



**Chapter 18**  
Waste & Resources

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## 18. Waste & Resources

### 18.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) has considered the potential waste and resource impacts associated with the Construction and Operational Phases of the Liffey Valley to City Centre Core Bus Corridor Scheme (hereafter referred to as the Proposed Scheme).

The potential impacts associated with the development of the Proposed Scheme during the Construction Phase have been assessed. Demolition, site clearance, excavation and construction are activities which will take place during the Construction Phase which are likely to generate surplus materials. In recent years there has been a shift in focus on best practice waste management and waste minimisation in construction and an increase in the reuse of construction by-products in projects.

The potential impacts associated with surplus materials from ongoing road infrastructure maintenance during the Operational Phase have also been assessed.

The assessment has been carried out according to best practice and guidelines relating to waste and resources assessment, and having regard to other similar large-scale road, rail and transportation projects.

Key aspects of the Proposed Scheme relevant to this waste and resources assessment are set out in Chapter 5 (Construction) and include:

- Construction and reconstitution of cycleways, footpaths, road widening and urban realm improvements;
- Removal of trees, concrete kerbs, walls, fences and gates;
- Removal of small retaining walls;
- Removal of roundabouts and modification to signalised junctions;
- New street furniture, including traffic lights and bus stops, and landscaping works;
- Removal of boundary walls, fences and gate walls;
- Minor utility diversions and / or protections will be required; and
- Excavation of pavements and carriageways.

A summary of the surplus materials arising from excavation, demolition, construction and operation of the Proposed Scheme is presented in Section 18.5.

The aim of the Proposed Scheme when in operation is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction). The Proposed Scheme which is described in Chapter 4 (Proposed Scheme Description) has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process have been incorporated, where appropriate.

## 18.2 Sustainable Resource and Waste Management Principles

### 18.2.1 Circular Economy

The principal objective of sustainable resource and waste management is to use resources more efficiently, where the value of products, material and resources is maintained in the economy for as long as possible such that the generation of waste is minimised. To achieve resource efficiency there is a need to move from a traditional linear economy to a circular economy (refer to Image 18.1).



**Image 18.1: A Simplified Model of the Circular Economy for Materials and Energy (European Environment Agency (EEA) 2016)**

The Department of Communications, Climate Action and Environment's (DCCA) A Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020 – 2025 (hereafter referred to as the National Waste Action Plan) (DCCA 2020) notes that:

*'In a circular economy the value of products and materials is maintained for as long as possible; waste and resource use are minimised, and resources are kept within the economy when a product has reached the end of its life, to be used again and again to create further value.'*

The European Union (EU) Circular Economy Action Plan (European Commission 2020) notes that:

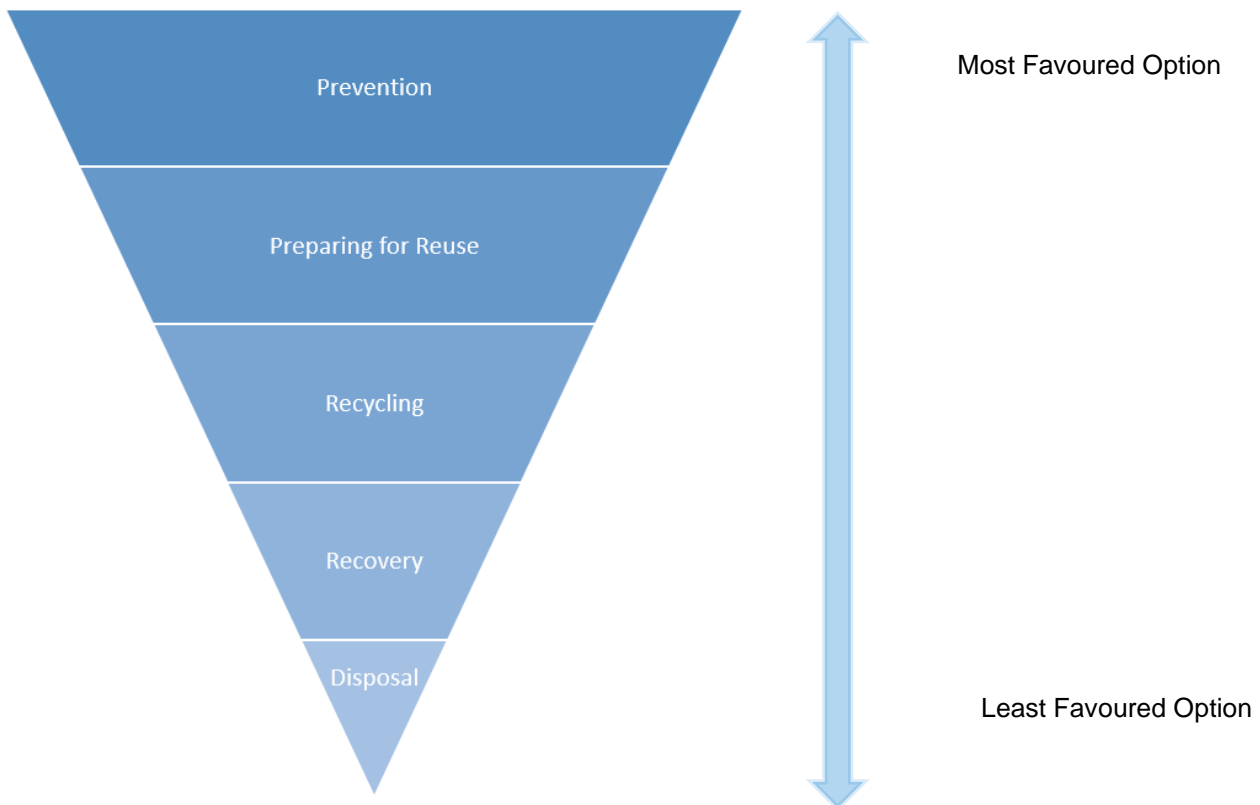
*'the EU needs to accelerate the transition towards a regenerative growth model that gives back to the planet more than it takes, advance towards keeping its resource consumption within planetary boundaries, and therefore strive to reduce its consumption footprint and double its circular material use rate in the coming decade.'*

Where residual waste generation is unavoidable it will be dealt with in a way that follows the waste hierarchy, as illustrated in Image 18.2 and set out in Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2009 on waste and repealing certain Directives and Directive 2018/851 of the European Parliament

and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (hereafter referred to as the Waste Framework Directive). The Government of Ireland released a Whole Government Circular Economy Strategy 2022-2023 (Government of Ireland 2021), setting out a policy framework for transitioning to a circular economy, measures to reduce the circularity gap, raise awareness and support investment into circular initiatives and identify barriers.

### 18.2.2 The Waste Hierarchy

The waste hierarchy supports the need to achieve efficient use of material resources, minimise the amount of waste produced (or otherwise increase its value as a resource) and reduce, as far as possible, the amount of waste that is disposed to landfill.



**Image 18.2: Waste Hierarchy (Waste Framework Directive 2020)**

The consideration of resources in the context of this assessment includes a review of the potential for beneficial reuse of materials arising from the construction of the Proposed Scheme (e.g. excavated soil and stones, concrete or bituminous mixtures).

