

Flood Risk Assessment

LITTLE HAMPTON, Land at Watersmead Business Park

14 May 2019

Prepared for: Amazon

CONTACT DETAILS

Name	Position	Email	Telephone	Mobile
J awsy J abbar	Principal Engineer			
David Meigh	Director			

APPROVALS

	Name	Position	Date
Prepared by	J awsy J abbar	Principal Engineer	14.05.19
Reviewed by	David Meigh	Director	14.05.19
Approved by	David Meigh	Director	14.05.19

VERSIONS

Number	By	Date	Context
1	J awsy J abbar	04.02.19	For Comment
2	Andrew Quinn	15.04.19	For Comment
3	J awsy J abbar	14.05.19	For Comment

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1 INTRODUCTION

Pinnacle Consulting Engineers Ltd have been commissioned by Amazon to carry out a Flood Risk Assessment report (FRA) for a proposed development of a site off Norway Lane, Watersmead Business Park, Toddington, BN17 6GY. A site location plan is enclosed in Appendix A.

With reference to the indicative flood maps published by the Environment Agency, the site appears to lie in Flood Zone 1. This FRA report has been prepared in accordance with the requirements contained within National Planning Policy Framework (NPPF, July 2018) and the associated Planning Practice Guidance. The guidance refers to the Environment Agency's 'standing advice' on flood risk. Based on requirements set by the Environment Agency, a Flood Risk assessment is needed to support the planning application.

This report has been prepared in accordance with (i) National Planning Policy Framework (NPPF), (Department for Communities and Local Government, July 2018) and the accompanying (ii) Planning Practice Guidance (Ministry of Housing, Communities and Local Government, March 2014); and (iii) Level 1 and 2 Strategic Flood Risk Assessment (SFRA) undertaken on behalf of Arun District Council by JBA Consulting, Nov 2016 (iv) Other statutory laws and local bylaws and rules.

It is stated in Paragraph 30 of the Flood Risk and Coastal Change chapter within the Planning Practice Guidance that 'a site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users'.

This report has been prepared to address the requirements of the NPPF and has derived the following data/information from various sources including:

- ¿ Information published or explicitly provided by the Environment Agency;
- ¿ Information published by the Local Planning Authority, including the SFRA;
- ¿ A site-specific topographical survey;
- ¿ Enquiries made to relevant authorities to understand possible risks of flooding in the area; and
- ¿ Specific design works carried out for this report.

Pinnacle Consulting Engineers Ltd are specialists in flood studies with a track record of several hundred successful FRA reports and assessments.

2 EXISTING SITE CONDITIONS

2.1 Site description

The proposed development is located at National Grid Reference (NGR) 503839, 103654 off Norway Lane, Watersmead Business Park, Toddington, BN17 6GY.

The existing site consists of three large warehouse buildings, associated service yards, circulation routes and HGV parking areas. The site is located to the east of Wick, in the north of Toddington and just north of A259. The site is bound to the north by railway tracks between Angmering and Ford, to the south by parking and circulation roads associated with the Bodyshop HQ building and the 'kids unlimited' pre-school, to the west by The Co-operative Childcare nursery and residential dwellings along Gratwicke Drive and to the east by a large feature lake running northwards towards Black Ditch. An approximately 0.5ha feature lake can be identified to the east of the site and appears to run into a complex of interconnecting tributaries and reservoirs roughly 140m north of the site.



Figure 2.1 - Aerial View of the existing development site (approximate site boundary edged red)

2.2 Topography

The development site is relatively flat with ground levels across the site varying between approximately 5m and 4m Above Ordnance Datum (AOD). The site falls generally in a south direction.

Topographical survey has been commissioned to confirm the levels across the site.

Details of existing development site levels are enclosed in Appendix B.

2.3 Geological ground conditions

Geological conditions at the site are detailed below and are based on a British Geological Survey (BGS) report and the Short Form Geotechnical Report carried out by Deltasimons in March 2019. The focus of this study on geology is on the potential movement of water through Made Ground, Drift Geology and Solid Geology.

These strata are outlined in Table 2.2.

Formation	Description
Artificial Ground (Made Ground)	Artificial deposits delineated in available Dynamic Sampler on site identify Made Ground proven to approximately 0.45m bgl.
Superficial Deposits (Drift Deposits)	River Terrace Deposits (undifferentiated) - Sand, Silt and Clay. These deposits are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river or estuary. These deposits have been proven to approximately 2.43m bgl.
Bedrock	New Pit Chalk Formation - Chalk. These sedimentary rocks are shallow-marine in origin. They are biogenic and detrital, generally comprising carbonate material (coccoliths), forming distinctive beds of chalk. Chalk deposits have been proven to 45.72m bgl.
Water Table	Available boreholes identify a water table at 5.18m deep that is not expected to significantly impact drainage design or associated earthworks activities.

Table 2.2 - Geological Ground Conditions

2.4 Existing surface water management

A GPR survey was conducted by Malcom Hughes Chartered Land Surveyors in March of 2019 to define the location of existing infrastructure within the site. Current survey records identify that the site has two fully operational, primary, positive surface water networks, with separate discharge locations serving the existing site. Due to the lack of evidence to suggest otherwise, it is reasonable to assume the identified networks discharge into the large feature lake situated approximately 20m to the east of the site. Assumed outfall locations are positioned along the eastern perimeter of the site. One of sewers are assumed to outfall from the north east corner of the site via a $\varnothing$ 375mm and the other discharges immediately to the east of the central service yard via a $\varnothing$ 1050mm pipe. Following a critique of the existing networks, it is assumed that surface water runoff discharges into the pond at an unrestricted rate.

A series of gullies are depicted running along the inner kerb lines bordering the large warehouse to the north and are assumed to connect into the adjacent sewers, which roughly follow the centre line of the existing circulation routes. A series of surface water sewers are identified running parallel to the existing buildings along the centre of the site; they are shown to serve the central service yard, the large distribution centre to the north and both warehouse buildings to the south.

The existing drainage arrangement shown on the drainage survey is provided from the GPR Survey and enclosed in Appendix B.

3 PROPOSED DEVELOPMENT

The proposed development comprises installation of 5 no. vehicle-to-ground lifts and a canopy cover over the associated service yard area for a temporary period of five years, minor alterations to the internal access road, including widening works, creation of a new spur, provision of a pedestrian footbridge, and associated lighting and drainage infrastructure provision.

The proposed development plans are enclosed in Appendix C.

4 PROBABILITY OF FLOODING

The NPPF identifies six potential sources of flooding:-

- ¿ Flooding from rivers (fluvial flooding);
- ¿ Flooding from the sea (tidal flooding);
- ¿ Flooding from land;
- ¿ Flooding from sewers;
- ¿ Flooding from groundwater; and
- ¿ Flooding from reservoirs, canals, and other artificial sources.

These are considered below.

4.1 Flooding from rivers (fluvial flooding) & sea (tidal flooding)

The assessment of flood risk in this report is based on the definitions in Table 1 of the Flood Risk and Coastal Change, Planning Practice Guidance, which recognises the following Flood Zones:

- ¿ Flood Zone 1 - little or no risk, with annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000-year)
- ¿ Flood Zone 2 - low to medium risk, with annual probability of flooding between 0.1% and 1.0% from rivers and between 0.1% and 0.5% from the sea
- ¿ Flood Zone 3a - high risk of flooding with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea.
- ¿ Flood Zone 3b - the 'Functional Floodplain' with an annual probability of flooding of 5% or greater.

An extract from the Environment Agency's online flood map published on their website is shown in Figure 4.1 below, with Flood Zone 3a & 3b denoted by dark blue hatch and Flood Zone 2 a light blue. The site is located within a Flood Zone 1 'Low Probability' area and therefore lies outside an area at risk of fluvial/tidal flooding.

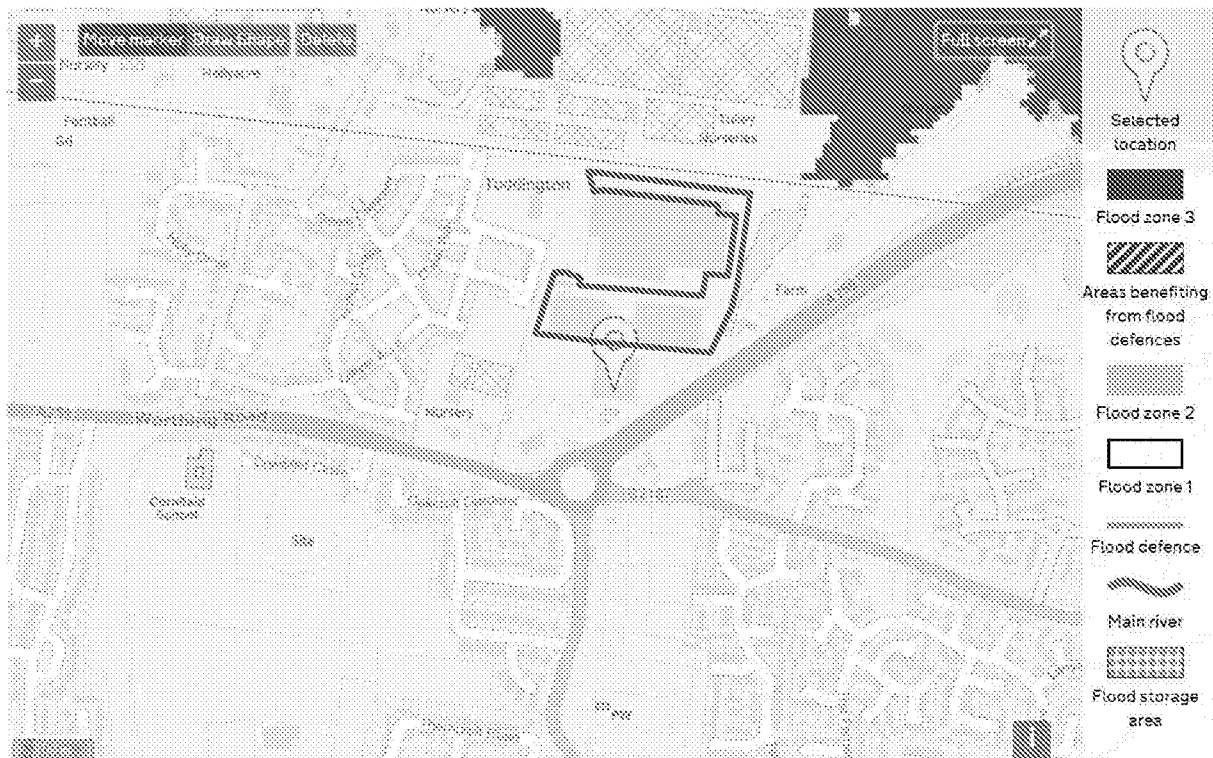


Figure 4.1 - Environment Agency Online Flood Map Extract for Planning (Approximate Site Extents Edged Red)

Based on the Figure 4.1, proposed site lies in Flood Zone 1.

