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Liffey Valley
to City Centre

Information on the Proposed Approach to Environmental Assessment

November 2020



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CONNECTS**

SUSTAINABLE TRANSPORT FOR A BETTER CITY.



Project Ireland 2040
Building Ireland's Future

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Table of Acronyms

Acronym	Meaning
ACA	Architectural Conservation Area
CBC	Core Bus Corridor
CIEEM	Chartered Institute of Ecology and Environmental Management
DCC	Dublin City Council
DCHG	Department of Culture, Heritage and the Gaeltacht
DCIHR	Dublin City Industrial Heritage Record
DEHLG	Department of Environment, Heritage and Local Government
DMRB	Design Manual for Road and Bridges
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
GHG	Greenhouse Gases
IGI	Institute of Geologists of Ireland
LAQM	Local Air Quality Management
NIAH	National Inventory of Architectural Heritage
NRA	National Roads Authority
NTA	National Transport Authority
pNHA	Proposed Natural Heritage Area
RMP	Records of Monuments and Places
RPS	Record of Protected Structures
SDCC	South Dublin County Council
SMR	Sites and Monuments Record
TIA	Transport Impact Assessment
TII	Transport Infrastructure Ireland
UNESCO	United Nations Educational, Scientific and Cultural Organization
WFD	Water Framework Directive
WHO	World Health Organisation
ZAP	Zone of Archaeological Potential

1. Introduction

The purpose of this document is to facilitate early engagement in relation to the proposed approach to the assessment of environmental impacts for the Liffey Valley to City Centre Core Bus Corridor (CBC) (hereafter referred to as the Proposed CBC). The Proposed CBC is one of the 16 CBCs that make up the BusConnects Dublin – Core Bus Corridor Infrastructure Works (hereafter referred to as the Works). Work regarding examination of the environmental impact is under way and that may culminate in an Environmental Impact Assessment Report (EIAR) to be prepared for submission as part of a planning application to An Bord Pleanála by the National Transport Authority (NTA) under the Roads Act 1993 (as amended).



Image 1.1: Indicative Overview of BusConnects Dublin – Core Bus Corridor Infrastructure Works with Liffey Valley to City Centre Core Bus Corridor Highlighted (refer to Chapter 2 for further detail)

The Proposed CBC is being planned as part of the Works with the aim of providing enhanced walking, cycling and bus infrastructure on key access corridors in the Dublin region, which will enable and deliver efficient, safe and integrated sustainable transport movement along these corridors. To achieve this aim, the NTA has identified the following objectives:

- Enhance the capacity and potential of the public transport system by improving bus speeds, reliability and punctuality through the provision of bus lanes and other measures to provide priority to bus movement over general traffic movements;
- Enhance the potential for cycling by providing infrastructure for cycling, segregated from general traffic wherever practicable;
- Support the delivery of an efficient, low carbon and climate resilient public transport service, which supports the achievement of Ireland's emission reduction targets;
- Enable compact growth, regeneration opportunities and more effective use of land in Dublin, for present and future generations, through the provision of safe and efficient sustainable transport networks;
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved sustainable connectivity and integration with other public transport services; and
- Ensure that the public realm is carefully considered in the design and development of the transport infrastructure and seek to enhance key urban focal points where appropriate and feasible.

The timeline for the Proposed CBC is:

- **Current through early-2021** – Preparation of Statutory Application including selection of the Preferred Route Option, optimised Engineering Design, EIAR, and identification of property requirements and drafting of Compulsory Purchase Order (CPO);
- **2021** – Statutory Process including submission of application to An Bord Pleanála, statutory consultation, Oral Hearing; and
- **2022 to 2027** – In the event of approval by An Bord Pleanála under section 51 of the Roads Act 1993 (as amended) and confirmation of the CPO, carry out property acquisition and construction.

The Emerging Preferred Route Option was published for a public consultation in November 2018. A second public consultation was held in March 2020 outlining the Draft Preferred Route Option taking into account the submissions from the public consultation. The second consultation accepted public submissions until 17 April 2020, however on-site public engagement was suspended due to introduction of Covid-19 restrictions. To complete this public engagement, the NTA are holding this additional round of public consultation prior to finalising the Preferred Route Option.

Following this further public consultation and the consideration of submissions received the preferred route option will be finalised and the Preferred Route Options Report will be completed and published. The environmental impact assessment work will be completed following the conclusion of the further public consultation process, the finalisation and publication of the Preferred Route Options Report, and subsequent detail design, and form part of the statutory submission to An Bord Pleanála for approval under section 51 of the Roads Act 1993 (as amended).

1.1 Policy Context

The Proposed CBC is located within the two Local Authority areas; South Dublin County Council (SDCC) and Dublin City Council (DCC).

The South Dublin Development Plan 2016-2022 does not have any objectives specific to bus infrastructure, but includes TM2 Objective 1 which states that it is an objective of SDCC:

'To secure the implementation of major public transport projects as identified within the relevant public transport strategies and plans for the Greater Dublin Area' (SDCC 2016, p.107).

The Dublin City Development Plan 2016-2022 includes Objective MT04 which states that it is an objective of DCC:

'To support improvements to the city's bus network and related services to encourage greater usage of public transport in accordance with the objectives of the NTA's strategy and the government's 'Smarter Travel' document' (DCC 2016, p.125).

Within Dublin City and South Dublin Local Authority area, the development plan is supported by area-based plans, comprising Strategic Development Zones, Local Area Plans (LAP) and Masterplans, giving more refined and detailed policies and objectives, including those relating to improved public transport infrastructure and connectivity.

In addition to the local policy context for the Proposed CBC, the following regional and national policy documents support the BusConnects Programme and its aims and objectives:

- National Policy Documents:
 - Project Ireland 2040: National Planning Framework (Government of Ireland 2018);
 - Project Ireland 2040: National Development Plan 2018-2027 (Department of Housing, Planning and Local Government 2018);
 - Climate Action Plan 2019 (Government of Ireland 2019);
 - Energy White Paper, Ireland's Transition to a Low Carbon Energy Future 2015-2030 (Department of Communications, Energy and Natural Resources 2015);
 - Transport – Climate Change Sectoral Adaptation Plan (Department of Transport, Tourism and Sport 2019);
 - Smarter Travel: A Sustainable Transport Future: A New Transport Strategy for Ireland 2009–2020 (Department of Transport, Tourism and Sport 2019); and
 - Smarter Travel: Ireland's First National Cycle Policy Framework 2009-2020 (Department of Transport, Tourism and Sport 2009).
- Regional Policy Documents:
 - Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region 2019-2031 (Eastern & Midland Regional Assembly (EMRA) 2019);
 - Transport Strategy for the Greater Dublin Area 2016-2035 (NTA 2016); and
 - Greater Dublin Area Cycle Network Plan (NTA 2013).

2. Project Description

2.1 Description of the Proposed Core Bus Corridor

The Proposed CBC will commence at a new bus terminus adjacent to the Liffey Valley Shopping Centre (which is being progressed as a separate project) and will be routed along the internal distributor roads to the west and south of the Liffey Valley Shopping Centre to the junction with the R833 Coldcut Road. It will then be routed along R833 Coldcut Road and R833 Ballyfermot Road to the junction with R833 Sarsfield Road. From here, the Proposed CBC will be routed via R833 Sarsfield Road, the R839 Grattan Crescent, along R810 Emmett Road, R810 Old Kilmainham, R810 Mount Brown, R810 James Street, R810 Thomas Street, R810 Cornmarket and along R810 High Street to the junction with R137 Nicholas Street and Winetavern Street where it will join the existing traffic management regime in the City Centre. Priority for buses will be provided along the entire route, consisting primarily of dedicated bus lanes in both directions with alternative traffic management measures proposed at particularly constrained locations.

For a full description of the Proposed CBC and for maps showing the Preferred Route Option please refer to the Liffey Valley to City Centre Public Consultation Brochure which can be found on the BusConnects website at this link <https://busconnects.ie/initiatives/core-bus-corridor/>.

2.2 Overview of Typical Construction Works

It should be noted that the level of construction work required will vary within the extents of the Proposed CBC. The typical works which will need to be undertaken in varying amounts includes:

- General site clearance (street furniture removal / relocation, etc.);
- Services protections / relocation / diversion (power supply, communications);
- Drainage works (amendment or upgrade of existing drainage system and/or installation of new drainage systems);
- Excavation as required;
- Road pavement reconstruction;
- Road markings (non-destructive removal of existing road markings, new road markings);
- Kerbs, footways and paved areas (removal and new);
- Road lighting and traffic signals works (relocation, cabling, ducting);
- Signage (removal / relocation / replacement of existing and/or installation of new);
- Landscaping works (top soiling, fence, trees relocation, hedges, road margins re-grading, possible conversion of impervious areas to green permeable space etc.);
- Structure works associated with bridge crossings and retaining walls;
- Localised construction work sites including reconstruction / alteration of driveway, loading areas, etc;
- Accommodation works including new boundary treatments to adjacent properties that would be subject to land take to accommodate the widening of the street/ road; and
- Construction compounds used as the primary location for storage of materials, fuel, plant and equipment, site offices, worker welfare facilities and limited vehicle parking.

3. Environmental Impact Assessment

3.1 EIA Project Team

The Environmental Impact Assessment is being led by Jacobs, with EIA co-ordination being undertaken by Jacobs, Arup and Systra with specialist input as required. The engineering design for the Proposed CBC is being developed by an independent engineering design team from Jacobs, however, there is close cooperation and collaboration between the EIA team and the engineering design team.

3.2 Proposed EIAR Structure

In order to ensure accessibility and to cover each of those listed factors, it is intended to present the data in line with the outline structure provided in Table 3.1.

Table 3.1: Proposed EIAR Structure

EIAR Chapter	Description
Volume 1: Non-Technical Summary	
NTS	Summary of the EIAR in non-technical language
Volume 2: Main Report	
Chapter 1	Introduction & Environmental Impact Assessment Process
Chapter 2	Need for the Proposed Scheme
Chapter 3	Consideration of Reasonable Alternatives
Chapter 4	Proposed Scheme Description
Chapter 5	Construction
Chapter 6	Traffic & Transport
Chapter 7	Air Quality
Chapter 8	Climate
Chapter 9	Noise & Vibration
Chapter 10	Population
Chapter 11	Human Health
Chapter 12	Biodiversity
Chapter 13	Water
Chapter 14	Land, Soils, Geology & Hydrogeology
Chapter 15	Archaeological & Cultural Heritage
Chapter 16	Architectural Heritage
Chapter 17	Landscape (Townscape) & Visual
Chapter 18	Waste & Resources
Chapter 19	Material Assets
Chapter 20	Risk of Major Accidents and/or Disasters
Chapter 21	Cumulative Impacts & Environmental Interactions
Chapter 22	Summary of Mitigation & Monitoring Measures
Chapter 23	Summary of Significant Residual Impacts
Volume 3: Figures	
Figures	Graphics and plans supporting the EIAR chapters, illustrating the Proposed Scheme and environmental information
Volume 4: Appendices	
Appendices	Technical reference information supporting the EIAR chapters, such as calculations and detailed background data.

4. Study Area

The following gives an overview of the baseline conditions within the study area for the Proposed CBC.

4.1 Human and Built Environment

The following gives an overview of the urban and built environment study area baseline. Along the Proposed CBC, there are a number of potentially sensitive receptors. A list of these is provided in Table 4.1.

Table 4.1: Examples of Different Types of Sensitive Receptors Along the Proposed CBC

Type of Receptor	Examples Along the Proposed CBC
Residential	Coldcut residential area; Palmers residential area; Whitehorn residential area; residential receptors lining the R833 Ballyfermot Road / Le Fanu Road / R833 Sarsfield Road / Sarsfield Road / Grattan Crescent / R810 Emmet Road / R810 Old Kilmainham / R810 Mount Brown / R810 James Street / R810 Thomas Street
Commercial	Offices; funeral homes; Liffey Valley Shopping Centre; Liffey Valley Retail Park; Fonthill Retail Park; Cherry Orchard Hospital; Cherry Orchard Industrial Estate; Ballyfermot Primary Care Centre; Corvin Medical Centre; Inchicore Medical Centre; St. James's Hospital; St. Patrick's University Hospital; Diageo Ireland; Dublin City Council; small businesses and restaurants along the Proposed CBC
Education	St. John's College De La Salle; Kylemore Music College; Ballyfermot College of Further Education; St. Michael's National School; St. Raphaels National School; De La Salle National School; Mini Miracles Creche and Montessori; Inchicore National School; Inchicore College of Further Education; National College of Art and Design
Community facilities and recreational resources	St. Matthews Church; Church of Our Lady of the Assumption; Ballyfermot Family Resource Centre; Markiewicz Park; Longmeadows Pitch and Putt and Park; St. Michael's Church Inchicore; Richmond Park; St. Augustine and St. John The Baptist Catholic Church; St. Audoen's Church; Ballyfermot Community Centre; Grattan Crescent Park; Trinity Centre for Health Sciences; Quarryvale Community and Leisure Centre CLG; Ballyfermot United Sports and Social Club; Markiewicz Park; Liffey Gaels GAA Club; Inchicore Sports and Social Club;
Tourism assets	Markiewicz Park; Longmeadows Pitch and Putt; Irish national War Memorial Park; Kilmainham Gaol; Royal Hospital Kilmainham; Hilton Dublin Kilmainham; Irish Museum of Modern Art; Guinness Storehouse; Vicar Street; Old Dublin City Wall; Christ Church Cathedral; Dublinia; Juries Inn Christchurch Dublin; St. Patrick's Tower; Wood Quay Amphitheatre and Viking Area; hostels and B&Bs along the Proposed CBC
Medical / Healthcare	Cherry Orchard Hospital; Ballyfermot Primary Care Centre; Corvin Medical Centre; Inchicore Medical Centre; St. James's Hospital and the new National Children's Hospital

4.1.1 Human Environment (Population, Human Health, Air Quality, Noise)

The Proposed CBC will intersect seven community areas which have an approximate total population of 52,000 according to the 2016 census (CSO 2016). It will commence at Liffey Valley Shopping Centre, in the community area of Rowlagh / Quarryvale, just west of the M50 Motorway and will cross the M50 Motorway on the R833 Coldcut Road. Immediately east of the M50 Motorway, the Proposed CBC will continue between a series of housing estates and will enter the community area of Ballyfermot Upper on the R833 Ballyfermot Road running in between Cherry Orchard Industrial Estate and Cherry Orchard Hospital. Once past Cherry Orchard Industrial Estate, the Proposed CBC will continue towards the community area of Ballyfermot and will pass mainly residential areas, with a mixture of houses lining the road and entrances to adjacent housing estates. It will continue through Ballyfermot towards Inchicore (Mary Immaculate and St Michael's), and will continue to pass mostly residential or mixed residential / commercial properties lining both sides of the Proposed CBC. It will continue east along R810 Emmet Road towards the community area of R810 James Street with the nature of the Proposed CBC changing from a more suburban residential character, to a more urban character with increasing numbers of commercial properties and apartments rather than houses lining the route. the Proposed CBC will end in the community area of Meath Street and Merchants Quay in the City Centre.

