Chapter 05
Construction

Contents

5. Construction

5.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) describes the construction activities associated with the Lucan to City Centre Core Bus Corridor Scheme, hereafter referred to as the Proposed Scheme.

The design of the Proposed Scheme has been developed to a stage where all potential environmental impacts can be identified, and a fully informed environmental impact assessment can be carried out.

The National Transport Authority (NTA) (the Employer for the construction works) shall set out the Employer's Requirements in the Construction Contract including all applicable mitigation measures identified in this EIAR, as well as additional measures required pursuant to conditions attached to any decision to grant approval. Procurement of the contractor will involve the determination that the appointed contractor is competent to carry out the works, including the effective implementation of the mitigation measures. The appointed contractor will be required to plan and construct the Proposed Scheme construction works in accordance with the Employer's Requirements, and the NTA will employ an Employer's Representative team with appropriate competence to administer and monitor the Construction Contract for compliance with the Employer's Requirements.

In order to allow an assessment of the Construction Phase impacts associated with the Proposed Scheme, this Chapter describes the construction phasing and programme as well as the construction activities necessary to undertake the works, including information on the Construction Compounds, construction plant and equipment.

This Chapter includes the following information:

- An overview of how the Proposed Scheme has been divided into sections is presented in Section 5.2;
- An overview of the construction activities proposed at each section along the Proposed Scheme (i.e. a description of what is proposed to be constructed) is presented in Section 5.3;
- A programme for the Proposed Scheme (i.e. when the sections will be constructed) is presented in Section 5.4;
- A general description of the construction methodology to be carried out at each section (i.e. how the Proposed Scheme will be built) is presented in Section 5.5;
- Information on the plant and equipment (i.e. what machinery will be used to construct the Proposed Scheme) is presented in Section 5.6;
- Information on the Construction Compounds is presented in Section 5.7;
- The temporary traffic management measures, including the staging measures to be carried out (i.e. how the vehicles, cyclists and pedestrians will be impacted and safely catered for, during the works) are presented in Section 5.8; and
- Infrastructure projects and developments which are expected to interface with the construction of the Proposed Scheme are referenced in Section 5.9.

Details of mitigation measures proposed to address potential impacts arising from construction activities are described in Chapter 6 to Chapter 21 as appropriate and are summarised in Chapter 22 (Summary of Mitigation & Monitoring Measures) of this EIAR.

A Construction Environmental Management Plan (CEMP) has also been prepared and is included as Appendix A5.1 in Volume 4 of this EIAR. The CEMP will be updated by the NTA prior to the commencement of the Construction Phase, so as to include any additional measures required pursuant to conditions attached to any decision to grant approval. The CEMP has regard to the guidance contained in the Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA) Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (TII 2007), and the handbook published by Construction Industry Research and Information Association (CIRIA) in the United Kingdom, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

All of the measures set out in the CEMP appended to this EIAR will be implemented in full.

5.2 Construction Phasing

The Proposed Scheme has been divided into three primary sections. These sections have been further subdivided into 13 sub-sections, according to the types of construction works required. The sections / sub-sections are:

- **Section 1:** N4 Junction 3 to M50 Junction 7:
  - **Section 1a:** Ballyowen Road;
  - **Section 1b:** Lucan Road;
  - **Section 1c:** Hermitage Road, Hermitage Park;
  - **Section 1d:** N4 Junction 3 to N4 Junction 2;
  - **Section 1e:** Old Lucan Road (West of the M50); and
  - **Section 1f:** N4 Junction 2 to M50 Junction 7.
- **Section 2:** M50 Junction 7 to Con Colbert Road:
  - **Section 2a:** Old Lucan Road (East of the M50) and Kennelsfort Road Lower;
  - **Section 2b:** Palmerstown Bypass; and
  - **Section 2c:** Chapelizod Bypass, Chapelizod Hill Road Bridge.
- **Section 3:** Con Colbert Road to City Centre:
  - **Section 3a:** Con Colbert Road;
  - **Section 3b:** Con Colbert Road, South Circular Road Junction;
  - **Section 3c:** St. Johns Road West (excluding Heuston Station); and
  - **Section 3d:** St. Johns Road West (including Heuston Station).

The location of each section / sub-section along the Proposed Scheme is shown in Figure 5.1 in Volume 3 of this EIAR. The construction activities to be carried out at each section / sub-section are described in Section 5.3.

5.3 Overview of Construction Works

The construction activities to be undertaken, and the anticipated duration of the works, in each section / sub-section are described in Section 5.3.1 to Section 5.3.3. The location of each section / sub-section along the Proposed Scheme is shown in Figure 5.1 in Volume 3 of this EIAR. This Section should be read in conjunction with the drawings listed in Table 5.1. These drawings are contained in Volume 3 of this EIAR.

Table 5.1: List of Relevant Drawings

Drawing Series Number	Description
BCIDA-ACM-SPW_ZZ-0006_XX_00-DR-CR-9001	Site Location Plan
BCIDA-ACM-GEO_GA-0006_XX_00-DR-CR-9001	General Arrangement
BCIDA-ACM-GEO_HV-0006_ML_00-DR-CR-9001	Mainline Plan and Profile
BCIDA-ACM-GEO_CS-0006_XX_00-DR-CR-9001	Typical Cross Sections
BCIDA-ACM-UBR_ZZ-0006_XX_00-DR-LL-9001	Landscaping General Arrangement
BCIDA-ACM-PAV_PV-0006_XX_00-DR-CR-9001	Pavement Treatment Plans
BCIDA-ACM-SPW_BW-0006_XX_00-DR-CR-9001	Fencing and Boundary Treatment
BCIDA-ACM-TSM_GA-0006_XX_00-DR-CR-9001	Traffic Signs and Road Markings
BCIDA-ACM-LHT_RL-0006_XX_00-DR-EO-9001	Street Lighting
BCIDA-ACM-TSM_SJ-0006_XX_00-DR-TR-9001	Junction System Design
BCIDA-ACM-STR_GA-0006_XX_00-DR-CB-9001	Bridges and Retaining Structures
BCIDA-ACM-DNG_RD-0006_XX_00-DR-CD-9001	Proposed Surface Water Drainage Works
BCIDA-ACM-UTL_UD-0006_XX_00-DR-CU-9001	IW Foul Sewer Asset Alterations
BCIDA-ACM-UTL_UE-0006_XX_00-DR-CU-9001	ESB Asset Alterations
BCIDA-ACM-UTL_UG-0006_XX_00-DR-CU-9001	GNI Asset Alterations

Drawing Series Number	Description
BCIDA-ACM-UTL_UW-0006_XX_00-DR-CU-9001	IW Water Asset Alterations
BCIDA-ACM-UTL_UL-0006_XX_00-DR-CU-9001	Telecommunications Asset Alterations
BCIDA-ACM-UTL_UC-0006_XX_00-DR-CU-9001	Combined Existing Utility Records

Further details on the design specifications, with regards to matters such as parking and loading bay widths, signalised junctions, priority junctions, roundabouts, bus stops, accessibility, traffic signals, lighting, utilities, drainage, pavement, and landscape design, please refer to the Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors, contained in Appendix A4.1 in Volume 4 of this EIAR.

5.3.1 Section 1: N4 Junction 3 to M50 Junction 7

5.3.1.1 Section 1a: Ballyowen Road

Section 1a encompasses a length of approximately 400m (metres) along Ballyowen Road, between Hermitage Road and Lucan Road. The construction activities at Section 1a will comprise widening, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture (rubbish bins, seats, lighting, benches, planters, bollards, cycle racks, bus stops (including shelters and information displays etc.)). The Ballydowd Pedestrian and Cycle Bridge (Structure Reference: 03) will be constructed over the N4, along the east side of Ballyowen Road, and will replace the existing pedestrian bridge. Further information on the Ballydowd Pedestrian and Cycle Bridge (Structure Reference: 03) construction methodology is provided in Section 5.5.4.1.3. A minor retaining wall will be constructed along the eastern side of Ballyowen Road, adjacent to the Ballydowd Pedestrian and Cycle Bridge (Structure Reference: 03). A small section of trees and scrub will be removed along the ascent to the overbridge. The expected construction duration will be approximately six months.

5.3.1.2 Section 1b: Lucan Road

Section 1b encompasses a length of approximately 250m along Lucan Road, between Ballyowen Road and N4 Junction 2 roundabout. The construction activities at Section 1b will comprise widening, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture and landscaping works. A piled boundary wall will be constructed along the northern verge of Lucan Road. A bike maintenance kiosk, and bike lockers will be relocated along Lucan Road. Various utility diversions and / or protections will be required; including water distribution and telecommunications infrastructure. Trees and vegetation will be removed along the northern verge of Lucan Road. The expected construction duration will be approximately three months.

5.3.1.3 Section 1c: Hermitage Road, Hermitage Park

Section 1c encompasses a length of approximately 600m along Hermitage Road and Hermitage Park, between Ballyowen Road and Ballyowen Lane. The construction activities at Section 1c will comprise quiet street treatment, consisting of new road markings, and the construction of a short length of new pedestrian / cyclist link from Ballyowen Lane to Hermitage Road. The existing walls at the entrance to Hermitage Park (from Hermitage Road and Ballyowen Lane) will be adjusted to accommodate the pedestrian / cyclist connections. The expected construction duration will be approximately one month.

5.3.1.4 Section 1d: N4 Junction 3 to N4 Junction 2

Section 1d encompasses a length of approximately 1,400m along N4 (Lucan Road), between N4 Junction 3 (Lucan Bypass), and N4 Junction 2 (Liffey Valley Interchange), including a section of the local road providing access to agricultural land and Hermitage Golf Club.

The construction activities at Section 1d along N4 will comprise widening, reconstruction, and resurfacing of the slip roads, footpaths and cycle tracks and new kerbs. Construction activities will also consist of new road markings, new street furniture and landscaping works. An existing footbridge over N4, connecting Mount Andrew and the Citybound bus stop on N4 will be maintained. Two major retaining walls (RW01 and RW05) will be constructed.

At Hermitage Golf Club the boundary wall will be demolished, relocated and reconstructed, incorporating a new retaining structure (RW01). Sports netting approximately 15m in height will be provided behind this retaining wall. Trees along the Hermitage Golf Club boundary will be removed and replaced. The construction activities along the local road providing access to Hermitage Golf Club will comprise quiet street treatment, including road markings and ramped pedestrian / cyclist crossing points at each end. The existing entrance gates and barrier to the Hermitage Golf Club will be unaffected by the proposed works. Further information on the construction methodology at Hermitage Golf Club is provided in Section 5.5.4.3.

At the Hermitage Medical Clinic, a new retaining structure (RW05) will be constructed. A minor blockwork gravity retaining wall will be constructed along the N4 westbound slip road. A fence will also be constructed along a stub wall on the southern side of N4. An existing masonry boundary wall will be reinstated and relocated along the northern verge of N4, between Hermitage Golf Club and N4. One overhead sign gantry (GY01) will be relocated will be replaced over the N4. Various utility diversions and / or protections will be required; including electricity overhead lines and underground cables and telecommunications infrastructure. Trees and vegetation will be removed and replaced at a number of locations along the N4 in this section.

The appointed contractor will liaise with the Hermitage Clinic in advance of the commencement of construction works to inform them of the proposed construction management arrangements. Refer to Chapter 7 (Air Quality) for more information on the dust mitigation measures which will be implemented by the appointed contractor. The expected construction duration will be approximately 18 months.

5.3.1.5 Section 1e: Old Lucan Road (West of the M50)

Section 1e encompasses a length of approximately 750m along Old Lucan Road, between N4 Junction 2 (Fonthill Road) roundabout and King's Hospital School. The construction activities at Section 1e will comprise widening, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture and landscaping works. The Construction Compounds (LU1a and LU1b) will be located at Section 1e with access / egress from Old Lucan Road (these compounds will be required for the majority of the 24 month period of Section 1). Various utility diversions and / or protections will be required; including water distribution and telecommunications infrastructure. Trees and vegetation will be removed and replaced at multiple locations along Old Lucan Road. The expected construction duration will be approximately three months.

