APPENDIX 5
Construction Erosion and Sediment Control Plan (CESCP)

Construction Erosion and Sediment Control Plan (CESCP)

1. INTRODUCTION

1.1. General

This document outlines the procedures and technical practices for implementing effective erosion and sediment control through a variety of delivery methods. The report provides an effective tool for reducing potential environmental effects by:

- Identifying erosion and sediment control objectives before construction;
- Encouraging planning to manage water, control erosion and control sediment by identifying potential impacts and mitigation measures;
- Providing a mechanism for clear communication to workers;
- Defining a performance expectation; and
- Assuring owners and regulators that due diligence has been exercised.

The purpose of a Construction Erosion and Sediment Control Plan (CESCP) is to:

- Minimise erosion potential by effective planning, procedures and water management;
- Apply erosion control measures to prevent the movement of sediment; and
- Apply sediment control measures to prevent off-site sediment release in the event of sediment movement.

This plan is intended to be a live working document and therefore the measures proposed herein may be added to or amended as the project progresses. This plan will form an integral part of the Environmental Operating Plan (EOP) for the proposed road development. In particular, the mitigation, control, monitoring and emergency measures for the proposed road development in relation to Erosion and Sediment Control are described in this document.

1.2. Description of the Proposed Road Development

Key Elements

The description of the proposed development has been divided into the sections outlined in Table 1.1 below.

Table 1.1 Proposed Development Sections

Section	Segment	Chainage
A	Section A of the proposed road development begins outside of Ballaghaderreen in the townland of Glebe East and terminates south of Frenchpark with a roundabout with the R361.	1,000 – 5,697
B	Section B of the proposed road development starts south of Frenchpark at the roundabout intersection with the R361 and continues east. Section B ends with roundabout intersection with the N61 in the townland of Gortnacrannagh.	10,000 – 24,200
C	Section C of the proposed road development starts with a roundabout intersection with the N61 and continues east towards the townland of Lavally where it ends in a roundabout intersection on the LP-1405 (link to the R368).	30,000 - 40,542

Section	Segment	Chainage
D	Section D of the proposed N5 alignment starts with a roundabout intersection of the LP-1405 (link to the R368), just north of Strokestown. The alignment finishes at a tie-in to the existing N5 in the townland of Scramoge.	50,000 – 53,970

The total length of the mainline is 33.4km of type 1 single carriageway.

1.3. Contract Procurement

The Contract Procurement is expected to be that of a Design/Build Contract. This type of contract places a responsibility on the appointed contractor to carry out the detailed design and to build the project and includes the requirement to comply with the obligations of the Environmental Impacts Assessment Report (EIAR), the Natura Impact Statement (NIS) and with the development consent for the proposed road development.

This CESCP sets out the minimum requirements that must be adhered to in terms of avoidance measures, minimisation measures, and protective measures for the water environment. Any alternative measures that may be incorporated at the construction stage will be required to provide at least the same, or, a better standard of protection.

1.4. Consultations

Consultation has taken place with the National Parks and Wildlife Services (NPWS) and the Inland Fisheries Ireland (IFI) and their comments/observations with regard to measures and controls for water quality protection have been adopted within the plan.

1.5. Scope and Methodology

The protection of lakes, watercourses, karst features and groundwater from pollution arising from construction works is achieved by avoidance in the first instance. Where potential impacts on lakes and watercourses cannot be avoided, the methodology seeks to implement appropriate mitigation during the construction phase to avoid adverse impacts and provide appropriate protection. This plan was completed and should be read with reference to the following documents:

- The European Water Framework Water Framework Directive (WFD) 2000/60/EC – European Communities (Water Policy) Regulations 2003 (SI 722 of 2003) (as amended).
- The Fisheries (Consolidation) Act 1959 (as amended).
- The Fisheries (Amendment) Act 1999 (No. 35 of 1999).
- E.C. (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293 of 1988).
- The Local Government (Planning and Development) Act 2000 (No. 30 of 2000).
- The Local Government (Water Pollution) Act 1977 (as amended), The Surface Water Regulations (S.I. No. 272 of 2009)
- The Wildlife Act (1976), as amended.
- Control of water pollution from construction sites. Guidance for consultants and contractors (C532) developed by the Construction Industry Research and Information Association (CIRIA, 2001).
- Control of Water Pollution from Linear Construction Projects. Technical Guidance (C648), (CIRIA, 2006).

- Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. (Eastern Regional Fisheries Board, 2003)
- Maintenance and protection of the Inland Fisheries resource during road construction and improvement works. (Southern Regional Fisheries Board, 2007)
- Guidelines for the crossing of watercourses during the construction of National Road Schemes. (National Roads Authority, 2008).
- Working at construction and demolition sites: PPG6 Pollution Prevention Guidelines (UK Environment Agency)

1.6. Principles of Erosion and Sediment Control

The principles of erosion and sediment control during the construction stage of a road project as outlined in CIRIA C648 include: -

- Erosion control (preventing runoff) is more effective than sediment control in preventing water pollution. Erosion control is less subject to failure from high rainfall, requires less maintenance and is also less costly.
- Plan erosion and sediment controls early in the project lifecycle and incorporate into the design and construction programme.
- Install drainage and runoff controls before starting site clearance and earthworks.
- Minimise the area of exposed ground.
- Prevent runoff entering the site from adjacent ground, as this creates additional polluted water.
- Provide appropriate control and containment measures on site.
- Monitor and maintain erosion and sediment controls throughout the project.
- Establish vegetation as soon as practical on all areas where soil has been exposed.

This CESCP sets out the minimum requirements that must be adhered to. Any alternative measures that may be incorporated at the construction stage will be required to provide at least the same, or, a better standard of protection to surface and groundwater bodies.

1.7. Contents of Plan

This plan contains the following information: -

(i) An identification of existing land use, surface water features, low-lying areas and natural drainage pathways;

(ii) An outline of the main construction activities likely to be relevant in relation to erosion and sediment generation;

(iii) Identification of the areas most likely to have the potential for runoff;

(iv) Collection of information on soil types, rainfall data, etc;

(v) Selection of the best controls to avoid and minimise runoff and erosion;

(vi) Ensure that control measures are correctly installed and sized - initial runoff controls to be in place before site works begin;

(vii) A description of the inspection and maintenance programme throughout construction to ensure the necessary controls are in place and operational.

(viii) Emergency Procedures.

2. SITE CHARACTERISTICS

2.1 General

The following gives a general overview of the landscape character and the main natural drainage pathways which are relevant in terms of erosion and sediment control.

2.2 Landscape Character

Section A

The landscape of Section A is typical of rural Ireland comprising of low lying agricultural farmland with sparsely located residential properties. Section A is notably low-lying and flat to gently-undulating; the proposed road closely follows the contours of the existing landscape with no major areas of cut or fill needed. In section A the proposed road development crosses through large areas of forestry particularly in the areas of Dungar and Turlaghnamaddy.

Section B

The landscape of section B includes a varied mix of rolling hills, large areas of agriculture farmland, forestry, bog and scrubland. Large sections of the proposed road development in Section B will require areas of cut and fill due to the undulating nature of the landscape. The alignment in Section B crosses the Carricknabraher River and the Owennaforeesha River. In addition the proposed road development also crosses an area of karst bedrock with surface karst features in the townland of Mantua.

Section C

The landscape in Section C is similar to that of Section B, as both are a varied mix of rolling hills, large areas of agriculture farmland, forestry and scrubland. The proposed road development within Section C will require large sections of cut and fill embankments due to the rolling hills in the area, most notably in the townlands of Cregga, Killeen East, Cuilrevagh and Lettreen. Section C crosses the Owenur River.

Section D

The proposed road development ties into the existing N5 in the townland of Scramoge. The landscape in Section D is a varied mix of rolling hills, areas of agriculture farmland and forestry. In Section D the proposed road development crosses the Strokestown River and the Scramoge River.

2.1 Natural Drainage Ways

The proposed road development crosses the following rivers and several small watercourses which are tributaries of these: -

- The Carricknabraher River;
- The Owennaforeesha River;
- The Owenur River;
- The Strokestown River; and,
- The Scramoge River.

Each of the watercourses listed above are within the EPA Hydrometric Area No. 26 (upper River Shannon section). Section A of the proposed road development does not cross any major rivers or watercourses.

Section B contains the Carricknabraher River, the Owennaforeesha River and the Mantua Stream all of which join the Breedoge River before outfalling into Lough Gara SPA on the Roscommon – Sligo border.

Section C of the proposed road development crosses the Owenur River.

