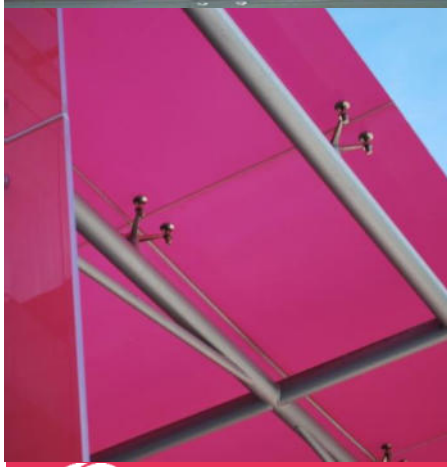








National Breast Imaging Academy, Wythenshawe Hospital, Manchester

Drainage Statement

Curtins Ref: 072094-CUR-01-XX-RP-C-92000

Revision: V02

Issue Date: 18 May 2023

Client Name: Manchester University NHS Foundation Trust

Site Address: Wythenshawe Hospital, Southmoor Road, Wythenshawe, Manchester, M23 9LT

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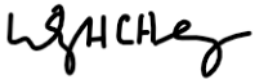
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Control Sheet

Rev	Description	Issued by	Checked	Date
V01	Issued for Planning	OJT	MW	10 January 2020
V02	Issued for Planning	WC	MW	18 May 2023

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins with respect to the information contained in the report will not extend to any third party.

Author	*Signature*	*Date*
Wayne Cheung MEng (Hons), CEng, MICE Senior Engineer		18 May 2023

Reviewed	*Signature*	*Date*
Marta Wolska MEng (Hons) Principal Civil Engineer		18 May 2023

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Appendix A

Proposed Site Layout

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Appendix D

Existing and Proposed Catchments

Greenfield Runoff Rate Calculation

Appendix E

Proposed Drainage Layout

Surface Water Model Details and Results

1.0 Introduction

1.1 Project Background

1.1.1 Curtins were appointed by Manchester University NHS Foundation Trust to provide a Drainage Statement for the proposed development for a National Breast Imaging Academy located to the West of the Nightingale Centre Building.

1.1.2 The site is located within the Flood Zone 1 which is defined as very low risk of flooding from rivers or the sea. As the site is smaller than 1.0 ha and is not in the critical drainage area, therefore Flood Risk Assessment will not be required.

1.1.3 The drainage asset is classified as private drainage and the maintenance responsibility shall be belonged to the asset owner of the new building.

1.1.4 The report is based on currently available information.

1.1.5 Proposals contained or forming part of this statement represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.2 Proposed Development

1.2.1 The development comprises of a new National Breast Imaging Academy Facility, which will connect to the existing Nightingale Centre to the East via a linked corridor. The proposal will include:

- A new building containing consult rooms, ultrasound and other facilities,
- A bin store,
- An external plant room,
- An external chiller, and
- landscaped areas

1.2.2 The proposed building is approximately 392m² and with the external works the site is approximately 1075.2m².

1.2.3 The proposed site layout is enclosed in *Appendix A.*

2.0 Existing Site Details

2.1 Site Location

2.1.1 The site is located to the West of the existing Nightingale Centre, which is off Southmoor Road, Wythenshawe.

2.1.2 The existing site is part of the existing car park and surrounding scrub land (see Figure 1).

2.1.3 The site is bound by Southmoor Road to the South, the Nightingale Centre to the East, a palisade fence and beyond this an industrial warehouse to the North and a carpark and the Medicine Evaluation Unit to the West.

Figure 1: Aerial Photograph (© Microsoft Corporation 2023)



2.1.4 The Environmental Agency's long term flood risk map has been reviewed and it is found that the site is very low risk flooding from reservoir, river or sea.

2.2 Existing Drainage

2.2.1 A CCTV and Utility survey has been carried out in December 2019 (see *Appendix B*); it is expected that there are no changes to the existing drainage since last survey but further survey may be carried out to inspect its service condition.

2.2.2 The CCTV survey highlights that the following drainage exists on the site:

- A 150mm diameter foul and 225mm diameter surface water drains are located within the Eastern area of the site respectively and flow from North to South before flowing East along the perimeter of the existing Nightingale Building.
- A 525mm diameter United Utilities surface water sewer runs through the Southern boundary of the site.

2.2.3 The drainage survey found that there is no drainage in the existing carpark.

2.2.4 The surveys highlight that wider drainage exists near to the site, such as foul and surface water networks within the Nightingale Building carpark, however this is outside of the site boundary.

2.2.5 The existing drainage within the development boundary should be maintained and protected during the works. The existing drainage may need to be diverted where clashes with the proposed structures exist.

3.0 Drainage Strategy

3.1 Proposed Foul Water Drainage

3.1.1 Existing survey information shows a foul water drain within the Eastern vicinity of the site.

3.1.2 The proposed drainage is a separate foul and surface water drainage system that will outfall to the existing drainage network.

3.1.3 The foul water from the new NBIA facility is proposed to discharge via a new connection(s) to this foul water drain located within the Eastern area of the proposed site.

3.1.4 The proposed peak foul flow rate has been estimated as 2.9 l/s, based on a total of 17.3 Discharge units, taken from M&E Engineer's information. The final foul flow should be reassessed at detailed design once the final internal layouts and number of appliances are confirmed.

3.1.5 It is anticipated that the network will eventually connect to the United Utilities Public Sewer network and therefore approval will be required from United Utilities and Lead Local Flood Authority (LLFA) for any additional/change of flows and new connections.

3.1.6 A Predevelopment enquiry has been sent to United Utility; response has not been received at the time of writing report.

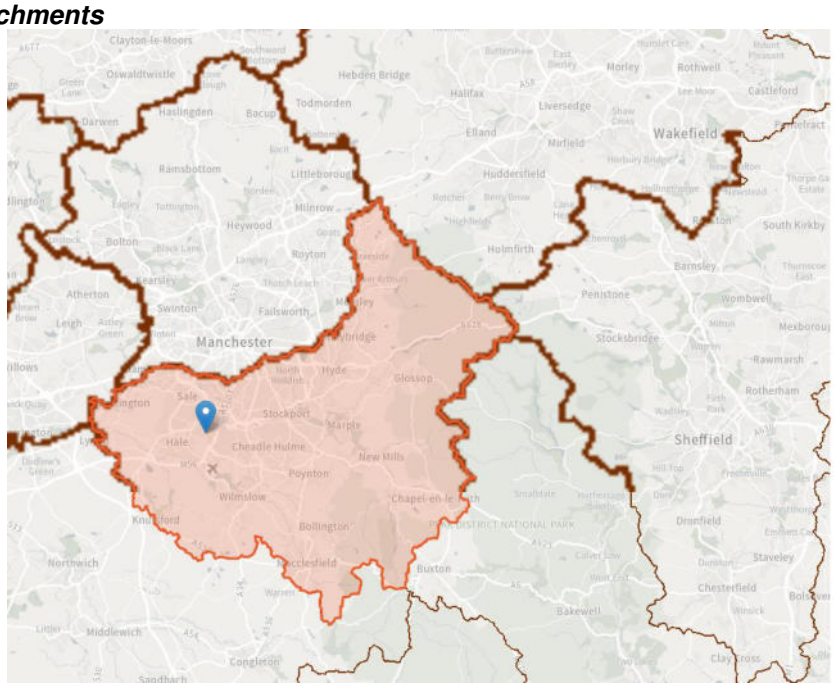
3.2 Proposed Surface Water Drainage

3.2.1 The new development site drainage is designed in accordance with the current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event plus climate change, and flood water, if there's any, generated for up to the critical 1 in 100-year plus climate change storm event shall be constrained within the site boundary so not to cause safety issues to the buildings, essential services or adjoining developments and services.

3.2.2 As release in February 2016 and updated in May 2022, the Environment Agency has provided updated climate change allowances for peak rainfall intensities which should be applied to new developments. Table 1 demonstrates the climate change allowances with central and upper end allowances being considered.

3.2.3 Based on the nature of the development, the lifespan of the building in excess of up to 60 years is anticipated. Therefore, the 2070s epoch is adopted and the climate change allowance for 3.3% and 1.0% annual exceedance rainfall events are 40% and 45% respectively. As such, these additional climate change allowances will be applied to the calculation.

Table 1: (Extract Environment Agency Guidance) Peak Rainfall Intensity Allowance in small and urban catchments



Upper Mersey Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

3.2.4 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

3.2.5 The British Geological Survey maps highlight that the site is underlain by a bedrock of Mudstone and superficial deposits of Diamicton. Ground investigation carried out by Curtins indicates the ground conditions on site generally comprised Made Ground overlying mudstone bedrock, Made Ground was predominantly cohesive, and the mudstone bedrock comprised gravel of angular to subangular mudstone. Based on ground condition, made ground and mudstone bedrock generally have low permeability and therefore infiltration will not be suitable. Borehole records have been included as *Appendix C*.

3.2.6 The nearest watercourse is the Fairywell Brook which is located approximately 520m West of the site. This would require various third-party land crossing and would not be considered feasible.

3.2.7 Several surface water systems are within the site boundary including a large UU 525mm diameter surface water sewer is located within the Southern area of the site and a 150mm diameter surface water drain in the Eastern area of the site.

3.2.8 It is anticipated that the proposed drainage system will utilise the existing surface water drainage on site. It is proposed that the site will discharge to the surface water system within the Eastern area of the site. Capacity of the existing system to be assessed if connection is feasible.

3.2.9 The proposed site is located partially on an existing carpark which is show on the CCTV survey that no drainage exists within this area. Therefore, the existing flows could not be calculated based on the existing drainage network on the site.

