



SRCL KNOWSLEY

Merseyside, L33 7UR

FLOOD RISK ASSESSMENT

Project No	21-305
Revision No	00
Issue date	29/07/22

Control Sheet

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1 EXECUTIVE SUMMARY

- 1.1.1 This FRA has been produced to support an application for amendments to an existing waste transfer facility. The proposals are for regrading (lowering) of an external service yard, erection of a new canopy structure over existing hardstanding, refurbishment and rearranging of office and industrial space within the existing buildings on site, formalised parking arrangements to the south parallel with Bradman Road, and additional waste processing plant & associated drainage within the main factory building.
- 1.1.2 The site is identified by the Environment Agency's Flood Map for Planning to be partially within in Flood Zone 2 associated with a tributary of the Simonswood Brook.
- 1.1.3 Environment Agency data has been utilised to assess the risk of flooding to the site inclusive of climate change. The data shows flooding would be contained to external and vehicular circulation areas only to the northernmost part of the site, with all existing building floor levels remaining above the predicted flood level.
- 1.1.4 Localised depressions on the site as well as parts of the highway network is predicted to be at risk of surface water flooding, however, as with fluvial flooding, this would only affect external circulation areas of the site.
- 1.1.5 The site is at low or negligible risk of flooding from groundwater, sewers or artificial sources.
- 1.1.6 The proposed refurbishment of the existing drainage system would likely reduce the surface water flood risk posed to the site and also potentially improve the drain down of any fluvial flooding that could impact the site. It would also relieve known pressures on a United Utility foul sewer crossing the site, by redirecting some surface water to storm sewers, as opposed to the foul sewer as is currently the case.
- 1.1.7 Given the proposed site use, the nature of the flood risk and the proposed drainage improvements, no specific mitigation measures are deemed required.
- 1.1.8 This document demonstrates that the proposals meet the aims of the National Planning Policy, being safe from all sources of flooding and not increasing flood risk elsewhere.

2 INTRODUCTION

2.1 Background

- 2.1.1 Calibro has been appointed by *Stericycle* to undertake a Flood Risk Assessment (FRA) to support proposed amendments to their waste transfer facility at Knowsley Industrial Estate.
- 2.1.2 This assessment considers the risks of all types of flooding to the site including tidal, fluvial, surface water, groundwater, sewer and artificial sources. It assesses if mitigation measures to ensure that the flood risk to the site is minimised are required and provides an outline flood emergency management plan.
- 2.1.3 The report also provides a summary of the proposed drainage strategy for the site.

2.2 National Policy

- 2.2.1 The National Planning Policy Framework (NPPF) states that a site-specific Flood Risk Assessment will be required for proposals:
 - a) that are greater than 1 hectare in area within Flood Zone 1;
 - b) for all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3;
 - c) in an area within Flood Zone 1 which has critical drainage problems; and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.
 - d) in an area within Flood Zone 1 identified in a Strategic Flood Risk Assessment as being at increased flood risk in the future.
 - e) in an area in Flood Zone 1 that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.
- 2.2.2 The site is partially located in Flood Zone 2 and therefore requires an FRA in accordance with NPPF.

2.3 Local Policy

- 2.3.1 Knowsley and Sefton Councils produced a Level 1 Strategic Flood Risk Assessment (SFRA) in 2009. Knowsley Council produced a Level 2 SFRA in 2012. Both documents remain live documents in the Local Plan Evidence Base.

3 EXISTING SITE AND HYDROLOGY CHARACTERISTICS

3.1 Site Location & Existing Conditions

- 3.1.1 The site is located on Acornfield Road in Knowsley Industrial Park, east of Kirkby. The approximate co-ordinates for the centre of the site are 343750, 399250 and the postcode is L33 7UR.
- 3.1.2 The site is approximately 1.3ha of brownfield land. It comprises a waste transfer facility with internal office spaces and external car parking. A service yard with loading bays is located in the northern portion of the site.
- 3.1.3 The site is located on the junction of Bradman Road and Acornfield Road and is accessed from Acornfield Road via a private road at the northern extent of the site.
- 3.1.4 The land use of the immediate site surroundings is industrial as the site falls within the Knowsley Industrial Park. Beyond the industrial park to the north and east, approximately 300m from the site, is open greenfield land. Land beyond the industrial park to the south and west is predominantly urban. Figure 3-1 and Figure 3-2 illustrate the site's location and approximate site boundary.

Figure 3-1 Site Location



Figure 3-2 Site Boundary



3.2 Topography

- 3.2.1 A topographic survey of the site is available and provided in Appendix A. This shows that the site is relatively flat.
- 3.2.2 Levels along the eastern boundary of the site are approximately 39.4mAOD. These levels are lower than the levels of the adjacent Acornfield Road, which are approximately 39.8mAOD adjacent to the northern extent of the site and 40.0mAOD in the south.
- 3.2.3 The southern site boundary has levels ranging from 39.7mAOD at its eastern extent to 40.0mAOD in its western extent. Bradman Road to the south of the site is shown to be approximately 200mm lower than the southern extent of the site.
- 3.2.4 With the exception of a small area in the far northwest of the existing building, which is level with the external service yard, the floor level of the existing waste transfer facility building is approximately 40.3mAOD.
- 3.2.5 The external service yard is also 40.3mAOD at its south eastern extent, falling to approximately 38.9mAOD at the north western extent of the site, which is the low point of the site.
- 3.2.6 A low perimeter wall, shown in Figure 3-3, is located partway (broadly halfway from west to central) along the northern site boundary, terminating at the start of the blue railings in image 3-3 below. The wall crest level is approximately 39.6mAOD at its eastern extent, rising to approximately 40mAOD in the northwestern corner of the site. The wall terminates and reverts to a Half batter type kerb for the remainder of the northern boundary up to the site entrance in the north east.



3.3 Ground Conditions

- 3.3.1 Geological data held by the British Geological Survey (BGS) shows the entire site to be underlain by Chester Formation Sandstone bedrock and Shirdley Hill Sand sandstone superficial geology.
- 3.3.2 BGS data also confirms the site is underlain by a highly productive aquifer.
- 3.3.3 Magic Mapping¹ shows that the site is located in a Groundwater Source Protection Zone III – Total Catchment.

3.4 Existing Drainage and Hydrology

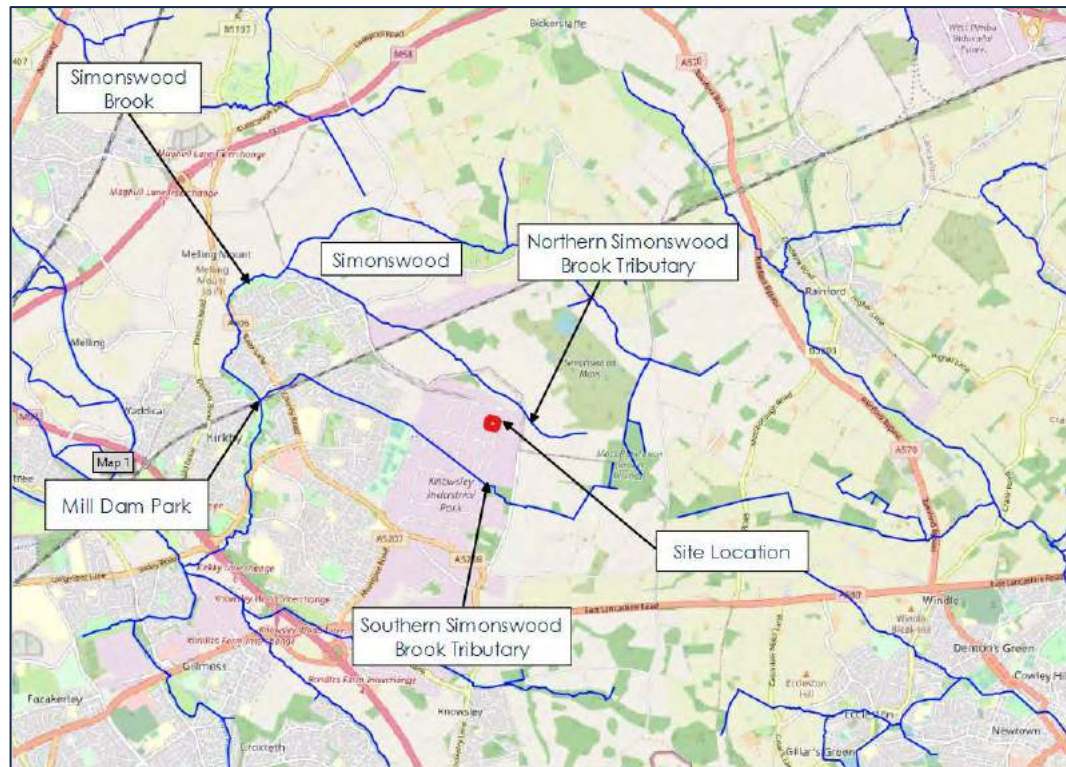
- 3.4.1 The site and immediate surroundings are dominated by industrial development and therefore served by an existing surface water drainage network. United Utilities asset records, provided in Appendix B, show public surface water sewers beneath both Acornfield and Bradman Roads.
- 3.4.2 The site is currently served by a positive drainage networks. As the site is a medical waste processing facility, to comply with EA permitting & compliance legislation, the majority of the external service yard areas, and internal processed trade fluent, have to discharge to the foul network in order to comply with Environment Agency regulations. External areas of hardstanding at the southern and eastern extent of the site are also served via a positive drainage system, parts of which also discharge to an existing foul sewer in Bradman Road. The existing drainage system across the

¹ <https://magic.defra.gov.uk/>

majority of the site is damaged or collapsed in places, and in need of repair/replacement.

- 3.4.3 A tributary of the Simonswood Brook is located approximately 300m east of the site. This tributary has its source at Simonswood Moss and flows in a westerly direction past the northeast corner of the industrial park, where it is culverted beneath local highways and a railway line. It joins the Simonswood Brook at Simonswood, where it flows south through Kirkby.
- 3.4.4 A second tributary of the Simonswood Brook is located approximately 600m south of the site. This southern tributary is culverted beneath the industrial park and for much of its course as it flows west until its confluence with the Simonswood Brook at Mill Dam Park.

Figure 3-4 Site Hydrology



4 THE PROPOSED DEVELOPMENT

4.1 Site Proposals

- 4.1.1 The proposals are for rearrangement and refurbishment of office space within the existing building, including additional/replacement office space. There will be no amendments to internal floor levels. A new canopy is to be constructed to the main building fronting the existing service yard, to enable workers shelter during inclement weather. The proposals also include for regrading (lowering) of an external service yard, formalised parking arrangements to the south parallel with Bradman Road, and additional waste processing plant & associated drainage within the main factory building.
- 4.1.2 Note that the new canopy structure will cover a like for like plan area of existing impermeable area of the service yard – thus not increasing impermeable area overall. Drainage from the canopy will be directed to surface water sewers, thereby reducing the area currently draining to foul sewers.
- 4.1.3 External works to the service yard include repairing/replacing of dilapidated sewers, regrading and minor lowering of the existing service yard, to approximately 38.8mAOD in the northwestern corner and 39.9mAOD in the centre. Areas adjacent to the existing building will remain at approximately 40.3mAOD. Appendix C shows the proposed levels.
- 4.1.4 Parking bays will be constructed along the southern extents of the site. The works will also include improving and upgrading drainage, including formalising the drainage for the proposed parking bays.
- 4.1.5 Improvements to drainage will abide by the Environment Agency regulations to drain surface water from hardstanding areas that medical waste is handled to foul sewers. Where possible, surface water emanating from areas currently draining to foul will also be directed to surface water sewers.

4.2 Development Vulnerability

- 4.2.1 Table 2 of the Planning Practice Guidance (PPG) defines which types of development are acceptable in each Flood Zone and is reproduced in Table 4-1. The proposed development is for waste transfer use which falls within the 'More Vulnerable' category. More Vulnerable development is acceptable in Flood Zone 2.

Table 4-1

PPG Development Vulnerability Classification

Flood Zone	Flood Risk Vulnerability				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception Test Required	✓	✓	✓
3a	Exception Test Required	✗	Exception Test Required	✓	✓
3b	Exception Test Required	✗	✗	✗	✓

5 SITE SPECIFIC FLOODING ISSUES

5.1.1 In accordance with the National Planning Policy Framework, this Flood Risk Assessment considers all sources of flooding including:

- a) Tidal Flooding – from the sea;
- b) Fluvial Flooding – from rivers and streams;
- c) Surface Water Flooding – overland surface water flow and exceedance;
- d) Groundwater flooding – from elevated groundwater levels or springs;
- e) Flooding from sewers – exceedance flows from existing sewer systems; and
- f) Artificial sources – reservoirs, canals etc.

5.1.2 Flood model data has been retrieved from the Environment Agency, which is provided in Appendix D and is discussed in Section 5.4.

5.2 Historic Flooding Issues

5.2.1 The Environment Agency does not hold any records of historical flooding at the site. Likewise, the Knowsley SFRA does not contain records of flooding incidents at or near the site.

5.3 Flood Zones

5.3.1 The Flood Zones represent the risk of flooding across England on the basis of the probability of flooding from both fluvial and tidal sources, ignoring the presence of existing defences. The Flood Zones are defined in Table 1 of the Planning Practice Guidance which is reproduced in Table 5-1.

Table 5-1 Environment Agency Flood Zone Classification

Flood Zone	Risk	Fluvial Flooding Chance	Tidal Flooding Chance
1	Low	> 1 in 1,000 year	
2	Medium	Between 1 in 100 and 1 in 1,000 year	Between 1 in 200 and 1 in 1,000 year
3	High	Up to 1 in 100 year	Up to 1 in 200 year
3b	Functional Floodplain	Land where water has to flow or be stored in times of flood. This is defined in the relevant SFRA.	

5.3.2 The Flood Map for Planning classifies the site as being located partially in Flood Zone 2. This demonstrates the northern extent of the site is predicted to be at risk during a 1 in 1,000 year fluvial flood event associated with the northern tributary of the Simonswood Brook.

- 5.3.3 However, note that the proposed canopy structure lies wholly within Flood Zone 1, and only external levels are to be marginally lowered within Flood Zone 2 extents.
- 5.3.4 The Flood Map for Planning also shows the locations of flood defences within the vicinity of the site, which are defined as 'High Ground'. However, the Environment Agency has confirmed the site does not benefit from defences.

Figure 5-1 Environment Agency Flood Map for Planning



5.4 Fluvial Flooding

- 5.4.1 Flood model outputs from the 2017 Upper Alt Tributaries model were obtained from the Environment Agency. The model is 1D-2D linked generated using Flood Modeller (1D) and TuFLOW (2D) software.
- 5.4.2 The data provided by the EA includes extracted levels at two locations, known as nodes, at the site, as shown in Figure 5-2 with flood levels during various present day events shown in Table 5-1.

Figure 5-2 Flood Model Nodes

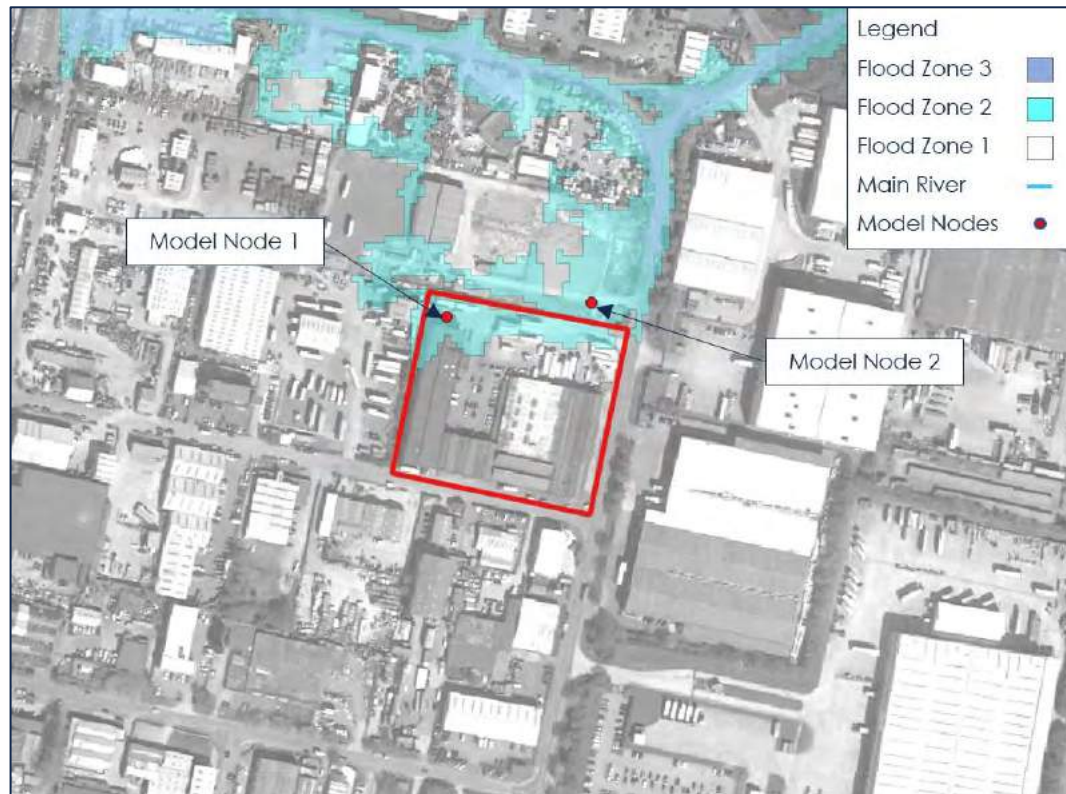


Table 5-1 Modelled Node Flood Levels

Node	Modelled Flood Level (mAOD)	
	1 in 100 year	1 in 1,000 year
1	N/A	39.58
2	N/A	39.60

Climate Change

- 5.4.3 In July 2021 the Environment Agency 'Flood Risk Assessments: Climate Change Guidance' was updated to reflect the latest predicted changes in peak river flow. These allowances are provided for over 100 management catchments for a range of time periods and probabilistic scenarios.
- 5.4.4 The application site lies within the 'Alt and Crossens' Management Catchment. The peak river flow climate change allowances for this Management Catchment presented by the PPG are reproduced in Table 5-2.

Table 5-2 Climate Changes Allowances for the 'Alt and Crossens' Catchment

Peak River Flows Scenario	2020s	2050s	2080s
Upper End	31%	56%	95%
Higher Central	21%	33%	58%
Central	16%	25%	44%

5.4.5 The PPG states that for 'More Vulnerable' infrastructure in Flood Zone 2 and 3a, the central peak river flow climate change allowance should be used. The proposals for a refurbished waste transfer site are deemed to have a design life of 50 to 60 years and as such, should consider the 2080s epoch. The design event for the proposals is therefore the 1 in 100 year +44% event (Table 5-2).

5.4.6 As the climate change allowances displayed in Table 5-2 were only updated in July 2021. The Alt and Tributaries model was updated in 2017 and therefore they do not include an event to match the newly updated allowances. For the 1 in 100 year event, it completed model runs assuming a 30%, 35% and 70% increase in flows, the resulting levels at the site are shown in Table 5-3.

Table 5-3 Modelled Node Flood Levels with Climate Change

Node	Modelled Flood Level (mAOD)			
	1 in 100 year	1 in 100 year +30%	1 in 100 year +35%	1 in 100 year +70%
1	N/A	N/A	38.92	39.58
2	N/A	39.53	39.56	39.60

5.4.7 The closest results to the design event (1 in 100 year +44%) provided by the Environment Agency are from the 1 in 100 year +35% event. However, the level difference at Node 2 between the climate change scenarios is low. Therefore, to ensure a precautionary approach, the 70% scenario has been used to inform the assessment of fluvial flood risks.

