

BAM Nuttall Ltd

Victoria North HIF Infrastructure & Enabling Works

Civil Infrastructure (Specification for Highway Works & Permanent Water Treatment Plant Works)

Reference: VNIF-ARP-ZZ-YYY-SP-C-001

P09 | 27 August 2024

Job number 282022

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Document Verification

Project title Victoria North HIF Infrastructure & Enabling Works
Document title Civil Infrastructure (Specification for Highway Works & Permanent Water Treatment Plant Works)
Job number 282022
Document ref VNIF-ARP-ZZ-YYY-SP-C-001
File reference

Revision	Date	Filename		
P02	09/08/22	Description	First Issue	
			Prepared by	Checked by
			Approved by	
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		Signature		Rachel Sandham.
P03	23/11/22	Filename		
		Description	Update to address client and technical advisor comments	
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C01	13/02/23	Filename		
		Description	Construction Issue	
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			Approved by	
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C02	02/02/24	Filename			
		Description	Construction Issue		
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P07	28/05/2024	Filename			
		Description	Inclusion of Permanent Water Treatment Plant Works civils section (Appendix A)		
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P09	27/08/2024	Filename			
		Description	Revision to earthworks tolerances CI 6.3/11		
			Prepared by	Checked by	Approved by
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Issue Document Verification with Document

✓

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PREAMBLE TO THE SPECIFICATION

1. The Specification referred to in the Tender shall be the ‘Specification for Highway Works’, published by the Stationery Office (formerly HMSO) as Volume 1 of the Manual of Contract Documents for Highway Works, as modified and extended by the following contract specific items:
 - i. Appendix 0/1: Contract specific Additional, Substitute and Cancelled Clauses, Tables and Figures;
 - ii. Appendix 0/2: Contract specific minor alterations to existing Clauses, Tables and Figures;
 - iii. The contract specific Numbered Appendices listed in Appendix 0/3;
 - iv. Appendix 0/4 contains a list of the Drawings.
 - v. Appendix 0/5: Special National Alterations of the Overseeing Organisation of Scotland, Wales or Northern Ireland.
2. The relevant publication date of each page of the Specification for Highway Works is given in the Schedule of Pages and Relevant Publication Dates.
3. An Additional Clause as indicated by a suffix ‘A’ in Appendix 0/5 is an alteration originating from the Overseeing Organisation of Scotland, Wales or Northern Ireland. An Additional Clause as indicated by a suffix ‘AR’ in Appendix 0/1 is a contract specific alteration.
4. A Substitute Clause, as indicated by the suffix ‘S’ in Appendix 0/5 is an alteration originating from the Overseeing Organisation of Scotland, Wales or Northern Ireland. A Substitute Clause as indicated by a suffix ‘SR’ in Appendix 0/1 is a contract specific alteration.
5. A Cancelled Clause as indicated by a suffix ‘C’ in Appendix 0/5 is an alteration originating from the Overseeing Organisation of Scotland, Wales or Northern Ireland. A Cancelled Clause indicated by a suffix ‘CR’ in Appendix 0/1 is a contract specific alteration.
6. Insofar as any of the contract specific Numbered Appendices may conflict or be inconsistent with any provision of the Specification for Highway Works the Numbered Appendices shall always prevail. Additionally, Numbered Appendices 0/1 and 0/2 shall take precedence over Numbered Appendix 0/5.
7. Any reference in the Contract to a Clause number or contract specific Appendix shall be deemed to refer to the corresponding Substitute Clause number or contract specific Appendix listed in Appendix 0/1, 0/2 or 0/5.
8. Where a Clause is altered any original Table/Figure referred to in the Clause shall apply unless the Table/Figure is also altered. Where a Table/Figure is altered any reference in a Clause to the original Table/Figure shall apply to the altered Table/Figure.
9. Where a Clause in the Specification relates to work goods or materials which are not required for the Works it shall be deemed not to apply.
10. Any Appendix referred to in the Specification which is not used shall be deemed not to apply.
11. Where a Clause in the Specification is prefixed by an # this indicates that this particular Clause has a substitute National Alteration for one or more of the Overseeing Organisations of Scotland, Wales or Northern Ireland. Substitute or additional National Clauses shall be

used within countries to which they specifically apply and they are deemed to replace corresponding Clauses in the main text of the Specification as appropriate. The substitute National Clauses are located at the end of the relevant Series together with the additional National Clauses of the Overseeing Organisations.

12. Other than where references to the Overseeing Organisation are made in the context of the Overseeing Organisation granting statutory or type approvals, the roles and functions of the Overseeing Organisation shall be undertaken by the *Employer*.
 - vi. Where the Specification requires the provision of documentation to the Overseeing Organisation for statutory or type approval such documentation shall be provided to the *Project Manager*.
13. If the Specification is used in conjunction with a Contract under which the Contractor is responsible for the design of any part of the Permanent Works, the delegation of the roles and functions of the Overseeing Organisation as stated in paragraph 12 above shall be further amended as follows:
 - (i) If any agreement, consent or approval required to be obtained from the Overseeing Organisation impacts on the health and safety of the general public, the environment or any property or equipment not owned or operated by the Contractor, such agreement, consent, approval shall be obtained from the Project Manager.
 - (ii) Where the Specification provides for the Overseeing Organisation to require a test, waive the requirement for a test or alter testing frequency, the party to whom the Overseeing Organisation's roles and functions have been ascribed by paragraph 12 above shall exercise such decisions in accordance with the Secretary of State's requirements stated in the Contract.
14. Where Standards and other documents are incorporated into the Contract by reference the respective edition used shall be that which is current on the Contract Reference Document Date 31/01/2020 unless otherwise stated in the Specification.
15. Appendix A (Permanent Water Treatment Plant Works – Civils Specification) has been included within this document to specify the requirements of the rising main and break chamber works elements of the Permanent Water Treatment Works Plant, within Red Bank Plateau that are required for the stripping and processing of methane gas from water entering the site from beneath the Showman's Guild. For specific performance requirements, see the Permanent Water Treatment Works Performance Specification VNIF-ARP-ZZ-YYY-SP-MP-0001.

Schedule of Pages and Relevant Publication Dates

Series / Appendix	Page Number	Publication Date
000	1 to 3	May 2014
000	6 to 7F	February 2016
000	4 to 5	November 2021
100	2, WF1, N2 to N11F	May 2014
100	N1	December 2014
100	1,3 to 30F	April 2022
200	1 to 3F	February 2016
300	1	May 2001
300	4	November 2002
300	2 to 3, 5 to 6F	May 2008
400	1, 9 to 11, 13, 17 to 20, 21, 23F	May 2017
400	2 to 8, 12,14 to 16, 22	March 2020
500	1 to 2, 4 to 39F, N1 to N2F	February 2020
500	3	March 2020
600	1 to 68, 70 to 77F, S1 to S4F, W1 to W4F, N1 to N5F	February 2016
600	69	February 2017
700	1 to 36F, N1 to N6F	February 2016
800	1 to 42F	November 2021
900	1 to 83F, S1 to S3F, W1 to W2F, N1F	July 2021
1000	3 to 33	January 2020
1000	1 to 2, 34 to 58F	November 2021
1100	1 to 16F	February 2021
1200	5	May 2001
1200	2 to 3, W1F	August 2003
1200	1, 14 to 16F	May 2004
1200	4, 9 to 11, 13	May 2005
1200	12	November 2006
1200	6 to 7, N1 to N4F	November 2007
1200	8	May 2008
1300	N2F	November 2003
1300	3 to 4	November 2004
1300	1, 5 to 10, 12F	November 2005
1300	2, 11 and N1	May 2006
1400	2, N1F	May 2001

Series / Appendix	Page Number	Publication Date
1400	1, 3 to 9F	May 2006
1500	1 to 31F	February 2017
1600	1, 4 to 5, 9, 15, 17 to 18, 24 to 26, 29 to 31, 35, 38, 49F	March 1998
1600	2, 6 to 8, 10 to 14, 16, 19, 27 to 28, 32 to 34, 36 to 37, 39 to 42, 44 to 48	November 2003
1600	3, 20 to 23, 43	November 2005
1700	2, 4, 6 to 7, 19, 24 to 27, 30 to 34	December 2014
1700	1, 3, 5, 8 to 18, 20 to 23, 28 to 29, 35 to 39F	March 2020
1800	1 to 39F	April 2021
1900	1 to 35F, S1 to S2F	August 2014
2000	1, 3 to 4F	May 2001
2000	2	November 2004
2100	1 to 2F	February 2016
2300	1	March 1998
2300	2 to 3F	May 2001
2400	1, 4, 7F	May 2005
2400	2	May 2006
2400	3, 5 to 6	May 2008
2500	1	May 2001
2500	2, 8, 11F	November 2003
2500	10	November 2004
2500	6 to 7, 9	May 2005
2500	5	May 2006
2500	3 to 4	November 2006
2600	1	March 1998
2600	2 to 4	November 2003
2600	5	November 2004
2600	6	May 2005
2600	7F	November 2006
3000	4 to 7, 10, 12 to 17, 19, 22 to 27F	May 2001
3000	20	November 2004
3000	2 to 3	May 2006
3000	8 to 9, 11, 18, 21	May 2008
5000	1, 4 to 19F, S1F	May 2005
5000	2 to 3	November 2008

Series / Appendix	Page Number	Publication Date
5700	1 to 30F	February 2020
Appendix A	1 to 4F	May 2014
Appendix B	1 to 3F	May 2014
Appendix C	1 to 2F	May 2014
# Appendix D	1F	May 2014
Appendix D (NI)	N1F	May 2014
Appendix E	1F	May 2014
Appendix F	1 to 55F	November 2021
Appendix G	Not used	
Appendix H	1	May 2004
Appendix H	2	November 2005
Appendix H	3	November 2006
Appendix H	4 to 9F	November 2008

Appendix 0/1: Contract Specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the Contract.

PART A: Volume 1 Specification

List of Additional Clauses, Table and Figures

Clause No. (etc)	Title
170 AR	Accepted Drawings The whole of the works shall be carried out in conformity with the plans, sections and detailed drawings accepted by the Engineer. No amendment shall be made to the accepted drawings except with the written agreement of the Engineer. A copy of the accepted drawings and this specification shall be available on the site at all times.
171 AR	Standards Works, goods and materials shall comply with the standards specified in this document or the relevant Specification of the British Standards Institution, hereinafter referred to as the BS. Any reference to a Standard published by the British Standards Institution, or to the specification of another body, shall be construed equally as reference to an equivalent one. A Contractor's submission shall be in accordance with the latest published Standard that is current at the date the submission is made. Where a Contractor wishes to use work, goods or materials for which a European, British Standard or equivalent is not available then appropriate details of their standards and their levels of safety, suitability and fitness for purpose shall be submitted to the Engineer for approval. This might be achieved by using products that have been assessed by an independent body. The British Board of Agrément (BBA) is authorized to issue European Technical Approvals under the provisions of the Construction Products Directive (89/106/EEC). Contractors are advised to discuss the use of newly developed products with the Engineer at the earliest opportunity. Additional quality assurance requirements, including certification under an EN 45011 accredited product conformity certification scheme, may be sought by the Engineer as a cost effective means of ensuring compliance with Standards. BSI kite marking is an example of a compliant certification scheme.

172 AR	British Board of Agreement Certificates Where any work, goods or materials are required to have a British Board of Agreement Certificate, only works goods or materials so certified shall be used and the Contractor shall in each case submit to the Engineer a copy of the certificate. The requirement for types of goods or materials to have a British Board of Agreement Certificate shall be satisfied by goods or materials having an equivalent Agreement certificate issued in any member state of the European Communities, provided that the goods or materials covered by such certificate offer in use levels of safety, suitability and fitness for purpose equivalent to those incorporated in the British Board of Agreement Certificate. This sub-clause applies also to works only in so far as the means of carrying out such works are indivisibly associated with the goods or materials for which an alternative Agreement certificate is proposed.
173 AR	Samples Before commencing the works, the Contractor shall deposit with the Engineer samples of any materials the Engineer may require. The Contractor shall obtain approval to the samples before commencing the work or during the course of the works prior to the materials being used. The materials used must be at least equal in every respect to the approved samples. The Engineer may at his discretion from time to time require the Contractor to provide material samples free of charge for testing as the Engineer may direct. Materials bearing the British Standard Kitemark will not generally require initial or routine sampling and testing.
174 AR	Testing The Contractor shall be responsible for the payment of all charges for tests on materials and in the event of failure he shall replace any faulty materials. Details of the Engineer's minimum anticipated testing schedule will be agreed before the works commence. Additional testing may be required by the Engineer at any time during the execution of the works. The Contractor, shall, when required, grant every facility to the Engineer for taking such samples, cores, specimens and carrying out any other test on site. He shall provide all attendance and samples, cores and specimens and make good after the tests free from charge.
175 AR	Condemned Materials Any materials condemned by the Engineer as unfit for use in the works shall be removed from the site immediately.
176 AR	Privately and Publicly Owned Services and Supplies The Contractor shall take all necessary measures required by the Employer or apparatus owner for the protection of existing mains, pipes, cables and other apparatus during the progress of the works and shall ensure that all requisite notice is given to the owner for the protection concerned. Where new utility plant is to be installed within the works the Contractor shall follow the recommendations set out in the National Joint Utilities Group Publication "Guidelines on the Installation and Colour Coding of Utilities' Apparatus". Where work is to be carried out in proximity to trees the Contractor shall follow the recommendations set out in the National Joint Utilities Group Publication No 10 "Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees". It is the Contractors responsibility to liaise with all utility owners in respect of the installation of their apparatus within the limits of the prospectively adoptable highway and ensure that adequate provision is made prior to the final wearing surfacing of the new carriageways and footways for the installation of such equipment. Where trenches are excavated after surface course has been applied, and prior to taking over, the entire width of surfacing shall be re-laid. The Engineer reserves the right to postpone the adoption of any new street where there is evidence that a Statutory Undertaker has not yet installed their equipment. For the purpose of this Specification, the term 'Statutory Undertaker' refers to companies providing gas, water or electricity, as well as telecommunications companies and other cable installers.

177 AR	Cleanliness of the Highway All highways including carriageways, footways, footpaths, bridleways and verges used by the Contractor shall be kept clean, free from dust, mud and debris of any description to the satisfaction of the highway authority or the police. The Contractor shall employ such equipment, mechanical or otherwise, as is necessary to clean the highway and/or the wheels of vehicles.
178 AR	Work Requiring Inspection The Contractor shall afford opportunity for the Engineer to examine any work which is about to be covered up or put out of view, and to examine foundations before permanent work is to be placed thereon. The Contractor shall give the Engineer at least three clear working day's notice before any formation or other work is to be covered with permanent work and before any testing is carried out during weekday construction. Failure to give such notice could result in the requirement for the later exposure of the work and its removal if considered necessary by the Engineer. The Contractor shall pay the costs of all such exposure, remedial works if required and reinstatement. The Engineer shall be given access to and may visit the work in progress from time to time. Such visits do not absolve the Contractor from his responsibility for supervising the work, nor for ensuring that it is carried out in accordance with the Specification and approved drawings. The Contractor is responsible for arranging and facilitating all inspections and approvals required. The Contractor shall make adequate allowances in the programme of work for adhering to these practices, and for the necessary associated notification and communications periods.
179 AR	Quality of Workmanship Where appropriate British Standard Specifications or British Codes of Practice or equivalent lay down standards of workmanship, these are to be recognised as the minimum acceptable standards. Where standards do not exist workmanship throughout shall be to the minimum good practice of the respective trade or class.
180 AR	Site Safety The Contractor shall take full responsibility for the adequate stability and safety of all site operations and methods of construction which shall comply fully with the current requirements of the Health & Safety at Work Etc Act 1974, The Management of Health and Safety at Work Regulations 1999, The Construction (Health, Safety and Welfare) Regulations 1996, The Construction (Design and Management) Regulations 2015 and other relevant legislation and documents.

Additional Clauses, Tables and Figures

Clause No. (etc.)	Title and Written Text
<i>Not used</i>	<i>Not used</i>

Substitute Clauses, Tables and Figures

Clause No. (etc.)	Title and Written Text
<i>Not used</i>	<i>Not used</i>

Appendix 0/2 – List of Contract-Specific minor alterations to existing clauses, tables and figures included in The Contract

Clause No.	Alteration to be Made
Table 6/1	Table 6/1 is modified by table 6/1A included in Appendix 6/1

Appendix 0/3 – List of Numbered Appendices Referred to in the Specification for Highway Works

List A contains a list of Numbered Appendices referred to in the Specification for Highway Works. Those not used within this contract are marked 'Not Used'.

Key and Guide to types of contract specific Numbered Appendices – who compiles/completes

- (Co) Compiler compiles.
- (Co/C) Compiler partially completes and Contractor completes and returns to the Overseeing Organisation.
- (Co/T) Compiler partially compiles and Tenderer completes and returns with tender.
- (C) Contractor completes and returns to Overseeing Organisation.
- (P) This indicates the Appendix is a national proforma and format must not be altered.

List A: List of Numbered Appendices Referred to in the Specification for Highway Works

Completed By	Appendix No.	Title	Comments
INTRODUCTION			
(Co)	0/1	Contract-specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the Contract	✓
(Co)	0/2	Contract-specific Minor Alterations to Existing Clauses, Tables and Figures included in the Contract	✓
(Co)	0/3	List of Numbered Appendices Referred to in the Specification and included in the Contract	✓
(Co)	0/4	List of Drawings included in the Contract	✓
(Co)	0/5	Special National Alterations of the Overseeing Department of Scotland, Wales or Northern Ireland	Not used
PRELIMINARIES			
(Co)	1/1	Temporary Accommodation and Equipment for the Overseeing Organisation	Not used
(Co)	1/2	Vehicles for the Overseeing Organisation	Not used
(Co)	1/3	Communication System for the Overseeing Organisation Working and Fabrication Drawings	Not used
(Co)	1/4	Working and Fabrication Drawings	Not used
(Co)	1/5	Testing to be carried out by the Contractor	✓
(Co)	1/6	Supply and Delivery of Samples to the Overseeing Organisation	Not used
(Co)	1/7	Site Extent and Limitations on Use	✓
(Co)	1/8	Operatives for the Overseeing Organisation	Not used
(Co)	1/9	Control of Noise and Vibration	Not used

Completed By	Appendix No.	Title	Comments
(Co)	1/10	Permanent Works to be Designed by the Contractor	Not used
(Co)	1/11	Temporary Works Design	✓
(Co)	1/12	Setting Out and Existing Ground Level	✓
(Co)	1/13	Programme of Works	Not used
(Co)	1/14	Payment Applications	Not used
(Co)	1/15	Accommodation Works	Not used
(Co)	1/16	Privately and Publicly Owned Services and Supplies	✓
(Co)	1/17	Traffic Safety and Management	Not used
(Co)	1/18	Temporary Diversions for Traffic	Not used
(Co)	1/19	Routeing of Vehicles	Not used
(Co) (C)	1/20	Recovery Vehicles for Breakdown	Not used
(Co) (C)	1/21	Information Boards	Not used
(Co) (C)	1/22	Progress Photographs	Not used
(Co)	1/23	Risks to Health and Safety from Materials or Substances	Not used
(Co) (C)	1/24	Quality Management System	Not used
(Co) (C)	1/25	Temporary Closed Circuit Television (CCTV) System for the Monitoring of Traffic	Not used
(Co) (C)	1/26	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Road works (TASCAR)	Not used
(Co) (C)	1/27	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Road works (TASCAR) – Particular Requirements	Not used
SITE CLEARANCE			
(Co)	2/1	List of Buildings etc. to be Demolished or Partially Demolished	Not used
(Co)	2/2	Filling of Trenches and Pipes	✓
(Co)	2/3	Retention of Material arising from Site Clearance	Not used
(Co)	2/4	Explosives and Blasting	Not used
(Co)	2/5	Hazardous Materials	Not used
FENCING AND ENVIRONMENTAL BARRIERS			
(Co)	3/1	Fencing, Gates and Stiles	Not used
ROAD RESTRAINT SYSTEMS (VEHICLE AND PEDESTRIAN)			
(Co)	4/1	Road Restraint Systems (Vehicle and Pedestrian)	✓
(C)	4/2	Information required to demonstrate compliance of road restraint systems	Not Used
DRAINAGE AND SERVICE DUCTS			
(Co)	5/1	Drainage requirements	✓
(Co)	5/2	Service Duct requirements	✓
(Co)	5/3	Surface water channels and drainage channel blocks	Not Used
(Co)	5/4	Fin drains and Narrow Filter drains	Not Used
(Co)	5/5	Combined Drainage and Kerb Systems	Not Used
(Co)	5/6	Linear Drainage Channel Systems	Not used
(Co)	5/7	Thermoplastics structural wall pipes and fittings	Not Used

Completed By	Appendix No.	Title	Comments
EARTHWORKS			
(Co)	6/1	Requirements for Acceptability and Testing etc. of Earthworks Materials	✓
(Co)	6/2	Requirements for dealing with Class U1B and Class U2 Unacceptable Material	✓
(Co)	6/3	Requirements for Excavation, Deposition, Compaction (other than Dynamic Compaction)	✓
(Co)	6/4	Requirements for Class 3 Material	Not Used
(Co)	6/5	Geotextiles used to separate Earthworks Materials	Not used
(Co)	6/6	Fill to Structures and Fill above Structural Foundations	✓
(Co)	6/7	Sub-formation and Capping and Preparation and Surface Treatment of Formation	✓
(Co)	6/8	Topsoiling, grass seeding and turfing	✓
(Co)	6/9	Earthwork Environmental Bunds, Landscape Areas, Strengthened Embankments	Not used
(Co)	6/10	Ground Anchorages, Crib Walling and Gabions	Not used
(Co)	6/11	Swallow Holes and other Naturally Occurring Cavities and Disused Mine Working	Not Used
(Co)	6/12	Instrumentation and Monitoring	✓
(Co)	6/13	Ground Improvement	Not Used
(Co)	6/14	Limiting Values for Controlled Waters (incorporating Appendix 6/15 - Limiting Values for Human Health and the Environment)	✓
(Co)	6/15	Limiting Values for Harm to Human Health and the Environment	Not used
ROAD PAVEMENTS - GENERAL			
(Co)	7/1	Permitted Pavement Options (Schedules 1, 2, 3, 4 and 5)	✓
(Co)	7/2	Excavation, Trimming and Reinstatement of Existing Surfaces	✓
(Co)(C)(T)(P)	7/3	Surface Dressing Sheets 1 and 2	Not used
(Co)(C)(T)(P)	7/4	Bituminous Sprays	✓
(Co)(C)(T)(P)	7/5	In Situ Recycling. The Repave and Remix Process	Not used
(Co)(C)(T)(P)	7/6	Breaking Up or Perforation of Existing Pavement	Not used
(Co)(C)(T)(P)	7/7	Slurry Surfacing Incorporating Microsurfacing (Sheets 1,2 & 3)	Not used
(Co)(C)(T)(P)	7/8	NOT USED	Not used
(Co)(C)(T)(P)	7/9	Cold-Milling (Planing) of Bituminous Bound Flexible Pavement	✓
(C)	7/10	Worksheet Pro Forma for Results of Testing for Constituent Materials in Recycled Coarse Aggregate and Recycled Concrete	Not used
(C)	7/11	Overband and Inlaid Crack Sealing Systems	Not used
(C)	7/12	Arrester Beds	Not used
(Co)	7/13	Saw-Cut and Seal Bituminous Overlays on Existing Jointed Concrete Pavements	Not used
(Co)	7/14	Preparation of Jointed Concrete Pavements Prior to Overlaying and Saw-Cutting and Seal of Bituminous Overlay	Not used
(Co)	7/15	Saw-Cut, Crack and Seal Existing Jointed Concrete Pavements	Not used

Completed By	Appendix No.	Title	Comments
(Co)	7/16	Cracking and Seating of Existing Jointed Unreinforced Concrete Pavements and CBM Roadbases	Not used
(C)	7/17	Cracking Plant and Equipment Progress Record	Not used
(Co)	7/18	Site Specific Details and Requirements for Cold Recycled Bitumen Bound Material	Not used
(Co)	7/19	Site Specific Details and Requirements for Recycling Cement Bound Material	Not used
(Co)	7/20	Site Specific Details and Requirements for Inducing Cracks	Not used
(Co)(C)(T)	7/21	Surface Dressing – Recipe Specification	Not used
(Co)(C)(T)	7/22	Repair to Potholes	Not used
ROAD PAVEMENTS – CONCRETE AND CEMENT BOUND MATERIALS			
(T)	10/1	Plant and Equipment for the Construction of the Exposed Aggregate Concrete Surface	Not Used
KERBS, FOOTWAYS AND PAVED AREAS			
(Co)	11/1	Kerbs, Footways and Paved Areas	✓
(Co)	11/2#	Access Steps	Not used
TRAFFIC SIGNS			
(Co)	12/1#	Traffic Signs: General	Not used
(Co)	12/2	Traffic Signs: Marker Posts	Not used
(Co)	12/3	Traffic Signs: Road Markings and Studs	✓
(Co)	12/4	Traffic Signs: Cones, Cylinders, FTD's and other Traffic Delineators	Not used
(Co)	12/5	Traffic Signs: Traffic Signals	Not used
(Co)	12/6	Traffic Signs: Special Sign Requirements on Gantries	Not used
ROAD LIGHTING COLUMNS AND BRACKETS, CCTV MASTS AND CANTILEVER MASTS			
(Co)	13/1#	Information to be provided when Specifying Lighting Columns and Brackets	✓
(C) (P)	13/2	Column and Bracket Data Sheets 1 and 2	Not used
(P)	13/3	Instructions for Completion of Column and Bracket Data Sheet	Not used
(C)(P)	13/4	Information to be Provided when Specifying CCTV Masts	Not used
(P)	13/5	Typical CCTV Mast Data Sheet	Not used
	13/6	Instructions for Completion of CCTV Mast Sheets	Not used
(Co/T)	13/7#	Information to be Provided When Specifying Cantilever Masts	Not used
(C)(P)	13/8	Typical Cantilever Masts Data Sheets 1 and 2	Not used
(P)	13/9	Instruction for Completion of Cantilever Masts Data Sheets	Not used
ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS			
(Co)	14/1	Site Records	✓
(Co)	14/2	Location of Lighting Units and Feeder Pillars	✓
(Co)	14/3	Temporary Lighting	✓
(Co/C)	14/4	Electrical Equipment for Road Lighting	✓
(Co/C)	14/5	Electrical Equipment for Lighting	✓
(Co/C)	14/6	Lighting Control	✓

Completed By	Appendix No.	Title	Comments
MOTORWAY COMMUNICATIONS			
(Co)	15/1	Motorway Communications	Not used
(Co)	15/2	Cable Duct Requirements	Not used
PILING AND DIAPHRAGM WALLING			
(Co)	16/1	Requirements for Piling and Diaphragm Walling	Not used
(Co)	16/2	Precast Reinforced and Prestressed Concrete Piles and Precast Reinforced Concrete Segmental Piles	Not used
(Co)	16/3	Bored Cast-in-place Piles	Not used
(Co)	16/4	Bored Piles Constructed using Continuous Flight Augers and Concrete or Grout Injection through Hollow Auger Stems	Not used
(Co)	16/5	Driven Cast-in-Place Piles	Not used
(Co)	16/6	Steel Bearing Piles	Not used
(Co)	16/7	Reduction of Friction on Piles	Not used
(Co)	16/8	Non-Destructive Method for Testing Piles	Not used
(Co)	16/9	Static Load Testing of Piles	Not used
(Co)	16/10	Diaphragm Walls	Not used
(Co)	16/11	Hard/Hard Secant Pile Walls	Not used
(Co)	16/12	Hard/Soft Secant Pile Walls	Not used
(Co)	16/13	Contiguous Bored Pile Walls	Not used
(Co)	16/14	King Post Walls	Not used
(Co)	16/15	Steel Sheet Piles	Not used
(Co)	16/16	Integrity Testing of Wall Elements	Not used
(Co)	16/17	Instrumentation for Piles and Embedded Walls	Not used
(Co)	16/18	Support Fluids	Not used
STRUCTURAL CONCRETE			
(Co)	17/1	Concrete: Classification of Mixes	✓
(Co)	17/2	Concrete: Impregnation Schedule	Not used
(Co)	17/3	Concrete: Surface Finishes	Not used
(Co)	17/4	Concrete: General	Not used
(Co)	17/5	Buried Concrete: Sulphate Attack	Not used
(Co)	17/6	Grouting and Duct Systems for Post-tensioned Tendons	Not used
STRUCTURAL STEELWORK			
(Co)	18/1	Requirements for Structural Steelwork	✓
PROTECTION OF STEELWORK AGAINST CORROSION			
(C)(P)	19/1	General	✓
(C)(P)	19/2	Requirements for other Work	Not used
(C)(P)	19/3	Form HA/P2 Paint Data Sheet	Not used
(C)(P)	19/4#	Form HA/P3 Paint Sample Despatch List – Sheets 1 & 2	Not used
(C)(P)	19/5	General Requirements	Not used
WATERPROOFING FOR STRUCTURES			
(Co)	20/1	Waterproofing for Concrete Structures	Not used

Completed By	Appendix No.	Title	Comments
BRIDGE BEARINGS			
(Co)	21/1	Bridge Bearing Schedule	Not used
(Co)	22/1	Not used	Not used
BRIDGE EXPANSION JOINTS AND SEALING OF GAPS			
(Co)	23/1	Bridge Deck Expansion Joint Schedule	Not used
(Co)	23/2	Sealing of Gaps Schedule (Other than in Bridge Deck Expansion Joints)	Not used
BRICKWORK, BLOCKWORK AND STONEWORK			
(Co)	24/1	Brickwork, Blockwork and Stonework	Not used
SPECIAL STRUCTURES			
(Co)	25/1	Requirements for Corrugated Steel Buried Structures	Not used
(Co)	25/2	Requirements for Reinforced Soil and Anchored Earth Structures	Not used
(Co)	25/3	Requirements for Pocket-Type and Grouted Cavity Reinforced Brickwork Retaining Wall Structures	Not used
(Co)	25/4	Environmental Barriers	Not used
(Co)	25/5	Requirements for Rigid Pipes for Drainage Structures	Not used
MISCELLANEOUS			
(Co)	26/1	Ancillary Concrete	✓
(Co)	26/2	Bedding Mortar	Not used
(Co)	26/3	Cored Thermoplastic Node Markers	Not used
LANDSCAPE AND ECOLOGY			
(Co) (C) (P)	30/1	General, Sheets 1,2 & 3	Not used
(Co) (C) (P)	30/2	Weed Control	Not used
(Co)	30/3	Control of Rabbits and Deer	Not used
(Co)	30/4	Ground Preparation	Not used
(Co)	30/5	Grass Seeding, Wildflower Seeding and Turfing	Not used
(Co) (C) (P)	30/6	Planting, Sheets 1 & 2	Not used
(Co)	30/7	Grass, Bulbs and Wildflower Maintenance	Not used
(Co)	30/8	Watering	Not used
(Co)	30/9	Establishment Maintenance for Planting	Not used
(Co)	30/10	Maintenance of Established Trees and Shrubs	Not used
(Co)	30/11	Management of Waterbodies	Not used
(Co)	30/12	Special Ecological Measures	Not used
MAINTENANCE PAINTING OF STEELWORK			
(C)(P)	50/1	Form HA/P1 (Maintenance) Paint System Sheet	Not used
(C)(P)	50/2	Requirements for Other Work	Not used
(C)(P)	50/3	Form HA/P2 Paint Data Sheet	Not used
(C)(P)	50/4	Form HA/P3 Paint Sample Despatch List: Sheets 1 & 2	Not used
(Co)(P)	50/5	General Requirements	Not used

Appendix 0/4 List of Drawings Included in the Contract

Drawings Brought into the Contract by Reference

The Highway Construction Details (HCD) are published by the Stationary Office (on behalf of the Highways Agency) as Vol.3 of the Manual of Contract Documents for Highway Works. Where reference is made to the HCD within the Sub Contract Documents they are deemed to form part of the Sub Contract.

