BARRY & PARTNERS

JBA consulting

Castleconnell Flood Relief Scheme

Preliminary CEMP

Final Report

November 2024

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OPW Oifig na nOibreacha Poiblí Office of Public Works

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Contract

This report relates to the Castleconnell Flood Relief Scheme commissioned by Limerick City and County Council, on behalf of the Office of Public Works. Conor O'Neill and Bernadette O'Connell of JBA Consulting compiled this report.

Purpose

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Abbreviations

AA	Appropriate Assessment
AEP	Annual Exceedance Probability
CEMP	Construction Environmental Management Plan
CFRAM	Catchment Flood Risk Assessment and Management
CIEEM	Chartered Institute of Ecology and Environmental Management
CMP	Construction Management Plan
ECoW	Ecological Clerk of Works
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
FRS	Flood Relief Scheme
GHS	Geological Heritage Site
GIS	Geographic Information System
GSI	Geological Survey Ireland
EIS	Environmental Impact Statement
EIA	Environmental Impact Assessment
LCCC	Limerick City and County Council
MCA	Multi-Criteria Assessment
NHA	Natural Heritage Area
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Assessment
NPWS	National Parks and Wildlife Service
OPW	Office of Public Works
PCD	Public Consultation Day
PE	Population Equivalent
pNHA	Proposed Natural Heritage Area
QI	Qualifying Interest
RBMP	River Basin Management Plan

SAC	Special Areas of Conservation
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Areas
UWWTP	Urban Wastewater Treatment Plant
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant
ZoI	Zone of Influence

1 Introduction

1.1 General

JBA Consulting and JB Barry and Partners have developed a preliminary Construction Environmental Management Plan (CEMP) in relation to the proposed Castleconnell Flood Relief Scheme (FRS) (the 'proposed development'). The proposed development will comprise the construction of flood defences or interventions at several locations within the village of Castleconnell along the River Shannon and ongoing maintenance and operation of said measures, as outlined in detail in Section 3.2.

1.2 Background

Limerick City & County Council (LCCC) intends to apply for planning permission for a Flood Relief Scheme in Castleconnell, along the River Shannon, from the northern properties located at The Elvers to Coolbane Woods Estate at the southern outstretches of the village. The proposed development, which will be submitted under Part 10 of the Planning and Development Act (2000) as amended, consists of development of a flood relief scheme to minimise the risks currently posed to people, the community, social amenity, environment and landscape.

Castleconnell Village has a history of flooding. A flood event occurred at the village and surrounding areas in the winter of 2009 following record rainfalls over the large River Shannon catchment. Further flood events were also experienced in 2015/2016 and 2020.

The following reports, produced by JBA, have been submitted with this preliminary CEMP as part of the planning application:

- EIAR
- Natura Impact Statement (NIS)

The above reports should be read in full to ascertain the ecological and environmental constraints that may be applicable to the construction works for this project.

1.3 Objective of the CEMP

The objective of this document is to inform all personnel (Main Contractor and sub-contractors) of their obligations with regards to environmental protection. The CEMP seeks to:

- Provide a basis for implementing construction-related mitigation measures to safeguard identified environmental issues;
- Comply with all relevant planning conditions, environmental legislation and statutory consents; and
- Promote best construction and environmental on-site practices for the duration of the works.

This CEMP defines the project-specific environmental measures that are to be put in place and procedures to be followed for the scope of construction works, both temporary and permanent, for the project. This plan and methodology seek to demonstrate how works on the project can be delivered in a logical, sensible and safe sequence with the incorporation of specific measures to mitigate the impact on people, property and the environment.

This should be viewed as a 'live' document, to be adapted and updated by the Main Contractor for implementation throughout the project in response to changing conditions on site. This review of construction activities covers a description of:

- Duration and phasing
- Site preparation
- Construction methods

- Materials source and transportation
- Employment and accommodation
- Dust, noise, and traffic
- Construction safety
- Waste disposal
- Services Requirements.

Proposed environmental measures that will be installed on site during construction are included in this CEMP. This document will be updated to include any additional conditions proposed by the relevant local authority as a result of their review of the CEMP.

The CEMP is an integral part of the site health, safety, environmental and quality management system and constitutes a component of the Construction Health and Safety Plan documentation. The CEMP is also subject to the requirements of the site quality management system with respect to documentation control, records control and other relevant measures.

In the event of an accident or emergency on site during the construction period, the CEMP will be reviewed, and procedures amended if necessary. All personnel and sub-contractors will be made aware of the CEMP during the toolbox talks. The site manager or his environmental manager will be responsible for maintaining and updating the approved document.

The Main Contractor will be required to produce a Contractor's CEMP, which will ensure that their construction activities are planned and will meet the environmental requirements outlined in this preliminary CEMP. The procedures agreed in this CEMP will be audited regularly throughout the construction phase to ensure compliance.

2 Legislation and Guidance

Relevant legislation and best practice guidance that have been considered includes but is not limited to the following:

2.1 National and International Legislation

- European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) which brings into effect the EU Water Framework Directive (2000/60/EC);
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I. No. 272 of 2009;
- Local Government (Water Pollution) Acts 1977-1990.

2.2 Environment Liability Regulations

The Regulations supplement existing National and European Legislation to achieve the prevention and remediation of environmental damage. Environmental damage under the Environmental Liability Regulations 2008 means:

- Water damage that has significant adverse effects on water status under the Water Framework Directive (2000/60/EC);
- Land damage that creates a significant risk to human health as a result of the direct or indirect introduction, in, on or under land, of substances, preparations, organisms or micro-organisms; and
- Damage to protected species and natural habitats.

The Regulations represent an overarching piece of legislation that can be used in concert with all the Agency's existing powers but will only be used in the appropriate circumstances when environmental damage has occurred as a result of an incident.

2.3 Best Management Guidelines

The following Guidelines will be used, as a minimum, by the contractor to prepare their Method Statements and Environmental Management Plan:

- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters. Inland Fisheries Ireland, (IFI, 2016);
- Inland Fisheries Ireland - Planning for Watercourses in the Urban Environment. A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning (IFI, 2020)
- Fishery guidelines for Local Authority works. Department of Marine and Natural Resources 1998;
- CIRIA – Guideline Document C532 – Control of Water Pollution from Construction Sites;
- CIRIA – Guideline Document C642 – Development and Flood Risk – Guidance for the Construction Industry;
- CIRIA Guidance C515: 'Control of groundwater for temporary works' (Somerville et al., 1986);
- CIRIA Guidance C741: Environmental good practice on site guide (Charles & Edwards, 2015);
- CIRIA Guidance C750D: 'Groundwater control: design and practice' (Preene et al., 2016);
- CIRIA - Control of water pollution from construction sites - guide to good practice (SP156);
- CIRIA - C648 Control of water pollution from linear construction projects & Site Guide C649;
- NetRegs Guidance for Pollution Prevention for works and maintenance in or near water (NetRegs, 2017);
- Environment Agency Pollution Prevention Guidelines for construction and demolition sites (EA, 2012); and
- NRA (2005) Guidelines for the crossing of watercourses during the construction of National Road Scheme.

3 Proposed Development

3.1 Site Location

The proposed development is located in the village of Castleconnell, Co. Limerick, on the eastern bank of the River Shannon. Flood flows at Castleconnell are heavily influenced by Parteen Weir and Lough Derg which is approximately 6.5km upstream of Castleconnell village. There is a topographical fall in a southerly direction with road levels adjacent to Rivergrove B&B on the Lacka Road of c.24mOD falling to 22.7mOD on Chapel Hill fronting the public carpark. Castleconnell is served by the M7 motorway, R445 regional road, and the Limerick-Ballybrophy railway line.

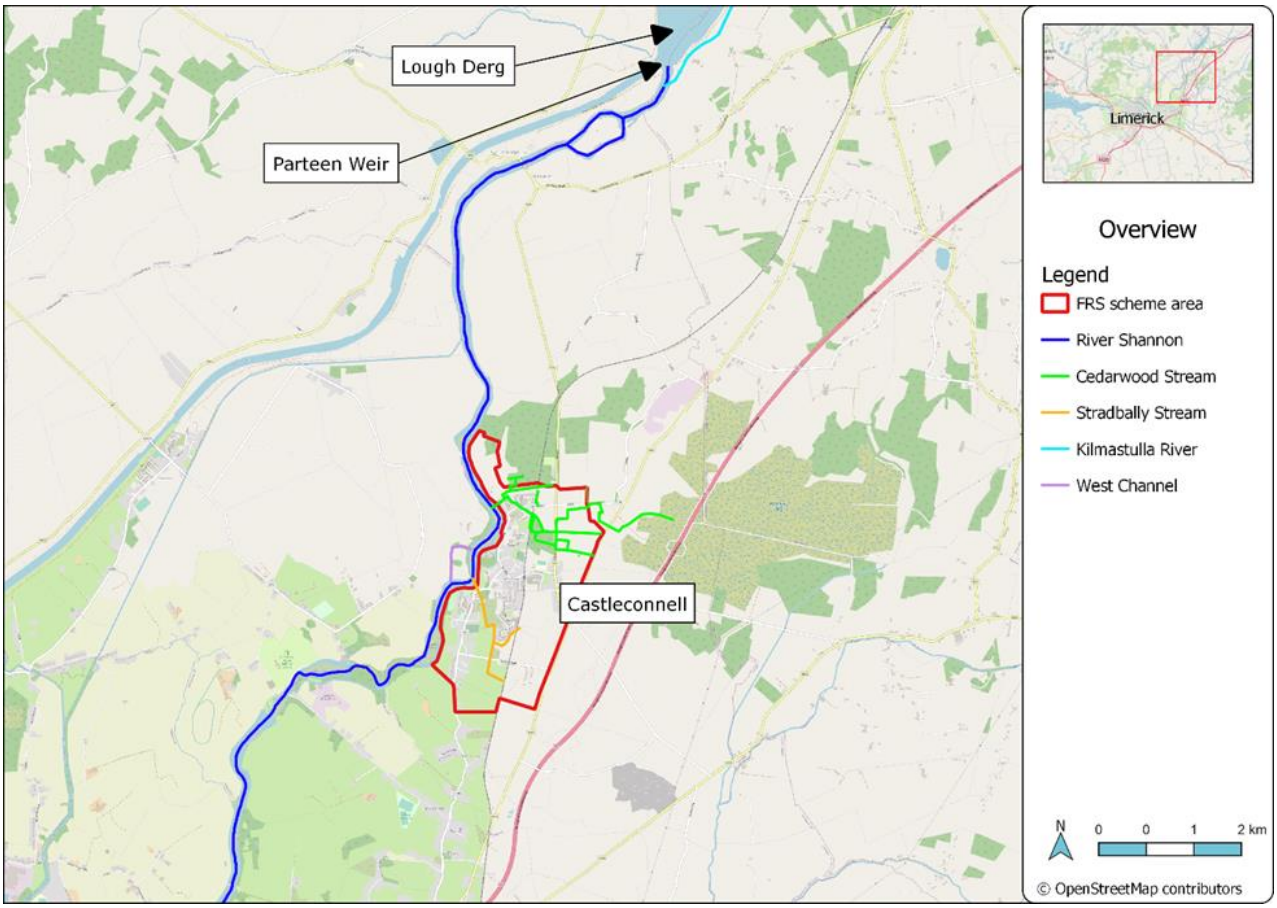

Figure 3-1: Castleconnell FRS Location

3.2 Proposed Development

The proposed development comprises the following. Numbers refer to references shown in Figure 3.2:

3.2.1 Rivergrove B&B and Grange House

Rivergrove B&B and Grange House are located at the northern end of Castleconnell Village on Elvers Road. Both are detached buildings with private gardens, with high stone walls separating them from the road, which is a narrow single-lane road lined with stone walls and trees or hedgerows. Rivergrove B&B is adjacent to the River Shannon, with views over the river and the riparian vegetation along its banks. Grange House is south of Rivergrove and also looks onto the River Shannon. Both houses have driveways which open onto Elvers Road.

The proposed development will require replacement of the existing wall to the west of Rivergrove B&B with a new flood wall (Figure 3.2, No. 1). The new flood wall extends across the existing entrance and a new

entrance will be provided at higher ground further to the East. Provision of a new low-level plinth inside the existing front boundary wall to the north of the B&B will avoid the need to replace the existing high stone wall. The proposed flood walls at this location will have a sheet piled foundation with a reinforced concrete plinth supporting a reinforced concrete flood wall which will be clad in stone similar to the existing wall. A short length of glass panels will be provided within the flood wall to maintain key views of the river from the conservatory.

The existing wall to the west of Grange House (Figure 3.2, No. 2) will also be replaced with a new flood wall that will continue along the southern side of the driveway until it ties in with high ground. Glass panels will be provided in sections, as agreed with the homeowner, to maintain key views of the river from key areas of the house. The proposed flood wall at this location will have a sheet piled foundation with a reinforced concrete plinth supporting a reinforced concrete flood wall which will be clad in stone similar to the existing wall. The open section of the Cedarwood Stream adjacent to the Mill Building will remain open, and a new culvert will be provided from the downstream point of this open section to its outfall to the River Shannon. This includes removal of the open feature in the garden, which will be replaced by the culvert. A new pumped foul connection will be provided to the public foul sewer to replace the existing free outfall from the house to the Cedarwood Stream open feature.

In this location tree removal would be required to facilitate construction on the new flood wall and to accommodate the driveway reconfiguration at Rivergrove B&B. Most of the trees to be removed are small garden trees.

3.2.2 Mall House

Mall House is a two-storey detached house at the northern end of the Mall Road. The house is overlooking the River Shannon. A private access lane runs along the western edge of Mall House to Dunkineely House, directly north of Mall House. The access lane separates Mall House from the River Shannon.

The walls to the north, west and south of Mall House will be replaced with a new flood wall that will be clad in stone similar to the existing wall. Where the northern face of the house is constructed against the boundary wall, a ramp will be constructed in the property of Dunkineely House to cut off flows from this side. The northern wing wall and hedge to the main entrance of Dunkineely House will be removed and demountable barriers will be provided in the gateway (one existing vehicular entrance plus one proposed pedestrian entrance). No protection is required to the front because the Mall Road is protected. (Figure 3.2, No. 4).

In this location tree removal would be required to facilitate construction on the new flood wall, most of which are small garden trees. This removal is needed to facilitate the construction of the new flood wall.