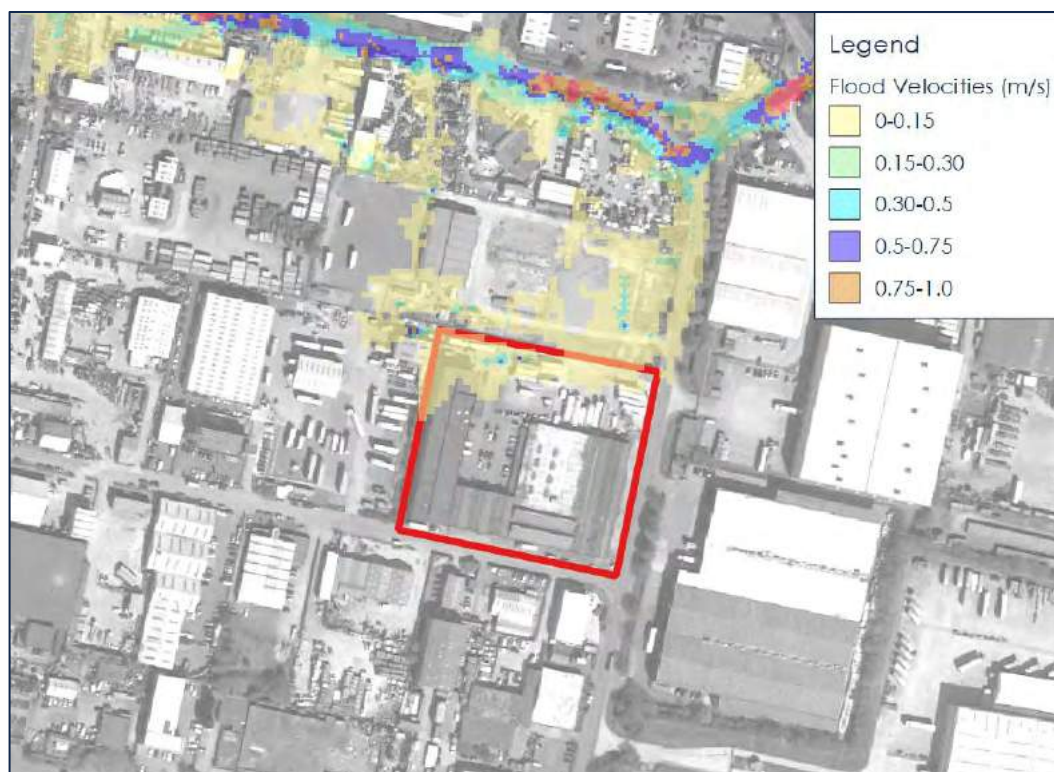
5.4.8 During the 1 in 100 year +70% event, the modelled flood level at Node 2 (at the northeastern extent of the site) is 39.60mAOD. This level is the same as the peak level during a present day 1 in 1,000 year event.

5.4.9 The flooding mechanism is likely to be for flood water to flow from the watercourse in the north, south towards the site. It would spill into the site once the flood level exceeds the level of low points in the land immediately to the north. However, the boundary kerbing along the northern boundary of the site is shown to be at least

39.55m AOD. It is unlikely this wall has been represented in the Alt and Tributaries model or the Flood Map for Planning. However, in reality the wall would hinder the propagation of flood water into the site during a present day 1 in 1,000 year or future 1 in 100 year flood event.

- 5.4.10 Taking a precautionary approach and presuming the wall would not hinder flood water entering the site, then inundation could occur during a present day 1 in 1,000 year or future 1 in 100 year event. In both scenarios, flood water could reach average depths of 300mm-600mm but would not reach the loading bays or internally within the building.
- 5.4.11 The proposed regrading will be of the service yard only and not the local highways or land to the north of the site. Therefore, the frequency of flooding to the site will remain unchanged, as would the predicted peak flood level on site.
- 5.4.12 The main potential impact of flooding therefore would be potential damage to vehicles parked on site as well as mobilisation of debris or contaminants on site. However, this is deemed to be low risk as the model outputs predict velocities would be low, generally less than 0.15m/s, as shown in Figure 5-3.

Figure 5-3 Flood Velocities – 1 in 100 Year +70% Event



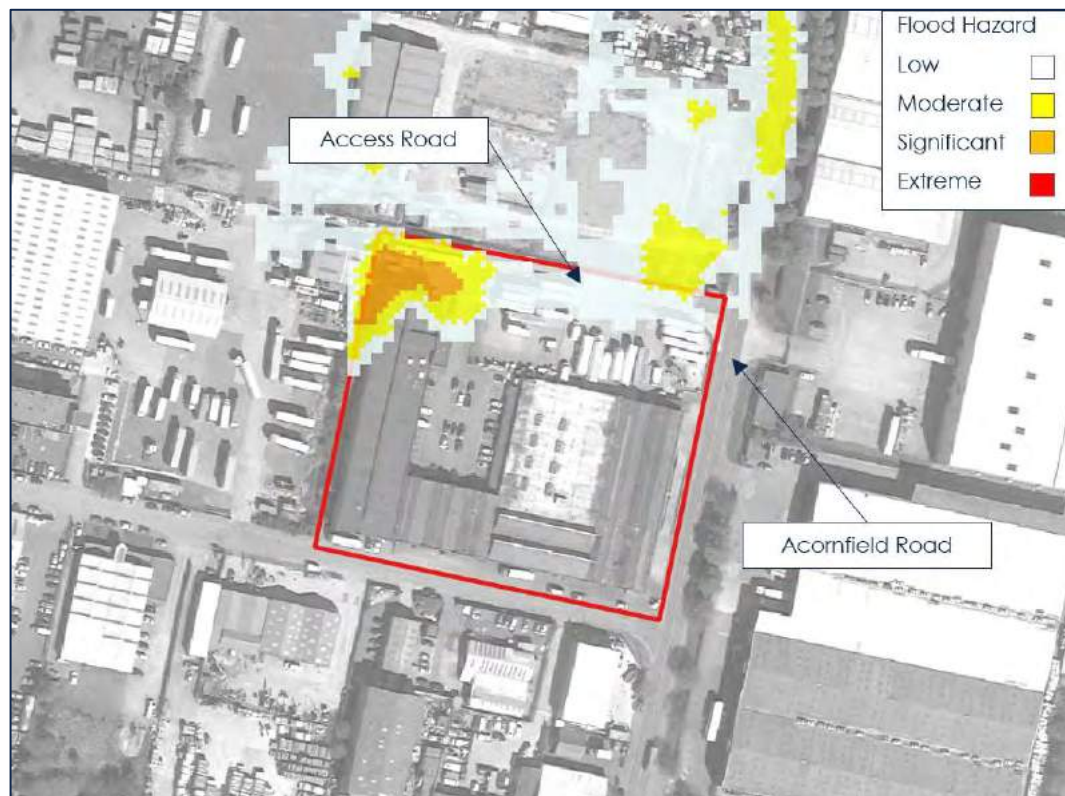
- 5.4.13 Furthermore, given the lower level of the service yard compared to the nearby roads, once inundated, flood water would remain on site until it drained via the site sewer system. As the site's sewers are to be re-laid and improved, it is likely that the site would drain down relatively quickly. In addition, the proposed redirection of some site surface water to the foul network would reduce the risk of spreading contaminants off site.

5.4.14 As a result of the above, given the potential impacts of fluvial flooding are likely to be low, the overall risk to the site proposals is **low**.

5.5 Safe Access and Egress

5.5.1 Site access is from Acornfield Road via a dedicated site access. The Alt and Tributaries model outputs show the site access road and Acornfield Road to be low hazard rating during a 1 in 100 year +70% flood event, in accordance with the ZUK0 methodology. The site access road will not be regraded and therefore, site access and egress would remain.

Figure 5-4 Flood Hazard Rating

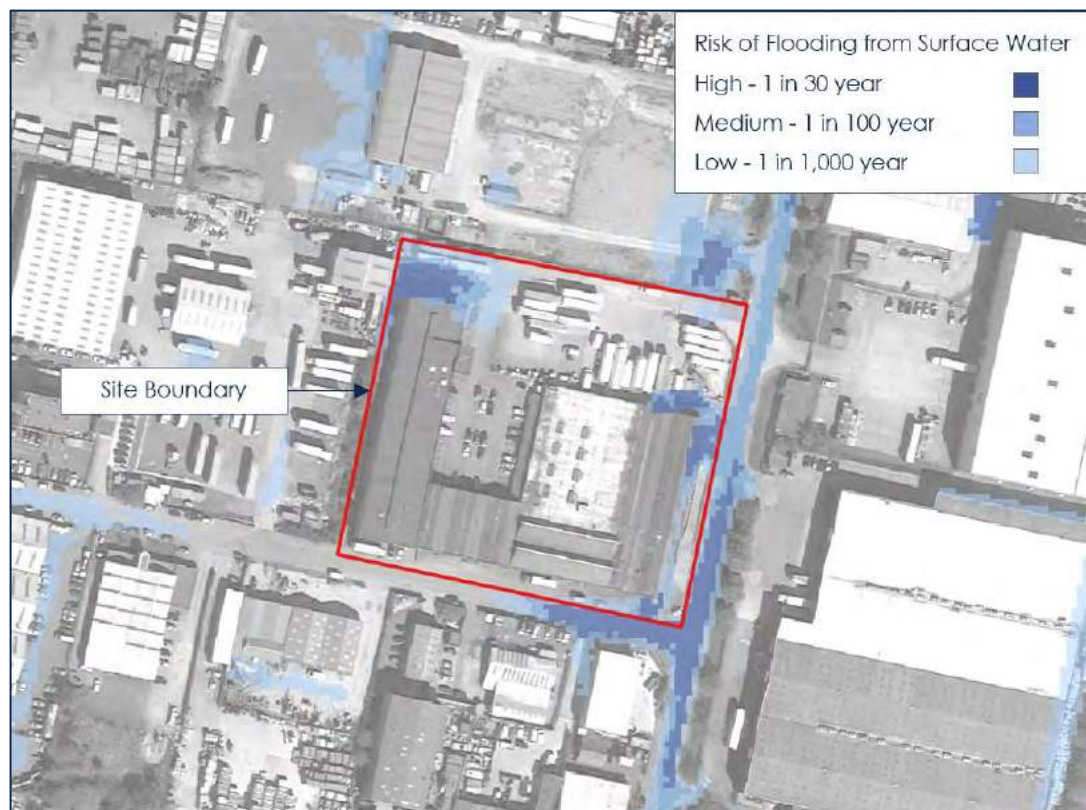


5.5.2 Furthermore, the site proposals include rear access doors from the site building and offices onto Bradman Road to the south, providing dry pedestrian access and egress to and from the site.

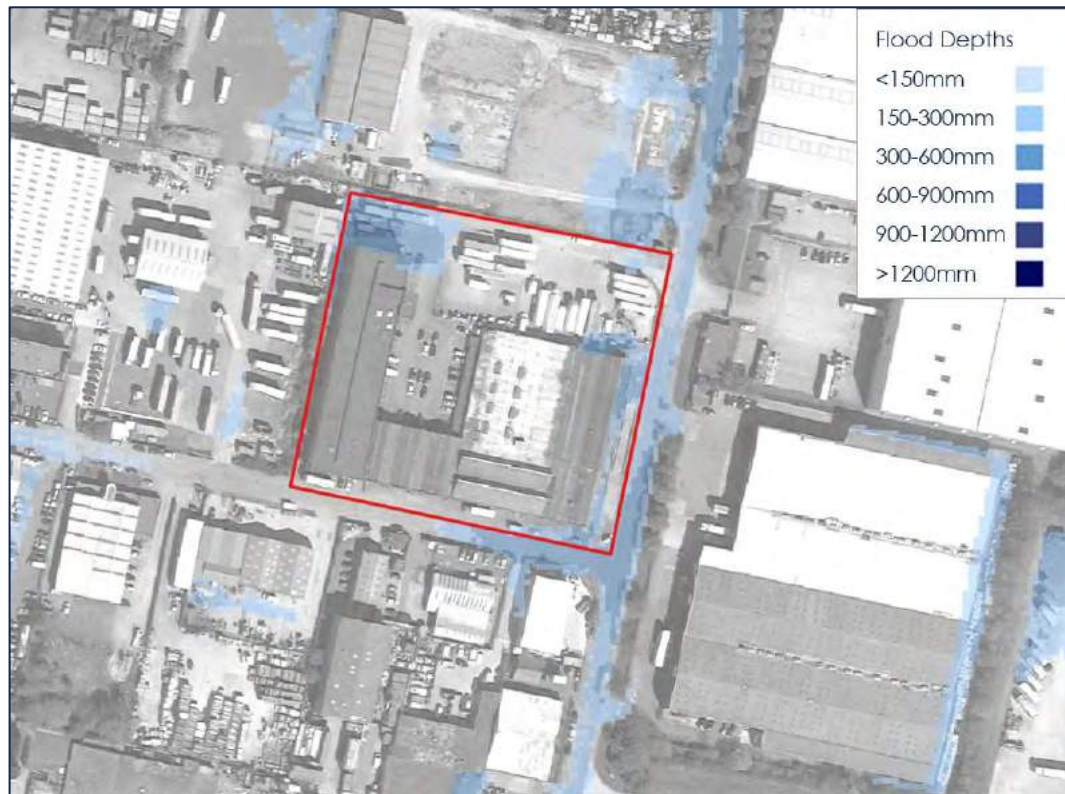
5.6 Surface Water Flooding

- 5.6.1 The Risk of Flooding from Surface Water (RoFSW) datasets indicates where water is expected to flow and accumulate during intense rainfall events. The mapping is derived by simulating 1 in 30, 1 in 100 and 1 in 1,000 year rainfall events on a 2m horizontal grid to define areas at high, medium and low risk of surface water flooding.
- 5.6.2 The RoFSW model doesn't represent the underground sewerage network. Instead, it assumes the network can receive a fixed amount of rainfall per hour. **Error! Reference source not found.** shows the RoFSW extents at the site.

Figure 5-5 RoFSW Extents



- 5.6.3 The outputs show that localised depressions on the site are at risk of surface water flooding. It also shows Bradman Road and Acornfield Road to be at risk. As with fluvial flooding, the parts of the site predicted to be at risk of flooding are external only and the raised nature of the building floor levels would ensure it would be very unlikely internal flooding would occur. Furthermore, the risk and depth of surface water flooding would likely be significantly reduced by the improved site drainage system.



- 5.6.4 As with fluvial flooding, surface water flooding of the site would be contained within the service yard until the site drainage system could convey it from the site. Therefore, it would be unlikely to cause damage to the site or result in the mobilisation of contaminants.
- 5.6.5 As a result, the risk from surface water flooding at the site is deemed to be **low**.

5.7 Groundwater Flooding

- 5.7.1 The information provided in Section 3.3 of this report indicates that the site is underlain by relatively permeable geology and an aquifer.
- 5.7.2 The Knowsley Level 2 SFRA also states that high groundwater levels are experienced across the authority area, although it acknowledges that groundwater flooding is unlikely to exceed the extent of Flood Zone 2. The SFRA also has no records of groundwater flooding within the vicinity of the site.
- 5.7.3 As a result of the above, the BGS susceptibility to groundwater flooding dataset has been utilised to better assess the risk of groundwater flooding. This shows the site and surrounding area to be within Class A 'Limited potential for groundwater flooding to occur'.
- 5.7.4 As a result of the above, the risk of flooding from groundwater is therefore considered to be **low**.

5.8 Flooding From Sewers

- 5.8.1 The site lies within an area well served by a separated public sewer system. Should the capacity of the local surface water sewers become overwhelmed flooding as predicted by the RoFSW dataset would be expected.
- 5.8.2 As a result of the above, the risk of sewer flooding to internal building areas or the site proposals is considered to be **low**.

5.9 Flooding from Artificial Sources

- 5.9.1 Mapping data from the Environment Agency shows that the site is located entirely outside the flood extents presented by potential reservoir breach, both assuming a 'wet day' with local rivers experiencing an extreme flood and a 'dry day' with local rivers at normal levels.
- 5.9.2 There are no other known artificial waterbodies within the vicinity of the site. Consequently, the risk from artificial sources is considered to be **negligible**.

5.10 Flood Risk Summary

- 5.10.1 The site is shown to be at overall low risk of flooding from all sources. The raised floor levels of the existing building provides mitigation against potential future internal fluvial or surface water flooding. In addition, the improved drainage system will help to further mitigate surface water flood risk which would likely reduce surface water flooding depths on site. As such, no specific additional mitigation measures are proposed.

6 PROPOSED DRAINAGE

6.1 Existing Scenario

- 6.1.1 Presently the site is served by a number of separate positive drainage networks, discharging to various Foul & Surface Water sewers/drains.
- 6.1.2 The areas draining surface water can be broken into 4 distinct parcels each with their own separate point of discharge as can be seen from the Existing Impermeable Areas plan in Appendix E
- 6.1.3 The sum of the 4 areas can be seen in table 6-1 below, along with the proposed changes to the areas as part of the refurbishment.

Table 6-1 Surface Water Drainage Areas

	Existing (Ha)	Proposed (Ha)	Difference (Ha)
Area 1 To Surface Sewer	0.197	0.308	+0.111
Area 2 To Surface Sewer	0.223	0.666	+0.443
Area 3 To Foul Sewer	0.734	0.354	-0.380
Area 4 To Foul Sewer	0.174	0.0	-0.174
Total	1.328	1.328	0

- 6.1.4 As mentioned in previous section the site must discharge surface water from all areas that handle medical waste goods to foul sewers to comply with EA permitting imposed on medical waste processing facilities. Under the existing scenario the site drains a total of 0.908 Ha to foul sewers.

6.2 Proposed Drainage

- 6.2.1 As part of the site's development, it is proposed to route as much surface water away from the existing foul network as possible, and into existing storm drains on the site, and ultimately into the wider Surface water sewer network. Refer to Appendix F for the Proposed Impermeable Areas layout.
- 6.2.2 By replacing & formalising some of the existing drainage routes, a total of 0.554 Ha is proposed to be routed away from foul sewers and into the storm network.
- 6.2.3 The Detailed Drainage Strategy layout showing the proposed repaired / re-routed sewers on the site can be found in Appendix G

- 6.2.4 As the proposals are repairing and replacing existing pipework whilst redirecting significant surface flows away from the strained foul sewer network, no further betterment is proposed.
- 6.2.5 The proposed surface water drains on site have been modelled in MicroDrainge and show no flooding for the 100yr plus 40% CC allowance storms, outputs can be found in appendix H.
- 6.2.6 Foul drainage on the site will be re-routed commensurate to the proposals, which are primarily refurbishment of canteen & welfare facilities and a replacement office area. All foul drainage is proposed to ultimately connect to existing foul drains on the site – so no new connection onto a public sewer are required.
- 6.2.7 The Client will make all necessary Trade Effluent applications/agreements with their provider for any additional process waste that may be generated from the proposed industrial equipment on the factory floor.