3.2.10 As the site is part of the existing car park and there is no existing drainage. Greenfield runoff rates Q_{bar} have been used to access the proposed flow rate. The proposed development area is 1075m². The existing flows are the following:

1 Year = 0.21 l/s

30 Year = 0.41 l/s

100 Year = 0.50 l/s

3.2.11 The greenfield runoff rate calculation is enclosed in *Appendix D*.

3.2.12 Since the greenfield runoff rates are less than 5.0 l/s, it is recommended not to adopt these rates as drainage blockage is highly possible. Therefore, the flow rate of 5.0 l/s is proposed.

3.2.13 Surface water drainage modelling has been carried out to determine the volume of the proposed attenuation tank. The tank requires a minimum volume of 24.9m³ within the cellular storage to accommodate the anticipated 100-year storm event, including an allowance of 45% climate change.

3.2.14 The drainage layout and surface drainage storage calculation are included in *Appendix E*.

3.2.15 Due to the site constraint, SuDS features such as permeable paving, pond and swale are not viable for the site.

3.2.16 United Utility has been approached via pre-development enquiry to confirm point of connection and the allowable flow rates discharged to the existing network, at the time this report was written no response from UU was received.

3.2.17 The network will eventually connect to the public sewer network and therefore approval will be required from United Utilities and Lead Local Flood Authority (LLFA) for any additional/change of flows and new connections.

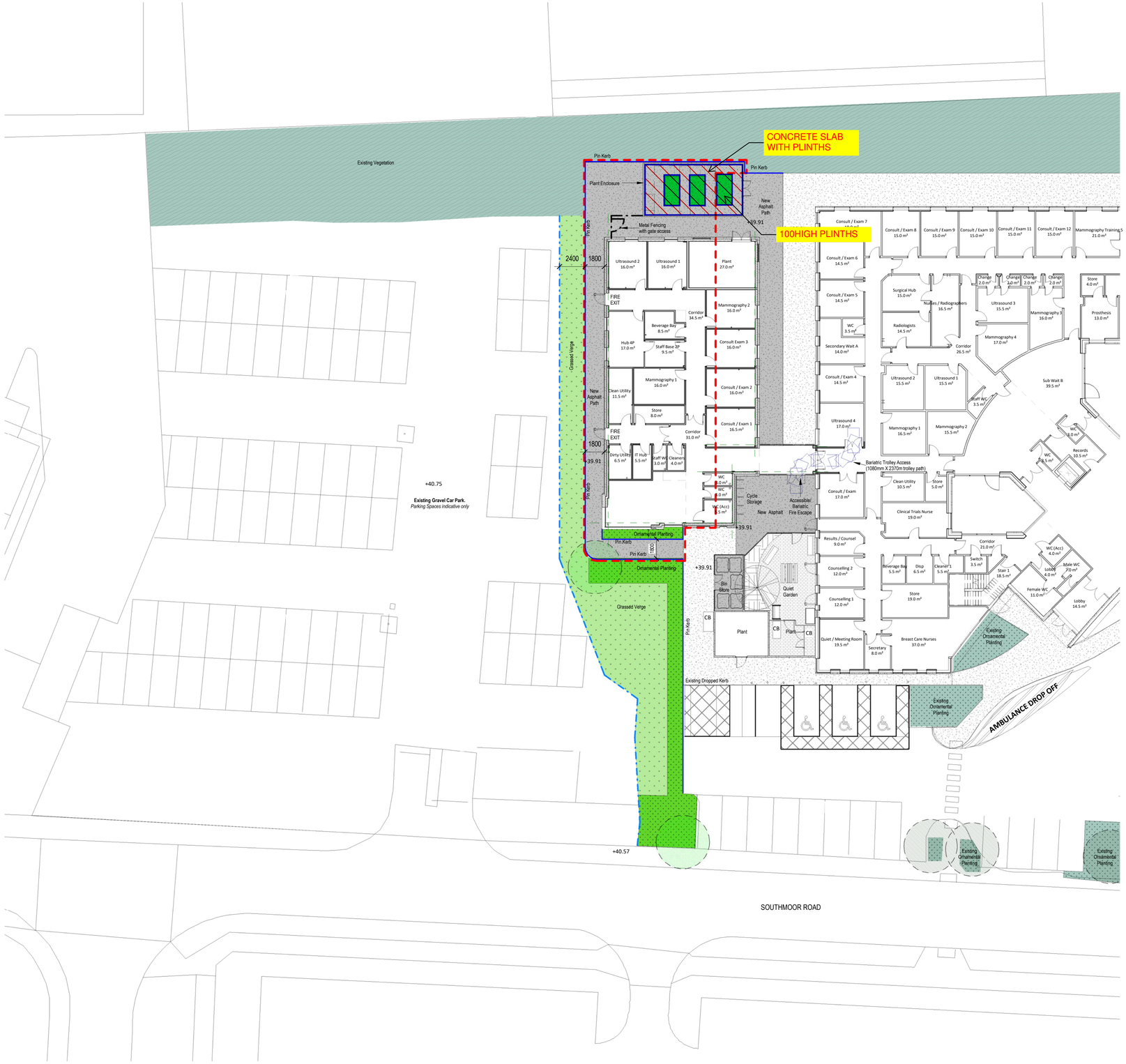
3.2.18 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

3.2.19 This proposed drainage strategy is subject to change following further survey works, correspondence and future information being available.

Appendix A

Proposed Site Layout

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Proposed Site Plan
1 : 200

KEY:

Note: Approx. areas are for overall external works

- Existing Asphalt Surface to be retained.
- Proposed New Asphalt Surface Approx. 300m²
- Proposed New Paving Stones & Garden refresh Approx. 45m²
- Proposed New Ornamental Planting Zone Approx. 82.5m²
- Proposed Grass Verge
- Existing Planting/ Vegetation
- Proposed Trees
- Trellis Planting to Fence
- External Steps with retaining structure
- Area of Ground Excavation / Levelling *Approx. 450m²*
- Proposed Standard Bullnosed Kerb
- Proposed Pin Kerb
- Proposed Metal Fencing 2100mm high Metal posts with mesh panels. Access Gate
- Proposed Diamond Wood Rail Fence 900mm High Posts
- CB — Existing Control Box

NOTES
All dimensions and levels to be checked on site

Any descrepancies are to be reported to the Architect before any work commences

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rev no.	rev date	rev by	description
P3	10.05.23	AS	Draft Issue for Stage 3 co-ordination
P2	14.02.23	AS	Stage 2 initial Issue
P1	06.02.23	AS	First Issue. Draft

project
National Breast Imaging Academy

location
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Employer

client
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key plan

drawing title
Proposed Site Plan

AFL job number 223196 | scale @ A1 | drawn AS | checked JG | rev date 10.05.23

dwg purpose: Information | status | rev P3

bim project | origin | zone | level | type | role | 5-digit no: BIA-AFL-01-00-DR-A-90100

Appendix B

Topographical Survey

Utility Survey

CCTV Survey

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PLAN GRID NORTH

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LEGEND

AB	AIR VALVE	LBY	LIFEBUOY
BB	BELISHA BEACON	MH	MANHOLE
BOL	BOLLARD	MKR	MARKER
BT	BT/TEL POLE	MP	MOORING POST
BW	BENCH MARK	MR	MOORING RING
BW	BENCH WARK	MW	MONITORING WELL
CB	CATCH BASIN	OP	OUTFALL PIPE
BT	BT INSPECTION COVER	OP	OUTFALL PIPE
CCTV	CCTV CAMERA	PO	POLICE OFFICE BOX
CCTV	CCTV CAMERA POST	PP	POST
CP	CAR PARK	PP	PUMPING PUMP
COM	COMMUNICATIONS COVER	PT	PITOT
CTV	CABLE TV COVER	RE	RIGGING EYE
DP	DOWN PIPE/CHANNEL	RL	ROAD LIGHT
DP	DOWN PIPE	RS	ROAD SIGN
DR	DRAIN	RTW	RETAINING WALL
DR	DRAIN INSPECTION COVER	SCP	SCOUR/DRAIN PIPE
EL	EASTS LEVEL	SHP	SHIPLINE
ELB	ELECTRIC BOX	SP	SIGN POST
EP	ELECTRIC POLE	SPT	SPOT LEVEL
LP	ELECTRICITY POLE	SV	STOP VALVE
FFL	FINISHED FLOOR LEVEL	TB	TRAFFIC BOLLARD
FH	FIRE HYDRANT	TB	TRAFFIC SIG CAB/ BOX
FP	FLAG POLE	TE	TOP OF EMBK
GL	GAS LIGHT	TL	TELEPHONE
GLT	GROUND LIGHT	TLB	TRAFFIC LIGHT BOX
GP	GAS POST	TP	TELEGRAPH POLE
GSP	GAS TAP	TP	TELEGRAPH POLE
GSV	GAS VALVE	VP	VENT PIPE
H	HYDRANT COVER	WC	WATER COURSE
HL	INVERT LEVEL	WI	WASH OUT
KO	KERB OUTLET	WST	WATER STOP TAP
LC	LAND DRAIN	WV	WATER VALVE
LD	LAND DRAIN	WV	WATER VALVE
LP	LAMP POST	WO	TREE WITH CROWN
			TREE MULTI-TRUNK
BAL	BALCONY		DEPT LINE
B/W	BRICK WALL		EDGE OF FEATURE
B/W	BARBED WIRE		KERB
C/L	CENTRE LINE		RAIL
F/W	POST AND WIRE		SURFACE CHANGE
F/R	POST AND RAIL		RAIL
C/L	CLOSE BOARD		BOTTOM BANK
C/B	CLOSE BOARDED		BOTTOM BANK
DN/LTH	DOWN LIGHT		BUILDING
LTH	LIGHTING FEATURE		BUILDING CANOPY
GATE	GATE		OVER HEAD ELECTRICAL
STATION	STATION		OVER HEAD TELECOM
ACP/COLLE	ACP/COLLE		
BARRIER	BARRIER		HEDGE

NOTES:
All levels relate to O.S (Newlyn) Datum, Established using network RTK.
Survey plotted on a plane local grid, orientated to National Grid.

