

Project
Fleet Factor
Stretton Way, Huyton

Title
Flood Risk Assessment

Project No
C14086

Date
August 2021

Revision
B

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Contents	Page
1. Introduction	2
2. National Policy and Water Management Guidance	3
3. Site Setting and Description	4
4. Sources of Flooding	5
5. Sourced Data	6
6. Probability of Flooding	9
7. Flood Risk and Vulnerability	10
8. Safe Development over Lifetime	12
9. Residual Risk	14
10. Conclusion / Summary	15

Appendices

Appendix A	-	Site Location Plan
Appendix B	-	Existing Site Plan
Appendix C	-	Proposed Site Plan
Appendix D	-	Topographical Survey
Appendix E	-	OS Water Network Map
Appendix F	-	Envirocheck Flood Map Data
Appendix G	-	Environment Agency Product 4 Information
Appendix H	-	Flood Compensation and Safe Access / Egress Layout

1. Introduction

Northern Structural Services have prepared a Flood Risk Assessment for the extension of an existing commercial building at Stretton Way, Huyton, Liverpool, L36 6JF.

The Environment Agency (EA) and Knowsley Metropolitan Borough Council (KMBC) need to be satisfied that the granting of planning permission will address the risk of flooding to the development site, and that the proposals will not in turn increase the risk of flooding to neighbouring land and property.

This Flood Risk Assessment has been prepared to the national guidance and requirements set out in the National Planning Policy Framework, 2019 (NPPF), National Planning Practice Guidance (NPPG), which sets out the guidance for preparation of site specific FRA's and reducing flood risk in general by using Sustainable drainage systems (SuDS).

The FRA has also been prepared to the local guidance and requirements set out in the Knowsley Local Core Strategy (January 2016); KMBC Level 1 Strategic Flood Risk Assessment (2009); KMBC Preliminary Flood Risk Assessment (2011); KMBC Level 2 Strategic Flood Risk Assessment (2012); and KMBC Local Flood Risk Management Strategy (2017).

The report will look at a surface water management strategy for the proposed new development to establish constraints and design requirements and to promote the use of Sustainable Drainage Systems (SuDS) as per the requirements set out in Principles of SuDS set out by DEFRA (2011); Ciria SuDS Manual C753 (2015); and Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015).

This flood risk assessment has therefore been prepared to identify and evaluate the various possible sources of flood risk to which the proposed site might be subjected to; to identify any mitigation, protection or compensation measures deemed necessary or feasible; and to manage the surface water so it sustainable, and does not increase the probability of flooding within, or near the site.

2. National Policy and Water Management Guidance

2.1. National Planning Policy Framework (NPPF) and National Planning Practice Guidance (NPPG)

NPPF 2019 set out the Government's national policy on development and flood risk, and seeks to provide clarity on what is required at regional and local levels, to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk.

NPPF Paragraphs 149 to 150 provide guidance for developments for the plans to take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk.

NPPF Paragraphs 155 to 165 provides guidance for planning and flood risk, where are plans should apply a sequential, risk-based approach to the location of development taking into account current and future impacts of climate change; to ensure that flood risk is not increased elsewhere due to the development; and to incorporate sustainable drainage systems.

NPPG, Paragraph 030, outlines that the objectives of this FRA are to establish whether a proposed development is likely to be affected by current or future flooding from any source; whether it will increase flood risk elsewhere; whether the measures proposed to deal with these effects and risks are appropriate; whether the evidence for the local planning authority to apply (if necessary) the Sequential Test; and whether the development will be safe and pass the Exception Test, if applicable.

2.2. Flood and Water Management Act

The Flood and Water Management Act takes forward some of the proposals from three previous strategy documents published by the UK Government - Future Water (2008), Making Space for Water (2008) and the UK Government's response to the Sir Michael Pitt's Review of the summer 2007 floods. In doing so it gives the EA a strategic overview role for flood risk, and gives local authorities responsibility for preparing and putting in place strategies for managing flood risk from groundwater, surface water and ordinary watercourses in their areas.

2.3. Knowsley Local Core Strategy

Knowsley Local Core Strategy, Policy CS24 states:

1. New development that may cause an unacceptable risk of flooding on the site or elsewhere will not be permitted.
2. New development should preferably be located in areas of low probability of flooding. New development in areas of medium or high flood risk will only be permitted if evidence has been submitted demonstrating that the development could not be practicably located in an area of lower flood risk and if applicable the 'exception test' has been complied with, in accordance with national guidance.
3. All development which is within or otherwise affects an area of flood risk or is larger than one hectare in size shall be accompanied by a site-specific Flood Risk Assessment (FRA).
4. New development shall include flood mitigation measures, where necessary, to manage flood risk associated with or caused by the development. These measures shall be derived from the Strategic Flood Risk Assessment (SFRA), relevant FRA(s) or a local strategy for flood risk management, and: a) Be designed to contribute to the biodiversity of the borough unless it can be demonstrated that this would not be technically feasible; b) Incorporate a Sustainable Drainage System; c) Be fully described in the planning application; d) Be funded by the developer, including long term maintenance
5. The drainage of new development shall be designed to reduce surface water run-off rates to those associated with a green-field site by treating it at its source. The chosen method of implementation should take account of site size, ground contamination or conditions, and potential damage to adjacent buildings or sites.

3. Site Setting and Description

3.1. Site Location

The development site is located in a commercial area of Huyton, which is approximately 1.5 km south-west of Whiston train station, approximately 1.5 km south-east of Huyton train station, and as detailed on the site location plan in Appendix A, is bound by commercial units to the north; Stretton Way to the east; and Logwood Mill Brook to the south and west.

The address of the site is Fleet Factors, Stretton Way, Huyton, Liverpool, with the nearest postcode being L36 6JF, with the co-ordinates to the centre of the site being E: 346025, N:389765.

3.2. Existing Site

As detailed on the existing site plan in Appendix B, the site currently consists of an existing commercial building to the north; a service yard to the centre / east; and undeveloped grassed areas to the south and west.

3.3. Proposed Development

The proposed site is shown on the development plan in Appendix C, with a full description of the development site being stated by the Architect.

In brief, and in relation to this flood risk assessment, the proposed development is to extend the commercial building to the centre / west of the site; to extend the yard to create a car park to the east / south of the site; and to create a new permeable service yards to the west.

3.4. Topographical Survey

As detailed on the topographical survey plans in Appendix D, the site has a general fall from north to south, with the levels ranging from a high point along the northern boundary of 23.383m AOD, to 22.081m AOD along the southern boundary. The finished floor level of the existing commercial building is 23.284m AOD.

3.5. Waterbody / Rivers / Canals

As detailed on the OS Water Network Map in Appendix E, the nearest waterbody, river or canal to the development, is the Logwood Mill Brook which flows along the southern and eastern boundary of the site.

3.6. On-Site Drainage and Public Sewers

It is believed that there are existing sewers within Stretton Way to the east of the site, and drainage within the site boundary that serve the existing commercial building.

3.7. Ground Conditions

On-site ground investigations to establish the ground strata are yet to take place. However, the ground conditions for the site can be determined via the British Geological Survey (BGS) website, where it shows the site has superficial deposits of Till, Devensian (Diamicton), over bedrock consisting of Etruria Formation (mudstone).

