airport navigational aids prior to the submission of any planning application.
- Wind energy developments should avoid the aviation exclusion zone for Galway Airport and other airfields in the County to ensure the safe operation of these facilities.

Telecommunications

- The potential electromagnetic interference of any proposal shall be assessed by the applicant in consultation with the relevant bodies prior to submission of any application.
- Proposals shall include measures to monitor the effects of the development on telecommunications and procedures to remedy any interference when the wind farm becomes operational.

Cumulative Impacts of Wind farms

The cumulative impacts of wind energy developments in the County, and in particular in areas close to Natura 2000 sites will be carefully monitored over the lifetime of the strategy. Any proposed wind energy developments close to Natura 2000 sites will require, subject to consultation with GCC, a HDA. Such assessments will need to consider the cumulative impacts of wind energy developments with the conservation objectives of the relevant site. Furthermore, increases in the density of wind farm developments occurring within or adjacent to Natura 2000 sites will only be considered where it can be shown, following a HDA, that the development, in combination with other plans or projects, will not have an adverse effect on the conservation management objectives of associated Natura 2000 sites.

MM10 Certain developments may be required to undertake and submit a monitoring report at appropriate intervals in the construction and operation phases to monitor mitigation measures and environmental impacts particularly in terms of soils, water quality and biodiversity. The monitoring report will be undertaken by an appropriately qualified professional and terms of monitoring will be agreed in advance with GCC.

MM11 Certain developments may be required to inform GCC in advance of key construction activities in sensitive areas and facilitate the monitoring by GCC of construction activities to ensure mitigation measures are being implemented adequately.

8.4 Wind Farm Layout, Design and Construction

Layout and Design

The layout and design of wind farms should be suited to the landscape setting and site context and minimise visual impact on the landscape.

Wind Turbines

- All wind turbines shall be geared to ensure that the blades rotate in the same direction.
- The wind turbines shall be finished to minimise their visual impact and to integrate with the landscape setting in so far as practicable.

Boundaries and Fencing

- Fencing shall generally be permitted around the substation and not on any other part of the site unless agreed as part of a rehabilitation programme for on site vegetation. The fencing shall then be permitted for the length of time required to ensure recovery of the vegetation.

Access Roads

- Access roads within the site shall be unsurfaced and shall be located and constructed so as to minimise their visual impact. If the development is decommissioned they shall be removed, unless an alternative use for them has been agreed in advance with the Planning Authority.
- Prior to commencement of development, details of access openings to the site shall be agreed with the Planning Authority.
- Prior to commencement of development, the developer shall submit and agree with the Planning Authority proposals in relation to vehicle types and use of public roads during the construction phase.
- Site road embankments and associated areas shall be contoured and seeded to the satisfaction of the Planning Authority after construction.
- Surface damage to public roads created during the construction phase shall be reinstated to the satisfaction of the Planning Authority.

Ancillary structures and equipment

- No structures other than wind turbines, substation, monitoring mast and other essential ancillary installations will be permitted.
- Cables from the turbine to the substation shall be located underground.
- The planning application shall include all details of all such installations and shall be provided to the Planning Authority as part of the planning process.
- Suitable landscaping proposals to reduce substation visibility shall also be submitted.
- All wind monitoring masts require planning permission. These are typically for a 40m or 50m mast required to monitor on-site wind speeds over 1-2 years.
- If a permanent, hub height mast is required, permission will be considered only if the developer demonstrates that it is necessary for the economical operation of the wind farm.

Grid Connection

- While the grid provider is responsible for grid connections, details of likely routes shall be included with the planning application. Connections within the wind farm will be laid underground.

8.5 Construction, Commissioning and Decommissioning

Commencement and Construction

- Acceptable developments shall generally be granted planning permission for a period of 10 years within which to carry out the proposed development.
- All liquids and hydrocarbons stored on site during construction shall be stored in a waterproof bunded area.
- Silt traps shall be provided to intercept silt laden water from the site during construction.
- All ancillary construction equipment shall be removed from the site within one month of final completion.
- Prior to commencement, the developer shall agree with the Planning Authority details of the redistribution of any excess spoil generated during the construction phase.
- If on-site borrow pits are to be used during the construction phase, the details shall be agreed with the Planning Authority beforehand. This may involve a separate planning application.
- An Environmental Monitoring Report may be required during the construction phase, including mitigation measures to maintain habitats present on site in accordance with the details submitted in the EIS and with the planning application, to be submitted to the Planning Authority at a minimum of every 12 months during construction.

Commissioning and Decommissioning

- The date of commissioning of the wind farm shall be notified to, and established in writing with, the Planning Authority before any commercial use of the development is commenced.
- The wind farm shall generally be decommissioned and removed 20 years after the date of commissioning of the wind farm unless, prior to the end of this period, planning permission has been granted for the retention of the wind farm for a further period.
- An annual monitoring programme may be required including details of bird usage, collisions and fatalities on the site.
- If any turbine has been non-operational continuously for 12 months, it shall be decommissioned by the developer. If the wind farm development is deemed to be operating unsatisfactorily, the Planning Authority will require that all necessary mitigation or other measures are implemented to ensure that the development complies with the conditions of planning permission.
- The sites of developments that are decommissioned shall be reinstated through the removal of on-site structures and other visually intrusive works and the re-establishment of appropriate soil and vegetation cover and drainage.

- In the case of wind farms that are operating satisfactorily, the Planning Authority may consider extending the lifetime of the planning permission through a subsequent application for retention of planning permission.

9 Chapter Nine Monitoring

9.1 Introduction

It is proposed, in accordance with the Directive, to base monitoring on a series of indicators which measure changes in the environment, especially changes which are critical in terms of environmental quality, for example water or air pollution levels. Monitoring will focus on the aspects of the environment that are likely to be significantly impacted upon by the implementation of the Draft WES. The targets and indicators are derived from the Environmental Protection Objectives (SEO) discussed in Chapter Five. The target underpins the objective whilst the indictors are used to track the progress of the objective and targets in terms of monitoring of impacts.

The monitoring programme will consist of an assessment of the relevant indicators and targets against the data relating to each environmental component. Similarly, monitoring will be carried out frequently to ensure that any changes to the environment can be identified.

9.2 Frequency of Monitoring and Reporting

Wind Energy Developments commonly take a number of years from pre planning, to anemometer monitoring, baseline studies for EIS and then the planning application. Considering these timeframes, it is proposed to review the WES in tandem with the review of the existing CDP 2009 -2015 and accompanying SEA Monitoring Report.

However, in some cases as data becomes available, the Planning Authority may prepare an additional SEA Monitoring Report, if it is deemed necessary, particularly if the new data and its spatial analysis identifies negative impact(s) on the environment. In turn, this list below is subject to review at each reporting stage to reflect new data.

Should the monitoring regime identify significant impacts (such as impacts on designated sites) early on in the Draft WES implementation, this should trigger a review of the Draft WES and monitoring regime. It is recommended that data arising from planning applications, particularly in terms of environmental constraints mapping and Environmental Impact Statements be integrated into the GIS and monitoring system. This will assist in assessing cumulative impacts also, in particular ecology, water quality and slope stability.