Other topics related to waste and resource management, such as Construction Phase traffic impacts, water quality impacts and mineral resources are considered in the following chapters:

- Construction Phase traffic impacts are considered in Chapter 6 (Traffic & Transport);
- Water quality and pollution risk are considered in Chapter 13 (Water); and
- Mineral resources are considered in Chapter 19 (Material Assets) and Chapter 14 (Land, Soils, Geology & Hydrogeology).

If excavated material is not required for the construction of the Proposed Scheme, the appointed contractor will undertake a study of suitable end uses including other construction projects beyond the Proposed Scheme, with priority to be given to activities which are higher up the waste hierarchy. The material would then be considered as a resource for reuse beyond the Proposed Scheme in so far as is reasonably practicable, and may be notified to the Environmental Protection Agency (EPA) as a by-product, as appropriate.

## **18.3 Methodology**

### **18.3.1 Study Area**

The study area for waste and resources generation assessment from the Proposed Scheme comprises the areas and activities within the Proposed Scheme boundary (including Construction Compounds and temporary land take).

Waste from the Proposed Scheme could be accepted at sites nationally and internationally (that are suitably licensed or permitted for the waste volume and type), for treatment, recovery and disposal. However, as waste management planning in Ireland takes place on a regional basis, the study area generally for waste treatment, recovery and disposal comprises Dublin and the Eastern-Midlands Waste Region (EMWR) (refer to Figure 18.1 and Figure 18.2 in Volume 3 of this EIAR). This consists of the following 12 Local Authority regions:

- Dublin City;
- Fingal;
- South Dublin;
- Dún-Laoghaire Rathdown;
- Kildare;
- Laois;
- Longford;
- Louth;
- Meath;
- Offaly;
- Westmeath; and
- Wicklow.

Where data is available at a Local Authority or regional level this has been used. National data is used where this is the only available level at which statistics and data is published.

### **18.3.2 Relevant Guidelines, Policy and Legislation**

#### **18.3.2.1 Guidelines and Policy**

The following guidelines and policy documents were considered when undertaking the waste and resources assessment:

- Circular Economy Programme 2021-2027 (EPA 2021b);
- Ireland's First Whole-of-Government Circular Economy Strategy- Public Consultation on the Proposed Publication of the Strategy (Department for Environment, Climate & Communications (DECC) 2021);
- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (EPA 2021a);
- Construction & Demolition Waste, Soil and Stone Recovery / Disposal Capacity – Updated report 2020 (Regional Waste Management Offices 2020);
- A new Circular Economy Action Plan for a Cleaner and More Competitive Europe (European Commission 2020);
- Whole of Government Circular Economy Strategy 2022 – 2023: Living more, Using Less (Government of Ireland 2021);
- Environmental Protection Agency (EPA) Waste Statistics for Ireland (EPA 2021b);
- National Waste Action Plan (Government of Ireland 2021a);
- Consultation on the Transposition of the Circular Economy Waste Package (DCCAE 2019);
- EU Construction and Demolition Waste Protocol and Guidelines (European Commission 2018);

- Transport Infrastructure Ireland (TII) The Management of Waste from National Road Construction Projects. Standard GE-ENV-01101 (TII 2017);
- Waste Management Plan for the Eastern-Midlands Region 2015 – 2021 (EMWR 2015);
- Circular Economy Action Plan (European Commission 2015);
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022);
- Waste Classification – List of Waste and Determining if Waste is Hazardous or non-Hazardous EPA (2015a); and
- Specification for Road Works Series 600 - Earthworks (including Erratum No. 1, dated June 2013). Standard CC-SPW-00600 (hereafter referred to as the TII Earthworks Standard) (TII 2013a).

### **18.3.2.2 Directives and Legislation**

The following directives and legislation were considered when undertaking the waste and resources assessment:

- Waste Framework Directive;
- S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2020 (hereafter referred to as the Waste Directive Regulations);
- S.I. No. 86/2008 - Waste Management (Facility Permit and Registration) Regulations 2008, as amended;
- S.I. No. 821/2007 - Waste Management (Facility Permit and Registration) Regulations 2007;
- S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007, as amended;
- S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007;
- Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (hereafter referred to as the Landfill Directive); and
- Number 10 of 1996 - Waste Management Act 1996 Revised (hereafter referred to as the Waste Management Act 1996).

A summary of key policy and legislation is included in Appendix A18.1 in Volume 4 of this EIAR.

### **18.3.3 Appraisal Method for the Assessment of Impacts**

The potential environmental impacts of solid waste and resource generation and management associated with the Proposed Scheme were assessed for both the Construction and Operational Phases. These impacts may be neutral, positive or adverse and are dependent on the measures employed to prevent and / or manage the waste generated.

#### **18.3.3.1 Assessment Methodology**

The potential impacts are assessed by describing waste and by-products generation and management from the Proposed Scheme and comparing this to the current waste and by-product management baseline in Ireland.

The impact assessment and waste management options of this EIAR (as set out in Section 18.5 and Section 18.6) have been considered in line with the waste hierarchy and the Waste Framework Directive - see Image 18.2.

The following factors were considered when determining the significance of impacts of the Proposed Scheme on the various aspects of the baseline environment:

- Desk study of current practices for waste and by-product management in Ireland;
- Data gathered on the types and quantities of waste and by-product generation and management from the Proposed Scheme. This is compared with the established baseline set out in Section 18.4;
- An assessment of the likely environmental impacts that may arise from the quantity of waste requiring disposal to landfill, in line with the significance criteria set out in Chapter 1 (Introduction);
- The surplus materials arising and waste infrastructure capacity in the Eastern-Midlands Region in which the Proposed Scheme is located; and

- A review of the Proposed Scheme in the context of the waste hierarchy and circular economy principles to determine the mitigation measures required.

### 18.3.3.2 Legislation, Policy and Guidance

The assessment considers relevant waste management legislation, policies and guidance applicable to all infrastructure components along the Proposed Scheme. This includes, but is not limited to the legislation, policy and guidance set out within Section 18.3.2.

### 18.3.3.3 Significance Criteria

The criteria used to categorise the significance of waste and resources impacts is based on the EPA Guidelines (EPA 2022) as set out in Table 1.4 of Chapter 1 (Introduction), which range from Imperceptible to Profound. The Institute for Environmental Management and Assessment (IEMA) released a Guide to Materials and Waste in Environmental Impact Assessment (IEMA 2020) (hereafter referred to as the IEMA Guidance) in 2020 setting out a standard approach to undertaking waste assessments for EIA. The EPA Guidelines are complemented by the more detailed approach set out in the IEMA Guidelines.

The IEMA Guidance sets out that the receptor for waste relates to availability of regional (and where appropriate, national) landfill void capacity baseline data collected on the availability and capacity of non-landfill waste management infrastructure (in conjunction with any identified trends) may be used to provide a more comprehensive context for assessing the magnitude of impacts (see Table 18.1). These magnitude criteria have informed the overall assessment of impact significance, using professional judgement.

As set out in the baseline (Section 18.4), Ireland’s construction and demolition (C&D) waste is predominately managed through backfilling material (82.4%) and only 10.4% is managed through disposal routes (EPA 2021c). Therefore, in conjunction with identified trends nationally and in the region, it is considered appropriate to use regional authorised waste management infrastructure intake capacity, as set out in Table 18.6.