Section D of the proposed road development crosses both the Strokestown and Scramoge Rivers. These rivers then merge north-east of Strokestown to form the Mountain River which then outflows into Kilglass Lough.

A map showing the locations of the catchments is given in Figure 10.13 contained within Volume 3 of the EIAR.

Following consultation with Inland Fisheries Ireland (IFI), the following major watercourses listed below have been identified as being considered Salmonoid or to have potential to be Salmonoid and consequently are treated as sensitive to pollution. In addition there is a requirement for angler access at these locations:

- Carricknabraher River;
- Owenaforeesha River; and
- Scramoge River

The ecological significance of these watercourses have been categorised as being of Local Importance Higher Value – refer to Chapter 7 – Biodiversity contained within Volume 2 of the EIAR for details.

3. POTENTIAL SOURCES OF RUNOFF

The following paragraph outlines what are considered to be the main potential sources of sediment and other water pollutants arising from the Construction Stage of the proposed road development.

3.1 Earthworks

The most significant area of concern regarding erosion and sediment control on any road construction project is the process where topsoil, subsoil and peat surfaces are exposed.

Typically these surfaces are exposed during: -

- The initial site clearance works/topsoil strip;
- Excavation of cuttings;
- Construction of fill slopes;
- Excavation and backfilling of soft spots underneath proposed embankments;
- The construction of borrow pits and material deposition areas;
- Transportation of soils, particularly saturated peat, within the bounds of the development either to material deposition areas or stockpile locations.
- The construction of spoil repositories;
- Construction of haul roads for earthworks operations;
- Stockpiling of acceptable and unacceptable earthworks material for reuse or removal offsite; and

- Stockpiling of road construction material (rockfill, capping and subbase etc.)

These sources of pollution have been identified through a detailed review of the project design.

3.2 Structures & Concrete

Concrete, grout and other cement-based products which would typically be used in the construction of structures are highly alkaline and corrosive and can have a devastating effect on water quality. Cement-based products generate very fine, highly alkaline silt (11.5 pH) that can physically damage fish by burning their skin and blocking their gills. This alkaline silt can also smother vegetation and the bed strata of watercourses and can indirectly mobilise pollutants such as heavy metals by changing the water's pH. Concrete and grout pollution is often highly visible.

Particular risks are posed to water quality when construction is taking place over or near surface water bodies (e.g. bridges or headwalls), through the potential for spillage of cement based compounds or hydrocarbons and physical disturbance giving rise to sediment release.

Cement and lime may also be used in soil improvement techniques and in soil stabilisation. These practices also have the potential for release to watercourses particularly through surface runoff of sediment laden waters.

3.3 Watercourse Crossings and In-stream Works

There are numerous minor watercourse crossings and stream diversions associated with this proposed road development. Diversion or maintenance of these channels has the potential to generate sediment through disturbance.

3.4 Construction Compounds & Machinery Re-fuelling/Lubrication

A number of temporary construction compound sites will be required along and / or in the vicinity of the proposed road development. These compounds will include (but will not be limited to): material stockpiles, loading and unloading areas, fuel stores, machinery stores, canteens and site offices and toilets. The location, size and suitability of the sites selected will be at the discretion of the contractor and will be subject to compliance with all relevant legislation. The following potential compound sites have been identified within the proposed development boundary (refer to Figures 2.1 – 2.26 in Volume 3 of the EIAR for details):

- Adjacent to the Frenchpark Roundabout at Ch. 5+600;
- Adjacent to the R369 between Ch. 17+200 and Ch. 17+600;
- Adjacent to the R368 between Ch. 34+750 and Ch. 35+000.

Particular considerations in relation to the location of such facilities and their generation of pollution during the construction stage include: -

- Sanitary Wastewater treatment;
- Hard-standing surface water runoff;
- Potential for hydrocarbon pollution to groundwater and surface water;
- Avoidance of flood risk areas;
- Set back distances from sensitive watercourses and ecological receptors.

In addition to the construction compound sites discussed above, the construction of the proposed development will require rock processing areas with crushing facilities

and material stockpiles at various locations along the proposed alignment. The location of these facilities will vary as the construction works progress. Rock processing areas will be located in areas of deep cuttings typically at the base of the cutting or in a specified area within the cutting itself. Cuttings through overburden may also require soil processing facilities. Material (soil) improvement areas may be required in order enhance poor strength or non-cohesive material allowing reuse within the works. These material improvement areas would likely be located in a designated area either, within or adjacent to, the cutting location. The significant cuttings included with the proposed development are summarised in Table 3.1 below.

Table 3.1 Significant Cuttings Proposed Along the Road Alignment

Chainage (m)	Location	Max Depth of Cut (m BGL)	Soil type / Stratum
13+000 -13+800	Ballaghcullia	10.9	Glacial Till / Sandstone
18+800 – 20+600	Kilvoy & Corry East	6.6	Glacial Till / Limestone
22+000 - 22+600	Cartronagor	4.2	Glacial Till
23+250 – 30+450	Gortnacrannagh	8.6	Glacial Till / Limestone
30+000 - 30+500	Gortnacrannagh	7.8	Glacial Till / Limestone
32+100 – 33+100	Killen East	13.0	Glacial Till
35+600 – 36+450	Cregga	27.0	Glacial Till / Limestone
36+850 – 37+600	Cuilrevagh	14.5	Glacial Till / Limestone
39+650 – 40+050	Lettreen & Corskeagh	4.7	Glacial Till
50+000 – 50+650	Lavally	7	Glacial Till
52+450 – 52+700	Scramoge	5	Glacial Till

Both rock and overburden cuttings/processing areas will generally include a material stockpile where either rock or overburden material is stored before being hauled to areas of fill along the scheme. These stockpiles and material/rock processing areas both have the potential to produce sediment which could be mobilised during periods of heavy rainfall.

In addition, it is envisaged that topsoil and/or acceptable material will be stockpiled during the course of the proposed road development. Stockpiles of granular material containing a high proportion of fines presents a risk for mobilisation of sediment laden water during periods of heavy rainfall.

4. WATERBODIES & GROUNDWATER RECEPTORS

The main waterbodies which could potentially be impacted by sediment are generally considered to be those relating to aquatic ecology (including adjacent wetlands) and fisheries. Other smaller local watercourses have the capacity to function as a conduit to more sensitive areas/watercourses further downstream. A summary of each of the main watercourse along the proposed road development is given in Table 4.1 below.

Table 4.1 Summary of Watercourses Adjacent to the Proposed Development

Waterbody	Description
Unnamed minor watercourse located in the townland of Rathkerry at Ch.1+200. (Local Importance Lower Value)	– Local minor watercourse – This watercourse has limited fishery potential with the downstream receptor being the River Lung.
Carricknabraher River (Local Importance Higher Vlaue)	– The Carricknabraher River has been assigned a value of Local Importance (Higher Value) by the project ecologist – This river has the capacity to function as a conduit to more sensitive areas downstream. – The river is not designated as being Salmonid at the proposed crossing but has been identified as having Salmonid potential. – No significant habitat for Otter, Kingfisher, Lamprey, Crayfish or Salmon was recorded during ecological surveys at the crossing points but the potential for these species to use the watercourses was acknowledged with suitable habitat located in the wider area.
Unnammed stream - located in the townland of Mullen at Ch.12+705. (Local Importance Lower Value)	– Local minor watercourse – This watercourse has limited fishery potential with the downstream receptor being the Carricknabraher River.
Owennaforeesha River (Local Importance Higher Vlaue)	– The Owennaforeesha River has been assigned a value of Local Importance (Higher Value) by the project ecologist – This river has the capacity to function as a conduit to more sensitive areas downstream. – The river is not designated as being Salmonid at the proposed crossing but has been identified as having Salmonid potential. – No significant habitat for Otter, Kingfisher, Lamprey, Crayfish or Salmon was recorded during ecological surveys at the crossing points but the potential for these species to use the watercourses was acknowledged with suitable habitat located in the wider area.
Unnammed minor stream in the townland of Drummin at Ch.14+632. (Local Importance Lower Value)	– Local minor watercourse – This watercourse has limited fishery potential with the downstream receptor being the Owennaforeesha River.
Mantua Stream at Ch.21+325. (Local Importance Lower Value)	– Local minor watercourse – This watercourse has limited fishery potential with the downstream receptor being the Breedoge River.
Unnammed minor watercourse in the townland of Mantua at Ch.23+200. (Local Importance Lower Value)	– Local minor watercourse – This watercourse has limited fishery potential and discharges to the Mantua stream with the downstream receptor being the Breedoge River.
Owenur River (Local Importance Higher Value)	– The Upper Owenur River is a modified channel which has been subject to significant drainage works. – The River is classified as Local Importance (higher value) on the basis of supporting semi natural habitat types

