

Lidl GB Ltd

**Flood Risk Assessment with
Outline Drainage Strategy**

For

Proposed Lidl Store

At

Church Road North
Liverpool
L15 6TE

Beam Consulting
14 Bond Street
Wakefield
West Yorkshire
WF1 2QP

Ref: 09-143-DOC-001

Date: 17 June 2020

REVISION RECORD

Revision	Description	Date	Prepared	Checked	Approved
-	First Issue	17-06-2020	KA	KGP	KGP

CONTENTS

EXECUTIVE SUMMARY.....	1
1.0 INTRODUCTION	3
2.0 BACKGROUND INFORMATION	4
2.1 EXISTING DEVELOPMENT	4
2.2 PROPOSED DEVELOPMENT	4
3.0 FLOOD RISK.....	5
3.1 RISK OF FLOODING OF DEVELOPMENT SITE	5
3.3 SOURCES OF FLOODING AND FLOOD RISK.....	6
3.4 SEQUENTIAL AND EXCEPTION TEST	7
4.0 DRAINAGE ASSESSMENT AND STRATEGY.....	9
4.1 SURFACE WATER DRAINAGE	9
4.2 FOUL WATER DRAINAGE	11
5.0 RECOMMENDATIONS.....	12

APPENDIX A - SITE LOCATION

APPENDIX B - PROPOSED SITE DRAWINGS

APPENDIX C - ENVIRONMENT AGENCY FLOOD MAP

APPENDIX D - DRAINAGE CALCULATIONS

APPENDIX E - PROPOSED DEVELOPMENT DRAINAGE STRATEGY

APPENDIX F - EXISTING SITE INFORMATION

EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) has been prepared for Lidl GB Ltd for the proposed Lidl Store at Church Road North, Liverpool, L15 6TE.

The assessment has been undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) February 2019 and its Technical Guidance.

Flood risk

The site is located within Flood Zone 1 – low probability of flooding from Surface water run-off that comprises land assessed as having a between 0.1% and 1.0% annual probability of flooding. Very low probability of flooding from rivers and sea that comprises land assessed as having a less than 0.1% annual probability of flooding. There is no risk of flooding from reservoirs. As the site is within low flood risk area based on EA flood maps then no further consultation with Environment Agency has been undertaken. The Environment Agency flood map is enclosed within Appendix C.

Based on the above, surface water flooding within the site and surrounding areas is very unlikely, hence the proposed development is acceptable. No flood protection measures are required. Proposed site levels are to be similar to existing and the proposed building floor level should be higher than external levels.

Surface water drainage

On the BGS website there are no boreholes within the site area or adjacent to the site and some of the closest boreholes to the site are unfortunately private. The two closest that are available to view indicate that the ground is soft dark brown sandy clay underlain by firm brown sandy clay with Boulder clay beneath (See Appendix F). Therefore the use of site infiltration and other similar SUDS systems are not suitable for this development.

The existing Cooperative store has a separate surface water and foul drainage systems that connect into a combined system prior to discharging from site into the public combined sewer in Church Road North. (See Appendix F).

It is therefore proposed to maintain this philosophy as this is the most feasible option. The existing surface water, foul and combined systems would be removed leaving the last combined manhole on the site. A new surface water and foul system would be installed combining in the existing combined manhole before discharging from site, as existing, into the public combined system in Church Road North. The proposed surface water drainage system will include on site attenuation and interceptor, prior to connecting into the flow control manhole.

The site area is 4,946m² and will comprise a total impermeable area of 4,827m². Based on the existing surface water discharge rate of 63.8 litre/sec less 30% for betterment this gives an allowable discharge of 44.6 litre/sec, to be limited by a flow control. Based on 1 in 30 year rainfall and 30% allowance for climate change 83m³ on site attenuation and for a 1 in 100 year rainfall and 30% allowance for climate change a 120m³ on site attenuation. Attenuation for the 1 in 100 year rainfall and 30% allowance for climate change can be provided using a traditional attenuation system located within the car parking/road areas of the development. The 30% climate change allowance will ensure that the

proposed development drainage system can cope with future predicted rainfall increase. See Appendix D for calculations.

Outline Drainage Strategy drawing 09-143-500 in Appendix E indicates the proposed layout.

The final solution for the drainage will depend on further investigation and development of detailed design.

Foul water drainage

The existing Co Operative store foul drainage system connects into the on-site combined system prior to discharging from site into the public combined sewer in Church Road North. The existing foul and combined systems would be removed leaving the last combined manhole on the site.

It is proposed to maintain this philosophy with a new foul system combining with the surface water in the existing combined manhole before discharging from site, as existing, into the public combined system in Church Road North (see Appendix F).

The final solution to be adopted will depend on further investigation and development of the detailed design.

Outline Drainage Strategy drawing 09-143-500 in Appendix E indicates the proposed layout.

1.0 INTRODUCTION

This Flood Risk Assessment (FRA) has been prepared for Lidl GB Ltd for the proposed Lidl Store at Church Road North, Liverpool, L15 6TE.

The assessment has been undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) February 2019 and its Technical Guidance.

The Report is based on the following information:

- i. Site location
- ii. Current Clients' proposal
- iii. EA online Flood Maps which show indicative hydraulically modelled flooding from rivers or sea without defences - the natural flood plain area that could be affected in the event of flooding from rivers and the sea - based on Light Detection And Ranging (LIDAR) satellite digital terrain maps (DTMs).

All comments and opinions contained in this report, including any conclusions are based on information available to Beam Consulting Engineers during investigations prior to completion of the report. Conclusions drawn by Beam Consulting Engineers may differ if the available information is subsequently found to be inaccurate, incomplete or misleading. Beam Consulting Engineers accept no responsibility should this prove to be the case, nor if additional information exists or becomes available in relation to this site.

Except as otherwise requested by the Client, Beam Consulting Engineers are not obliged and disclaim any obligation to update the report for events outside Beam Consulting Engineers' direct control taking place after:

- i. The date on which the assessment was undertaken, and
- ii. The date on which the report is issued.

Beam Consulting Engineers make no representation whatsoever in relation to the legal significance of findings reported or any legal matters referred to in the following report.

This document is a risk assessment of flooding issues associated with the noted site. The information presented and recommendations/conclusions stated are based on published statistical data and are for guidance only. The statements provide no guarantee against flooding of the site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities referenced.

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2.0 BACKGROUND INFORMATION

The site is located Church Road North, Liverpool, L15 6TE.

National Grid reference for the site is 330294, 389354. The site location plan is enclosed within Appendix A.

2.1 EXISTING DEVELOPMENT

The existing site is a Cooperative store with associated car parking and roadway. The site area is 4946m² (0.4946 ha) and currently has 4582m² impermeable, split into 2655m² of roof area and 1932m² of hardstanding. The remaining 359m² is landscaping.

2.2 PROPOSED DEVELOPMENT

It is proposed to demolish the existing building and build a new proposed built Lidl Store with associated car parking and service area.

The proposed site layout drawing is enclosed within Appendix B.

