

## Chapter 11

## Construction Phase

### 11.1 Introduction

This chapter discusses the impact during the Construction Phase of the N9 Kilcullen to Powerstown Scheme, on the natural environment, on existing residential developments and human beings, and on areas of heritage / archaeological interest.

The principal land use affected by the proposal apart from urban type development on the outskirts of Carlow Town is agriculture.

The impact of the completed scheme on the environment as well as the impact during the construction stage is also discussed in detail in other sections of this report. This chapter summarises the possible impact during construction of the works only.

### 11.2 Timescale of Construction

The overall construction period to complete the proposed works has been assessed to be 36 to 42 months. This is on the assumption that the works will be undertaken in a single construction contract. The construction period for structure A10 at Usk Little (length exceeds 100 metres) is assessed to be 6 months.

It should be noted that most construction activities will be for considerably shorter periods at each location.

The programme on which this assessment of construction impacts is based has had to make broad assumptions about the likely sequence of construction operations and about the method of working.

### 11.3 Construction Activities

#### 11.3.1 Site Construction Compounds

Site construction compounds will be required during the construction phase to provide office, canteen and possibly testing facilities. The construction compounds will also provide facilities for material storage and maintenance of construction plant. An office for the Employer's Representative and assistant staff will also be located within a site compound.

The principal site construction compounds will be established at the commencement of the contract, and remain in place throughout the construction period. Other compounds will be established along the route to suit the programme and nature of the works. The exact locations and mode of operation of the site construction compounds selected by the contractor will be subject to approval. The proposed sites should be located away from residential property and watercourses wherever possible.

At this time, 1 area of land included within the lands to be acquired has been identified as a potential site for a construction compound, at Junction 5 (see Figure 3.2 in Volume 2). As this site is located at the southern limit of the works, it is likely that the main compounds will be located along the route on lands that are not part of the CPO lands.

Secondary site compounds are likely to be established along the route corridor depending on works activities, probably located close to the mainline junction construction sites.

Where compounds are located close to watercourses, the compounds are to be designed and managed so that run-off from the compounds is collected and banded to prevent contamination of the watercourse.

The site compounds will have the following temporary impacts:

- Increase in traffic flows, particularly larger vehicles.
- Increase in local noise levels during working hours.
- Visual intrusion.

Other potential impacts that need to be guarded against include:

- Accidental spillage of pollutants into watercourses.
- Dirt, mud and other materials being dropped from lorries and plant or spread onto approach roads by traffic travelling to and from the site.

The sites of the construction compounds will be cleared, reinstated and landscaped upon completion of the works to the satisfaction of Kildare County Council.

### 11.3.2 Earthworks Operations

Earthworks operations involve the excavation and transportation of excavated cut material along the route and the use of this material for the construction of road embankments and noise / landscape bunds. Excess excavated material may have to be disposed of off site and suitable materials imported to site.

#### Earthworks Quantities

The estimated earthworks quantities are outlined and discussed in Section 7.6 “Soils and Geology” in Chapter 7. The main earthworks quantities for the Mainline Dual Carriageway and associated side roads are as follows:

Topsoil Strip	532,000m <sup>3</sup>
Topsoil Re-use	182,000m <sup>3</sup>
Suitable Cut Material	3,417,000m <sup>3</sup>
Embankment Fill	2,950,000m <sup>3</sup>
Capping Layer	502,000m <sup>3</sup>
Unsuitable Cut	770,000m <sup>3</sup>
Re-use of Unsuitable	500,000m <sup>3</sup>

Overall there is a balance of suitable cut material for re-use in embankments and in the capping layer. This assumes that 460,000m<sup>3</sup> of material will be hauled from the cuttings north of Ch. 41,000 to form the embankments at the southern end of the scheme between Ch. 32,300 and Ch. 33,500. If however it is decided to import fill material from nearby sources, the contractor will then have to export a similar quantity of surplus excavated material to suitable areas such as restitution of nearby disused quarries. The contractor would have flexibility in selecting some of the material excavated from rock cuttings for use in the sub-base layer, which would reduce the amount of sub-base material to be brought to site from external sources. This would also reduce the amount of surplus suitable cut material that would need to be removed from site. The most likely scenario is that the contractor

will adopt a combination of importing suitable material to form the embankments at Clonmelsh, using some excavated rock for use on the sub-base layer and removal of some suitable material off site, as well as surplus unsuitable material.