Waterbody	Description
Clooncullan Lough (Local Importance Higher Value)	– Lough Clooncullaan, is surrounded by wetland habitats including Rich Fen and Reed Swamp (refer to ecological habitat mapping Figures 7.27 – 7.51 – EIAR Volume 3). – The Lough itself has been classified as Local Importance (higher value) – The Ovaun stream discharges to Clooncullan Lough. – Clooncullan Lough discharges to the Owenur River downstream.
Ovaun Stream at Ch.34+750. (Local Importance Lower Value)	– The Ovaun stream is a modified channel which has been subject to significant drainage works. – This watercourse has limited fishery potential. It discharges to Clooncullan Lough which in-turn discharges to the Owenur River.
Strokestown River (Local Importance Higher Vlaue)	– The Strokestown River is a highly modified channel which has been the subject to extensive drainage works. – The River is classified as Local Importance (higher value) on the basis of supporting semi natural habitat types – This watercourse has limited fishery potential with the downstream receptor being the Mountain River.
Scramoge River (Local Importance Higher Vlaue)	– The Scramoge River, its tributary and surrounding lands were assigned Local Importance (higher value) on the basis of supporting semi natural habitat types with high biodiversity and high degree of naturalness and habitat connectivity throughout the wider area. – The river is not designated as being Salmonid at the proposed crossing but has been identified as having Salmonid potential. – No significant habitat for Otter, Kingfisher, Lamprey, Crayfish or Salmon was recorded during ecological surveys at the crossing points but the potential for these species to use the watercourses was acknowledged with suitable habitat located in the wider area.

The route of the proposed development alignment passes through areas of karstified bedrock with surface features present such as swallow holes, springs, a turlough and numerous enclosed depressions. Exposed bedrock is also present in a number of locations. Given that these features provide a direct connection to groundwater and that the underlying aquifer is classified as a Regionally Important Groundwater Resource, protection from construction sediment and other water pollutants is required. The main features which require protection during the construction stage are summarised in Table 4.2 below.

Table 4.2 Summary of Groundwater Receptors Adjacent to the Proposed Development

Groundwater Feature	Description
Leggatinty Swallow Hole & Cave	– There are 2 No. swallow hole features and a cave located at Leggatinity. – A local stream enters the cave at Legatinity and reappears at Cloonshanville Spring to the north. – A number of enclosed depressions are also located at this location. – The proposed alignment passes within c.200m of these features.

Groundwater Feature	Description
Polloweneen (Mantua) Swallow Hole Features	– There are 4 No. swallow hole features located immediately adjacent to the proposed alignment. – A number of enclosed depressions are also located at this location. – Polloweneen swallow hole has been shown to be connected underground to the Polecat Groundwater Supply Scheme springs. – Swallow holes also shown to be connected to Tobernacuilly spring. – One of these swallow hole feature will be excavated and filled with drainage stone during the construction stage.
Polecat Springs Groundwater Supply	– The Polecat Springs groundwater supply is a spring which is located in the townland of Lissavilla c.3km north-east of Elphin. – The proposed development is inside the Zone of Contribution (ZOC) for this supply between Ch. 17+500 and 34+000 – see Figure 9.7 EIAR Volume 3. The ZOC boundary has been recently redelineated due to tracer studies carried out as part of this scheme. The area of the ZOC through which the proposed development passes is mapped as being connected to the supply based solely on karst underground connections.
Peak-Mantua Groundwater Supply	– The Peak-Mantua groundwater supply scheme is a spring which is located in the townland of Peak c.2.5km east of Bellanagare. – The northern boundary of the ZOC) for this supply extends directly along the perimeter of the proposed alignment over a length of c.1.5km between Ch. 15+500 and 17+000 – see Figure 9.7 EIAR Volume 3.
Lugboy Swallow Hole	– This swallow hole feature is located c.250m south of the proposed alignment. – The Ovaun stream discharges into this swallow hole c.770m downstream of a proposed road drainage outfall. This outfall will be constructed in advance of the main construction works to facilitate the disposal of storm water runoff. – This swallow hole feature is connected to a spring(s) which feeds the Owenur River in the vicinity of Drummullin east of Elphin.
Cregga Turlough	– A Turlough is located at Cregga and a number of karst features are also recorded in the area. – The Turlough is surrounded by steep hillslopes to the east and therefore receives a large portion of overland runoff. – Bedrock is at or close to the ground surface across the area enclosed by the Turlough and in the surrounding hillslopes.

5. EARTHWORKS

5.1 Earthworks

Existing Environment

Solid Geology

There are three main rock units identified along the proposed road development: -

- Visean Limestone Formation;
- Ballymore Limestone Formation; and
- Fearnaght/Boyle Sandstones.

The majority of the proposed road development is underlain by limestone noted to be karstified. This karstification has impacts on surface and groundwater quality due to the presence of preferential flowpaths to sensitive water bodies which allow rapid conveyance within the aquifer system.

Subsoils

Fine grained glacial till is the predominant soil type present along the proposed road development. Isolated pockets of made ground and lacustrine deposits (Marl) were also encountered. A number of areas of alluvium and peat deposits were encountered along the length of the proposed road development. Areas of soft, highly compressible or organic soil will not be suitable as road foundations. Along many areas of the proposed road development, the subsoils encountered generally have a high silt content with low permeability and therefore are potentially easily mobilised by rain/runoff waters when exposed.

Unacceptable Material

Areas of soft and/or compressible or organic soil will require an engineered solution to provide suitable footing for road foundations. In these areas ground improvement measures will be required in line with the design criteria to be stated in the Works Requirements. The method of ground improvement will be dependent on the work programme of the appointed contractor and his preferred method of work. The final solution will be specific to the construction programme, and the available time for completion or phasing of the works.

Typical methods adopted may consist of one of more of the following solutions:

- Excavate and Replacement;
- Surcharging;
- Vertical Drainage Measures;
- Basal Reinforced Earthworks;
- Staged Construction Techniques;
- Limiting Rates of Construction; and
- Pile Supported Embankment.

The total volume of peat, alluvium and lacustrine deposits to be excavated would be approximately 940,000m^3 (full excavate and replace). This material will be deposited in material deposition areas whereby the material will be placed in specially designed areas which will allow settlement and drainage to occur and with natural re-vegetation taking place over time. The excavation and removal to material deposition areas presents risks to adjacent waterbodies from potential sedimentation and nutrient enrichment from potential organic material within the peat sediment.

Imported Material

There will be a requirement to import construction materials and concrete. There are a number of quarries in the vicinity of the proposed road development which may be utilised in the sourcing of this material. Only those quarries that are authorised will be used in the construction phase. The assessment of the earthworks quantities including the reusability of the materials indicate that there will be a deficit of acceptable material over the entire project if the option of full excavation and replacement is adopted.

Soil Improvements

A soil improvement programme may be adopted by the contractor in order to reduce the volume of unacceptable material and allow reuse of marginal material along the proposed road development. Soil improvement (the process of improvement) involves the treatment of soils with various binder applications to improve their properties and allow their reuse for various applications of the construction. An example of soil improvement would involve waterlogged clay being treated to fulfil roles on site such as bulkfill or use within embankments or landscaping measures. The advantage of soil improvement is that material which would otherwise be disposed of can now be reused lessening the need for material deposit areas and/or export of material from the proposed road development.

A typical form of soil improvement involves the use of plant to apply binders such as lime or cement to the poor quality soil material with mixers then utilised to incorporate these products into the parent material and a crusher to process the material ready for treatment. Typically a spreader applies the binding agent (lime/cement) to the material in-situ. The material can also be excavated and moved to a more appropriate location before the binder is applied. A mixing drum or mechanical cultivator is then used to pulverise the binding agent into the material. The material is then allowed to cure before being transported to its required location on the proposed development where it is placed and compacted in accordance with the TII Specification for Road Works.

The use of lime/cement binders during soil improvement presents risks to adjacent waterbodies and/or karst features. Specific construction management measures for soil improvement processes (should they be utilised) are described in Section 7 of this plan.

Quarrying and Rock Processing

The processing of rock from cuttings for reuse within the proposed road development will require rock crushing and processing facilities. The exact locations of rock processing facilities will be determined by the appointed contractor; however it is likely that this activity will occur within the road cutting footprint itself. These activities have the potential to create high quantities of sediment laden runoff given the hardstanding nature of the rock cut face. The main watercourses at risk are therefore those adjacent to the likely location of these rock processing facilities which are:

- The Ovaun Stream located some 250m south of a deep cutting at Lugboy – this watercourse then flows into Clooncullaan Lough and the Owenur River.
- Cregga Turlough which is located adjacent to the deep cutting at Cregga.

