

The background features a vibrant red field with several abstract geometric elements. In the top-left, there's a green quarter-circle and a blue arc. The top-center has a large white circle with a blue border. The top-right shows a dark blue horizontal band and a white arc. The bottom-left contains a blue shape with a white circle and a dark blue shape with a white circle. The bottom-right is dominated by a large green arc and a red arc with a white border.

**Appendix J**  
Preliminary Design Report  
– Retaining Walls

National Transport Authority  
**Belfield / Blackrock to City Centre  
Core Bus Corridor Scheme**  
Preliminary Design Report -  
Retaining Walls

Issue | 12 January 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 268401

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**ARUP**

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Photos of Existing Wall

# 1 Introduction

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## 1.1 Design Brief

Arup has been appointed by the National Transport Authority (NTA) to undertake a preliminary design of the proposed Belfield/Blackrock to City Centre Core Bus Corridor (CBC) Scheme (hereinafter referred to as the 'Proposed Scheme') of the BusConnects CBC network. Arup's appointment includes the preliminary design of structures on this Proposed Scheme.

This report includes the considerations and assumptions made during the preparation of the preliminary design of the retaining wall structures on the Belfield/Blackrock to City Centre Core Bus Corridor.

## 1.2 Project Background

The BusConnects Dublin Programme is a plan to transform Dublin's bus system, with the Core Bus Corridor (CBC) project providing 230 km of dedicated bus lanes and 200 km of cycle tracks across sixteen of the busiest bus corridors in and out of the city centre. The project is fundamental to addressing the congestion issues in the Dublin region with the population due to grow by 25 % by 2040. In June 2018 the National Transport Authority (NTA) published the Core Bus Corridors Project Report, which sets out the vision for the provision of bus lanes and cycle tracks on sixteen key bus corridors.

The Belfield/Blackrock to City Centre CBC is identified in this document as forming part of the radial Core Bus Network. The BusConnects Dublin Core Bus Network is shown in Figure 1.

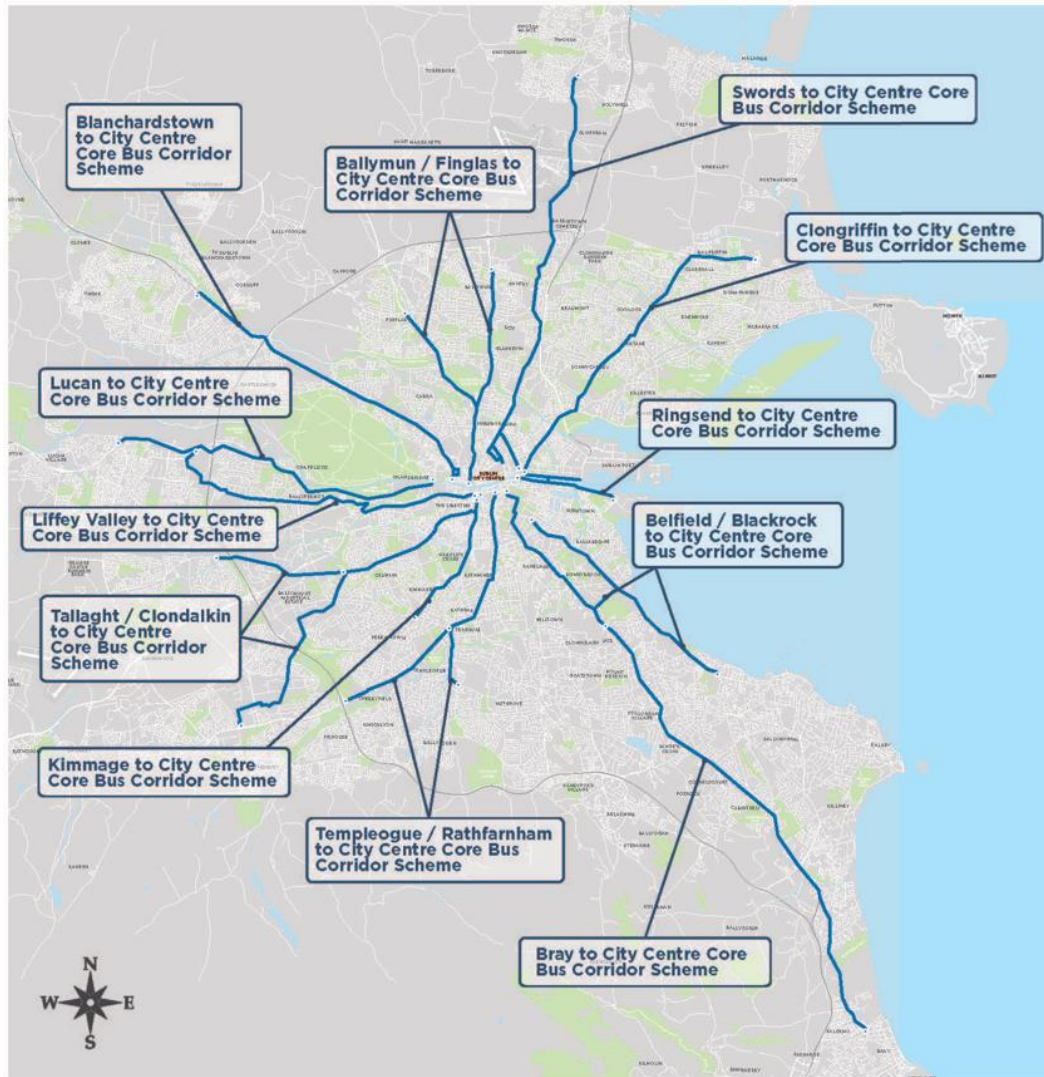


Figure 1: BusConnects Dublin Radial CBC Network

The Proposed Scheme commences at the junction of Montpellier Place and Stradbroke Road in Blackrock. The corridor proceeds along Temple Hill, Frascati Road, Rock Road, Merrion Road, through Ballsbridge Village, routing along Pembroke Road and Baggot Street before turning onto Fitzwilliam Street Lower where it terminates at its junction of Mount Street Upper.

The Proposed Scheme also routes along Nutley Lane between Stillorgan Road and Merrion Road.

### 1.3 Previous Studies

The first non-statutory public consultation on the BusConnects CBCs took place on a phased basis between Nov 2018 to May 2019. The second round of public consultations occurred between Mar 2020 to Apr 2020. A third round of public consultations then followed between November 2020 and December 2020.

Consultation with the principal project stakeholders (i.e. Dublin City Council, Dún Laoghaire-Rathdown County Council, Transport Infrastructure Ireland, An Garda, Utility companies and the National Transport Authority) has also taken place.

A desktop study was undertaken to identify the existing structures within the project extents, with site inspections undertaken where information was limited.

## 2 Site & function

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### 2.1 Site Location

Only one wall with a retained height greater than 1.5m was identified as being required along this scheme. This wall is referenced as Retaining Wall RW01 for the purposes of this report.