3.2.3 Mall Road

Mall Road is a single-lane road connecting Castleconnell Village centre with the residential areas to the north, including Mall House, Grange House, and Rivergrove B&B. Works will take place along a stretch of Mall Road from Maher's Pub in the south, north past the junction with Island House and Scanlon Park, to Mall House (approx. 450m in total). A low stone wall runs along its entire length on its western side, except for the entrance to Island House, and several small openings which act as fishermen's access to the river (known as opes).

The northern end of Mall Road, from the Island House/Scanlon Park junction to Mall House, has good views of the River Shannon to the west, with sections of trees or other vegetation. On its eastern side is a large green field, with several detached houses at the northern end, across from Mall House.

The southern end of Mall Road, from the junction down to Maher's Pub, is more enclosed due to tall trees on Cloon Island and Island House.

The existing wall to the west of the Mall Road will be demolished, with a new flood wall constructed which will be set back by c. 1m and constructed outside the SAC and alluvial woodland (Figure 3.2, No. 5). The existing footpath along the Mall Road will similarly be moved back in line with the new wall. However, c.

55m immediately south of the entrance to Island House, the existing wall will be replaced along its existing alignment due to the narrowness of the road (Figure 3.2, No. 8).

A demountable barrier will be constructed in the main fisherman access point through the Mall wall, known locally as Broderick's slip (Figure 3.2, No. 6).

In this location tree removals will be required, outlined in the standalone Arboricultural Impact Assessment Report. Most of the trees are on the southern part of the road along its border with Cloon Island. These are the trees immediately adjacent to the existing stone wall, with more existing trees west of these which will remain in place.

3.2.4 Island House and Scanlon Park Junction

The Island House and Scanlon Park junction approximately splits Mall Road into northern and southern halves. It is an uncontrolled junction, with no pedestrian crossing markings, and a stop sign from the Scanlon Park side. Immediately south of the junction on the Scanlon Park (eastern) side of Mall Road is a pumping station owned and operated by Uisce Éireann.

Island House itself sits on Cloon Island, and is accessed from Mall Road by a causeway and long driveway. Several trees along the driveway will require pruning to facilitate the works, but will all be retained.

A ramp will be constructed at the entrance to Island House (Figure 3.2, No. 7). A flood gate will be provided on top of this to defend up to a greater flood event level. Nominal raising of the Scanlon Park junction, approx. 100mm, will be required to accommodate this. The driveway to Island House will also be raised by c. 250mm and a handrail will be provided along either side of the causeway. The sluice gates on the causeway structure will be removed to allow flow through Cloon Stream.

3.2.5 Maher's Pub

Maher's Pub is at the southern end of Mall Road, with a large car park which backs onto the trees associated with Cloon Island.

A new flood wall alongside Maher's Pub car park will be provided (Figure 3.2, No. 9). It is proposed to set back the wall along the rear (western) boundary by c. 6m to remain outside of the root protection zone of the Cedar tree, which is used by herons for nesting. This flood wall extends along the northern boundary of nr. 7 Meadowbrook Estate, terminating at the end of the cul-de-sac. A section of the existing boundary wall will be removed, and a gate will be provided through the wall for emergency access to Stormont House and for maintenance of the embankment in the Stormont House grounds only. There will be no access for members of the public through the gate.

In this location trees removal will be required to facilitate the construction of the new flood wall.

3.2.6 Meadowbrook Estate

Meadowbrook Estate is a cul-de-sac residential estate of 12 no. houses, with an entrance of New St. The houses are semi-detached with small front and rear gardens. To the west and northwest of Meadowbrook is a green area and wooded area associated with Cloon Island and Stormont House.

A flood embankment will be constructed along the rear of Meadowbrook Estate, from nr. 7 Meadowbrook Estate and north of Stormont House (Figure 3.2, No. 10). This will tie in with the new flood wall along nr. 7 Meadowbrook Estate, with a gate provided through the wall between the estate and the new embankment.

In this location trees removal will be required to facilitate the construction of the new embankment and new flood wall.

3.2.7 Stormont House

Stormont House is a detached house on a large plot of land which is adjacent to the River Shannon, west of the centre of Castleconnell. The house has wide views of the river, with a low stone wall along its western side. The house is accessed by a long driveway from Chapel Hill to the south, which passes by Castleconnell Castle and two other houses to the east.

A low-level flood wall will be constructed along the west of Stormont House (Figure 3.2, No. 11), inside the existing castellated boundary wall. The ground levels along the Stormont House entrance road will also be raised, and a short length of low-level flood wall to tie in with rock at the Castle in two locations, one to the east of the entrance to Stormont House and the second adjacent to the road raising at the Coolbane Woods junction will also be constructed. These walls will be concealed by earth at either side.

In this location trees removal will be required to facilitate the construction of the new embankment and new flood wall.

3.2.8 Coolbane Woods

Coolbane Woods is a small residential estate to the south of Castleconnell, accessed from Chapel Hill. The estate is bound to the west by a wooded area, with trees also lining the entrance road to the houses.

At the junction, road raising to the '504 event' 1% AEP level will occur adjacent to the castle (Figure 3.2, No. 14). A demountable flood barrier to the west of the junction will be constructed, to defend up to the 'Baseline Design Event (limitations in operational conditions)'.

A flood embankment will be constructed along the southern boundary of the Coolbane Woods entrance road and along the rear of house no.'s 1-4, to tie into higher ground to the south (Figure 3.2, No. 15).

In this location trees removal will be required to facilitate the construction of the new embankment.

3.2.9 Cedarwood Stream

The Cedarwood Stream is a tributary of the River Shannon which flows in a westerly and north-westerly direction between the residential areas of Cedarwood Grove and The Commons, under The Commons Road, along the back of gardens of houses in Castle Court and on Elvers Road, before outflowing to the River Shannon near Grange House (Figure 3.2, No. 16). The stream has a narrow riparian strip and is heavily overgrown.

Overgrown vegetation will be removed from the Cedarwood Stream, from its interface with the railway adjacent to a property known as 'Coole' (V94 PY9X), as part of the construction works. Annual inspection and maintenance will take place thereafter to manage future vegetation that may impact conveyance. An existing 1.2m diameter circular culvert at Coole House will be replaced with a larger rectangular culvert (2m wide x 1.3m high) to ensure improved conveyance.

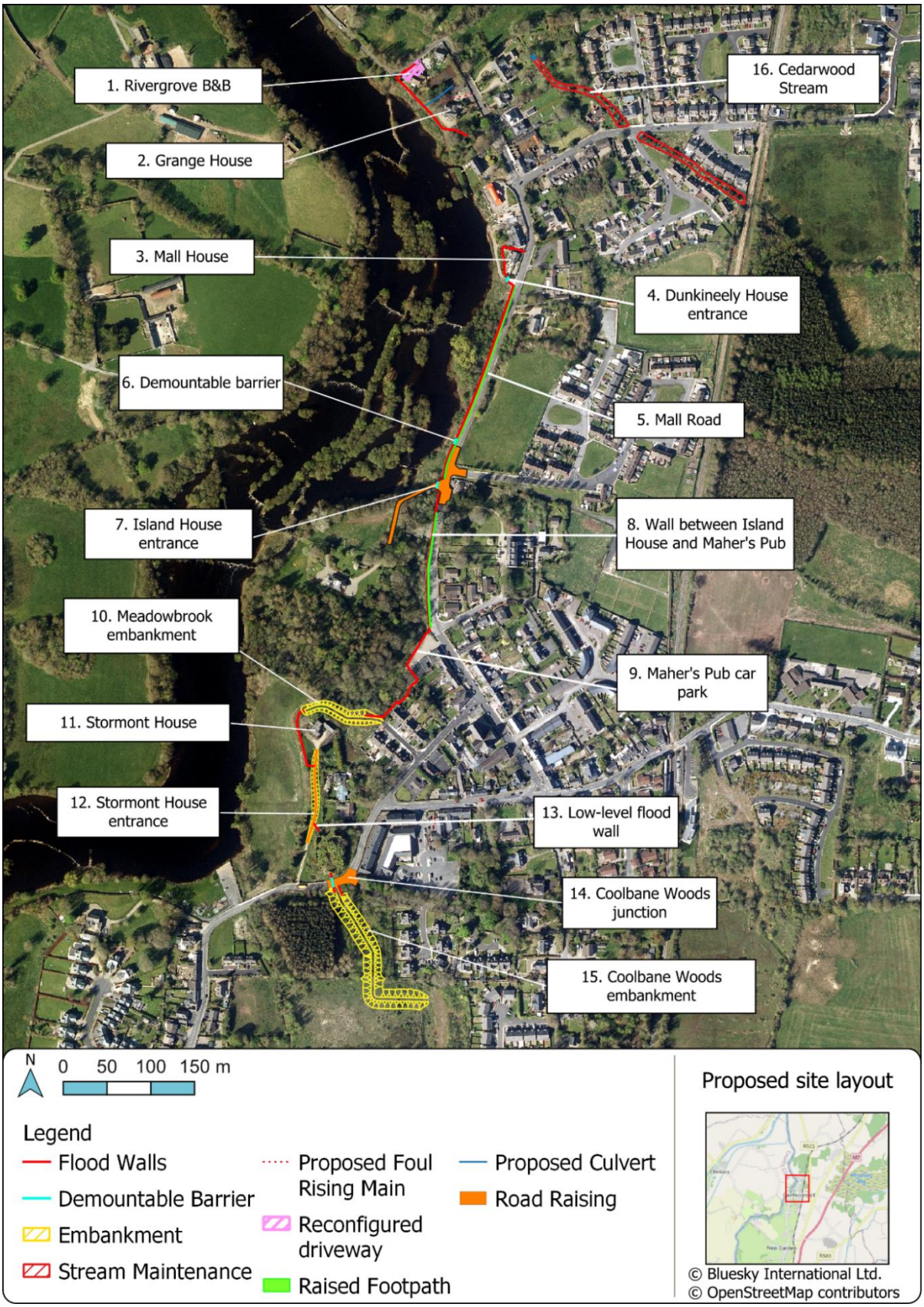

Figure 3.2: Proposed Flood Relief Scheme Layout

3.3 Receiving Environment

The proposed development is situated in Castleconnell, along the banks of the River Shannon. The proposals are generally located on or close to the banks of the river. Several protected or sensitive habitats have been identified in the area, including the river itself and alluvial woodland, provided in an Annex I habitat. Other parts of the development will be located along public areas such as roads or footpaths, or in open green spaces.

3.4 Invasive Non-Native Species

Several invasive non-native species (INNS) were recorded in the area including Giant Hogweed, Zebra Mussel, Quagga Mussel and Greylag goose. Moreover, there is an informal Invasive species control by Castleconnell River Association who have been controlling Giant Hogweed around the river edges and riparian woodlands informally over the last few years.

There is potential for working machinery to get contaminated with fragments of invasive non-native species and spread it elsewhere within the site or outside of the site. Excavation and movement of soil has the potential to spread INNS across the area; any spoil removed from site has the potential to introduce INNS along the roads and at the receiving environment.

Mitigation measures for the management and control of INNS are outlined in Section 6.11.

3.5 Watercourses in the Vicinity of the Proposed Site

The proposed site lies on the eastern banks of the Lower River Shannon. The site is within the Water Framework Directive (WFD) Lower Shannon catchment, Shannon [Lower]_SC_090 sub-catchment and Shannon (Lower)_060 sub-basin.

The groundwater body underlying Castleconnell (IE_SH_G_052) has a good status according WFD classification for the 2016-2021 assessment period and no risks are identified.

A number of small streams which are tributaries of the River Shannon flow within the Castleconnell FRS area. The Cedarwood Stream, to the north of Castleconnell, has a sand and pebble bed, steep banks and is culverted for long portions of its reach. Clearance of bank-side vegetation and works to a culvert on the stream are included as part of the FRS. The Stradbally Stream is located in the south and enters the River Shannon by the Ferry Playground.

4 Roles and Responsibilities

The Main Contractor is responsible for ensuring that all employees and sub-contractors follow the requirements of the CEMP. The Contractor will be required to provide training and supervision to ensure that the requirements are adhered to.

It is anticipated that the main environmental responsibilities for the key staff will be as set out below.

4.1 Director of the Contracting Company

The director of the contracting company will be responsible for the overall strategic direction and decision making.

- Ensure all departments work towards project goals,
- Ensure the company complies with all legal, regulatory, and contractual obligations,
- Maintain relationships with key stakeholders including clients, regulatory bodies, and the community.

4.2 Contracts Manager

The contracts manager will:

- Oversee the project contracting process from start to finish,
- Manage contracts with clients, sub-contractors, and suppliers ensuring compliance with terms and conditions of contracts,
- Ensure all contractual obligations are met,
- Prepare regular progress reports for stakeholders.

4.3 Site Manager

The site manager will be required to:

- Prepare the Contractor's CEMP. This will include the key elements as outlined in this preliminary CEMP;
- Be responsible for ensuring that adequate equipment, adequate control measures and adequate resources are made available to meet the requirements of the CEMP;
- Manage the preparation of the methods statements and will be responsible for implementing these on-site;
- Retain all training records; and
- Retain all records on the quantities of material that leaves the site for disposal, and all disposal records.
- Continuous monitoring of the site will be carried out by the Site Manager.

4.4 Ecological Clerk of Works

- Act as the contact for the Planning Authority and agree the frequency and number of site inspections and monitoring programme for the implementation of the biodiversity related mitigation of the EcIA and CEMP;
- Act as the primary on-site ecological contact for the main contractor and site manager regarding implementation of the Biodiversity related mitigation of the EcIA and CEMP;
- Ensure compliance with all Biodiversity related mitigation of the EcIA and CEMP;
- Request relevant records and documentation from the site manager where necessary;
- Attend routine meetings with the site manager;
- Keep detailed records of any ecological incidents and the remedies required and implemented. Report these to the main contractor and Planning Authority;

- The ECoW shall produce the staged monitoring reports in agreement with the Planning Authority on the implementation of Biodiversity related mitigation of the EcIA and CEMP. The ECoW shall submit these directly to the Planning Authority and to the main contractor;
- The ECoW shall also act as overall technical advisor to the main contractor and site manager regarding the implementation of all Biodiversity related mitigation of the EcIA and CEMP.