3.0 FLOOD RISK

3.1 RISK OF FLOODING OF DEVELOPMENT SITE

The flood risk and site drainage assessment is based on the following sources of information:

i. EA online Flood Maps:

The site is located within Flood Zone 1 – low probability of flooding from Surface water run-off that comprises land assessed as having a between 0.1% and 1.0% annual probability of flooding. Very low probability of flooding from rivers and sea that comprises land assessed as having a less than 0.1% annual probability of flooding. There is no risk of flooding from reservoirs. As the site is within low flood risk area based on EA flood maps then no further consultation with Environment Agency has been undertaken. The Environment Agency flood map is enclosed within Appendix C.

Based on the above, surface water flooding within the site and surrounding areas is very unlikely, hence the proposed development is acceptable. No flood protection measures are required. Proposed site levels are to be similar to existing and the proposed building floor level should be higher than external levels.

The proposed development shall embody SUDS (Sustainable Urban Drainage Systems) principles. The site surface water is to be collected by proposed drainage with an attenuation tank and petrol interceptor prior to exiting the site using the existing combined drainage.

3.2 SOURCES OF FLOODING AND FLOOD RISK

Sources of flooding	Flood risk
Streams and rivers Flooding that can take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.	There are no streams or rivers recorded within the site area. The Mersey, at its closest point, is located approximately 4km to the southwest of the site. The lake in Sefton Park is the closest to the site and is located approximately 2.7km to the southwest of the site. There is also a lake in Newsham Park, approximately 2.8Km to the northwest.
Coastal or estuarine Flooding that can occur from the sea due to a particularly high tide or surge, or combination of both.	The Mersey, at its closest point, is located approximately 4km to the southwest of the site and therefore is not at risk of flooding from the sea.
Groundwater Where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable ground (aquifers), usually due to extended periods of wet weather.	The site is located in a higher-lying area and therefore is not at risk of flooding from groundwater.
Sewers and highway drains Combined, foul or surface water sewers and highway drains that are temporarily over-loaded due to excessive rainfall or due to blockage.	The highways next to the site and adjacent development have their own drainage systems in place. In the case of them being temporarily over-loaded due to excessive rainfall or due to blockage the water is collected within highways, car parks or landscaped areas.
Surface water The net rainfall falling on a surface (on or off the site) which acts as runoff which has not infiltrated into the ground or entered into a drainage system.	The highways next to the site and adjacent development have their own drainage systems in place. In the case of them being temporarily over-loaded due to excessive rainfall or due to blockage the water is collected within highways, car parks or landscaped areas.
Infrastructure failure Canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.	The highways next to the site and adjacent development have their own drainage systems in place. In the case of them being temporarily over-loaded due to excessive rainfall or due to blockage the water is collected within highways, car parks or landscaped areas.

3.3 SEQUENTIAL AND EXCEPTION TEST

Based on NPPF and its Technical Guidance the sequential and exception tests are not applicable as the site is within Flood Zone 1 and hence outside the floodplain.

Whilst the Sequential Test is not applied the principles are followed in general in the flood risk assessment below:

Possible Hazard	Comments/ Remediation
A. Effect of Development on General Flood Risk Flooding caused by local sources - natural watercourses on or near to the site?	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car parking spaces or landscaped areas.
B. Effect of Development on General Flood Risk Flooding caused to local sources - run-off from adjacent properties/ adjoining land	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car parking spaces or landscaped areas.
C. Contribution to Flood Flows from Development Drainage Flooding caused to adjacent properties from surface run-off from hard-paved areas.	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car parking spaces or landscaped areas.
D. Contribution to Flood Flows from Development Flooding caused to 3rd party properties	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car parking spaces or landscaped areas.

Whilst the Exception Test is not applied the principles are followed in general in the flood risk assessment below:

Possible Issue	Comments/ Remediation
E. Benefit of Site Development to the Wider Community over Flood Risk	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car parking spaces or landscaped areas.
F. Does an alternative site exist for the development?	The site is at a suitable location for the proposed development with sufficient space to accommodate it.
G. Can the site be made safe?	The proposed development shall consider and embody SUDS (Sustainable Urban Drainage Systems) principles if suitable. Any site surface water runoff shall be restricted and collected within an onsite attenuation prior to discharging into existing sewer. In excessive rainfall or due to blockage the water shall be collected within highway, car parking spaces or landscaped areas.

4.0 DRAINAGE ASSESSMENT AND STRATEGY

4.1 SURFACE WATER DRAINAGE

The existing site area is 4,946m² (0.4946ha). The existing site is a Co Operative store with associated car parking and roadway. The site area is 4946m² (0.4946 ha) and currently has 4582m² impermeable, split into 2655m² of roof area and 1932m² of hardstanding. The remaining 359m² is landscaping.

The proposed redevelopment areas are as follows:

Roofs	1,747
Roads and parking	3,080
Grass and permeable surfacing	119
TOTAL	4,946 m²

Therefore the proposed development has a small increase of 240m² impermeable area.

In compliance with SUDS (Sustainable Urban Drainage Systems) various surface water discharge methods and reducing the amount discharged to the water course/sewer have been considered as per the table below.

Infiltration	The use of soakaways is generally an ideal SUDS solution for developments. Permeability testing in accordance with BRE Digest 365 should be carried out and this information then used to determine the viability of the use of soakaways to deal with rainwater runoff. Soakaways can be used to deal with run-off both from buildings and paved areas. It should also be noted that soakaways can cause flooding to nearby basements and properties. Hence, the groundwater flow paths should be determined by a geotechnical investigation. Soakaways should be located in landscaped areas of the site. In accordance with Building Regulations soakaways are not to be located within 5m of any structure. Soakaways must be designed to cope with a 1 in 10 year storm with an allowance for climate change and a factor of safety greater or equal to 2.
Ponds or wetlands	Ponds or wetlands can be used in conjunction with restricted discharge outlets to control the maximum rate of discharge from a site. However, the health and safety risks associated with ponds and wetlands may make them inappropriate without incorporating significant control measures into the scheme design.
Permeable paving/discharge to soft landscape	The use of permeable surfacing for parking areas combined with discharge from paths onto adjacent soft areas are ideal for reducing run-off via drainage systems. Permeable paving can be used as an infiltration mechanism to discharge direct to the ground if the sub-strata is sufficiently permeable or alternatively can be used as on-site storage where used in conjunction with a flow restriction to attenuate flows into existing drainage systems.

French drains	French drains can be located in landscaped areas of the site. See the notes on soakaways. It is also possible to use French drain construction lined with an impermeable barrier as a storage facility.
Swales	Swales are similar to wetlands except they are designed to empty when not required to balance flows; similar comments apply as above.
Restricted flows combined with onsite storage	<p>If the above solutions are inappropriate then the final drainage system may incorporate a flow restriction and on-site storage. This could be in the form of oversized pipes or tanks to attenuate the additional flows and then discharge into the existing surface water sewer system or into the water subject to consent and approvals.</p> <p>The underground storage system must be designed to accommodate the calculated flows for a 1 in 30 year return period together with an allowance for climate change. The road, with the management of kerbs and levels, can be designed to contribute to the storage capacity for a 1 in 100 year storm. Alternatively the underground storage system should be designed to accommodate the 1 in 100 year event. 30% shall be allowed for climate change.</p> <p>Options for on-site storage include:</p> <ul style="list-style-type: none"> a) Buried tanks b) Lined French drains c) Oversized pipes and manholes d) Paving with under paving storage <p>The choice of solution depends upon relative levels of surfacing, inlet and discharge points and forms part of the detailed drainage design.</p>

On the BGS website there are no boreholes within the site area or adjacent to the site and some of the closest boreholes to the site are unfortunately private. The two closest that are available to view indicate that the ground is soft dark brown sandy clay underlain by firm brown sandy clay with Boulder clay beneath (See Appendix F). Therefore the use of site infiltration and other similar SUDS systems are not suitable for this development.