**Table 18.1: Significance Criteria adapted from EPA Guidelines and IEMA Guidance for Magnitude of Impact for Inert and Non-Hazardous Waste**

No change	Negligible	Minor	Moderate	Major
Zero waste generation and disposal from the development	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by <1%	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by 1-5%	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by 6-10%	Waste generated by the development will reduce regional authorised waste management infrastructure intake capacity by >10%

The approach of the EPA was supplemented by the IEMA Guidance in order to establish the waste management significance ratings for this assessment of non-hazardous waste. The EPA significance ratings are used to describe the impacts arising from the construction and operation of the Proposed Scheme.

### 18.3.4 Data Collection and Collation

#### 18.3.4.1 Desk Study

A desk study was undertaken which comprised the following tasks:

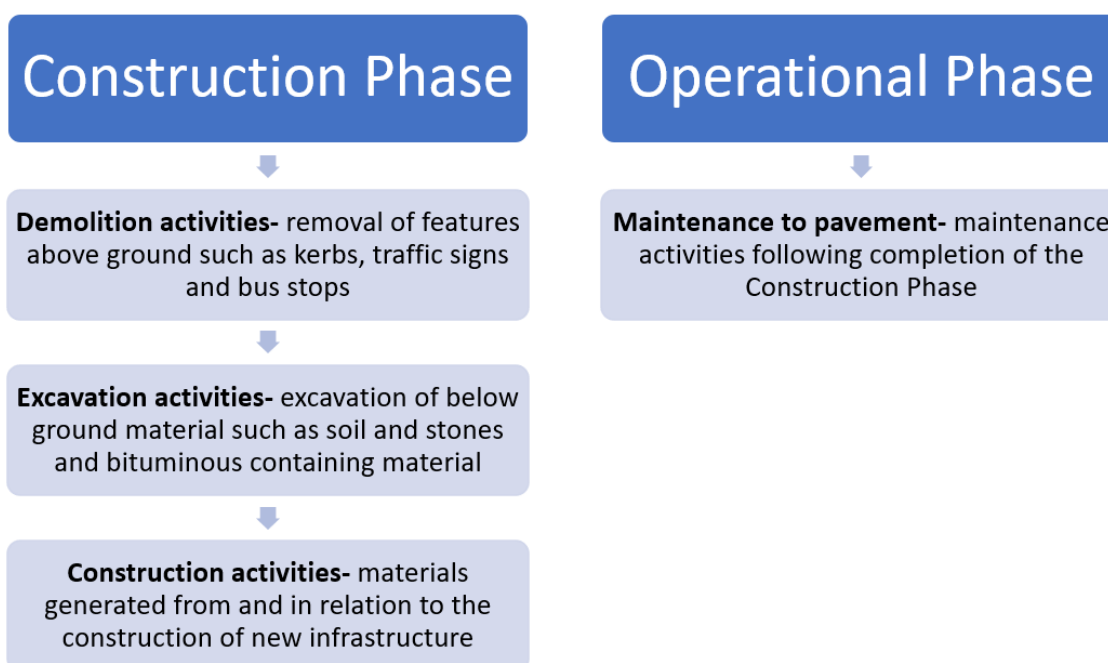
- Review of relevant policy and legislation which creates the legal framework for waste and resource management in Ireland;
- Review of the estimated surplus materials and by-product generation for the Construction Phase of the Proposed Scheme and subsequently incorporated into the development of the EIAR;
- Review of Operational Phase waste (i.e. associated with carriageway maintenance);
- Review of the Proposed Scheme design during development of the EIAR to identify appropriate mitigation and move waste management up the waste hierarchy through implementation of best practice where possible;



- Types, quantities and management of C&D waste arisings generated in Ireland and the relevant Local Authority and EMWR jurisdictions were reviewed;
- Types, quantities and management of commercial and industrial waste generated in Ireland (EPA 2021c) and EMWR jurisdictions (Regional Waste Management Offices 2020) were reviewed; and
- Availability (type and capacity) of waste infrastructure within each of the local authority jurisdictions through which the Proposed Scheme will pass and also in the EMWR were obtained.

#### 18.3.4.2 Waste Generation Phases

A summary of both phases of the Proposed Scheme and the source of surplus materials considered in this assessment is set out in Image 18.3. For the purpose of the Proposed Scheme, bituminous materials have been quantified and assessed under the excavation activities



**Image 18.3: Summary of Surplus Materials Source Considered in this Assessment for Each Phase of Proposed Scheme**

##### 18.3.4.2.1 Construction Phase

Information including the following was gathered to inform the impact assessment related to C&D waste for the Proposed Scheme:

- A description of proposed demolition, excavation material quantities and properties;
- Consideration of options for reuse within the Proposed Scheme of materials generated during construction; and
- Consideration of the on-site and off-site treatment, reuse, recovery or disposal of materials.

##### 18.3.4.2.2 Operational Phase

During the Operational Phase, the predominant surplus materials generation will result from maintenance activities.

The assessment quantified surplus materials being generated only in the areas of carriageway being widened or narrowed as a result of the Proposed Scheme, as the existing road network would continue to require maintenance in any event. It is assumed that additional maintenance would be required, above the baseline, in areas of carriageway that will be widened. It is assumed that less maintenance will be required, compared to the baseline, in areas of the carriageway that will be narrowed as part of the Proposed Scheme. The resulting annual

surplus bituminous material generation was calculated over a 60 year period using the Association of Directors of Environment, Economy, Planning and Transport (ADEPT) and the Mineral Products Association (MPA) published rates of service life of bituminous material for asset management purposes (ADEPT and MPA 2015). Although assessed in this Chapter, in the Operational Phase the infrastructure will be maintained by the Local Authority, in accordance with their own standards and requirements.

### **18.3.5 Waste Management Principles**

In the construction of the Proposed Scheme the appointed contractor will have regard to the following principles of the waste hierarchy, in line with the Waste Framework Directive (see Image 18.2).

#### **18.3.5.1 Prevention and Reuse**

Waste prevention and minimisation is the most environmentally sustainable means of managing surplus material from demolition, excavation and construction materials. The principles of prevention and minimisation of waste are inherent in the design of the Proposed Scheme.

Where naturally occurring material will be used for the purpose of construction in its natural state within the Proposed Scheme, this material will not be deemed to be a waste in accordance with Section 3 of Number 10 of 1996 - Waste Management Act, 1996 as amended (hereafter referred to as the Waste Management Act 1996). Naturally occurring material, including topsoil, will be reused for the purpose of construction throughout the Proposed Scheme, where feasible. The material will also be subject to testing to ensure it is suitable for its proposed end use.

Where non-naturally occurring surplus excavation material occurs within the Proposed Scheme it will be beneficially reused within the Proposed Scheme, where feasible. The use of excavation material on other projects, for example in engineering works or landscaping may take place where feasible and where it cannot be reused on site. Where construction by-products are proposed to be further used on-site or off-site, this will take place in compliance with Article 27 of the Waste Directive Regulations. The appointed contractor will be responsible for ensuring compliance with these regulations, where appropriate.