Finally, it is recommended that the monitoring report be made available to the public upon its completion. It is recommended that this data be shared with neighbouring local authorities to assist in monitoring transboundary effects should they arise.

Table 9a: Monitoring Table

Environmental Protection Objectives	Indicators	Targets	Data Source
Biodiversity, Flora & Fauna			
B1:Protect diversity and integrity of designated habitats and species and maintain wildlife corridors	% Habitat Loss	No net loss of important habitats or wildlife corridors	NPWS/ GCC
B 2:Protect aquatic environment	No. of significant impacts to aquatic environment. No depreciation of water quality attributed to wind energy developments	No Significant impacts	EPA/NPWS/GCC
B3 Avoid significant adverse impacts (direct, cumulative and indirect) to protected habitats, species or their sustaining resources in designated sites by development within or adjacent to these sites.	No. of significant adverse impacts to relevant habitats and species in designated heritage sites	No significant adverse impacts to habitats, species or sustaining resources	GCC/NPWS
Soil and Geology			
SG 1:Maintain soil quality and function in defined areas	Specific soil management plans for wind energy developments as part of Construction Management Plans	No recorded soil contamination incident	EPA/GCC
SG 2:Demonstrate best practice modeling for landslide susceptibility and risk assessment	No of applications showing current best practice in modeling including peat stress testing, and consultation with GSI	No Landslides /bog bursts attributable to wind energy developments	GCC
SG 3: Minimise damage to peat and mineral soils	No. of CMPs to address in detail	Reuse of soil and appropriate management of peat soils	GCC
SG 4:Encourage reuse	Amount of soil and bedrock	Reuse of soil and bedrock as	GCC

and recycling of soil /bedrock associated with wind farm developments	going to landfill	first principle for CMP	
Water			
W 1:Protect and enhance the quality of aquatic systems and their associated functions by maintaining high water quality standards	Biotic Quality Rating (Q values) and risk assessment	Maintain Q4 value in line with WFD requirements. No reductions in Q values in relevant watercourses	EPA/GCC/SRBD
W 2:Minimise run off and pollutants from clearfelling and site clearance to water	Biotic Quality Rating and risk Assessment. CMPs with information and commitment to manage same. Agreement with NPWS and WRBD on measures	No severe pollution incident	GCC/EPA/WRBD /NPWS
W 3:Prevent pollution and contamination of groundwater	Changes in groundwater quality from construction of wind energy developments	No change or improvements in groundwater quality associated with wind energy development	EPA/WRBD
W 4:To prevent pollution of surface waters (including coastal and estuarine***)*** from wind energy developments	Changes in surface estuarine water quality due to wind energy construction	No change or improvement in surface estuarine water quality due to wind energy development	EPA/WRBD
Population and Human Health			
PH1:Ensure local and neighbouring communities benefit economically from wind energy developments in the defined areas	No. of construction jobs sources from local area. Establishment of community fund	% total jobs from local area. Amount paid into community fund	GCC/HSE
PH 2:To protect human health from hazards or nuisances arising from wind energy developments specifically noise, shadow flicker, visual impacts and temporary construction impacts	Occurrence of spatially concentrated complaints in regard to environmental nuisances (eg; noise complaints, shadow flicker)	No spatial concentration of health problems or nuisance arising from environmental factors and wind energy developments	
Landscape			
L1: To protect the county's unique and special landscapes, from negative wind energy development impacts	Degradation of unique or special landscapes due to negative visual impacts associated with wind energy	No significant degradation of unique or special landscapes due to negative visual impacts associated with wind energy	GCC
L2: Minimise visual	Degradation of landscape	No degradation of valued	

impacts of wind farm developments through appropriate design and siting	features and character from wind energy	landscape features and no significant adverse impact on landscape quality of unique or sensitive landscapes	
Cultural Heritage			
CH1:Protect and conserve archaeology resources in relation to wind energy developments	No of applications granted resulting in full or partial loss of entries to the RMP	No developments to result in full or partial loss of such sites	GCC/DoEHLG
CH 2:To preserve and protect the special interest and character of the county's architectural heritage in relation to wind energy developments	No of applications addressing impact of wind energy development on setting of ACAs or protected structures where relevant.	No wind energy developments to significantly impacts on settings of ACAs and protected structures	
Air Quality and Climate			
AQ 1: Increase energy from renewable resources in particular wind energy developments in appropriate sites	Amount of MW produced from wind energy over lifetime of WES	500 mw approved by 2020	GCC
AQ 2: Decrease greenhouse gas emissions	Reduction in GHG emissions	500 mw approved by 2020	
Material Assets			
MA 1: Maximise use of land zoned for wind farm development	Planning applications in defined areas	Mw generated over lifetime of strategy to 500 mw in defined areas.	GCC
MA 2:Transport: facilitate sharing of access roads for wind energy developments in defined areas	No in km. of new roads constructed for wind energy; no of road widening actions required for wind energy	Minimal number of new roads constructed	
MA 3: Waste: minimise waste production and operate sustainable waste management practices	Volume of waste recycled from construction of wind farms. Volume of waste sent to landfill	Meet national targets on recycling of construction waste Meet national targets on recycling of construction waste	
MA 4 Demonstrate best practice in reuse and recycling of construction and demolition waste	Volume of waste recycled from construction of wind farms. Volume of waste sent to landfill		
MA 5:Promote energy efficiency in construction associated with wind energy developments	CMPs that address this	Energy efficiency and emissions plans as part of CMPS	

MA 6: Noise – minimise negative noise impacts associated with construction and operation of wind energy developments	CMPS that address noise	No noise complaints form wind energy construction and operation	
MA 7: Ensure new energy infrastructure is connected to the national grid in a sustainable manner	No adverse impacts on designated sites, or water resources	No net loss of important habitats or wildlife corridors	
MA 8: Ensure that renewable energy developments do not impact negatively on existing wastewater treatment plans	No decline in water quality arising from impacts to wastewater treatment plans	No adverse impacts to wastewater treatment plants in defined areas.	
MA 9: Prevent development on lands that pose a significant flood risk	No development for wind energy permitted on known flood risk lands	No flooding incident arising from development on flood risk lands	

10 Chapter Ten, Summary of draft WES policies and their relationship to impacts, mitigation measures, monitoring measures and Strategic Environmental Objectives

10.2 Introduction

The purpose of the following Table 10 is to provide in summary form the following:

- the policies of the WES,
- their significant impacts,
- mitigation measures – in the existing WES and those measures identified through the SEA and HDA process;
- monitoring measures and how they relate to the Environmental Protection Objectives (EPOs).

Please note that this is a summary table only and the relevant sections will require reading for further information and detail.