4.5 Health and Safety Manager

The health and safety manager will be required to:

- Formulate a Health and Safety Plan as required by the Safety, Health, and Welfare at Work (Construction) Regulations, 2013,
- Manage the provision of PPE and ensure proper implementation,
- Prepare risk assessments,
- Establish medical protocol,
- Prepare escape and evacuation procedures,
- Implement appropriate communications with site staff including toolbox talks and daily briefings with respect to health and safety
- Maintain a record of the location and contact information for the nearest emergency services and facilities including:
    - Accident and Emergency (A&E)
    - Ambulance Service
    - Fire Services
    - Local Garda station, district and divisional headquarters

4.6 Waste Manager

The waste manager will be responsible for waste management during the construction phase and will be required to:

- Implement the RWMP prepared by the contractor;
- Ensure the waste management procedures and methods outlined in the RWMP comply with local and national regulations
- Track waste generation, handling and disposal and report on performance of waste management regularly;
- Promote and implement waste reduction;
- Update the RWMP as needed as the program progresses;

4.7 Liaison Officer

The Liaison Officer will act as the primary point of contact between the project team, relevant stakeholders and the community. They will be required to arrange for liaison with:

- Limerick City and County Council;
- Statutory and regulatory bodies;
- Property owners temporarily affected by proposed works; and
- Community members.

4.8 Staff, Operators, and Sub-Contractors

Staff and operators will be responsible for:

- Ensuring that mitigation measures are in place before the work commences;
- Reporting any environmental incidents to the site manager and the ECoW;

- All site personnel will undertake site induction prior to carrying out any activity. Induction topics to be covered include:
  - Duties and responsibilities; Emergency response procedure; Site rules; Environmental best practice; and Waste management and housekeeping

5 Construction Operations

The construction of the scheme will lead to employment by direct construction work, and indirectly by the requirement for other local support services during the works. The numbers employed are unknown at this stage and are also likely to vary over the construction period.

5.1 Programme of Works

The proposed works will be constructed in a general north to south sequence. Depending on seasonal conditions works proposed within the Stormont House property and Coolbane Woods can be constructed in parallel with the works to the north. It is estimated that the works will take approximately 30-36 months to complete. Vegetation clearance works, where required, will need to take place outside the bird breeding season (March to August inclusive).

Area of works	Estimated Construction Time in Months
Northern properties	4
Cedarwood Stream	1
Mall House	1
Mall Road North	3
Island House	1
Scanlon Park Junction	0.5
Mall Road South	3
Maher's Pub	1
Meadowbrook Estate Wall	1
Stormont House Embankment	2
Stormont House	1
Coolbane Woods Junction	0.5
Coolbane Woods Embankment	5
Total	**24**

5.1.1 General Construction Methodology

A general sequence of construction activities is outlined below. Site-specific activities are outlined in the Buildability Report.

- Install temporary traffic management measures, including localised signage and advanced advertisement and site accommodation works (i.e. hoarding within the works area)
- Vegetation clearance and demolition of existing structures marked for removal
- Undertake enabling works including identification of utilities
- Excavations of existing ground surface
- Undertake ground preparation works
- Installation of concrete flood walls through a sheet piled solution or concrete piled solution
- Where embankments are proposed: excavations down to suitable bearing material. Establish working areas on either side of excavations.
- Import and compact suitable filling material
- Backfill excavated material
- Reinstate barriers, boundaries, access, and gardens where appropriate
- Place topsoil on embankment and seed

5.2 Equipment, machinery and works.

Equipment to be used during the construction of the works will be typical of a project of this scale. The precise configuration of on-site plant will be determined by the contractor. In general, the following machinery will be used:

- Excavators;
- Dumpers;
- Pile drivers;
- Pumps;
- Concrete pumps;
- Cranes;
- Forklifts;
- Delivery vehicles for materials; and
- Generator

The main activities on site will involve vegetation clearance, service diversions including; gas, electric, telecom, foul and surface water, diversion of streams, construction of new flood walls and embankments.

5.3 Site Confines

The proposed development site is shown in Figure 3.2 above, and proposed compound locations are shown in Figure 6-1 below. Site establishment by the Contractor will be limited to the following:

- Setting up of access control to the site;
- Construction traffic management and alert signage, including pedestrian management;
- On-site toilet facility, site offices and site canteen;
- Temporary fencing, hedgerow/tree protection fencing, silt (watercourse protection) fencing and site security;
- Bunded storage of fuels and refuelling area; and
- Storage of materials.

Mitigation measures associated with site and compound establishment are outlined in Section 6.1.1.

5.4 Method Statements

In advance of any operations commencing at the site the appointed contractor will be required to prepare Method Statements for approval by LCCC. The method statement should accompany the submission to the council – along with this CEMP for approval. This may include:

- Location of site compounds, storage areas, and car parking facilities for workers;
- Site security fencing and hoarding, including fencing off of sensitive ecological features;
- Traffic management plan and Waste Disposal Plan;
- Working within private properties;
- Details on vegetation clearance and earthworks, Landscape Plan;
- Biosecurity Plan;
- Storm Water Management Plan; and
- Bunding/drip tray proposals for fuel storage & vehicles as required.

6 Environmental Impacts and Mitigation Requirements

During the construction and operational stages of the development there are potential risks to ecological features from the following;

- Potential leakage of hydrocarbon/lubricants;
- Increased surface water runoff and sediment loading;
- Concrete spills;
- Physical and noise disturbance to habitats and species;
- Dust deposition;
- Noise;
- Vibration; and
- Lighting disturbance.

Measures will be proposed in the following sections to mitigate against any potentially significant impacts on the surrounding environment in the vicinity of the site and downstream of the site. These measures were developed in and as a result of the EIAR and NIS prepared for the development.

6.1 Toolbox talks and Environmental Management

A suitably qualified ECoW will be appointed to oversee all site installation activities with respect to the environment. This shall include preparation and delivery of toolbox talks to on-site personnel. Topics covered will include spill control, working on or near watercourses, silt management, storage of waste, working around trees and hedgerows, nesting birds, protected species and invasive non-native species.

The ECoW will oversee critical activities on site that could have an impact on sensitive habitats and species. The ecologist will be responsible for ensuring that measures set out in this CEMP shall be implemented.

6.1.1 Standard Environmental Best Practice

The activities required for the proposed development's construction phase shall remain within the boundary of the proposed site, bar select compound areas, which will be located in adjacent lands for mitigation control reasons. The CEMP will also strictly adhere to best practice environmental guidance including but not limited to the following:

- CIRIA Guidance C532: Control of water pollution from construction sites. Guidance for consultants and contractors;
- CIRIA Guidance C741: Environmental good practice on site guide;
- CIRIA Guidance C750D: Groundwater control: design and practice;
- CIRIA (C512): Environmental Handbook for Building and Civil Engineering Projects;
- CIRIA (C697): The SUDS Manual;
- CIRIA (C649) Control of water pollution from linear construction projects: Site guide;
- CIRIA (C848): Control of water pollution from linear construction projects: Technical guidance;
- Inland Fisheries Ireland: Guidance on Protection of Fisheries During Construction Works In and Adjacent to Waters; and
- Inland Fisheries Ireland: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning

6.1.1 Environmental Management of Site Compounds

The principal contractor will be required to ensure good environmental management within the site compounds. The below list of measures will be incorporated into site compound environmental management:

- The proposed site compounds are partially within the 1% AEP Flood Zone, as shown in Figure 6-1. The 2nd and 3rd secondary compounds will be used for the temporary storage of excavated and imported

materials for the construction of embankments only. Any lubricants, oils, fuels, cement or other potentially harmful chemicals or substances will be stored in the main compound;

- The proposed site compounds are not located in areas of sensitive habitat, and are located on dry land and set back from watercourses;
- Lubricants, oils, fuels, cement or other chemicals will be stored in sealed containers in a bunded area. This storage area will be located in the main compound, outside the flood extent shown in Figure 6-1;
- The contractor will only store a manageable quantity of materials in the secondary compounds at any one time. The contractor will also import and export soil continuously, to limit the quantity of soil stored on site at one time;
- At present, a flood risk alert system is in operation for residents of Castleconnell. This system will be extended for use by the contractor, who will monitor flood risk and remove any heavy machinery, materials, or substances from flood zones prior to a predicted flood event. Flows over Parteen Weir are published daily by ESB, and should also be monitored by the contractor for the duration of the works;
- Only plant and materials necessary for the construction of the works will be permitted to be stored at the compound location;
- Site establishment by the Contractor will include the following:
    - Site offices;
    - Site facilities (canteen, toilets, drying rooms, etc.);
    - Office for construction management team;
    - Secure compound for the storage of all on-site machinery and materials;
    - Temporary car parking facilities;
    - Temporary fencing; and
    - Site Security to restrict unauthorized entry;
- All sub-contractors will be given an induction toolbox talk so that they are aware of material storage arrangements;
- Construction materials within the compound will be stored in a designated area in an organised manner so as to protect them from accidental damage and deterioration as a result of exposure;
- Bunded storage of fuels and refuelling area. Bunds shall be 110% capacity of the largest vessel contained within the bunded area;
- A chemical storage plan will be in place as required, including spill kits;
- A separate container will be located in the Contractors compound to store absorbents used to contain spillages of hazardous materials. The container will be clearly labelled, and the contents of the container will be disposed of by a licenced waste contractor at a licenced site. Records will be maintained of material taken off site for disposal;
- A maintenance programme for the bunded areas will be managed by the site environmental manager. The removal of rainwater from the bunded areas will be their responsibility. Records will be maintained of materials taken off site for disposal;
- The site environmental manager will be responsible for maintaining all training records and weekly environmental inspections;
- Drainage collection system for washing area to prevent run-off into surface water system;
- Stockpiling of spoil and spoil-like materials will be appropriately located within the compounds to minimise exposure to prevailing winds and risk of runoff; and
- All refuelling of vehicles will be carried out at the fuel stores within the site compounds and only ADR trained personnel will be permitted to operate fuel bowsers.

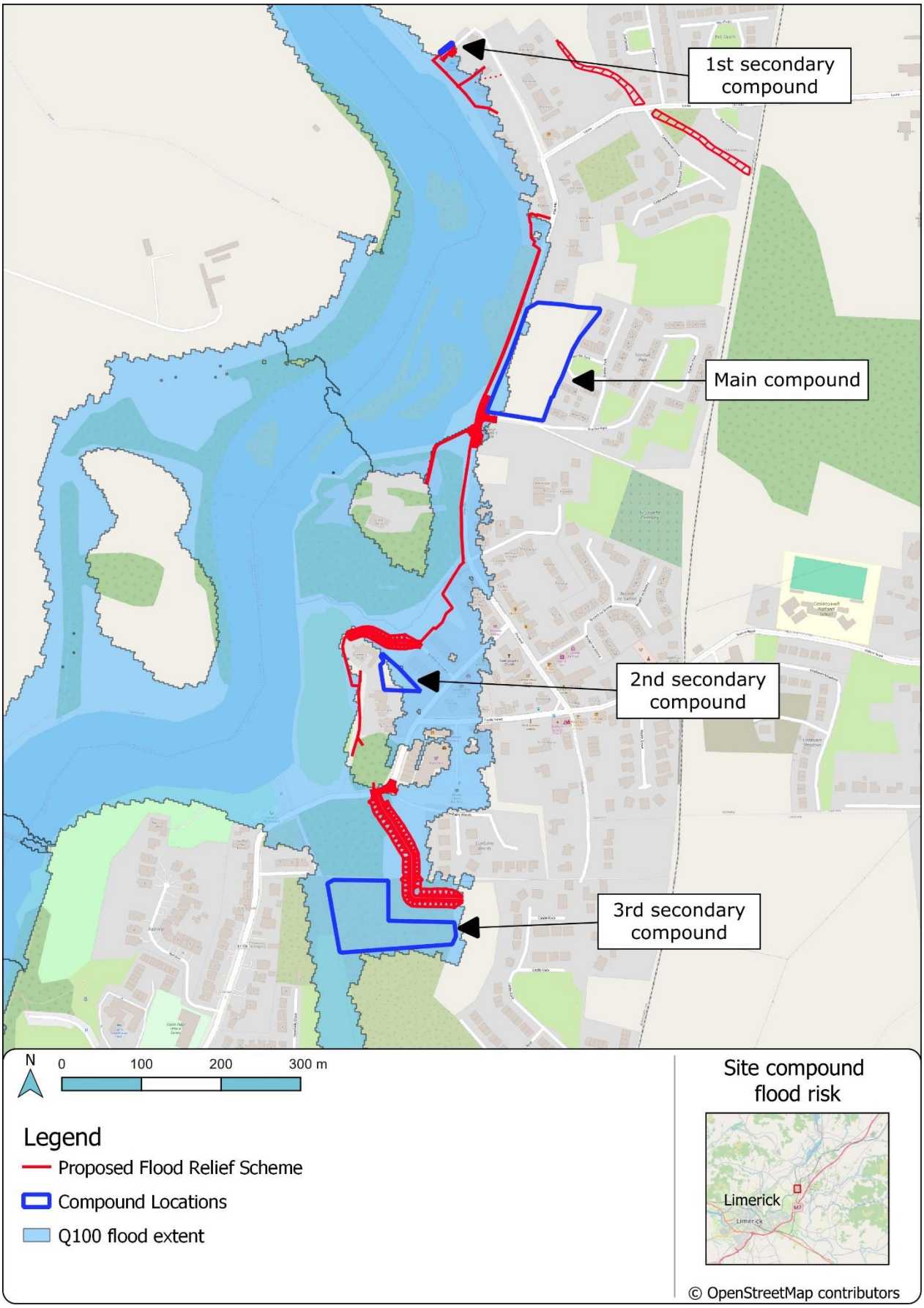

Figure 6-1: Site compound Locations

6.2 Planned Erosion and Sediment Control Practices

6.2.1 Protecting Water Quality - Surface Water Controls

In order to protect surface water throughout the proposed development site, the principal contractor will be required to develop and implement a Surface Water Management Plan and Pollution Control Plan.