#### **18.3.5.2 Recycling, Recovery and Disposal**

Where surplus materials are generated which cannot be reused, these will be waste and will be delivered to recycling or recovery facilities authorised where feasible and in accordance with the Waste Management Act, 1996, as amended and which hold a Certificate of Registration, Waste Facility Permit or EPA Licence.

All wastes removed from site will be transported by the holder of the appropriate waste collection permit, granted in accordance with S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007, as amended.

The option of disposal is the least desirable outcome for surplus material generated by the Proposed Scheme and will only be considered where it is not feasible to deliver wastes for recycling or recovery to appropriately licensed / permitted facilities for reuse / recycling purposes.

In addition, where waste facility capacity does not exist within Ireland for management of specific waste streams, such as hazardous soils, these will be exported for treatment, recovery or disposal in accordance with the provisions of S.I. No. 419/2007 - Waste Management (Shipments of Waste) Regulations 2007 and in accordance with current practice in Ireland.

It will be the responsibility of the appointed contractor, under the Waste Management Act 1996, as amended, to ensure that all material delivered to authorised waste facilities is correctly classified and will meet the waste acceptance criteria of the receiving site.

It will be the responsibility of the appointed contractor to secure agreements for reuse, recycling or disposal of surplus materials from the Proposed Scheme in construction projects or authorised facilities where appropriate, in accordance with the Waste Management Act, 1996 as amended and associated regulations.

### 18.3.5.3 Best Practice Waste Management Measures

Table 18.2 sets out a list of best practice waste management measures which will be implemented by the appointed contractor, where practicable during the Proposed Scheme construction in accordance with the waste hierarchy.

**Table 18.2: List of Waste Management Best Practice Actions (Construction Phase)**

Stage in Hierarchy	Action
<b>Recycling</b>	Where possible, metal, timber, glass and other recyclable material will be segregated and removed off-site to a permitted / licensed facility for recycling. Waste stream colour coding and photographs will be used to facilitate segregation.
<b>Recycling</b>	On-site office and food waste arising will be source separated at least into dry mixed recyclables, biodegradable and residual wastes.
<b>Recycling</b>	Waste bins, containers, skip containers and storage areas will be clearly labelled with waste types which they should contain, including photographs as appropriate.
<b>Prevention</b>	The site will be maintained to prevent litter and regular litter picking will take place throughout the site.
<b>Prevention</b>	'Just-in-time' delivery will be used as where practicable to minimise material wastage (Building Research Establishment (BRE) 2012; EPA 2015b)
<b>General</b>	The appointed contractor will record the quantity in tonnes and types of waste and materials leaving the site during the demolition works. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show material which is recovered and disposed of.
<b>Prevention</b>	Paints, sealants and hazardous chemicals will be stored in secure, bunded locations.
<b>Prevention</b>	All hazardous waste will be separately stored in appropriate lockable containers prior to removal from site by an appropriate waste collection holder.
<b>General</b>	Waste generated on-site will be removed as soon as practicable following generation for delivery to an authorised waste facility.
<b>General</b>	The appointed contractor will ensure that any off-site interim storage facilities for excavated material have the appropriate waste licences or waste facility permits in place.
<b>Prevention</b>	All staff on-site will be trained on how to minimise waste (i.e. training, induction, inspections and meetings).
<b>Prevention</b>	Materials on-site will be correctly and securely stored (BRE 2012).
<b>Prevention / Recycling</b>	Segregated skips will be used on-site if space permits (particularly for hazardous, gypsum, metal, timber, inert waste and general waste) (BRE 2012).

## 18.4 Baseline Environment

The baseline environment for waste and by products management in Ireland is described in the following sections. Construction waste, including demolition and excavation waste, will be generated at the Construction Phase of the Proposed Scheme. Construction waste due to maintenance activities will also be generated during the Operational Phase of the Proposed Scheme.

Construction waste, including demolition and excavation waste, will be the main type of waste generated as a result of the Proposed Scheme.

There will be small quantities of municipal-type waste generated during construction and operation (i.e., associated with maintenance activities). Therefore, the waste management baseline of construction and municipal waste was established for both the Construction and Operational Phases.

Article 27 of the Waste Directive Regulations allows a material producer to determine, under certain circumstances, that a material is a by-product and not a waste. Substances or objects, such as soil and stones, produced during construction projects can be determined as a by-product if they satisfy all of the following criteria:

1. Further use of the material is certain;
2. The material can be used directly without any further processing other than normal industrial practice;
3. The material is produced as an integral part of the production process; and

4. Further use is lawful, in that the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

Substances or objects will be a by-product if they meet each of the conditions detailed in Article 27. The baseline area for reuse of by-products in accordance with Article 27 comprises the whole country, as no regional distinction is made in the Article 27 register.

Where it is proposed to use an Article 27 EPA notification in relation to excavation material from the Proposed Scheme, the appointed contractor will be responsible for ensuring compliance with Article 27 of the Waste Directive Regulations including notification to the EPA, seeking a determination from the EPA on the matter and compliance with all relevant Agency guidance on the matter. Where it is proposed to use soil from off-site which is a by-product and subject to Article 27 of the Waste Directive Regulations, the appointed contractor is responsible for carrying out any necessary due diligence regarding the material and ensuring that all EPA guidelines relating to that Article 27 notification have been complied with before the soil is imported into the site. Where feasible, appropriate and available construction by-products arising from other sites will be used in the development of this site in place of virgin materials.

### 18.4.1 Construction Waste

List of Waste (LoW) codes for typical C&D wastes are included in Appendix A18.2 in Volume 4 of this EIAR. In 2019, the latest year for which there are published statistics available, 8.8 million tonnes of C&D waste was generated in Ireland, an increase of 2.6 million tonnes from 2018 (EPA 2021). Of this waste, 7.5 million tonnes comprised soil and stones, making up 85% of the material waste stream. A breakdown of the composition of C&D waste in Ireland in 2019 is set out in Table 18.3. These figures should be considered as a guide only as C&D waste can vary significantly from one project to another, depending on the nature of the development and the waste management practices employed on-site.

**Table 18.3: Quantity of C&D Waste Collected by Authorised Waste Collectors in 2019 (EPA 2021c)**

Waste Materials from C&D Sources	Quantity (tonnes)	Proportion of Material Stream (%)
Soil and stone	7,488,357	84.8
Mixed C&D waste	393,247	4.5
Concrete, bricks, tiles and similar	608,746	6.9
Metals	190,904	2.2
Bituminous mixtures	113,454	1.3
Segregated wood, glass and plastic	30,423	0.3
<b>Total</b>	<b>8,825,131</b>	

The EPA reports that a total of 580,977 tonnes of hazardous waste was managed and treated in Ireland in 2019, 65% of which was exported for treatment. Hazardous waste types include contaminated soils, motor oil, asbestos and chemical waste.

The EPA reports that Ireland achieved 82.4% material recovery of C&D waste in 2019 (EPA 2021c). Under the Waste Framework Directive, EU Member States must achieve 70% of material recovery of non-hazardous and non-soil-and-stone C&D waste by 2020.