An existing wall currently contains the levels of Rock Road adjacent to Blackrock Park at this location. The revised carriageway configuration requires a widening of the embankment beyond the extents of the existing wall. It is proposed to demolish the existing wall and replace it with a new reinforced concrete spreadfoot cantilever retaining wall.

The wall will be approximately 90m in length with a maximum retained height of 4.0m.

Figure 2: Location Plan



### 2.2 Function of Structure and Obstacles Crossed

The purpose of this retaining wall is to maintain the required ground level in the area that is affected by the proposed bus corridor, where the height difference is too high to be maintained with an embankment.

### 2.3 Choice of Location

The wall is located where geometric constraints don't allow for traditional earthwork batters to be contained within the site boundaries and to minimise land take in the adjacent park.



## 2.4 Site Description and Topography

The surrounds comprise of a brownfield site, with the wall located adjacent to an existing carriageway and recreational park.

## 2.5 Vertical and Horizontal Alignments

Refer to the road design drawings for the proposed vertical and horizontal road alignments along the scheme.

## 2.6 Existing Underground and Overground Services

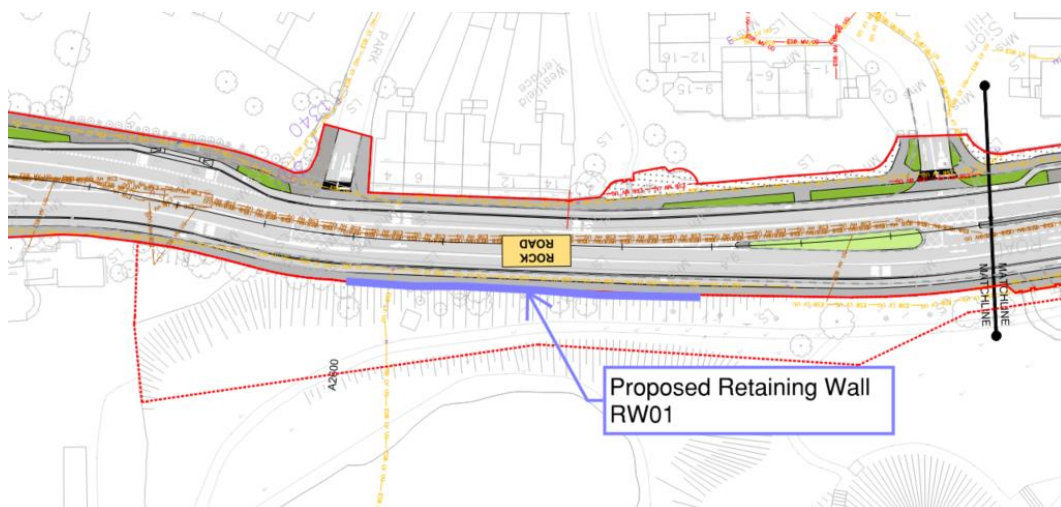
The services mentioned in Table 1 below are existing underground services in the vicinity of the proposed structure.

Table 1: Existing Services

Retaining wall	Utility Provider	Service	Comment
RW01	ESB	LV electricity (UG)	Retained Parallel at back of wall and crossing perpendicular to wall
	Council	Street Lighting	Realigned Parallel adjacent top of wall
	Council	Stormwater Combined Network	Crossing perpendicular to wall Crossing perpendicular to wall
	Virgin Media	Virgin Media cables	Retained Down centre of Rock Road

These services are illustrated in the figures below.

Figure 3: RW01 existing Services



No above ground services were identified at the retaining wall location.

## **2.7 Geotechnical Summary**

A geotechnical desktop study of the area has been undertaken using existing GI information. Where identified, supplementary GI information was requested to increase the understanding of the geological conditions at targeted locations across the scheme.

Refer to Section 7 for details of the ground conditions at each retaining wall location.

## **2.8 Hydrology and Hydraulic Summary**

It is not expected that the construction of the retaining walls on this scheme will have any significant impact on the local hydrogeology.

## **2.9 Archaeological Summary**

There is no impact envisaged from these structures.

## **2.10 Environmental Summary**

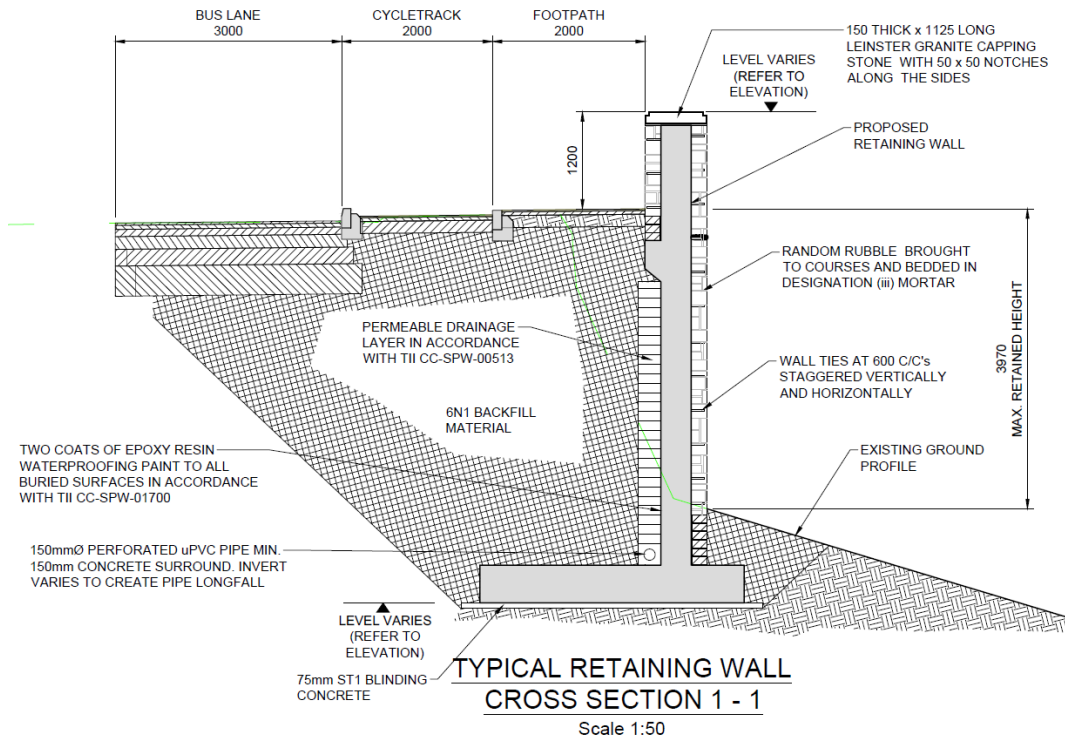
An Environmental Impact Assessment Report (EIAR) is currently being prepared for this project. Outcomes from this EIA will be reviewed and incorporated once determined.