A group made up of the Health Service Executive (HSE) and Lenus - the Irish Health Research Repository have published health profiles for all the Local Authorities in Ireland. The most recent of these profiles published relate to 2015. According to the 2015 Health Profile, DCC has a higher than average percentage of persons who report their health as being bad or very bad at 2% (national 1.5%) or who have a disability at 14.9% (national 13.0%) (HSE 2015a). According to the 2015 Health Profile, SDCC is less affluent than the average for Ireland, with a higher proportion of the population categorised as either marginally below average or disadvantaged (HSE 2015b).

On the topic of air quality and human health, in July 2019 the EPA released a report entitled Urban Environmental Indicators on the topic of nitrogen dioxide (NO₂) concentrations in Dublin (EPA 2019d). The EPA reported that NO₂ could be described as problematic being potentially over the EU limit in some areas around the city, including certain City Centre streets and the M50 motorway. NO₂ is an air pollutant linked to traffic emissions and has the potential to affect lung health and increase susceptibility to respiratory infections.

The full length of the Proposed CBC is included in the EPA noise mapping for road traffic (EPA 2019c). This information will be used as an initial review of the baseline noise environment at noise sensitive receptors in close proximity to the alignment. It should be noted that there are parts of the existing network along the Proposed CBC which already experience high noise levels due to the existing traffic in the area and general urban sources.

There are a number of potentially sensitive receptors such as residential areas, educational facilities, healthcare facilities and leisure facilities located along, or in close proximity to the Proposed CBC. These are outlined in Table 4.1.

4.1.2 Archaeological & Cultural Heritage

The Proposed CBC will run along R810 Emmet Road, approximately 90m south of Kilmainham Gaol, a National Monument in State ownership (Record of Monuments and Places (RMP) DU018-125, NM 625). It is one of the largest unoccupied gaols in Europe. Prior to the construction of the Kilmainham Gaol, this part of Kilmainham was known as Gallows Hill and convicted criminals were hanged here. The rear of the Gaol is separated from R810 Emmet Road by the River Cammock, which is lined with banks of mature trees.

A second National Monument, St Audoen's Church (RMP DU018-020075, NM 34), is located at the eastern end of the Proposed CBC, on the north side of R108 High Street. The church stands within the recently renovated St Audoen's Park, a small but historic public space.

There are no RMP / Sites and Monuments Records (SMR) sites within 50m of the Proposed CBC where it will run from Liffey Valley to Inchicore, at the R810 Emmet Road / R111 South Circular Road Junction. Beyond this point, however, it will enter the designated Zone of Archaeological Potential (ZAP) for the Historic City of Dublin (RMP DU018-020). There are numerous recorded archaeological sites (63) adjacent to the Proposed CBC from this point onwards, many of which have no above ground presence. The sites represent Dublin's Viking, medieval and post-medieval settlement history, both within and outside of the walled city.

At Kilmainham, there is a 16th / 17th century house at the junction of Old Kilmainham and Kearns Place, described as a 'curious house that belonged to a miller' (DU018-020300). This formed part of a small settlement ('Old Kilmainham') that had developed around the mills that once stood to the north, along the banks of the River Cammock. The mills were the property of the Knight's Hospitallers priory, which had been founded in the 12th century close or at the site of the early medieval monastery of *Cill Maighneann*, on a ridge of high land along the southern bank of the River Liffey.

Historically, R810 James Street forms part of the main thoroughfare into Dublin on the west side of the walled town. At the western end, the street led to Kilmainham, a settlement and priory, while at the eastern end, it led directly to Dublin, via R810 Thomas Street. The route follows a more ancient, early medieval roadway, known as the Slighe Mhór, that extended across the country as far as Galway. There is a cluster of sites along R810 James Street and R810 Thomas Street, many of which are associated with the medieval and post-medieval settlement within this western suburb that first developed in the 13th century. Most of these sites have no above-ground presence, and are known from documentary and cartographic sources, and/or from archaeological excavation.

Over a third of the sites (25) are clustered around R810 Cornmarket and R108 High Street, within the former walled city, and include the sites of a Viking house, medieval houses and habitations sites, a guildhall, a shambles, an inn, a windmill and two watercourses. The earliest archaeological levels at R108 High Street have been dated to c. 1010, when the street was laid out during the western expansion of the 10th century Viking town. R108 High Street became the most important thoroughfare in medieval Dublin. In c. 1241 it is referred to as the 'main street of Dublin' and it linked the western approach to the city with Christchurch and the castle through the mural gate

called Newgate. To date, no evidence of the medieval aqueduct that ran along the northern street alignment on R108 High Street has been encountered in archaeological excavations along R108 High Street.

4.1.3 Architectural Heritage

Liffey Valley and Cherry Orchard Ballyfermot remained largely rural until the 20th century. Features of note include the Cherry Orchard Hospital complex (National Inventory of Architectural Heritage (NIAH) 50080367 to 50080372) including a post box (NIAH 50080457). Other cast iron post boxes were noted at Le Fanu Road (NIAH 50080458) and R833 Ballyfermot Road (NIAH 50080371) and Landen Road (NIAH 50080377). In Ballyfermot, features of note include religious or institutional buildings such as St. Matthew's Church (NIAH 5008036), Church of Our Lady of the Assumption on R833 Ballyfermot Road (NIAH 50080370), which are 20th century churches, St. John's College on Le Fanu Road (DCC Record of Protected Structures (RPS) 4310, NIAH 50080362) which was built in 1745 as a country house but is now in use as a monastery. Mount La Salle on R833 Ballyfermot Road (NIAH 50080372) is similarly in use as a monastery. Seven Oaks on R833 Sarsfield Road (DCC RPS 7477), built around 1870, is in use as a convent. Canon Troy House on Chapelizod Hill Road (DCC RPS 1349) was built around 1900 and has remained in residential use.

Industrial heritage includes the sites of a number of gravel pits on the R833 Ballyfermot Road such as at Markiewicz Park and The Steeples, both of which have been included in the Dublin City Industrial Heritage Record (DCIHR) along with the Great Southern and Western Railway and associated bridges on R833 Sarsfield Road.

Inchicore was initially a small village on the River Camac and was a watering place for sheep prior to being brought to market, hence the name, Inse Coire or Sheep Island. The village developed considerably in the 19th century as a suburb heavily associated with the railway and subsequently as a tramway terminus. Terraces of workers cottages such as at Inchicore Terrace South (DCC RPS 3992) remain as evidence of this. Similarly, the Omnibus Coach Works on Spa Road was a former Tramway Depot. The village itself consists of predominantly two-storey 19th century terraces, shops, banks and public houses. Botable public buildings include Inchicore United Workman's Club (50080088), St. Michael's Church (DCC RPS 2639), Inchicore National School (DCC RPS 7476), Inchicore College of Further Education (NIAH 50080157) and the Art Deco Inchicore Library (NIAH 50080156).

Kilmainham is of medieval origin and there is a 16th / 17th Century house site located on Kearn's Place (DU018-020300). Many of the buildings and features that were noted along the proposed route for the Proposed CBC are of industrial or scientific interest, including Kilmainham Bridge (DU018-020289, NIAH 50080059), a former dye works at Kearns Court and the Academy Of Medical Laboratory Science (NIAH 50080167).

Terraces of 19th and 20th century houses and cottages were identified on Brookfield Road and in Mount Brown. These include the late 19th century St. John's Terrace (NIAH 50080181) and Ceannt Fort (NIAH 50080180) a Local Authority scheme built in the 1920s to the design of T. J. Byrne.

R810 James Street is located within the old Liberty of Dublin. St James's Hospital which is located at the west end contains workhouse buildings dating from 1790, in addition to 19th and 20th century hospital buildings. (DCC RPS 4011).

Mary Aikenhead House (NIAH 50080302), a 1940 Local Authority apartment scheme designed by Herbert Simms is located opposite to the hospital. Prominent Street furniture on R810 James Street includes the Obelisk Fountain (DCC RPS 4054). R810 James Street contains many 18th and 19th century terraced houses, many of which have been converted to shops or apartments. However, R810 James Street is dominated by those associated with the Guinness Brewery, founded in 1759 (DCC RPS 4028 to 4047).

Other prominent structures on R810 James Street include St. James's Church (DCC RPS 4020) and the Parochial Hall (DCC RPS 4019).

From R810 James Street, the Proposed CBC will continue on to R810 Thomas Street much of which is within the Thomas Street and Environs Architectural Conservation Area. It contains many buildings dating from the 17th, early-18th, 18th and 19th centuries. These include former distillery sites at the St. Patrick's Tower, (DU018-020023,

NIAH 50080329) which was built in 1757 and was formerly part of the Roe Distillery and The National College of Art, formerly the Powers Distillery (DCC RPS 8175). St. Catherine's Church of Ireland Church (DCC RPS 8153, DU018-020074, NIAH 50080611) which was built around 1765 to the design of John Smyth and lies on the site of a 12th century church. This site is of National importance and this is partly due to its association with Robert Emmet who was the leader of the 1803 Rebellion and was executed outside the church.

Cornmarket which also lies within the Thomas Street Architectural Conservation Area (ACA) is an upstanding section of the medieval city walls which have survived in Cornmarket (DCC RPS 4276 NIAH 50080550) along with a number of commercial buildings (DCC RPS 2057 to 2059).

Bridge Street Upper contained a number of industrial heritage sites such as smithies which are recorded in the DCIHR. R108 High Street was the main thoroughfare in medieval Dublin. Significant sites on R108 High Street include the mid-19th century St. Audeon's Catholic Church (DCC RPS 3821), St. Audeon's Church of Ireland Churches dating from around 1190 (DCC RPS 3822, DU018-020075), Taylor's Hall dating to 1705 (DU018-020342, NIAH 0080535) and Synod Hall (DU018-020081, NIAH 50080530) dating back to around 1875.

4.1.4 Landscape (Townscape) & Visual

The Proposed CBC will range from outer new town centre at Liffey Valley to outer suburbs at Ballyfermot and Inchicore, to inner suburb at Kilmainham to the City Centre areas at R810 James Street, R810 Thomas Street and R108 High Street. The majority of the Proposed CBC will comprise a two or three-lane traditional carriageway.

With the exception of sections within Liffey Valley Shopping Centre, sections of mixed-use at Ballyfermot and along central urban areas, residential development with private gardens will generally front the Proposed CBC from Ballyfermot (R833 Ballyfermot Road) through to R810 James Street. Residential Conservation Areas lie along short sections of R810 Sarsfield Road, R839 Grattan Crescent, R810 Emmet Road / Mount Brown and R810 Thomas Street. There is an increasingly mixed-use urban character around Ballyfermot and east from R810 James Street.

Large areas of open space with mature tree planting will bound the Proposed CBC south of Liffey Valley Shopping Centre, along R833 Ballyfermot Road, at De La Salle School, Markiewicz Park, Longmeadows Park, Liffey Gaels GAA Club, Grattan Crescent Park, along the River Camac Valley, and at St Audeon's Park. Semi-mature and mature tree lined streets are also notable along sections of R833 Ballyfermot Road, R839 Grattan Crescent, R810 Emmet Road / R810 James Street and on R108 High Street.

R810 Thomas Street / R810 Cornmarket are ACAs and the corridor of the River Camac, R810 James Street, R810 Thomas Street and R108 High Street are Conservation Areas.

There are a small number of Protected Structures along R833 Sarsfield Road with a substantial number along R810 Mount Brown / R810 James Street, R810 Thomas Street and R108 High Street.

Key Urban Nodes along the Proposed CBC will include Liffey Valley Shopping Centre, Ballyfermot, R833 Grattan Crescent / R810 Emmet Road, R111 South Circular Road / R810 Emmet Road, R810 James Street / St. James's Hospital Entrance, R810 Cornmarket and Christchurch.

4.1.5 Material Assets

The following are examples of the potential utilities which may interact with the Proposed CBC based on information obtained from a number of utility companies to date:

- Water Mains: There are water mains lining the entire Proposed CBC;
- Sewers: There are sewer lines running along the majority of the Proposed CBC, particularly from Ballyfermot to the City Centre;
- Gas Infrastructure: There are gas mains running along the majority of the Proposed CBC, particularly from Ballyfermot to the City Centre; and

- Electricity Lines: There are a number of underground electricity cables interacting with the majority of the Proposed CBC, ranging from low to high voltage, particularly from Inchicore to the City Centre. Overhead lines will interact with the Proposed CBC less frequently.

4.2 Natural Environment

The following describes the study area and gives an overview of the baseline with regards to the natural environment.

4.2.1 Air Quality

The EPA manages a number of air quality monitoring stations within Dublin. These show air quality in Dublin to be generally good. Long-term nitrogen dioxide (NO₂) trends have generally been below both the annual and 1-hour limit values. With respect to particulate matter (PM₁₀ and PM_{2.5}), continuous monitoring has been carried out at a number of the monitoring stations including Rathmines, with long-term data showing a general flat to downward trend. Annual averages for both benzene and carbon monoxide (CO) have been recorded well below their respective limit values.

The most representative monitoring station to the western section of the Proposed CBC is the Blanchardstown monitoring station, located close to the M50 Motorway Junction with the N3 National Road, one junction further north on the M50 Motorway (EPA 2019b). A review of monitoring data from this monitoring location over a five-year period indicated concentrations are less than 70% of the annual mean limit value for NO₂ and show a general downwards trend. Annual mean concentrations for PM₁₀ are lower than NO₂ at 41% of the limit values. There is no monitoring of PM_{2.5} at the Blanchardstown station however a ratio of 0.65 can be derived from the Rathmines station which monitors both PM₁₀ and PM_{2.5} indicating that PM_{2.5} at the Blanchardstown monitoring station is predicted to be roughly 44% of its annual mean limit value.

The Ballyfermot monitoring station is located roughly 200m from the Proposed CBC as it moves closer to the city and is a suburban monitoring station. Average NO₂ concentrations over a 5-year period are 43% of the annual mean limit value at the station. Average PM₁₀ concentrations at the station were 31% of the annual mean limit value.

4.2.2 Biodiversity

Habitats present in Liffey Valley Retail Park include amenity grassland, buildings and artificial surfaces, treelines, ornamental / non-native shrub and dry meadows and grassy verges. From the M50 Motorway heading west residential properties are the dominant habitat type along R833 Coldcut Road, but a large area of mixed woodland also lines the road on the northern side. As the Proposed CBC will traverse through Ballyfermot village it will be dominated by residential properties and commercial buildings with amenity grassland and treelines found in recreational parks, outside commercial premises and at Cherry Orchard Hospital. From here treelines form the northern boundary of Markiewicz Park, mixed woodland lines the corridor at Mount La Salle and amenity grassland and treelines are found outside De La Salle and St Raphael's schools. Treelines and scattered trees and parkland are present along the corridor at Longmeadows Pitch and Putt and dry meadows and grassy verges dominate Longmeadows Park. Larger areas of amenity grassland are present near the Liffey Gaels GAA Club and residential properties are now the dominant building types. Residential properties and patches of amenity grassland outside educational facilities and churches also appear along the Proposed CBC as it passes through Inchicore. From Christ Church Cathedral to Brookfield Road, near St. James's Hospital, the defining habitat type is buildings and artificial surfaces.