5.3.1.6 Section 1f: N4 Junction 2 to M50 Junction 7

Section 1f encompasses a length of approximately 2,000m along N4 (Lucan Road), between N4 Junction 2 (Liffey Valley Interchange) and M50 Junction 7, including the slip roads at N4 Junction 2, and M50 Junction 7. The construction activities at Section 1f will comprise widening, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new street furniture and landscaping works. The Liffey Valley Pedestrian Bridge (Structure Reference: 01) will be constructed over the N4 to connect the new bus stops on N4 and Liffey Valley Bus Interchange. Further information on the Liffey Valley Pedestrian Bridge (Structure Reference: 01) construction methodology is provided in Section 5.5.4.1.1. As part of the structural works, a new ramp and steps will be constructed on either side of the Liffey Valley Pedestrian Bridge, incorporating a retaining wall (RW02) on the south side of the Liffey Valley Pedestrian Bridge (Structure Reference: 01). Sign faces on three existing overhead sign gantries will be replaced, and one new overhead sign gantry (GY02) will be constructed over the N4. The existing pedestrian and cyclist bridge over N4 connecting Liffey Valley Shopping Centre with Old Lucan Road will be maintained. The existing bridge and stairs on the north side of the footbridge will be maintained, however the ramp on the south side of the footbridge serving the existing bus stop will be removed. Various utility diversions and / or protections will be required; including foul water infrastructure and telecommunications infrastructure. The expected construction duration will be approximately 12 months.

5.3.2 Section 2: M50 Junction 7 to Con Colbert Road

5.3.2.1 Section 2a: Old Lucan Road (East of the M50) and Kennelsfort Road Lower

Section 2a encompasses a length of approximately 1,100m along Old Lucan Road, between M50 and the junction of the Oval with Palmerstown Bypass, including a section of Kennelsfort Road Lower. The construction activities at Section 2a will comprise widening and narrowing of discrete sections, reconstruction, and resurfacing of the roads, parking spaces, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure and new street furniture and. An existing pedestrian / cyclist bridge over M50 connecting Old Lucan Road either side of the M50 will be maintained. One boundary wall on the east side of Kennelsfort Road Lower will be reconstructed. Various utility diversions and / or protections will be required; including electricity underground cables and telecommunications infrastructure. The expected construction duration will be approximately nine months.

5.3.2.2 Section 2b: Palmerstown Bypass

Section 2b encompasses a length of approximately 500m along Palmerstown Bypass, and Chapelizod Bypass, between N4 Junction 1 (M50) and the start of the Chapelizod Bypass. The construction activities will comprise widening, reconstruction, and resurfacing of discrete sections of the roads, bus stops, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture and landscaping works. Sign faces on two existing overhead sign gantries will be replaced over Palmerstown Bypass. An existing footbridge over Palmerstown Bypass connecting Kennelsfort Road Upper and Kennelsfort Road Lower will be maintained. A fence / railing along Palmerstown Bypass will be relocated along a new line. The Construction Compound (LU2) will be located at Section 2b, with access / egress from Palmerstown Bypass (note that the Construction Compound is for all of Section 2 and could be in use for 12-18 months). Various utility diversions and / or protections will be required; including electricity underground cables, gas mains and telecommunications infrastructure. Trees and vegetation will be removed at discrete locations along Palmerstown Bypass and Chapelizod Bypass. The expected construction duration will be approximately three months.

5.3.2.3 Section 2c: Chapelizod Bypass, Chapelizod Hill Road Bridge

Section 2c is located on the Chapelizod Bypass, with works concentrated at the Chapelizod Hill Road Bridge, including a section of Chapelizod Hill Road. The existing Chapelizod Bypass and existing Chapelizod Hill Road Bridge will be widened to facilitate bus stop laybys on either side of Chapelizod Bypass at this location. As part of the structural works, a new pedestrian ramp and stair access will be constructed on each side of the Chapelizod Hill Road Bridge, incorporating two retaining walls (RW03 and RW04). Further information on the Chapelizod Hill Road Bridge Widening (Structure Reference: 02) construction methodology is provided in Section 5.5.4.1.2.

The construction activities at Section 2c along Chapelizod Hill Road will comprise reconstruction, resurfacing of the roads, footpaths, and cycle tracks, new kerbs, new road markings, new street furniture and landscaping works. Boundary walls (with railings) will be replaced along Chapelizod Hill Road either side of Chapelizod Hill Road Underbridge and finished to match the detailing of village improvement scheme in Chapelizod Village Centre. Noise walls along the northern side of Chapelizod Bypass at the Chapelizod Hill Road Underbridge will be replaced where necessary. Trees and vegetation on both sides of the Chapelizod Bypass, in the areas under the proposed ramps and steps will be removed. Utility (foul water infrastructure) diversions and / or protections will be required. The expected construction duration will be approximately six months.

The construction works on the rest of the Chapelizod Bypass will be limited to the installation of new road signage and road markings.

5.3.3 Section 3: Con Colbert Road to City Centre

5.3.3.1 Section 3a: Con Colbert Road

Section 3a encompasses a length of approximately 1,000m along Con Colbert Road, between Chapelizod Bypass and South Circular Road. The construction activities at Section 3a will comprise widening and narrowing of discrete sections, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs.

Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture and landscaping works. The Construction Compound (LU3) will be located at Section 3a, with access / egress from Con Colbert Road (note that the Construction Compound is for all of Section 2 and could be in use for 12 months to 18 months). It is intended that this area will also be used as a Construction Compound on the Liffey Valley to City Centre Core Bus Corridor Scheme (Construction Compound LV3), pursuant to conditions imposed by An Bord Pleanála, should they grant approval. It is envisaged that the Construction Phases of the Proposed Scheme, and the Liffey Valley to City Centre Scheme will not overlap. Depending on the respective timing of the proposed schemes, the area may continue to be used uninterrupted as a Construction Compound if the second scheme commences construction within a relatively short period of time after the first scheme finishing construction. Alternatively, in the eventuality that there is likely to be a substantial time period (e.g. greater than one year) between the Construction Phases of the two schemes, the NTA in discussion with the Local Authority will identify the most appropriate interim use of the area. When the area has ceased to be used as a Construction Compound it will be returned to its original condition by the appointed contractor for the second scheme. Trees will be removed and replanted along the central median. The expected construction duration will be approximately six months.

5.3.3.2 Section 3b: Con Colbert Road, South Circular Road Junction

Section 3b is located at the Con Colbert Road, South Circular Road, St. John's Road West Junction. The construction activities at Section 3b will comprise widening and narrowing of discrete sections, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture and landscaping works. Various utility diversions and / or protections will be required; including electricity underground cables and water distribution infrastructure. Trees and vegetation will be removed and replanted at this junction. The expected construction duration will be approximately six months.

5.3.3.3 Section 3c: St. John's Road West (excluding Heuston Station)

Section 3c encompasses a length of approximately 1,000m along St. John's Road West, between South Circular Road and Military Road, excluding Heuston Station. The construction activities at Section 3c will comprise widening and narrowing of discrete sections, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture and landscaping works. A vehicle restraint system (VRS) barrier will be relocated along St. John's Road West. The existing wall, steps and planters to the front of the Eir building on the south side St. Johns Road West will be reconfigured to provide a new footway and cycle track. Trees will be removed at the southern boundary of St. John's Road West, and trees will be replanted along the length of Section 3c. The expected construction duration will be approximately six months.

5.3.3.4 Section 3d: St. Johns Road West (including Heuston Station)

Section 3d encompasses a length of approximately 150m along St. John's Road West, between Military Road and River Liffey, including the section of the road that passes Heuston Station. The construction activities at Section 3d will comprise widening and narrowing of discrete sections, reconstruction, and resurfacing of the roads, footpaths, and cycle tracks, and new kerbs. Construction activities will also consist of new road markings, new and amended traffic signal infrastructure, new street furniture and landscaping works. New outbound bus stops are to be constructed in front of Dr Steevens' Hospital opposite the south façade of Heuston Station. This will include new carriageway construction and landscaping works. Minor reductions will be made to the height of the existing wall to the rear of the southbound platform of the Heuston Station Luas Stop. Various utility diversions and / or protections will be required; including electricity underground cables, water distribution and telecommunications infrastructure. Trees will be removed and replanted along Section 3d. The expected construction duration will be approximately six months.

5.4 Construction Programme

A programme for the Proposed Scheme is provided in Table 5.2. The total Construction Phase duration for the overall Proposed Scheme is estimated at approximately 24 months. However, construction activities in individual sections will have shorter durations as outlined in Section 5.3. The programme identifies the approximate duration

of works at each section. The location of each section / sub-section along the Proposed Scheme is shown in Figure 5.1 in Volume 3 of this EIAR.

Table 5.2: Proposed Scheme Construction Programme

Section Ref.	Approximate Construction Duration	Approximate Length (m)	Year 1				Year 2			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Section 1a	6 months	400								
Section 1b	3 months	250								
Section 1c	1 month	600								
Section 1d	18 months	1,400								
Section 1e	3 months	750								
Section 1f	12 months	2,000								
Section 2a	9 months	1,100								
Section 2b	3 months	500								
Section 2c	6 months	Structure								
Section 3a	6 months	1,000								
Section 3b	6 months	Junction								
Section 3c	6 months	1,000								
Section 3d	6 months	150								

In order to achieve the overall programme duration, it will for the most part, be necessary to work on more than one section / sub-section at any one time. The programme has been prepared with a view to providing as much separation as practicable between sections under construction at any given time. This has been done in order to minimise traffic disruption and facilitate the ease of movement of sustainable modes, bus services and goods along the Proposed Scheme.

5.5 Construction Methodology

This Section provides an outline of how each element of the Proposed Scheme infrastructure will be constructed. It should be read in conjunction with the phasing set out in Section 5.3 and Section 5.4, and also with the traffic management stages set out in Section 5.8.

5.5.1 Pre-Construction

The NTA will prepare the Construction Contract documents, which will include all applicable mitigation measures identified in this EIAR, as well as any additional measures required in any conditions attached to any decision by An Bord Pleanála, should they grant approval.

The preparations will also include the need for additional investigative survey works (such as ground investigation and slit trenching to confirm the location of existing utilities) to supplement the information in the Construction Contract documents. Any such additional investigative survey works that could be deemed to be construction activities will follow the requirements of the CEMP, where necessary.

The NTA will also serve notices on impacted landowners in accordance with the requirements of the Compulsory Purchase Order (CPO) process to ensure necessary lands are available for the construction works.

5.5.2 Preparatory and Site Clearance Works

Additional preparations will be required prior to commencing the road and street upgrade works, to confirm the construction methodology, such as additional investigative survey works (such as confirmatory invasive species surveys, ground investigation and slit trenching to confirm the location of existing utilities).

There will be elements of preparatory works, including establishing the Construction Compounds, the installation of fencing and signage, vegetation clearance and treatment of non-native invasive species, demolition works (e.g. such as boundary walls) etc. required in preparation for the main construction activities.

5.5.2.1 Land Acquisition and Boundary Treatment

Condition surveys of properties adjacent to the Proposed Scheme that the works have the potential to affect will be undertaken prior to works commencing. Liaison with impacted landowners will be carried out in advance of commencement of boundary works to properties.

Boundary works will be commenced where both permanent and temporary land acquisition is required to ensure that sufficient space is available to construct the Proposed Scheme. Boundary treatments will be carried out on a section-by-section basis (with sections / sub-sections defined in Section 2, and in line with the traffic management stages set out in Section 5.8.3.

This will be a mixture of boundary walls / fencing along industrial / commercial land, railings along parks and temporary boundaries, as required. Any land temporarily acquired from a landowner will only be utilised for the purposes of undertaking boundary works or accommodation works related to the land in question.

Any lands acquired temporarily to facilitate construction work will be returned to landowners on completion of the works. Existing boundary walls or fencing being relocated will be constructed to match the existing conditions, unless otherwise agreed. The removal of trees, vegetation, lawns, paving etc. will be minimised in so far as practicable.

5.5.2.2 Fencing

Fencing will be erected on a section-by-section basis (with sections / sub-sections defined in Section 2, and in line with the traffic management stages set out in Section 5.8.3.

5.5.2.3 Construction Traffic Management Measures and Signage

Prior to commencing the construction works described below within a sub-section of the Proposed Scheme, temporary traffic management measures will be installed. The temporary traffic management measures, including measures for pedestrians, cyclists, public transport users, general traffic, proposed lane closures, road closures and diversions are discussed in detail in Section 5.8. Temporary traffic management signage will be put in place in accordance with the requirements of the Department of Transport's Traffic Signs Manual, Chapter 8, Temporary Traffic Measures and Signs for Roadworks (hereafter referred to as the Traffic Signs Manual) (Department of Transport, Tourism and Sport 2019). Further information is also provided in the Construction Traffic Management Plan (CTMP) in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.2.4 Tree Protection

Trees to be retained within and adjoining the works areas will be suitably protected as necessary as per the British Standards Institution (BSI) British Standard (BS) 5837:2012 Trees in Relation to Design, Demolition, and Construction (BSI 2012). Trees identified for removal will be removed in accordance with BS 3998:2010 Tree Work. Recommendations (BSI 2010). The location of trees to be retained, and trees to be removed is shown on the Landscaping General Arrangement Drawings (BCIDA-ACM-UBR_ZZ-0006_XX_00-DR-LL-9001).