## 3 Structure and Aesthetics

### 3.1 General Description of Recommended Structure

The retaining wall comprises a reinforced spreadfoot cantilever retaining wall. The wall is required to retain the widened R118 embankment from spilling into the adjacent Blackrock Park.

Figure 4: Typical section



### 3.2 Aesthetic Considerations

The wall will be clad in masonry stonework, similar to existing. Dún Laoghaire Rathdown County Council have been consulted regarding the aesthetics and their Parks Department will provide input into the detailed design.

### 3.3 Proposals for the Recommended Structure

#### 3.3.1 Proposed Category

The retained height of the wall is smaller than 5 m, hence it is classified as a Category 1 structure in accordance with DN-STR-03001.

#### 3.3.2 Span Arrangements

Not Applicable.

### **3.3.3 Minimum Headroom Provided**

Not Applicable.

### **3.3.4 Approaches including run-on Arrangements**

Not Applicable.

### **3.3.5 Foundation Type**

The wall will comprise a spread footing foundation cast on a 75mm blinding layer, bearing on the subsurface below. The preliminary design calculations require a maximum SLS bearing pressure of 125 kPa.

### **3.3.6 Substructure**

Not applicable.

### **3.3.7 Superstructure**

Not applicable.

### **3.3.8 Articulation Arrangement, Joints & Bearings**

Nominal 20 mm vertical movement joints will be used between sections of wall to allow for natural expansion and contraction of the concrete. Stainless steel dowel bars will be used to control differential displacement of the wall sections.

### **3.3.9 Vehicle Restraint System**

Where walls present a hazard within the clear zone, a Vehicle Restraint System (VRS) will be provided in accordance with DN-REQ-03034.

### **3.3.10 Drainage**

A permeable drainage layer will be provided behind the in-situ concrete retaining wall in accordance with CC-SPW-00500 and will provide positive outfall from a one end to the other of the structure and will connect to the mainline road drainage.

### **3.3.11 Durability**

The structures will comprise reinforced concrete, which is a highly durable material. Concrete specification and cover to reinforcement will be in accordance with TII publication DN-STR-03012 (Design for Durability).

### **3.3.12 Sustainability**

Recycled GGBS will be used in the design and construction of some of the concrete elements of the structure leading to a more sustainable structure overall.

### **3.3.13 Inspection and Maintenance**

The proposed structure is of reinforced concrete construction, with the working design life for the structure being 120 years (Working Life Category 5). It is expected that the structure will have minimal maintenance and inspection requirements.

Dún Laoghaire Rathdown County Council have been consulted with regards to the inspection and maintenance of this structure.

## **4 Safety**

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### **4.1 Traffic Management During Construction including Land for Temporary Diversions**

Consultation has taken place with Dún Laoghaire Rathdown County Council (DLRCoCo) regarding the traffic management proposals (TMP). It is intended to construct the wall from the road side to minimise impact on the park and the TMP has been discussed with DLRCoCo.

### **4.2 Safety During Construction**

The Designer will take account of the General Principles of Prevention, as specified in the Schedule 3 of the Safety, Health and Welfare at Work Act 2005, liaise with the Project Supervisor appointed by the Client for the Design Process and the Project Supervisor appointed for the Construction Stage and carry out all other duties as required by Clause 15 of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013).

### **4.3 Safety In Use**

Safety barriers in accordance with TII Publication DN-REQ-03034 will be used to protect errant vehicles from the hazard posed by walls within the clear zone.

### **4.4 Lighting**

There is street lighting which currently runs at the back of the footpath adjacent the existing wall. It is proposed to relocate this lighting to align with the position of the new wall.

## **5 Cost**

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### **5.1 Budget Estimate in Current Year, including Whole Life Cost**

To be developed at a further stage of the design.

## **6 Design Assessment Criteria**

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### **6.1 Actions**

Design actions for the retaining wall is as set out in the sections below.

### **6.2 Permanent Actions**

Permanent Actions in accordance with IS EN 1991-1-1:2002 and the associated National Annex.

### **6.3 Snow, Wind and Thermal Actions**

Snow actions are not considered in the design of the retaining walls.

Wind actions shall be in accordance with IS EN 1991-1-4 and the associated National Annex.

Thermal actions will be assessed in accordance with IS EN 1991-1-5 and the associated National Annex.

### **6.4 Actions relating to Normal Traffic**

The application of traffic loads and distribution through the soil will be applied to the retaining walls in accordance with PD 6694-1:2011 (*Recommendations for the design of structures subject to traffic loading to BS EN 1997-1:2004*).

### **6.5 Actions relating to Abnormal Traffic**

Not applicable.

### **6.6 Footway or Footbridge Live Loading**

Not applicable.

### **6.7 Provision for Exceptional Abnormal Loads**

Not applicable.

### **6.8 Accidental Actions**

Not applicable.

### **6.9 Actions During Construction**

Not applicable.



## 6.10 Any Special Loading not Covered Above

Hydrostatic loading on the back of the wall should be considered to account for the potential failure of the back of wall drainage system. The extent of water-pressure should be determined taking account of existing water table levels, local topography and the likelihood of water pressure build-up behind the wall.

## 7 Ground Conditions

A geotechnical desktop study of the area has been undertaken using existing GI information where available. Where identified, supplementary GI information was requested to increase the understanding of the geological conditions at targeted locations across the scheme. The supplementary GI was undertaken by Ground Investigations Ireland Ltd (GII) towards the end of 2020.

The retaining wall will be constructed adjacent to Rock Road from approximate chainage A1320 to A1550. Based on the desk study the ground conditions comprise Made Ground over Till derived from Limestone over Limestone. Exploratory locations R15-CP03 verified the stratigraphy of the overburden (rockhead and rock type was not verified) as it recorded a 1.7m thick layer of Made Ground over a 2.4m thick layer of Dublin Boulder Clay. Taking into account the stratigraphy and the height of the proposed retaining wall, a slope of 1:1.5 is proposed for the initial calculations of the land take. The proposed retaining wall is expected to be founded on Dublin Boulder Clay. In case localised softer material is encountered during construction works, this material will have to be excavated and replaced with a granular fill material (i.e. 6N).

The table below describes the ground profile encountered in borehole R15-CP03.

Table 2: Ground profile at RW01 based on R15-CP03

Ground Strata Description	Depth to top of stratum (m BGL)	Elevation at top of stratum (mOD)	Thickness of stratum (m)	N-Value
<b>Made Ground</b> , Brownish grey slightly sandy gravelly Clay with occasional fragments of glass	0	10.67	1.7	23
Stiff brown slightly sandy gravelly <b>CLAY</b> with occasional subangular to subrounded cobbles	1.7	8.97	2.3	17
Very stiff brown slightly sandy gravelly <b>CLAY</b> with occasional subangular to subrounded cobbles. Obstruction: Large boulder or rockhead	4	6.67	Not Available	Refusal

Notes:

1. Groundwater was not encountered during the drilling.
2. Depth of the borehole is 4.5m

## 8 Drawings and Documents

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### 8.1 List of All Documents Accompanying the Submission

Relevant documents are included as appendices to this report.