Borehole logs (found on the BGS website) near to the development site also show that the ground predominantly consist of clay over mudstone.

4. Sources of Flooding

In accordance with the NPPF, flood risk must be assessed for all sources of flooding and development of the site should be carried out in such a way as to mitigate any potential flood risk to both the site and third parties and their property. This section identifies all possible sources of flooding.

4.1. Fluvial Flooding

Fluvial flooding results from watercourses / rivers surcharging and flooding the surrounding areas.

4.2. Coastal Flooding

Coastal flooding results from high tides from the sea.

4.3. Pluvial Flooding

'Pluvial' flooding is that which results from rainfall generated overland flow before the run-off enters any watercourse, drain or sewer. It is more often linked to high intensity rainfall events (typically in excess of 30mm per hour). However, it can also result from lower intensity rainfall or melting snow where the ground is saturated, frozen, developed or has low permeability. This results in overland flow and ponding in depressions in the topography. In urban areas 'pluvial' flows are likely to follow the routes of highways and other surface connectivity to low spots where flooding can occur. In some cases, it can deviate from this route into adjacent developments via dropped kerbs (either for access to driveways or disability access).

4.4. Groundwater Flooding

Groundwater flooding is caused by the emergence of water from sub-surface permeable strata. Fluctuations in the groundwater table can cause flooding should the table rise above the existing ground level. Groundwater flooding events tend to have long durations, lasting days or weeks.

4.5. Flooding from Drains and Sewers

Flooding from drains and sewers is caused when the capacity of the drains and sewers is exceeded, and will result in flooding from the manholes.

4.6. Canals, Reservoirs and Other Artificial Sources

Flooding from canals, reservoirs and artificial sources is caused when the capacity of the sources are exceeded, or if there is, an infrastructure failure.

5. Sourced Data

Data from the Environment Agency; local strategic flood risk assessments; and information from other parties are to be studies to establish which sources of flooding are at the site.

5.1. Environment Agency Flood Maps for Planning

The EA fluvial flood zone map shown in Figure 1, indicates that the development site areas are in Flood Zone 1 (land having a less than 1 in 1,000 annual probability of river flooding), with the southern and western boundary (adjacent to Logwood Mill Brook) being in Flood Zone 3 (land having a 1 in 100 or greater annual probability of river flooding).



Figure 1 – EA Fluvial Flood Zone Map

The EA fluvial flood probability map shown in Figure 2, indicates the development site has a better than very low probability of fluvial flooding, with the south and western boundary (adjacent to Logwood Mill Brook) having a medium to high probability of flooding.



Extent of flooding from rivers or the sea

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

Figure 2 – EA Fluvial Flood Probability Map

The EA pluvial flood map shown in Figure 3, indicates that there is a low probability of surface water / pluvial source across the development site.



Extent of flooding from surface water

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

Figure 3 – EA Pluvial Flood Map

The Extents of Flooding from Reservoirs Map in Figure 4 indicates that the site is not in a flooding area.

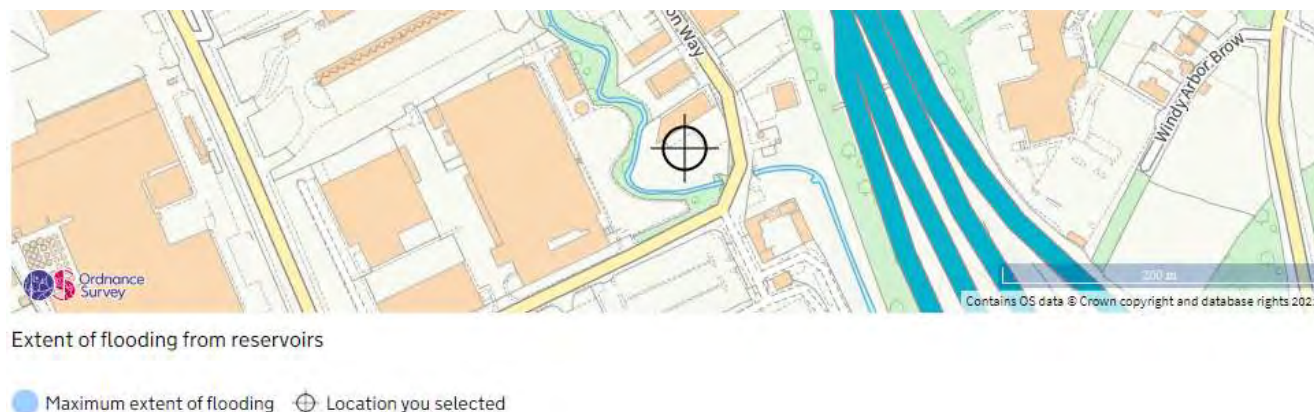


Figure 4 – EA Extents of Flooding from Reservoirs Map

5.2. Landmark Envirocheck Data Maps

Refer to Appendix F for Landmark Envirocheck flood map data. The data shown on the maps have been sourced from studies by JBA Consulting and the Environment Agency (EA). The summary of each of the maps are as follows:

Flood Data Map

The EA/NRW flood data map, indicates that the development areas of the site are in Flood Zone 1 (land having a less than 1 in 1,000 annual probability of river flooding), with the southern and western boundary (adjacent to Logwood Mill Brook) being in Flood Zone 3 (land having a 1 in 100 or greater annual probability of river flooding).

Pluvial, Fluvial and Coastal Flooding

The Envirocheck (JBA) 75-year return period flood map indicates that there is no pluvial, fluvial or coastal flooding at the development areas of the site.

The Envirocheck (JBA) 100-year return period flood map indicates that there is no fluvial or coastal flooding at the development areas of the site, with fluvial flooding along the southern and western boundaries (adjacent to Logwood Mill Brook).

The Envirocheck (JBA) 200-year return period flood map indicates that there is no fluvial or coastal flooding at the development areas of the site, with fluvial flooding along the southern and western boundaries (adjacent to Logwood Mill Brook).

The Envirocheck (JBA) 1000-year return period flood map indicates that there is no pluvial or coastal flooding at the development site location, no fluvial flooding in the central areas of the site, but fluvial flooding of between 0.1m to 0.3m to the southern areas, and between 0.05m to 0.1m to the northern areas.

In summary, the JBA maps indicate that there is no flooding at the development site from pluvial, fluvial or coastal sources for up to the 200-year return period, with fluvial flooding only occurring during the 1000-year return period to southern and northern areas. Therefore, the maps concur with other data, where the probability of flooding is deemed to be low.

Surface Water Flood Depths

The Envirocheck (EA/NRW) 30-year return period flood map indicates that there is no surface water / rainfall flood depth within the development areas of the site.

The Envirocheck (EA/NRW) 100-year return period flood map indicates that there is no surface water / rainfall flood depth within the development areas of the site.

The Envirocheck (EA/NRW) 1000-year return period flood map indicates that there is surface water / rainfall flooding across the site, with the depths between 0.15m to 0.30m at the development areas of the site.

