I&L CONSULTING ltd.

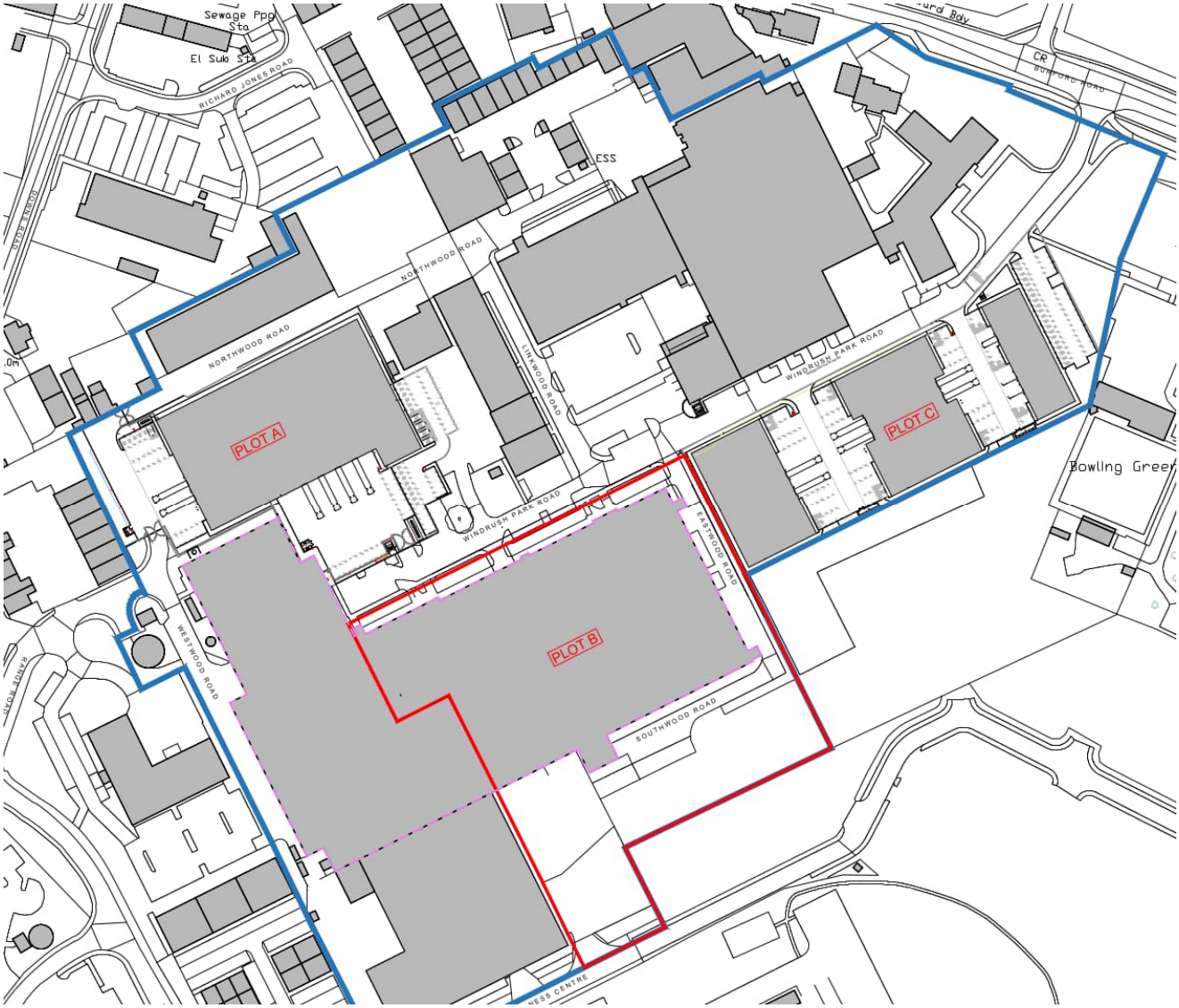
Windrush Park Road, Witney – Plot B

Flood Risk Assessment

CANMOOR

23-011_Windrush Park Road, Witney – Plot B

29th February 2024



Quality Control

Prepared by	Checked by	Approved by
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
Final	27.07.2023	Submission for Full Planning	GV	Grant Verster	Consultant
R1	06.02.2024	Revised Layout	GV	Grant Verster	Consultant
R2	29.02.2024	Revised Layout	GV	Grant Verster	Consultant

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1. Introduction

I&L Consulting Limited (I&L) have been commissioned by the Applicant, Canmoor Developments Ltd, to undertake a Flood Risk Assessment (FRA) for a proposed industrial development off Windrush Park Road in Witney. The site lies within the authority of Oxfordshire County Council (OCC).

The relevant national planning guidance is set out by the National Planning Policy Framework (NPPF, updated in 2019). A FRA is required because the proposed development is over 1 ha. The FRA must assess all aspects of flood risk both to the proposed development itself and also the potential impact on people and property elsewhere within the catchment.

1.1 Study Aims and Objectives

The overall objective of this study was to carry out a FRA that meets the requirements of the NPPF and SBC flood risk policies. These consider surface water runoff management and the specific needs of the Environment Agency (EA), OCC and Tames Water. The study is required to assess all aspects of flood risk to the proposed development, the potential impacts of the development on people and property elsewhere within the catchment and identify possible mitigation measures to ensure that the development is safe in the event of a flood. To achieve this aim, the following key actions were undertaken:

- Obtain flood data from the EA and OCC;
- Review topographical and flood risk data to identify the existing flood risk posed to the site from all sources;
- Assess the residual flood risk post-development;
- Consider the vulnerability of the users and the development, taking account of the vulnerability classification;
- Assess the safety of the route of access/egress from the site in a flood event;
- Identify suitable mitigation measures to protect the development site against flooding; and
- The production of a conceptual surface water drainage strategy for the proposed development.

