

Chapter 20

Mitigation Measures

20.1 General

The assessment of the proposed M7 Naas to Newbridge By-Pass Upgrade Scheme has identified a number of impacts that would arise as a result of the construction and future use of the widened motorway and the new interchange. A number of mitigation measures have been identified with a view to reducing potentially significant impacts.

Mitigation measures are the measures proposed in order to avoid, reduce or where possible remedy the significant adverse environmental effects of the proposed development. Mitigation measures have been incorporated into the design of the proposed development and will be applied during both the construction and operational phase where they have been assessed as necessary.

The following chapter provides a summary of the mitigation measures for the proposed scheme as contained within the preceding chapters of the EIS. This is a summarised version stating only the mitigation measures to be provided and does not discuss the requirement for the measures to be applied or the residual impacts.

20.2 Traffic

The traffic analysis undertaken has shown that at operation the upgrade of the M7 reduces the peak hour congestion and improves traffic flow. No operational mitigation measures are required.

A detailed traffic management plan will be developed by the appointed contractor and agreed with the relevant authorities in order to minimise the impact of construction on existing traffic movements on the M7. This will include the maintenance of two daytime traffic lanes on the M7 in each direction throughout the construction phase.

A detailed traffic management plan will also be developed by the appointed contractor to ensure maintenance of traffic flow on the R445 during the construction of the new interchange. It is envisaged that single lane contraflow will be maintained in both directions to minimise any potential impact.

20.3 Mitigation Measures for Ecology

Habitats

While no invasive alien species have been recorded along the line of the scheme, to avoid the risk of introduction of invasive alien species of plant, earthworks and landscaping along the scheme will adhere to the National Roads Authority *Guidelines for the treatment of Invasive Alien Species on National Road Schemes* (2010). The appointed Contractor will also be obliged to be familiar with the European Communities (Birds and Natural Habitat) Regulations 2011 which makes it an offence to spread certain species of invasive plant.

Water Quality

To avoid impacts on water quality and associated biota within the Grand Canal and all other watercourses crossed by the motorway during the construction phase all detailed design, construction and operation will be carried out in accordance with *Guidelines for the Crossing of Watercourses During the Construction of National*

Road Schemes (NRA, 2006), Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (Murphy, 2007) and Control of water pollution from construction sites; Guidance for Consultants and Contractors (SP156) (CIRIA, 2002) in addition to the specified requirements below and elsewhere within the EIS.

Throughout the construction phase Best Practice will be adhered to in relation to all activities that may impact on aquatic or riparian habitats. Any discharge to surface waters from either the construction or operation stage must not impact negatively on the salmonid status of the River Liffey catchment. Specific mitigation measures will include the following:

- Measures will be taken to ensure there is no entry of suspended solids to all surface waters during the construction phase by use of sediment traps or settlement ponds. This will entail a mechanism for containment of runoff in the event of accidental spillage to enable clean-up and appropriate disposal through licensed facilities. The contractor will monitor discharges from the site for total suspended solids, pH and other parameters as required by Inland Fisheries Ireland (IFI), to ensure all discharges are in compliance with levels to be agreed with IFI.
- As grout/cementous materials are highly toxic to aquatic life all such works must be maintained in complete isolation of all waters and the storm water system. Wash down from delivery and concrete pumping areas will be contained and removed off site for appropriate disposal.
- The short-term storage and removal/disposal of excavated material will be planned and managed such that the risk of pollution from these activities is minimised. This will include storage locations being a minimum of 50m from any watercourse, and such facilities to be bunded with drainage directed through appropriately sized settlement ponds and sediment traps.
- Temporary storage of oil and diesel for plant machinery will be required during the duration of the construction period. All fuels will be stored in a bunded facility with filling and take-off points within the bunded area. The bunds will protect against accidental tank rupture and will ensure any spilled oil can be retained for subsequent disposal to an appropriate facility.
- During construction, temporary, contained chemical toilet facilities will be used, which will be taken off site for emptying at a suitably licensed disposal location. Consequently, there will be no discharge of sewage to surface waters.
- Adequate security measures will be put in place to prevent any acts of vandalism that may result spillage or discharge of pollutants.
- To avoid impacts on water quality and associated biota within all waterbodies during the operation phase surface water run-off will either be directed through hydrocarbon interceptors before discharge to surface waters.
- Landscape management on the scheme upgrade will minimize the usage of fertilizer, herbicides and pesticides to avoid direct and indirect contamination of surface waters. No application of herbicides and pesticides will be undertaken within 2m of any waterbody.
- In order to limit the peak flow from the road drainage runoff and reduce it to the existing run off rates, flow restricting devices will be provided upstream of the inlet to a receiving waterbody. This will necessitate provision of temporary storage of the surface water runoff. This storage or attenuation will be provided upstream of the flow restriction by the provision of a number of lined attenuation ponds and online attenuation. A penstock/shut-off valve will be