#### Appendix A - Drawings

The following drawings are included as part of this submission.

Table 3: Drawing List

Drawing Number	Drawing Title
BCIDC-ARP-STR_KP-1415_XX_00-DR-CB-0001	Key Plan
BCIDC-ARP-STR_GA-1415_RW_01-DR-CB-0001	General Arrangement

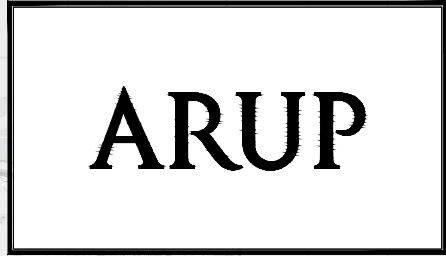
#### Appendix B – Geotechnical Information

#### Appendix C – Photos of Existing Wall

## Appendix A

### Drawings



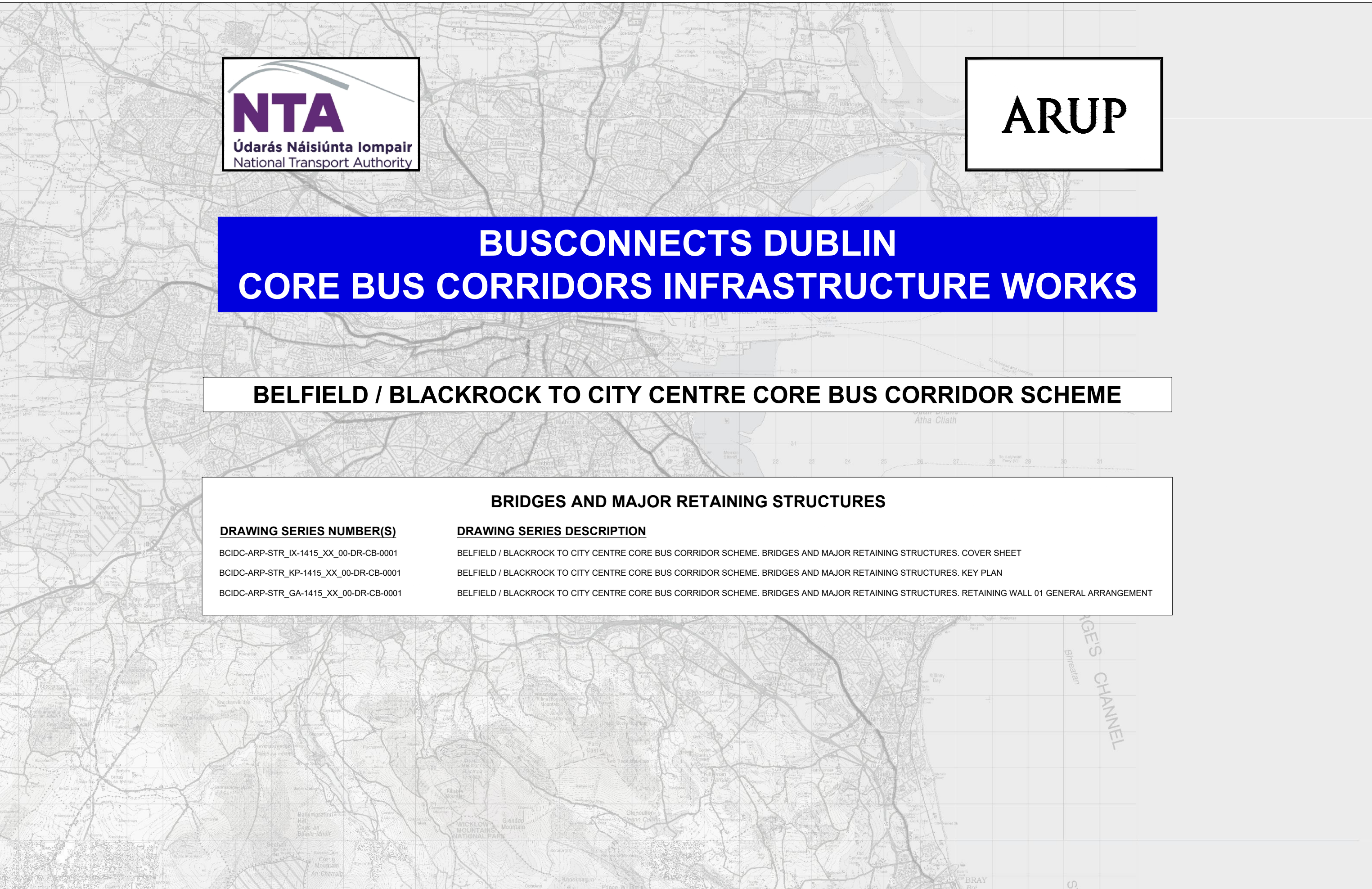


# BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS

## BELFIELD / BLACKROCK TO CITY CENTRE CORE BUS CORRIDOR SCHEME

DRAWING SERIES NUMBER(S)	DRAWING SERIES DESCRIPTION
BCIDC-ARP-STR_IX-1415_XX_00-DR-CB-0001	BELFIELD / BLACKROCK TO CITY CENTRE CORE BUS CORRIDOR SCHEME. BRIDGES AND MAJOR RETAINING STRUCTURES. COVER SHEET
BCIDC-ARP-STR_KP-1415_XX_00-DR-CB-0001	BELFIELD / BLACKROCK TO CITY CENTRE CORE BUS CORRIDOR SCHEME. BRIDGES AND MAJOR RETAINING STRUCTURES. KEY PLAN
BCIDC-ARP-STR_GA-1415_XX_00-DR-CB-0001	BELFIELD / BLACKROCK TO CITY CENTRE CORE BUS CORRIDOR SCHEME. BRIDGES AND MAJOR RETAINING STRUCTURES. RETAINING WALL 01 GENERAL ARRANGEMENT

I:\global\europa\Dublin\Jobs\26860026840-1-004-Internal\4-02 Drawings\4-02 BCIDC\BCIDC-141513 STR\Drawings\DR\BCIDC-ARP-STR\_IX-1415\_XX\_00-DR-CB-0001.dwg



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 d. Information concerning the position of apparatus shown on this drawing is based on drawings supplied by the utility owners and/or the utility works contractor, whilst every care has been taken in the preparation of this drawing, positions should be taken as approximate and are intended for general guidance only and no representation is made by the NTA as to the accuracy, completeness, sufficiency or otherwise of this drawing and the position of the apparatus. The information contained herein does not purport to be comprehensive or final as the apparatus is subject to being altered and/or superseded. Recipients should not rely on this information. Any liabilities are hereby expressly disclaimed.  
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Rev	Date	Drn	Chk'd	App'd	Description
M01	04/03/2022	BM	BB	NH	ISSUE FOR PHASE 4: PLANNING