Table 10 Summary of WES, SEA and HDA				
Policies in WES	**Potential Significant Impacts**	**Mitigation Measures**	**Monitoring (Targets)**	**EPOs**
WE1 Development of Renewable Energy Generation:		Refers to all relevant guidelines including DoEHLG Planning Guidelines, EIA and sub threshold EIA Guidelines. For specific mitigation measures in the draft WES see the following sections. In addition, blue and bold text highlights new mitigation measures for the WES that the SEA and HDA identified.	Monitoring reports will be prepared every second year. As monitoring data becomes available flexibility to amend WES is provided for. Indicators for monitoring of EPOs are provided below. For some parameters such as biodiversity and water, the monitoring indicators will complement each other. **In addition, the SEA identified two additional mitigation measures MM10 and MM11 relating to monitoring.**	All EPOS
	Section 7.6.1 Biodiversity, Flora and Fauna	**Section 8.3.2 Biodiversity plus MM7 Invasive Species and MM8 (MM8.1 to MM8.9)**	No net loss of important habitats or wildlife corridors; no significant impacts to aquatic environment, no significant adverse impacts to habitats, species or sustaining resources	B1, B2, B3, W1
	Section 7.6.2 Water	**Section 8.3.3 Water plus MM8 (MM 8.1 to MM 8.9)**	Maintain Q4 value, no reduction in Q values, no severe pollution incident, no change or improvements in groundwater quality, no change or improvement in estuarine water quality.	W1, W2,W3, W4, B2, B3
	Section 7.6.3 Soil and Geology	**Section 8.3.4 Soil and Geology**	No recorded soil contamination incident, no landslides/bog bursts, reuse of soil and management of peat soils, reuse of soil and bedrock as first principle of CMP	SG1, SG2, SG,SG4 B2, W2, PH2
	Section 7.6.4 Landscape	**Section 8.3.5 Landscape**	No significant degradation of unique/special	

			landscapes, no degradation of landscape features and no significant adverse impact on landscape quality of unique or sensitive landscapes	L1, L2, PH2
	Section 7.6.5 Cultural Heritage	**Section 8.3.6 Cultural Heritage plus MM 9**	No developments to result in full or partial loss of sites (RMP), no significant impacts on settings of ACAs and protected structures	CH1, CH2, PH2, L1
	Section 7.6.6 Population and Human Health	**Section 8.3.7**	% total jobs from local area, amount paid into community fund, no spatial concentration of health problems or nuisance	PH1, PH2, MA6
	Section 7.6.7 Air Quality and Climate	**Section 8.3.8**	500 MW approved by 2020	AQ1, AQ2, PH2
	Section 7.6.8 Material Assets	**Section 8.3.9**	MW generated over lifetime of strategy to 500 Mw in defined areas, minimal number of new roads, meet national targets on recycling of construction waste, energy efficiency and emissions plans as part of CMPs, no noise complaints from construction and operation, no net loss of important habitats or wildlife corridors, no adverse impacts to wastewater treatment plants in defined areas, no flooding incidents	MA1 to MA 9
	Section 7.6.9 Cumulative Impacts .	**Section 8.3.10 plus MM10, MM11**	Monitoring will be undertaken by GCC as part of review of strategy. Monitoring for developments on case by case basis provided for in MM11	

WE2 Development of Low Carbon Economy	Positive impacts associated with reduced greenhouse gas emissions. Potential impacts relate to implementation of WES as outlined above.	The aim of a low carbon economy is reflected through the implementation of the WES. The WES already contained a number of mitigation measures and additional measures have been identified through the SEA and HDA process.	As above	MA 1-9, PH1
WE3 County Partnership Approach	Potential impacts relate to implementation of the WES as detailed above	Please see mitigation measures as outlined for WE 1	As above	As per WE1
WE4 National and Local Targets	Potential impacts relate to implementation of the WES as detailed above.	The WES sets out the planning context for the achievement of these targets and also the Mitigation Measures in the WES and additional measures through the SEA and HDA provide for appropriate environmental management.	As above	All EPOs
WE5 Community Consultation	Impacts on human health and population as outlined above.	Section 8.3.7 provided mitigation measures in the WES; in addition guidelines and advice on adherence to the		SEO 16

and Benefits		DoEHLG Planning Guidelines on Wind Energy are referenced and provide for community consultation		
WE 6 Wind Energy Infrastructure	Potential Impacts as outlined for WE1	**Policy reworded and included in WES Mitigation Measure MM1**	As above	All EPOs
Objectives				
WE1 Strategic Areas	Potential Impacts as outlined for WE1	Mitigation Measures in WES and additional mitigation measures of the SEA and HDA **in particular MM 8.1 to MM 8.9, MM 7, MM10 and MM11** provide for environmental issues to be captured and addressed through the planning application, and design process.	As above	All EPOs
WE2 Acceptable in Principle Areas	Potential Impacts as outlined for WE1	Mitigation Measures in WES and additional mitigation measures of the SEA and HDA **in particular MM 8.1 to MM 8.9, MM 7, MM10 and MM11** provide for environmental issues to be captured and addressed through the planning application, and design process.	As above	All EPOs
WE 3 Open to Consideration Areas	Potential Impacts as outlined for WE1	Mitigation Measures in WES and additional mitigation measures of the SEA and HDA **in particular MM6, MM 8.1 to MM 8.9, MM 7, MM10 and MM11** provide for environmental issues to be captured and addressed through the planning application, and design process.	As above	All EPOs
WE4 Not normally permissible Areas	The designation of areas as not normally permissible means wind energy development is very unlikely to occur within these areas.	**The SEA and HDA in particular informed the selection of these areas due to the likelihood of wind energy developments in such areas giving rise to significant adverse impacts that could not be mitigated or would impact adversely on the conservation objectives of Natura 2000 sites.**	Monitoring of the WES will assist in identifying if any impacts arise on the not normally permissible areas. In addition, site specific EIAs and HDAs would have to address impacts if close to not normally permissible areas.	No likely interaction with most EPOs. Likely to improver B1, B2,W1
WE5	This policy generates a number of	As any wind energy applications will be	General monitoring associated with review	Uncertain

Low Wind Speed Areas	uncertain to neutral impacts on the EPOS. This is because due to the low windspeeds and environmental considerations, wind energy development is unlikely to occur at any significant scale within these areas over the lifetime of the WES.	assessed on a case by case basis and the anticipated sites of such developments are unknown, predicting impacts for this policy is difficult, hence the generation of a number of uncertain to neutral impacts. In turn where wind energy applications arise, impacts for example relating to archaeology are likely to be mitigated through development management and relevant guidelines as detailed in the WES and SEA	of WES	interaction s with a number of EPOS.
WE6 Wind Energy Development and Guidance	As outlined for Policy WE 1	As outlined for Policy WE1	As outlined for Policy WE1	All EPOs
WE 7 Wind Energy Development Projects	As outlined for Policy WE1.	**Objective reworded and included in WES** **Mitigation Measure MM2** The inclusion of reference to biodiversity and ecological receptors will better capture potential cross boundary impacts on species or habitats in neighbouring counties. This would be of particular relevance to mobile species such as birds and fish species.	As outlined for Policy WE1	All EPOs
WE 8 Small scale and Micro Generation	As outlined for Policy WE1	**Objective reworded and included in WES** **Mitigation Measure MM3** The purpose of this rewording is to clarify the position regarding the Habitats Directive. Habitats Directive Assessment Screening is required for development activities in a Natura 2000 site; for developments close to such sites, it is good practice to undertake a screening exercise.	As outlined for Policy WE1	All EPOs