Contract Specific Drawings

Drawing No.	Title
VNIF-ARP-00-YYY-DR-CH-3001	Site Highways Key Plan
VNIF-ARP-00-YYY-DR-CH-3002	Site Highways General Arrangement Sheet 1
VNIF-ARP-00-YYY-DR-CH-3003	Site Highways General Arrangement Sheet 2
VNIF-ARP-00-YYY-DR-CH-3006	Site Highways Kerbing and Paving Layout Sheet 1
VNIF-ARP-00-YYY-DR-CH-3007	Site Highways Kerbing and Paving Layout Sheet 2
VNIF-ARP-00-YYY-DR-CH-3008	Site Highways Typical Sections
VNIF-ARP-00-YYY-DR-CD-0002	Proposed Site Wide Surface Water Drainage General Arrangement
VNIF-ARP-00-YYY-DR-CD-0003	Proposed Foul Drainage General Arrangement
VNIF-ARP-00-YYY-DR-CD-0004	Drainage Details Sheet 1 of 5
VNIF-ARP-00-YYY-DR-CD-0005	Drainage Details Sheet 2 of 5
VNIF-ARP-00-YYY-DR-CD-0006	Drainage Details Sheet 3 of 5
VNIF-ARP-00-YYY-DR-CD-0007	Drainage Details Sheet 4 of 5
VNIF-ARP-00-YYY-DR-CD-0008	Drainage Details Sheet 5 of 5
VNIF-ARP-00-YYY-DR-CD-0009	Proposed Surface Water Drainage Schedules
VNIF-ARP-00-YYY-DR-CD-0010	Proposed Surface Water Drainage Sheet 1 of 2
VNIF-ARP-00-YYY-DR-CD-0011	Proposed Surface Water Drainage Sheet 2 of 2
VNIF-ARP-00-YYY-DR-CD-0013	Permeable Paving Details
VNIF-ARP-00-YYY-DR-CD-0015	Proposed Headwall Details River Outfall Union Walk
VNIF-ARP-00-YYY-DR-CD-0016	Proposed Headwall Details River Outfall Basin
VNIF-ARP-00-YYY-DR-CD-0017	Proposed Foul Water Drainage Schedules
VNIF-ARP-00-YYY-DR-CD-0018	Proposed Exceedance Route GA Sheet 1 of 2
VNIF-ARP-00-YYY-DR-CD-0019	Proposed Exceedance Route GA Sheet 2 of 2
VNIF-ARP-00-YYY-DR-CD-0020	Basin Sections
VNIF-ARP-00-YYY-DR-CD-0021	Basin Plan
VNIF-ARP-00-YYY-DR-CD-0022	Proposed Foul Water Drainage Sheet 1 of 2
VNIF-ARP-00-YYY-DR-CD-0023	Proposed Foul Water Drainage Sheet 2 of 2
VNIF-ARP-00-YYY-DR-CD-0026	Proposed Headwall Details Basin Outfall Sheet 1 of 2
VNIF-ARP-00-YYY-DR-CD-0027	Proposed Headwall Details Basin Outfall Sheet 2 of 2
VNIF-ARP-00-YYY-DR-CD-0028	Proposed Pipe Details River Outfall P&P Bridge
VNIF-ARP-00-YYY-DR-CD-0030	Long Sections Profile 1
VNIF-ARP-00-YYY-DR-CD-0031	Long Sections Profile 2
VNIF-ARP-00-YYY-DR-CD-0032	Long Sections Profile 3

VNIF-ARP-00-YYY-DR-CD-0033	Long Sections Profile 4
VNIF-ARP-00-YYY-DR-CD-0034	Long Sections Profile 5
VNIF-ARP-00-YYY-DR-CD-0035	Long Sections Profile 6
VNIF-ARP-00-YYY-DR-CD-0036	Long Sections Profile 7
VNIF-ARP-00-YYY-DR-CD-0037	Long Sections Profile 8
VNIF-ARP-00-YYY-DR-CD-0038	Long Sections Profile 9
VNIF-ARP-00-YYY-DR-CD-0039	Long Sections Profile 10
VNIF-ARP-00-YYY-DR-CD-0042	Foul Long Section Profile 1
VNIF-ARP-00-YYY-DR-CD-0043	Foul Long Section Profile 2
VNIF-ARP-00-YYY-DR-CD-0044	Foul Long Section Profile 3
VNIF-ARP-00-YYY-DR-CD-0045	Foul Long Section Profile 4
VNIF-ARP-00-YYY-DR-CD-0046	Foul Long Section Profile 5
VNIF-ARP-00-YYY-DR-CD-0047	Proposed Orifice Details
VNIF-ARP-00-YYY-DR-CD-0048	Channel Drain Details
VNIF-ARP-00-YYY-DR-CD-0049	Attenuation Tank & Tree Pit Details
VNIF-ARP-00-YYY-DR-CD-0050	Proposed Hydrobrake Details Sheet 1
VNIF-ARP-00-YYY-DR-CD-0051	Proposed Hydrobrake Details Sheet 2
VNIF-ARP-00-YYY-DR-CD-0052	Proposed Hydrobrake Details Sheet 3
VNIF-ARP-00-YYY-DR-CD-0054	Proposed Surface Water Drainage Schedules 2
VNIF-ARP-00-YYY-DR-CD-0055	Proposed Pipe Details River Outfall St. Catherine's Wood
VNIF-ARP-00-YYY-DR-CD-0056	Proposed Complex Control Details Sheet 1
VNIF-ARP-00-YYY-DR-CD-0057	Proposed Complex Control Details Sheet 2
VNIF-ARP-00-YYY-DR-CD-0058	Outlet Grille Standard Detail
VNIF-ARP-00-YYY-DR-CD-0059	Proposed Hydrobrake Details Sheet 5
VNIF-ARP-00-YYY-DR-CD-0060	Proposed Complex Control Details Sheet 3
VNIF-ARP-00-YYY-DR-CU-0002	Existing HIF Utilities & Drainage Sheet 1 of 3
VNIF-ARP-00-YYY-DR-CU-0003	Existing HIF Utilities & Drainage Sheet 2 of 3
VNIF-ARP-00-YYY-DR-CU-0004	Existing HIF Utilities & Drainage Sheet 3 of 3
VNIF-ARP-00-YYY-DR-CU-1002	Proposed Electrical Demands & Adoptable Electrical Networks (Strategic Overview)
VNIF-ARP-00-YYY-DR-CU-1010	HIF Utilities, Drainage Diversions & Abandonments Sheet 1 of 3
VNIF-ARP-00-YYY-DR-CU-1011	HIF Utilities, Drainage Diversions & Abandonments Sheet 2 of 3
VNIF-ARP-00-YYY-DR-CU-1012	HIF Utilities, Drainage Diversions & Abandonments Sheet 3 of 3
VNIF-ARP-00-YYY-DR-CU-1013	Proposed Adoptable 6.6kV Circuits & LV Supplies Sheet 1 of 3
VNIF-ARP-00-YYY-DR-CU-1014	Proposed Adoptable 6.6kV Circuits & LV Supplies Sheet 2 of 3
VNIF-ARP-00-YYY-DR-CU-1015	Proposed Adoptable 6.6kV Circuits & LV Supplies Sheet 3 of 3
VNIF-ARP-00-YYY-DR-CU-1016	Proposed HIF Potable Water Network Sheet 1 of 3
VNIF-ARP-00-YYY-DR-CU-1017	Proposed HIF Potable Water Network Sheet 2 of 3
VNIF-ARP-00-YYY-DR-CU-1018	Proposed HIF Potable Water Network Sheet 3 of 3
VNIF-ARP-00-YYY-DR-CU-1019	Proposed HIF Telecoms Network Sheet 1 of 3
VNIF-ARP-00-YYY-DR-CU-1020	Proposed HIF Telecoms Network Sheet 2 of 3
VNIF-ARP-00-YYY-DR-CU-1021	Proposed HIF Telecoms Network Sheet 3 of 3

VNIF-ARP-00-YYY-DR-CU-2001	Proposed HIF Utilities - Typical Details Sheet 1 of 2
VNIF-ARP-00-YYY-DR-CU-2002	Proposed HIF Utilities - Typical Details Sheet 2 of 2
VNIF-ARP-00-YYY-DR-CU-2003	Proposed HIF Utilities – Long Sections 1 of 3
VNIF-ARP-00-YYY-DR-CU-2004	Proposed HIF Utilities – Long Sections 2 of 3
VNIF-ARP-00-YYY-DR-CU-2004	Proposed HIF Utilities – Long Sections 3 of 3
VNIF-ARP-00-YYY-DR-CU-1007	Proposed Openreach Diversions
VNIF-ARP-00-YYY-DR-CU-1008	Proposed Gas Diversions
VNIF-ARP-00-YYY-DR-CS-0009	Ancillary Structural Details
VNIF-ARP-00-YYY-DR-CS-0014	Lighting Foundation Details
VNIF-ARP-00-YYY-DR-CE-0001	Proposed Site Contours
VNIF-ARP-00-YYY-DR-CE-0002	Proposed Site Isopach
VNIF-ARP-00-YYY-DR-CE-0003	Indicative Cut & Fill Volumes
VNIF-ARP-00-YYY-DR-CE-0005	Approximate Location and Extent of Historic Constraints
VNIF-ARP-00-YYY-DR-CE-0006	Extent of Required Proof-Rolling and Soft Spot Treatment
VNIF-ARP-00-YYY-DR-CE-0007	Treatment at Formation Level
VNIF-ARP-00-YYY-DR-CE-0008	Existing Monitoring Boreholes
VNIF-ARP-00-YYY-DR-CE-0010	Extent of Temporary Site Weathering Layer
VNIF-ARP-00-YYY-DR-CE-0011	Stockpile Risk Zones
VNIF-ARP-00-YYY-DR-CE-0012	Indicative maximum extent of temporary stockpiling area
VNIF-ARP-00-YYY-DR-CS-0007	Red Bank Access Link Retaining Walls
VNIF-ARP-00-YYY-DR-CS-0008	Retaining Walls – Section
VNIF-ARP-00-YYY-DR-EL-0001	Lighting Layout General Arrangement Sheet 1 of 9
VNIF-ARP-00-YYY-DR-EL-0002	Lighting Layout General Arrangement Sheet 2 of 9
VNIF-ARP-00-YYY-DR-EL-0003	Lighting Layout General Arrangement Sheet 3 of 9
VNIF-ARP-00-YYY-DR-EL-0004	Lighting Layout General Arrangement Sheet 4 of 9
VNIF-ARP-00-YYY-DR-EL-0005	Lighting Layout General Arrangement Sheet 5 of 9
VNIF-ARP-00-YYY-DR-EL-0006	Lighting Layout General Arrangement Sheet 6 of 9
VNIF-ARP-00-YYY-DR-EL-0007	Lighting Layout General Arrangement Sheet 7 of 9
VNIF-ARP-00-YYY-DR-EL-0008	Lighting Layout General Arrangement Sheet 8 of 9
VNIF-ARP-00-YYY-DR-EL-0009	Lighting Layout General Arrangement Sheet 9 of 9
VNIF-ARP-00-YYY-DR-EL-0011	Low Voltage Schematic
VNIF-ARP-00-YYY-DR-EL-0023	Feeder Pillar Details
VNIF-ARP-00-YYY-DR-EL-0024	Access Chamber Details

SERIES 0100: PRELIMINARIES

1. The Contractor shall be responsible for the testing of representative samples of materials as described in Table 1/5.
2. Both geotechnical and chemical testing is required.
3. Test results and/or test certificates shall be submitted to the Engineer and Project Manager in accordance with Clause 105.2.
4. The cost of the samples and tests shall be borne by the Contractor.
5. Tests comparable to those specified in this Appendix will be necessary for any equivalent work, goods or materials proposed by the Contractor (See sub-clause 105).
6. Where within the following tables the symbol (N) is shown, this indicates that a UKAS or equivalent accredited laboratory sampling and test or certificate is required.
7. Unless otherwise shown in this Appendix or information is supplied complying with Note 10 below, UKAS test report or certificate is required for all material tests.
8. Unless otherwise shown in this Appendix tests for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
9. Unless otherwise shown in this Appendix test certificates for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
10. If small quantities less than those quoted are involved, unless stated differently elsewhere, testing frequency shall be 1 per location/source.
11. In the event that any test or inspection reveals that the element tested or inspected does not meet the requirements of the Specification, the following action shall be implemented.
 - Further tests shall be undertaken to determine the extent of the non-conformance.
 - The location and nature of the non-conformance shall be recorded on a non-conformance form.
 - Following remedial action of the affected area, repeat testing shall take place to confirm compliance with the requirements of the Specification.

A register of all non-conformances shall be maintained, including the non-conformance number, date raised, nature of defect and date signed-off.

Upon receipt at the laboratory, the samples shall be logged into the sample store where they will be kept until required for testing. All laboratory testing shall be in accordance with the relevant British Standard, or other approved method. After testing, any material remaining shall be disposed of in accordance with the Environmental Protection (Duty of Care) Regulations 1991.

Appendix 1/5 Testing to be carried out by the Contractor

Series 300						
Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comment
306	Permanent fencing					Quality Management scheme applies
		Concrete Components	Cover to reinforcement	1 per consignment (max 1 per 100 components (BS 1722))		

Series 500						
Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comment
501	Pipes for Drainage & Service Ducts					Product Acceptance Scheme or equivalent applies for products not falling under the Construction Products Regulations (CPR).
	Vitrified clay					
	Concrete-PC/SRC	Not exceeding 900 mm dia				
	Concrete-Prestressed					
	Iron-cast					
	Iron-ductile					
	PVC-U					
	Polypropylene					
	GRP					
	Plastics. See Table 5/1 & 5/2					
	Corrugated steel		(Manufacturers tests)		Required (AASHTO)	
	Corrugated steel bitumen protection	Not exceeding 900mm dia				
	Other material				Required	Product Acceptance Scheme or equivalent applies

Series 500					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
503	Pipe Bedding	Grading and fines content	1 per week (min of 3)*	Required	Tests from the factory production control system operated by the producer to be provided - see Annex C of BS EN 13242. Appropriate tests/samples for the resistance to freezing and thawing (magnesium sulphate soundness) should be scheduled where required, NG 803.4
		Water-soluble sulphate (WS) Content (N)	5 per source*		[Minimum to allow for natural variability of sulphur compounds]
		Oxidisable sulphides (OS) content and total potential sulphate (TPS) content (N)	5 per source*		
		Resistance to fragmentation (N)	1 per source*		
505	Filter medium backfill	Plastic index (N)	1 per source*		[Results of routine control tests from the factory production control system operated by the producer to be provided - see Annex C of BS EN 13242 and Annex D of BS EN 13285]
		Resistance to fragmentation (N)	1 per source*		[Appropriate tests/samples for the resistance to freezing and thawing (magnesium sulfate soundness) should be scheduled where required, NG 803.4]

Series 500					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
		Water-soluble sulphate (WS) content (N)	5 per source		[Minimum to allow for natural variability of sulphur compounds]
		Oxidisable sulphides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Grading and fines content	1 per week		[Results of routine control tests from the factory production control system operated by the producer to be provided - see Annex C of BS EN 13242 and Annex D of BS EN 13285]
		Permeability (N)	1 per source*		
507	Chambers				Product certification scheme applies
	Precast concrete				
	Corrugated galvanised steel	Manufacturer's tests		Required	Product certification scheme applies
	Manhole steps				
	Steel fitments				
	Covers, grates and frames				Product certification scheme applies
	Cover bolts				Quality management scheme applies
508	Gullies and pipe junctions	Manufacturer's tests	Manufacturer's tests	Product certification scheme applies	Product certification scheme applies
509	Water tightness of joints	Air test	All pipelines with watertight joints.	Required	

Series 500					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
512	Backfill to pipe bays	Grading	1 per 50 tonnes (min of 3)*	Required	[Appropriate tests/samples for the resistance to freezing and thawing (magnesium sulfate soundness) should be scheduled where required, NG 803.4]
		Water-soluble sulphate (WS) content (N)	5 per source*		Minimum to allow for natural variability of sulphur compounds
		Oxidisable sulfides compounds (OS) content and total potential sulfate (TPS) content (N)	5 per source*		
517	Linear drainage systems	Load test	A minimum of 1 test and not less than 1 test per 1000m for each type and source	Required	Certificate that the systems comply with Clause 517 is required [Kitemark certificate or equivalent applies]
518	Thermoplastics structures wall pipes and fittings	(Manufacturer's tests)		Required	BBA certification (or equivalent) applies

Series 600 – Requirements for testing (see also “Series 600 - Requirements for testing - chemical testing on potentially aggressive fill materials” below)					
Clause	Work, goods or material	Test	Frequency of testing (quantities are part thereof)	Test certificate	Comment
603, 616	Subgrade – granular and cohesive soils	Plate load test (600mm diameter plate)	50m grid across the sub-formation and 30m centres along carriageway .	Yes	See Appendix 6/7.2 Tests along carriageway to be off-set from the centreline on alternating sides.

Series 600 – Requirements for testing (see also “Series 600 - Requirements for testing - chemical testing on potentially aggressive fill materials” below)					
Clause	Work, goods or material	Test	Frequency of testing (quantities are part thereof)	Test certificate	Comment
	Subgrade – cohesive soils	Hand shear vane	50m grid across the sub-formation and 30m centres along carriageway	Yes	See Appendix 6/7.2 Tests along carriageway to be off-set from the centreline on alternating sides.
601, 602, 603	Verification sampling of remedial excavations	Chemical verification testing - see Appendix 6/14 for suite of determinands	See Appendix 6/2.2	Yes	See Appendix 6/14, 6/14.1, 6/14.2 and 6/14.3
601, 608, 612, 613, 631, 644	General fill	Classification, description, PSD, MC, compaction (2.5kg rammer).	1 per 500m ³ . Minimum of 2.	Yes	See Table 6/1 and 6/1A
		Concrete aggressivity (Note 2)	1 per 500m ³ . Minimum of 2.	Yes	See Table 1/5B
	Site won Class 1A, 1B and 1C	Plate load test (600mm diameter plate) or other method approved by the Engineer.	Plate load tests at 50m grid in plan and vertical intervals of 0.5m within the body of the fill.	Yes	See Table 6/1A
	Site won Class 2A and 2C				
		Chemical validation testing (Note 3)	1 per 500m ³ . Minimum of 3.	Yes	See Appendix 6/14 and Appendix 6/14.4
601, 618	Topsoil for landscaped areas	PSD	1 per 500m ³ A minimum of three samples per source.	Yes	See Appendix 6/8
	Site won Class 5A	Chemical validation testing (Note 3)	One sample per 100m ³ A minimum of three samples per source.		See Appendix 6/14 and Appendix 6/14.5

Series 600 – Requirements for testing (see also “Series 600 - Requirements for testing - chemical testing on potentially aggressive fill materials” below)					
Clause	Work, goods or material	Test	Frequency of testing (quantities are part thereof)	Test certificate	Comment
601, 618	Topsoil for landscaped areas Imported Class 5B	No geotechnical testing required	-	Yes	See Appendix 6/8
		Chemical validation testing (Note 3)	1 per 100m ³ for brownfield or unknown sources. 1 per 500m ³ for greenfield sources. A minimum of three samples per source.		See Appendix 6/14 and Appendix 6/14.5
601, 608, 612, 613, 631, 644	Capping Site won Class 6F2	Classification, description, PSD, MC, LA coefficient, compaction (vibrating rammer).	1 per 500m ³ . Minimum of 2	Yes	See table 6/1 and 6/1A
		Concrete aggressivity (Note 2)	1 per 500m ³ . Minimum of 2.	Yes	See Table 1/5B
		Plate load test (600mm diameter plate) or other method approved by the Engineer.	Plate load tests at 50m grid in plan and 30m centres along carriageway	Yes	See table 6/1A Tests along carriageway to be off-set from the centreline on alternating sides.
		Chemical validation testing (Note 3)	1 per 500m ³ . Minimum of 3.	Yes	See Appendix 6/14 and Appendix 6/14.4
601, 608, 612, 613, 631, 644	Capping Imported Class 6F5	Classification, description, PSD, MC, LA coefficient, compaction (vibrating rammer).	3 per source	Yes	See table 6/1 and 6/1A
		Concrete aggressivity (Note 2)	1 per 500m ³ . Minimum of 2.	Yes	See Table 1/5B

Series 600 – Requirements for testing (see also “Series 600 - Requirements for testing - chemical testing on potentially aggressive fill materials” below)					
Clause	Work, goods or material	Test	Frequency of testing (quantities are part thereof)	Test certificate	Comment
		Plate load test (600mm dia plate) or other method approved by the Engineer.	Plate load tests at 50m grid in plan and 30m centres along carriageway .	Yes	See table 6/1A Tests along carriageway to be off-set from the centreline on alternating sides.
		Chemical validation testing (Note 3)	Not required if material recovered in accordance with the WRAP protocol (Note 2). One sample per 50m ³ for brownfield or unknown sources. One sample per 200m ³ for greenfield sources. A minimum of three samples per source.	Yes	See Appendix 6/14 and Appendix 6/14.4
601, 610, 612	Fill to structures Class 6N,6P Site won	Classification, description, PSD, MC, LA coefficient, compaction (vibrating rammer), effective angle of internal friction and effective cohesion, permeability.	1 per 500m ³ . Minimum of 3.	Yes	See table 6/1 and 6/1A
		Concrete aggressivity (Note 2)	1 per 500m ³ . Minimum of 2.	Yes	See Table 1/5B
		Chemical validation testing (Note 3)	1 per 500m ³ . Minimum of 3.	Yes	See Appendix 6/14 and Appendix 6/14.4

Series 600 – Requirements for testing (see also “Series 600 - Requirements for testing - chemical testing on potentially aggressive fill materials” below)					
Clause	Work, goods or material	Test	Frequency of testing (quantities are part thereof)	Test certificate	Comment
601, 610, 612	Fill to structures Class 6N,6P Imported	Classification, description, PSD, MC, LA coefficient, compaction (vibrating rammer), effective angle of internal friction and effective cohesion, permeability.	2 per source	Yes	See table 6/1 and 6/1A
		Concrete aggressivity (Note 2)	1 per 500m³. Minimum of 2.	Yes	See Table 1/5B
		Chemical validation testing (Note 3)	Not required if material recovered in accordance with the WRAP protocol (Note 2). Not required if quarried stone from a greenfield site. One sample per 50m³ for brownfield or unknown sources. A minimum of three samples per source.	Yes	See Appendix 6/14 and Appendix 6/14.4
Notes 1. As detailed in Appendix 6/1.2.4, site won material proposed for re-use and imported materials will require testing to determine the potential risk to buried concrete in accordance with BRE Special Digest SD1. 2. Concrete Aggressivity. “Aggregates from Inert Waste: Quality Protocol” , Environment Agency and WRAP. Accessed from LIT 8709_c60600.pdf (publishing.service.gov.uk) . See also “Series 600 - Requirements for testing - chemical testing on potentially aggressive fill materials” below, for recommended test methods. 3. Contamination testing. See requirements of Appendix 6/14. See also “Series 600 - Requirements for testing - chemical testing on potentially aggressive fill materials” below for recommended test methods.					

Series 600 – Requirements for testing - chemical testing on potentially aggressive fill materials (see also “Series 600 – Requirements for testing” above, for relevant sampling and testing frequencies)

Sample type	Determinand	Recommended test methods
Brownfield site (pyrite present)		
SOIL	pH in 2.5:1 soil/water extract	BR 279 Electrometric method
		BS 1377-3 Section 9 Electrometric method
	SO ₄ in 2:1 water/soil extract WS (g/l SO ₄)	BR 279 Procedures for gravimetric method, cation exchange or ion chromatography.
		BS 1377-3, Section 5 Gravimetric or ion exchange methods. (Values determined as g/l SO ₃ should be multiplied by 1.2.)
		TRL Report 447, Test 1 Sulfate extraction procedure as BS 1377-1, but ICP-AES used to determine sulfur in solution.
	Acid soluble sulfate AS (% SO ₄)	BR 279 Gravimetric method
		BS 1377-3, Section 5 Gravimetric methods. (Values determined as g/l SO ₃ should be multiplied by 1.2.)
		TRL Report 447, Test 2 Preparation and extraction of sulfate as BS 1377-3, ICP-AES used to determine sulfur in solution.
	Total sulfur TS (% S)	BR 279 Only Ignition in oxygen method recommended.
		TRL Report 447, Test 4A Microwave digestion method.
		TRL Report 447, Test 4B Ignition in oxygen method (e.g. with sulphur-carbon determinator).
	Soluble magnesium (g/l Mg)	BR 279 Atomic absorption spectrometry (AAS) method.
		Commercial test laboratory in-house procedure: Determination of magnesium in solution by ICP-AES.
	Nitrate (g/l NO ₃)	BR 279
	Chloride (g/l Cl)	BR 279
		BS 1377-3 Section 7

Series 800						
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment	
801, 803, 804, 805, 806, 807	General Requirements for Unbound Mixtures for Subbase (other than slag) adjacent to cement bound materials, concrete pavements, structures or products	Water-soluble sulphate (WS) content (N)	1 per 400 tonnes or per location if less than 400 tonnes	Required		
		Oxidisable sulphides (OS) content and total potential sulphate (TPS) content (N)	1 per 400 tonnes or per location if less than 400 tonnes			
	Unbound mixtures beneath surface of a road or paved central reserve	Frost heave (N)	1 per source			
		Grading and fines content	1 per week			
		Plastic Index (N)				
		Resistance to fragmentation (N)	6 monthly			
		Resistance to wear – micro-Deval test				
		Resistance to freezing and thawing (magnesium sulphate soundness) (N)	1 per source			
		Water absorption (N)				
		Volume stability of blast furnace slags	6 monthly			
		Volume stability of steel (BOF and EAF) slags	6 monthly			
		CBR (N)	1 per source and then monthly			
		OMC/mc (N)	As required			
		Density (N)	As required			
		Water absorption (N)	As required			
		Deformation resistance specified in clause 886				
810, 821, 822, 823, 830, 831, 832, 834, 835	General Requirements for Cement and other Hydraulically Bound Mixtures	Binder content		Required		
		Coefficient of linear expansion				
		Tests for control and checking of HBM Tests specified in Table 8/16				
		Tests for control and checking of HBM Tests specified in Table 8/16				
		Tests for laboratory mixture design test specified in Clause 880				
		Immediate Bearing Index Category Test BS EN 13286-47				

Series 800					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
		Compressive strength BS EN 13286-41 (N)			
		Modulus of elasticity BS EN 13286-43 (N)			
		Surface modulus Specified in Clause 884 (N)			
		Deformation resistance specified in Clause 886			
840	Hydraulically Stabilised Soils	Binder content			
		Performance assessment specified in Table 8/15			
		Total potential sulphate content (N)			
		Surface modulus Specified in Clause 884 (N)			
		Deformation resistance specified in Clause 886			

Series 1100						
Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comment
#1101	Precast concrete kerbs, channels, edgings and quadrants		Bending strength	Minimum of 8 per 1000 units of each product (BS EN 1340)	Required	
1104	Precast concrete flags and tactile paving		Bending strength	Minimum of 8 per 1000 units of each product (BS EN 1339)	Required	
	Bedding	Granular material				Appropriate tests/samples should be scheduled where not included under other Clauses
		Mortar				
1107	Concrete block paving		Compressive strength	Minimum of 8 per 1000 m2 of each product (BS EN 1338)	Required	
1108	Clay pavers		Bending Strength	Minimum of 8 per 1000 m2 of each product (BS EN 1344)	Required	

Series 1100					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
		Skid resistance (N)	Minimum of 8 per 1000 m2 of each product (BS EN 1344)		

Series 1300					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
1305	Anchorage for use in drilled holes	Tensile load (Manufacturer’s tests)		Required	To provide well attested and documented evidence
1306	Anchorage in drilled holes to columns and masts with flange plates	Loading test on site	[As required]		
1310	Welding	Welding procedures (Manufacturer’s tests)	(Every seven years)		Quality management scheme applies
		Welder qualification (Manufacturers tests)	(Sub-Clauses 1310.1 and 1310.2 (7.1.3))		
		Production testing (Manufacturer’s tests)	(Sub-Clauses 1310.1 and 1310.2 (7.1.4))		
	Welded joints	Destructive testing	[See sub-clauses 1310.1 and 1310.2 (7.1.5)]		[(N) See NG1310]
1313	GFRP laminates	Loss on ignition	1 per 50 production columns		[see sub-clauses 1313.10-17]
		Colour fastness	1 per batch		
		Electric strength			
		Water absorption			
		Impact Strength			
1314	Brackets for laminated GFRP lighting column			Required	
	Polyurethane foam	Bulk density	1 per batch		
		Surface hardness			
		Apparent bulk density	2 per batch		
		Impact strength			
		Flexural stress			

Series 1400					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
1421	Cable				[Special sample tests to BS 6346 or BS 5467, according to the cable used, should be scheduled where appropriate] Product certification scheme applies
1424	Lighting Units	Tests specified in Clause 1424	Each unit	Required	Product certification scheme applies Certification that the installation complies with BS 7671 (the IET Wiring Regulations) is required
	Networks	Tests specified in Clause 1424	Each network	Required	Certification that the installation complies with BS 7671 (the IET Wiring Regulations) is required
Series 1700					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comment
1707	Concrete	Cube Strength (N)	Reinforced concrete – three cubes from 15m3 or 15 batches whichever represents the lesser volume	Required	
1712	Reinforcement				
		Steel bars		Required (BS 4449)	CARES Certificate required.
		Steel wire		Required (BS 4482)	
		Steel fabric		Required (BS 4483)	

*Indicates that the frequency of testing is given in general guidance and is only indicative of the frequency that may be appropriate. Where materials are known to be marginal or if initial test results show them to be such, the frequency of testing should be increased. Conversely where material properties are consistently in excess of specified minimum requirements or well below specified maximum limits, then the frequency of testing should be reduced.

Notes on Appendix 1/5.

The frequency of testing is given for general guidance and is only indicative of the minimum frequency that would be acceptable.

Where materials are known to be marginal or if initial test results show them to be such, the frequency of testing is to be increased.

Test samples shall be obtained evenly throughout the placed material. Samples shall not be taken from within the same layer where more than 1 sample is required per total m³ of placement.

Where material is determined to be unsuitable for testing in accordance with BS1377 Part 4 due to coarse grading, field trials may be used to determine the upper and lower bound moisture content for compaction.

Appendix 1/7: Site Extent and Limitations on Use

Extents of the Site

1. The site extents are shown on the contract drawings.

Limitations on the Use of the Site

2. The Contractor is to liaise with the Highway Authority to agree any limitations on use for all public highway areas.
3. The Contractor shall not use the site for any purpose other than that of carrying out the Works.
4. Storage of plant and materials shall be restricted to the Contractor's site compound and specific working areas.

Appendix 1/11: Design of works by Contractor

Temporary Works

The Contractor is responsible for any temporary works necessary to access and operate safely on the site.

Appendix 1/12: Setting Out and Existing Ground Levels

1. The Contractor shall prove the validity of the coordinates and levels of any ground markers and bench marks used for the setting out of the works and shall be responsible for maintaining and rechecking the co-ordinates of such stations at frequent intervals (not exceeding 4 weeks).
2. As soon as the Contractor takes possession of the site, coordinated and levelled works benchmarks are to be established at suitable intervals around the site. The Contractor shall produce a drawing showing the locations of these benchmarks with their OS grid co-ordinates. The Contractor shall install the benchmarks, identifying on the drawing their level in metres Above Ordnance Datum (mAOD). Checks are to be made on these benchmarks once every month and any adjustments recorded on the relevant drawings.

Additional Survey Information & Trial Pits

3. The Contractor shall be responsible for undertaking any additional topographical survey, ground penetrating radar survey, trial pits or any other type of survey which they deem necessary to meet the requirements of the Remediation Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017) and determine the location of existing surface and buried features on the site, including animal burrows.

Identification of Route & Setting out of Existing and Proposed Services

4. The Contractor shall use information from topographic survey, the ground penetration radar survey and trial pits to produce drawings, sketches, plans and cross sections showing the layout of existing services in key locations. He shall use these drawings to identify suitable routings for the new services (ducts, pipes, chambers etc.) to be installed.
5. The Contractor shall place markers on site to detail the location of existing and proposed buried services as defined by trial pitting and non-intrusive survey techniques. Markers shall be located at a minimum of 2.5m centres along the line of existing mains, services, sewers and cables, and the extent of any underground chamber shall also be marked.

Appendix 1/16: Privately and Publicly Owned Services and Supplies

1. The Contractor shall coordinate his Works with the works to be undertaken by the Utility Companies and/or their appointed subcontractors. The scope of work in respect of these responsibilities shall include, but is not limited to, the following:
 - a) Integrating Statutory Undertakers' and other Authorities' programmes into the Programme for the Works.
 - b) Co-ordinating and sequencing any Statutory Undertakers' and other Authorities' work on site.
 - c) Agreeing maximum and minimum lengths of open trench required.
 - d) Agreeing minimum periods of warning required before laying operations are due to commence.
 - e) Agreeing an installation programme for mains and service connections.
 - f) Agreeing a system for advance notice of laying operations.
 - g) Checking that relevant decisions reached during programme co-ordination stage are passed to Site and understood by those concerned.
 - h) Ensuring that the agreed installation/construction programme is regularly updated, alterations anticipated and notified to all participants in good time.
 - i) Ensuring periodic checks are made to see that warning notices and operation completion notices/work inspection and approval notices are passed expeditiously.
 - j) Existing known services on site are identified on the utility drawings. The Contractor is to be responsible for locating these services prior to commencing works adjacent to them.
2. The Contractor should be aware that other unknown services may be present on and surrounding the site, and should take suitable precautions when excavating. To include CAT scanning at a minimum before excavating. Where appropriate, hand-dug trial pits shall also be excavated to confirm for the presence of buried services.
3. Details of preliminary arrangements that have been made with Statutory Undertakers and others for the alteration of services affected by the Works are listed in this Appendix. The precise extent of all work associated with privately and publicly owned services and supplies shall be determined after the exact location of all underground pipes, ducts, cables and other apparatus has been verified by the Contractor.
4. The Contractor is to co-ordinate their work with any diversions, disconnections, and new supplies required on site. It is the Contractors responsibility to co-ordinate the required utility works within his programme.
5. The Contractor is to make arrangements with the Statutory Undertakers and others concerned, for the coordination of his work with all work which needs to be done by them or their Contractors concurrently with the Works. Compliance with the periods of notice given in this Appendix does not relieve the Contractor of his obligations.
6. The Contractor is to keep written records of the agreements reached with each of the Utility Companies regarding the detailed coordination of Works and Programme.
7. The Contractor is to manage the Works and take reasonable endeavours to ensure that the Utility Companies and any other Statutory Undertakers can undertake their works in a timely manner and meet the agreed timescales in order to maintain the progress of the works to the contract Programme of Works.
8. The Contractor is to manage and programme his Works in such a way that the Contractor's Works do not disrupt, disturb or delay the Utility Companies in the efficient undertaking of their works.

