

19. Inter-relationship and Interaction of Effects/Impacts

19.1 Introduction

This Chapter draws from the main environmental issues (addressed in the individual sections of the EIS) and identifies the main inter-actions and inter-relationships of effects/impacts between them, including the proposed mitigation measures and having regard to current knowledge and methods of assessment. An indication is also given of the cumulative effects of the proposed road development.

19.2 Inter-relationship and Interaction of Effects/Impacts

19.2.1 Description of the Inter-relationships Interactions

Each chapter of the EIS details baseline information and identifies the significant potential and residual construction and operational effects/impacts of the proposed road development. However, this Chapter details the significant interactive and inter-related effects/impacts.

Table 19.1 indicates the key elements and activities of the proposed development during both the construction and operational phases and how they inter-act and inter-relate with the various environmental aspects considered in detail in Chapter 6 through to Chapter 18 of this EIS.

Table 19.2 describes the key sensitive receptors highlighted through the study, and how the different environmental aspects inter-act and inter-relate at these sites.

Tables 19.1 and 19.2 are indicative only and do not purport to contain or replace all or any of the issues raised in the main assessment sections of this EIS. Their purpose is to demonstrate the main likely and significant inter-relationships and inter-actions between different environmental aspects considered.

While many inter-relationships and inter-actions have been identified, it is anticipated that the mitigation measures included in the road development (and outlined in the other relevant sections of the EIS) will also minimise these effects.

19.2.2 Cumulative Effects

Cumulative effects address the long-term changes that may result from construction and operation of the proposed road development and the combined effect of this road development with other road developments that are not part of the proposed road development.

This review is undertaken to ensure that the combined effects of the proposed road development and other influences are assessed in total, and not as individual aspects of the environmental assessment.

Other proposed road developments identified within the vicinity of the proposed site include, the Kilkenny Ring Road Extension, the Waterford City By-pass and the N9 Kilcullen to Powerstown Scheme. The cumulative impact of all these schemes together will result in changes to traffic flows on existing roads and changes to the environment that these proposed roads pass through.

The changes to traffic have been addressed within Chapter 6 of this EIS and include the predicted traffic generation for the full length of the new route between Kilcullen and Waterford. In addition, each of the proposed roads noted above has been approved through separate statutory procedures, and have been accounted for in the traffic modelling.

These road schemes will cumulatively have a beneficial effect in providing improvements to the existing road network, improving journey times and providing a safer road network. The schemes together offer opportunity for future economic growth in population centres and opportunity to facilitate development in southeastern Ireland.

Table 19.1 Summary of Key Proposed Activities and Scheme Elements that Inter-act and Cause Inter-related Effects

Receptor	Traffic	Community	Noise and Vibration	Air Quality	Landscape and Visual	Terrestrial Ecology	Aquatic Ecology & Hydrology	Soils, Geology and Hydrogeology	Climate	Material Assets	Archaeology and Cultural Heritage	Architectural Heritage
Construction traffic.	Increase in HCV's on public roads.	Journey disruption for road users. Certain roads have been identified for use by construction vehicles. Potential for damage to pavements/verges.	Potential for temporary elevated noise levels adjacent to haul roads during the construction period.	Construction traffic has the potential to produce dust and other emissions.	No significant inter-action anticipated.	Potential for dust and other emissions to affect terrestrial flora and fauna.	Potential for dust and other pollutants to affect rivers and streams.	Potential for contamination of the soils in the vicinity of the route due to petrol or diesel spillage.	Potential for temporary increase in emissions to air.	Potential for dust and noise emissions to affect farm animals and crops.	Potential for vibration to cause structural damage to archaeological structures.	Potential for vibration to cause possible cosmetic or structural damage to buildings of architectural importance.
Construction of the road surface, verges and drainage.	No significant inter-action anticipated.	No significant inter-action anticipated.	Potentially elevated noise levels during the construction period.	Potentially elevated dust and other emission levels during the construction period.	Potentially significant visual impact until grass and other vegetation has established.	Dust, noise and other emissions may potentially affect terrestrial flora and fauna. Removal of trees and hedgerows	Potential for silt, dust, chemicals and other pollutants to affect rivers and streams.	Potential risk of pollution of the soils in the vicinity of the route due to petrol or diesel spillage.	Temporary increase in emissions to air.	Potential for dust and noise to affect farm animals and crops. Disruption to farm accesses.	Potential for vibration to cause structural damage to archaeological structures.	Potential for vibration to cause cosmetic or structural damage to buildings of architectural importance.
Bridge Construction	No significant inter-action anticipated.	No significant inter-action anticipated.	Potential for temporary elevated noise levels during the construction period.	Potentially elevated dust and other emission levels during the construction period.	Potentially significant visual impact, however the bridges have been designed to be aesthetically pleasing.	A number of the bridges are in designated cSAC. All lands proposed for compensatory planting will be permanently acquired. Dust, noise and other emissions may potentially affect terrestrial flora and fauna.	The structures are designed to span the river channels with no in-stream works as appropriate. Potential for silt, dust, chemicals and other pollutants to affect rivers and streams.	Potential risk of pollution of the soils in the vicinity of the route due to petrol or diesel spillage. Potential impacts on river cSAC areas through the placement of imported construction materials.	Temporary increase in emissions to air.	Potential for dust and noise to affect farm animals and crops. Disruption to farm accesses.	Potential for vibration to cause structural damage to archaeological structures.	Potential for vibration to cause cosmetic or structural damage to buildings of architectural importance.