4.2 Flooding from land & sewers

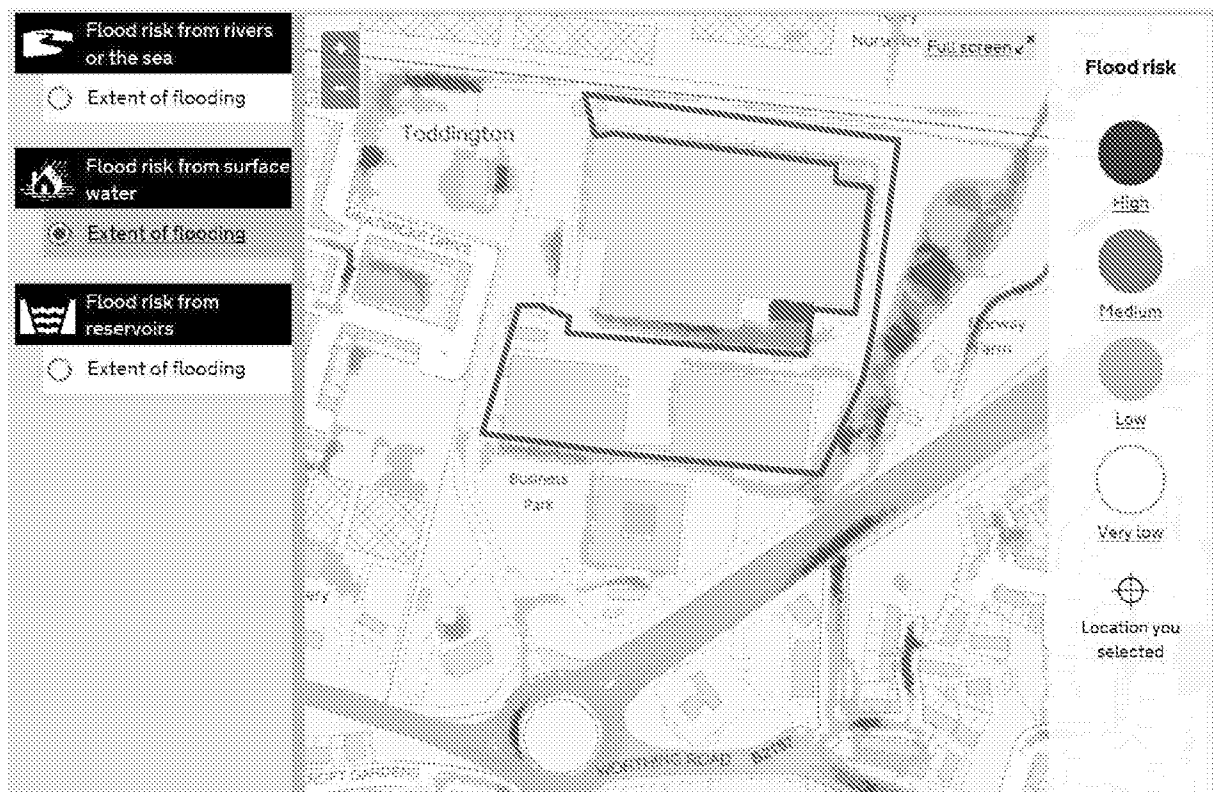


Figure 4.2 ~ Environment Agency Online Flood Map Extract for surface water flooding (Approximate Site Extents Edged Red)

Based on the Figure 4.2, proposed site lies in low to medium zone for the surface water flooding.

4.3 Flooding from groundwater

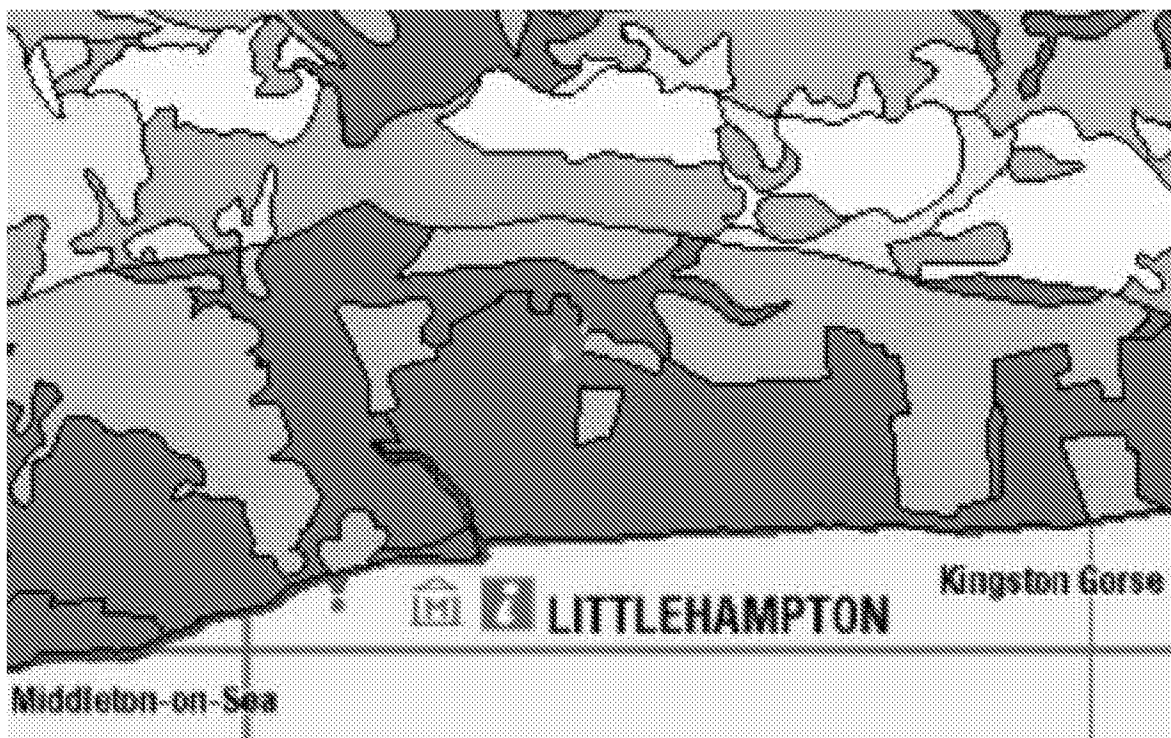


Figure 4.3 ~ Defra Groundwater Vulnerability Map (Approximate Site location Edged Red)

Based on the Figure 4.3 the proposed site lies in Major Aquifer High vulnerability zone.

4.4 Flooding from reservoirs, canals, and other artificial sources

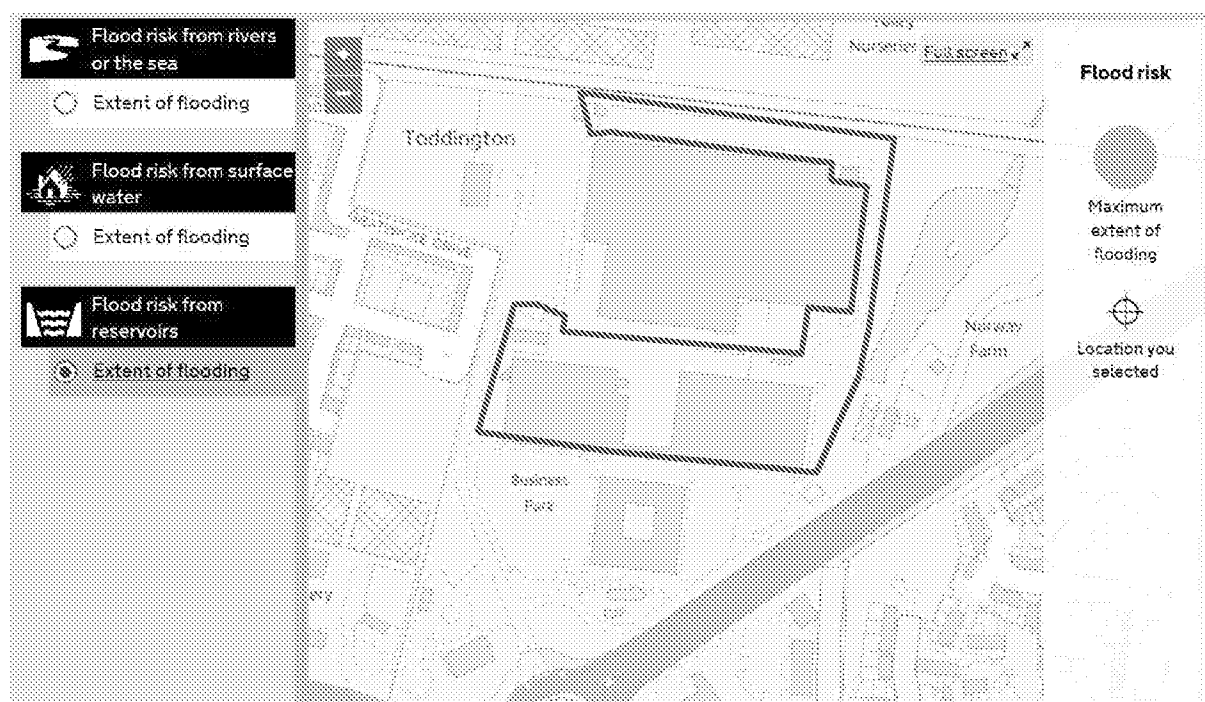


Figure 4.4 - Environment Agency Online Flood Map Extract for Reservoir flooding (Approximate Site Extents Edged Red)

Based on the Figure 4.4 the proposed site lies in a no risk zone of flooding from reservoirs.