6.2.2 Surface Water Management Plan

In order to safeguard the local surface water network, and in turn the local groundwater network, from surface water-based pollution events, the following must be strictly adhered to:

- The Principal Contractor will ensure compliance with environmental quality standards specified in the relevant legislation, namely European Communities (Environmental Objectives (Surface Waters)) Regulations, 2009 (S.I. No. 272 of 2009 and amendments), and the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988);
- The contractor will construct a site compound at a location remote from any drains;
- Oil booms and oil soakage pads will be maintained on-site to enable a rapid and effective response to any accidental spillage or discharge. These shall be disposed of correctly and records will be maintained by the environmental manager of the used booms and pads taken off site for disposal;
- Management of silt-laden water on-site, including procedures for accidental leaks / spills to ground, as well as water quality monitoring to ensure compliance with environmental quality standards specified above;
- At no point during the construction phase will untreated water be discharged to local surface water network without the water quality meeting the statutory limits as set under the environmental quality standards specified above;
- Fail-safe site drainage and bunding through drip trays on plant and machinery will be provided to prevent discharge of chemical spillage from the sites to surface water;
- Any accidental discharge will be controlled by the use of oil booms in the water prior to construction starting;
- Washout of concrete plant will occur at a designated impermeable area with waste control facilities;
- Wherever reasonably possible, pre-cast concrete features should be utilised to minimise the risk of a concrete-based pollution event;
- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete;
- Temporary stockpiles will be monitored for leachate generation. These stockpiles will be placed within designated areas and not located within the vicinity of watercourses, wetlands or artificial surface water drainage features;
- Excavated contaminated soils will be segregated and securely stored in a designated area where the possibility of runoff generation or infiltration to ground or surface water drainage has been eliminated through bunding and imperviable geotextile linings. The contaminated soils will then be classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC. Furthermore, the contractor will ensure that no cross-contamination with clean soils happens elsewhere throughout the development site;
- Silt fencing will be installed prior to the commencement of any construction works in order to enhance the protection of identified water features (Figure 6-2). An ECoW will be present during the installation of these protective measures to ensure that they are installed to best practice standard and correctly located in their assigned areas. The following sub-sections will provide greater detail on specific locations of these silt fence / trench sections;
- Silt fences will be repaired and/or replaced as necessary by the principal contractor as part of the on-going environmental monitoring programme;
- Planning of works should be conscious of available weather forecasts and avoid working during heavy rain/storm events to minimise the risk of runoff;

- Storage locations and topsoil piles will be placed in appropriate places, distant to existing drains/sewerage within site;
- All soil stockpiles shall be covered (i.e., with a tarpaulin or vegetated) to minimise the risk of rain/wind erosion. Vegetation will be established as soon as possible on all exposed soils;
- In the event of an extended dry period, stockpiles will be dampened using a water to minimise the risk of airborne particles entering watercourses;
- Silt fencing or other appropriate measures shall be put in place downstream of exposed soils or soil stockpiles; and
- Excavations will remain open for as little time as possible before the placement of fill to minimise the potential of water ingress into excavations.

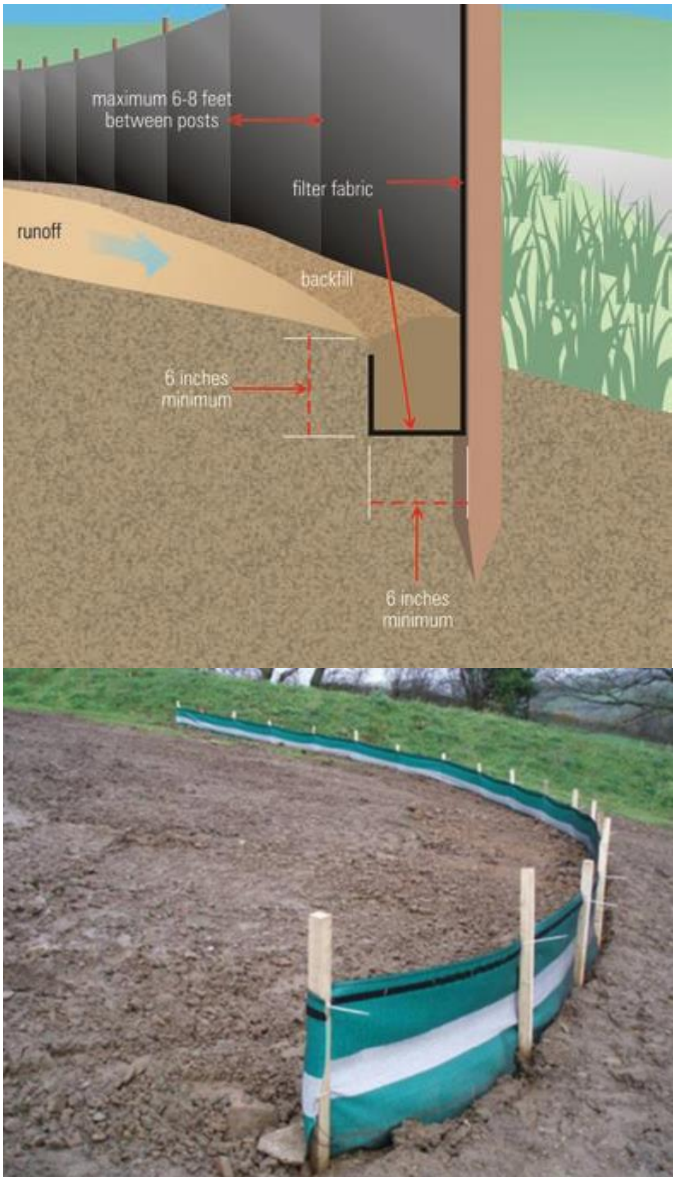

Figure 6-2: Example of suitable silt fence mitigation ensuring maximum safeguard efficiency

6.2.3 Concrete Management Procedures

A concrete management plan will be drawn up at the outset of the project to ensure safe management of concrete pours, management of concrete lorries and washing of materials used in concrete construction etc. It will cover at minimum the points below:

- Washout of concrete plant will occur at a designated impermeable area with waste control facilities.

- Concrete delivery, concrete pours and related construction methodologies will be part of the procedure agreed with the contractor to mitigate any possibility of spillage or contamination of the local environment. Particular attention will be paid during the pouring process in order to avoid leakages or spills of concrete;
- Wherever reasonably possible, pre-cast concrete features should be utilised to minimise the risk of a concrete-based pollution event; and
- Controlled release or pre-washing of installed culverts to ensure that the first release of water through culverts does not result in a washing through of concrete (and other built-up debris).

6.2.4 Pollution Control Plan

In case of accidental spills, the following will be taken into account:

- There will be no refuelling of machinery within or near the river channel. Refuelling will take place at designated locations at distances of greater than 30 metres from the watercourse;
- No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times;
- Spill kits containing absorbent pads, granules and booms will be stored in the site compound with easy access for delivery to site in the case of an emergency;
- A minimum stock of spill kits will be maintained at all times and site foremen's vehicles will carry large spill kits at all times;
- Absorbent material will be used with pumps and generators at all times and used material disposed of in accordance with the Waste Management Plan;
- All used spill materials e.g., absorbent pads, will be placed in a bunded container in the contractor's compound. The material will be disposed of by a licenced waste contractor at a licenced facility;
- Records will be maintained by the ECoW and/or an environmental site manager; and
- Regular inspections and maintenance of plant and machinery checking for leaks, damage or vandalism will be made on all plant and equipment.

In the event of a spill the principal contractor will ensure that the following procedure are in place:

- Emergency response awareness training for all Project personnel on-site works;
- Appropriate and sufficient spill control materials will be installed at strategic locations within the site. Spills kits for immediate use will be kept in the cab of mobile equipment;
- Refuelling will take place at designated locations at distances of greater than 30 metres from the watercourse;
- Vehicles should not be left unattended when refuelling;
- Any fuel needed to be stored on the site will be stored appropriately and at a location that is set back from the river. All other construction materials will be stored in this compound. The compound will also house the site offices and portable toilets. This compound will either be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation;
- All vehicles will be regularly maintained and checked for fuel and oil leaks;
- Spill kits will be stored in the site compound with easy access for delivery to site in the case of an emergency. A minimum stock of spill kits will be maintained at all times and site vehicles will carry spill kits at all times. Spill kits must include suitable spill control materials to deal with the type of spillage that may occur and where it may occur. Typical contents of an on-site spill kit will include the following as a minimum:
    - Absorbent granules;
    - Absorbent mats/cushions;
    - Absorbent booms;
    - Track-mats, geotextile material and drain covers.
- All potentially polluting substances such as oils and chemicals used during construction will be stored in containers clearly labelled and stored with suitable precautionary measures such as bunding within the site compound;
- All tank and drum storage areas on the site will, as a minimum, be bunded to a volume not less than the following:

  - 110% of the capacity of the largest tank or drum within the bunded area, or
  - 25% of the total volume of substances which could be stored within the bunded area.
- All hydrocarbons to be utilised during construction are to be appropriately handled, stored and disposed of in accordance with the TII document 'Guidelines for the crossing of watercourses during the construction of National Road Schemes'[1];
- The site compound fuel storage areas and cleaning areas will be rendered impervious and will be constructed to ensure no discharges will cause pollution to surface or ground waters.
- Designated locations for refuelling are within site compound;
- Potentially contaminated run off from plant and machinery maintenance areas will be managed within the site compound surface water collection system;
- Damaged or leaking containers will be removed from use and replaced immediately;
- The use of settling lagoons, settling tanks, or equivalent, with outflow control measures may be used for the interception of surface water or groundwater pumped from an active working area;
- If a spillage of a hazardous material to groundwater occurs, the groundwater will be contained and pumped to a tank or holding vessel prior to shipment off site for disposal. The contractor will maintain disposal records. The contractor will identify the cause of the spillage and mitigation measures and controls will be put in place to prevent a repeat. The CEMP for the site will be updated and contractors and sub-contractors will be made aware of the amendments;
- The Contractor will clean equipment prior to delivery to the site. The Contractor will avoid using any equipment which leaks fuel, hydraulic oil, or lubricant. The Contractor will maintain equipment to ensure efficiency and to minimise emissions. Where possible, the contractor should maximise the use of biofuels;
- Management/Response plans will be implemented to identify mobilisation of soil particles/pollution and initiate the interception and treatment of pollution/silt runoff;
- The use of precast elements should be maximised to avoid wet concreting in close proximity to water.

6.2.5 Flooding During Construction

There is a possibility that a flood will occur during the construction phase. To ensure that Castleconnell does not become vulnerable to floods during construction, the contractor will be required to monitor conditions that may cause inundation. In the event of a storm event, temporary flood barriers will be erected at the exposed locations. All works undertaken near the banks will be fully consolidated to prevent scour and run-off of silt. Consolidation may include use of protective and biodegradable matting or geotextiles on the banks and the sowing of grass seed on bare soil. Earth works will be aimed to take place during the driest season to ensure that any flooding during the wet season does not result in mobilisation of significant quantities of unconsolidated material.

6.3 Site-Specific Ecological Mitigation Measures

6.3.1 Stream Diversion (Cedarwood Culvert Construction)

The construction of both culverts will require significant instream works. Temporary stream redirection is considered preferable, particularly in the case of the 40m long culvert at the outfall.

These recommendations as well as any other recommendations that come as a result of consultation with IFI. All stages of the stream diversion should be overseen by an ECoW who will monitor all stages of instream works, with regular reporting to the LCCC and Inland Fisheries Ireland.

[1] NRA (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes, available: https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Crossing-of-Watercourses-during-the-Construction-of-National-Road-Schemes.pdf.

The proposed stream diversion will outfall north of the current Cedarwood alignment. The stream diversion should be constructed in advance of dewatering the stream. The temporary riverbed should be made of compacted soil lined with Terram geotextile which will also extend up the banks. Appropriate gravels and boulders (in line with local bedrock type present in the stream) should be placed overtop the Terram geotextile. Both ends of the temporary diversion should be disconnected from the stream with a geotextile Terram lined sheet piling in advance of connection. The temporary diversion should be opened in tandem with the closure of the works area, described below.

As there is limited space at the smaller upstream culvert, stream diversion may not be possible and over pumping will be required at this location.

Dry works area

In order to ensure the safeguarding of the River Shannon and its downstream habitats which support a variety of protected species; the presence of an ECoW will be required during the installation of the dry cell sheet piling within the stream at the upstream and downstream boundaries of the zone of works.

Dewatering of the proposed dry cell area will require the installation of a temporary dam using sheet pilings and/or one tonne sandbags, or any other barrier following contractors design specification, from bank to bank. Water should be introduced back into the river only after suspended sediment has settled and/or filtered from the water. The methodology for this water reintroduction should follow best practice guidance as set out by the contractor and ECoW in the final CEMP, which should be approved by IFI and LCCC.

One approved method involves pumping water into a settling pond more than 30m from the stream before slowly spilling the water through silt bag traps into a discharge point located on the edge of the newly diverted stream or directly into the River Shannon. The discharge point will consist of a circle of triple silt fences surrounding a circle of straw bales wrapped in Terram geotextile. All waters pumped from the dry cell area will first settle within the pond and then filter though the silt bag, straw bales, and silt fences before diffusely discharging back into the river. The discharge points will be constructed prior to commencement of construction works and will be monitored on a daily basis when in use to ensure that the release of any polluting material is mitigated.

These works will need to be scheduled for a dry weather period, as heavy rains during these works will compromise the absorption ability of the discharge point. Should any aquatic fauna enter the dewatering system the ECoW will be there to secure them and ensure their safe return to the temporarily redirected Cedarwood Stream or River Shannon, whichever is suitable. Fish salvage and translocation efforts will ensure that there will be no entrapment as a result of the dry cell dewatering.

All instream works should be conducted between July and September inclusive as per IFI recommendations.

6.3.2 Construction of Walls along Mall Road.

The walls running along Mall Road will be removed and replaced with a flood wall which will be set back almost 1.5m towards the road (Figure 6-3).

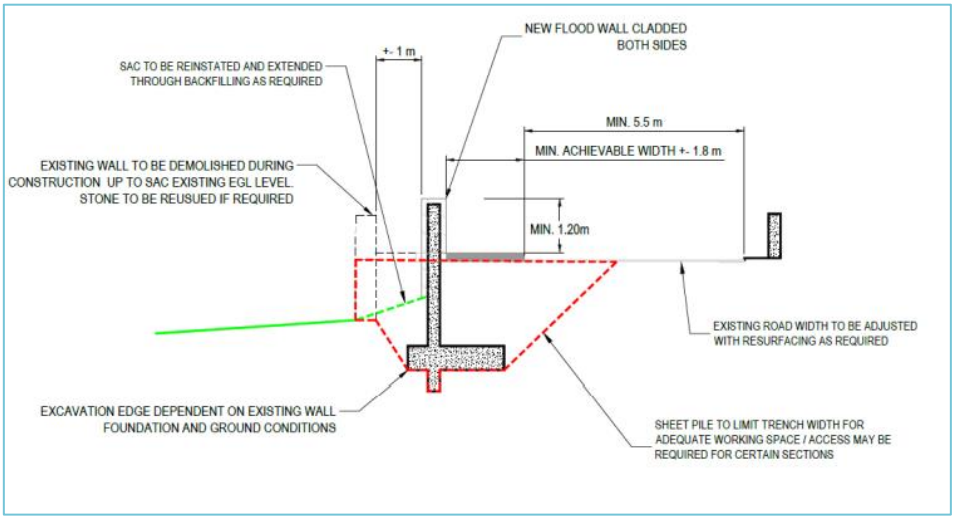

Figure 6-3: Cross section of new proposed wall

Standard trenched silt fencing is not feasible in this location due to the presence of trees (alluvial woodland) nearby. Construction works should take place as follows:

It is expected that demolition of the wall will be required ahead of excavation to mitigate against the risk of collapse. Sheet piling will be utilised at this location, however to prevent sediment movement before attaining necessary depth for the sheet piling installation a light silt fence is proposed.