In summary, the data from the EA flood map identifies that no surface water / rainfall flooding for the development areas of the site up to the 1 in 100-year event, with flooding only occurring to depths between 0.15m to 0.30m during the 1000-year return period. Therefore, the maps concur with other data, where the probability of flooding is deemed to be low.

Ground Water Flooding

The Envirocheck / BGS flood data map indicates that there is potential for groundwater flooding at surface, within the development areas of the site. The ESI groundwater flood map indicates that there is a negligible risk of ground water flooding in the development areas of the site.

Canal Failure

The Envirocheck (JBA) canal failure map indicates that the development site is in the canal coverage area, but is not in a canal failure area.

Historic Flood Map

The Envirocheck historic flood map indicates that there has been flooding at the development site from any source.

5.3. Environment Agency Product 4 Data

Flood data, and guidance on the development has been received from the EA for the site, as shown in Appendix G. The summary of the data is as follows:

Flood Node Map

The EA product 4 node map indicates that the nearest node to the development areas of the site is Node 1.

Node 1 Flood Level Data

The flood levels at Node 1, as stated in the table are as follows:

Node 10

10% AEP (1 in 10 year)	-	21.37m AOD
4% AEP (1 in 25 year)	-	21.54m AOD
1.33% AEP (1 in 75 year)	-	21.78m AOD
1% AEP (1 in 100 year)	-	21.86m AOD
1% AEP (1 in 100 year) + Climate Change	-	22.06m AOD
0.5% AEP (1 in 200 year)	-	22.04m AOD
0.1% AEP (1 in 1000 year)	-	22.61m AOD

To ensure that sufficient flood mitigation, resistance, resilience and compensation measures are incorporated into the development design, the highest 1% AEP + climate change flood level is to be taken into consideration. Therefore, the 1% AEP + climate change flood level at the site is deemed to be:

1% AEP (1 in 100 year) + CC	-	22.06m AOD
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To ensure that sufficient safe access and egress routes are assessed for the site, and the full extent of potential flooding is known, the highest 0.1% flood level is to be taken into consideration. Therefore, the 0.1% flood level at the site is deemed to be:

1% AEP (1 in 1000 year)	-	22.61m AOD
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6. Probability of Flooding

Now that the extents of the sources of flooding are known from the above data, an assessment is to be made of the probability of flooding from each of the sources.

Fluvial Flooding - Probability: Low

The flood data maps indicate that the development site is in Flood Zone 1 (land having a less than 1 in 1,000 annual probability of river flooding), with the southern and western boundary (adjacent to Logwood Mill Brook) being in Flood Zone 3 (land having a 1 in 100 or greater annual probability of river flooding) only.

The JBA maps indicate that there is no flooding at the development site from fluvial or coastal sources for up to the 200-year return period, with fluvial flooding only occurring during the 1000-year return period to southern and northern areas.

Therefore, as the flood maps indicate the development areas to be in Flood Zone 1, and indicate flooding during the 1000-year (0.1% AEP) event only, the probability of fluvial / coastal flooding is deemed to be low.

Pluvial Flooding - Probability: Low

The EA pluvial flood map shown in Figure 3, indicates that there is a low probability of surface water / pluvial source at the development site.

The JBA maps indicate that there is no flooding at the development site from pluvial sources for up to the 200-year return period.

The data from the EA flood map identifies that no surface water / rainfall flooding for the development areas of the site up to the 1 in 100-year event, with flooding only occurring to depths between 0.15m to 0.30m during the 1000-year return period.

Therefore, as the flood maps indicate pluvial flooding during the 1000-year (0.1% AEP) event only, the probability of pluvial flooding is deemed to be low.

Ground Water Flooding - Probability: Low

The Envirocheck / BGS flood data map indicates that there is potential for groundwater flooding at surface, within the development areas of the site. The ESI groundwater flood map indicates that there is a negligible risk of ground water flooding in the development areas of the site.

Based on BGS data identifying the ground to predominantly consist of clay over mudstone (very low permeability material), the ESI flood map indicating a negligible risk of flooding, and the commercial building being higher than the external levels, it is deemed that the risk of ground water flooding at the site is low.

Flooding from Drains and Sewers - Probability: Low

The nearest drain and sewer are believed in to be in Stretton Way to the east of the site. There has been no history of flooding from the sewers, it is likely that the flood water will be contained within roads due to the upstand kerbs, and flood water would flow in a north to south direction into Logwood Mill Brook, before discharging onto the site. Therefore, the probability of flooding from drains and sewers for the site is deemed to be low.

Canals, Reservoirs and Other Artificial Sources - Probability: Low

There are no known canals, reservoirs or artificial sources near the development site; The Extents of Flooding from Reservoirs Map in Figure 4, indicates that the site is not in a flooding area; The Envirocheck (JBA) canal failure map indicates that the development site is in the anal coverage area, but is not in a canal failure area; And there has been no history of flooding from any sources.

Therefore, based on the assessed data, the risk of flooding from canals, reservoirs or artificial sources is deemed to be low.

7. Flood Risk and Vulnerability

The NPPG Paragraphs 065 to 067 sets out the flood risk for a site by assessing the flood zones, flood risk vulnerability classification, and flood risk vulnerability and flood zone ‘compatibility’.

7.1. Flood Zones

There are four classifications for flood zones, as defined in Table 1 of the NPPF and NPPG document.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as ‘clear’ on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water should flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

The EA flood map data has identified that the development areas of the site are in Flood Zone 1.

7.2. Flood Risk Vulnerability Classification

NPPG Paragraph 066, Table 2 stated the flood risk vulnerability classifications as:

Flood Risk Vulnerability Classification
Essential Infrastructure Essential transport infrastructure (including mass evacuation routes) which should cross the area at risk; Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood; Wind turbines.
Highly Vulnerable Police and ambulance stations; fire stations and command centers; telecommunications installations required to be operational during flooding; Emergency dispersal points; Basement dwellings; Caravans, mobile homes and park homes intended for permanent residential use; Installations requiring hazardous substances consent.

More Vulnerable Hospitals; Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels; Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels; Non-residential uses for health services, nurseries and educational establishments; Landfill* and sites used for waste management facilities for hazardous waste; Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable Police, ambulance and fire stations which are not required to be operational during flooding; Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure; Land and buildings used for agriculture and forestry; Waste treatment (except landfill* and hazardous waste facilities); Minerals working and processing (except for sand and gravel working); Water treatment works which do not need to remain operational during times of flood.
Water-Compatible Development Flood control infrastructure; Water transmission infrastructure and pumping stations; Sewage transmission infrastructure and pumping stations; Sand and gravel working; Docks, marinas and wharves; Navigation facilities.

This development is classed as a 'Less Vulnerable' as the development is a used for commercial purposes.

7.3. Flood Risk Vulnerability and Flood Zone 'Compatibility'

NPPG Paragraph 067 Table 3, gives guidance on flood risk vulnerability compared with flood zone, to determine the compatibility.

Flood Risk Vulnerability and Flood Zone 'Compatibility'					
Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	† Exception Test required	✗	Exception Test required	✓	✓
Zone 3b*	* Exception Test required	✗	✗	✗	✓*

In accordance with Table 3 of the NPPF the development is appropriate due to it being in Flood Zone 1, and is classed as less vulnerable.