5 POLICY STATUS FOR PROPOSED DEVELOPMENT

5.1 Vulnerability classification

The proposed development complies with the following principles:

- ¿ The proposed development lies within Flood Zone 1;
- ¿ The proposed development is classified as 'less vulnerable' in accordance with Table 2 of the Flood Risk and Coastal Change, Planning Practice Guidance (reproduced as Table 5.1 below).

Essential Infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood Wind Turbines
Highly Vulnerable	Police stations, Ambulance stations, Fire stations, Command Centres and telecommunications installations required to be operational during flooding Emergency dispersal points Basement dwellings Caravans, mobile homes and park homes intended for permanent residential use Installations requiring hazardous substances consent
More Vulnerable	Hospitals Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels Buildings used for dwelling houses; student halls of residence, drinking establishments, nightclubs and hotels. Non-residential uses for health services, nurseries and educational establishments Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	Police, ambulance and fire stations which are not required to be operational during flooding. Buildings used for shops; financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in 'more vulnerable', and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment plants and sewage treatment plants (if adequate pollution control measures are in place). Sewage treatment works (if adequate measures to control pollution and manage sewage during flood events are in place).
Water-compatible Development	Flood control infrastructure. Water transmission infrastructure, pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel workings. Docks, marinas, wharves Navigation facilities.

	MOD defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.
Notes 1 - This classification is based partly on Defra/Environment Agency research on Flood Risks to People (FD2321/TR2)21 and also on the need of some uses to keep functioning during flooding. 2 - Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity. 3 - The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.	

Table 5.1 ~ Flood Risk Vulnerability Classification

Vulnerability Classification		Essential Infrastructure	Water-compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	V	V	V	V	V
	Zone 2	V	V	Exception Test	V	V
	Zone 3a	Exception Test	V	U	Exception Test	V
	Zone 3b	Exception Test	V	U	U	U
Key V Development is appropriate U Development should not be permitted						

Table 5.2 ~ Flood Risk Vulnerability and Flood Zone :Compatibility~

The proposed development is appropriate in accordance with Table 3 of the Flood Risk and Coastal Change, Planning Practice Guidance, reproduced in Table 5.2 above.

5.2 Sequential Test & Exception Test

The NPPF requires that all development is sequential tested to steer new development to areas at the lowest probability of flooding (Flood Zone 1). The Sequential Test would normally be completed by the Local Planning Authority (LPA) to inform the preparation of the Local Development Framework (LDF), where one exists. However, where this process has not yet been completed the onus for the provision of evidence demonstrating successful application of the Sequential Test falls to the developer, or

promoter of the site. The NPPF also requires the layout of a site to be sequentially tested to locate the most vulnerable land uses in the areas at lowest risk of flooding.

The NPPF Planning Practice Guidance acknowledges that in some circumstances it may not be possible to locate development in areas of low or appropriate (considering development vulnerability) flood risk or that there may be other valid reasons for a development to take place within the floodplain. In these circumstances, it is necessary to apply the Exception Test to clearly demonstrate that the benefits for development of a site outweigh the flood risks to the development and its occupants. Table 3 of the Flood Risk and Coastal Change, Planning Practice Guidance (reproduced in Table 5.2 above) indicates when the Exception Test is required.

The proposed development site falls entirely into Flood Zone 1, meaning the Sequential Test is deemed to be passed and the Exception Test is not required.

6 FLOOD RISK MANAGEMENT STRATEGY

The proposed alterations to the internal access road have necessitated the replacement of a small area of landscaping with additional hardstanding. It is anticipated that the associated minor increase in runoff could be accommodated within the existing surface water drainage infrastructure.

Given that the proposal is to marginally increase the amount of impermeable area by 789m² (refer to Appendix D), it is anticipated any overland flow routes will be left unaffected. All surface water storage requirements up to the 1 in 100 year event plus an allowance for climate change are to be stored within the site.

Current survey records identify that the site has two fully operational primary positive draining surface water networks, with separate discharge locations serving the existing site. Should infiltration be ruled out as a viable mode of water management, any additional impermeable area created by the proposed development can be effectively managed within the existing drainage infrastructure. Following a critique of the existing networks, it is assumed that surface water runoff discharges into the pond to the east of the site at an unrestricted rate.

Results of an infiltration test conducted in May 2019 have confirmed that infiltration would be a viable method of surface water management. It is therefore required under Building Regulation (H3) that drainage via infiltration be seen as the primary objective for surface water management. Therefore, the 789m² of impermeable area created by the proposed development will be drained and infiltrated via cellular soakaway storage units. Please refer to Appendix F for the results of the site specific Infiltration test.

Please refer Appendix E of this report for the proposed drainage strategy plan and also to the Drainage Strategy Report for further details.

7 CONCLUSION

With reference to the indicative flood map published by the Environment Agency, the development site is located within Flood Zone 1 :Low probability~. This has been confirmed by the site-specific flood risk assessment as detailed at Section 4.1.

From Table 5.1 the site is classified as :Less Vulnerable~ (Flood Risk Vulnerability Classification) and therefore, from Table 5.2 the development is classified as :appropriate~.

Due to vulnerability groundwater zone, the use of infiltration methods is considered a very low viability option for the discharge of surface water runoff. It is assumed that the existing surface water drainage infrastructure has capacity to accommodate the minor increase in runoff associated with the proposed development.

Results of a survey of utilities identifies that two primary positively draining network exist within the site and are assumed to discharge into the adjacent pond to the east at an unrestricted rate.

The additional 789m² of impermeable area created by the proposed development can be managed by infiltration; this is confirmed by the results of an infiltration test conducted in May 2019 by Delta-Simons.

Additional water quality measures will be provided by the inclusion of appropriate deep silt trapped gullies, petrol interceptors and silt boxes to all channel drains.

Appendix A - Site Location Plan



1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

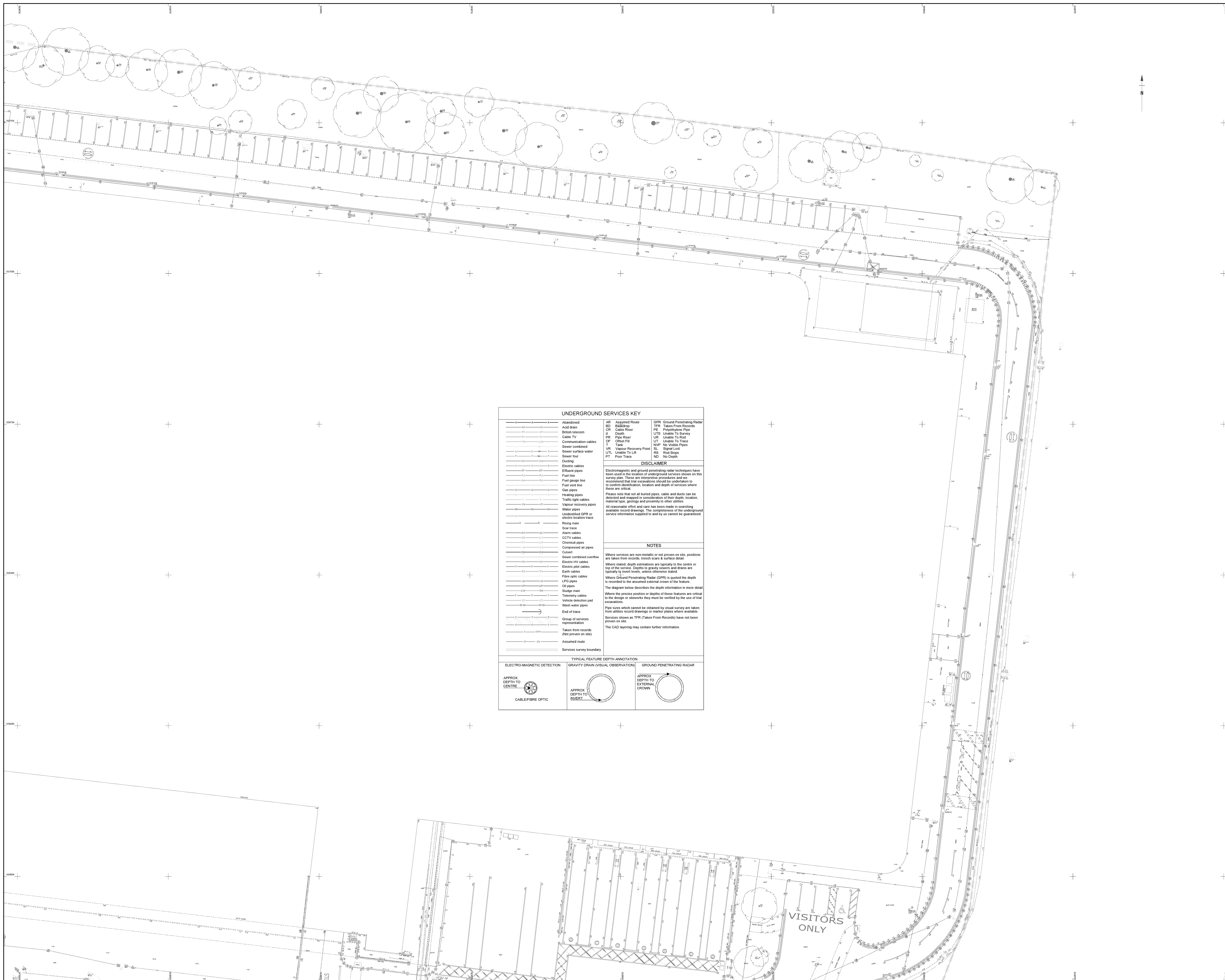
 SITE BOUNDARY

PROJECT
LITTLEHAMPTON
DBN3 REFURBISHMENT

PINNACLE
CONSULTING ENGINEERS

DRAWING STATUS			
TENDER			
SCALE @ AI 1:2000	DATE FEB '19	DRAWN BY RW	CHECKED JJ
DRG NO. I90213-PIN-00-XX-DR-C-0200			REVISION TI

Appendix B - GPR Survey



Survey Notes	
Grid:	Local Plane Metric related to National Grid at survey control SC2
Levels:	Related to OS datum from GNSS positioning, converted using the National Geoid Model OSGM15.