SURVEY STATIONS

Name	Easting	Northing	Height
SEP5	386823.853	388130.794	41.394
SEP6	386817.975	388178.874	40.270
SEP100	386786.638	388217.530	39.294
SEP101	386772.314	388199.154	40.124
SEP102	386772.314	388199.154	40.124
SEP103	386784.443	388189.152	40.371

0 2m 4m 8m 12m 16m
SCALE BAR

REV	DATE	DESCRIPTION

SURVEY & ENGINEERING PROJECTS

Client
Curtins Consulting
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Project Title
Topographical Survey of Land at:
Wythenshawe Hospital
Southmoor Road
Wythenshawe
Manchester
M23 9QZ

Surveyed	Drawn	Checked
D. Balmer	P. Canadine	R. Critchley

Scale	Date	Drawing Ref.	No.	Size	Rev
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File Name: S20154-U.dwg

LEGEND

AV	AIR VALVE	BT	BT/...A / BT/...A
BT	BT INSPECTION COVER	CD	CD/...A / CD/...A
CB	CONTROL BOX	CP	CP/...A / CP/...A
COL	COLUMN MOUNTED POST	CT	CT/...A / CT/...A
COM	COMMUNICATIONS COVER	CV	CV/...A / CV/...A
CTV	CABLE TV COVER		
DP	DOWN PIPE (RAINWATER)	E	E/...A / E/...A
DP	DOWN PIPE	ELECTRIC	
DP	DRAIN POINT	ELECTRIC STREET LIGHTING	
EH	ELEC. INSPECTION COVER	FL	FL/...A / FL/...A
EM	ELEC. METER	FUEL LINE	
EP	EARTH ROD	GAS	G/...A / G/...A
EP	ELECTRICITY POLE	GYPO PROTECTION LINE	
FCL	FINISHED FLOOR LEVEL	M	M/...A / M/...A
FH	FIRE HYDRANT	MAINS WATER	MW/...A / MW/...A
G	GULLY	SEWER FW	SW/...A / SW/...A
GLT	GROUND LIGHT	SEWER SW	SW/...A / SW/...A
GST	GAS TAP	SEWER UK	SW/...A / SW/...A
GSV	GAS VALVE	TELECOMMUNICATIONS CABLE	T/...A / T/...A
HC	HOUSE CONNECTION COVER	UNIDENTIFIED TRACE	U/...A / U/...A
IL	INVERT LEVEL	UNIDENTIFIED CABLE	U/...A / U/...A
LP	LAMP POST	UNIDENTIFIED PIPE	U/...A / U/...A
MH	MANHOLE	SURVEY BOUNDARY	
MKR	MARKER		
OP	OUTFALL PIPE		
PC	PEDESTAL		
PP	PETROL PUMP	QUALITY LEVEL	
RE	RODDING EYE		
SWP	SOIL VENT PIPE	A – Verification	
SOF	SOFFIT LEVEL	B1 – Horizontal/Vertical location using multiple techniques	
TV	STOP VALVE	B2 – Horizontal/Vertical location using a single technique	
TCB	TELEPHONE CALL BOX	B3 – Horizontal location using a single technique	
TL	TRAFFIC LIGHT		
TLB	TRAFFIC LIGHT BOX	B4 – Assumed route	
WC	WATER COURSE		
WM	WATER METER	C – Site Reconnaissance	
WO	WATER OUTLET		
WST	WATER STOP TAP	D – Desktop utility records search	
WSV	WATER STOP VALVE		
EOT	END OF TRACE		
NAD	NO ACCESS TO KEY AREA		
UTL	UNABLE TO LIFT		
UTS	UNABLE TO SCALE		
SCL	SCALE CHANGES		
S/L	SIGNAL LOSS		
BLK	BLOCKED		
NC	NO FURTHER GPR CONTACTS		
BC	BACKDROP INVC		
TOP	TOP OF PIPE		
TOF	TOP OF RYPE		
	EOT SYMBOL		

NOTES:

All levels relate to an existing site datum. Survey plotted on a plain local grid, oriented to an existing site grid. Detail shown grey taken from an existing drawing Ref. S20154-T_3D.dwg.

This Underground Utilities survey was conducted in compliance with the BSI PAS128:2014 standard.

Each utility is given a quality test indicating first an abbreviation of the services' function (eg. E = Electric Cables) followed by the Quality Level to which that service was located (eg. B4 = Assumed route).

Quality Level descriptions shown in the above legend are for reference purposes only and are abbreviated versions of full descriptions.
For full information on Quality Levels, please consult the BSI PAS128:2014 standards document.

Lines annotated as GPR indicate a series of consistent subsurface anomalies which have been identified by Ground Penetrating Radar and assigned a Quality Level B2. The nature of these anomalies could not be determine by non-invasive means. GPR lines that were identifiable as a service are shown as their respective service.

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At SEP we use skilled and experienced staff, modern up to date techniques and top of the range electromagnetic and radar technology to locate and trace sub-surface utilities. However the performance of the equipment employed in non-invasive surveys can be adversely affected by factors outside the control of SEP. Therefore SEP cannot guarantee that all utilities present on site have been located. It is the responsibility of the Client to consult regional authority records and undertake trial digs where appropriate.

Where similar services run in close proximity it may be impossible to separately trace individual services as the trace signal can experience interference. In such cases, services will be shown as a single, annotated line. The displayed depth will refer to the shallowest detected utility.

Successful tracing of non-conductive materials may be limited. Drainage gulleys are due tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

Depth information of underground services/features are generally accurate to within +/- 10% (i.e. a pipe at 2m deep may be accurate to +/-200mm) but this cannot be guaranteed. Depths shown usually refer to the top of the service. Gravity sewer and drain depths are usually to invert (base of drainage channel) unless otherwise stated.

Some above ground features may have been obscured at time of survey. It is not always possible to operate the Ground Penetrating Radar in areas including, but not limited to, dense vegetation, rubble, debris and/or rough/uneven ground.

Existing record information that was made available to SEP by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

Excavation in the vicinity of services shown should be carried out with due diligence (Ref. HSG47).

0 2m 4m 8m 12m 16m

SCALE BAR

REV	DATE	DESCRIPTION

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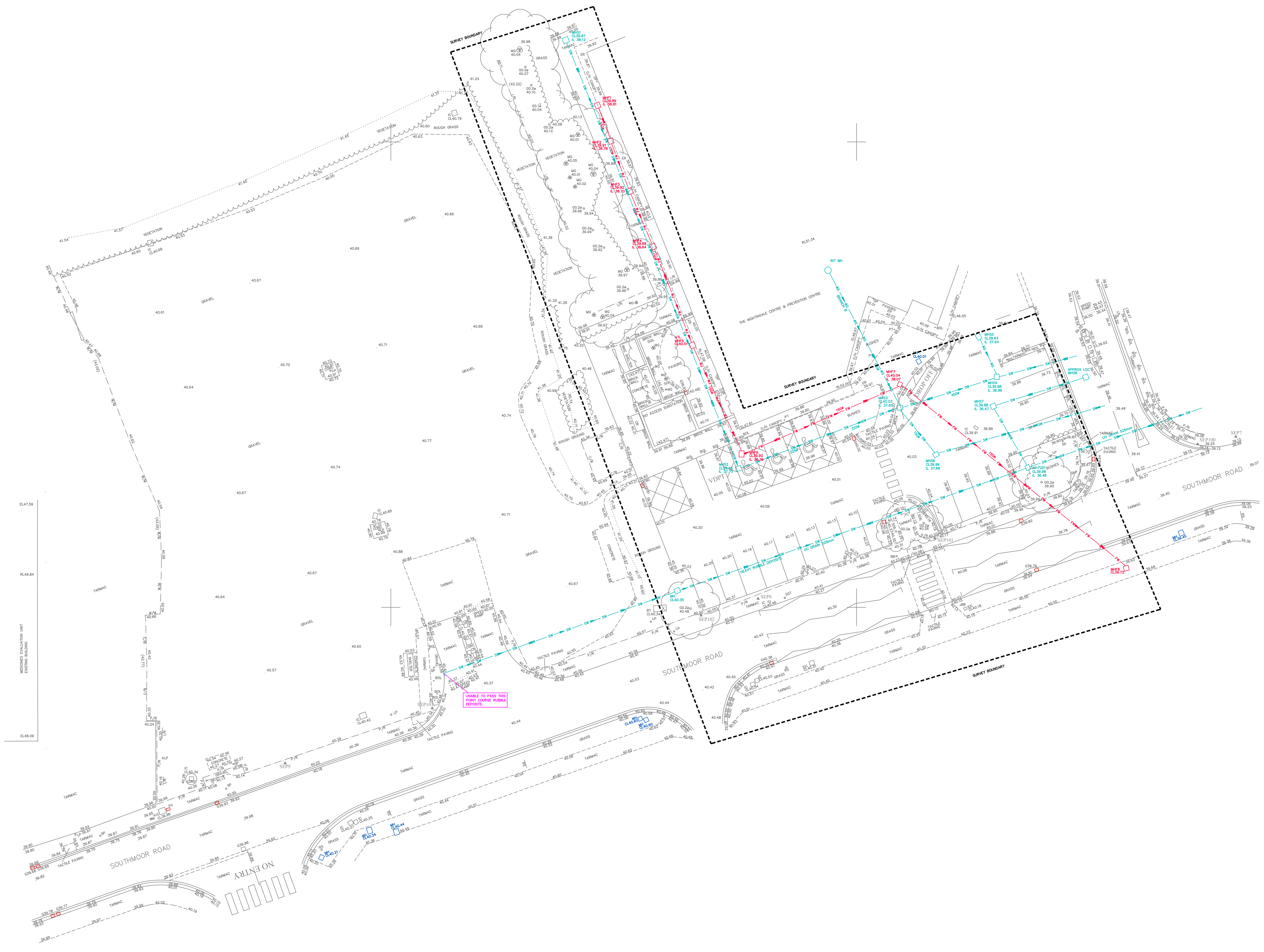
Client
Curtins Consulting
Merchant Exchange
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M1 5WG