Specific construction management mitigation for these areas is outlined in Section 7 of this plan.

Haul Routes

The main construction activities will consist predominantly of earthworks operations and subsequent road pavement construction. The earthworks will involve the excavation and placement of materials (with possibility for blasting in rock cuttings) for the construction of cuttings and embankments as well as the hauling of materials and importation of materials to complete the road formation and sub-formation. The main materials that will be hauled to, from and within the site in bulk are:

- Earthworks, including topsoil, general cut and fill material, rock and capping materials;

- Pavement Materials, including granular sub-base material and bituminous pavement materials;
- Concrete, both in-situ and precast units such as concrete bridge beams, pipes, culverts and headwalls;
- Other materials will be required including fencing material, plants, ducting etc.

To construct the earthworks, materials will need to be hauled between different sections of the development. In general, materials will be hauled along the route of the proposed road, thus limiting the need to use the public road network. The use of this haul route along the alignment will also present potential for sediment and/or organic material (within the peat) to enter watercourses at crossing points.

6. EROSION AND SEDIMENT CONTROLS

6.1 General

The principal objectives in relation to erosion and sediment control during the earthworks operation will be: -

- To keep the exposed surface area to an absolute minimum;
- To minimise the amount of runoff from the site;
- To organise the work so that it progresses from the low point towards the high point within each outfall catchment;
- To have an efficient earthworks operation to ensure that fill is placed as material is removed; and
- To ensure that the unacceptable material is removed and placed in controlled material deposition areas in an efficient manner.

6.2 Principal Avoidance Measures

The protection of watercourses from pollution by construction works is achieved through avoidance in the first instance. In this regard, the following measures will be implemented during the construction phase: -

(i) Site clearance involving topsoil stripping will progress along with the earthworks and will not be carried out over large areas in advance of the earthworks;

(ii) It is estimated that a maximum of 940,000m^3 of peat, silt and alluvium will be excavated as part of the proposed road development. The excavated peat, silt and alluvium soil will be deposited in material deposition areas. These material deposition areas have been specifically designed to avoid sediment entering adjacent watercourses and minimise water quality impacts on waterbodies

(iii) Bridge and watercourse crossing construction will involve clear span bridge structures over the Carricknabraher, Owennaforeesha, Owenur and Scramoge Rivers and a box culvert over the Strokestown River in order to avoid significant and lengthy works adjacent to major watercourses.

6.3 Principal Control Measures

6.3.1 General

This section outlines the principal mitigation and protection measures that will be prescribed for the construction phase in order to protect all the catchments, watercourses and ecologically designated areas. Specific measures are described in Section 7. General control measures will include: -

- There will be maintenance of good site management at all times and all site personnel will be made aware of the importance of the freshwater environment and the requirement to avoid pollution of all types, throughout all stages of the construction phase.
- Surface water flowing onto the construction area will be minimised through the advance construction of cut-off ditches – see Plate 6.1 below.
- All soiled construction runoff water will be passed through sedimentation ponds prior to outfall to the receiving watercourse. These sedimentation ponds may be a combination of temporary settlement ponds and permanent attenuation ponds for the road drainage during the construction phase – see Section 7.1 for details on runoff calculations and sizing of temporary sedimentation ponds.
- The storage of oils, fuel, chemicals and hydraulic fluids will be in secure areas within the site compounds and will not occur within a minimum of 10m from watercourses.
- Storage tanks shall have secondary containment provided by means of an above ground bund to capture any oil leakage. Storage tanks and associated provision, including bunds, will conform to the current best practice for oil storage and will be undertaken in accordance with *Best Practice Guide BPGCS005 – Oil Storage Guidelines* (Enterprise Ireland).
- 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 to the TII/NRA document "Guidelines for the crossing of watercourses during the construction of National Road Schemes". All chemical and fuel filling locations will be protected from potential spillages through the provision of appropriate protection measures including bunded areas and double skinned bowser units with spill kits.
- Compounds/storage facilities will be located at least 10m away from sensitive watercourses. 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. Compounds shall not be constructed in lands at risk of flooding.
- Foul drainage from all site offices and construction facilities will be taken off-site and disposed of by a licensed contractor, in accordance with legislation to prevent pollution of rivers and local water supply.
- Management of construction material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This will involve the construction of collector ditches surrounding material stockpiles to contain runoff and direct it to the settlement ponds (either operational or temporary depending on the construction sequence) before discharge to an adjacent watercourse. In addition the establishment of vegetation on the exposed soil adjacent to material stockpiles may also be used to slow down and treat (through settlement) runoff waters. Typical examples of where silt fences would be employed adjacent to stockpiled materials is indicated in Plate 6.1 below.
- Where construction works are carried out alongside stream and river channels, protection of such rivers from silt load will be carried out. This will be through the use of retaining a grassed buffer zone, the provision of silt fences or compacted earthen berms so as to prevent direct runoff of waters from the construction site to watercourses.
- Where road drainage outfalls are to be located, the vegetation at these sites will be stripped immediately prior to the construction of the outfall and a

Hessian or equivalent material pinned over all exposed soil following completion. This will be re-seeded using native species of grass only.

- Where required, the pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc for outfalls, bridges and culverts will be completed in the dry and allowed cure for 48 hours before re-flooding in order to avoid pollution of watercourses.

Plate 6.1 Typical Silt Fence Usage

- Use of settlement ponds, silt traps and bunds and minimising construction within watercourses. Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap. An example of a typical temporary settlement pond/lagoon is presented In Plate 6.2 below.
- Riparian vegetation will be fenced off to provide a 5m buffer zone for its protection. Construction works at crossings will result in the loss of riparian vegetation, however these works will be minimised so as to result in the least amount of disturbance and loss being incurred.
- Any surface water abstracted from a river for use during construction (e.g. overpumping of a drain) shall be through a pump fitted with a filter to prevent intake of fish.

Plate 6.2 Typical Temporary Settlement Pond/Lagoon

- The use and management of concrete in or close to watercourses will be carefully controlled to avoid spillage which as stated earlier has a deleterious effect on water chemistry and aquatic habitats and species. Alternate construction methods are encouraged for example, use of pre-cast concrete or permanent formwork will reduce the amount of in-situ concreting required. Where on-site batching is proposed by the contractor, this activity will be carried away from watercourses (minimum 10m). Washout from such mixing plant and also from concrete delivery trucks will be carried out only in a designated contained impermeable area. A typical washout facility is indicated in Plate 6.3 below.

Plate 6.3 Typical Washout Facility

- Material deposition areas will be initially enclosed within double silt fences, as shown in Plate 6.4, and settlement ponds will be initially constructed at the drainage outfalls of these sites. Where required, an access road will then be constructed within the deposition area.
- Wheel wash facilities will be installed at the exit from each material deposition area. All construction vehicles leaving the material deposition areas will be required to pass through these facilities.
- Temporary sedimentation ponds will be provided within these areas at appropriate locations which will be influenced by the compartmentalisation sequencing. These ponds will provide treatment for sediment runoff prior to discharge to adjacent watercourses.