Notes

Topographical Survey Legend

[illegible]

ROADS

Karte		Stream	
Edge of Surfacing		Ditch	
Pedestrian Crossing		Weir	
Track		Culvert	
Footpath		Grip (Land Drain)	
		Spring	

ET FURNITURE	
--------------	--

Beltano Beacon	= BB		
Blue Step	= BS		
Bulldozer	= B		
Crk Eye	= CE		
Cost Chalk	= CC		
Crackdown TV	= CTV		
Crack	= CR		
Decorative Pole	= DP		
Fixed Light	= FL		
Flag Short	= FS		
Lamp Post	= LP		
Letter Box	= LB		
Home Place (owner)	= HP		
Mowing Ring	= MR		
Wife Post or Mowing Post	= MP		
Swing Marker	= MS		
Mix Stone	= MS		

Hedge	
Edge of wood/beaches	
Slump	= SLUMP
Individual Tree	
Grass with height	
Greater than 1m	
Cliff Face	
Marsh	
Reeds	

LEVEL AND HEIGHT INFORMATION

Reflector Spot	= RP	
Road Sign	= RE	
Road Sign	= RS	Standard Spot Height = +133.45
Speed Camera	= SC/CAM	Precision Spot Height = +132.456
Information Sign	= SIGN	Gas Level = +80.349
Stop	= SF	Water Level = +W2.92
Traffic Light	= TL	Depth Level = +23.82
Telephone Pole	= TP	Thickness Level = +130.580
Telephone Pole (Bottom Pole)	= TP, P	Coast Level = +126.45
Traffic Light Camera	= TL/C/P	Insert Level = +82.15
Control Box	☐ C/BOX	Map Level = +130.00
British Telephone Box	☐ B/BOX	Flare Level = +718.00
Overhead Box	☐ O/BOX	Finished Floor Level = +737.00
Gas Box	☐ GAS BOX	Top of Ground Level = +131.00
	☐ DRT BOX	Entr Level = +136.00

HAMBERS AND PIPE

Inspection Cover	IC	Flat Roof Level	FR/L
Inspection Cover (Dac)	IC/DL	Top of Canopy Level	TC/L
Manhole	MH	Underline of Canopy Level	UC/L
British Telecom Cover	BT	Window Sill Level	WS/L
Inspection Cover (Comms)	IC/COM	Window Head Level	WH/L
Cable TV	CAV	Springing Level	SL
Inspection Cover Traffic Signals	IC/TL	Arch Level	AL
Gully	G	Cable Level	CL
Kero Outlet	KO	Top of Well Level	TW/L
Vent Pipe	VP	Underline of Beam Level	UB/L
		General Height	HT/L

SURVEY INFORMATION SHEET

Sell Pipe	e SWP	Diagram of a trench with various markers and labels: - Personnel Ground Marker (triangle with 'X') - G.S. Trip Station (triangle with 'X') - G.S. Bench Mark (upward arrow) - Stop Valve (circle with 'X') - Stop Tap (circle with 'X') - Unusable in 18" cover (circle with 'X') - Gas Pipe (circle with 'X') - Sell Pipe (circle with 'X') - Lamp Pole (circle with 'X') - Hydrant (circle with 'X')
Gas Pipe	e G-RPC	
Unusable in 18" cover	UL	
Stop Tap	e ST	
Stop Valve	e SV	
Lamp Pole	e LP	
Hydrant	e HD	

GEOTECHNICAL INFORMATION	
---------------------------------	--

Borehole	 BH
Trial Pit	TP
Monitor Pin	MCP
Probe Hole	 PH
Window Sample	WS

Sheet Index

1	2
3	4

[illegible]



**MALCOLM
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LAND SURVEYORS**

65 Cross Street, Sale, Manchester
M33 7HF, Tel: 0161 905 1205
www.malcolmhughes.co.uk
survey@mh.co.uk

Accreditations








Client

SMR ARCHITECTS
FLOOR 2, THE EXCHANGE, STATION PARADE
HARROGATE, HG1 1TS

Project

THE BODY SHOP
NORWAY LANE, WICK
LITTLEHAMPTON BN17 6LS

Drawing Title

UNDERGROUND SERVICES

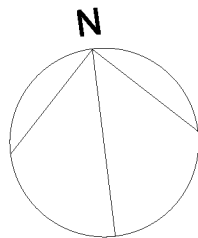
Drawn By	AP	05/03/19	Survey Date	FEBRUARY 2019
Checked by	DJ	05/03/19	Scale	A0@1:200

53168/2

Appendix C - Proposed Development Plans

Do not scale this drawing.
Architects are to be notified of any discrepancies.
Contractors must check all dimensions on site.
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For other information refer to the latest revision of any cross referenced drawings.
To be read in conjunction with relevant design standards/protocols.

This is a colour drawing. In order to ensure any subsequent reproduction is viewed correctly it should be printed in full colour.



5 0 5 10 15 20 25
SCALE 1:500 m

TREE LIKELY TO REQUIRE ROOT PROTECTION - REFER TO ARBORICULTURIST REPORT / LANDSCAPE PLAN

TREE TO BE FELLED, SUBJECT TO ARBORICULTURIST / LANDSCAPE ARCHITECT CONFIRMATION

EXISTING TARMAC PARKING AREA RETAINED FOR VAN STAGING

EXISTING SOFT LANDSCAPING TO BE REPLACED WITH HGV GRADE TARMAC SURFACE - 750m2

EXISTING KERB LINE CUT BACK TO BE REPLACED WITH HGV GRADE TARMAC - 25m2

ROAD BUILDUP, KERBING, HAUNCH AND DRAINAGE DETAILS TO STRUCTURAL ENGINEER'S DESIGN

EXISTING REDUNDANT OIL TANK - TO BE RELOCATED BY LANDLORD

KERBLINE AMENDED TO ALLOW FOR HGV BYPASS AND ADDITIONAL VAN STAGING

KERB RADIUS MODIFIED TO ALLOW FOR LINE HAUL VEHICLE TO MANOEUVRE

PROPOSED HGV LAYBY

SMOKING SHELTER MOVED TO ALLOW FOR AMENDED KERB LINE

2m HIGH FENCE AND ARMCO TO BE INSTALLED TO SEGREGATE LOADING AREA - 12 LINEAR METRES

NEW PEDESTRIAN CROSSING, REFER TO SMR DRAWING 3007

CYCLE SHELTER TO BE REMOVED AND EXISTING HANDSTANDING TO BE REPAIRED AND MADE GOOD

NEW ARMCO TO PREVENT VEHICLE TRAFFIC ACCESSING DA YARD - 61 LINEAR METRES

EXISTING PLANT REMOVED AND EXISTING WALLS TO BE REPAIRED AND MADE GOOD

2no. ADDITIONAL LEVEL ACCESS DOORS TO BE INSTALLED

NOTE:
AREAS OF NEW WORKS TO RECEIVE NEW VEHICLE PEDESTRIAN BOLLARDS TO NEW DOORS & ARMCO TO ALL NEW WALLS & TEMPORARY STRUCTURES.
ADDITIONAL INFORMATION AVAILABLE ON REQUEST

P3	CONSTRUCTION ISSUE	30.04.19	MB	SR
P2	PEDESTRIAN BRIDGE REPLACED WITH CROSSING	28.03.19	MB	SR
P1	TENDER ISSUE	28.02.19	MB	SR
Rev	Description	Date	Dm	Ckd

Status

CONSTRUCTION

SMR

SMALLEY MARSEY RISPIN

ARCHITECTS

Floor 2 The Exchange Station Parade Hemmigate HG1 1TS
01423 707 757 admin@smrarchitects.co.uk