Project Title
Utility Survey of Land at:
Wythenshawe Hospital
Southmoor Road
Wythenshawe
Manchester
M23 9QZ

Surveyed	Drawn	Checked
M.Law	D.Shipton	M.Law

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	Jan 20	S20154-U	01	A0	--

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PLAN GRID NORTH

File Name: Wythenshaw Hospital- Drainage Survey.dwg

LEGEND

AV	AIR VALVE	BT	BT
BT	BT INSPECTION COVER	CABLE DUCT	DUCT
CB	CONTROL BOX	CABLE TV	CATV
CCTV	CCTV CAMERA POST	CCTV	CCTV
COM	COMMUNICATIONS COVER	TELECOMS	COM
CTV	CABLE TV COVER	EARTH ROD STRIP	ER
DC	DRAINAGE CHANNEL	ELECTRIC	ELEC
DP	DOWN PIPE	FIBRE-OPTICS	F/O
DR	DRAIN	FUEL LINE	FL
EIC	ELEC INSPECTION COVER	GPR DETECTION LINE	GPR
ELB	ELECTRIC BOX	MAINS GAS	GAS
ER	EARTH ROD	MAINS WATER	W
EP	ELECTRICITY POLE	SEWER CW	CW
FFL	FINISHED FLOOR LEVEL	SEWER FW	FW
FH	FIRE HYDRANT	SEWER SW	SW
G	GULLY	TRAFFIC SIGNAL CABLE	TS
GLT	GROUND LIGHT	UNIDENTIFIED TRACE	UNID
GST	GAS TAP	UNIDENTIFIED CABLE	UC
GSV	GAS VALVE	UNIDENTIFIED PIPE	UP
IC	INSPECTION COVER	VEHICLE DETECTION CABLE	VDC
IL	INVERT LEVEL	SURVEY BOUNDARY	
KO	KERB OUTLET		
LP	LAMP POST		
MH	MANHOLE		
MKR	MARKER		
OP	OUTFALL PIPE		
PN	PYLON		
PP	PETROL PUMP		
RE	RODDING EYE		
RWP	RAINWATER PIPE		
SOF	SOFFIT LEVEL		
SV	STOP VALVE		
TCB	TELEPHONE CALL BOX		
TL	TRAFFIC LIGHT		
TLB	TRAFFIC LIGHT BOX		
TP	TELEGRAPH POLE		
WM	WATER METER		
WO	WATER OUTLET		
WST	WATER STOP TAP		
WSV	WATER STOP VALVE		
EOT	END OF TRACE		
OSA	OUT OF SURVEY AREA		
UTL	UNABLE TO LIFT		
UTS	UNABLE TO SONDE		
UTT	UNABLE TO TRACE		
S/L	SIGNAL LOSS		
BLK	BLOCKED		
NFH	NO FURTHER GPR CONTACTS		
BD	BACKDROP PIPE		
NVP	NO VISIBLE PIPE		
ToP	TOP OF PIPE		
⊔	EOT SYMBOL		

FROM STATUTORY AUTHORITY PLANS

BT
CABLE DUCT
CATV
CCTV
TELECOMS
ELECTRIC
MAINS GAS
MAINS WATER
SEWER CW
SEWER FW
SEWER SW
FIBRE-OPTICS — F/O STAT

NOTES:

All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

Services shown as "From Statutory Authority Plans" line styles are taken from Statutory Records plans supplied by the relevant regional authority. These services were not located and are shown for indicative purposes only.

DISCLAIMER:

At Layer Surveys staff use skilled and experienced staff, modern up to date techniques and top of the range electromagnetic and radar technology to locate and trace sub-surface utilities. However the performance of the equipment employed in non-invasive surveys can be adversely affected by factors outside the control of Layer Surveys. Therefore Layer Surveys

cannot guarantee that all utilities present on site have been located. It is the responsibility of the Client to consult regional authority records and undertake trial digs where appropriate.

Where similar services run in close proximity it may be impossible to separately trace individual services as the trace signal can experience interference. In such cases, services will be shown as a single, annotated line. The displayed depth will refer to the shallowest detected utility.

Successful tracing of non-conductive materials may be limited. Drainage gulleys are dye tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

Depth information of underground services/features are generally accurate to within +/- 10% (i.e. a pipe at 2m deep may be accurate to +/-200mm) but this cannot be guaranteed. Depths shown usually refer to the top of the service. Gravity sewer and drain depths are usually to invert (base of drainage channel) unless otherwise stated.

Some above ground features may have been obscured at time of survey. It is not always possible to operate the Ground Penetrating Radar in areas including, but not limited to, dense vegetation, rubble, debris and/or rough/uneven ground.

Existing record information that was made available to Layer Surveys by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

Excavation in the vicinity of services shown should be carried out with due diligence (Ref. HSG47).

SHEET LAYOUT

SCALE BAR: 0 10m 20m 40m 60m 80m

REV	DATE	DESCRIPTION

Layer Surveys Ltd
See the Complete Picture

Client
Curtains

Project Title
Drainage Survey At:
Wythenshaw Hospital
Southmoor Road
Wythenshaw
Manchester
M23 9QZ

Surveyed	Drawn	Checked		
P.F	G.B	D.W		
Scale	**Date**	**Drawing Ref.**	**No.**	**Size**	**Rev**
1:200	Dec 19	Lay0391	01	A0	01

Appendix C

Borehole Records

Borehole Log

Borehole No. **BH01**

Sheet 1 of 2

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: -	Hole Type CP
Location:		Level:	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)		Dates: 04/04/2023 - 04/04/2023	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			MADE GROUND: Light grey concrete and limestone gravel. Gravel is medium to coarse, subangular to angular of concrete, limestone and rare brick. Occasional cobbble of subangular concrete and limestone.
					0.40			MADE GROUND: Light grey concrete layer.
					0.50			MADE GROUND: Brownish grey gravel subbase. Gravel is fine to coarse of subangular to angular limestone.
	▼	0.90	ES					MADE GROUND: Brown silty, sandy, very gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular of limestone, brick and concrete.
		1.20	D		1.20			MADE GROUND: Reddish brown mottled grey slightly silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular of mudstone, siltstone, rare coal and brick.
		1.20		N=4 (1,1/1,1,1,1)				
					1.70			MADE GROUND: Reddish brown mottled grey silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of sandstone, mudstone and siltstone. (Reworked Clay).
		2.00		N=6 (1,1/1,1,2,2)	2.00			MADE GROUND: Brown mottled grey and dark brown/black slightly silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is medium to coarse, subrounded of mudstone and siltstone. (Reworked Clay).
		2.00 - 2.50	B					
		2.50	ES					
					2.60			MADE GROUND: Dark greyish brown mottled brown and grey slightly silty, slightly sandy, gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick fragments, mudstone, siltstone, with rare roots. (Reworked Clay).
		3.00	D					
		3.00		N=8 (1,1/2,2,1,3)				
		4.00	D		4.00			

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 0.15m, breaker used to break through 0.35m of concrete, hand excavation resumed up to 1.20m. Groundwater struck at 0.80m, groundwater seepage encountered at the base of the borehole after drilling.

Borehole Log

Borehole No. **BH01**

Sheet 2 of 2

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: -	Hole Type CP
Location:		Level:	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)		Dates: 04/04/2023 - 04/04/2023	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		4.00 4.00 - 4.50	B	N=35 (2,3/4,9,10,12)				MADE GROUND: Dark brown mottled grey slightly silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular of mudstone, siltstone. Cobbles of subrounded mudstone.
					4.30			*Contains pockets of wood/organic material.*
								Dark greyish brown MUDSTONE.
		5.00 5.00	D	50 (10,14/50 for 80mm)				
		6.00 6.00	D	50 (8,15/50 for 90mm)	6.00			End of borehole at 6.00 m

Remarks

Service inspection pit hand excavated from GL to 0.15m, breaker used to break through 0.35m of concrete, hand excavation resumed up to 1.20m. Groundwater struck at 0.80m, groundwater seepage encountered at the base of the borehole after drilling.

Borehole Log

Borehole No. **BH02**

Sheet 1 of 2

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: -	Hole Type CP
Location:		Level:	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)		Dates: 03/04/2023 - 03/04/2023	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Grey aggregate gravel. Gravel is medium to coarse, subangular to angular of limestone.
					0.30			MADE GROUND: Soft to firm brown slightly sandy, gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is fine to coarse, subrounded to angular of brick, concrete, wood, plastic, sandstone, fabric, limestone.
		0.50	ES					
		1.20	D					
		1.20		N=2 (1,1/0,0,1,1)				
					1.30			MADE GROUND: Soft to firm greyish brown slightly gravelly CLAY. Gravel is fine to coarse, subrounded to angular of brick, sandstone, mudstone and coal.
		1.50	ES					
					1.80			Firm brown mottled grey slightly gravelly CLAY. Gravel is fine to coarse, subrounded to subangular of sandstone, mudstone, coal and siltstone.
		2.00	D					
		2.00		N=7 (1,1/2,1,1,3)				
		2.00 - 2.50	B					
		3.00	D					
		3.00		N=6 (1,1/1,1,2,2)				
		4.00	D					

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater struck at 4.80m bgl, rose to 4.00m bgl after 20 minutes.

Borehole Log

Borehole No. **BH02**

Sheet 2 of 2

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: -	Hole Type CP
Location:		Level:	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)		Dates: 03/04/2023 - 03/04/2023	Logged By JL

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		4.00 4.00 - 4.50	B	N=25 (3,4/5,6,7,7)				
	▼				4.60			Brown/orange very clayey, gravelly SAND. Sand is fine to medium. Gravel is fine to coarse, subangular to angular of sandstone. (Weathered Bedrock).
					4.80			Dark greyish brown MUDSTONE.
		5.00 5.00	D	40 (6,10/40 for 220mm)				
		6.00		50 (8,15/50 for 220mm)	6.00			End of borehole at 6.00 m

5
6
7
8

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater struck at 4.80m bgl, rose to 4.00m bgl after 20 minutes.