6.3 Designing for Exceedance/Emergency

- 6.3.1 The refurbishment of the overall facility does not propose to alter any existing flow routes, and as such all exceedance flows will largely follow existing established flow paths.
- 6.3.2 Notwithstanding the above, as part of the EA permitting imposed upon the site, the site must be able to cater for a 2hour fire fight on the site, without any flows discharging from site.
- 6.3.3 United Utilities have confirmed that they would expect a maximum rate of 25l/s. therefore a 2 hour fire fight will produce a volume of $25\text{l/s} \times 60\text{s} \times 60\text{m} \times 2\text{hr}$ Litres. = 180.000 l = 180m³
- 6.3.4 As such a fire Water Retention plan has been devised, whereby all drains exiting the site will be fitted with penstocks to close off flows & contain within the site. All flows will follow overland routes and or into the drainage system via gullies, and will be directed to the Northwest corner of the site, which is the natural low point.
- 6.3.5 To enable flows that may gather along the eastern boundary to reach the northwest corner, as they otherwise pond and disperse onto Acornfield road, it is proposed to install a false gully from the Northeastern surface water outfall, that will only be utilised when the penstock in the outfall manhole is closed. As such flows will surcharge out of the false gully into a lower level area that will then drain overland to the main storage area in the North West.
- 6.3.6 Refer to appendix I for the Fire Water Retention Plan

7 SUMMARY

- 7.1.1 This FRA has been produced to support an application to improve and refurbish an existing waste transfer facility at Knowsley Industrial Park, Knowlsey, Merseyside.
- 7.1.2 The proposals are for rearrangement and refurbishment of office space, a new canopy is to be constructed to the main building fronting the existing service yard, regrading (lowering) of an external service yard, formalised parking arrangements to the south parallel with Bradman Road, and additional waste processing plant & associated drainage within the main factory building.
- 7.1.3 The site is identified by the Environment Agency's Flood Map for Planning to be Partially in Flood Zone 2 associated with a tributary of the Simonswood Brook.
- 7.1.4 Results from the Environment Agency River Alt Upper Tributaries model have been used to inform this assessment.
- 7.1.5 The model demonstrates that the proposed service yard is at risk from flooding during a present day 1 in 1,000 year and future 1 in 100 year event but building ground floor, including proposed office space, would remain above the level of these events. Both events have similar predicted flood levels.
- 7.1.6 The proposed service yard will be lower than the local road network. As a result, flooding would likely remain stationary on site until the improved site drainage discharged it. This would minimise the risk of mobilising debris or contaminants from the site.
- 7.1.7 Local features such as a low perimeter wall on the northern boundary are unlikely to have been represented in the flood modelling. To ensure a conservative assessment, these features have not been accounted for in this assessment. However, in reality they could reduce the likelihood of the site flooding.
- 7.1.8 Local depressions on the site are shown by the RoSWF maps to be at risk of surface water flooding. However, as with fluvial flooding this would only likely inundate the external service yard. The proposed improvements to the site drainage would reduce the risk of surface water flooding.
- 7.1.9 Site access and egress would be possible for the duration of the design flood event with the access road and local highway (Acornfield Road) having a low hazard rating on account of the low velocities. Dry pedestrian access would be available from the offices onto Bradman Road to the south of the site.
- 7.1.10 As a result of the above, the risk posed to the site from fluvial and surface water sources is low.
- 7.1.11 The site is deemed to be at low risk of groundwater and sewer flooding and negligible risk of flooding from reservoirs or artificial sources.
- 7.1.12 The site proposals the site and its users will be safe from flooding and the proposals will meet the requirements of NPPF with respect to flood risk.
- 7.1.13 The proposed drainage refurbishment / redirection will alleviate foul sewers of 0.554 Ha of surface water inflow.
- 7.1.14 The proposals will ensure the site can contain flows generated from a 2 hour fire fight scenario.

APPENDICES

APPENDIX A

Topographic Survey

[illegible]

Quality Levels (PAH128)				
	Quality Level	Horizontal Accuracy	Vertical Accuracy	Detection Clarification
Desktop Records Search	D	N/A	N/A	Service shown on records only not searched
Site Reconnaissance	C	N/A	N/A	A segment of utility whose location is demonstrated by visual reference to street markers, geographical features or evidence of physical street works (manhole/s and/or manholes)
Detection	B4	Undetected	Undetected	A utility segment which is suspected but has not been detected and is therefore shown as an assumed line
Detection	B3	+/- 500mm	Undetected	Horizontal location of only the utility detected by one of the geophysical techniques used
Detection	B2	+/- 250mm	40% Detection Depth	Horizontal and vertical location of the utility detected by one of the geophysical techniques used
Detection	B1	+/- 150mm	15% Detection Depth	Horizontal and vertical location of the utility detected by multiple geophysical techniques used
Verification	A	+/- 50mm	25mm	Horizontal and vertical location of the top and/or bottom of the utility

0.00	0.00	0.00	CATV Cable
0.00	0.00	0.00	CCTV Cable
0.00	0.00	0.00	Concra Cable
0.00	0.00	0.00	Duct
0.00	0.00	0.00	Earthing Rod
0.00	0.00	0.00	Electric Cable
0.00	0.00	0.00	Electric HV Cable
0.00	0.00	0.00	Electric LV Cable
0.00	0.00	0.00	Fibre Optic
0.00	0.00	0.00	Gas Pipe
0.00	0.00	0.00	GPR Anomaly
0.00	0.00	0.00	GPR Linear
0.00	0.00	0.00	Heating Pipe
0.00	0.00	0.00	Rising Main
0.00	0.00	0.00	Surface Sewer
0.00	0.00	0.00	Found Sewer
0.00	0.00	0.00	Trade Effluent
0.00	0.00	0.00	Traffic Signal Cable
0.00	0.00	0.00	Unidentified
0.00	0.00	0.00	Water Main
0.00	0.00	0.00	Vent Pipe
0.00	0.00	0.00	Fuel Pipe
0.00	0.00	0.00	Oil Pipe Line
0.00	0.00	0.00	Survey Events
0.00	0.00	0.00	Assume Route
0.00	0.00	0.00	Taken From Records


 detected by Radio detection of GPR. The route of these is shown from surface
 extension such as pipe repairs or valves. This data should be viewed as a guide only
 and safe digging techniques should be used at all times.
 Records information & positions should be viewed as approximate and indicative. Safe
 digging practices should be used to verify their position and type.
 Utilities depths marked with an 'Y' have been detected using an indirect method
 and therefore should be regarded as less reliable than a directly traced utility.

Letters correspond with
 CCTV report and
 indicate pipe
 inferences.

GPR Anomaly
 GPR Linear
 Heating Pipe
 Rising Main
 Surface Sewer
 Fault Sewer

[illegible]

of this information to Third Parties and unauthorised copying or replication of this data without approval is forbidden.

[illegible]

General

with RICS accuracy band E, as described in RICS guidance note buildings and utilities (3rd Ed.)

Grid ticks should be used to check for plotting distortions.

vegetation, debris or vehicles at survey dates may be omitted. Hedge & Vegetation details are outline.

All arrows point up unless otherwise stated

The grid shown on this survey is based on Ordnance

All other stations are relative to this in plane projection and Grid North orientation is from S2 (i.e. one point localisation with a scale factor equal to 1).

Layout

Sheet 1 Sheet 2

Sheet 3 Sheet 4




Direction
of North

A	13/11/21	A5	Additional drainage details added	EH
REV	DATE	DRAWN	DESCRIPTION	CHECKED

SUBSCAN
UDS

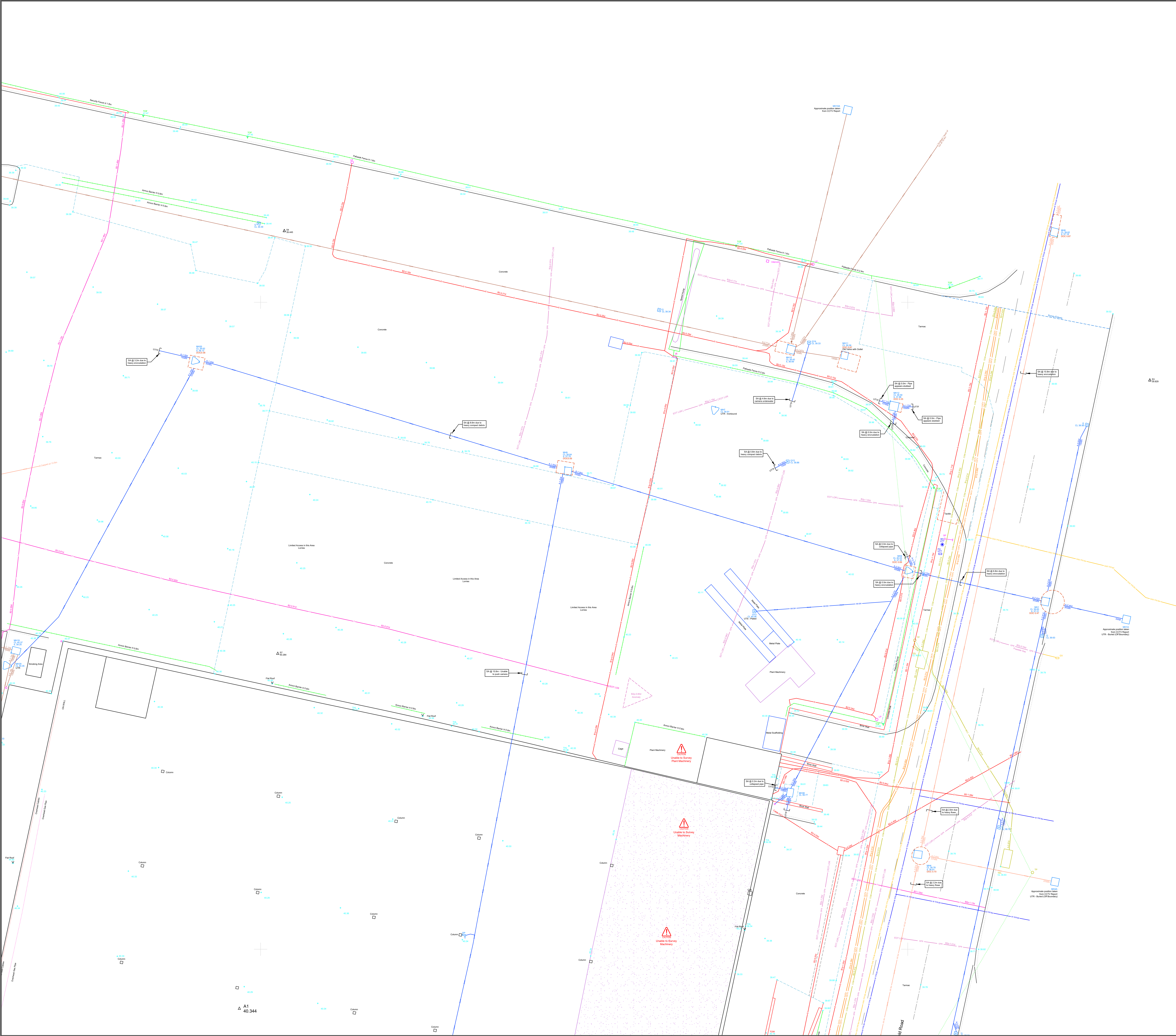
www.burtonelli.com 1001 Grand Ave. Suite 200

SITE Pennine House, Bradman Road

DRAWING TITLE:
Topographical & Underground Utilities Survey
Drainage Survey

GR25647-3DT-UU-DR -Knowsley		1/100
PROJECT REF GR/25647	SHEET 1 of 4	REV A

CHECKED	GRD, RH	DATE	11/19/2021
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Disclaimer

All services shown on this plan have been surveyed using approved detectors and the connections between manholes, if not traced, are assumed to be direct.

Should the background, or topographical, information for the survey area be based on an Ordnance Survey file we are not liable for any loss that may arise due to a lack of accuracy in that digital data.

Location accuracy detected by EMI methods are determined by referring to manufacturer's guidelines for the equipment used. In ideal conditions the accuracies for the underground utilities located and mapped are +/-10% of the depth. Whilst this technique has proven to be successful, it is not 100% reliable and is affected by ground conditions. The depths obtained are for the centre of the conductor and do not necessarily the depth to a duct or pipe.

Although all reasonable effort is made during site detection, the completeness of the underground services information cannot be guaranteed. An electric current will flow along the path of least resistance. This means that when a current is induced into a feature it will 'jump' to adjacent features if they offer a better conducting pathway. It is possible, therefore, that features that are detected by connecting to one type of apparatus may not in fact be that type of utility. The identification of apparatus cannot be assumed to be totally accurate. It should be noted that the technique is limited to detecting features that either generate an electromagnetic field, such as power cables, or around which an electromagnetic field can be induced, such as some water pipes and some communications cables, and it cannot therefore be guaranteed to reveal the exact routes of all buried services or to detect their presence.

GPR is only useful on flat relatively smooth surfaces free from obstructions. Areas of vegetation, waterlogged areas or uneven ground will often not be scanned using GPR as the data is too unreliable.

GPR is affected by below ground conditions. Saturated ground or concrete re-enforcement bars are examples of below ground conditions that can have effects on the results of scans.

Service information can also be shown on the drawings taken from statutory undertakers record plans. This information is shown for the sake of completeness and Subscan UK Ltd can take no responsibility for the positional accuracy of such information as this may be digitised directly from service plans provided. Information shown as sit plan information may duplicate traced routes but may be offset due to the inaccuracy of the service records from which the information has been digitised.

Warning

Water & Gas utilities marking out properties are generally of a size that cannot be detected by Radio detection or GPR. The route of these is shown from surface evidence such as gas deep valves. This data should be viewed as a guide only and safe digging techniques should be used at all times.

Reserve Information: A location shown by reserve is approximate and indicates. Safe digging depths marked with an 'X' have been detected using an indirect method and therefore should be regarded as less reliable than a direct traced utility.

Quality Levels (PAS128)

Quality Level	Horizontal Accuracy	Vertical Accuracy	Detection Clarification
Desktop Records Search	D	N/A	N/A
Site Reconnaissance	C	N/A	N/A
Detection	B4	Undefined	Undefined
Detection	B3	+/- 500mm	Undefined depth
Detection	B2	+/- 250mm	Detected Depth
Detection	B1	+/- 150mm	+/- 10% Detected Depth
Verification	A	+/- 50mm	+/- 25mm

Sub Surface Key

0.00m	CATV Cable
0.00m	CCTV Cable
0.00m	Comms Cable
0.00m	Duct
0.00m	Earthing Rod
0.00m	Electric Cable
0.00m	Electric HV Cable
0.00m	Electric LV Cable
0.00m	Fibre Optic
0.00m	Gas Pipe
0.00m	Gas Pipe
0.00m	GPR Anomaly
0.00m	GPR Linear
0.00m	Heating Pipe
0.00m	Rising Main
0.00m	Surface Sewer
0.00m	Foul Sewer
0.00m	Combined Sewer
0.00m	Trade Effluent
0.00m	Traffic Signal Cable
0.00m	Unidentified
0.00m	Water Main
0.00m	Vent Pipe
0.00m	Fuel Pipe
0.00m	Oil Pipe Line
0.00m	Survey Extents
0.00m	Assume Route
0.00m	Taken From Records

Copyright

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Topographic & Utility Key

AV	Air Valve	TL	Traffic Light
BH	Boxhole	TP	Tenograph
BN	Bus Stop	Pole	
CRSM	Cruciform		
BO	Bollard		
MAIL	Mailbox		
BUS	Bus Stop	V	Vent
CCTV	Camera	WL	Water Level
Col	Column	WM	Water Meter
G	Gully	WO	Waste Out
EL	Electric	WV	Water Valve
PLANT	Plant	1.000	Depth (m)
EP	Electric Pole	UTR	Unable to Raise
ER	Earth Road	UTR	Unable to Raise
FF	Fire Hydrant	UTR	Unable to Raise
FPL	Flag Pole	ECOT	End of Trace
FV	Flag Valve	(S)	Sonded
GV	Gate Valve	SIA	Survey
(I)	Induced	AB	Assumed
IL	Invert Level	Route	Route
QL	Flow Light	TFR	Taken from Records
LP	Lamp Post	UTR	Unable to Raise
MH	Manhole	UTS	Unable to Raise
MR	Marker	UTR	Unable to Raise
RE	Road	UTR	Unable to Raise
Eye	Eye	UTR	Unable to Raise
RWAP	Road Water	MAR	Main Access
SC	Stop	CL	Cover Level
SP	Sign	IL	Invert Level
SV	Stop Valve	LUS	Underneath/Soft
SVP	Stop Valve	DOC	Depth of Cover
Pipe	Pipe	DOC	Depth of Cover
TAP	Tap	PT	Pour Trace
TOP	Top	NOP	No Visible Pipe
Fence	Fence	ED	Electric Duct
TOW	Top of Wall	BL	Blocked with
TEL	Telecom	CR	Cable-Related
		CR	Cable-Related
		CR	Cable-Related

General

This survey has been carried out in accordance with RICS accuracy band E, as described in RICS guidance notes Buildings and Utilities (3rd Ed.)

Drawing units are metres, quoted units are metres.

Grid ticks should be used to check for plotting distortions.

Details or services hidden or obscured by vegetation, debris or vehicles at survey dates may be omitted. Hedge & Vegetation details are outline.

Any assumed details are shown in DASHDOT line style.

All arrows point up unless otherwise stated.

Control & Datum Information

All levels shown in this drawing are related to Ordnance Survey datum by means of a single vertical datum. All levels are related to Ordnance Survey datum by means of a single vertical datum. All levels are related to Ordnance Survey datum by means of a single vertical datum.

The grid shown on this survey is based on Ordnance Survey datum. All levels are related to Ordnance Survey datum by means of a single vertical datum. All levels are related to Ordnance Survey datum by means of a single vertical datum.

All other details are related to this to show position and Grid North coordinate is from 10 (i.e. one point less than the grid North coordinate).