The existing Cooperative store has a separate surface water and foul drainage systems that connect into a combined system prior to discharging from site into the public combined sewer in Church Road North. (See Appendix F).

It is therefore proposed to maintain this philosophy as this is the most feasible option. The existing surface water, foul and combined systems would be removed leaving the last combined manhole on the site. A new surface water and foul system would be installed combining in the existing combined manhole before discharging from site, as existing, into the public combined system in Church Road North. The proposed surface water drainage system will include on site attenuation and interceptor, prior to connecting into the flow control manhole.

The site area is 4,946m² and will comprise a total impermeable area of 4,827m². Based on the existing surface water discharge rate of 63.8 litre/sec less 30% for betterment this gives an allowable discharge

of 44.6 litre/sec, to be limited by a flow control. Based on 1 in 30 year rainfall and 30% allowance for climate change 83m³ on site attenuation and for a 1 in 100 year rainfall and 30% allowance for climate change a 120m³ on site attenuation. Attenuation for the 1 in 100 year rainfall and 30% allowance for climate change can be provided using a traditional attenuation system located within the car parking/road areas of the development. The 30% climate change allowance will ensure that the proposed development drainage system can cope with future predicted rainfall increase. See Appendix D for calculations.

Outline Drainage Strategy drawing 09-143-500 in Appendix E indicates the proposed layout.

The final solution for the drainage will depend on further investigation and development of detailed design.

4.2 FOUL WATER DRAINAGE

The existing Co Operative store foul drainage system connects into the on-site combined system prior to discharging from site into the public combined sewer in Church Road North. The existing foul and combined systems would be removed leaving the last combined manhole on the site.

It is proposed to maintain this philosophy with a new foul system combining with the surface water in the existing combined manhole before discharging from site, as existing, into the public combined system in Church Road North (see Appendix F).

The final solution to be adopted will depend on further investigation and development of the detailed design.

Outline Drainage Strategy drawing 09-143-500 in Appendix E indicates the proposed layout.

5.0 RECOMMENDATIONS

Based on the flood risk assessment our recommendations are as follows:

Flood risk

The site is located within Flood Zone 1 – low probability of flooding from Surface water run-off that comprises land assessed as having a between 0.1% and 1.0% annual probability of flooding. Very low probability of flooding from rivers and sea that comprises land assessed as having a less than 0.1% annual probability of flooding. There is no risk of flooding from reservoirs. As the site is within low flood risk area based on EA flood maps then no further consultation with Environment Agency has been undertaken. The Environment Agency flood map is enclosed within Appendix C.

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Surface water drainage

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Foul water drainage

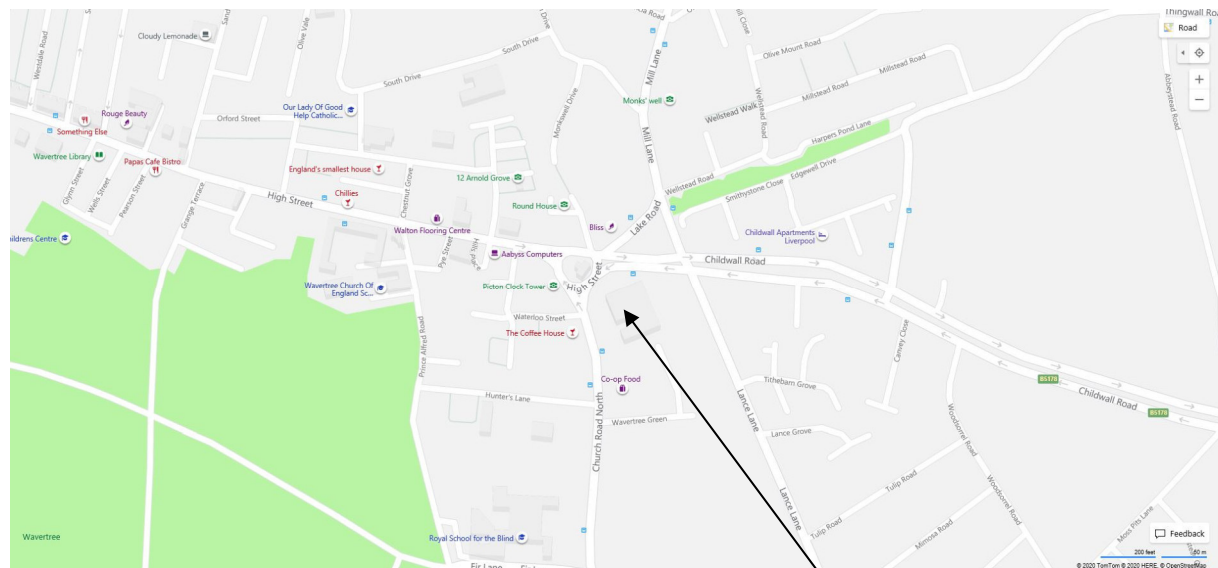
The existing Cooperative store foul drainage system connects into the on-site combined system prior to discharging from site into the public combined sewer in Church Road North. The existing foul and combined systems would be removed leaving the last combined manhole on the site.

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The final solution to be adopted will depend on further investigation and development of the detailed design.

Outline Drainage Strategy drawing 09-143-500 in Appendix E indicates the proposed layout.

APPENDIX A - SITE LOCATION

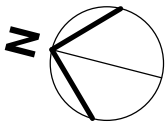


Site Location

APPENDIX B - PROPOSED SITE DRAWINGS

Revision	Description	Author	Checker	Date
P1	First issue	DWW	NJC	19.08.19
P2	First floor welfare relocated	JG	DWW	29.08.19
P3	Buildings facade retained	BAS	DWW	22.10.19
P4	Plant added onto the new build proposal	BS	DWW	05.11.19
P5	Areas Revised	BS	DWW	18.11.19
P6	EVC Points Added	BS	DWW	05.12.19

Lidl Wavertree			
<div></div>	Total Site Area	4,947m ²	(0.49 ha)
	GF GIA	1640m ²	
	FF GIA	320m ²	
	Total GIA	1960m ²	
<div></div>	Sales Area	1122m ²	
<div></div>	GF Warehouse	257m ²	
<div></div>	FF Warehouse	240m ²	
<div></div>	GF Ancillary	261m ²	
<div></div>	FF Ancillary	80m ²	
	Aisles	5	
	Parking Spaces	69	