A summary of the permitted waste facilities for the EMWR, active at the time of preparation of this assessment, is provided in Table 18.4. Many permit holders are authorised to accept more than one waste type. Table 18.4 sets out the minimum and maximum number and capacity for each waste type. The minimum figure sets out the waste facilities accepting the specified waste type only and the maximum figure is the total capacity of the facilities accepting the specified waste type (this could also include capacity for other waste types). Figure 18.1 and Figure 18.2 in Volume 3 of this EIAR show the locations of permitted construction waste facilities in Dublin and the EMWR, respectively.

**Table 18.4: Summary of EMWR Waste Facility Permit Data (Regional Waste Management Office (Offaly County Council) 2021)**

Waste Type	Number of Waste Facility Permit Sites in the EMWR	Capacity of Waste Facility Permit Sites in the EMWR (tonnes)
Soil and Stones	74	1,753,044
Wood	5	57,100
Concrete	23	656,791
Bituminous mixtures	3	149,500
Other Construction Wastes or Combinations of the above	79	1,648,851

Article 27 of the European Union (Waste Directive) Regulations 2020 allows a material producer to determine, under prescribed circumstances, that a material is a by-product and not a waste and so can be reused on-site or off-site within the industry.

On receipt of 'Article 27' notifications by the EPA, materials can be determined as a waste or a by-product. In some cases no determination is issued by the EPA. This means that the material has not been determined as a waste. In 2019, the EPA received by-product notifications for 5.98 million tonnes of soil and stones material. The EPA determined that 2.77 tonnes of the soil and stone notified were a by-product, as notified and 49,000 tonnes were waste. Notifications for 1.05 million tonnes were withdrawn. The estimated quantity of C&D material notified in 2018 as a by-product for which no determination was made to date was 2.11 million tonnes. The EPA notes in its 2020 'Guidance to Planners, Planning Authorities and An Bord Pleanála on the Management of Excess Soil and Stone from Developments', that it will endeavour to issue determinations as waste or by-products for all notifications from 2020 (EPA 2020) and determinations have started to be issued.

A summary of Article 27 notifications for three key road construction materials for the years 2017 to 2020 is presented in Table 18.5. A significant increase in the number of notifications occurred for soil and stones and bituminous mixtures from 2017 to 2020, with bituminous mixtures notifications increasing from 10 to 186 and soil and stones notifications increasing from 92 to 172, with a peak in 2019 of 214.

**Table 18.5: Number of Article 27 Notifications (2017 to 2020)**

Waste Type / Year	2017	2018	2019	2020
Soil and stones	92	153	214	172
Bituminous mixtures / road planings	10	109	175	186
Concrete / demolition concrete	9	24	8	5

Article 27 notification data obtained from the EPA, shows that there were 2,504,482 tonnes of material notified in the EMWR in 2020, which was established as the baseline for the Proposed Scheme.

A summary of waste licence facilities and corresponding capacity for the EMWR, including both C&D waste and municipal waste management facilities, is set out in Table 18.6. Figure 18.3 in Volume 3 of this EIAR shows the location of waste facilities by waste type within the EMWR. The regional waste management offices have published a Construction and Demolition Waste, Soil and Stone Recovery / Disposal Capacity – Update Report 2020 (Regional Waste Management Offices 2020) which states that:

*'Licensed capacity is most prominent in the EMWR which has a healthy supply of active capacity and substantial new capacity due to come on stream. The Region contains 80% of the active national capacity.'*

**Table 18.6: Summary of EMWR Waste Licence Capacity (EPA 2021e)**

Facility Description	Number of Waste Licensed Facilities (February 2021)	Annual Capacity (Tonnes)
Co-incineration of waste	2	215,000
Composting and anaerobic digestion	10	282,000
Hazardous	11	185,998
Incineration	2	835,000

Facility Description	Number of Waste Licensed Facilities (February 2021)	Annual Capacity (Tonnes)
Integrated waste management facilities	9	1,887,200
Material recovery facilities (MRF)	8	1,650,000
Non-hazardous landfill	3	470,000
Soil recovery facilities	10	3,893,800
<b>Total</b>	<b>55</b>	<b>9,418,998</b>

Table 18.4, Table 18.5 and Table 18.6 set out the baseline for construction waste, permitted and licensed capacity and Article 27 notifications for 2020. This data has been used to establish a baseline for 2020. The available C&D waste and by-product capacity in EMWR for 2020 is approximately 10.7 million tonnes based on the following assumptions:

- Using the available capacity for permitted facilities for construction and demolition wastes;
- Including only licensed facilities accepting soil and stones; and
- Including all Article 27 notifications dated 2020 in the EMWR.

**Table 18.7: C&D Waste Management Baseline for EMWR, 2020 (Permitted, Licensed and Article 27 Notifications)**

C&D Waste Management Baseline for 2020	Capacity / Annual Intake (Tonnes)
Permitted capacity (Regional Waste Management Office (Offaly County Council 2021)	4,265,286
Licensed annual intake (soil and stone facilities) (EPA 2021e)	3,893,800
Article 27 (by-product) notifications (EPA 2020)	2,504,482
<b>Total</b>	<b>10,663,568</b>

## 18.4.2 Municipal Waste

Municipal waste will be generated in small quantities during the Construction and Operational Phases (i.e. associated with maintenance activities) of the Proposed Scheme. Municipal waste in Ireland is made up of household waste as well as commercial and other waste that, because of its nature or composition, is similar to household waste. According to the EPA, Ireland generated 3.1 million tonnes of municipal waste and recycled 37% of this in 2019 (EPA 2021d).

Of the 3.1 million tonnes of municipal waste generated in Ireland in 2019, 37% was recycled, 46% was used in energy recovery, 15% was landfilled and 2% of waste was estimated to be unmanaged. Of the 3.1 million tonnes of municipal waste, 48% is estimated to be non-household municipal waste. Since 2001, significant changes have occurred in the management of municipal waste in Ireland, notably the dramatic decline in landfilling over this period accompanied by increased levels of recycling in the early 2000s and subsequently an increase in the share of municipal waste sent for energy recovery since 2011.

In September 2020, the DCCAIE published a new national waste strategy, the National Waste Action Plan (DCCAIE 2020). The following targets were noted in the Waste Action Plan for municipal waste in Ireland which will be implemented using waste collection permit conditions:

- Municipal solid waste (MSW) recycling rate of 55%, 60%, and 65% by 2025, 2030 and 2035 respectively; and
- Limit the amount of MSW to landfill to 10% by 2035.

To achieve these targets from the 37% recycling rate in 2019 improvements are required in waste reduction, segregation and contamination rates. The EPA estimates that (Government of Ireland 2019):

*'...that Ireland's municipal recycling (including organic waste for composting and anaerobic digestion through the organic bin) rate could increase from 41% to 62% if all recyclable (including organic) material was removed from the general waste bins and placed into the correct mixed dry recycling and organic waste bins.'*

Biodegradable municipal waste (BMW) comprises those elements of the municipal waste stream that will degrade biologically, for example food waste, garden and parks waste, waste paper and cardboard. Under the Landfill

Directive, Ireland is committed to meeting targets for the diversion of BMW from disposal to landfill including a target of less than 427,000 tonnes to landfill in 2020. This has already been achieved and the quantity of BMW disposed to landfill in 2020 was 104,255 tonnes.

