Technical design note

Project name	North Star Academy		
Design note title	Cut-off Barrier Specification		
Document reference	23941-HYD-XX-XX-TN-GE-1004		
Author	Tim Hatrey & Simon Calkin		
Revision	C01		
Date	15 March 2024	Approved	✓

1. Introduction

Hydrock has been commissioned by ISG Ltd to provide the specification for a slurry wall/ cut off trench which is to be installed at the North Star Academy site in Sea Mills, Bristol.

The slurry cut-off wall is required to act as an impermeable barrier to stop the movement of percolating surface waters moving through the Made Ground which underlies the existing school structure.

Elevated concentrations of sulphate were found to be pervasive within the recently deposited Made Ground. It is of note that no elevated sulphate concentrations were identified in the ground during ground investigation undertaken prior to demolition This Made Ground is considered to have been derived from the demolition of the previous structure on the site. Building materials such as plasterboard and plaster both contain Gypsum which is a sulphate mineral.

The characteristic value determined was a concentration of 900mg/l of soluble sulphate. This is not considered a risk to human health or to the environment for this development. However, the high sulphate levels can create aggressive ground conditions with respect to the durability of buried concrete. The original concrete design was based on historical ground investigation information which yielded a DS-1-AC-1 concrete classification. However, based on recent testing, DS-2-AC-2 concrete is recommended as the placed concrete is now in contact with Made Ground. The risk of sulphate attack is governed by the movement of water which mobilises the sulphate in solution. Groundwater is not recorded during previous investigations and is therefore expected to be at depth below 3.15m bgl. Some water seepage was noted from the Made Ground but this is anticipated to be localised pockets of perched water. Even in unsaturated ground sulphate can migrate by diffusion provided there is sufficient water to coat particles of soil. It is considered unlikely that the groundwater below the site will mobilise the sulphate in solution and the key risk is percolating surface water entering through the unsaturated Made Ground.

The proposed solution is to provide a continuous containment wall around the building. This impermeable barrier is to be installed around the exterior of the building in order to break the pathway by cutting off the mobilisation of sulphates through groundwater solution. The containment wall will comprise of both a bentonite slurry wall and a sulphate resistant concrete wall, used to form retaining walls.

2. Extend of the Slurry Cut-off Wall

The containment wall needs to encircle the building as a continuous barrier. The wall needs to fully penetrate the Made Ground and extend a minimum of 300mm into the underlying natural soils. The required depths of the slurry wall are provided on Hydrock drawing FS0779-HYD-XX-ZZ-DR-C-7010 and are based on the depths the of Made Ground encountered during the foundation inspection. No investigation has been undertaken to confirm the depths along the proposed slurry wall alignment. The slurry wall and concrete walls will be a minimum of 600mm in width.

The wall will be formed from a bentonite slurry filled trench or a retaining wall formed with sulphate resistant concrete. The details of the external retaining walls are provided on Hydrock drawing FS0779-HYD-XX-ZZ-DR-S-2005.

The alignment of the slurry was is provided in drawing FS0779-STL-XX-ZZ-DR-L-9400 and will fully incircle the building. The alignment of the slurry cut-off wall has been refined based on the drainage and services design in order to minimise the number of drainage and service penetrations. A concrete wall will be used where there are a number of service penetrations such as on the north west of the structure. Where the containment barrier changes in composition between concrete and bentonite cement the join will need to be covered with a waterproof membrane - Coltex waterproof composite. The composite will need to cover the full length of the join and be extended 0.5m either side. A detail of the composite is shown in Hydrock drawing FS0779-HYD-XX-ZZ-DR-C-7104.

Where there is risk of desiccation within the top 0.5m of the curing slurry wall, The desiccated slurry will not provide a fully waterproof barrier and therefore the effects of desiccation shall be mitigated by installing a composite on the outside of the slurry wall (0.5m deep) once the grout has hardened. The composite will be lapped over the slurry wall and up to the underside of the asphalt layer. This is required to prevent the percolation or draining of water through the granular sub-base to the inside of the containment wall We recommend the use of Voltex Waterproofing composite is used. The trench should be backfilled with cohesive or sand material to protect the integrity of the membrane. A detail is provided on Hydrock drawing FS0779-HYD-XX-ZZ-DR-C-7103. Between the wall and the structure, the ground shall be encapsulated by impermeable hardstanding with a fall in level that directs surface water away from the building. A general section of the proposed slurry wall is provided in Hydrock drawing FS0779-HYD-XX-ZZ-DR-C-7301 and a plan showing the slurry wall alignment is shown in drawing FS0779-HYD-XX-ZZ-DR-C-7200, which is appended to this document.

The slurry cut-off wall must be stiff enough to offer resistance to penetration by tree roots. It is recognised that nature has a capacity to grow roots into fractured rock in its search for nutrients and water. Roots are however less likely to penetrate through hard unfractured / un-fissured material that is low in moisture content and devoid of nutrients, such as this artificially cemented grout. Should a root penetrate into the cut-off wall, it is considered unlikely that it will cause major perforation, as a root will effectively fill the gap it generates. Any localised shrinkage or cracking of material around such a root within the wall would be regarded as negligible when considering the whole mass of the buried structure.

3. Slurry Wall Specification

The slurry wall must achieve the following criteria:

- Be relatively impermeable, with a permeability, k of less than $1x10^{-8}$ m/s
- Must not be prone to desiccation (based on moisture contents, Atterberg Limit testing, and observations). Top 0.5m of wall where desiccation is prone during curing shall be modified with membrane barrier to ensure impermeability within this zone.
- Be of High strength with a minimum undrained shear strength, Cu of 150kPa or equivalent to a UCS derived unconfined compressive strength of 300kPa.
- Must have a design life of 60 years.

4. Compliance Testing

Hydrock must be provided with a method statement of installation and specification of the slurry wall by the supplier - Keller Group.

Base on the slurry wall alignment (approximately 190m) and the average depth (1.65m) of Made Ground around the building it is estimated that the volume of slurry required will be approximately $190m^3$.

Samples of the slurry should be collected in U100 or thin wall sample tubes and tested in an accredited geotechnical laboratory.

In order to confirm that the slurry used has achieved the required specification, a testing schedule has been set out in Table 4-1. The expectation is that suitable strength shall be achieved between 28 & 90 days:

Table 4-1: Bentonite Slurry Testing Schedule.

Test	Testing frequency	Age of sample tested
Moisture Content and Atterberg Limit Determination	1 per 40m^3	8 days 15 days 28 days 90 days
Compressive Strength Triaxial Test with Permeability Determination	1 per 40m^3	
Defined and tested in accordance with: BS 1377: 1990 BS EN ISO 17892-12:2018 BS EN ISO 17892 **The results of all the testing should be provided to Hydrock for review.**		

5. Maintenance

During the lifespan of the slurry wall it is anticipated that sections of the wall will need to be excavated to allow for additional service connections or repair works. In this situation the contractor should be made aware of the slurry wall and the requirements for reinstatement.

Any excavations cutting though the slurry wall will need to be reinstated with low permeability and low shrinkage grout such as KM Readigrout or Fosroc Conbextra which are readily available.