A light silt fence with shallow stakes will be placed between the existing wall and the alluvial woodland in advance of deconstruction. This light silt fence will be lined with terram/impermeable geotextile material which will be held down with geotextile sandbags, the fence itself can also be reinforced with geotextile sandbags to the rear. This lightweight silt fence will sit on the surface of the woodland and can be manoeuvred around trees, limiting damage to trees and particularly their roots. This method will be used instead of normal silt fencing which requires a shallow trench to be dug. The silt fence will prevent any silt or debris created during the deconstruction of the wall from entering the woodland and potentially into the River Shannon aquatic habitat.

After the wall is demolished/disassembled, excavations for the new wall foundations can commence. Once this work is complete, any sand and silt build up in the silt fencing should be removed in the direction of the road and away from the SAC. Any silt should be carefully disposed of, away from watercourses.

Protection of water from cement leachate: It is expected that the flood wall and foundations will be constructed in-situ using poured concrete however, there may be scope to propose pre-cast concrete units following the detailed design site investigations. The newly excavated space to facilitate the wall foundations should be lined with an impermeable geotextile to create a sealed working space with a fenced buffer between any works involving concrete or cement. Once this area is lined the foundation and wall can be constructed. The wall will then be faced above ground level on both sides with stone reclaimed from the original stone wall and similar imported stone if needed.

Once the wall is constructed the silt fencing should be carefully removed to prevent any trapped pollutants from entering the SAC. This should be completed by hand with silt fencing transported out of the area by wheelbarrow. Alternatively, the silt fencing can be placed in a suitable container and lifted over the wall using machinery placed on the road.

6.3.3 Construction of walls and embankments along Cloon Stream Maher's Pub, Meadowbrook, Stormont House

The construction of the new flood wall adjacent to Maher's Pub will be within a few metres (Approximately. 2-5metres) from the Cloon Stream. Construction should follow the same mitigation measures as the construction of walls along Mall Road however there is no requirement for deconstruction of an existing wall

in this section. Lightweight silt fencing with geotextile sandbags will be placed on the boundary of the proposed excavation area. A geotextile lining will be placed in the excavation foundation trench as described above after which the same method is followed.

The embankment behind Meadowbrook and Stormont House will be constructed near the Cloon Stream. The embankments will require some level (to be confirmed following further site investigation) of excavation at the foot of the proposed slope which will be backfilled as part of the construction. Lightweight silt fencing with geotextile sandbags will be put on the boundary of this excavation zone between the Cloon Stream and the proposed embankment.

The silt fence will stay in place until the soil on the bank has settled and grass has rooted, keeping potential loose soil in place, and preventing any soil from washing into the Cloon Stream.

6.3.4 Cedarwood vegetation and silt removal, replacement of culvert at private property

The Cedarwood Stream will require vegetation removal from the channel to increase conveyance. The stream is currently choked with brambles, as well as some trees that are growing on the bank. Trees on top of the bank are not expected to require removal, however some lower branches may be cut back.

Silt in the Cedarwood Stream may also be removed. Mitigation to protect downstream water quality will be required.

This work will require the following mitigation:

- Tree and vegetation removal will be carried out from 1st September to 28th February only. Where possible, remove vegetation and branches by hand;
- It is expected that the removal of silt in stream will result in a high load of sediment release downstream and therefore mitigation to prevent release of silt downstream should be installed. A series of silt screens should be placed downstream of the silt removal works on the Cedarwood stream. This will be under advisement from the ECOW on the placement and number required. Sediment/silt removal within the stream should be carried out from downstream to upstream. Only sediments should be removed, and the bank and stream bed should be left intact;
- Before instream silt removal, translocation of fish, should be carried out;
- The replacement of the culvert at Coole House will require works to be carried out in the dry. The stream will be blocked off to create a dry bed, and overpumping of the water will be carried out; and
- ECoW will be present to advise and monitor the works within this sensitive environment.

6.3.5 Rivergrove works from Riparian area

The proposed method for constructing the flood wall at Rivergrove will require entering the riparian habitat, and mitigation will be required to protect this habitat. This will likely include the following measures as discussed with NPWS:

- A stone platform to be installed for machinery to enter and work in the riparian area, which will be underpinned by terram to ensure the stone can be completely removed after construction and keep release of dusts and small stones from entering the river.
- Seasonal constraint: works should be completed during the summer months and should be finished by the end of September ahead of any anticipated flood. Any machinery would be removed ahead of a flood, if flooding is forecast during this season.
- Any concrete should be pumped from the dry side.
- Translocation of lamprey should be carried out in this soft mud before the works are started. (further detailed in next section)
- High tensile geotextile should be used under the stone to ensure the textile does not rip. No stones should be allowed to fall into the river (off the terram).
- Stone used for the platform should be pre-washed aggregate only, to minimise leaching of stone dust into the Shannon.
- ECoW should be present during these works.

- Compaction of soil – after works are complete the stone platform and geotextile will be removed. It is likely the soil under the platform will be compacted from the weight of the machinery and soil, and therefore habitat remedial works should be carried out.

6.3.6 Protection of Stradbally Stream from sediment during construction

Two drainage ditches that drain into the Stradbally Stream (and thus the Lower River Shannon SAC) are located within the working area of the new embankment to be constructed at Coolbane woods.

Mitigation to prevent sediment release from construction will be put in place to protect the water quality of the local watercourses, and thus QIs such as fish, otter, birds etc.

- Prior to any work commencing at this site, a silt-screen/trap will be staked into the ditches to safeguard the Stradbally stream from substantial sediment input. This can either be strawbale screen or fabric silt screen; and
- The appointed ECoW will be present to initially inspect the structural integrity of the silt-screen. Furthermore, the ECoW will be there to monitor its sediment loading and bring it to the attention of site workers if the screen's silt capacity has been reached and needs changing. The removed silt-laden material will need to be disposed of at least 20m away from the aquatic habitats.

6.3.7 Works at Island House causeway

Road raising will occur at the Island House causeway, which lies directly over and adjacent to the Cloon Stream. Lamprey are present in this stream.

The works will require some excavation of existing material, pouring of lightweight cement, and topping with gravel. The Cloon Stream will be protected to prevent any material from falling from the causeway during the works.

The following measures are proposed:

- During construction the existing sluices will be fully closed to control the water entering stream. This will reduce the flow temporarily while the works are being carried out;
- Sandbags and geotextile will be used to create a temporary wall beside the steep banks that are unprotected either side of the causeway where sediment/ water could drain off into the Cloon Stream;
- Manual excavation around Root Protection Areas (RPAs)
- The ECOW will be present to advise and monitor the works next to this sensitive environment.

A significant portion of the RPA of a Category A Beech tree will be impacted by proposed works. The final design will need to consider the retention of any large diameter roots (>25mm) as Beech trees are particularly sensitive to root disturbance. Trees marked for removal to accommodate the proposed floodgate at the entrance of Island House are in a declined condition and are suitable for removal.

6.3.8 Mammals

6.3.9 Bats

Construction will take place within daylight hours, outside of bat activity hours (i.e., one hour pre-sunset) to minimise the risk of disturbance to commuting and foraging bats.

Mitigation measures are required to minimise the risk of disturbance to roosting bats, including those potentially roosting in trees scheduled for removal:

- A suitably qualified ecologist (ECoW) will be present during the removal of any trees with bat roost potential, to monitor for bats during felling;
- Any clearing of vegetation/trees with the potential for bat roosting should be completed in September/October (i.e., before the hibernation period begins, so that bats have the opportunity to move

on from the site while conditions are still favourable to find new roosts) and can be carried out without a licence;
- Soft-felling techniques will be employed, with trees left to lie for 24 hours before removal, in order to allow any roosting bats to escape; and
- Lighting will not shine directly onto any roosts identified within the works area.

Otter

A pre-construction survey for Otter will be carried out within 10 months prior to construction. This will be supplemented by inspection of the FRS construction area immediately prior to site clearance to ensure no holts or couches have been created in the intervening period. This should particularly be undertaken around the Cloon Stream area which is heavily vegetated and is suitable for otter. It is unlikely any holts are to be found, however if the presence of otter is found, appropriate steps will be taken, and a derogation licence will be applied for from NPWS. Any mitigation required will be agreed with NPWS.

Trenching works shall not create confined areas where Otter may get trapped. However, if such areas are created, the area will be fitted with an escape ramp (no more than 45º) to allow trapped animals to escape when the area is not in operation. These areas must be made safe before leaving site each day.

6.3.10 Birds – general measures

General construction mitigation measures will minimise risk of disturbance to breeding and non-breeding birds:

- Limit displacement and habitat degradation by controlling vehicle movement and working from non-vegetated areas as much as possible;
- Vehicles will not encroach onto habitats beyond the proposed Scheme footprint;
- Tree felling and vegetation clearance will take place outside the breeding season (March to August, inclusive), unless permission is obtained from NPWS outside of these times. Any clearance outside this timeframe will require a suitably qualified ecologist or ECoW to be present and to check the area for nesting birds prior to any vegetation removal;
- Work around the heronry will be carried out outside of the breeding season and will be able to start as soon as the last chicks have fledged provided there are no other nesting birds around. A suitably qualified ecologist or ECoW will be present to carry out pre-work checks. The use of heavy machinery, and loud disturbance should not occur in the month leading to the start of the breeding season (February) as this is likely to cause abandonment;
- All plant and equipment will conform with the Construction Plant and Equipment Permissible Noise Levels Regulations 1996 (SI 359/1996) and other relevant legislation;
- Plant and equipment will be turned off when not in use, with no unnecessary revving;
- Lighting will not shine directly onto surrounding areas and will be switched off at night; and
- Dipper / grey wagtail nesting box to be installed under the arches of the bridge to Island house.

Herons – Protection of nests from construction disturbance

- Work around the heronry will be carried out outside of the Heron breeding season which begins in February and ends in August. Construction, in particular initial vegetation clearance and the sheet piling works should start in August and must be finished by January. Minor construction work can then continue with supervision from ECoW.
- A suitably qualified ecologist or ECoW will be present to carry out pre work check of the nests in August to ensure the chicks have fledged;
- If the works stray into the next breeding season, the use of heavy machinery, and loud disturbance should not occur from the month leading to the start of the breeding season (February) as this is likely to cause abandonment. Works may have to halt in until chicks have fledged; and
- Monthly monitoring of the heronry should be carried out prior to, during, and post-construction to assess the impact of the disturbance and whether further measures need to be implemented. This will be carried out by a suitably qualified ecologist.

6.3.11 Aquatic environment

Fish Translocation efforts - Rivergrove/Grange House Walls and Cedarwood Outfall

The construction of improved flood relief walls along the banks of the River Shannon will require works to take place on the river side of the flood wall. This will require the placement of sheet piling to create a dry cell for the works. With limited construction space at Rivergrove in the garden area, a temporary working platform will be constructed within the river side of the flood wall to facilitate the construction of the wall and piling works. Works at Grange House will be carried out from the dry side in the footprint of the existing wall. The sediment along the banks in this location contains Lamprey ammocoetes which will require translocation to other nearby available habitat, to avoid mortality. Other fish in the area will likely leave through disturbance however if any become entrapped, they will also require removal. The zone of works for translocation efforts is shown in Figure 6-4 below.

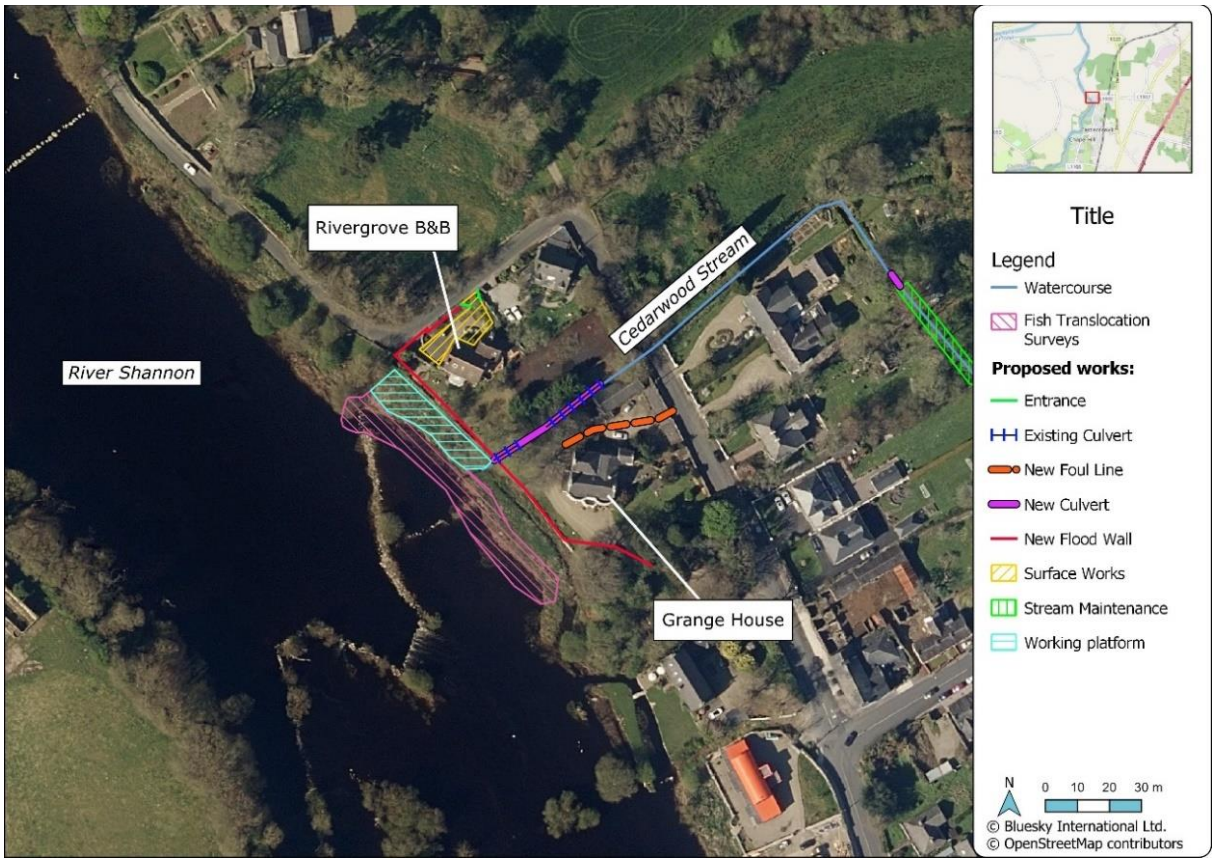

Figure 6-4: Location of fish translocation efforts.