Client: **NTA**  
Údarás Náisiúnta Iompair  
National Transport Authority

Engineering Designer: **ARUP**

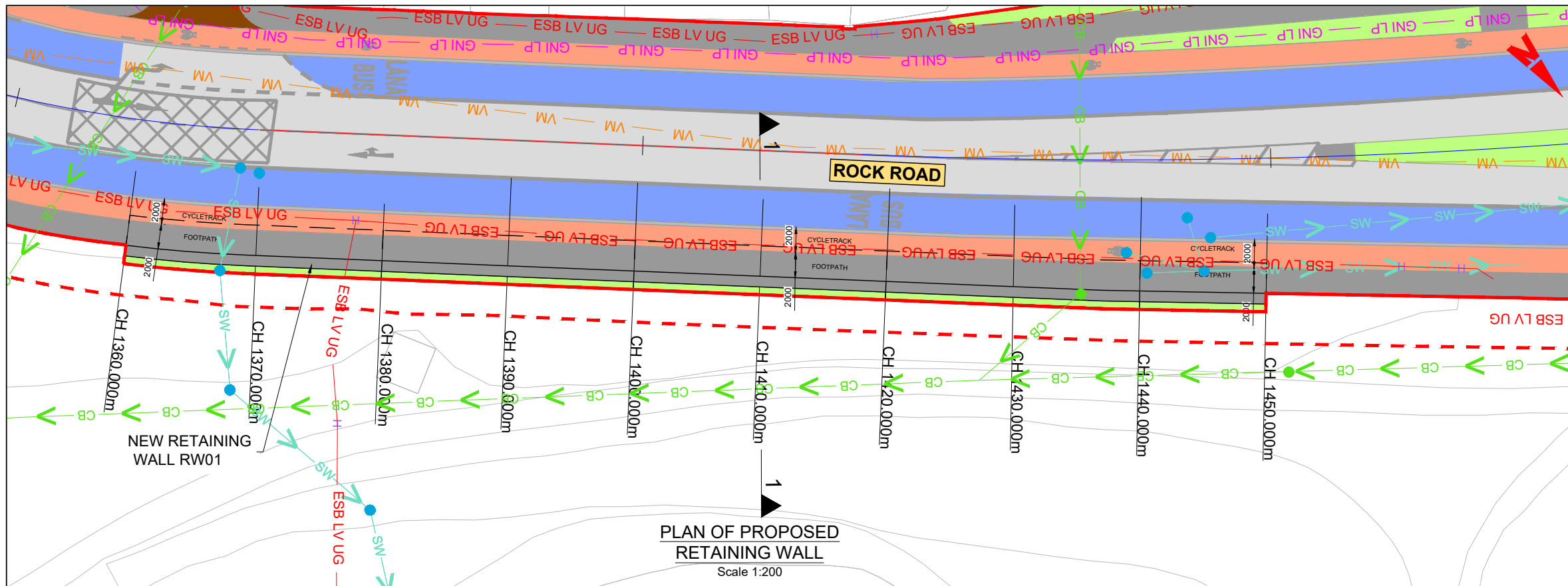
Date: 04/03/2022    Scale: N/A @ A1 / N/A @ A3    Drawn: BM    Checked: BB    Approved: NH

Project Code: BCIDC    Originator Code: ARP    QMS Code: 268401-00

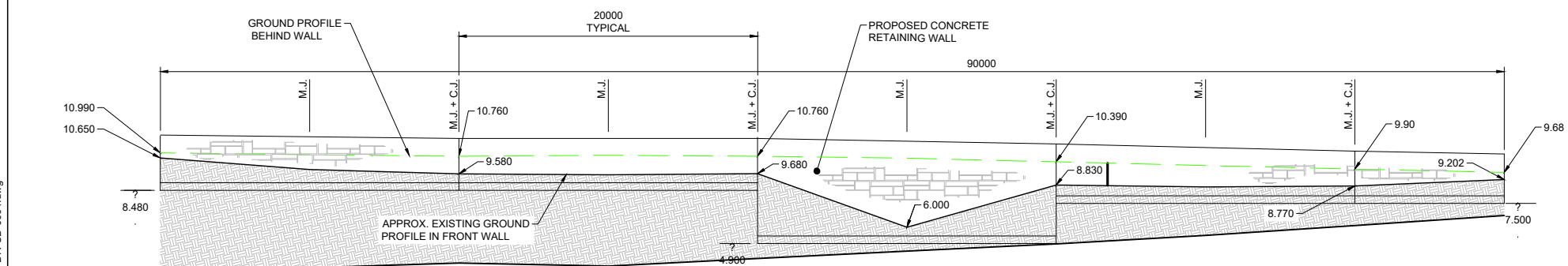
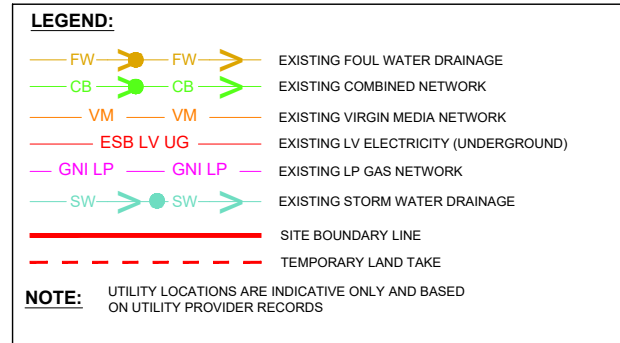
Programme Title		Drawing Title	
<b>BUSCONNECTS DUBLIN CORE BUS CORRIDORS INFRASTRUCTURE WORKS</b>		BELFIELD / BLACKROCK TO CITY CENTRE CORE BUS CORRIDOR SCHEME BRIDGES AND MAJOR RETAINING STRUCTURES COVER SHEET	
Drawing File Name	Sheet Number	Status	Rev
BCIDC-ARP-STR_IX-1415_XX_00-DR-CB-0001	01 of 01	A	M01