SPACE
ARCHITECTS

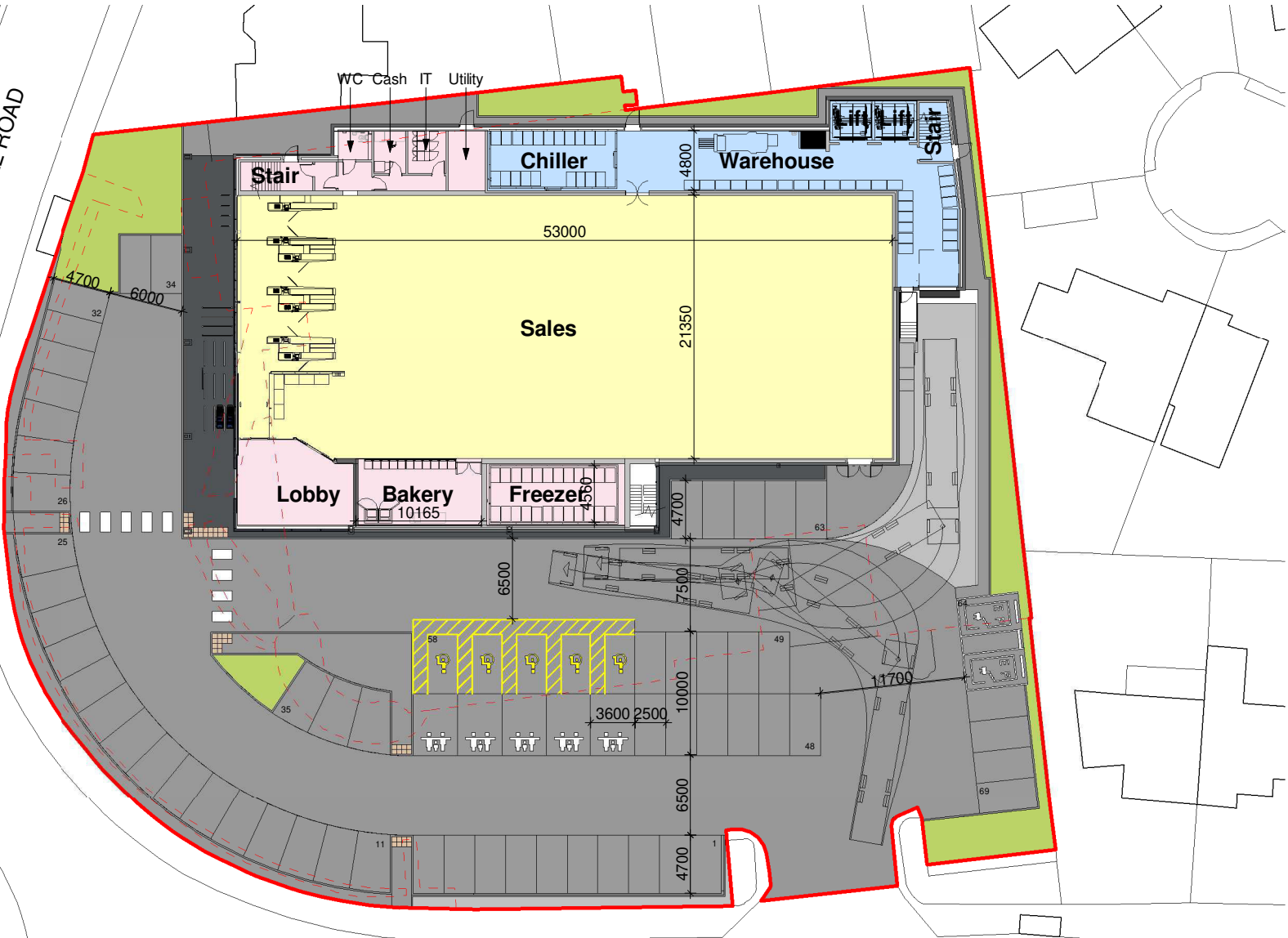
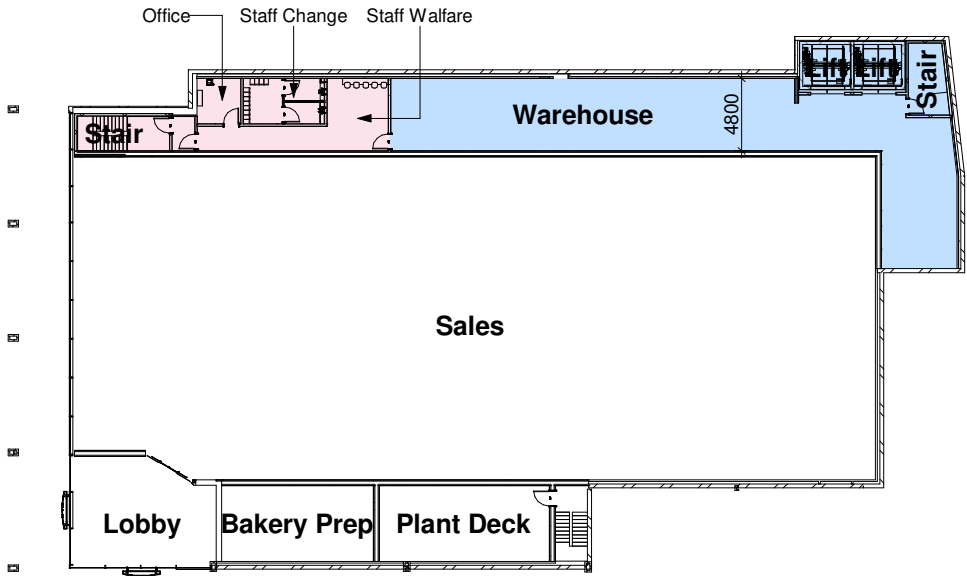
Spaceworks
Benton Park Road
Newcastle upon Tyne
NE7 7LX
T: +44 (0)844 800 6660
www.spacearchitects.co.uk

Project Lidl Wavertree				
Drawing Title Site Plan				
Project No. 08001	Drawing No. ZZ-XX-DR-A-91-0001	Status S0	Revision P6	Scale at A3 1 : 500
File Reference: 08001-SPACE-ZZ-XX-DR-A-91-0001-S0-P6				

This drawing is Copyright - Check all dimensions on site - Inform originator of any discrepancies - Work to figured dimensions only - Do not scale