		In addition, MM10 monitoring w ill also assist in identifying potential cumulative impacts associated with small scale generation.		
WE 9 Electricity Infrastructure	As outlined for Policy WE1	As outlined in Policy WE1	As outlined in Policy WE1	All EPOs
WE 10 Offshore Wind Energy Development	A number of impacts are identified as uncertain in relation to this policy subject to the finalization of the Ocean Renewable Energy Development Plan. The draft plan highlights the need for additional research relating to the marine environment and particular species and indeed the coastal landscape which is quite sensitive around much of County Galway.	However a number of other impacts are likely to be addressed through development control and mitigation measures developed as part of the offshore renewable energy plan and at project level	Subject to the finalization of the Ocean Renewable Energy plan, monitoring may be expanded to refer to specific offshore considerations.	
WE 11 Habitats Directive Assessment	Avoidance of Natura 2000 site and the HDA process has informed this policy and the designation of areas as not normally permissible.	**Objective reworded and included in WES** **Mitigation Measure MM4**	As outlined in Policy WE1 and MM10 and MM11	B1,B2,B3, W1,W4

10.2 Conclusion

The Draft WES sets out an overall strategy, policies and objectives for Galway County Council to promote wind energy development in appropriate areas whilst providing the most appropriate development management guidelines. This SEA Environmental Report demonstrates how environmental parameters have been addressed in WES preparation process to date. Consultation has been undertaken for the Scoping of the Environmental Report, and current baseline information has been described for all SEA parameters. The SEA and HDA process informed the selection of areas for designation during the preparation process. A key element of the SEA process is the assessment of reasonable alternatives and these were considered through the plan preparation process and assessed in some detail in Chapter Six of this ER.

WES policies were assessed in terms of the impacts on the environment and mitigation measures proposed through rewording of the policies where necessary
Mitigation measures were also developed that avoided sensitive areas or developed particular measures to address potential construction and operation impacts associated with the implementation of the WES.

The SEA and Habitats Directive Assessment (HDA) have informed the Draft WES through an ongoing iterative process that incorporated environmental considerations and sensitivities throughout the strategy development. The SEA and HDA has been undertaken in line with the Planning and Development (Strategic Environmental Assessment) Regulations 2004 (SI 436 2004 and S.I 435 of 2004) and the European Union (Natural Habitats) Regulations 94 of 1999, as amended SI 233/1998 and SI 378/2005**. Subject to the full and proper implementation of the mitigation measures outlined in this ER, including appropriate site level investigations, it is considered that significant adverse impacts on the environment will be avoided**.

10.2.1 Implications for Galway County Council and the Elected Members

This Environmental Report, which identifies the likely significant effects on the environment of implementing the WES has been submitted to the Elected Members for their consideration and should be read in conjunction with the WES. The Environmental Report must be taken account of before adopting the Plan.
The WES was adopted by Galway County Council on 21st September 2011 and the SEA Statement is now available.

Environmental Protection Agency Strategic Environmental Assessment Checklist for Draft Wind Energy Strategy SEA.

SECTION 1 - SCREENING

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
1.1	In reaching a determination of the requirement for SEA, have the criteria set out in Annex 1 of the SEA Directive and Schedule 2A of S.I. 436 or Schedule 1 of S.I. 435 been taken into account?	Galway Council required a SEA to be undertaken as part of the Wind Energy Strategy, no separate screening exercise was undertaken.	SEA Directive Article 3(6)/6(3) S.I. Nos 435 & 436 of 2004
1.2	Has a determination been made, in consultation with the DoEHLG, regarding the requirement for an appropriate assessment in accordance with the Habitats Directive?	Galway County Council required an Appropriate Assessment to be undertaken as part of the Wind Energy Strategy	Habitats Directive Article 6(3)
1.3	Has the relevant competent authority consulted the prescribed environmental authorities as required and notified them of its determination?	Yes	SEA Directive Article 3(6)/6(3) S.I. Nos 435 & 436 of 2004
1.4	Has the relevant statutory authority made available for public inspection a copy of its determination on the requirement for SEA?		S.I. Nos 435 & 436 of 2004

Additional Recommended Task

	Question	Yes, No, Comment	
1.5	Does the screening determination clearly state whether SEA is required or not, who has made the decision and when?	Galway County Council made the decision, prior to the tender for the SEA and HDA.	
1.6	If the P/P has been screened out of SEA, does it clearly demonstrate that it does not meet all/most of the criteria of Annex 1 and Schedule 2A of S.I. 436 and Schedule 1 of S.I. 435?	n/a	
1.7	Has a description been provided in the ER of the screening process and subsequent determination?	Yes, Chapter One.	

SECTION 2- SCOPING

Minimum Requirements

	Question	Yes, No, Comment	Statutory basis
2.1	Were the designated environmental authorities consulted when deciding on the scope of the information to be included in the Environmental Report?	Yes, designated environmental authorities plus a further 16 consultees	SEA Directive Article 5 (4) S.I. Nos 435 & 436 of 2004

Additional Recommended Tasks

	Question	Yes, No, Comment	
2.2	Does the proposed scope of the report cover all the relevant information in accordance with Annex 1 of the SEA Directive and all of the points in Schedule 2 and Schedule 2B of S.I. 435 and S.I. 436? If not, have reasons for eliminating issues from further consideration been documented?	All environmental issues were listed in the Scoping Report. None were eliminated.	
2.3	Has informal preliminary scoping taken place with the designated authorities prior to the commencement of the P/P making process?	Yes, informal meetings were held at early stage of process with EPA and NPWS.	DoEHLG Guidelines S.3.14
2.4	Have scoping meetings/workshops been held with (a) any of the designated environmental authorities, (b) relevant internal departments within the organisation and (c) other relevant statutory and non-statutory organisations?	Scoping meeting held with EPA and NPWS; meetings also held with Galway County Council personnel. .	
2.5	Where appropriate, if the zone of influence extends beyond the plan boundary, has transboundary notification and consultation been undertaken with other Member States & adjoining authorities on the scope of the SEA?	Mayo, Roscommon, North Tipperary, and Clare local authorities were written to as part of scoping process.	
2.6	As part of the scoping exercise, have the designated authorities been given an outline of: a) the geographical area involved (including a referenced and scaled map of the area) b) the nature of the plan and its intended lifespan c) the likely scale, nature and location of development within the area during the life of the plan (in broad terms) d) the predicted significant effects of this development	Yes scale map showing existing designations in the County was issued along with scoping letter to all 19 consultees. Scoping Report sent to designated authorities included maps, nature and lifespan of plan, outlined environmental effects and locations.	DoEHLG Guidelines S.3.17
2.7	Has a Scoping Report been prepared which clearly highlights key environmental resources, zone of influence of the P/P, alternatives, key existing environmental issues/problems and likely significant environmental effects of the P/P?	Key environmental resources mapped, likely significant effects were described.	DoEHLG Guidelines S.3.16
2.8	Does the scoping report reflect the size/level of detail in the P/P?	Yes	