Table 19.1 (Cont'd) Summary of key proposed works activities, which are inter-active and cause inter-related effects

Receptor	Traffic	Community	Noise and Vibration	Air Quality	Landscape and Visual	Terrestrial Ecology	Aquatic Ecology & Hydrology	Soils, Geology and Hydrogeology	Climate	Material Assets	Archaeology and Cultural Heritage	Architectural Heritage
Earthworks and rock excavation	Potential for temporary closure of roads during nearby blasts. Transport of unsuitable material off site may increase volume of HCV's on public roads	General inconvenience from noise, and/or ground bourne or airborne vibration, and from temporary road closures.	Potential for significant short-term noise and/or ground bourne or airborne vibration when blasting.	Potential for significant short-term dust creation, and other emissions during the construction phase.	Potentially significant visual impact until grass and other vegetation has established.	Noise and dust emissions may potentially affect terrestrial flora and fauna.	Potential for dust and diesel spillage to affect rivers and streams.	Risk of destabilising the ground during blasting. Risk of drawing down groundwater at wells in vicinity of cuttings.	Temporary increase in emissions to air.	Dust, noise and vibrations may affect farm animals and crops. Disruption to farm accesses and dairying activities.	Possible disturbance/exposure of archaeology	Potential for vibration to cause cosmetic or structural damage to buildings of architectural importance.
In-stream watercourse construction works and works along banks.	No significant inter-action anticipated.	Access to and along riverbanks for walkers/anglers or others may be temporarily disrupted.	No significant inter-action anticipated.	No significant inter-action anticipated.	Potential for temporary loss of vegetation along riverbanks.	Potential for temporary loss of vegetation along riverbanks.	Risk of pollution to riparian and in-stream habitat.	Risk of pollution of soils in sensitive areas from imported materials.	No significant inter-action anticipated.	Potential for temporary disruption to drainage characteristics on farmland.	Potential for possible finds, e.g. old bridges, or other features of archaeological value, or disruption to it.	Potential for possible finds, e.g. mills, culverts, or other features of architectural value, or disruption to it.
Operational Traffic Flows	Changes in traffic flows on local road network, with reduction in traffic through bypassed towns.	Reliable and safer road with increased traffic capacity and improved journey times. Encourage economic development. Reduction in transport costs, and possible increased demand for housing. Reduced traffic improves safety for pedestrians/cyclists. Possible loss in passing trade.	Increased traffic noise levels at certain receptors. Reduced traffic noise levels along existing routes. At some receptors the predicted traffic from the proposed road development will result in increased noise levels above the design targets.	Decreased air quality at certain receptors. Increased air quality along existing routes.	Potential for views being disturbed by passing traffic.	Noise and air quality emissions may potentially affect terrestrial flora and fauna.	Chemicals and other pollutants may affect rivers and streams.	Traffic flows on the proposed road will increase the risk of contamination of the soils in the vicinity of the route. Potential sources of contamination include petrol or diesel spillage or a spillage of goods being carried on the road.	Road traffic would be expected to be the dominant source of GHG emissions as a result of the proposed road development.	No significant inter-action anticipated.	No significant inter-action anticipated.	Potential for vibration to cause cosmetic or structural damage to buildings of architectural importance.