A suitably qualified arborist will be appointed by the contractor to monitor tree protection, and tree removal related activities. The design has been developed to ensure removal of trees has been minimised in so far as practicable. Where necessary, protective fencing will be erected, and mitigation measures will be put in place, prior to construction works commencing in the immediate vicinity.

Works required within the root protection area of trees to be retained will follow the arboricultural methodology included in Appendix A17.1 Arboricultural Impact Assessment in Volume 4 of this EIAR. Further information on mitigation measures with regards to the removal, and protection of trees is provided in Chapter 12 (Biodiversity) and further information on the assessment of tree removal with regards to landscape and visual impact is provided in Chapter 17 (Landscape (Townscape) & Visual) of this EIAR.

5.5.2.5 Vegetation Clearance and Treatment of Non-Native Invasive Species

Vegetation (e.g. hedgerows, scrub, grassland) clearance and treatment of non-native invasive species (e.g. Japanese knotweed, Himalayan balsam, Giant hogweed) will be undertaken within the Proposed Scheme boundary, where necessary.

A suitably qualified specialist will be appointed by the contractor to monitor vegetation clearance, and treatment of non-native invasive species. Prior to construction, the NTA will ensure that confirmatory invasive species surveys will be undertaken by the specialist to re-confirm the presence and / or extent of species within the footprint of the Proposed Scheme. Further information with regards to pre-construction ecological surveys and restrictions are provided in Chapter 12 (Biodiversity) of this EIAR. Vegetation identified for removal will be removed in accordance with BS 3998:2010 Tree Work. Recommendations (BSI 2010) and best arboricultural practices as detailed and monitored by the specialist. The Invasive Species Management Plan (ISMP) for the control of invasive plant species on the Proposed Scheme is included in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.2.6 Archaeological Investigations

The NTA will procure the services of a suitably qualified archaeologist as part of its Employer's Representative team administering and monitoring the works. In addition, a suitably qualified archaeologist will be appointed by the contractor to monitor archaeological and cultural heritage matters during construction, to acquire any licenses / consents required to conduct the work, and to supervise and direct the archaeological measures associated with the Proposed Scheme in accordance with the Employer's Requirements. In the event of archaeological features or material being uncovered during the Construction Phase, all machine work will cease in the immediate area to allow the archaeologist time to inspect and record any such material. Further information on archaeological management is included in Section 15.5 in Chapter 15 (Archaeological & Cultural Heritage) of this EIAR.

5.5.2.7 Ground Investigations

Prior to construction, localised confirmatory ground investigation will be undertaken where necessary by the appointed contractor.

Information on the specific ground investigations conducted along the Proposed Scheme have been outlined in Chapter 14 (Land, Soils, Geology & Hydrogeology) of this EIAR.

5.5.2.8 Construction Compounds

As part of preparatory works, the Construction Compounds will be set up which will include installation of the necessary facilities including the site office, welfare facilities, etc. Controlled access to the Construction Compounds will be implemented, fencing will be erected, and lighting will be installed. The Construction Compounds will be secured with Closed-Circuit Television (CCTV), where necessary, to ensure safe storage of all material, plant and equipment. Temporary fencing will be erected, and site security will be employed. Further information on the Construction Compounds is included in Section 5.7.

5.5.2.9 Lighting

The majority of the Proposed Scheme is already artificially lit. However temporary lighting will be required at times along the Proposed Scheme at certain locations during the Construction Phase, as necessary. Where it is necessary to disconnect public lighting during the construction works or to undertake works outside of daylight hours where existing lighting is low, appropriate temporary lighting will be provided. Temporary lighting will also be installed at the Construction Compounds for the duration of the Construction Phase.

The standard of temporary lighting installed during the Construction Phase will meet the standard of the existing carriageway and will be appropriate to the speed and volume of traffic during construction. Temporary construction lighting will generally be provided by tower mounted floodlights, which will be cowled and angled downwards to minimise spillage of light from the site.

New permanent lighting and upgrades to the existing lighting infrastructure are also proposed as part of the Proposed Scheme's lighting strategy, the details of which are addressed in Section 4.6 (Key Infrastructure Elements) in Chapter 4 (Proposed Scheme Description) of this EIAR.

5.5.2.10 Demolition

In some locations along the Proposed Scheme, items, such as walls, gates, fencing, lighting poles, bus stops, etc. will need to be removed or demolished. The impacts of materials arising from the Proposed Scheme demolitions are assessed in Chapter 18 (Waste & Resources) of this EIAR. Measures for managing demolition materials are included in the Construction Demolition Resource Waste Management Plan (CDRWMP) in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.3 Road and Street Upgrades

5.5.3.1 General

The Proposed Scheme will be constructed in a manner which will minimise, as much as practicable, any disturbance to residents, businesses and road users. Road and street upgrade works will be completed in a staged manner, as described in Section 5.8.3, whereby traffic of all modes will be managed to ensure construction can continue while ensuring the safety of all road users, and personnel, and maintaining flow of all modes of traffic wherever practicable.

5.5.3.2 Parking and Access

When roads and streets are being upgraded, there will be some temporary disruption / alterations to on-street and off-street parking provision, and access to premises in certain locations along the Proposed Scheme. Local arrangements will be made on a case-by-case basis to maintain continued access to homes and businesses affected by the works, at all times, where practicable. Details regarding temporary access provisions will be discussed with residents and business owners prior to construction starting in the area. The duration of the works will vary from property to property, but access and egress will be maintained at all times. The location of temporary land acquisition, proposed gates, and the relocation of existing gates are shown in the Fencing and Boundary Treatment Drawings (BCIDA-ACM-SPW_BW-0006_XX_00-DR-CR-9001) in Volume 3 of this EIAR.

Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

5.5.3.3 Earthworks

Topsoil and subsoil will be excavated as part of the Proposed Scheme; for foundations, bus stop shelters, signs, public lights, traffic signal poles, tree pits, etc. This topsoil and subsoil may be temporarily stored at the Construction Compounds for reuse where practicable, in line with the principles of circular economy. The Proposed Scheme will aim to minimise the amount of materials brought onto the Proposed Scheme in so far as practicable. The acceptability of earthworks material for reuse will be determined, by testing and analysis, to determine if materials meet the specific engineering standards for their proposed end-use.

All earthworks will be managed having regard to the Guidelines for the Management of Waste from National Road Construction Projects (TII 2017), and Number 10 of 1996 Waste Management Act, 1996, as amended (hereafter referred to as the Waste Management Act). The management of materials is discussed in Chapter 18 (Waste & Resources) of this EIAR. The overall estimated quantities of demolition, excavation, and reuse materials for the Proposed Scheme are outlined respectively in Table 18.8, Table 18.9, and Table 18.13 in Chapter 18 (Waste & Resources) of this EIAR. The overall estimated quantities of imported materials for the Proposed Scheme are outlined in Table 19.10 in Chapter 19 (Material Assets) of this EIAR.

5.5.3.4 Cellars

Excavations within the City Centre will be minimal, thereby reducing the risk of interference with existing cellars along the Proposed Scheme. At certain locations, cellars extend outwards from buildings into adjoining footpaths or streets. Cellars, coal holes and light wells have been identified at Section 3d. Building condition surveys will be

completed immediately prior to any works. However, it is not anticipated that proposed works will impact directly on any cellars.

5.5.3.5 Drainage

Adjustment or upgrade works will be required to service chambers and manholes, gullies, etc. Access manholes located in the footways will be lowered or raised to match the proposed carriageway levels, where the carriageway will be widened into the existing footways.

Specific controls and mitigation measures will be put in place to manage runoff and minimise pollution to receiving water bodies during the Construction Phase of the Proposed Scheme. Further information with regards to drainage, and drainage design is included in Chapter 4 (Proposed Scheme Description), Chapter 13 (Water), Chapter 19 (Material Assets) and the Surface Water Management Plan (SWMP) in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.5.3.6 Utility Works

Realignment, upgrade or replacement of utilities and services will be required in conjunction with, or to accommodate the Proposed Scheme. Any such works to utilities and services will be along or immediately adjacent to the Proposed Scheme. A list of utility and service works along the Proposed Scheme is provided in Chapter 19 (Material Assets) of this EIAR.

Utilities and services, including overhead and underground, comprise amongst others:

- Watermains;
- Storm water and foul sewers;
- Electricity ducts and cabling;
- Gas mains;
- Telecommunications and TV ducting and cabling; and
- Traffic signalling ducting and cabling.

The existing overhead utilities and services will be located and recorded prior to the commencement of works. Any relocation of existing overhead lines will be coordinated to ensure interruption to the existing network is minimised.

Proposed utility works are based on available records, and preliminary site investigations. Prior to excavation works being commenced, localised confirmatory surveys will be undertaken by the appointed contractor to verify the results of the pre-construction assessments undertaken and reported in this EIAR.

Areas to be excavated for utility trenches will first be traced for live services using established scanning techniques. Where necessary, trenches excavated for utility diversions will be supported to ensure that the sides of the excavation are secure. Each of the different utilities will be re-laid at a location, depth and spacing in agreement with the appropriate standards, and the trench then backfilled.

5.5.3.7 Pavement and Carriageway Works

This Section describes the pavement and carriageway works to be completed along the Proposed Scheme, including construction, or alterations to the carriageway, kerbs, parking and loading bays, footpaths, cycle tracks (cycle paths, cycle tracks, cycle lanes), bus stops (island, shared landing area, inline, layby), etc. The following options outline the pavement construction / reconstruction scenarios required along the Proposed Scheme:

- Where the existing road surfacing is showing signs of deterioration, the existing pavement will be replaced (i.e. road pavement and surfacing will be removed and replaced to similar levels as existing);
- Where the quality of the existing road pavement is poor or where the existing road will be widened, full depth road foundation and pavement reconstruction will be carried out; and

- In some instances, road overlay (i.e. the addition of new pavement / road surfacing material), with no excavation, will be provided.

The proposed pavement treatment along the Proposed Scheme is provided in the Pavement Treatment Plans (BCIDA-ACM-PAV_PV-0006_XX_00-DR-CR-9001) in Volume 3 of this EIAR.

Existing asphalt / bituminous layers will be removed using road planers, with planings being recycled where possible, as is common practice. Following this, existing lower courses of road make-up or ground will be excavated in layers using mechanical excavators in order to segregate materials for reuse, recycling or disposal, as appropriate, with materials being transported using lorries. The new or rehabilitated pavement will then be constructed from formation level, in coordination with the installation of street furniture assets. Plant used in construction of the new road make-up will be excavators, rollers, dumpers, and lorries. Road markings and reflective road studs will also be installed.

The choice of materials will include unbound or hydraulically bound granular materials for the foundation, hydraulically bound materials, hot or cold bituminous mixtures for base and binder layers and natural stone or concrete paving units, bituminous mixtures or concrete materials for the surface. Specialist products such as high friction surfacing treatments will also be applied to the surface of the pavement where appropriate.

5.5.3.8 Traffic Signal Junctions

During the works, the existing traffic signals will remain in operation, supplemented as necessary by temporary traffic signals, until such time as the new signals become operational.

The existing signalised junctions along the Proposed Scheme will be upgraded to provide bus priority, enhanced pedestrian crossings and segregated cycling facilities. In general, traffic signals will be replaced, and additional dedicated signals will be provided for buses, cyclists and pedestrians. Underground works will be required to provide additional ducts for traffic signal electrical and telecommunication cables, as described in Section 5.5.3.6, with associated chambers and control boxes above ground. Additional traffic monitoring equipment will be provided, including CCTV cameras and other detectors.

5.5.3.9 Ancillary Road Furnishings

Street furniture such as rubbish bins, signage, seats, lighting, benches, planters, bollards, cycle racks and bus stops (including shelters and information displays etc.) will be installed.

5.5.3.10 Landscaping

Where vegetation, grassed areas and hedgerows are disturbed during the works, these will be reinstated, and replaced, where practicable. New trees will be planted in suitable tree pits, where necessary, at various locations as shown in the Landscaping General Arrangement Drawings (BCIDA-ACM-UBR_ZZ-0006_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

5.5.4 Structural Works

5.5.4.1 Principal Structures

The principal structural works which form part of the Proposed Scheme are summarised in Table 5.3. Further details are provided in Section 5.5.4.1.1 to Section 5.5.4.1.4. Further information on the structures along the Proposed Scheme is provided in the Bridges and Retaining Structures Drawings (BCIDA-ACM-STR_GA-0006_XX_00-DR-CB-9001) in Volume 3 of this EIAR.