The estimated earthworks quantities for the Athy to R747 Link Road are:

Topsoil Strip	90,000m <sup>3</sup>
Topsoil Re-use	28,000m <sup>3</sup>
Suitable Cut Material	404,000m <sup>3</sup>
Embankment Fill	375,000m <sup>3</sup>
Capping Layer	60,000m <sup>3</sup>
Unsuitable Cut	50,000m <sup>3</sup>
Re-use of Unsuitable	50,000m <sup>3</sup>

The earthworks operations will have the greatest impact on the environment during the construction phase of the works. The main impacts arising from earthworks construction will be:

- Construction Noise and Vibration
- Aquatic Ecology and Water Quality
- Air Quality / Dust
- Access to Land
- Disturbance of Drainage
- Disposal of Excess Material / Import of Material

### 11.3.3 Structures

The construction of the various structures along the route will involve excavation for the foundations of the structures or the sinking of piles to support the structures, as well as the construction of support structures and bridge decks. These works should have minimal impact on the environment, though significant noise levels can be generated by the equipment used. Care will have to be taken where such works are undertaken in the vicinity of watercourses to ensure there is no contamination of the water by the materials and equipment used in the construction. This will be of particular concern during the construction of the bridges across the River Greese, the River Lerr and the River Burren.

The detailed design of the river bridges will require that construction of the superstructures adopts a method that does not require temporary direct support from the ground such as: supporting deck formwork from a launching girder, or placement of pre-fabricated structural elements. Adoption of 1 of these methods of construction will avoid impact on the river channels that would otherwise be caused if the decks were to be supported from the ground during construction.

There are a total of 30 mainline overbridges and 10 underbridges to be constructed as part of the scheme, which includes the Athy to R747 Link Road, as well as a number of accommodation underpasses, box culverts and piped culverts for drainage. An overbridge carries the minor road over the mainline and an underbridge allows the road / railway / river to pass under the mainline.

A schedule of the principle structures to be constructed is given in Tables 3.4.2, 3.4.3, 3.4.4 and 3.4.5 in Chapter 3 - Description of Proposed Scheme.

## **Section A Bridge No. A10 – Usk Little Overbridge**

The proposed structure carrying the existing N9 over the proposed N9 dual carriageway at Usk Little (Structure No. A10) is greater than 100 metres in length.

### General Description

The proposed overbridge carries the existing N9 over the proposed N9 dual carriageway at Mainline Ch. 71,900 and comprises a 3 span bridge supported on a pair of intermediate supports and end supports. The approximate length of the structure is 136 metres from end of wingwall to end of wingwall. The structure will provide access between Kilcullen and Ballitore maintaining the existing N9 route. There are properties approximately 130 metres to the north and approximately 70 metres south of the structure.

The existing N9 will be temporarily diverted to allow construction of the proposed structure.

### Visual Impact

The proposed mainline is in significant cut at this location and the alignment of the existing N9 will generally be maintained. There is therefore minimal visual impact from this structure on the surrounding areas.

### Construction Impacts

The proposed structure A10 would require longer to construct and would consume larger quantities of reinforced concrete, due to the form of deck construction. Otherwise, it is considered that this structure would not have any construction impacts additional to those at other bridge sites.

## **11.3.4 Drainage Facilities**

The installation of drainage facilities involves construction techniques that are in many ways similar to the construction of structures. However, as the drainage works are always connected to existing watercourses, care must be taken to avoid release of contaminants, including suspended soils and silts, into the watercourses.

Culverts across streams of salmonid potential would adopt arch or portal structures which can be constructed with minimal impact on the watercourse. Other watercourses would use box or pipe culverts, with the invert set below streambed level to maintain a depth of water through the culverts in low flow conditions. Measures would be required to pass the water through the works while the culverts are being constructed.

The diversion of watercourses will require particular care to minimise impacts on the watercourse. Possible impacts include risk of pollution, risk of siltation, loss and / or disturbance of riparian and in-stream habitat. Assuming good practice is employed for watercourse crossings, as outlined in Section 7.3, the risk of construction impacts will be minimised.

## **11.3.5 Road Pavement Construction**

Road pavement construction involves the transportation and deposition of aggregates and aggregate cement / bitumen materials. These materials will have to be hauled to site using heavy vehicles.