1.2 Scope of Works

In order to meet the above objectives, the following scope of work and tasks were undertaken:

- **Task 1: Data Collection.** I&L Consulting collected relevant available information on the nature of the flooding at the site. The Applicant and their consultant team have provided information about the site and proposed development layout and design.
- **Task 2: Identification of Current and Post-Development Flood Risk.** The existing and post-development flood risk posed to the site was assessed from the data that was collected in Task 1. The assessment identifies the flood risk from all potential sources of flooding and includes consideration of the impact of climate change on flood risk.
- **Task 3: Assessment of Site Safety**. I&L Consulting considered whether flood resilience measures needed to be undertaken and the safety of the route of access/egress from the site.

1.3 Data Collected

Table 1 lists the data that has been collected as part of this assessment. Comments on the source and the nature of the data are also provided.

Table 1: Collected Data

Purpose	Data and Source	Comments
Identification of site location	Ordnance Survey Map	Identifies the position of the site and local hydrological features
Identification of flood risk	Environment Agency Flood Map	Risk of flood from tidal and fluvial sources
	Topographical Survey	Existing site levels and topography
	Development details (drawings for existing site and proposed development)	Information on the layout of the proposed development
	Strategic Flood Risk Assessment (SFRA)	Reports that identify existing flood risk information within the area and considerations for development.
Identification of the existing drainage network	Sitewide Drainage Plan	Asset plans and drainage drawings identify public and private sewers nearest to the site.
Identification of ground conditions	British Geological Society (BGS) Bore Logs and site investigation reports	Identifies the type of aquifer, groundwater level, permeability and geotechnical information

2. Planning Policy and Evidence

2.1 National Planning Policy Framework (2021)

The NPPF sets out what needs to be taken into account by developers to assess whether a proposed development is likely to be at risk of flooding or has the potential to increase flood risk elsewhere. Within the recently published updated NPPF (2021), the principles relating to flood risk management remain mostly unchanged from the 2012 version.

The overall objective of the NPPF is to steer development towards areas of lowest flood risk. NPPF policy aims to ensure flood risks have been taken into account and appropriate measures put in place to ensure that:

- The development is safe;
- Where possible, the flood risk overall is reduced;
- Increased flood risk does not occur elsewhere; and
- Appropriate mitigation measures are employed to deal with these effects and risks.

Paragraph 167 and footnote 55 of the NPPF outlines that a site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

The EA Flood Map shows the site to be located within Flood Zone 1, low risk from fluvial flooding but medium/high risk for surface water flooding.

The NPPF considers the vulnerability of different forms of development to flooding; and classifies the proposed development as ‘Less Vulnerable’.

2.2 Oxfordshire County Council – Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire, November 2018

PEAK FLOW CONTROL

NATIONAL STANDARDS

S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

LOCAL STANDARDS

L1 The greenfield runoff rate will need to be agreed with the LLFA, Environment Agency (EA), relevant sewerage undertaker and Canal and River Trust (CRT), where appropriate, and should take into account the 1 in 1 year, 1 in 30 year and 1 in 100 year rainfall events, including climate change allowances.

L2 Evidence would need to be provided to support a higher rate of discharge than greenfield rates, and would have to be agreed by the relevant authorities as in L1.

L3 For brownfield or previously developed sites, where it is proposed to discharge runoff at rates greater than greenfield rates, evidence will be required to demonstrate why it is not feasible to achieve greenfield

rates. The capacity of any existing drainage system within the site should also be assessed in order to determine the current discharge rates.

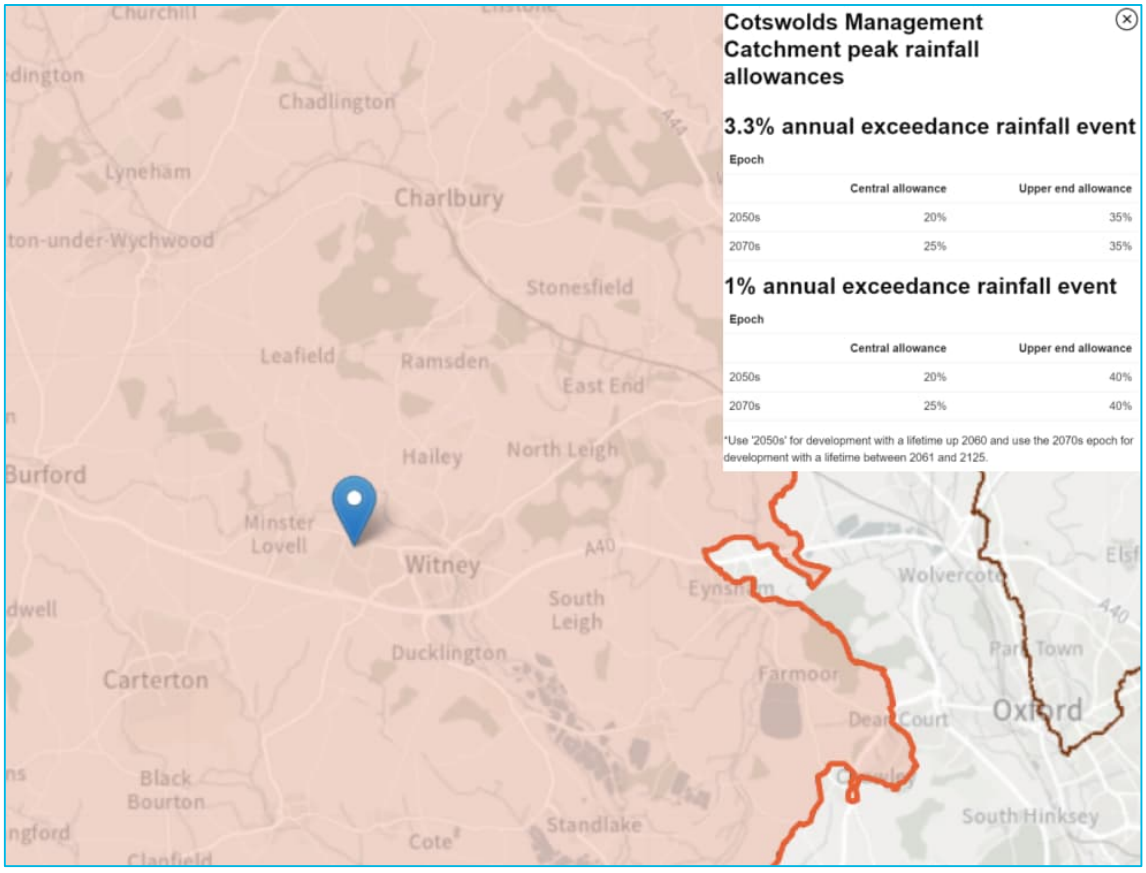
L4 All flow control devices restricting the rate of flow should have a bypass feature to manage flows when a blockage occurs. The bypass can be an internal weir overflow within the chamber discharging to the outfall pipe or channel. An overflow shall be provided from any basin/pond etc safely routing flows to the discharge location.