A summary of waste licence facilities and corresponding capacity for the EMWR are provided in Table 18.6. Capacity from composting and anaerobic digestion, municipal waste landfill, Material Recovery Facilities (MRFs), integrated waste management facilities, municipal waste incinerators and cement kilns accepting wastes for co-incineration can all be used to treat municipal waste. Figure 18.3 in Volume 3 of this EIAR, shows the location of waste facilities by waste type within the EMWR.

## **18.5 Potential Impacts**

This Section presents potential impacts that may occur due to the Proposed Scheme, in the absence of mitigation but taking into account the best practice measures set out previously in Section 18.3.5 and expanded upon in this Section. This informs the need for mitigation or monitoring to be proposed (refer to Section 18.6). Predicted residual impacts taking into account any additional proposed mitigation and/or monitoring are then presented in Section 18.7.

### **18.5.1 Characteristics of the Proposed Scheme**

Surplus materials are likely to be generated during the following activities and are addressed in this Section:

- Demolition – including waste generated from the removal of features above-ground, such as kerbs, traffic signs and bus stops;
- Excavation – including waste generated from the excavation of below-ground material, such as soil and stones and bituminous containing material etc.; and
- Operation – including waste generated from maintenance activities following completion of the Construction Phase.

Surplus organic materials, including vegetation from shrub, tree or garden clearance or deposits removed from within redundant drainage channels, may generate waste material for treatment at organic waste facilities. There is adequate capacity for the management of such wastes, please see Section 18.4. Segregation facilities may be provided, where necessary, on the construction site to ensure that recovery and recycling of such wastes is maximised.

Small volumes of general municipal wastes will be generated by construction workers during the Construction Phase (e.g. from offices and welfare facilities at the Construction Compounds). Segregation facilities will be provided on the construction site, if necessary, to ensure that recovery and recycling of such wastes is maximised.

### **18.5.2 Do Nothing Scenario**

In the Do Nothing scenario, the Proposed Scheme would not be implemented and the materials described in Section 18.5 would not be generated. However, ongoing maintenance of the existing road infrastructure would continue to result in waste generation. The resource and waste impact would be Neutral.

### **18.5.3 Construction Phase**

#### **18.5.3.1 Introduction**

C&D waste is defined as waste which arises from construction, renovation and demolition activities. Typical C&D wastes which are likely to arise during the Construction Phase of the Proposed Scheme are set out in Appendix A18.2 List of Waste Codes for Construction and Demolition Wastes in Volume 4 of this EIAR, including EPA LoW codes.

The most environmentally sustainable means of managing excavated material is its prevention and minimisation. See Section 18.3.5 and Table 18.2 for the principles of waste management. The appointed contractor will be responsible for the implementation of these for the Proposed Scheme. In recent years there has been a shift in

focus on best practice waste management and waste minimisation in construction and an increase in the reuse of construction by-products in projects.

#### 18.5.3.1.1 Demolition

All material generated from the Proposed Scheme will be considered for reuse for construction within the Proposed Scheme or in other construction projects in accordance with Article 27 of the Waste Directive Regulations. It will be the responsibility of the appointed contractor to review the feasibility of reuse of materials and ensure that the necessary testing is undertaken to demonstrate compliance with Article 27, as appropriate.

Materials will require on-site segregation by waste classification and if not suitable for reuse, will be delivered to an authorised recycling, recovery or disposal facility.

Where practicable and appropriate, and if in reusable condition, street and roadside infrastructure such as bus stops, lighting poles, traffic signals, manhole access covers and signs will be reused within the Proposed Scheme. If not reused, they will be delivered to appropriately authorised recycling or recovery facilities.

Where metal railings and gates are removed, they may have inherent value due to their metal content. These will be delivered for metal recycling to an authorised waste facility where not reused.

Some example facilities which are currently authorised to accept metal and electronic waste include:

- Irish Lamp Recycling Co. Ltd, Woodstock Industrial Estate, Kilkenny Road, Athy, Co. Kildare; and
- Hammond Lane Metal Company, Pigeon House Road, Dublin 4, Dublin.

The least preferable option is disposal to an authorised facility and will be considered by the appointed contractor when reasonable opportunities for reuse, recycling and recovery are unavailable.

Table 18.8 shows the estimated quantity and type of waste that will be generated by demolition activities in connection with the Proposed Scheme.

**Table 18.8: Estimated Demolition Waste Types and Quantities**

Waste Type	Approximate Waste and Material Quantity (Tonnes)
Concrete, bricks, tiles and similar	1,700
Metals	450
Segregated wood, glass and plastic	80
<b>Total</b>	<b>2,230</b>

The estimated 2,230 tonnes of demolition waste which will be generated as a result of the Proposed Scheme is equivalent to 0.02% of the C&D waste management baseline in the EMWR set out in Table 18.7.

The potential impact of demolition waste during the Construction Phase will be Adverse, Not Significant and Short-Term.

#### 18.5.3.1.2 Excavation

Excavation waste will arise from such activities as:

- Excavation of existing carriageways (e.g. road narrowing, removal of islands);
- Excavation of existing footpaths and cycle tracks and pedestrianised areas (e.g. widening, urban realm improvement);
- Alteration of roundabouts to signalised junctions; and
- Excavation for utility diversions and / or protections.

In line with current practice in Ireland, surplus materials and wastes from the Proposed Scheme will be managed as follows:



- Where practicable, naturally occurring excavated material will be reused within construction of the Proposed Scheme in accordance with Article 27 of the Waste Directive Regulations, Waste Framework Directive and Section 3 of the Waste Management Act 1996, as amended;
- Excavation material will be used as engineering and landscaping material within the Proposed Scheme and on other projects requiring the types of materials generated, where practicable, through Article 27. Reuse of topsoil and excavated material within the Proposed Scheme is proposed, where practicable. The material will also be subject to testing to ensure it is suitable for its proposed end use;
- Should material meet the acceptance criteria set out in Article 28 of the Waste Directive Regulations, this material will be delivered to recovery or disposal facilities which are authorised to collect this material under the Waste Management Act 1996 (i.e. which hold a Certificate of Registration, Waste Facility Permit or EPA Licence), should such recovery or disposal facilities become available by the time of commencement of construction of the Proposed Scheme;
- In accordance with the law, all excavation wastes requiring removal from site for recycling or recovery will be delivered to facilities which are authorised under the Waste Management Act 1996 (i.e. which hold a Certificate of Registration, Waste Facility Permit or EPA Licence). Examples of recycling / recovery activities for excavation material include:
  - Processing of stone to produce construction aggregate;
  - Backfilling of quarries; and
  - Raising land for site improvement or development.
- Any hazardous waste arising will be managed by the appointed contractor in accordance with the applicable legislation; and
- In accordance with the law, all wastes removed from site will be transported by the holder of the appropriate waste collection permit, granted in accordance with S.I. No. 820/2007 - Waste Management (Collection Permit) Regulations 2007.

It will be the responsibility of the appointed contractor to secure agreements for acceptance of surplus excavation materials from the Proposed Scheme in authorised and regulated facilities, in accordance with the Waste Management Act 1996 and associated regulations.

Where carriageway is removed it will be reused where possible within the Proposed Scheme through implementation of the measures set out below.