9. Where the Contractor is diverting utilities, or making provision for the diversion of utilities (such as the installation of ducts or chambers) on behalf of the Statutory Undertakers, they shall ascertain and comply with the special requirements of each Statutory Undertaker. Compliance with such special requirements shall not relieve the Contractor of any of his other obligations and liabilities under the Contract. Fulfilment of such other obligations and liabilities shall not relieve him of his responsibility to comply with the said special requirements.
10. Private Services to individual properties have not generally been listed or shown on the drawings. The Contractor is to make arrangements with the Statutory Undertakers and others concerned for the phasing of all necessary locations, disconnections and diversions of private services affected by the Works.
11. For information/specifications in relation to the routing and provision of new supplies, refer to separate documents.
12. Disconnected apparatus can be removed by the Contractor only with the prior approval of the Authority concerned.
13. The names, addresses and telephone numbers of the authorities serving the locality are listed in Table 1/16-1:

Table 1/16-1: Statutory Undertakers and other Authorities Contacts List		
Statutory Undertakers and other Authorities	Address	Contact Details
ENWL (Electricity)	Electricity North West Ltd, Borron Street, Stockport, SK1 2JD	Chris Cliff Design Engineer Tel: 07920 238980
United Utilities (Water)	United Utilities Group PLC, Haweswater House, Lingley Mere business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP	Linsey Eccleston (Diversions) Design Engineer Tel: 0345 072 6067/ 07341121675
Cadent Gas Ltd (Gas)	Cadent Gas Ltd, Mersey Road North, Failsworth, M35 9FF	Michael Eyres Design Officer Tel: 0161 790 3000/ 07890 256 644
BT Openreach (Telecoms)	Openreach Ltd, Kelvin House, 123 Judd Street, London, WC1H 9NP	Mark Anderson Repayments Project Manager Tel: 07802190381
Virgin Media (Telecoms)	Virgin Media, 280 Bartley Way, Bartley Wood Business Park, HOOK, Hampshire, RG27 9UP	
United Utilities (Drainage)	United Utilities Group PLC, Haweswater House, Lingley Mere business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP	Tel: 0345 072 6067

Table 1/16-2: Services and Supplies Affected by the Works				
Location	Description	Group*	Drawing No.	Details
HIF Site (Plateau Avenue, park, u-tube river crossings, Dantzic Street union bridge to river crossing, Roger Street & adjacent roads, Red Back Plateau Avenue to Roger Street)	6.6kV Ring Mains within the 'HIF area'	C	VNIF-ARP-00-YYY-DR-CU-1013 to 15	Exact interface point to be confirmed, likely dependent on Dantzic Street trial hole findings for future ring main routing. Current strategy for the HIF site area to be designed by DNO and constructed by Contractor. Opportunity for this area of network to be designed and constructed by Contractor (and their subcontractor) as contestable works.
HIF Offsite (Dantzic Street/Dalton Street to Queens Park Substation)	6.6kV Ring Mains to Queens Park Primary Substation	B/C	VNIF-ARP-00-YYY-DR-CU-1002 VNIF-ARP-00-YYY-DR-CU-1015	To be designed and constructed by DNO, with works done downstream of the interface point undertaken by Contractor. Strategy to be confirmed.
HIF Site	Secondary Substation	C	VNIF-ARP-00-YYY-DR-CU-1015	Current strategy for the HIF site area to be designed by DNO and constructed by Contractor. Opportunity for this area of network to be designed and constructed by Contractor (and their subcontractor) as contestable works.
HIF Site	LV supplied from secondary substations to feeder pillars	C	VNIF-ARP-00-YYY-DR-CU-1013 to 15	Current strategy for the HIF site area to be designed by DNO and constructed by Contractor. Opportunity for this area of network to be designed and constructed by Contractor (and their subcontractor) as contestable works.
HIF Site	Feeder Pillars & downstream LV	C	VNIF-ARP-ZZ-YYY-DR-E-0001 to 0003	Non-adoptable network
HIF Site (Plateau Avenue, Park & Bridge Crossing)	HIF site - new water mains along Plateau Avenue and through park	B/C	VNIF-ARP-00-YYY-DR-CU-1003	Preferred strategy and extents to be confirmed – either wholly designed and constructed by Contractor (and their subcontractor) or designed by DNO and constructed by Contractor. Extent of routing through park, easement requirements, and confirmation of water main size still required from DNO.
HIF Site (Plateau Avenue, Roger Street & adjacent roads)	HIF site Virgin Media - expansion of	C	VNIF-ARP-00-YYY-DR-CU-1019 to 21	

	Virgin Media network throughout 'HIF area'			
HIF Offsite (Red Bank)	HIF offsite Virgin Media - off site Virgin Media network reinforcements	B/C	VNIF-ARP-00-YYY-DR-CU-1021	Work to be undertaken by Virgin Media but coordinated with Contractors works on site.
HIF Site (Plateau Avenue, Roger Street & adjacent roads, u-tube crossings)	HIF site Openreach - Expansion of Openreach network throughout 'HIF area'	C	VNIF-ARP-00-YYY-DR-CU-1019 to 21	
HIF Offsite (Dantzic Street & Collyhurst Road)	HIF offsite Openreach - Off site Openreach network reinforcements	C	VNIF-ARP-00-YYY-DR-CU-1019 & 21	Work to be undertake by Openreach but coordinated with Contractors works on site.

*

- A Work expected to be complete before the commencement of the Works.
- B Works required after commencement of the Works which does not require prior work by the Contractor but does require the Contractor to undertake liaison and coordination
- C Work required after commencement of the Works which does require prior work by the Contractor.
- D Work expected to be in progress at the commencement of the Works.
- E Work to be wholly undertaken by the Contractor.

Table 1/16-3: Services and Supply diversions to be completed in works area				
Location	Description	Group*	Drawing No.	Details
To be provided on drawing VNIF-ARP-00-YYY-DR-CU-0002 to 0004 and 1002 to 1004 Schedule VNIF-ARP-ZZ-YYY-SH-CU-001				

SERIES 0200 SITE CLEARANCE

Appendix 2/2 Filling of Trenches and Pipes

1. All underground structures, chambers and foundations which are no longer in use within the area as shown on the Contract Drawings are to be removed to accommodate the works.
2. Any subsequent voids found shall be backfilled with selected granular material (6F1/6F2/6F4/6F5) in accordance with Clause 601 and compacted in accordance with Clause 602. Where compliant compaction is not achievable, those areas should be backfilled with GEN1 concrete.
3. Refer to Appendix 5/1 in this specification for requirements for sewers and manholes to be abandoned.

SERIES 0400: ROAD RESTRAINT SYSTEMS

Appendix 4/1: Road Restraint Systems (Vehicle and Pedestrian)

1. Road restraint system requirements are shown on the contract drawings.

SERIES 0500: DRAINAGE AND SERVICE DUCTS

Definitions

1. References to SHW are to the Specification for Highway Works (March 1998 with all Amendments) and, where appropriate, to the associated Notes for Guidance on the Specification for Highway Works.
2. References to CESWI are to Civil Engineering Specification for the Water Industry 7th Edition, published by WRc 2011.
3. References to DCG are to the Design and Construction Guidance for foul and Surface Water Sewers Offered for Adoption – Approved Version 2.1, 25th May 2021. DCG Specification is drawn from CESWI but is not a full reproduction of the document and is supplemented by additional information. Any clauses in the DCG document which relates to workmanship or materials not required shall be deemed not to apply.
4. References to SuDS relate to Sustainable Drainage Systems as referred to in CIRIA Report Number C697.

Hierarchy of Specifications

1. Where a conflict occurs between the Specifications and the tender drawings, the requirements of the tender drawings shall apply.
2. For the sections of the drainage design proposed to be non-adopted, the specification shall be in accordance with the requirements of SHW and in particular with Series 500 and the amendments and particulars included in this document.
3. For the sections of the drainage design proposed to be adopted, the specification shall be in accordance with the requirements of the DCG and the amendments and particulars included in this document. Where the DCG does not specify the particular required, the design shall be in accordance to CESWI.
4. Where a conflict occurs between CESWI and SHW, SHW shall apply.
5. The specification for all SuDS features (including permeable paving, basins and storage tanks) shall be in accordance with the requirements of CIRIA C753. Compliance with the O&M Manual, located within the H&S file, shall be adhered to.
6. For the utility networks proposed to be adopted, the specification shall be in accordance with Series 500 SHW and the individual Infrastructure Provider's specifications. Where a conflict occurs between SHW and Infrastructure Provider's specifications, the Infrastructure Provider's specifications shall apply.

Appendix 5/1: Drainage Requirements

General Requirements

1. Drainage requirements are shown on the Contract Drawings.
2. The Contractor shall verify the locations, line and level, of existing drainage apparatus before any excavation starts on Site.
3. The Contractor shall be responsible for coordinating the drainage with all existing and proposed utilities and services.
4. The contractor shall be responsible for submitting application to connect drains to the public sewers in accordance with S106 and S115 of the Water Industry Act.

5. No construction works shall proceed until technical acceptance from the Adopting Organisation provided under a S104 for the adoptable network.
6. Pipes shall be laid on setting blocks only where a concrete bed or cradle is used. Pipe spigots shall not be permitted to bear on sockets inverts in such a manner as to produce uneven pressure on the joints.
7. All ends of pipe run stub connections or pipes runs left open during the course of construction shall be fitted with temporary expanding stoppers to prevent soil or other material from entering pipes, and to anchor each pipe to prevent flotation or other movement before the Works are complete.
8. Pipeline marker tape shall be laid 300-400mm below the finished surface or at pavement formation level, whichever is greater. Where the cover depth is greater than 2m, an additional marker tape layer shall be laid 600mm above the top of the pipe.
9. Completed pipelines shall have a smooth internal bore free from lipped joints, jointing or other materials, and shall be cleaned before and after laying.
10. All pipes shall be laid truly in straight lines both in direction and gradient between manholes, rodding eyes, access chambers, etc. Bends shall only be provided where shown on the drawings. Pipes shall be laid true to the invert levels and gradients shown on the drawings and, in the event of any variation in the position of any manhole or the line of the sewer being considered necessary, the Works shall be constructed as directed.
11. The allowable tolerance on given invert levels shall be + 5 mm. Provided that the as-laid gradient of the pipe runs between successive given invert levels shall not vary by more than 10% from that shown on the drawings and provided that the relative level differences between pipes in an individual installation are maintained.
12. Control of the pipe laying shall be provided by means of sight rails or electronic laser equipment.
13. The maximum roughness coefficients which shall be permitted under the Contract are:
 - a. 0.15mm for jointed pipes.
 - b. 3.00mm for filter drain pipes.
14. Maximum roughness coefficient K shall comply with the DCG guidance.
15. All connections to existing gully outfalls to be thoroughly cleaned by water jetting prior to connection. Care must be taken to prevent debris/rubble entering sewer system.
16. Any connection to an existing chamber or sewer greater than 150mm diameter to be mechanically cored (e.g. diamond drilled).
17. During construction and following completion, all manholes shall be covered to prevent access by unauthorised persons and ingress of debris. Ground water and water arising from construction operations shall only be permitted to enter the permanent drainage system with the express written permission of the Sewerage Undertaker and the Highway Authority. Furthermore, before carrying out any works in existing public sewers and highway drains, the Contractor will be required to demonstrate to the Sewerage Undertaker and the Highway Authority that all persons working in the sewers comply with the Undertaker's requirements with respect to training.

Materials

1. Pipe Bedding and Backfill
 - a. The type of pipe and bedding shall be as shown on the Contract Drawings and as shown on the standard detail drawing VNIF-ARP-00-YYY-DR-CD-0008. When the type of pipe is not specified on the Contract Drawings the Contractor shall obtain clarification from the Engineer.

- b. Unless otherwise approved, materials for pipe bedding or surround shall be a nominal single size granular material, natural crushed gravel or rock in accordance with the SHW Series 500. The grading of the material shall be varied depending on the pipe diameter. The water-soluble sulphate content shall not exceed 1.9g of sulphate (expressed as SO₃) per litre when tested in accordance with BS 1377 Part 3.
- c. Where the cover to a private pipe is less than 1200mm under carriageway and 900mm under non trafficked areas the bed and surround shall be Class A3.
- d. Where the cover to an adoptable or diverted pipe covered by the S104 Agreement is less than 1200mm under carriageway and 900mm under non-trafficked areas a reinforced concrete strip will be provided, with the bed surround beneath either Class S, as agreed with United Utilities.
- e. Gully connections to have bedding A3 where the pipe is less than 1200mm under carriageway and 900mm under non-trafficked.
- f. Where concrete bed and surround is to be used in drains or sewers other than gully connections, compressible filler (bitumen impregnated insulating board) shall be used at each pipe joint and extend for the full depth of the bed and surround. Where the pipe is less than 450mm diameter the thickness shall be 18mm, otherwise 36mm. Precast concrete setting blocks shall be used and shall have rectangular faces, with sufficient plan area to prevent punching of the blinding layer or formation, and to provide adequate seating for the pipes. They shall be manufactured from compressive strength C16/20 concrete using the same type of cement as in the adjacent concrete bed. Blocks shall not be used until they have achieved a cube strength of 13.5N/mm².
- g. Compressible packing for use between pipes and precast concrete setting blocks shall consist of bitumen damp proof sheeting complying with BS 743. Two layers are to be used on each block.
- h. Trench backfill material to Clause 505, between pipe bedding and road formation levels, shall be Type 1 granular sub-base material to Clause 803.

2. Vitrified Clay Pipes and Pipeline Fittings

- a. Vitrified clay gullies shall comply with the relevant provisions of BS EN 295: Part 1 or BS 65.
- b. Pipes and fittings up to and including 150 mm diameter shall be double spigot for jointing with push-fit polypropylene flexible couplings and shall be jointed in accordance with the manufacturer's instructions.
- c. Pipes above 150 mm diameter shall be of the socket and spigot type, with flexible joints, and shall be jointed in accordance with the manufacturer's instructions.

3. Plastic Pipes and Fittings

- a. uPVC and Polypropylene pipes shall be to BS 4660 or BS EN 1401 and jointed using sealing rings. Colour to be black.
- b. All pipe joints in the Contract shall be flexible and watertight in accordance with Sub-clause 3 of Clause 504 SHW.

4. Gullies and Gully Cover Slabs

- a. Precast concrete gullies and gully cover slabs shall comply with the relevant provisions of BS 5911-6.
- b. Vitrified clay gullies shall comply with the relevant provisions of BS EN 295.
- c. All gully gratings and frames shall be type D400 to BS EN 124, non-rock design with a captive hinge and an approved theft proof design.

- d. Gullies positioned in landscaped areas shall be a pedestrian type gully.

5. Manholes, Covers and Frames

- a. Precast concrete manholes and cover slabs of circular cross-section shall comply with the relevant provisions of BS EN 1917 and BS 5911-3.
- b. Polypropylene inspection chambers shall comply with BS EN 13598-1 or BS EN 13598-2.
- c. Any manholes within paved areas comprising brick, block, cobble or any other small elements shall, unless stated otherwise within the contract drawings or schedules, have stainless steel infill type covers in accordance with BS EN 124-3 and Fabricated Access Cover Trade Association (FACTA). Specification. The cover size and load classification shall be as stated in the contract drawings or schedules and shall comply with the FACTA classification.
- d. Any manholes within asphalt paved areas, unless stated otherwise within the contract drawings or schedules, shall have cast iron frames and covers. The cover size and load classification shall be as stated in the contract drawings or schedules and shall comply with BS EN 124 classification.
- e. Requirements for chambers and manholes shall meet UU and DCG requirements for construction i.e., safety chains and benching requirements.

Excavation and Backfilling

Excavation

1. General

- a. The Contractor shall carry out his operations in such a manner as to avoid damage, or deterioration of, the formation of excavations.
- b. Excavation in roads and streets shall be carried out in accordance with the provisions of the HAUC “Specification for the Reinstatement of Openings in Highways”.
- c. If the Contractor encounters ground in the formation that he considers unsuitable, or if the formation is damaged or allowed to deteriorate, the Contract Administrator and the Highway Authority shall be promptly informed. At the Contract Administrator direction, the unsuitable material shall be removed and the resulting excavation shall be refilled to formation level with pipe bedding material or GEN1 concrete.
- d. If the Contractor exceeds the width specified for an excavation or exceeds the depth specified to formation, or if the Final Surface is damaged or allowed to deteriorate, the Contract Administrator shall be promptly informed. The Contractor shall at his own expense reinstate the Final Surface with the pipe bedding material or GEN1 concrete.
- e. The sides of all excavations shall be vertical and shall be supported by systems of timbering using poling boards, runner or steel trench sheeting according to the ground conditions encountered. Support systems shall be designed to ensure the proper execution of the Works; to prevent any settlement of the adjoining ground or structures thereon; and prevent any loss of ground during excavation; and to ensure that backfilling can be carried out in accordance with the requirements leaving no voids. No part of the support system shall remain in the excavation after backfilling.
- f. Excavated material that is suitable for use as backfill shall be adequately protected to maintain its suitability for re-use.

- g. Excavated material or any other materials shall be placed at a safe distance from the excavation and shall not be placed closer than a horizontal distance equal to the depth of the excavation unless suitable working and safety arrangements are made.
- h. The Remediation Implementation and Verification Plan (RIP - ref. VNIF-ARP-ZZ-YYY-RP-CG-0017) includes requirements with respect to the control of excavations and stockpiling to prevent the spread of contamination. The requirements of the RIP shall also be met.

2. Trenches

- a. The maximum and minimum permitted trench widths from the base of the trench to a level 300 mm above the crown of the pipe are shown on the drawings. For trenches in rock the limits of the additional excavation are shown on the drawings.
- b. Trench widths may be reduced provided adequate space is demonstrated that for the proper support of the trench and for the laying, aligning and joining of the pipes and for the placing of the bedding and covering as required.

3. Excavation in Highways

- a. Before commencing excavation in highways, a vertical saw cut shall be made through the highway construction at each side of the excavation, using a disc saw or similar approved equipment.

4. Disused Drains, Manholes and Foundations

- a. All disused drains on the site shall be grouted up or taken up and cleared away. Any contaminated earth shall be removed from the site.
- b. Disused manholes shall be removed and filled with suitable material compacted in layers of not more than 200mm unconsolidated thickness. Old foundations encountered within excavations shall be broken out and cleared away to a depth of 1m below the proposed pipe invert
- c. All disused drains radiating from the excavation shall be traced, marked on a drawing and the Contract Administrator shall be informed. The length of drains traced shall be treated in accordance with to Sewers and Manholes to be Abandoned).

Dealing with Water

- 1. Ground water and water arising from construction operations shall not be permitted to enter the permanent drainage system.
- 2. The RIP includes specific requirements for the handling of groundwater arising from excavations in certain areas of the site, for example, the former Carriage Shed. The requirements of the RIP shall also be met.

Backfilling

1. General

- a. Backfilling shall, wherever practicable, be undertaken immediately after the specified operations preceding it have been completed. Backfilling shall not, however, be commenced until the works to be covered have achieved a strength sufficient to withstand all loadings imposed thereon.
- b. Backfilling around permanent works shall be undertaken in such a manner as to avoid uneven loading or damage. The initial layer of backfill material shall, unless otherwise specified, be free from stones and any other material that is unsuitable.

- c. Filling material to excavations not situated in the highway shall be in accordance with SHW Clause 2.49, placed and compacted to form a stable backfill.
- d. Mechanical appliances may only be used for compaction of backfill material when there is a minimum of 300mm of material above the crown of the pipe, providing the appliance is suitable for the conditions and will not damage or displace the pipes.
- e. Where the excavations have been supported and the supports are to be removed, these, where practicable, shall be withdrawn progressively as backfilling proceeds, in such a manner as to minimise the danger of collapse, and all voids formed behind the supports shall be filled and compacted.
- f. Filling material to excavations situated under road pavements or other hard-paved areas receiving vehicle loading (other than adopted highways) shall be class 6F1, 6F2 or 6F5 material.
- g. Excavations in adopted highways shall be filled above the level of any pipe surround required, in accordance with the HAUC 'Specification for the Reinstatement of Openings in Highways' or otherwise as required by the relevant Highway Authority. However, the minimum pavement construction thicknesses given in section 7 of this Specification shall be maintained.

3. Pipe Trenches

- a. Backfill to pipe trenches shall not be thrown directly onto but shall be carefully placed under and around pipes and compacted in thin layers using hand tools, up to at least 300 mm above the crown of the pipe or top of the special surround.
- b. Filling above the initial layer shall be deposited in layers not exceeding 250 mm unconsolidated thickness and compacted to a dry density not less than that of the material in which the trench has been excavated.
- c. The filling of trenches shall not be left proud of the surface and all surplus materials shall be removed. All restored surfaces shall be properly compacted and maintained.
- d. Mechanical appliance may only be used for compaction of backfill when there is a minimum of 450 mm of material above the crown of the pipe, providing the appliance is suitable for the conditions and will not damage or displace the pipes.

Land Drains

1. General

- a. All land drains encountered in the works shall be maintained in working order during construction.

Working in Existing Sewers

- 1. The Contractor must submit his proposals to and obtain a Permit to Work from the Highway Authority and/or the Sewerage Undertaker.
- 2. The Contractor shall allow sufficient time for seeking a Permit to Work.
- 3. All work carried out on the existing drainage system is to be carried out in accordance with the general requirements of the Highway Authority and/or the Sewerage Undertaker.
- 4. The ends of connections and pipes not required for immediate use shall be closed with purpose made stoppers, discs or joiners. The position of all pipes ends and junctions shall be recorded by the Contractor and shall be clearly marked on the surface with a concrete post or pad. The stopper shall be marked with blue plastic tape for surface water or red for foul. Galvanised wire shall be installed linking the concrete posts and the stopper to facilitate location at a later date.

5. All connections shall be surrounded with GEN3 concrete 150 mm thick.
6. Where connectors are required to existing sewers, the Contractor shall keep the working area free from sewer flows. The Contractor shall provide all necessary measures to deal with wet and dry weather flows in existing storm and foul sewers.
7. The Contractor shall ensure that no debris falls into the sewer flow.
8. The Contractor shall avoid causing nuisance or offence to the public from any odours, leakage or flooding as a result of his operations.
9. The Contractor shall be responsible for making an Application to the Drainage Undertaking under Section 106 of the Water Industry Act 1991 for each private connection made to Public Sewers, and under Section 115 for each connection made from the Public Highway.
10. On completion of the Works immediately prior to award of substantial completion, an internal inspection of pipelines by colour CCTV shall be carried out. The Contractor shall provide all necessary equipment, including suitable covered accommodation for viewing the monitor screen, together with personnel experienced in the operation of the equipment and interpretation of the results. Pipes of diameter greater than 0.9m diameter shall be visually inspected jointly by the Contractor and the Contract Administrator.
11. If any defects are found during the inspection, the Contractor shall submit his proposal for their remedy to the Contract Administrator.
12. Chamber covers in the carriageway shall be solid double triangular non-rock, 600 x 600 clear opening, load class D400. Covers in areas not subject to wheeled traffic shall be solid 600 x 600 clear opening, load class A15. Foul water manhole covers in the building floor slab shall be double seal airtight covers, unless specified otherwise on the Contract Drawings.
13. Chambers for highway drainage are as the Contract Drawings details.
14. The structural adequacy of drainage pipes under the building floor slab is to be ensured by complying with the Clay Pipe Development Association principles and relevant typical pipe details in their published guidance notes.

Connection to Existing Sewers

1. The position of all pipes ends when complete shall be fully surveyed on site with co-ordinates and levels supplied to the Project Manager in an agreed format. Additionally, all pipe ends and junctions shall be clearly marked on the surface with a concrete post or pad. The stopper shall be marked with blue plastic tape for surface water or red for foul. Galvanised wire shall be installed linking the concrete posts and the stopper to facilitate location at a later date.
2. Pipe connections within the Works which are specified as requiring a new manhole/chamber shall be formed using standard manhole/chambers construction details agreed by the relevant authority/Overseeing Organisation.
3. Junctions shall be formed using purpose made 45° oblique junctions of appropriate size. Where connections are to be made to an existing pipe, purpose made saddles may be used, with the prior permission of the Overseeing Organisation, provided that no internal projections greater than 5mm remain. They shall be properly mortared in, ensuring no mortar enters the main pipeline, and the hole surrounded with 150mm of Class GEN3 concrete. Where necessary a pipe shall be removed from the main line and replaced with an approved purpose made junction pipe.
4. Where pipe connections are made to a brick sewer, concrete culvert, stone built or lined channel, the pipes shall be well and tightly built into the concrete, brick or masonry work and be so placed as to discharge at an angle not greater than 60° to the direction of flow of the sewer, drain or channel and with the end of the pipe carefully cut to the necessary angle. All special connecting pipes shall be true and properly jointed.
5. All connections shall be surrounded with C28/35 (GEN3) concrete 150 mm thick.

6. Where connectors are required to existing sewers, the Contractor shall keep the working area free from sewer flows. The Contractor shall provide all necessary measures to deal with wet and dry weather flows in existing storm and foul sewers.
7. The Contractor shall ensure that no debris falls into the sewer flow.
8. The Contractor shall avoid causing nuisance or offence to the public from any odours, leakage or flooding as a result of his operations.
9. Before entering or breaking into an existing sewer or drain, the Developer shall give notice of his intention to do so to the authority responsible for the pipeline to which the connection is to be made. The Developer is reminded of his responsibility for complying with the requirements of the Health & Safety at Work Act.
10. For connections to adopted Public Sewers, the Contractor shall be responsible for making an Application to the Drainage Undertaker under Section 106 of the Water Industry Act 1991 for each connection made to Public Sewers, and under Section 115 for each connection made from the Public Highway.
11. Pipe connections within the Works shall be formed using standard chambers for connection.

General Requirements for Chambers/Manholes/Gullies

1. Existing covers and frames shall be adjusted as necessary to suit the finished levels.
2. Care shall be taken to prevent rubble and debris entering existing chambers. Any rubble and debris entering existing chambers shall be removed by the Contractor.
3. All manholes when completed shall be tested as specified
4. Precast Concrete Manholes
 - a. The jointing material for manhole units shall be mortar or a bitumen or resin mastic sealant or proprietary seals provided by the manufacturer of the manhole system, with the concrete surfaces primed with an appropriate compound.
 - b. Any holes formed in precast units for lifting purposes shall be sealed after erection with 1:3 cement/sand mortar, finished flush with the inside of the manhole.
 - c. Where it is necessary to provide a backdrop and rodding eye in concrete manholes, suitable lengths of chamber rings shall be provided so that the position of the rodding eye hole does not occur at or near a joint between chamber rings. The rodding eye hole shall then be cut through the chamber ring so as to provide an invert level with that of the backdrop junction. A special short length of pipe shall then be cut to fit through the chamber ring to form the rodding eye.
 - d. Precast units which bed onto bases shall be manufactured so that imposed vertical loads transmitted directly via the full thickness of the unit.
 - e. The profile of the joints between the units and the underside of the slabs, shall be capable of withstanding applied loadings from such slabs and spigot ended sections shall only be used where the soffit of the slab is recessed to receive them.
5. Brick and In-Situ Concrete Manholes and Chambers
 - a. Manholes and chambers constructed in brickwork or in-situ concrete shall comply with the relevant provisions of Sections 4 and 6 respectively and the Sub-Clauses set out below.
 - b. Galvanised step irons shall be built into the manhole and chamber walls. These shall be positioned 150mm each side of the centre line of the access cover or shaft. The bottom step iron, rung shall be 300 mm. above the benching. The top step iron, rung shall be placed on the left side (facing the steps) where practicable, and not more than 675 mm from the top of

the manhole cover. Step irons are not required where the depth to benching is less than 900mm.

- c. Where detailed, galvanised steel ladders as described in BS 8301, or stainless steel ladders as described on the drawings, shall be fixed to the manhole and chamber walls.
- d. Brickwork shall be laid in English bond with all joints filled solidly in 1:3 cement/sand mortar and neatly flush pointed internally as the work proceeds. No bats or broken bricks shall be used except as closers for the purpose for breaking bond. Joints shall not exceed 7 mm in thickness.
- e. Where brickwork is corbelled each course shall not oversail the course below by more than 32 mm.
- f. Arches are to be built in the brickwork over each pipe 300 mm diameter or larger, with bricks cut to the required shape. Arches shall be two half brick sizes of 450mm diameter and over and one half brick size for pipes under 450mm diameter.

6. Inverts and Benching

- a. Manhole inverts for pipes greater than 300mm diameter and benching shall be constructed in C28/35 (GEN3) concrete with a screed finish or rough finish as appropriate. The concrete shall extend to 50 mm above the highest pipe. Where there is no change of diameter, the invert shall follow the same gradient as the outgoing sewer unless otherwise shown on the drawings.
- b. Where inverts and benching are to be formed in in-situ concrete it shall finished with 20 mm min thick high strength concrete topping (granolithic finish) applied as soon as practicable after casting.
- c. Inverts for pipes up to and including 300mm diameter shall be formed using channel pipes. Above 300mm diameter inverts shall be formed using channel pipes or granolithic finish.
- d. Invert channel shall form a transition between the gradients of the incoming and outgoing sewers and, where there is a change in the direction of these sewers, the channel shall be accurately finished to a smooth curved surface with either purpose - made spigot and socket channels or in-situ concrete. The sides of main channels above half diameter shall be vertical up to the level of the soffit of the inlet pipe. The soffits of the incoming and outgoing pipes shall be level or to the mean gradient of the drainage run unless otherwise shown on the drawing.
- e. Invert channels 450mm or greater in depth shall have one or more toe-holes built in to give convenient access and shall have a suitable handrail or post within easy reach.
- f. Inverts of manholes with channels 600 mm diameter and over shall be fitted with a 10 mm closed-link galvanised steel safety chain and fittings, built -in to hang across the pipe diameter below the soffit of the outgoing pipe. Hooks for hanging the chain shall also be provided
- g. All benching shall have a fall of between 1 in 10 and 1 in 30 from the back to front and a 25 mm radius nosing to the channel

7. Gullies

- a. All gullies shall be trapped.
- b. Gully pots shall be set on a foundation of 150mm thick GEN3 concrete to BS EN 206 and the complementary BS 8500 and haunched around the bottom. When the base concrete has set, backfilling shall be carried out using 150mm of GEN 3 concrete to the top of the gully pot. The remainder of the backfilling shall be in appropriate road pavement materials except where mechanical compaction of granular sub-base is impracticable, Class GEN3 concrete shall be used.

8. Manhole Covers and Gully Grates

- a. Manhole covers and frames and gully gratings and frames shall conform to BS EN 124 as shown below, unless shown otherwise within the manhole schedule.

Location	Class	FACTA Class
Trafficked areas and main access road kerbside and footways, pedestrian areas and car parks.	D400	FACTA D

- b. Manholes within paved areas comprising slab, brick, block, cobble or any other small elements shall, unless stated otherwise within the contract drawings or schedules, recessed and be suitable to accommodate the finished surfacing. The materials and finishes used for the infill shall be the same as those used in the surrounding pavement, and any patterns shall be consistent with the surroundings and be filled in accordance with the manufacturer's requirements and specifications.
- c. Manhole is located within asphalt paved areas, unless stated otherwise within the contract drawings or schedules, shall have non recessed cast iron frames and covers.
- d. Any manhole covers offered for adoption by United Utilities are to be solid cast iron covers with a 150mm deep frame, be kitemarked in accordance with United Utilities requirements and Sewers for Adoption 7th Edition. Infill covers are not permitted for adoptable manholes.
- e. Gully gratings and frames in the asphalt finished highway to be D400 Group 4 min classification and to be hinged, non-rocking with captive hinge and of size 525mm x 575mm with 370mm x 430mm clear opening.
- f. Gully gratings and frames in the slab, brick, block, cobble or any other small element finished highway or landscape to be D400 Group 4 min classification.

9. Setting Manhole and Gully Covers and Frames

- a. Unless otherwise noted all covers within and adjacent to buildings, footpaths and roads shall be set square to wall and kerb lines.
- b. The frame shall be bedded and fixed in accordance with the manufactures requirements and specifications.
- c. Adjusted or replaced gully gratings in existing carriageways shall be set so that the front edge of the grating is flush with the new surface; the back edge of the grating (adjacent to the kerb) shall be set 6mm below the true surface of the new channel. The covers shall be oriented so that the hinged cover closes with the hinged side of the cover closest to oncoming traffic.
- d. Where brickwork is corbelled, each course shall not oversail the course below by more than 32 mm.
- e. Two sets of manholes lifting keys for each type of manhole shall be provided and handed over when directed

Catchpits and Interceptors

1. Catchpits

- a. Catchpits shall be constructed in accordance with the procedure specified for manholes with the exception of inverts and benching.
- b. Pipes built into catchpit chamber walls shall be cut off flush with internal face of the chamber and any space round the pipe pointed with 1:3 cement/sand mortar.

2. Interceptors

- a. Petrol interceptors are not required within this contract.

Drains, Sewers and Manholes to be Abandoned

1. Pipes to be grouted shall be filled with a grout to Clause 506, consisting of pulverised fuel ash and cement mixed with the minimum amount of water to ensure fluidity and shall be introduced at the higher end of the drain or sewer length being filled. Grouting operations shall proceed such that no length of sewer shall be filled until all upstream communicating lengths have been completed.
2. The seals at the lower end of each run of drain or sewer shall be fitted with a flexible breather pipe, fixed at the soffit of the sewer and turned vertically upwards to a height of 600 mm above the soffit level of the higher end of the relevant sewer length.
3. The head of existing drain or sewer lengths 'cut off' and exposed during excavations for new works shall be suitably sealed and a 150 mm flexible injection pipe constructed through the seal at the soffit of the sewer. The injection pipe shall be turned vertically and extend upwards for at least 1 metre.
4. On completion of grouting operations, the injection pipe shall be sealed with a plug of concrete at least 150 mm deep and having 150 mm bearing outside the injection pipe.
5. Surplus water shall be disposed of.
6. The shaft of manholes on abandoned sewers shall be broken down to a level of 1 metre below finished ground level and the remaining void filled with foamed concrete to Cl. 2.39 or Mix GEN3 concrete. Above the remaining structure suitable selected fill, Type 1 or Type 2 granular material shall be deposited in layers not exceeding 200mm unconsolidated thickness, fully compacted and brought up to the level of the underside of the sub-base.

Testing and Sterilisation

1. The Contractor shall carry out air and/or water tests in accordance with Clause 509 on all sections of pipeline with flexible watertight joints.
2. Testing Non-Pressure Drainage Networks
 - a. Non-pressure Networks laid in open cut shall be tested with air after they are jointed and before any concreting or backfilling is commenced, other than such may be necessary for structural stability whilst under test.
 - b. A further air test shall be carried out on completion of the Works. Prior to this test all lengths of gravity pipelines shall be rodded with a profile disc to ensure the nominal bore of the pipeline is clear of any restriction.
 - c. Upon completion of each section of the works an Interim Test Certificate of the form included at the end of this Appendix shall be submitted as confirmation of the successful testing of backfilled gravity pipeline and manholes
 - d. A final Test Certificate of the form included at the end of this Appendix shall be submitted following successful testing of the gravity pipelines and manholes in the Works
3. Water Test for Non-Pressure Drainage Networks
 - a. In the event of the failure of any test, or the occupancy of infiltration, the defect shall be located and repaired and the test repeated.
4. Air Test for Non-Pressure Drainage Networks
 - a. Where gullies or other ground floor appliances are connected, a 50 mm test should be applied with a maximum loss of 12 mm over a 5 minute period.
5. CCTV Visual Inspection of Drainage Networks

- a. On completion of the Works, and also immediately prior to vesting of any sewers to the Sewage Undertaker or Highway Authority, an internal inspection of carrier pipelines by a full colour CCTV inspection shall be carried out. This survey shall extend to all existing sewers (belonging to either the Highway Authority or Sewerage Undertaker) which are located within the boundary to the site. CCTV survey is not required for gully connections. The Contractor shall provide all necessary equipment, including suitable covered accommodation for viewing the monitor screen, together with personnel experienced in the operation of the equipment and interpretation of the results. A condition report shall be prepared and submitted as outlined in part (e).
- b. If any defects are found during the inspection, the Contractor shall submit his proposal for their remedy to the Clients Representative and Highway Authority.
- c. Prior to each inspection, the Contractor shall thoroughly clean the internal surfaces of sewers and manholes to remove all deleterious matter, without such matter being passed forward into existing public sewers or water courses.