The recovery of Lamprey ammocoetes is a precise and slow process as ammocoetes retreat into their burrows when disturbed. Translocation efforts will follow guidelines for standard electrofishing surveys as set out in Harvey and Cowx (2003). To successfully translocate ammocoetes, this work should be carried out in accordance with the criteria below:

- This work will be conducted by an electrofishing team led by a qualified aquatic ecologist and/or ECoW under license - Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962.
- The precise location of the proposed piling must be communicated with the Electrofishing lead who will conduct the translocation work in tandem with the piling efforts. Stop nets reaching to the river bottom will be erected around affected areas.
- The electrofishing lead will assess the substrate conditions to determine if appropriate habitat is present before fishing the areas using a zigzag pulse and draw manner with a minimum effort of 1 minute fishing per sq. m.

- Captured fish will be quickly removed using a dip net (not the electrofishing anode) and placed in a storage tank with aeration system. Lamprey will be spread out across appropriate habitat at a density of <10 sq. m.
- If adult salmon/trout are trapped and subsequently recovered, they should be returned to the river as soon as they are caught. Others that may be caught during fishing efforts should be moved to an aeration system before being transported to a section of the River Shannon with appropriate habitat. Fish should not be kept within the aeration system for more than 2 hours.
- Once all lamprey habitat is surveyed and ammocoetes are translocated, the remaining area should be fished for other species. Fishing efforts should continue until there is successive efforts with no catch return.
- Works should not take place if the water temperature exceeds 20°C to avoid thermal stress to fish. Dissolved oxygen levels should also be kept to 90% or above. If there is a significant reduction in oxygen level or if significant stress/mortality is observed fishing efforts should be suspended.
- This methodology should be approved by IFI in advance of works.

Control of Zebra/Quagga mussel during Construction

Precautionary measures should be taken in terms of biosecurity to prevent spread of Zebra and/or Quagga mussel. The juvenile stages of zebra and quagga mussel can be less than 1mm in size - cleaning should take place even if nothing is visible to the naked eye, as they can attach to any equipment or clothing that comes in contact with water.

The follow biosecurity measures should be adhered to:

- Check any equipment, and clothing after leaving the water for mud, aquatic animals or plant material. Remove anything you find and leave it at the site.
- Clean everything thoroughly as soon as possible. Use hot water (at least 45°C), steam or a high-pressure spray if possible.
- Dry - drain water from every part of equipment before leaving the site. Dry the surfaces of everything and allow to air dry for at least 48 hours – some species can live for many days or weeks in moist conditions. Disinfect cleaned items if complete drying is not possible. Use disinfectant such as Virkon Aquatic, Virasure or any other proprietary disinfectant product. Areas difficult to dry can be sprayed or wiped down with disinfectant.[2]

6.3.12 Vegetation

Mitigation for Alluvial forests (Woodlands)

Planting of trees in the Alluvial woodland No. 1 is outlined in the NIS, to compensate for removal of twenty-one trees from the Mall Road (Phase 2) construction. The canopy structure of this woodland is mostly composed of non-native trees such as Beech, Sycamore, and White Poplar. Any of these trees to be removed may be done so without damage to the woodland. However, any other tree species such as Alder, Ash and Willow will be protected where possible. If native tree species are to be removed, post-construction tree planting, using suitably sourced native species, should occur to replace these native trees.

Where construction is taking place next to a protected habitat, an Ecological Clerk of Works should be present at the start of the work anywhere beside the Alluvial Forests. The ECoW should provide a toolbox talk to the construction team prior to any ground works taking place, advise on any areas where:

[2] NBDC (2022) *Ireland's Invasive Alien Species Recreational Boating and Watercraft Pathway Action Plan 2022-2027, National Parks and Wildlife Service / Department of Culture, Heritage and Gaeltacht*, available: https://www.npws.ie/sites/default/files/IAS_Boating-and-watercraft_PAP_FINAL_June2022.docx.

- The woodland will be demarcated by fencing to prevent access or potential damage to the alluvial woodland adjacent to the riverbank and north of the works on new western outfall. Mitigation will ensure location of new outfall is not located within Alluvial forest habitat.
- No construction work, storage or dumping of material will be undertaken in the Alluvial Forests 91E0 exclusion area.
- As works will be undertaken inside the existing SAC boundary, an adequate buffer zone will be provided to ensure that the alluvial woodland and riparian zone is not degraded and there is no bankside erosion.
- Deadwood: During construction work, any deadwood located within the construction area will not be removed from the woodland. Branches and deadwood removed during pruning activity (during construction and ongoing maintenance) will be placed in various locations within the woodland (as advised by a woodland ecologist) to increase the dead wood present.
- Tree root protection: An Arborist has carried out an assessment of works next to trees in Alluvial Forest on the Mall Road. In the Arborist Report[3], the proposed wall raising and footpath intrusion along The Mall road was assessed and it was noted the construction will intrude into the RPA of a number of trees of the Annex I habitat Alluvial Forests. It is considered that 86 trees have been recommended for removal due to the works required within the immediate locations of their stems. It is however considered that this will be minimal, and there are sufficient areas outside the affected rooting areas of these retained trees. The potential impact upon retained trees is therefore considered limited.
- Tree pruning will be undertaken in late winter/early spring (November to March) under supervision of a woodland ecologist. This includes the initial tree-pruning during construction and maintenance pruning works post construction.
- No landscape planting

Control of Giant Hogweed during Construction

Giant hogweed is a biennial/perennial plant and spreads prolifically by productions of thousands of seeds. Any flowering stalks will be removed immediately by cutting the flower head off. Giant hogweed flowers from approximately May/June/July and set seed from July to August. Hand cutting will only be carried out if the operator is wearing full protective clothing to prevent skin contamination by the sap. Note: removal of flowering heads is already being informally controlled by a local river conservation group.

Any Giant Hogweed that is growing in the location of proposed walls or embankment will be dug up to take the root out. If it is not possible to dig up, treatment with herbicide will be necessary. For spot treatment of Giant Hogweed, the most effective chemical for the control of giant hogweed is glyphosate. Injection into the stem of the plant approximately 300mm above the ground with 5ml of a 5% v/v solution can be used where spot treatment is required. Foliar spray application should be undertaken before the flowering stem has fully elongated in mid-spring during periods of mild, dry weather. Where control is being undertaken later in the year after stem elongation, the stems should be cut back to ground level and the re-growth sprayed.

It is likely that seeds will be present in the soil. It is therefore important to control the movement of soil from around the construction site, and offsite. No soil will be removed from the site, as this will spread Giant Hogweed to a new location. Any movement of soil created during construction will be stored as close as possible to the original location and placed back where it originated from where possible.

Tall Herb Fen

The proposed method for constructing the flood wall at Rivergrove will require entering the riparian habitat, and mitigation will be required to protect this habitat.

[3] JB Barry JBA (2024) Castleconnell *FRS Limerick BS5837- Tree survey, Arboricultural Impact Assessment*.

NPWS Divisional Ecologist has been consulted on the proposed construction methodology for this section. This will include the following measures as discussed with NPWS:

- A stone platform can be installed in this section, for machinery to enter into the riparian area, which will be underpinned by terram geotextile to ensure the stone can be completely removed after construction, and keep release of dusts and small stones from entering the river.
- Seasonal constraint: works should be completed during the summer months and should be finished by the end of September ahead of any anticipated flood. Any machinery would be removed ahead of a flood, if flooding is forecast during this season.
- Stone used for the platform should be pre-washed aggregate only, to minimise leaching of stone dust into the River Shannon.
- Any concrete should be pumped from the dry side where possible. An ECoW will be present if pumping concrete is required from the working platform.
- A Translocation survey for Lamprey and fish is required due to presence of soft sediments before temporary working platform is placed
- High tensile geotextile should be used under the stone to ensure the textile does not rip. No stones should be allowed to fall into the river (off the terram).
- Re-instatement of habitat - after works are complete the stone platform and geotextile will be removed. It is likely the soil under the platform will be compacted from the weight of the machinery and soil, and therefore habitat remedial works should be carried out. Loosening of the soil should be done with hand tools only as there will be no machinery allowed into the riparian area. This should be carried out under supervision of the ECoW.
- ECoW: where construction is taking place at Rivergrove and Grange house protected habitat, an Ecological Clerk of Works should be present at the start of the work anywhere beside the Tall Herb Fen
- Toolbox talk: The ECoW should provide a toolbox talk to the construction team prior to any ground works taking place, advise on any areas to avoid if possible. Lamprey and fish are also present here.

Wet grassland

Wet grassland is of higher local importance as it is species rich grassland located in the SAC boundary and connected to the flood plain. This habitat may be impacted during construction by vehicles driving over it to construct the embankment, flood wall and road raining. This will cause compaction and opening of the soil, and tracking over this habitat in the summer which will disturb fauna. Storage of material such as earth for the embankment could also cause compaction and smothering of the grassland.

The following mitigation measures are required:

- Fence off access to this grassland before construction begins;
- No vehicles are allowed to track over this grassland during construction, they must stay to the existing road up to Stormont house;
- No storage of materials such as earth/soil, stone etc;
- No storage/parking up of vehicles allowed; and
- ECoW present to monitor this habitat is not being disturbed/tracked over.

6.3.13 Seasonal Constraints

During construction there will be restrictions on specific activities due to seasonal constraints:

- Vegetation clearance throughout the scheme area will be restricted during the breeding bird and nesting season from 1st of March to the 31st of August inclusive. Caution will be applied out of season for early or late breeding behaviour depending on climatic conditions.
- Works proposed near Rivergrove B&B and Grange House are in proximity to Tall Herb Fen an Annex I habitat. Works should be completed 1st May to 30th September prior to any possible seasonal flooding.
- Mitigation for vegetation removal should be completed during the planting season which extends from October to March.

6.4 Dust and Air Quality

Construction activities have the potential to generate some dust emissions. The extent of dust generation is dependent on the nature of the material (soils, peat, sands, gravels, silts etc.) and the location of the construction activity. In addition, the potential for dust dispersion depends on the local meteorological factors such as rainfall, wind speed and wind direction.

During construction, dust could be generated by activities such as:

- Site fencing;
- Excavation works;
- Construction work;
- Hauling surplus material to other areas within the site; and
- Movement of vehicles on site during construction.
- Temporary storage of soil.

A plan for dust minimisation will be included in the Health and Safety plan in order to minimise production of dust to preserve air quality and also to provide safe and favourable conditions for those working on site and living nearby.

Generally, there is a risk that dust may cause an impact on sensitive receptors within 25m of the source of the dust generated.

Significant dust emissions could arise during dry weather. The use of water suppressants will therefore be used during any dry weather conditions (if required). Where temporary stockpiles are required, the material will be stored in designated areas and will be covered with tarpaulins and/or regularly dampened during dry weather periods. Movement of material within the site and to and from the site will be kept to a minimum. The temporary stockpile of infill will be covered to avoid dust emissions

The following mitigation measures are to be implemented during the construction phase:

6.4.1 General Measures

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;
- Display the head or regional office contact information; and
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked;
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook;
- If applicable, hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100 m of site boundary, with cleaning to be provided if necessary;
- Carry out regular site inspections to monitor compliance with the recommended mitigation measures, record inspection results, and make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable;
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas; and
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Waste Material to be disposed of at an appropriately licensed facility

6.4.2 Measures specific to demolition

- Ensure effective water suppression is used during demolition operations. Handheld sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

6.4.3 Measures specific to earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- Only remove the cover in small areas during work and not all at once.

6.4.4 Measures specific to construction

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

6.4.5 Measures specific to trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes and any subsequent action in a site logbook;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits;
- Access gates to be located at least 10 m from receptors where possible.