Layout

Sheet 1	Sheet 2
Sheet 3	Sheet 4

North Arrow

Direction of North

THE SURVEY ASSOCIATION

FULL MEMBER

SUBSCAN UK Ltd

www.subscan.co.uk Tel: 0204-4099 9280

Client

Stericycle

Site

Pennine House, Bradman Road
Liverpool
L33 7YX

DRAWING TITLE

Topographical & Underground Utilities Survey
Drainage Survey

DRAWING REF

GR25647-30T-AU-DR-Knowlesy

SCALE

1/100

PROJECT

GR25647

DATE

2 of 4

REV

A

SURVEYED

SR, MA, NP

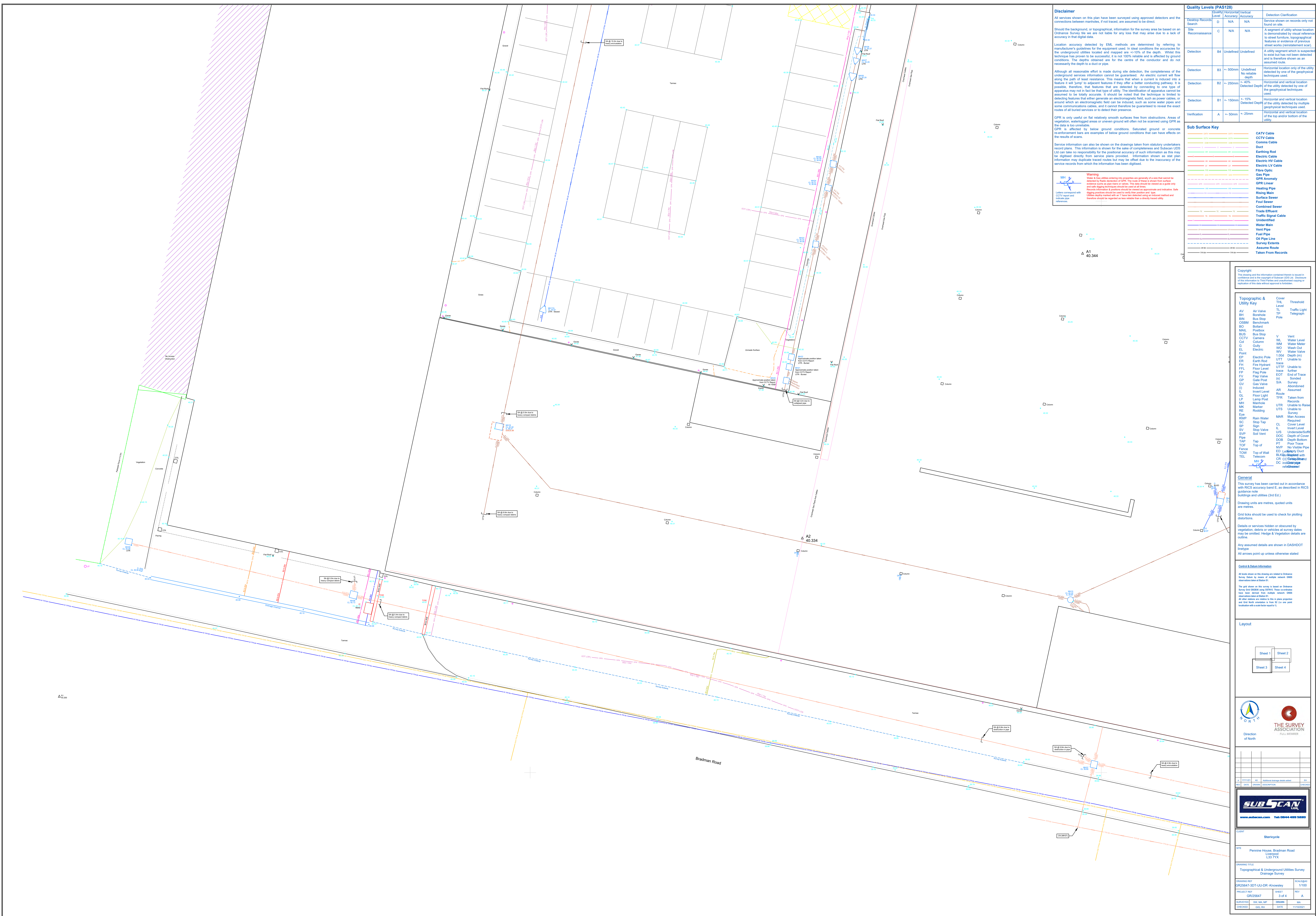
DRAWN

MA

CHECKED

GR, BR, DATE

11/05/2011



APPENDIX B

United Utilities Asset Map



Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
7201	39.41	FO	37.11	150			VC	5.482655	1 in 30
7201	39.41	FO	36.92	225			VC	75.29861	1 in 184
5504		FO	0	225			VC	66.48816	
6005		SW	0	675			CO	38.83298	
5201	39.81	SW	36.87	600			CO	89.82204	1 in 998
6202	39.85	FO	36.05	225			VC	91.23416	1 in 74
6009		FO	0	225			VC	46.29207	
8302	39.66	FO	37.24	225			VC	42.73785	1 in 151
5203	39.52	SW	36.71	600			CO	77.46612	1 in 456
6001	40.14	SW	37.23	525			CO	84.40379	1 in 234
5003	39.48	FO	34.55	225			CO	18.43909	
5002	39.66	FO	34.59	225			VC	78.26238	1 in 301
5401	38.42	SW	35.62	900			VC	15.13275	1 in 378
7005	40.19	SW	37.99	525			CO	63.8259	1 in 266
5001	39.27	SW	35.16	1050			CO	9.433981	
4505		FO	0	225			VC	36.22005	1 in 398
7002	40.64	SW	37.89	675			VC	96.5396	
7102	39.75	FO	36.62	225			VC	27.34521	
8203	39.82	FO	36.95	225			VC	8.062258	1 in 269
6003	39.68	FO	35.68	225			VC	94.92102	
7001	40.42	SW	37.9	675			VC	71.80529	1 in 232
6002	39.66	FO	36.03	300			VC	12.5903	
4506	38.37	FO	35.12	225			VC	101.214	1 in 30
5202	39.5	FO	34.79	225			VC	12.55601	1 in 628
4402	38.31	FO	36.05	225			VC	91.48816	1 in 158
6006	39.91	FO	36.63	375			VC	64.33681	1 in 82
6804		SW	0	600			VC	141.6142	1 in 141
7103	39.65	SW	0	525			CO	72.86465	
6203	40.12	FO	0	225			VC	91.9837	
6007	39.81	SW	36.36	450			CO	8.062258	
5903	39.46	SW	35.45	900			CO	73.44706	1 in 253
7101	39.57	SW	37.7	375			VC	65.90653	1 in 187
8301	39.57	SW	36.91	600			CO	95.90099	
7301	38.24	FO	36.47	225			VC	168.8408	1 in 208
5301	39.45	FO	35.66	225			VC	30.95066	
6903		FO	0	225			VC	53.35099	
4002	39.15	FO	34.29	225			VC	27.65863	1 in 213
7901		SW	0	675			CO	95.59673	
5902	39.52	FO	35.39	450			VC	87.89785	1 in 109
4502	38.48	SW	35.38	1000			CO	34.52335	
7006	40.45	SW	38.02	225			VC	95.07891	
6004	66.72	FO	35.02	225			VC	31.04835	1 in 72
8401		SW	0	675			CO	86.12201	
5503		FO	0	225			VC	30.1297	
7401	39.32	SW	36.24	750			CO	92.96236	1 in 443
8201		SW	0	600			CO	55.54278	
7003	40.42	SW	0	525			CO	95.0789	
6008		SW	0	675			CO	17.14565	
6401	38.63	SW	35.95	750			CO	132.2195	1 in 427
5004	39.24	SW	35.95	225			VC	88.45903	
6002	39.66	FO	35.88	300			VC	13.60147	1 in 68
5001	39.27	SW	35.16	1050			CO	91.0631	1 in 285
7004		FO	0	300			VC	100.6628	
4008		FO	0	300			VC	10.42219	
6011		SW	0	150			VC	7.419901	

Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
7201	39.41	FO	37.11	150			VC	5.482655	1 in 30
7201	39.41	FO	36.92	225			VC	75.29861	1 in 184
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6003	39.68	FO	35.68	225			VC	94.92102	
7001	40.42	SW	37.9	675			VC	71.80529	1 in 232
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5202	39.5	FO	34.79	225			VC	12.55601	1 in 628
4402	38.31	FO	36.05	225			VC	91.48816	1 in 158
6006	39.91	FO	36.63	375			VC	64.33681	1 in 82
6804		SW	0	600			VC	141.6142	1 in 141
7103	39.65	SW	0	525			CO	72.86465	
6203	40.12	FO	0	225			VC	91.9837	
6007	39.81	SW	36.36	450			CO	8.062258	
5903	39.46	SW	35.45	900			CO	73.44706	1 in 253
7101	39.57	SW	37.7	375			VC	65.90653	1 in 187
8301	39.57	SW	36.91	600			CO	95.90099	
7301	38.24	FO	36.47	225			VC	168.8408	1 in 208
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7901		SW	0	675			CO	95.59673	
5902	39.52	FO	35.39	450			VC	87.89785	1 in 109
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6004	66.72	FO	35.02	225			VC	31.04835	1 in 72
8401		SW	0	675			CO	86.12201	
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7401	39.32	SW	36.24	750			CO	92.96236	1 in 443
8201		SW	0	600			CO	55.54278	
7003	40.42	SW	0	525			CO	95.0789	
6008		SW	0	675			CO	17.14565	
6401	38.63	SW	35.95	750			CO	132.2195	1 in 427
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6002	39.66	FO	35.88	300			VC	13.60147	1 in 68
5001	39.27	SW	35.16	1050			CO	91.0631	1 in 285
7004		FO	0	300			VC	100.6628	
4008		FO	0	300			VC	10.42219	
6011		SW	0	150			VC	7.419901	

LEGEND

Abandoned

Foul

Surface Water

Combined

Public Sewer

Private Sewer

Section 104

Rising Main

Sludge Main

Overflow

Water Course

Highway Drain

All point assets follow the standard colour convention:

red - combined

blue - surface water

brown - foul

purple - overflow

Manhole

Head of System

Extent of Survey

Rodding Eye

Inlet

Discharge Point

Vortex

Penstock

Washout Chamber

Valve

Air Valve

Non Return Valve

Soakaway

Cascade

Flow Meter

Hatch Box

Oil Interceptor

Summit

Drop Shaft

Orifice Plate

Side Entry Manhole

Outfall

Screen Chamber

Inspection Chamber

Bifurcation Chamber

Lamp Hole

T Junction / Saddle

Catchpit

Valve Chamber

Vent Column

Vortex Chamber

Penstock Chamber

Network Storage Tank

Sewer Overflow

Ww Treatment Works

Ww Pumping Station

Septic Tank

Control Kiosk

Change of Characteristic

MANHOLE FUNCTION

FO Foul

SW Surface Water

CO Combined

OV Overflow

SEWER SHAPE

CI Circular

EG Egg

OV Oval

FT Flat Top

RE Rectangular

SQ Square

TR Trapezoidal

AR Arch

BA Barrel

HO HorseShoe

UN Unspecified

SEWER MATERIAL

AC Asbestos Cement

BR Brick

PE Polyethylene

RP Reinforced Plastic Matrix

CO Concrete

CSB Concrete Segment Bolted

CSU Concrete Segment Unbolted

CC Concrete Box Culvert

PSC Plastic / Steel Composite

GRC Glass Reinforced Plastic

DI Ductile Iron

PVC Polyvinyl Chloride

CI Cast Iron

SI Spun Iron

ST Steel

VC Vitrified Clay

PP Polypropylene

PF Pitch Fibre

MAC Masonry, Coursed

MAR Masonry, Random

U Unspecified

Address or Site Reference:

S R C L LTD BRADMAN ROAD,
KNOWSLEY INDUSTRIAL PARK,
LIVERPOOL,
L33 7UR

Scale: 1:1250

Nodes: 57

Sheet: 1 of 1

Date: 08/02/2022

Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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SEWER RECORDS

United Utilities

Water for the North West

APPENDIX C

Proposed Levels

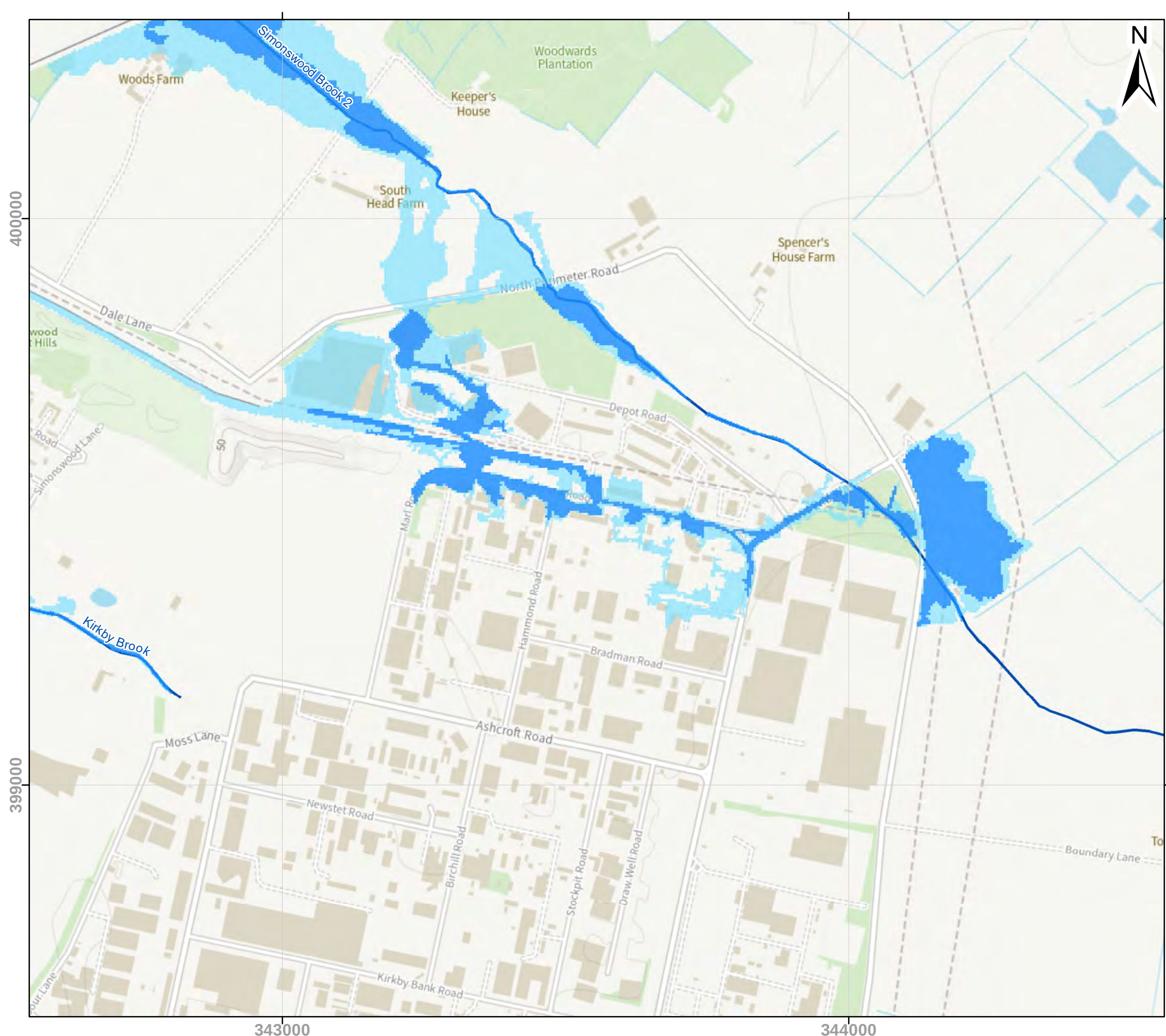


- Notes:
- Drawing Produced against site layout by Waingap Architectural Consultants
 - Topographical survey reference by Subscan.
 - Paths indicated as the Primary Access are to have level access thresholds and approach paths, ramped or stepped in accordance with Part M of the Building Regulations.
 - Communal paths and paths from parking areas / highway to front door.
 - Communal paths and paths to the front door shall be constructed from concrete paving slabs. A 1200mm wide x 1200mm long landing is to be provided adjacent all front doors. The minimum path width is to be 900mm or 1200mm as indicated on drawing.
 - Where ramps are indicated on the drawings these shall have a maximum gradient of 1 in 12 for ramps up to 5m long and 1 in 15 for ramps up to 10m long. Intermediate landings shall be a minimum length of 1.2m.
 - All flights of two or more steps to the primary level access, are to be provided with metal hand railings.
 - Private footpaths to side and rear of plots.
 - Paths formed from paving slabs are to be precast concrete slabs. Minimum path width to be 600mm but 900mm where utilised for bin access/egress.
 - All levels are for information purposes only and subject to change during planning & detailed design.

CD	FIRST ISSUE	WW	29.07.22
REV	DESCRIPTION	BY	DATE
STATUS FOR PLANNING			
CLIENT SRCL Ltd			
SITE SRCL, KNOWSLEY, MERSEYSIDE			
TITLE SITE LEVELS			

APPENDIX D

Environment Agency Flood Data



Flood Zone Map: Knowsley Industrial Park, Liverpool, L33 7UR

Produced: 05/04/2022
Our Ref: CL250548
NGR: SJ4373799248

Key

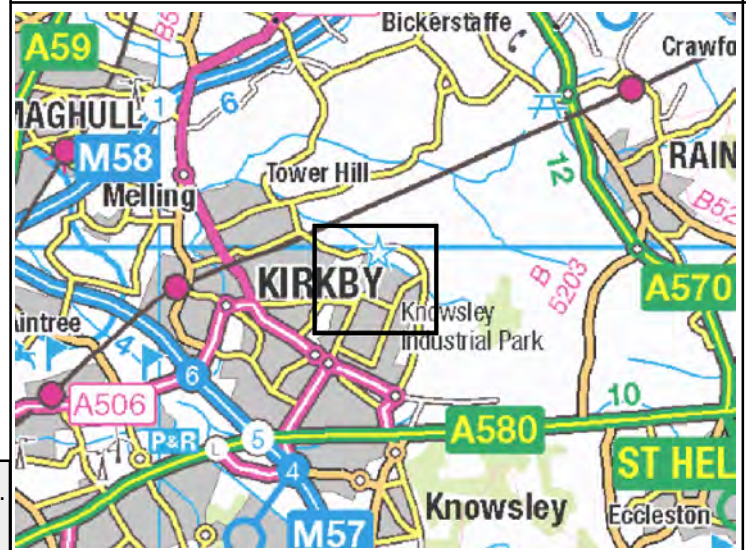
- Areas Benefitting From Defences
- Flood Zone 3
- Flood Zone 2
- Main River

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

ABD (Areas Benefitting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1% fluvial flood event.



Modelled Data and Flow Map: Knowsley Industrial Park, Liverpool, L33 7UR

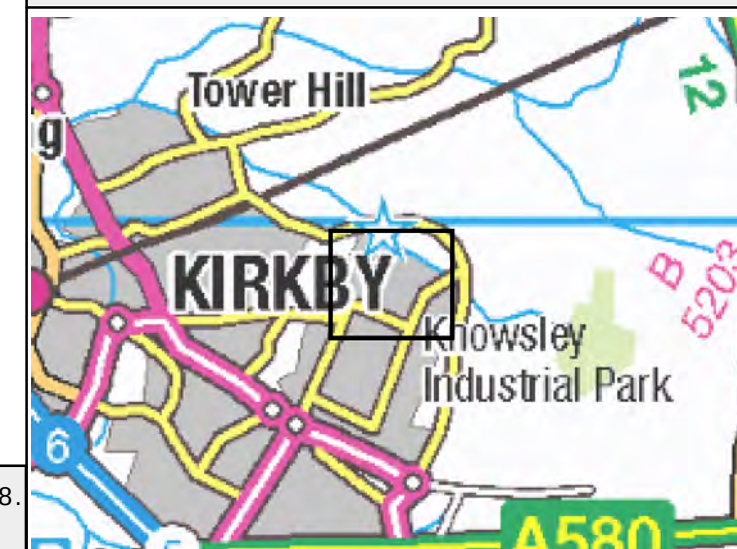
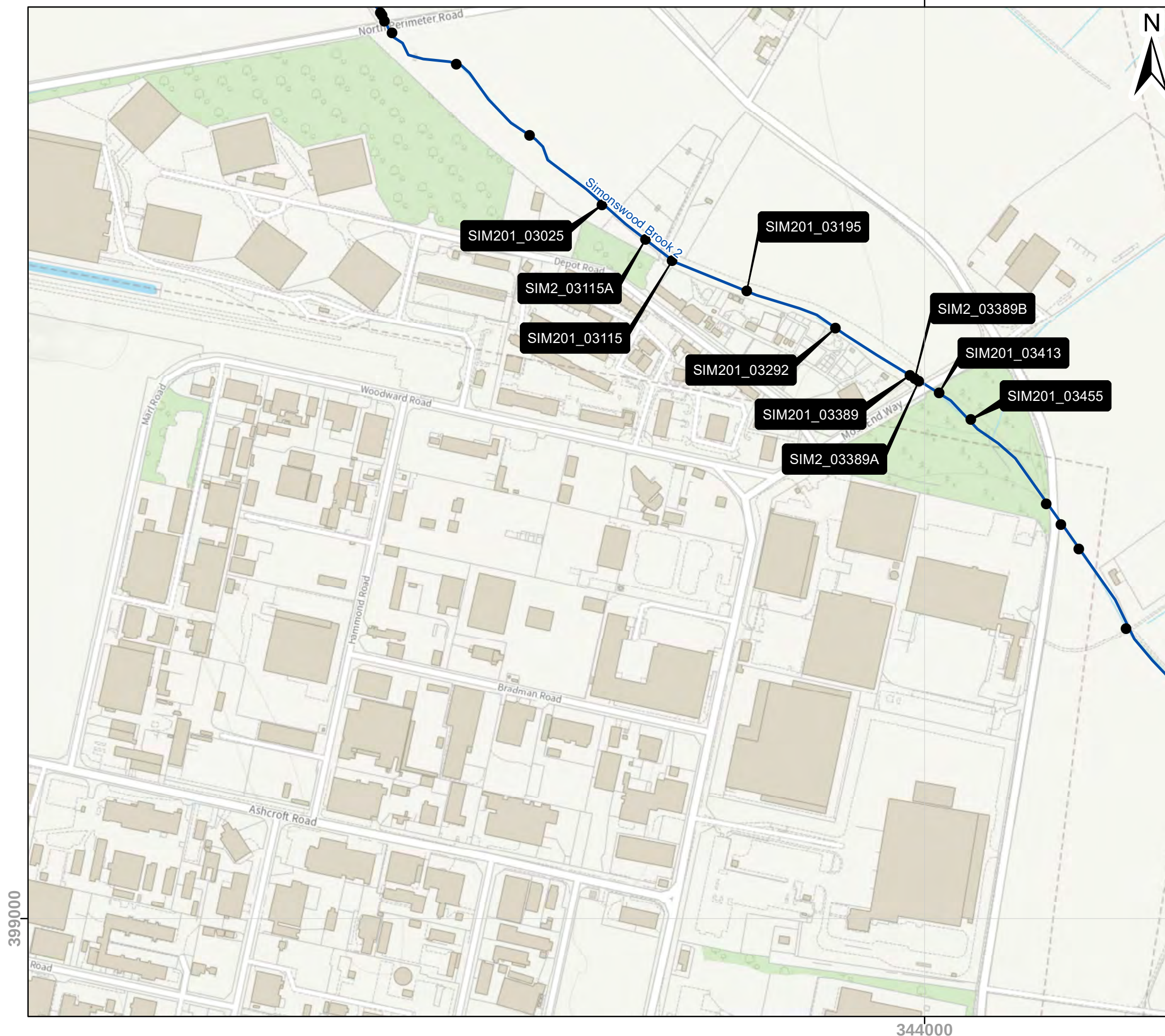
Produced: 05/04/2022