6. Scope of Work

- a. The scope of work shall include inspection of the drains or sewers and associated manholes shown on the drawings so as to discover evidence of their structural and serviceable condition and locate all branches. The survey of the drains/sewers shall be by colour closed circuit television.
- b. Sufficient water shall be maintained in the drains or sewers to show the correct orientation of camera to invert, and to highlight any low points.

7. Report

- a. Two copies of the complete report, both copies including photographs and a videotape, shall be handed over within 14 days of completion of the Survey. The Works shall not be considered complete until the report has been handed over to the Contract Administrator & Project Manager.

8. Testing Of Manholes and Chambers

- a. All manholes and chambers shall be cleaned internally and tested. The manhole or chamber shall then be completely filled with water and after time has been allowed for adsorption to take place, refilled to the level of the top of the cover. For two hours no more water shall be added to the manhole or chamber and if at the end of this time the water has not dropped in level by more than 25 mm the manhole or chamber shall be regarded as satisfactory. Should the drop in level be more than the amount stated, the leakages shall be located, and the manhole or chamber rectified.
- b. Manholes and chambers constructed below the ground water table shall have all outlet pipes closed by means of expanding stoppers. After a period of 2 hours if water has entered the manhole or chamber to a depth of 25 mm or more the manhole or chamber shall be regarded as unsatisfactory.

Interim Test Certificate

Interim Test Certificates for testing during installation shall include the following:-

Project Name:

Name of Contractor/Sub-Contractor:

Service:

Section Under Test:

Nature of Test:

Water/Air

Pressure

Duration

Materials and installation in accordance with the Specification: Yes/No

Record Drawing received by Contractor: Yes/No

Signatures: for Contractor/Sub-Contractor:

Witness:

Date of Test:

Final Test Certificate

Final Test Certificates shall include:-

Project Name:

Name of Contractor/Sub-Contractor:

Service:

Section Under Test:

Nature of Test:

Water/Air

Pressure

Duration

Complete set of Interim Test Certificates received by Contractor: Yes/No

Test Certificates for Plant Items received by Contractor: Yes/No

Systems flushed: Yes/No

System rodded with profile disc: Yes/No

System commissioned: Yes/No

Record Drawings received by Contractor: Yes/No

Signatures: for Contractor/Sub-Contractor:

Witness:

Date of Test:

Permeable Paving

1. Refer to the Landscape Architects drawings and specifications for related information on proposed permeable paving features.
2. Refer to the Highways and Drainage Engineers drawings and specifications for related information on proposed build-ups and details on the proposed permeable paving features.
3. For supporting guidance on all SuDS elements, refer to ‘The SuDS Manual’ – CIRIA C753.

Detention Basins

1. Refer to the Landscape Architects drawings and specifications for related information on proposed Detention Basin features.
2. Refer to the Highways and Drainage Engineers drawings and specifications for related information on proposed build-ups and details on the proposed Detention Basin features.
3. For supporting guidance on all SuDS elements, refer to ‘The SuDS Manual’ – CIRIA C753.

Storage Tanks

1. Refer to the Highways and Drainage Engineers drawings and specifications for related information on proposed details on the proposed Storage Tanks features.
2. For supporting guidance on all SuDS elements, refer to ‘The SuDS Manual’ – CIRIA C753.

Linear Drainage Channels

1. The requirements for linear drainage channel systems are shown on drawings:
 - a. Proposed Surface Water Drainage Sheet 1 of 2
 - b. Proposed Surface Water Drainage Sheet 2 of 2
2. All covers and grates are to be locked to the base unit.
3. Loading classification of the channel and grating shall be in accordance with BS EN 124:2015.
4. Linear drainage channels to have removable access covers at the head of each run to ensure maintenance of the channels can be undertaken. Intermediate access cover locations, where required, shall be indicated on the Contract Drawings.
5. All outfall units shall comprise a sump and have a foul odour trap, unless defined otherwise on the contract drawings.

Appendix 5/2: Service Duct requirements

1. All of the below clauses are subject to Statutory Authority approval and will be superseded by DNO/ICP construction design.
2. Service duct requirements are shown on the Contract Documents.
3. All service ducts (except for traffic signals) shall be BBA approved and comply with BS EN 50086-2-4. They shall be jointed using sealing rings, unless shown otherwise on the Contract Drawings, and shall be supplied and installed by the Contractor.
4. Ducts for services should be smooth internal bore Polyethylene, to standards as defined in Table 5/2 of Clause 501.
5. Standard polypropylene draw cord shall be installed in all new ducts and shall be terminated at ground level, inside draw pits or the top of signal poles.
6. Minimum trench widths as per trench drawings and to be confirmed by Statutory Authorities.
7. The minimum depth of cover to service ducts from finished surface levels as per trench drawings and shall be confirmed with the Statutory Authorities.
8. Bedding to be constructed according to Statutory Authorities' specifications and in accordance with Clause 503.
9. Backfill material (between pipe bedding and road formation level) shall be 'as dug' material, naturally occurring at the place or level of excavation, free from stones larger than 40mm, debris and organic material. Excavated material that is not suitable as backfill shall be removed from site. Class 1, Class 2 or Class 3 material to be used in accordance with Clause 505 and Table 6/1 of Series 600.
10. Ducts shall be laid to ensure that no water logging occurs within the ducts. All ducts shall be laid with a constant fall between chambers.
11. Access chambers shall be confirmed with Statutory Authorities. Design based upon:
 - a. Engineered brick for Openreach - carriageway chamber Type JBC4(N) (see 'New Sites Fibre Handbook' V.9.5 June 2021 & Drawing CN 15644 Sheet 3).
 - b. Cubis Modula chambers for Virgin Media – carriageway chamber Type CW1 (see 'New Build Handbook' v1-63).
 - c. ENWL chambers based on ENWL/ICP design. It is anticipated that future excavation pulling pits will be preferred by ENWL for cable pulling, rather than chambers. Preferred chamber/pulling pit method to be determined in construction design by DNO/ICP.
12. Ducts into chambers shall be terminated internally within 80mm of the chamber wall.
13. Duct chambers within vehicle areas (including landscaped public realm to be trafficked) should have a loading class of D400 and for those within footways/parkland should have a loading class of B125.

SERIES 0600: EARTHWORKS

Appendix 6/1: Requirements for acceptability and testing etc. of earthworks materials

6/1.1 Acceptability limits for fills

i) Permitted Classes (Table 6/1, Table 6/1A)

Acceptable earthwork materials shall be designated as follows:

Class 1A*, 1B* or 1C* – general granular material

Class 2A* or Class 2C* – general cohesive material

Class 5A or 5B – Topsoil in landscape and planting areas

Class 6F2 or Class 6F5 – capping

Class 6N or Class 6P fill to structures

An asterisk (*) against the material class denotes that the compaction requirements of Table 6/1 have been modified in this project specific specification from method to end product.

ii) A schedule of acceptability limits for the fill materials required for this Contract (that are not already fully defined in Table 6/1) is given in Table 6/1A. Where the limits in Table 6/1A conflict with those in Table 6/1, Table 6/1A shall take precedence. The grading requirements for each class of fill are given in Table 6/2 and Table 6/5. The compaction requirements are given in Table 6/1.

iii) Any materials not listed in Table 6/1A shall be considered unacceptable. In addition, the following materials shall be considered unsuitable and shall be rigorously excluded from the works:

- Peat, wood, stumps and other perishable and putrescible materials.
- Material which contains concentrations of determinands that exceed the relevant verification and validation criteria presented in Appendix 6/14.

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
1A1*	Well graded granular material	General fill – future development plots	As table 6/1	Grading	BS 1377: Part 2 or BS EN 13242	Table 6/2	Table 6/2	End product 100% of test results ≥ 92.0% of maximum dry density and at least 95% of test results >95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content ≤ 10%. Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >4% CBR based on a rolling assessment of the most recent 20 tests	-	
				Uniformity coefficient	See note 5	10	-	
				Moisture Content	BS1377: Part 2 (note 4)	[tbc] To be determined by Dry Density/ Moisture Content undertaken on site by the Contractor on material proposed for use as fill.		
				Optimum moisture content	BS1377: Part 4 (2.5kg rammer)	-	-	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements

CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
1A2*	Well graded granular material	General fill –carriageways and footpaths	As table 6/1	Grading	BS 1377: Part 2 or BS EN 13242	Table 6/2	Table 6/2	End product 100% of test results ≥ 92.0% of maximum dry density and at least 95% of test results >95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content ≤ 10%. Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >5% CBR based on a rolling assessment of the most recent 20 tests	-	
				Uniformity coefficient	See note 5	10	-	
				Moisture Content	BS1377: Part 2 (note 4)	[tbc] To be determined by Dry Density/ Moisture Content undertaken on site by the Contractor on material proposed for use as fill.		
				Optimum moisture content	BS1377: Part 4 (2.5kg rammer)	-	-	
1B1*	Uniformly graded granular material	General fill - future development plots	As table 6/1	Grading	BS 1377: Part 2 or BS EN 13242	Table 6/2	Table 6/2	End product 100% of test results ≥ 92.0% of maximum dry density and at least 95% of test results >95.0% of
				CBR	Plate load test (600mm diameter plate) or other	100% of results >2.5% CBR	-	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
					method approved by the Engineer	95% of results >4% CBR based on a rolling assessment of the most recent 20 tests		maximum dry density based on a rolling assessment of the most recent 20 tests Air void content ≤ 10%. Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).
				Uniformity coefficient	See note 5	10	-	
				Moisture Content	BS1377: Part 2 (note 4)	[tbc] To be determined by Dry Density/ Moisture Content undertaken on site by the Contractor on material proposed for use as fill.		
				Optimum moisture content	BS1377: Part 4 (2.5kg rammer)	-	-	
1B2*	Well graded granular material	General fill –carriageways and footpaths	As table 6/1	Grading	BS 1377: Part 2 or BS EN 13242	Table 6/2	Table 6/2	End product 100% of test results ≥ 92.0% of maximum dry density and at least 95% of test results >95.0% of maximum dry density based on a rolling
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >5% CBR	-	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
						based on a rolling assessment of the most recent 20 tests		assessment of the most recent 20 tests
				Uniformity coefficient	See note 5	10	-	Air void content ≤ 10%.
				Moisture Content	BS1377: Part 2 (note 4)	[tbc] To be determined by Dry Density/ Moisture Content undertaken on site by the Contractor on material proposed for use as fill.		Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).
				Optimum moisture content	BS1377: Part 4 (2.5kg rammer)	-	-	
1C1*	Coarse graded granular material	General fill - future development plots	As table 6/1	Grading	BS 1377: Part 2 or BS EN 13242	Table 6/2	Table 6/2	End product
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >4% CBR based on a rolling assessment of the most recent 20 tests	-	100% of test results ≥ 92.0% of maximum dry density and at least 95% of test results >95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content ≤ 10%. Dry density to be determined in

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
								accordance with BS1377: Part 4 (4.5kg rammer).
				Uniformity coefficient	See note 5	10	-	
				Moisture Content	BS1377: Part 2 (note 4)	[tbc] To be determined by Dry Density/ Moisture Content undertaken on site by the Contractor on material proposed for use as fill.		
				Optimum moisture content	BS1377: Part 4 (4.5kg rammer)	-	-	
1C2*	Coarse graded granular material	General fill –carriageways and footpaths	As table 6/1	Grading	BS 1377: Part 2 or BS EN 13242	Table 6/2		End product 100% of test results ≥ 92.0% of maximum dry density and at least 95% of test results >95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content ≤ 10%. Dry density to be determined in accordance with
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >5% CBR based on a rolling assessment of the most recent 20 tests		
				Uniformity coefficient	See note 5	10		

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
				Moisture Content	BS1377: Part 2 (note 4)	[tbc] To be determined by Dry Density/ Moisture Content undertaken on site by the Contractor on material proposed for use as fill.		BS1377: Part 4 (4.5kg rammer).
				Optimum moisture content	BS1377: Part 4 (4.5kg rammer)	-		
2A1*	Wet cohesive material	General fill - future development plots	As table 6/1	Grading	BS 1377: Part 2	Table 6/2	Table 6/2	End product Dry density:100% of test results $\geq$ 92.0% of maximum dry density and at least 95% of test results >95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content: 100% of test results <10% and at least 95% of test results <5% based on a rolling assessment of the most recent 20 tests.
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >4% CBR based on a rolling assessment of the most recent 20 tests	-	
				Plastic Limit (PL)	BS1377: Part 2	-	-	
				Liquid limit	BS1377: Part 2	30%	60%	
				Plasticity Index	BS 1377: Part 2	15%	40%	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
				Moisture Content	BS1377: Part 2 (note 4)	PL-4%	PL+2%	Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).
				Undrained shear strength	Clause 633	60 kPa	‘-	
2A2*	Wet cohesive material	General fill –carriageways and footpaths	As table 6/1	Grading	BS 1377: Part 2	Table 6/2	Table 6/2	End product
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >5% CBR based on a rolling assessment of the most recent 20 tests	-	Dry density:100% of test results ≥ 92.0% of maximum dry density and at least 95% of test results >95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content: 100% of test results <10% and at least 95% of test results <5% based on a rolling assessment of the most recent 20 tests.
				Plastic Limit (PL)	BS1377: Part 2	-	-	
				Liquid limit	BS1377: Part 2	30%	60%	
				Plasticity Index	BS 1377: Part 2	15%	40%	
				Moisture Content	BS1377: Part 2 (note 4)	PL-4%	PL+2%	
				Undrained shear strength	Clause 633	60 kPa	-	Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
2C1*	Stony cohesive material	General fill - future development plots	Any material, or combination of materials, other than chalk	Grading	BS1377: Part 2	Table 6/2	Table 6/2	End product Dry density:100% of test results $\geq$ 92.0% of maximum dry density and at least 95% of test results $>$ 95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content: 100% of test results $<$ 10% and at least 95% of test results $<$ 5% based on a rolling assessment of the most recent 20 tests. Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results $>$ 2.5% CBR 95% of results $>$ 4% CBR based on a rolling assessment of the most recent 20 tests	-	
				plastic limit (PL)	BS1377: Part 2	-	-	
				Moisture Content	BS1377: Part 2	PL-4%	PL+2%	
				Undrained shear strength	Hand vane	60 kPa	-	
				Liquid limit	BS1377: Part 2	30%	60%	
				Plasticity index	BS1377: Part 2	15%	40%	
2C2*	Stony cohesive material	General fill –carriageways and footpaths	Any material, or combination of materials, other than chalk	Grading	BS1377: Part 2	Table 6/2	Table 6/2	End product Dry density:100% of test results $\geq$ 92.0% of maximum dry density and at least
				CBR	Plate load test (600mm diameter plate) or other	100% of results $>$ 2.5% CBR	-	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
					method approved by the Engineer	95% of results >5% CBR based on a rolling assessment of the most recent 20 tests		95% of test results >95.0% of maximum dry density based on a rolling assessment of the most recent 20 tests Air void content: 100% of test results <10% and at least 95% of test results <5% based on a rolling assessment of the most recent 20 tests. Dry density to be determined in accordance with BS1377: Part 4 (2.5kg rammer).
				plastic limit (PL)	BS1377: Part 2	-	-	
				Moisture Content	BS1377: Part 2	PL-4%	PL+2%	
				Undrained shear strength	Hand vane	60 kPa	-	
				Liquid limit	BS1377: Part 2	30%	60%	
				Plasticity index	BS1377: Part 2	15%	40%	
Class 5B	Topsoil (site won or imported)	Soil cover layer and areas of planting	General purpose grade	-	-	-	-	No compaction
						Other specification requirements are detailed in the Landscape Architects Specification (VNIF-PLA-ZZ-YYY-SP-L-0001)		

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements

CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
Class 6F2	Site won selected granular material (coarse grading)	Capping	Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials contaminated with tar and tarbitumen binders, unburnt colliery spoil and argillaceous rock. Grading requirements in the next column shall not apply to chalk. Bitumen requirements in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less. Where material in this Class is imported onto site it shall be classified as Class 6F5 and comply with the requirements for that material.	Grading	BS 1377: Part 2 (On site materials only)	Table 6/2	Table 6/2	Table 6/4 method 6
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >4% CBR based on a rolling assessment of the most recent 20 tests	-	
				Optimum moisture content	BS 1377: Part 4 (vibrating hammer method)	-	-	
				Moisture content	Clause 613	Optimum mc – -2%	Optimum mc	
				Los Angeles coefficient	Clause 635	-	50	
				Class Ra (asphalt) content	Clause 710	-	50%	
				Bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2%	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
6F5	Selected granular material (coarse grading) – Imported on to the site	Capping	Unbound mixture complying with BS EN 13285 containing aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except chalk, shale, siltstone or slate, see Note 7) A2 (crushed concrete) A3 (crushed bricks, masonry) A4 (mixed recycled aggregate) G (mining and quarry industry – except G2 (black coal shale)) Aggregates from source code A4 shall contain not more than 50% of constituents in Class Ra (bituminous materials). Bitumen requirements in the next column shall not apply if the Class Ra (asphalt) content of any	Size, designation and overall grading category	BS EN 13285 – 0/80 and GE	Tab 6/5	Tab 6/5	Table 6/4 method 6
				CBR	Plate load test (600mm diameter plate) or other method approved by the Engineer	100% of results >2.5% CBR 95% of results >4% CBR based on a rolling assessment of the most recent 20 tests	-	
				Maximum fines and oversize categories	BS EN 13285 – UF12 and OC75	Tab 6/5	Tab 6/5	
				Los Angeles coefficient	BS EN 13242 – LA50	-	50	
				Laboratory dry density and optimum water content	BS EN 13285, Clause 5.3 – declared values	-	-	
				Water content	BS EN 1097-5	Optimum mc – -2%	Optimum mc	
				Class Ra (asphalt) content	Clause 710	-	50%	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements

CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
			recycled aggregate is 20% or less	Bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2%	
6N	Selected well graded granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate) A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale)	(i) grading	BS EN 933-2	Tab 6/5	Tab 6/5	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)
				(ii) uniformity coefficient	See Note 5	10	–	
				(iii) Los Angeles coefficient	Clause 635	–	40	
				(iv) effective angle of internal friction (ϕ') and effective cohesion (c')	Clause 636	$\phi' = 34$ $c' = 0$	No limit	
				(v) permeability	Clause 640	1x10-5 m/s	–	
				(vi) moisture content	BS 1377: Part 2 See Note 4	OMC – 2%	OMC + 2%	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
6P	Selected granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (ix) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not ‘as dug’ it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS EN 933-2	Tab 6/5	Tab 6/5	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)
				(ii) uniformity coefficient	See Note 5	5	–	
				(iii) Los Angeles coefficient	Clause 635	–	60	
				(iv) effective angle of internal friction (ϕ') and effective cohesion (c')	Clause 636	$\phi' = 34$ $c' = 0$	No limit	
				(v) permeability	Clause 640	1x10 ⁻⁵ m/s	–	
				(vi) mc	BS 1377: Part 2	OMC – 2%	OMC + 2%	

Table 6/1A – Acceptable Earthworks material for construction: classification and compaction requirements								
CLASS	GENERAL MATERIAL DESCRIPTION	USE	PERMITTED CONSTITUENTS (All subject to the requirements of Clause 601 of Materials and Workmanship Specification)	PROPERTY	MATERIAL PROPERTIES	LIMITS		COMPACTION REQUIREMENTS
					TEST	LOWER	UPPER	
Footnotes to Table 6/1: Note 1 – (02/16) App = contract specific Appendix Note 2 – (02/16) Tab = Table Note 3 – (02/16) Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in this Appendix 6/1 shall apply. Where this contract specific Appendix 6/1 gives limits for other properties not listed in Table 6/1 such limits shall also apply Note 4 – (02/16) Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 where the material is a soil or BS EN 1097-5 where the material is required to conform to a harmonised European Standard Note 5 – (02/16) Uniformity coefficient is defined as the ratio of the particle diameters D60 to D10 on the particle-size distribution curve, where: D60 = particle diameter at which 60% of the soil by weight is finer D10 = particle diameter at which 10% of the soil by weight is finer Note 6 – (02/16) The limiting values for Class U1B material are given in Appendix 6/14. Note 7 – not used Note 8 – (02/16) Where material source codes are referenced these are as listed in Table 6/7. Note 9 – (02/16) Where materials are required to be aggregates conforming to BS EN 13242 materials certificated as being compliant with BS EN 13285 are acceptable for use provided that they meet all the specification requirements and the Declaration of Performance for constituent parts to BS EN 13242 are provided to the Project Manager. Note 10 – (02/16) Materials shall comply with the current Environmental Regulations at the time of use. Reference shall be made to Annex ZA (informative) of BS EN 13242.								

6/1.2 Special requirements for determining acceptability

The Contractor is responsible for the classification and determination of acceptability of all earthwork materials in accordance with this specification and the requirements of the Remedial Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017).

Where appropriate, the Contractor shall ensure materials from site clearance activities (*SHW Series 200*) are processed and reused on site.

The Contractor shall determine compliance with this Specification on the basis of both geotechnical requirements (Appendix 6/1) and chemical requirements (Appendix 6/2, Appendix 6/14 and the RIP).

All handling of earthworks materials is to be undertaken in accordance with the RIP. The Contractor shall undertake selection and processing of the excavated earthworks material to maximise the potential for re-use in the Works. Materials which are acceptable for reuse without processing shall be stockpiled separately from materials which are geotechnically or chemically unacceptable (and require off-site disposal) and materials which are acceptable only after processing.

Unacceptable materials will require offsite disposal. Confirmation of the waste classification of these materials for disposal and the destination of these materials shall be documented within the Completion Verification Report produced by the Contractor (*Clause 6/2.2*).

6/1.2.1 Specialist site attendance

The Contractor shall appoint an appropriately qualified and experienced Civil Engineer, Site Chemist or Environmental Scientist for the Infrastructure Works. Duties shall include (but are not limited to):

1. Inspection of the ground beneath the footprint of former buildings and other infrastructure for contamination, together with preparing a written and photographic record of the inspection;
2. Supervising sampling of soil, water and free phase hydrocarbon;
3. Scheduling of samples for chemical analysis;
4. Identifying and delineating unforeseen contamination and implementing procedures for dealing with this material;
5. Assessing the results of soil chemical testing and advising whether material may be reused on site;
6. Monitoring and recording details of remediation processes;
7. Recording daily observations (including photographic records) for site activities, extent of excavations, plant/personnel present on site, location of and material within stockpiles, test results, quantities of material removed from site and location of imported material;
8. Ensuring that site won material is sampled and tested in accordance with the specified testing suites and testing frequency and ensuring that soils that do not meet the chemical testing requirements and validation criteria (Appendix 6/14) either:
 - Undergo appropriate processing/treatment; or
 - Are removed from site.
9. Ensuring that imported material is sampled and tested in accordance with the specified testing suites and testing frequency and ensuring that soils that do not meet the chemical testing requirements and validation criteria (Appendix 6/14) are not imported to site;
10. Undertaking monitoring from borehole installations in accordance with Appendix 6/12.
11. Producing a Completion Verification Report upon completion of Works (*Clause 6/2.2*) to include a summary of the works completed, including daily and photographic records, chemical and geotechnical test results and comparison to the remediation/ clean cover soil targets, details of any changes to the approved Earthworks Strategy and records of any regulatory correspondence.

6/1.2.2 Imported materials

For imported materials, testing shall be carried out at the point of deposition with the exception of chemical testing which should be undertaken before material is imported to site.

To determine the acceptability of imported earthworks materials the Contractor shall carry out the tests, at no less than the stated intervals, given in Appendix 1/5 and apply the classification requirements given in Table 6/1, Table 6/1A and the chemical testing requirements and the relevant validation criteria given in Appendix 6/14 (Table 6/14D and Table 6/14E as appropriate).

If, any material has altered its classification or become unacceptable for any reason, the classification and acceptability tests given in Appendix 1/5 shall be repeated.

Notwithstanding the testing schedule given in Appendix 1/5, the Contractor is responsible for ensuring the acceptability of all the earthworks materials used on site.

Records of imported material shall be maintained by the Contractor and presented in the Validation Report (Clause 6/2.3).

6/1.2.3 Site won materials

All handling and assessment of earthworks materials is to be undertaken in accordance with the Remediation Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017). To determine the acceptability of site won earthworks materials the Contractor shall carry out the tests, at no less than the stated intervals, given in Appendix 1/5 and apply the classification requirements given in Table 6/1, Table 6/1A and the chemical testing requirements and the relevant validation criteria given in Appendix 6/14 (Table 6/14D and Table 6/14E as appropriate).

Where materials have been stockpiled for longer than 14 calendar days, the Contractor shall carry out classification and acceptability testing in accordance with Appendix 1/5 not more than 5 calendar days prior to their use within the permanent works.

The Contractor shall keep an updated schedule of both laboratory and in-situ testing. This schedule shall record the following:

- Sample or test number (a unique reference number);
- Sample or test location (co-ordinated reference point to National Grid and level to Ordnance Datum, plus layer number if the material sampled or tested is being placed in multiple layers to achieve the design level);
- Description of the material tested;
- Date sampled;
- Description of tests to be carried out;
- Date sample dispatched for testing;
- Date test result received;
- Classification of soil in terms of Table 6/1 and Table 6/1A.

All sampling data shall be compiled during the site works and maintained on site along with records of any decisions made. A plan showing the sample locations and logs shall be maintained on site. All chemical analysis results shall be recorded. The Contractor shall maintain a photographic record of all sampling operations, and the excavation, placement and validation of the earthworks materials. An accurate record of all waste soils leaving the site shall be maintained along with the basic characterisation data required to satisfy the Landfill Regulations and other waste management regulations including the Duty of Care.

6/1.2.4 Concrete aggressivity

In addition to noting the requirements of *Clause 601.16* and *601.17*, the Contractor will undertake Chemical testing to determine the Aggressive Chemical Environment for Concrete (ACEC) class of proposed fill materials in accordance with BRE Special Digest 1 'Concrete in Aggressive Ground' Part 1, Box C10.

The required frequency of concrete aggressivity testing is given in Appendix 1/5A. The required suite of testing is presented in Table 1/5B.

On receipt of concrete aggressivity testing results, the Contractor shall determine the Aggressive Chemical Environment for Concrete (ACEC) class of the appropriate classes of proposed fill materials in accordance with BRE Special Digest 1 'Concrete in Aggressive Ground'. The results of this assessment should be presented in the Contractor's Verification Report (*Clause 6/2.2*).

6/1.2.5 Records

All sampling of earthworks materials is to be undertaken in accordance with the Remediation Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017). Sampling and analytical data shall be compiled during the site works and maintained on site along with records of any decisions made. A plan showing the sample locations and logs shall be maintained on site. All chemical analysis results shall be recorded. The Contractor shall maintain a photographic record of all sampling operations, and the excavation, placement and validation of the earthworks materials. An accurate record of all waste soils leaving the site shall be maintained along with the basic characterisation data required to satisfy the Landfill Regulations and other waste management regulations including the Duty of Care.

6/1.2.6 Non-conformance

In the event that any test or inspection reveals that the element tested or inspected does not meet the requirements of the Specification, the following action is to be implemented:

Further tests to be undertaken to determine the extent of the non-conformance.

If the reason for the non-conformance is low undrained shear strength, the material may be compacted by further passes of the roller and retested. If the re-tests meet the required strength, the material is to be considered acceptable. If the re-tests fail to achieve the required density the non-conforming material is to be removed, replaced and retested.

If the reason for the failure is the use of unsuitable material, the unsuitable material shall be removed, replaced with suitable material and re-tested.

The location and nature of the non-conformance shall be recorded.

6/1.3 Designation of material as Class 3

Chalk is not to be used in the works (*Clause 605.1*)

6/1.4 Requirements for processing to render unacceptable material acceptable

Subject to material balance, excavated materials falling in class U1A (other than those listed in clause 601.2(i)(b)), and class U1B (cl 601.2(ii)), which are suitable for processing, are to be processed to create acceptable material (*Clause 601.4*).

Processing of site won soils is likely to lead to up to four categories of recovered material:

1. General fill: Material that is acceptable for re-use as Class 1 or Class 2 fill.
2. Topsoil: Material that is acceptable for re-use as Class 5 fill.
3. Selected granular material: Material that is acceptable for re-use as Class 6F5, Class 6N or Class 6P fill.

4. Residual material that is unacceptable for use as either general fill, topsoil or as selected granular material (Class U1A/U1B).

Classification of site won materials shall be undertaken following any processing or treatment.

All processing plant is to be accompanied by a standard rules Environmental Permit and comply with the requirements of Environment Agency Standard Rules SR2008N027 - mobile plant for the treatment of soils and contaminated material, substances or products.

As required by the RIP, the Contractor is to prevent the release and dust and shall minimise waste from processing.

6/1.5 Permitted use of rapid assessment procedure for material acceptability

Where moisture content is specified as the method of material classification and control, the Contractor may use a “rapid” method as an alternative to BS1377: Part 2 method provided that such “rapid” methods are weekly calibrated against conventional BS methods using drying ovens.

6/1.6 Requirements for removal off site of excavated acceptable material or unacceptable material requiring processing or retention of surplus material on site

Subject to the requirements of a Materials Management Plan (*Clause 6/2.1.1*) and Stockpile Management Plan (*Clause 6/2.1.4*), material that is potentially suitable for use in subsequent development works by third parties, shall be retained in stockpiles on site at the locations and to the maximum possible extents shown on Drg VNIF-ARP-00-YYY-DR-CE-0012. These stockpiles will remain on site beyond Practical Completion of the HIF Infrastructure Works. This material will not be used as acceptable fill during the HIF Infrastructure Works (temporary or permanent works). Only acceptable earthworks materials as defined in *Clause 6/1* and Table 6/1A, shall be retained on site within the area shown on Drg VNIF-ARP-00-YYY-DR-CE-0012. Different material classes, as defined in Table 6/1A, are to be stockpiled separately within the area shown on Drg VNIF-ARP-00-YYY-DR-CE-0012.

No acceptable material is to be removed from the site without the agreement of the Project Manager.

Unacceptable material that is to be processed in accordance with *Clause 6/1.2* and/or *Clause 6/1.4* is not to be removed from the site.

Appendix 6/2: Requirements for dealing with Class U1B and U2 unacceptable material

The Contractor shall draw to the attention of all personnel working on the site the nature of possible contamination and the need to take any precautionary measures in handling material from the ground (both soil and groundwater).

6/2.1 Pre-commencement Documentation

The requirements for pre-commencement documentation for dealing with contaminated material (Class U1B and U2 unacceptable material) are presented in the Remedial Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017).

As described in the RIP, the following management plans, technical notes and method statements have been produced by the Contractor to support the activities to be undertaken on site:

- A project execution plan (PEP)/construction environmental management plan (CEMP), which includes:
 - A traffic management plan.
 - A spill response plan.
 - An environmental management plan.
 - A site waste management plan.
 - A noise and vibration monitoring plan.
- An asbestos management plan.
- A transport routes plan.
- A bulk earthworks activity plan.
- A stockpile management plan.
- A plan for managing surface water run-off and safeguarding the River Irk.

The Contractor shall also be responsible for obtaining all Statutory Environmental Permits, mobile plant licences and other relevant consents and licenses required to undertake the works.

6/2.1.1 Materials Management Plan

As detailed in the RIP, the HIF Infrastructure Works shall be undertaken in accordance with a Materials Management Plan or series of operation-specific Material Management Plans.

6/2.1.2 Asbestos Management Plan

As detailed in the RIP, the HIF Infrastructure Works shall be undertaken in accordance with an asbestos management which plan has been produced by the Contractor and details the methods to be adopted on site for managing asbestos risk, including methods of dust prevention and suppression.

6/2.1.3 Construction Environmental Management Plan

As detailed in the RIP, the Contractor has prepared a Construction Environmental Management Plan (CEMP). The CEMP sets out objectives, good practice measures and monitoring that will be adopted throughout the works in order to manage effectively and minimise, as far as reasonably practicable, potential environmental impacts associated with construction activities.

In developing the CEMP, the Contractor has recognised that the stated overall aims, requirements, mitigation measures and the objectives of the scheme.

6/2.1.4 Stockpile Management Plan

The RIP presents strategies for the management of excavated material. Different classes of acceptable material are to be stockpiled separately.

6/2.1.4.1 Temporary Stockpiles for use during the HIF Infrastructure Works

Included in the Stockpile Management Plan are measures to effectively manage risks associated with the presence of steep slopes on site (*Clause 6/3.15*). To avoid the potential to induce instability in existing steep slopes, temporary stockpiles shall not be placed in the areas indicated on Drg. VNIF-ARP-00-YYY-DR-CE-0011. In addition, no stockpiling is to be undertaken in an area extending 15m from the crest of the permanent risk zone shown in light blue on Drg. VNIF-ARP-00-YYY-DR-CE-0011.

6/2.1.4.2 Stockpiled Material for use in subsequent development works

The Stockpile Management Plan also sets out measures to be adopted by the Contractor in order to effectively manage risks associated with the retention of suitable material in stockpiles on site for use in works undertaken by others following completion of the HIF Infrastructure Works (*Clause 6/1.6*). Different classes of acceptable material are to be stockpiled separately. To avoid the potential to induce instability in existing steep slopes, stockpiles of material retained on site for use in subsequent development works shall not be placed in the areas indicated on Drg. VNIF-ARP-00-YYY-DR-CE-0012.