If a programme of air quality monitoring shall be implemented at the site boundaries for the duration of construction phase activities to ensure that the air quality standards relating to dust deposition and PM10 are not exceeded, the following limits are recommended;

- Dust Deposition Rate limit = 350 mg/m2/day (averaged over a 30+/-2-day period using Bergerhoff Gauge Method);
- Dust Deposition Rate limit affecting sensitive ecological receivers = 1,000 mg/m2/day;
- PM10 24 Hour Mean concentration limit = 50 µg/m3 not to be exceeded more than 35 times a calendar year;
- PM10 Annual Mean concentration limit = 40 µg/m3; and
- PM2.5 Annual Mean concentration limit = 25 µg/m3

Where levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented. A complaints log shall be maintained by the construction site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

6.5 Noise and Vibration

Appropriate mitigation measures have been identified to ensure the Construction Phase target noise limits are not exceeded. The contractor will be required to implement the control measures recommended in BS 5228 and apply the appropriate measures where applicable. Other measures will include:

- Working hours during site construction operations will be restricted to daytime hours from 07:30 hours to 16:30 hours (Monday to Friday) and, as may be required, from 08.00 hours to 13.00 hours (Saturdays). Evening and night-time work is not expected to take place although it is possible that limited 24 hours working may be required to take place on occasion. This will only take place with the prior agreement of LCCC;
- An on-site speed limit will be enforced for all traffic. Drivers of vehicles will be advised of the speed limits through the erection of signs i.e. a typically recommended on site speed limit is 10 km/hr;
- Where practicable, the use of quiet working methods and the most suitable plant will be selected for each activity having due regard to the need for noise control;
- Best practicable means will be employed to minimise noise emissions and will comply with the general recommendations of BS 5228. To this end operators will use “noise reduced” plant and/or will modify their construction methods so that noisy plant is unnecessary;
- By positioning potentially noisy plant as far as possible from noise sensitive receivers the transmission of sound can be minimised. Earth mounds and/or stockpiles of material or perimeter hoarding on site can be used as a physical barrier between the source and the receiver;
- Mechanical plant used on site will be fitted with effective exhaust silencers. Vehicle reverse alarms will be silenced appropriately in order to minimise noise breakout from the site while still maintaining their effectiveness;
- All plant will be maintained in good working order. Where practicable, machines will be operated at low speeds and will be shut down when not in use;
- Compressors will be of the “noise reduced” variety and fitted with properly lined and sealed acoustic covers;
- In all cases engine and/or machinery covers will be closed whenever the machines or engines are in use;
- All pneumatic percussive tools will be fitted with mufflers or silencers as recommended by the equipment manufactures. Where practicable, all mechanical static plant will be enclosed by acoustic sheds or screens;
- Employees working on the site will be informed about the requirement to minimise noise and will undergo training on the following aspects:
    - The proper use and maintenance of tools and equipment.
    - The positioning of machinery on-site to reduce the emission of noise to the noise sensitive receivers.
    - Avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment.
    - The use and maintenance of sound reduction equipment fitted to power pressure tools and machines.
- Cognisance will also be taken of the Environmental good practice site guide 2005 compiled by CIRIA and the UK Environment Agency. This guide provides useful and practical information regarding the control of noise at construction sites;
- Where excessive noise levels are recorded, further mitigation measures will be employed which may include temporary wooden hoarding / acoustic screening to be installed to a height of no less than 2m around areas of construction where loud noise levels occur;
- The contractor will ensure that the TII Guidelines which identify limits for protection against cosmetic damage as a function of vibration frequency are not exceeded through the use of the selected low vibration piling method;
- Responsible Person – The Contractor will appoint a responsible and trained person who will be present on site and who will be willing to answer and act upon complaints and queries from the local public; and
- Night-time Working - If there are items of plant (*e.g.*, dewatering pumps and similar) in use during night-time hours they will be chosen, sited and enclosed such that levels at the nearest properties do not exceed the measured background noise levels.

In addition to this, specific vibration mitigation measures will be observed at Rivergrove B&B, where sheet piling works will take place close to the existing stone boundary wall. Rivergrove B&B and the boundary wall form part of a Protected Structure, and are also part of an Architectural Conservation Area (ACA).

A Vibration Monitoring Programme will be put in place during sheet piling works at Rivergrove B&B, close to the existing stone boundary wall. Vibration monitors will be placed on the wall and baseline data gathered in advance of construction works commencing. The locations of the vibration monitors will be dictated by the contractor's structural engineer and placed on the wall itself to provide an accurate representation of vibrations within the structure. Removable stainless steel fixings placed into mortar joints will be used to fix the bracketry to the structure and will be removed upon completion of the works with the consent of the conservation engineer.

The vibration monitors will have both visual and audio alarms to warn if vibration limits are being approached or exceeded. A vibration cut off threshold of 4 mm/s peak particle velocity (PPV) will be adopted in line with ***Eurocode 3 Part 5 for transient vibrations close to ruins or buildings of architectural merit***. The alarm system allows the setting of pre-set limits to amber and red alert levels, with flashing lights and sirens alerting site staff of exceedances. The lower level will be set to 3mm/s to trigger an amber light while the upper level will be set to 4mm/s to trigger a red light and a siren. Any exceedance of pre-set vibration limits will result in work stoppage, assessment of the cause of exceedance and measures put in place to avoid future exceedances.

6.6 Traffic

A detailed Construction Traffic Management Plan for the proposed works will be prepared prior to the commencement of construction by the contractor to ensure the safety of road users and construction personnel and to facilitate access to properties where proposed works will temporarily limit access. All vehicles entering and exiting the site, including (material and equipment deliveries) and cars/vans (Contractor's personnel, client staff and Visitors) will do so via the agreed route which will be outlined in the Strategy.

Table 6-1: Construction machinery on site

Machinery	Structures team	Embankment team	Site yard	Total (if all active)
Excavators	1	2	1	4
JCB / multi-purpose plant / mini digger	2	1		3
Dumper Trucks	2	2		4
Scrapers / bulldozers	0	2		2
Crane	1	0		1
Pump	1	0		1
Compact Roller	1	2		3
Site vehicles	4	4		8

The import and export of material during excavation, demolition, and structural works will result in an increase in traffic movements, particularly Heavy Goods Vehicles (HGVs). On average, estimated one-way HGV trips, will be between 12-19 per hour. An estimate of the total number of vehicle movements will be calculated by the Main Contractor.

The Construction Traffic Management Plan (CTMP) will be agreed between the Contractor, local authorities and client's Representative. The CTMP will include the following:

- Adherence to relevant laws, regulations, and standards governing construction activities and traffic management. Key aspects will be adherence to traffic regulations, permitting and licensing, environmental regulations, health and safety standards, local authority requirements, emergency response plans, and public consultation;
- Deliveries will be limited to working hours (08:00 to 19:00 Monday to Friday, 08:30 to 14:00 Saturday, and none on Sundays or public holidays, or as determined by the County Council);

- Construction vehicles will use the haul route highlighted in Figure 6-5. This utilises the M7 and Regional Roads R445 and R525 which avoids the use of Castleconnell Town Centre where possible. Some limited use of the centre of Castleconnell will likely be required due to the location of proposed works (e.g., Meadowbrook Estate and Maher's Pub car park), however this will be kept to a minimum;
- Details of a Stop-and-Go management systems proposed to facilitate access to the Rivergrove B&B and properties along Elvers Road;
- Proposed works will result in either controlled or restricted access to the following properties:
- Rivergrove B&B
- Mall House and two properties to the east of Mall House
- Dunkineely House
- Island House
- Stormont House
- Coole House
- Main entrance access to Meadow Brook Estate
- Alternative arrangements will be made for residents of these properties;
- A wheel wash facility will be setup if required to ensure that sediment does not leave site and get deposited on roads to and from the site. Periodic road cleaning around the site will also take place if required; and
- All necessary traffic safety precautions shall be undertaken by the Contractor to ensure the safety of all traffic and pedestrians using the existing roads adjacent to the site and connecting minor roads during the execution and completion of the Works, and all precautions shall be taken to minimise disruption to the local residents.

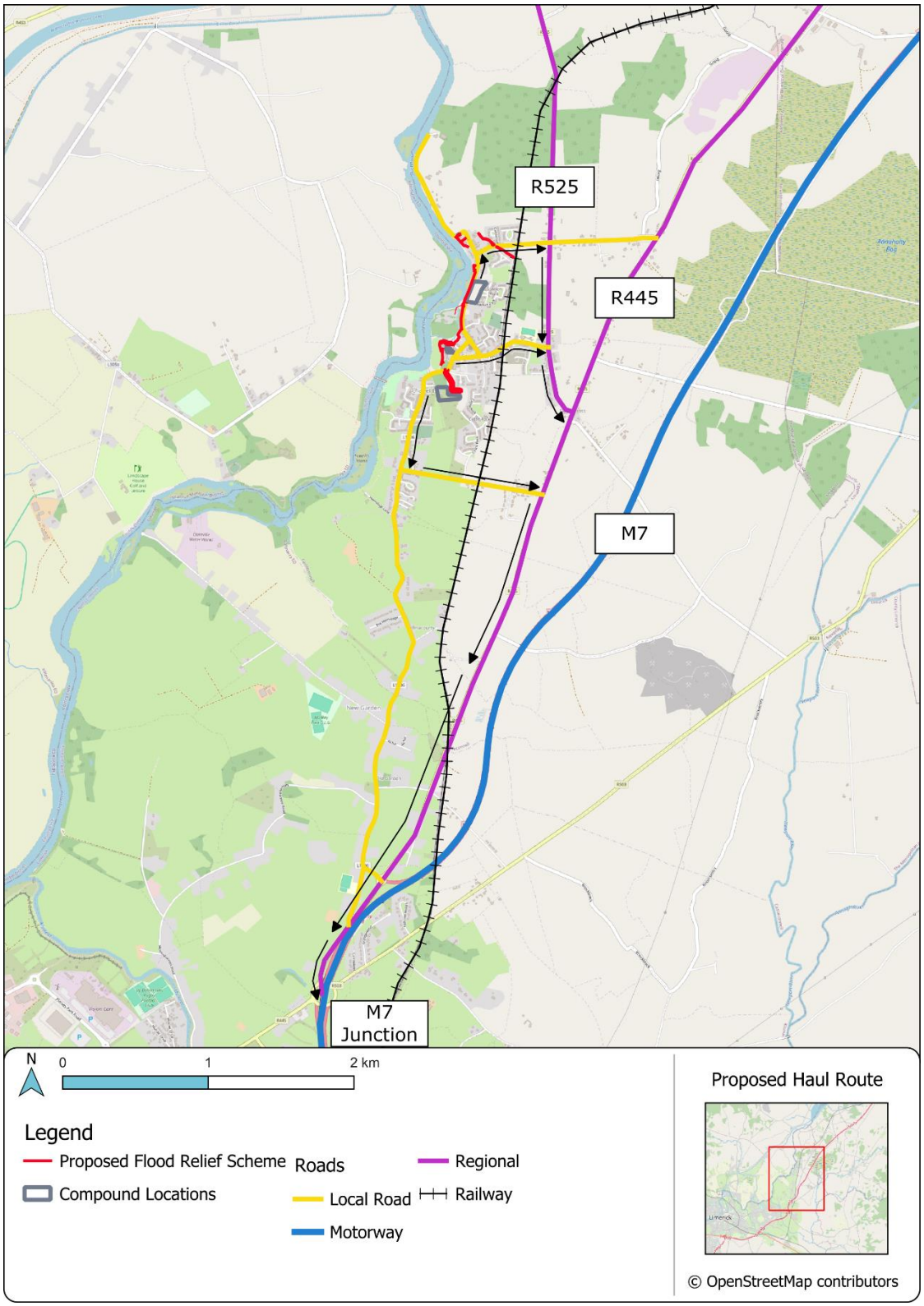

Figure 6-5: Proposed haul route

6.7 Archaeology

A detailed specification for masonry, capping and cladding of the new flood walls was developed by the conservation engineers Southgate Associates (Appendix 12.9 of the EIAR). It is proposed to reclaim and reuse existing stone, as well as the use of locally sourced stone. Where new flood walls are proposed, wall

cladding will be of the same or similar stone. Where possible, the stone from existing walls which are to be demolished will be used for cladding. Otherwise, local stone will be used.

Furthermore, all of these features are vulnerable to flood events, and fieldwork revealed several portions (particularly along the Mall Road) where lime mortar had eroded and sections had to be repaired. The construction phase will provide an opportunity to make repairs to retained sections of wall using suitable materials (e.g., salvaged stone from demolished sections, lime mortar). The memorial plaque embedded in stone wall and the limestone kerbstones on the Mall will be reinstated within the new floodwall and footpath.

The removal of the culvert to the rear of Coole to be replaced by a larger box culvert is mitigated by the reinstatement of the stream crossing. The new culvert should include stone parapets to maintain the aesthetic appeal of the existing culvert which, though not old, contributes to the setting of Coole, a protected structure.

As recommended by the NMS in the 'Archaeology and Flood Relief Scheme Guidelines', Limerick County Council and OPW have engaged a Project Archaeologist to advise on the archaeological aspects of the FRS. This role will continue into the construction stage of the FRS where they will advise on archaeological mitigations, including surveys, archaeological monitoring, the assessment of potential on archaeological discoveries, archaeological excavations, and reporting requirements. This may include inspections of archaeological heritage (both terrestrial and underwater). They will also advise the contracting authority on post-excavation progress, requirements, and archiving and finally the publication and dissemination of results of archaeological works.

The PA will advise on compliance with relevant legislation (including the Planning and Development Act, 2000, as amended), the implications of local authority listing of Protected Structures and ACAs, and compliance with the National Monuments Acts.

In case of encounters with unrecorded archaeological features, the current policy of the Minister for Housing, Local Government and Heritage is the preservation in situ of archaeological sites. Where preservation in situ cannot be achieved, then a programme of full archaeological excavation will be implemented to ensure the preservation by record of the portion of the site directly affected.

PLEASE NOTE: the above recommendations are subject to the approval of the National Monuments Section at the Department of Housing, Local Government and Heritage.

6.8 Waste Management

A Resource Waste Management Plan (RWMP) will be prepared by the appointed contractor which will outline precautions, procedures, and methods to help manage, reduce, and dispose of waste arising during the construction phase. The RWMP will outline waste reduction techniques, guidelines to be followed, compliance measures and the waste disposal streams to be used during the development. The document will be a working document subject to revision, when necessary, as the programme progresses. All construction waste will be segregated and removed to an approved location.

Estimated volumes of demolitions and excavation works have been prepared for each area of proposed works and are included in the Material Assets appendix. A summary of estimates is outlined below.

Table 6-2: Estimated demolition waste volumes

	Stone walls	Concrete	Paving / Road works	Total volume
Total Volume (m3)	**989**	**129**	**531**	**1,649**

Table 6-3: 19105-JBAI-XX-XX-RP-B-06058_CEMP_P01.01

	Excavate and spoil material	Backfill spoiled material	Remove spoiled material from site	Temporary platform material imported and removed	Import Embankment Clay	Import material for roadworks	Total Volume moved (m3)
Total Volume (m3)	**33130**	**11815**	**21315**	**1100**	**24068**	**4248**	**95676**

A key waste reduction strategy will be reuse of material where feasible. Over one third of excavated soil will be reused as backfill on site. The contractor will also explore other reuse options off-site, such as reuse as a byproduct under Article 27. These strategies will reduce the amount of material being exported off-site as a waste. It is assumed that there will be a wastage of approximately 10% of all waste generated on site.

During construction, waste generated on site poses potential risks to the health and safety of construction personnel. A comprehensive Health and Safety Programme will be prepared in accordance with the requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) which outlines that waste disposal methods shall not occur in a manner that is injurious to health and safety. The programme will be implemented on the site prior to commencement of construction and maintained for the duration of the works to minimise any risks to site personnel and visitors. A Construction Stage Traffic Management Plan will be developed and agreed with Limerick City & County Council and the relevant property owners prior to commencement of the works.