Project

DBN3 - NEW COURTWICK LANE, LITTLEHAMPTON

Client

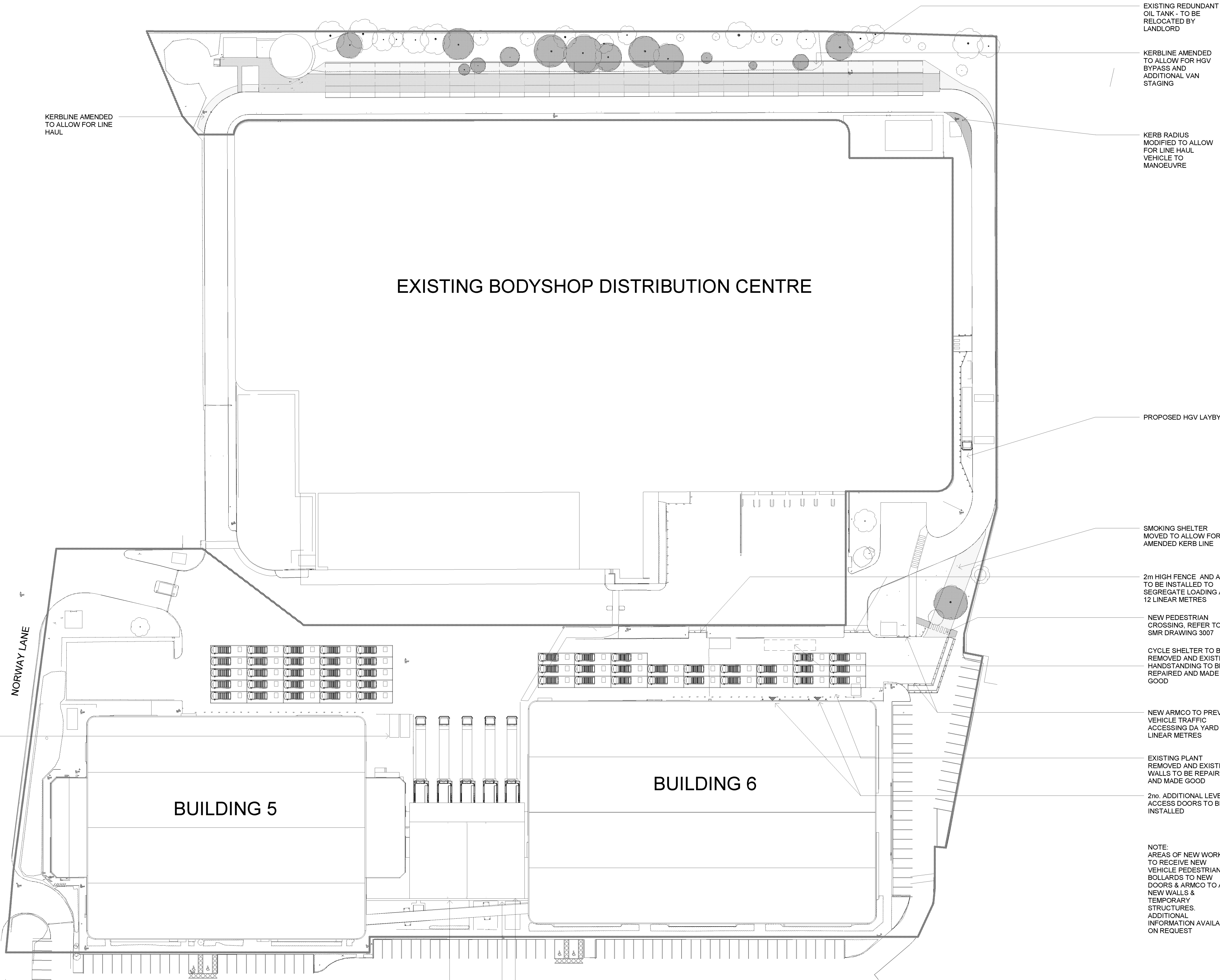
amazonlogistics

Drawing Title

PROPOSED SITE GA

Proj Ref	Origin	Zone	Level	Type	Role	Num	Status	Rev
-- DBN3	- SMR	- 00	- ZZ	- DR	- A	- 3001	- S3	- P3

SMR Job Ref	Sheet	Scale	Drawn
7260-00-3001	A1	NOTED	MB



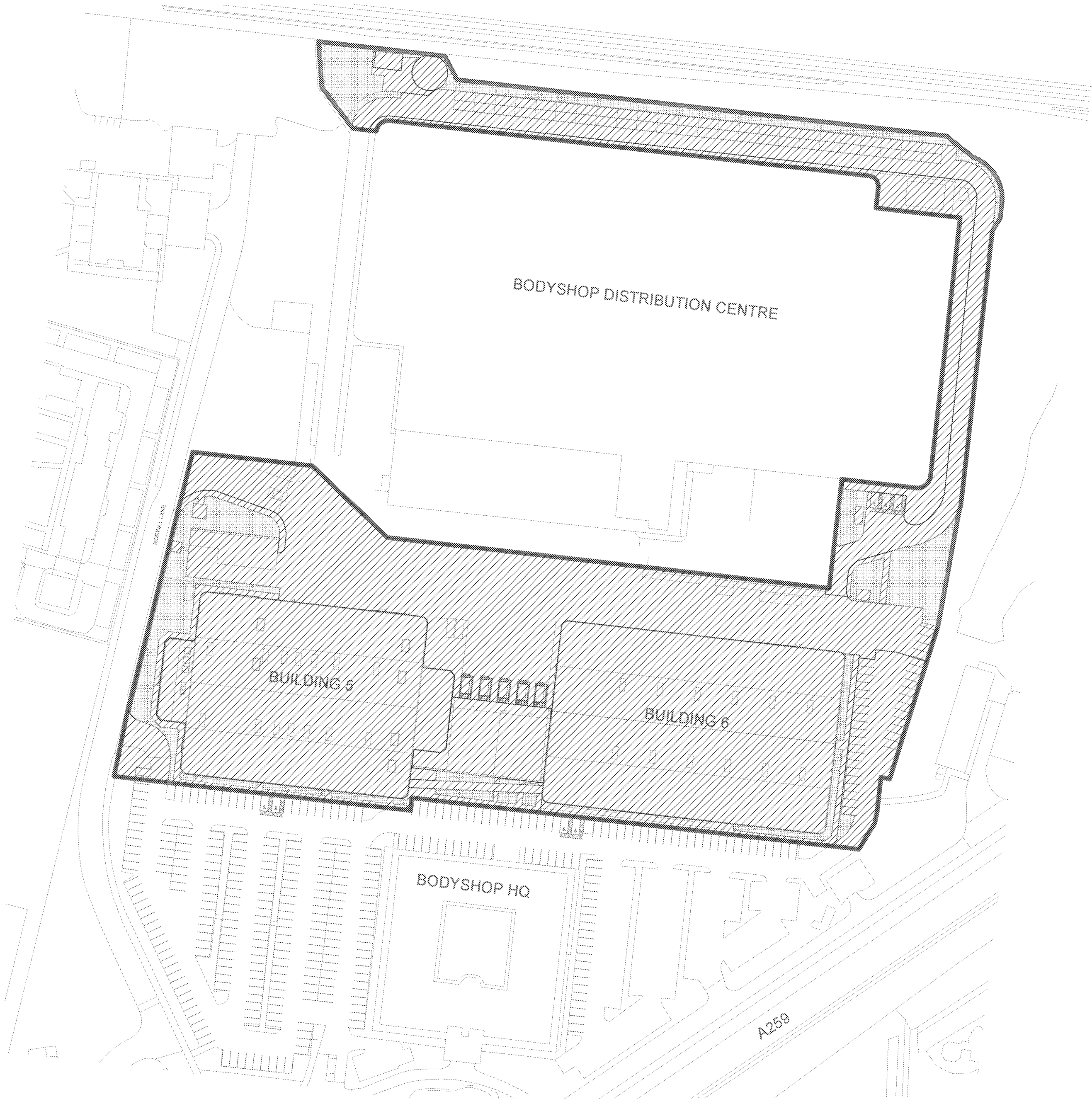
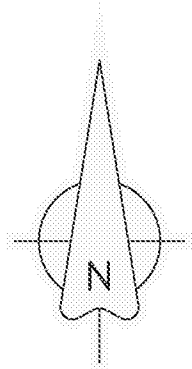
PROPOSED SITE PLAN
1 : 500