installed in the last downstream manhole before discharge to facilitate the isolation of spillage events within the online attenuation storage.

- Where attenuation ponds are proposed, these will include appropriate planting to facilitate further treatment of road runoff in a treatment forebay or a depressed treatment basin, planted with a suite of native wetland plant species.
- Landscape management on the scheme upgrade will minimize the usage of fertilizer, herbicides and pesticides to avoid direct and indirect contamination of surface waters. No application of herbicides and pesticides will be undertaken within 2m of any waterbody.
- Within the Stream at Ch.6+700, hydraulic continuity within the channel downstream of the existing culvert to be replaced under the previously realigned road will be maintained at all times during construction. Monitoring of water quality in the stream downstream of the existing culvert will be undertaken continuously during construction to ensure silt levels do not exceed levels as agreed with Inland Fisheries Ireland.

Reference is also made to the mitigation measures detailed in Section 13.8 'Hydrology'.

Fauna

Otter

With the exception of the Ladytown Stream, as there will be no modification to any of the other watercourse culverts along the stretch of motorway to be widened, there will be no alteration to the existing potential for movement of otter. However, as existing fencing is in poor repair with numerous gaps and broken sections, fencing within 100m either side of all watercourse crossings will be upgraded in accordance with the UK Highways Authority specification *Nature Conservation advice in relation to otters* (DMRB, 2001).

Mammal passage will be provided within the modified Ladytown Stream culvert, either alongside or within the extended culvert, with associated fencing as per the DMRB (2001) specification.

To provide required cover for otter and other fauna utilizing the watercourses, where appropriate landscape design will aim to re-establish natural riparian zones.

Freshwater Crayfish, Brook Lamprey and Trout

The stretch of stream to be culverted upstream of the Ladytown Overbridge (Ch. 6+700) will require preconstruction salvage of Freshwater Crayfish under licence from the Department of Arts, Heritage and the Gaeltacht.

The stretch of watercourse to be diverted downstream of Ch 6+700 will require the preconstruction salvage of Freshwater Crayfish, Brook Lamprey and Brown Trout. This will be undertaken under licence from DAHG and Inland Fisheries Ireland, as appropriate.

A fish pass arrangement will be provided to overcome the weir downstream of the existing culvert which will entail a series of interconnected pools from the upstream side of the proposed culvert to a new 1.5m x 1.5m box culvert to be provided under the existing R445. The pools will provide a permanent water depth of 500mm in order to facilitate fish passage. The proposed fish pass culvert under the R445 will be constructed with a depressed culvert invert in order to ensure that it also remains permanently backwatered in order to facilitate the movement of fish.

During construction, the diversion channel shall be formed in the dry and arrangements made for the salvage and relocation of crayfish, lamprey and trout to be completed before the flow is diverted.

Any modified section of stream channel will allow for the unimpeded movement of salmonids, lamprey and freshwater crayfish up and downstream.