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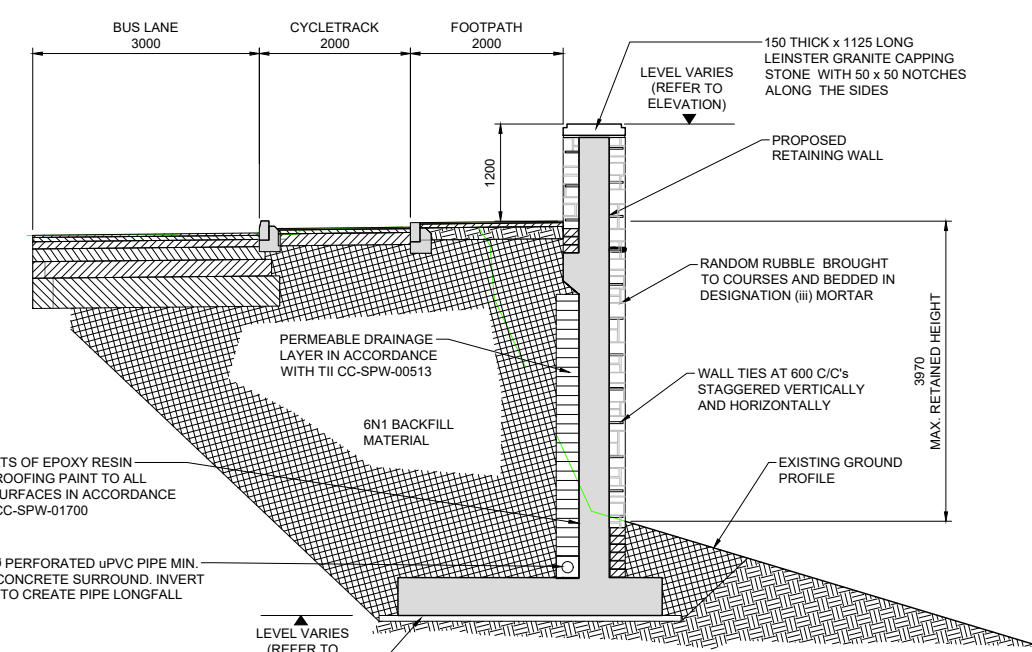




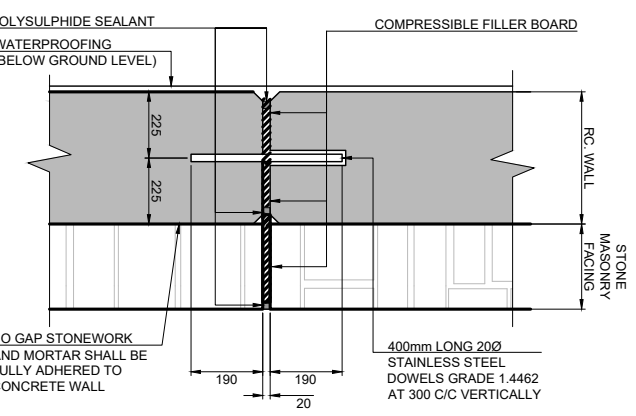
- NOTES:**
- ALL DIMENSIONS ARE SHOWN IN MILLIMETRES UNLESS NOTED OTHERWISE.
  - ALL LEVELS ARE SHOWN IN METRES ABOVE ORDNANCE DATUM USING GEIOD OSGM02.
  - FINISHES:
    - BURIED UNFORMED SURFACES - U1
    - BURIED FORMED SURFACES - F1
    - EXPOSED UNFORMED SURFACES (EXCLUDING AREA TO BE WATERPROOFED) - U3
    - ALL OTHER EXPOSED FORMED SURFACES - F4
  - MATERIALS:
    - LOCATION: CONCRETE GRADE: - C45/55 (50% GGBS)
    - RETAINING WALLS
    - NON-STRUCTURAL CONCRETE: CONCRETE GRADE: - ST1
    - LOCATION: CONCRETE FOR BLINDING
  - BURIED CONCRETE SURFACES SHALL BE TREATED WITH TWO COATS OF EPOXY RESIN WATERPROOFING PAINT IN ACCORDANCE WITH TII CC-SPW-01700.
  - ALL EXPOSED CONCRETE SHALL BE IMPREGNATED WITH A HYDROPHOBIC PORE LINER IN ACCORDANCE WITH THE TII CC-SPW-01700.
  - EXTERNAL CONCRETE ARISES TO BE CHAMFERED 25x25 UNO.
  - INTERFACE BETWEEN NATURAL GROUND WITH 6N AND INTERFACE BETWEEN EMBANKMENT FILL WITH 6N TO BE BENCHED. MAXIMUM BENCH HEIGHT SHALL BE 0.5M AND BENCHES SHALL HAVE A MINIMUM SLOPE GRADIENT OF 5%.
  - STONE MASONRY FACING TO BE ANCHORED TO RETAINING WALL USING ANCON POST FIXED STAIFIX UNIVERSAL WALL STARTER SYSTEM AND SD21 125MM WALL TIES OR EQUIVALENT AT 600MM STAGGERED HORIZONTAL AND VERTICAL CENTRES.
  - LOCALISED SOFT SPOTS, IF PRESENT, TO BE EXCAVATED AND REPLACED WITH 6N2



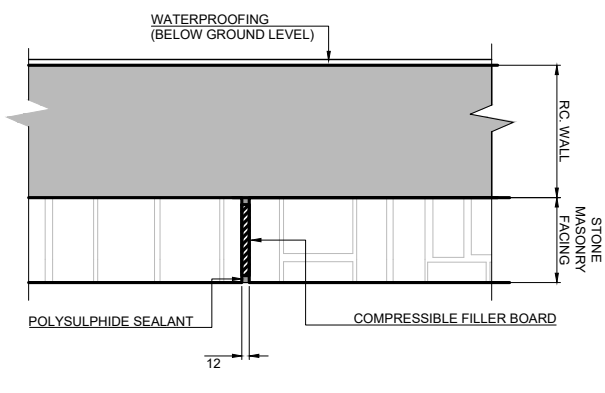
**ELEVATION OF PROPOSED RETAINING WALL**  
Scale 1:200



**TYPICAL RETAINING WALL CROSS SECTION 1 - 1**  
Scale 1:50



**TYPICAL RC WALL AND MASONRY EXPANSION JOINT DETAIL**  
Scale 1:10



**TYPICAL MASONRY EXPANSION JOINT DETAIL**  
Scale 1:10

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<p>Date: 04/03/2022</p>		<p>Scale: As Shown @ A1 As Shown @ A3</p>		<p>Drawn: BM</p>		<p>Checked: BB</p>		<p>Approved: NH</p>		<p>Drawing Title: BELFIELD / BLACKROCK TO CITY CENTRE CORE BUS CORRIDOR SCHEME BRIDGES AND MAJOR RETAINING STRUCTURES RETAINING WALL 01 GENERAL ARRANGEMENT</p>	
<p>Project Code: BCIDC</p>		<p>Originator Code: ARP</p>		<p>QMS Code: 268401-00</p>		<p>Drawing File Name: BCIDC-ARP-STR_GA-1415_RW_01-DR-CB-0001</p>		<p>Sheet Number: 01 of 01</p>		<p>Status: A Rev: M01</p>	