Common pipistrelle bats were recorded along the large area of mixed woodland which lines the northern side of R833 Coldcut Road (as it approaches the M50 Motorway from the east), during bat activity surveys carried out in 2018.

4.2.3 Water

In 2009, the Eastern River Basin District (ERBD) River Basin Management Plan (RBMP) 2009-2015 was published (ERBD 2009). In the ERBD RBMP the impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the Water Framework Directive (WFD) by 2015 and include a programme of measures to address and alleviate these pressures by 2015. The second cycle RBMP for Ireland (2018-2021) was published in April 2018 (Government of Ireland 2018b). The second cycle continues to classify status of water bodies and assess its risk of not meeting WFD objectives but builds on lessons learned from the previous cycle by implementing supporting measures to achieve objectives and tackle the significant pressures to water in Ireland by changing agricultural approaches and improving waste water treatment.

A summary of the baseline condition of Water Framework Directive water bodies within the study area is provided in Table 4.2.

Table 4.2: Water Framework Directive (WFD) Water Body Baseline Conditions

Water Body	Condition
Liffey_180	Liffey_180 is within 09 Liffey and Dublin Bay Catchment and flows into Liffey_190 and then Liffey Estuary Upper. Liffey_180 has an Unassigned WFD status and is At Risk of not achieving Good status by 2027; significant pressures have been identified including urban waste water from combined sewer overflows and urban runoff from diffuse sources causing nutrient and organic pollution.
Liffey_190	Liffey_190 is within 09 Liffey and Dublin Bay Catchment and flows into Liffey Estuary Upper. The water body has a Moderate WFD status and is At Risk of not achieving Good status by 2027. A range of significant pressures in relation to industry have been identified, in addition to waste, urban waste water from combined sewer overflows and urban runoff from diffuse sources.
Camac_040	Camac_040 is within 09 Liffey and Dublin Bay Catchment and flows into Liffey Estuary Upper. The water body has a Poor WFD status and is At Risk of not achieving Good status by 2027. A range of significant pressures have been identified, including culverting causing alteration to habitats, urban waste water from combined sewer overflows and urban runoff from diffuse sources.
Poddle_010	Poddle_010 is within 09 Liffey and Dublin Bay Catchment and flows into Liffey Estuary Upper. It has an Unassigned WFD status and is At Risk of not achieving Good status by 2027 due to urban runoff from diffuse sources causing nutrient and organic pollution, as well as hydro-morphological impacts as result of significant culverting.
Liffey Estuary Upper	Liffey Estuary Upper is a transitional water body within the 09 Liffey and Dublin Bay Catchment and is in Liffey Estuary Nutrient Sensitive Area. It is fed by Camac_040, Liffey_190 and Poddle_010 and flows into Liffey Estuary Lower before reaching Dublin Bay. Liffey Estuary Upper has a Good WFD status and is At Risk of not achieving WFD objective of Good status by 2027. The main risk is urban waste water from combined sewer overflows at Ringsend. The key impacts are nutrient pollution and alterations to habitats due to morphological changes.
Grand Canal	Canals are artificial water bodies and consequently are classified based on their ecological potential rather than ecological status. The Grand Canal is determined to be of Moderate Ecological Potential due to elevated levels of faecal coliforms and ammonia, even though macroinvertebrate status indicated good ecological potential.

Along the Proposed CBC, OPW mapping indicates fluvial flooding associated with the Camac_040 affecting multiple properties. There are five past flood events recorded on this watercourse and within the study area.

4.2.4 Land, Soils, Geology & Hydrogeology

The following outlines the soils, geology and hydrogeology information within the study area.

- **Landscape, Geomorphology and Topography:** The Proposed CBC will begin between 50mOD and 60mOD and will gradually fall until to R108 High Street where the elevation is <10mOD. Corine Land Cover 2018 classifies the land use as discontinuous urban fabric to continuous urban fabric with pockets of artificial (industrial use and green urban areas);
- **Soils and Subsoils:** The Teagasc soils map (Teagasc 2019) shows that most of the soils in the study area are classified as made ground with pockets of fine loamy drift with Limestones and siliceous stones found surrounding the Liffey Valley Shopping Centre until the R833 Ballyfermot Road and in the Phoenix Park. There are also significant Alluvial and Gravel deposits along the

banks of the River Liffey. The GSI Quaternary mapping (subsoils) (GSI 2019) shows that the study area is underlain by glacial till, with gravels and alluvium associated with the banks of the River Liffey;

- **Bedrock Geology:** The 1:100,000 GSI bedrock geology map (GSI 2019) indicates that the study area is underlain by the following Carboniferous formations: Waulsortian Limestone, Tober Colleen and Lucan formations. The depth to bedrock ranges from 0mbgl to 25mbgl;
- **Hydrogeology:** The GSI Groundwater resources (Aquifers) map (GSI 2019) shows that the study area is underlain by a Locally Important Aquifer and a Poor Aquifer. The groundwater vulnerability is variable throughout the study area. There are a number of groundwater wells and springs indicated within the study area according to the GSI Groundwater Wells and Springs dataset (GSI 2019);
- **Designated Sites:** There are 12 County Geological Sites (GSI 2019) and three proposed Natural Heritage Areas (pNHAs) (NPWS 2019) within the study area;
- **Possible Sources of Contamination and Unsuitable Material:** There are a number of historic pits and quarries, and a number of historic industries (mainly mills) within the study area. There are several facilities within the study area that are either currently licensed or previously licensed with the EPA for waste, industrial emissions and integrated pollution control (EPA 2019d). Considering the urban fabric of the study area there is likely to be some sources of contamination within the made ground throughout the study area; and
- **Economic Geology:** The crushed rock aggregate potential within the study area is low to moderate from Palmerstown towards the City Centre (GSI 2019). However, in areas of shallower rock the aggregate potential is very high (Lucan, Hermitage, Astagob and Ballyowen areas). Along the course of the River Liffey the aggregate potential is typically moderate-very high. There are no active pits, mines or quarries within the study area. There are some mineral localities indicated by the GSI within the study area, including limestone at Palmerstown, lead at Palmerstown and clay/brick in Crumlin. There are considerable amounts of deep well drained soils in Ballyowen, Fonthill, Brooklawn, Castleknock and the Phoenix Park, some of which may be suitable for agriculture.

5. Proposed EIA Methodology

The following describes the proposed approach to compiling the EIAR under the proposed EIAR chapter headings as outlined previously in Table 3.1.

5.1 Traffic & Transport

5.1.1 Proposed Assessment Methodology

The assessment of the Proposed CBC in relation to the receiving transport environment will require a qualitative assessment of changes to the transport environment, as well as quantitative analysis that will be undertaken using a suite of multi-modal transport modelling tools which will be developed for the Works.

The assessment of traffic and transport impacts requires both Strategic regional wide demand responsive analysis of the impacts of the Proposed CBC as well as providing a more refined level of detail on items such as general traffic re-distribution away from the Proposed CBC on to surrounding roads and specific traffic turning movements at individual junctions. It also requires an assessment of bus, pedestrian and cycle operations and bus reliability with a focus on the movement of people along the route.

The NTA's East Regional Model (ERM) will be the primary modelling tool in the hierarchy and will provide the overarching information on forecast travel demand for each mode of transport and will be supported by macro and micro-level modelling tools which will allow for more detailed and refined modelling at a local level. It is intended to use a corridor-wide, road (motorised vehicle only) based Dublin Local Area Model (DLAM) in combination with multi-modal corridor micro-simulation models which will both sit under the NTA's East Regional Model (ERM) in the hierarchy of assessment tools.

The traffic and transport impact assessments will be undertaken in accordance with the 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA 2017), the 'Traffic and Transport Assessment Guidelines' (NRA 2014), the National Cycle Manual (NTA 2011) and the UK Design Manual for Roads & Bridges (DMRB), Volume 11, Section 2, Part 5 (UK Highways Agency 2011).

The traffic and transport assessment will be informed by the following reports which will be included as part of the EIAR:

- **Transport Impact Assessment (TIA)** – this report will include the comprehensive assessment of the individual CBC covering all transport modes for both Construction and Operational Phases; and
- **Transport Modelling Report** - will detail the model development, data inputs, calibration and validation and forecast model development for the suite of models that will be used to support the assessment.

The assessment of traffic and transport impacts will take account of receptors relevant to the Proposed CBC including:

- Buses;
- Pedestrians / mobility impaired;
- Cyclists;
- General traffic; and
- On-street parking, off-street parking, loading, taxis.

In addition, the following modes of transport will be considered as part of the modelling:

- Public Transport including MetroLink, inter-urban rail, suburban rail, DART, light rail (Luas) and bus;
- Traffic including private car, taxis and goods vehicles;
- Walking; and
- Cycling.

The traffic and transport assessment carried out on the Proposed CBC will include the following elements:

- A qualitative assessment, including site visits, will be undertaken to understand the current baseline conditions on the Proposed CBC extents and surrounding network;
- The Operational and Construction Phase impacts will be assessed using three levels or tiers of modelling tools;
- The modelling will cover four major phases of development, as follows:
 1. Existing Conditions (2020) – Base year Do-Nothing models will be developed to represent existing 2020 conditions. The base models will serve as the foundation for all the future models to be developed.
 2. Construction Year Models – Based on the construction approach, interim model year scenarios will be created to assess the construction stage of the Proposed CBC.
 3. Future ‘Do Minimum’ Conditions – The Do-Nothing models will be developed further to represent the agreed future design years, without the Proposed CBC. Typically, a ‘Do Minimum’ model will include any known improvements or changes to the transport network that have taken place or been approved. These models are important to form the reference case by which to compare the design (Do Something) models.
 4. Future ‘Do Something’ Design Year Models – These models will be the Proposed CBC design models, implementing all the elements that are provided from the design team. The development of these models will be an iterative process that will entail a number of updates and changes, in order to incorporate corridor impact mitigations and develop the final planning design for each Proposed CBC.
- A Construction Phase impact assessment will assess impacts on local and wider general traffic, and on the pedestrian, cycling and public transport environment;
- Operational Phase impacts will be assessed using the suite of modelling tools to be developed for year of opening and future design year operations;
- The traffic and transport impacts will be assessed with regard to the following receptors:
 - **Buses:** impacts to bus services as a result of closures and rerouting of general traffic onto parallel corridors will be assessed;
 - **Pedestrians / Mobility Impaired:** levels of service impacts on key footpaths and streets will be assessed within the study area;
 - **Cyclists:** quality of services assessments will be undertaken on all primary and secondary cycling routes;
 - **General Traffic:** impacts on general traffic movements and re-routing onto the surrounding road network will be assessed;
 - **On-Street Parking, Off-Street Parking, Loading, Taxis:** impacts on on-street parking, loading facilities and taxi ranks will be assessed.
- The potential construction and operational impacts will be identified, and mitigation measures outlined where required. Potential residual impacts post mitigation will also be identified and reported; and
- The interrelationship between other environmental factors and traffic and transport will be assessed. The cumulative effects of the adjacent Proposed Bus Infrastructure CBCs forming part of the Works and other construction projects (including transport, utility and building projects) for which planning approval has been received or is in the process of application, such as MetroLink, will also be assessed.

5.2 Air Quality

5.2.1 Proposed Assessment Methodology

In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values, or ‘Air Quality Standards’, are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set.

The air quality assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). The assessment of air quality will be conducted with consideration of additional relevant legislation and guidance including:

- Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC);
- European Union Directive on air quality assessment and management (96/62/EC) and the associated 'daughter Directives', which set the Limit Values;
- Air Quality Standards Regulations 2011 (S.I. 180 of 2011), which incorporates EC Directive 2008/50/EC which has set limit values for the pollutants sulphur dioxide (SO₂), nitrogen dioxide (NO₂), particulate matter (PM₁₀), benzene and carbon monoxide (CO);
- Air Pollution Act 1987 (No. 6 of 1987) (as amended);
- Guidance on the Assessment of Dust from Demolition and Construction (Institute of Air Quality Management (IAQM) 2014);
- UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air Quality (UK Highways Agency 2019); and
- Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (NRA 2011).

5.2.1.1 Study Area

The Construction Phase study area is focused on potential impacts arising due to the generation of dust. These impacts usually occur within 500m of the dust generating activity as dust particles fall out of suspension in the air (IAQM 2014). Dust impacts may occur during the Construction Phase due to material handling activities on site, including excavation and pavement construction. Deposition typically occurs in close proximity to each site and therefore the study area is limited to a 500m radius from any dust generating activities. The study area with respect to impacts from air quality emissions from vehicle and HGV movements is limited to sensitive receptors less than 200m from road links which are affected by significant changes in volume (i.e. above 5%). This study area is the same for designated conservation areas (either Irish or European designation) with respect to ecology as the potential to impact is highest within 200m of the Proposed CBC and when significant changes in Annual Average Daily Traffic (AADT) (>5%) occur.

The highest potential for Operational Phase air quality impacts to occur is within 200m of the Proposed CBC and any road links which are significantly impacted by the redistribution of traffic on other routes. The UK DMRB guidance (UK Highways Agency 2019) on which the NRA (now Transport Infrastructure Ireland (TII)) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (NRA 2011) is based, states that road links at a distance of greater than 200m from a sensitive receptor will not influence pollutant concentrations at the receptor.

5.2.1.2 Desktop Study

A desktop review of available baseline air quality data within the study area will be undertaken. A review of traffic volumes to determine if significant changes in AADT (>5%) occur will be undertaken. An air quality assessment will be carried out following procedures described in the publications by the EPA (EPA 2002, 2003, 2015, 2017) and using the methodology outlined in the policy and technical guidance notes, LAQM.PG(16) and LAQM.TG(16), issued by UK Department for Environment, Food and Rural Affairs (UK DEFRA) (UK DEFRA 2016, 2018) and UK Highways Agency (UK Highways Agency 2007). NRA's (now TII) document entitled Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (NRA 2011) provides guidance on assessment procedures, the primary aspect of which relates to existing ambient air quality and sensitive receptors.

The following data sources will be referred to during the air quality assessment:

- Environmental Protection Agency – National Ambient Air Quality Monitoring Data Archive;

- Environmental Protection Agency – Air Quality in Ireland 2018 Report and previous reports (1997 – 2019);
- Dublin Regional Air Quality Management Plan 2009-2012;
- National Parks and Wildlife Service (NPWS) Maps; and
- Environmental Protection Agency – Integrated Pollution Control and Industrial Emissions Licences.

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality 'Air Quality in Ireland 2018' (EPA 2019a), details the range and scope of monitoring undertaken throughout Ireland. The key pollutants reviewed in the assessments are nitrogen dioxide (NO₂), particulate matter (PM₁₀ and PM_{2.5}), benzene and carbon monoxide (CO).

5.2.1.3 Survey Requirements

In order to characterise the existing air quality environments, representative available air quality monitoring data from the EPA, the proposed MetroLink project and DCC will be analysed to enable a full and proper impact assessment of the Proposed CBC is undertaken and to enable suitable mitigation to be designed as needed.

NO₂ monitoring using a network of diffusion tubes has been undertaken at a number of locations along the Proposed CBC and adjacent impacted road links for a period of four months. This data will aid model validation and provide baseline data for the assessment.