600 M² TEMPORARY BUILDING TO BE INSTALLED BY SPECIALIST TO OFFER ENCLOSED CENTRAL INDUCT. ALLOW 3 HGV LOADING DOORS.

ACCESS TO LANDLORD TO BE PROVIDED

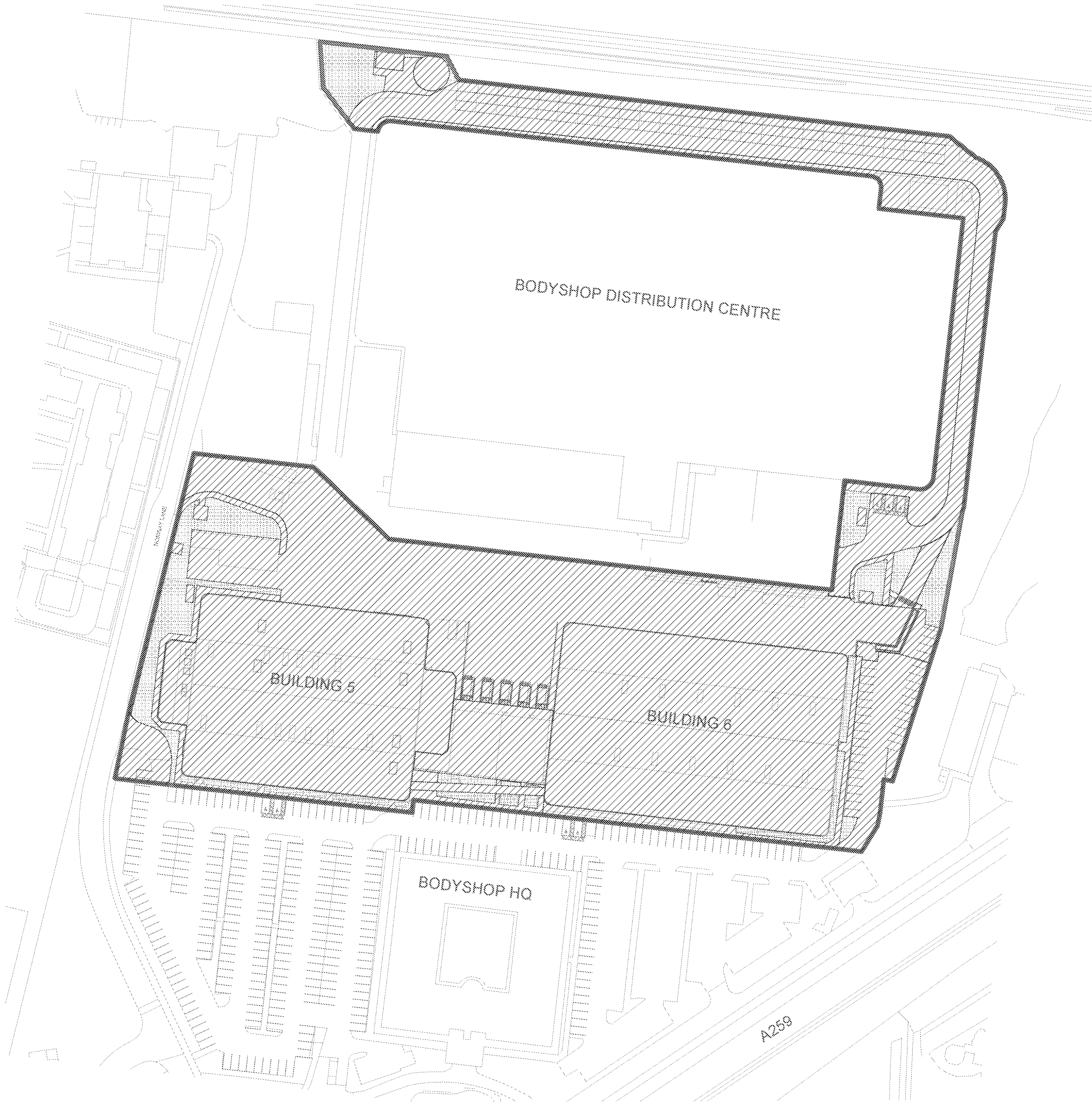
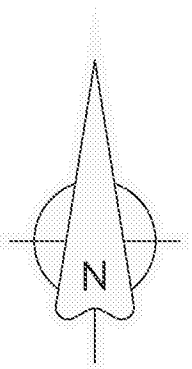
PEDESTRIAN ACCESS TO FACILITATE SERVICE ACCESS TO SOLAR MAINTENANCE.

Appendix D - Existing & Proposed Impermeable Areas



EXISTING SITE

TOTAL IMPERMEABLE AREA = 24,647M²
TOTAL PERMEABLE AREA = 2,927M²



PROPOSED SITE

TOTAL IMPERMEABLE AREA = 25,436M²
TOTAL PERMEABLE AREA = 2,132M²

GENERAL NOTES

- DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
- FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
- ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

LEGEND

- SITE BOUNDARY
- ||||| PERMEABLE AREA
- //// IMPERMEABLE AREA

0 50MM ON A1 DWG. 50

TI	FOR TENDER	AO	JJ	XX.04.19
REV	DESCRIPTION	BY	CHK	DATE
CLIENT				

amazonlogistics

PROJECT
LITTLEHAMPTON
DBN3 REFURBISHMENT

DRAWING TITLE
EXISTING AND PROPOSED
IMPERMEABLE AREAS

PINNACLE
CONSULTING ENGINEERS

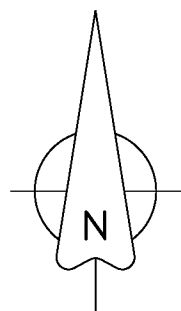
ALCHEMY,
BESSEMER ROAD,
WELWYN GARDEN CITY,
HERTS
AL7 1HE. TELEPHONE: 01707 527 830
NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS			
TENDER			
SCALE @ A1 1:1000	DATE APR'19	DRAWN BY AO	CHECKED JJ
DRG NO. 190213-PIN-00-XX-DR-C-0205	REVISION TI		

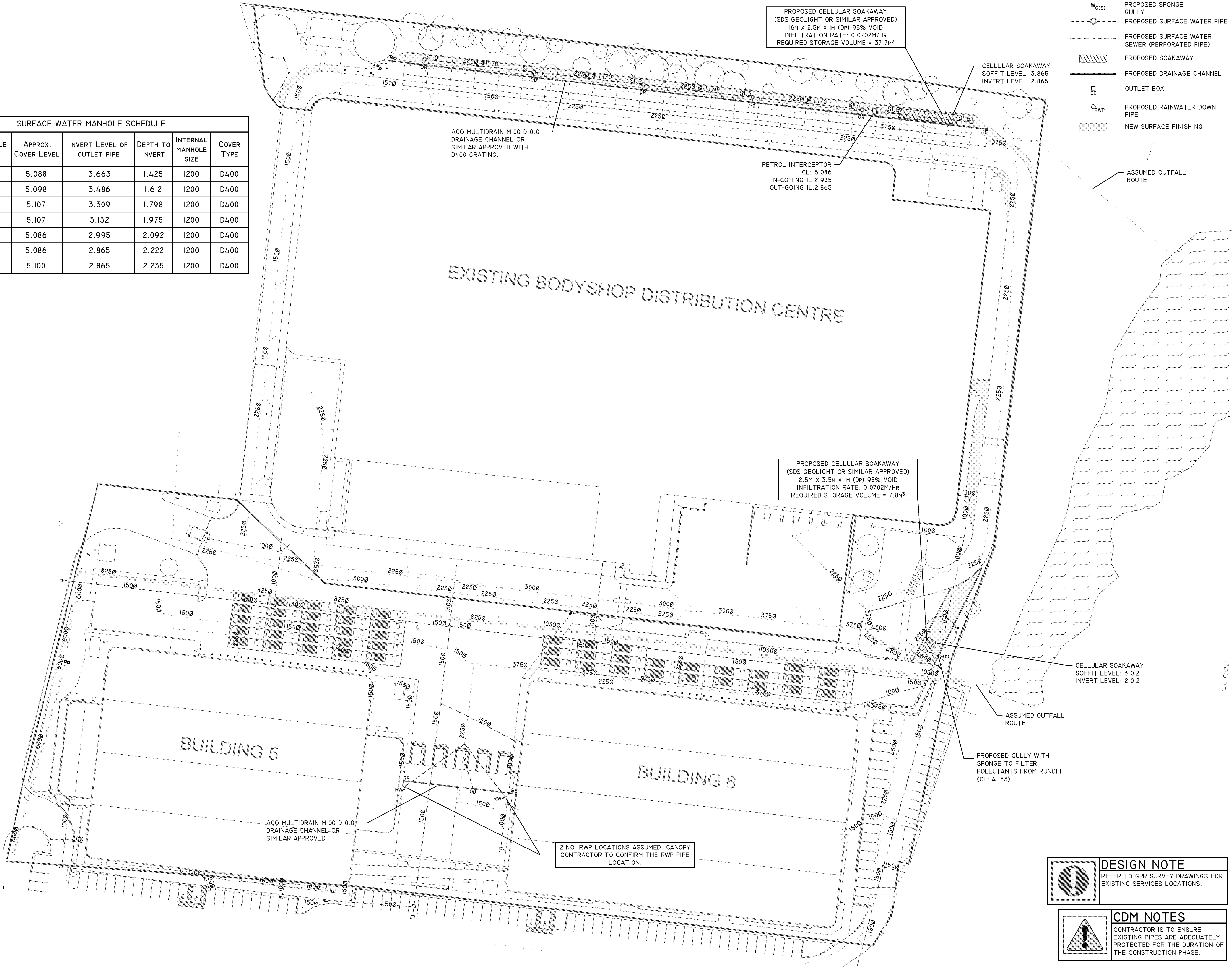
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REF: 190213

Appendix E – Proposed Drainage Strategy



SURFACE WATER MANHOLE SCHEDULE						
MANHOLE REF	MANHOLE TYPE	APPROX. COVER LEVEL	INVERT LEVEL OF OUTLET PIPE	DEPTH TO INVERT	INTERNAL MANHOLE SIZE	COVER TYPE
SI.0	PCC	5.088	3.663	1.425	I200	D400
SI.1	PCC	5.098	3.486	1.612	I200	D400
SI.2	PCC	5.107	3.309	1.798	I200	D400
SI.3	PCC	5.107	3.132	1.975	I200	D400
SI.4	PCC	5.086	2.995	2.092	I200	D400
SI.5	PCC	5.086	2.865	2.222	I200	D400
SI.6	PCC	5.100	2.865	2.235	I200	D400



LEGEND

- SITE BOUNDARY
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING PRIVATE SURFACE WATER SEWER
- PROPOSED SPONGE GULLY
- PROPOSED SURFACE WATER PIPE
- PROPOSED SURFACE WATER SEWER (PERFORATED PIPE)
- PROPOSED SOAKAWAY
- PROPOSED DRAINAGE CHANNEL
- OUTLET BOX
- PROPOSED RAINWATER DOWN PIPE
- NEW SURFACE FINISHING

GENERAL NOTES

- DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
- FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
- ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