Table 5.3: Principal Structures

Structure Name	Structure Reference	Section Reference
Liffey Valley Pedestrian Bridge	01	Section 1f
Chapelizod Hill Road Bridge Widening	02	Section 2c
Ballydowd Pedestrian and Cycle Bridge	03	Section 1a

Structure Name	Structure Reference	Section Reference
Retaining Walls	RW01	Section 1d
	RW02	Section 1f
	RW03	Section 2c
	RW04	Section 2c
	RW05	Section 1d

5.5.4.1.1 Liffey Valley Pedestrian Bridge (Structure Reference: 01)

The Liffey Valley Pedestrian Bridge will be constructed over the N4 to connect the new bus stops on Old Lucan Road with the new bus stops on N4 and Liffey Valley Bus Interchange. A new pedestrian ramp and steps will be constructed on both sides of the bridge. This will require the construction of a retaining wall (RW02) on the south side of the bridge.

The Liffey Valley Pedestrian Bridge will be a single span, warren truss structure, with a span length of approximately 42.8m. The structure will be painted structural steel, supported on braced steel supports to the north and south of the N4. The warren truss will be designed with a full through construction where the structure is built up around the deck. This structure will be fully integral and will not require bearings or expansion joints. The parapets will be detailed to a height of 1.25m along the length of the truss. A further painted steel, simply supported, 9.1m ladder beam structure will span over the bridge approach ramps connecting the pedestrian bridge to the Liffey Valley Shopping Centre. The approach ramps servicing the eastbound bus stop will be formed of a combination of ladder beam structures and retained earthworks. The westbound bus stop approach ramp will be formed of a combination of ladder beam structure and graded earthworks embankment on approach to Fonthill Road.

The construction methodology broadly comprises the following activities:

- **Installation of Construction Traffic Management Measures:** Temporary closure of the existing bus lanes on the N4 in each direction;
- **Site Clearance and Excavation:** Excavation works will be carried out to the north and south of the bridge, to facilitate the bridge supports, and for the approach ramp and stair support locations;
- **Construction of Foundations:** Foundation and column support for the bridge will be constructed on site. The foundations will be placed and poured for both supports, and for the ramp and stair supports;
- **Construction of Substructure:** The superstructure will be supported on braced steel supports to the north and south of N4. The support piers / trestles will be erected;
- **Construction of the Superstructure:** The truss will be prefabricated and assembled off site in two separate units that will then be erected and lifted on site. The bridge superstructure and approach ramps and stairs will be fabricated off site and brought to the N4 in sections for assembly. The bridge will be craned into position and assembled. During the bridge erection, N4 carriageways will be closed in both directions, over a night or weekend. A diversion will be implemented, via N4 Junction 2, Liffey Valley Shopping Centre, Coldcut Road, Kennelsfort Road, and to Chapelizod Bypass. The ramp and stairs will be assembled and lifted into place. Erection of the ramps and stairs will not require road closures. Erection of the superstructure will be carried out by a crane positioned on the N4 carriageway / hard shoulders; and
- **Finishing works:** this will be minor tie in works, signage etc.

5.5.4.1.2 Chapelizod Hill Road Bridge Widening (Structure Reference: 02)

The Chapelizod Hill Road Bridge will be widened to facilitate the provision of new bus stop layby on the east side of Chapelizod Bypass.

The existing bridge is an in-situ box structure, with an internal span of 9.8m, and a vertical clearance of minimum 5.2m on the southern side. The existing bridge will be widened by 6.0m, with the provision of a new portal frame.

The construction methodology broadly comprises the following activities:

- **Installation of Construction Traffic Management Measures:** Temporary closure of the existing bus lanes on the Chapelizod Bypass in each direction. Chapelizod Hill Road will be closed to vehicular through traffic at the worksite for approximately three months to facilitate the works. A local diversion will be put in place during the works period. Access for pedestrians and cyclists will be facilitated during the construction of the substructure. Chapelizod Hill Road will be closed to all users when the contiguous bored piles are being constructed. The Chapelizod Bypass eastbound carriageway will be closed when the superstructure is being lifted into place. This will likely occur over night, or over a weekend;
- **Site Clearance and Excavation:** Trees and vegetation under the proposed ramps and steps will be removed. The existing embankment and foundations will be removed, and the existing wingwall will be demolished;
- **Construction of Embankment:** Placement and Compaction of Fill Material: The proposed embankment will be built up along the widened section of Chapelizod Bypass embankment. The earth fill material will be placed and compacted to the rear of the structure, and retained by the combined resistance of the superstructure, substructure and foundations. Fill to the sides of the structure will be retained by the major piled retaining walls (RW03 and RW04) on either side of the structure;
- **Construction of Foundations:** The substructure will be formed on bored concrete piled foundations rock socketed to the bedrock substrate;
- **Construction of Substructure:** The substructure will be formed of contiguous bored piles with an in-situ concrete capping beam and pilecap. The bored piles will be constructed from a fill embankment parallel to the Chapelizod Bypass. The capping beam will be placed and poured;
- **Construction of the Superstructure:** The superstructure will be formed using a precast portal frame cast off site, delivered and lifted into position from the Chapelizod Bypass A concrete parapet will also be provided to prevent falls from height; and
- **Finishing works:** High containment kerbs and raised verges will be constructed, and an additional 0.55m high steel fence with mesh infill will be provided to the top of the concrete parapet. The bridge deck will be waterproofed, and new high-quality pavement will be established, to tie in the new structure with the adjoining carriageway. Finally, the existing parapet to Chapelizod Hill Road Bridge will be removed.

5.5.4.1.3 Ballydowd Pedestrian and Cycle Bridge (Structure Reference: 03)

The Ballydowd Pedestrian and Cycle Bridge (Structure Reference: 03) will be constructed over the N4 at Junction 3, parallel to Ballyowen Road bridge. The existing pedestrian bridge will be removed and replaced with a wider structure, accommodating the new two-way cycle track and pedestrian footpath across the N4.

The new bridge has been designed to match the form and aesthetic of the existing footbridge being replaced, where practicable and will comprise a single-span fully integral structure formed of painted steel three-dimensional arched trusses (50m) spanning the N4 carriageways. The superstructure will be approximately, 5.9m (internal) wide with a span of approximately 50m. The superstructure will be supported on cast in-situ reinforced, concrete abutments with spread footing foundations. The longitudinal top, middle and bottom chords, vertical and diagonal bracing will be formed from steel circular hollow sections. The deck will be formed of a structural steel plate welded to the truss members. The plate will be surfaced with a combined waterproofing and surfacing material providing appropriate slip resistance. The sub structure will be formed of in situ reinforced concrete abutment located within the existing N4 embankments. The abutments will be designed and detailed to match the geometry of the existing abutments to be removed.

The construction methodology broadly comprises the following activities:

- Installation of Construction Traffic Management Measures: Temporary closure of the existing bus lane and hard-shoulder on the N4 in each direction.
- Demolition of Existing Pedestrian Bridge;
- Excavation for Bridge Supports;
- Construction of the New Pedestrian and Cycle Bridge; and
- Finishing Works.

5.5.4.1.3.1 Demolition of Existing Pedestrian Bridge

Demolition of the superstructure of the fully integral Ballydowd Footbridge will be carried out by crane lift. The superstructure shall be lifted out of place as a single unit which includes all steel members including the parapet. The crane shall be a truck mounted unit positioned on the main carriageways of the N4. During the bridge removal, N4 carriageways will be closed in both directions, over a night or weekend. Once in position the superstructure will be connected to the crane before being released from the integral connections at both abutments. As the bridge is fully integral the steel members will need to be mechanically cut at the connection point to the abutments to release the structure. Upon release the superstructure will be lifted out of position on to the back of a truck for transport away from site. The superstructure may be cut into additional sections if required to facilitate easier transport. The superstructure will likely be disassembled off site into its constituent elements before being recycled.

The abutments will then need to be demolished. This demolition will be carried out from the existing embankments limiting the need for road closures. Demolition will use mechanical means such as a rock breaker. The broken-down concrete sections will be removed from site before being crushed and recycled if practicable to do so.

5.5.4.1.3.2 Excavation for Bridge Supports

Excavation works will be carried out on either side of the bridge, to provide suitable footing for the bridge support.

5.5.4.1.3.3 Construction of the New Pedestrian and Cycle Bridge

Once the ground has been excavated, concrete foundations will be poured on either side of the bridge, to provide supports for the bridge.

Following completion of the foundations, the main truss span will be assembled. The substructure will be formed within the embankments of the N4 carriageways. The superstructure will be prefabricated off-site within a steel fabricators manufacturing yard. The fabricated elements will be transported to site in large sections and assembled within the Construction Compound (LU1b). This will reduce the requirement for fabrication activity on site next to the N4, increasing safety, adding efficiency, and enhancing quality for the construction process. Once the superstructure is assembled, it will be transported along the N4 from the Construction Compound to the bridge location. This will require a temporary closure of the N4 westbound carriageway and should be carried out at night to minimise disruption to road users.

The main truss span will be lifted into position. Erection of the superstructure will be carried out by cranes positioned on the main carriageways of the N4. During the bridge erection, N4 carriageways will be closed in both directions, over a night or weekend. The construction sequence will need to prioritise minimal construction within / over the N4 and avoid the need for substantial traffic management measures on the N4 where possible. The carriageway vertical clearance of 5.7m will need to be maintained at all times during the construction stage.

5.5.4.1.3.4 Finishing Works

New high-quality pavement will be established, to tie in the new structure with the adjoining carriageway.

5.5.4.1.4 Retaining Walls

Retaining walls with a retained height greater than 1.5m are classed as principal structures. There are five principal retaining walls along the Proposed Scheme, as detailed in Table 5.4.

Table 5.4: (Principal) Retaining Walls along the Proposed Scheme

Structure Reference	Structure Type	Details	Chainage (m)	Length (m)	Max Retained Height (m)	Section Reference
RW01	Secant Piled Wall	Located on the eastbound verge of N4, the Hermitage Golf Club Retaining Wall is required to facilitate the provision of continuous two-way cycle track and footway along N4. A piled retaining	A545 to A851	306.4	3.5	Section 1d

Structure Reference	Structure Type	Details	Chainage (m)	Length (m)	Max Retained Height (m)	Section Reference
		structure has been proposed to minimise the removal of mature trees along the N4 carriageways. The retaining wall will be clad to match the masonry cladding of the existing retaining wall. The existing retaining wall is to be demolished and replaced to facilitate the required widening.				
RW02	Reinforced Concrete Gravity Retaining Wall	Located on the westbound verge of the N4 beside Abbott Pharmaceuticals, the N4 Retaining Wall is required to facilitate carriageway widening and the creation of a new bus stop and associated infrastructure along the N4. A gravity retaining wall structural form is proposed for this wall. The existing boundary wall on site is to be demolished and replaced. A new boundary wall will be provided to the top of the retaining wall with a minimum height of 1.8m and patterned profile finish.	A2115 to A2245	135.05	2.6	Section 1f
RW03	Contiguous Piled Wall	Located on the eastbound verge of the Chapelizod bypass this retaining wall will be formed of a piled retaining structure. The structure is required to retain the earthwork embankment of a widened Chapelizod Bypass to facilitate a new bus stop at Chapelizod Hill Road Bridge. The wall will also retain fill from proposed access steps and ramps between the Chapelizod Bypass and Chapelizod Hill Road. The wall will be finished in precast concrete fascia panels with a pattern profile finish.	A5628 to A5634 and A5646 to A5676	38	4.5	Section 2c
RW04	Soil Nails with Shotcrete Facing	Located on the westbound verge of the Chapelizod bypass this retaining wall will be required to facilitate Chapelizod Bypass carriageway widening to form a new bus stop at Chapelizod Hill Road Bridge. The wall will be formed of soil nails with a shotcrete facing. A supplementary insitu reinforced concrete facing with a pattern profile finish shall be provided to the front of this shotcrete.	A5582 to A5636 and A5642 to A5644	68	1.95	Section 2c
RW05	Reinforced Concrete Gravity Retaining Wall	Located on the eastbound verge of the N4 and Junction 2 off-slip beside Hermitage Medical Centre, this wall will be approximately 83m in length with a maximum retained height of 1.5m. The wall is required to facilitate carriageway widening of the slip road. It will be formed by a gravity retaining structure with a combined boundary wall. The boundary wall will have a minimum height of 2.0m and finished with a masonry stone cladding to match the masonry cladding of the existing boundary wall.	A1166 to A1250	83	1.5	Section 1d

Retaining walls are typically installed to cater for level differences between the road and adjoining lands. RW02 will form part of the ramp and steps at the Liffey Valley Pedestrian Bridge (Structure Reference: 01), RW03 and RW04 will form part of the ramp and steps at the Chapelizod Hill Road Bridge (Structure Reference: 02). The existing retaining walls at RW01 and RW02 will be demolished and replaced by new walls. The retained area behind the existing retaining walls will be dug out first and the wall will then be demolished with a hydraulic breaker mounted to an excavator.