First Floor Plan

1 : 500



Site Plan

1 : 500

R:\08001\CDE\Building Models\Revit\08001-SPACE-ZZ-XX-M3-A-0001-MODEL-18.rvt

APPENDIX C - ENVIRONMENT AGENCY FLOOD MAP

Flood map for planning

Your reference
09-143

Location (easting/northing)
339294/389354

Created
17 Jun 2020 12:32

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

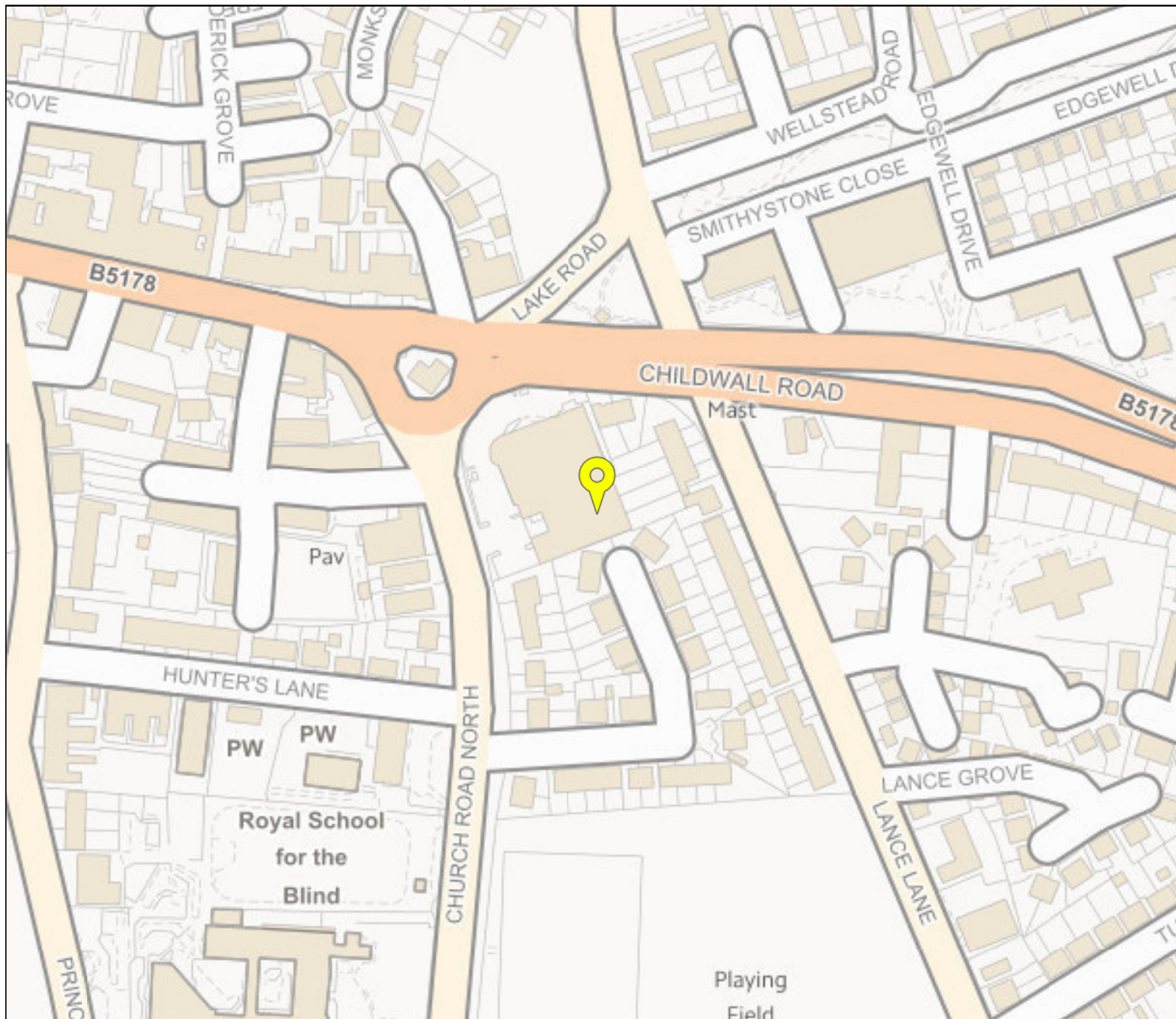
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>











Flood map for planning


Your reference
09-143

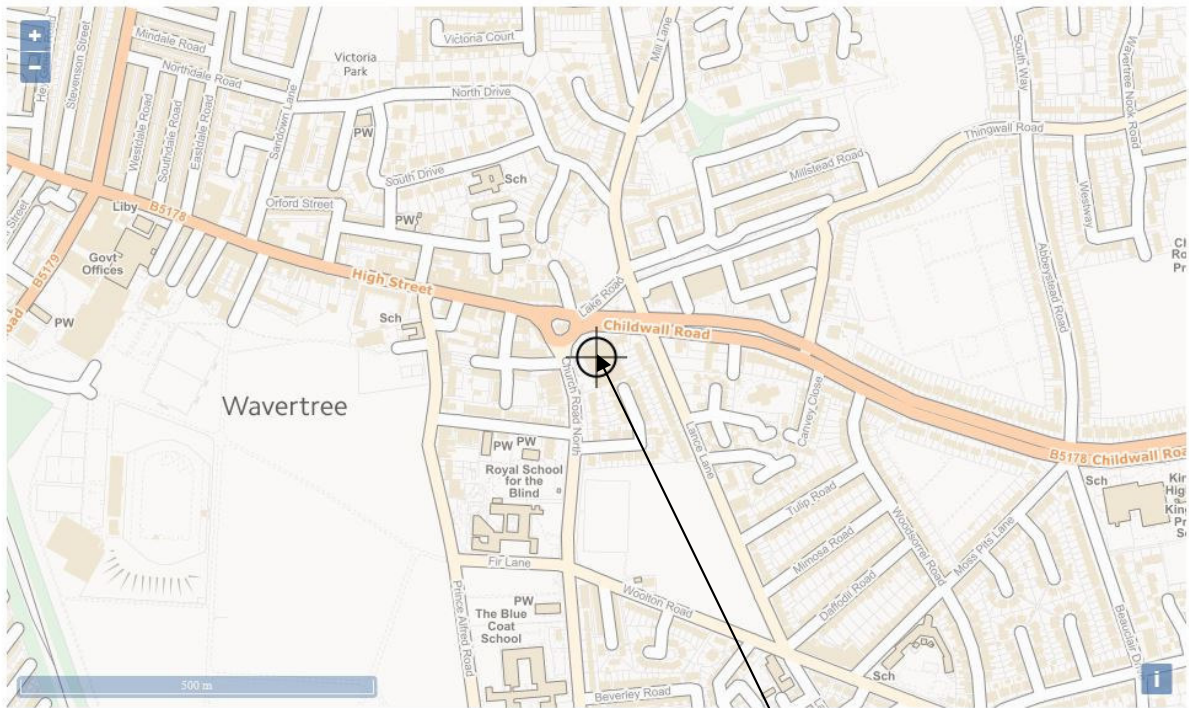
Location (easting/northing)
339294/389354