DRAINAGE NOTES

- CONTRACTOR TO CONFIRM THE APPROVAL FOR THE TYPE OF PIPE AND BEDDING BEING USED WITH THE PERMITTING AUTHORITY PRIOR TO ANY CONSTRUCTION COMMENCING.
- ANY TRAFFIC MANAGEMENT REQUIRED TO UNDERTAKE WORKS IN THE PUBLIC HIGHWAY MUST BE APPROVED BY THE LOCAL AUTHORITY PRIOR TO THESE WORKS COMMENCING.
- ALL WORKS IN THE PUBLIC HIGHWAY MUST BE CARRIED OUT WITH THE PRIOR APPROVAL AND TO THE SATISFACTION OF THE LOCAL AUTHORITY.
- THE CONTRACTOR IS TO LIAISE WITH THE WATER AUTHORITY ENGINEER, AFFORDING THEM REASONABLE NOTICE TO INSPECT THE WORKS DURING CONSTRUCTION.
- THE CONTRACTOR IS TO ALLOW FOR JET WASHING ALL LENGTHS OF EXISTING SEWERS WHICH ARE TO BE RETAINED.
- ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH BS EN 752.
- THE CONTRACTOR MUST CHECK THE LEVELS AND CONDITION OF ALL EXISTING MANHOLES AND DRAINAGE OUTFALLS PRIOR TO CONSTRUCTION OF ANY DRAINAGE, UNLESS OTHERWISE AGREED, TO ENSURE THE PROPOSED DESIGN MAY BE ACHIEVED. ANY DISCREPANCIES MUST BE REPORTED TO PINNACLE IMMEDIATELY.
- ALL RWP POSITIONS ARE TO BE CONFIRMED BY THE ARCHITECT.
- WHERE RWPs ARE CONNECTED DIRECT TO THE DRAIN, RODDING ACCESS PLATES ARE TO BE PROVIDED.
- CONTRACTOR IS TO ALLOW FOR ALL ABANDONED DRAINAGE RUNS AND MANHOLES / SOAKAWAYS TO BE FULLY GROUTED UP OR REMOVED AS NECESSARY.
- ALL BURIED MANHOLES TO BE REINSTATED AND INVERT LEVELS SUPPLIED TO PINNACLE. MANHOLE COVERS ARE TO BE BROUGHT UP TO THE REQUIRED LEVELS.
- ALL GULLIES TO BE SET 5MM LOWER THAN THE PROPOSED FINISHED LEVELS.
- ALL SURFACE WATER AND RAIN WATER PIPEWORK TO BE Ø150MM, LAID TO A MINIMUM FALL OF 1 IN 100 U.N.O.

0 50MM ON A1 DWG. 50

C2	FOR CONSTRUCTION	AO	JJ	14.05.19
C1	FOR CONSTRUCTION	AO	JJ	02.05.19
P03	FOR INFORMATION	AO	AO	01.05.19
P02	FOR INFORMATION	AO	JJ	16.04.19
P01	FOR INFORMATION	AO	JJ	15.04.19
T1	FOR TENDER	RW	JJ	01.03.19
REV	DESCRIPTION	BY	CHK	DATE

CLIENT

amazon logistics

PROJECT
LITTLEHAMPTON
DBN3 REBURFISHMENT

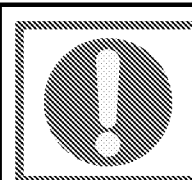
DRAWING TITLE
PROPOSED DRAINAGE
STRATEGY

PINNACLE
CONSULTING ENGINEERS

ALCHEMY,
BESSEMER ROAD,
WELWYN GARDEN CITY,
HERTS.
AL7 1HE. TELEPHONE: 01707 527 630
NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS			
CONSTRUCTION			
SCALE @ A1	DATE	DRAWN BY	CHECKED
1:500	FEB '19	RW	JJ
DRG NO.	REVISION		
190213-PIN-00-XX-DR-C-0220			C2

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DESIGN NOTE

REFER TO GPR SURVEY DRAWINGS FOR EXISTING SERVICES LOCATIONS.



CDM NOTES

CONTRACTOR IS TO ENSURE EXISTING PIPES ARE ADEQUATELY PROTECTED FOR THE DURATION OF THE CONSTRUCTION PHASE.

Appendix F - Infiltration Test Results

Soakaway Infiltration Report

Amazon Littlehampton DBN2

Presented to Pinnacle c/o Amazon

Issued: May 2019

Delta-Simons Project Number: 19-0138.07

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
1	Final	10 th May 2019	-			
				Gemma Tatton Consultant	Tom Horner Associate	Paul Bennett Unit Director

1.0 Authorisation and Purpose

Delta-Simons Environmental Consultants Limited (Delta-Simons) has been requested by Pinnacle on behalf of Amazon (the "Client") to undertake three BRE365 soakaway tests (SA101 to SA103) to provide information for the suitability and design for soakaways as a drainage solution at Amazon Littlehampton DBN2 (hereafter referred to as the "Site").

2.0 Limitations

No limitations were encountered during the works.

3.0 Context

Delta-Simons has previously completed the following report pertaining to the Site:

- ▲ Short Form Geotechnical Report, Amazon DBN2 Refurbishment, Littlehampton, (Ref. 19-0138.04), dated March 2019.

A review of the Site's published geology and hydrogeology is provided below.

4.0 Desktop Information

From BGS mapping, the Site is indicated to be underlain by superficial River Terrace Deposits, followed by bedrock of the New Pit Chalk Formation. Ground conditions encountered during Delta-Simons previous investigation comprised a thin layer of Made Ground, overlying generally cohesive deposits to a maximum (proven) depth of 2.8 m bgl, followed by Chalk bedrock (encountered as clay in the south of the Site). Groundwater was not encountered during the works.

5.0 Fieldworks and Results

Soakage testing was undertaken in general accordance with BRE Digest 365: Soakaway Design [Ref. 1] on 8th and 9th May 2019.

The soakage testing comprised the excavation of three trial pits (SA101 to SA103) to depths of between 1.3 and 1.7 m bgl. The geology of the trial pit locations was logged. A gravel pack and monitoring pipes were then installed in the trial pits and the remaining voids were backfilled with arisings. The remaining spoil was graded back to original ground level.

The gravel pack in the test locations was then filled with water from a water container and the depth to water from ground level recorded at regular intervals.

The soakage test data was recorded and used to calculate the soil infiltration rate for the locations.

5.1 Identified Ground and Groundwater Conditions

Ground conditions encountered in each location comprised the following:

SA101

- ▲ Grass over topsoil comprising of dark brown slightly clayey fine to medium sand with frequent rootlets to a depth of 0.4 m bgl;
- ▲ River Terrace Deposits comprising of soft dark brown slightly sandy clay to a depth of 0.8 m bgl; and
- ▲ River Terrace Deposits comprising of light brown slightly gravelly clayey fine to medium sand, with gravel content comprising of flint, to a depth of 1.6 m bgl.

SA102

- ▲ Topsoil comprising of dark brown slightly gravelly slightly clayey fine to medium sand with rootlets. Gravel content comprised of flint, to a depth of 0.14 m bgl;
- ▲ River Terrace Deposits comprising of soft dark brown slightly sandy clay to a depth of 0.4 m bgl;
- ▲ River Terrace Deposits comprising of soft dark brownish mottled blue clay to a depth of 1.5 m bgl; and
- ▲ River Terrace Deposits comprising of light brown slightly gravelly clayey medium to coarse sand, with gravel content comprising of flint, to a depth of 1.7 m bgl.

SA103

- ▲ Grass over topsoil comprising of dark brown slightly clayey fine to medium sand to a depth of 0.6 m bgl; and
- ▲ New Pit Chalk Formation comprising of white slightly sandy chalk gravel to a depth of 1.3 m bgl.

6.0 Soakage Tests

Test results are provided in Appendix I and summarised in Table 1 below. The approximate locations of the soakage tests/trial pits are shown on Figure 1.

Table 1: Summary of Testing in General Accordance with BRE 365

Soakaway Test Reference Number	Test Depth Range (m bgl)	Infiltration Rate	Geology
SA101	0.6 – 1.6	2.4×10^{-05}	Sand
SA102	0.8 – 1.7	1.5×10^{-05}	Clay and Sand

It was not possible to obtain an infiltration rate in SA103 due to the high rates at which water drained during the test, therefore, this can be interpreted as a very high permeability classification.

7.0 Conclusions

The infiltration testing has been undertaken to a maximum depth of between 1.3 and 1.7 m bgl in sand (SA101), clay and sand (SA102) and chalk (SA103), which is considered to represent the mapped superficial deposits / bedrock geology. Given the nature of the soils encountered, the infiltration tests reached the 25% effective depth over a period of approximately 52 minutes and 1 hour, in SA101 and SA102, respectively. It was not possible to obtain an infiltration rate for SA103 due to the high rates at which the water drained.

As a result, traditional soakaways are considered to be a suitable method of drainage at the Site, provided they are placed within the granular River Terrace Deposits or within the New Pit Chalk Formation.

8.0 References

Ref 1: BRE Digest 365: Soakaway Design, BRE 1991.