6/2.2 Contamination of soils

6/2.2.1 Identified areas of contamination

Requirements for remediation of identified areas of contamination are presented in the Remedial Implementation and Verification Plan (RIP - ref. VNIF-ARP-ZZ-YYY-RP-CG-0017). The RIP also makes provision for additional ground investigation to further define a number of identified contamination outliers.

Remediation of the identified areas of contamination is to be undertaken by excavation. On reaching the extent of each remediation excavation, verification samples will be undertaken from the sides and base of the excavation as follows:

- A 5 litre (minimum) composite sample will be collected by taking small sub-samples of the exposed made ground from across the entire base of the excavation. In excavations with dimensions less than 25m, a minimum of three subsamples will be taken. In larger excavations, a nominal 25m grid will be applied across the base of the excavation and a minimum of three subsamples taken from each whole or partial grid square. All composite samples shall be well mixed into a single base verification sample before being dispatched for analysis.
- 5 litre (minimum) composite samples will be collected from each wall of the excavation by taking small sub-samples of the exposed made ground. In excavations with dimensions less than 25m, a minimum of three subsamples will be taken. In larger excavations, a nominal 25m grid will be applied across each excavation wall and a minimum of three subsamples taken from each whole or partial grid square. A single composite sample shall be produced for each wall of the excavation by thorough mixing of the relevant subsamples before being dispatched for analysis.

All composite samples shall undergo chemical testing in accordance with the requirements of Appendix 1/5 and for the list of determinands identified in Table 6/14A, Table 6/14B or Table 6/14C as appropriate. The results of testing shall be compared with the verification requirements presented in Table 6/14A, Table 6/14B or Table 6/14C as appropriate.

If the results of sampling and analysis identify any exceedances of the appropriate verification criteria, further localised excavation is to be undertaken and sampling and verification will be repeated. Alternatively, further detailed quantitative risk assessment will be undertaken on the reduced source term to determine whether residual risks to human health and controlled waters are acceptable.

The results of all chemical verification and validation testing shall be documented within the Completion Verification Report (*Clause 6/2.2*) in the form of raw laboratory data and processed data (screened against the appropriate targets). The grid co-ordinates (easting, northing, and elevation) of in situ test locations shall be documented within the analytical data and Completion Verification Report.

6/2.2.2 Excavated soils to be recovered for re-use

The Contractor shall undertake chemical validation testing of soils proposed for use as fill material, at the frequency determined in Appendix 5/1 and for the contaminants outlined in Table 6/14D and Table 6/14E as appropriate.

All samples for chemical verification and validation testing are to be analysed according to MCERTS standards. The Contractor must allow sufficient time for the sampling, analysis and decision making process required to meet the design objectives.

Material that is acceptable for re-use based upon complying with chemical validation criteria (Appendix 6/14) may be used as fill within the works, subject to any processing required to render its geotechnical properties acceptable (*Clause 6/1.4*).

Material that is unacceptable due to having been found to contain concentrations of contaminants in exceedance of the appropriate validation criteria presented in Appendix 6/14, may be further processed or treated as appropriate to render it acceptable. Material that cannot be further processed or treated, is to be classed as unacceptable and is to be removed from site.

The results of all chemical verification and validation testing shall be documented within the Completion Verification Report (*Clause 6/2.2*) in the form of raw laboratory data and processed data (screened against the appropriate targets). The grid co-ordinates (easting, northing, and elevation) of in situ test locations shall be documented within the analytical data and Completion Verification Report.

6/2.2.3 Unexpected contamination

Should unexpected contamination be encountered during the earthworks the Contractor shall stop work in this area immediately. The Contractor shall design a strategy for delineating the area of previously unforeseen contamination and a method for preventing spread of this contamination to other areas of the site. The Contractor shall determine an appropriate methodology for treating this material for reuse elsewhere on the site, or transport off-site. The Contractor's method shall be documented in the Completion Verification Report (*Clause 6/2.3*).

6/2.3 Completion Verification Report

During the Works, the Contractor is to collect and collate data for inclusion in a Completion Verification Report which shall be submitted to the NEC Supervisor following the completion of the works. The requirements for the Completion Verification Report are set out in the Remedial Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017).

The Contractor shall ensure that any deviation from the approved RIP to address unexpected ground conditions, is documented within the Completion Verification Report. On completion, a set of as built drawings shall be produced along with all relevant information to demonstrate that the requirements of the Remediation Strategy have been met.

Regulatory sign-off of the Completion Verification Report will be required prior to contract completion.

The Completion Verification Report will form part of an Operating & Maintenance Manual to be forwarded to the future site operator, to allow them to address any residual risks.

The report shall include all as-built information in accordance with the requirements of the BIM Execution Plan (BEP). This shall include, but is not limited to, information such as extent of works, location of obstructions removed, location of obstructions remaining, location of testing, location and type of material placed, details of surface finishes, survey information.

Appendix 6/3 – Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)

6/3.1 Earthworks drawings and reports

Earthworks details are provided in the following drawings and documents:

Drawing/Report Reference	Title
AEG ref NW1580	AEG (2019) Northern Gateway Final Factual Report (Rev.00)
AEG ref NW1604	AEG (2021) Northern Gateway Phase 2 Final Factual Report (Rev.00)
Arup ref MNG-ARP-SW-RP-CG-102	Arup (2019) Northern Gateway Ground Conditions Desk Study
VNIF-ARP-00-YYY-RP-CG-0001	Arup (2021) Ground Investigation Interpretative Report
VNIF-ARP-00-YYY-DR-CE-0001	Proposed Site Contours
VNIF-ARP-00-YYY-DR-CE-0002	Proposed Site Isopach
VNIF-ARP-00-YYY-DR-CE-0003	Indicative Cut & Fill Volumes
VNIF-ARP-00-YYY-DR-CE-0005	Approximate Location and Extent of Historic Constraints
VNIF-ARP-00-YYY-DR-CE-0006	Extent of Required Proof-Rolling and Soft Spot Treatment
VNIF-ARP-00-YYY-DR-CE-0007	Treatment at Formation Level
VNIF-ARP-00-YYY-DR-CE-0008	Existing Monitoring Boreholes
VNIF-ARP-00-YYY-DR-CE-0010	Extent of Temporary Site Weathering Layer
VNIF-ARP-00-YYY-DR-CE-0011	No Stockpiling Zones
VNIF-ARP-00-YYY-DR-CE-0012	Indicative maximum extent of temporary stockpiling area
VNIF-ARP-00-YYY-DR-CE-0013	Re-use of site-won soils – Screening criteria zones
VNIF-ARP-00-YYY-DR-CE-0014	Red Bank Terrace Regrading Cross Sections Sheet 1 of 2
VNIF-ARP-00-YYY-DR-CE-0015	Red Bank Terrace Regrading Cross Sections Sheet 2 of 2
VNIF-ARP-00-YYY-DR-CE-0016	Earthworks Cross Sections Plan
VNIF-ARP-00-YYY-DR-CE-0017	Plot RB02 and RB03 Regrading Cross Sections
VNIF-ARP-00-YYY-DR-CS-0007	Red Bank Access Link Retaining Walls
VNIF-ARP-00-YYY-DR-CS-0008	Retaining Walls - Section

The depth of excavation may vary from that indicated on the Contract Drawings depending on the ground conditions encountered.

As shown in the Contract Drawings, existing steep slopes adjacent to Plots RB02 and RB03 are to be regraded to a gradient of 1v to 2.5h and ground levels beneath plots RB02 and RB03 are to be lowered. As shown on the Contract Drawings 1(v) to 3(h) slopes shall be constructed to allow the areas of reduced ground level to tie in with adjacent site areas. Once the regrading works are complete, the contractor shall inspect the formation for visual and olfactory evidence of contamination and shall address any areas of potential contamination in accordance with the contractor's discovery and remediation strategy.

As shown on Drg. VNIF-ARP-00-YYY-DR-CE-0012 a section of proposed carriageway crosses an existing retaining wall. The retaining wall is to be broken out to a minimum of 1m below the sub-base to ensure hard spots do not develop along the proposed carriageway.

As shown on Drgs VNIF-ARP-00-YYY-DR-CU-0002 to 0004, a number of existing drainage and utility corridors cross the site. Requirements for the treatment of this infrastructure are presented in Appendix 1/16.

6/3.2 Blasting for excavation

Not permitted.

6/3.3 Cutting faces

Not used.

6/3.4 Watercourses

The Remediation Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017) includes specific requirements for the protection of watercourses. The requirements of the RIP shall also be met.

The Contractor shall provide adequate drainage for all earthworks and shall take all reasonable precautions to prevent the discharge of silt or other contamination to surface watercourses.

No modifications are to be made to existing watercourses, the embankment modification will not require any changes to the River Irk.

6/3.5 Embankment construction

6/3.5.1 Limits on oversteepening or increase in width

Except for the area of regrading of existing slopes shown on Drg. VNIF-ARP-00-YYY-DR-CE-0003 the limit for slope gradients during construction and finished slopes is to be 1(v) in 3(h).

6/3.5.2 Stage construction of fills

Staged construction is not required. (*Clause 608.6*)

6/3.6 General construction of fills

6/3.6.1 Site Trial

Not required (*Clause 612.6*)

6/3.6.2 Material

Only acceptable material that meets the requirements of Appendix 6/1 and Appendix 6/14 is to be used in construction of fills. Mixing of acceptable granular and cohesive materials is not permitted.

Haulage of material is to proceed only when sufficient spreading and compaction plant is operating at the place of deposition to ensure compliance with the requirements of this specification.

If the material to be placed is in, or reaches a condition such that it cannot be compacted in accordance with this specification, the Contractor is to do one of the following:

- Make good by removing the material either to tip or elsewhere until it is in a suitable condition for re-use and replacing it with suitable material;
- Make good the material by wetting or drying;

- Cease work on the material until its physical condition is such that it can again be compacted in accordance with the agreed procedure.

6/3.7 Compaction

All compaction is to be carried out in accordance with Clause 612.

Compaction is to be carried out to meet the requirements of Table 6/1A and Table 6/4.

As detailed in the Remedial Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017), following excavation, verification and filling of the remedial areas listed below, additional compaction will be implemented to reduce infiltration:

- The gasworks
- TP422/423
- TP405a

In these areas of the site, in addition to standard compaction requirements, the upper fill will be sealed by receiving two passes of a smooth roller.

These additional measures will be extended for a distance of 10m in all directions, beyond the limits of each reinstated remedial excavation.

For the gas works area, if remedial excavations extend to the crest of the existing steep slopes overlooking the River Irk, it will not be possible to extend the additional compaction in the direction of the existing slopes, however this extended treatment will be applied in all other directions.

6/3.8 Excavation supports

Excavation supports are not required for the permanent works. The Contractor must ensure stability when excavating trenches or openings.

6/3.9 Requirements for benching or shaping to natural or earthworks slope faces to receive fill.

Slopes steeper than 1 in 5 that are to receive fill are to be benched.

Where fill materials are to be placed against existing soils, each new sloping layer shall be benched into the existing soils.

The benching in existing cohesive soils shall be cut with vertical faces and have level horizontal surfaces. Each bench shall have a vertical face cut to a height equal to 2 No. compacted / consolidated layer thicknesses for the fill material being placed. The horizontal surface shall be no less than 600mm wide.

Benching in existing granular deposits shall have a sub-vertical face cut to the steepest angle which is stable and a level horizontal face. Each bench shall have a sub-vertical face cut to a vertical height equal to 2 No. compacted / consolidated layer thicknesses for the fill material being placed. The horizontal surface shall be no less than 600mm wide. 46. Fill materials shall be thoroughly compacted / consolidated up to the vertical face of each bench

6/3.10 Mixing of acceptable and unacceptable materials

Mixing is not permitted (*Clause 602.6*).

6/3.11 Surface level tolerance

The final surface shall, after completion have a surface level tolerance within +50 mm and -50 mm, relative to its designed level.

Horizontal Alignment is to be +/- 50mm.

Where the tolerances of this Clause are exceeded, the Contractor shall determine the full extent of the area which is out of tolerance and shall make good as follows:

- (i) if the surface is too high it shall be re-trimmed and re-compacted in compliance with Clause 612 and this Clause;
- (ii) if the surface is too low it shall be corrected by the addition of acceptable material complying with Table 6/1A having characteristics and strength matching the overlain material, deposited and compacted in compliance with Clause 608 and 612 and this Clause. In cohesive materials Class 2, where this low surface is less than 150 mm below design level, material shall be removed to a depth of at least 150 mm below design level before the additional material is deposited and compacted.

6/3.12 Damage to adjacent buildings and utilities

The maximum permissible damage criteria for adjacent structures and services is to be advised by the NEC Supervisor. The Contractor shall be responsible for demonstrating and ensuring that damage to adjacent structures and services arising from earthworks operations does not exceed this criterion.

All services on and adjacent to the site shall be maintained in a serviceable condition and measures must be taken to ensure that earthwork operations do not cause damage above the agreed criterion or disrupt their continued operation.

The Contractor is responsible for demonstrating and ensuring that damage to adjacent structures and services do not exceed the agreed criterion, and is to engage with utility owners in advance of commencing earthworks activities to demonstrate that this condition will be met. Demonstration will require appropriate calculation in accordance with best practice guidance and an appropriate level of monitoring.

The Contractor is responsible for the control of all ground movements and for remediating any resulting damage to adjacent structures.

6/3.13 Obstructions

6/3.13.1 During site clearance

In addition to the requirements of Appendix 2/1, a number of features have been identified at the site which are associated with former rail operations and are to be removed during site clearance. Additional features may be encountered as the works progress.

The features identified to date include:

1. The remains of up to two former rail turntables.
2. Four lighting column bases.
3. The retaining wall in the lower-lying section of Red Bank terrace.

The turntables, lightning bases and retaining wall are to be broken out to the full depth of the relic structures. The contractor shall inspect the formation and sub-formation for visual and olfactory evidence of contamination and shall address any areas of potential contamination in accordance with the Contractor's discovery strategy.

6/3.13.2 During Remediation

A number of additional features have been identified at the site which are associated with former rail operations and are to be removed during remediation. Additional features may be encountered as the works progress.

The features identified to date include:

1. The remains of a former carriage shed.
2. The remains of an area referred to as 'former gas works'

Details of the requirements for the remediation of the carriage shed and former gas works are presented in the Remediation Implementation and Verification Plan (RIP – ref. VNIF-ARP-ZZ-YYY-RP-CG-0017).

On reaching the extent of each remediation excavation, validation samples will be undertaken in accordance with *Clause 6/2.2*.

Once these features have been removed and validated as appropriate, the resulting voids are to be filled with acceptable material in accordance with *Clause 601*, Table 6/1, Table 6/1A, Appendix 6/1 and the Contract Drawings.

6/3.13.3 Other obstructions

In all areas of the site except Plots RB02 and RB03, following removal of the known obstructions identified in 6/3.13.1, in-situ soils are to be excavated to a depth of 500mm (see Drg. VNIF-ARP-00-YYY-DR-CE-0007), to identify and remove relic structures and obstructions that are encountered. All obstructions/relic structures encountered that are larger than 0.0034 m³ in volume are to be removed to a depth of 2m below original ground level. All obstructions remaining deeper than 2.0m below original ground level are to be surveyed and the relevant data included in the Contractor's Completion Verification Report (*Clause 6/2.3*). All voids created by excavation and removal of obstructions/relic structures are to be inspected for visual and olfactory evidence of contamination. Any areas of potential contamination identified shall be addressed in accordance with the Contractor's discovery strategy.

All voids created by excavation and removal of obstructions/relic structures shall be back filled with acceptable material in accordance with *Clause 601*, Table 6/1, Table 6/1A, Appendix 6/1, Appendix 6/14 and the Contract Drawings.

Once excavation in Plots RB02 and RB03 reaches the scheduled level (38.0m AOD), the exposed formation is to be inspected for obstructions and any obstructions identified are to be recorded. Drawings showing all recorded obstructions are to be provided in the Completion Verification Report (*Clause 6/2.3*).

6/3.14 Site finishes

6/3.14.1 Areas of public open space

Topsoil to support proposed planting is required on the lower regraded slopes adjacent to plots RB02 and RB03 (see Landscape Architect's Specification and accompanying drawings). Prior to placing topsoil, the contractor shall inspect the formation and sub-formation for visual and olfactory evidence of contamination and shall address any areas of potential contamination in accordance with the contractor's discovery strategy.

The requirements for topsoil are provided in the Landscape Architect Specification (VNIF-PLA-ZZ-YYY-SP-L-0001). Topsoil shall also meet the relevant requirements of Appendix 6/14.

6/3.14.2 Temporary site weathering layer

Once the required formation levels shown on Drg. VNIF-ARP-00-YYY-DR-CE-0001 are achieved and material that is to be stockpiled for use in subsequent development works by third parties has been placed, areas where made ground remains exposed at the surface of the site will be hydroseeded to provide a short-term barrier between residual contamination in made ground soils and unauthorised users of the site (Drg. VNIF-ARP-00-YYY-DR-CE-0010).

6/3.15 Stockpiling

6/3.15.1 Temporary risk zones

A risk zone has been identified associated with existing slopes and is shown in purple on Drg. VNIF-ARP-00-YYY-DR-CE-0011. No stockpiling is to take place in this temporary risk zone. This temporary risk zone is to be maintained throughout the Infrastructure Works.

6/3.15.2 Permanent risk zone

In addition to the requirements of Clause 6/3.15.1, a permanent risk zone has been identified associated with the existing slopes adjacent to Plot RB05b. This is shown in light blue on Drg. VNIF-ARP-00-YYY-DR-CE-0011. No construction or other development is to be undertaken in this permanent risk zone, except for the landscaping and planting requirements given in the Landscape Architect Specification (VNIF-PLA-ZZ-YYY-

SP-L-0001). No stockpiling is to be undertaken in an area extending 15m from the crest of the permanent risk zone.

6/3.15.3 Other requirements

In addition to the areas defined on Drg. VNIF-ARP-00-YYY-DR-CE-0011. it will be necessary for the Contractor to control stockpiling in adjacent areas. The Contractor's Stockpile Management Plan (*Clause 6/2.1.4*) shall identify all proposed stockpiles that are within 30m of the crest of existing slopes.

Appendix 6/6: Fill to structures and fill above structural foundations

6/6.1 Drawing references for fill to structures and fill above structural foundations

Details showing the formation levels and requirements are shown on the following drawings:

Drawing reference	Title
VNIF-ARP-00-YYY-DR-CS-0007	Red Bank Access Link Retaining Walls
VNIF-ARP-00-YYY-DR-CS-0008	Retaining Walls - Section

6/6.2 General requirements

Fill to structures and fill above structural foundations shall be as shown on the above-referenced Contract Drawings.

Class 6N or Class 6P material are to be used as fill to structures and above structural foundations.

Appendix 6/7 – Capping and preparation and surface treatment of formation

6/7.1 Drawing references for formation

Details showing the formation levels and requirements are shown on the following drawings:

Drawing reference	Title
VNIF-BNL-ZZ-YYY-DR-CE-0001	Proposed HIF Lite Site Contours using highway formation levels

6/7.2 Formation requirements

Existing topsoil and subsoil shall be stripped.

Any site-won topsoil is to be set-aside for potential reuse (Class 5A fill - Appendix 6/3.14.1) provided it meets the requirements of Appendix 6/1, the Landscape Architect Specification (VNIF-PLA-ZZ-YYY-SP-L-0001) and Appendix 6/14.5. Any unsuitable material is to be stockpiled separately from the materials which can be reused in the Works and removed from site.

In the areas shown on Drg. VNIF-ARP-00-YYY-DR-CE-0006 prior to filling operations, the exposed earthworks surface after any required excavation, is to be proof-rolled and tested in accordance with Appendix 1/5 to identify soft spots.

The proof-rolling shall consist of at least two passes of a smooth-wheeled vibratory roller having a minimum mass per metre roll width of 2100 kg, or other suitable method agreed with the Project Manager.

A minimum undrained shear strength value of 50 kN/m² is required across the sub-formation in cohesive soils and soil stiffness greater than 2% CBR is required at sub-formation level in granular soils. Should soft spots be identified that do not meet these requirements, their lateral extent shall be determined by inspection and additional testing as appropriate and is to be recorded on as-built drawings.

Soft spots each with an area in plan of no more than 100 square metres and extending no more than 1m below sub-formation level shall be excavated and backfilled using Class 1 or Class 2 general fill or other acceptable fill materials.

For soft areas each with an area in plan of larger than 100 square metres or deeper than 1m below sub-formation level, the Contractor is to agree the treatment with the Project Manager.

On completion of proof-rolling and soft-spot treatment, a programme of testing is to be undertaken to validate the geotechnical properties of the sub-formation against the requirements set out in Appendix 1/5.

Appendix 6/8 – Topsoiling, grass seeding and turfing

6/8.1 Drawing references for Topsoiling, grass seeding and turfing

Details showing the location of the required areas of topsoiling, grass seeding and turfing are shown in the Landscape Architect's Specification and the relevant drawings referenced therein.

6/8.2 General

Topsoil is to be stripped from all areas requiring excavation and filling. Topsoil excavated as part of the earthworks may be re-used subject to meeting the requirements of Appendix 6/1, the Landscape Architect Specification (VNIF-PLA-ZZ-YYY-SP-L-0001), Clause 602.9 and Appendix 6/14.5. Imported topsoil shall also meet the requirements of the Landscape Architect Specification (VNIF-PLA-ZZ-YYY-SP-L-0001), Clause 602.9 and Appendix 6/14.5.

Topsoil is to be stripped, handled, stored and replaced in accordance with the Good Practice Guide for Handling Soils (MAFF April 2000), the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra 2009, updated 2018).

Appropriate topsoil management of any storage mounds shall be employed in accordance with Clause 602.10 and the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009, updated 2018). Strict precautions shall be taken to prevent soils being mixed with deleterious material.

6/8.3 Whether surplus topsoil is to be stored or disposed of by the Contractor.

Subject to further agreement with the Project Manager, topsoil that is potentially suitable for use in subsequent development works by third parties, may be retained in stockpiles on site as indicated on Drg. VNIF-ARP-00-YYY-DR-CE-0012. These stockpiles will remain on site beyond Practical Completion of the HIF Infrastructure Works. As this material will not be used as during the Infrastructure Works (temporary or permanent works), requirements for this material fall outside the scope of this Specification.

6/8.4 Thickness of topsoil to be deposited

Details of the extent of the soil cover layer and the thicknesses of topsoil and subsoil that are required for landscaping and planting in different areas of the site are provided in the Landscape Architect's Specification and the relevant drawings referenced therein.

Appendix 6/12 – Instrumentation and monitoring

6/12.1 Drawing references for existing instrumentation and monitoring installations

Details showing the location of existing instrumentation and monitoring boreholes are provided on the following drawings:

Drawing reference	Title
VNIF-ARP-00-YYY-DR-CE-0008	Existing Monitoring Boreholes

6/12.2 Proposed instrumentation and monitoring installations

A programme of monitoring is required to monitor settlement of soils underlying the proposed plateau road embankment. This settlement monitoring programme should include provision of surface settlement monitoring stations together with a minimum of two borehole extensometers. Extensometers shall be provided along Sections A and B (Drg.VNIF-ARP-00-YYY-DR-CE-0002). See Clause 6/12.5.2 for extensometer monitoring requirements.

The Contractor shall present detailed proposals for settlement monitoring to the Project Manager for approval, at least 28 days before the settlement monitoring infrastructure is to be installed. The contractor's proposals shall confirm the details and proposed location of the following:

- The offsite reference datum points that are to be used during the monitoring.
- The surface settlement monitoring stations.
- The extensometers:
 - The type of extensometer to be installed (e.g. magnetic, vibrating wire or other)
 - Details of how each extensometer is intended to provide information on settlement within the various strata encountered in each installation.

Ground conditions at Sections A and B are anticipated to consist of approximately 3m of made ground overlying approximately 8m of glacial till, over bedrock. In addition to providing a datum in the upper bedrock, extensometer installations shall provide sufficient information to allow settlement to be monitored in both the made ground and glacial till.

Within the made ground, extensometers should allow monitoring data to be collected for each approximate 2m vertical interval, however if ground conditions are found to be variable, the extensometers shall allow settlement in both granular made ground and cohesive made ground to be measured separately.

The Contractor's extensometer proposals shall also set out the proposals for monitoring settlement within the overlying embankment fill, once earthworks are complete.

The Contractor's proposals shall include a programme indicating when the various elements of the settlement monitoring infrastructure will be installed with respect to key stages in the embankment construction. See Clause 6/12.4 for requirements to protect extensometers during monitoring.

6/12.3 Protection of existing instrumentation and monitoring installations throughout the works

The Contractor is to protect the existing inclinometer boreholes identified on Drg. VNIF-ARP-00-YYY-DR-CE-0008, throughout the Works.

These are:

1. Inclinometer installations:

Exploratory hole	Depth (m bgl)	East	North	Elevation (m AOD)
BH301	15.08	384852.11	399762.18	41.87
BH302	14.08	384826.9	399705.6	42.76

6/12.4 Protection of proposed instrumentation and monitoring installations

Protection of extensometers (*Clause 6/12.2*) is to be provided.

In addition, the Contractor is to protect the existing groundwater sampling, ground gas monitoring and groundwater monitoring boreholes identified on Drg. VNIF-ARP-00-YYY-DR-CE-0008, until instructed to suspend monitoring by the Project Manager. Agreement that monitoring and sampling can be suspended shall be reached with the NEC Project Supervisor.

These are:

Explo.-hole	Depth (m bgl)	East	North	Elevation (m AOD)	Groundwater sampling?	Ground gas monitoring?	Groundwater level monitoring?
BH101	7.8	384796.682	399802.989	43.377		Y	Y
BH102	8.5	384763.18	399691.375	42.934	Y	N	Y
BH103	8.3	384689.014	399695.588	42.57	Y	N	Y
BH104	15	384607.46	399631.24	41.588		Y	Y
BH105	11.2	384463.735	399571.588	40.666	Y	N	Y
BH106	11.3	384459.989	399509.165	40.671		N	Y
BH112	4.3	384401.713	399486.259	32.249		Y	Y
BH201	9.3	384762.04	399820.851	43.4	Y	Y	Y
BH202	9	384723.888	399716.141	42.663	Y	Y	Y
BH203	24	384845.747	399748.863	41.891	Y	N	Y
BH204	16.5	384815.474	399703.59	43.276		Y	Y
BH205	10.8	384689.078	399735.153	42.578	Y	Y	Y
BH206	6.8	384729.233	399690.75	42.692		Y	Y
BH207	16.1	384654.246	399626.1	41.638		Y	Y
BH208	14.6	384562.98	399592.56	40.66		Y	Y
BH209	17	384548.843	399628.33	41.214		Y	Y
BH210	19.6	384479.67	399554.7	40.45	Y	N	Y
BH211A	11.6	384441.79	399513.96	40.44		N	Y
BH212	11.5	384487.32	399426.078	30.377	Y	N	Y
BH213	3.5	384475.449	399487.578	31.943		Y	Y
BH214A	5	384430.619	399360.713	30.033		N	Y
WS201B	1.65	384735.29	399787.2	43.55		Y	Y
WS207	5	384628.92	399674.79	41.91		N	Y
WS208	4.65	384566	399473	30.168		N	Y
BH303	12.7	384719.84	399660.22	42.3		N	Y
BH304	16.7	384618.46	399600.49	41.18		Y	Y
BH305	12.03	384525.98	399549.39	39.77		Y	Y
BH306	6.3	384520.14	399490.63	31.45	Y	Y	Y
BH307	5	384461.01	399430.12	30.61		Y	Y
BH309	11.5	384863.87	399641.32	30.5		N	Y

Explo.-hole	Depth (m bgl)	East	North	Elevation (m AOD)	Groundwater sampling?	Ground gas monitoring?	Groundwater level monitoring?
BH310	16	384838.09	399638.18	32.6	Y	N	Y
BH311	17.32	384411.7	399557.68	46.2		Y	Y
BH312	16.82	384382.83	399519.93	45.6		N	Y
BH313	12.4	384395.83	399507.84	39.81		Y	Y
BH314	12.45	384439.7	399502.02	43.11	Y	Y	Y
BH315	13.52	384852.04	399729.3	39.26	Y	Y	Y
BH320	6.7	384889.76	399761.36	34.26		Y	Y
BH321	6	384770.34	399639.02	34.2	Y	Y	Y
BH322	6	384715.2	399587.28	32.49	Y	N	Y
BH323	2.6	384658.4	399576.88	30.21		Y	Y
BH324	15.3	384593.99	399584.6	41		N	Y
BH325	4.5	384446.11	399359.16	29.95		Y	Y

6/12.5 Monitoring and sampling requirements during the Works

6/12.5.1 Existing Inclinometers

The Contractor shall monitor existing inclinometer installations (*Clause 6/12.3*) at four week intervals throughout the HIF Infrastructure Works.

6/12.5.2 Proposed Extensometers

Extensometers should be installed and at least two rounds of baseline monitoring undertaken, before embankment construction commences. To validate design assumptions, monitoring should continue on a weekly basis. The Project Manager will issue instructions to terminate extensometer monitoring.

6/12.5.3 Existing ground gas monitoring and groundwater monitoring installations

The Contractor shall take ground gas and groundwater level readings from existing installations (*Clause 6/12.4*) at two week intervals until instructed to cease monitoring by the Project Manager.

The Project Manager may issue a single instruction for a complete suspension of monitoring from these installations or alternatively may issue a series of instructions for progressive suspension of monitoring.

6/12.6 Reporting of monitoring data

The results of all monitoring from inclinometers extensometers, groundwater monitoring installations and ground gas monitoring installations, shall be reported in the Completion Verification Report (*Clause 6/2.3*).

6/12.7 Decommissioning of boreholes and installations during the Works

Following receipt of instructions from the Project Manager, borehole installations that are no longer required for geotechnical monitoring, groundwater sampling, ground gas monitoring and/or groundwater level monitoring are to be decommissioned.

Any other boreholes or borehole installations encountered during the Works and not listed in *Clause 6/12.3* and *6/12.4* are also to be decommissioned.

All borehole and borehole installation decommissioning is to be undertaken in accordance with current EA guidelines. Appropriate EA guidance is to be found here: [Decommissioning redundant boreholes and wells | EA Grey Literature \(freshwaterlife.org\)](#).

Appendix 6/14 – Limiting values for controlled waters, (incorporating Appendix 6/15 - Limiting values for human health and the environment)

Given the proximity of the River Irk and the potential sensitivity of groundwater, all fill materials are to be assessed for re-use against the limiting values for pollution of controlled waters, human health and the environment presented in this Appendix.

The results of all chemical verification and validation testing are to be presented in the Completion Validation Report (Clause 6/2.3).

6/14.1 Verification of excavations in the former gas works area

On completion of breaking out and associated excavations in the former gas works area (Clause 6/2.2), the excavations are to be verified against the criteria presented in Table 6/14A.

Table 6/14A – Chemical testing requirements and verification criteria – former gas works area		
Contaminant	Verification target (mg/kg)	Rationale for verification target
Ammoniacal nitrogen	4.5	RTM
Benzo(a)Pyrene	3.6	RTM
Fluoranthene	7	95%ile of Plateau made ground
Anthracene	1.8	95%ile of Plateau made ground
TPH – C8-C35	1000*#	Professional judgement
*Discovery strategy to be implemented to ensure no soil with visual or olfactory evidence of contamination is re-used		
# If exceedances of these values are noted, the risk-derived criteria for individual carbon bands detailed in this table shall be applied.		

6/14.2 Verification of excavations in the TP422/TP423 area and the TP405a area

Following a programme of additional ground investigation to further delineate the TP422/TP423 outlier and the extent of PFAS impact in the vicinity of TP405a, and following completion of the necessary remedial excavations in the TP422/TP423 and TP405a areas (Clause 6/2.2), the excavations are to be verified against the criteria presented in Table 6/14B.

Table 6/14B – Chemical testing requirements and verification criteria – TP422/TP423 and TP405a area		
Contaminant	Verification target (mg/kg)	Rationale for verification target
PFPA	<2µg/kg	Requested by EA
PFHxA	<2µg/kg	Requested by EA
PFHpA	<2µg/kg	Requested by EA
6:2-FTS	<2µg/kg	Requested by EA
PFOA	<1µg/kg	Laboratory limit of detection and typical site concentration
PFHxS	<2µg/kg	Requested by EA
PFNA	<2µg/kg	Requested by EA
PFOS	<2µg/kg	Laboratory limit of detection and typical site concentration
PFDA	<2µg/kg	Requested by EA

6/14.3 Verification of the former carriage shed

On completion of the necessary remedial excavations in the carriage shed area (Clause 6/2.2), the excavations are to be verified against the criteria presented in Table 6/14C.

Table 6/14C – Chemical testing requirements and verification criteria – former carriage shed		
Contaminant	Verification target (mg/kg)	Rationale for verification target
Benzo(a)Pyrene	3.6	RTM
Fluoranthene	7	95%ile of Plateau made ground
Anthracene	1.8	95%ile of Plateau made ground
TPH – C8-C35	1000*#	Professional judgment
PFOS	<2µg/kg	Laboratory limit of detection and typical site concentration
PFOA	<1µg/kg	Laboratory limit of detection and typical site concentration
PFPA	<2µg/kg	Requested by EA
PFHxA	<2µg/kg	Requested by EA
PFHpA	<2µg/kg	Requested by EA
6:2-FTS	<2µg/kg	Requested by EA
PFHxS	<2µg/kg	Requested by EA
PFNA	<2µg/kg	Requested by EA
*Discovery strategy to be implemented to ensure no soil with visual or olfactory evidence of contamination is re-used		
# If exceedances of these values are noted, the risk-derived criteria for individual carbon bands detailed in this table shall be applied.		

6/14.4 General site won fill materials: Class 1A, 1B, 1C, 2A and 2C fill – Red Bank plateau.

All material proposed for re-use as fill on the Red Bank plateau area shall meet the requirements of Table 6/1 and Table 6/1A. The Contractor shall undertake chemical testing of excavated materials which are proposed for reuse on site as general fill at the frequencies set out in Appendix 1/5.