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## **Appendix B**

### **Geotechnical Information**



720900

720950

721000

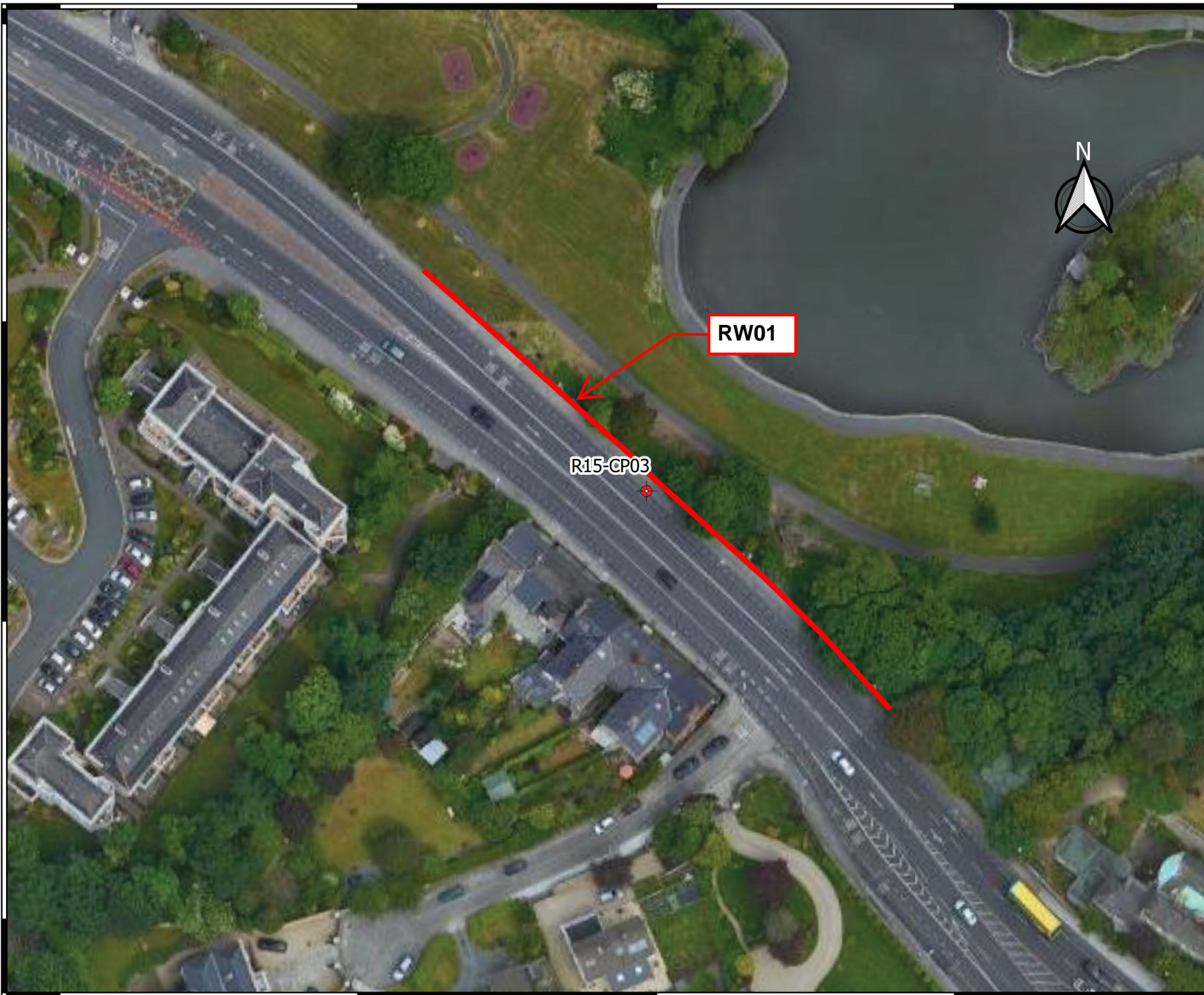
721050

729750

729700

729550

729600



 Cable Percussion



RW01

R15-CP03

Client:

# ARUP

Project Code:

9754-07-20 R15

Project Title:

Bus Connect Route 15

Drawing Title:

Figure 4 Site Location



**GROUND INVESTIGATIONS IRELAND**  
Geotechnical & Environmental

Ground Investigations Ireland Ltd.  
Catherinstown House,  
Hazelhatch Road,  
Newcastle, Co. Dublin  
www.gii.ie 01-6015175/5176

0 7 14 21 28 35 m

Drawn By:  
PC

Date:  
21/01/21

720900

720950

721000

721050





Machine : Dando 2000 Method : Cable Percussion	Casing Diameter 200mm cased to 4.50m	Ground Level (mOD) 10.67	Client National Transport Authority	Job Number 9754-07-20
	Location 720998.3 E 729671.7 N	Dates 05/11/2020	Project Contractor Ground Investigations Ireland	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	EN				10.57 10.37 10.27	0.10 (0.20) 0.30 0.40 (0.40)	CONCRETE. MADE GROUND: Grey very sandy angular to sub-angular fine to coarse Gravel. CONCRETE.		
1.00-1.45	SPT(C) N=23 B T			2,2/3,4,5,11	9.87	0.80 (0.90)	MADE GROUND: Grey very sandy angular to sub-angular fine to coarse Gravel. MADE GROUND: Brownish grey slightly sandy gravelly Clay with occasional fragments of glass.		
1.50	EN				8.97	1.70	Stiff brown slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles.		
2.00-2.45	SPT(C) N=19 B T			1,3/3,5,5,6		(2.30)			
2.50	EN								
3.00-3.45	SPT(C) N=17 B T			1,2/3,3,5,6					
3.50	EN								
4.00-4.45	SPT(C) 50/295 B T			2,3/5,6,7,32	6.67 6.57	4.00 4.10	Very stiff brown slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles. Obstruction: Large boulder or rockhead		
							Refusal at 4.50m		