Retaining walls will generally be constructed of reinforced concrete, with railing and cladding as required, with suitable materials depending on the local environs. Retaining walls will generally be constructed by first isolating the site of the retaining wall using fencing, as appropriate, to the location. The existing ground will then be stripped to formation level. Existing services will be diverted as required to enable wall construction. A side slope will be battered back to enable construction. Blinding will be installed at formation level. Formwork and reinforcing steel for the wall will be fixed in place. Then concrete will be poured in sections and formwork removed after initial curing of concrete. After a sufficient curing period the area behind the wall will be backfilled.

5.5.4.2 Minor Structural Works

The minor structural works which form part of the Proposed Scheme are summarised in Table 5.5. Further details are provided in Section 5.5.4.2.1 to Section 5.5.4.2.3.

Table 5.5: Minor Structures

Structure Name	Structure Reference	Section Reference
Hermitage Golf Club Sports Netting (Refer to Section 5.5.4.3)	n/a	Section 1d
Gantry	GY01	Section 1d
	GY02	Section 1f
High Mast Lighting Column	L01	Section 1a
	L02	Section 3b
Retaining Walls	MRW1	Section 1a
	MRW2	Section 1b
	MRW3	Section 1d
	MRW4	Section 1d
	MRW5	Section 3d

5.5.4.2.1 Sign Gantries

There are six existing portal sign gantries and eight existing cantilever sign gantries along the Proposed Scheme. Of these, one portal gantry and five cantilever gantries will be retained without modifications, five portal gantries and three portal gantries will have some of the signage plates replaced and one cantilever gantry will be relocated. In addition, one new portal gantry will be constructed. Details of the new and relocated gantries are provided in Table 5.6.

Prior to construction works commencing the appointed contractor will inspect the position and condition of the gantry foundations and evaluate whether new foundations need to be constructed and / or relocated. Gantry foundations will be constructed during the verge and central reservation phases of construction and the steelwork and signage will be installed during out-of-hours works under a carriageway closure.

Table 5.6: New and Relocated Sign Gantries along the Proposed Scheme

Structure Reference	Structure Type	Existing / New	Chainage (m)	Section Reference
GY01	Cantilever Gantry	Relocated	A1220	1d
GY02	Portal Gantry	New	A2220	1f

5.5.4.2.2 High Mast Lighting Column

High mast lighting columns, as defined by PLG07, require relocation at N4 Junction 3 off-Slip Road and the South Circular Road junction, as summarised in Table 5.7.

Table 5.7: Relocated High Mast Lighting Columns along the Proposed Scheme

Structure Reference	Structure Type	Existing / New	Chainage (m)	Section Reference
L01	High Mast Lighting Column	Relocated	A238	1a
L02	High Mast Lighting Column	Relocated	A8450	3b

High mast lighting foundations will be constructed within existing verges/ islands under temporary traffic management. Existing ground will be excavated to the required founding level with excavations benched as required to ensure stability. In-situ concrete foundation will be formed within excavated area prior to backfilling to finished ground levels. Finally, the high mast lighting column and lifting unit will be installed to the top of foundation prior to removal of temporary traffic management.

5.5.4.2.3 Minor Retaining Walls

Retaining walls with a retained height less than 1.5m are classed as minor retaining walls. There are 5 minor retaining walls along the Proposed Scheme, as detailed in Table 5.8. Retaining walls are typically installed to cater for level differences between the road and adjoining lands. Retaining walls will be constructed as described in Section 5.5.4.1.4.

Table 5.8: Minor Retaining Walls along the Proposed Scheme

Structure Reference	Chainage (m)	Length (m)	Max Retained Height (m)	Section Reference
MRW1	B70 – B90	25	0.8	1a
MRW2	N200 – N300	100	0.8	1b
MRW3	A1060 - A1160	106	1.5	1d
MRW4	A1250 – A1310	65	1.5	1d
MRW5	A9625 – A9680	52	0.2	3d

5.5.4.3 Hermitage Golf Club

Works will be carried out at Hermitage Golf Club, including:

- Overlay works along sections of the access road;
- Removal and reconstruction of the boundary wall (incorporating a retaining wall (RW01));
- Construction of two-way cycle track adjacent to the boundary wall;
- Tree and vegetation removal and replacement; and
- Erection of sports netting (130m in length and 15m in height) to ensure that the existing risk of golf balls reaching the N4 is not increased and could be reduced.

It is anticipated that the construction methodology will be carried out in the following sequence:

- Implementation construction traffic management measures, as per Table 5.10 (including closure of the bus lane, footway, and cycle track, diversion of the footway and cycle track and implementation of a speed limit);
- Erection of site security fencing behind the existing boundary wall;
- Demolition of free-standing section of the boundary wall to create a temporary construction access (from the N4);
- Erection of a temporary support to the existing retaining wall on the N4 side;
- Felling of trees and erection of golf netting foundations;
- Construction of a temporary piling platform where trees have been felled;
- Installation of piles for the proposed retaining wall (RW01), (piling rig to access the cleared area from the temporary construction access from the N4);
- Demolition of existing retaining wall, and excavation to level (from the N4);
- Facing / cladding of proposed retaining wall (stone from the existing wall will be taken down and set aside for reuse. The retaining wall will be clad to match the masonry cladding of the existing retaining wall);
- Construction of cycle track; and
- Landscaping.

The works area will be accessed directly from the N4. Golf will continue to be playable on the holes adjacent to the temporary land acquisition during construction works. Further information on the surface water management,

for the works at this location is provided in the Surface Water Management Plan (SWMP) in Appendix A5.1 CEMP in Volume 4 of this EIAR.

Works in Section 1d will be restricted by the mammal breeding season (December to June), the bird breeding season (March to August) and the planting season (November to March).

5.5.5 Construction Site Decommissioning

On completion of construction, all construction facilities and equipment such as plant, materials, temporary signage, and laydown areas, Construction Compounds, etc. will be removed. The area which was occupied by the Construction Compounds will be reinstated – refer to the Landscaping General Arrangement Drawings (BCIDA-ACM-UBR_ZZ-0006_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

5.6 Construction Plant and Equipment

In order to assess a reasonable worst-case Construction Phase impact scenario, with regards to air quality and noise and vibration, an estimate of construction plant and equipment that will be necessary to construct the Proposed Scheme has been prepared. The estimated peak daily numbers of principal items of plant and equipment working within a section is indicated in Table 5.9. It should be noted that these are peak daily numbers.

The appointed contractor will select and utilise plant and equipment in a manner that ensures Construction Noise Thresholds, as defined in Chapter 9 (Noise & Vibration) of this EIAR, are not exceeded. Refer to Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) of this EIAR for the Construction Phase air quality and noise and vibration assessments, and associated mitigation measures.

Table 5.9: Estimated Peak Daily Plant and Equipment Numbers

Plant / Equipment	Section												
Type	1a	1b	1c	1d	1e	1f	2a	2b	2c	3a	3b	3c	3d
Lorry	8	7	4	10	8	15	10	8	8	12	4	12	4
Backhoe Mounted Hydraulic Breaker	2	2	1	3	2	4	3	4	2	4	1	4	1
8t (tonne) Excavator	2	2	1	3	2	4	3	4	2	4	1	4	1
13t (Rubber Wheeled) Excavator	2	2	-	3	2	4	3	4	2	4	1	4	1
16t (Rubber Wheeled) Excavator	2	2	-	3	2	4	3	4	2	4	1	4	1
6t Dumper	2	2	1	3	2	4	3	4	2	4	1	4	1
Road Planer	2	2	-	3	2	4	3	4	2	4	1	4	1
Road Sweeper	1	1	-	2	1	2	2	1	2	2	1	2	1
Asphalt Paver	1	1	-	2	1	2	2	1	2	2	1	2	1
Asphalt Roller	2	2	1	4	2	4	4	2	2	4	2	4	2
3t Roller	2	2	1	3	2	4	3	4	2	4	1	4	1
Vacuum Excavator	2	2	2	2	2	2	2	2	2	2	2	2	2
Piling Rig	-	1	-	2	-	-	-	-	2	-	-	-	-
Mobile Crane	1	-	-	1	-	1	-	1	1	-	1	-	-

5.7 Construction Compounds

In order to construct the Proposed Scheme, the appointed contractor will require Construction Compounds from which they can manage the delivery of the Proposed Scheme.

5.7.1 Construction Compound Locations

The location of the Construction Compounds in relation to the Proposed Scheme are shown in Figure 5.1 in Volume 3 of this EIAR. The Construction Compound locations have been selected due to the amount of available space, their relative locations near to the majority of the Proposed Scheme major works, and access to the National and Regional Road network. Refer to Chapter 6 (Traffic & Transport) of this EIAR for an assessment of the construction traffic.

The Construction Compound LU1a will be located northeast of the N4 Junction 2, with access / egress from Old Lucan Road, as shown in Image 5.1. The area of Construction Compound LU1a is approximately 1,020m^2 (metres squared).

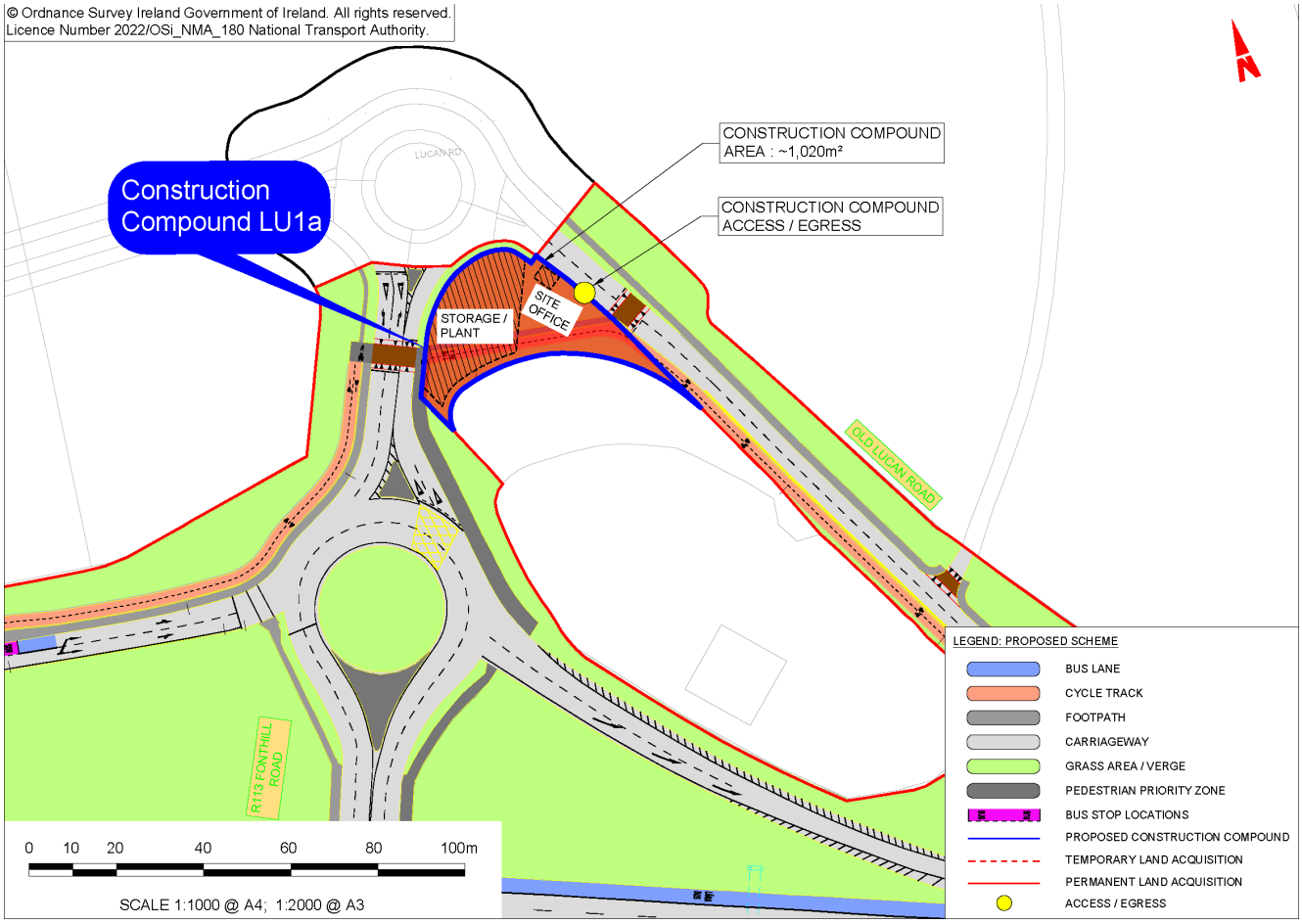

Image 5.1: Location and Extent of Construction Compound LU1a

Construction Compound LU1b will be located between the N4 National Road and the Old Lucan Road, on a narrow strip of grass lined with trees and shrubs on the north side, and a low stone boundary wall at the roadside, with access / egress from the N4 and the Old Lucan Road, as shown in Image 5.2. The area of the Construction Compound LU1b is approximately 2,760m^2.