Appendix A - Drawings

ATTENUATION TANK - AT-01
IMPERMEABLE DRAINED AREA
SRP = 1 IN 100 YR + 40% CLIMATE CHANGE.
STORAGE PROVIDED IN CELLULAR STORAGE CRATES.
350m² x 1m DEEP.
CL = 35.500
IL(IN) = 34.000
TOP OF TANK = 35.000
BASE OF TANK = 34.000

-550mm BELOW GROUND LOCALLY

FW-13
B125 CVR
CL: 36.800
IL: 35.600

YARD GULLY ADDED TO SEATING AREA

CHANNEL RELOCATED TO OTHER SIDE OF CROSSING

SERVICE PENETRATIONS THROUGH BENTONITE WALL SEE DRAWING FS0779-HYD-XX-ZZ-DR-C-7104

EXSW-04
B125 CVR
CL: 37.150
IL: 36.150

SW-05
D400 CVR
CL: 37.425
IL: 36.300

LAND DRAIN TO BE CONNECTED TO INLET PIPE LOCALLY

-470mm BELOW GROUND LOCALLY

4 No. DRAINAGE PENETRATIONS THROUGH SLURRY WALL

ADDITIONAL CHANNELS ADDED NORTHEAST DUE TO NO DRAINAGE ALLOWANCE

ADDITIONAL CHANNEL ADDED DUE TO NO DRAINAGE ALLOWANCE

PATH TO RUN OFF TO SOFT

CONFIRMATION REQUIRED TO CONFIRM INSTALLATION OF FLOW CONTROL DEVICE

EXSW-06
FLOW CONTROL
B125 CVR
CL: 35.000
IL: 34.000

SHED DRAINAGE DRAINAGE CONNECTION NOT REQUIRED.

FLOW CONTROL CHAMBER TO VENT IN PLACE OF THE EXISTING ATTENUATION

EXSW-30
SILT TRAP
B125 CVR
CL: 36.850
IL: 34.875

EXFW-01
B125 CVR
CL: 36.970
IL: 36.100

UNKNOWN RUN REDUNDENT AND CAP OFF AS PART OF NEW WORKS

STACK TO RUN ABOVE GROUND. TBC

ADDITIONAL CHANNEL ADDED

EXFW-02
B125 CVR
CL: 36.850
IL: 35.550

EXFW-03
B125 CVR
CL: 36.850
IL: 36.050

EXFW-05
B125 CVR
RECESSED
CL: 36.850
BD: 36.150
IL: 35.250

EXFW-06
B125 CVR
RECESSED
CL: 36.850
IL: 35.200

EXFW-07
B125 CVR
CL: 36.850
IL: 35.000

EXSW-07
B125 CVR
CL: 34.260
IL: 33.630

DRAINAGE PENETRATIONS THROUGH CONCRETE WALL SEE DRAWING FS0779-HYD-XX-ZZ-DR-C-7104

EXFW-08
B125 CVR
CL: 34.130
IL: 33.550

EXSW-02
B125 CVR
RECESSED
CL: 36.850
IL: 35.750

ALLOWANCE TO BE MADE FOR DOWNPIPE AND THRESHOLD BRANCH CONNECTIONS. SOME EXISTING PRESENT HOWEVER SHOWN NOT TO ALIGN

EXFW-04
B125 CVR
CL: 36.850
IL: 36.200

FFL: 36.850

UNKNOWN RUN CONFIRMATION DRAIN IS REDUNDANT AND TO BE CAPPED AT MANHOLE

EXFWMH
CL: 34.010
IL: TBC

EXSWMH
CL: 34.010
IL: TBC

STACK TO RUN ABOVE GROUND. TBC

CAPPED DRAINAGE FOR FUTURE CONNECTION

DUE TO REQUIRED LOCATION OF SLURRY WALL, DRAINAGE RUN TO BE RELOCATED WITHIN THE PERIMETER OF SLURRY WALL

STACK OUT OF PLACE BY 2m. NEW RUN TO BRANCH ONTO EXISTING STACK AND CAPPED

EXFW-10
B125 CVR
CL: 36.850
IL: 36.100

EXFW-12
B125 CVR
CL: 34.420
IL: 33.600

EXSW-01
B125 CVR
RECESSED
CL: 36.850
IL: 36.000

EXFW-09
B125 CVR
RECESSED
CL: 36.850
IL: 36.300

EXFW-11
B125 CVR
CL: 36.850
BD: 35.950
IL: 34.650

DRAINAGE PENETRATIONS THROUGH CONCRETE WALL SEE DRAWING FS0779-HYD-XX-ZZ-DR-C-7104

SW-101
B125 CVR
CL: 36.850
IL: 36.260

ALTERNATIVE ROUTE FOR THE SURFACE WATER DRAINAGE DUE TO WESSEX WATER REJECTING CLEGG'S STRATEGY. NO PRE-DEV OR S106 SUBMITTED IN PREVIOUS SCHEME. AWAITING CONFIRMATION BETWEEN DFE AND WW ON AGREEMENT INCLUDING TEMPORARY DISCHARGE AT THE CURRENT LOCATION PRIOR TO REROUTING WORKS

ALLOWANCE TO BE MADE TO REPLACE ALL COVER FRAMES. SOME RUSTED DURING IDLE TIME.

CONDITION OF ALL EXISTING DRAINAGE UNKNOWN. CCTV SURVEY TO CONFIRM.

SURFACE WATER RUN-OFF FROM STAIRS TO FOLLOW EXCEEDANCE ROUTES INTO GRAVEL FILTER TRENCH

ADDITIONAL CHAMBERS / RUNS ADDED DUE TO ADDITIONAL DOWNPIPES

SW-100
B125 CVR
CL: 36.850
IL: 36.355

RISK
DRAINAGE FOR EXISTING HARD STANDING TBC

FILTER TRENCH TO EDGE OF EXISTING HARDSTANDING

N 177251.162

UNABLE TO SURVEY - DENSE VEGETATION

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

This list is not an exhaustive register of all hazards or risks present, it identifies only the significant risks remaining following the internal risk assessment undertaken by the project designers. It should be considered alongside the typical risks and hazards that a competent and experienced contractor would expect to be present during such construction related activity.

CONSTRUCTION
The Contractor's attention is drawn to the following Health and Safety risk.
1. Working adjacent to a live roads.
2. Working in proximity of underground services. (refer to services plans for further information).
3. Working adjacent to steep slopes (Soft landscaping in areas are proposed to be 1:2 gradient)
4. Working in soils with high sulphate content
5. Working in confined spaces. (Proposed chambers and space restricted external areas).

Maintenance/Cleaning*
- None that would not be identified by a competent contractor.

*For further information relating to end use, maintenance & demolition, see the Health and Safety File.

All works should be undertaken in accordance with the Construction (Design & Management) Regulations 2015.

LEGEND - DRAINAGE

PROPOSED DRAINAGE - FOUL

100Ø@1:100 — FOUL WATER DRAIN - **PVCu**
Approx. gradient and diameter as noted, 100mm Ø UNO

FW-01 — FOUL WATER MANHOLE
PC Ring 1.2m Ø UNO

FW-01 — FOUL WATER INSPECTION CHAMBER
PVCu 450mm Ø. Max 1.2m depth - reduced access to 3.0m
Connections over 150mm - chamber to be **RANGE 600**
NOTE: Drawn to 900mm Ø for clarity

Note: All internal foul MH's and IC's to have recessed covers. double sealed and locking to prevent odours. Refer to layout for location.

SAC — FOUL WATER SHALLOW ACCESS CHAMBER
Max depth to invert 600mm from GL, 300mm Ø

YG — FOUL YARD GULLY (to be trapped)
Gully reference as noted on drawing.
Cover grade to suit loading.

FD — FLOOR DRAIN (to be trapped)
Internal use only, refer to architect for details / specification.
Roddable from above slab into standard (01) fitting.
Floor Drain / Gully to be kept charged to avoid odours.

01 & 01A — FOUL OUTLET / STACK POSITION
Shown indicative, refer to architect for setting out.
All branches 100mm Ø UNO.
01 - Outlet connects into standard 90° rest bend.
01A - Indicates access required in above slab plumbing for rodding, refer to service engineers drawings for details.
SVP - Indicates soil vent pipe by service engineer; with access.