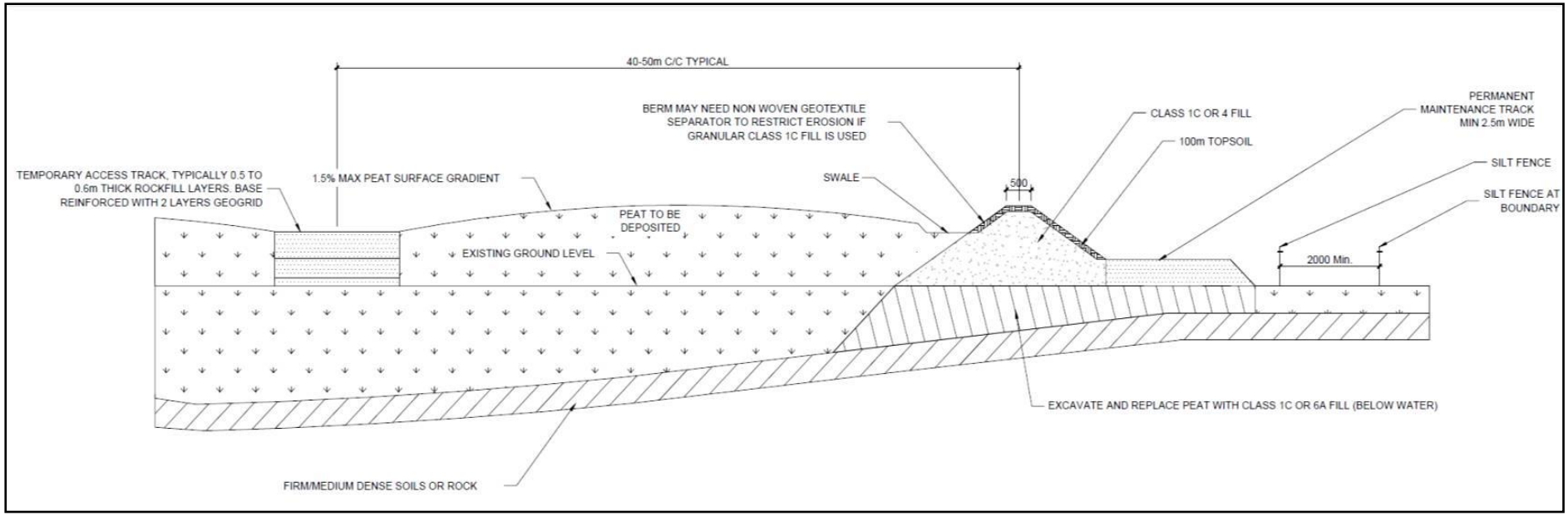

Plate 6.4 Typical Detail for Material Deposition Area

7. SPECIFIC MITIGATION MEASURES

7.1 Watercourse Crossings and Attenuation Ponds

A summary of each watercourse that is either crossed by or in close proximity to the proposed road development is given in Table 7.1 below. Specific mitigation measures proposed for each of these locations to mitigate risks to water quality have been summarised under a number of headings below. In addition, Figures 1 – 15 in Appendix A10.2 outline specific mitigation measures at each location. A list of construction requirements at each of the major river crossings is also provided below.

Table 7.1 Summary of Watercourses Potentially Impacted by the Proposed Road Development

Waterbody Name	Townland	Chainage	Summary of Adjacent Works
Unnamed Stream	Rathkerry	1+200	Watercourse Crossing Attenuation Pond
Carricknabraher River	Mullen	10+135	Watercourse Crossing Attenuation Pond Material Deposition Area
Unnammed Stream - Tributary of the Carricknabraher River	Mullen	12+705	Watercourse Crossing Attenuation Pond
Owennaforeesha River	Drummin	14+522	Watercourse Crossing Attenuation Pond
Unnammed Stream - Tributary of the Owennaforeesha River	Drummin	14+632	Watercourse Crossing Attenuation Pond
Mantua Stream	Mantua	21+325	Watercourse Crossing Material Deposition Area
Unnammed - Tributary of the Mantua Stream	Mantua	23+200	Watercourse Crossing Attenuation Pond Material Deposition Area
Owenur River	Tullycarton	30+720	Watercourse Crossing Attenuation Pond
Clooncullan Lough	Clooncullan	33+000 – 35+000	Located c.210m south of the road scheme. Attenuation Pond
Ovaun Stream	Clooncullan	34+750	Located c.215m south of the road scheme. Attenuation Pond
Strokestown River	Vesnoy	51+150	Watercourse Crossing Attenuation Pond
Scramoge River	Scramoge	52+825	Watercourse Crossing Attenuation Pond

Watercourse Crossing Locations

In order to provide protection during construction to each of the watercourses listed in Table 7.1 above, specific construction sequencing and drainage requirements are proposed.

The work area in the vicinity of each watercourse will be cordoned off prior to any construction activities commencing on site. The provision of double silt fences along the cordoned work areas will be employed to contain any potential silt or sediment runoff. Where multiple crossings are proposed due to parallel access tracks adjacent to the mainline, a double silt fence will be provided between the two crossing points to protect from potential sediment runoff at each location.

Stockpiling, temporary or otherwise, of construction material or topsoil will be prohibited within 10m of watercourses in order to minimise sources of sediment runoff. In addition site compounds shall not be located within 5m of any watercourse. Fuel storage, temporary or otherwise, shall be permitted only within site compound areas and not within 10m of a watercourse at these locations.

To avoid any risk of impacting on sensitive fishery watercourses during construction, all instream works to the mainline channel of the following major watercourses will only be permitted between the period of the 1st May and the 31st September: the Carricknabraher, Owennaforeesha and Scramoge Rivers.

Temporary Sedimentation Basins

In order to limit the potential for pollution due to runoff from construction, runoff waters will be directed through a sedimentation pond prior to discharge. In this regard, save as set out below, the operational (permanent) road drainage attenuation ponds together with the associated outfalls to the receiving watercourse, will be constructed in advance of the main construction works.

The purpose of a temporary sedimentation basin is to provide an area where sediment laden runoff is allowed to pond, so that the suspended sediment will settle out.

At specific locations (e.g. during the advancement of deep rock cuttings at Lugboy and Cregga), it may be necessary to first establish temporary sedimentation basins in areas where it is not possible to construct the operational attenuation ponds in advance of the construction works, or where it will not be possible to outfall to an attenuation pond due to the nature of the works or topology. These temporary ponds will be contained within an earthen bund and will be lined to prevent infiltration in areas of high or extreme vulnerability.

In order to ensure that temporary sedimentation ponds are sized correctly, the design parameters to be followed for these ponds is detailed below. Runoff from the exposed surfaces has shall be calculated using the Modified Rational Method and applying extreme rainfall information obtained from Met Eireann and specific to the area. The ponds shall be designed to accommodate a depth of rainfall constituting to a 1 in 10 year (14 hour) flood event at 1m depth. Contingency measures should be in place to release water via a spillway or similar in the event of a more serious rainfall event.

Modified Rational Formula: $Q = C \times i \times A$

Where: Q = the peak discharge (m^3/hour);

C = Coefficient of permeability (conservatively assume 0.6 for a stripped construction site)

i = rainfall intensity (m/hour); *The depth of rainfall constituting to a 1 in 10 year (14 hour) flood event at 1m depth*

A = the contributing area (m^2);

The design of temporary sedimentation ponds shall be carried out as in accordance with Ciria Document C532 "*Control of Water Pollution from Construction Sites"* (Ciria, 2001) and Ciria Document C648 "*Control of water pollution from linear construction projects*" (Ciria C648, 2006).

Each temporary pond shall be subject to detailed design by the contractor. Permanent attenuation ponds which are constructed in advance of the main earth works to be utilised during the construction stage shall be sized in accordance with the detailed drainage design to cater for the 1 in 100 year flood event. During the construction stage accumulated sediment will be removed on a periodic basis.

On completion of the road construction works, permanent ponds utilised during the construction stage shall be cleaned of any remaining silt and debris and all necessary works undertaken to establish the required vegetation for the long term operation of the pond.

Construction Sequencing

The construction sequencing will take place in a manner which will mitigate potential impacts upon the receiving waters. A double layer of silt fences along identified work areas adjacent to watercourses (as shown in Figures 1 – 15 in Appendix A10.2) will be provided in advance of works commencing on site to contain silt and sediment runoff. Pre-earthwork ditches will then be provided in order to collect surface runoff during the start of construction. On completion of the earthworks the drainage along this section will be established as soon as is practicable.

Once the permanent road drainage has been installed, it will outfall to one of the proposed attenuation pond locations. During the construction stage temporary drainage measures will be employed to connect this drainage to the attenuation ponds where required, or in certain instances to a temporary settlement pond. This will prevent surface water runoff outfalling untreated to existing watercourses.

Construction Requirements at Sensitive Watercourses

The following are specific construction requirements to reduce potential contamination impacts on the Carricknabraher, Owennaforeesha and Scramoge Rivers.

- Instream works will only be permitted between the period of the 1st May and the 31st September.
- Pre-construction water quality monitoring shall take place in the receiving watercourses to establish baseline conditions at the locations indicated on Figures 10.2 – 10.6 in Volume 3 of this EIAR.
- A water quality monitoring programme (see Section 8.2 for details) will be undertaken at suitable locations in the receiving watercourse during the construction phase.
- A 10m offset adjacent to the watercourses listed above, will be demarcated at the outset of works with double silt fences put in place. Site drainage will be directed through a settlement facility prior to discharge. Temporary facilities to trap and contain any accidental spillage shall also be provided.
- Topsoil stripping in proximity to each of the above named rivers will be undertaken as much as feasible in dry weather conditions and all stockpiles will be located as far away as practicable from the river but in any event no closer than 10m.