8. Safe Development over Lifetime

No sequential or exception test will be required due to the development building being appropriate (in accordance with NPPG). However, the development is to be safe for its lifetime, by taking into account the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.

There are therefore several design principles for any development at the site which include:

- Suitable finished floor levels of any commercial building to ensure they are above the flood level, with recommended free board above the known flood levels;
- Safe and access and egress from each of the residential units, where footpaths and roads are to be above the 0.1% AEP flood level;
- Suitable flood compensation measures to ensure flood water not displaced to areas outside the development site;
- Sustainable surface water drainage methods to ensure the surface water run-off rates and volume from the development are reduced to not increase flood risk elsewhere.

Each of the design principles to be applied for any development at the site are detailed below, and will demonstrate that the site will pass the exception test.

8.1. Finished Floor Levels

The finished floor levels of the commercial building extension is to replicate the existing building flood level of 23.284m AOD.

This is higher than the modelled flood level data at the site (as stated by the EA Product 4 data), with a summary of the proposed flood level and flood level being as follows:

Finished Floor Level	-	23.284m AOD
1% AEP (1 in 100 year) + CC	-	22.06m AOD
1% AEP (1 in 100 year) + CC Freeboard	-	1.224m
1% AEP (1 in 1000 year)	-	22.61m AOD
1% AEP (1 in 1000 year) Freeboard	-	0.674m

The NPPF recommends that the finished floor level is at least 600mm (0.600m) above the known flood level. Therefore, as the finished floor level is 0.674m above the 1% AEP level, this is deemed to be acceptable.

8.2. Flood Flows and Water Displacement

Suitable flood compensation areas, depths and volumes are to be formed within the site to ensure that the development does not affect the flood flows or displaces any water to areas downstream of the Logwood Mill Brook. This is to be achieved by replicating the flood areas, depths and volumes lost where the new building is over the flood extent area.

As detailed on the flood compensation drawing in Appendix H, the lost flood area is below the new commercial building extension only. The flood loss area equates to 3.00m², with the existing level being 22.580m AOD, and therefore a flood loss depth of 0.03m (flood level of 22.610m – existing level of 22.580m), which equates to a volume of 0.090m³.

The compensation area / volume is within the new permeable yard, where the levels currently higher than the 0.1% AEP flood level of 22.610m (between 22.610m AOD to 22.724m AOD). These levels are to be reformed to a level of 22.580m, to match the existing, over an area of approximately 9.00m². Therefore, the flood gain depth will also equate to 0.03m (flood level of 22.610m – reformed level of 22.580m), which equates to a volume of 0.270m³.

The levels within the new formed car park and permeable yard that are in the 01% AEP flood extent area are to remain as existing, and therefore will be allowed to flood during the extreme flood event with no flood compensation required.

Steps are to be built from the rear door of the new commercial building extension to the existing ground levels.

8.3. Safe Access and Egress

Safe access and egress it to be made to and from the commercial building during the extreme AEP's.

Safe access and egress route levels are to be higher than the 0.1% AEP level of 22.610m AOD. The flood compensation and safe access /egress plan in Appendix H, identifies the existing levels along the northern areas of the service yard / car park, and site entrance are at a lowest level of 22.749m AOD.

Therefore, as these levels are higher than the 0.1% AEP flood level, safe access and egress can be made from the commercial building, off / into the site from Stretton Way.

8.4. Surface Water Management Principles

The surface water for the developed building is to be managed so that it adheres to the current regulations, and local authority requirements, where the principles of the surface water management will be as follows:

Run-Off Destination

Surface water run-off is to discharge to one or more of the following in the order of priority shown:

- Discharge into the ground (infiltration).
- Discharge to a surface water body.
- Discharge to a surface water sewer, highway drain or other drain.
- Discharge to combined sewer.

BGS data identifies the ground to predominantly consist of clay and mudstone, and therefore due to the low percolation values, it is deemed that surface water discharge into the ground is not feasible.

Therefore, the surface water is to discharge to a surface water body, which is Logwood Mill Brook directly to the south / west of the site.

The Management Train

A concept fundamental to implementing a successful SuDS scheme is the management train. This is a sequence of SuDS components that serve to reduce run-off rates and volumes and reduce pollution. The hierarchy of techniques that are to be used for the surface water management of the development are:

- Prevention - Prevention of run-off by good site design and reduction of impermeable areas.
- Source Control - Dealing with water where and when it falls (e.g. infiltration techniques).
- Site Control - Management of water in the local area (e.g. swales, detention basins).
- Regional Control - Management of run-off from sites (e.g. balancing ponds, wetlands).

The new yard to the east of the site, and the parking bays in the new car park area can be formed of permeable paving / surfacing, which will reduce the surface water run-off, and act as a pollutant control.

Surface water run-off from the new extension area will either discharge directly to the permeable yard system to the rear, or through trapped gullies to the front, where both will act as a pollutant control.

Peak Surface Water Flow

The peak surface water flow from the post development extension, yard and car park is not to exceed the pre-development rate.

The post development surface water is to be restricted to the equivalent pre-development rates, as a minimum, with the aim to restrict to the equivalent greenfield run-off rates, with the consideration of future climate change.

Flood Risk

The drainage system will be designed so that, unless an area is designed to hold and/or convey water, flooding does not occur on any part of the site for a 1 in 30-year rainfall event.

The drainage system will also be designed so that, unless an area is designed to hold and/or convey water, flooding does not occur during a 1 in 100-year rainfall event in any part of a building (including a basement) or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

The design of the site will ensure that flows resulting from rainfall more than a 1 in 100-year rainfall event are managed in exceedance routes that avoid risk to people and property both on and off site.

Climate Change

The NPPF makes it a planning requirement to account for climate change in the proposed design. The recommended allowances are taken from the Environment Agency guidance (Table 2) summarised in Table 4 below.

Applies across all of England	Total change anticipated for the 2020's	Total change anticipated for the 2050's	Total change anticipated for the 2080's
Upper End	10%	20%	40%
Central	5%	10%	20%

The baseline year is 1961 to 1990. It is anticipated the life span of the developed building will be approximately 80 years, and therefore will fall at least into the 2080's and will have rainfall intensity increase of 40%. This increase in rainfall is to be taken into consideration for the surface water management of the proposed development, to ensure that the probability of flooding remains low.

9. Residual Risk

It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible, however, there are practicable ways to minimise the risk such as by allowing a freeboard (safety margin) and by using suitable construction and management techniques.

This flood risk assessment has been prepared in accordance with the NPPF, Local Planning Policy and the NPPG. Any recommendations regarding floor levels are based on the relevant British Standards (BS8533), the standing advice provided by the EA or based on common practice.

Northern Structural Services do not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

The owner/occupier of the property will be required to carry out maintenance on any SuDS devices within the site boundary. It will be the owner's /occupier's responsibility to regular upkeep the drainage network on site throughout the lifetime of the development to ensure that flood risk on and off site is managed effectively.

10. Conclusion / Summary

The site currently consists of an existing commercial building to the north; a service yard to the centre / east; and undeveloped grassed areas to the south and west.

The proposed development is to extend the commercial building to the centre / west of the site; to extend the yard to create a car park to the east / south of the site; and to create a new permeable service yards to the west.