PROPOSED DRAINAGE - STORM

150Ø@1:100 — STORM WATER DRAIN - **PVCu**
(Structured walled pipe required at diameter >150mm)
Approx. gradient and diameter as noted, 100mm Ø UNO

STORM WATER DRAIN / CHAMBER TO BE RELOCATED DUE TO CLASH WITH SLURRY WALL

SW-01 — STORM WATER MANHOLE
PC Ring 1.2m Ø UNO

SW-01 — STORM WATER INSPECTION CHAMBER
PVCu 450mm Ø. Max 1.2m depth - reduced access to 3.0m
Connections over 150mm - chamber to be **RANGE 600**
NOTE: Drawn to 900mm Ø for clarity

RE — STORM RODDING EYE
Ø as noted

SILT TRAP

CONCRETE ENCASEMENT TO PIPE
Refer to limits of cover table drawing 7101

01 & 01A — RAIN WATER OUTLET
Shown indicative, refer to architect for setting out.
Branch Ø to suit RWO diameter.
01 - Outlet connects into standard 90° rest bend.
01A - Indicates access required in above slab plumbing for rodding, refer to service engineers drawings for details.

AG — RAIN WATER OUTLET ACCESS GULLY
Branch Ø to be max 100mm .
AG - Outlet connects to gully.

RG — ROAD GULLY (to be trapped)

YG — YARD GULLY (to be trapped)

PG — PAVED AREA GULLY (to be trapped)

DC — DRAINAGE CHANNEL
(Refer to layout for specification)

TH — THRESHOLD DRAINAGE CHANNEL
(Assumed not required. Architect to confirm.
Refer to architect for details / specification)

INDICATES EXTENT OF SLURRY WALL

INDICATES DRAINAGE CROSSING/PENETRATION OF SLURRY WALL

TOPSOIL COVERED GRAVEL FILTER DRAIN DETAIL WITH PERORATED PIPE

00.00 — INVERT LEVEL OF BENTONITE WALL

PUBLIC AND PRIVATE EXISTING DRAINAGE

150Ø@1:100 — EXISTING PUBLIC FOUL SEWER

150Ø@1:100 — EXISTING PUBLIC STORM SEWER

150Ø@1:100 — EXISTING PUBLIC COMBINED SEWER

150Ø@1:100 — EXISTING PRIVATE FOUL SEWER

150Ø@1:100 — EXISTING PRIVATE STORM SEWER

FOUNDATIONS

INDICATES PIPE THROUGH FOUNDATION

T.O.F. 0.000 — TOP OF FOUNDATION (TYPICAL)

KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. Levels shown in metres above Ordnance Datum (mAOD).
5. All private drainage to comply with current Building Regulations, BS EN-752 Drain and Sewer systems outside Buildings and other relevant British Standards and Codes of Practices.
6. All external drainage within trafficked areas with less than 1.2m cover to have type Z concrete bed and surround. All external drainage within landscaped areas with cover less than 0.6m to have type Z concrete bed and surround. All drainage with greater than the minimum required to have type S bed and surround.
7. All drainage to be laid soffit to soffit unless otherwise shown.
8. The Contractor is to verify the line, level and diameter of existing sewers before commencing drainage works.
9. All foul drainage to be minimum 100mm diameter, all surface water drainage to be minimum 150mm diameter unless otherwise shown.
10. Cover levels shown on this drawing refer to approximate surface levels. It is the contractors responsibility to ensure that access covers and frames are set at the final surface levels.
11. Where possible the contractor is to orientate manhole biscuits and covers to locate them parallel to kerbs and paving.
12. The Contractor should comply with hs(g) 47 "Avoiding Danger from Underground Services" when excavating around existing services.
13. It is the contractors responsibility to determine the location and depth of all existing services, mains and cables prior to construction.
14. Contractor to provide temporary screens in each of the down stream manholes during the construction period of the development in accordance with SFA 2.9.10 and the local sewerage undertakers requirements.
15. All in-situ concrete and precast concrete components to be manufactured using Sulphate Resisting Portland Cement, (SRPC) to BS 4027, if required, subject to soil conditions. Manhole components to be to BS EN 1917:2002.
16. All ironwork to be kite marked by BSI or certified by equal inspection authority.
17. All redundant connections to be capped off and grouted from the down stream manhole.
18. All new drainage pipes to be jetted, CCTV surveyed with DVD recording and any defects highlighted to the supervising officer. Following the rectification of any defects, the drain is to be re-surveyed with CCTV and the recordings made available to the project manager/engineer.
19. Prior to commencing the works the contractor is to confirm details of the existing drainage system as noted on the drawing.
20. Prior to commencing the works the contractor is to undertake the drainage investigation work as noted on the drawing.

REV						
C04	LEGEND AMENDED, BENTONITE WALL BASE LEVELS ADDED, FD ADDED TO CYCLESHED.					
	C.HOPKINSON	05/03/24	J.GAGE	06/03/24	J.MAGEE	06/03/24
C03	DRAINAGE UPDATED TO SOLUM INFORMATION. 3m EASEMENT CONVERTED TO PROPOSED. FILTER DRAIN ADDED TO CYCLE SHED. CONCRETE WALLS ADDED TO DRAINAGE BY NORTHERN AND SOUHTERN STEPS. FILTER DRAIN ADDED TO LEGEND.					
	J.SHIMMIN	29/02/24	J.MAGEE	29/02/24	J.MAGEE	29/02/24
C02	ISSUED FOR CONSTRUCTION.					
	J.SHIMMIN	19/10/23	D.WEBB	19/10/23	J.MAGEE	19/10/23
C01	ISSUED FOR CONSTRUCTION.					
	B.MURPHY	23/08/23	D.WEBB	23/08/23	J.MAGEE	23/08/23
P04	LEVELS UPDATED FOLLOWING LANDSCAPE LAYOUT					
	J.SHIMMIN	17/08/23	D.WEBB	17/08/23	J.MAGEE	
P03	DRAINAGE UPDATED FOLLOWING CCTV AND LANDSCAPE LAYOUT					
	J.MAGEE	20/10/22	J.MAGEE	20/10/22		
P02	VOLUME UPDATED FROM 00 TO XX					
	J.NEAL-LONG	12/10/22	J.MAGEE	12/10/22	J.MAGEE	12/10/22
	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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CLIENT
ISG