- The storage of oils, fuel, chemicals, hydraulic fluids, shall only take place within site compounds and will be located at a minimum distance of 10m from any watercourse. Storage shall be undertaken in accordance with current best practice for oil storage (See Section 6 for details).
- All machinery operating in these locations will cleaned in advance of works and routinely checked to ensure no leakage of oils or lubricants occurs. All fuelling of machinery will be undertaken at a minimum set-back of 10m from each river.

Soil Improvements

Soil improvement activities, if utilised by the contractor, would involve lime/cement binder being spread over the ground surface and mechanically mixed with curing then taking place leading to a subsequent improvement in the quality of the material. The spreading of the binding agent (lime/cement) has the potential to impact on water quality in adjacent watercourses either though direct runoff during periods of rainfall or from airborne propagation of the binder. In addition to the measures outlined in this document, the contractor shall implement environmental measures as outlined in UK DMRB HA 74/07 "Section 6 – Environmental Considerations" The following are specific construction requirements to reduce potential contamination impacts from soil improvement activities:

- Soil improvement works shall only be carried out in calm, clear and dry metrological conditions. Lime/cement application shall not be exposed to wind and where any risk occurs will be misted/sprayed down immediately. Other handling systems shall be carried out with regard to the mitigation measures set out in Chapter 13 (Air Quality and Climate) in Volume 2 of this EIAR;
- Soil improvement works shall not take place within 25m of any of the minor watercourses as listed in Table 4.1;
- Soil improvement works shall not take place within 100m of any of the major watercourses as listed in Table 4.1 or within 100mm of Clooncullaan Lough;
- Soil improvement works shall not take place within 100m of the Polloweneen Swallow Hole features or within 100m of the boundary of Cregga Turlough. The boundary of Cregga Turlough KER is identified in the ecological habitat mapping – Figures 7.27 – 7.51 in EIAR Volume 3. The Polloweneern Swallow Hole features are indentified in Figure 10 in Appendix A10.2 of this document.

7.2 Polloweneen (Mantua) Swallow Hole Features

In the townland of Mantua between Ch. 18+300 and Ch. 19+500 there are multiple swallow holes both north and south of the proposed road development. Such features provide direct access for pollution to enter the groundwater system, therefore it will be necessary to protect such features from untreated construction surface water runoff. In addition, at least one of these swallow holes is connected directly to the Polecat Groundwater Supply Scheme which serves Elphin and its surrounds.

A double silt fence will be constructed along the site boundary so as to intercept and minimise the potential direct runoff from the works area to the adjacent swallow holes and watercourses. Cut-off ditches will be provided to collect construction runoff; which will then pass through a temporary settlement pond before out-falling into the nearest watercourse – refer to Plate A1.8 for details.

The swallow hole at Ch. 19+045 is located in the centre of the proposed road alignment. During the construction phase this swallow hole will be excavated to bedrock and backfilled with a permeable coarse grained stone (Class 6A or 6C

material or similar) placed and wrapped in a geotextile membrane. Prior to this treatment the area around the swallow hole will be fenced off with a double silt fence in order to provide protection and minimise potential construction runoff.

Due to the presence of swallow holes in this area, management of construction material stockpiles is of the highest importance. Soiled runoff from stockpiles shall be managed by controlling and diverting such runoff to a sedimentation pond prior to discharge. No direct discharge from the works will be permitted to the swallow holes at this location.

Topsoil stripping in proximity to the swallow hole features at this location will be undertaken as much as feasible in dry weather conditions. All stockpiles will be located no closer than 10m to any of these swallow hole features.

7.3 Cregga Turlough

Cregga Turlough is located approximately 3.2km to the north-west of Strokestown in the townland of Cuilrevagh. Cregga Turlough is situated in a depression with a rounded ridge of hills along the eastern side and relatively high land to the west except at the central point where the contours lead to Annaghmore Lough, less than 1km away. The proposed road development runs north and north-east of Cregga Turlough between Ch. 36+600 and Ch. 37+950. The land acquisition boundary ranges between 116m and 291m from the boundary of the turlough and is 116m from the turlough at its closes point at Chainage Ch.36+725. Due to the undulating nature of the landscape at this location, sections of the proposed road development require significant earthworks as it passes in the vicinity of the Turlough including large cuttings between Ch. 35+150 to Ch. 36+450 (Cut 1) and Ch. 36+900 to Ch. 37+650 (Cut 2).

The Turlough receives surface runoff from surrounding areas and discharges directly to groundwater through its base. It is therefore imperative that silt and sediment laden waters running off the construction works are controlled through interception and settlement prior to discharge.

The water balance to the Turlough during construction must be maintained and therefore cut-off drains shall be provided to direct waters away from the construction site and to the Turlough – see Plates 7.1 & 7.2 below.

The following specific construction requirements to reduce potential contamination impacts upon the Turlough are required: -

- Pre-construction water quality monitoring shall take place in the Turlough to establish baseline conditions – see Figures 10.2 – 10.6 in EIAR Volume 3 for location of same.
- A water quality monitoring programme (see Section 8.2 for details) will be undertaken at suitable locations in the receiving watercourse during the construction phase. .
- The storage of oils, fuel, chemicals, hydraulic fluids, shall only take place within site compounds. Storage shall be undertaken in accordance with current best practice for oil storage (See Section 6 for details).
- All machinery operating in the works area adjacent to the Turlough will be cleaned in advance of works and routinely checked to ensure no leakage of oils or lubricants occurs.

Detailed and specific construction sequencing together with specific drainage designs are proposed in these areas as detailed below.

Construction Sequencing

Cut 1 – Ch. 35+150 to 36+450 (Lugboy)

A road drainage attenuation pond is proposed at Ch. 34+850. This pond will be constructed prior to the commencement of the main earthworks to facilitate treatment of discharge from construction runoff.

The construction sequence for the cuttings shall ensure that the cutting is completed in sections so that the base gradient allows conveyance to temporary settlement ponds located within the cutting. It is envisaged that the construction sequence would involve starting the cutting at Ch. 35+150 and advancing the works towards Ch. 36+450. A temporary settlement pond could be located at Ch 35+050 approx. The temporary settlement pond may be relocated as the dig advances with the preceding settlement area only filled in once the new settlement area is operational and the road and cutting drainage is constructed. Settlement ponds, temporary or otherwise, will be constructed prior to the excavation works commencing and will be constructed as detailed in Section 6.1 of this CESCP. In addition, filter drains will be constructed along each of the berms in the cutting to convey natural clean surface and groundwater to the watercourse directly.

To capture and separate natural clean water runoff from up-gradient lands, cut-off ditches will be provided along the up-gradient boundary of the cut section (east of Ch. 36+100, which is in the natural catchment of the Turlough). The intercepted clean water will be allowed to discharge to the Turlough through infiltration galleries that are to be constructed between Ch. 36+500 to Ch. 36+700 to facilitate the natural recharge of the Turlough. To facilitate this outfall arrangement infiltration galleries will be constructed in advance of the main works programme.

A typical cross-section through the cutting is given in Figures 4.37 and 4.38 in Volume 3 of the EIAR. In addition a plan of the area is also given in Plate 7.1 illustrating the possible sequencing of the works.

As the excavation progresses, the soiled construction runoff will be conveyed westward with the profile of the road to the Ovaun Stream passing through temporary and permanent settlement ponds. Between Ch. 36+100 and Ch. 36+750, construction runoff will be treated in a temporary settlement pond and discharged to the Turlough at Ch36+500 to Ch36+700 through the infiltration galleries described above.