## 11.4 Impact of Construction Activities

### 11.4.1 General

This section addresses the impact of construction operations on the various elements that make up the environment, and identifies possible measures to mitigate the impact.

The preliminary design of the works has been undertaken with a view to minimising the possible impact of the completed works on the environment. It is, however, inevitable that the construction operations will impact on the environment, and the local population will undoubtedly perceive some disturbance.

The impact of construction activities and the associated traffic management on the environment at each particular location will vary, depending on the nature of the terrain, the nature of any development adjacent to the works, and the nature of the construction work being carried out.

It should however be noted that the impacts discussed will only exist during the 36 to 42 month construction period, and that most construction activities will be for considerably shorter periods at each location.

### 11.4.2 Construction Impacts

The potential impact of the construction works on various elements of the environment are discussed below:

#### **Construction Disruption (General)**

The contract for the construction of the road scheme will include provisions to minimise any temporary nuisance that may occur, and the management of the construction site and the undertaking of the works will be monitored to ensure compliance with the requirements of the contract. Such measures would include restricting site working hours and noise levels, provision of engineered traffic management schemes, and provision of settlement ponds to protect watercourses. These issues are discussed below.

#### **Road Network**

In order to minimise inconvenience to road users, the contract will require the contractor to put in place measures to maintain all roads and accesses affected by the works, or their replacements, and to maintain traffic flows and existing accesses until such time as the permanent works have been completed. With the new road construction being largely off line and diversions being constructed to maintain traffic flows along roads where necessary during construction of the works, there should be minimal severance.

The most significant impacts to traffic flows along the existing N9 will occur at the following points:

- At the tie-ins at both ends of the new scheme and at Junction 3, where new road construction / overlays etc. could cause disruption to traffic. Temporary traffic management and careful planning of the works will be required to minimise this disruption.
- At Usk Little where the new mainline is in a cutting where it crosses under the existing N9. Before this cutting can be formed, the long N9 Overbridge (No.

A10) and the L6096 Local Road diversion will have to be constructed and in operation to maintain the existing traffic flows.

- At Athy, where the roundabout and its tie-ins with the existing N78 need to be formed.

Along the Regional and Local Roads, the most significant impact will occur where bridge structures are to be formed along the line of the existing roads or close to them. Temporary diversions will be required where the bridge and new road construction would otherwise close the existing road. These diversions are likely to be in place for 6 – 12 months.

At two locations it is not practical to take additional lands to maintain the flow of traffic during construction of the side road realignments. These locations are the L6079 realignment at Yellowbogcommon, at the northern end of the scheme, and the L3052 realignment of Linkardstown Lane, south of Junction 4. At both locations, the existing road will be retained to pass traffic around the works during construction of the bridge and the roadworks on the west side of the Mainline. In order to construct the short sections of new road on the east side of the bridge, the Local roads will be closed to traffic for durations of approximately 8 – 10 weeks. Safe passage for pedestrians and cyclists would be provided during this period, while vehicular traffic would be able to use the existing road network to bypass the road works.

One-way shuttle working may be required around some earthworks and bridge operations. Furthermore, construction of the underbridges at the following locations may involve one-way shuttle working during erection of the structures;

- L6095 Ballymount
- L8014 Coolavash

Construction traffic will result in heavy vehicles using the road network. As several of the Local Roads are not suitable for use by construction traffic, these roads will be closed to vehicles associated with the construction. The worst effected roads are likely to be the roads leading to the principal site compounds.

### **Diversion of the N9 National Primary Road**

The existing N9 is by far the most heavily trafficked road within the route corridor and it will be intercepted by the proposed new road at 4 locations.

- At the northern tie at Junction 1;
- At the road crossing at Usk Little;
- At Junction 3 where the new road will cross over the existing N9;
- At the southern tie in at Junction 5.

The design of the crossings at these locations has allowed for the maintenance of two way traffic flows along the N9 during the construction stage.

In addition, the existing N9 will be improved to a full 7.3m wide carriageway with shoulders over a length of 1360 metres to the southwest of Junction 3 to near the Carlow County boundary, by widening the road on the southeast side.

At Junction 1, the existing road is a full two lane Motorway section north of the N78 overbridge, while south of the junction the road transitions to a single carriageway road over a length of 400 metres. Traffic management measures will be required to transfer traffic onto one or other of the two carriageways in advance of the junction

(i.e. on the north side of the N78 overbridge) to channel the traffic around the works for the construction of the new dual carriageway using the width of the existing road.