PROJECT
NORTH STAR ACADEMY

TITLE
DRAINAGE LAYOUT

HYDROCK PROJECT NO.
C-23941

SCALE @ A1
1:200

STATUS DESCRIPTION
SUITABLE FOR CONSTRUCTION

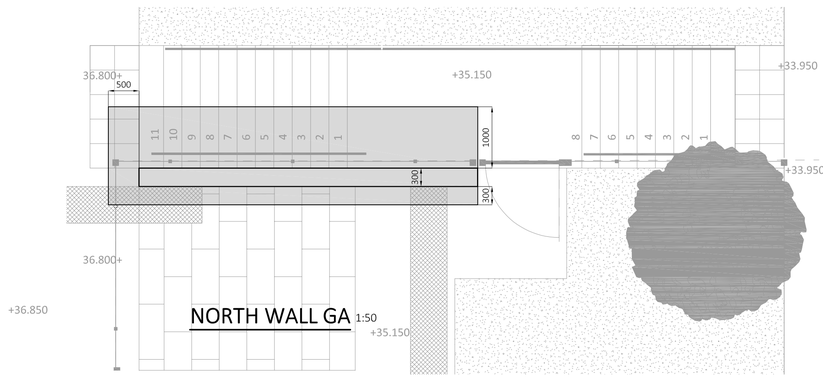
STATUS
A5

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
FS0779-HYD-XX-ZZ-DR-C-7010

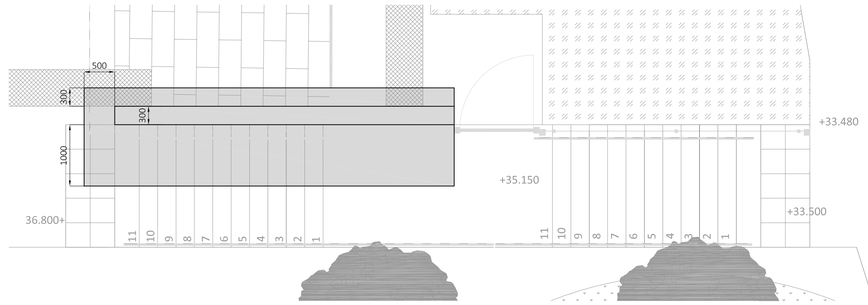
REVISION
C04

REINFORCEMENT SCHEDULE

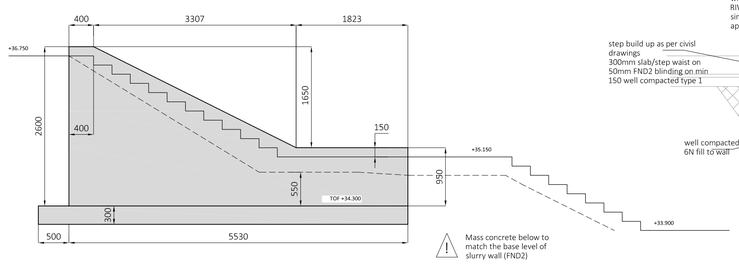
Member	Mark	Type & size	No off	No in each	Total no	Length mm	Shape code	A mm	B mm	C mm	D mm	E/R mm	Wt kg	Rev letter
NORTH WALL	01	B 12	1	58	58	1375	11	500					70.8	C2
	02	B 10	2	31	62	1025	21	450	165				39.1	C2
	03	B 8	1	29	29	850	21	350	165				9.7	C2
	04	B 10	1	2	2	5425	00	5425					6.7	C2
	05	B 10	1	19	19	825	21	350	165				9.7	C2
SOUTH WALL	01	B 12	1	58	58	1375	11	500					70.8	
	02	B 10	2	31	62	1025	21	450	165				39.1	C2
	03	B 8	1	29	29	850	21	350	165				9.7	C2
	04	B 10	1	2	2	5425	00	5425					6.7	C2
	05	B 10	1	19	19	825	21	350	165				9.7	C2



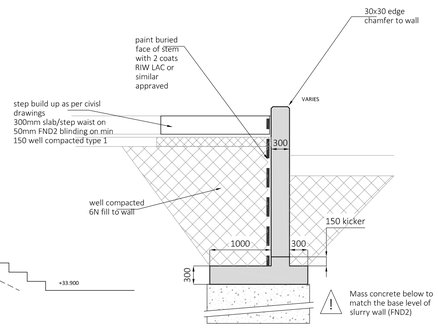
NORTH WALL GA 1:50



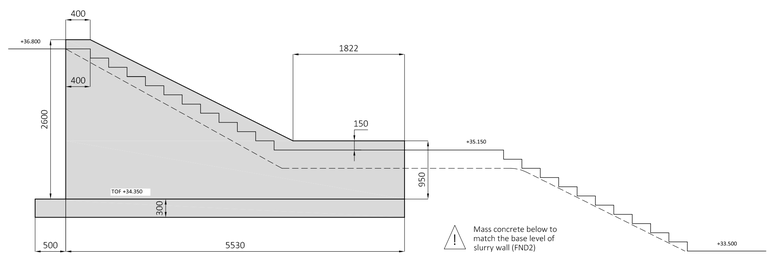
SOUTH WALL GA 1:50



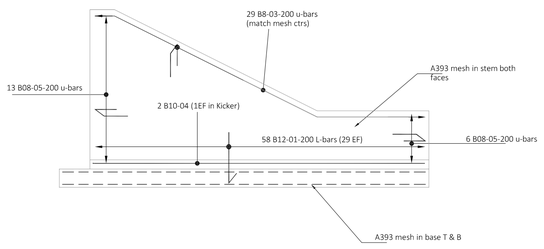
NORTH WALL ELEVATION 1:50

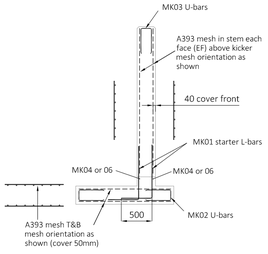


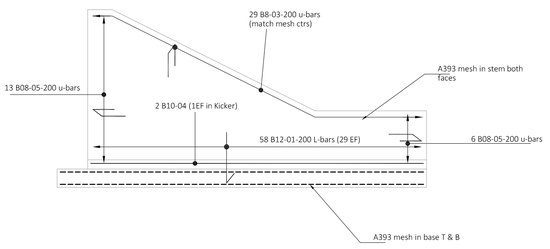
TYPICAL SECTION 1:50

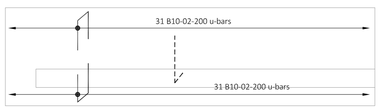


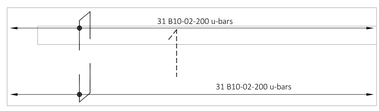
SOUTH WALL ELEVATION 1:50











KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification.
   Figured dimensions only are to be taken from this drawing.
2. This drawing is to be read in conjunction with all relevant engineers' and service engineers' drawings and specifications.
   This drawing is copyright.

Reinforcement Notes:

1. Do not scale from this drawing.
2. All work to comply with the relevant British Standards, Codes of practise and Building Regulations.
3. Reinforcement shall be High Yield steel denoted (B) in accordance with BS 4449.
   Fabric reinforcement to be in accordance with BS 4483.
   Bending of reinforcement to be in accordance with BS 8666.
4. Minimum cover to all reinforcement to be :
   Stem: top & front face 40mm, rear face: 50mm
   base : 50mm
5. Concrete specification
   Specialist mix
   Strength Class C28/35 ,
   Design chemical class: DC2
6. Minimum bar laps below,
   use good bond
   mesh lapps 450mm
7. A393 mesh throughout in stem each face (EF)
   A393 mesh throughout in base top & bottom

REVISIONS

	LAP						
BAR Ø	8	10	12	16	20	25	32
GOOD	320	440	570	830	1090	1410	1800
POOR	450	630	810	1180	1550	2010	2570

	ANCHORAGE						
BAR Ø	8	10	12	16	20	25	32
GOOD	300	380	450	600	750	940	1200
POOR	420	540	650	860	1070	1340	1720

FENCING / BARRIERS & ASSOCIATED FIXINGS TO SPECIALIST S/C DEISGN

REV	REVISION NOTES/COMMENTS					
STA.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
C2	ISSUED FOR CONSTRUCTION	RM	22.01.24	ZP	22.01.24	RM	22.01.24
C1	ISSUED FOR CONSTRUCTION	RM	26.10.23	ZP	26.10.23	RM	26.10.23

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CLIENT
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PROJECT
North Star Academy Coombe
Dingle-Bristol