Our Ref: CL250548

NGR: SJ4373799248

Key

- Node Points
- ~ Main River



Node Point ID	Defended / Undefended / Climate Change	Annual Exceedence Probability (%)	Water Level (mAOD)	Flow (cumecs)
SIM201_03455	Kirkby2017_ND	0.10%	40.75	3.23
SIM201_03455	Kirkby2017_ND_30%CC	0.10%	40.78	4.30
SIM201_03455	Kirkby2017_ND	0.50%	40.67	1.81
SIM201_03455	Kirkby2017_ND_35%CC	1.00%	40.71	2.42
SIM201_03455	Kirkby2017_ND	1.00%	40.60	1.39
SIM201_03455	Kirkby2017_ND_30%CC	1.00%	40.70	2.26
SIM201_03455	Kirkby2017_ND_70%CC	1.00%	40.75	3.30
SIM201_03455	Kirkby2017_ND	1.30%	40.59	1.35
SIM201_03455	Kirkby2017_ND	2.00%	40.57	1.29
SIM201_03455	Kirkby2017_ND	3.33%	40.52	1.22
SIM201_03455	Kirkby2017_ND	4.00%	40.48	1.20
SIM201_03455	Kirkby2017_ND	5.00%	40.38	1.16
SIM201_03455	Kirkby2017_ND	10.00%	40.17	1.10
SIM201_03455	Kirkby2017_ND	20.00%	39.87	1.01
SIM201_03455	Kirkby2017_ND	50.00%	39.09	0.72
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SIM201_03413	Kirkby2017_ND_30%CC	0.10%	40.79	1.29
SIM201_03413	Kirkby2017_ND	0.50%	40.67	1.26
SIM201_03413	Kirkby2017_ND_35%CC	1.00%	40.71	1.27
SIM201_03413	Kirkby2017_ND	1.00%	40.60	1.25
SIM201_03413	Kirkby2017_ND_30%CC	1.00%	40.70	1.27
SIM201_03413	Kirkby2017_ND_70%CC	1.00%	40.75	1.28
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SIM201_03413	Kirkby2017_ND	4.00%	40.48	1.21
SIM201_03413	Kirkby2017_ND	5.00%	40.38	1.18
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SIM201_03413	Kirkby2017_ND	20.00%	39.87	1.03
SIM201_03413	Kirkby2017_ND	50.00%	39.08	0.73
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SIM201_03389	Kirkby2017_ND_30%CC	1.00%	37.62	1.27
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SIM201_03292	Kirkby2017_ND_35%CC	1.00%	37.38	1.38
SIM201_03292	Kirkby2017_ND	1.00%	37.33	1.32
SIM201_03292	Kirkby2017_ND_30%CC	1.00%	37.37	1.37
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SIM201_03292	Kirkby2017_ND	1.30%	37.33	1.31
SIM201_03292	Kirkby2017_ND	2.00%	37.32	1.30
SIM201_03292	Kirkby2017_ND	3.33%	37.31	1.28
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SIM201_03292	Kirkby2017_ND	5.00%	37.29	1.24
SIM201_03292	Kirkby2017_ND	10.00%	37.27	1.17
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SIM201_03292	Kirkby2017_ND	50.00%	37.16	0.77
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SIM201_03195	Kirkby2017_ND_30%CC	1.00%	37.18	1.47
SIM201_03195	Kirkby2017_ND_70%CC	1.00%	37.39	1.57
SIM201_03195	Kirkby2017_ND	1.30%	37.11	1.39
SIM201_03195	Kirkby2017_ND	2.00%	37.09	1.37
SIM201_03195	Kirkby2017_ND	3.33%	37.06	1.34
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SIM201_03115	Kirkby2017_ND_30%CC	0.10%	37.77	1.91
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SIM201_03115	Kirkby2017_ND	20.00%	36.77	1.16
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SIM201_03025	Kirkby2017_ND	10.00%	35.43	1.29
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SIM2_03389B	Kirkby2017_ND_30%CC	0.10%	38.47	1.29
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SIM2_03389B	Kirkby2017_ND_35%CC	1.00%	38.47	1.27
SIM2_03389B	Kirkby2017_ND	1.00%	38.46	1.25
SIM2_03389B	Kirkby2017_ND_30%CC	1.00%	38.47	1.27
SIM2_03389B	Kirkby2017_ND_70%CC	1.00%	38.47	1.28
SIM2_03389B	Kirkby2017_ND	1.30%	38.46	1.24
SIM2_03389B	Kirkby2017_ND	2.00%	38.46	1.24
SIM2_03389B	Kirkby2017_ND	3.33%	38.46	1.22
SIM2_03389B	Kirkby2017_ND	4.00%	38.45	1.21
SIM2_03389B	Kirkby2017_ND	5.00%	38.45	1.18
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SIM2_03389B	Kirkby2017_ND	50.00%	38.33	0.73
SIM2_03389A	Kirkby2017_ND	0.10%	38.48	1.28
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SIM2_03389A	Kirkby2017_ND	1.00%	38.47	1.25
SIM2_03389A	Kirkby2017_ND_30%CC	1.00%	38.48	1.27
SIM2_03389A	Kirkby2017_ND_70%CC	1.00%	38.48	1.28
SIM2_03389A	Kirkby2017_ND	1.30%	38.47	1.24
SIM2_03389A	Kirkby2017_ND	2.00%	38.47	1.24
SIM2_03389A	Kirkby2017_ND	3.33%	38.47	1.22
SIM2_03389A	Kirkby2017_ND	4.00%	38.46	1.21
SIM2_03389A	Kirkby2017_ND	5.00%	38.46	1.18
SIM2_03389A	Kirkby2017_ND	10.00%	38.44	1.12
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SIM2_03389A	Kirkby2017_ND	50.00%	38.34	0.73
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SIM2_03115A	Kirkby2017_ND_35%CC	1.00%	36.04	1.58
SIM2_03115A	Kirkby2017_ND	1.00%	35.97	1.48
SIM2_03115A	Kirkby2017_ND_30%CC	1.00%	36.04	1.57
SIM2_03115A	Kirkby2017_ND_70%CC	1.00%	36.07	1.69
SIM2_03115A	Kirkby2017_ND	1.30%	35.96	1.46
SIM2_03115A	Kirkby2017_ND	2.00%	35.95	1.43
SIM2_03115A	Kirkby2017_ND	3.33%	35.94	1.39
SIM2_03115A	Kirkby2017_ND	4.00%	35.93	1.37
SIM2_03115A	Kirkby2017_ND	5.00%	35.93	1.34
SIM2_03115A	Kirkby2017_ND	10.00%	35.91	1.27
SIM2_03115A	Kirkby2017_ND	20.00%	35.89	1.16
SIM2_03115A	Kirkby2017_ND	50.00%	35.81	0.84

Fluvial Flood Level Map: Knowsley Industrial Park, Liverpool, L33 7UR

Produced: 05/04/2022

Our Ref: CL250548

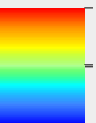
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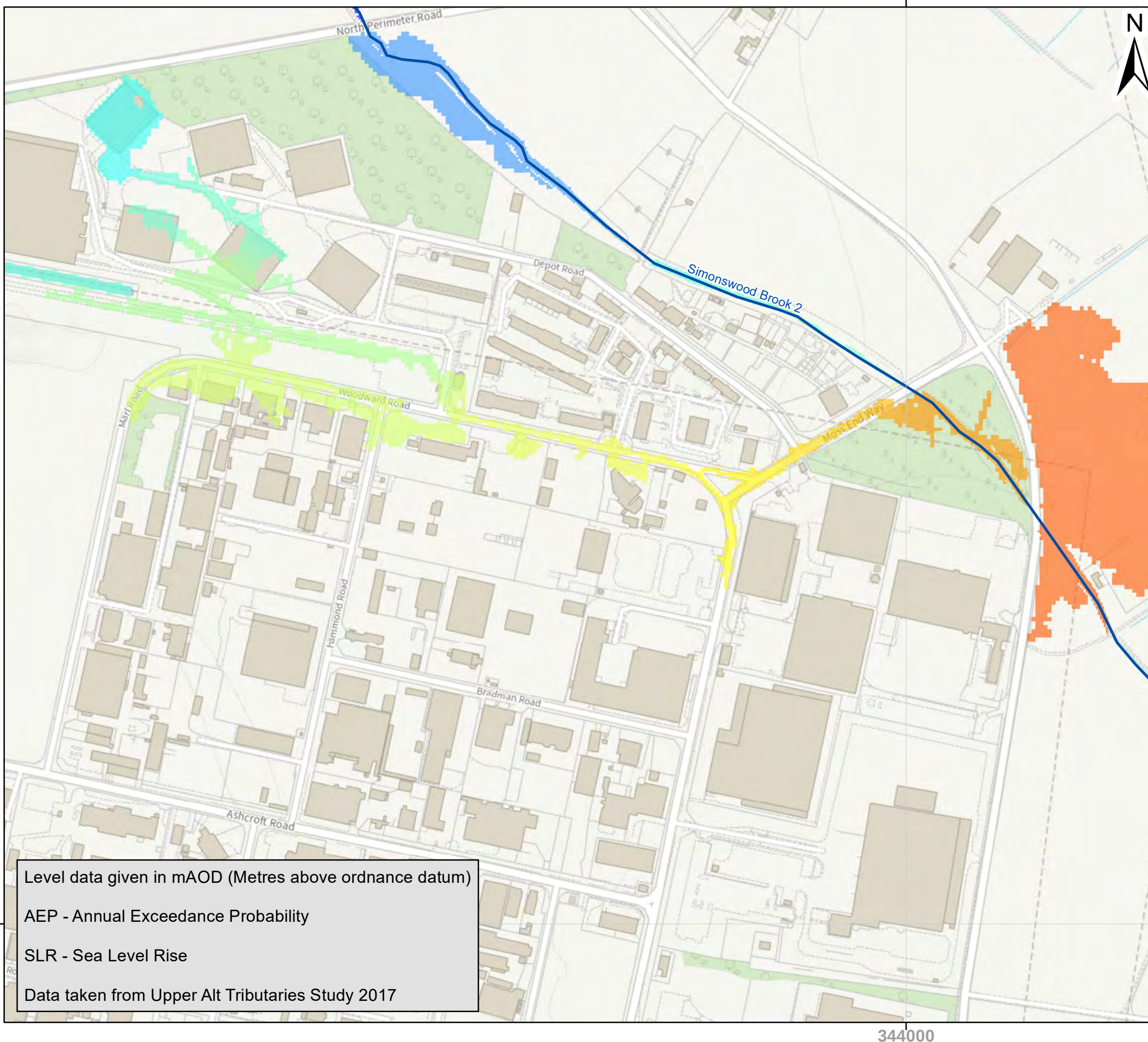
Key

 Main River

**Fluvial 1% Annual Exceedance
Probability Undefended Scenario**

mAOD

 High : 42
Low : 34

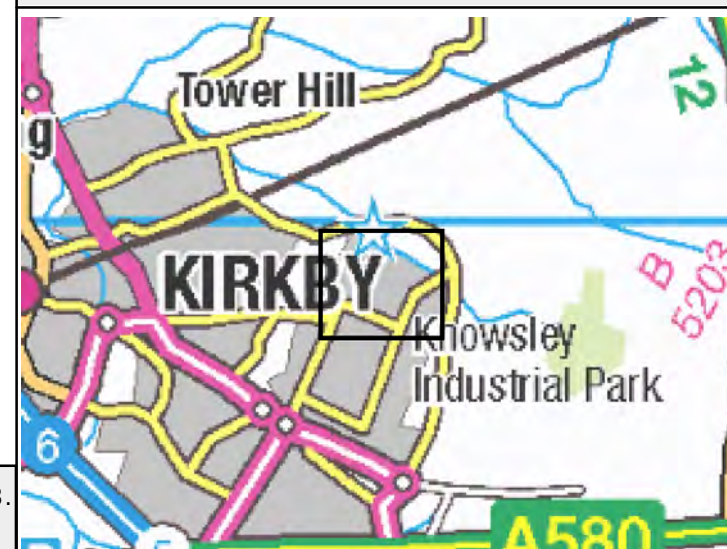


Level data given in mAOD (Metres above ordnance datum)

AEP - Annual Exceedance Probability

SLR - Sea Level Rise

Data taken from Upper Alt Tributaries Study 2017



Fluvial Flood Level Map: Knowsley Industrial Park, Liverpool, L33 7UR

Produced: 05/04/2022

Our Ref: CL250548

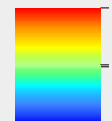
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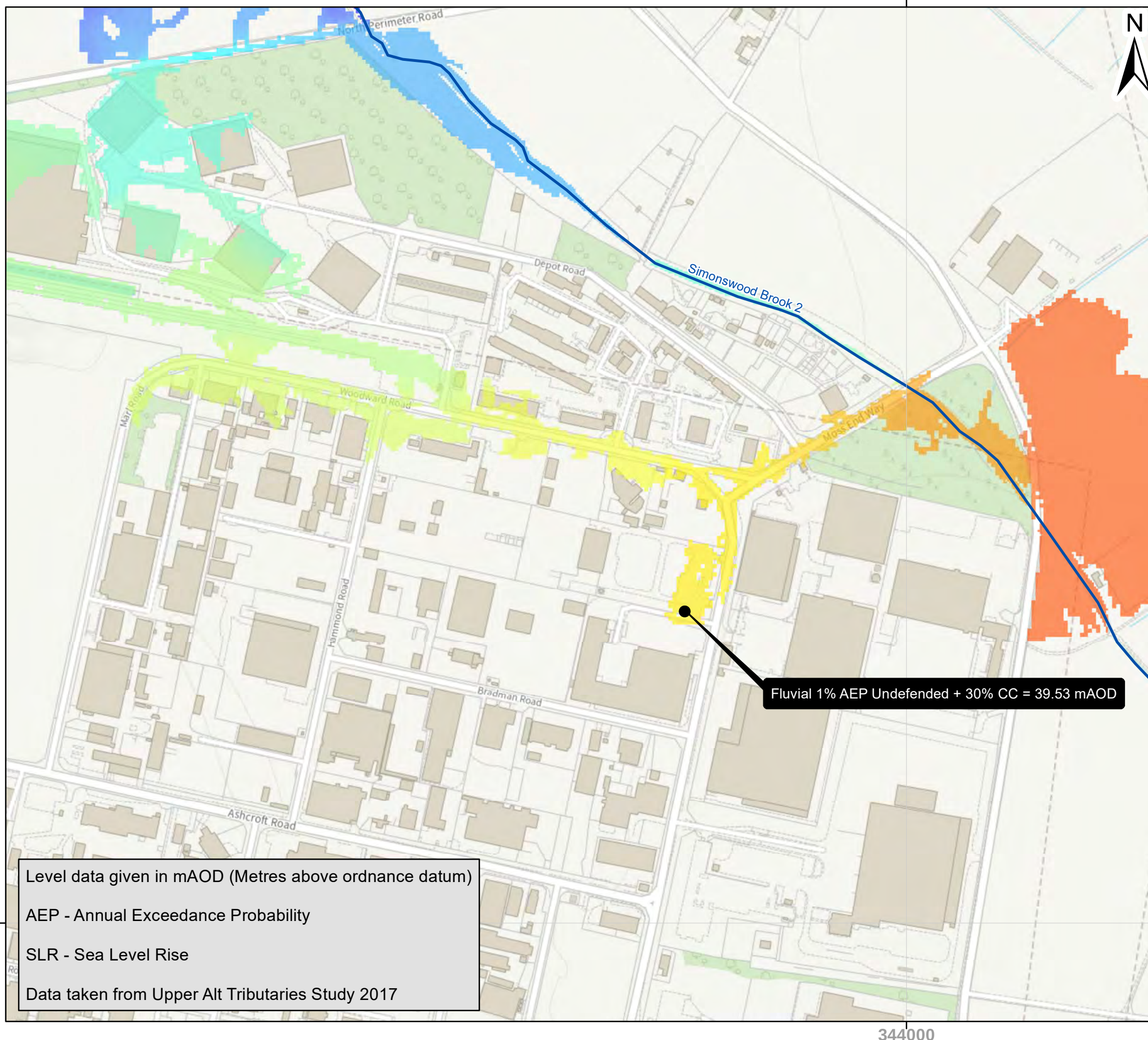
Key

 Main River

**Fluvial 1% + Climate Change (30%)
Annual Exceedance Probability
Undefended Scenario**

mAOD

 High : 42
Low : 34

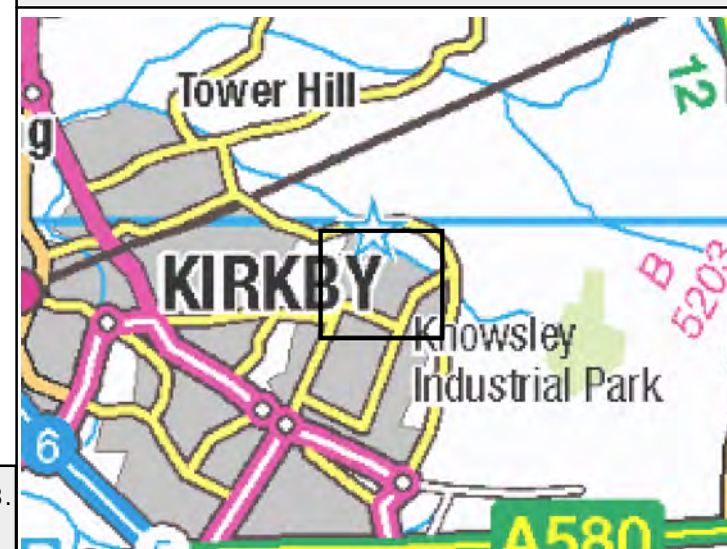


Level data given in mAOD (Metres above ordnance datum)