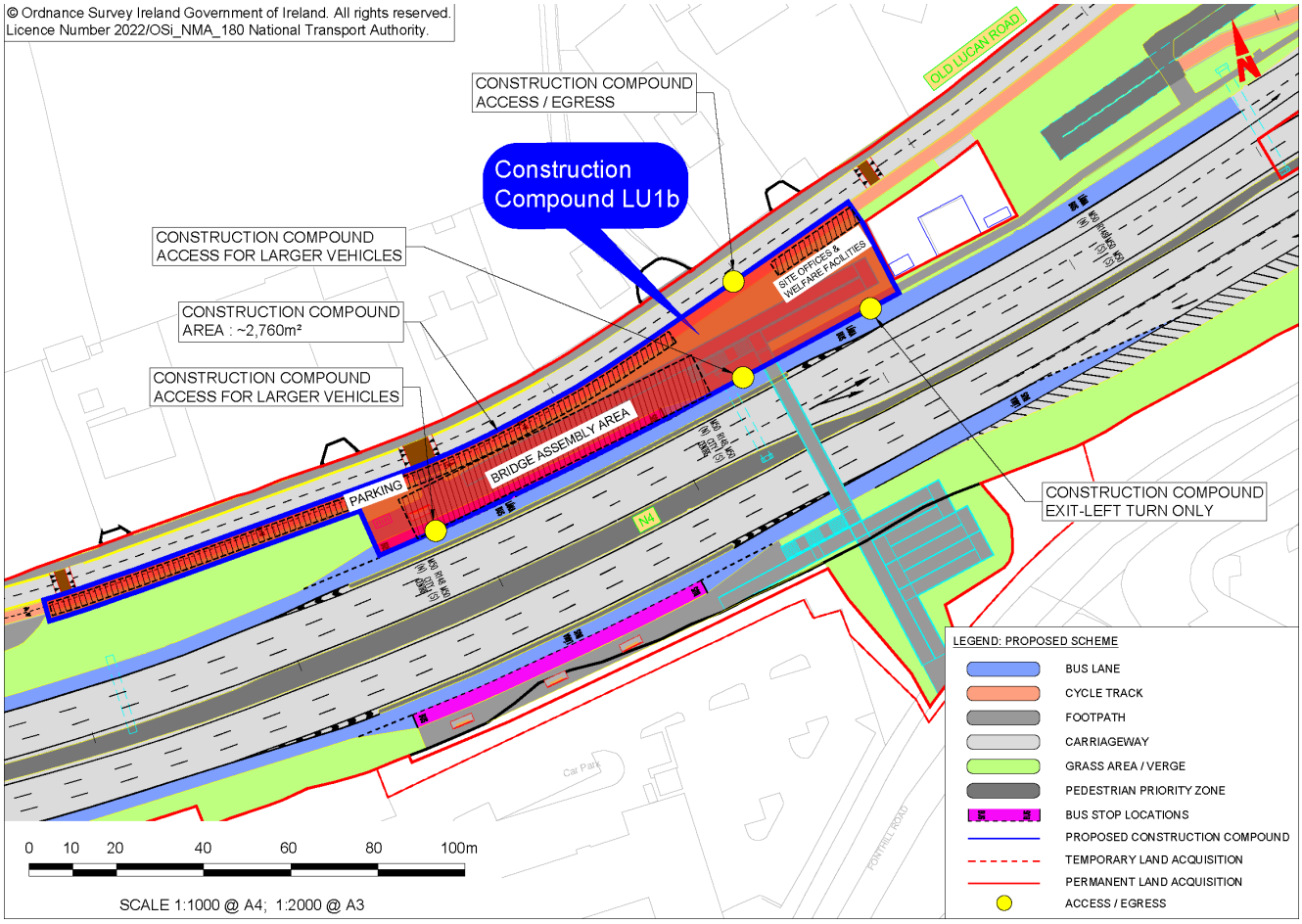

Image 5.2: Location and Extent of Construction Compound LU1b

Construction Compound LU2 will be located north of Palmerstown Bypass between the Kennelsfort Road Junction and the Oval Junction, with access / egress from the Palmerstown Bypass, as shown in Image 5.3. The area of Construction Compound LU2 is approximately 2,310m^2.

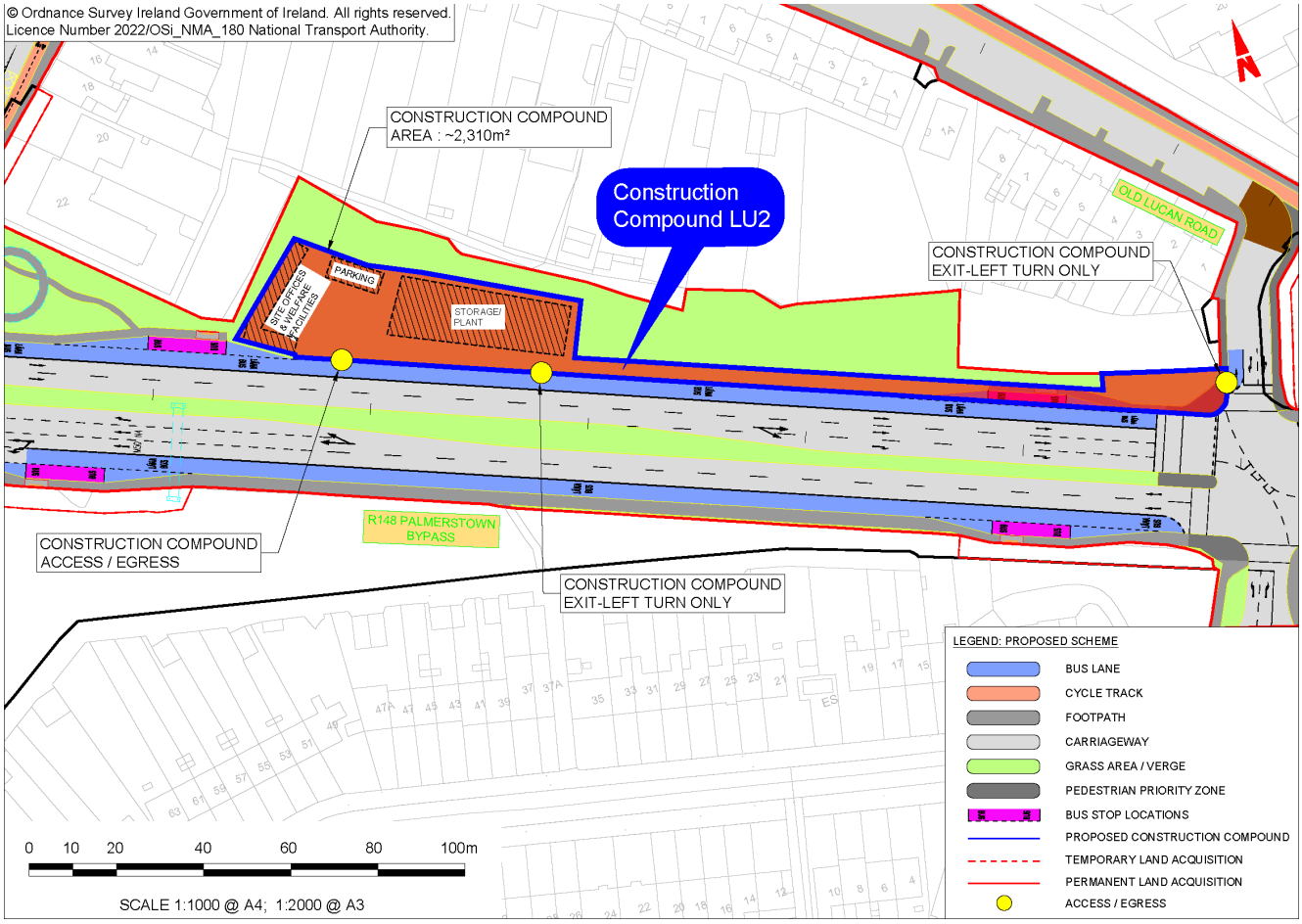

Image 5.3: Location and Extent of Construction Compound LU2

Construction Compound LU3 will be located within Liffey Gaels Park, south of Chapelizod Bypass, at the Con Colbert Road Junction, with access / egress from Con Colbert Road, as shown in Image 5.4. The area of Construction Compound LU3 is 4,460m^2.

It is intended that this area will also be used as a Construction Compound on the Liffey Valley to City Centre Core Bus Corridor Scheme (Construction Compound LV3), pursuant to conditions imposed by An Bord Pleanála, should they grant approval. It is envisaged that the Construction Phases of the Proposed Scheme, and the Liffey Valley to City Centre Scheme will not overlap. Depending on the respective timing of the proposed schemes, the area may continue to be used uninterrupted as a Construction Compound if the second scheme commences construction within a relatively short period of time after the first scheme finishing construction. Alternatively, in the eventuality that there is likely to be a substantial time period (e.g. greater than one year) between the Construction Phases of the two schemes, the NTA in discussion with the Local Authority will identify the most appropriate interim use of the area. When the area has ceased to be used as a Construction Compound it will be returned to its original condition by the appointed contractor for the second scheme.

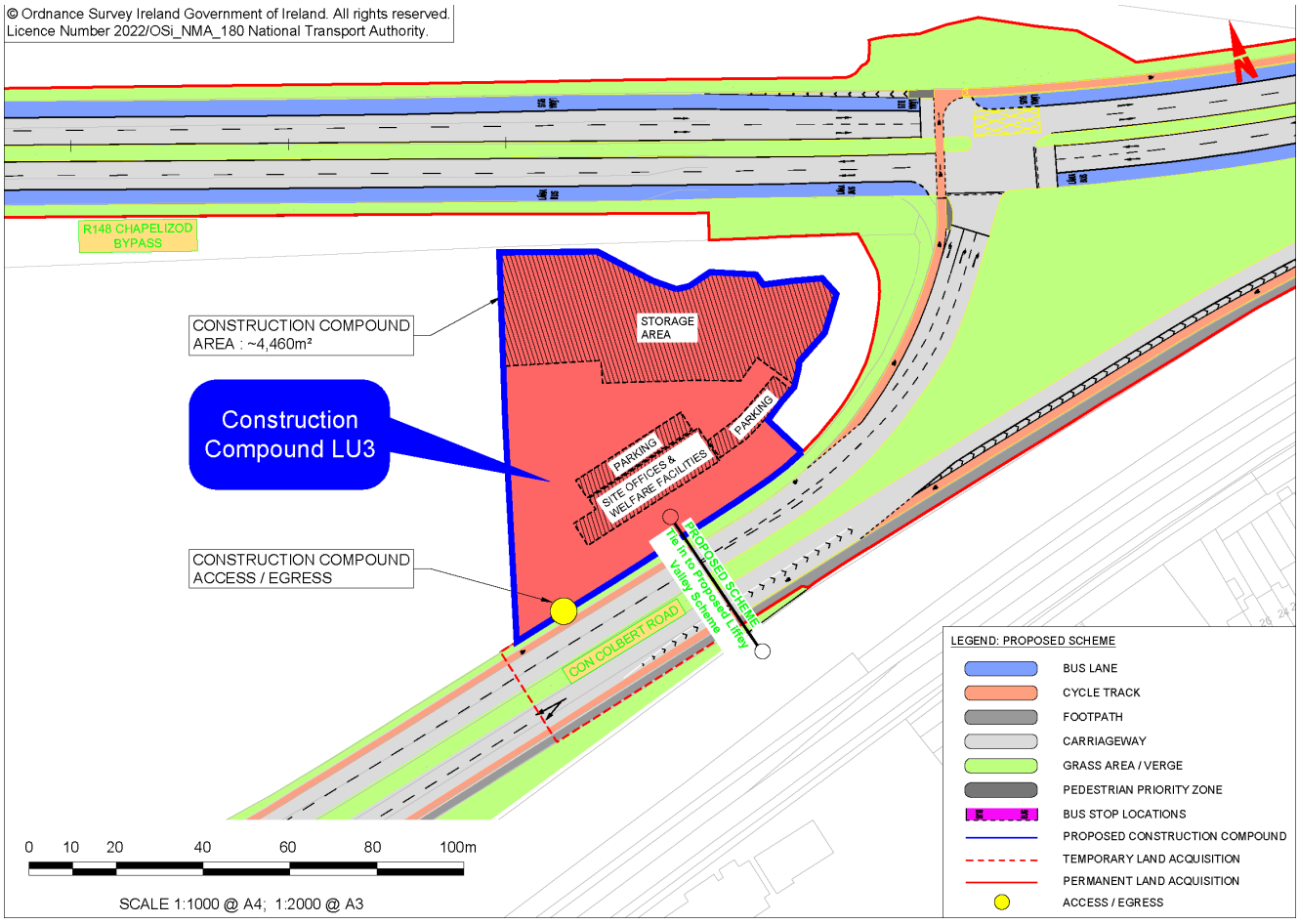

Image 5.4: Location and Extent of Construction Compound LU3

5.7.2 Construction Compound Activities

As shown in Image 5.1 to Image 5.4, the Construction Compounds will contain a site office and welfare facilities for NTA personnel and contractor personnel. Limited car parking will be allowed at the Construction Compounds, in line with the principles of the Construction Stage Mobility Management Plan (CSMMP), as described in Appendix A5.1 CEMP in Volume 4 of this EIAR, which will be prepared by the appointed contractor. Materials such as topsoil, subsoil, concrete, rock etc., will be stored at the Construction Compounds for reuse, as necessary. Items of plant and equipment, described in Section 5.6 will also be stored within the Construction Compounds.