At Usk Little, where the existing N9 crosses over the line of the proposed dual carriageway at a heavy skew on the N9 Overbridge (No. A10), the existing road will be diverted around the east side of the road and bridge works. Refer to Figure 3.27 in Volume 2.

Additional land has been included in the land take at Junction 3 to provide for a two lane temporary diversion of the N9 around the bridge works. Refer to Figure 3.43 in Volume 2.

The improvements to the existing N9 over a length of 1360 metres to the southwest of Junction 3 will be undertaken by initially constructing the new south bound carriageway and shoulder alongside the existing road. The rest of the road cross-section will be constructed after transferring the south bound traffic onto the new section of road pavement. Some additional traffic management, possibly including one-way shuttle working, will be required when constructing the section near the southern tie in. Refer to Figure 3.40 in Volume 2 for details.

At Junction 5, the existing N9 will be diverted over a length of nearly 1.2 kilometres. North and South of the proposed junction. North of the junction, the realigned N9 will run parallel to the existing road over a distance of 300 metres before the two alignments merge at the tie in. The new works will be largely constructed independently of the traffic on the existing road, though construction of the verge may have to be undertaken after transferring the southbound traffic onto the new road. South of the junction, the realigned N9 will be constructed largely off line from the existing road, but will cross the existing N9 just north of the culvert at the northwest corner of the landfill site. The vertical alignment of the realigned road has been designed to match closely with the existing road level. Refer to Figures 3.49 and 3.50 in Volume 2 for further details.

### **Effects on Pedestrians / Cyclists**

The construction of the works should not have a significant impact on the movement of pedestrians and cyclists, as the main road works are largely off line, and diversions will be constructed to maintain traffic flows along all roads during the construction of the works.

### **Community Severance**

Community severance may be described as being the separation of residents from facilities and services used within their community, caused by new or improved roads or changes in traffic flows. It is considered that the construction of the works should not result in any additional community severance in addition to that caused by the completed scheme, though the local population may experience some inconvenience during construction of the N9 scheme.

### **Effects on Users of Public Transport**

Bus Eireann operate Expressway routes from Dublin to Waterford via Castledermot, Carlow and Kilkenny. These routes travel via the existing N9 and stop at intermediate communities along its length. As vehicular access will be maintained along the existing N9 at all times, there will be no need to divert any bus services. Bus Eireann as well as private operators operate a number of local bus routes in the area, and school buses also operate. Where the works on the

Regional and Local Road diversions affect the safe use of existing bus stops, alternative bus stops will be provided nearby following discussions with bus operators, the Roads Authority and others as appropriate.

### **Land Severance**

Land severance due to the implementation of the project occurs at various locations along the length of the scheme, particularly severance of agricultural land. It is considered that the construction of the works will not result in any additional land severance, over and above that caused by the scheme, and the contractor will be required to maintain access to properties and lands at all times.

### **Boundary Treatment**

In general the permanent boundary treatment will be provided where possible prior to general construction activity, with a temporary fence provided to protect the public from the works where it is not possible to erect the permanent boundary treatment at the outset.

### **Earthworks Operations**

The earthworks operations will have the greatest impact on the environment during the construction phase of the works. However, any such nuisance arising from earthworks will be short term.

The main impacts arising from earthworks construction will be:

- **Construction Noise and Vibration**  
The use of heavy earthmoving equipment will result in increased noise levels and may result in some minimal ground borne vibration. The excavation of rock in the deeper cuttings will be the largest potential source of ground and air borne vibration.
- **Water Quality**  
Surface water runoff could be contaminated with suspended solids, chemicals, diesel and oil etc, which would be seriously damaging to watercourses and groundwater. Measures must be implemented to prevent such pollution.
- **Air Quality / Dust**  
The movement of construction vehicles along haulage routes may generate dust. This will be of particular nuisance to farms and residents.
- **Access to Land**  
Although access to all land areas from the public road will be maintained throughout the construction period, access to some areas of land could be disrupted during the earthworks operations. Arrangement of temporary access routes will have to be agreed with the relevant landowners / tenants.
- **Disturbance of Drainage**  
Some farmland drainage may be disrupted as a result of the earthworks construction. Temporary drainage will be provided to maintain the integrity of farmland drainage until such time as the permanent drainage facilities are in place.
- **Disposal of Excess Material / Import of Material**  
Excess excavated material not required for the construction of the scheme will be required to be removed from site and disposed of. Similarly suitable material for road construction will be required to be sourced off site and imported to site. This will result in heavy transport vehicles going to and from the site and in addition will have impacts on sites remote from the road

scheme where disposal of material will occur or where the required imported material is to be sourced.