5.2.1.4 Impact Assessment

In line with the guidance, the assessment will cover potential impacts to air quality and will describe the existing baseline conditions and the likely potential impacts associated with the Construction and Operational Phases of the Proposed CBC. The impact assessment process will involve:

- Assigning the receptor sensitivity;
- Identifying and characterising the magnitude and significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts; and
- Assessing the significance of any residual impacts after mitigation.

The air quality assessment carried out on the Proposed CBC will include the following elements:

- Review of standards and legislation;
- Identification of air quality issues relevant to the components of the Proposed CBC;
- Review of background ambient air quality monitoring data in the vicinity of the Proposed CBC;
- Assessment of potential impacts of plant and equipment processes during the Construction Phase on air quality; and
- Assessment of potential impacts of traffic on ambient air quality, with a particular focus on nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}).

The assessment will take account of sensitive receptors relevant to the Proposed CBC. Sensitive receptors include locations where people spend significant periods of time, such as residential properties. Ecological receptors are habitats that might be sensitive to dust. Examples of these sensitive receptors include:

- Residential dwellings;
- Industrial or commercial uses sensitive to dust;
- Recreational areas and sports grounds;
- Schools and other educational establishments;
- Buildings of religious sensitivity;
- Designated ecological area of conservation (either Irish or European designation);
- Hospitals and nursing homes; and
- Offices or shops.

Assessment criteria for the impact of dust during the Construction Phase are set out in the TII guidelines (NRA 2011) and the Institute of Air Quality Management guidelines (IAQM 2014). These are used to assess the impact of dust emissions from construction and demolition activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. It is important to note that the predicted impacts associated with the earthworks during the Construction Phase of the Proposed CBC are short term in nature. A series of mitigation measures to avoid or reduce potential impacts will be proposed in the EIAR.

The UK DMRB guidance (UK Highways Agency 2019), on which the TII guidance (NRA 2011) is based, states more specifically that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment:

- Road alignment change of 5 metres or more;
- Daily traffic flow changes by 1,000 Annual Average Daily Traffic (AADT) or more;
- HGVs flows change by 200 vehicles per day or more;
- Daily average speed changes by 10km/h or more; or
- Peak hour speed changes by 20km/h or more.

The ADMS-Roads dispersion model will be used to predict the ground level concentrations of air pollutants on impacted links for the proposed opening year of 2028 and design year 2043 for the Do Minimum and Do Something scenarios. The modelling will incorporate the following features:

- Detailed fleet composition with future year predictions for the changes between 2020 and the proposed opening year of 2028 and the proposed design year of 2043;
- Detailed traffic flow, speed and variations as modelled;
- The potential for impacts due to turbulent flow patterns of traffic emissions in narrow streets with relatively tall buildings on both sides will be taken into consideration;
- Hourly-sequenced meteorological data over a five-year period will be used in the model;
- A receptor grid will be created at which concentrations will be modelled in order to determine the concentration gradient in the study area; and
- Some specific sensitive receptors may also be mapped at the façade of the buildings along the main traffic routes.

5.3 Climate

5.3.1 Proposed Assessment Methodology

In order to reduce the risk due to climate change, National and European statutory bodies have set targets for future greenhouse gas (GHG) emissions. Ireland has signed up to several climate agreements including the EU 2030 Climate and Energy Policy Framework (EC 2014) which aims to reduce GHG emissions by 40% compared with 1990 levels by 2030. The Climate Action Plan (Government of Ireland 2019), designed to help Ireland achieve these targets specifically states that delivery of the BusConnects Programme by 2030 is an important measure for Ireland's development towards a more climate friendly future. The Proposed CBC will assist with the modal shift to more sustainable transport options from private cars and also provide an improved cycling network.

The climate assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). The assessment of climate will be conducted with consideration of additional relevant legislation and guidance including:

- 2030 Climate and Energy Policy Framework (EC 2014);
- Climate Action and Low Carbon Development Act (No. 46 of 2015);
- Climate Action and Low Carbon Development – National Policy Position Ireland (Department of Communications, Climate Action and Environment (DCCAE) 2013);
- Climate Action Plan (Government of Ireland 2019);

- Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (NRA 2011); and
- Local Authority climate and planning guidance:
 - DCC Development Climate Change Action Plan 2019-2024;
 - SDCC Climate Change Action Plan 2019-2024.

It is proposed that the climate assessment will be carried out in accordance with the policies, plans and guidance listed and established best practice, and will be tailored accordingly based on professional judgement and local circumstance.

In line with the guidance, the assessment will cover potential impacts to climate and will describe the existing conditions and the likely potential impacts associated with the Construction and Operational Phases of the Proposed CBC. The assessment will also review the potential impacts on the Proposed CBC due to future climate change. The impact assessment process will involve:

- Identifying and characterising the magnitude and significance of any potential impacts including those from traffic emissions;
- Incorporating measures to avoid and mitigate (reduce) these impacts; and
- Assessing the significance of any residual impacts after mitigation.

The climate assessment carried out on the Proposed CBC will include the following elements:

- Review of legislation;
- Identification of climate issues relevant to the components of the Proposed CBC;
- Review of baseline GHG emissions;
- Assessment of proposed landscape changes for the Proposed CBC on climate;
- Assessment of potential impacts of plant, materials and equipment processes on climate; and
- Assessment of potential impacts of anticipated traffic pattern changes and transport modal split on climate.

5.4 Noise & Vibration

5.4.1 Proposed Assessment Methodology

There are no statutory standards in Ireland relating to noise and vibration limit values for construction works, or for environmental noise sources in general relating to the Operational Phase. In the absence of these statutory standards, the assessment will make reference to other national guidelines and standards, where available in addition to international standards relating to noise and or vibration impact for environmental sources.

The noise and vibration assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). The following additional standards and guidelines will form the main basis for the impact assessment methodologies to be adopted and for setting appropriate criteria:

- British Standard (BS) 5228. Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (BSI 2009 +A1 2014);
- BS 5228. Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (BSI 2009+A1 2014);
- BS 6472-1: Guide to Evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting' (BSI 2008);
- BS 7385: Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (BSI 1993);
- BS 8233: Sound Insulation and Noise Reduction for Buildings (BSI 2014);
- BS 4142: Method for Rating and Assessing Industrial and Commercial Sound (BSI 2014+A1:2019);

- UK Design Manual for Roads and Bridges (DMRB). Volume 11 Section 3 Part 7 LA 111 Sustainability & Environmental Appraisal – Noise and Vibration (UK Highways Agency 2020);
- Dublin Agglomeration Environmental Noise Action Plan (DCC et al 2018 – 2023);
- European Communities (Noise Emission by Equipment for Use Outdoors) (Amendment) Regulations (S.I. No. 241/2006);
- Good Practice Guide on Noise Exposure and Potential Health Effects (European Environment Agency (EEA) Technical Report No.112010);
- International Standard (ISO) 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation (1996);
- ISO 1996. Description, Measurement and Assessment of Environmental Noise. Part 1: Basic Quantities and Assessment Procedures (2016);
- ISO 1996. Description, Measurement and Assessment of Environmental Noise. Part 2: Determination of Sound Pressure Levels (2017);
- Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1 (TII (NRA) 2004);
- Good Practice Guide for the Treatment of Noise during the Planning of National Road Schemes (TII (NRA) 2014);
- Calculation of Road Traffic Noise (CRTN) (UK Department of Transport 1988); and
- Environmental Noise Guidelines for the European Region (World Health Organisation (WHO) 2018).

5.4.1.1 Study Area

The noise and vibration study area for the Construction Phase assessment will include sensitive environments surrounding surface construction work areas and all identified noise and vibration sensitive buildings along the individual bus corridors, cycle routes and routes carrying redistributed traffic. This includes works areas around roadworks, utility services, road resurfacing, road realignments, construction of bus gates, provision of bus-based Park and Ride sites in key locations and construction compounds. Construction traffic haul routes will also be assessed as part of the study area for this phase of the works.

The noise and vibration study area for the Operational Phase assessment will include identified noise sensitive buildings and areas along the realigned roads along the bus priority routes, roads where redistributed traffic will travel, and noise sensitive areas in proximity to new ancillary elements such as parking areas.

5.4.1.2 Desktop Study

A desk study will be undertaken to characterise the baseline noise environment at sensitive locations which will be in close proximity to construction works at locations along the length of the Proposed CBC. The key sources of desktop available baseline data include published noise mapping studies undertaken by TII which feed into the Dublin Local Authorities Agglomeration Noise Action Plan 2018 – 2023 (DCC, *et al.* 2018). The available noise mapping includes existing sources of major road noise sources within the Dublin Agglomeration area. This information provides a useful high-level overview of noise levels in the wider study area but does not provide accurate noise levels for specific locations, taking account of localised features (e.g. boundary walls). The parameters presented in terms of the noise mapping are the L_{den} and L_{night} noise parameters which are both long term noise indicators based on annual traffic and transport modes. The existing mapping available is based on noise modelled data from 2016. This information will be reviewed and will feed into the desktop assessment.

The full length of the Proposed CBC is included in the EPA noise map for road traffic. This information will be used as an initial review of the baseline noise environment at noise sensitive areas in proximity to the Proposed CBC.

5.4.1.3 Survey Requirements

Noise measurements will be conducted at the identified sensitive locations. This will be undertaken using both attended and unattended noise monitoring programmes to capture and define the prevailing noise environment.

Attended measurements will be conducted at noise sensitive areas during daytime periods. Noise monitoring equipment will be set up typically within the grounds of the properties identified either in the front or rear garden of residential properties depending on the orientation of the source to the property, within common open spaces, car parks, commercial and educational buildings, amenity areas, etc.

Unattended surveys will be undertaken through the use of monitoring installations to capture noise levels within identified sensitive areas over longer survey periods. These locations will be installed within secure locations (e.g. property gardens, secure public buildings).

All surveys will be conducted in accordance with ISO 1996: Description, Measurement and Assessment of Environmental Noise Part 1: Basic quantities and assessment procedures, 2016 and Part 2: Determination of Sound Pressure Levels (ISO 2017).

5.4.1.4 Impact Assessment

In line with the above guidance, the assessment will cover potential impacts to noise and vibration and the likely potential impacts associated with the Construction and Operational Phases of the Proposed CBC. The impact assessment process will involve:

- Assigning the receptor sensitivity;
- Identifying and characterising the magnitude and significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts; and
- Assessing the significance of any residual impacts after mitigation.

The noise and vibration assessment carried out on the Proposed CBC will include the following elements:

- Review of relevant standards and legislation and setting appropriate criteria for noise and vibration;
- Identification of key sources of noise and vibration issues relevant to the components of the Proposed CBC;
- Review of baseline noise and vibration (where relevant) in the vicinity of the Proposed CBC obtained from detailed baseline study work;
- Assessment of potential impacts associated with the Construction Phase using the guidelines and standards;
- Assessment of potential impacts associated with the Operational Phase associated with operational public transport, stationary sources (where relevant) and traffic using the guidelines and standards;
- Identification of required mitigation measures required to reduce identified significant impacts to within the adopted criteria; and
- Assessment of residual impacts following implementation of mitigation.

The assessment will take account of sensitive receptors relevant to the Proposed CBC. Sensitive receptors include locations where people spend significant periods of time and where concentration, sleep and amenity are important considerations. Examples of these sensitive receptors include:

- Residential dwellings;
- Recreational and high sensitivity amenity areas;
- Schools and other educational establishments;
- Buildings of religious sensitivity;
- Hospitals and nursing homes; and
- Offices.

5.5 Population

5.5.1 Proposed Assessment Methodology

Potential effects from the Proposed CBC will be reported at a community level. In order to report effects at this community level, community boundaries will be used, as defined by the 2016 Census Parish boundaries. The assessment will consider localised effects on individual receptors, including community facilities and recreational resources, as well as considering effects on individual residential land parcels. The significance of effects on these receptors will then be reported for each community affected by the Proposed CBC. Similarly, the assessment will consider the significance of effects on accessibility to employment by looking at commuting patterns and transport accessibility within each community.

For economic effects, the assessment will consider the significance of localised effects on individual commercial receptors and land parcels affected by the Proposed CBC (could include commercial receptors outside of the footprint of the Proposed CBC that could experience effects).

The population assessment will be carried out in accordance with relevant guidance, including the EPA EIAR Guidelines (EPA 2017). Design Manual for Roads and Bridges (DMRB) LA 112 Population and Health (UK Highways Agency 2020) and Transport Analysis Guidance (UK Department for Transport 2015). Sensitivity and magnitude will be applied following the relevant guidance where available. As some assessment topics have no prescribed method for determining the sensitivity of Population receptors or the significance of impacts on those receptors for the purposes of an EIA, sensitivity and magnitude will be determined based on best practice and professional judgment.

A baseline assessment will be completed using the most up to date publicly available data wherever possible. This will include but not be limited to the following sources:

- Census (Central Statistics Office (CSO) 2016) - Demographic, residential, and employment statistics;
- Population scoping reports and impacts assessments for other major linear infrastructure projects, e.g. Dublin Water Supply Project; Dublin MetroLink;
- GeoDirectory data;
- Ordnance Survey Ireland Prime 2 data;
- Google maps;
- Proposed CBC Design Drawings;
- National Public Transport Access Nodes (NaPTAN) (NTA 2020); and
- Other reports and documents relating to the receiving environment, including other chapters of the EIAR.

The baseline assessment will seek to establish a full list of population receptors, including local educational, community, recreational and healthcare facilities, as well as commercial receptors. This will be informed by the latest available census data (currently 2016) from the CSO.

Route walkovers will be undertaken where necessary to validate the population receptors identified as part of the baseline desktop study. This will include areas along the Proposed CBC as well as areas away from the corridor extents where traffic is expected to be dispersed.

The following methodology will be applied to the assessment of community impacts:

- **Community accessibility:** The sensitivity of community facilities and recreation resources will be defined by the importance of the receptor in the community setting and the availability of suitable alternatives within close proximity. Hospitals and schools will, generally, be assigned a very high and high sensitivity, respectively, whereas derelict or unused resources will be assigned a very low sensitivity. Magnitude shall be informed by the findings of the traffic and

transport assessment and will be determined by the extent of change in traffic flows in the vicinity of the receptor.

- **Accessibility to employment:** The sensitivity of commuters will be defined by the availability and accessibility of transport options within the community. Commuters with few transport options available to them and who are heavily reliant on private vehicle travel (>50%) will be assigned a high sensitivity whereas residents with a relatively high number of transport routes will be assigned a low sensitivity. Magnitude will be determined by the extent of change in the availability of travel options (e.g. reduction in walking time to the nearest bus stop) and the extent of change in accessibility (e.g. increased / decreased journey times and changes in trip length) allowing improved access to employment.
- **Community amenity:** The assessment will consider the residual significance reported for other environmental effects (noise and vibration effects, air quality effects, traffic and transport effects, and landscape and visual effects). The level of significance from each environmental effect will be determined by the individual environmental methodologies, and an in-combination assessment matrix will be used to determine the significance of the localised effects on individual community facilities and recreational resources.
- **Community land use – land take:** The assessment will consider the direct land take of community land (e.g. community facilities, parks and residential land). Derelict land or unoccupied buildings will be assigned a very low sensitivity. The magnitude of land take effects on community land will be determined by the degree of loss of the resource. Direct acquisition and demolition of buildings would be considered high magnitude. A low magnitude would be assigned where there is a minor loss of, or alteration to one or more features or elements e.g. amendment to access or acquisition of land resulting in changes that do not compromise the overall viability of property / facility.
- **Community land use – severance:** The assessment will consider the impact on community land, residential properties, private gardens and car parking spaces. Derelict land or unoccupied buildings will be assigned a very low sensitivity. The magnitude of severance effects on residential land shall be determined by the extent of any severance, introduction (adverse) and removal (positive). Where complete severance is introduced with no accessibility provision, a high magnitude will be assigned. A low magnitude would be assigned where severance is introduced but ample accessibility is provided.