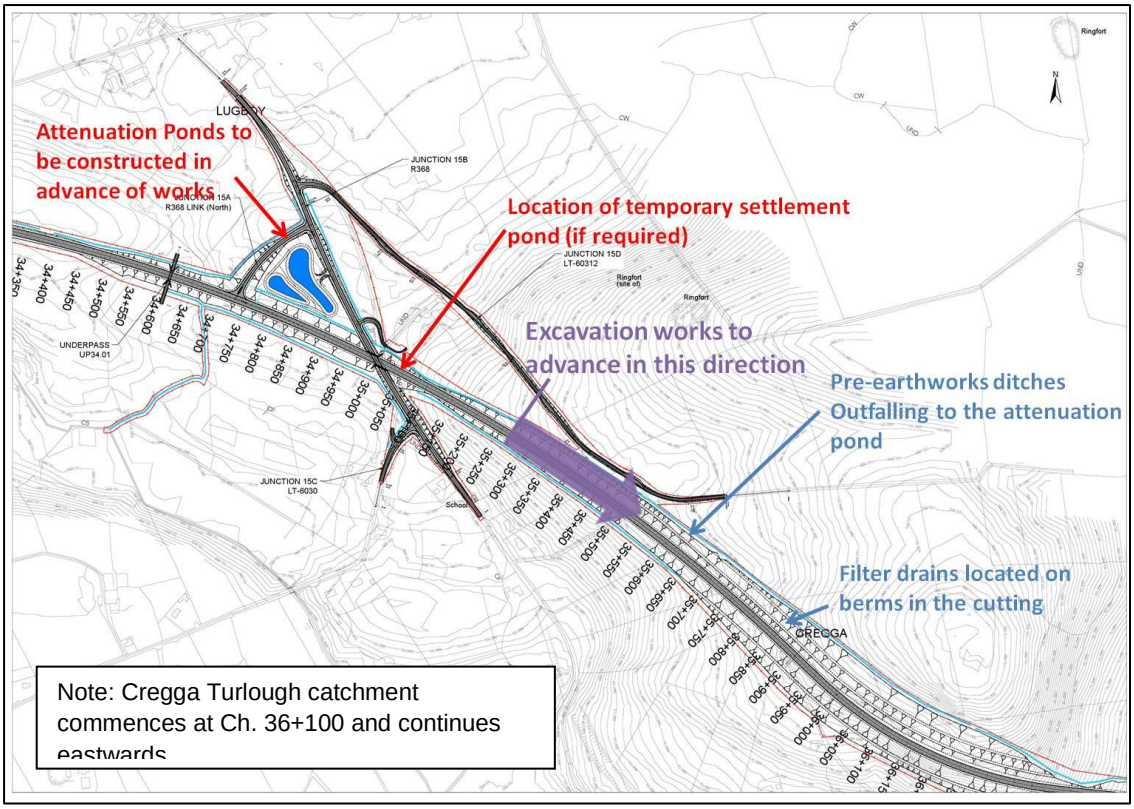

Plate 7.1 Construction Sequencing Between Ch. 35+150 and 36+450

Cut 2 – Ch. 36+900 to Ch. 37+650

Similarly for Cut Section 1 the sequence of excavation may commence at Ch. 36+900 and progress to Ch. 37+650.

A temporary settlement pond located between Ch. 36+500 and Ch. 36+900 will be constructed prior to the commencement of the earthworks. This will facilitate the treatment of soiled construction runoff from the cut section.

Additional temporary settlement ponds may be located along the cut section where required which will then discharge to this final pond before discharging to the Turlough. All discharges to the Turlough will first pass through a sedimentation pond and will discharge through the infiltration galleries.

A shallow cut-off ditch will be provided along the up-gradient boundary of the cut section to capture overland runoff and interflow and discharge this greenfield runoff to the Turlough through the proposed infiltration galleries. These galleries are located between Ch. 37+670 to Ch. 37+870 and Ch. 38+030 to Ch. 38+130. These infiltration galleries are to be utilised during the operational phase of the proposed road development to allow natural recharge water to drain to the Turlough.

As the excavation progresses, the soiled construction runoff will be conveyed to a construction phase outfall to the Turlough at Ch. 38+030 to Ch. 38+130 and will be serviced by a temporary settlement pond/ponds as required.

The construction sequence for the cuttings shall ensure that the cutting is completed in sections so that the base gradient allows conveyance to temporary settlement ponds. This may be achieved by starting the cutting at Ch. 36+900 and advancing the works towards Ch. 37+650.

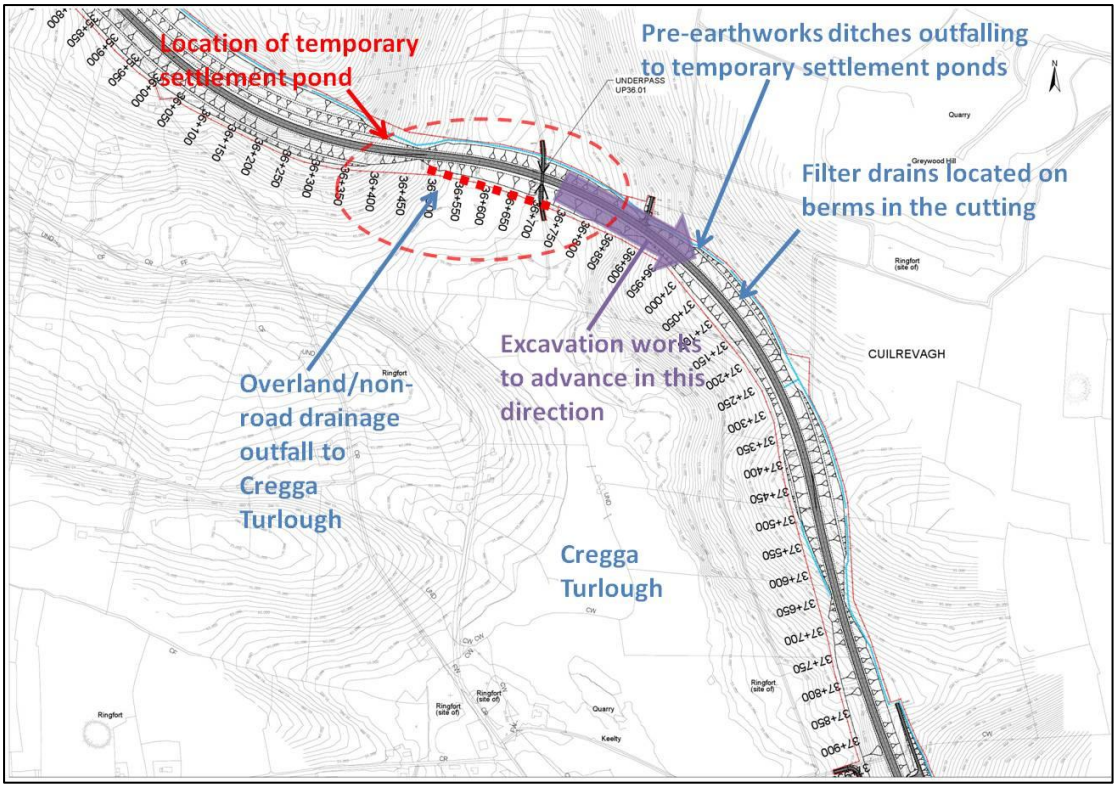

Plate 7.2 Construction Sequencing Between Ch. 36+900 to Ch. 37+650

7.4 Material Deposition Areas

Material Deposition areas are proposed at various locations along the proposed road development, none of which are located in ecologically sensitive areas. In all cases a minimum setback of 5m from watercourses is provided– please refer to Table 7.1 for details.

Double silt fences will be provided outside the proposed footprint of the material deposition areas in advance of commencement of construction works. In order to contain the deposited material, engineered bunds (see Plate 6.4) will be provided around the perimeter of the material deposition areas. Runoff from the material deposition areas will be directed to sedimentation ponds which will be provided upstream of the outfall to the receiving watercourse. These ponds will be maintained until the material deposition areas have stabilised and become adequately vegetated. In addition the specific construction sequence for these areas (described below) will allow for settlement of sediment prior to discharge to the receiving watercourse through the provision of additional temporary sedimentation ponds.

Table 7.1 Location of Material Deposition Areas

Area No.	Location and Chainage	Area (Hectares)	Approx Capacity (m^3)
1	Ch.4+640 – Ch 4+750, South of proposed N5	0.4	8,000
2	Ch 4+750 – Ch 4+80, North of proposed N5	1.1	22,000
3	Ch 5+400 – Ch 5+680, South of proposed N5	1.4	28,000
4	Ch.14+700 – Ch 15+520, South of proposed N5	4.5	90,000
5	Ch.14+950 – Ch 15+200, North of proposed N5	2.6	52,000
6	Ch.15+320 – Ch 15+600, North of proposed N5	1.8	36,000

Area No.	Location and Chainage	Area (Hectares)	Approx Capacity (m^3)
7	Ch.15+550 – Ch 15+780, South of proposed N5	2.9	58,000
8	Ch.16+075 – Ch 16+130, South of proposed N5	0.4	8,000
9	Ch.17+000 – Ch 17+600, South of proposed N5	1.8	36,000
10	Ch 17+050 – Ch 17+150, South of proposed N5	0.4	8,000
11	Ch 17+150 – Ch 17+600, South of proposed N5	7.3	146,000
12	Ch 17+640 – Ch 17+875, South of proposed N5	2.0	40,000
13	Ch 21+000 – Ch 21+175, South of proposed N5	2.7	54,000
14	Ch 20+950 – Ch 21+450, North of proposed N5	5.4	108,000
15	Ch 21+350 – Ch 21+750, North of proposed N5	5.4	108,000
16	Ch 22+150 – Ch 22+850, South of proposed N5	8.4	168,000
17	Ch 22+680 – 22+840, North of proposed N5	0.4	8,000
Total Storage Volume		**48.9**	**978,000**

Construction Sequencing

The construction sequence of each of the material deposition areas is such that the area allocated for material deposition is compartmentalised to allow a material deposition area to be first established in one compartment, while the runoff water from this compartment flows into and is contained within an adjacent compartment. This will allow settlement of sediment to take place prior to runoff water discharging to a receiving watercourse. Once a compartment has been filled, the adjacent compartment, which was used temporarily as a sedimentation pond, is then itself filled with material and the next compartment acts as the settlement area for the runoff from this section. This process is repeated as the works advance until all compartments are filled. A final treatment pond will retained upstream of the outfall until the areas have stabilised and vegetation has established. A typical cross-section of the material deposition areas is given in Plate 6.4.