TITLE
External Retaining Wall
RC Details - Sections & Plans

HYDROCK PROJECT NO.
C-23941

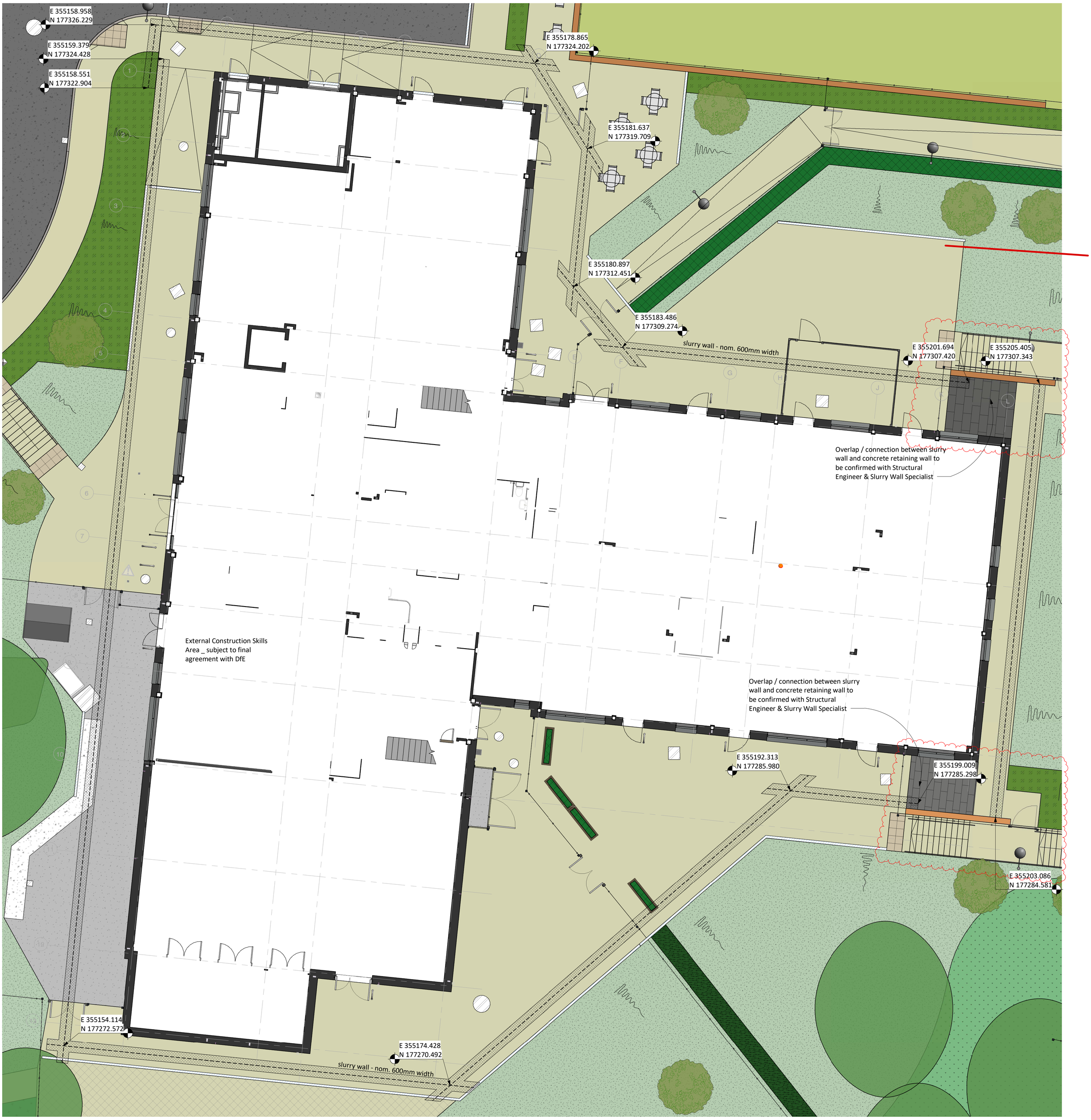
SCALE @ A1
1:50

STATUS DESCRIPTION
CONTRACTUAL (FULL APPROVAL)

STATUS
A5

DRAWING NO.
FS0779-HYD-XX-ZZ-DR-S-2005

REVISION
C02



9400_Slurry Wall Layout

1 : 100

NB :
NE readings are based on centre of slurry wall.

CDM 2015 Risk Summary Table

Refer to STL designers CDM 2015 - Hazard Awareness & Risk Identification (HARI) Checklist: ***FS0779-STL-XX-XX-HS-A-0001*** for a full list of risks. Risks listed below apply to this plan only

Refer also to the ISG rolling risk register: ***North Star Academy rolling risk register***

Ref	Risk Description
A01	Steep banking slope to site
A02	Vehicles turning adjacent to walkway.
A08	Risk of students climbing fencing
A22	Risk of students climbing handrails or falling down stairwell in double height spaces.

STATUS	REV	DATE	DESCRIPTION
A5	C03	24/01/24	Construction Issue
S4	P08	03/11/23	General update to reflect / capture comments and design team co-ordination
S2	P05	17/10/23	Issued for Information
S2	P03	17/08/23	Issued for Information

CLIENT

REVISED BY: LC

CHECKED BY: GMcK

ORIGINATOR NO: 155521

CONSULTANT

STRIDE TREGLOWN

www.stridetreglown.com

PROJECT

North Star Academy
Hallen Drive, Sea Mills, Bristol, BS9 2NT

DRAWING TITLE

External Slurry Wall Layout

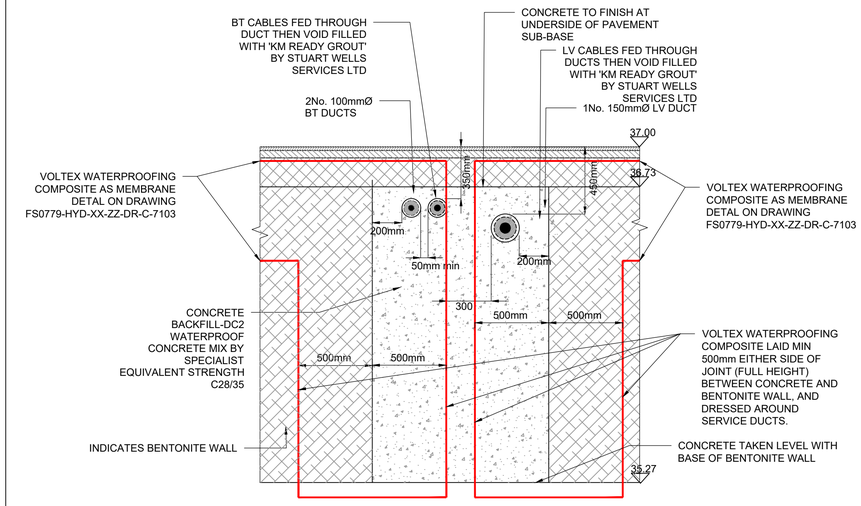
STATUS CODE: A5 : Authorized and accepted

SCALE: 1 : 100@A1

DRAWING USAGE: *Construction*

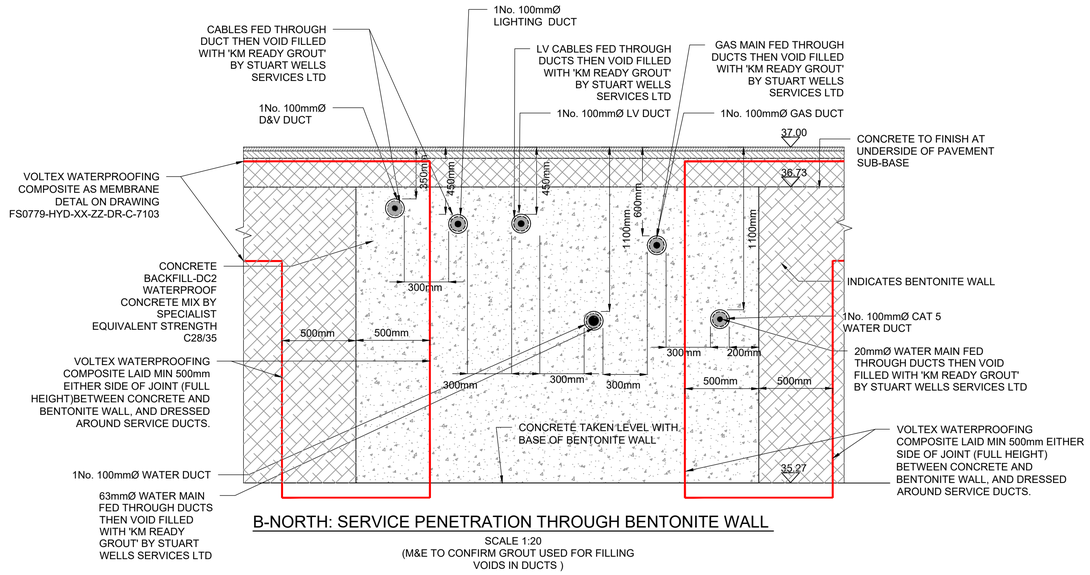
PROJECT - ORIGINATOR - VOLUME - LEVEL - TYPE - ROLE - NUMBER: FS0779-STL-XX-ZZ-DR-L-9400