AGS

Borehole Log

Borehole No. **BH03**

Sheet 1 of 2

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: -	Hole Type CP
Location:		Level:	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)		Dates: 04/04/2023 - 04/04/2023	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES		0.30			MADE GROUND: Light grey concrete and limestone gravel. Gravel is medium to coarse, subangular to angular of concrete, limestone and rare brick. Occasional cobbble of subangular concrete and limestone.
								MADE GROUND: Brown very sandy, very gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to angular of brick, concrete, limestone, plastic, woven material, rare glass and coal. Occasional cobbles of brick.
		1.20 1.20 1.20 - 1.70	D B	N=3 (1,0/0,1,1,1)	1.20			MADE GROUND: Dark greyish brown silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, subangular of brick.
		2.00 2.00	D	N=5 (1,1/1,1,1,2)				
		3.00 3.00 3.00 - 3.50	D B	N=8 (1,1/2,1,2,3)	3.00			MADE GROUND: Dark greyish brown slightly silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is medium to coarse, rounded to subangular of mudstone and siltstone. Occasional cobble of subrounded mudstone. (Reworked Clay).
								Bands of dark brown/black organic material containing hay. Organic smell noted.
		4.00	D					

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater seepage encountered at the base of the borehole after drilling.

Borehole Log

Borehole No. **BH03**

Sheet 2 of 2

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: -	Hole Type CP
Location:		Level:	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)		Dates: 04/04/2023 - 04/04/2023	Logged By LW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		4.00		N=14 (1,2/1,1,2,10)				
					4.40			Light grey MUDSTONE.
		5.00 5.00	D	50 (9,10/50 for 170mm)				
		6.00 6.00	D	50 (8,17/50 for 125mm)	6.00			End of borehole at 6.00 m

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater seepage encountered at the base of the borehole after drilling.

Trial Pit Log

Trialpit No
HP01
Sheet 1 of 1

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: - Level:	Date 03/04/2023
Location:		Dimensions (m): Depth 1.20 (0.5 × 0.5)	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.60 - 0.70	ES					Grass over dark brown sandy, very gravelly CLAY with cobbles. Sand is fine to coarse. Gravel is fine to coarse, subrounded to angular of brick, concrete, plastic, glass, mudstone. Cobbles of brick, concrete, mudstone, plastic bags. (TOPSOIL).
				1.20			End of pit at 1.20 m

Remarks: Hand pit excavated from GL to 1.20m.

Stability: Stable

Trial Pit Log

Trialpit No
HP02
Sheet 1 of 1

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: - Level:	Date 03/04/2023
Location:		Dimensions (m): Depth 1.10 (0.5 × 0.5)	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	1.00	ES		1.10			Grass with wooden mulch over dark brown slightly sandy, very gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to angular of brick, concrete, twigs, mudstone, glass, rare coal and plastic. (TOPSOIL).
							End of pit at 1.10 m

1
2
3
4

Remarks: Hand pit excavated from GL to 1.10m. Terminated due to large boulder.

Stability: Stable

AGS

Trial Pit Log

Trialpit No
HP03
Sheet 1 of 1

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: - Level:	Date 03/04/2023
Location:		Dimensions (m): 0.5 × 0.5, Depth 1.20	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Grass over black/dark brown very clayey slightly gravelly SAND with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of brick, concrete, mudstone and siltstone. (TOPSOIL).
	0.50 - 0.60	ES		0.43			MADE GROUND: Dark greyish brown slightly sandy, very gravelly CLAY with some cobbles. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of brick, concrete, mudstone and siltstone.
							Organic smell noted.
				0.85			Soft brown mottled grey slightly silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium, subangular of siltstone and mudstone.
				1.20			End of pit at 1.20 m

1
2
3
4

Remarks: Hand pit excavated from GL to 1.20m.

Stability: Stable

AGS

Trial Pit Log

Trialpit No
HP04
Sheet 1 of 1

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: - Level:	Date 03/04/2023
Location:		Dimensions (m): Depth 1.20 (0.5 × 0.5)	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Grass over dark brown/black very clayey, slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular of brick and rare plastic. (TOPSOIL).
	0.45 - 0.55	ES		0.35			MADE GROUND: Greyish brown slightly sandy, very gravelly, cobbly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of concrete, brick, plastic. Cobbles of concrete, brick, plastic. Becoming less gravelly with depth.
▼				0.85			Soft brown mottled grey slightly silty, slightly sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subrounded to subangular of mudstone and siltstone.
				1.20			End of pit at 1.20 m

1
2
3
4

Remarks: Hand pit excavated from GL to 1.20m. Water at the base of the handpit.

Stability: Stable

AGS

Trial Pit Log

Trialpit No **HP05**

Sheet 1 of 1

Project Name: NBIA Wythenshawe Hospital	Project No. 072094	Co-ords: - Level:	Date 03/04/2023
Location:		Dimensions (m): 0.73 × 0.5, Depth 0.33	Scale 1:20
Client: Manchester University NHS Foundation Trust (MFT)			Logged LW

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			Dark grey tarmac.
				0.32			MADE GROUND: Yellowish brown sandy GRAVEL subbase. Sand is fine to coarse. Gravel is fine to coarse, subrounded to angular of limestone. Frequent cobbles of limestone.
							Large root extending from a tree towards the wall.
				0.33			MADE GROUND: Brownish red concrete foundation.
							End of pit at 0.33 m

1
2
3
4

Remarks: Hand pit to view building foundations excavated from GL to 0.33m. Length of handpit restricted due to services.