The site has a general fall from north to south, with the levels ranging from a high point along the northern boundary of 23.383m AOD, to 22.081m AOD along the southern boundary. The finished floor level of the existing commercial building is 23.284m AOD.

The nearest waterbody, river or canal to the development, is the Logwood Mill Brook which flows along the southern and eastern boundary of the site.

There are existing sewers within Stretton Way to the east of the site, and drainage within the site boundary that serve the existing commercial building.

The site has superficial deposits of Till, Devensian (Diamicton), over bedrock consisting of Etruria Formation (mudstone). With borehole logs near to the development showing that the ground consist of clay over mudstone.

The flood maps indicate the development areas to be in Flood Zone 1, and indicate flooding during the 1000-year (0.1% AEP) event only, and therefore the probability of fluvial / coastal flooding is deemed to be low.

The flood maps indicate pluvial flooding during the 1000-year (0.1% AEP) event only, and therefore the probability of pluvial flooding is deemed to be low.

Based on BGS data identifying the ground to predominantly consist of clay over mudstone, the ESI flood map indicating a negligible risk of flooding, and the commercial building being higher than the external levels, it is deemed that the risk of ground water flooding at the site is low.

The nearest drain and sewer are believed in to be in Stretton Way to the east of the site. There has been no history of flooding from the sewers, it is likely that the flood water will be contained within roads due to the upstand kerbs, and flood water would flow in a north to south direction into Logwood Mill Brook, before discharging onto the site. Therefore, the probability of flooding from drains and sewers for the site is deemed to be low.

There are no known canals, reservoirs or artificial sources near the development site; The Extents of Flooding from Reservoirs Map in Figure 4, indicates that the site is not in a flooding area; The Envirocheck (JBA) canal failure map indicates that the development site is in the anal coverage area, but is not in a canal failure area; And there has been no history of flooding from any sources. Therefore, based on the assessed data, the risk of flooding from canals, reservoirs or artificial sources is deemed to be low.

In accordance with Table 3 of the NPPF the development is appropriate due to it being in Flood Zone 1, and is classed as less vulnerable.

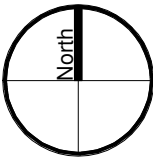
The finished floor level of the commercial building is level is 23.284m, it is 0.674m above the 1% AEP level. The NPPF recommends that the finished flood level is at least 600mm (0.600m) above the known flood level. Therefore, this is deemed to be acceptable.

Suitable flood compensation areas, depths and volumes are to be formed within the site to ensure that the development does not affect the flood flows or displaces any water to areas downstream of the Logwood Mill Brook.

Safe access and egress route levels are to be higher than the 0.1% AEP level of 22.610m AOD. The existing levels along the northern areas of the service yard / car park, and site entrance are at a lowest level of 22.749m AOD, and therefore safe access and egress can be made to the building from Stretton Road.

Therefore, as these levels are higher than the 0.1% AEP flood level, safe access and egress can be made from the commercial building, off / into the site from Stretton Way.

Appendix A
Site Location Plan



Notes

The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing.
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Scale Bars

TO BE USED ONLY AS GUIDANCE

1:100	mm		1000		3000		5000
1:200	mm			5000		8000	
1:500	M		5		15		25
1:1250	M		10		30		50 70

Rev	Description	By	Date
Client	Fleet Factors Pension Fund		
Job	Proposed Extension, Fleet Factors, Huyton		
Drawing	Planning - Site Location Plan		
POZ Ref	P5801_100	Rev	
BS Ref			
Date	19/07/21	Scale	1 : 1250 @ A3
3D CoOrd	AMH	2D CoOrd	AMH
		Approved	MKM
Project Status	Planning	Tender	Construction
	Design	Contract	As Built

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Site Location Plan
1 : 1250

P:\MCAD\5801-5850\5801\PAL\Design\Models\Fleet Factors Existing July 2021.rvt
02/08/2021 10:31:36

Appendix B

Existing Site Plan



Existing Site Plan
1 : 200

Notes
The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing.
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Scale Bars		TO BE USED ONLY AS GUIDANCE			
1:100	mm	0	1000	2000	3000
1:200	mm	0	1000	2000	3000
1:500	M	0	5	10	15
1:1250	M	0	10	20	30



1	Drawing issued for planning.	MKM	06.09.21
Rev	Description	By	Date
Client	Fleet Factors Pension Fund		
Job	Proposed Extension, Fleet Factors, Huyton		
Drawn	Planning - Existing Site Plan		
Revised	P5801_101	Rev	1
Date	19/07/21	Scale	1 : 200
Drawn	AMH	2D Coord	AMH
Approved	AMH	Approved	MKM
Project Status	Planning	Tender	Construction
	Design	Contract	As Built

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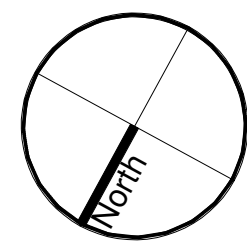
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Appendix C
Proposed Site Plan



Notes
The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing.
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Scale Bars		TO BE USED ONLY AS GUIDANCE			
1:100	mm	0	1000	2000	3000
1:200	mm	0	1000	2000	3000
1:500	m	0	10	20	30
1:1250	m	0	10	20	30



Proposed Site Plan
1 : 200

1	Drawing issued for planning.	MKM	06.09.21
Rev	Description	By	Date
Client: Fleet Factors Pension Fund			
Job: Proposed Extension, Fleet Factors, Huyton			
Drawing: Planning - Proposed Site Plan			
P5801_105		Rev	1
Date	19/07/21	Scale	1 : 200
Drawn	AMH	2D Coord	MKM
Check	AMH	3D Coord	MKM
Project Stage	Planning	Tender	Construction
	Design	Contract	As Built