STATUS _ REVISION: A5_C03



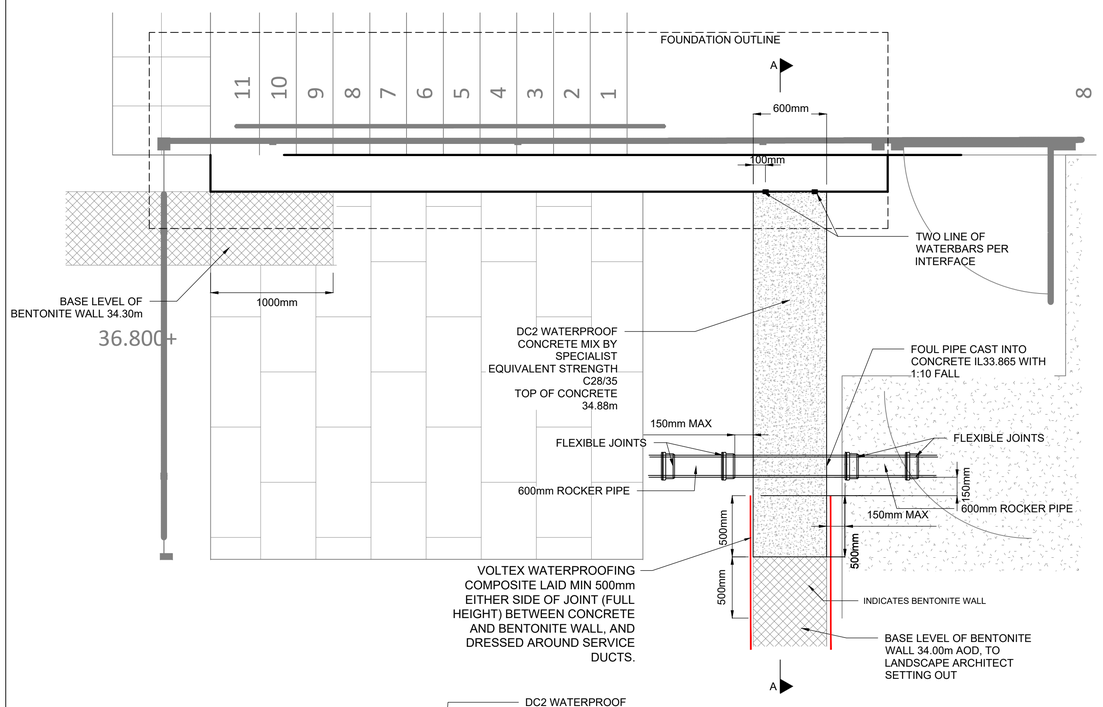
A-WEST: SERVICE PENETRATION THROUGH BENTONITE WALL

SCALE 1:20
(M&E TO CONFIRM GROUT USED FOR FILLING VOIDS IN DUCTS)



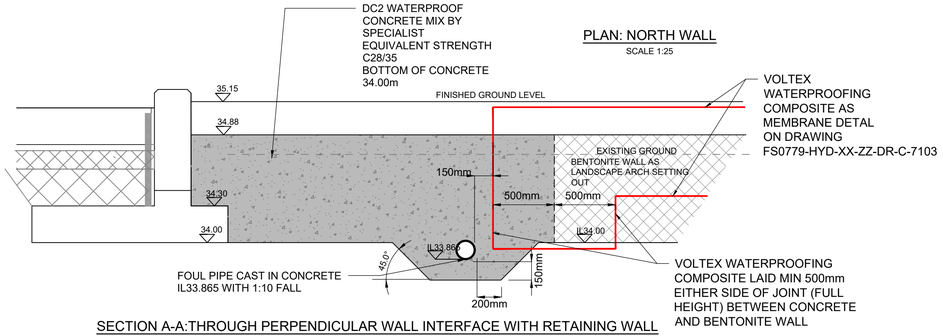
B-NORTH: SERVICE PENETRATION THROUGH BENTONITE WALL

SCALE 1:20
(M&E TO CONFIRM GROUT USED FOR FILLING VOIDS IN DUCTS)



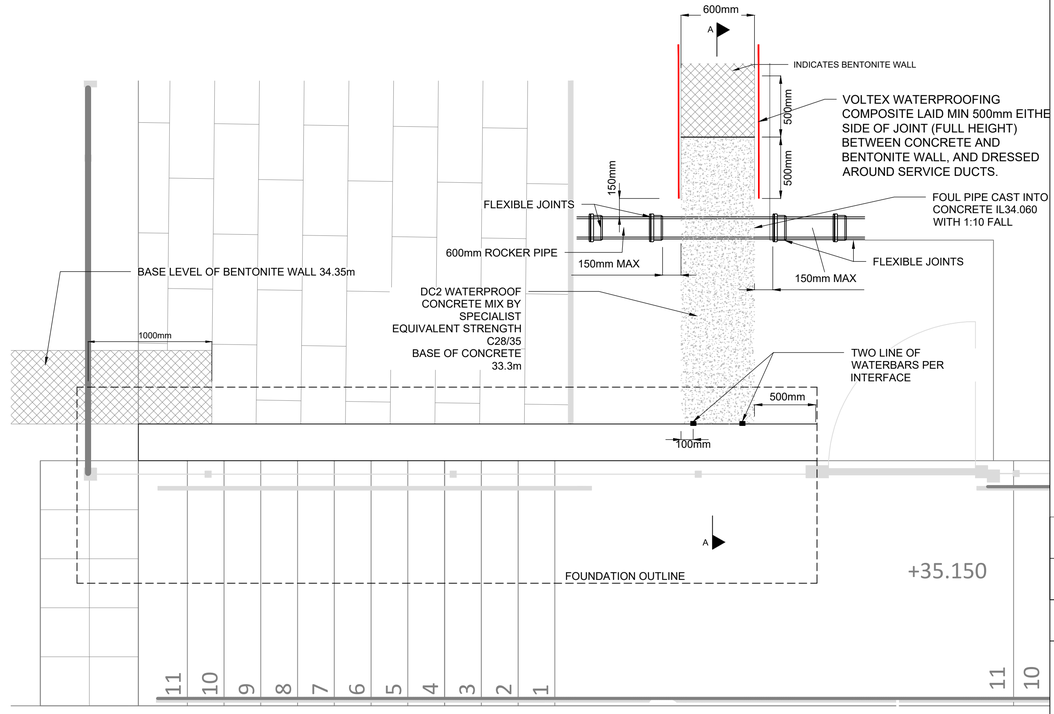
PLAN: NORTH WALL

SCALE 1:25



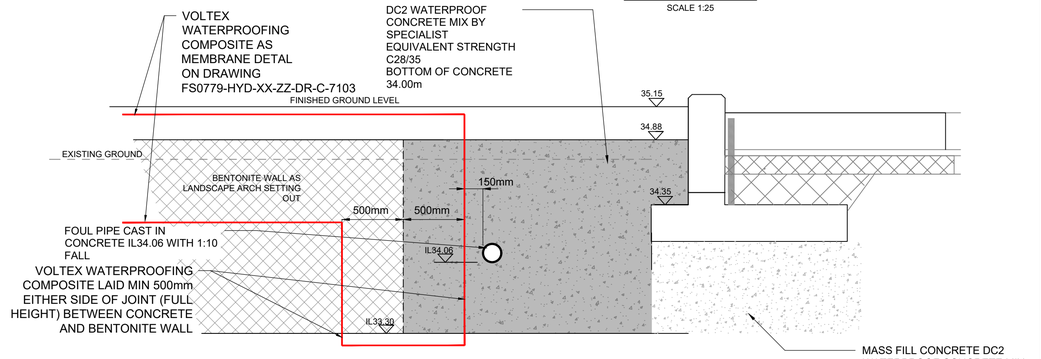
SECTION A-A:THROUGH PERPENDICULAR WALL INTERFACE WITH RETAINING WALL

SCALE 1:25



PLAN: SOUTH WALL

SCALE 1:25



SECTION A-A:THROUGH PERPENDICULAR WALL INTERFACE WITH RETAINING WALL

SCALE 1:25

KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. The DWG file is issued for the purposes of coordination only and do not represent formal drawing issue and are not to be reprinted in any form. Formal issue of drawings is via DWF, Adobe PDF files and/or hard copies and their associated information issue sheets.
3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.