Stability: Stable

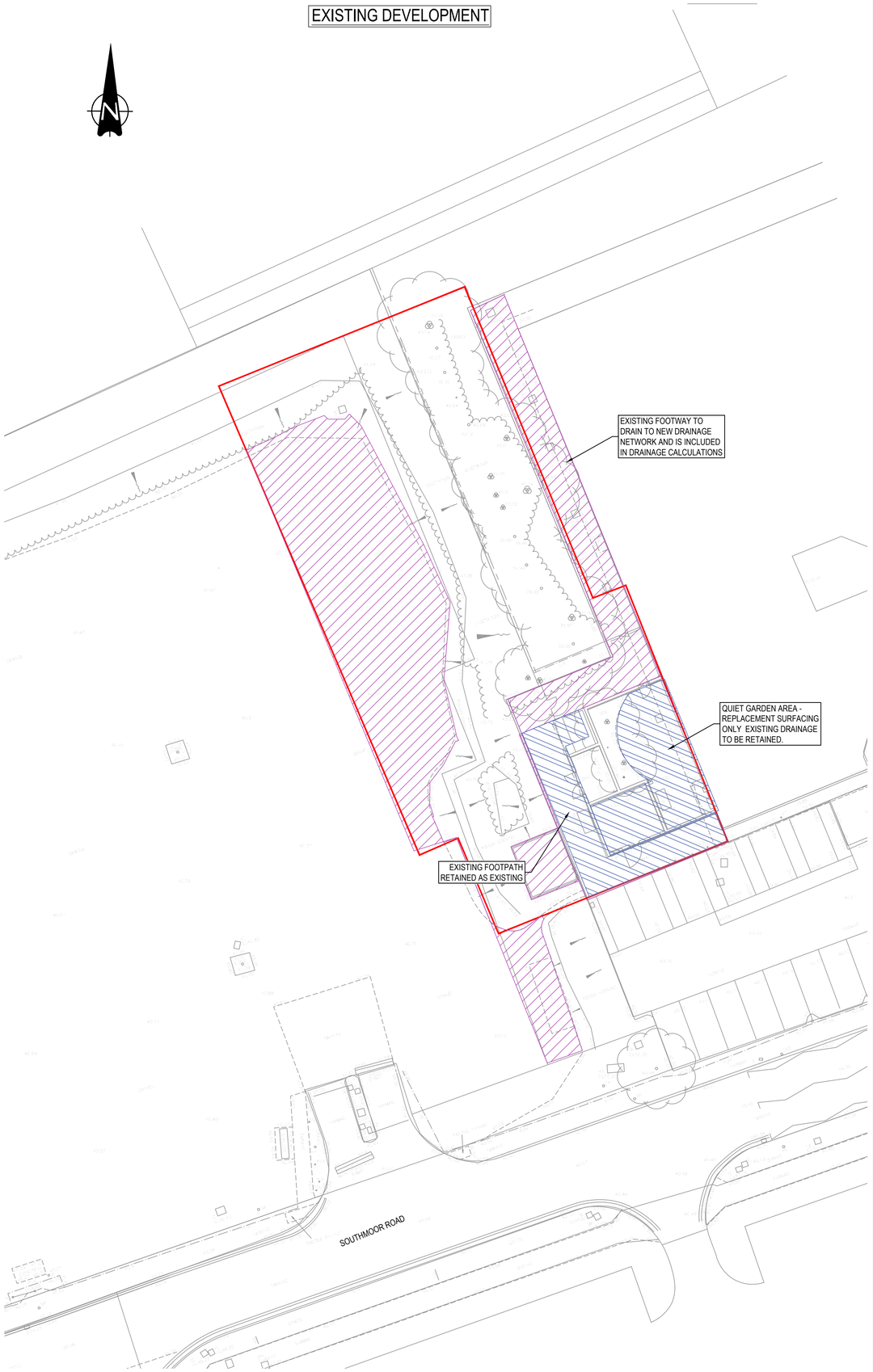
AGS

Appendix D

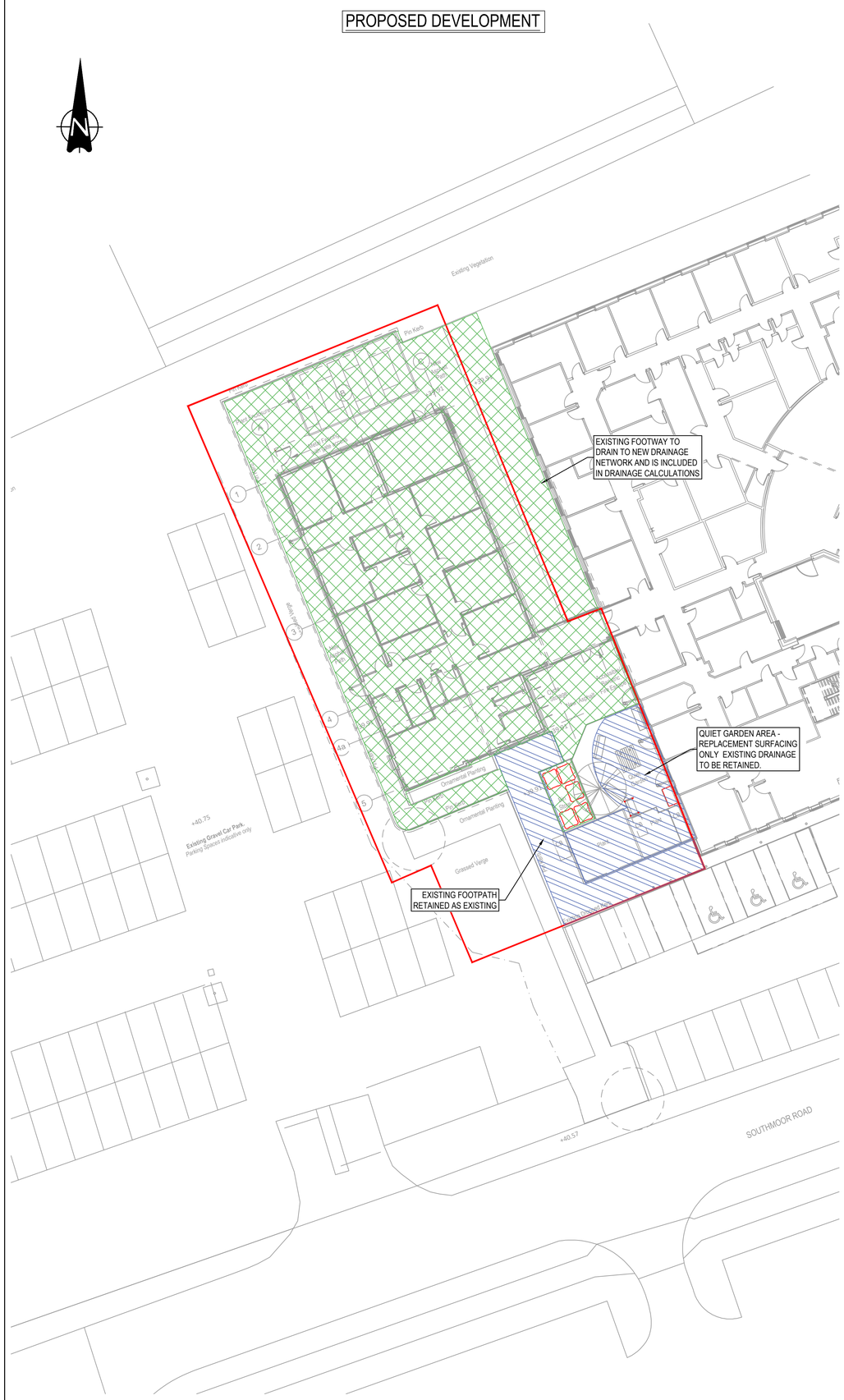
Existing and Proposed Catchments

Greenfield Runoff Rate Calculation

EXISTING DEVELOPMENT



PROPOSED DEVELOPMENT



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.

KEY:

ESTIMATED SITE BOUNDARY BASED ON ARCHITECTS DRAWING BIA-AFL-01-00-DR-A-90101-P3

TOTAL SITE AREA 0.11 Ha

EXISTING IMPERMEABLE AREA
0.043 Ha

PROPOSED IMPERMEABLE AREA
0.076 Ha

RETAINED IMPERMEABLE AREA EXCLUDED FROM DRAINAGE CALCULATIONS*
0.015 Ha

*AREA EXCLUDED AS THIS AREA IS EITHER RETAINED, OR IS SUBJECT TO A REPLACEMENT OF SURFACING ONLY.

SURFACE WATER DRAINAGE
PROPOSALS WILL BE SUBJECT TO AGREEMENT WITH THE RELEVANT AUTHORITIES.

PROPOSED FLOW RATES:
SW OUTFALL
ALLOWABLE DISCHARGE RATES HAVE BEEN CALCULATED BASED ON A GREENFIELD RUNOFF CALCULATIONS FOR THE SITE ARE 0.11Ha.
THE EXISTING DISCHARGE RATES FROM THE SITE HAVE BEEN ESTIMATED AS:
1-YEAR **0.21 l/s**
30-YEAR **0.41 l/s**
100-YEAR **0.50 l/s**.

THEREFORE, THE DISCHARGE RATE HAS BEEN SET AT 5 l/s, FOR THE 1, 30 & 100-YEAR (+45%CC) STORM EVENTS, IN ORDER TO REDUCE THE RISK OF BLOCKAGES

AGREEMENT OF THIS DISCHARGE RATE IS TO BE AGREED WITH THE LLFA & UNITED UTILITIES.

DRAWING BASED ON:

ARCHITECTS DRAWINGS:
- BIA-AFL-01-00-DR-A-20101 REV P5 PROPOSED LAYOUT, GROUND FLOOR
- BIA-AFL-01-01-DR-A-20102 REV P3 PROPOSED ROOF LAYOUT

LANDSCAPE ARCHITECT'S DRAWINGS:
- BIA-AFL-01-00-DR-A-90100 REV P3 PROPOSED SITE PLAN
- BIA-AFL-01-00-DR-A-90101 REV P3 EXTERNAL WORKS - GARDEN, BIN STORE & PLANT AREA

M&E DRAWINGS:
- 3139-SHA-00-NB-DR-M-4000 - SOIL WIP RECEIVED 12/05/23
- BELOW GROUND SERVICES PLAN RECEIVED 12/05/23

FOUNDATION DRAWINGS:
- BIA-CUR-00-XX-M3-000001 STRUCTURAL PLAN WIP RECEIVED 12/05/23

TOPOGRAPHICAL SURVEY:
- S20154-T-01, REV A, BY SEP DATED JANUARY 2020

CCTV SURVEY:
- LAY0391-01, BY LAYER SURVEYS LTD, DATED DECEMBER 2019

Rev:	Description:	Date:	By:	Chkd:
P02	STAGE 3 ISSUE	19/05/23	ATL	MW
P01	FOR PLANNING	10/01/20	OJT	MW

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Status:
STAGE 3

Project:
NATIONAL BREAST IMAGING ACADEMY
WYTHENSHAW HOSPITAL

Drg Title:
EXISTING & PROPOSED
DRAINAGE CATCHMENTS

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	10/01/20	OJT	OJT	MW
Scale: 1:200				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
072094	CUR	01	XX	DR	C	92000	P02

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hrwallingford

Greenfield runoff
estimation for s

www.uksuds.com | Greenfield runc

Calculated by:	Wayne Cheung
Site name:	NBIA
Site location:	Manchester

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.39037°
Longitude:	2.29185°
Reference:	24338755
Date:	May 17 2023 14:

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.11

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	824	824
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

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Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.24	0.24
1 in 1 year (l/s):	0.21	0.21
1 in 30 years (l/s):	0.41	0.41
1 in 100 year (l/s):	0.5	0.5
1 in 200 years (l/s):	0.57	0.57

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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Appendix E

Proposed Drainage Layout

Surface Water Model Details and Results

COVER LEVELS ESTIMATED FROM PROPOSED SITE PLAN - ADJUSTEMENTS WILL BE REQUIRED TO SUTI FINAL DETAILED DESIGN LEVELS.

FFL/ 40.080
175mm THICK SLAB

TOP OF FOUNDATIONS 39.555
STRIP FOOTINGS 600mm DEEP

ALL POP-UP ILS 39.605 UNLESS NOTED OTHERWISE.

FOUL DRAINAGE TO BE 1:100
- MIN 1:40 NO WC CONNECTIONS
- MIN 1:80 WITH WC CONNECTION

SURFACE WATER TO BE 150Ø LAID AT MIN 1:100 UNLESS NOTED OTHERWISE

MH F01 450Ø CL:39.89 IL:39.29

MH S02 600Ø CL:39.91 IL:38.35 BD IL 39.40

MH F05 450Ø CL:39.89 IL:39.19

MH F04 450Ø CL:39.91 IL:39.27

MH S03 600Ø CATCHPIT CL:39.89 IL:38.17

MH S04 600Ø CATCHPIT CL:39.89 IL:38.10

CELLULAR STORAGE TANK:
7m x 2.5m x 1.2m DEEP
OUTLET IL:38.05
PROVIDES 23.9m³
ATTENUATION VOLUME
BASED ON 95% VOID RATIO

CAPACITY OF EXISTING DRAINS TO BE ASSESSED IF CONNECTION IS POSSIBLE

EXISTING GULLY & CONNECTION WITHIN GARDEN AREA TO BE RETAINED. GRATING TO BE REPLACED: TO BE AGREED WITH LANDSCAPE ARCHITECT.

EXS1 CL:39.87 IL:38.12

MH S01 600Ø CL:39.91 IL:38.50

EXF1 CL:39.89 IL:38.81

FULL EXTERNAL AREA SERVED BY NEW LINEAR DRAIN

EXF2 CL:39.91 IL:38.78

EXACT LOCATION OF LINEAR DRAIN TO BE CONFIRMED ONCE DETAILED LEVELS DESIGN COMPLATED.