The following methodology will be applied to the assessment of economic impacts:

- **Commercial amenity – direct effects:** In some cases, a single (direct) environmental effect in isolation can result in an amenity effect where the business has a particular sensitivity. Certain activities can be sensitive to noise and vibration effects, for example, including performing arts, advanced manufacturing, and sound recording facilities. Based on the sensitivity to noise of certain user groups, this might also extend to care services (care homes and hospitals) and animal services (catteries, kennels and veterinary surgeries). Specific considerations to assess the sensitivity of commercial receptors will include: Is this an outdoor asset and therefore more reliant on the quality of the environment, e.g. a football stadium? Does the operation of the business rely on the visual landscape to attract trade, e.g. a restaurant or hotel? Are the customers or visitors to the commercial receptor particularly sensitive to environment effects, e.g. office workers sensitive to noise? Professional judgement will be applied to determine if a single significant residual environmental effect is likely to create a direct amenity effect on the business such that the viability of the business could be comprised.
- **Commercial amenity – in-combination effects:** In-combination amenity effects on commercial receptors will be assessed using the same method as for community facilities and recreational resources.
- **Commercial land use – land take:** Land take sensitivity is based on the extent of the commercial land. Commercial land greater than 5 hectares will be assigned a very high sensitivity in line with DMRB guidance. The magnitude of impact on commercial land holdings shall be determined by the degree of loss of the resource. Where there is permanent land take

of a substantial section of a land holding, a high magnitude will be assigned. Minimal disruption to non-operational land or a car park would be assigned a low magnitude.

- **Commercial land use – severance:** Severance sensitivity is based on the extent of the commercial land. Commercial land greater than 5 hectares will be assigned a very high sensitivity in line with DMRB guidance. Derelict land or unoccupied buildings will be assigned a low sensitivity. The magnitude of severance effects on commercial land will be determined by the extent of any severance, including introduction (adverse) and removal (positive). Where complete severance is introduced with no accessibility provision, a high magnitude will be assigned. A low magnitude will be assigned where severance is introduced but ample accessibility is provided.

5.5.1.1 Overall Impacts on Communities and Economic Activity

A summary of the proposed scope for the assessment of Population impacts is provided in Table 5.1. As illustrated in the table, once the assessment of the different population aspects has been completed, conclusions will be drawn as to the overall potential for significant impacts.

Table 5.1: Proposed Scope for the Population Assessment

Receptors	Employment	Accessibility	Amenity	Land use
Community Assessment				
Community facilities and recreational resources	n/a	Direct accessibility impacts in the vicinity of the receptor (construction and operation)	In-combination amenity impacts (construction and operation)	Direct land take and severance (construction and operation)
Commuters	Direct employment impacts (changes to journey times) (construction and operation)	**	n/a	n/a
Residential properties	n/a	n/a	n/a	Direct land take, and severance (construction and operation)
Economic Assessment				
Commercial receptors	**	**	Direct and In-combination amenity impacts (construction and operation)	Direct land take, and severance (construction and operation)

** Not included to avoid 'double counting' within the assessment.

5.6 Human Health

5.6.1 Proposed Assessment Methodology

The human health assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). The documents to be referenced in addition include, but are not limited to:

- Environmental Noise Guidelines for the European Region (WHO 2018);
- Night Noise Guidelines for Europe (WHO 2009);
- Guidelines for Community Noise (WHO 1999);
- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (EPA 2016);
- BS 5228-1:2009+A1:2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise (BSI 2008);
- Air Quality Standards Regulations 2011 (S.I. 180 of 2011);

- Air Quality Guidelines (WHO 2005);
- Health Impact Assessment Resource and Tool Compilation (US EPA 2016);
- Health in Environmental Assessment – A Primer for a Proportionate Approach (Cave *et al.* on behalf of Institute of Environmental Management and Assessment (IEMA) 2017); and
- Health Impact Assessment Guidance (Institute of Public Health Ireland 2009).

In the development of the EIAR, the human health assessment will consider individual specialist assessments and surveys, such as traffic and transport, air quality, noise and vibration, landscape (townscape) and visual, and major accidents and/or disasters.

The 2017 draft EPA guidelines (EPA 2017, p.29) note that in an EIAR, *'the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc.'* and that *'assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Integrated Pollution Prevention and Control, Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment, Seveso III, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them'*.

The Institute for Environmental Management and Assessment (IEMA) discussion document (Cave *et al.* 2017), is a primer for discussion on what a proportionate assessment of the impacts on health should be in EIA and is a useful document when considering what can and should be assessed in the context of EIA.

The WHO defined health in its broader sense in its 1948 constitution as *'a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity'*. Therefore, whilst the EPA guidance will be used in terms of health protection, for a more holistic assessment as per the IEMA document, the broader health effects in terms of opportunities for improvement of health and for improvement of access to services will be considered. Therefore, health protection, health improvement and improving services will all be considered in the EIA Report.

Within this context potential impacts on the protection of human health, both physical and psychological, will be assessed.

The main objective of the human health assessment will be to:

- Confirm that all pathways relevant to human health have been identified within the specialist assessments;
- Confirm that appropriate consideration of the inter relationships of human health impacts is presented in the EIAR; and
- Confirm that the assessments have appropriately considered the need for key mitigation measures.

At a broad level, it is envisaged that the main elements of the human health assessment will include:

- Presenting details of feedback from the Consultation Phase of the Proposed CBC relating to human health issues;
- Gathering of the main statements relevant to human health from the EIAR assessments, project description and any other separate assessments, into one coherent section so that it can be easily read and understood by the public and stakeholders;
- Provide clear references for the EIAR specialist assessments and separate assessments that fully address impacts and key mitigation measures relevant to human health; and
- To consider opportunities for health improvements and access to services, including but not limited to health services, as they may impact on human health.

A literature review will be undertaken to develop an understanding of the baseline conditions within the study area. A further literature review of potential health impacts arising from similar projects, both in Ireland and

internationally if / as applicable, will be undertaken to identify potential health impacts on the population arising from the Proposed CBC.

5.7 Biodiversity

5.7.1 Proposed Assessment Methodology

The biodiversity assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). In addition, the collation of ecological baseline data and the preparation of the Biodiversity chapter will have regard to the following legislation and planning documentation. This is not an exhaustive list but is instead a list of those most relevant for the purposes of undertaking the EIA:

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, hereafter referred to as the Habitats Directive;
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, hereafter referred to as the Birds Directive;
- European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended, hereafter referred to as the Birds and Habitats Regulations;
- Wildlife Acts 1976 to 2018, hereafter referred to as the Wildlife Acts;
- Flora (Protection) Order, 2015 (S.I. No. 356 of 2015);
- Fisheries Acts 1959 to 2019, hereafter referred to as the Fisheries Acts;
- National Biodiversity Plan 2017-2021 (Department of Culture, Heritage and the Gaeltacht 2017);
- Dublin City Biodiversity Action Plan 2015-2020 (DCC 2015); and
- South Dublin County Council Development Plan 2016-2022.

The desktop study will involve the collection and review of relevant published and unpublished sources of biodiversity data, collation of existing information on the ecological environment and consultation with relevant statutory bodies (e.g. National Parks and Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI)). The following information sources, at a minimum, will be accessed as part of the desktop study:

- Online data available on Natura 2000 network of sites (hereafter referred to as European sites) and on Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs) as held by the NPWS. Available online at www.npws.ie/protectedsites/ and <http://webgis.npws.ie/npwsviewer/>;
- National Biodiversity Data Centre (NBDC) Online Database. Available online at <http://maps.biodiversityireland.ie/#/Map>;
- Recent Ordnance Survey Ireland (OSI) orthophotography for the corridor study area;
- Records of rare and protected species held by the NPWS;
- Habitat and species Geographic Information System (GIS) datasets provided by the NPWS;
- Bat records from Bat Conservation Ireland's (BCI) database;
- Environmental information/data for the area available from www.epa.ie (Envision Online Environmental Map Viewer - <http://gis.epa.ie/>);
- Information on the status of EU protected habitats and species in Ireland (NPWS 2019);
- Records from the Botanical Society of Britain and Ireland (BSBI); and
- Information contained within the Flora of County Dublin (Doogue *et al.* 1998).

The surveys, impact assessment and the preparation of this chapter will have regard to the following guidance documents:

- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Union 2013);
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM) 2018);

- Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority 2009);
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (National Roads Authority 2008);
- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn) (Collins (ed.) 2016);
- The Bat Workers' Manual, 2nd Edition (Mitchell-Jones and McLeish 1999);
- Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. (Kelleher and Marnell 2006);
- Design Manual for Roads and Bridges (Highways Agency 2001a, 2001b and 2005); and
- Various Irish Wildlife Manuals produced by National Parks and Wildlife Service that may be applicable to the habitats and/or species encountered during the ecological surveys.

Over the summer months of 2018, extensive ecological surveys were carried out along the Proposed CBC including surveys for the following groups of biodiversity receptors: habitats and flora (including invasive species), mammals (including bats, badgers and otter), and breeding birds.

The footprint of the Proposed CBC is set in an urban environment and is predominantly along existing roads and/or hardstanding areas. The study area for the likely key biodiversity receptors will vary according to the Zone of Influence (Zol) of the Proposed CBC and will be informed by best practice guidelines as described in this chapter. Details on the likely study areas are described in Table 5.2.

Table 5.2: Description of Biodiversity Survey Study Areas

Key Ecological Receptor	Study Area Description
Habitats	An area within the Zol of the project where habitats could be directly or indirectly affected during construction/operation.
Protected Flora	An area within the Zol of the project where protected flora could be directly or indirectly affected during construction/operation.
Fauna species (other than those listed below)	An area within the Zol of the project where fauna species could be directly or indirectly affected during construction/operation.
Breeding birds	An area suitable for breeding birds within the Zol of the project where breeding birds could be directly or indirectly affected during construction/operation.
Wintering birds	An area suitable for wintering birds within the Zol of the project where wintering birds could be directly or indirectly affected during construction/operation.
Bats	An area suitable for bats within the Zol of the project where bats could be directly or indirectly affected during construction/operation.
Aquatic Ecology	Watercourses to be crossed within the Zol of the project where the aquatic ecology could be directly or indirectly affected during construction/operation.

Further surveys to inform the EIA have been undertaken. This includes:

- A multidisciplinary walk over survey of the entirety of the Proposed CBC in the period November 2019 to April 2020, which included updating the habitat and flora surveys (including invasive species) previously carried out in 2018. Signs of mammals, as well as trees with potential bat roost features, have also been recorded during the multidisciplinary survey;
- Wintering bird surveys were carried out in February and March 2020 at sites along the Proposed CBC where direct impacts (i.e. habitat loss) may occur;
- Detailed botanical surveys carried out in May/June 2020 for any specific areas with habitats of interest or value as noted in 2018 and 2019 / 2020 surveys (these surveys included, as deemed necessary, taking relevés (a small plot of vegetation, analysed as a sample of a wider area));
- Bat activity surveys, comprising walked transects and bridge emergence / re-entrance surveys, have been carried out along selected sections / bridges of the Proposed CBC across three seasons (autumn 2019, spring 2020 and summer 2020) as per the Bat Conservation Trust guidelines (Collins (ed.) 2016);
- In areas where it is proposed to remove substantial vegetation, breeding bird surveys were carried out in April-June 2020; and

- Specialised aquatic surveys may be required at sites where works will be taking place adjacent to or within a waterbody (e.g. construction of new bridges over waterbodies). The requirement for aquatic surveys (e.g. for invertebrates and/or fish) will be decided on a case by case basis.

The impact assessment criteria will take account of the CIEEM guidelines (CIEEM 2018) referred to previously. The magnitude or scale of the potential impacts of the Proposed CBC will be characterised and described based on the type of impact, its extent, duration, frequency, timing and reversibility (i.e. whether or not it is permanent or temporary). The likelihood of an impact occurring, and the predicted impacts, will also be assessed and may be identified as being certain, likely or unlikely. Professional judgement will be used in considering the contribution of all relevant criteria in determining the overall magnitude of an impact

5.8 Water

5.8.1 Proposed Assessment Methodology

The water assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). In order to minimise any impact on water body status, the assessment of surface water will consider the potential impacts during Construction and Operational Phases with regards to the relevant water quality legislation such as:

- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (2000/60/EC), hereafter referred to as the Water Framework Directive (WFD);
- European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003);
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009);
- European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010);
- European Communities (Drinking Water) Regulations 2014 (S.I. No. 122 of 2014);
- European Communities (Drinking Water) (No. 2) Regulations 2007 (S.I. No. 278 of 2007);
- European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. No. 293 of 1988);
- European Communities (Quality of Shellfish Waters) Regulations, 2006 (S.I. No. 268 of 2006);
- Bathing Water Quality Regulations, 2008 (S.I. No. 79 of 2008);
- European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 477 of 2011);
- The EU Floods Directive 2007/60/EC; and
- European Communities (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010).

The assessment supporting this chapter for the Proposed CBC EIAR will be undertaken in accordance with the TII Road Drainage and the Water Environment guidance document (TII 2015). The following guidance will also be consulted during preparation of the EIAR chapter:

- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA 2005);
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2008); and
- The Planning System and Flood Risk Management – Guidelines for Planning Authorities (the FRM Guidelines) (Office of Public Works (OPW) 2009).

In line with the guidance listed, the assessment will cover potential impacts on surface waters and flood risk, and will describe the existing conditions and the likely potential impacts associated with the Construction and Operational Phases of the Proposed CBC. The impact assessment process will involve:

- Assigning the importance of each hydrological attribute in terms of its sensitivity to change;
- Identifying and characterising the magnitude and significance of any potential impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts;
- Specifying appropriate monitoring if necessary; and
- Assessing the significance of any residual impacts after mitigation.

5.8.1.1 Study Area

The study area for the Proposed CBC in relation to the surface water environment includes all surface water bodies and floodplains within 500m of the Proposed CBC. The land use in the immediate vicinity of the Proposed CBC is predominantly urban and suburban but also comprises some limited greenfield sites.

5.8.1.2 Desktop Study

A baseline study will be undertaken in order to be able to determine the impact expected from the Proposed CBC. The baseline information will be collected by desktop analysis and will involve collection of data in relation to the aspects described in the following sections.