REV						
C02	SERVICE PENETRATION DETAIL AMENDED					
	C.HOPKINSON	05.03.24	J.GAGE	06.03.24	J.MAGEE	06.03.24
C01	ISSUED FOR CONSTRUCTION.					
	J.GAGE	01.03.24	J.GAGE	01.03.24	J.MAGEE	01.03.24
REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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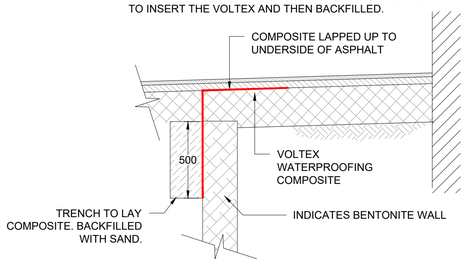
CLIENT
ISG

PROJECT
NORTH STAR ACADEMY

TITLE
DRAINAGE DETAILS
SHEET 5

HYDROCK PROJECT NO.	SCALE @ A1
C-23941	AS SHOWN
STATUS DESCRIPTION: SUITABLE FOR CONSTRUCTION	STATUS: A5
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): FS0779-HYD-XX-ZZ-DR-C-7104	REVISION: C02

VOLTEX SHOULD BE LAID AFTER THE CONTAINMENT WALL HAS CURED. TRENCH TO BE DUG TO THE REQUIRED DEPTH TO INSERT THE VOLTEX AND THEN BACKFILLED.



MEMBRANE DETAIL: LAPPED OVER BENTONITE WALL

SCALE 1:20

KEY PLAN

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
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3. Note that all care has been taken with the export of DWG files and their content, but we recommend that you make due dimensional checks before using any DWG file information. Any errors found are to be reported to Hydrock immediately.
4. CBR values in accordance with SI report. contractor to inform engineer of any soft spots during construction.
5. In the event of any contradiction between this drawing and the specification, then the contractor shall seek clarification from the engineer before proceeding.
6. All in-situ concrete and precast concrete components to be manufactured using sulphate resisting portland cement (srpc) to BS 4027, if required, subject to soil conditions.
7. Refer to landscape architects drawings for extent of external surfaces and kerbing.
8. Drainage trenches within traffic areas and footways or in areas to be adopted shall be backfilled using granular type 1 material up to the road formation level.
9. Old drainage or service trenches to be excavated are to remove soft or degraded material and backfilled with specified granular sub-base material.
10. Subgrade variation: if material appears to vary from anticipated conditions, or if there are extensive soft spots, test subgrade CBR to BS 1377-4 OR BS 1377-9.
11. Soft or damaged areas to be excavated and replaced with sub-base material, compacted in layers 300 mm (maximum) thick.
12. Final excavation to formation / subformation level to be carried before compaction of subgrade.
13. Excavation or compaction not to be carried out in wet conditions when the subgrade may be damaged or destabilized.
14. Compact thoroughly by roller or other suitable means, adequate to resist subsidence or deformation of the subgrade during construction and of the completed roads / pavings.
15. Particular care to be taken when compacting fully at intrusions, perimeters and where local excavation or backfilling has taken place.
16. Subgrade improvement layer (capping) to Highways Agency 'Specification For Highway Works', Table 6/1, Placed and compacted to Highways Agency 'Specification For Highway Works', Table 6/1, Clauses 612 and 613.3, 613.8, 613.9, 613.10 and 613.13.
17. Depth of frost susceptible material below final surface of paving to be (minimum) 450mm.
18. Do not place fill on frozen surfaces. remove material affected by frost. Replace and re-compact if not damaged after thawing.
19. Subgrades and sub-base should be protected to prevent degradation by construction traffic, construction operations and inclement weather.
20. Type 1 unbound mixture for sub-base to Highways Agency 'Specification For Highway Works', Clause 801 and 803.
21. Type 1 to be spread and levelled in 150 mm maximum layers, each layer thoroughly compacted.
22. At drainage fittings, inspection covers, perimeters and where local excavation and backfilling has taken place particular care should be taken to ensure material is fully compacted.

REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
C01	MEMBRANE DETAIL ADDED					
	C.HOPKINSON	05/03/24	J.GAGE	06/03/24	J.MAGEE	06/03/24