Due to the nature of the works in an urban environment there are limited opportunities to achieve a cut / fill balance of materials that could be more readily accommodated on a greenfield project where earthworks embankments / bunds are more common. Material from the existing pavement layers will be temporarily stockpiled at the proposed Construction Compounds and sent to a suitable recovery facility for recycling and reuse as recycled aggregate material in the industry as further described in this Section and Table 18.13.

Material for excavation will need to be tested by the appointed contractor for quality, contamination and could potentially be reused as general fill or general landscape fill material in construction under the provisions of Article 27. Material which meets the necessary acceptance criteria will be delivered to an authorised soil recovery facility. Material which requires recycling will be sent to an authorised waste facility and may be used in accordance with Article 28 of the Waste Directive Regulations. Article 28 sets the criteria which must be complied with, and the EPA must use, to determine a waste reaches “end of waste” status and becomes a material.

Excavated materials such as capping, subbase, bituminous and concrete materials could be reused or recycled in line with TII specifications:

- Capping, subbase, bituminous and concrete materials could be reused or recycled in fill and capping materials (e.g. Material Class 6A, 6B, 6C, 6F, 6G, 6H, 6I, 6M, 6N) providing they comply with the Specification for Road Works Series 600 – Earthworks (CC-SPW-00600) (TII 2013a);
- Subbase, bituminous and concrete materials could be reused or recycled in subbase or base materials (e.g. Granular Material Type A to Clause 803) providing they comply with the Specification for Road Works Series 800 – Unbound and Cement Bound Mixtures (CC-SPW-00800) (TII 2013b); and

- Subbase and bituminous materials could be recycled in base or binder materials (e.g. Asphalt Concrete base and binder products to Clause 3 or Low Energy Bound Mixtures to Clause 8.1) providing they comply with Road Pavements – Bituminous Materials (CC-SPW-00900) (TII 2015).

Information on quantities of potential material reuse and recycling is provided in Table 18.13.

These pavement materials will either be removed directly from the Proposed Scheme or temporarily stored and removed at a later date as part of a spoil / waste management strategy having consideration of the intermittent nature of the street works construction activities. The waste types likely to be generated during the Construction Phase are set out in Table 18.9.

**Table 18.9: Summary of Excavation Material Type and Quantities**

Materials from C&D Sources	Approximate Waste and Material Quantity (Tonnes)
Soil and stone	81,000
Concrete, bricks, tiles and similar	8,000
Bituminous mixtures	12,000
<b>Total</b>	<b>101,000</b>

The total forecast of surplus excavation material from the Proposed Scheme is 101,000 tonnes and this is equivalent to 0.95% of the C&D waste management baseline for the EMWR, as set out in Table 18.7.

The potential impact of excavation waste during the Construction Phase will be Adverse, Slight and Short-Term.

#### 18.5.3.1.3 Construction

Construction works, site offices and temporary works facilities are also likely to generate waste. General construction waste can vary significantly from site to site but typically will include the following non-hazardous fractions:

- Soil and stone;
- Concrete, brick, tiles and ceramics;
- Bituminous mixtures;
- Metals;
- Wood;
- Municipal type wastes generated by construction employees; and
- Other.

The hazardous waste streams which could arise from construction activities include the following:

- Waste electrical and electronic equipment (WEEE) components;
- Batteries;
- Asbestos;
- Wood preservatives;
- Liquid fuels; and
- Contaminated soil.

Also included within this definition are surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities.

The Construction Phase will require the importation of a number of key construction materials for the Proposed Scheme works. This material will include items such as concrete, granular fill / aggregate, bituminous mixtures and structural steel. Table 18.10 provides an estimate of the quantities of the major materials required to complete the Construction Phase of the Proposed Scheme, for impacts on material assets see Chapter 19 (Material Assets).

**Table 18.10: Estimated Quantities of Major Construction Materials Required by the Proposed Scheme**

Material	Estimated Quantity (Tonnes)
Bituminous mixtures	32,000
Recycled Aggregate	47,000
Concrete	12,000
Structural Steel	32

In the case of the Proposed Scheme, the most likely type and quantity of general construction waste will be surplus concrete and unusable or damaged pipe segments which may arise on-site. Quantities of these materials are estimated to be small; assumed to be approximately between 5% to 15% of construction material delivered to site (WRAP 2014). There is adequate capacity for the management of such wastes, please see Section 18.4. Segregation facilities will be provided to ensure that recovery and recycling of such wastes are maximised.

The potential impact of construction waste during the Construction Phase will be Adverse, Imperceptible and Short-Term.

#### 18.5.3.1.4 Municipal Waste

It is anticipated that there will typically be 250 to 270 construction staff employed over the Construction Phase of the Proposed Scheme, increasing to a peak of 300. Small volumes of general municipal wastes will be generated by construction staff during the Construction Phase (e.g. from offices and welfare facilities). Segregation facilities will be provided on the construction site to ensure that recovery and recycling of such wastes is maximised.

The potential impact of municipal waste during the Construction Phase will be Adverse, Imperceptible and Short-Term.

#### 18.5.3.2 Summary of the Potential Construction Phase Impacts

A summary of the potential impacts for the Construction Phase is set out in Table 18.11.

**Table 18.11: Summary of Potential Construction Phase Impacts**

Assessment Topic	Potential Impact
Demolition waste	Adverse, Not Significant and Short-Term
Excavation waste	Adverse, Slight and Short-Term
Construction waste	Adverse, Imperceptible and Short-Term
Municipal waste	Adverse, Imperceptible and Short-Term

The Construction Phase of the Proposed Scheme is not predicted to give rise to significant impacts and all the impacts will be short-term in duration.

### 18.5.4 Operational Phase

#### 18.5.4.1 Construction and Demolition Waste

Operational waste may arise as a result of carriageway maintenance which will be undertaken at regular intervals, or as necessary. This will primarily consist of bituminous mixtures due to the maintenance of carriageway pavement. Only waste generated from the areas where road widening and narrowing, undertaken as part of the Proposed Scheme, have taken place will be considered in this assessment, as routine maintenance, and associated waste generated, would be carried out on the existing road irrespective of the Proposed Scheme. It is important to note that maintenance operations will be undertaken under the jurisdiction of the relevant Local Authority.

It is envisaged that bituminous mixtures will be reused within new carriageway construction as far as practicable and in accordance with all applicable legislation. Bituminous mixtures which are not incorporated into the Proposed Scheme may be salvaged by the Local Authority for reuse elsewhere in accordance with Article 27, of

the Waste Framework Directive. Bituminous mixtures may be recycled in accordance with the provisions of an Article 28 (End of Waste) decision by the EPA (EPA 2020).

The quantity of bituminous mixtures generated over the assumed lifetime of the Proposed Scheme (60 years), will decrease, compared to the Do Nothing scenario, by approximately 11,500 tonnes due to an overall narrowing of the carriageway. Therefore, there will be a decrease in maintenance needs during operation of the Proposed Scheme, in comparison to required maintenance of the existing carriage way under the Do Nothing scenario. Therefore, the potential impact of operational C&D waste will be Positive, Not Significant and Long-Term.

#### 18.5.4.2 Municipal Waste

It is anticipated that maintenance activities during the Operational Phase will result in no greater levels of waste generation than during the Construction Phase. Therefore, the potential impact of municipal waste, generated during maintenance activities during the Operational Phase will be Neutral and Long-Term.