Construction Method statements for all works impacting the watercourse at the Newhall Interchange shall be agreed with Inland Fisheries Ireland prior to construction.

Badger

The existing fencing along the motorway has numerous gaps where animals can access the carriageway. The entire fencing network (apart from those stretches referred to under Otter above) will be repaired or replaced as required in accordance with the NRA'S *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes*.

Bats

As no impacts are expected on any bat species as a result of the proposed scheme, there are no specific mitigation requirements identified.

Other mammals

Measures detailed for otter and badger above will serve to mitigate potential impacts for other mammal species also.

Birds

Measures as detailed above for otter and the maintenance of water quality serve to mitigate potential impacts on kingfisher.

Where practicable, tree and hedgerow clearance will be avoided between 1st March and 31st August during the bird nesting and breeding season.

To compensate for the loss of habitat for other bird species, landscaping proposals will entail the use of native trees and shrubs. In addition, the use of pesticides and herbicides will be minimized to avoid reductions in insect populations and potential impacts on bird fertility.

20.4 Mitigation Measures for Hydrogeology

The hydrogeology assessment considers that the scheme design effectively avoids impacts on the hydro-geological environment. It concludes that at operation the scheme will have imperceptible to beneficial impacts.

Mitigation by avoidance

The proposed scheme is considered the best possible, in terms of minimising the impact to the hydrogeological environment. Mitigation by avoidance has been actively applied to the preliminary alignment design as the Impact Assessment progressed. This includes avoiding the construction of new fills or excavation of new cuts along the route of the proposed scheme, limiting the footprint of the upgraded road to within the existing landtake, and utilising the existing drainage system to convey road runoff from the proposed newly paved surfaces.

Groundwater levels & quality

To minimise the potential impacts on groundwater levels and quality during and post construction, the following mitigation measure should be adopted:

Backfill or decommission any obsolete ground investigation pits and/or boreholes in accordance with Institute of Geologists of Ireland (IGI) publication Well Drilling Guidelines to avoid groundwater contamination.

Groundwater flow

The proposed scheme design including drainage systems and the mitigation measures detailed in this chapter are considered to also mitigate the likely impacts on groundwater levels, flows and quality of the operational phase.

20.5 Mitigation Measures for Hydrology

Mitigation by avoidance

The design process is considered the best possible mitigation, in terms of avoiding impact to the hydrological environment. Mitigation by avoidance has been actively applied to the design as the Impact Assessment progressed. This includes avoiding the construction of new watercourse crossings, and with the exception of the new interchange, avoiding the lengthening of existing crossings, limiting the footprint of the upgraded road to within the existing landtake, and utilising the existing drainage outfalls to discharge road runoff from the proposed newly paved surfaces.

Watercourse quality

The principles of SuDS (Sustainable Drainage Systems) have been used throughout the scheme in order to improve the quality of runoff prior to discharge. In the verges where filter drains are used for road drainage, these will prevent the discharge of sediment and suspended solids from the road to the watercourse. In the median where linear drainage channels are used, the inspection chambers will contain silt traps to collect the sediment. A suitable maintenance programme will be developed at detailed design stage to ensure that satisfactory operation of the drainage is maintained.

Water quality improvement will be provided through the provision of oil and petrol interceptors; these interceptors will be Class 1 bypass oil and petrol separators designed to cater for 10% of the peak flow from a five year storm. A suitable maintenance programme will be developed at detailed design stage to ensure the satisfactory ongoing operation of the oil and petrol interceptors.

Each outfall is to be fitted with a shut off valve/penstock in order to facilitate the interception & isolation of any spillage before discharge to the downstream watercourse. Spillage containment will be occur in either the lined attenuation ponds or the sealed oversized pipes provided in advance of each outfall.

In addition to minimise the potential impacts on watercourse quality during construction measures for the containment of suspended solids on site will be required to be included in all method statements for construction.