6.9 Pest Control

It is recommended that a rodent and pest control plan is put in place to manage and limit any potential disturbance to populations that may utilise the site. The pest control plan should be in accordance with the following guidelines:

- Chartered Institute of Environmental Health (CIEH) “Pest minimisation: Best practice for the construction industry” or a similar appropriate standard.

A Pest Control Plan for the construction phase shall be completed and included in the Contract specific CEMP written by the Contractor.

6.10 Soil and Geology

- The Contractor will be required to install a Soil Management Programme for the operations at the site. The Programme will contain as a minimum, ways to minimise truck movements across the site to avoid soil compaction, and re-use of suitable material on-site to minimise the quantities that need to be imported;
- Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment. Covering of topsoil stockpiles with rapid vegetation or other means is proposed as part of the construction methodology. The material will be stored away from any surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust;
- Fill material will be tested and imported from a licensed facility to ensure no external contamination is introduced to the soil and geological environment;
- A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated stormwater to the underlying subsoil; and

- The pouring of concrete will take place within an impermeable area using a geo-synthetic material to prevent concrete runoff into the soil/ groundwater media. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility off site. During detailed design, the potential use of pre-cast concrete sections will be evaluated.

The contractor will be required to carry out a waste characterisation of the material that will be taken off site for disposal. A waste acceptance criteria (WAC) analysis and asbestos levels should be determined on any material that will be taken off site for disposal. All wastes in the European Waste Catalogue are classified by a unique 6-digit code. In this case (waste soil/stones), two List of Wastes (LoW) Codes are applicable to material that may be taken off site for disposal during the construction phase:

- 17 05 03* - Soil and stones containing hazardous substances
- 17 05 04 - Soils and stones other than those mentioned in 17 05 03.

Any soil samples that are found to contain contaminants should be subjected to full quantification analysis. If the waste soil is sent to a waste licenced soil recovery facility, the chemical analysis of the soil must meet the requirements given in Table 3.3 (Summary of Soil Trigger Levels for Soil recovery Facilities) of the Environmental Protection Agency's Draft Publication – Waste Acceptance Criteria and Development of Soil Trigger Values for EPA-Licenced Soil Recovery Facilities, December 2017. The acceptance of this material at a licenced soil recovery facility will be subject to the approval of the facility operator.

Soils at Coolbane Woods are peaty and works will require a surcharge programme (with or without vertical wick drains) to increase the strength of the peat. This should be completed in advance of the main contract. A programme of settlement and porewater pressure monitoring during the surcharge programme will verify the progress. Alternatively, a dig-and-replace option will be used, whereby peat is excavated and replaced with a suitable clay/foundation material. In this scenario a surcharge programme will not be required, and excavated peat will be reused as fill elsewhere on the site or on another site as an Article 27 byproduct, or exported off-site as a waste. The use of a strengthening geogrid for load spreading and staged construction can be adopted to prevent bearing capacity and stability issues.

6.11 Biosecurity

A habitats and invasive species survey was carried out in August 2019 which found the presence of Giant Hogweed. The Castleconnell River Association have been informally controlling Giant Hogweed over the last few years. Since the initial survey, JBA ecologists noted a decrease in its presence during subsequent surveys. The presence of seeds in soil is still highly likely and therefore mitigation measures will be implemented.

Under European legislation, Regulation (EU) No 1143/2014 prohibits the introduction and dispersal of invasive non-native species (INNS) listed in the Third Schedule.

Biosecurity measures will be implemented to prevent the spread of invasive species. These measures will include:

- Toolbox talks on invasive plant species to be provided to all relevant personnel prior to access to site being permitted;
- A 3-metre buffer zone to be erected around the identified infested areas, no unauthorised personnel to be admitted within this buffer;
- All works carried out within the buffer zone will be done by suitably trained personnel;
- All machinery being brought to site must be clean and free from contaminants;
- Any machinery used within the 3-metre buffer zone must be thoroughly cleaned with hot water (at least 45°C) and checked before being removed;
- Any Giant Hogweed that is growing in the location of proposed walls or embankment should be dug up to take the root out. If it is not possible to dig up, treatment with herbicide, such as glyphosate, will be necessary.

- Any clothing and equipment that comes into contact with water or mud from riparian zones should be checked for zebra and quagga mussel juveniles and removed and left on site for appropriate cleaning or disposal;
- No vehicles are to be allowed on or off site without being thoroughly inspected and cleaned.
- Equipment should be fully drained of water and dried, disinfectant such as Virkon Aquatic or Virasure shall be employed if complete drying is not possible;
- On completion of the works all machinery must be thoroughly inspected and cleaned down before being removed from site;
- All contaminants and contaminated soils are to be disposed of in an appropriate manner;
- Removed soils need to be disposed of in an appropriate manner to a licenced facility; and
- Imported soils must be free from invasive species.

7 Monitoring

7.1 Alluvial woodland monitoring

Post-construction monitoring of all Alluvial woodlands should be carried out. This should include a condition assessment of 91E0 woodlands and removal of negative indicator species, such as Sycamore and invasive species. These species may be more prevalent post-construction due to movement of soil. This will be undertaken for a minimum of five years post-construction. The results of the 5-year monitoring should be used to assess whether further monitoring or management action is required (e.g. if the monitoring relevé(s) fail or shows an unfavourable trend)

Monitoring should be carried out of development of compensation woodland to mitigate for the permanent loss of emerging woodland at Coolbane woods to facilitate construction of the embankment.

7.2 Hydrophilous tall herb fen monitoring

Post-construction monitoring of this habitat should be carried out. This will be undertaken for a minimum of five years as some impacts (e.g. spread of invasive species), may not be immediately apparent. The results of the 5-year monitoring should be used to assess whether further monitoring or management action is required (e.g. if the monitoring relevé(s) fail or shows an unfavourable trend).

7.3 Giant Hogweed monitoring

Seeds of this plant can remain viable for up to 15 years, although most will become unviable after just 2 years. Following the completion of the scheme, due to the disturbance of the soils from machinery and excavations, Giant Hogweed seeds may be encouraged to germinate from the soil disturbance in the following years.

Eradication will require monthly checks during the growing season to ensure that any late germinating plants are controlled before they can set seed. Follow-up removal will be required for a period of at least 5 years to ensure complete control. Subsequent soil disturbance in the area, however, may give rise to a new flush of seedlings.

7.4 Dust and Air Quality Monitoring

Monitoring of Air Quality and Dust related impacts will be required during the construction stage only of the proposed development. The monitoring activities are to:

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority if and when requested. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with the dust management measures, record inspection results, and make an inspection log available to the local authority if and when requested.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition and/or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site.

Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

7.5 Water Quality Monitoring

Water quality monitoring must be carried out prior to, during and post-construction in order to establish baseline water quality metrics, evaluate the impacts of the construction whilst ongoing, and how the works impact water quality once the site has been restored. Monitoring and assessment should follow EPA guidance. The protocol should be implemented so that data are collected in a standardised manner and can be integrated into EPA databases. Typical metrics that should be recorded to determine the assessment are:

- Flow (continuous monitoring using on-line flow meter with recorder);
- pH;
- Temperature;
- Conductivity;
- Biochemical Oxygen Demand;
- Chemical Oxygen Demand;
- Dissolved Oxygen;
- Suspended Solids;
- Ammonium (as N);
- Nitrate (as N);
- Total Phosphorus (as P);
- Ortho-phosphate (as P);
- Turbidity;
- Hydrocarbons; and
- Biological Quality (Q Rating)

These metrics will be collected on all streams within the construction area. This will include points located upstream of any works, and then points within the works area and at the outfall locations. At connection points (e.g., Stradbally to River Shannon), sampling should occur prior to the confluence, and at the junction point.

Monitoring during construction will be within the remit of the ECoW appointed, who will have a stop-works power to halt activity as needed. In-field/live analysis of results such as:

- pH;
- Dissolved Oxygen;
- Conductivity; and
- Turbidity/Suspended Solids.

Water quality monitoring will be undertaken by the ECoW to allow reactive management, especially during instream works, and where releasing water after working in the dry, or other high impact situations. Discharge standards will meet Surface Water Regulation Standards for all relevant parameters, or comparable to water quality standards achieved upstream, as determined by baseline.

7.6 Archaeological Monitoring

All earth moving activities, including any additional site investigation works will be subject to archaeological monitoring under licence from the NMS of the DHLGH and the NMI, and will ensure the full recognition of, and the proper excavation and recording of, all archaeological soils, features, finds and deposits which may be disturbed below the ground surface.

The archaeologist will have the power to inspect all excavation to formation level for the proposed works and to temporarily halt the excavation work, if and as necessary. They will be given the power to ensure the temporary protection of any features of archaeological importance identified. The archaeologist will be afforded sufficient time and resources to record and remove any such features identified in accordance with

the licensing requirements agreed. All archaeological issues will be resolved to the satisfaction of the DHLGH and the NMI.

Archaeological excavation ensures that the removal of any archaeological soils, features, finds and deposits is systematically and accurately recorded, drawn and photographed, providing a paper and digital archive and adding to the archaeological knowledge of a specified area (i.e. preservation by record). As archaeological excavation involves the removal of the archaeological soils, features, finds and deposits, following this mitigation measure there is no further impact on the archaeological heritage.

A detailed written and photographic record of the walls on Mall Road will occur in the advance of the dismantling of walls, this will assist in identification any reuse of decorative masonry fabric in its construction which can be feature in historic towns and villages. The heritage masonry contractor will set aside any decorative masonry fabric that might be found in the walls during its dismantling, for the archaeological examination and recording. If such fabric is discovered, its relocation into the new wall in a prominent spot for public display will be discussed with the National Monuments Service if deemed appropriate.

8 Health and Safety

As required by the Regulations, a Construction Health and Safety Plan will be prepared which addresses health and safety issues from the design stages through to the completion of the construction and maintenance phases. This plan is treated as a 'live' working document and will be reviewed as the development progresses by the main contractor. The contents of the Construction Health and Safety Plan will follow the requirements of the Regulations.

In accordance with the Regulations, a “Project Supervisor Design Process” has been appointed and a “Project Supervisor Construction Stage” will be appointed.

The Project Supervisor Construction Stage will assemble the Construction Health and Safety Plan as the project progresses. The Plan will be incorporated into the overall technical record system at the end of the project.

Conditions on the site must be included in the creation of the Plan, and better working conditions such as minimising dust, vibration etc. have all been included as elements of the Plan. The Plan will include measures for minimisation of dust, vibration and noise to provide a safe place of work.

All visitors to the site will be required to report to the site manager and the site is to be adequately secured to prevent unauthorised access. These measures shall not have any negative impact on the safety of human beings when implemented. Ensuring that relevant health and safety legislation is adhered to and that recommended mitigation measures are implemented is the responsibility of the ‘Project Supervisor Construction Stage.’

8.1 Emergency/Incident Response Plan

8.1.1 Objective

The emergency or incident response plan outlines procedures that will establish preparedness and ensure prompt, efficient, and appropriate response to environmental or health and safety emergencies or incidents. The Project Supervisor Construction Stage (PSCS) will, as required by the Safety Health and Welfare legislation, prepare emergency procedures for major accidents on-site.

If an environmental emergency or incident arises, the contractor will implement the Environmental Emergency Procedures. The procedure will be prepared and agreed with LCCC in advance of work proceeding at the site. The most likely causes of an emergency or incident may arise from:

- Discharge of potentially polluting materials;
- Rupturing of a silt fence or curtain during heavy periods of rain;
- An uncontained spillage in the contractor’s compound;
- Faulty or incorrect use of equipment;
- Storm/adverse weather;
- Unstable stockpiles;
- Power failures;
- Falls from a height; and
- Smoking.

All contractors and sub-contractors will be made aware of the Emergency/Incident Response Plan. The Emergency/Incident Response Plan will address, as a minimum:

- Fuel handling procedures;
- Silt curtain construction details;
- Adequate supplies of spill control equipment;
- Traffic accidents on the public road;
- Notification procedures;

- Measures to protect water in the event of a spillage;
- Incident reporting procedure and contact details for appointed personnel
- Location and contact information for the nearest emergency services, ambulance and Accident & Emergency (A&E) facilities including:
- Accident and Emergency;
- Ambulance Service;
- Fire Services;
- Local Garda Station, district and divisional headquarters;
- Medical protocol;
- Escape and evacuation procedure; and
- Prevention of illness/injury of site staff due to weather/elements.

In the event of a spill the Contractor will ensure that the following procedures are in place:

- Emergency and incident response awareness training for all Project personnel on-site works;
- Appropriate and sufficient spill control materials will be installed at strategic locations within the site; Spills kits for immediate use will be kept in the cab of mobile equipment;
- Spill kits will be stored in the site compound with easy access for delivery to site in the case of an emergency. A minimum stock of spill kits will be maintained at all times and site vehicles will carry spill kits at all times. Spill kits must include suitable spill control materials to deal with the type of spillage that may occur and where it may occur. Typical contents of an on-site spill kit will include the following as a minimum;
    - Absorbent granules;
    - Absorbent booms; and
    - Absorbent mats/cushions.
    - Spill kits will contain gloves to handle contaminated materials and sealable disposal sacks.
    - Track mats will be provided to ensure access following heavy rainfall.
- Any contaminated materials/soil media will be segregate, analysed and disposed of by a licensed waste disposal contractor.

8.1.2 Contact personnel in the event of an environmental emergency

Below are provided some contact details for organisations/statutory bodies that should be contacted if an environmental emergency arises on site. The appointed Contractor will add to this as needed.

- Limerick County Council, Planning & Environmental Services Department Tel: (061) 556000
- Limerick County Council Emergency Telephone Contact Outside Office Hours: (061) 417833
- Inland Fisheries Ireland, 3044 Lake Drive, City West Business Park, 01 884 2600
- Local Conservation officer, NPWS, 90 North King Street, Dublin, (065) 6846307
- Environmental Protection Agency Headquarters, PO Box 3000, Environmental Protection Agency, Johnstown Castle Estate, Co. Wexford, Y35 W821, (053) 916 0600
- Uisce Éireann, PO Box 860, South City Delivery Office, Cork City, 1800 278 278/01 707 2828
- ESB Limerick, Rosbrien, Limerick, V94 A5D2, 1800 372 999
- Bord Gais, Gas Networks Ireland 1850 20 50 50
- National Monuments Service, Newtown, Enfield, Co. Meath, A83 PP86, +353 (0) 469543673
- Ambulance Service 112 / 999

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