#### 18.5.4.3 Summary of Potential Operational Phase Impacts

A summary of the potential impacts for the Operational Phase is set out in Table 18.12.

**Table 18.12: Summary of Potential Operational Phase Impacts**

Assessment Topic	Potential Impact
C&D waste	Positive, Not Significant and Long-term
Municipal waste	Neutral and Long-term

The Operational Phase of the Proposed Scheme is not predicted to give rise to significant impacts.

## 18.6 Mitigation and Monitoring Measures

### 18.6.1 Construction Phase

The Construction Phase is not predicted to give rise to significant adverse impacts and therefore, no specific mitigation or monitoring measures are required. However, a suite of management measures is outlined which the appointed contractor will implement and, in any event, the appointed contractor will ensure that waste arisings will be managed in accordance with the waste hierarchy and in compliance with the provisions of the Waste Management Act 1996, as amended.

A Construction and Demolition Resource and Waste Management Plan (CDRWMP) has been prepared and this will be implemented (and updated as necessary) by the appointed contractor in line with the Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (EPA 2021b). The CDRWMP outlines how waste arising during the Construction and Demolition Phase of the Proposed Scheme will be managed in a way that ensures compliance with the provisions of the Waste Management Act 1996, as amended (refer to the CDRWMP within Appendix A5.1 Construction and Environmental Management Plan in Volume 4 of this EIAR). The appointed contractor will update the CDRWMP in advance of construction commencing.

The following measures will be implemented during construction, where practicable by the appointed contractor, to ensure the maximum quantity of material is reused on the Proposed Scheme and to contribute to achieving the objectives set out in the National Waste Action Plan as follows:

- Stockpiling of existing subbase, capping layer and topsoil material generated on-site for direct reuse in the Proposed Scheme where practicable in the proposed Construction Compounds (subject to material quality testing to ensure it is suitable for its proposed end use); and
- Recycled aggregates and reclaimed bituminous mixtures will be specified in the Proposed Scheme where practicable. For example, suitable recycled aggregates and appropriate site won material may be specified in the proposed road base / binder layers, subbase layers under footpaths / cycle tracks, and capping layer material within the road, footpath and cycle track pavement, subject to testing to ensure material is suitable for its proposed use.

The quantities outlined in Table 18.13 will not result in a change to the significance rating for the impact assessment of excavation waste. Therefore, the impact of excavation waste will remain Adverse, Slight and Short-Term.

**Table 18.13: Quantities of Proposed Material for Reuse and Recycling**

Reuse or Recycle	Material for Reuse or Recycle	Approximate Quantity (tonnes)	Reuse or Recycle Specification for Example TII Series or Other Reuse Specification	Reuse or Recycle Class (note: Class to be Provided in all Cases where TII Specification is used)
Recycle on Proposed Scheme	Bitumen (surface / binder / base)	3,500	TII Series 900 (TII 2015)	Bituminous planings for reuse in base and binder layer
Reuse on Proposed Scheme	Subbase material under footpaths and roads	18,500	TII Series 800 (TII 2013b)	Sub-base material under footpaths and cycle track
Reuse on Proposed Scheme	Granular Capping material from road widening	11,000	TII Series 600 (TII 2013a)	Road pavement capping material

It is estimated that potentially up to 33,000 tonnes of recycled or reused material could be incorporated into the Proposed Scheme (refer to Table 18.13).

The following management measures will be implemented in so far as is reasonably practicable:

- Where waste generation cannot be avoided, waste disposal will be minimised;
- Opportunities for reuse of materials, by-products and wastes will be sought throughout the Construction Phase of the Proposed Scheme;
- Possibilities for reuse of clean non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use;
- Where excavated material cannot be reused within the Proposed Scheme works, material will be sent for recovery or recycling;
- Source segregation: Metal, timber, glass and other recyclable material will be segregated (and waste stream colour coding will be used) during construction works and removed off-site to a permitted / licensed facility for recycling;
- Material management: 'Just-in-time' delivery, where practicable, will be used to minimise material wastage;
- General construction waste and by-products will be reused within the Proposed Scheme, where practicable, or appropriately reused (in accordance with Article 27 of the Waste Directive Regulations), recovered, recycled or disposed of off-site, as arranged by the appointed contractor; and
- Any hazardous waste arising will be managed by the appointed contractor in accordance with the applicable legislation.

**Waste auditing:** The quantity and types of waste and materials leaving site during the Construction Phase will be recorded by the appointed contractor. The name, address and authorisation details of all facilities and locations to which waste and materials will be delivered will be recorded along with the quantity to each facility. Records will show material which is recovered, which is recycled and which is disposed of.

Where Article 27 notifications are required in relation to the Proposed Scheme, the appointed contractor will complete and submit these Article 27 notifications to the EPA for by-product reuse.

Any off-site interim storage or waste management facilities for excavated material will have the appropriate EPA Licence, Waste Facility Permit or Certificate of Registration, as appropriate, in place.

The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e. EPA Licence, Waste Facility Permit or Certificate of Registration).

### 18.6.1.1 Summary of Predicted Construction Phase Impacts

A summary of the predicted residual impacts during the Construction Phase, following implementation of the appropriate management measures, is shown in Table 18.14.

**Table 18.14: Summary of Predicted Construction Phase Impacts Following the Implementation of Mitigation and Monitoring Measures**

Aspect of the Proposed Scheme	Potential Impact (Pre-Mitigation and Monitoring)	Residual Impact (Post Mitigation)
Demolition waste	Adverse, Not Significant and Short-Term	Adverse, Not Significant and Short-Term
Excavation waste	Adverse, Slight and Short-Term	Adverse, Slight and Short-Term
Construction waste	Adverse, Imperceptible and Short-Term	Adverse, Imperceptible and Short-Term
Municipal waste	Adverse, Imperceptible and Short-Term	Adverse, Imperceptible and Short-Term

### 18.6.2 Operational Phase

Maintenance operations will be undertaken under the jurisdiction of the Local Authority and in accordance with their waste management plans. No additional mitigation or monitoring measures are considered necessary.

#### 18.6.2.1 Summary of Predicted Operational Phase Impacts

A summary of the predicted residual impacts during the Operational Phase following implementation of mitigation measures is outlined in Table 18.15.

**Table 18.15: Summary of Predicted Operational Phase Impacts Following the Implementation of Mitigation and Monitoring Measures**

Aspect of the Proposed Scheme	Potential Impact (Pre-Mitigation and Monitoring)	Residual Impact (Post Mitigation)
C&D waste	Positive, Not Significant and Long-Term	Positive, Not Significant and Long term
Municipal waste	Neutral and Long-Term	Neutral and Long-Term

## 18.7 Residual Impacts

No significant residual impacts have been identified either in the Construction or Operational Phase of the Proposed Scheme, whilst meeting the scheme objectives set out in Chapter 1 (Introduction).

### 18.7.1 Construction Phase

The Construction Phase of the Proposed Scheme is not predicted to give rise to any significant residual impacts.

### 18.7.2 Operational Phase

The Operational Phase of the Proposed Scheme is not predicted to give rise to any significant residual impacts.

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