Table 19.1 (Cont'd) Summary of key proposed works activities, which are inter-active and cause inter-related effects

Receptor	Traffic	Community	Noise and Vibration	Air Quality	Landscape and Visual	Terrestrial Ecology	Aquatic Ecology & Hydrology	Soils, Geology and Hydrogeology	Climate	Material Assets	Archaeology and Cultural Heritage	Architectural Heritage
Noise barriers	No significant inter-action anticipated.	No significant inter-action anticipated.	Will reduce noise levels at receptors adjacent to the scheme.	No significant inter-action anticipated.	Potential for barriers to increase visual impact on adjacent properties. This can be reduced through screen planting.	No significant inter-action anticipated.	No significant inter-action anticipated.	Construction of bunds will reduce the amount of material that needs to be removed from site.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	Potential for improving the setting of architectural heritage sites.
Removal of treelines and hedgerows.	No significant inter-action anticipated.	Loss of trees and hedgerows has the potential for negative impact on community amenity areas.	No significant inter-action anticipated.	No significant inter-action anticipated.	Significant interactions with Terrestrial Ecology, as indicated in Chapters 10, and 11 of the EIS.	Significant interactions with Terrestrial Ecology, as indicated in Chapters 10, and 11 of the EIS.	No significant inter-action anticipated.	Loss of trees and hedgerows can potentially result in soil erosion and / or changes in ground moisture conditions.	No significant inter-action anticipated.	Loss of boundaries and trees can reduce the shelter available to farm animals.	No significant inter-action anticipated.	Potential for disimproving the setting of architectural heritage sites.
Screen and compensatory planting.	No significant inter-action anticipated.	Landscape and visual screen planting is provided to soften the views of the proposed road and the surrounding landscape. This applies to those adjacent to the road, or road users themselves.	Landscape and visual screening bunds will reduce noise levels experienced at adjacent properties.	Screen planting may be an additional benefit for air quality as there is evidence that dense planting of trees and shrubs can reduce pollution concentrations.	Screen and compensatory planting will soften views of the road from key visual receptors and compensate for removal of trees and hedgerows.	New areas of semi-natural habitat can be created along the road to create ecological corridors, which can mitigate loss of trees and hedgerows.	No significant inter-action anticipated.	Additional trees and hedgerows can potentially result in soil stabilisation and / or changes in ground moisture conditions.	No significant inter-action anticipated.	Screen and compensatory planting will generally result in increased landtake.	No significant inter-action anticipated.	Potential for improving the setting of architectural heritage sites.
Drainage, Attenuation and Pollution control measures	No significant inter-action anticipated.	To mitigate potential for flooding of local roads and lands.	No significant inter-action anticipated.	No significant inter-action anticipated.	Landscape planting will ensure that drainage and pollution control measures do not adversely impact on the landscape.	Attenuation within designated areas conforms to high design specification to replicate semi-natural water body and can enhance the local Terrestrial Ecology.	Potential for flooding and/ or off-site migration of run-off pollutants into local rivers, streams, roads and lands.	Potential for migration of run-off pollutants into the ground and groundwater.	No significant inter-action anticipated.	To mitigate potential for flooding of farm roads and lands.	No significant inter-action anticipated.	No significant inter-action anticipated.

Table 19.1 (Cont'd) Summary of key proposed works activities, which are inter-active and cause inter-related effects

Receptor												
Activity / Scheme Element	Traffic	Community	Noise and Vibration	Air Quality	Landscape and Visual	Terrestrial Ecology	Aquatic Ecology & Hydrology	Soils, Geology and Hydrogeology	Climate	Material Assets	Archaeology and Cultural Heritage	Architectural Heritage
Materials stockpiling	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	Potential for material stockpiling to impact on air quality.	No significant inter-action anticipated.	Materials will not be stockpiled within cSACs to prevent pollution.	Materials will not be stockpiled within cSACs or adjacent to watercourses to prevent potential pollution.	Materials will not be stockpiled within or adjacent wetland sites.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.
Junction lighting	Junction lighting is provided to enhance safety, and hence will be beneficial to traffic.	Light spillage has the potential to adversely impact on local communities.	No significant inter-action anticipated.	No significant inter-action anticipated.	Horizontal cut-off light fittings will be used to reduce the potentially significant visual effects due to lighting.	Road lighting can adversely affect terrestrial fauna.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.

Table 19.2 Summary of Key Sensitive Sites which Experience Inter-active and Inter-related Effects