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PROJECT

NORTH STAR ACADEMY

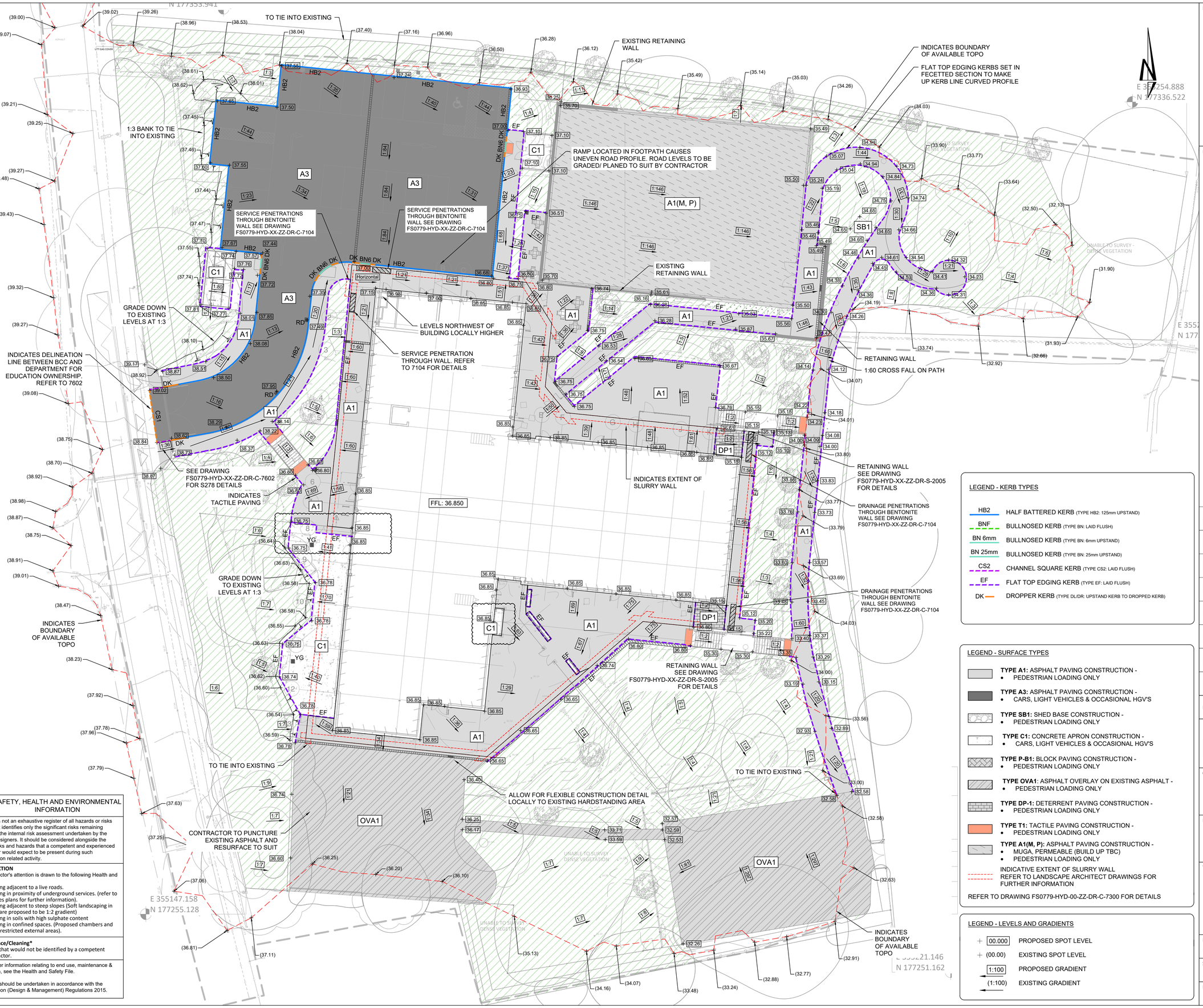
TITLE

EXTERNAL DETAILS
SHEET 2

HYDROCK PROJECT NO.	SCALE @ A1
C-23941	AS SHOWN

STATUS DESCRIPTION	STATUS
SUITABLE FOR CONSTRUCTION	A5

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
FS0779-HYD-XX-ZZ-DR-C-7301	C01



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

This list is not an exhaustive register of all hazards or risks present, it identifies only the significant risks remaining following the internal risk assessment undertaken by the project designers. It should be considered alongside the typical risks and hazards that a competent and experienced contractor would expect to be present during such construction related activity.

CONSTRUCTION
The Contractor's attention is drawn to the following Health and Safety risk.
1. Working adjacent to a live roads.
2. Working in proximity of underground services. (refer to services plans for further information).
3. Working adjacent to steep slopes (Soft landscaping in areas are proposed to be 1:2 gradient)
4. Working in soils with high sulphate content
5. Working in confined spaces. (Proposed chambers and space restricted external areas).

Maintenance/Cleaning*
- None that would not be identified by a competent contractor.

*For further information relating to end use, maintenance & demolition, see the Health and Safety File.

All works should be undertaken in accordance with the Construction (Design & Management) Regulations 2015.

LEGEND - KERB TYPES

HB2	HALF BATTERED KERB (TYPE HB2: 125mm UPSTAND)
BNF	BULLNOSED KERB (TYPE BN: LAID FLUSH)
BN 6mm	BULLNOSED KERB (TYPE BN: 6mm UPSTAND)
BN 25mm	BULLNOSED KERB (TYPE BN: 25mm UPSTAND)
CS2	CHANNEL SQUARE KERB (TYPE CS2: LAID FLUSH)
EF	FLAT TOP EDGING KERB (TYPE EF: LAID FLUSH)
DK	DROPPER KERB (TYPE DL/DR: UPSTAND KERB TO DROPPED KERB)

LEGEND - SURFACE TYPES

- **TYPE A1:** ASPHALT PAVING CONSTRUCTION -
  - PEDESTRIAN LOADING ONLY
- **TYPE A3:** ASPHALT PAVING CONSTRUCTION -
  - CARS, LIGHT VEHICLES & OCCASIONAL HGV'S
- **TYPE SB1:** SHED BASE CONSTRUCTION -
  - PEDESTRIAN LOADING ONLY
- **TYPE C1:** CONCRETE APRON CONSTRUCTION -
  - CARS, LIGHT VEHICLES & OCCASIONAL HGV'S
- **TYPE P-B1:** BLOCK PAVING CONSTRUCTION -
  - PEDESTRIAN LOADING ONLY
- **TYPE OVA1:** ASPHALT OVERLAY ON EXISTING ASPHALT -
  - PEDESTRIAN LOADING ONLY
- **TYPE DP-1:** DETERRENT PAVING CONSTRUCTION -
  - PEDESTRIAN LOADING ONLY
- **TYPE T1:** TACTILE PAVING CONSTRUCTION -
  - PEDESTRIAN LOADING ONLY
- **TYPE A1(M, P):** ASPHALT PAVING CONSTRUCTION -
  - MUGA, PERMEABLE (BUILD UP TBC)
  - PEDESTRIAN LOADING ONLY

INDICATIVE EXTENT OF SLURRY WALL
REFER TO LANDSCAPE ARCHITECT DRAWINGS FOR FURTHER INFORMATION

REFER TO DRAWING FS0779-HYD-00-ZZ-DR-C-7300 FOR DETAILS

LEGEND - LEVELS AND GRADIENTS

+ 00.000	PROPOSED SPOT LEVEL
+ (00.00)	EXISTING SPOT LEVEL
1:100	PROPOSED GRADIENT
(1:100)	EXISTING GRADIENT

KEY PLAN

NOTES

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4. All levels are shown in metres above Ordnance Datum (m AOD).
5. In the event of any contradiction between this drawing and the specification, then the contractor shall seek clarification from the engineer before proceeding.
6. Refer to landscape architects drawings for extent of external surfaces and kerbing.
7. The landscape architect / architect is responsible for providing setting out of the proposed site layout.
8. The works on site affect statutory undertakers apparatus, where the contractor is required to verify the location and depth of all such apparatus prior to commencement of work and to take any precautions necessary when working in the vicinity of apparatus.

NOTE A
Proposed spot levels have been determined from onsite boundary tie in levels provided by Glanville dated Oct 2022. The contractor is responsible for the coordination of the on-site tie in levels and to advise Hydrock of any variations/discrepancies.

NOTE B
Prior to commencement of remediation/overlay works the contractor is to undertake a full service/utilities scan to establish details of existing utilities in the vicinity of the works. The contractor is responsible for the co-ordination/alterations of such utilities with the proposed works.

REV	GENERAL AMENDMENTS					
C04	C.HOPKINSON	05/03/24	J.GAGE	06/03/24	J.MAGEE	06/03/24
C03	UPDATED TO SUIT NEW LAYOUT, ENTRANCE FOOTPATH AMENDED.					
	J.GAGE	01/03/24	J.GAGE	01/03/24	J.MAGEE	01/03/24
C02	CONSTRUCTION ISSUE					
	J.SHIMMIN	12/01/23	D.WEBB	12/01/23	J.MAGEE	12/01/23
C01	TIE IN AREAS AND AND RETAINING WALLS UPDATED. SEE REVISION CLOUDS FOR CHANGES					
	J.SHIMMIN	19/10/23	D.WEBB	19/10/23	J.MAGEE	19/10/23
P04	LEVELS UPDATED FOLLOWING LANDSCAPE LAYOUT					
	J.SHIMMIN	17/08/23	D.WEBB	17/08/23	J.MAGEE	17/08/23
P03	LEVELS UPDATED FOLLOWING LANDSCAPE LAYOUT					
	J.MAGEE	20/10/22	J.MAGEE	20/10/22	J.MAGEE	20/10/22
P02	VOLUME UPDATED FROM 00 TO XX					
	J.NEAL-LONG	12/10/22	J.MAGEE	12/10/22	J.MAGEE	12/10/22
P01	SUITABLE FOR CONTRACTORS PROPOSALS					
	J.MAGEE	07/10/22	J.MAGEE	07/10/22	J.MAGEE	07/10/22

REV	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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CLIENT
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PROJECT
NORTH STAR ACADEMY

TITLE
EXTERNAL WORKS

HYDROCK PROJECT NO.	SCALE @ A1
C-23941	1:200

STATUS DESCRIPTION	STATUS
SUITABLE FOR CONSTRUCTION	A5

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
FS0779-HYD-XX-ZZ-DR-C-7200	C04