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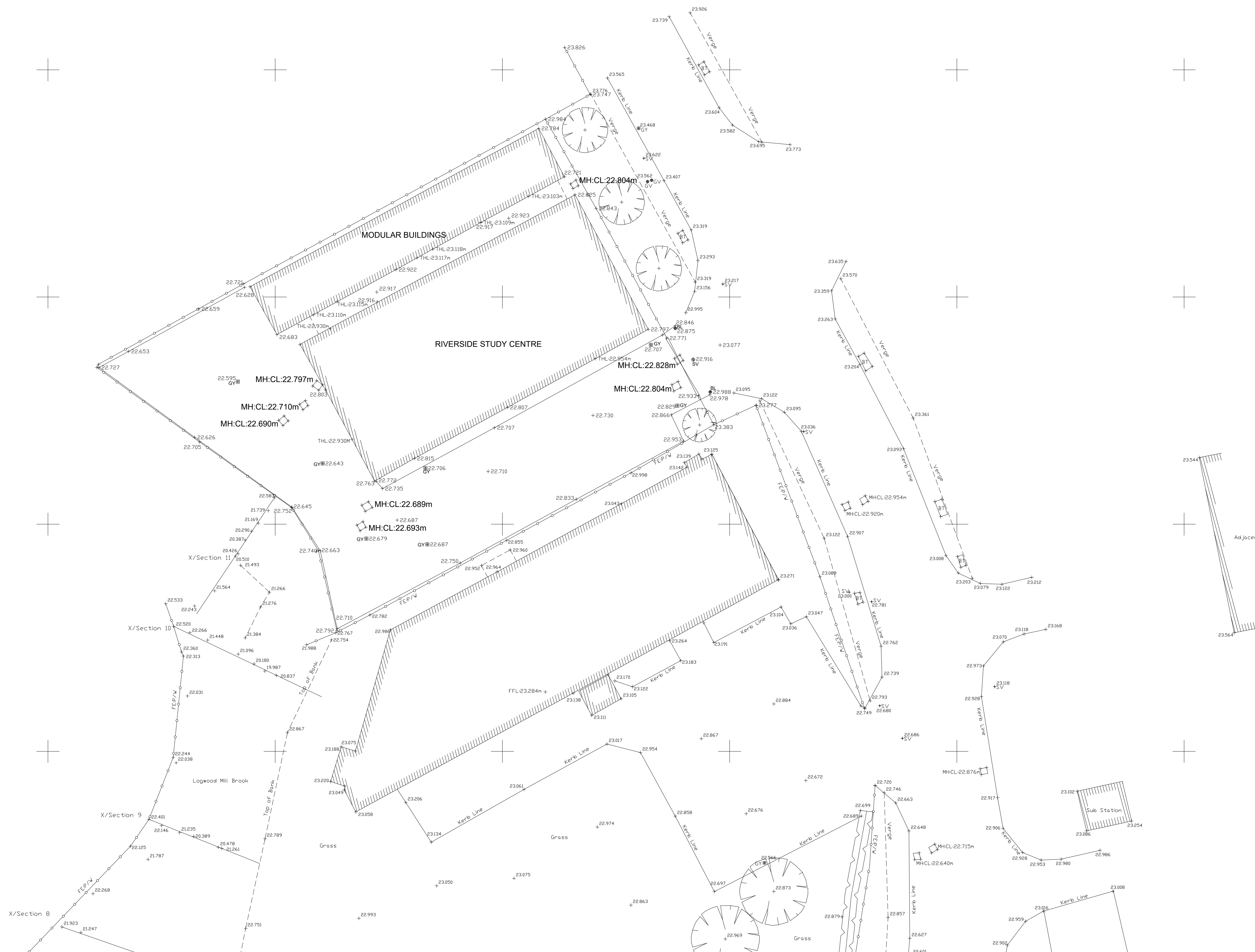
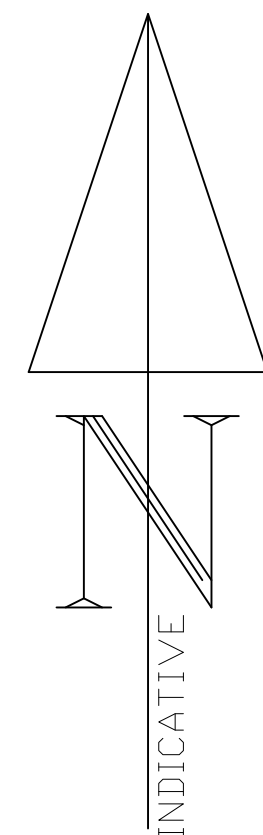
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Appendix D

Topographical Survey Plan

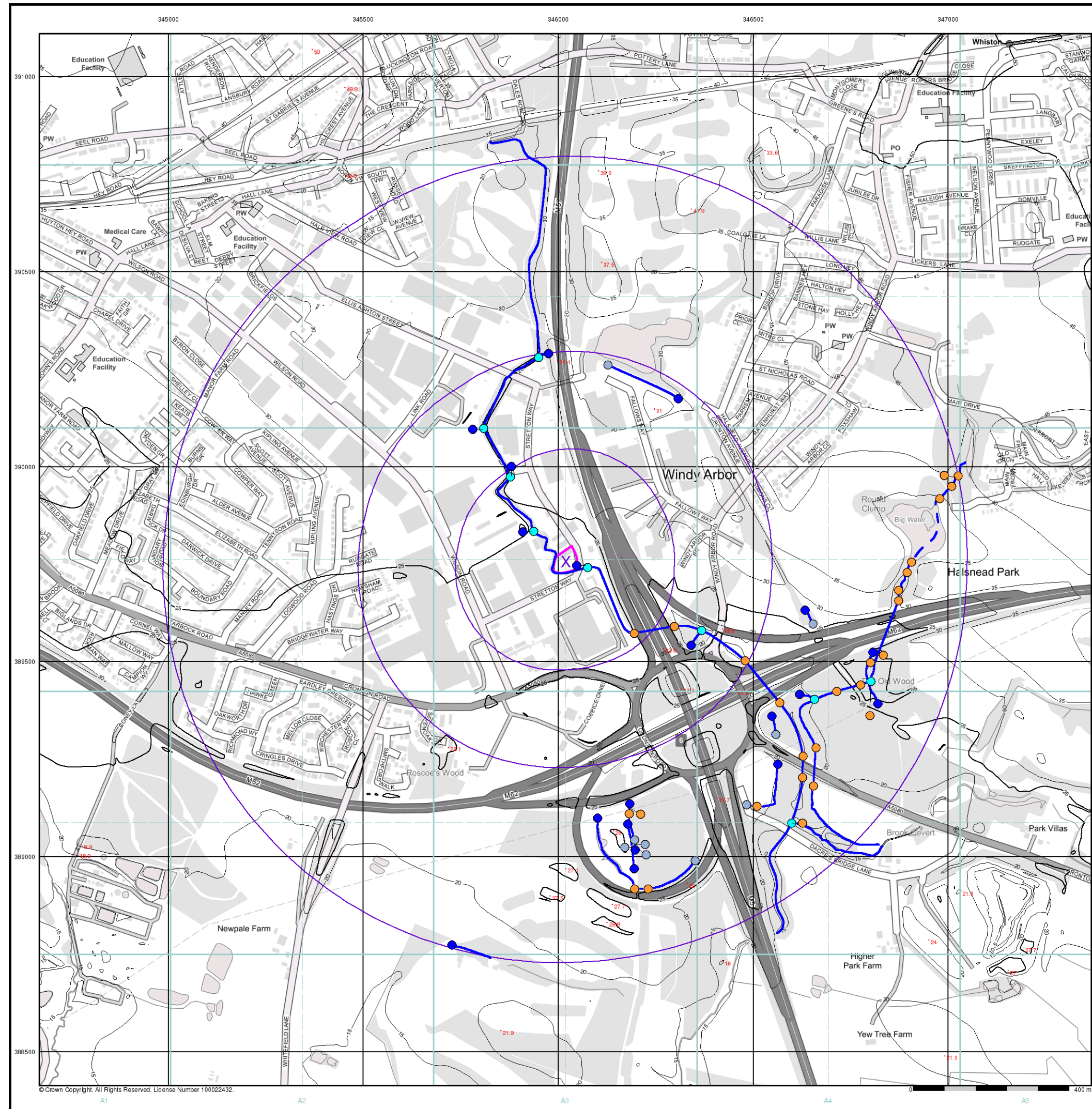
ABBREVIATIONS (where applicable)											
AV	Air Valve	DC	Drainage Channel	IC	Inspection Cover	OH	Overhead	SK	Skookaway	VP	Vent Pipe
BK	Brick	DP	Drain Pipe	IL	Invert Level	PAV	Paving	SPT	Septic Tank	WL	Water Level
BL	Ballard	EP	Electricity Pole	IS	Interceptor	PB	Paving Box	ST	Stilt	WM	Water Meter
BS	Bus Stop	ER	Earthing Rod	IR	Iron Roatings	PE	PE Pipe	SV	Stop Valve	WO	Wash Out
BT	British Telecom	FB	Flower Bed	JB	Junction Box	PM	Parking Meter	SVC	Security Video Camera		
C/B	Cable Boread	FE	Fence	KO	Keir Outlet	P/R	Post and Rail	T/CB	Telephone Call Box	MG	Multifit Tree
CL	Chainlink	FI	Fire Hydrant	LB	Lift Bin	PO	Post	TH	Threshold Level		
CLK	Chainlink	FL	Floor Level	LP	Lamp Post	P/W	Post and Wire	T	Traffic Light		
CO	Column	FG	Flag Pole	MC	Manhole Cover	RE	Roading Eye	TP	Telephone Pole		
CON	Concrete	GP	Gate Post	MR	Marker	RET	Retaining	TP	Telephone		
CP	Catch Pit	GV	Gas Valve	MS	Milestone	RS	Road Sign	UG	Underground		
CPS	Cable Paving Slabs	GV/S	Gas Valve	MS	Milestone	RSJ	Roller Steel Joist	U	Unable to Raise Further		
CTV	Cable Television	HT	Height	MY	Mercury	SC	Sign	UTR	Unable to Raise		