8. MONITORING AND AUDIT

8.1 Introduction

The Construction Erosion and Sediment Control Plan (CESCP) will form part of the Environmental Operating Plan (EOP). The EOP shall be prepared in accordance with the NRA's *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan*.

The minimum requirements for the control of sediment shall include all of the controls, measures, mitigations and monitoring described in this plan. The monitoring of all aspects of the EOP, including the CESCP, will be carried out by the contractor. The responsibilities of the Employer will be discharged by the Employer's Site Representative Staff. The contractor will be required to undertake continuous monitoring of the works to ensure compliance with the EOP, including the CESCP. In addition, the Employers Site Representative Staff will oversee the works to ensure that the contractor is complying with their responsibilities.

8.2 Monitoring and Audit

8.2.1 General

The avoidance, control and mitigation measures outlined in this document will ensure that erosion and sedimentation arising from the works is controlled. They have been developed in accordance with best practice, in consultation with environmental organisations including NPWS and IFI, and have been shown to work on other projects. As with all systems, there is a requirement to have monitoring, audit and feedback loops to demonstrate the operation of the system. The following describes the framework of the pre-construction monitoring and construction monitoring regime;

8.2.2 Pre-Construction

Pre-construction water quality monitoring in the receiving watercourses shall be undertaken at the following watercourses: the Carricknabraher River, the Owennaforeesha River, the Owenur River, the Strokestown River and the Scramoge River; with a minimum of six monthly samples being taken to establish baseline conditions. This testing shall include (but will not be limited to): Suspended Solids (SS), Turbidity, Dissolved Oxygen (DO), Nitrate, Nitrite, Total Nitrogen, Phosphate, Total Phosphorus, Temperature, Ammonia, Biological Oxygen Demand (BOD) and Total Hydrocarbons. The locations of these sampling points are shown on Figure 10.8 contained within EIAR Volume 3.

8.2.3 Construction Stage

Similarly monthly surface water quality sampling shall be undertaken at the above locations and for the sample quality parameters throughout the construction phase. This monitoring will be reviewed on an ongoing basis during construction. Where the surface water regulations are exceeded in these watercourses, an investigation shall be undertaken to identify the source of non-compliance and corrective action implemented where the non-compliance is deemed to be associated with the proposed road development. To support the reactive element of this monitoring all watercourses to which there is a discharge from the works shall be monitored on a daily basis for turbidity. Readings will be taken from the watercourses immediately upstream and downstream of the works and where the difference between these readings exceeds 30ntu, this will trigger investigatory procedures.

The investigation will establish whether or not the elevated turbidity readings are as a result of the construction works. Where this is the case, immediate corrective actions which may include stopping of these sediment generating works will be enforced until such time that such polluting activities can be controlled.

8.2.4 Contractor

The procedures and monitoring and audit regime outlined in this section shall be used by the contractor to ensure and demonstrate the effective operation of the avoidance, control and mitigation measures for Erosion and Sediment control. It will facilitate use as a feedback loop to target any issues that may arise.

8.2.5 Site Environmental Manager (SEM)

In order to ensure the successful development, implementation and maintenance of the EOP, the Client will be required to appoint an independent Site Environmental Manager (SEM) to provide independently verifiable audit reports.

The Site Environmental Manager must possess sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken, a Level Eight qualification recognised by the Higher Education and Training Awards Council

(HETAC), or a University equivalent, or other qualification acceptable to the Employer, in Environmental Science or Environmental Management, Environmental Hydrology, Engineering or other relevant qualification acceptable to the Employer.

Separate from the on-going and detailed monitoring carried out by the contractor as part of the EOP; the SEM shall carry out the inspection/ monitoring regime described below on behalf of the employer. The results will be stored in the SEM's Monitoring file and will be available for inspection/ audit by the Client, NPWS or IFI staff. All inspections/ monitoring/ results will be recorded on standard forms.

Inspection / Monitoring Regime:

(i) Inspect the Principal Control Measures outlined in this plan on a weekly basis. Report findings to the Contractor;

(ii) Inspect surface water treatment measures (ponds, tanks, mini-dams, sandbags, etc.) on a daily basis and obtain turbidity readings;

(iii) Inspect all outfalls to watercourses on a daily basis and obtain turbidity readings. Where excavation, deposition, pumping out or concreting works are on-going in the vicinity obtain turbidity readings three times per day;

(iv) Daily visual inspection of watercourses to which there is a discharge from the works and those in the vicinity of construction works;

(v) Wheel wash facilities shall be inspected on a weekly basis;

(vi) Borrow Pits shall be inspected on a daily basis while in operation and on a weekly basis thereafter;

(vii) Material Deposition Areas shall be inspected on a daily basis while in operation and on a weekly basis thereafter;

(viii) Stockpiles shall be monitored on a daily basis while being filled or emptied and otherwise on a weekly basis;

(ix) Control measures for works at or near water bodies shall be inspected on a daily basis;

(x) Concrete operations at or near watercourses shall be supervised and designated chute washing out facilities shall be inspected on a daily basis;

(xi) Site Compounds shall be inspected on a weekly basis;

(xii) The Contractor's EOP monitoring results shall be audited by the SEM on a frequent basis (6 times per quarter at a minimum);

(xiii) Any and all exceedance of the investigatory level for turbidity shall be reported the Employer and shall be investigated thoroughly by the SEM and the Contractor. Where the works are identified as the source causing the exceedance, the procedure outlined in Item "(xiv) (a)- (d)" below shall be followed;

(xiv) Any direct release of sediment to a watercourse causing plumes or exceedance of the turbidity investigatory levels shall result in: -

  (a) the Employer shall be notified immediately;

  (b) the contractor will be required to take immediate action and to implement measures to ensure that such discharges do not re-occur;

  (c) Works if stopped, shall not recommence until appropriate corrective measures to avoid any repetition are put in place. Such measures shall be agreed with the SEM following consultation with the Employer;

  (d) Works and/ or discharges from the works shall not recommence until written consent is received from the SEM.

(xv) Where the SEM considers that the risk of a sediment release is high, he/she shall inform the contractor and request protective action to be taken. The SEM shall report all such notifications and requests to the Contract Manager and the Client.

9. EMERGENCY PROCEDURES

9.1 Introduction

Prior to commencing works, the Contractor shall prepare an Emergency Response Plan based on a thorough risk assessment. The plan shall detail the procedures to be undertaken in the event of the release of any sediment into a watercourse, serious spillage of chemical, fuel or other hazardous wastes (e.g. concrete), non-compliance incident with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.

9.2 Resources

Relevant staff, including cover staff, shall be trained in the implementation of the Emergency Response Plan and the use of any spill kit/ control equipment as necessary. The contractor shall provide a list of all such staff to the Employer's Site Representative detailing the name, contact number, and training received, and the date of that training.

The Contractor shall provide a full list, including the exact locations, of all pollution control plant and equipment to the Employer's Site Representative. All such plant and equipment shall be maintained in place and in working order for the duration of the works.

9.3 Spill Response

The Emergency Response Plan shall include a simplified Spill Response with the following as a minimum: -

(i) Instruction to stop work;

(ii) Instruction to contain the spill;

(iii) Details of spill clean-up material location;

(iv) Name and contact details of responsible staff;

(v) Measures particular to the location and the activity;

(vi) Instruction to contact the SEM (including Name and Contact Details).

This Spill Response shall be displayed at several locations throughout the site and at all sensitive locations.

10. REFERENCES

Control of Water Pollution from Construction Sites: CIRIA (C532) 2001;

Control of water pollution from linear road projects: CIRIA (C648) 2006;

Guidelines for the Crossing of Watercourses during the Construction of Road Projects: National Roads Authority (TII) (2006);

NRA (TII) Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan: National Roads Authority (2007).