### **Narraghmore Group Water Scheme**

The Narraghmore Group Water Scheme supply well is located on the east side of the road at Ch. 66,850 (Refer Figure 7.19 in Volume 2). The road drainage between Ch. 65,600 and Ch. 67,300 discharges into the watercourse that crosses the route at Ch. 67,200, and will be isolated from the source of the well. However, during the construction stage there is potential for run-off from the road to flow over the lands immediately upstream of the well, and this poses a potential risk to the water source. As part of the works the contractor will be required to put in place an environmental protection policy for all site operations which could potentially impact on the water supply. These would include measures to ensure that soil and silts from the road construction do not wash off into the stream which crosses the road at Ch. 66,820, by installing settlement ponds at the discharge point, and the installation of temporary hydro-carbon traps to intercept any oil contaminants that could be spilled from equipment and wash into the stream.

### **Narraghmore Bog**

Narraghmore Bog is located along the west side of the route between Ch. 69,300 and Ch. 70,600 (Refer Figure 7.20 in Volume 2). The road drainage between Ch. 70,500 and Ch. 73,300 discharges into the watercourse that runs along the eastern edge of Narraghmore Bog. To minimise any construction impacts it will be necessary to put in place an environmental protection policy for all site operations which could potentially impact on the bog. These would include measures to ensure that soil and silts from the road construction do not wash off into the stream by installing settlement ponds at all discharge points, and the installation of temporary hydro-carbon traps on each outfall to intercept any oil contaminants that could be spilled from construction equipment.

### **Flora & Fauna**

The N9 Kilcullen to Powerstown Scheme will have a direct impact on flora and fauna within the footprint of the road. In addition, construction activities can also impact on flora and fauna, due to any of the following:

- Disturbance caused to animals by road construction noise.
- Destruction of plant life by construction plant and stockpiling of materials outside of lands acquired.
- Destruction of nesting habitats for breeding birds.
- Changes in the drainage regime through bog land.
- Spread of dust, affecting vegetation and animal life.

Mitigation of these impacts would include where possible:

- Control of the movement of construction plant within the site, to ensure that the minimum area of ground will be disturbed outside the footprint of the works.
- Restrictions on the removal of hedgerows, trees, treelines, or areas of scrub during the months of March to August inclusive to avoid impacts on breeding birds; in particular best practice would be to avoid any clearance of vegetation during the period March to June.
- An assessment of habitat suitability and the presence of breeding birds along the route of the proposed scheme will be undertaken to assess whether any nests are present prior to construction to avoid impacts on breeding birds.

- Careful planning of the locations for storing/ stockpiling materials on site.
- No separate mitigation is proposed for the impacts of noise on flora and fauna, as most organisms seem to adapt well to the noise disturbance.

### **Aquatic Ecology and Water Quality**

Protection of watercourses during the construction period will be required in order to prevent pollution of the water by silt and sediment and other pollutants from the works. Activities, which may cause water pollution, are:

- “In-stream” excavation and construction;
- Piling and bridge construction;
- Earthmoving;
- Diesel storage and refuelling;
- Road carriageway construction;
- Breaking and demolishing existing structures;
- Toilet and washroom wastewater.

These construction activities, could result in the following impacts:

- Pollution of streams and rivers by suspended solids from adjacent construction areas, and disturbance of bed material during “in-stream” excavation and construction.
- Pollution of streams and rivers may also occur from other substances during construction such as fuels, lubricants and curing of concrete.
- Creation of barriers to fish movement.
- Destruction of river and stream habitats by construction plant.