Scale
1:2500

Created
17 Jun 2020 12:32

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area


0 20 40 60m



Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

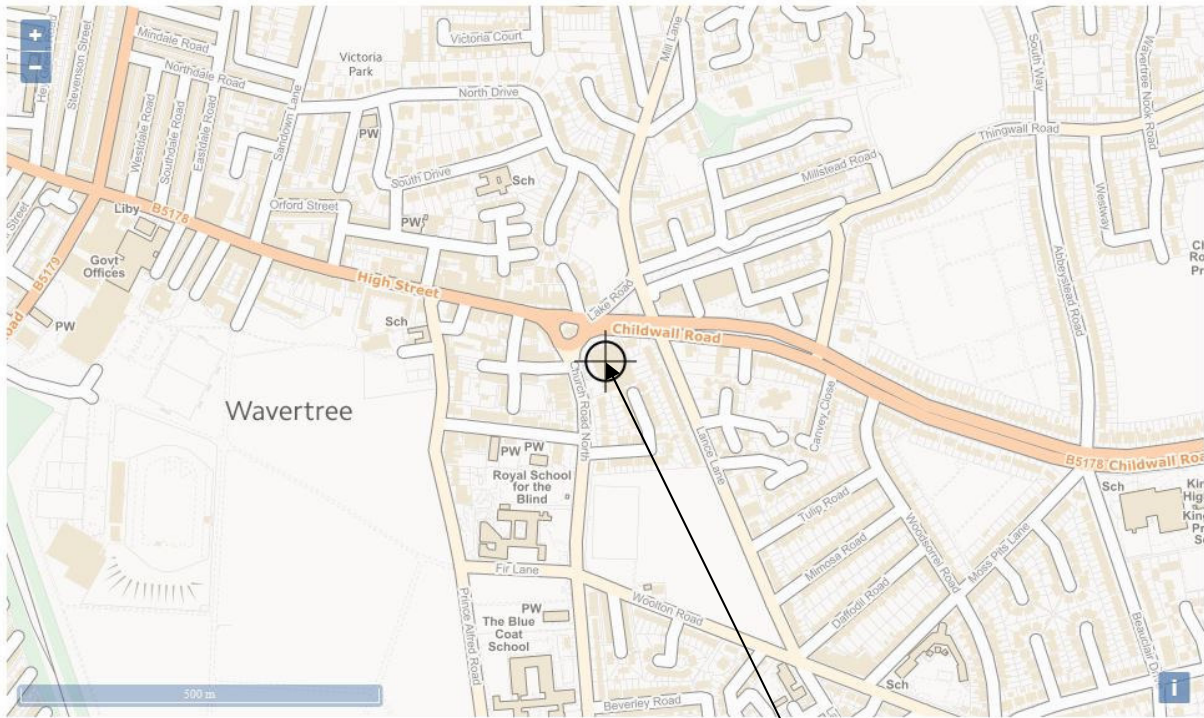
Site Location



Extent of flooding from surface water

● High ● Medium ● Low ○ Very low ⊕ Location you selected

Site Location



Extent of flooding from reservoirs

- Maximum extent of flooding
- Location you selected

Site Location

APPENDIX D - DRAINAGE CALCULATIONS

Project Title: Lidl Wavertree

09-143

Prepared By: KA

Date: 06/2020

Checked By: KGP

Date: 06/2020

EXISTING AND PROPOSED DEVELOPEMENT SURFACE WATER RUN-OFF 1 in 2 year

DESIGN DATA

Site location =	Wavertree
Rainfall intensity, i (l/s) =	50
Existing Impemeable area, Ai (m ²) =	4587
Routing coefficient, Cr =	1
Volumetric run-off coefficient, Cv =	1

RESULTS

Surface water discharge from the existing site	
Q (existing site)=	63.8 l/s
Proposed site allowable discharge	
Q (proposed site) =	44.6 l/s

EXISTING SITE

Rate of run-off, Q = $A_p \times i \times C_r \times C_v \times 2.78$

Q existing = 63.8 l/s

PROPOSED SITE

Proposed site allowable discharge is Existing less 30% :

Q proposed = 44.6 l/s

DESIGN NOTES

1. Surface water storage design is in accordance with the Wallingford Procedure - Design and Analysis of Urban Drainage. Volume 1 Principles, Methods and Practice. Volume 4 - Modified Rational Method.

Project Title: Lidl Wavertree

09-143

Prepared By: KA

Date: 06/2020

Checked By: KGP

Date: 06/2020

SURFACE WATER ATTENUATION FOR 30 YEAR RAINFALL RETURN PERIOD

DESIGN DATA

Site location =	Wavertree
M5-60 rainfall ratio (mm) =	20
60min rainfall ratio to 2 day rainfalls of 5 year return period, r =	0.4
Impemeable area (m ²) =	4877
Total site area (m ²) =	4946
Proposed discharge rate (l/s) =	44.6
Allowance for Climate Change (%) =	30

CALCULATIONS RESULTS

Required storage volume (m³) = 83

DETAILED CALCULATIONS

Duration, D	15	30	60	120	240	360	600	1440	2880
Z1	0.64	0.79	1.00	1.20	1.44	1.63	1.85	2.35	2.81
M5-D	12.8	15.8	20.0	24.0	28.8	32.6	37.0	47.0	56.2
Z2	1.511	1.529	1.543	1.535	1.518	1.501	1.481	1.434	1.401
M30-D	19.33	24.16	30.87	36.85	43.72	48.94	54.78	67.40	78.74
i (mm/hr)	77.34	48.33	30.87	18.42	10.93	8.16	5.48	2.81	1.64
i + Climate Change %	100.54	62.83	40.13	23.95	14.21	10.60	7.12	3.65	2.13
Area (m ²)	4877	4877	4877	4877	4877	4877	4877	4877	4877
Qp (l/s)	136.31	85.18	54.40	32.47	19.27	14.38	9.66	4.95	2.89
Qe (l/s)	44.63	44.63	44.63	44.63	44.63	44.63	44.63	44.63	44.63
Balancing Q	91.68	40.55	9.77	-12.16	-25.37	-30.26	-34.98	-39.68	-41.74
Storage volume (m ³)	82.51	72.98	35.18	-87.54	-365.27	-653.51	-1259.12	-3428.51	-7212.73

DESIGN NOTES

1. Surface water storage design is in accordance with the Wallingford Procedure - Design and Analysis of Urban Drainage. Volume 1 Principles, Methods and Practice. Volume 4 - Modified Rational Method.

Project Title: Lidl Wavertree

09-143

Prepared By: KA

Date: 06/2020

Checked By: KGP

Date: 06/2020

SURFACE WATER ATTENUATION FOR 100 YEAR RAINFALL RETURN PERIOD

DESIGN DATA

Site location =	Wavertree
M5-60 rainfall ratio (mm) =	20
60min rainfall ratio to 2 day rainfalls of 5 year return period, r =	0.4
Impemeable area (m ²) =	4877
Total site area (m ²) =	4946
Proposed discharge rate (l/s) =	44.6
Allowance for Climate Change (%) =	30