Enclosed:

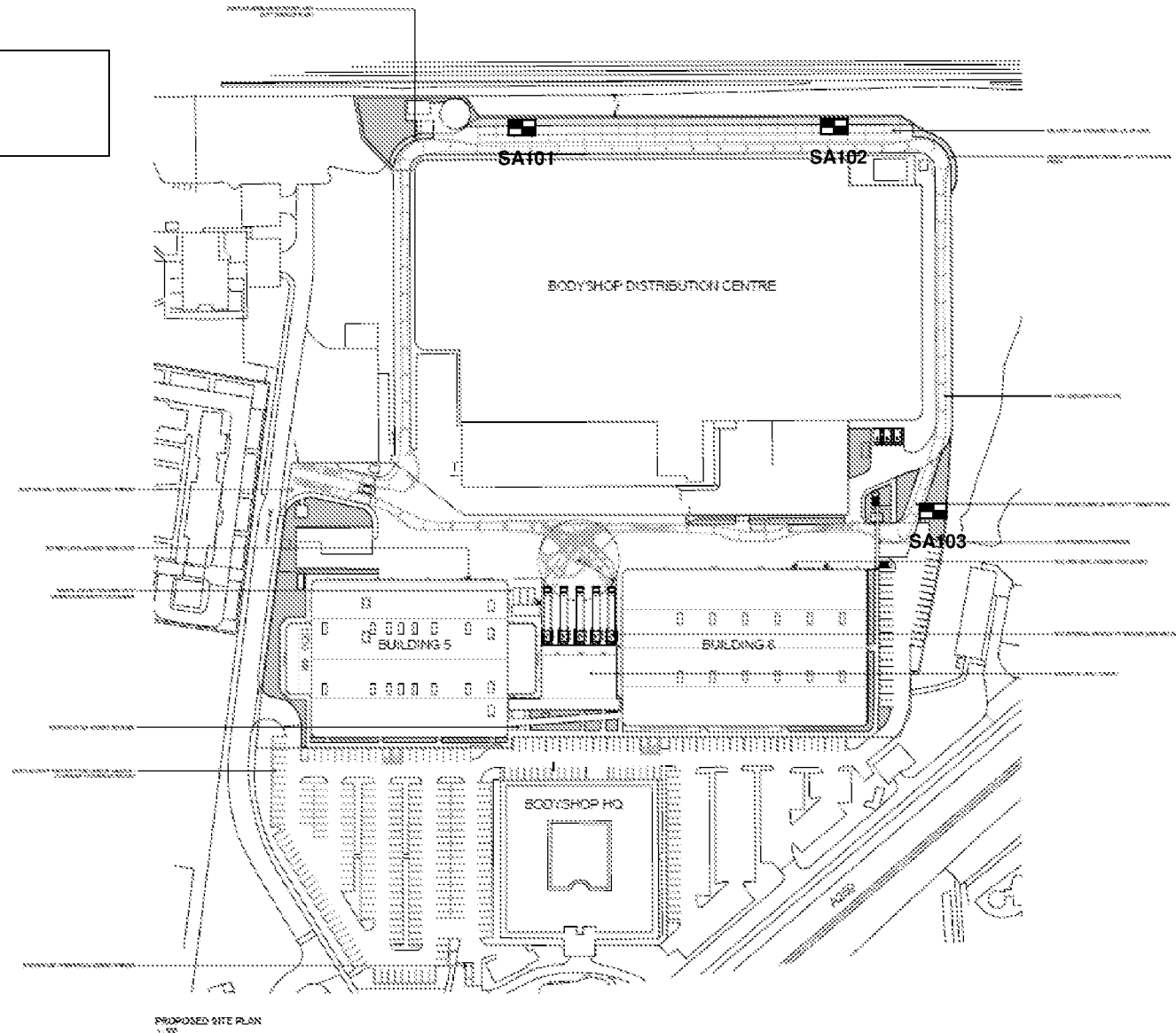
Figure 1 Approximate Intrusive Location Plan

Appendix A Soakaway Test Results

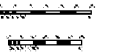
Figure 1 – Approximate Intrusive Location Plan

LEGEND

SA101 BRE365 Soakaway



0 10 20 30 40 50 60 70 80 90 100
METRES



NOTES TO
REVIEWER
1. ALL PROPOSED
CONSTRUCTION
WORKS TO BE
IN ACCORDANCE
WITH THE
RELEVANT
LEGISLATION
AND
STANDARDS

NOTES TO
REVIEWER
2. ALL PROPOSED
CONSTRUCTION
WORKS TO BE
IN ACCORDANCE
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RELEVANT
LEGISLATION
AND
STANDARDS

NOTES TO
REVIEWER
3. ALL PROPOSED
CONSTRUCTION
WORKS TO BE
IN ACCORDANCE
WITH THE
RELEVANT
LEGISLATION
AND
STANDARDS

1. PROJECT NO. 19-0138.07
2. PROJECT NAME Amazon Littlehampton DBN2
3. PROJECT LOCATION Amazon Littlehampton DBN2
4. PROJECT DESCRIPTION Amazon Littlehampton DBN2
5. PROJECT START DATE 19/05/2019
6. PROJECT END DATE 19/05/2019
7. PROJECT STATUS In Progress
8. PROJECT MANAGER GT
9. PROJECT COORDINATOR TH
10. PROJECT DESIGNER GT
11. PROJECT CHECKER TH
12. PROJECT APPROVER GT
13. PROJECT REVIEWER TH
14. PROJECT SIGNOFF GT
15. PROJECT SIGNATURE GT
16. PROJECT SIGNATURE TH
17. PROJECT SIGNATURE GT
18. PROJECT SIGNATURE TH
19. PROJECT SIGNATURE GT
20. PROJECT SIGNATURE TH

Plan provided by the Client

Appendix A – Soakaway Test Results

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.

[illegible]

DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 19-0138.07
CHECKED BY: SS	REVISION: 1	
DATE: 09/05/2019		SOAKAWAY NUMBER: SA101

	units	Infill 1	Infill 2	Infill 3
Length	m	1.04		
Width	m	0.50		
Depth	m	1.70		
Gravel type		20mm single size		
Voids ratio		0.40		
Resting groundwater level at time of testing	m	0.00		
Depth of first reading	m	0.84	0.81	0.81
Depth of final reading	m	1.65	1.65	1.65
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	1.04	1.02	1.02
Depth at 25% full/effective depth	m	1.45	1.44	1.44
Time at 75% full/effective depth	mins	8.63	10.80	17.78
Time at 25% full/effective depth	mins	34.38	64.67	27.92
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m ³	0.08	0.09	0.09
Mean surface area for outflow (50% full/effective depth)	m ²	1.77	1.81	1.81
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	25.75	53.87	10.15
Soil infiltration rate, f =	m/s	0.000000000	0.000000000	0.000000000
or	m/s	0.00000	1.5E-05	7.0E-05

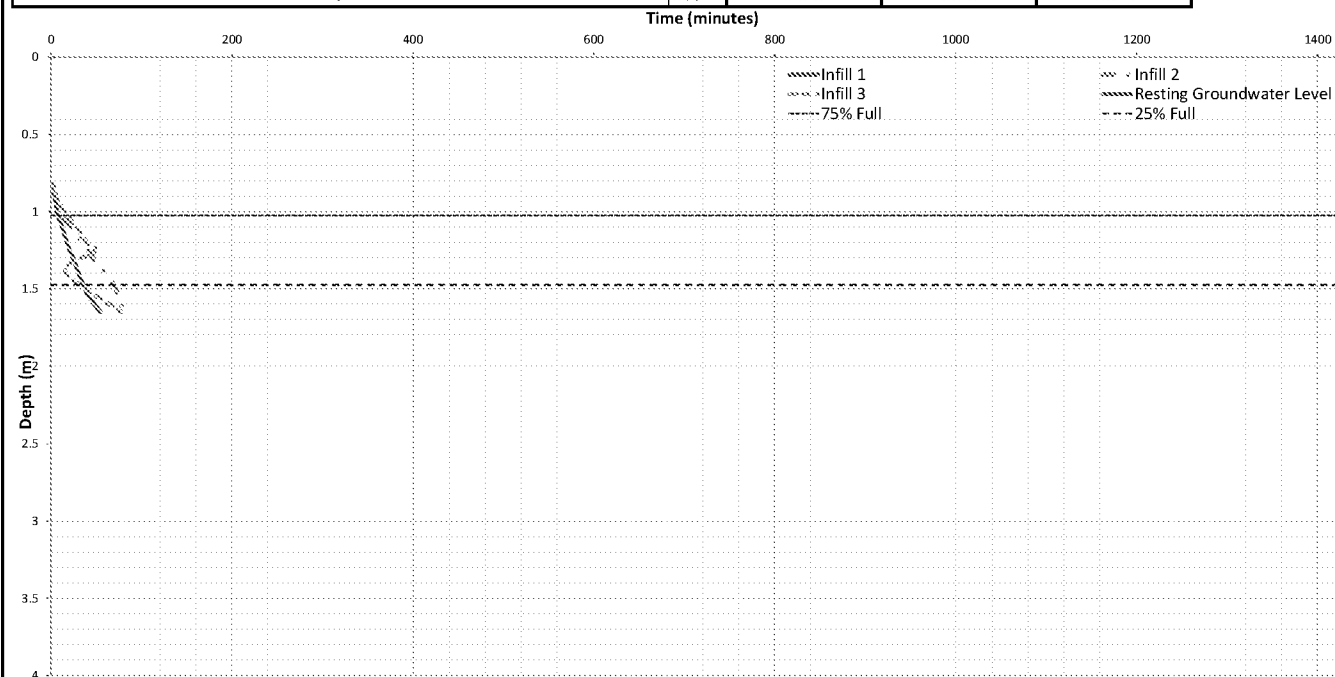
Recommended soil infiltration rate

1.5E-05

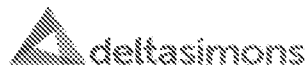
m/s

Note:

Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.



LOG	DEPTH (m)	BACKFILL	DEPTH (m)
Dark brown slightly gravelly slightly clayey sand	0.0	Arisings	0.0
Dark brown slightly sandy CLAY	0.2		
Dark brownish mottled blue CLAY	0.4		
		Gravel	0.8
Light brown slightly gravelly clayey SAND	1.5		
	1.7		1.7



TITLE: Soakaway Test Results
Amazon Littlehampton DBN2
Amazon

In accordance with BRE Digest 365 (2016)

DRAWN BY: CB
CHECKED BY: SS
DATE: 09/05/2019
SCALE: Not to Scale
REVISION: 1

PROJECT NUMBER:
19-0138.07
SOAKAWAY NUMBER:
SA102

NORWICH
Pinnacle House
3 Meridian Way
Norwich
NR7 0TA

WELWYN GARDEN CITY
Alchemy
Bessemer Road
Welwyn Garden City
AL7 1HE

LONDON
Woolverstone House
61 Berners Street
London
W1T 3NJ

DUBLIN
Grosvenor Court
67 Patrick Street
Dun Laoghaire
County Dublin

THE HAGUE
Business Suite 5.01 D-1
Business Center, WTC
Prinses Margrietplantsoen 33
2595 AM, The Hague
Netherlands