Material proposed for re-use in the Red Bank plateau area shall be inspected and material with visual and olfactory evidence for contamination treated in accordance with the contractor's discovery and remediation strategy, or removed from site. Re-use criteria for materials that are excavated within Red Bank plateau and recovered for re-use within the Red Bank plateau area are presented in Table 6/14D.

Table 6/14D – Chemical testing requirements and validation criteria for re-use of general site won fill materials – Red Bank plateau		
Contaminant	Verification target (mg/kg)	Rationale for verification target
Nickel	27	RTM
Zinc	191	RTM
Benzo(a)Pyrene	3.6	NBC
Fluoranthene	7	95%ile of Plateau made ground

Table 6/14D – Chemical testing requirements and validation criteria for re-use of general site won fill materials – Red Bank plateau		
Contaminant	Verification target (mg/kg)	Rationale for verification target
Anthracene	1.8	95%ile of Plateau made ground
TPH C8-C35	1000*#	Professional judgement, see note
PFOS	2µg/kg	Laboratory limit of detection and typical site concentration
PFOA	1µg/kg	Laboratory limit of detection and typical site concentration
PFPA	2µg/kg	Requested by EA
PFHxA	2µg/kg	Requested by EA
PFHpA	2µg/kg	Requested by EA
6:2-FTS	2µg/kg	Requested by EA
PFHxS	2µg/kg	Requested by EA
PFNA	2µg/kg	Requested by EA
*Discovery strategy to be implemented to ensure no soil with visual or olfactory evidence of contamination is re-used		
# If exceedances of these values are noted, the risk-derived criteria for individual carbon bands detailed in this table shall be applied.		

Material which does not meet the soil validation criteria shall be processed/treated where possible (subject to working space constraints and the requirements of the earthworks cut/fill balance) in order to maximise material reuse.

Treated material shall be validated against the agreed validation criteria prior to reuse. Any treated material that does not meet the soil validation criteria is to be removed from the site.

6/14.5 Topsoil: Class 5 fill

The Contractor shall undertake chemical testing of proposed Class 5 materials at the frequencies set out in Appendix 1/5. Class 5 materials may either be site won or imported providing they meet the requirements of the Landscape Architect Specification (VNIF-PLA-ZZ-YYY-SP-L-0001), Table 6/1, Table 6/1A and Table 6/14E and do not display any signs of visual or olfactory contamination. The suite of determinands for which testing is required and the relevant soil validation criteria are presented in Table 6/14E.

Table 6/14E – Proposed topsoil validation criteria			
Determinand		Soil target (mg/kg)	Leachate target (mg/l)
Metals	Antimony	500	-
	Arsenic	40	-
	Beryllium	1.7	-
	Cadmium	85	-
	Chromium	93.5	0.02
	Chromium (hexavalent)	6	-
	Copper	190	0.1
	Lead	310	0.01

Table 6/14E – Proposed topsoil validation criteria			
Determinand		Soil target (mg/kg)	Leachate target (mg/l)
	Mercury	56	-
	Nickel	26.5	0.05
	Selenium	430	-
	Vanadium	500	-
	Zinc	191	0.4
Inorganic	Cyanide	24	-
	Cyanide (free)	24	-
	Boron	500	-
	Phenol	500	-
	Phenol (Monohydric)	500	-
	Asbestos	No visible asbestos <0.01%	-
TPH	Ali >C5-C6	161	-
	Ali >C6-C8	500	-
	Ali >C8-C10	155	1
	Ali >C10-C12	283	1
	Ali >C12-C16	142	1
	Ali >C16-C21	50.9	-
	Ali >C21-C35	50.9	-
	Ali >C35-C44	50.9	-
	Aro >C7-C8	500	-
	Aro >C8-C10	153	1.6
	Aro >C10-C12	76	0.5
	Aro >C12-C16	208	0.7
	Aro >C16-C21	323	0.4
	Aro >C21-C35	500	0.3
	Aro >C35-C44	500	-
PAH	Acenaphthene	336	-
	Dibenz-a-h-anthracene	0.32	-
	Fluoranthene	7	0.00003
	Fluorene	183	-
	Indeno(1,2,3-cd)pyrene	46	-
	Phenanthrene	500	-
	Pyrene	500	-
	Naphthalene	13	-
	Acenaphthylene	500	-
	Anthracene	500	0.0005
	Benzo(a)anthracene	15	-
	Benzo (g,h,i) perylene	359	-

Table 6/14E – Proposed topsoil validation criteria			
Determinand		Soil target (mg/kg)	Leachate target (mg/l)
	Benzo(a)pyrene	3.2	0.00006
	Benzo(b)fluoranthene	4.1	-
	Benzo(k)fluoranthene	107	-
	Chrysene	32	-
BTEX	BTEX - Benzene	1.4	-
	BTEX - Toluene	500	-
	BTEX - Ethyl Benzene	440	-
	BTEX - m & p Xylene	428	-
	BTEX - o Xylene	475	-
	Xylene	428	-
PCBs	PCB BZ 105	0.000074	-
	PCB BZ 114	0.000004	-
	PCB BZ 118	0.000171	-
	PCB BZ 123	0.000006	-
	PCB BZ 126	0.000005	-
	PCB BZ 156	0.000032	-
	PCB BZ 157	0.000008	-
	PCB BZ 167	0.000013	-
	PCB BZ 169	0.000001	-
	PCB BZ 189	0.000005	-
	PCB BZ 77	0.000016	-
	PCB BZ 81	0.000001	-

Site won material which does not meet the required soil validation criteria presented in Table 6/14E shall be processed/treated where possible (subject to working space constraints and the requirements of the earthworks cut/fill balance) in order to maximise material reuse.

Treated material shall be validated against the agreed soil validation criteria presented in Table 6/14E prior to reuse. Any treated material that does not meet the soil validation criteria is to be removed from the site.

SERIES 0700: ROAD PAVEMENTS – GENERAL

Appendix 7/1 – Permitted Pavement Options

Permitted Pavement Options – Schedule 1A

Schedule 1A: Permitted Pavement Options									
Drawing Ref.	Area			Design traffic for 40 years (msa)	Design traffic (cv/lane/day)	Site Category	Investigatory Level	Min PSV / AAV	Permitted pavement option
	Description	Chainage	Lane						
VNIF-ARP-00-YYY-DR-CH-3006 and VNIF-ARP-00-YYY-DR-CH-3007	Plateau Av carriageway (no surfacing)	n/a	n/a	0.5	<250	Category 6 to Interpave Design and construction of Concrete Block Permeable Pavements	-	n/a	C01
VNIF-ARP-00-YYY-DR-CH-3006 and VNIF-ARP-00-YYY-DR-CH-3007	Plateau Av laybys (no surfacing)	n/a	n/a	0.05	<250	Category 5 to Interpave Design and construction of Concrete Block Permeable Pavements	-	45 PPV	C02
VNIF-ARP-00-YYY-DR-CH-3006 and VNIF-ARP-00-YYY-DR-CH-3007	Plateau Av carriageway	n/a	n/a	0.5	<250	S2 to CD236	-	50	C03

Permitted foundation options – Schedule 1B

Schedule 1: Permitted Foundation Options										
Drawing Ref.	Area	Chainage	Foundation Class	Construction type	Design Option	Capping		Sub-base		Comments
						Material	Thickness	Material	Thickness	
VNIF-ARP-00-YYY-DR-CH-3006 and VNIF-ARP-00-YYY-DR-CH-3007	Plateau Av carriageway – permeable paving	n/a	n/a	Full	Non-adopted	n/a	n/a	CGA to BS7533-13	500	Depth specified based on drainage attenuation requirements
VNIF-ARP-00-YYY-DR-CH-3006 and VNIF-ARP-00-YYY-DR-CH-3007	Plateau Av carriageway	n/a	Class 2	Full	n/a	n/a	n/a	Type 1 to 803	280	-

Subgrade Characteristic – Schedule 1C

Schedule 1C: Subgrade Characteristic Sections*	
Chainage	Short-term subgrade surface modulus
*Subject to ground investigation results. Design assumes a CBR Value of 5.0%. To be verified by the Contractor.	

General Requirements – Schedule 2

Schedule 2: General Requirements		
Grid for checking surface levels of pavement courses [702.4]:	Longitudinal dimension:	10m
	Transverse dimension:	2m
Surface regularity [702.5, Table 7/2]:	Category of Road:	Category B
Interval for measurement of longitudinal regularity [702.7]:		50m
Interval for measurement of transverse regularity [702.8]:		50m

Permitted Construction Materials – Schedule 3

	C01		C02		C03	
Pavement Layer	Material Ref.	Thickness (mm)	Material Ref.	Thickness (mm)	Material Ref.	Thickness (mm)
Surface Course	-	-	-	-	SC1	40
Binder Course	BC1	90	-	-	BC1	70
Base	B1	90	B1	80	B1	90
Blinding Layer	BL1	100	BL1	100	-	-
Sub-base	SB1	500	SB1	500	SB2	280
Total	780		680		480	

General Requirements for Construction Materials – Schedule 4

Schedule 4: General Requirements for Construction Materials	
Clause	Requirement
801.2	Limiting distance for deposition of unbound mixtures referred to in sub-Clause 801.2
801.3	Limiting distance for deposition of unbound mixtures referred to in sub-Clause 801.3
801.7	Whether any material shall not comply with sub-Clause 801.7.
801.9	Limiting distance for deposition of unbound mixtures referred to in sub-Clause 801.9
801.11	Limiting distance for deposition of unbound mixtures referred to in sub-Clause 801.11
801.14	Whether any materials shall not comply with sub-Clause 801.14
801.16	Limiting thickness for deposition of unbound mixtures referred to in sub-Clause 801.16
802.4	Whether unbound materials up to 225 mm compacted thickness can be spread in more than one layer.
802.7	Whether unbound materials up to 225 mm compacted thickness can be spread in more than one layer.
802.14	Thickness of compacted layer.
802.27	Thickness of compacted layer.
810.6	Whether the coefficient of linear expansion of the mixture is to be determined, using the test method specified in Clause 871.
810.7	Whether the coefficient of linear expansion of the mixture is to be determined, using the test method specified in Clause 871.
818.1	Whether induced transverse cracks are required; and the specified spacing of induced transverse cracks.
818.3	Whether induced longitudinal cracks are required; and the specified location of induced longitudinal cracks.
818.9	Whether induced longitudinal cracks are required; and the specified location of induced longitudinal cracks.
820.2	When an existing pavement layer is used to produce HBM, whether the recycled aggregate or recycled concrete aggregate is to be tested to confirm compliance with sub-Clause 820.1.
901.6	Requirements for resistance to fragmentation (hardness) if different from the requirements of sub-Clause 901.6.
901.7	Requirements for resistance to freezing and thawing (durability) if different from the requirements of sub-Clause 901.7
901.8	Requirements for cleanness if different from the requirements of sub-Clause 901.8.
901.13	Requirements for resistance to fragmentation (hardness) if different from the requirements of sub-Clause 901.13
901.16	Requirements for resistance to freezing and thawing (durability) if different from the requirements of sub-Clause 901.16.
901.19	Requirements for cleanness if different from the requirements of sub-Clause 901.19.
902.2	Requirements for reclaimed asphalt if different from the requirements of sub-Clause 902.2.
903.27	Requirements for PSV of temporary running surface if different from sub-Clause 903.27. Applicable to C01 pavement.

903.35	Requirements for positioning of longitudinal joints if different from the requirements of sub-Clause 903.35.
903.36	Requirements for treating the faces of cold upstanding edges if different from the requirements of sub-Clause 903.36
903.38	Requirements for assessment of compaction at joints in binder courses and bases if different from the requirements sub-Clause 903.38.
903.40	Whether sealant shall be applied to the top surface of all base and binder course joints.
925.2	Whether a demonstration or approval trial is required - Not required.
1001.2	Requirements for concrete conformity if different from sub-Clause 1001.2.
1004.7	Testing requirements for concrete cubes.
1028	Requirements for trial lengths.
1033.10	Permission for butt welding

Requirements for Construction Materials – Schedule 5

Schedule 5: Requirements for Construction Materials			
Material Ref.	Clause	Description	Requirement
SC1	911	Hot Rolled Asphalt Surface Course (Design Mixtures)	Mixture designation [911.1]: HRA 30/14 F surf 40/60 des. Coated chippings size [911.3]: 14/20mm Required declared PSV category for chippings [915.2]: 50 Required maximum AAV category for chippings [915.2]: 14
BC1	906	Dense Binder Course Asphalt Concrete (Recipe Mixtures)	Mixture designation [906.1]: AC20 dense bin 40/60 rec.
B1	906	Dense Base Asphalt Concrete (Recipe Mixtures)	Mixture designation [906.1]: AC32 dense base 40/60 rec.
BL1	n/a	Blinding layer	
SB1	803	Type 1 unbound mixture	Mixtures containing crushed gravel course aggregate: - permitted [803.1]: Yes - minimum CBR [803.8]: 30% - trafficking trial [803.8]: No
SB2	n/a	CGA Sub-base	Course graded aggregate (CGA): - Grading: 4/20 Physical property requirements to Table A.3 BS7533-101

Binder Data Requirements – Schedule 7

The following data shall be provided to the Overseeing Organisation for modified binders as required in sub-Clauses 937.3 and 943.4. The data should not be more than 12 months old. A table in which the binder data may be recorded is given at the end of this section.

For work carried out for the Overseeing Organisation in England, a copy of the results should be handed to the Overseeing Organisation.

I. Binder Samples

Bituminous binders shall be sampled according to BS EN 58. For modifiers blended with the other component materials of the mixture at the mixer a simulated binder shall be prepared. Such modifiers are generally less intimately mixed with the bitumen and less well dispersed throughout the mixture than when pre-blended. Evidence that the simulated binder offers the same performance as the binder produced when the modifier is added at the mixer shall be provided.

II. Penetration

Binder penetration at 25°C (BS EN 1426), 100g 5 seconds for the binders as supplied, after hardening in the Rolling Thin Film Oven Test (RTFOT) in accordance with BS EN 12607-1, and after RTFOT and Ageing in the Pressure Ageing Vessel at 85 C (PAV85) in accordance with BS EN 14769.

III. Product Identification Test and Rheological Properties

Results for the binder(s) proposed shall comprise rheological data for each binder in the form of complex shear (stiffness) modulus (G^*) and phase angle (δ delta) determined in accordance with BS EN 14770 for binder as supplied, after RTFOT and after RTFOT BS EN 12607-1 and PAV85 Ageing in accordance with BS EN 14769.

IV. Storage Stability Test

All binders shall be stored strictly in accordance with the manufacturer's instructions. Polymer modified binders claimed to remain homogeneous in storage without agitation shall be tested for storage stability in accordance with BS EN 13399. The mean of the differences in softening point between the top and bottom samples, of not less than five pairs of such samples shall not exceed 5°C. Manufacturers of pre-blended modified binders shall state what precautions are necessary to ensure that adequate homogeneity is maintained during storage.

V. Photomicrograph

A typical photomicrograph of the modified binder and binder using ultra-violet or other technique to provide maximum contrast of the polymer structure to the binder before modification shall be supplied together with details of sample preparation techniques. A photomicrograph is intended only to indicate the presence of a polymer modifier in the binder and should not be used as an indicator of performance. Guidance on the interpretation of photomicrographs is given in BS EN 13632 Visualisation of polymer dispersion in polymer modified bitumen.

VI. Cohesion

Vialit Pendulum cohesion test curve of the binder, in accordance with BS EN 13588 for the binder as supplied, after RTFOT BS EN 12607-1, and after RTFOT and PAV85 Ageing in accordance with BS EN 14769.

VII. FRAASS Brittle Point

FRAASS brittle point measured using BS EN 12593 shall be provided on the binder as supplied, after RTFOT and after RTFOT and PAV85 Ageing in accordance with BS EN 14769.

Manufacturer of binder			
Product name			
Batch ref			
Binder type			
Binder source			
Softening point difference in storage stability test			
Test	Supplied binder	After RTFOT	After RTFOT and PAV88
Penetration at 25°C 0,1mm (100g and 5 secs)			
Penetration at 5°C 0,1mm (200g and 60 secs)			
Vialit pendulum cohesions maximum peak value J/cm ²			
Product identification test			
Complex shear (stiffness) modulus (G*) and phase angle (δ) data			
Frass brittle point			
Other properties the Contractor considers useful			

Where indicated with # the Contractor shall attach a graphical output to this schedule.

Binder Data Requirements – Schedule 8

The following data should be provided to the Overseeing Organisation for materials designed in accordance with Clause 901.17 and Clause 929 in respect of the proposed mixture:

- Saturation Ageing Tensile Stiffness (SATS) ratio.

Appendix 7/2: Excavation, Trimming and Reinstatement of Existing Surfaces

1. The Contractor is to refer to the contract drawings for locations of any trenches and pits that will require to be excavated in existing paved surfaces (vehicular and footway surfaces).
2. The Contractor is to refer to the contract drawings for locations and estimated areas of existing paved areas which require to be trimmed, regulated and reinstated to match levels where new and existing pavements abut or where new construction overlays existing pavement:

Paving and Kerbing Sheet 1	VNIF-ARP-00-YYY-DR-CH-3006
Paving and Kerbing Sheet 2	VNIF-ARP-00-YYY-DR-CH-3007

3. Trench reinstatement in vehicular, footway surfaces and verges shall be in accordance with the “Specification for Reinstatement of Openings in Highways” issued by Highway Authorities and Utilities Committee.
4. A bond coat in accordance with Appendix 7/4, shall be applied to all surfaces, including vertical edges prior to overlay being placed.
5. The reinstatement of any surface shall be completed so that it is as flat and flush with the surrounding adjacent surfaces. There should be no depression or crowning in the surface.
6. For junctions between bituminous materials refer to CD226.
7. For junctions between concrete materials refer to HCD Series C drawings.

Appendix 7/4 – Bond Coats, Tack Coats and Bituminous Sprays

Sheet 1 – Information to be provided by the Compiler

Bituminous sprays shall comply with Clause 920 of the Specification and with the requirements of this Appendix.

1. The following areas of pavement shall be treated with a bond coat prior to overlay:
 - a. Cold milled (planed) areas of existing pavements to be overlaid.
 - b. Existing pavements to be overlaid without milling.
 - c. New bituminous layers left exposed for more than 24 hours.
 - d. Areas that have been trafficked by vehicles other than the Contractor’s vehicles used to construct the area.
2. Bond coat shall be a C50 BP 4 bituminous spray to BS EN 13808, gritted as required in accordance with clause 920.13.
3. Street furniture, ironwork and drop-kerbs shall be masked using self-adhesive masking material before application starts and removed on completion of the works.
4. For thin surface course systems in accordance with Clause 942, the bond coat requirements shall be in accordance with the HAPAS certificate.
5. The emulsion shall be allowed to break prior to overlay.
6. Tack coats shall not be permitted.

Sheet 2 – Information to be provided by the Contractor

The Contractor shall provide the following information with their tender, or prior to commencement of the work:

1. The product or products he proposes to use together with their declaration(s) of performance, as specified. [920.2, 920.3, 920.4, 920.5]
2. For each product, a copy of the BS EN ISO 9001 certificate showing the name of the manufacturer, the name of the certification body and the reference number and date of the certificate.
3. The spraying equipment proposed, and a test certificate. [920.7. 920.9]
4. The source or sources of blinding material proposed [920.12]
5. Contingency plans in the event of any breakdown.

Appendix 7/9: Cold Milling (Planing) of Bituminous Bound Flexible Pavement

1. The Contractor is to carry out a sweep of the pavement to locate any buried metalwork in accordance with Clause 709.11 prior to commencing any planing operation.
2. A nominal planing depth (using constant planing) of 50mm applies in the areas of tie-in.
3. The Contractor is to refer to the Contract Drawings and Appendix 7/2 for locations where areas of existing pavement are to be planed.

SERIES 1100: KERBS, FOOTWAYS AND PAVED AREAS

Appendix 11/1: Kerbs, Footways and Paved Areas

General Requirements for Kerbs, Channels, Edgings and Quadrants

1. Kerbing shall be laid in accordance with Clause 1101 of the Specification.
2. Concrete backing to kerbs is to be laid the same day as the concrete kerb bed.
3. Haunching concrete to kerbs and channels shall be in place for a minimum of 24 hours prior to laying pavement materials.
4. All kerbs to be hydraulically pressed precast concrete units in accordance with BS EN 1340.
5. Concrete backing to kerbs shall be Type ST2. Dimensions required for the bedding and backing are shown on the standard detail series of drawings.
6. The use of kerbs/channels precast to the required radius is required. Where the required radius is not manufactured the nearest precast radius should be used and the joints cut neatly by sawing radially to achieve the desired radius with even joints not more than 10mm wide. The joints are to be fitted by 'buttering' with Class 1 mortar coloured to match and not pointed after laying.
7. Where standard kerb units are to be reduced in length within areas of existing or future public highway the minimum length of kerb / channel and edging units is half of a standard unit.
8. Radii of 0.45 or less are to be made up of quadrants or angled kerbs.
9. Precast concrete channels laid to a radius not exceeding 12m shall not exceed 450mm long.
10. Typical sections giving full details of the foundation and backing are shown in Standard Details, including the requirement for dowel bars.
11. Where units are to be set on a race of fresh concrete, a foundation of C16/20 concrete should be deposited along the line of units, onto which the units are laid directly on fresh mixed concrete and set to line and level. The backing concrete should be laid monolithically with a race of fresh concrete, dowel bars should be fixed into the base and extended into the backing haunching.
12. Where units are to be bedded onto a concrete edge beam, the concrete foundation shall be formed on the compacted sub-base to a minimum thickness of 150mm and wide enough to accommodate the units and backing concrete. Soundly fixed formwork or shuttering shall be used and the Class C16/20 concrete to BS 5328 shall be compacted to produce a dense foundation free from honeycombing. The minimum period between concreting and the removal of the formwork or shuttering shall be 24 hours.
13. Kerb and channel units on the concrete foundation shall be laid butt jointed on a maximum 25mm thick bed of semi-dry 3:1 cement mortar to Clause 9.04. Any surplus bedding material shall be thoroughly cleaned off and the foundation wetted if necessary prior to the placing of the backing concrete. The backing of C16/20 concrete to BS EN 206 shall be placed in a soundly fixed road form or shutter and thoroughly compacted to produce a concrete dense and free from honeycombing to the section as shown on Standard Details.
14. Kerb and channel units shall be laid true to line and level in a flowing alignment and shall not be backed until they have been inspected and approved by the Engineer.

15. Channels shall be laid in a broken joint bond with the kerbs

General requirements for the construction of footways and paved areas

- 16 For details of permitted pavement options for footway construction see Appendix 7/1 of the Specification.
17. Footways and paved areas shall be laid in accordance with the relevant British Standard except as set out below.
18. Any references in the British Standards to the Specification for Roads and Bridge Works are to be read as Specification for Highway Works.
19. Flags and paving blocks shall be laid to the patterns, bonding and orientation specified in the Contract. Laying shall commence at the lowest point. The width of joints between adjacent paving units shall commence at the lowest point. The width of joints between adjacent paving units and their edge restraints shall be as the specified joint width or in the range 2mm to 5mm when “as spacers” is specified.
20. Special end blocks, edge blocks, central V blocks and radial blocks shall not be used unless approval had been obtained from the Client’s Representative.
21. No cut block or flag less than one third of its original size will be permitted for incorporation in the works. Cutting shall be carried out on water damped bench mounted saws; the use of guillotines, splitters, Stihl saws and the like will not be permitted. Care should be taken to ensure cuts are even; poor cutting and/or jagged edges will not be permitted.
22. Joint lines shall be set out using string lines to keep the lines parallel. Every fourth joint shall be checked so that it is within $\pm 2\text{mm}$ off the parallel line set out from the base line. The sorting of paving units will be required due to the dimensional tolerances of the paving products to achieve this.
23. The footway construction depths stated above for the sub-base and road base are minimum dimensions, but the depth of the bedding layer is fixed. These construction depths should be used for all new pavement construction.
24. Where existing footways are to be re-laid the pavement construction shall be removed to the top of the existing road base level or sub-base level (if no roadbase). Then, subject to the condition of this layer and the subsequent approval of the Engineer, the new surface can then be laid directly onto this layer with the appropriate bedding material.

Footway Construction

Permitted Pavement Options – Schedule 1

Schedule 1: Permitted Pavement Options		
Drawing Ref.	Area	Permitted Pavement Option
VNIF-ARP-00-YYY-DR-CH-3006 + VNIF-ARP-00-YYY-DR-CH-3007	Footway paving with clay pavers	F01
VNIF-ARP-00-YYY-DR-CH-3006 + VNIF-ARP-00-YYY-DR-CH-3007	Footway paving with Cropped sided granite setts	F02
VNIF-ARP-00-YYY-DR-CH-3006 + VNIF-ARP-00-YYY-DR-CH-3007	Footway paving with Resin Bound Gravel	F03
VNIF-ARP-00-YYY-DR-CH-3006 + VNIF-ARP-00-YYY-DR-CH-3007	Asphalt footway paving with no surfacing	F04

VNIF-ARP-00-YYY-DR-CH-3006 + VNIF-ARP-00-YYY-DR-CH-3007	Asphalt footway paving with AC surfacing	F05
VNIF-ARP-00-YYY-DR-CH-3006 + VNIF-ARP-00-YYY-DR-CH-3007	Pre-cast concrete blister block paving	T01
VNIF-ARP-00-YYY-DR-CH-3006 + VNIF-ARP-00-YYY-DR-CH-3007	Pre-cast concrete corduroy block paving	T02

Permitted Footway Construction Materials – Schedule 2

Schedule 2A: Permitted Construction Materials								
	F01		F02		F03		F04	
Pavement Layer	Material Ref.	Thickness (mm)	Material Ref.	Thickness (mm)	Material Ref.	Thickness (mm)	Material Ref.	Thickness (mm)
Surface Course	SCF1	85	SCF2	80	SCF3	TBC*	-	-
Binder Course	LCF1	40	LCF1	40	BCF1	20	BF1	90
Base	BF1	150	BF1	90	BF1	50	-	-
Subbase	SB1	160	SB1	160	SB	225	SB1	210
Total	435		370		295		300	
*Thickness based on manufacturer’s specification								

Schedule 2B: Permitted Construction Materials								
	F05		T01		T02			
Pavement Layer	Material Ref.	Thickness (mm)	Material Ref.	Thickness (mm)	Material Ref.	Thickness (mm)		
Surface Course	SCF4	25	SCF5	60	SCF6	60		
Binder Course	BF1	90	LCF1	40	LCF1	40		
Base	-	-	BF1	90	BF1	150		
Subbase	SB1	210	SB1	210	SB1	160		
Total	325		400		410			

Footway Type 1 (F01)

SCF1 - Surfacing to be clay paver 200(L) x 65(W) x 85 (D) mm. Clay pavers to be produced in accordance with BS EN 1344. Weathering resistance should be Class FP100 and abrasion resistance class A3 in accordance with BS EN 1344. Units to have a minimum USRV of 45 and PSV of 45 to BS 7932.

Jointing between units to be slurry grout jointing mortar Type 40 to BS 7533-101, with a minimum compressive strength of 40MPa and Flexural Strength of 6MPa. Joints are to be between 6mm and 10mm thick.

LCF1 – laying course to be bedding mortar Type 25 to BS 7533-101, with a minimum compressive strength of 25MPa and Flexural Strength of 3.5MPa.

BF1 - Dense Binder Course Asphalt Concrete (Recipe Mixtures). Mixture to clause 906.1: AC20 dense bin 40/60.

SB1 - Type 1 unbound mixture to clause 803.

Footway Type 2 (F02)

SCF1 - Surfacing to be granite cropped sided setts 100(W) x 80(D) x 100 (L) mm. Setts to be produced in accordance with BS EN 1342. Abrasion resistance to be maximum 18mm in accordance with BS EN 14157. Water resistance to be maximum 0.30% , tested in accordance with BS EN 13755. Units to have a minimum USRV of 45 and PSV of 45 to BS 7932. Class 2 dimensional tolerance of the sett in accordance with BS EN 1342.

Jointing between units to be slurry grout jointing mortar Type 40 to BS 7533-101, with a minimum compressive strength of 40MPa and Flexural Strength of 6MPa. Joint width to be a maximum of 8mm.

LCF1 – laying course to be bedding mortar Type 25 to BS 7533-101, with a minimum compressive strength of 25MPa and Flexural Strength of 3.5MPa.

BF1 - Dense Binder Course Asphalt Concrete (Recipe Mixtures). Mixture to clause 906.1: AC20 dense bin 40/60.

SB1 - Type 1 unbound mixture to clause 803.

Footway Type 3 (F03)

SCF3 – Resin bound gravel to the architect's and manufacturer's specification.

BC1 – 6mm Dense Asphalt Concrete Surface Course. Mixture to clause 909.1: AC6 Dense surf 100/150.

BF1 - Dense Binder Course Asphalt Concrete (Recipe Mixtures). Mixture to clause 906.1: AC20 dense bin 40/60.

SB1 - Type 1 unbound mixture to clause 803.

Footway Type 4 (F04)

BF1 - Dense Binder Course Asphalt Concrete (Recipe Mixtures). Mixture to clause 906.1: AC20 dense bin 40/60.

SB1 - Type 1 unbound mixture to clause 803.

Footway Type 5 (F05)

SCF4 – 6mm Dense Asphalt Concrete Surface Course. Mixture to clause 909.1: AC6 Dense surf 100/150. Minimum PSV:55. Required maximum AAV category:14.

BF1 - Dense Binder Course Asphalt Concrete (Recipe Mixtures). Mixture to clause 906.1: AC20 dense bin 40/60.

SB1 - Type 1 unbound mixture to clause 803.

Hazard Warning Paving Type 6 (T01)

SCF5 – Buff Precast Concrete blister Flags, 400 x 400 x 50mm. Flags to be produced in accordance with BS EN 1339. Bending strength Class 3 and abrasion Class 3 to BS EN 1339. Units to have a minimum USRV of 45 and PSV of 45 to BS 7932.

Jointing between units to be slurry grout jointing mortar Type 40 to BS 7533-101, with a minimum compressive strength of 40MPa and Flexural Strength of 6MPa. Joints are to be between 6mm and 10mm thick.

LCF1 – laying course to be bedding mortar Type 25 to BS 7533-101, with a minimum compressive strength of 25MPa and Flexural Strength of 3.5MPa.

BF1 - Dense Binder Course Asphalt Concrete (Recipe Mixtures). Mixture to clause 906.1: AC20 dense bin 40/60.

SB1 - Type 1 unbound mixture to clause 803.

Hazard Warning Paving Type 7 (T02)

SCF5 – Precast Concrete corduroy Flags, 400 x 400 x 50mm. Flags to be produced in accordance with BS EN 1339. Bending strength Class 3 and abrasion Class 3 to BS EN 1339. Units to have a minimum USRV of 45 and PSV of 45 to BS 7932.

Jointing between units to be slurry grout jointing mortar Type 40 to BS 7533-101, with a minimum compressive strength of 40MPa and Flexural Strength of 6MPa. Joints are to be between 6mm and 10mm thick.

LCF1 – laying course to be bedding mortar Type 25 to BS 7533-101, with a minimum compressive strength of 25MPa and Flexural Strength of 3.5MPa.

BF1 - Dense Binder Course Asphalt Concrete (Recipe Mixtures). Mixture to clause 906.1: AC20 dense bin 40/60.

SB1 - Type 1 unbound mixture to clause 803.

Kerbs, Channels, Edgings and Quadrants

1. The location and extent of kerbs, channels and edging is shown on the drawings.
2. Kerbs shall be constructed from the materials described below.
3. Joints within channels shall be staggered with adjacent kerbing.
4. Quadrants, angles and transitions shall be used where required.
5. The following kerb types are to be used throughout the site:

Schedule 3: Requirements for Kerbing to be used throughout site			
Ref.	Dimensions	Material	Construction Method
HB2*	125 x 255	Concrete	Edge beam
DL*	125 x 255	Concrete	Edge beam
DR*	125 x 255	Concrete	Edge beam
EF*	50 x 150	Concrete	Edge beam
CS1*	255 x 125	Concrete	Edge beam
Marshall's Charcoal Conservation Kerb or similar approved	145 x 205	Concrete	Design and testing to 1340

* denoted kerbs, channels and edgings are standard designations to BS EN 1340 Table NA.1

6. The following kerb types are to be used outside of the adoptable highway areas of the site:
 - Marshall's Charcoal Conservation Kerb or similar approved. 145 x 205 x 915mm, complying to BS EN 1340. Minimum bending Class 1, weathering Class 3 and abrasion Class 4 in accordance with BS EN 1340. Units to have a minimum USRV of 45 and PSV of 45 to BS 7932.

SERIES 1200: TRAFFIC SIGNS

Appendix 12/3: Traffic Signs: Road Markings and Studs

1. Road marking requirements are shown on the contract drawings.
2. Road markings and signage within the adopted highway are to be agreed with Manchester City Council as part of the Section 278 works. Works within the public highway will be specified MCC to meet the highway authority's requirements.

SERIES 1300: ROAD LIGHTING COLUMNS AND BRACKETS, CCTV MASTS AND CANTILEVER MASTS

Appendix 13/1: Information to be provided when specifying lighting columns and brackets

General

1. All columns shall be as per the data sheets provided within this specification document.
2. Lighting columns, foundations and bracket arms shall be of the types described in Table 13/1-1.
3. Lantern/luminaire types shall be as specified in the Luminaire Specification Data Sheets VNIF-ARP-00-YYY-SH-EL-0001.
4. The locations of columns are shown on the lighting general arrangement drawing series VNIF-ARP-00-YYY-DR-EL-0001 to 0009.
5. All columns and brackets shall be designed in accordance with the Specification of Highways Works (SHW), Design Manual for Road and Bridges (DMRB), BSI Published Documents, BS EN 40, PD6547 Guidance of BS EN 40-3-1, BS EN 40-3-3 and the Design Manual for Roads and Bridges BD 94/07.
6. The column manufacturer shall be registered with and certified by either B.S.I. Quality Assurance Services or Lloyds Register Quality Assurance Limited for the manufacturer, supply and verification of lighting columns under their assurance schedule to BS EN ISO 9002:1994.
7. Steel lighting columns, components and bracket arms shall have the following guaranteed design life:

Mild Steel	25 years
Timber	25 years
Corten/Weathering Steel	30 years

8. The columns shall be provided as specified within the Column and Luminaire Specification Data Sheets VNIF-ARP-00-YYY-SH-EL-0001.
9. Bracket Arm projections shall have a 5 degree inclination as specified. The luminaries shall be at an inclination of 0 degrees. Bracket spigot dimensions to suit luminaire type.
10. Additional protection is required to planted columns below ground in accordance with SHW 1900 table 19/4B.