L5 For all residential developments, the proposed impermeable area for the site used in all calculations should include an additional allowance of 10% to account for the potential of Urban Creep.

2.3 Climate Change

Predicted future change in peak river flows caused by climate change are provided by the EA within their online guidance1. The UK has been split into a series of regionalised 'River Basin Districts'. These River Basin Districts are further split into Management Catchments, for which a range of climate change projections have been applied.

The Proposed Development falls within the Severn Middle Worcestershire Management Catchment. The extract below identifies the relevant peak rainfall allowances from this Management Catchment.



When determining the appropriate allowance for use in an FRA the anticipated lifespan of the development should be considered. This Proposed Development is expected to have a design life which goes beyond 2060.

The EA guidance is to use the central allowance for the 2070s epoch (2061 to 2125), which gives values of 25% for the 3.3% (30yr) and 25% for the 1% (100yr) rainfall events. The value of **25%** has be used in the surface water calculations appended to this report.

[1] Environment Agency, Flood risk assessments: climate change allowances: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-1

3. Site Description

The proposed development site which is the subject of this Flood Risk Assessment (FRA) is located off Windrush Park Road in the Windrush Industrial Park. The existing site is currently fully developed by an existing Industrial unit along with service yard and parking. The development will be accessed via Windrush Park Road and Glenmore Business Centre Road (southern boundary).

The proposed development will consist of a two terraces of industrial units with associated parking, soft landscaping and HGV turning areas. The total development site generally flat with a total site area of 2.1Ha.

The existing site is a Brownfield development with associated hardstanding and drainage, see **Appendix A**. The proposal would be to drain the developed site by gravity and discharge at a restricted rate using a hydro brake flow control into the existing public storm water network, see **Appendix C**.

The site location plan is shown in Figure 1 below.

Figure 1: Site Location Plan

3.1 Topography and Hydrological Setting

Environment Agency (EA) river mapping shows that the nearest watercourse is the River Windrush, which is located approximately 840m to the north of the site.

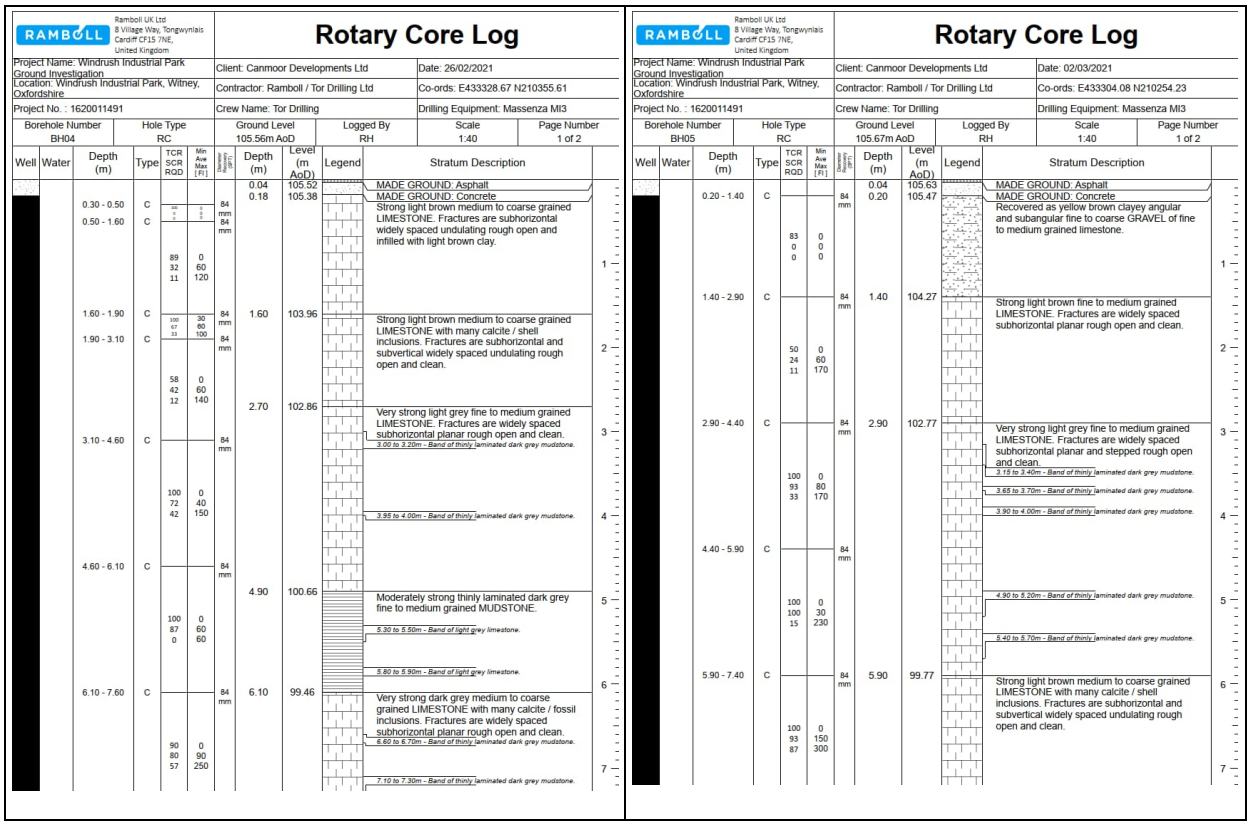
The topographic survey (**Appendix A**) indicates that the site levels are generally flat. Spot levels taken from topographical survey have site levels generally at 105.50m AOD with the existing Industrial unit having an FFL of 105.60m AOD.