Section 7.3 Aquatic Ecology and Water Quality of Chapter 7 describes in greater detail the potential impacts on freshwater habitats both during the construction phase and when the scheme is in operation. Mitigation of impacts on aquatic ecology and water quality both when the road scheme is in operation and during the construction phase is outlined within 7.3.6 of Chapter 7. The most significant mitigation measures to note during the construction phase are as follows:

- Release of suspended soils to all rivers and streams should be avoided by adopting best practice such as planning construction activities affecting watercourses during drier months, halting construction during periods of heavy precipitation, restricting vehicular and equipment access to such work areas.
- Protection of watercourses by careful planning of construction activities adjacent to watercourses.
- Protection of watercourses by careful planning of in stream construction activities and installation of cofferdams.
- Preservation of stream flows for movement of fish by ensuring a minimum depth of water will be maintained in the streams.
- New concrete will not be allowed to cure in contact with river water.
- Existing vegetation is to be retained where possible by use of temporary fencing etc.
- Discharges to watercourse from storage areas and denuded areas is to be controlled via settlement ponds.
- Permanent stream diversions are to be planned in consultation with the Regional Fisheries Board.

- Storage areas and works compounds should be located away from watercourses and all effluent and discharges should be properly treated and disposed of in authorised sites.
- Contamination of watercourse from concrete curing and effects of silane concrete coatings must be.

A more detailed list of mitigation measures is contained within Section 7.3.6 of Chapter 7.

### **Construction Noise Impacts on Humans**

Construction noise may arise from many sources as outlined below.

- Earthmoving: Exhaust noise and other mechanical noises arising from the use of excavators, earth moving and compacting equipment,
- Noise arising from drilling and blasting to excavate rock in cuttings, where permitted, the use of hydraulic rock breakers in cuttings and in the preparation of bridge foundations.
- Road Carriageway Construction: Exhaust noise and other mechanical noises arising from the use of road and paving plant.
- Construction of Bridges, Culverts and Retaining Walls and Demolishing Structures: Exhaust noise and other mechanical noises arising from the use of construction equipment, pumps, and material handling.

Studies carried out by the Construction Industry Research and Information Association (CIRIA) Report 64 (*Noise from construction and Demolition Sites - Measured Levels and their Prediction*) showed that the highest noise levels generated in construction works were from piling operations, particularly from the use of diesel piling hammers. The report recommends that the quietest method of construction should always be specified, subject to practicality as it is recognised that certain methods of construction may not be appropriate at all sites. Notwithstanding this, the contractor will be obliged to employ *Best Practicable Environmental Option* (BPEO) as per CIRIA Report 64, to minimise noise.

Mitigation of noise impacts on humans during construction can be delivered as follows:

- Controlling of normal site working hours within the Construction Contract to those hours outlined in Table 11.1.
- Specifying, within the Construction Contract, maximum peak and average noise levels at various parts of the site, by time of day for weekdays and weekends as outlined in Table 11.1. Control stations can be set up at selected sensitive locations close to residential properties.

**Table 11.1 Schedule for Noise Levels at Control Stations**

Schedule		Total Noise Level at Control Stations	
Period	Hours	Activity Noise level, L <sub>Aeq,1hour</sub> measured at Control Station: dB(A)	Maximum Sound Level measured at Control Station: L <sub>pA's</sub> : dB(A)
Monday to Friday	0700 – 1900	75	85
Monday to Friday	1900 – 2200	60	65
Saturdays	0800 – 1630	70	80
Sundays and public Holidays	0900 – 1600	60	65
All unattended plant outside normal working hours		50	55

L<sub>Aeq</sub> - the equivalent continuous sound level for the measurement period.

L<sub>pA's</sub> - measurement using the 'slow' setting on the Sound Level Meter.

- Imposing restrictions on times and locations where blasting may be used to excavate rock in cuttings following consultation with affected parties.
- Selection of the appropriate plant and the fitting of silencing equipment. This can be accomplished by using well-silenced exhausts and the closure of machines using acoustic covers.
- Correct maintenance and operation of site plant.

### Construction Vibration

In general terms there are four typical construction activities that can give rise to construction induced vibration:

- Earthmoving: The use of excavators, bulldozers, dump trucks and compacting plant will result in some ground borne vibration. The zone of influence will be limited to a narrow band on each side of the works. Drilling and blasting to excavate rock in the deeper cuttings, where permitted, together with the use of hydraulic rock breakers will be the largest potential source of vibration.
- Construction of Bridges, Culverts and Retaining Walls: Construction equipment, cranes, pumps and piling equipment will likely be employed at bridge sites. With the exception of piling operations and excavation using hydraulic rock breakers there is unlikely to be any significant generation of ground borne vibration.
- Road Carriageway Construction: Vibration will arise mainly from compaction of road pavement materials using vibratory rollers.
- Breaking and Demolishing Structures: Ground vibration is likely to arise from the use of pneumatic and hydraulic breakers though generally the zone of influence will be limited to a narrow band on each side of the works.