5.8.1.2.1 Water Framework Directive (WFD) Water Quality and Status

WFD classification for surface water bodies consist of ecological status and chemical status classification. The quality element relevant to ecological status includes biological elements, water chemistry and the physical conditions of the water body. Natural surface water bodies are assigned to one of five ecological status classes (High, Good, Moderate, Poor or Bad). Other water bodies have been given Unassigned status which means that it could not be determined with certainty that the status is higher than Moderate.

Heavily modified water bodies are assigned to one of five ecological status classes (Maximum, Good, Moderate, Poor or Bad). Chemical status follows analysis for the EU list of priority hazardous substances and the status is determined as Good or Fail. This information is compiled by the EPA from sampling of representative points in the national monitoring network and the data is presented on the EPA website and reported in the EPA Report Water Quality in Ireland 2013-2018 (EPA 2019e).

5.8.1.2.2 Catchment Characteristics and Environmental Pressures

Baseline information should also be temporal in scale and therefore looking ahead to likely future trends is important. The WFD requires all water bodies to aim to achieve Good status by 2027. EPA has classified each water body in terms of its 'Risk' to achieving that target. The EPA has identified nine significant pressures causing the risk to achieving Good Status. These include agriculture, wastewater, hydromorphology, forestry, diffuse urban runoff, peat extraction, industry, mines and quarries and other. This information will also form part of the baseline.

5.8.1.2.3 Water Dependent Areas

Water bodies which are designated for their usage as bathing water or sources of drinking water, for the presence sensitive habitats and species, shellfish habitats or as areas sensitive to eutrophication due to excessive inputs of phosphorus and/or nitrogen are afforded special further protection, so this will also be considered in gathering the baseline. At the assessment stage it will be assumed that these water bodies are more sensitive to changes to the existing baseline.

5.8.1.2.4 Flood Risk

A characterisation of flood risk along the Proposed CBC will be informed by Office of Public Works (OPW) online flood mapping (OPW 2019). These maps provide an overview of the extent of fluvial and coastal water flooding, in addition to records of past flood events. Further detailed information on flood risk, if required to support the EIAR chapter, will be obtained through the undertaking of a Flood Risk Assessment (FRA).

5.8.1.3 Survey Requirements

A site walk over will be required by an experienced hydrologist to determine the baseline characteristics of all watercourses crossed by the Proposed CBC. In addition, where it is possible, any other non-designated water bodies, ditches, drains or culverted rivers that are crossed by the Proposed CBC will be identified, and general existing drainage arrangements will be noted where impermeable areas may increase as a result of the Proposed CBC.

5.8.1.4 Assessment Criteria

The sensitivity of surface water receptors (e.g. rivers, streams and surface water drains) that could potentially be affected by the Proposed CBC will be determined with reference to their relative importance or 'value' (e.g. whether features are of national, regional or local value).

The scale or magnitude of potential impacts (both positive and adverse) depends on the degree and extent to which the Proposed CBC may change the environment, which usually varies according to project phase (Construction and Operational Phases).

Factors that will be considered to determine the magnitude of potential impacts include:

- Area of influence (the magnitude of an impact is directly related to the size of the area affected);
- Level of deviation from baseline conditions;
- Duration of impact;
- Sensitivity of the resource; and
- Project timing (in relation to season).

The significance of an impact will then be determined by combining the sensitivity of the receptor with the predicted magnitude of impact.

5.8.1.5 Flood Risk Assessment (FRA)

The FRA will be carried out in accordance with the Office of Public Works (OPW) Guidelines for Planning Authorities (GPA) 2009: The Planning System and Flood Risk Management (OPW; Department of Environment, Heritage and Local Government (DEHLG) 2009).

5.9 Land, Soils, Geology & Hydrogeology

5.9.1 Proposed Assessment Methodology

The land, soils, geology and hydrogeology assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). In addition, the following guidance documents will be referred to:

- Guidelines for the Preparation of Soil, Geology and Hydrogeology Chapters of Environmental Impact Statements (Institute of Geologists of Ireland (IGI) 2013); and
- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA 2008).

The assessment for this chapter also follows the following policy, plan and guideline documents:

- European Communities (Water Policy) Regulations 2014 - S.I. No. 350 of 2014;
- European Communities Environmental Objectives (Groundwater) Regulations 2010 - S.I. No. 9 of 2010, as amended by the European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2011 - S.I. No. 389 of 2011, the European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2012 - S.I. No. 149 of 2012 and the European

- Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016 - S.I. No. 366 of 2016;
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 - S.I. No. 272 of 2009 as amended by the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012 - S.I. No. 327 of 2012;
- European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015 - S.I. No. 386 of 2015;
- European Communities (Water Policy) Regulations 2003 - S.I. No. 722 of 2003 as amended by the European Communities (Water Policy) (Amendment) Regulations, 2005 - S.I. No. 413 of 2005;
- European Communities (Water Policy) (Amendment) Regulations, 2008 - S.I. No. 219 of 2008;
- European Communities (Water Policy) (Amendment) Regulations, 2010 - S.I. No. 93 of 2010;
- European Communities (Drinking Water) Regulations 2014 - S.I. No. 122 of 2014, as amended by the European Union (Drinking Water) (Amendment) Regulations 2017 - S.I. No. 464 of 2017;
- European Communities (Quality of Salmonid Waters) Regulations 1988 – S.I. No. 293 of 1988;
- Institute of Geologists of Ireland (IGI 2013). Guidelines for the Preparation of Soil, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- National Roads Authority (NRA 2008). Environmental Impact Assessment of National Road Schemes – A Practical Guide;
- National Roads Authority (NRA 2008). Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy, hereafter referred to as the Water Framework Directive (WFD);
- Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration, hereafter referred to as the Groundwater Directive; and
- Water Services Acts (2007 – 2017).

The overall extent of the study area for this chapter will be determined having regard to the IGI Guidelines (IGI 2013). The minimum study area will be 250m beyond the land take boundary for the Proposed CBC as per the NRA Guidelines (NRA 2008b). This may be extended or reduced as appropriate to account for sensitive nearby features or for example where the Proposed CBC has been expanded to include areas of minimal intrusive works but changes to traffic levels.

In order to identify and quantify the potential impact of the Construction Phase and Operational Phase of the Proposed CBC, it is first necessary to undertake a desk study of the baseline geological and hydrogeological environment of the region and then a detailed study within the study area of the Proposed CBC. The existing soils, geology and hydrogeology conditions will be interpreted from desk study information, site walkovers, consultation with relevant bodies and from project specific ground investigations.

In addition, the engineering design teams for the Proposed CBC will provide available information such as the site boundaries, discharge points, levels and plan outline of any proposed earthworks and details of any dewatering that may be required.

The baseline desktop study will cover the following topics:

- Geomorphology and topography;
- Soils and subsoils;
- Bedrock geology;
- Hydrogeology;
- Designated sites;
- Relevant historic land-use;

- Contaminated land; and
- Economic geology.

As part of the desk-based study to establish the baseline conditions (i.e. soils, geological and hydrogeological environment), the desk based review will include the following sources of information:

- Topographical and geographic maps and datasets including Google, Bing, OSI, and INFORMAR Seabed Mapping;
- Geological Survey Ireland Maps and Datasets and Publications;
- Teagasc Soils Data;
- Department of Communications, Energy and Natural Resources (2011) State Mining and Prospecting Facilities; and
- EPA Environmental Mapping and Datasets.

Existing publicly available ground investigation data will be reviewed in terms of relevance and quality and included in the baseline assessment if appropriate. The outcome from examining these available data is a Conceptual Site Model (CSM). The CSM is a summary of baseline geological and hydrogeological conditions and important features within the study area and considers the susceptibility of the identified features to potential activities that may be associated with the Proposed CBC. The susceptibility will be described in terms of source-pathway-receptor linkages. A 'Feature Importance ranking' can then be assigned to each feature. Table 4.1 and Table 4.3 of the NRA Guidelines (NRA 2008b) provide criteria for ranking the importance of the identified soils and geological constraints which will be used as the basis for this assessment.

The IGI Guidelines lists five generic types of geological / hydrogeological environments that may be encountered and all five types of environment are likely to be encountered within the region. Based on the initial desk study, the route traverses a number of these different types of environments. However, the guidance is to adopt a precautionary principle when there is any doubt over the type of environment and therefore the most critical type of environment may be considered across the Proposed CBC where appropriate during the assessment.

The IGI Guidelines has a non-exhaustive list of activities associated with proposed development. The following are the activities from this list that are expected as part of the Proposed CBC, however it will be refined and expanded as necessary during the compilation of the EIAR:

- Earthworks;
- Storage / transmission of leachable and hazardous materials;
- Lowering of groundwater levels by pumping or drainage;
- Discharges to ground of dewatering waters; and
- Excavation of material above and below the ground water table.

Ground investigations will be undertaken as determined necessary by the engineering designers and the relevant information from these will feed into the preparation of this chapter of the EIAR. Site walkovers will also be undertaken to inform the assessment.

The likely significant impacts will be identified by classifying the importance of the relevant attributes and quantifying the magnitude of potential impacts on these attributes. This will be undertaken in accordance with the IGI Guidelines (IGI 2013) which outlines a 13-step methodology that is divided across four distinct elements:

- Initial Assessment;
- Direct and Indirect Site Investigation;
- Mitigation Measures, Residual Impacts and Final Impact Assessment; and
- Completion of the Soils, Geological and Hydrogeological Sections of the EIAR.

5.10 Archaeological & Cultural Heritage

5.10.1 Proposed Assessment Methodology

In addition to the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017), the study will be informed by the following legislation, guidelines and advice notes:

- European Convention on the Protection of the Archaeological Heritage (ratified by Ireland 1992), 'Valetta Convention' (Council of Europe 1992);
- Convention for the Protection of the Architectural Heritage of Europe (ratified by Ireland 1997), 'Granada Convention' (Council of Europe 1985);
- Framework Convention on the Value of Cultural Heritage for Society, 'Faro Convention' (Council of Europe 2005);
- National Monuments Act, 1930 to 2014;
- Architectural Heritage Protection Guidelines for Planning Authorities (Department of Arts, Heritage and the Gaeltacht (DAHG) 2011);
- National Landscape Strategy for Ireland 2015-2025 (DAHG 2015);
- Framework and Principles for the Protection of the Archaeological Heritage (Department of Arts, Heritage, Gaeltacht and Islands (DAHGI) 1999);
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 (No. 19 of 1999);
- Code of Practice for Archaeology agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and TII, 2017;
- Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (NRA 2005);
- Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes (NRA 2005);
- Heritage Act, 1995 (No. 4 of 1999) (as amended);
- The UNESCO World Heritage Convention, 1972;
- Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas, (International Council on Monuments and Sites (ICOMOS) 2005);
- Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (ICOMOS 2011);
- The Setting of Heritage Assets, Historic Environment Good Practice Advice in Planning Note 3 (Second Edition) (Historic England 2017);
- International Cultural Tourism Charter (ICOMOS 1999);
- Historic Landscape Characterisation in Ireland: Best Practice Guidance (The Heritage Council 2013);
- Department of Culture, Heritage and the Gaeltacht (DCHG). National Monument Service: National Monuments in State Care: Ownership and Guardianship, 4th March 2009 Dublin;
- DCHG. Sites listed in the Record of Monuments and Places (RMP);
- DCHG. Archaeological Survey of Ireland. Sites and Monuments Records (SMR) database;
- The Historic City of Dublin tentative list submission for future inscription as a UNESCO World Heritage Site (08/04/2010);
- The topographical files of the National Museum of Ireland;
- Excavation Bulletins and Excavations Database;
- Aerial Photographs;
- Historic Cartographic Sources;
- Dublin City Industrial Heritage Record (DCIHR);
- DCHG. National Inventory of Architectural Heritage (NIAH) Garden Survey; and

- DCHG. NIAH Building Survey which took place as follows:
 - Dublin north city (2015) (D1, D8, D7 and north inner city to the canal); and
 - South County Dublin.

5.10.1.1 Study Area

In order to inform the likely and significant impacts on archaeology and cultural heritage, a 50m heritage constraint zone (buffer zone) will be established on either side of the centre line of the Proposed CBC.

This 100m wide corridor will be assessed in order to identify the known and recorded archaeological and cultural heritage assets and thus provide an understanding of the archaeological and historical development of the wider landscape and streetscape. Professional judgement will be used to determine where the Proposed CBC assessment extents should be extended to take into account archaeological sites/monuments or structures that lie beyond the Proposed CBC impact assessment extents. As required and where appropriate, the relationship of structures, sites, monuments and complexes that fall outside the Proposed CBC extents will be considered and evaluated.

Off the main Proposed CBC extents, on streets to which traffic will be dispersed and where works may be required, targeted site inspections informed by the design proposal and the findings of the desk-based research will take place as necessary. For historic towns and villages that have a recorded Zone of Archaeological Potential (ZAP), these areas will be considered.

The following heritage assets are considered as part of the baseline:

- **World Heritage Sites:** World Heritage sites, National Monuments and assets of acknowledged international importance or that can contribute significantly to international and national research objectives;
- **National Monuments:** The National Monument Act defines a National Monument as '*a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto*' (National Monuments Act 1930, Section 2);
- **Recorded Monuments:** The primary source of information for archaeology is the RMP, maintained by the DCHG. The RMP documents known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites in rural areas identified as cropmarks on vertical aerial photographs dating to before 1700 AD (with some later ones also being included). It is based on a comprehensive range of published and publicly available documentary and cartographic sources;
- **Areas of Archaeological Potential:** Areas of Archaeological Potential can be defined as parts of the urban and rural landscape that possess the potential to contain archaeological remains due to the settlement history of a place and or the presence of topographic features such as rivers, lakes and high defensible ground. For example, the ZAP for the historic town of Dublin is (RMP DU018-020); and
- **Non-Designated Sites:** Newly identified archaeological sites or undesignated assets can contribute to research objectives and an understanding of a particular area. Examples of previously undesignated sites in an urban environment may include cellars or sites of an industrial heritage value.

5.10.1.2 Desktop Study

By using existing data sets such as the RMP, it will be possible to map dominant clusters of monuments and define broad spatial patterns based on site type or monument classes. This broadly reflects occupation and settlement character types along the Proposed CBC:

- The National Monuments, Preservation Orders, Register of Historic Monuments list for County Dublin were sourced directly from the DCHG; and

- The Sites and Monuments Record (SMR), as revised in the light of fieldwork, formed the basis for the establishment of the statutory Record of Monuments and Places in 1994 (RMP; pursuant to Section 12 of the National Monuments (Amendment) Act, 1994) (as amended). The RMP records known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites identified as cropmarks on vertical aerial photographs. The information held in the RMP files is read in conjunction with published constraint maps. Archaeological sites identified since 1994 have been added to the non-statutory SMR database of the Archaeological Survey of Ireland (National Monuments Service, DCHG), which is available online at www.archaeology.ie and includes both RMP and SMR sites. Those sites designated as SMR sites have not yet been added to the statutory record, but are scheduled for inclusion in the next revision of the RMP.

The EIA will include a detailed evaluation of the archaeological and cultural heritage resource, based on a desk study of published and unpublished documentary and cartographic sources and supported by a field survey.