Existing site drainage plan included as **Appendix A** shows existing foul and surface water drain runs along with gully positions. Existing surface water discharges via a piped network to the Thames Water public

surface water sewer located to the south of the site in Glenmore Business Centre Road at an unrestricted rate.

3.2 Geology and Hydrogeology

Intrusive testing has been undertaken Ramboll across the site. Two BHs have been completed on the proposed site which show the site to be underlain with gravel to 1.3m bgl. and below this limestone and mudstone. BH logs included below.



RAMBOLL — Ramboll UK Ltd, 8 Village Way, Tongwynlais, Cardiff CF15 7NE, United Kingdom

Rotary Core Log

Project Name: Windrush Industrial Park Ground Investigation	Client: Canmoor Developments Ltd		Date: 26/02/2021
Location: Windrush Industrial Park, Witney, Oxfordshire	Contractor: Ramboll / Tor Drilling Ltd		Co-ords: E433328.67 N210355.61
Project No. : 1620011491	Crew Name: Tor Drilling		Drilling Equipment: Massenza MI3
Borehole Number: BH04	Hole Type: RC	Ground Level: 105.56m AoD	Logged By: RH / Scale: 1:40 / Page Number: 1 of 2

Well	Water	Depth (m)	Type	TCR / SCR / RQD	Min Ave Max [Ø1]	Depth (m)	Level (m AoD)	Legend	Stratum Description
						0.04	105.52		MADE GROUND: Asphalt
						0.18	105.38		MADE GROUND: Concrete
		0.30 - 0.50	C						Strong light brown medium to coarse grained LIMESTONE. Fractures are subhorizontal widely spaced undulating rough open and infilled with light brown clay.
		0.50 - 1.60	C	89 / 32 / 11	0 / 60 / 120				
		1.60 - 1.90	C			1.60	103.96		Strong light brown medium to coarse grained LIMESTONE with many calcite / shell inclusions. Fractures are subhorizontal and subvertical widely spaced undulating rough open and clean.
		1.90 - 3.10	C	58 / 42 / 12	0 / 60 / 140				
						2.70	102.86		Very strong light grey fine to medium grained LIMESTONE. Fractures are widely spaced subhorizontal planar rough open and clean.
		3.10 - 4.60	C	100 / 72 / 42	0 / 40 / 150				3.00 to 3.20m - Band of thinly laminated dark grey mudstone.
									3.95 to 4.00m - Band of thinly laminated dark grey mudstone.
		4.60 - 6.10	C	100 / 87 / 0	0 / 60 / 60	4.90	100.66		Moderately strong thinly laminated dark grey fine to medium grained MUDSTONE.
									5.30 to 5.50m - Band of light grey limestone.
									5.80 to 5.90m - Band of light grey limestone.
		6.10 - 7.60	C	90 / 80 / 57	0 / 90 / 250	6.10	99.46		Very strong dark grey medium to coarse grained LIMESTONE with many calcite / fossil inclusions. Fractures are widely spaced subhorizontal planar rough open and clean.
									6.60 to 6.70m - Band of thinly laminated dark grey mudstone.
									7.10 to 7.30m - Band of thinly laminated dark grey mudstone.

RAMBOLL — Ramboll UK Ltd, 8 Village Way, Tongwynlais, Cardiff CF15 7NE, United Kingdom

Rotary Core Log

Project Name: Windrush Industrial Park Ground Investigation	Client: Canmoor Developments Ltd		Date: 02/03/2021
Location: Windrush Industrial Park, Witney, Oxfordshire	Contractor: Ramboll / Tor Drilling Ltd		Co-ords: E433304.08 N210254.23
Project No. : 1620011491	Crew Name: Tor Drilling		Drilling Equipment: Massenza MI3
Borehole Number: BH05	Hole Type: RC	Ground Level: 105.67m AoD	Logged By: RH / Scale: 1:40 / Page Number: 1 of 2

Well	Water	Depth (m)	Type	TCR / SCR / RQD	Min Ave Max [Ø1]	Depth (m)	Level (m AoD)	Legend	Stratum Description
						0.04	105.63		MADE GROUND: Asphalt
		0.20 - 1.40	C			0.20	105.47		MADE GROUND: Concrete
				83 / 0 / 0	0 / 0 / 0				Recovered as yellow brown clayey angular and subangular fine to coarse GRAVEL of fine to medium grained limestone.
		1.40 - 2.90	C			1.40	104.27		Strong light brown fine to medium grained LIMESTONE. Fractures are widely spaced subhorizontal planar rough open and clean.
				50 / 24 / 11	0 / 60 / 170				
		2.90 - 4.40	C			2.90	102.77		Very strong light grey fine to medium grained LIMESTONE. Fractures are widely spaced subhorizontal planar and stepped rough open and clean.
				100 / 93 / 33	0 / 80 / 170				3.15 to 3.40m - Band of thinly laminated dark grey mudstone.
									3.65 to 3.70m - Band of thinly laminated dark grey mudstone.
									3.90 to 4.00m - Band of thinly laminated dark grey mudstone.
		4.40 - 5.90	C	100 / 100 / 15	0 / 30 / 230				4.90 to 5.20m - Band of thinly laminated dark grey mudstone.
									5.40 to 5.70m - Band of thinly laminated dark grey mudstone.
		5.90 - 7.40	C	100 / 93 / 87	0 / 150 / 300	5.90	99.77		Strong light brown medium to coarse grained LIMESTONE with many calcite / shell inclusions. Fractures are subhorizontal and subvertical widely spaced undulating rough open and clean.

4. Existing Flood Risk

This section of the report identifies the existing risks from the different forms of flooding identified in NPPF.