M.B.Surveying.Ltd Land & Engineering Surveyors ne Cottage Haul Road, Ashton Hayes Cheshire, CH3 8BH Tel: 01829 759306 Fax: 05660 761556 www.mbsurveying.co.uk	DATUM NOTES CO-ORDINATES USED ARE BASED ON A LOCAL ARBITRARY GRID. LEVELS ARE RELATED TO :- ORDNANCE SURVEY DATUM. DATUM USED LOCATED AT:- MH: CL: REF:8605 VALUE GIVEN AS:- 23.670m SURVEY CONTROL STATIONS SHOWN		* Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded as approximate only. * Tree species (where shown) should be treated with caution and expert identification is advised. * Although this is a digital survey the accuracy and amount of detail shown is only commensurate with the graphical scale of mapping as specified. Care should be exercised when working to larger scales. * Whilst every effort has been made to achieve accuracy on this plan, CRUCIAL clearance dimensions, levels and invert levels should be checked prior to design and construction. * Kerb levels have been taken in the bottom of the channel.		DRAWN	CHECKED	TRACED	CHECKED	APPROVED	Client:  Fleet Factors Ltd	STRETTON WAY HUXTON BUSINESS PARK LIVERPOOL L36 6JF TEL:0151 4807222 FAX:0151 4807333 	TITLE:	Extended Topographical Survey at Fleet Factors Ltd, Huxton Business Park.	
	DATE:	NOTES:	INITIALS	DATE	SCALE: 1/200	CLIENT REF: FF/ETS/01	Sheet:01 OF 02	DWG No: MBS-589-01	DATE: 10/10/08					



Appendix E
OS Water Network Map



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OS Water Network Lines Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

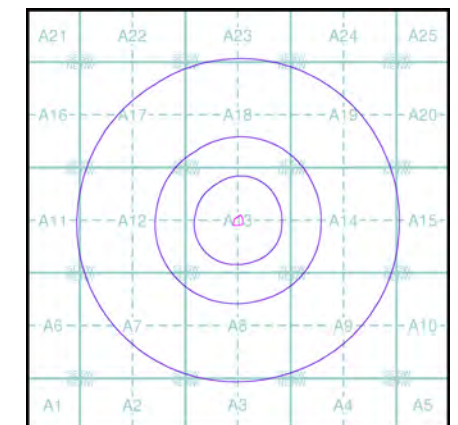
OS Water Network Data

- | | |
|--------------|-------------------------|
| Canal | Drain |
| Reservoir | Other |
| Foreshore | Lake |
| Marsh | Transfer |
| Tidal River | Lock Or Flight Of Locks |
| Inland River | Sea |
| Junction | Source |
| Outlet | Other |
| Pseudo | |

Contours (height in meters)

- Standard Contour 105 100 95
- Master Contour 105 100 95
- Spot Height 167.3
- MLW Mean Low Water
- MHW Mean High Water