An Environmental Operating Plan will be prepared by the contractor prior to construction. As a minimum this plan will include for the following:-

- The proposed works at the Newhall Interchange will incorporate the use of settlement ponds, silt traps and bunds to prevent silt laden runoff draining to the Ladytown Stream. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap. Management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and surrounding stockpiles with cut-off ditches to contain runoff. All land drains and streams that occur in areas of land that will be used for site compound/storage facilities will be fenced off at a minimum distance of 5m. In addition, measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse.
- Surface water flowing onto the construction area will be minimised through the provision of berms and diversion channels.
- All chemical and fuel fill points and hoses will be contained within bunded areas.
- Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent pollution of rivers and local watercourses in accordance with the relevant statutory regulations.
- Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with recognised standards as laid out by the EPA.
- Routine monitoring of water quality will be carried out upstream & downstream of the proposed works at the Ladytown Stream. Parameters to be monitored will include pH, Total Suspended Solids (TSS), BOD and COD. Monitoring of water quality in the stream downstream of the existing culvert will be undertaken for 1 month prior to construction commencing and acceptable water quality levels agreed with Inland Fisheries Ireland.
- Where concrete is to be placed under water it will be designed to provide a cohesive mix to limit segregation and washout of fine material. This will be achieved by having either a higher than normal fines content, a higher cement content or the use of chemical admixtures.
- Hydrophilic grout and quick-setting mixes or rapid hardener additives shall be used, to promote the early set of concrete surface exposed to water. When working in or near the surface water and the application in situ cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be considered.
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses. The following construction mitigation measures will be utilised to control concrete and cementitious material wash down water interaction with surface water.
- All batching and mixing activities will be located in areas well away from watercourses and drains.
- Surface water drainage around the batching plant will be controlled via the provision of perimeter bunding with runoff diverted to appropriate treatment facilities.
- There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials.
- Washout from mixing plant of concrete lorries will be carried out in a designated, contained impermeable area.

Watercourse flow

In addition to the SuDS measures outlined above, as described in Chapter 4, flow restricting devices will be provided upstream of the point of discharge to a receiving waterbody in order to restrict the outlet flows to existing runoff rates together with the provision of temporary storage of the surface water runoff. This storage or attenuation will be provided upstream of the flow restriction by oversizing the upstream pipe networks and utilising the storage capacity of the proposed filter drains.

The runoff from the section between J9 Maudlins and J8 Johnstown will continue to be discharged through the petrol interceptors and attenuation ponds that were constructed as part of the Naas Road Widening Scheme in 2006.

Flood Risk

The existing channel upstream of the culvert to be extended will be locally improved to ensure that the likely increase in afflux associated with the culvert extension is accommodated within the channel. In addition a stilling pond will be provided between the existing culvert outlet and the new culvert to be constructed under to the eastbound on-slip.

20.6 Mitigation Measures for Soils and Geology

The soil and geology assessment concludes that the impact on the underlying soils/bedrock is imperceptible and as such there are no specific mitigation measures required.

The Contractor shall develop and adhere to a Waste Management Plan. The Waste Management Plan shall set out the Contractor's proposals regarding the treatment, storage and recovery or disposal of waste.

Excavation of Materials

The excavation of materials on site may encounter contaminated soils and/or unsuitable soft ground. If encountered, this material will be excavated and disposed of off-site in accordance with Waste Management Regulations and the waste management plan at appropriately licensed waste facilities.

Importation of Materials

In order to minimise the importation of material on-site, any suitable material excavated from site will be utilised in the construction of the upgrade. This may not always be suitable as volumes of materials required are greater than available, in particular for the construction of the new interchange at J10 Newhall and as such materials will need to be imported on-site. Only clean, uncontaminated material will be used as fill material.