The Contractor shall submit the following information:

11. Not less than two weeks before ordering equipment, the Contractor shall provide the Overseeing Organisation with completed Data Sheets 1 and 2 for Columns and Brackets in accordance with the instructions in Appendix 13/2. At the same point the Contractor shall also provide full fabrication drawings for all new column types for review and approval by the Overseeing Organisation.
12. The following values shall be established by the Contractor for the equipment being offered:
 - a) The lanterns weights and windage areas, and centres of application of the forces from the centroid of the column shaft.
 - b) Size, length and angle of lantern fixing.

- c) Size requirements for the base compartment(s) to accommodate all the necessary control gear and/or distribution equipment.
- 13. Non-standard elements (such as Col 1, Col 7) will go through the process of prototyping and mock ups for review and approval by the Overseeing Organisation. Refer to section 5/ii in this appendix.

Identification and Location Markings (Maintenance Numbers)

- 14. The maintenance numbers shall be applied after any on-site protective treatments.
- 15. Numbering of equipment columns shall be in accordance with the project standards. Labelling method shall be confirmed with FEC and MCC prior to application.
- 16. There are no double arm columns on the project.
- 17. Multi fixture columns (such as Col 1) will have one maintenance number.
- 18. The numbering system shall be agreed with the Overseeing Organisation prior to application of any numbering treatment.

Column Foundations, Anchorages and Attachments Systems

- 19. Where possible, all columns shall be root planted.
- 20. Foundations for planted columns shall be in accordance with the requirements shown on the civil engineers' models VNIF-ARP-00-YYY-M2-CS-0001 and general arrangement drawings VNIF-ARP-00-YYY-DR-CS-0014 shall be installed as detailed on the manufacturer's column data sheets for the column.
- 21. The Contractor shall co-ordinate the design of column foundations and associated anchoring systems with the Overseeing Organisation / Engineers prior to the ordering of columns.

Requirements for Columns and Brackets are:

22. General

- a. Columns shall support all equipment as detailed within this specification and on drawings.
- b. All lighting columns shall have a cable entry slot width 'X' of 75mm.
- c. Columns shall be earthed with an 8mm (min diameter) earthing terminal with bolt and nut with two washers, all of which shall be manufactured from brass. The earthing stud shall be so positioned as to be readily accessible through the door opening.
- d. A baseboard of 12mm hardwood or other suitable non-hydroscopic material shall be fixed in each column base and shall be of sufficient size to accommodate all service fuses / isolation and service cable terminations.
- e. The bracket arms shall be fixed with the factory provided impregnated polymer coat grub screws to the manufacturer's instructions to prevent rotation in service.
- f. The column shall be aligned vertically with the flush door position in relation to the pedestrian route / highway as agreed with the Project director.

23. Bespoke Columns Col1 and Col7

- a. All relevant requirements as identified for General columns requirements in section i) above.
- b. Bespoke columns shall be developed in line with the design intent as shown in the Luminaire Specification Data Sheets VNIF-ARP-00-YYY-SH-EL-0001.
- c. Col1:
 - Corten material finish 6m box column with laser cut lattice pattern to front and back faces.
 - Gobo projectors mounted to the sides to provide patterned light over sculptural elements.

- Catenary luminaires with catenary support cables to be suspended between column and nearby trees.
 - Drivers mounted to baseboard of 12mm hardwood or other suitable non-hydroscopic material, fixed within the column base with a lockable door / enclosure which shall be sufficient size to accommodate all service fuses, isolation and service cable terminations.
- d. Col7:
- Corten material finish gateway structure with laser cut lattice pattern to front and back faces.
 - Linear fixture integrated into cross bar
 - Drivers mounted to baseboard of 12mm hardwood or other suitable non-hydroscopic material, fixed within the column base with a lockable door / enclosure which shall be sufficient size to accommodate all service fuses, isolation and service cable terminations.
- e. All holes and penetrations through the base shaft and mounting boxes shall be completed off site prior to the application of any protective coatings, free of sharp burs and edges. Holes shall be fitted with black or white rubber gomits (to approximate match of final finish colour) to further protect entry/exit cables from damage.

24. CCTV

- a. Refer to VNIF-ARP-00-YYY-SP-Y-0001 for CCTV specification.
- b. Lighting columns that hold CCTV cameras will be denoted with /cctv
- c. Columns will have two flush weather proof doors of dimensions 600x115mm with stainless tamper proof locking screws and an earth terminal. The lower door will be for electrical connections including a Charles Endirect Isolator
- d. Duct entry below for 2No. power and 1No. data ducts.
- e. Bracketry to be incorporated into the column as part of column specification and development.
- f. The following will be mounted within CCTV columns:
 - 1No. Fused connection unit (83mm x 83mm x 47mm)
 - 230V AC Isolator for lighting feed (83 x 150 x 50mm)
 - 2No. 230VAC-24VDC rectifiers (to feed media converter and PoE injector) (72mm x 90mm x 61mm)
 - 1No. fibre to copper media converter (150mm x 10mm x 30mm)
 - 1No. mid span PoE injector (38mm x 62mm x 151mm)

25. Column Doors

- g. Lighting columns shall generally be installed such that the location of the door is facing away from oncoming traffic. Door sizes to be 600mm x 115mm for all standard columns 6m to 8m. For columns 4m tall, service doors shall be 100x500mm.
- h. Where columns are provided as CCTV containing more than one electrical service columns shall be provided two door openings in accordance with BD94/07 (DMRB Vol 2 Section 2: Special Structures). Access doors shall be provided with key locking certified as high security double bitted VDS class 1. All doors on totems containing CCTV equipment shall be keyed alike with 10no. keys issued under this contract. Doors on totems with no CCTV equipment shall be keyed separately from those containing CCTV equipment.
- i. Columns shall be provided with weatherproof doors with stainless tamperproof locking screw. The bottom of the door shall be a minimum of 500mm above ground level (unless specified otherwise) and have an earth terminal.

26. Column and Bracket Arm Protection

- a. All steel lighting columns, bases and brackets shall be hot dipped galvanized to BS EN ISO 1461 at the fabrication factory with any additional protection against corrosion in accordance with Series 1900 of the Specification for Highways Works.
- b. Environmental and Accessibility will be inland and ready access.
- c. The finish for all new columns shall be G2a with RAL to match as specified on the Luminaire Specification Data Sheets VNIF-ARP-00-YYY-SH-EL-0001.
- d. The required durability of the paint system shall be as follows:

No Maintenance	8 years
Minor Maintenance	8 Years
Major Maintenance	15 years

Column Schedule

Column Ref	Height	Luminaire Type 1	No.	Luminaire Type 2	No.	CCTV	Notes
Col1 (-N)	6m	L08	1	L07	3-4	No	Weathering Steel finish custom column with gobo projector (L08) that supports catenary system (L07), St Catherine's Wood
Col2 (-N)	4m	L05	1			No	Timber column with steel base, Active Travel
Col2-cctv	4m	L05	1			Yes	Timber column with steel base, Active Travel
Col3 (-N)	6m	L16	1			No	Steel column, Plateau Avenue
Col3-cctv	6m	L16	1			Yes	Steel column, Plateau Avenue
Col4a (-N)	4m	L04	1			No	Weathering Steel finish column, St Catherine's Wood
Col4a-cctv	4m	L04	1			Yes	Weathering Steel finish column, St Catherine's Wood
Col4b (-N)	4m	L04	1			No	Corten effect finish column, Red Bank Terraces, Waterfront
Col4b-cctv	4m	L04	1			Yes	Corten effect finish column, Red Bank Terraces, Waterfront
Col5	4m	L05	1			No	Temporary lighting routes, Waterfront
Col6	4m	L05	1			Yes	Steel column, Active Travel
Col6-cctv	4m	L05	1			No	Steel column, Active Travel
Col7 (-N)	4m	L11	1			No	Arch Structure, Viaduct
Col8	6m	L07	3-4			No	Support structure for catenary system in St Catherine's Wood

Note: Columns with -N designation denotes an External Connector Kit by Signify will be mounted to the column. Holes shall be provided for fixing the Kit at 3.5m above ground level. An additional lockable door shall be required on columns where noted on drawings for access to drivers.

SERIES 1400: ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS

Appendix 14/1 – General

Introduction

- a. This specification covers the requirements for the provision of a private electrical supply network, to feed public realm lighting and event power, that will be adopted by FEC/Manchester City Council.
- b. The Contractor shall install, test and commission all electrical works and controls network required to provide an operational lighting system as described within the specifications, appendices, datasheets and drawings.
- c. The extent of the electrical works shall include, but not be limited to, the following:
 - i. Liaison with the Distribution Network Operator (DNO) for the disconnection of redundant apparatus and the connection or transfer of electrical supplies to new/relocated apparatus
 - ii. LV distribution system
 - iii. Earthing, including circuit protective conductors and supplementary bonding
 - iv. All cabling, wiring support and ducting systems
 - v. Exterior lighting lanterns/luminaires, supporting columns, brackets and accessories
 - vi. Lighting control system for the public realm lighting
 - vii. CMS Cellular based network connected lighting control system for the public realm lighting
 - viii. All builders and civil engineering work associated with the electrical services
 - ix. Provision of electrical details and ducting route drawings for approval
 - x. Provision of CCTV ducting
 - xi. Provision of temporary event power installations
 - xii. Testing and commissioning
 - xiii. Operation and Maintenance Manuals
- d. All electrical materials and works provided by the Contractor will only be adopted by the Overseeing Organisation once they are satisfied that this specification has been adhered to.
- e. The Contractor shall co-ordinate the electrical and data services installations in both spatial and programme terms, with all other elements that comprise the site as a whole, including existing structural, architectural and below ground works.
- f. Within this specification, “The Product” shall mean all components necessary to provide a complete operational system meeting the requirements of this specification.

Legislation and Regulations

- g. The product shall comply with the following legislation and regulations – the current latest versions of all documents shall be used:
 - i. The Highways Act
 - ii. Goods and Services

- iii. The Management of Health and Safety at Work Regulations
- iv. Electricity at Work Regulations
- v. BS 7671: Requirements for Electrical Installations
- vi. ILE Publications: TR 5 Brightness of Illuminated Advertisements
- vii. Construction (Design and Managements) Regulations

Scheme Areas and Details of Extents

- h. Documentation and Design Responsibility
- i. The following activity matrix identifies elements of design work and documentation that the Contractor will be responsible for completing as part of the electrical engineering services contract. This schedule is not deemed to be comprehensive as there may be other elements of design work specifically mentioned or implied within the particular requirements and associated equipment data sheets.

Design/Management Activity	Responsibility			
	Client / Overseeing Organisation	Lighting / Electrical Engineer	Contractor	Specialist Systems Sub Contractor / Integrator
Tender Drawings		✓		
Tender Specifications		✓		
Equipment Data Sheets		✓		
CDM Hazard Identification & Risk Assessments		✓		
Responsibility for coordinating with and placing orders for the disconnection, transfer or provision of new utility connections (electricity, data, CCTV etc).			✓	
LV Distribution Network – including the production of lighting calculations, development of cable routes and ducting and sizing of cables etc.		✓		
Installation of Earthing and Bonding network and provision of supplementary bonding conductors.			✓	
Sizing of feeder pillars and selection of electrical equipment		✓		
Column mounting and foundation details		✓		
Foundation Design Verification			✓	
External Lighting Scheme		✓		
Design intent for bespoke luminaire housings		✓		

Specialist design development and Detail Design of bespoke luminaires and housings, in line with design intent		S		✓
Organising a prototype of bespoke luminaires and housings. Facilitating of onsite mock-ups and samples as required			✓	
Approval of bespoke luminaires and housings	✓	S		
Specialist detail design, programming and commissioning of the lighting control system for part night dimming and events.			S	✓
Installation of lighting columns and associated control equipment			✓	S
Design and provision of temporary lighting to highways and public realm.			✓	
External Lighting Construction Drawings		✓		
Submittal of external lighting and electrical designs for approval by the local Highways Authority and Client.			✓	
CDM Risk Register		✓		
Method Statements				✓
Spatial Co-ordination and production of Co-ordination Drawings		✓		
Installation Drawings		✓		
Builders Work Drawings		✓		
Installation Wiring Diagrams		✓		
Record Drawings and O&M Manuals			✓	
Installation details and co-ordination of electrical engineering services.			✓	

Electrical Design Requirements

- j. Arup have completed calculations in line with BS 7671: 2018 Amendment 2 using (Amtech) Trimble ProDesign software.
- k. The basis of the Arup calculations is on the assumption that the supply to each feeder pillar will be a TN-S (3 wire single phase) supply from the DNO / iDNO. The design parameters used are a maximum earth loop impedance of 0.35 Ohms and a maximum fault level of 16.8kA based on standard guidance documentation from Electricity Northwest (ENWL). Once the characteristics of supply has been confirmed by the DNO / iDNO, should these be different from above, the Contractor shall liaise with Arup to determine any impact on the electrical design.
- l. Arup have liaised with ENWL to understand the standard rating of fuses provided within 100A single phase utility cut-outs, which is 80A – this information has been used to size the tails from the meter / isolator, which is based upon 25mm² tails. Once the cut-out fuse rating

has been confirmed by the DNO / iDNO, should these be different from above, the Contractor shall liaise with Arup to determine any impact on the electrical design.

Appendix 14/2 – Site Records

1. As- built drawings shall be produced by the Contractor, on one number copies of general arrangement drawings that shall be produced by the Contractor.
2. The Contractor shall also supply test certificates cross-referenced to the apparatus identified on the as-installed drawings.
3. The Contractor shall supply one number copies of the Operations and Maintenance manuals to the Overseeing Organisation to support the site records.

Appendix 14/3 Location of lighting units and feeder pillars

1. The position and description of Lighting Units, illuminated signs and bollards, feeder pillars, electrical isolation pillars and driver enclosures shall be as described on drawings and within this specification.
2. Generally, the lighting and event power distribution strategy shall be provided through distribution boards within feeder pillars. Final circuit cabling is to be routed within HDPE ducting.

Appendix 14/4 – Temporary Lighting

1. Existing Lighting
 - a. Existing road lighting units, lit traffic signs and bollards which are proposed to be removed or altered as part of the works, shall be maintained in full operation, as far as is reasonably practicable throughout the period of the works. Due to practicalities of construction, any relaxations and requirements shall be agreed with Overseeing Organisation prior to impacting any service.
2. Lighting is required to all public accessible areas throughout the duration of the works. Where the phasing of the works will not permit continuation of the service the Contractor shall apply to the Project Manager for approval to deliver temporary lighting to area(s). The Project Manager will provide approval for temporary lighting provision only when the following conditions have been satisfied:
 - a. Approvals required will only be given when temporary lighting is operational, unless a relaxation has been granted above.
 - b. The Contractor shall provide temporary lighting to match current level of provision in the following situations:
 - i. The Contractor shall illuminate lane reduction tapers. The lighting shall be positioned so that it does not cause discomfort glare to oncoming vehicles.
 - ii. The precise position of each unit shall be agreed with the Supervisor. The Contractor shall ensure that each unit is separated from traffic by an approved method. Each unit shall be supported so that it is vertical and stable at all times.
 - iii. Any requirements and limits for control of noise stipulated by the Local Authority Environmental Health are to be adhered to during the operation of any temporary lighting system.
 - iv. The Contractor shall provide for temporary lighting where the existing installation cannot be maintained to meet the requirements of BS 5489 and/or BS EN 13201 appropriate for each location.

Appendix 14/5 – Electrical Equipment for Lighting

Luminaires and Lamps

1. Lantern/luminaire types shall be as specified in the Luminaire Specification Data Sheets VNIF-ARP-00-YYY-SH-EL-0001.
2. Luminaires shall be fully compatible with the columns and brackets.
3. The Contractor shall order spare equipment as follow:
 - a. For each type of luminaire specified, the Contractor shall provide spare luminaires for 5% of each source type, or a minimum of 2 where the total number of a fitting type installed does not exceed 20.
 - b. Where luminaires are designed with replaceable light sources / drivers the Contractor shall provide spare light engines/sources/drivers for 5% of each source type, or a minimum of 2 No. if the quantity of luminaires is less than 20.

Spare equipment shall be ordered at the same time of ordering the installed equipment. Equipment should free issue to the Project Manager prior to completion.

Ancillary Equipment

4. Internal wiring between the terminal block in the lantern and the components in the base of the column shall be PVC insulated and sheathed cable of 300/500 volt grade, have a copper conductor size of not less than 2.5 sq mm.
5. Secondary Isolators and Cut-Outs
 - a. All cut-outs within lighting columns shall provide double-pole isolation via a switch complying with BS EN 60947-3. All cut-outs shall have a minimum rating of 32 amps and fuse removal shall not be possible unless the isolation switch is in the 'OFF' position. The Isolation Switch fuse shall be a modular system, the components selected to fulfil the requirements of the Contract. All the components of which shall connect together to give the appearance of being a singular unit.
 - b. The cut-outs shall provide a minimum degree of protection to IP22 and have a high mechanical and dielectric strength. Incoming phase terminals shall be shrouded when all connections have been made and cables shall be terminated so as not to allow accidental detachment.
 - c. Sub-circuits shall be protected by a separate second fuse link.
6. Fuses
 - d. Fuses are to be used within lighting column cut-outs and are to be HRC to BS 88 Part 2 and shall not be re-wirable.
 - e. Fuse ratings shall be 6amps for light sources up to and including 100 watts and 10 amps for light sources greater than 100 watts.
7. Terminations
 - f. Columns shall be supplied from a feeder pillar and looped from column to column via underground cabling. All looped connections shall be made in the bottom terminals of the fused isolator cut-out. The armouring of the underground cables shall be secured onto the gland plate of the cut-out or have a nonferrous sleeve fitted below the armouring and earthing clamps fitted to make a positive grip on the armour wires. The earthing clamps and gland plate shall be bonded to the main column earthing terminal with 6 sq mm single core PVC cable.
 - g. When terminating armoured cable which includes an integral CPC, the CPC core of the cable shall be cross-bonded to the armouring.

Feeder Pillars

Siting and Installation:

8. It is to be assumed that all feeder pillars are to be supplied and installed new and sized according to the electrical requirements of each location.
9. The proposed locations of feeder pillars are indicated on the drawings. The Contractor shall verify that these locations are appropriate based on the site conditions and liaise with Arup if these require relocating.
10. The locations of DNO supplies and the envisaged routes of private network cable has been considered when selecting feeder pillar locations.
11. Feeder pillars must be orientated so that maintenance can be carried out safely and should be set back as far as practical from the highway to reduce the risk of collision.
12. Feeder pillars shall be mounted on a minimum 250mm thick foundation of concrete ST2 mix complying with BS EN 206. They shall be rooted or provided with fixing bolts to enable the unit to be securely located. After completion of the cabling, any void under the feeder pillar base shall be filled to 25mm below the door with rounded aggregate, maximum size 14mm, and sealed overall with a cold pour compound of an approved type to prevent the ingress of moisture from below. A spare 100mm diameter cable duct shall be provided through the concrete surround from the base of the feeder pillar and capped.
13. For feeder pillars sited in grassed areas, a 600mm width of hard surfacing shall be laid with the surface flush with the ground across the width of the feeder pillar in front of the door. The other sides of the feeder pillar shall be similarly surrounded with hard surfacing 200mm in width. All hard surfaced areas shall slope away from the feeder pillar.

Feeder Pillar Construction:

14. Feeder pillars shall be constructed from not less than 5mm thick galvanised steel. They shall be sealed to minimum IP65 on the doors and IP45 on the vent louvres. They shall include a full-size backboard of varnished marine plywood at least 15mm thick or other approved non-hygroscopic material. Alternatively, a purpose-designed equipment mounting system may be used. The entry for cables shall be via the roof.
15. Doors shall be fitted high-security cylinder locks with patented keys – all keyed-alike. The locking mechanism shall be lubricated with grease immediately following installation. 15 sets of keys shall be provided prior to the adoption of the installation.
16. A suite of keys for securely locking enclosures will be required for the following:
 - a. CCTV Cabinets
 - b. Event Power
 - c. Feeder Pillars
 - d. Columns housing drivers for remotely located fixtures (for example L01, L09 and L10).
17. A sturdy documentation pocket shall be provided on the inside of the feeder pillar door.
18. Ventilation shall be provided to prevent the build-up of condensation and, in certain cases, the feeder pillar shall be protected by vermin-proof screens.
19. Protection against corrosion shall be by hot-dip galvanising to BS EN ISO 1461 with grey paint finish, the minimum coating thickness to be approved by the overseeing organisation/designer.
20. All doors are to be provided with an earthing strap connected to the main earthing terminal.

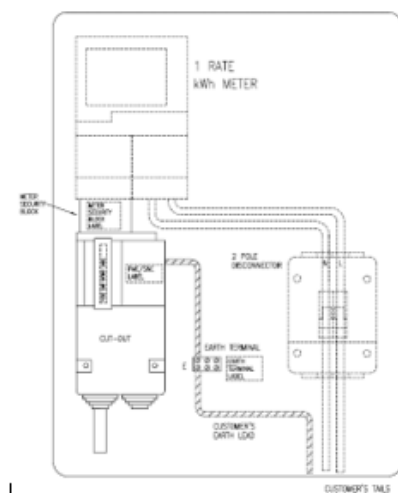
Feeder Pillar Internal Arrangement:

21. Arup have made allowance within feeder pillars for equipment provided by the DNO / metering supplier, based information supplied by ENWL (see below). Where the requirements confirmed by the DNO / iDNO are different to this, the Contractor shall liaise with Arup.

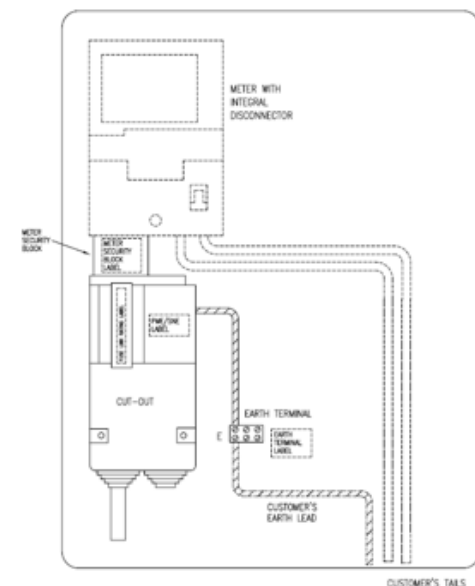
ENW have Three Meter Board sizes -

Small 505 x 340mm – Typical use is for Single phase cut-outs, 100A fitted in an outside viewing cabinet.

Medium 575 x 375mm – Typical usage as above.



ES900000 -53-068 – Single Phase Termination



ES900000 -53-071 – Single Phase Termination with Integral Meter Disconnect

Figure 1 – Standard cut-out and metering information from ENWL

22. The following information has been provided by ENWL on the installation arrangements – the Contractor shall liaise with the DNO / iDNO to confirm specific requirements.

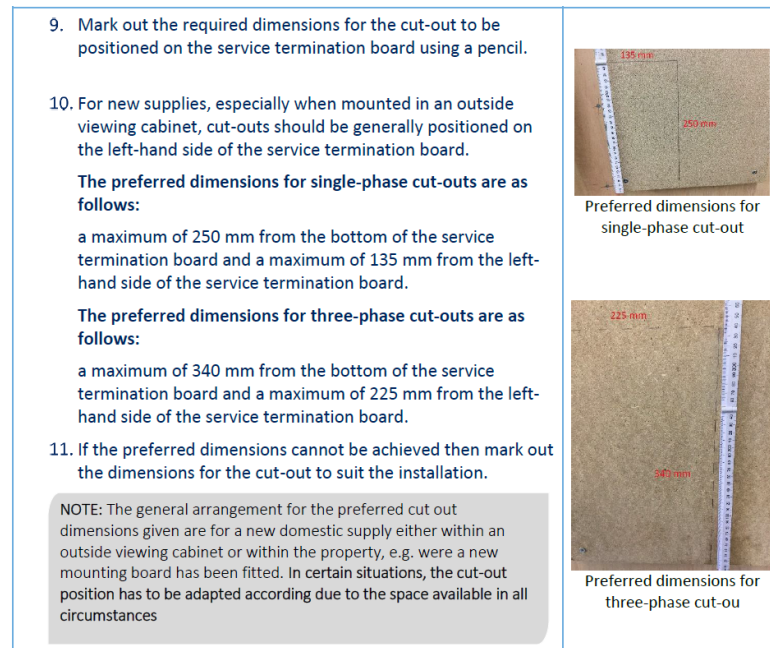


Figure 2 - Information shared by ENWL

23. There is no requirement for internal lighting within each feeder pillar.
24. Thermostat controlled internal heating shall be provided only to feeder pillars that contain electronic control e.g. Street Lighting Server, DALI and DMX control equipment.
25. A 13amp three-pin BS 1363 metal-clad twin switched socket shall be provided and securely mounted to the backboard.
26. Outgoing circuit protection shall be by means of Miniature Circuit Breakers (Type C or D) or RCBOs within an appropriately rated distribution board. The circuit protective devices are indicated within the distribution board schedules.
27. Outgoing circuits to street furniture and event power supplies shall be RCD protected in accordance with BS 7671, as indicated in the distribution board schedules
28. All distribution boards shall have the capacity to accommodate 20% or 2 spare outgoing circuit ways, whichever is greater.
29. A laminated and accurate schematic circuit diagram shall be provided and inserted into the documentation pocket of the feeder pillar door.
30. All feeder pillars shall be fitted with a durable warning sign, fitted externally and in a prominent position, indicating “DANGER 400 VOLTS” or “DANGER 230 VOLTS” as appropriate and a ‘lightning flash’ in black on yellow.

Event Power

31. The Contractor shall supply a number of external power supplies for use to supply small scale events. Event Power will be provided as follows:
 - a. Provision of SP&N industrial BS EN 60309 ‘Commando’ style socket outlet(s) with integral isolator integrated within the feeder pillar within St Catharine’s wood. Access to the event power is to be provided via lockable access hatches fitted on the doors of the feeder pillar. Standard feeder pillar locks shall be provided (triangle keys or similar) which are different to the main locks on the feeder pillar. 10 sets of keys shall be provided prior to the adoption of the installation.

Transient Voltage Surge Suppression

32. The Contractor shall be responsible for the supply, installation, testing and commissioning of transient voltage surge suppression (TVSS) devices as required by BS 7671 and BS EN 62305. The proposed locations and types of TVSS devices are indicated on the LV Schematics.
33. Surge protection devices (SPDs) for power supplies must be capable of diverting both direct lightning impulses 25kA 10/350µs per pole and surge currents 40kA 8/20µs per pole.
34. The arrester must be a 2-stage combined arrester e.g. Type 1 and 2 to protection level 1 100kA 10/350µs per device or 25kA 10/350µs per pole. The arrester must be fully energy co-ordinated between lightning and surge currents.
35. The let through voltage should not exceed 1.5kV even in the event of 100kA 10/350µs lightning impulse. The arrester shall also limit follow currents. This is in line with the attached. The arrester shall have a maximum let through voltage of 1.5kV making it suitable for Overvoltage Category I of IEC 60364-4-44 and BS 7671.
36. The arrester must comply with BS EN 62305-4 and EN 61643-11.

Earthing

37. Earthing shall be provided in accordance with the requirements of the BS 7671 and BS 7430.
38. The Contractor shall liaise with the distribution network operator (DNO) / independent distribution network operator (iDNO) to determine the specific requirements of the earthing installations relative to the source of supply.
39. Earth Electrodes
 - a. Earth electrodes and inspection chambers (concrete type) shall be provided by the Contractor at each proposed feeder pillar location.
 - b. Earth rods shall be manufactured from copper clad steel (copper shall be bonded to the steel core) and be no less than 16mm in diameter. Cable clamps shall have an aluminium bronze body and a phosphor bronze screw.
 - c. Earth rods shall be located in an earth rod core and surrounding housing.
 - d. All earth rods and installations shall conform to, and shall be tested by the approved method as stated in BS 7671.
 - e. The structure earth electrode resistance is to be below 20 ohms. Where ground conditions are adverse, additional or large diameter rods are to be used.
 - f. Additional Earth electrodes may be required on long cable runs in order to comply with Earth Electrode resistance requirements above, depending on the earth loop impedance of the supply from the DNO/iDNO – requirements will be confirmed once the utility supply characteristics have been confirmed

Cables and Cable Joints

40. Cabling
 - a. Underground cables shall be laid in duct except where they leave the duct to enter the cable slot of the apparatus and shall be XLPE/SWA/PVC (sheath) construction with stranded copper conductors manufactured to BS 5467 and shall have BASEC approval by an ISO 9001 compliant company.

- b. Cables installed within conduits on bridges, walls etc. shall be LS0H singles with stranded copper conductors manufactured to BS EN 50525-3-41 and shall have BASEC approval by an ISO 9001 compliant company.
- c. Extra low voltage cabling from luminaire drivers shall be double-insulated H07RN-F type with stranded copper conductors manufactured to BS EN 50525.
- d. Circuits shall which have a separate integral CPC core which shall be cross-bonded to the cable armouring at termination points.
- e. All cores shall be of equal cross sectional area and be sized to meet the requirements of BS 7671. Arup have completed the necessary calculations, and proposed cables are included within the distribution board schedules.
- f. Internal wiring between the terminal block in the lantern and the components in the base of the column shall be PVC insulated and sheathed cable of 300/500 volt grade, have a copper conductor size of not less than 2.5 sq mm.
- g. All cores shall be correctly colour coded in accordance with BS 7671 and cables for continuous earth bonding shall be green/yellow PVC insulated single core copper cable of minimum cross section 6 sq mm 600 volt grade conforming to BS 6004.
- h. All underground cables (except DNO cables) shall be identified as to their origin and destination by labels affixed to the cut-out.

Electrical Connections

41. DNO Supplies

- a. The Contractor shall be responsible for liaising with the DNO / iDNO and for organising the provision of metered single-phase LV supplies to each feeder pillar, as indicated on drawings. Routing of DNO service cables through areas with finished surfaces that are expensive or onerous to reinstate shall be avoided unless there is no practical alternative source of electrical supply.

Trenching and Ducting

42. Ducting

- a. Duct routes should be logical and perpendicular where necessary with consideration given to the possibility of future access for maintenance or upgrade.
- b. All ducting shall be manufactured from high density polyethylene and coloured orange with white 9mm high lettering “STREET LIGHTING” at intervals of not more than 1.0m along its length.
- c. All main distribution ducts shall have an internal diameter of 100mm and average wall thickness of 5.0mm. Ducting to final legs and between columns may be 50mm diameter.
- d. All ducts shall be laid at a depth of:
 - a. Verge and footways – 450mm minimum cover.
 - b. Carriageway – 600mm minimum cover.
- e. A yellow warning marker tape with black legend containing two stainless steel wires and displaying, at 1.0m intervals, “Caution – Street Lighting Cable Below” shall be laid at a depth of 150mm below finished surface.
- f. The Contractor shall liaise with the DNO / iDNO as to the ducting requirements for new and relocated utility connections into columns, feeder pillars, advertising boards and street furniture as appropriate to deliver the required service.

43. Cable Laying

- a. Jointing of cable is not permitted and only continuous lengths of cable between apparatus will be accepted.
- b. Cables shall not be laid at a temperature below 0 degrees centigrade.
- c. The cable shall be laid in such a way as to not cause damage either when drawing the cable through duct or by creating an internal bend radius that exceeds manufacturer's recommendations.
- d. Any cabling attached to buildings or structures must be done so in such a manner as to minimise its aesthetic impact whilst complying with the relevant standards.
- e. Cables shall be supported on the building surface using approved saddles, the spacing of which shall conform to the recommendations of BS 7671.
- f. Cables shall be drawn through ducts and terminated into apparatus on the same day to reduce the risk of cable theft. Where cables cannot be terminated on the same day they shall be protected, coiled and buried until termination takes place.

44. Cable Joints

- a. Final connections to inground uplights shall be made via a resin filled buried type cable joint located below the luminaire within the mounting block. Joints shall be made with sufficient additional flex cable to the incoming, outgoing and final connection to the luminaire, so that joints can be made outside of the mounting block to allow for works to be undertaken at ground level. The jointing block shall be positioned on a bed of free draining material below the inground luminaire or adjacent to the spike mounted uplight.

CCTV and CCTV Columns

45. Refer to VNIF-ARP-00-YYY-SP-Y-0001 for the CCTV specification.

Specification for Electrical Testing & Commissioning

46. Electrical testing shall be carried out by competent persons in accordance with the latest edition of BS 7671 and the Health and Safety Executive Guidance Notes on all new installations on completion, and periodically on existing installations as instructed by the Overseeing Organisation.
No job, installation or equipment will be considered complete until full electrical tests have been provided by the Contractor.

47. Site Tests

- a. The Contractor shall carry out all necessary checks and tests to prove that the completed installations fully comply with specified requirements.
- b. Upon completion of the electrical installation, or any substantial section thereof, the installation or that section and all of the associated electrical equipment shall be subjected to the tests specified in BS 7671, together with such other tests as may be specified in order to prove compliance with the Specification.
- c. All of the required checks and tests shall be carried out in accordance with a programme to be agreed with the Engineer, and facilities shall be made available for the Engineer to be present at all such checks and tests if he so desires.
- d. Tests not carried out in the presence of the Engineer shall not be regarded as valid for the purpose of the contract, unless the Engineer shall have authorised the Contractor to proceed with the testing process in his absence.