CALCULATIONS RESULTS

Required storage volume (m ³) =	120
Rainfall intensity (mm/hr) =	130

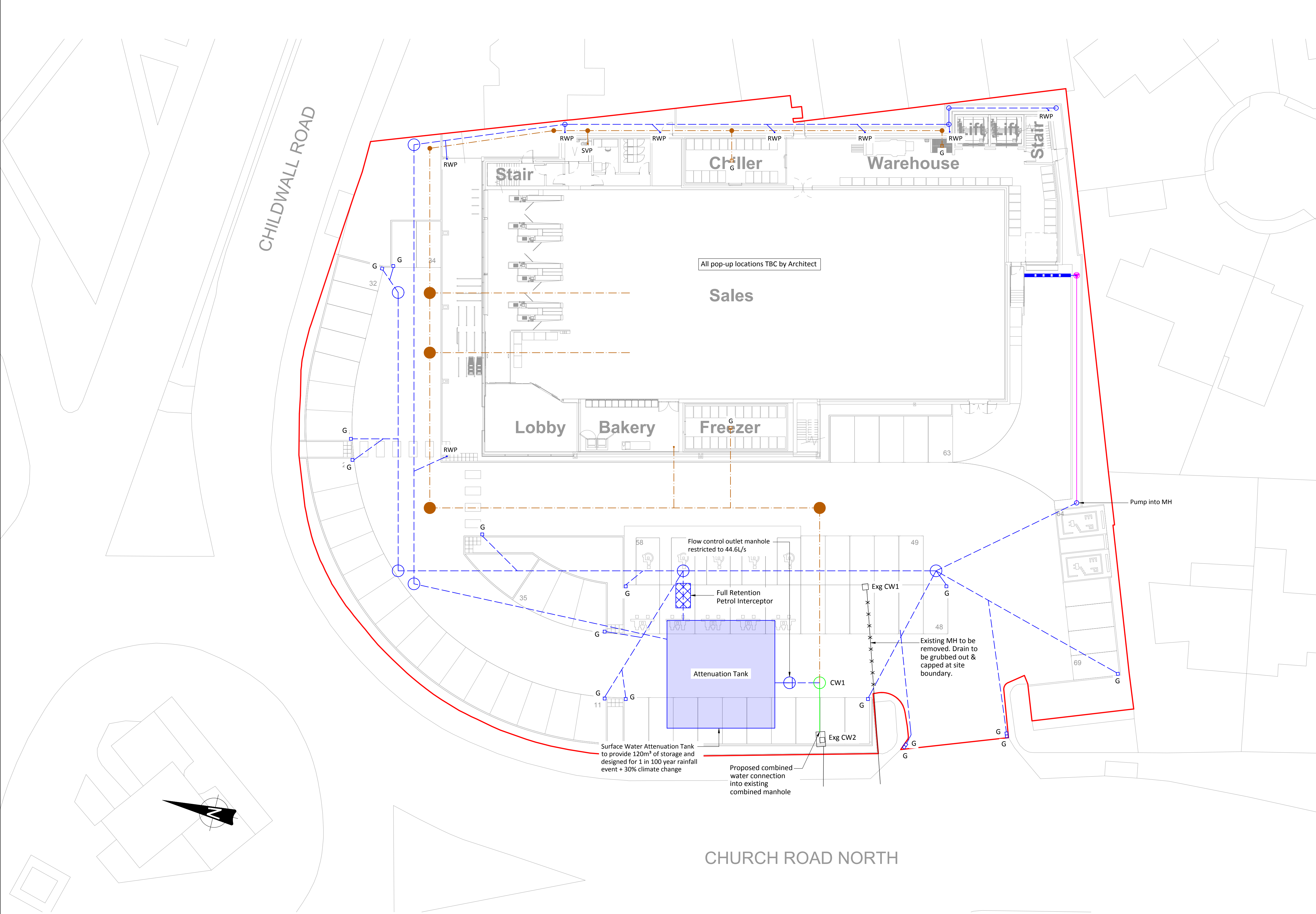
DETAILED CALCULATIONS

Duration, D	15	30	60	120	240	360	600	1440	2880
Z1	0.64	0.79	1.00	1.20	1.44	1.63	1.85	2.35	2.81
M5-D	12.8	15.8	20.0	24.0	28.8	32.6	37.0	47.0	56.2
Z2	1.955	1.996	2.030	2.014	1.980	1.949	1.914	1.834	1.768
M100-D	25.02	31.54	40.60	48.34	57.01	63.54	70.82	86.20	99.35
i (mm/hr)	100.09	63.09	40.60	24.17	14.25	10.59	7.08	3.59	2.07
i + Climate Change %	130.11	82.01	52.78	31.42	18.53	13.77	9.21	4.67	2.69
Area (m ²)	4877	4877	4877	4877	4877	4877	4877	4877	4877
Qp (l/s)	176.41	111.19	71.56	42.60	25.12	18.67	12.48	6.33	3.65
Qe (l/s)	44.63	44.63	44.63	44.63	44.63	44.63	44.63	44.63	44.63
Balancing Q	131.77	66.56	26.93	-2.03	-19.51	-25.96	-32.15	-38.30	-40.98
Storage volume (m ³)	118.60	119.81	96.94	-14.65	-280.94	-560.84	-1157.38	-3309.22	-7081.92

DESIGN NOTES

1. Surface water storage design is in accordance with the Wallingford Procedure - Design and Analysis of Urban Drainage. Volume 1 Principles, Methods and Practice. Volume 4 - Modified Rational Method.

APPENDIX E - PROPOSED DEVELOPMENT DRAINAGE STRATEGY



Plan
Scale 1:200

This drawing is copyright. © Beam Consulting Engineers Ltd. A1

Notes

1.

All existing drainage information shown on this drawing is based on Technics Geospatial Consultant Surveyors Topographical Survey Drawing 4765-0520-01 Rev A.

2.

Drainage gully locations to be confirmed by the Architect subject to levels.

3.

All RWP's connecting into MH system to be 100Ø in minimum 1:100 gradient.

4.

All drainage connecting into SW system from road gullies/drainage channels to be 150Ø with minimum 1:150 gradient.

Key (MH's)

—>—

Existing Foul Water Drain

—>—

Existing Surface Water Drain

—>—

Existing Combined Water Drain

X · X · X ·

Existing Drain Abandoned

□ EG

Existing Gully

○ ERWP

Existing Rainwater Pipe

○ ERE

Existing Rodding Eye

—>—

Proposed Surface Water Drain

□ G □ G

Proposed Gully

—>—

Proposed Drainage Channel

○ RWP

Proposed Rainwater Pipe

○ RE

Proposed Rodding Eye

—>—

Proposed Foul Water Drain

○ SVP

Proposed Soil Vent Pipe

○ RE

Proposed Rodding Eye

—>—

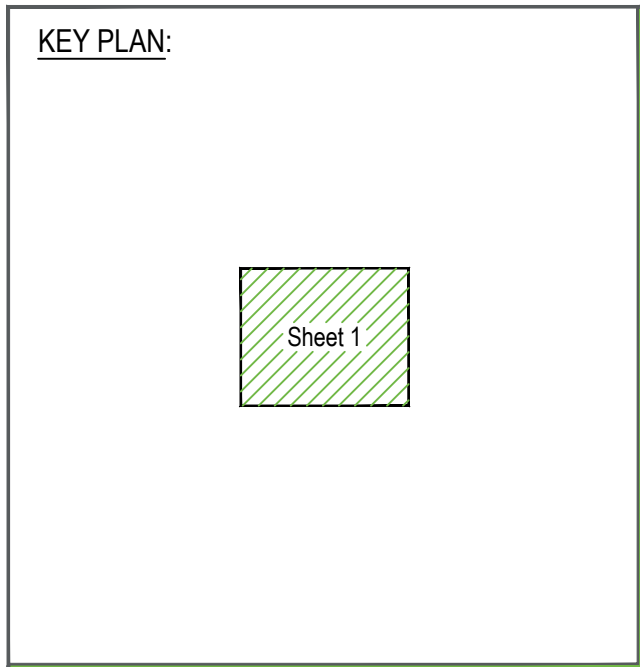
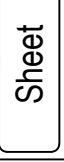
Proposed Pumped Water Drain

|||||

Concrete Pipe Protection

DESCRIPTION	REV	DATE	CHK	APR
<div><div>beamconsulting</div><div>Beam Consulting 14 Bond Street Wakefield WF1 2QP Tel: 01924 361653 Fax: 01924 364631</div></div>				
PROJECT Church Road North, Wavertree				
DRAWING TITLE Outline Drainage Strategy				
CLIENT Lidl Great Britain Limited				
STATUS Information				
DRAWN	JD	DATE	22.06.2020	
CHECKED	KA	SCALE	AS SHOWN @ A1	
APPROVED	KGP	DRAWING NUMBER	09-143-500	
			REVISION	-

APPENDIX F – EXISITING SITE INFORMATION




SURVEY STATIONS			
Name	Casting	Horthing	Height
0001	230233.796	200308.1823	52.361
0002	230251.582	200327.742	52.887
0003	230240.373	200409.657	51.989
0005	230273.785	200401.006	52.636
0006	230267.604	200408.577	52.855
0007	230228.983	200408.952	51.983
0003	230265.367	200443.970	52.367

LEGEND:


LEGEND:

SERVICE DEPTHS:


• Depths of services can be measured from different points:



A



B



C

A Indicates where GPR depth is measured from.