2.9	Does the scoping report provide the designated authorities with sufficient information to form a view on the likely significant effects of implementation of the P/P?	Yes it is considered sufficient	
2.10	Has a Scoping Issues Paper (for land use plans) been prepared to facilitate consultation? Have the environmental issues raised in the Issues paper been appropriately addressed in the scoping report?	No issues paper developed for this WES	DoEHLG Guidelines S.3.14
2.11	Have the public and other interested bodies been identified and consulted at the scoping stage?	In addition to prescribed bodies, a number of non statutory organisations were consulted including Irish Peatland Conservation Council and Bat Conservation Ireland	
2.12	Have the teams responsible for the preparation of the P/P and the ER been involved in the scoping exercise?	Yes	EPA Guidelines-Stage 2
2.13	Have the responses to the scoping exercises been included in the Scoping Report?	Responses from meetings with prescribed bodies have been included in scoping report	
2.14	Has the Scoping Report been made public?	No	
2.15	Where an appropriate assessment is required and will be undertaken in conjunction with the SEA, have any environmental problems, indicators or other issues relevant to the assessment been identified, that need to be considered during the SEA process?	Yes, particular sensitivities associated with water resources, and peat habitats have been considered in particular in light of the potential environmental impacts of wind energy developments Also freshwater pearl mussel catchments	Habitats Directive Article 6

SECTION 3 – CONSULTATION
Consultation with Designated Authorities, Public, and, where applicable, International and National Transboundary Consultations

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
3.1	Have the Draft P/P and accompanying ER been made available to the designated authorities and the public?	Draft P/P, ER and AA (referred to as Habitats Directive Assessment) are being made available to the public and designated authorities.	SEA Directive Article 6(1)/6(3) S.I. Nos 435 & 436 of 2004
3.2	Have the designated environmental authorities and the public been given an early and effective opportunity to express their opinion on the draft P/P and the accompanying ER?	There will be a submission period and public notices advertising the availability of the documents	SEA Directive Article 6(2)/6(4) S.I. Nos 435 & 436 of 2004
3.3	Have the ER and the opinions expressed by the designated authorities and the public during consultation been taken into account during the preparation of the P/P?	A table in the ER details issues raised and how they will be considered in the Draft WES and SEA process	SEA Directive Article 8 S.I. Nos 435 & 436 of 2004
3.4	Where relevant, has a copy of the Draft P/P and the ER been forwarded to other Member States before its adoption?	n/a	SEA Directive Article 7 S.I. Nos 435 & 436 of 2004
3.5	Where relevant, have the Member States been given a reasonable time frame to respond to the draft P/P and ER?	n/a	
3.6	Have the opinions expressed by other Member States during transboundary consultation been taken into account?	n/a	SEA Directive Article 7 S.I. Nos 435 & 436 of 2004

Additional Recommended Tasks

	Question	Yes, No, Comment	
3.8	Has a description of the outcome of all consultations (including transboundary) been documented in the ER?	An additional column besides the summary of consultation highlights if this has been addressed in the Wind Energy Strategy and SEA or AA	
3.9	Where a consultation recommendation has not been taken on board, has an explanation been provided of why?	Yes	
3.10	Have P/Ps and ERs for counties contiguous to the border with Northern Ireland been subject to transboundary consultation with the relevant Northern Ireland Environmental Authorities?	n/a	DoEHLG Guidelines S. 5.9

3.11	If the zone of influence of the P/P extends beyond the P/P boundary, have relevant statutory Bodies/Authorities and adjoining Local Authorities been informed and consulted?	Local authorities in Counties Mayo, Roscommon and Clare were informed through Scoping Consultation..	DoEHLG Guidelines S. 5.9

SECTION 4 – PLAN DESCRIPTION

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
4.1	Has an outline of the contents and the main objectives of the P/P been provided in the ER?	Yes, Chapter One	SEA Directive Article 5 Annex I (a)
4.2	Has information been provided on the relationship of the P/P with other relevant P/Ps?	Yes, Chapter Three	SEA Directive Article 5 Annex I (a)

Additional Recommended Tasks

	Question	Yes, No, Comment	
4.3	Has a referenced and scaled map illustrating the geographical extend of the P/P area been included in the ER?	Yes	
4.4	Have any relevant conflicts and/or synergies between the P/P objectives and the objectives of other P/Ps in the hierarchy (including transboundary) been identified and described?	Reference has been had to Ocean Renewable Energy Plan and Screeb 110 kv upgrade.. Synergies in particular in terms of renewable energy policies and directives identified.	
4.5	Has the zone of influence of the P/P been described appropriately?	Yes, Chapter Four Baseline	
4.6	Has the potential for transboundary effects of the plan been identified?	Yes, particularly for certain parameters such as landscape	

SECTION 5 – EXISTING ENVIRONMENT

Minimum Requirements

	Question	Statutory Basis
5.1	(a) Are the relevant aspects of the current state of the environment described? (b) Are any existing environmental problems described (in particular those relating to areas designated pursuant to the Birds and Habitats Directives)? (c) Are the environmental characteristics of areas that are likely to be significantly affected by the P/P identified? (d) Is the likely evolution of the existing environment without the implementation of the P/P described? (e) Have any significant gaps in the baseline data been identified? (f) Have alternative/proxy data sources been identified where existing baseline data is unavailable?	SEA Directive Article 5 Annex I (b), (c), (d)

Environmental Receptor	(a)	(b)	(c)	(d)	(e)	(f)	Comment
Biodiversity, flora and fauna	Y	Y	Y	Y	Y	Y	Information provided and data from the AA process has been incorporated also. Also information from County Development Plan SEA and SEAs of neighbouring local authorities have been utilised for all parameters
Water (surface, ground, estuarine and coastal)	Y	Y	Y	Y	Y	Y	Considerable data is available from EPA and the Environmental Report for the Western RBD, also other SEAs as above
Soil	Y	Y	Y	Y	Y	Y	Certain data relating to soil depth is not available for the county but information on till or drift geology was utilised. Landscape susceptibility mapping not available so mitigation measures and liaison with GIS recommended.
Landscape	Y	Y	Y	Y	Y	Y	Baseline information, policies and reviews of some EIAs addressing visual impacts
Cultural Heritage (architectural and archaeological heritage)	Y	Y	Y	Y	Y	Y	Known archaeological and architectural data including protected structures, architectural conservation areas and known archaeological sites.
Population	Y	Y	Y	Y	Y	Y	It was not feasible to accurately get DED data for acceptable and strategic areas as zones do not follow DED boundaries. Galway County Council used the Geodirectory to generate buffers from properties during WES preparation
Human Health							Very little data available on human health at county level. Some data available for west region
Air	Y	Y	Y	Y	Y	Y	Data available for county; IPPC data mapped
Climatic Factors	Y	Y	Y	Y	Y	Y	County level data available and utilised. Further detail available on carbon outputs for the County.
Material Assets	Y	Y	Y	Y	Y	Y	County level information on waste, transport, energy usage, noise and flooding available and utilised.
Interrelationships	Y	Y	Y	Y	Y	y	Principal interrelationships described and highlighted on certain parameters. Matrix provided that also demonstrates interrelationships between parameters
Other	-	-	-	-	-	-	-