UK Studies (TRL (Transport Research Laboratory) Supplementary Report 328) have shown that, although ground vibration above human perception threshold may be caused by certain construction plant, these vibration levels are generally well below that which is considered to cause structural damage to buildings. With the exception of vibration generated by blasting operations, rock breakers, compaction

and piling equipment it is unlikely that vibrations from construction equipment will be perceived by human beings except within a narrow zone adjacent to the works.

The effects of blasting will be felt over a greater distance; however the use of properly designed small blasts can minimise the amplitude of ground borne and air borne shock waves during blasting.

Mitigation of construction vibration can be delivered as follows:

- Control of site working hours as outlined in Table 11.1.
- Limiting the maximum induced amplitude and peak particle velocity / acceleration resulting from blasting at specified locations adjacent to the site.
- Imposing restrictions on times and locations where blasting may be used, and by close liaison with the local population.
- Selection of the most appropriate method of execution of the works to comply with any restrictions imposed by the contract.

Construction vibration attributable to piling operations can be reduced by the use of bored piles, where such methods of construction are appropriate, rather than impact hammer methods.

### **Contaminated Material**

The identification and treatment of material from areas of contaminated ground and / or structures will necessitate additional precautionary measures. Mitigation will be achieved through the contract documents by specifying in situ remedial measures, where practical, taking the form of encapsulation (cover layers), all under the appropriate guidelines. Where necessary provision will be made in the contract for the safe removal and transport of contaminated material to approved licensed sites.

An active landfill site is located in a disused quarry area situated at Ch. 71,740 – Ch. 71, 820, in the vicinity of Usk Little. Made ground is currently at a thickness of approximately 10.0m. Evidence of elevated levels of contaminants such as Heavy Metals and Polycyclic Aromatic Hydrocarbons (PAH's) were encountered at this site during the Preliminary Site Investigation. Laboratory test results on samples from the landfill site indicate that the level of these contaminants exceeds the Dutch Standard Trigger levels. Further investigation will be required to fully assess the implications of the presence of these contaminants.

Five buildings are to be demolished or partially demolished as part of the scheme. These will have to be inspected for the presence of asbestos or other contaminants, and appropriate action taken if asbestos or other contaminants are found.

### **Air Quality**

The construction operations that are likely to impact on air quality are:

- Generation of dust by plant working on site,
- Exhaust smoke / pollutants from plant working on site, and vehicles hauling to and from the site,
- Use of chemicals with volatile vapours in the works.

A number of construction activities mainly associated with earthworks operations can give rise to dust. See Table 11.2.

**Table 11.2 Dust Generators and Possible Mitigation Measures**

Item	Description	Impact	Mitigation
1	Site clearance	Minor	
2	Cut and fill operations, including haulage of earthworks materials along the road corridor	Minor	
3	Transfer of earthworks and pavement materials via public roads	Potentially significant	Keep roads clean
4	Vehicle / plant movement on unpaved roads and over construction sites	Potentially significant	Water the haul roads
5	Material transfer to and from trucks, particularly aggregates for production of concrete and bituminous pavement materials	Potentially significant	Transport materials in moist condition
6	Wind erosion of stockpiled materials and working areas	Potentially significant	Cover / wet stockpiles
7	Concrete and asphalt batching plants	Potentially significant	Use dust extractors

Mitigation of exhaust pollutants from plant and equipment used for construction of the works can be achieved by correct maintenance and operation of site plant.

Mitigation of airborne dust can generally be achieved by adopting “best practices”. If dust nuisance becomes excessive in sensitive areas, it may be necessary to construct temporary sealed pavements to remove the source of dust.

Mitigation of the spread of vapours given off by chemicals used in the works can be achieved by undertaking the operations generating the vapours within enclosures, and suspending work if necessary when wind conditions adversely spread the vapours to the surrounding area.

### **Agriculture**

The main impacts of the construction works on agriculture will be from:

- Noise
- Dust
- Restricted access to severed land
- Disturbance of drainage.