EXF3 CL:39.92 IL:38.70 NEW CONNECTION INTO EXISTING MANHOLE

MH F02 450Ø CL:39.90 IL:38.67 NEW CHAMBER ON EXISTING DRAIN

MH F03 450Ø CL:39.91 IL:38.64 BD IL:39.23

EXF4 CL:39.89 IL:38.64

RETAINED SURFACE WATER DRAINAGE TO BE PROTECTED DURING CONSTRUCTION. ANY DAMAGE TO BE REPARIED.

MH F06 450Ø CL:39.89 IL:38.59 BD IL 39.09

MH F07 450Ø CL:39.89 IL:38.57 NEW CHAMBER ON EXISTING DRAIN S106 AGREEMENT (INDIRECT) REQUIRED UU REQUIRED.

MH S06 600Ø CL:39.89 IL:37.94 NEW CHAMBER ON EXISTING DRAIN S106 AGREEMENT (INDIRECT) REQUIRED UU REQUIRED.

MH S05 150Ø CL:39.89 IL:38.08 FLOW CONTROL MANHOLE LIMITED TO 5 l/s HYDROBRAKE OPTIMUM REF CTL-SHE-0093-5000-1900-5000 DESIGN HEAD 1.9m DESIGN FLOW 5 l/s

EXF6 CL:39.92 IL:38.36

EXS2 CL:39.95 IL:37.75

SURFACE WATER DRAINAGE

PROPOSALS WILL BE SUBJECT TO AGREEMENT WITH THE RELEVANT AUTHORITIES.

PROPOSED FLOW RATES:

SW OUTFALL

ALLOWABLE DISCHARGE RATES HAVE BEEN CALCULATED BASED ON A GREENFIELD RUNOFF CALCULATIONS FOR THE SITE ARE 0.11Ha.

THE EXISTING DISCHARGE RATES FROM THE SITE HAVE BEEN ESTIMATED AS:

1-YEAR **0.21 l/s**

30-YEAR **0.41 l/s**

100-YEAR **0.50 l/s.**

THEREFORE, THE DISCHARGE RATE HAS BEEN SET AT 5 l/s, FOR THE 1, 30 & 100-YEAR (+45%CC) STORM EVENTS, IN ORDER TO REDUCE THE RISK OF BLOCKAGES

AGREEMENT OF THIS DISCHARGE RATE IS TO BE AGREED WITH THE LLFA & UNITED UTILITIES.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

SURCHARGED OUTFALL:

THE DRAINAGE MODEL HAS BEEN CARRIED OUT WITHE A ASSUMED SURCHARGED OUTFALL LEVEL AET 1m ABOVE THE SOFFIT OF THE EXISTING DRAIN.

ATTENUATION REQUIREMENTS:

ATTENUATION OF APPROX. 24m³ IS PROVIDED BY CELLULAR ATTENUATION

SUSTAINABLE FEATURES:

DUE TO SITE CONSTRAINTS, SUDS FEATURES NOT CONSIDERED VIABLE FOR THE SITE.

INFILTRATION IS NOT CONSIDERED APPROPRIATE FOR THIS SCHEME.

FOUL WATER DESIGN

FW OUTFALL

FW PEAK FLOW RATE ESTIMATED AT 2.9 l/s BASED ON 17.3 DUs, FROM M&E DESIGNER'S DRAWING 3139-SHA-00-NB-DR-M-4000.

LEVELS INDICATE THAT PUMPING WILL NOT BE REQUIRED.

A S106 (INDIRECT) AGREEMENT WITH UNITED UTILITIES IS REQUIRED FOR BOTH SW & FOUL DRAINAGE OUTFALLS.

DRAWING BASED ON:

ARCHITECTS DRAWINGS:
- BIA-AFL-01-00-DR-A-20101 REV P5 PROPOSED LAYOUT, GROUND FLOOR
- BIA-AFL-01-00-DR-A-20102 REV P3 PROPOSED ROOF LAYOUT

LANDSCAPE ARCHITECT'S DRAWINGS:
- BIA-AFL-01-00-DR-A-90100 REV P3 PROPOSED SITE PLAN
- BIA-AFL-01-00-DR-A-90101 REV P3 EXTERNAL WORKS - GARDEN, BIN STORE & PLANT AREA

M&E DRAWINGS:
- 3139-SHA-00-NB-DR-M-4000 - SOIL WIP RECEIVED 12/05/23
- BELOW GROUND SERVICES PLAN RECEIVED 12/05/23

FOUNDATION DRAWINGS:
- BIA-CUR-00-XX-M3-000001 STRUCTURAL PLAN WIP RECEIVED 12/05/23

TOPOGRAPHICAL SURVEY:
- S20154-T-01, REV A, BY SEP DATED JANUARY 2020

CCTV SURVEY:
- LAY0391-01, BY LAYER SURVEYS LTD, DATED DECEMBER 2019

"RESIDUAL HAZARD REGISTER (RELATES TO CIVIL/STRUCTURAL MATTERS ONLY)
MUST BE READ IN CONJUNCTION WITH CURTINS RESIDUAL HAZARD REGISTER XXXXX-CUR-ZZ-XX-HA-X-00001.
HAZARDS THAT SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR HAVE NOT BEEN INDICATED ON THIS DRAWING. SHOULD ANY ADDITIONAL HAZARDS BE IDENTIFIED, THE CONTRACTOR SHOULD NOTIFY ALL RELEVANT PROJECT TEAM MEMBERS."

HAZARD REGISTER

Hazard Ref.	Item (Feature, Element or Activity)	Potential Hazard Identified	Action (Information to Assist Control)
1.00 Enabling / Highwayworks			
1.01	Working adjacent/within Live Car Park	Risk to construction workers and equipment.	Construction Management Plan to assess edge protection, access routes and appropriate activities within proximity to live highway interface.
3.00 Existing Buried & Overhead Services			
3.01	Existing Live Services	Reduce	Carry out additional surveys and investigations to locate and protect the services in co-ordination with Services Engineer/Statutory Undertakers.

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
4. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
5. ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
6. WHERE EXISTING DRAINAGE IS BEING USED, ALLOWANCES SHOULD BE MADE TO REMEDIATE THIS DRAINAGE IN LINE WITH AVAILABLE CCTV SURVEY INFORMATION.
7. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
8. BUILDING LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT.
9. OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.
10. THIS DRAWING IS PRELIMINARY AND IS SUBJECT TO CHANGE AT LATER STAGES.

KEY:

- ESTIMATED SITE BOUNDARY BASED ON ARCHITECTS DRAWING BIA-AFL-01-00-DR-A-90101-P3
- EXISTING FOUL WATER DRAIN
- EXISTING SURFACE WATER DRAIN
- DRAINAGE TO BE REMOVED
- PROPOSED FOUL WATER DRAIN PROPOSED
- PROPOSED SURFACE WATER DRAIN
- PROPOSED DRAINAGE CHANNEL - CASTSLOT TREADSAFE D400 OR SIMILAR APPROVED. SIZES AS SHOWN
- AB PROPOSED ACCESS/OUTLET BOX
- FG PROPOSED FOUL GULLY
- SVP SVP - SOIL VENT PIPE
- RWP RAINWATER PIPE
- PROPOSED CELLULAR ATTENUATION TANK
- PROPOSED FOUNDATIONS
- PROPOSED SERVICES

MANHOLE SCHEDULE- SURFACE WATER

MH REF	CL (mAOD)	IL (mAOD)	DEPTH TO SOFFIT (m)	DS PIPE DIA (mm)	MH DIA (mm)	MH TYPE	COVER SIZE (mm)	COVER CLASS	COVER TYPE	RECESSED	RESTRICTED ACCESS	BACK DROP	COMMENTS
S01	39.91	38.50	1.26	150	600	PPIC	600X600	D400	SINGLE SEALED	N	Y		RESTRICTED ACCESS 350mm DIA MAX;
S02	39.91	38.35	1.34	225	600	PPIC	600X600	D400	SINGLE SEALED	N	Y	39.40	RESTRICTED ACCESS 350mm DIA MAX;
S03	39.91	38.17	1.44	300	600	PPIC CATCHPIT	600X600	C250	VENTED COVER	N	Y		RESTRICTED ACCESS 350mm DIA MAX; CATCHPIT 350mm SUMP
S04	39.91	38.10	1.51	300	600	PPIC CATCHPIT	600X600	C250	SINGLE SEALED	N	Y		RESTRICTED ACCESS 350mm DIA MAX; CATCHPIT 350mm SUMP
S05	39.91	38.08	1.68	150	1500	TYPE B CATCHPIT	1200 X 675	C250	SINGLE SEALED	N	N		CATCHPIT 350mm SUMP
S06	39.91	37.94	1.75	225	600	PPIC	600X600	C250	SINGLE SEALED	N	Y		RESTRICTED ACCESS 350mm DIA MAX;

MANHOLE SCHEDULE- FOUL WATER

MH REF	CL (mAOD)	IL (mAOD)	DEPTH TO SOFFIT (m)	DS PIPE DIA (mm)	MH DIA (mm)	MH TYPE	COVER SIZE (mm)	COVER CLASS	COVER TYPE	RECESSED	RESTRICTED ACCESS	BACK DROP	COMMENTS
F01	39.91	39.29	0.52	100	450	PPIC	450 X 450	D400	SINGLE SEALED	N	N		
F02	39.91	38.67	1.09	150	450	PPIC	450 X 450	D400	SINGLE SEALED	N	Y	39.23	RESTRICTED ACCESS 350mm DIA MAX;
F03	39.91	38.64	1.12	150	450	PPIC	450 X 450	D400	SINGLE SEALED	N	Y		RESTRICTED ACCESS 350mm DIA MAX;
F04	39.91	39.27	0.54	100	450	PPIC	450 X 450	C250	SINGLE SEALED	N	N		
F05	39.91	39.19	0.57	150	450	PPIC	450 X 450	C250	SINGLE SEALED	N	N		
F06	39.91	38.59	1.17	150	450	PPIC	450 X 450	C250	SINGLE SEALED	N	Y	39.09	RESTRICTED ACCESS 350mm DIA MAX;
F07	39.91	38.57	1.19	150	450	PPIC	450 X 450	C250	SINGLE SEALED	N	Y		RESTRICTED ACCESS 350mm DIA MAX;