- e. Every test certificate shall include, in addition to all other requirements, the date and time of the test, the ambient conditions, a fully detailed description of the test(s) carried out, the results obtained, and any relevant performance curves.
- f. No material, apparatus, equipment, or installation shall be covered or otherwise permanently concealed from view until the Engineer has had the opportunity to inspect it, or given written authorisation for covering to proceed.
- g. No work shall have a final paint finish until it has been inspected by the Engineer or painting has been authorised, unless the final paint finish is necessary to provide the necessary climatic protection.
- h. No apparatus, equipment, plant, or installations shall be recognised as complete until all of the specified inspections and tests have been satisfactorily carried out.
- i. The Engineer shall have the right to waive, at his sole discretion, the requirements relating to his inspection of materials, apparatus equipment and installations and the witnessing of tests thereon. The exercise by the Engineer of this right shall not in any way relieve the Contractor of his obligations to carry out the prescribed tests and to submit test certificates.

48. Cable Testing

- a. As soon as is practicable after the completion of installation and jointing of the cables specified herein, or of any usable group of such cables, the Contractor shall carry out the tests described below, together with such other tests and measurements to prove compliance with this Specification and with the requirements of BS 7671.
- b. An insulation resistance test, carried out with a 'Megger' insulation tester or other similar type of testing instrument, to measure the insulation resistance between each conductor and the remaining conductors and between each conductor and the metallic sheath, if any, and armouring.
- c. An earth continuity test shall be carried out to verify that the cable armouring and metal sheath, if any, have been properly bonded to earth.
- d. Phase-rotation and phase-correspondence shall be tested to prove that the cables have been correctly connected.

49. Commissioning

- a. Following the satisfactory conclusion of inspections and tests on completed sections of the Works, the Contractor shall duly commission each section of the electrical installation and leave it in full working order. The term 'Commissioning' shall be deemed to include:
 - i. The energising of electrical distribution circuits and equipment which have previously been inspected, tested, found to be satisfactory and capable of being energised with complete safety.
 - ii. The setting of electrical protective devices and systems, where relevant.
- b. The verification of the performance of all such plant and equipment by the carrying out, where required, of further tests and the making of all necessary adjustments so as to obtain optimum performance.
- c. Compliance with the requirements of this Section of the Specification shall not, by itself, in any way relieve the Contractor of any of his obligations under the Sub-contract.
- d. The Contractor shall ensure that all connections and adjustments are made correctly, and that the installations and equipment are in a completely safe and satisfactory condition.
- e. All activities carried out by the Contractor in pursuance of the requirements of this section of the Specification shall be carried out, or continuously supervised, by a competent and experienced commissioning engineer.
- f. The Contractor shall be wholly responsible for ensuring that all switching operations and all work on electrical circuits and equipment which have once been energised are carried out in

a thoroughly safe manner and shall operate, and rigidly adhere to, an approved 'permit-to-work' system.

- g. The Contractor shall prepare a commissioning schedule detailing the plant to be commissioned, the operations to be carried out, the time scale, with proposed dates for specific operations, and attendance or provisions by others. This commissioning schedule, in draft form, shall be submitted not less than four weeks in advance of the date on which commissioning is to commence.
- h. If required by the Engineer, the Contractor shall present the information from the commissioning schedule in the form of a flow diagram or a PERT ('Critical Path') chart.
- i. The procedures to be followed by the Contractor for commissioning the electrical equipment and installations shall be proposed by the Contractor and submitted to the Engineer for approval.
- j. No connections or adjustments shall be made to plant or equipment which has already been commissioned and set to work, except with the prior consent of the Engineer.
- k. No plant or equipment shall be charged, energised or operated without the prior agreement of the Engineer. All applicable test certificates shall have been first submitted to the Engineer.
- l. All commissioning procedures shall be carried out in a safe and satisfactory manner and in accordance with the provisions of the all relevant guidance documents and standards.
- m. Following completion of commissioning, each item of equipment or, where several items of equipment are interdependent, the complete plant shall operate continuously and satisfactorily under normal operating conditions for a period of 72 hours without defect of any kind. In the event of any defect or mal-operation becoming apparent during this period the Contractor shall forthwith determine the cause and rectify it by means of repair, replacement, adjustment or modification and the reliability run shall be re-commenced. All materials, equipment and labour required to locate and rectify any such defect shall be provided by the Contractor at his own expense.
- n. No plant, equipment or installation shall be considered as complete until the prescribed commissioning procedures have been satisfactorily carried out and the reliability run has been completed without untoward incident.

50. Inspection and Testing

- a. All electrical circuits or part circuits forming the new installation shall be inspected and tested to meet the full requirements of the latest edition of BS 7671, with amendments, before anyone is allowed to use the new installation or equipment. A photocopy of the original certificate shall be handed to the Contract Administrator immediately after the works are completed. The original test certificates shall be presented to the Contract Administrator for insertion into the safety file subject to the paragraphs below.
- b. The certificate used shall be approved by the Project Manager.
 - i. The Project Manager shall in writing, notify the Main Contractor and the Contractor.
 - ii. The Contractor shall provide all labour, plant and instruments necessary for testing the works. All test instruments shall have valid calibration certificates.
 - iii. If any portion of the works fails to pass the test, the necessary remedial works shall be carried out to the satisfaction of the Contract Administrator and the tests of the said portion shall be repeated within a reasonable time upon the same terms and conditions as above.
 - iv. Concealed or buried work shall be inspected in the presence of the Contract Administrator (or his representative) before any permanent covering is applied. The Contractor shall give due notice in writing to the Contract Administrator when the said concealed or buried work is ready for inspection and the Contract Administrator shall without unreasonable delay carry out the inspection and/or witness the tests

unless he informs the Contractor in writing from time to time that he considers such inspection unnecessary, but in no instance shall concealed work or buried work be covered without being tested by the Contractor in the manner described in the specification.

- c. Equipment shall be stripped down for inspection as appropriate.

Specification for Aiming and Commissioning of Luminaires

51. All adjustable luminaires (gobo projectors type L08 within St Catherine's Woods) shall be aimed, focused, and locked etc by the Contractor under the supervision of the Lighting Consultant.
52. All focusing and adjusting shall be carried out after the entire installation within the respective Area is complete. All access equipment required to undertake the aiming, shall be furnished by the Contractor.
53. As aiming and adjusting is completed, locking set screws, nuts and bolts, shall be securely tightened.
54. Where possible, units shall be focused during the normal working day. Where daylight prevents this, focusing shall be carried out during the night at a time mutually agreeable to Contractor, Lighting Consultant, and Client.
55. For Type L08 mounted on COL1 columns commissioning is likely to take one evening. The Contractor shall allow sufficient time for the aiming of the lighting for each area:
 - a. St Catherine's Wood
56. Adjustments shall be made in accordance with the Lighting Consultant's stated intent, under his/her supervision.
57. The Contractor shall allow for commissioning with and without accessories (such as baffles and glare shields) to achieve uniform distribution and reduce glare to appropriate levels where applicable.

Clean up

58. At the time of final acceptance by the client, all luminaires shall have been thoroughly cleaned with materials and methods recommended by the manufacturers, all broken parts shall have been replaced and all lamps shall be operative.

Appendix 14/6 – Lighting Control

1. The Contractor shall install, test and commission a Lighting Control System (LCS) to meet the requirements of the control narrative as described below. This shall include, but not be limited to the following:
 - a. System topography: Equipment specification and selection
 - b. Spatial co-ordination: Pillar and column integrated
 - c. Enclosure requirements: locations, number, sizing, power requirements etc.
 - d. Software programming
 - e. Onsite commissioning of the functional lighting control system to deliver part night dimming and remote control for changing schedules.
2. The Contractor shall employ a Specialist Lighting Control Supplier(s) (SLCS) as appropriate to undertake the design and commissioning works on their behalf.
3. The control system shall be the Interact City IoT platform by Signify. This is a platform hosted within the cloud that stores and processes data to manage lamps, luminaires and services.
4. Software shall be Interact City, and shall be managed by Signify. There will be the following connected devices on the platform:

- a. Luminaires
 - b. Control units
 - c. Sensors
5. Lighting schedules and fault reporting shall be identified through real time notifications, that are accessible through an app based platform.
6. The system configuration is as follows:
 - a. Interact Smart City Dashboard held on site server (location to be agreed with MCC/FEC) allowing lighting management with future connectivity to the CCTV and traffic management within the site. This is through an open API managed and delivered by Signify to connect to the City dashboard.
 - b. Via a Zhaga socket and smart driver, or via group cabinet control, the cellular network connects to the Interact City dashboard allowing control of the systems.
7. There shall be the following types of controls through the Victoria North HIF Development:
 - a. Connector Node
 - i. Luminaires shall have a 4pin Zhaga node and D4i driver integrated to connect to Interact City. Signify to provide Connector Nodes for onsite installation by the Contractor to each lantern head.
 - b. External Connector Kit
 - i. Luminaires with remote DALI drivers shall be controlled using an external connector kit surface mounted at 3.5m AGL on a nearby column, as noted on drawings. Connector Kits shall be installed by the Contractor.
 - c. Group Control via Cabinet
 - i. Non-dimmable circuits (such as the L12 spike mounted floodlights, and L14 wall mounted floodlights) shall require the following equipment, mounted within the feeder pillar, as noted on lighting layout drawings:
 1. Surge guard
 2. Segment control unit
 3. SIM card
 4. Battery
 5. Antenna to be surface mounted on feeder pillar
 - ii. Dimmable circuits (such as the L02 bollards) shall require coded mains dimming. This shall be achieved through a code mains transmitter and code mains transformer, in addition to the equipment for group control.
8. The reference design is based on Signify products. The street lighting Interact City software shall be capable of serving web pages, shall have energy and event datalogging capabilities and shall have an astronomical clock to trigger events and lighting scenes.
9. Depending on physical constraints for each area/zone/street, the Cellular protocol shall be distributed using nodes and external connector nodes, with group control from feeder pillars.
10. A Central Management System shall be provided for remote monitoring and action triggering.
11. A lighting control schedule has been provided using the BS EN 13201-2:2015 - Road lighting. Performance requirements.

Table 3 — P lighting classes

Class	Horizontal illuminance		Additional requirement if facial recognition is necessary	
	$\bar{E}^a$ [minimum maintained] lx	E_{min} [maintained] lx	$E_{v,min}$ [maintained] lx	$E_{sc,min}$ [maintained] lx
P1	15,0	3,00	5,0	5,0
P2	10,0	2,00	3,0	2,0
P3	7,50	1,50	2,5	1,5
P4	5,00	1,00	1,5	1,0
P5	3,00	0,60	1,0	0,6
P6	2,00	0,40	0,6	0,2
P7	performance not determined	performance not determined		
^a To provide for uniformity, the actual value of the maintained average illuminance shall not exceed 1,5 times the minimum $\bar{E}$ value indicated for the class.				

NOTE 4 A high colour rendering contributes to a better facial recognition.

Figure 3 - P Lighting Classes

12. Levels shall be commissioned on site with a calibrated illuminance meter. Times to be confirmed with MCC and FEC prior to commissioning.
 - a. Scene 1 – School run (4pm – 6pm)
 - b. Scene 2 – Evening (sunset – 9pm)
 - c. Scene 3 – Night (9pm – 4am)
 - d. Scene 4 – Early (4am – sunrise)
 - e. Special Event

Zone	Lighting Description	Control Description	Scene #1	Scene #2	Scene #3	Scene #4	Scene #5
Plateau Avenue	Column mounted luminaires	Dimmable	P3	P3	P3	P3	P3
Red Bank Terraces	Column mounted luminaires to primary routes	Dimmable	P2	P2	P3	P2	P2
	Bollard luminaires to secondary routes	Dimmable	P4	P4	P5	P4	P4
	Illuminated handrail to stairs	Photocell On/Off	75%	75%	50%	75%	100%
	Stanchion luminaires to stairs	Photocell On/Off	On	On	On	On	On
	Gabion seating	Switch On/Off	On	On	Off	On	On
	Wall mounted luminaires	Switch On/Off	On	On	Off	On	On
Active Travel	Column mounted luminaires	Dimmable	P2	P2	P3, P4, P5	P2	P2
Red Bank Viaduct	Arch integrated luminaires	Dimmable	P4	P4	P5	P4	P4
	Gabion seating	Switch On/Off	On	On	Off	On	TBC
		Switch On/Off	On	On	Off	On	TBC
	Tree uplights	Dimmable	P4	P4	P5	P4	TBC

	Bollard luminaires						
Union Plaza Waterfront	Column mounted luminaires	Dimmable	P2	P2	P3	P2	P2
	Bollard luminaires	Dimmable	P4	P4	P5	P4	TBC
	Cast concrete seating	Switch On/Off	On	On	Off	On	TBC
St Catherine's Wood	Column mounted luminaires	Dimmable	P3	P3	P5	P3	P3
	Bollard luminaires	Switch On/Off	On	On	On	On	TBC
	Stanchion luminaires	Photocell On/Off	On	On	Off	Off	TBC
	Projectors	Switch On/Off	On	On	Off	Off	TBC
	Catenary system	Switch On/Off	On	On	Off	Off	TBC

Note: Along the active travel during Scene 3 there will be a transition of light levels from the Terraces (P3) to the Woodland (P5). Every 4 columns will step down via dimming the output sequentially to smooth transition from a brighter space to a darker space.

SERIES 1700: STRUCTURAL CONCRETE

Appendix 17/1: Concrete Classification of Mixes

(12/14) APPENDIX 17/1: SCHEDULE FOR THE SPECIFICATION OF DESIGNED CONCRETE

Requirement	Schedule
Designed Concrete Ref/Location in the Works	C40/50
Intended Working Life of Structure	120 years
Nominal Cover to Reinforcement	50mm or as noted on drawings
Applicable Exposure Classes (Excluding DC Class)	XC3/4, XF3, XD3
DC Class	DC-2
Compressive Strength Class of Concrete	C40/50
Minimum Cement Content (kg/m ³)	380
Maximum Free Water/Cement Ratio	0.40
Required Group or Type and Class of Cement or Combination (where a DC class has not been specified)	IIIB
Maximum Aggregate Size (mm)	20
Chloride Content Class	Cl 0.40
For Lightweight Concrete, the Density Class or Target Density	N/A
For Heavyweight Concrete, the Target Density	N/A
Consistence Class	S3
Special Type or Class of Cement or Combination	Sulphate resistant
Required Source/Special Type of Aggregate	Freeze/thaw resistant
Maximum Cement Content (kg/m ³)	500
Required Admixture	N/A
Air Entrainment Required	N/A
Minimum or Maximum Temperature of Fresh Concrete (°C)	Min. 5 Max. 30
Sampling and Testing	As described in NR/L2/CIV/140/1700C
Requirements to Control Early Thermal Cracking	No specific requirements

Table 1 - Appendix 17/1: Schedule for The Specification of Designed Concrete

SERIES 1800: STRUCTURAL STEELWORK

Appendix 18/1: Requirements for Structural Steelwork

		Drawings and Documents That Give Related Structural Steelwork Requirements		
Series 1800 Clause Reference	Additional Information Required	Not Applicable	See Approved for Construction Drawing(s)	See Appended Document(s)
1804 – Specifications and Documentation				
1804.1.1	Execution Specification, General – drawing numbers of all approved for construction drawings and document references of all appended documents that give all the necessary requirements for the execution of the steelwork		By Fabricator	
1805 – Constituent Products				
1805.1	Constituent Products, General - properties of products not covered by listed standards.	X		
1805.3.1	Structural Steel Products, General - grades, qualities and, if appropriate, coating weights and finishes for steel products.		By Fabricator	
1805.3.3	Surface conditions - additional requirements related to special restrictions on either surface imperfections or repair of surface defects by grinding in accordance with BS EN 10163, or with BS EN 10088 for stainless steel.	X		
1805.3.3	Surface conditions - surface finish requirements for other products.	X		
1805.3.3	Surface conditions - where decorative or specialist surface finishes are required.	X		
1805.3.4	Special properties - Additional requirements for special properties if relevant.	X		
1805.4	Steel castings - Grades, grade suffixes', finishes and options for steel castings.	X		
1805.6.3	Structural bolting assemblies for non-preloaded applications - property classes of bolts and nuts, and surface finishes for structural bolting assemblies for non-preloaded applications.	X		
1805.6.3	Structural bolting assemblies for non-preloaded applications - mechanical properties for large diameter bolting assemblies.	X		
1805.6.3	Structural bolting assemblies for non preloaded applications - full details for the use of insulation kits.		By Fabricator	

		Drawings and Documents That Give Related Structural Steelwork Requirements		
Series 1800 Clause Reference	Additional Information Required	Not Applicable	See Approved for Construction Drawing(s)	See Appended Document(s)
1805.6.4	Structural bolting assemblies for preloading - property classes of bolts and nuts and surface finishes for structural bolting assemblies for preloading.	X		
1805.6.4	Structural bolting assemblies for preloading - where stainless steel bolts can be used in preloaded applications.	X		
1805.6.7	Foundation bolts - where reinforcing steels may be used for foundation bolts together with the steel grade.	X		
1805.6.8	Locking devices - where locking devices are required.	X		
1805.6.8	Locking devices - if products other than those in the referred standards are to be used.	X		
1805.6.11	Fasteners for thin gauge components - mechanical fastener type for use in stressed skin applications.	X		
1805.6.12	Special fasteners - special fastener not standardised in CEN or ISO standards, as well as any tests necessary.	X		
1805.8	Grouting materials - grouting materials to be used.	X		
1805.9	Expansion joints for bridges - requirements for type and characteristics of expansion joints.	X		
1805.10	High strength cables, rods and terminations - tensile strength grade and coating of wires.	X		
1805.10	High strength cables, rods and terminations - designation and class of strands.	X		
1805.10	High strength cables, rods and terminations - minimum breaking load and diameter of steel wire ropes and requirements related to corrosion protection.	X		
1805.11	Structural bearings - Schedule of design requirements and acceptance tests.	X		
1806 – Preparation and Assembly				
1806.2	Identification - where soft or low stress stamps may not be used for stainless steel	X		
1806.2	Identification - zones where identification marks are not permitted or shall not be visible after completion.	X		
1806.4.4 (2)	Hardness of free edge surfaces - edge surfaces where the relaxation for machine plasma cutting described in 1806.4.4 (2), is not permitted.	X		

		Drawings and Documents That Give Related Structural Steelwork Requirements		
Series 1800 Clause Reference	Additional Information Required	Not Applicable	See Approved for Construction Drawing(s)	See Appended Document(s)
1806.5.4 c)	Cold forming - minimum bending radii for stainless steels other than those to grades listed in 1806.5.4 b).	X		
1806.5.4 d)	Cold forming - protective membranes for cold formed thin gauge components.	X		
1806.6.1	Dimensions of holes - special dimensions for movement joints.	X		
1806.6.1	Dimensions of holes - nominal hole diameter for hot rivets.	X		
1806.6.1	Dimensions of holes - dimensions of countersinking	X		
1806.7 (1)	Cut outs - re-entrant corners where a smaller radius than that described in 1806.7 is permitted.	X		
1806.8	Full contact bearing surfaces - where full contact bearing surfaces are required.	X		
1806.9 (2)	Connections for temporary components – special requirements applying to connections for temporary components, including those related to fatigue.	X		
1806.9 (3)	Connections for temporary components – where the removal or addition of permanent material or the introduction of permanent notches is permitted.	X		
1806.10	Assembly check – if, and to what extent, trial assembly is to be used.	X		
1807 – Welding				
1807.1 (1)	Welding Quality Requirements - if the BS EN ISO 3834 quality requirements shall conform to the requirements for EXC2.	X		
1807.5.6 (1)	Temporary attachments – areas where welding of temporary attachments is not permitted.	X		
1807.5.9.1	Butt welds, general - the location of butt welds used as splices.	X		
1807.5.9.1	Butt welds, general - where a flush surface is required.	X		
1807.5.9.2 (1)	Single sided welds – where the use of permanent steel backing is permitted.	X		
1807.5.13	Slot and plug welds – the dimensions of holes for slot and plug welds.	X		
1807.5.14.1	Arc spot welds - if weld washers are accepted for stainless steels.	X		
1807.5.14.1	Arc spot welds – the minimum visible width of arc spot welds.	X		
1807.5.15	Other weld types - requirements for other weld types.	X		

		Drawings and Documents That Give Related Structural Steelwork Requirements		
Series 1800 Clause Reference	Additional Information Required	Not Applicable	See Approved for Construction Drawing(s)	See Appended Document(s)
1807.5.17	Execution of welding - requirements for grinding and dressing of the surface of completed welds	X		
1807.7.2	Amendments to EN 1011-3 requirements – the surface finish of the weld zones on stainless steels.	X		
1807.7.3	Welding dissimilar metals - requirements for welding different stainless steels to each other or to other metallic materials.	X		
1808 – Mechanical Fastening				
1808.2.1	Use of bolting assemblies, General - where, in addition to tightening other measures or means are to be used to secure the nuts.	X		
1808.2.1 (1)	Welding of mechanical fasteners – where welding of property class 4.6 nuts, bolts and washers is permitted.	X		
1808.2.2	Bolts - minimum diameter of fasteners for thin gauge components and sheeting.	X		
1808.2.2	Bolts - dimensions of bolts in connection utilising the shear capacity of the unthreaded shank.	X		
1808.2.4	Washers - dimensions and steel grade of plate washers to be used with slotted or oversized holes.	X		
1808.2.4	Washers - dimensions and steel grade of taper washers.	X		
1808.3	Tightening of non-preloaded bolts - where full contact bearing is required (see 1806.8).	X		
1808.4	Preparation of contact surfaces in slip resistant connections - requirements related to contact surfaces in slip resistant connections for stainless steels	X		
1808.5.1 (2)	Cover Plates in Preloaded Joints – measures permitted to limit the out-of-plane bending stiffness of cover plates.	X		
1808.5.1 (6)	Tightening of preloaded bolts, General - preloaded bolts that shall be tightened by the torque method.	X		
1808.5.1 (8)	Fit up of preloaded joints - maximum gap between faying surfaces and mating surfaces	X		
1808.7.2	Installation of rivets - where a flush surface of countersunk rivets is required.	X		
1808.7.3	Acceptance criteria - where outer faces of plies are required to be free of indentation by the riveting machine.	X		

		Drawings and Documents That Give Related Structural Steelwork Requirements		
Series 1800 Clause Reference	Additional Information Required	Not Applicable	See Approved for Construction Drawing(s)	See Appended Document(s)
1808.8.4	Fastening side laps - requirements for the side lap fasteners as structural fasteners in stressed skin applications.	X		
1808.9	Use of special fasteners and fastening methods - requirements for procedure tests.	X		
1808.9	Use of special fasteners and fastening methods – head finish	X		
1808.9	Use of special fasteners and fastening methods - requirements for use of hexagon injection bolts.	X		
1809 – Erection				
1809.4.1(1)	Reference system – the reference temperature for setting out and measuring the steelwork if different from 15°C.	X		
1809.5.3	Maintaining suitability of supports - if compensation for settlement of supports is required.	X		
1809.5.4	Temporary supports - where levelling nuts on foundation bolts under the base plate are required to be removed.	X		
1809.5.4	Temporary supports - where packings for bridges may be left in position.	X		
1809.5.5(1)	Grouting and sealing – requirements for the treatment of steelwork, bearings and concrete surfaces before grouting.	X		
1809.5.5	Grouting and sealing – the method of sealing the edges of a base plate if no grouting is needed.	X		
1810 – Surface Treatment				
1810.1 (4)	Surface treatment, General - prescriptive requirements for corrosion protection		By Fabricator	
1810.1 (5)	Surface treatment, General - requirements for friction surfaces and class of treatment or tests required for surfaces in slip resistant connections	X		
1810.1(6)	Surface treatment, General - extent of surfaces to be painted at preloaded connections	X		
1810.1(7)	Surface treatment general – the extent of surfaces that are affected by pre-loaded bolts in non-slip resistant connections.	X		
1810.1 (8)	Preparation of fasteners - if the lower embedded part of foundation bolts is required to be untreated.	X		
1810.1 (9)	Galvanizing - Requirements for procedure qualification of the dipping process if hot dip galvanizing of components after manufacture is required.		By Fabricator	

		Drawings and Documents That Give Related Structural Steelwork Requirements		
Series 1800 Clause Reference	Additional Information Required	Not Applicable	See Approved for Construction Drawing(s)	See Appended Document(s)
1810.1 (10)	Galvanizing - Requirements for the inspection, checking or qualification of the preparation to be carried out before subsequent overcoating, for galvanized components.		By Fabricator	
1810.2	Preparation of steel substrates - Requirements for surface cleanliness of stainless steels.	X		
1810.2 (1)	Preparation of steel substrates - requirements for the preparation of surfaces to receive corrosion protection if they are to be different from those described in BS EN ISO 8501-3:2007 preparation grade P3.	X		
1810.3	Weather resistant steels - requirements for the surface treatment of non-weather resistant steels in contact with uncoated weather resistant steels.		By Fabricator	
1810.5	Galvanizing - where enclosed spaces shall be sealed after galvanizing and, if so, with what sealant.	X		
1810.6	Sealing of spaces - where weld imperfections permitted by the welding procedure specification require sealing by application of suitable filler material.	X		
1810.6	Sealing of spaces – the method to be used for sealing the interface if mechanical fasteners penetrate the wall of sealed enclosed spaces.	X		
1810.6 (2)	Sealing of spaces - internal spaces that are to be hermetically sealed.	X		
1810.7	Surfaces in contact with concrete - specific requirements for coating surfaces in contact with concrete.		By Fabricator	
1810.9 (2)	Repairs of coatings to precoated constituent products – method and extent of repair after welding.		By Fabricator	
1810.10.2	Cleaning of stainless steel components - the method, level and extent of cleaning of stainless steels.	X		
1811 – Geometrical Tolerances				
1811.1	Tolerance types - additional information related to special tolerances if these tolerances are specified.	X		
1811.3.2 (2)	Tolerance types, additional information - tolerance on steelwork dimensions and levels at completion	X		
1811.3.2 (4)	Tolerance types, additional information - Camber requirements	X		

		Drawings and Documents That Give Related Structural Steelwork Requirements		
Series 1800 Clause Reference	Additional Information Required	Not Applicable	See Approved for Construction Drawing(s)	See Appended Document(s)
1811.3.3	Alternative criteria - where the specified alternative criteria for functional tolerances may be applied.	X		
1812 – Inspection, Testing and Correction				
1812.2.1 (1)	Constituent products - specific testing requirements for proprietary products.	X		
1812.3	Manufacturing: geometrical dimensions of manufactured components – repairs by welding to cover plates	X		
1812.5.1	Inspection of non-preloaded bolted connections - requirements for checking the installation of an insulation system.	X		
1812.5.2.1	Inspection of friction surfaces - requirements for the inspection and testing of preloaded bolts used for stainless steels connections.	X		
1812.5.5.1	Special fasteners and fastening methods, General - requirements for the inspection of connections using special fasteners or special fastening methods.	X		
1812.7.1 (1)	Inspection of trial erection - additional requirements for the inspection of a trial erection	X		
1812.7.3.4	Location and frequency - additional measurements, other than the position of components adjacent to site interconnection nodes.	X		
1812.7.3.4	Location and frequency - conditions other than under the self-weight of steelwork, under which positional measurements should be made.	X		
1812.7.3.6	Definition of nonconformity - envelope of permissible positions where significant movement of a structure is anticipated.	X		
1812.7.4	Other acceptance tests - specific requirements including tolerance range on the load, if components of a structure are to be erected to a specific load.	X		

SERIES 1900: PROTECTION OF STEELWORK AGAINST CORROSION

Appendix 19/1 – General

59. Paint Protection for Lighting and Electrical Apparatus

- a. All steel components other than galvanised, weathered/corten or stainless steel elements shall be provided with a corrosion protection paint system suitable for a C3 Environment in accordance with ISO 12944. The paint system shall be applied to 100% of the lighting column or feeder pillar.
- b. The Contractor shall take measures to contain people, plant, materials, dust and debris. Compliance with this does not confer immunity from relevant legal requirements.
- c. The contractor shall make good any damage to the paint system arising during fabrication transportation and erection.
- d. The paint system shall comprise of the following:
 - i. 1st Coat - On the internal root section, to 250mm above ground level and on the overall external surfaces, one coat of Mordant Solution, T wash.
 - ii. 2nd Coat - On the internal root section, to 250mm above ground level, one coat of modified vinyl micaceous iron oxide with high solids to give a high build coating colour grey to provide a minimum dry film thickness of 60 microns.
 - iii. 3rd Coat - On the external surface overall, one coat of two pack high build epoxy zinc phosphate primer, light grey to provide a minimum dry film thickness of 75 microns.
 - iv. 4th Coat - On the external root section to 250mm above ground level, one coat of modified vinyl micaceous iron oxide with high solids to give a high build coating, coloured grey to provide a minimum dry film thickness of 75 microns.
 - v. 5th Coat - On the external surface overall, one coat of modified vinyl with high solids to give a sheen finish to the dried film to provide a minimum dry film thickness of 60 microns.
- e. A line on the circumference of the base section shall denote ground level.
- f. The minimum dry film thickness shall be:
 - i. Root - 60µm (internal) 210µm (external to 250mm)
 - ii. External - 135µm (from 250mm)
- g. Refer to VNIF-ARP-00-YYY-SH-EL-0001 for paint RAL colour

SERIES 2600: MISCELLANEOUS

Appendix 26/1: Ancillary Concrete

1. Standardised prescribed concrete used for each purpose shall be as described in Table 26/1-1.
2. The specification requirements of standardised prescribed concrete mixes required for use on the contract are given in Table 26/1-2.
3. The mixes shown in Table 26/1-2 shall be supplied as standard mixes in accordance with the relevant clauses of BS 8500: Parts 1 and 2: 2015.
4. Designated mixes agreed as equivalent will be acceptable as alternative mixes to those below.

Table 26/1-1 Prescribed Concrete used for each Purpose	
Purpose	Standardised Prescribed or Designated Concrete
5. Bed to drain Type A#. Foundations, channels and benching to chambers	GEN3
6. Bed haunch and surround to drains other than Type A#. Surround to chambers and gullies	GEN3
9. Backfill to gullies	GEN3
12. Access chambers (i) Footings for Access chambers; (ii) Surrounds for Access chambers;	GEN3 as stated in Appendix 5/1 GEN3 as stated in Appendix 5/1

Table 26/1 - 2 Standardised Prescribed Concrete Mixes						
1.	Standard mix	ST1	ST2	ST3	ST4	ST5
2.	Characteristic strength	C6/8	C8/10	C12/15	C16/20	C20/25
3.	Cement Designation (BS8500) complying with BS EN 197-1	CEM I	CEM I	CEM I	CEM I	CEM I
4.	Nominal maximum size of aggregate mm	20	20	20	20	20
5.	Types of aggregate:	BS EN 12620: 2002	BS EN 12620: 2002	BS EN 12620: 2002	BS EN 12620: 2002	BS EN 12620: 2002
6.	Workability Slump	50mm	50mm	50mm	50mm	50mm
7.	Quality assurance requirements	-	-	-	-	-
8.	Other requirements					
	a) Admixtures: (Complying with BS EN 934)	ALL	ALL	ALL	ALL	ALL

Specified Prohibited (Unless approved by Engineer) Amount					
b) Temperature of fresh Concrete					
- Maximum	32	32	32	32	32
- Minimum	5	5	5	5	5
c) Additional requirements					

Appendix A: Permanent Water Treatment Plant Works – Civils Specification

A.1 Overview

This specification only relates the installation of the rising main, break chamber and outfall and their associated civils works. The design of the pumping station, stripping plant, feeder pipe (between pumping station and stripping plant) and rising mains are to meet the requirements as set out in the Permanent Water Treatment Works Performance Specification VNIF-ARP-ZZ-YYY-SP-MP-0001.

Construction of this drainage network should be in accordance with Series 500 of this specification, and supplemented with specific information set out here.

A.2 Design Standards

The following design standards shall apply:

- Permanent Water Treatment Works Performance Specification VNIF-ARP-ZZ-YYY-SP-MP-0001.
- Sewerage Sector Guidance Appendix C v2.1 (known as Design and Construction Guide, DCG). Although specific sections of DCG are referenced within this specification for clarity, the entire document shall apply unless specifically excluded.
- Standards for Highways Series 500.
- BS 8204-2:2003 + A2:2011

A.3 Pumping System

The pumping station shall be manufactured and assembled as a full packaged solution by the supplier, including any feeder pipes and rising mains – as per Permanent Water Treatment Works Performance Specification VNIF-ARP-ZZ-YYY-SP-MP-0001.

A.4 Rising Main

The rising main shall be installed in accordance with DCG Part D6 and Part E, unless otherwise specified by VNIF-ARP-ZZ-YYY-SP-MP-0001.

The rising main should be laid to a minimum gradient of 1:500 rising and 1:300 falling, with sewerage-type air release valves provided at high points to facilitate air removal. However, a continuously-rising pipeline without air valves is preferred – as per DCG Part D6.3.

Minimum depths of cover to the crown of rising mains without protection should be as follows:

- 0.9m landscaped areas
- 1.2m highways and parking areas

For rising mains, non-degradable marker tape should be laid 300mm above the top of pipe. For non-metal mains, the marker tape should incorporate a trace wire as per DCG Part D6.1.

Thrust blocks and/or self-anchoring joints to be designed and installed as per Suppliers requirements to fulfil the Permanent Water Treatment Works Performance Specification VNIF-ARP-ZZ-YYY-SP-MP-0001, and in accordance with DCG Part E5.7.

Pipework materials and specification shall be in accordance with the Permanent Water Treatment Works Performance Specification VNIF-ARP-ZZ-YYY-SP-MP-0001, and DCG Part B7 & B8.

As per DCG Part E2, polyethylene pressure pipes for rising mains shall comply with the relevant provisions of BS EN 12201-2. The colour shall be black. For full material requirements see Permanent Water Treatment Works Performance Specification VNIF-ARP-ZZ-YYY-SP-MP-0001.

A.5 Break Chamber

A high strength concrete topping in the Break Chambers is required. The concrete surface of the benching and channels is to be finished with a 20mm minimum thick wearing screed, neatly shaped and finished to all branch connections and applied with a steel trowel. The wearing screed shall be produced, laid and finished in accordance with the relevant provisions of BS 8204-2:2003 +A2:2011. The classification of the abrasion resistance shall be Class AR2 to Table 3. The screed may be applied either as monolithic or separately laid and bonded.