4.1 Fluvial & Tidal Flooding

The EA has produced Flood Zone maps for much of England and Wales. The current displayed map is reproduced as Figure 2 below and shows the site to lie within Flood Zone 1 (low risk). Flood Zone 1 is defined as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

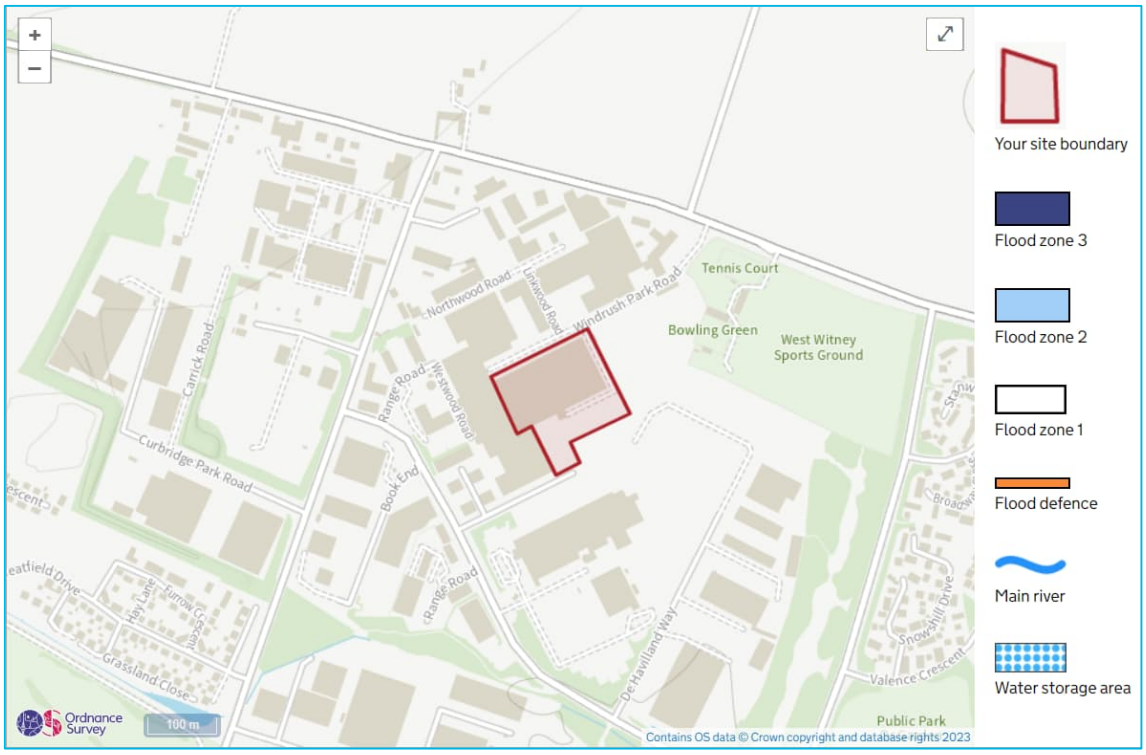


Figure 2: EA Flood Map for Planning (Source: https://flood-map-for-planning.service.gov.uk/)

On the coast storm surges and high tides can threaten low lying coastal areas and can be sometimes large and rapid enough to overtop defence works, causing significantly more damage than river flooding. Tidal flooding is not considered a risk to the site due to the inland location of the development.

Therefore, flood risk from fluvial and tidal sources to the site is considered to be low.

4.2 Surface Water Flooding

Surface water flooding occurs when rainfall is unable to infiltrate into the ground and/or engineered drainage networks and accumulates on the surface.

The risk of flooding from surface water is presented in the GOV.UK online map at a strategic scale. It can be seen from the surface water flood map in Figure 3 that the site is shown to be at a very low risk of surface water flooding. There are isolated areas of medium flood risk located in the existing parking areas on site. This surface water flooding would be from sub-standard existing drainage.

As part of the redevelopment a new drainage system will be installed with surface water attenuation and flow control. The risk following development will therefore be at low level and unlikely to cause any risk to the site.

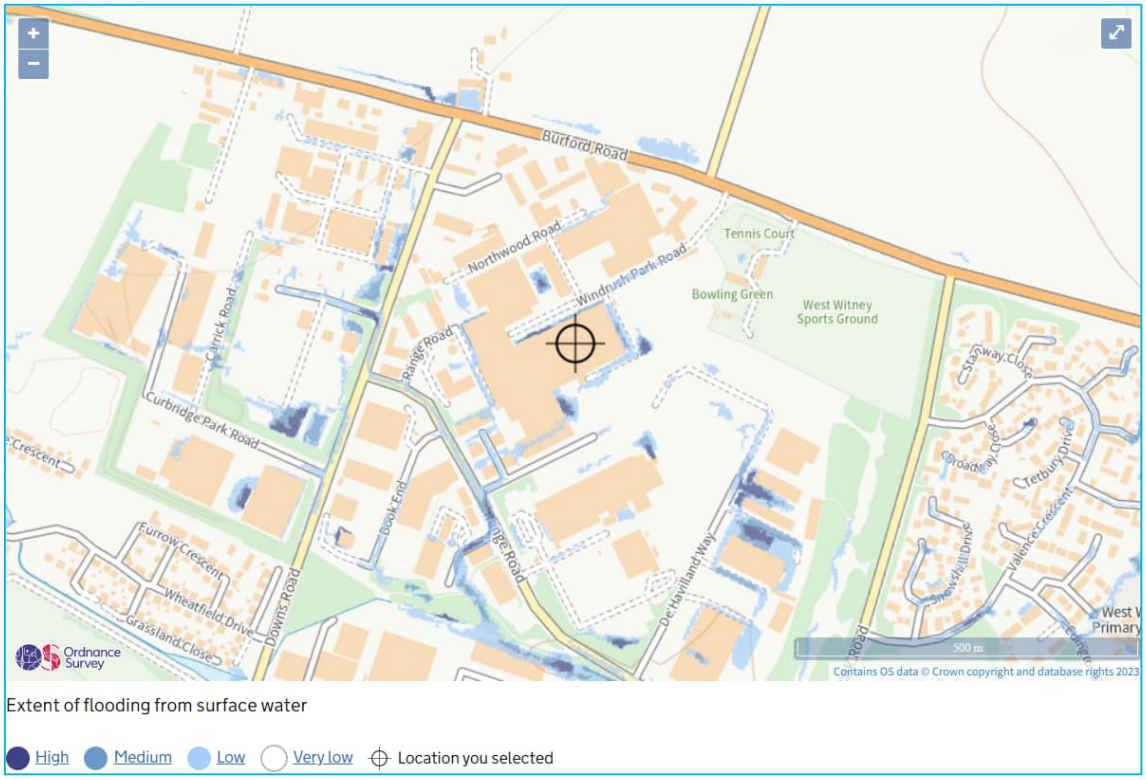


Figure 3: Surface Water Flood Risk Map. (Source: https://flood-warning-information.service.gov.uk)

Given the topography, existing drainage system and surface water flood map information, the site is understood to be at a low risk from surface water flooding.