B Indicates where depth is measured from when using radio frequency.

C Indicates where depth is taken from on drainage pipes using a tape measure.

ABBREVIATIONS:

[illegible]

SURVEY AND DATUM INFORMATION:

The results of the subsurface survey have been measured utilizing the existing survey control as indicated in the drawing mentioned above.

SUPPLY STATIONS				
Name	Easting	Northing	Height	
CO01	330233.796	380281.823	52.361	
CO02	330251.542	380237.742	52.387	
CO04	330245.373	380492.807	51.985	
CO05	330273.786	380461.866	52.600	
CO06	330267.044	380468.577	52.365	
CO07	330258.993	380499.930	51.983	
CO03	330257.307	380493.933	52.367	

UTILITY NOTES:

Services shown outside the survey boundary are for information only and may not be complete. If information is required outside our survey boundary, please contact a Technical Project Manager.

WEATHER CONDITIONS:

A	22/05/20	First Issue	LW
Rev.	Date	Revision	Signed

DO NOT SCALE!

Client:	Lidl UK		
Project:	Church Road North Liverpool L15 9EF		
Survey Quality:	Topographical and "QLB" Utility Survey		
Start Date of Survey:	07/05/2020		
Drawing Status:	Surveyed RS/OD	Drawn: LW	Approved: LJM
Digital File: 4765-0520-01.dwg	Original Size: A0	Scale: 1:200	Sheet: 1 of 1

Drawing No.	4765-0520-01	Revision:	A
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2.Warning:
Assumed Route (B4) positions are indicative only and are in an approximate position. Safe digging practices in accordance with HS(G)47, must be used to verify the information and establish their actual position.

3.Warning:
Records information and positions (QLD) are indicative only and are in an approximate position. Safe digging practices in accordance with HS(G)47, must be used to

DESKTOP UTILITY RECORDS		
Utility Type	Provider Details	Date Acquired
Gas	Cadent, GTC and ESP	02/10/12/2019
Water - Sewers	United Utilities	04/12/2020
Electric	Manweb	03/12/2020
BT	Openreach	03/12/2019
Telecoms	Virgin & Vodafone	03/12/12/2019

Surface Geology

3D Models

Borehole Scans

Earthquake Timeline

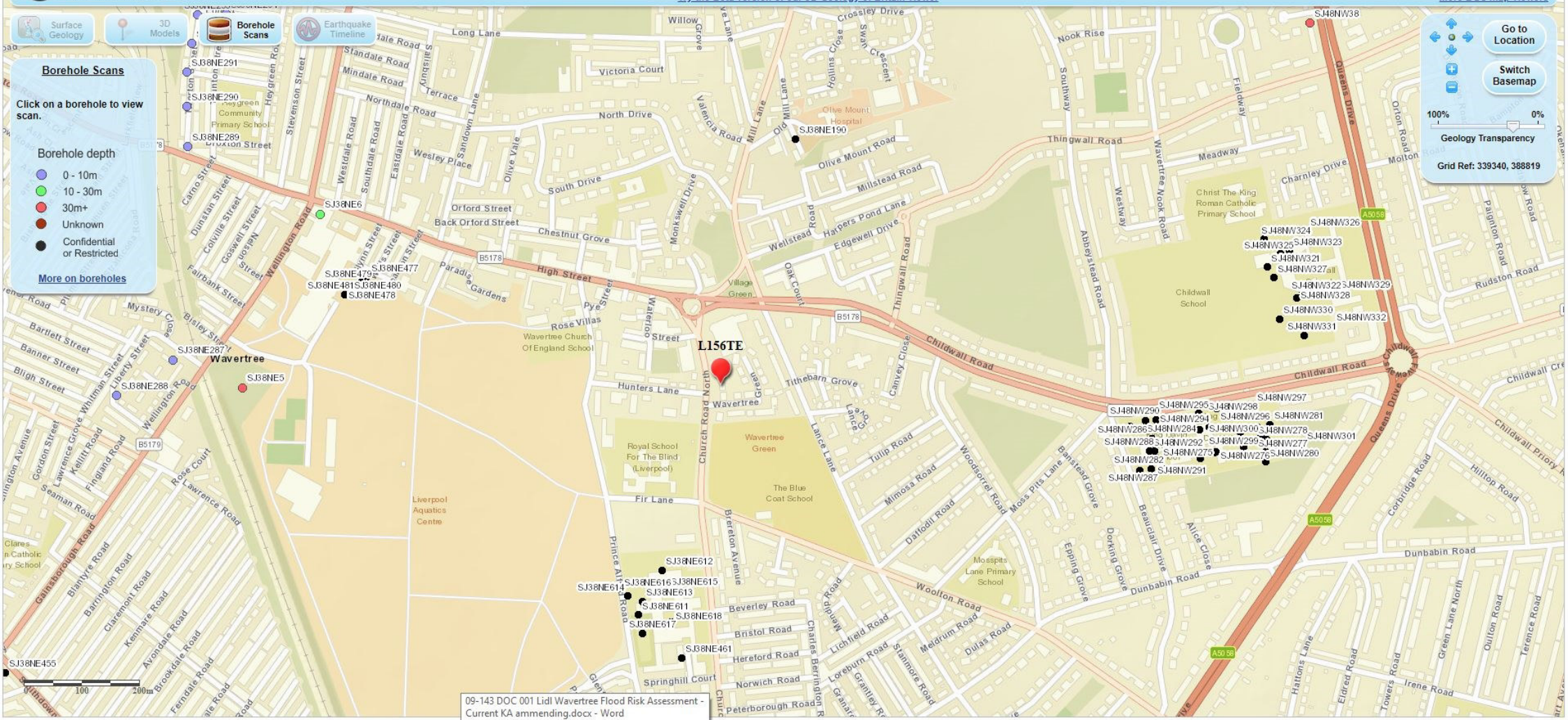
Borehole Scans

Click on a borehole to view scan.

Borehole depth

- 0 - 10m
- 10 - 30m
- 30m+
- Unknown
- Confidential or Restricted

[More on boreholes](#)



[Go to Location](#)

[Switch Basemap](#)

100% 0%

Geology Transparency

Grid Ref: 339340, 388819

288

Borehole Number : 2

Sheet 1 of 1.

Job Number : 6692 Location : Abyssinia St. Liverpool

Dia. & Drilling Methods
light cable percussion
150mm diameter.

Client : Kevin Smith Associates.

[illegible]

General Remarks :
Trial pit excavated over one hour and thirty minutes.
length 0.80m x width 0.70m x depth 1.00m.
Water at end of shift 7.10m.

Dates : 11-Sept-92

Driller : T.O.

Engineer: A.M.T.

Coordinates :