AEP - Annual Exceedance Probability

SLR - Sea Level Rise

Data taken from Upper Alt Tributaries Study 2017



Fluvial Flood Level Map: Knowsley Industrial Park, Liverpool, L33 7UR

Produced: 05/04/2022

Our Ref: CL250548

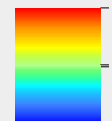
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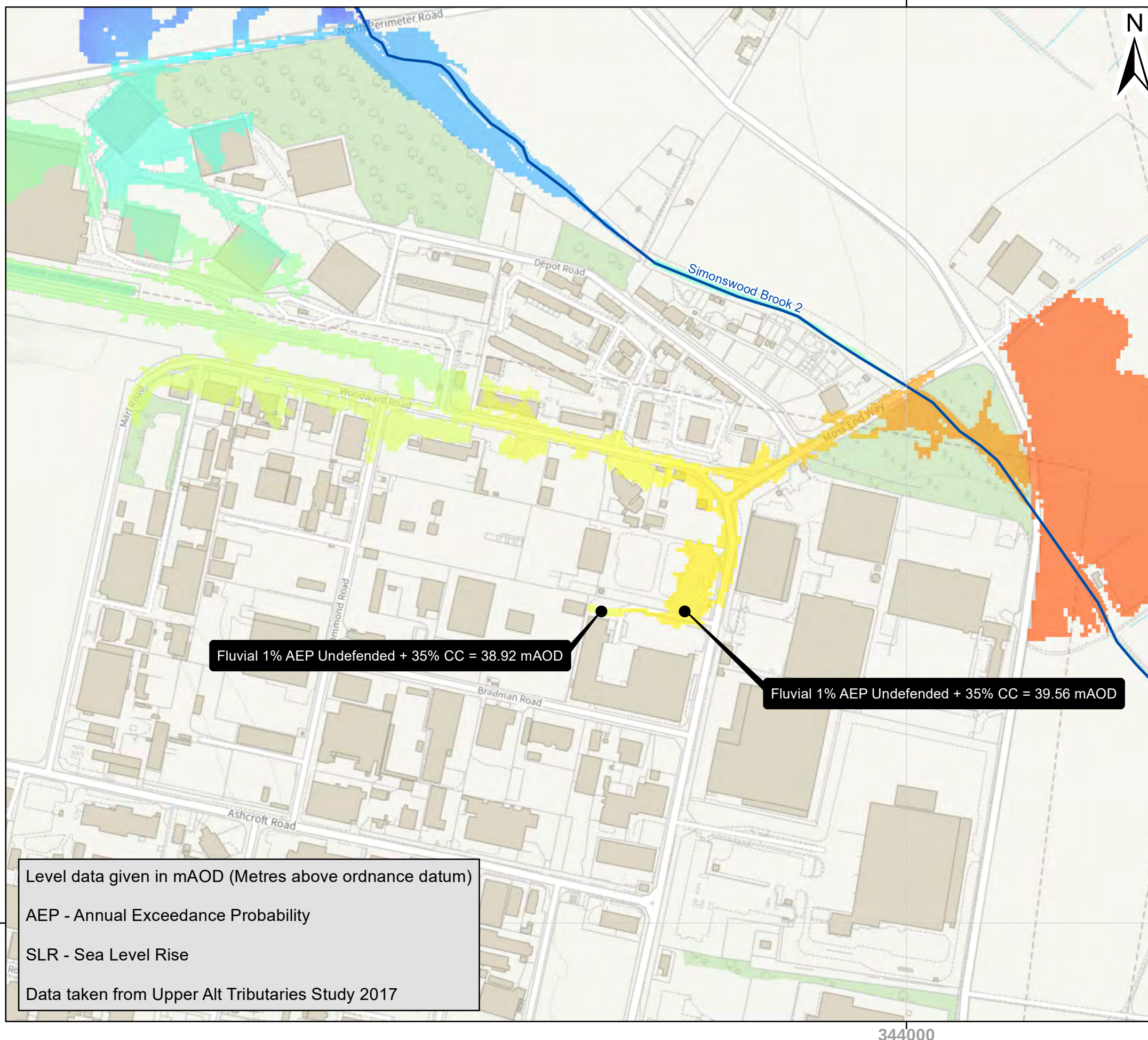
Key

 Main River

**Fluvial 1% + Climate Change (35%)
Annual Exceedance Probability
Undefended Scenario**

mAOD

 High : 42
Low : 34

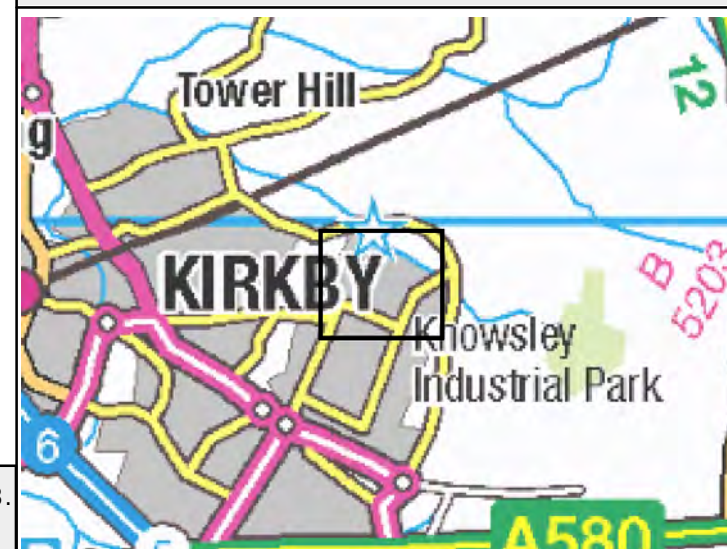


Level data given in mAOD (Metres above ordnance datum)

AEP - Annual Exceedance Probability

SLR - Sea Level Rise

Data taken from Upper Alt Tributaries Study 2017



Fluvial Flood Level Map: Knowsley Industrial Park, Liverpool, L33 7UR

Produced: 05/04/2022

Our Ref: CL250548

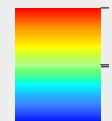
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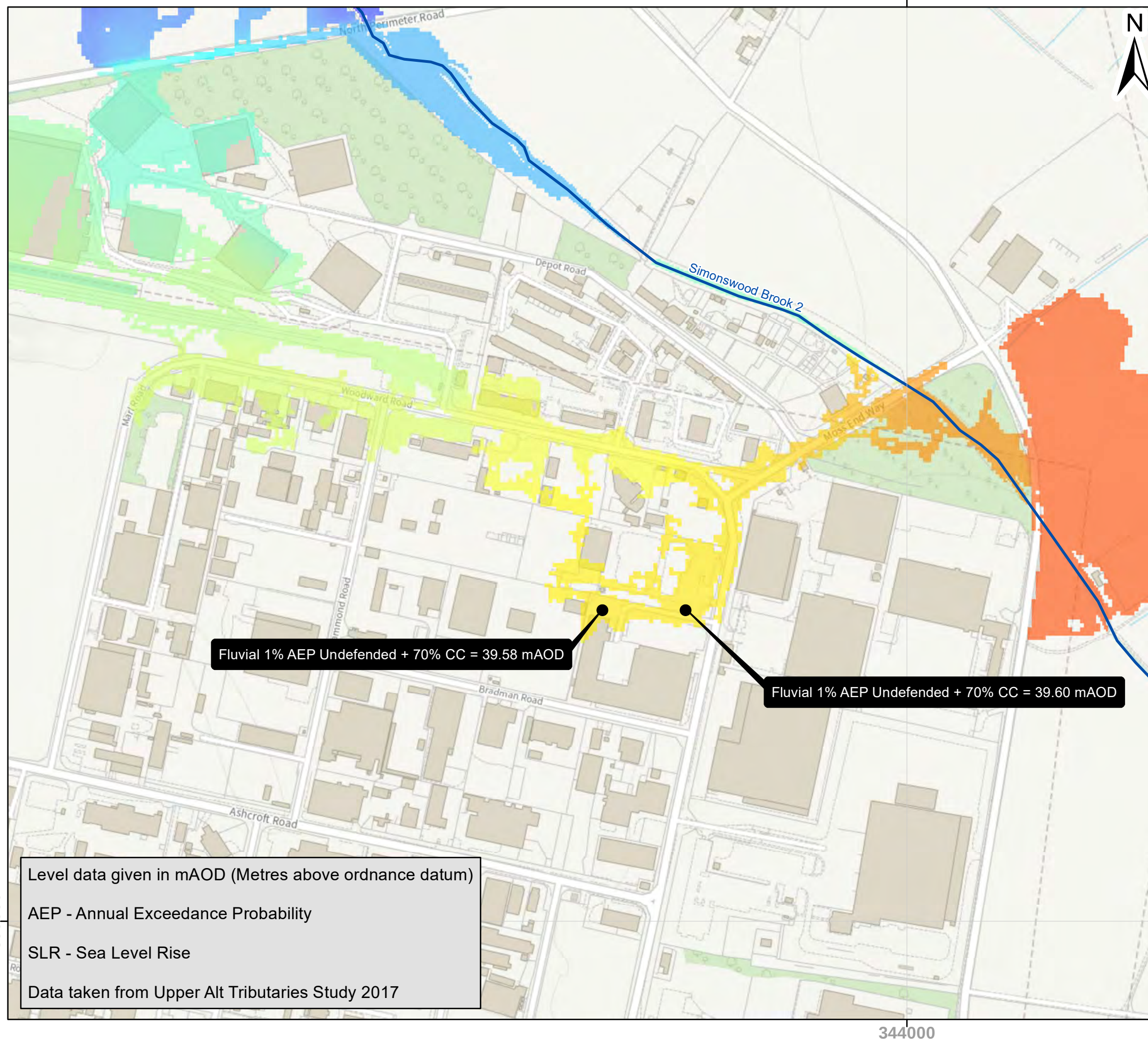
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 Main River

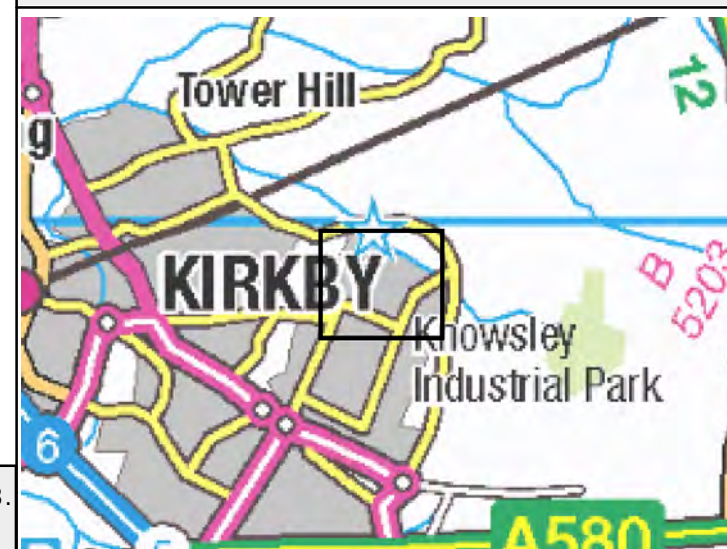
**Fluvial 1% + Climate Change (70%)
Annual Exceedance Probability
Undefended Scenario**

mAOD

 High : 42
Low : 34



Level data given in mAOD (Metres above ordnance datum)
AEP - Annual Exceedance Probability
SLR - Sea Level Rise
Data taken from Upper Alt Tributaries Study 2017



Fluvial Flood Level Map: Knowsley Industrial Park, Liverpool, L33 7UR

Produced: 05/04/2022

Our Ref: CL250548

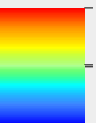
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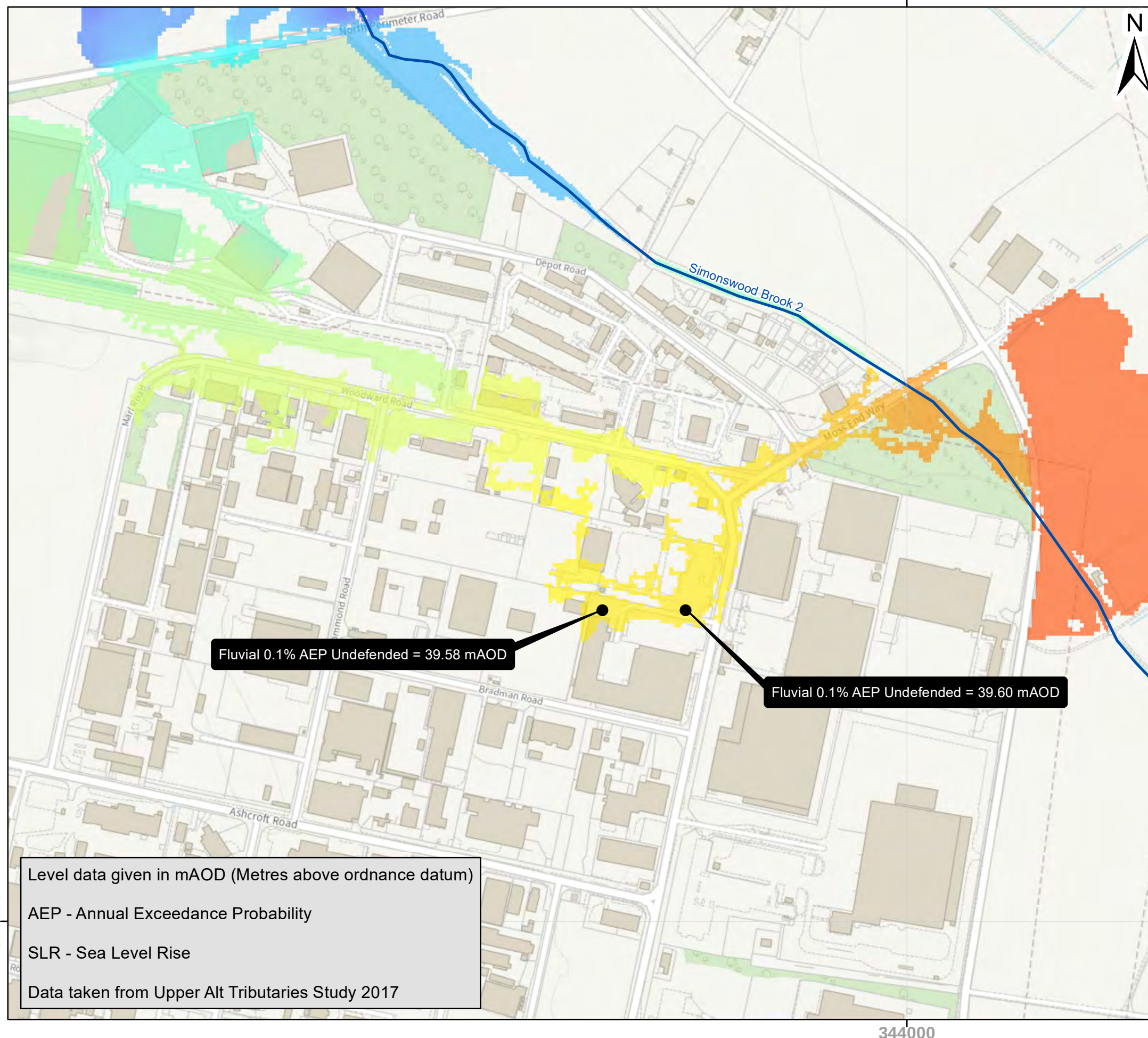
Key

 Main River

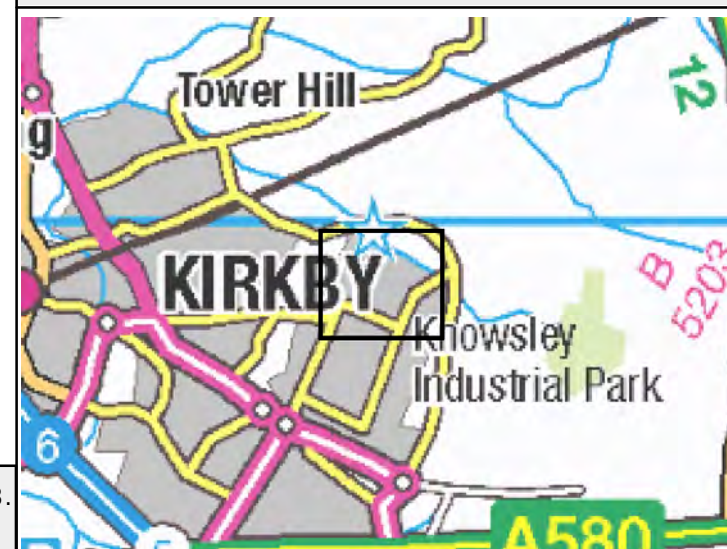
**Fluvial 0.1% Annual Exceedance
Probability Undefended Scenario**

mAOD

 High : 42
Low : 34



Level data given in mAOD (Metres above ordnance datum)
AEP - Annual Exceedance Probability
SLR - Sea Level Rise
Data taken from Upper Alt Tributaries Study 2017



Fluvial Flood Level Map: Knowsley Industrial Park, Liverpool, L33 7UR

Produced: 05/04/2022

Our Ref: CL250548

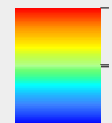
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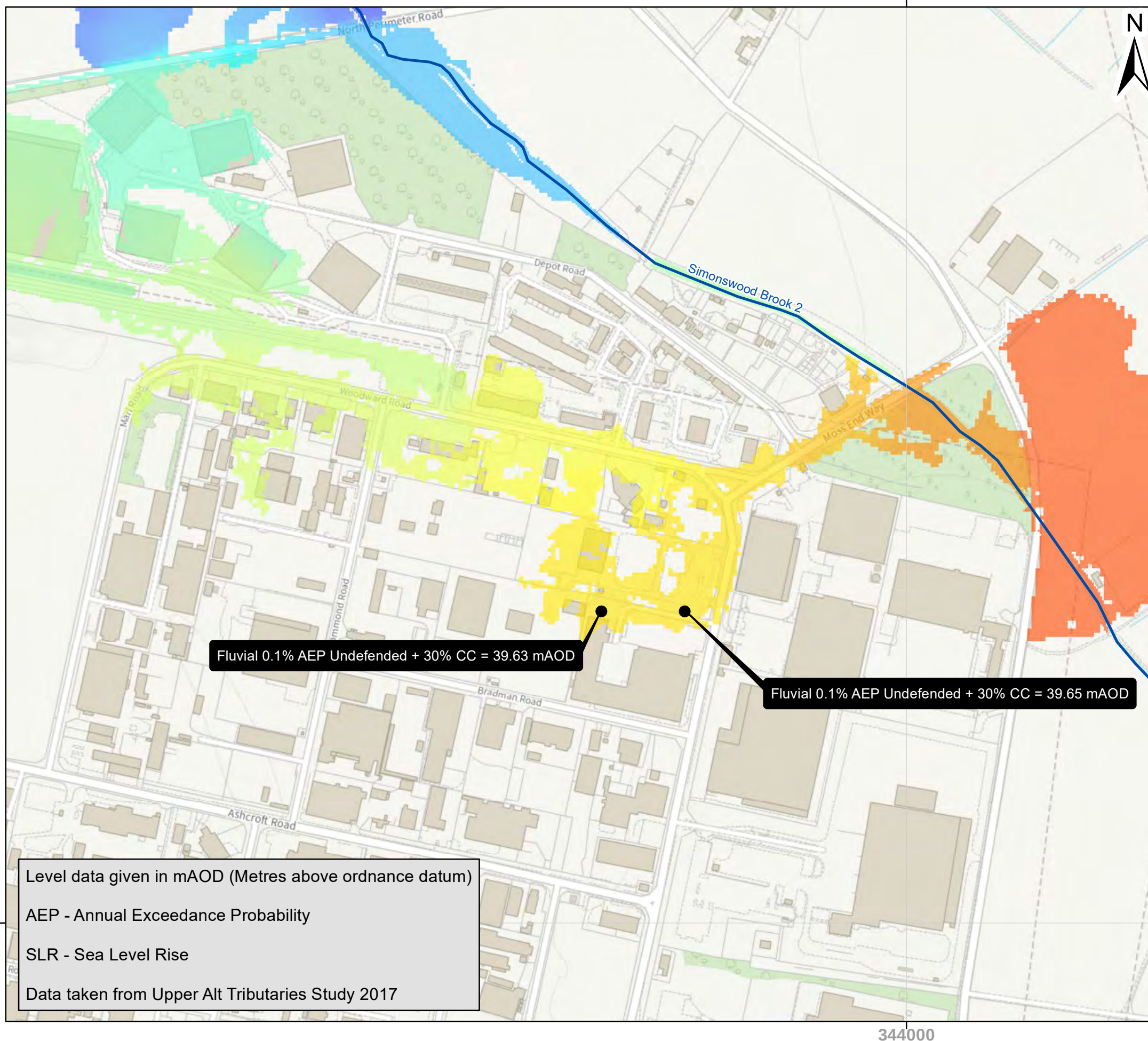
Key