4.3 Groundwater Flooding

The site geology is expected to consist of a made ground over sand and gravel with bedrock of limestone. The site is therefore not considered to be at risk from ground water flooding.

The existing flood risk from groundwater is therefore considered to be low.

4.4 Sewer Flooding

A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes. Most adopted surface water drainage networks are designed to the criteria set out in Sewers for Adoption. One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30-year rainfall event. By definition a 1 in 100-year event would exceed the capacity of the surrounding sewer network as well as any proposed drainage.

To ensure that sewer and surface water flooding is not exacerbated; surface water must be considered within the design of the site. This ensures that any additional surface water and overland flows are managed correctly, to minimise flood risk to the site and the surrounding area.

The site will have new surface and foul water connection points. The connection and network downstream have been designed considering the future developments in these sites.

Therefore, the risk of sewer flooding to the site is considered low.

4.5 Artificial Sources of Flooding

The EA Flood Risk from Reservoirs mapping indicates that the site is located outside of an area of potential risk from flooding. There has been no loss of life in the UK from reservoir flooding since 1925.

Figure 4: Reservoir Flood Risk Map. (Source: https://flood-warning-information.service.gov.uk)

Therefore, the risk from this type of flooding can be considered low.

4.6 Summary of Existing Flood Risk

The flood risk from fluvial & tidal flooding, surface water flooding, sewer flooding and groundwater is assessed to be low.

The flood risk to the site is summarised in Table 3.

Table 2: Summary of flood risk to the Site

Type of Flooding	Source of Flooding	Existing Flood Risk
Fluvial and Tidal	River Windrush	Low
Surface Water	Runoff from the site and surrounding land	Low
Sewers	Surrounding public foul drainage systems	Low
Ground Water	Underlying geology and groundwater levels	Low
Artificial Sources	none	n/a

5. Flood Risk from the Proposed Development

The proposal is for erection of a two terraces of two light industrial, E(g) iii, B2 and B8 units complete with ancillary office accommodation at first floor, individual parking and service areas on a site of circa 2.1 hectares at an existing Brownfield site located inside the Windush Industrial Estate.

The proposed development drawing is included in **Appendix B**.

5.1 Fluvial and Tidal Flooding

The site is located within Flood Zone 1 and at low risk of fluvial flooding.

The proposed development work would not have any impact on the fluvial or tidal flooding.

Therefore, the risk of flooding from fluvial and tidal sources has therefore been assessed as to remain low.

5.2 Surface Water Flooding and Proposed Drainage Strategy

Recommendation provided in the OCC Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire, reference policy L3, is;

"where it is proposed to discharge runoff at rates greater than greenfield rates, evidence will be required to demonstrate why it is not feasible to achieve greenfield rates. The capacity of any existing drainage system within the site should also be assessed in order to determine the current discharge rates."

Additional Guidance.

"As a minimum, brownfield sites should reduce the discharge by 40% to account for the impacts of climate change, from the existing site runoff OR from the original un-surcharged pipe-full capacity of the existing system, whichever is the lowest.

A utility scan of the site has been undertaken, see **Appendix B** and Figure 5 below. This shows an existing site is served by two pipes, 1 no. 225 dia. and a 150 dia. surface water pipes. There is no existing restriction in place on the discharge rate for the surface water from the existing industrial unit and external yard.

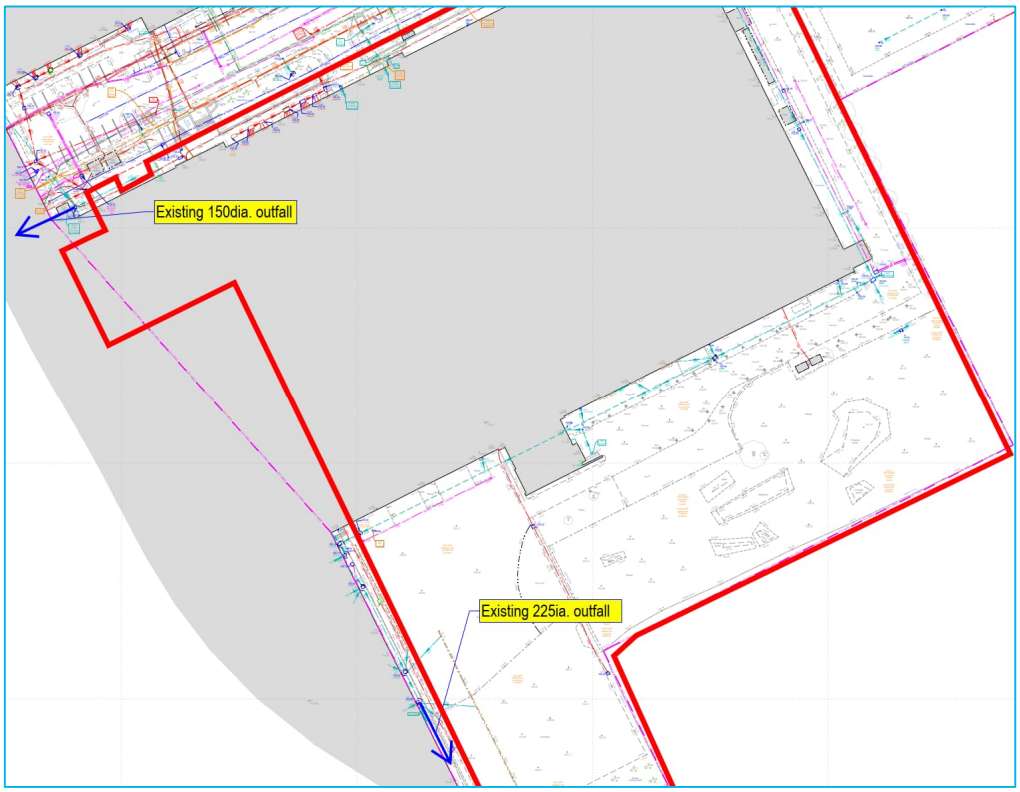


Figure 5: Extract from Utility plan showing existing drainage on site

The surface water flood maps (Figure 3, above), shows the site is not prone to surface water flooding.