Yes: Y
No: N

	Question	Yes, No, Comment	Statutory Basis
5.2	Has a description been included of any difficulties (such as technical deficiencies or lack of know how) encountered in compiling the required information?	Yes, end of Chapter Two Methodology	SEA Directive Article 5 Annex 1 (h) S.I. Nos 435 & 436 of 2004

Additional Recommended Tasks

	Question	Yes, No, Comment	
5.3	Does the relevant current state of the environment (baseline), as described, reflect: a) the availability of data? b) The size and level of detail of the P/P?	Yes, where data available it has been incorporated. Varying levels of detail on different environmental parameters. This is acknowledged in the technical difficulties section.	
5.4	Have trends for key environmental receptors been presented and described using appropriate environmental data?	Yes, again where data is available and trends can be identified with some confidence. Environmental problems in neighbouring counties as identified through SEAs has also been used.	
5.5	What sources of environmental data and/or environmental information systems (e.g. GIS) have been used?	GIS has been used extensively as evidenced through the figures included in the ER. Other documentary sources include the SEA ER for the West River Basin District, Galway County Development Plan and SEA, neighbouring Development Plans and SEAs and Census 2006 data.	
5.6	Have existing environmental problems relevant to the P/P been identified and put into the context of relevant environmental objectives, standards, thresholds etc.?	Yes where environmental objectives, and standards exist so eg: Water Framework Directive Standards and Air Quality Standards	

SECTION 6 – OBJECTIVES, TARGETS AND INDICATORS

Note: See Appendix IV – Objectives, Targets and Indicators explanation

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
6.1	Have any environmental protection objectives, established at International, European Community or Member State level which are relevant to the P/P been identified?	Yes, eg 40% of renewables by 2020.	SEA Directive Article 5 Annex 1(e)
6.2	Have these objectives and any environmental considerations been taken into account (placed in context/linked into the P/P) during the preparation of the P/P?	Yes, ensuring the Draft WES is compliant with key statutory and policy regime both nationally, EU and county.	SEA Directive Article 5 Annex 1(e)

Additional Recommended Tasks

	Question	Yes, No, Comment	
6.4	Are the proposed environmental objectives linked to appropriate targets and indicators?	Yes	
6.5	In relation to environmental targets; (a) have limits or thresholds been established where appropriate? (b) have timescales been set where appropriate?	Yes Timescales are intended for lifetime of strategy (upto 2017) but provision made for 2 yearly monitoring	
6.6	Are the **environmental indicators** capable of the following; • describing trends in the baseline environment? • demonstrating the likely significant environmental impact(s) of the implementation of the P/P? • being used in a monitoring programme? • providing an early warning of significant unforeseen adverse effects? • prioritising key environmental impact(s)? • is the number of environmental indicators manageable, in terms of time and resources?	 Yes Yes Yes Yes subject to monitoring requirements being maintained Yes Yes	DoEHLG Guidelines S.4.13 S. 7.11 S.7.12

6.7	Have the environmental objectives been linked to targets and indicators for those environmental receptors identified as being significantly affected? Yes.

Environmental Receptor	**O**	**T**	**I**	**Comment***
Biodiversity, flora and fauna	Y	Y	Y	For each parameter the EPOs have been developed in tandem with the indicators and targets to ensure data and trends can be properly captured over the implementation of the strategy. Objectives, targets and indicators aim to address potentially affected environmental receptors associated with wind energy development
Water (surface, ground, estuarine and coastal)	Y	Y	Y	
Soil	Y	Y	Y	
Landscape	Y	Y	Y	
Cultural Heritage (architectural and archaeological heritage	Y	Y	Y	
Population	Y	Y	Y	
Human health	Y	Y	Y	
Air	Y	Y	Y	
Climatic factors	Y	Y	Y	
Material assets	Y	Y	Y	
Other				

Yes: Y
No: N

Environmental objective (O): In SEA, objectives are broad, overarching principles which should specify a desired direction of change, for example, 'reduce air pollution' or 'improve human health'.

Environmental target (T): A target usually underpins an objective often having a time deadline that should be met and should be accompanied by limits or thresholds

Environmental indicator (I): Indicators are used to track the achievements of objectives and targets, describe the baseline situation, monitor the impact of the proposed plan or programme on the environment and monitor impacts

Proxy indicators: A measure of activity resulting from a P/P which provides information on environmental impact without the need for a direct measure of an environmental receptor

SECTION 7 – CONSIDERATION OF ALTERNATIVES

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
7.1	Have 'reasonable alternatives' been identified and described?	Yes – 7 with a further 5 sub options based on spatial alternatives.	SEA Directive Article 5 Annex 1 (h) S.I. Nos 435 & 436 of 2004
7.2	Have the reasons for selecting (a) the alternatives and (b) the preferred alternative been provided?	Yes.	SEA Directive Article 5/ Article 9(1)b Annex 1 (h) S.I. Nos 435 & 436 of 2004
7.3	Has a description of how the assessment of alternatives was undertaken been provided?	Yes, evaluation against EPOs	SEA Directive Article 5 Annex 1 (h) S.I. Nos 435 & 436 of 2004

Additional Recommended Tasks

	Question	Yes, No, Comment	
7.4	Are the potential alternatives proposed assessed against the relevant environmental objectives and against each other?	Each alternative is assessed against EPOs	(Modified IEMA)
7.5	Has a clear explanation been given of the likely significant environmental effects of each alternative?	Yes	
7.6	Has clear written justification been given for the choice of the preferred alternative?	Yes	
7.7	Do the alternatives considered reflect the objectives and hierarchy of the P/P?	They generally reflect the hierarchy but some alternatives were found to be untenable to achieve over the proposed lifetime of the strategy..	

SECTION 8 – LIKELY SIGNIFICANT EFFECTS OF THE PLAN OR PROGRAMME

Minimum Requirements

	Question	Statutory Basis
8.1	Are the likely significant effects on the environment described?	SEA Directive Article 5 Annex I (f) S.I. Nos 435 & 436 of 2004

Environmental Receptor	S	M	L	P	T	Sec	Cm	Sy	+	-	Comment
Biodiversity, flora and fauna	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	As several impacts for most parameters are relating to site level, some uncertainty exists in terms of length and level of impact. However, for each parameter where impacts can be identified and described this is presented. A preliminary discussion describes common impacts associated with wind energy
Water (surface, ground, estuarine and coastal)	Y	Y	Y	Y	Y	Y	Y	Y		Y	In addition to normal water quality issues, particular attention has been paid to freshwater pearl mussel
Soil	Y	Y	Y	Y	Y	Y	Y	Y		Y	
Landscape	Y	Y	Y	Y	Y		Y	Y		Y	
Cultural Heritage (architectural and archaeological heritage	Y	Y	Y	Y	Y	Y	Y	Y		Y	
Population	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Human Health	Y	Y	Y	Y	Y	Y					
Air	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Climatic factors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Material Assets	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Interrelationships	Y	Y	Y	Y	Y	Y	Y	Y		Y	
Other											

Note:

S	Short -term effects

M	Medium-term effects
L	Long-term effects
P	Permanent effects
T	Temporary effects
Sec	Secondary effects
Cm	Cumulative effects
Sy	Synergistic effects
+:	Positive effects
-:	Negative effects

Additional Recommended Tasks

	Question	**Yes, No, Comment**	
8.2	Are significant effects described in relation to: - current environmental conditions - relevant environmental standards and thresholds	Yes Yes	
8.3	Are appropriate impact prediction methods used, and, are impacts quantified where relevant?	Where possible. Impact prediction was facilitated by the matrix approach and policies assessed against the EPOs	
8.4	Have the methods used for impact prediction been described?	Yes. General discussion of common impacts associated with wind energy developments ; this assisting in targeting likely impacts of implementation of WES in identified areas.	