 Main River

**Fluvial 0.1% + Climate Change
(30%) Annual Exceedance
Probability Undefended Scenario**

mAOD

 High : 42
Low : 34

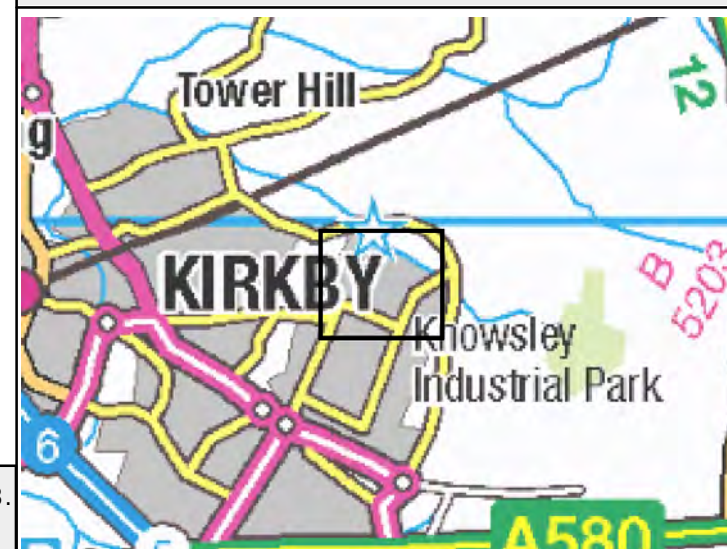


Level data given in mAOD (Metres above ordnance datum)

AEP - Annual Exceedance Probability

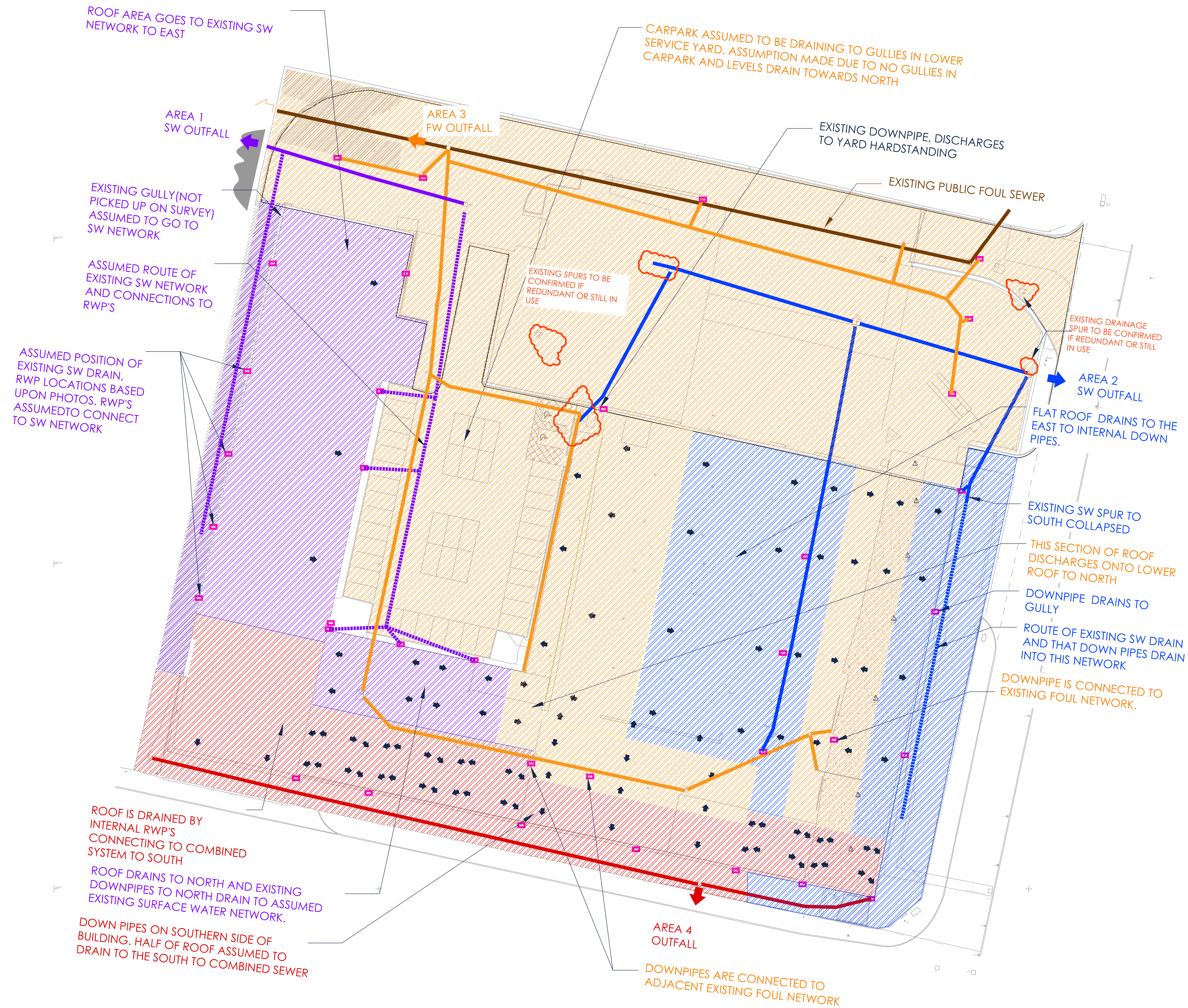
SLR - Sea Level Rise

Data taken from Upper Alt Tributaries Study 2017



APPENDIX E

Existing Impermeable Areas



EXISTING BROWNFIELD AREAS

AREA 1 - 0.197Ha
To surface water drain to North West

AREA 2 - 0.223Ha
To surface water Sewer in Acorn Field Road to east

AREA 3 - 0.734Ha
To Foul Sewer to North West

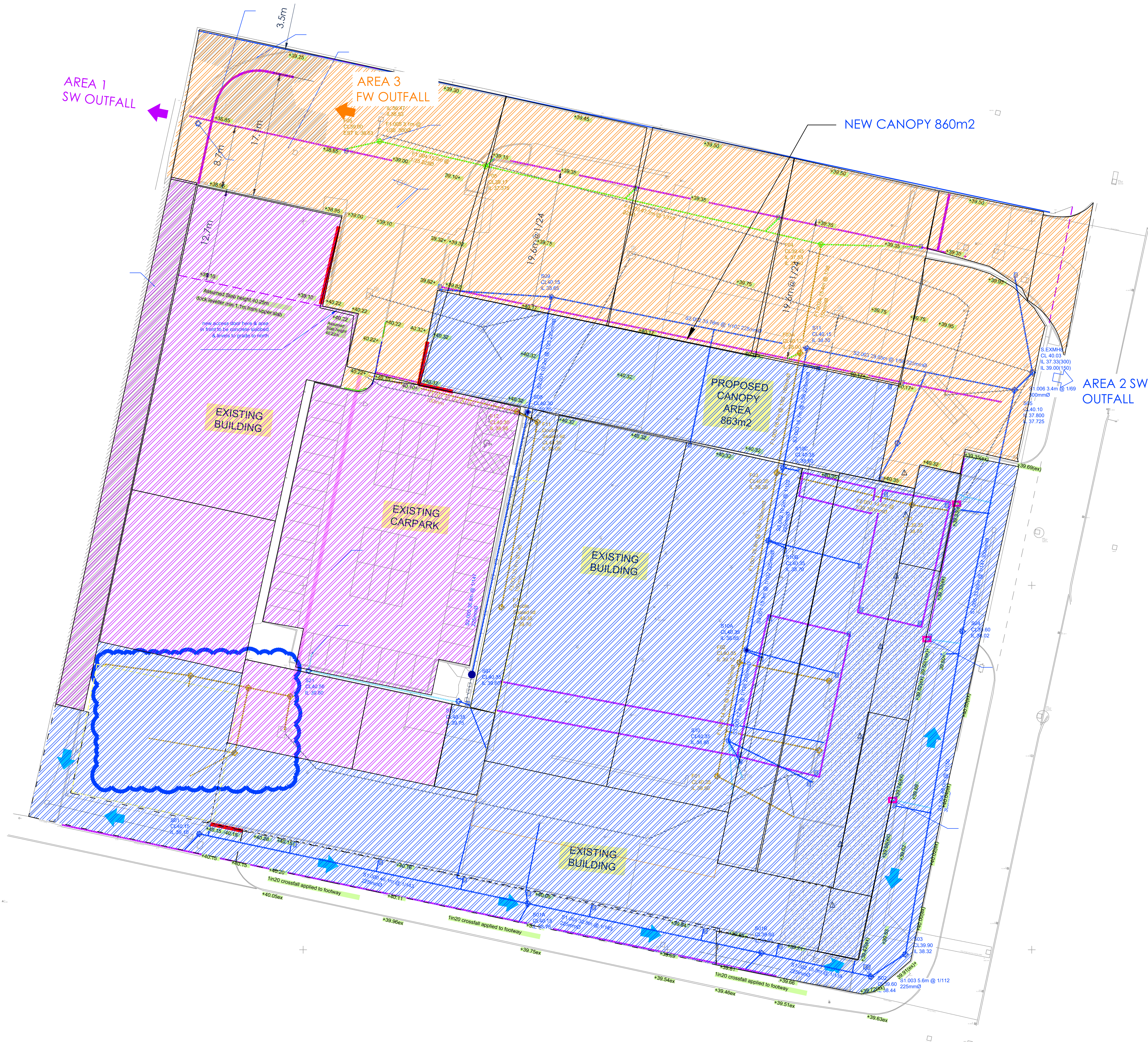
AREA 4 - 0.174Ha
To foul Sewer in Bradman Road to South

Sum = 1.328 Ha

CD	FIRST ISSUE	WW	29.07.22
REV	DESCRIPTION	BY	DATE
STATUS FOR PLANNING			
CLIENT SRCL Ltd			
SITE SRCL, KNOWSLEY, MERSEYSIDE			
TITLE EXISTING IMPERMEABLE AREAS PLAN			
calibro			
SCALE AT AS	DATE	DRAWN	CHECKED
1:200	17/02/22	NJB	WW
PROJECT NO	DRAWING NO	REV	REV
21-305	90-100		00

APPENDIX F

Proposed Impermeable Areas



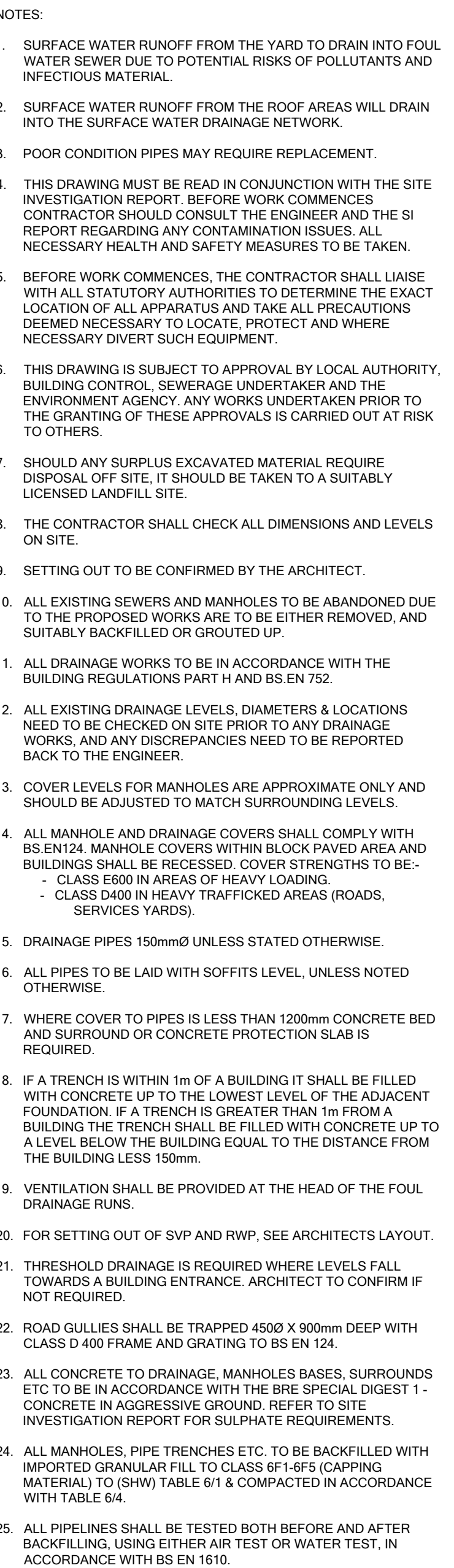
PROPOSED CATCHMENT AREAS

- AREA 1 - 0.308Ha
- AREA 2 - 0.666Ha
- AREA 3 - 0.354
- Sum = 1.328 Ha

CD	FIRST ISSUE	WW	29.07.22
REV	DESCRIPTION	BY	DATE
STATUS FOR PLANNING			
CLIENT SRCL Ltd			
SITE SRCL, KNOWSLEY, MERSEYSIDE			
TITLE PROPOSED IMPERMEABLE AREAS PLAN			

APPENDIX G

Detailed Drainage Strategy



Drainage Legend

-  PROPOSED SURFACE WATER SEWER
-  PROPOSED DRAINAGE CHANNEL
-  PROPOSED FOUL WATER SEWER
-  PROPOSED SURFACE WATER FLOWS TO FOUL SEWER (SERVICE YARD FLOWS)
-  EXISTING SW DRAINAGE NETWORK
-  EXISTING FW DRAINAGE NETWORK
-  EXISTING COMBINED DRAINAGE NETWORK
-  EXISTING DRAINAGE NETWORK TO BE REMOVED
-  PUBLIC FOUL SEWER EASEMENT
-  REPAIR TO EXISTING FOUL/COMBINED DRAIN
-  REPAIR TO EXISTING SURFACE WATER DRAIN
-  PROPOSED RETAINING WALL
-  EXCEEDANCE FLOW ROUTES

00	FIRST ISSUE	WW	28/07/22
REV:	DESCRIPTION:	BY:	DATE:
STATUS:	PRELIMINARY		
CLIENT:	SRCL Ltd		
SITE:	SRCL, KNOWSLEY, MERSEYSIDE		
TITLE:	DETAILED DRAINAGE STRATEGY		

APPENDIX H

MicroDrainage Network Results

Calibro Consultants Ltd		Page 0
Whitefriars Bristol BS1 2NT	21-305 SRCL Knowsley Site Drainage	
Date 27/06/2022 12:09 File 21-305 Network.MDX	Designed by WW Checked by WW	
XP Solutions	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Foul

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0
Ratio R	0.377	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Foul

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.364	4-8	0.038

Total Area Contributing (ha) = 0.402

Total Pipe Volume (m³) = 4.058

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	14.326	0.350	40.9	0.001	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	25.755	0.650	39.6	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	9.234	0.250	36.9	0.001	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	31.895	0.450	70.9	0.060	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	57.674	0.550	104.9	0.060	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	14.958	0.980	15.3	0.180	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	3.105	0.050	62.1	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.20	39.500	0.001	0.0	0.0	0.0	1.21	9.5	0.2
1.001	50.00	5.55	39.150	0.001	0.0	0.0	0.0	1.23	9.7	0.2
2.000	50.00	5.12	38.750	0.001	0.0	0.0	0.0	1.27	10.0	0.2
1.002	50.00	5.99	38.450	0.062	0.0	0.0	0.0	1.20	21.1	11.2
1.003	50.00	6.74	37.925	0.122	0.0	0.0	0.0	1.28	50.8	22.0
1.004	50.00	6.82	37.375	0.302	0.0	0.0	0.0	3.37	133.9	54.5
1.005	50.00	6.84	36.320	0.402	0.0	0.0	0.0	2.00	141.3	72.6

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Free Flowing Outfall Details for Foul

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.005	MH41	39.053	36.270	0.000	1200	0
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Simulation Criteria for Foul

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
		Number of Storage Structures	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	5	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location GB 343712 399253 SJ 43712 99253		Cv (Winter)	0.840
Data Type	Point Storm	Duration (mins)	30

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Foul

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000
 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 1.000
 Site Location GB 343712 399253 SJ 43712 99253 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

										Water	Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	
1.000	MH31	15 Winter	2	+0%	100/15 Winter				39.510	-0.090	
1.001	MH32	15 Winter	2	+0%	100/15 Winter				39.159	-0.091	
2.000	MH35	15 Winter	2	+0%	100/15 Winter	100/15 Winter			38.760	-0.090	
1.002	MH33	15 Winter	2	+0%	30/15 Winter				38.525	-0.075	
1.003	MH34	15 Winter	2	+0%	30/15 Winter	100/15 Winter			38.024	-0.126	
1.004	MH39	15 Winter	2	+0%	30/15 Winter	100/15 Winter			37.475	-0.125	
1.005	MH40	15 Winter	2	+0%	30/15 Winter				36.620	0.000	

		Flooded		Half Drain		Pipe		
PN	US/MH Name	Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded	
1.000	MH31	0.000	0.02		0.2	OK		
1.001	MH32	0.000	0.02		0.2	OK		
2.000	MH35	0.000	0.02		0.2	OK	2	
1.002	MH33	0.000	0.49		10.0	OK		
1.003	MH34	0.000	0.39		19.1	OK	1	
1.004	MH39	0.000	0.40		47.6	OK	1	
1.005	MH40	0.000	1.01		62.0	OK		

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Foul

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 1.000
 Site Location GB 343712 399253 SJ 43712 99253 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

US/MH		Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	MH31	15 Winter	30	+0%	100/15 Winter				39.514	-0.086
1.001	MH32	15 Winter	30	+0%	100/15 Winter				39.163	-0.087
2.000	MH35	15 Winter	30	+0%	100/15 Winter	100/15 Winter			38.819	-0.031
1.002	MH33	15 Winter	30	+0%	30/15 Winter				38.829	0.229
1.003	MH34	15 Winter	30	+0%	30/15 Winter	100/15 Winter			38.265	0.115
1.004	MH39	15 Winter	30	+0%	30/15 Winter	100/15 Winter			37.802	0.202
1.005	MH40	15 Winter	30	+0%	30/15 Winter				36.929	0.309

Flooded				Half Drain	Pipe			
	US/MH	Volume	Flow / Overflow	Time	Flow		Level	
PN	Name	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
1.000	MH31	0.000	0.04			0.4	OK	
1.001	MH32	0.000	0.04			0.4	OK	
2.000	MH35	0.000	0.14			1.3	OK	2
1.002	MH33	0.000	1.13			23.1	SURCHARGED	
1.003	MH34	0.000	0.92			44.8	SURCHARGED	1
1.004	MH39	0.000	0.95			111.6	SURCHARGED	1
1.005	MH40	0.000	2.45			150.3	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Foul