Site-specific investigation have been completed and the BH logs confirm the site to be underlain by Limestone and Mudstone which has a very low potential for infiltration drainage. The preliminary design has therefore not allowed for any infiltration.

The proposed aquacell storage on site, shown on the attached drainage strategy drawing (**Appendix D**), will be left aligned as ground water is not expected to be an issue on this site. Infiltration through the base and sides of these storage tanks will therefore be possible.

The surface water drainage network for the proposed development is in line with the principles of integrated Construction Industry Research and Information Association (CIRIA) Sustainable Drainage System SuDS and source control methods to convey surface water runoff flows from the site as well as national and local standard.

- The site is a Brownfield site with existing drainage in place and no formal restrictions on discharge rates. The existing site is 100% impermeable! The in-situ ground is not expected to be conducive to infiltration drainage and therefore SuDS options at the proposed development are limited. The proposal therefore is to limit the discharge from the redeveloped site for from 1 in 1 year to 1 in 100 year return periods, including climate change allowances;
- Appropriate attenuation to be provided onsite;
- The onsite surface water drainage design will follow the principles listed in the Approved Document Part H of the Building Regulations and Sewers for Adoption 7th Edition. The Building Regulations established a hierarchy for surface water disposal which encourages a SuDS approach;
- No surcharge for the 1:1year rainfall event except for the outfall pipe which may surcharge due to restriction.
- Onsite surface water sewers shall be designed to a 1 in 30 year no flooding standard in accordance with BS EN 752: 2017. There will be no flooding of buildings or off-site areas during a 1 in 100-year return period storm event including climate change allowance.
- Any onsite flooding in the 1:100+40% event, will be directed into a safe place or mitigation measures to be provided on site for any flooding over 5m^3.

The proposed drainage network and attenuation requirements are modelled using industry standard hydraulic modelling software and included in **Appendix C**. The controlled discharge will be made into the public sewer network as approved by Thames Water located in the southwest corner of the site.

The proposed drainage layout is included in **Appendix D**.

Therefore, the risk of surface water flooding from the proposed development will remain low.

An assessment has been undertaken to compare the existing uncontrolled surface water runoff from the 2.1ha impermeable site. The existing site has existing 150dia and a 225 pipes serving the site. A 'Colebrook-White' calculation, see **Appendix C**, has been undertaken which shows the existing pipes have a combined discharge capacity of 56.8L/s. As per the recommendations given in the Local Flood Risk Strategy a **50% reduction/betterment** has been applied limiting the redeveloped site to a controlled **28.4L/s**.

Table 4: Existing/Proposed Surface Water Runoff

Storm Event	Existing(l/s)	Proposed(l/s)	Reduction (l/s)	Reduction (%)
1yr Storm	56.6	28.4	28.2	50%
2yr Storm	150.2	28.4	121.8	81%
30yr storm	286.6	28.4	258.2	90%
100yr Storm	374.3	28.4	345.9	92%
100yr Storm + 40%CC	524.0	28.4	495.6	95%

As can be seen the proposed controlled runoff will equate to a 95% reduction from the existing scenario for the 100yr storm event. The drainage has been designed to accommodate all storms up to and including the

100yr event, including a 40% allowance for climate change. **Appendix D** shows the proposed drainage strategy, and the **Appendix C** shows the corresponding drainage calculations.

Assessment of Surface Water Management Options

For sustainable management of surface water run-off from a new development, the use of SuDS is recommended. Table 6 provides a comparison of the different kinds of SuDS systems and their suitability for use at the development site.

5.3 Water Quality

Table 26.2 of the CIRIA C753 SuDS Manual identifies that the pollution hazard level associated with the land uses within the Proposed Development as being 'Medium'. On a scale from 0 – 1, 'Commercial Yard & delivery areas' are deemed to have the following pollution hazard indices:

- Total suspended solids = 0.7
- Metals = 0.6
- Hydrocarbons = 0.7

The SuDS Manual confirms that in England and Wales, where the destination of runoff is to a watercourse then surface water indices should be used for the surface water discharge (Table 26.3 of The SuDS Manual).

The proposed surface water drainage strategy discharges to an existing sewer out falling into a watercourse. Therefore, the use of the surface water indices approach is deemed to be appropriate.

In terms of pollution control the site it is proposed that the commercial yard and delivery areas are to be protected by Class 1 bypass petrol interceptor. The pollution mitigation assessment is summarised in Tables 5 below. The pollution removal characteristics of the pollution control features are based on data in CIRIA C753 and data provided by the product manufacturers.

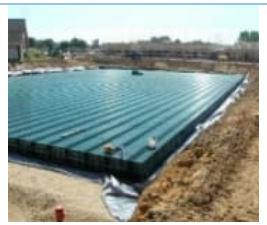
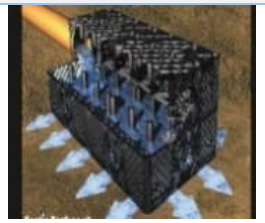
Table 5: Pollution Mitigation Assessment for the site

Type of SuDS component	Total suspended solids (TSS)	Metals	Hydrocarbons
Class 1 Bypass Petrol Interceptor (Kingspan or similar)	0.4*	0.6*	0.8*
Total	**0.4**	**0.6**	**0.8**

*subject to manufactures details

The results in Table 5 show that there is a minor residual impact associated with the Total Suspended Solids. However, whilst Pollution Mitigation Index data is not provided in CIRIA C753 for gullies/catch pit manholes, it is anticipated that sumps at the base of the gullies and catch pits will provide a positive improvement that would mitigate the residual impact for the Total Suspended Solids.