Mitigation measures for noise and dust have been discussed above. Additional mitigation may be required, particularly near vulnerable livestock. With good communication with farmers it should be possible to identify such vulnerable areas and apply appropriate measures to eliminate any impacts.

Dust may also prove to be a problem for milking facilities, including storage tanks, as contamination of dairy products may occur, and additional measures may be required in the vicinity of dairy farms. These will be assessed following discussions with affected farmers.

Access to severed land will be maintained by providing temporary access until such time as the permanent accesses are constructed. These temporary access routes should be agreed in discussion with the affected landowner.

Some disturbance of farmland drainage may occur during construction, and it will be important that temporary drainage should be provided to maintain the quality of agricultural land. Where existing land drainage is affected, it will be necessary to ensure that all severed land drains and ditches are connected to the drainage installed as part of the road works. Where necessary, temporary measures, including over-pumping may have to be adopted to ensure that flooding does not damage farmland.

### **Archaeological Sites**

As there are areas of archaeological interest along the scheme the arrangements for taking action have been defined in detail in Chapter 10 Architectural, Archaeological and Cultural Heritage.

### **Historic Buildings**

It is not expected that the construction phase will have a significant direct impact on the historic buildings in the scheme area, as these are remote from the area of the proposed works. However, control of vibration from construction activities may be required where such historic houses are within direct proximity of the route.

### **Impact of Construction on Public Utility Services**

Alterations and diversion works will be required to the existing utility services as a result of the road scheme. This may cause a small interruption to some local services. These will be planned in advance and those directly affected will be consulted.

## **11.5 Remedial or Reductive Measures**

The mitigation measures required during the Construction Phase are outlined in the previous section. The highlights of the main measures are contained below.

Cofferdams or other approved methods should be employed when working in watercourses, to separate the works from the flow of water. Alternatively, the watercourse could be diverted to ensure that the water is unlikely to come into contact with works traffic and pollutants.

To avoid impacts on breeding birds there should be no removal of hedgerows, trees, tree-lines, or areas of semi-natural habitat from the 1st March to the 31st of August inclusive. Although the Wildlife (Amendment) Act, 2000 affords protection to breeding birds by prohibiting the clearance of vegetation during this period, there is an exemption for works associated with road construction. An assessment of habitat suitability and the presence of breeding birds along the route of the proposed scheme will be undertaken to identify whether any nests are present prior to construction.

Surface water runoff can be contaminated with suspended solids, chemicals, diesel and oil etc., which can be seriously damaging in watercourses and groundwater. For this reason any discharge of surface water run-off into receiving systems should be free from suspended solids, oil or other polluting materials. Silty water could be treated using silt trays/settlement tanks, and consequently the contractor will be required to install temporary interceptors and traps during the construction of the works, until such time as permanent facilities are constructed.

Pollution of groundwater through the ingress of contaminated water during piling operations will be controlled through the use of appropriate construction techniques.

Storage tanks for diesel should be kept in bunded compounds, ensuring that the area is impermeable, to prevent leeching of any leaked diesel into the surrounding ground. Similarly, chemicals, paints and cleaning fluids should be stored in designated secured buildings with appropriate sealed drainage sumps.

All machinery and plant used should be regularly maintained and serviced and should comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is minimised. Such maintenance should be carried out in areas remote from watercourses.

The contractor will be required to take every precaution to prevent dirt, mud or other material being dropped or spread by traffic associated with the works on roads, which are being used by the public. In the event that dirt, mud or other material is spilt or spread by works associated traffic, the contractor will be required to clean all roads in use by the public.

The contractor will also be required to provide toilets and washroom facilities for the workforce, with appropriate facilities for storage and disposal of waste to ensure that no waste will be allowed to enter the watercourses.

The Contractor will be required to work generally within the normal working hours indicated in Table 11.1 and only in exceptional circumstances will he be permitted to work outside these times.

The Contractor will be required to manage the works so that the noise limits incorporated within the Construction Contract are not exceeded.

Local Roads leading to principal site compounds are to be assessed for the use of heavy vehicles and the road pavement may be widened and strengthened as required. At site compounds, all run-off is to be collected and discharged into an attenuation pond so that no contamination of the watercourses can occur.

Construction of temporary road diversions to maintain the flow of Traffic along the existing road network until such time as the permanent works have been completed and the scheme opened to traffic.