5.10.1.3 Survey Requirements

The Proposed CBC will be subject to walkover surveys in order to identify potential archaeological, historical, and heritage assets as well as features of cultural heritage merit that may be subject to direct or indirect impacts as a result of the Proposed CBC.

5.10.1.4 Impact Assessment

Archaeological and cultural heritage sites cannot be directly replaced and cultural heritage material assets are generally considered to be location-sensitive. In this context, any change to their environment, such as construction activity and ground disturbance works, could adversely affect these sites.

The likely significance of impacts is determined taking into account the magnitude of the impact and the baseline rating on which the impact has an effect. The impact significance is defined as imperceptible, slight, moderate, significant, very significant or profound.

In accordance with the Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes (NRA 2005a), the significance criteria used to evaluate an archaeological site, monument or complex are as follows:

- Existing status (level of protection);
- Condition or preservation;
- Documentation or historical significance;
- Group value;
- Rarity;
- Visibility in the landscape;
- Fragility or vulnerability; and
- Amenity value.

In accordance with the EPA guidelines (EPA 2017), the context, character, significance and sensitivity of each heritage asset requires evaluation.

5.11 Architectural Heritage

5.11.1 Proposed Assessment Methodology

In addition to the overarching guidance such as the EPA EIAR Guidelines (EPA 2107) and the European Commission EIA Guidance (EC 2017), the study will be informed by the following legislation, guidelines and advice notes:

- Architectural Heritage Protection: Guidelines for Planning Authorities (DEHLG 2011);
- The Design Manual for Urban Roads and Streets, as updated (DEHLG 2019);
- The Framework and Principles for the Protection of the Archaeological Heritage guidelines (Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI) 1999);
- Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes (NRA 2005);
- Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (NRA 2005);
- Dublin City Council's Public Realm Strategy 2011-2017 (DCC 2012);
- UNESCO International Conventions including the 1972 UNESCO Convention Concerning the Protection of World Cultural and Natural Heritage;
- International Council of Monuments and Sites (ICOMOS) International Charters;
- EC European Green Paper on the Urban Environment (EC 1990);
- The European Landscape Convention 2000;
- Council of Europe 1985 (Grenada) Convention for the protection of the Architectural Heritage of Europe;
- The Architectural Heritage and Historic Properties Act 1999; and
- The National Monuments Act 1930 to 2004.

5.11.1.1 Study Area

In accordance with the NRA Guidelines (NRA 2005b), a study area of 50m on either side of the centre line of the Proposed CBC will be assessed, though professional judgement will be used to decide where this should be extended if necessary. The same approach will be adopted on roads off the Proposed CBC corridor where traffic is likely to be dispersed and where works may be required. There are sections of the Proposed CBC which are proposed to be widened. It will be important to identify all items of architectural heritage in these areas in order to assess the potential impact of any road widening on such structures.

The nature of the existing environment and key baseline features will be identified, including:

- Historical routes / roads, their origin and history;
- Surface treatments, cobbles, paving and kerbs;
- Boundary treatments including walls, railings, gateways and steps;
- Street furniture;
- Adjoining designed landscapes and streetscapes including protected structures, Architectural Conservation Areas, demesnes, vernacular and industrial buildings, bridges and archaeological sites;
- Designed vistas and streetscapes;
- Landscaping treatments, trees and planting, particularly where the form part of a designed/historic streetscapes or where they contribute to vistas and the character of streetscapes; and
- The Urban Realm.

A description of the receiving environment will be prepared, including a description of the location, extent and historical context and general character of the route of the Proposed CBC. More specific data concerning the nature, character and value/sensitivity of each of the identified architectural heritage features and vistas along the route will then be provided in more detail including their protected status and sensitivity. These data will be based on the desk-based study and on targeted site visits to assess key features.

5.11.1.2 Desktop Study

The architectural heritage assessment will be undertaken with the aid of a desktop study of available data to identify key built heritage receptors that may be affected by the Proposed CBC. The following published data sources will be referenced as part of the desktop study:

- Cartographic sources from the Ordnance Survey of Ireland (OSI), Trinity College Dublin (TCD) Glucksman Map library, University College Dublin (UCD) Richview Library and Department of Geography, Dublin City Archive, The Royal Irish Academy Irish Historic Town Atlas Series and digital and aerial mapping including OSI, Bing, Google and Apple Maps;
- Published National Inventory of Architectural Heritage (NIAH) surveys for both Buildings and Gardens/Demesnes/Designed Landscapes;
- The Dublin Environmental Inventory and Dublin Docklands Inventory;
- Dublin City Council and Heritage Council (2003) Dublin City: Architectural Heritage Surveys, which provides a useful index of surveys that have previously been carried out including Dublin City Council, Dublin Civic Trust and Foras Forbartha Heritage Surveys, Irish Architectural Archive surveys, Irish Georgian Society surveys, UCD urban inventories and Masters in Urban and Building Conservation theses;
- The National Monuments Service Sites and Monuments Record (SMR);
- Industrial heritage inventories/studies;
- Vernacular heritage inventories/studies;
- Archival resources from Irish Architectural Archive, Dublin City Archive, UCD Richview Library, the National Library and Photographic Archive, The National Archive, National Monuments and Dublin City Archaeological Archives, Transport and Military Archives and OPW Archive;
- Published architectural and Local histories including but not limited to Casey's Buildings of Ireland: Dublin, DCC's The Georgian Squares of Dublin, Hone Craig and Fewer's New Neighbourhood of Dublin, Kelly's Four Road's To Dublin, Dr Susan Galvan's Dublin's Victorian Suburbs, O'Maitiú's Dublin's Suburban Town's, and similar resources for Dublin City;
- Published journal articles accessed either through the Irish Architectural Archive, UCD library, TCD Library, Technological University Dublin (TUD) library or through Google Scholar, JSTOR, Academia.edu or Researchgate;
- Landscape designations, including landscape sensitivity classifications and protected views and prospects will also be considered;
- Development Plans for each Local Authority including the Record of Protected Structures (RPS), Record of Monuments and Places (RMP), list of Architectural Conservation Areas (ACA), Development plan maps depicting protected structures, architectural conservation areas, Recorded Monuments and Zones of Archaeological Potential, protected views, conservation areas, Local Authority industrial and vernacular heritage inventories, landscape character areas; and
- Local Area Plans along the route, particularly heritage related local objectives.

5.11.1.3 Survey Requirements

An inspection of the Proposed CBC will be carried out to determine the general character of the route, utilising the relevant data gathered during the review of the published inventories and information sources. Targeted field inspections informed by the findings of the desk-based study will be undertaken and the features recorded photographically and in descriptive form. Adjoining architectural heritage features, designed landscapes and vistas will also be noted.

5.11.1.4 Impact Assessment

Following the assessment of the baseline environment and consultation, the effects likely to arise on architectural heritage along the Proposed CBC will be assessed.

The impact assessment process will involve:

- Assigning the receptor sensitivity on the heritage assets that are identified in the desk-based survey, site survey and through consultation;
- Identifying and characterising the magnitude and significance of any potential impacts on the architectural/heritage assets within the study area;
- Incorporating measures to avoid and mitigate (reduce) these impacts; and
- Assessing the significance of any residual effects on the on the architectural/heritage assets after mitigation.

5.12 Landscape (Townscape) & Visual

5.12.1 Proposed Assessment Methodology

The landscape (townscape) and visual assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). In addition, the collation of the townscape and visual baseline data and the preparation of the chapter will have regard to the following non-exhaustive list of legislation and planning documentation:

- Legislation:
 - European Landscape Convention 2000; and
 - Historic Gardens: The Florence Charter 1981.
- Planning documentation (landscape / townscape / visual):
 - Dublin City Parks Strategy 2019-2022 (DCC 2019);
 - Dublin City Tree Strategy 2016-2020 (DCC 2016);
 - Dublin City Heritage Plan 2002-2006 (DCC 2002);
 - South Dublin County Heritage Plan 2010-2015 (SDCC 2010); and
 - Local Area Plans, Urban Development / Framework Plans, Masterplans, etc., as appropriate.
- Guidance documents:
 - Landscape and Landscape Assessment: Consultation Draft Guidelines for Planning Authorities, Ireland (Department of the Environment and Local Government (DELG) Draft June 2000);
 - Guidelines for Landscape and Visual Impact Assessment, 3rd edition (Landscape Institute and IEMA 2013);
 - Environmental Guidelines Series for Planning and Construction of National Roads (NRA 2005-2009);
 - Design Manual for Urban Roads and Streets (Department of Transport, Tourism and Sport (DTTAS) 2013); and
 - Various landscape / townscape publications that may be applicable to the understanding of the baseline environment.

The townscape assessment will involve reviewing and analysing the following:

- Survey mapping and aerial photography of the Proposed CBC;
- Landscape/townscape planning policies and objectives and other relevant documentation in order to ascertain the townscape and visual significance and sensitivity;
- Tree Survey Reports and associated Drawings;
- Plans, sections, etc., of the Proposed CBC;
- Engineering and servicing drawings for the Proposed CBC;
- Other sections of the EIAR, in particular:
 - Project Description;
 - Biodiversity;
 - Hydrology;

- Traffic & Transport;
- Archaeology & Cultural Heritage;
- Architectural Heritage; and
- Material Assets.
- Photomontages (accurate visual representations) prepared for the Proposed CBC where necessary.

The assessment will cover potential impacts from a landscape (townscape) and visual perspective and will describe the existing conditions and the likely potential impacts associated with the construction and operation of the Proposed CBC. The assessment of impacts and their significance will be based on the EPA EIAR Guidelines (EPA 2017) and the Guidelines for Landscape and Visual Impact Assessment, 3rd edition (Landscape Institute and IEMA 2013).

5.12.1.1 Study Area

The study area for the Proposed CBC will include all areas of anticipated physical change, as well as locations from which such changes would be seen. The study area will also be widened as required in order to ensure that alterations in traffic volumes on surrounding streets are also captured and these alterations are assessed with regards to their potential to affect the townscape and visual character of those areas.

5.12.1.2 Desktop Study

The following information will be collated as part of the desktop study:

- Land use zoning (residential, open space, etc.);
- Specific townscape and visual related objectives (architectural conservation areas, tree protection, views and prospects, protected structures, etc.); and
- Other townscape and visual related aspects (character areas, ecological areas, etc.).

5.12.1.3 Survey Requirements

Walkover surveys of the Proposed CBC will be undertaken in order to understand the following:

- Overall townscape character;
- Corridor characteristics and features;
- Boundary and property characteristics;
- Main structural / built townscape elements;
- Key views and vistas; and
- Important trees and plantings (including formal Tree Survey).

5.13 Waste & Resources

5.13.1 Proposed Assessment Methodology

The waste and resources assessment will require a comprehensive policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). In addition, the following policy, plan and guideline documents will be considered when undertaking the waste and resources assessment:

- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DEHLG 2006);
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives;
- The Eastern-Midlands Region Waste Management Plan 2015-2021 (DCC 2015);

- Public Consultation Waste Action Plan for a Circular Economy 2019 (DCC 2019);
- Construction and Demolition Waste Statistics for Ireland. Latest Reference Year: 2017 (EPA 2019);
- Ireland's Environment – An Assessment 2016 (EPA 2017);
- Waste Classification – List of Waste and Determining if Waste is Hazardous or non-Hazardous (EPA 2015);
- National Waste Report 2012 (EPA 2014);
- Closing the loop - An EU action plan for the Circular Economy (EC 2015);
- The EU Construction and Demolition Waste Management Protocol (EC 2017).;
- European Communities (Waste Directive) Regulations 2011 (S.I. 126 of 2011);
- Construction and Demolition Waste Management – A Handbook for Contractors and Site Managers (FÁS and the Construction Industry Federation 2002);
- Standard GE-ENV-01101. The Management of Waste from National Road Construction Projects (TII 2017);
- Standard CC-SPW-00600. Specification for Road Works Series 600 Earthworks (including Erratum No. 1, dated June 2013) (TII 2013);
- Waste Management Acts, 1996, as amended (No. 10 of 1996);
- Waste Management (Collection Permit) Regulations 2007, as amended (S.I. 820 of 2007); and
- Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007).

The consideration of resources in the context of the assessment includes maximising the beneficial reuse of resources arising from the construction of the Proposed CBC (e.g. excavated soil, concrete, asphalt). An overview of materials requirements and management on the Proposed CBC will be provided in the EIAR.

The principal objective of sustainable resource and waste management is to use material resources more efficiently, where the value of products, materials and resources are maintained in the economy for as long as possible and 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. Where waste is generated, it should be dealt with in a way that follows the waste hierarchy, which implements the EU Waste Framework Directive (2008/98/EC) and actively contributes to the economic, social and environmental goals of sustainable development.

A desktop study will be undertaken which will include the following tasks:

- Review of relevant policy and legislation which creates the legal framework for waste and resource management in Ireland;
- Waste and by-product generation estimates will be estimated for the Construction Phase of the Proposed CBC and subsequently incorporated into the development of the EIAR;
- Construction industry and asphalt processing sector representative organisations and bodies will be contacted to obtain any relevant information and data relevant to the Proposed CBC; and
- The Proposed CBC will be reviewed during development of the EIAR to identify mitigation and move waste management up the waste hierarchy through implementation of best practice where possible.

The assessment will seek to identify and confirm the following:

- Waste arisings used to inform the baseline and assessment of the likely significant environmental impacts of waste;
- Availability of waste infrastructure to be used to inform the baseline and assessment of the likely significant environmental impacts of waste; and
- Planning, development management and waste management policies to be considered during the assessment process; and particularly with respect to defining any mitigation measures required.

This information will be used to establish the baseline waste quantities, understand the future recovery and disposal capacity within the appropriate study area and to identify opportunities for reuse and recovery of excavation and demolition materials from the Proposed CBC.

The assessment of impacts will be informed by a review of waste and by-products generation and management from the Proposed CBC, and comparing this to baseline practices in the industry in Ireland. The following factors will be considered when determining the significance of the impacts, both positive and adverse, of the Proposed CBC on the various aspects of the receiving environment:

- Desktop assessment of current practices for waste and by-product generation and management in Ireland;
- Initial assessment will be undertaken by gathering data on waste and by-product generation and management from the Proposed CBC from the design team. This will be compared with baseline practice in the industry in Ireland;
- The assessment will consider the types and quantities of solid waste that will be generated during construction and operation, and the severity of the likely significant environmental impacts that may arise from the quantity of waste requiring disposal to landfill (this being the least preferred waste management option, with a finite usable capacity);
- The assessment will consider waste arisings and waste infrastructure capacity in Local Authority jurisdictions through which the Proposed CBC will pass and in the region; and
- The Proposed CBC will be reviewed in the context of the waste hierarchy and circular economy principles to identify the degree of mitigation that can be achieved.

5.14 Material Assets

5.14.1 Proposed Assessment Methodology

It is proposed that the assessment of the impact on utilities and imported materials will be carried out in accordance with the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017) and established best practice; and will be tailored accordingly based on professional judgement and local circumstance.

Information will be collected by the engineering designers from a number of utility providers and Dublin City Council to determine the location of utilities. Service data gathered through consultation with the relevant service providers will be obtained which will present the approximate locations of known services at a point in time.