OS Water Network Map - Slice A



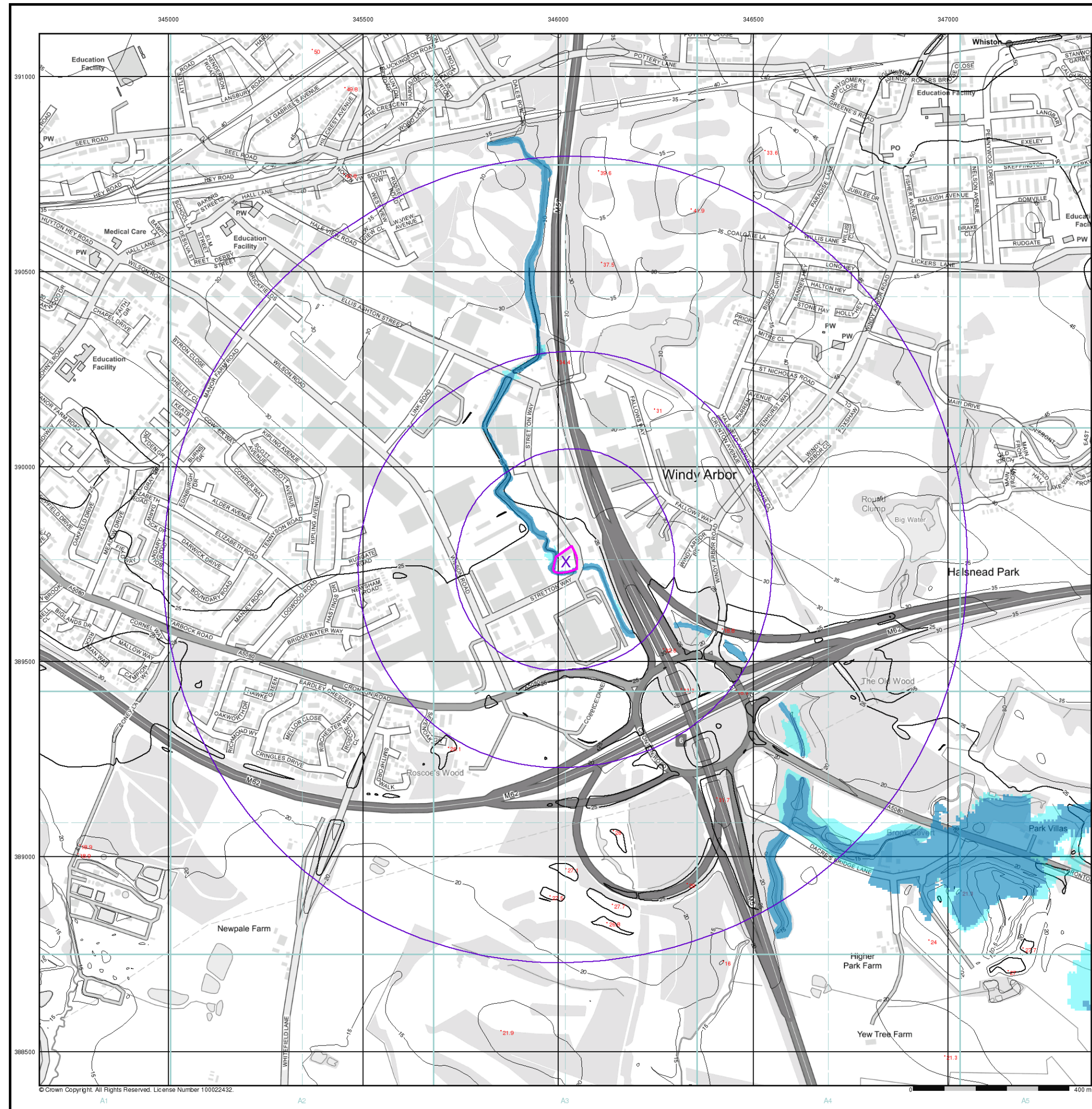
Order Details

Order Number: 284219328_1_1
Customer Ref: Fleet Factor
National Grid Reference: 346020, 389760
Slice: A
Site Area (Ha): 0.3
Search Buffer (m): 1000

Site Details

Site at 346030, 389770

Appendix F
EnviroCheck Flood Map Data



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Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

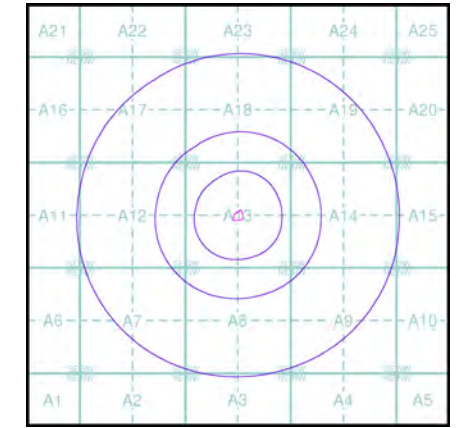
Flood Data

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

- Standard Contour: 105, 100, 95
- Master Contour: 105, 100, 95
- Spot Height: 167.8
- MLW: Mean Low Water
- MHW: Mean High Water

EA/NRW Flood Data Map - Slice A



Order Details

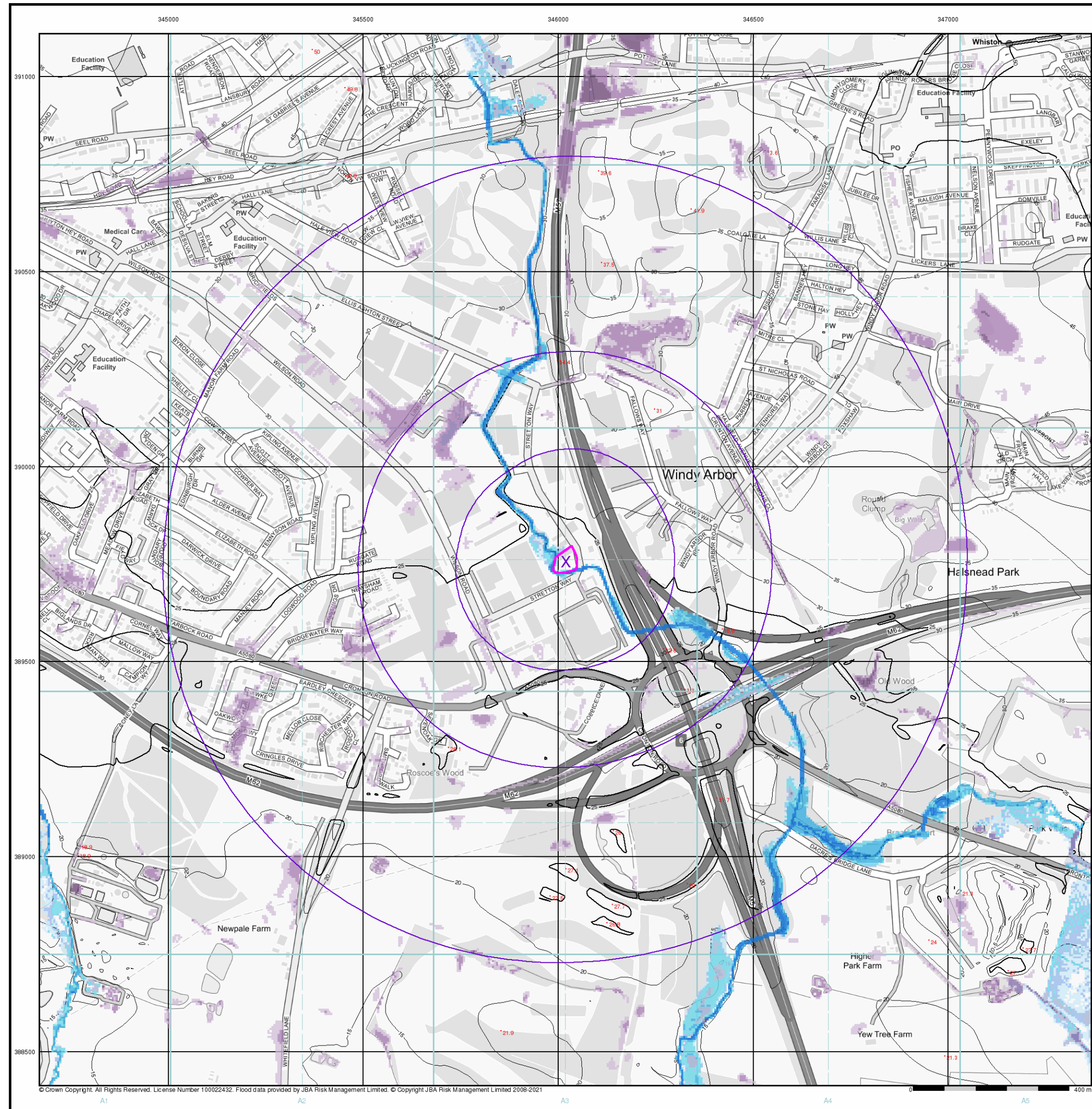
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 National Grid Reference: 346020, 389760
 Slice: A
 Site Area (Ha): 0.3
 Search Buffer (m): 1000

Site Details

Site at 346030, 389770

Landmark
 INFORMATION GROUP

Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



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Envirocheck®

LANDMARK INFORMATION GROUP®

JBA 75 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

Standard Contour: 105, 100, 95

Master Contour: 105, 100, 95

Spot Height: 167.8

MLW: Mean Low Water

MHW: Mean High Water

JBA 75 Year Return Flood Map (Undefended) - Slice A

Order Details

Order Number: 284219328_1_1
Customer Ref: Fleet Factor
National Grid Reference: 346020, 389760
Slice: A
Site Area (Ha): 0.3
Search Buffer (m): 1000

Site Details

Site at 346030, 389770

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