20.7 Mitigation Measures for Material Assets

Agricultural Property

This section describes the measures that when implemented will mitigate the adverse impact on agriculture. The assessment does not consider at this stage measures such as compensation for land acquisition and disturbance. The following general mitigation measures are proposed for the proposed scheme:

- Good communication between the contractor and adjacent landowners during the construction phase, especially when excessively loud activities are programmed, will prevent undue disturbance to farm animals due to noise. It will also facilitate farm enterprises so that valuable livestock sensitive to noise can be moved away from the construction work during critical times.
- Access will be restored to lands where it is removed or restricted by the proposed scheme. The location of such access will be at a suitable location and, where possible, with the agreement of the landowner.
- In general, permanent fencing along the proposed scheme will be timber post and rail fence with chain-link wire mesh in accordance with NRA Road Construction Details Drawing No. RCD/300/01. Permanent fencing of attenuation ponds will be 2.4m high chain link security fence. Where permanent fencing is erected on the boundary of the M7 motorway or associated attenuation ponds, it will be maintained by the Local Authority.
- For farm holdings with equestrian livestock, permanent fencing will be timber post and rail fence with chain-link wire mesh in accordance with NRA Road Construction Details Drawing No. RCD/300/02. Where permanent fencing is erected on the boundary of the M7 motorway or associated attenuation ponds, it will be maintained by the Local Authority.
- All existing land drains and watercourses severed by the proposed road will either be directed to a culvert under the proposed national road and / or associated side road realignments or will be incorporated into the new road drainage system. The new drainage system will be designed to ensure that the current drainage situation will not be made any worse and there will be no increased risk of flooding as a consequence of the proposed road scheme.
- Any services that are interfered with as a result of the road scheme will be repaired / replaced without unreasonable delay.
- Ducting for the restoration of water and power supply services will be provided, as necessary, at a suitable location with the agreement of the landowner.

Non Agricultural Property

This section describes the measures that when implemented will mitigate the adverse impact on property. The assessment does not consider at this stage measures such as compensation for land acquisition and disturbance. The following general mitigation measures are proposed for the M7 Naas to Newbridge By-pass Upgrade scheme:

- The replacement of boundary walls on non-agricultural properties will be on a like for like basis or better, subject to safety considerations, or will be treated as a compensation issue.
- Prior to construction and subject to written agreement of the relevant property owners, property condition surveys will be undertaken in relation to all buildings / structures in use located within 50 metres of the extents of the CPO boundary.
- Any services that are interfered with as a result of the road scheme will be repaired / replaced without unreasonable delay.

20.8 Mitigation Measures for Human Beings

Construction Phase

The construction of the motorway widening is proposed to be undertaken over 7 phases. Appropriate traffic management measures will be undertaken to ensure that

any adverse impact with respect to journey times and congestion is kept to a minimum. This will include the maintenance of two daytime traffic lanes in each direction throughout the construction phase. Lane closures will only be permitted at night between 10pm and 06.00am the following morning.

On the R445, during the construction of the new roundabouts, single lane traffic contraflow will be maintained in both directions. This form of traffic management on the R445 has been shown to be effective.

Temporary hoarding will be provided around the extents of the site in the vicinity of the two most south westerly properties located between the R445 and the motorway. This hoarding will be maintained until the construction of the new interchange, including the erection of the noise barriers and the landscape planting, has been completed.

Other mitigation measures for human beings are addressed in Sections 13.5 Noise and Vibration, Section 13.6 Air Quality and Climate and Section 13.10 Landscape and Visual.

Operational Phase

No additional operational phase mitigation measures are considered necessary.

20.9 Mitigation Measures for Archaeology, Architecture and Cultural Heritage

Archaeology

- Prior to construction going ahead, a programme of archaeological testing will be undertaken within the footprint of the proposed attenuation ponds and Newhall Interchange expansion. This work will be undertaken by a licence eligible archaeologist in consultation with the National Monuments Service of the DoAHG. Full provision will be made for the resolution of any archaeological features/deposits that may be discovered, should that be deemed the appropriate manner in which to proceed.
- Every effort will be made to avoid impacting on ringfort (RMP KD019-035) during the construction phase of the proposed development. The site will be cordoned off from construction traffic and if any of the existing planting is removed from the M7 corridor, this will be reinstated to prevent a permanent visual impact on the monument.