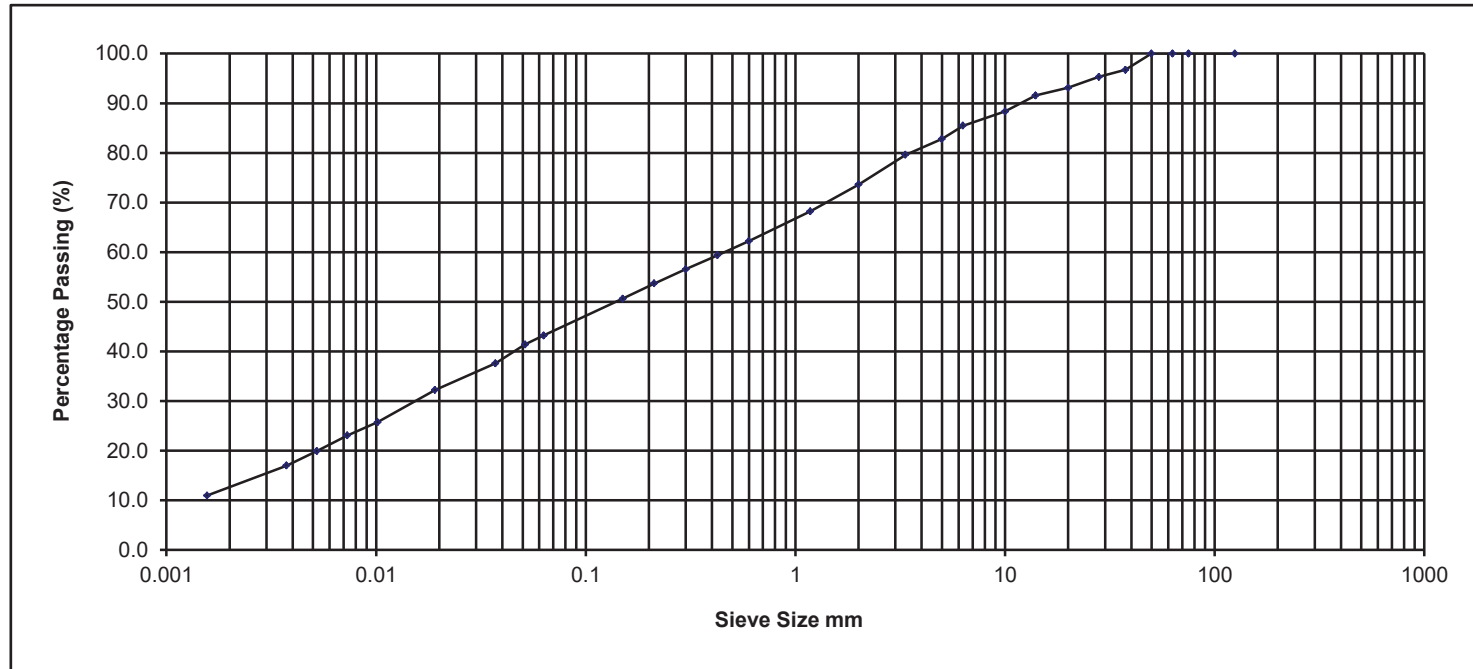
<b>Remarks</b> Borehole complete at 4.50mBGL. No groundwater encountered. Borehole backfilled and footpath reinstated Chiselling from 4.50m to 4.50m for 1 hour.	Scale (approx)	Logged By
	1:50	Tmcl
	<b>Figure No.</b> 9754-07-20.R15-CP03	



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Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	96.7
28.000	95.3
20.000	93.1
14.000	91.6
10.000	88.4
6.300	85.5
5.000	82.8
3.350	79.6
2.000	73.6
1.180	68.2
0.600	62.2
0.425	59.4
0.300	56.6
0.212	53.7
0.150	50.6
0.063	43.2
0.051	41.4
0.037	37.6
0.019	32.2
0.010	25.7
0.007	23.1
0.005	19.9
0.004	17.0
0.002	11.0

### Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Clay	Percentage Particle Size						Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse		
	Silt		Sand		Gravel			
11.0	32.2		30.4		26.4		0.0	0.0

Sample Description: Brown slightly gravelly slightly sandy silty CLAY

Project No. NMTL 3326

BH/TP No. R15-CP03

Project: Bus connect Route 15

GII Project ID-9754-07-20

Sample No. B

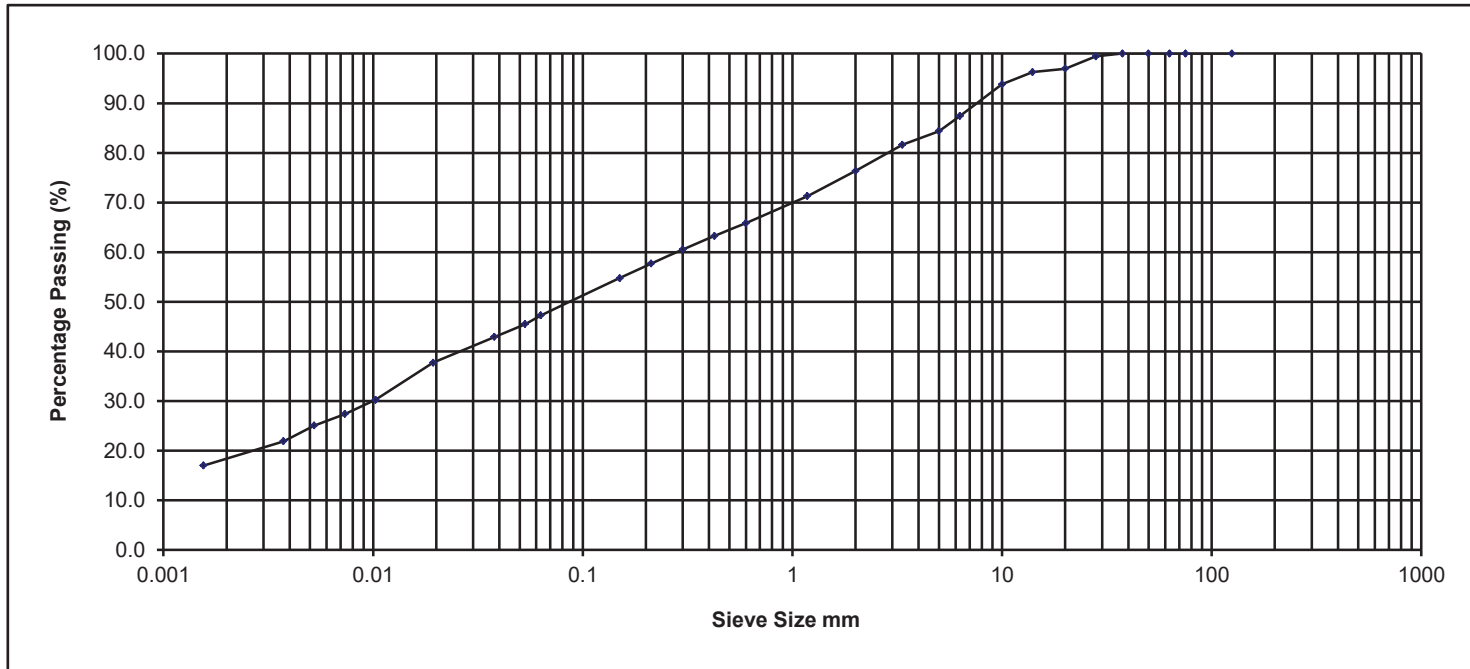
**NM**  
**TL**  
**Ltd**

Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	15/12/2020	Depth	2.0m
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**NMTL Ltd**

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	99.4
20.000	97.0
14.000	96.3
10.000	93.8
6.300	87.4
5.000	84.4
3.350	81.6
2.000	76.4
1.180	71.3
0.600	65.8
0.425	63.2
0.300	60.5
0.212	57.7
0.150	54.8
0.063	47.2
0.053	45.5
0.038	42.9
0.019	37.7
0.010	30.2
0.007	27.4
0.005	25.1
0.004	21.9
0.002	17.0

### Determination of Particle Size Distribution BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5



Percentage Particle Size

Clay	Fine			Medium			Coarse			Cobbles	Boulder
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
17.0										0.0	0.0

Sample Description: Brown slightly gravelly slightly sandy silty CLAY

Project No. NMTL 3326

BH/TP No. R15-CP03

Project: Bus connect Route 15

GII Project ID-9754-07-20

Sample No. B

**NM**  
**TL**  
**Ltd**

Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	15/12/2020	Depth	4.0m
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## Appendix C

### Photos of Existing Wall

Photos of existing wall