All necessary authorisations, under the Waste Management Act, as amended, will be obtained prior to undertaking temporary storage. Certain materials will be reused where practicable, primarily excavated material. Further information on the reuse of material within the Proposed Scheme is included in Chapter 18 (Waste & Resources) of this EIAR. Further information on the air quality and noise and vibration assessments, and associated mitigation measures at the Construction Compound is included in Chapter 7 (Air Quality) and Chapter 9 (Noise & Vibration) of this EIAR.

5.7.3 Construction Compound Services

The Construction Compounds will be fenced off, lit (during working hours) and secured with CCTV, as described in Section 5.5.2.8. Temporary lighting, including security lighting will be required at the Construction Compounds, as described in Section 5.5.2.9. Access to the Construction Compounds will be restricted to site personnel and authorised visitors only.

The Construction Compounds will be engineered with appropriate services. Water, wastewater, power, and communications connections will be organised by the appointed contractor. At work areas along the Proposed Scheme, where permanent provisions (for the duration of the construction programme) are not practicable, appropriate temporary provisions will be made, including the use of generators if required. Temporary welfare facilities will need to be used, for example, portable toilets in the vicinity of works. Wastewater from temporary welfare facilities will be collected and disposed of to a suitably licenced facility.

Appropriate environmental management measures will be implemented at the Construction Compounds, for example, to minimise the risk of fuel spillage, and to ensure that the Construction Compounds and the approaches to it are appropriately maintained. Further information on the air quality, noise and vibration and water related mitigation measures that will be implemented is included in Chapter 7 (Air Quality), Chapter 9 (Noise & Vibration) and Chapter 13 (Water) of this EIAR.

Following completion of the construction works, the Construction Compound areas will be cleared and reinstated to match pre-existing conditions.

5.8 Construction Traffic Management

The CTMP has been prepared to facilitate the assessment of the potential impacts on traffic and transport along the Proposed Scheme. The CTMP includes details of the temporary traffic management measures that will be implemented during the construction of the Proposed Scheme.

The staging of construction and associated temporary traffic management measures has considered the receiving environment when developing the schedule of works.

The CTMP has given due consideration to facilitate the maximum practicable movement of people during the Construction Phase through implementing the following hierarchy of transport mode users:

- Pedestrians;
- Cyclists;
- Public Transport; and
- General Traffic.

Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

The construction traffic management measures have been developed in accordance with Chapter 8 of the Traffic Signs Manual (Department of Transport, Tourism and Sport 2019). Construction traffic management measures are summarised in Section 5.8.1 to Section 5.8.3, with further details (such as routing of construction vehicles, timings of material deliveries, etc.) included in the CTMP in Appendix A5.1 CEMP in Volume 4 of this EIAR.

5.8.1 Pedestrian and Cyclist Provisions

The measures set out in Section 8.2.8 of the Traffic Signs Manual (Department of Transport, Tourism and Sport 2019) will be implemented, wherever practicable, to ensure the safety of all road users, in particular pedestrians (including able-bodied pedestrians, wheel-chair users, mobility impaired pedestrians, pushchair users) and cyclists. Therefore, where footpaths or cycle facilities are affected by construction, a safe route will be provided past the works area, and where practicable, provisions for matching existing facilities for pedestrians and cyclists will be made. Where this is not practicable, pedestrians will be directed to use the footpath the opposite side of the road, crossing at controlled crossing points.

5.8.2 Public Transport Provisions

Existing public transport routes will be maintained throughout the duration of the Construction Phase of the Proposed Scheme (notwithstanding potential for occasional road closures / diversions as discussed in Section 5.8.3). Wherever practicable, bus services will be prioritised over general traffic. However, the temporary closure of sections of existing dedicated bus lanes will be required to facilitate the construction of new bus priority infrastructure that is being developed as part of the Proposed Scheme. Some existing bus stop locations will need to be temporarily relocated to accommodate the works. This will be done in discussion with the NTA, and service providers. In such cases, temporary bus stops will be safely accessible to all users and all temporary impacts on bus services will be determined in consultation with the NTA and the service providers.

5.8.3 General Traffic Provisions

The roads and streets along the Proposed Scheme, will remain open to general traffic wherever practicable during the Construction Phase. However, lane closures, road closures and diversions will be necessary to facilitate construction.

Where necessary, road closures and diversions will take into consideration the impact on road users, residents, businesses, etc. Road closures and diversions will be carried out with regard to the Traffic Signs Manual. All road closures and diversions will be determined by the NTA, in consultation with the local authority and An Garda Síochána, as necessary. Access will be maintained for emergency vehicles along the Proposed Scheme, throughout the Construction Phase.

The anticipated lane closures, road closures, and diversions that may be required during the Construction Phase of the Proposed Scheme, includes those identified in Table 5.10.

Table 5.10: Road Closures, Lane Closures and Diversions

Section Ref.	Road Closures	Lane Closures				Diversions
	Temporary Road Closures	Temporary Lane Closures (peak periods)	Temporary Lane Closures (off peak periods)	Short Sections of Stop / Go System	Notes	
Section 1a	Yes (night / weekend closure of N4 to facilitate Structure Reference: ST03)	Yes (Public Transport, to facilitate Structure Reference: ST03 foundation works)	Yes (Public Transport, to facilitate Structure Reference: ST03 foundation works)	No	Right turn lanes may be removed for a period	Yes (during N4 night time closure eastbound and westbound traffic will utilise the Junction 3 on-slips and off-slips)
Section 1b	Yes (night closure of Ballyowen Road to facilitate final surfacing works)	No	Yes (Public Transport, General Traffic (Right turn only lane removed – Lucan Road) and one-way system over short distances on Ballyowen Lane	No on Ballyowen Road, but may be required on Ballyowen Lane	n/a	Yes (Vehicles traveling north along Ballyowen Road will be diverted west along the N4 to Jct.4 then heading north to Lucan Road. Vehicles traveling from Lucan Road will be diverted east to N4 Junction 2 where they will turn around and turn west back to Junction 3 to

Section Ref.	Road Closures	Lane Closures				Diversions
	Temporary Road Closures	Temporary Lane Closures (peak periods)	Temporary Lane Closures (off peak periods)	Short Sections of Stop / Go System	Notes	
			for Road marking alterations)			access Ballyowen Road.)
Section 1c	No	Yes (one-way system over short distances on Hermitage Road for Road marking alterations)	Yes (one-way system over short distances on Hermitage Road for Road marking alterations)	Yes	n/a	Yes (Pedestrians only through Hermitage Park)
Section 1d	No	No	Yes (Public Transport, to facilitate Hermitage Golf Club and Hermitage Medical Clinic boundary works)	No	Pedestrian access restricted during works	Yes (pedestrians directed to westbound footpath and over the N4 via Junction 3 overbridge or St Lomans footbridge on approach to works; Pedestrians needing to access The Hermitage Clinic or Old Lucan Road are required to cross the slip road, travel east on the N4 and cross the on-slip onto the N4 footway east of the works. Pedestrians needing to access The Hermitage Clinic or Old Lucan Road are required to cross the N4 Junction 2 eastbound off-slip road, travel east on the N4 and cross the on-slip onto the N4 footway east of the works.)
Section 1e	No	No	Yes (Public Transport)	Yes	Accesses to be maintained by flagman control. Pedestrians to be redirected to opposite footway.	Not for vehicles; Pedestrians yes
Section 1f	Yes (night / weekend closure of N4 to facilitate Structure Reference: ST01)	No	Yes (Public Transport, General Traffic – reduced to two lanes both directions)	No	N/A	No
Section 2a	No	Yes (General Traffic – proposed one-way system on Old Lucan Road; Possible one-way system on Kennelsfort Road Lower)	Yes (General Traffic – R148 Chapelizod Bypass – Night-time only)	Yes	n/a	Yes (Diversion to be provided as alternative to Kennelsfort Road exit onto R148 at junction with The Oval; pedestrians redirected to use opposite footway)
Section 2b	Yes (Local access only to Old Lucan Road on approach to The Oval)	No	Yes (Public Transport, N4 General Traffic – two lanes maintained in each direction)	No	No Right turns from R148 Chapelizod Bypass to Kennelsfort Road Lower & no left turns from Kennelsfort Road Lower for a period	Yes (Proposed diversion for right turn ban into Kennelsfort Road Lower along Old Lucan Road from Petrol Station at The Oval Junction)
Section	Yes (closure	Yes (Public	Yes (Public	No	Construction	Yes (southbound [one-way]

Section Ref.	Road Closures	Lane Closures				Diversions
	Temporary Road Closures	Temporary Lane Closures (peak periods)	Temporary Lane Closures (off peak periods)	Short Sections of Stop / Go System	Notes	
2c	of Chapelizod Hill Road for two to three months to facilitate Structure Reference: ST02)	Transport – two lanes of R148 Chapelizod bypass in each direction maintained)	Transport, General Traffic – one lane in each direction maintained)		traffic management proposals in this location has been discussed with DCC and they raised no issues.	only diversion along Lucan Road and R112 Kylemore Road)
Section 3a	No	No	Yes (Public Transport and 1 traffic lane both directions)	No	Footways to be closed during works.	Yes (pedestrians to be diverted along Memorial Road, Inchicore Road and Sarsfield Road)
Section 3b	No	Possibly (General Traffic – Right turn lane from St John's Road West)	Yes (General Traffic South Circular Road reduced to one lane NB, possible left turn slip closures onto South Circular Road if needed)	No	Footways / pedestrian crossings to be impacted during construction.	Pedestrians to be diverted to opposite footway for some works
Section 3c	No	No	Yes (Public Transport)	No	Taxi bay may be reduced for a period. Pedestrian facilities to be impacted during construction.	Pedestrians to be diverted to opposite footway for some works
Section 3d	No	No	Yes (Public Transport – reduced to one lane in both directions)	No	Taxi rank may be reduced for a period. Left turn diversion proposed at St Johns Road West. Pedestrian crossing to be impacted during construction.	Yes (left turn diversion in front of station to Heuston Station Car park)

The existing carriageway layout will be maintained along the Proposed Scheme to facilitate existing traffic flows, where practicable, however at active construction works areas, the carriageway layout will be modified to provide sufficient space for construction works to be undertaken. The active construction works areas will be dictated by the construction programme in Section 5.4.

In the first instance, where the carriageway width is constrained, the lane widths will be reduced to a minimum of 3.0m. In circumstances where lane width reductions are not sufficient to facilitate the existing layout, the carriageway will be reduced by one lane of traffic in one direction, or one lane of traffic in each direction. Over the majority of the Proposed Scheme, the existing carriageway layout consists of two lanes of traffic in each direction. Along these sections, when construction works areas are active, the carriageway will be reduced to one lane of traffic in each direction. The traffic will be split into three traffic management stages (Stage A to Stage C) as described in Section 5.8.3.1 to Section 5.8.3.3.

Where there is one lane of traffic in each direction, single lane traffic will be controlled by a stop / go system of temporary traffic lights with priority provided to traffic travelling towards the City Centre during the morning peak period and this will be reversed during the afternoon peak period. Where necessary, the appointed contractor will implement lane closures and / or traffic diversions to supplement the stop / go system. The traffic management measures may give rise to some traffic delays outside of the morning peak period and afternoon peak period; however it is anticipated that these would be of a short duration.