Receptor	Traffic	Community	Noise and Vibration	Air Quality	Landscape and Visual	Terrestrial Ecology	Aquatic Ecology & Hydrology	Soils, Geology and Hydrogeology	Climate	Material Assets	Archaeology and Cultural Heritage	Architectural Heritage
<p>The River Barrow and River Nore System cSAC (Site Code 2160) – including crossings of the following rivers</p> <p>King's Little Arrigle Tributary Nore Pococke Madlin Barrow</p>	No significant inter-action anticipated.	The River Nore is an area of high amenity. The Barrow valley is a major amenity area for recreation, fishing and walking.	No significant inter-action anticipated.	No significant inter-action anticipated.	The King's River is an area of high amenity, which has been recognised by the long structure proposed. The Barrow valley is an Area of Outstanding Landscape.	The River Barrow, King's River and the River Nore are designated cSAC. All lands proposed for compensatory planting will be permanently acquired.	The structures will span the river channels with no in-stream works proposed other than sensitive connection of drainage outfalls to watercourses.	Potential impacts on river cSAC areas through the placement of imported construction materials.	No significant inter-action anticipated.	No significant inter-action anticipated.	Potential impacts on associated features of archaeology and cultural heritage.	Potential impacts on associated features of architectural heritage.
<p>Hugginstown Fen cSAC (Site Code 0404)</p>	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	The impact on the associated landscape east of the wetland is significant, resulting in alteration of the existing character.	Hugginstown Fen cSAC was selected for designation on the basis of its alkaline fen habitat, Annex I of EU Habitats Directive.	Past management of the site has included some drainage channels, peat cutting and grazing.	The fen overlies limestone glacial till, underlain by acid Old Red Sandstone. Hydrogeological study concluded no mitigation measures are required for the reduction in fen catchment or for reduction in groundwater recharge. The contractor will be required to implement the mitigation measures detailed in the EIS.	No significant inter-action anticipated.	No significant inter-action anticipated.	Waterlogged areas are frequently rich sources of archaeology.	No significant inter-action anticipated.

Table 19.2 (Cont'd) Summary of key sensitive sites which experience inter-active and inter-related effects

Receptor	Traffic	Community	Noise and Vibration	Air Quality	Landscape and Visual	Terrestrial Ecology	Aquatic Ecology & Hydrology	Soils, Geology and Hydrogeology	Climate	Material Assets	Archaeology and Cultural Heritage	Architectural Heritage
Danganbeg Wetland	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	Impacts on species-rich area of wet grassland. Habitat recreation of wetland is proposed through acquisition of adjacent land, to replace the area impacted.	Potential impacts on the wetland sites hydrology. The site contains tufa springs, a habitat which has links with the Annex I Habitat (petrifying springs with tufa formation)	Potential hydrogeological impact on Danganbeg Wetland. Hydrogeological study concluded no mitigation measures will reduce these potential impacts to acceptable levels.	No significant inter-action anticipated.	No significant inter-action anticipated.	Waterlogged areas are frequently rich sources of archaeology.	No significant inter-action anticipated.
Cloghristick Wood	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	The wood is indicated as an area of natural interest. (ref. Carlow County Development Plan)	The wood is designated pNHA and is part of the Rivers Barrow and Nore cSAC. Compensatory planting is proposed to mitigate the loss of the southern tip of the woodland.	No significant inter-action anticipated.	Re-use of soils in areas of compensatory planting will minimise impacts.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.
Sheepstown National Monument Site (Church and Graveyard)	No significant inter-action anticipated.	Potentially beneficial effect through improved access and parking facilities.	No significant inter-action anticipated.	No significant inter-action anticipated.	Screen planting will reduce any potential impacts on the site's setting.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	Potentially beneficial effect through improved access and parking facilities.	No significant inter-action anticipated.
Residential Dwellings and Clusters of houses (in close proximity)	Screen planting will reduce the potential for passing traffic to be intrusive.	Proximity of road has potential for community impacts where local roads are closed.	Potential for increased noise & vibration impacts due to works and traffic.	Potential for increased dust and air pollution impacts due to works and traffic.	Proximity of road elements has the potential to obstruct and intrude on views.	No significant inter-action anticipated.	Drainage measures will minimise the potential for flooding of local lands and property.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.	No significant inter-action anticipated.

Table 19.2 (Cont'd) Summary of key sensitive sites which experience inter-active and inter-related effects

Receptor	Traffic	Community	Noise and Vibration	Air Quality	Landscape and Visual	Terrestrial Ecology	Aquatic Ecology & Hydrology	Soils, Geology and Hydrogeology	Climate	Material Assets	Archaeology and Cultural Heritage	Architectural Heritage
Key Farming Enterprises	No significant inter-action anticipated.	No significant inter-action anticipated.	Potential for increased noise & vibration impacts due to works and traffic.	Potential for increased dust and air pollution impacts due to works and traffic.	No significant inter-action anticipated.	No significant inter-action anticipated.	Drainage measures will minimise the potential for flooding of farmlands.	No significant inter-action anticipated.	No significant inter-action anticipated.	Loss of land and access to severed lands are the key potential impacts.	No significant inter-action anticipated.	No significant inter-action anticipated.