SECTION 9 – MITIGATION MEASURES

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
9.1	Have mitigation measures been proposed for all significant adverse effects on the environment of implementing the P/P?	Yes	SEA Directive Article 5 Annex I (g)

Additional Recommended Tasks

	Question	Yes, No, Comment	
9.2	Have the proposed mitigation measures been incorporated into the P/P?	Yes. Under Chapter Five	
9.3	Have the proposed mitigation measures been linked, where appropriate, to specific relevant significant environmental effects?	Yes	
9.4	Has an explanation been provided where mitigation of significant adverse effects is not proposed?	n/a	
9.5	Are the mitigation measures proposed within the remit of the statutory authority? If not, is there reasonable certainty that they will be implemented?	Yes	
9.6	Do the proposed mitigation measures have potential to fully avoid or mitigate the relevant impact(s)? If not, have additional measures been considered?	Yes – if properly adhered to and implemented at project level. In addition, specific monitoring mitigation measures are provided for.	
9.7	Is a description provided of any likely post-mitigation residual impacts included?	No. difficult to assess this until WES implemented and projects are delivered on the ground. Monitoring requirements do pick up on this however.	
9.8	If the appropriate assessment shows that the P/P would have a significant impact on the integrity of a Natura 2000 site, has the statutory authority considered further alternatives to try to avoid these impacts?	It is anticipated that an emphasis on Stage 1 and 2 of this HDA process will, through a series of iterations, ensure that potential adverse effects are identified and eliminated through the inclusion of mitigation measures designed to avoid, reduce or abate potential impacts	

SECTION 10 – MONITORING PROGRAMME

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
10.1	Has a monitoring programme of significant environmental effects of implementing the P/P been described?	Yes	SEA Directive Article 10 Annex 1 (i) S.I. Nos 435 & 436 of 2004
10.2	Does the monitoring programme allow unforeseen adverse effects to be identified, for instance, where assumptions underpinning the ER's impact predictions may not come true in practice?	Yes, flexibility and statement supporting corrective monitoring if other impacts or additional data arise	SEA Directive Article 10(1) Annex 1 (i) S.I. Nos 435 & 436 of 2004
10.3	Have thresholds / trigger levels been assigned which will determine the need for appropriate remedial action?	Statement that supports corrective action and review if monitoring identifies significant impacts on implementation of draft WES	SEA Directive Article 10(1) Annex 1 (i) S.I. Nos 435 & 436 of 2004

Additional Recommended Tasks

	Question	Yes, No, Comment	
10.4	Are responsibilities for carrying out the monitoring programme clearly defined?	Yes	DoEHLG Guidelines S. 7.7
10.5	Are responsibilities for responding to any significant negative environmental effects of implementation of the P/P clearly defined?	Yes	
10.6	Are responsibilities for identifying and responding to unforeseen adverse effects of implementation of the P/P clearly defined?	Yes	
10.7	Has the frequency of monitoring been specified in the monitoring programme?	Yes	
10.8	Has the frequency of reporting on the results of the monitoring programme been specified?	Yes	
10.9	Does the monitoring programme address significant gaps identified in the baseline data?	Recommendation advises that GIS should be utilised in monitoring programme and updated as data becomes available from sources such as EIAs	DoEHLG Guidelines S. 7.4

10.10	Does the monitoring programme utilise existing monitoring arrangements where appropriate?	Yes	
10.11	Does the monitoring programme include provision for the ongoing review of environmental targets and indicators?	Yes	
10.12	Has provision been made to produce regular monitoring reports during the time period of the P/P?	Yes	
10.13	Does the monitoring programme address transboundary effects, if any?	Recommendation that monitoring data be shared and transboundary impacts identified over course of draft WES	
10.14	What provisions are there to make the results and interpretation of the monitoring programme available to the designated environmental authorities and the public?	Recommendation that this be made available to the public.	

SECTION 11 – ENVIRONMENTAL REPORT AND NON-TECHNICAL SUMMARY

Note: This section provides an overview of the compliance of the ER with the requirements of the SEA Directive and the SEA Regulations. Where non-compliance has been highlighted in previous sections of the SEA Process Checklist, actions taken to resolve non-compliance should be highlighted in the 'Comment' section.

Minimum Requirements

	Question	Yes, No, Comment	Statutory Basis
11.1	Does the ER contain all of the aspects listed in Annex 1 of the SEA Directive and Schedule 2 and 2B of S.I. 435 and 436 of 2004?	Yes	SEA Directive Article 5 Annex 1 S.I. Nos 435 & 436 of 2004
11.2	Does the ER include a non-technical summary?	Yes	SEA Directive Article 5 Annex I (j) S.I. Nos 435 & 436 of 2004
11.3	Does the non-technical summary clearly summarise the following:		SEA Directive Article 5 Annex I (j) S.I. Nos 435 & 436 of 2004

	Y/N	Comment
a) Contents and main objectives of the draft P/P	Y	Main objectives and context of draft WES provided

b) Current state of the environment and evolution	Y	Summary of existing environment and trends
c) Environmental characteristics of area significantly affected	Y	Key environmental characteristics
d) Existing environmental problems	Y	Yes
e) Environmental protection objectives	Y	All EPOs provided and their purpose explained.
f) Significant effects on the environment	Y	Summary of key effects and how they were predicted
g) Mitigation measures	Y	Summary of key mitigation measures
h) Alternatives	Y	Summary of the alternatives
i) Monitoring	Y	Summary of key monitoring and explanation of same

Additional Recommended Tasks

	Question	Yes, No, Comment	
11.4	Has a description been provided in the ER of the screening process and subsequent determination?	Y	
11.5	Have the responses to the scoping exercises been included in the ER? Has an explanation been given as to how these responses were considered?	Yes, summary of issues raised and how addressed in Draft WES or ER	
11.6	Is the non-technical summary concise and easy to understand?	Yes, every attempt has been made to use easily understood language. Short glossary of terms is provided.	DoEHLG Guidelines S. 4.41
11.7	Has a description of the outcome of all consultations (including transboundary) been documented in the ER?	Yes	
11.8	Have relevant references, glossary of terms and scaled maps (with source identified) been included?	Yes	

1 Annex B: Environmental Assessment and Summary of Material Amendments of WES

1.1.1 Introduction.

This Annex presents the findings of the assessment of the material amendments as proposed by Galway County Council at the July 2011 Council Meeting. This assessment is undertaken against the Environmental Protection Objectives prepared as part of the SEA process and presented in Chapter Five of the SEA ER.