Rev:	Description:	Date:	By:	Chkd:
P04	STAGE 3 ISSUE	19/05/23	ATL	MW
P03	PROPOSED DRAINAGE UPDATE	15/02/23	TH	MW
P02	CCTV UPDATE	22/01/20	OJT	MW
P01	FOR PLANNING	10/01/20	OJT	MW

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Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham

Status: FOR INFORMATION

Project: NATIONAL BREAST IMAGING ACADEMY WYTHENSHAW HOSPITAL

Drg Title: PROPOSED DRAINAGE LAYOUT

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	10/01/20	OJT	OJT	MW

Scale: 1:200

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
072094	CUR	01	XX	DR	C	92500	P04

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Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.358	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

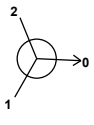
Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S01	0.030	5.00	39.910	600	380719.130	388255.050	1.410
S02	0.019	5.00	39.910	600	380723.516	388244.311	1.562
S03	0.006	5.00	39.910	600	380714.399	388222.334	1.745
S04	0.006	5.00	39.910	600	380725.644	388226.953	1.806
S05	0.012	5.00	39.910	1500	380728.535	388232.025	1.835
S06			39.910	600	380730.474	388231.936	1.895

Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S01	S02	11.600	0.600	38.500	38.423	0.077	150.0	150	5.24	50.0
1.001	S02	S05	13.272	0.600	38.348	38.260	0.088	150.0	225	5.44	50.0
2.000	S03	S04	12.157	0.600	38.165	38.104	0.061	200.0	300	5.18	50.0
2.001	S04	S05	5.838	0.600	38.104	38.075	0.029	200.0	300	5.27	50.0
1.002	S05	S06	1.941	0.600	38.075	38.015	0.060	32.4	150	5.42	50.0

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S01	380719.130	388255.050	39.910	1.410	600	 0	1.000	38.500	150
S02	380723.516	388244.311	39.910	1.562	600	 1	1.000	38.423	150
						0	1.001	38.348	225
S03	380714.399	388222.334	39.910	1.745	600	 0	2.000	38.165	300
S04	380725.644	388226.953	39.910	1.806	600	 1	2.000	38.104	300
						0	2.001	38.104	300
S05	380728.535	388232.025	39.910	1.835	1500	 1	2.001	38.075	300
						2	1.001	38.260	225
						0	1.002	38.075	150

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S06	380730.474	388231.936	39.910	1.895	600	1	1.002	38.015	150



Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	18.000	Drain Down Time (mins)	240
Ratio-R	0.358	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node S06 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to 30yr, 100yr+45% CC 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 minute storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.225	300	1.225	600	1.225	900	1.225	1200	1.225
60	1.225	360	1.225	660	1.225	960	1.225	1260	1.225
120	1.225	420	1.225	720	1.225	1020	1.225	1320	1.225
180	1.225	480	1.225	780	1.225	1080	1.225	1380	1.225
240	1.225	540	1.225	840	1.225	1140	1.225	1440	1.225

Node S05 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	38.075	Product Number	CTL-SHE-0093-5000-1900-5000
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node S04 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	38.126
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	21.0	0.0	1.200	21.0	0.0	1.201	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	94.631	26.777	30 year 360 minute summer	29.696	7.642
1 year 15 minute winter	66.408	26.777	30 year 360 minute winter	19.303	7.642
1 year 30 minute summer	62.502	17.686	30 year 480 minute summer	23.318	6.162
1 year 30 minute winter	43.861	17.686	30 year 480 minute winter	15.492	6.162
1 year 60 minute summer	43.047	11.376	30 year 600 minute summer	19.053	5.212
1 year 60 minute winter	28.599	11.376	30 year 600 minute winter	13.018	5.212
1 year 120 minute summer	27.239	7.198	30 year 720 minute summer	16.951	4.543
1 year 120 minute winter	18.097	7.198	30 year 720 minute winter	11.392	4.543
1 year 180 minute summer	21.313	5.485	30 year 960 minute summer	13.883	3.656
1 year 180 minute winter	13.854	5.485	30 year 960 minute winter	9.197	3.656
1 year 240 minute summer	17.098	4.519	30 year 1440 minute summer	10.030	2.688
1 year 240 minute winter	11.360	4.519	30 year 1440 minute winter	6.741	2.688
1 year 360 minute summer	13.347	3.435	100 year +45% CC 15 minute summer	433.303	122.610
1 year 360 minute winter	8.676	3.435	100 year +45% CC 15 minute winter	304.072	122.610
1 year 480 minute summer	10.629	2.809	100 year +45% CC 30 minute summer	290.377	82.167
1 year 480 minute winter	7.062	2.809	100 year +45% CC 30 minute winter	203.773	82.167
1 year 600 minute summer	8.786	2.403	100 year +45% CC 60 minute summer	199.139	52.627
1 year 600 minute winter	6.003	2.403	100 year +45% CC 60 minute winter	132.303	52.627
1 year 720 minute summer	7.894	2.116	100 year +45% CC 120 minute summer	123.447	32.623
1 year 720 minute winter	5.305	2.116	100 year +45% CC 120 minute winter	82.015	32.623
1 year 960 minute summer	6.572	1.731	100 year +45% CC 180 minute summer	94.580	24.339
1 year 960 minute winter	4.354	1.731	100 year +45% CC 180 minute winter	61.480	24.339
1 year 1440 minute summer	4.868	1.305	100 year +45% CC 240 minute summer	74.355	19.650
1 year 1440 minute winter	3.272	1.305	100 year +45% CC 240 minute winter	49.400	19.650
30 year 15 minute summer	231.479	65.500	100 year +45% CC 360 minute summer	55.995	14.410
30 year 15 minute winter	162.441	65.500	100 year +45% CC 360 minute winter	36.399	14.410
30 year 30 minute summer	153.602	43.464	100 year +45% CC 480 minute summer	43.781	11.570
30 year 30 minute winter	107.791	43.464	100 year +45% CC 480 minute winter	29.087	11.570
30 year 60 minute summer	104.640	27.653	100 year +45% CC 600 minute summer	35.650	9.751
30 year 60 minute winter	69.521	27.653	100 year +45% CC 600 minute winter	24.358	9.751
30 year 120 minute summer	64.725	17.105	100 year +45% CC 720 minute summer	31.621	8.475
30 year 120 minute winter	43.002	17.105	100 year +45% CC 720 minute winter	21.251	8.475
30 year 180 minute summer	49.672	12.782	100 year +45% CC 960 minute summer	25.771	6.786
30 year 180 minute winter	32.288	12.782	100 year +45% CC 960 minute winter	17.071	6.786
30 year 240 minute summer	39.164	10.350	100 year +45% CC 1440 minute summer	18.479	4.953
30 year 240 minute winter	26.020	10.350	100 year +45% CC 1440 minute winter	12.419	4.953

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Results for 1 year Critical Storm Duration. Lowest mass balance: 95.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S01	10	38.553	0.053	3.7	0.0376	0.0000	OK
15 minute winter	S02	10	38.406	0.058	5.9	0.0307	0.0000	OK
30 minute winter	S03	22	38.201	0.036	0.6	0.0127	0.0000	OK
30 minute winter	S04	23	38.201	0.097	3.6	1.5324	0.0000	OK
30 minute winter	S05	23	38.200	0.125	5.7	0.2380	0.0000	OK
15 minute summer	S06	1	38.015	0.000	3.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S01	1.000	S02	3.6	0.664	0.249	0.0628	
15 minute winter	S02	1.001	S05	5.8	0.735	0.137	0.1050	
30 minute winter	S03	2.000	S04	0.6	0.153	0.008	0.1467	
30 minute winter	S04	2.001	S05	-2.5	0.206	-0.032	0.1386	
30 minute winter	S05	Hydro-Brake®	S06	3.5				5.4

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Results for 30 year Critical Storm Duration. Lowest mass balance: 95.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S01	930	39.276	0.776	0.5	0.5497	0.0000	SURCHARGED
1440 minute winter	S02	930	39.276	0.928	0.8	0.4883	0.0000	SURCHARGED
1440 minute winter	S03	930	39.276	1.111	0.1	0.3912	0.0000	SURCHARGED
1440 minute winter	S04	930	39.276	1.172	1.0	23.3694	0.0000	SURCHARGED
1440 minute winter	S05	930	39.276	1.201	0.9	2.2802	0.0000	SURCHARGED
15 minute summer	S06	1	39.240	1.225	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S01	1.000	S02	0.5	0.327	0.031	0.2042	
1440 minute winter	S02	1.001	S05	0.7	0.277	0.017	0.5278	
1440 minute winter	S03	2.000	S04	0.1	-0.003	0.001	0.8561	
1440 minute winter	S04	2.001	S05	-0.8	-0.023	-0.010	0.4111	
1440 minute winter	S05	Hydro-Brake®	S06	0.7				8.9

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 95.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S01	160	39.638	1.138	3.5	0.8057	0.0000	FLOOD RISK
240 minute winter	S02	160	39.636	1.288	5.4	0.6775	0.0000	FLOOD RISK
240 minute winter	S03	160	39.637	1.472	0.7	0.5183	0.0000	FLOOD RISK
240 minute winter	S04	160	39.638	1.534	6.8	24.4952	0.0000	FLOOD RISK
240 minute winter	S05	160	39.634	1.559	6.4	2.9594	0.0000	FLOOD RISK
15 minute summer	S06	1	39.240	1.225	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	S01	1.000	S02	3.2	0.549	0.219	0.2042	
240 minute winter	S02	1.001	S05	5.0	0.473	0.119	0.5278	
240 minute winter	S03	2.000	S04	0.5	0.074	0.007	0.8561	
240 minute winter	S04	2.001	S05	-5.8	-0.121	-0.074	0.4111	
240 minute winter	S05	Hydro-Brake®	S06	4.3				18.2

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