A desktop study will be undertaken to identify the materials likely to be required to be imported by the Proposed CBC. In identifying these, information will be gathered from the Waste assessment which will be identifying suitable re-use opportunities for the 'waste' materials. This will help determine how much material is still required to be imported by each Proposed CBC.

As part of the design development, utility surveys will be undertaken by the engineering designers. The information obtained from these surveys will inform the EIA baseline and potential for impacts. Additional utility surveys to inform the EIA will not be required.

The assessment will cover potential impacts on utilities and the impacts of imported material on and from the Proposed CBC. It will describe the existing conditions and the likely potential impacts associated with the construction and operation of the Proposed CBC. The impact assessment process will involve:

- Identifying the utility connections and diversions required;
- Identifying the type and quantity of material to be imported;
- Identifying the sources of the materials to be imported;
- Identifying and characterising the magnitude and significance of any potential impacts;
- Incorporating measures to mitigate these impacts; and
- Assessing the significance of any residual impacts after mitigation.

5.15 Risk of Major Accidents and/or Disasters

5.15.1 Proposed Assessment Methodology

The assessment of the risk of major accidents and/or disasters will be desk-based and will require a policy, plan and strategy review, including the overarching guidance such as the EPA EIAR Guidelines (EPA 2017) and the European Commission EIA Guidance (EC 2017). Additional documentation to be referenced as part of the assessment will include, but will not be limited to:

- A National Risk Assessment for Ireland 2017 (Department of Defence 2017);
- National Risk Assessment 2019 Overview of Strategic Risks (Department of the Taoiseach 2019);
- Guidance on Assessing and Costing Environmental Liabilities (EPA 2014);
- A Guide to Risk Assessment in Major Emergency Management (DEHLG 2010);
- A Guide to the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015) (Health and Safety Authority (HSA) 2015);
- Dublin City Council Road Safety Strategy 2020 (DCC 2016); and
- Flood Risk Management Plans for the following catchments:
 - Liffey and Dublin Bay (Office of Public Works (OPW) 2018).

The study area for the purposes of identifying and assessing risk of major accidents and/or disasters is the Proposed CBC extent as well as any road links which are significantly impacted by the redistribution of traffic on other routes. In addition, any construction traffic routes to and from the Proposed CBC during the Construction Phase will be considered within the study area. The assessment will review the current risk profile with respect to natural disasters, transport incidents, construction incidents and security. Regard will also be had to sites in Dublin which come under the Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances) Regulations 2015 (S.I. No. 209 of 2015).

The methodology will largely be based on the guidance listed, specifically A Guide to Risk Assessment in Major Emergency Management (DEHLG 2010). The assessment will be carried out in three stages as outlined in the following:

- **Identification and Screening** – an exercise will be undertaken to identify all reasonable potential unplanned risks that the Proposed CBC may be vulnerable to or may increase the risk of, and screen them with respect to whether they are already addressed elsewhere (such as in the EIAR chapters or within the design);
- **Risk Classification** – each risk identified and screened in will be evaluated with regard to the likelihood of occurrence and the potential impact (as per Table 2 and Table 3 of DEHLG 2010). As per those tables, the likelihood is ranked from 1 (extremely unlikely) to 5 (very likely), and potential impact is ranked from 1 (minor) to 5 (catastrophic); and
- **Risk Evaluation** – following risk classification, the likelihood score will be multiplied by the impact score to give the significance of each risk. The risks will then be grouped into three categories based on their significance scores, namely high risk (score from 15 to 25), medium risk (score of 8 to 12), and low risk (score of 1 to 6).

Once all of the risks are identified, classified and evaluated, mitigation and monitoring measures will be proposed for any of the medium or high risks identified. These risks will then be re-evaluated with the proposed mitigation in order to give a post-mitigation score.

6. Potential Impacts

The following table provide a list of the potential environmental impacts as a result of the Proposed CBC (Table 6.1).

Table 6.1: Potential Impacts Related to the Construction and Operation of the Proposed CBC

Potential Impacts
Traffic & Transport
<ul style="list-style-type: none"> Disruption to transportation due to works along the Proposed CBC (Construction Phase). Reduction in capacity available for general traffic (e.g. cars, HGVs, taxis) along the Proposed CBC (Operational Phase); Reduction in on-street parking and loading facilities (Operational Phase); Significant increase in people carrying capacity of sustainable transport modes (bus, cycling and walking) which will offset and exceed the reduction in capacity for general traffic (Operational Phase).
Air Quality
<ul style="list-style-type: none"> Dust emissions from activities such as excavation and pavement construction, which can be exacerbated by winds and dry weather (Construction Phase); Emissions from HGVs and on-site construction plant and equipment which may give rise to emissions including; particulate matter (PM₁₀ and PM_{2.5}), benzene, nitrogen oxides (NO_x) and Carbon Monoxide (CO) (Construction Phase); Changes in traffic composition and flows as a result of the Proposed CBC resulting in changes to vehicle-related air emissions (nitrogen dioxide (NO₂), carbon monoxide (CO), benzene and particulate matter (PM₁₀ and PM_{2.5})) and localised air pollution impacts (Construction and Operational Phases); Alterations in traffic flows on adjacent road links, changes in road alignment and road speeds as result of the operation of the Proposed CBC (Construction and Operational Phases).
Climate
<ul style="list-style-type: none"> GHG emissions as a result of construction traffic and embodied energy from construction materials (Construction Phase); Reduced GHG emissions per kilometre travelled per person and reduced congestion as a result of a modal shift from private cars to public transport, which improves engine efficiency and further reduces GHG emissions (Operational Phase); The Proposed CBC will assist the Climate Action Plan to implement major sustainable-mobility projects to increase the use public transport in major cities in Ireland by 50% and increase cycling by providing improved facilities (Operational Phase).
Noise & Vibration
<ul style="list-style-type: none"> Noise and vibration as a result of construction works (e.g. excavation, road resurfacing and construction of new structures) and construction traffic, particularly HGV movements (Construction Phase); Noise and vibration impacts associated with traffic on realigned road layouts and traffic changes on surrounding roads (Operational Phase).
Population
<ul style="list-style-type: none"> Potential for community impacts on the following: <ul style="list-style-type: none"> Community accessibility (Negative during Construction Phase; Positive during Operational Phase); Accessibility to employment (Negative during Construction Phase; Positive during Operational Phase); Community amenity (Negative during Construction Phase; Positive during Operational Phase); Residential land use (Negative during Construction Phase). Potential for economic impacts on the following: <ul style="list-style-type: none"> Commercial amenity (direct and in-combination effects) (Construction and Operational Phase); Commercial land use (Construction Phase).
Human Health
<ul style="list-style-type: none"> Impacts on health as a result of physical emissions (i.e. noise, vibrations and dust) (Construction Phase); Impacts as a result of any utility disruptions (Construction Phase); Impacts associated with community severance (Construction Phase); Impacts as a result of traffic pattern changes in areas surrounding the Proposed CBC (Construction and Operational Phase); Improved health outcomes as a result of improved provision for active modes of transport, i.e. walking and cycling (Operational Phase).

Potential Impacts	
Biodiversity	
<ul style="list-style-type: none"> Reduction in surface water quality in the receiving environment as a result of surface water runoff and discharge into any surface water feature. This in turn could result in the degradation of aquatic/wetland habitats and indirect impacts on the aquatic species that these habitats may support, such as otters, amphibians and fish (if present) (Construction and Operational Phases); Reduction in air quality as a consequence of dust deposition associated with construction activities, which in turn could result in habitat degradation (Construction Phase); Introduction and/or spread of non-native invasive plant species, as a result of earthworks, vegetation removal, ground investigations, maintenance works, etc., which in turn could result in habitat degradation (Construction and Operational Phases); Habitat loss, fragmentation and/or temporary severance (e.g. barrier effect), which in turn may result in impacts on species dependent on these habitats for survival (Construction and Operational Phases), such as: <ul style="list-style-type: none"> Bats (e.g. the loss of roosting, foraging and commuting habitats); Badgers (e.g. the loss of suitable breeding and foraging habitats); Otters (e.g. the loss of breeding, foraging, resting and commuting habitats); Breeding birds (e.g. the loss of breeding and foraging habitats); Wintering birds (e.g. the loss of foraging and resting habitats); Amphibians (e.g. the loss of breeding habitat); and Common lizard (e.g. the loss of breeding and resting habitats). Mortality risk to fauna species (e.g. birds and bats) due to vegetation clearance works (Construction Phase); Loss of rare or protected flora species (e.g. those protected under the Flora Protection Order, 2015) due to vegetation clearance works (Construction Phase); Increase in emissions to air, noise, vibration and human activity levels, which in turn could result in the disturbance to and/or displacement of fauna species present within the Zone of Influence (Zol) of the Proposed CBC (Construction and Operational Phases); Permanent introduction / increase in light levels, which in turn could result in the disturbance to and/or displacement of fauna species (particularly bats) present within the Zone of Influence (Zol) of the Proposed CBC (Operational Phase). 	
Water	
<ul style="list-style-type: none"> Contaminated and/or increased surface water runoff or discharges into local watercourses (Construction and Operational Phases); Disturbance to watercourse bed and banks from in stream works during construction of new or widened crossings (Construction Phase); Disrupting local drainage systems due to diversions required to accommodate the construction works (Construction Phase); Risk of construction works flooding, which may result in secondary impacts on water quality and hydromorphology (Construction Phase); Increased fluvial flooding from new infrastructure being located within the functional floodplain, and subsequent losses of flood storage (Operational Phase); Disturbance to watercourse bed and banks from new and widened crossings and any other in channel structures, potentially resulting in changes in flow dynamics and sediment transfer processes (Operational Phase); Decreased runoff pollutant load from traffic due to a decrease in private car usage and increase in public transport and usage of improved cycling routes (Operational Phase); Improved water quality as a result of new or upgraded drainage measures where there were previously no or inadequate measures present (Operational Phase). 	
Land, Soils, Geology & Hydrogeology	
<ul style="list-style-type: none"> Release of contamination from existing ground to the environment during excavation activities (Construction Phase); Change to water supply (Construction and Operational Phase); Pollution of groundwater and watercourses from accidental spillages (Construction and Operational Phases); Pollution of groundwater and watercourses from surface runoff (Construction and Operational Phases); Excavation of contaminated ground resulting in pollution of soils, geology and hydrogeology (Construction Phase); Excavation of earth resulting in loss of natural soils (Construction Phase); Disposal of earth resulting in an increase volume of earth sent to landfill (Construction Phase); Loss of aggregate resource and geological feature (Operational Phase). 	
Archaeological, Architectural & Cultural Heritage	
<ul style="list-style-type: none"> The demolition, removal or part removal of a heritage asset or incursion into the curtilage of a structure due to construction activities (Construction Phase); 	

Potential Impacts
<ul style="list-style-type: none"> • Ground disturbance and excavation, caused by construction or maintenance activities which may lead to the damage or destruction / removal of recorded or previously unknown (newly revealed) heritage assets (Construction and Operational Phases); • The degradation of the setting and amenity of a monument or the severance / fragmentation of interrelated features (Construction and Operational Phases); • Temporary or permanent removal of upstanding statues, plaques, monuments and elements of archaeological, architectural and cultural heritage sites (Construction Phase); • Visual impacts, vibration impacts or temporary impacts such as the presence of hoarding / fencing around historic monuments (Construction Phase); • Visual impacts could result in a change in the character of the receiving historic environment. This change may have a positive or negative affect on the heritage asset (Operational Phase); • Vibration impacts may increase (if buses are in close proximity to or over heritage structures or as result of increases in traffic on roads surrounding and adjoining the Proposed CBC) or decrease (as a result of a decrease in traffic along the Proposed CBC) (Operational Phase).
Landscape (Townscape) & Visual
<ul style="list-style-type: none"> • Streetscape disturbance and visual unfamiliarity arising from initial site establishment, including the provision of construction compounds, provision of hoarding, construction accesses, etc. (Construction Phase); • Impacts from general construction activity and associated traffic movements (Construction Phase); • Impacts from demolition works including removal of trees and vegetation (Construction Phase); • Impacts on property boundaries and gardens (Construction Phase); • Impacts from traffic diversions (Construction Phase); • Changes to the physical layout of the street / corridor / Urban Realm (Operational Phase); • Alteration of views / visual character of the streetscape/townscape (Operational Phase); • Changes to Urban Realm: lighting, footpaths, cycleways, street furniture, planting etc. (Operational Phase); and • Changes to traffic movements, profiles and characteristics (Operational Phase).
Waste & Resources
<p>Impacts from the generation and management of waste from the following sources:</p> <ul style="list-style-type: none"> • Waste arising where demolition is required (Construction Phase); • Excavated material arising from works to divert / move utilities and to facilitate road pavement reconstruction (Construction Phase); • Road re-surfacing (Construction Phase); • Construction of cycle tracks and pedestrian footpaths (Construction Phase); • Damage during handling or storage of construction materials (Construction Phase); • Office and canteen waste from construction compounds (Construction Phase); • Ongoing road maintenance (Operational Phase); and • Ongoing bus / bus stop maintenance (Operational Phase).
Material Assets
<ul style="list-style-type: none"> • Impacts as a result of utility diversions (Construction Phase); • Impacts associated with the importation of construction materials (Construction Phase); and • Impacts associated with new utility connections and the usage of those utilities by the Proposed CBC (Operational Phase).

7. Cumulative Impacts & Environmental Interactions

The EPA EIAR Guidelines (EPA 2017) define cumulative effects as:

'The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects'.

A relatively minor impact on a particular receptor caused by the Proposed CBC could be significant if it is added to other impacts from other nearby developments (cumulative impacts). Additionally, the Proposed CBC may have multiple different impacts on a single receptor which by themselves are not significant, but when all acting at the same time on that receptor the impact to that receptor may be deemed to be significant (environmental interactions).

7.1 Cumulative Impacts

Annex IV of the EIA Directive (2014/52/EU) sets out the information required for the EIAR. This includes, in accordance with Part 5 (e), a description of the likely significant effects resulting from:

'the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources'.

The EIAR will include a chapter which will assess the cumulative impact of the Proposed CBC with other proposed developments. The cumulative assessments will be carried out in accordance with relevant guidance

In order to identify any reasonably foreseeable major developments which have the potential to result in a cumulative impact with the Proposed CBC, consultation with the Local Authority Planning Departments will be undertaken and a number of planning resources will be referenced. These will include:

- Local Authority planning lists;
- Local Authority planning websites;
- An Bord Pleanála website;
- National Planning Application Database; and
- The EIA Portal maintained by the Department of Housing, Planning and Local Government.

7.2 Environmental Interactions

For each environmental topic there will be certain interactions or interdependencies with other environmental topics. An assessment of these interactions will be undertaken as required by Article 3 of the EIA Directive (2014/52/EU), which states the following:

'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

- (a) Population and human health;*
- (b) Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;*
- (c) Land, soil, water, air and climate;*
- (d) Material assets, cultural heritage and the landscape;*
- (e) **The interaction between the factors referred to in points (a) to (d).***

An assessment of the potential impact interactions will be undertaken as part of the EIAR with all potentially significant impact interactions highlighted and, where relevant, mitigation proposed. Impact interactions for the Proposed CBC will be assessed in accordance with relevant guidance.

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