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 1.000
 Site Location GB 343712 399253 SJ 43712 99253 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
	Name	Storm							(m)	(m)
1.000	MH31	15 Winter	100	+40%	100/15 Winter				39.861	0.261
1.001	MH32	15 Winter	100	+40%	100/15 Winter				39.850	0.600
2.000	MH35	15 Winter	100	+40%	100/15 Winter	100/15 Winter			39.354	0.504
1.002	MH33	15 Winter	100	+40%	30/15 Winter				40.046	1.446
1.003	MH34	15 Winter	100	+40%	30/15 Winter	100/15 Winter			39.502	1.352
1.004	MH39	15 Winter	100	+40%	30/15 Winter	100/15 Winter			39.004	1.404
1.005	MH40	15 Winter	100	+40%	30/15 Winter				37.409	0.789

PN	Flooded US/MH		Volume (m ³)	Flow / Cap.	Overflow (l/s)	Half Drain Pipe		Level Exceeded
	Name					Time (mins)	Flow (l/s)	
1.000	MH31		0.000	0.29			2.6	SURCHARGED
1.001	MH32		0.000	0.70			6.6	SURCHARGED
2.000	MH35		4.394	1.74			16.1	FLOOD 2
1.002	MH33		0.000	1.36			27.5	SURCHARGED
1.003	MH34		2.421	1.27			62.0	FLOOD 1
1.004	MH39		3.573	1.36			159.7	FLOOD 1
1.005	MH40		0.000	3.70			227.2	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW East

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	5
FEH Rainfall Version	2013
Site Location GB 343712 399253 SJ 43712 99253	
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	0.000
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	150

Designed with Level Soffits

Time Area Diagram for SW East

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.437	4-8	0.233

Total Area Contributing (ha) = 0.670

Total Pipe Volume (m³) = 17.541

Network Design Table for SW East

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	99.947	0.700	142.8	0.060	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	5.625	0.050	112.5	0.140	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	45.000	0.300	150.0	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	32.822	0.220	149.2	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	36.833	0.250	147.3	0.060	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	15.462	0.150	103.1	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	6.53	39.150	0.060	0.0	0.0	0.0	1.09	43.4	10.8
1.001	50.00	6.60	38.450	0.200	0.0	0.0	0.0	1.23	49.0	36.1
1.002	50.00	7.19	38.325	0.250	0.0	0.0	0.0	1.28	90.6	45.1
1.003	50.00	7.61	38.025	0.300	0.0	0.0	0.0	1.28	90.8	54.2
2.000	50.00	5.57	39.600	0.060	0.0	0.0	0.0	1.07	42.7	10.8
2.001	50.00	5.77	39.350	0.110	0.0	0.0	0.0	1.29	51.2	19.9

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Network Design Table for SW East

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.002	42.710	0.300	142.4	0.040	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.000	54.633	0.400	136.6	0.170	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	22.625	0.150	150.8	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	4.146	0.400	10.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.002	50.00	6.42	39.200	0.150	0.0	0.0	0.0	1.09	43.5	27.1
3.000	50.00	5.82	39.350	0.170	0.0	0.0	0.0	1.12	44.4	30.7
2.003	50.00	6.72	38.825	0.370	0.0	0.0	0.0	1.28	90.3	66.8
1.004	50.00	7.63	37.805	0.670	0.0	0.0	0.0	4.91	347.1	121.0

Free Flowing Outfall Details for SW East

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.004	MH19	39.750	37.405	0.000	0	0
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Simulation Criteria for SW East

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	0	Number of Storage Structures	0
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	5	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location GB 343712 399253 SJ 43712 99253		Cv (Winter)	0.840
Data Type	Point Storm	Duration (mins)	30

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW East

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 1.000
 Site Location GB 343712 399253 SJ 43712 99253 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

US/MH		Return Climate		First (X)		First (Y)		First (Z)		Water	Surcharged
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Overflow	Act.	Level (m)	Depth (m)
1.000	MH14	15 Winter	2	+0%	100/15 Winter	100/15 Winter				39.229	-0.146
1.001	MH15	15 Winter	2	+0%	30/15 Winter	100/15 Winter				38.639	-0.036
1.002	MH16	15 Winter	2	+0%	30/15 Winter					38.468	-0.157
1.003	MH17	15 Winter	2	+0%	30/15 Winter					38.185	-0.140
2.000	MH20	15 Winter	2	+0%	30/15 Winter	100/15 Winter				39.682	-0.143
2.001	MH21	15 Winter	2	+0%	30/15 Winter	100/15 Winter				39.452	-0.123
2.002	MH22	15 Winter	2	+0%	30/15 Winter	100/15 Winter				39.328	-0.097
3.000	MH24	15 Winter	2	+0%	30/15 Winter	100/15 Winter				39.498	-0.077
2.003	MH23	15 Winter	2	+0%	30/15 Winter					39.029	-0.096
1.004	MH18	15 Winter	2	+0%	30/15 Winter					37.988	-0.117

		Flooded		Half Drain		Pipe		
PN	US/MH Name	Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded	
1.000	MH14	0.000	0.24		10.3	OK	1	
1.001	MH15	0.000	1.00		31.5	OK	2	
1.002	MH16	0.000	0.46		38.9	OK		
1.003	MH17	0.000	0.55		45.9	OK		
2.000	MH20	0.000	0.28		11.2	OK	2	
2.001	MH21	0.000	0.42		19.2	OK	2	
2.002	MH22	0.000	0.60		25.0	OK	2	
3.000	MH24	0.000	0.73		31.3	OK	2	
2.003	MH23	0.000	0.80		63.6	OK		
1.004	MH18	0.000	0.69		109.3	OK		

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW East

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 1.000
 Site Location GB 343712 399253 SJ 43712 99253 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

US/MH		Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	MH14	15 Winter	30	+0%	100/15 Winter	100/15 Winter			39.274	-0.101
1.001	MH15	15 Winter	30	+0%	30/15 Winter	100/15 Winter			39.032	0.357
1.002	MH16	15 Winter	30	+0%	30/15 Winter				38.852	0.227
1.003	MH17	15 Winter	30	+0%	30/15 Winter				38.627	0.302
2.000	MH20	15 Winter	30	+0%	30/15 Winter	100/15 Winter			39.836	0.011
2.001	MH21	15 Winter	30	+0%	30/15 Winter	100/15 Winter			39.776	0.201
2.002	MH22	15 Winter	30	+0%	30/15 Winter	100/15 Winter			39.682	0.257
3.000	MH24	15 Winter	30	+0%	30/15 Winter	100/15 Winter			40.070	0.495
2.003	MH23	15 Winter	30	+0%	30/15 Winter				39.290	0.165
1.004	MH18	15 Winter	30	+0%	30/15 Winter				38.376	0.271

Flooded				Half Drain Pipe			Level Exceeded
PN	US/MH Name	Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	
1.000	MH14	0.000	0.52		22.2	OK	1
1.001	MH15	0.000	2.16		68.2	SURCHARGED	2
1.002	MH16	0.000	0.98		82.8	SURCHARGED	
1.003	MH17	0.000	1.07		89.1	SURCHARGED	
2.000	MH20	0.000	0.57		22.9	SURCHARGED	2
2.001	MH21	0.000	0.78		35.3	SURCHARGED	2
2.002	MH22	0.000	1.13		46.9	SURCHARGED	2
3.000	MH24	0.000	1.37		58.4	FLOOD RISK	2
2.003	MH23	0.000	1.47		117.6	SURCHARGED	
1.004	MH18	0.000	1.30		206.2	SURCHARGED	

Calibro Consultants Ltd		Page 4
Whitefriars Bristol BS1 2NT	21-305 SRCL Knowsley Site Drainage	
Date 27/06/2022 12:11 File 21-305 Network.MDX	Designed by WW Checked by WW	
XP Solutions	Network 2020.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW East

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
		Number of Storage Structures	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 343712 399253 SJ 43712 99253	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

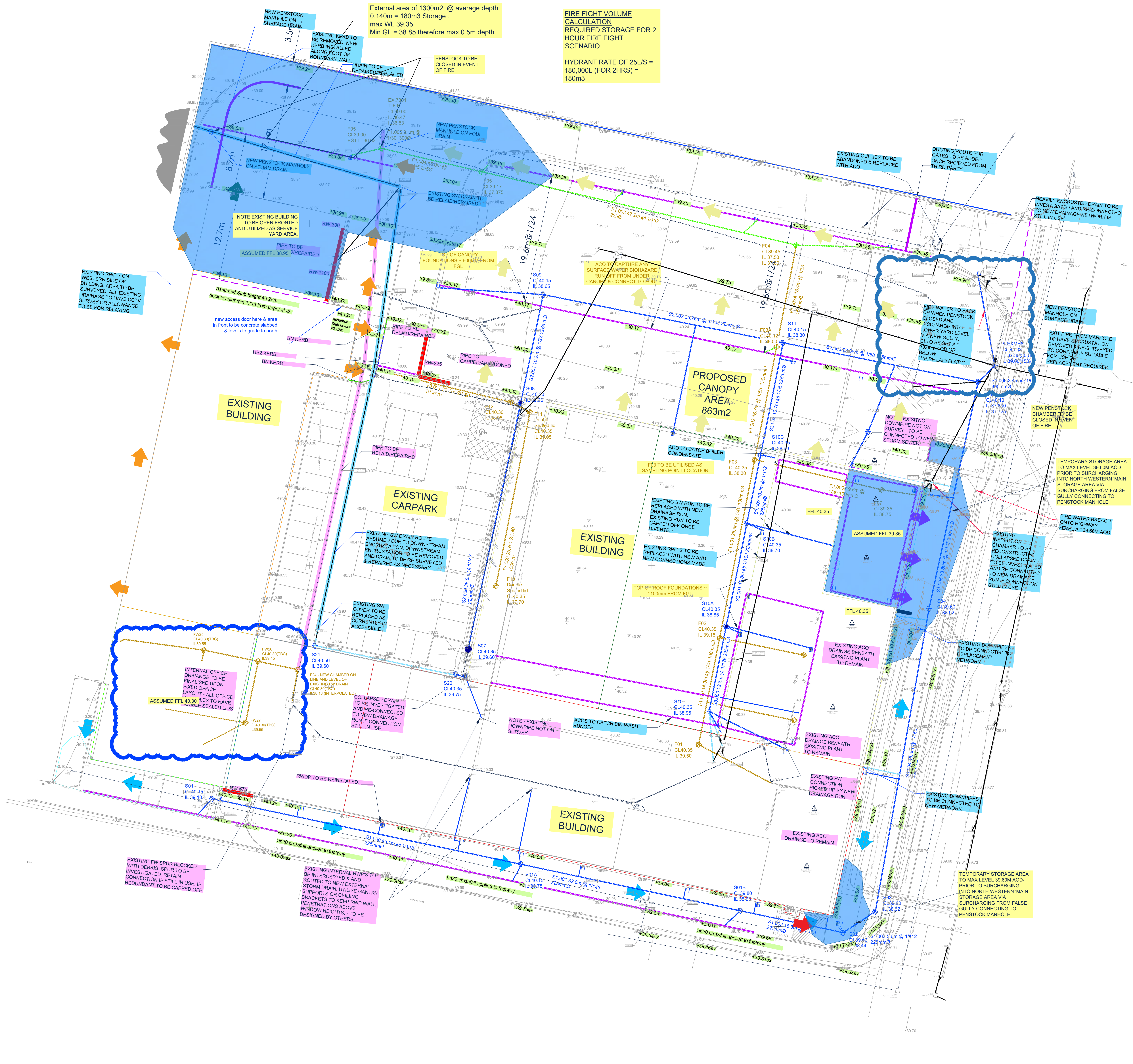
Profile(s)	Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

US/MH		Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	MH14	15 Winter	100	+40%	100/15 Winter	100/15 Winter			40.150	0.775
1.001	MH15	15 Winter	100	+40%	30/15 Winter	100/15 Winter			39.617	0.942
1.002	MH16	15 Winter	100	+40%	30/15 Winter				39.555	0.930
1.003	MH17	15 Winter	100	+40%	30/15 Winter				39.328	1.003
2.000	MH20	15 Winter	100	+40%	30/15 Winter	100/15 Winter			40.355	0.530
2.001	MH21	15 Winter	100	+40%	30/15 Winter	100/15 Winter			40.302	0.727
2.002	MH22	15 Winter	100	+40%	30/15 Winter	100/15 Winter			40.152	0.727
3.000	MH24	15 Winter	100	+40%	30/15 Winter	100/15 Winter			40.364	0.789
2.003	MH23	15 Winter	100	+40%	30/15 Winter				39.571	0.446
1.004	MH18	15 Winter	100	+40%	30/15 Winter				38.882	0.777

Flooded				Half Drain Pipe			Level Exceeded
PN	US/MH Name	Volume (m ³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	
1.000	MH14	0.451	0.84		35.5	FLOOD	1
1.001	MH15	17.336	2.94		92.6	FLOOD	2
1.002	MH16	0.000	1.13		95.4	SURCHARGED	
1.003	MH17	0.000	1.43		119.3	FLOOD RISK	
2.000	MH20	5.049	1.04		41.9	FLOOD	2
2.001	MH21	1.512	1.04		47.0	FLOOD	2
2.002	MH22	2.339	1.55		64.3	FLOOD	2
3.000	MH24	14.026	1.59		68.1	FLOOD	2
2.003	MH23	0.000	1.98		157.8	SURCHARGED	
1.004	MH18	0.000	1.72		272.8	SURCHARGED	

APPENDIX I

Fire Water Retention Plan



- NOTES:
1. THIS DRAWING MUST BE READ IN CONJUNCTION WITH CALIBRO LAYOUT 20-316-80-1100 FOU, & SURFACE WATER DRAINAGE STRATEGY
 2. SURFACE WATER RUNOFF FROM THE YARD TO DRAIN INTO FOUL WATER SEWER DUE TO RISKS OF POLLUTANTS AND INFECTIOUS MATERIAL. THIS IS SUBJECT TO A TRADE EFFLUENT CONSENT FROM SEVERN TRENT WATER.
 3. SURFACE WATER RUNOFF FROM THE ROOF AREAS WILL DRAIN INTO THE SURFACE WATER DRAINAGE NETWORK. ANY CONNECTIONS INTO THIS SURFACE WATER NETWORK, EXCEPT FOR RWPS AND OFF-SITE CONNECTIONS, SHOULD BE DISCONNECTED AND DIVERTED.
 4. POOR CONDITION PIPES SHOULD MAY REQUIRE REPLACEMENT.
 5. THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE SITE INVESTIGATION REPORT. BEFORE WORK COMMENCES THE CONTRACTOR SHOULD CONSULT THE ENGINEER AND THE SI REPORT REGARDING ANY CONTAMINATION ISSUES. ALL NECESSARY HEALTH AND SAFETY MEASURES TO BE TAKEN.
 6. BEFORE WORK COMMENCES, THE CONTRACTOR SHALL LIAISE WITH ALL STATUTORY AUTHORITIES TO DETERMINE THE EXACT LOCATION OF ALL APPARATUS AND TAKE ALL PRECAUTIONS NECESSARY TO LOCATE, PROTECT AND WHERE NECESSARY OVERT SUCH EQUIPMENT.
 7. THIS DRAWING IS SUBJECT TO APPROVAL BY LOCAL AUTHORITY, BUILDING CONTROL, SEWERAGE UNDERTAKER AND THE ENVIRONMENT AGENCY. ANY WORKS UNDERTAKEN PRIOR TO THE GRANTING OF THESE APPROVALS IS CARRIED OUT AT RISK TO OTHERS.
 8. SHOULD ANY SURPLUS EXCAVATED MATERIAL REQUIRE DISPOSAL OFF SITE, IT SHOULD BE TAKEN TO A SUITABLY LICENSED LANDFILL SITE.
 9. THE CONTRACTOR SHALL CHECK ALL DIMENSIONS AND LEVELS ON SITE.
 10. SETTING OUT TO BE CONFIRMED BY THE ARCHITECT.
 11. ALL EXISTING SEWERS AND MANHOLES TO BE ABANDONED DUE TO THE PROPOSED WORKS ARE TO BE EITHER REMOVED, AND SUITABLY BACKFILLED OR GROUTED UP.
 12. ALL DRAINAGE WORKS TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS PART H AND BS EN 752.
 13. ALL EXISTING DRAINAGE LEVELS, DIAMETERS & LOCATIONS NEED TO BE CHECKED ON SITE PRIOR TO ANY DRAINAGE WORKS, AND ANY DISCREPANCIES NEED TO BE REPORTED BACK TO THE ENGINEER.
 14. COVER LEVELS FOR MANHOLES ARE APPROXIMATE ONLY AND SHOULD BE ADJUSTED TO MATCH SURROUNDING LEVELS.
 15. ALL MANHOLE AND DRAINAGE COVERS SHALL COMPLY WITH BS EN 242 MANHOLE COVERS WITH BLOCK PAVED AREA AND BUILDINGS SHALL BE RECESSED. COVER STRENGTHS TO BE:
 - CLASS 5000 IN AREAS OF HEAVY LOADING
 - CLASS 4000 IN HEAVY TRAFFICKED AREAS (ROADS, SERVICES YARDS)
 16. DRAINAGE PIPES 150mmØ UNLESS STATED OTHERWISE.
 17. ALL PIPES TO BE LAID WITH SLOTTED LEVEL, UNLESS NOTED OTHERWISE.
 18. WHERE COVER TO PIPES IS LESS THAN 1200mm CONCRETE BED AND SURROUND OR CONCRETE PROTECTION SLAB IS REQUIRED.
 19. IF A TRENCH IS WITHIN 1m OF A BUILDING IT SHALL BE FILLED WITH CONCRETE UP TO THE LOWEST LEVEL OF THE ADJACENT FOUNDATION. IF A TRENCH IS GREATER THAN 1m FROM A BUILDING THE TRENCH SHALL BE FILLED WITH CONCRETE UP TO A LEVEL BELOW THE BUILDING EQUAL TO THE DISTANCE FROM THE BUILDING LESS 150mm.
 20. VENTILATION SHALL BE PROVIDED AT THE HEAD OF THE FOUL DRAINAGE RUNS.
 21. FOR SETTING OUT OF SWP AND RWP, SEE ARCHITECTS LAYOUT.
 22. THRESHOLD DRAINAGE IS REQUIRED WHERE LEVELS FALL TOWARDS A BUILDING ENTRANCE. ARCHITECT TO CONFIRM IF NOT REQUIRED.
 23. ROAD GULLIES SHALL BE TRAPPED 4500 X 900mm DEEP WITH CLASS 5000 FRAME AND GRATING TO BS EN 124.
 24. ALL CONCRETE TO DRAINAGE, MANHOLES BASES, SURROUNDS ETC TO BE IN ACCORDANCE WITH THE BRE SPECIAL DIGEST 1 - CONCRETE IN AGGRESSIVE GROUND. REFER TO SITE INVESTIGATION REPORT FOR SULPHATE REQUIREMENTS.
 25. ALL MANHOLES, PIPE TRENCHES ETC. TO BE BACKFILLED WITH IMPROVED GRANULAR FILL TO CLASS 6/8/5 CAPPING MATERIAL TO (BSW) TABLE 6/1 & COMPACTED IN ACCORDANCE WITH TABLE 6/4.
 26. ALL PIPELINES SHALL BE TESTED BOTH BEFORE AND AFTER BACKFILLING, USING EITHER AIR TEST OR WATER TEST, IN ACCORDANCE WITH BS EN 1610.

REV	DESCRIPTION	BY	DATE
1	FIRST ISSUE	WW	29.07.22
2	FOR PLANNING		
3	SRCL Ltd		
4	SRCL, KNOWSLEY, MERSEYSIDE		
5	FIRE WATER RETENTION STRATEGY		



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