Architecture

- No recommendations in relation to specific architectural heritage sites are deemed necessary.

Cultural Heritage

- With the exception of the above mitigation measures, no further recommendations in relation to specific cultural heritage sites are deemed necessary.

20.10 Mitigation Measures for Landscape and Visual

M7 Widening

The proposed development would not have any impact on the existing embankments and vegetation outside of the grass verges except where it is proposed to install noise barriers.

The noise barriers proposed between residential houses and the development largely screens the changes to the view, however in areas where existing vegetation will be lost or disturbed, it is recommended to compensate for the loss with new planting (e.g. by planting new vegetation outside of the barrier). The following locations would benefit from site specific mitigation planting in combination with the proposed noise barriers:

Table 20.1: Locations associated with noise barriers which require mitigation planting

Visual Reference Point No.	Noise Assessment No.	Chainage (approx.)	Mitigation description
VRP2	R04	630 - 730	Installation of the noise barrier on the motorway-side of the existing hedgerow on the boundary, so that the hedgerow is retained, screening the barrier.
VRP4	R08, R09	1630 - 1900	Planting between the M9 noise barrier and the residential property boundaries, to soften the presence of the barrier.
VRP6	R11-15	2950 - 3500	Replacement planting of any hedgerow or trees/woodland lost as a result of the barrier, to be located outside of the barrier (on the house-side), i.e. screening the barrier from the houses.
VRP10	R25-30	6950-7350	Subject to the agreement of the owner/s of the adjacent fields, planting of a tree line on the field/house-side of the barrier. (Planting here would take further land from the fields, which would already have been reduced to accommodate the west-bound off-ramp to the new interchange.) Since the houses are separated from the motorway by the fields and by their garden boundary vegetation, only trees along the barrier, once matured, would have any direct visual effect.
VRP18	R43-46	11550-11650	The noise barrier should be located inside (motorway-side) of the existing hedgerow on the motorway corridor boundary, to soften its presence in views from the houses. If this requires moving the barrier down the embankment it could be made taller to achieve the required noise screening effect.
VRP21	R51	11900	The noise barrier should be located inside of the motorway corridor boundary, to preserve the hedgerow that exists along a section of the boundary. A new hedgerow should be planted outside (house-side) of the barrier along the section of the boundary where there is currently no hedgerow.

Two locations do not have noise barriers proposed in their vicinity but would benefit from mitigation planting for visual screening:

Table 20.2: Site Specific Mitigation Planting

Visual Reference Point No.	Noise Assessment No.	Chainage (approx.)	Mitigation description
VRP13	n/a	9550-9700	Supplementary planting to fill any gaps in the motorway boundary hedgerow would completely screen the development from view.
VRP17	R42	11200-11350	Supplementary planting on the wide embankment where a belt of woodland could be established and screening improved substantially.

Newhall Interchange

A landscape planting mitigation plan has been prepared for the proposed new Newhall Interchange (refer to **Figure 14.1, EIS Volume 3**).

The main objective of the mitigation plan is to visually screen the interchange from its receiving environment by enclosing and interspersing the interchange landscape with belts of native woodland vegetation (only native species should be planted, to maximise the ecosystem services of the planting as well providing screening). The woodland belts are bordered by strips of shrub planting on the road-side, to step down in height to the grass verges of the road/s.

The mitigation plan recommends the retention of as much existing vegetation in and around the interchange site as possible, including vegetation within the existing motorway corridor and the affected hedgerows and treelines dividing the adjacent agricultural fields.

Formal or feature planting is proposed only on the roundabouts and on the approach to the roundabouts on the R445 (in the form of avenues of trees), to indicate arrival at an urban location. The realigned Due Way, linking the industry/warehousing zoned lands south and east of the interchange to the Newhall Retail Park, is also given an urban style landscape treatment.