1.1.2 Public Submissions on the second draft of the WES, SEA ER and NIS.

During the meeting of Galway County Council on 21st July, a number of alterations were proposed by elected members on the draft Wind Energy Strategy (WES). The following amendments, not in accordance with the Manager's Report and Recommendations of 30th June 2011, were made by the elected members to the proposed WES at the Galway County Council meeting held on 21st July 2011.

The following Table A shows the assessment of these material amendments against the EPOs and provides a commentary on same. Additionally, the NIS assessed the implications of these amendments from the Habitats Directive Assessment perspective.

Table A: Environmental Assessment of Material Amendments

Material Amendment	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs
Section 4.2 Strategic Guidance on Landscape Capacity for Wind Energy Developments Insert after first paragraph: ***This guidance is intended as broad advice on landscape character areas and will need to be balanced against site-specific assessments of the landscape capacity at project level.***	B1, B2, B3, SG1,SG2, SG3, SG4, W1,W2, W3, W4, PH1,PH2, CH1, CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9			L1, L2	
The aim of the landscape guidance contained in the draft WES is to provide strategic level advice and therefore the site specific landscape impacts are more appropriately addressed at project level. This amendment is assessed as a neutral to positive impact in relation to landscape and therefore no mitigation measures are suggested for this amendment.					
Section 5.1.5 Community Involvement and Benefit All wind farm developments ***shall*** require a Community Impact Statement (CIS) in identifying the potential impact of the proposed development on the local community and proposals to address any impacts identified. The CIS ***will*** also	B1, B2, B3, SG1,SG2, SG3, SG4, W1,W2, W3, W4, L1,L2, CH1, CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9	PH1, PH2			

include details of all measures taken to consult with the local community and any benefits that may arise or be provided for the local community as a result of the proposed development					
The purpose of this section is to promote adequate consultation with local communities in relation to wind energy developments. The current and proposed text will enhance consultation procedures with local communities in relation to wind energy developments and is identified as providing a positive impact on human health and population within the SEA process.					
Material Amendment	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs
Include the following additional wording in WE4 after the final paragraph **"*The approach taken to the compilation of the Wind Energy Strategy is based on a consistent and robust methodology which was not varied to take account of individual planning permissions which have been fully assessed under HDA. However, where any project has been granted planning permission following HDA assessment which shows that the project complies with the Habitats Directive and the Birds Directive, it is considered that this project is consistent with and in full compliance with this Wind Energy Strategy".*				B1, B2, B3,	SG1,SG2, SG3, SG4, W1,W2, W3, W4, L1,L2, CH1, CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9

This is not recommended for inclusion as it is specifically addressing individual projects which are better addressed through development control and Environmental Impact Assessment as appropriate. In addition, at site level a development may have been subject to Habitats Directive Assessment but there may be other environmental legislation that should be referenced and included to ensure such a project is in full compliance with the WES. In particular, other SEA parameters including water, soil and geology and landscape impacts would also need to be in compliance with the development management guidelines established in the draft WES.					
Material Amendment	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs
Include the following additional wording in WE2 after the final paragraph "***The approach taken to the compilation of the Wind Energy Strategy is based on a consistent and robust methodology which was not varied to take account of individual planning permissions which have been fully assessed under HDA. However, any project which was subject to a planning application which has been granted permission following assessment of all factors including landscape capacity, it is considered that this project is consistent with and in full compliance with this Wind Energy Strategy".***				B1, B2, B3,	SG1,SG2, SG3, SG4, W1,W2, W3, W4, L1,L2, CH1, CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9
This is not recommended for inclusion as it is specifically addressing individual projects which are better addressed through development control and Environmental Impact Assessment as appropriate. At SEA level it is problematic state individual projects are 'in full compliance'					

with the draft WES as this is more appropriately addressed at project not SEA level assessment.					
Material Amendment	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs
Amend the designation on the areas of land on the attached map from “Acceptable in Principle” to “Not Normally Permissible”.	B1,B2,B3, SG1,SG2, SG3, SG4, W1,W2, W3, W4, L1,L2, CH1, CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9	PH1, PH2			
This rezoning is likely to have a neutral to positive impact on many SEA parameters as it directs wind energy development from this particular area. It does dilute the WES methodology but has been proposed in response to concerns raised by the local community.					
Material Amendment	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs
Amend the designation on the lands which were the subject of Submission No.18 from “Not Normally Permissible” to “Open				B1,B2,B3, SG1,SG2, SG3, SG4, W1,W2, W3, W4, PH1, PH2,L1,L2, CH1,	

for Consideration				CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9	
The overall target for 2020 in the WES for Open for Consideration areas is 30 MW, a target that is dispersed over a total county land area of 18%. The environmental impact of this rezoning is assessed as being largely neutral for many SEA parameters. However, this is better addressed at project level and therefore is not in the spirit of the SEA directive.					
Material Amendment	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be mitigated	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs
Amend the designation on the lands which were the subject of Submission No 17 from "Not Normally Permissible" to "Open for Consideration".	.		L1,L2,	B1,B2,B3, SG1,SG2, SG3, SG4, W1,W2, W3, W4, PH1, PH2,CH1, CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9	
The proposed rezoning of this area is not recommended as it is based on individual projects that are more appropriately addressed at project and Environmental Impact Assessment level. In addition, the proximity of this area to Clifden town, and other important tourism and recreational areas including Connemara National Park and Diamond Hill results in potential conflicts with landscape, human health and population and cultural heritage					
Material Amendment	No likely interaction with EPOs	Likely to improve status of EPOs	Probable conflict with EPOs – unlikely to be	Potential conflict with EPOs – likely to be mitigated	Uncertain interactions with EPOs

			mitigated		
Amend the designation on the land which were the subject of Submission No.8 (marked as No.7 on map) from “Not Normally Permissible” to Open for Consideration”.			B1	B2,B3, SG1,SG2, SG3, SG4, W1,W2, W3, W4, PH1, PH2,CH1, CH2, AQ1, AQ 2, MA1, MA2, MA3, MA4, MA5, MA5, MA6, MA7, MA8,MA9	
This amendment changes the designation of an area of land amounting 79.2ha from not Normally Permissible to Open for Consideration. This area of land is entirely situated within the Slieve Aughty SPA and partially situated within the Old Sonnagh Bog SAC. The Slieve Aughty SPA is designated for supporting internationally important breeding populations of Hen Harrier and Merlin. The designation of this area as Open for Consideration will have the potential to lead to direct impacts to the Slieve Aughty SPA and Old Sonnagh Bog SAC. Direct impacts, such as a loss of Annex 1 blanket bog habitat or breeding/foraging habitat for Hen Harriers and Merlin, as a result of land-take associated with wind farm developments will have the potential to result in likely significant effects to these sites. This proposed rezoning is also not recommended as it conflicts with the guidance given in the West Regional Planning Guidelines 2010 – 2022 in objective IO54 of these guidelines. This Objective states that Natura 2000 sites should be placed in the Not Normally Permissible category when developing county-wide Wind Energy Strategies.					