5.8.3.1 Stage A

To carry out Stage A works safely, traffic management will be implemented as shown in Image 5.5, by means of narrowing the existing lanes carrying public transport and general traffic to 3.0m. A lateral safety zone will be implemented between the carriageway and the works area, with an appropriate safe distance as per Table 8.2.2.2 of the Traffic Signs Manual.

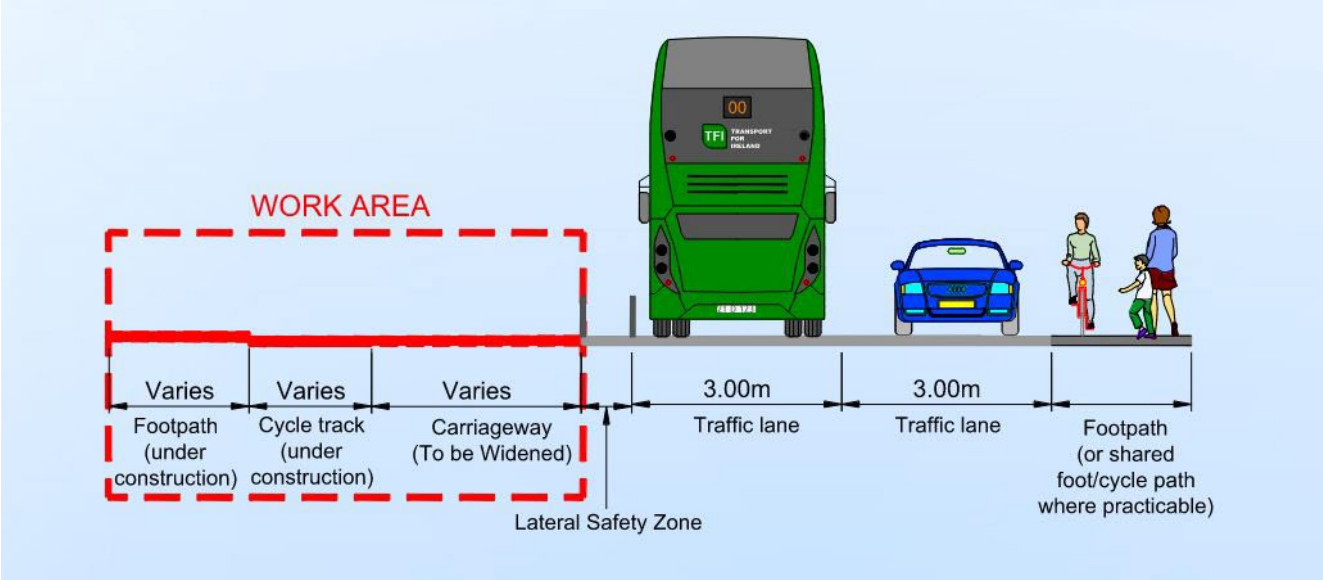

Image 5.5: Work Area - Stage A

5.8.3.2 Stage B

Stage B commences following the completion of Stage A. Public transport, general traffic, pedestrians and cyclists will be transferred to the opposite side of the carriageway to facilitate Stage B works. This stage will include the same methodology as outlined in Stage A, however carried out on the opposite side of the carriageway, as shown in Image 5.6.

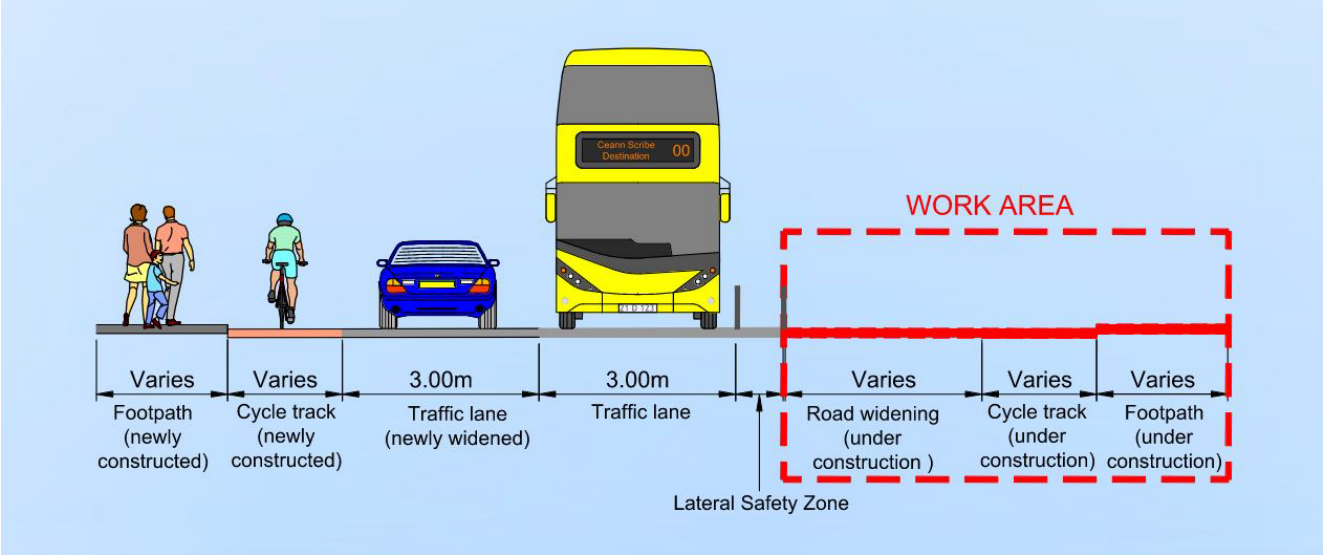

Image 5.6: Work Area - Stage B

5.8.3.3 Stage C

Once Stage B is complete, Stage C will entail completion of the proposed final road surfacing. To maintain traffic movement at this stage, lane closures, road closures, or diversions will be implemented, as appropriate.

5.9 Interface with Other Projects

The likely timelines of the Proposed Scheme construction works have considered the potential for simultaneous construction of, and cumulative impacts with other infrastructure projects and developments which are proposed along, or in the vicinity of the Proposed Scheme. The likely significant cumulative impacts caused by the Proposed Scheme in combination with other existing or planned projects were identified and assessed in Chapter 21 (Cumulative Impacts & Environmental Interactions) of this EIAR.

Interface liaison will take place on a case-by-case basis through the NTA, as will be set out in the Construction Contract, to ensure that there is coordination between projects, that construction access locations remain unobstructed by the Proposed Scheme works and that any additional construction traffic mitigation measures required to deal with cumulative impacts are managed appropriately.

5.10 Construction Environmental Management

5.10.1 Construction Environmental Management Plan

As stated in Section 5.1, a CEMP has been prepared for the Proposed Scheme and is included as Appendix A5.1 in Volume 4 of this EIAR. The CEMP will be updated by the NTA prior to finalising the Construction Contract documents for tender, so as to include any additional measures required pursuant to conditions attached to An Bord Pleanála's decision. It will be a condition of the Employer's Requirements that the successful appointed contractor, immediately following appointment, must detail in the CEMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR. The CEMP has regard to the guidance contained in the Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (TII 2007), and the handbook published by CIRIA in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

Details of mitigation measures proposed to address potential impacts arising from construction activities are described in Chapter 6 to Chapter 21, as appropriate and are summarised in Chapter 22 (Summary of Mitigation & Monitoring Measures) of this EIAR.

A number of sub-plans have also been prepared as part of the CEMP and these are summarised in the following sections. For the avoidance of doubt, all of the measures set out in the CEMP and the sub-plans appended to this EIAR will be implemented in full by the appointed contractor to the satisfaction of the NTA.

5.10.1.1 Construction Traffic Management Plan

The CTMP has been prepared to demonstrate the manner in which the interface between the public and construction-related traffic will be managed and how vehicular movement will be controlled. It will be a condition of the Employer's Requirements that the successful appointed contractor, immediately following appointment, must detail in the CTMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála, should they grant approval. Further details on the assessment of construction traffic, and traffic related mitigation measures are provided in Chapter 6 (Traffic & Transport) of this EIAR.

5.10.1.2 Invasive Species Management Plan

The Invasive Species Management Plan (ISMP) has been prepared which provides the strategy to be adopted in order to manage and prevent the spread of the non-native invasive plant species. Non-native invasive plant species were identified in close proximity to the Proposed Scheme during ecological surveys. It will be a condition of the Employer's Requirements that the successful appointed contractor, immediately following appointment, must detail in the ISMP how it is intended to complete the works in accordance with the Employer's Requirements, and will be subject to the NTA's approval. Further details on the assessment of non-native invasive species, and associated mitigation measures are provided in Chapter 12 (Biodiversity) of this EIAR.

5.10.1.3 Surface Water Management Plan

The SWMP has been prepared which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme. It will be a condition of the Employer's Requirements that the successful appointed contractor, immediately following appointment, must detail in the SWMP how it is intended to effectively implement all the applicable measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval.

5.10.1.4 Construction and Demolition Resource and Waste Management Plan

The Construction and Demolition Resource and Waste Management Plan (CDRWMP) has been prepared which provides the strategy that will be adopted in order to ensure that optimum levels of reduction, reuse and recycling are achieved. It will be a condition of the Employer's Requirements that the successful appointed contractor, immediately following appointment, must detail in the CDRWMP the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval. Further details on waste management are provided in Chapter 18 (Waste & Resources) of this EIAR.

5.10.1.5 Environmental Incident Response Plan

The Environmental Incident Response Plan (EIRP) has been prepared to ensure that in the unlikely event of an incident (environmental, or non-environmental), response efforts are prompt, efficient, and suitable for the particular circumstances. The EIRP details the procedures to be undertaken in the event of a significant release of sediment into a watercourse, or a significant spillage of chemical, fuel or other hazardous substances (e.g. concrete), non-compliance incident with any permit or licence, or other such risks that could lead to a pollution incident, including flood risks. It will be a condition of the Employer's Requirements that the successful appointed contractor, immediately following appointment must detail in the EIRP, the manner in which it is intended to effectively implement all the applicable mitigation measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval.

5.10.2 Mitigation Measures

Mitigation and monitoring measures have been identified as environmental commitments and overarching requirements which shall avoid, reduce or offset potential impacts which could arise throughout the Construction Phase of the Proposed Scheme. These mitigation and monitoring measures which are relevant to the Construction Phase of the Proposed Scheme are detailed in Chapter 6 to Chapter 21, and are summarised in Chapter 22 (Summary of Mitigation & Monitoring Measures) of this EIAR.

5.10.3 Construction Working Hours

It is generally envisaged that construction working hours will be between 07:00hrs and 23:00hrs on weekdays, and between 08:00hrs and 16:30hrs on Saturdays. Night-time and Sunday working will be required to facilitate street works that cannot be undertaken during day time / evening conditions. The planning of such works will take consideration of sensitive receptors, in particular any nearby residential areas.

5.10.4 Personnel Numbers

Throughout the Construction Phase there will be some variation in the numbers of personnel working on site. It is anticipated there will be 250 to 270 personnel directly employed across the Proposed Scheme, rising to 300 personnel at peak construction.

5.10.5 Construction Health and Safety

The requirements of Number 10 of 2005 – Safety, Health and Welfare at Work Act 2005, S.I. No. 291/2013 Safety, Health and Welfare at Work (Construction) Regulations, 2013 (hereafter referred to as the Regulations), and other relevant Irish and European Union safety legislation will be complied with at all times. As required by the Regulations, a Health and Safety Plan will be formulated which will address health and safety issues from the design stages through to the completion of the Construction Phase. This plan will be reviewed as the Proposed Scheme progresses. The contents of the Health and Safety Plan will follow the requirements of the Regulations. In accordance with the Regulations, a ‘Project Supervisor Design Process’ has been appointed and ‘Project Supervisor Construction Stage’ will be appointed, as appropriate.

5.11 References

ADCO (2021). UAIA BusConnects Dublin – BusConnects Project Proposed Boardwalks Custom House Quay and North Wall Quay, River Liffey

BSI (2010). BS 3998:2010 Tree Work. Recommendations

BSI (2012). 5837:2012 Trees in Relation to Design, Demolition, and Construction

CIRIA (2015). Environmental Good Practice on Site Guide, 4th Edition

DTTS (2019). Traffic Signs Manual, Chapter 8, Temporary Traffic Measures and Signs for Roadworks

TII (2007). Guideline for the Creation, Implementation and Maintenance of an Environmental Operating Plan

TII (2017). Guidelines for the Management of Waste from National Road Construction Projects

Guidance and Legislation

S.I. No 291/2013 Safety, Health and Welfare at Work (Construction) Regulations 2013

Safety, Health and Welfare at Work Act 2005

Waste Management Act 1996 (as amended)