20.11 Mitigation Measures for Noise and Vibration

Operational Phase Noise Mitigation

The scheme will incorporate noise mitigation in the form of a low noise road surface as part of its standard construction. This will be applied along the length of the widened M7 road in addition to the slip roads of the new Newhall Interchange.

Additional mitigation measures which can be considered, therefore, include the use of road side barriers and or bunds or a combination of both. Consideration has therefore been given to noise barriers at locations where the assessment thresholds set out in Kildare Local Authorities NAP are predicted to be exceeded.

Table 20.3 presents the likely required extent of noise barriers assuming a low noise road surface is used along the full length of the widened section of the M7.

Table 20.3 Extent of Noise Mitigation Required

Receiver No.	Barrier Chainage	Side of Road	Barrier Height (m)	Location
R4	~ Ch 620 – Ch 730	North	2m	Top of Cutting
R8 & R9	~ Ch 1,600 - Ch 1,900	North	2.5m	Top of cutting above M9 slip road
	~ Ch 1,600 - Ch 1,900	North	2.5m	Top of embankment of M7 Northbound Lane
R11 – R15	~ Ch 2,770 - Ch 3,680	South	2.5m	Top of embankment/side of road
R25 & R28	~ Ch 7,000 - Ch 7,400	South	2m	Top of cutting
	M7 Southbound Off-Slip (Newhall Interchange)	South	2m	Edge of Road
R36	~ Ch 8,450 - Ch 8,830	South	2m	Edge of road/top of cutting
R44 – R46	~ Ch 11,450 - Ch 11,680	North	2m	Top of cutting
R50 – R51	~ Ch 11,700 - Ch 12,000	North	2.5m	Top of cutting

Construction Noise

The contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228-1 2009. These measures will typically include:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits outlined in BS 5228:2009 *Part 1* through a monitoring programme.
- Plant items such as breakers working in close proximity to residential properties (i.e. within 80m of residential properties) will incorporate additional noise screening measures.

Vibration

The noise and vibration assessment concluded that the proposed road scheme is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or even cosmetic damage. As such no specific mitigation measures are recommended.

The NRA Guidelines recommend that in order to ensure that there is no potential for vibration damage during construction, vibration from construction activities should not exceed the values set out in **Table 20.4**

Table 20.4 Maximum Allowable Vibration Levels During Construction Phase

Allowable vibration velocity (Peak Particle Velocity) at the closest part of any sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Ground vibration from the operation of an additional traffic lane will be orders of magnitude less than that required to cause cosmetic or structural damage to buildings or lead to disturbance of occupiers, hence mitigation measures are not required in respect of the operational phase.

20.12 Mitigation Measures for Air Quality and Climate

Construction Phase

In order to minimise dust emissions during construction, a series of mitigation measures have been prepared and will be included in the EOP for implementation during the construction phase of the project. A description of the EOP can be found in Chapter 4 of this EIS. These mitigation measures are listed in the NRA guidelines (NRA 2011) and consist of the following:

- Site roads will be regularly cleaned and maintained. Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic only. Any road that has the potential to give rise to fugitive dust will be regularly watered during dry and/or windy conditions;
- Vehicles using site roads will have their speeds restricted where there is a potential for dust nuisance at nearby properties;
- Where practicable, vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads. This will ensure that mud and other wastes are not tracked onto public roads. Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- The dust minimisation procedures put in place will be monitored and assessed by the contractor. In the event of dust nuisance occurring outside the site boundary, the effectiveness of existing measures will be reviewed and further mitigation will be implemented to rectify the problem.

Operational Phase - Air Quality

No project mitigation measures proposed. Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality.

20.13 Resource and Waste Management

In addition to the specific mitigation measures identified under each environmental discipline the Contractor, prior to any demolition, excavation or construction, will be obliged, as detailed in Chapter 4 of this EIS, to produce and adhere to a:

- Construction Management Plan;
- Environmental Operating Plan; and
- Waste Management Plan.