Table 6: Assessment of Suitability of SuDS at the site as the drainage hierarchy

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site
Retention	Balancing Pond		Provides both storm water attenuation and treatment. Run-off from each rain event is detained and treated in the pool. The retention time promotes pollutant removal through sedimentation.	Good removal of pollutants, can be used where groundwater is vulnerable, good community acceptability, high ecological, and amenity benefits.	No reduction in run-off volume, land take may limit use in high density sites.	× Not suitable for the type of development
	Sub-surface Storage		Oversized pipes, tank systems and modular geocellular systems that can be used to create a below ground storage structure.	Modular and flexible, dual usage (infiltration/storage, high void ratios), can be installed beneath trafficked and soft landscaped areas.	No water quality treatment.	✓ Sub-surface storage is recommended.
Wetland	Shallow wetland Extended detention wetland Pond wetland Pocket wetland Submerged gravel wetland Wetland channel		Wetlands provide storm water attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands detail flows for an extended period to allow sediments to settle and to remove contaminants. They can provide significant ecological benefits.	Good pollutant removal and if lined can be used where groundwater I vulnerable. Good community acceptability, ecological and amenity benefits.	Land take is high, requires base flow, little reduction in run-off volume, not suitable for steep sites.	× Wetlands are not possible due to the high land take required
Infiltration	Infiltration trench Infiltration basin Soakaway		Surface water run-off can be discharged directly to ground for infiltration by soakaways, basins, or trenches. A prerequisite is that both groundwater and ground conditions are appropriate to receive the quality and quantity of water generated.	Reduces the volume of run-off, effective at pollutant removal, contributes to groundwater recharge, simple and cost-effective, easy performance observation.	Requires appropriate pre-treatment, basins require a large flat area, offset from foundations.	× Infiltration unlikely with the expected geology under the site. Proposed tanks to be left unlined to allow some infiltration if possible.

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site
	Porous paving Permeable paving		Block or porous paving allows run-off to infiltrate through to subbase layer. Water can then be infiltrated into ground or conveyed into storage or drainage systems.	Reduces the volume of run-off and if designed for infiltration contributes towards groundwater recharge. East to install and retrofit. Simple to manage. If lined can be used where groundwater is sensitive.	Not suitable for heavily trafficked areas or adoptable roads. Requires regular sweeping to prevent clogging with dirt.	✓ Porous paving to the car parking could be used but this would need to be assessed against HGV movements.
Filtration	Surface sand filter Sub-surface sand filter Perimeter sand filter		Structures designed to treat surface water run-off through filtration using a sand bed filter medium. The filters can be designed with or without infiltration. Temporary storage of run-off is achieved through ponding above the filter layer. They are used where particularly high pollutant removal is required.	Flexibility of design, efficient in removing pollutants, suitable for retrofits and in tightly constrained urban locations.	Not for high sediment content, detention times can support algae growth, minimum hydraulic head of 1.2m required, possible odour problems, high capital and maintenance cost.	× There is no requirement for high pollution reduction at this site
	Bioretention/filter swale		Vegetated strips of land designed to accept run-off as overland sheet flow between a hard-surfaced area and a receiving system.	Landscaping features, effective in removing pollutants, flexible layout to fit into landscape, suited for highly impervious areas, good retrofit, capability, effective pre-treatment option.	Requires landscaping and management, large land required, not suitable for steep sites; no significant attenuation or reduction of flows.	× No requirement for high pollution reduction; large land areas not available.
	Filter trench/drain		Shallow excavations filled with rubble or stone that create temporary subsurface storage for filtration of storm water run-off.	Hydraulic benefits achieved with filter trenches, trenches can be incorporated into site landscaping and fit	High clogging potential without effective pre-treatment, limited to small catchments,	× Not feasible for the proposed development

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site
			Receive lateral inflow from an adjacent impermeable surface.	well beside roads and car parks.	high cost of replacing filter material.	
Detention	Detention basin		Surface storage basins that provide flow control through attenuation. Normally dry and in certain situations the land may also function as a recreational facility	Cater for a wide range of rainfall events, can be used where groundwater is vulnerable, potential for dual land use, easy to maintain.	Land take, little reduction in run-off volume, detention depths constrained by levels.	× Not suitable and not required for this site
	Enhanced dry swale Enhanced wet swale		Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate.	Incorporate into landscaping, good removal of pollutants, reduces run-off rates and volumes, low cost.	Not suitable for steep areas, significant land take, not suitable in areas with roadside parking.	× Not suitable and not required for this site
Conveyance	Conveyance swales Rills		Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Negate the need for underground pipework. Can provide some attenuation. Possible reduction in run-off volume via plant uptake and infiltration.	Potential trip/wheel hazard, disable access issues.	× Not suitable and not required for this site
Source control	Green/brown roof		Multi-layered system that covers the roof of a building with vegetation cover/landscaping over a drainage layer. Designed to intercept and retain precipitation, reducing the volume of run-off and attenuating peak flows.	Mimics greenfield state of building footprint for high density developments, good removal of pollutants, ecological benefits, insulates buildings, sound absorption.	Additional weight, not appropriate for steep roofs, maintenance of roof vegetation.	× Not suitable for the proposed structure at this site

5.3.1 Maintenance of SuDS

The on-site drainage will be managed by the site management company who will be responsible to maintain any on-site services including drainage. The off-site private drainage is managed by a management company managing the business park.

Table 7: Management and Maintenance Strategy

Drainage Feature	Regular Maintenance	Occasional/Remedial Maintenance	Monitoring
Drainage channels/Gullies	• Inspections will include gratings; covers including their locking bolts; sumps and sump buckets; exposed concrete surround and adjacent surfacing. • Check for accumulation of debris and silt and cleaned as necessary • Gratings, frames and all associated locking parts to be checked for damage. • Exposed concrete and adjacent surfacing to be checked for cracking and general damage. • Check condition of inlet and outlet pipes, flow controls, baffles and isolation structures	• Channel/Slot cleaning will be by flushing with water or high-pressure jetting (no boiling water or cleaning agent will be used). All silt buckets and sumps will be cleaned out replaced back into the units ensuring they are correctly fitted. • All channel surfaces and joints will be checked and repaired as necessary. • Repair/rehabilitation of inlets, outlet, as required.	• Inspect every 4 months or after large storm.
Manholes/Inspection Chambers	• Check for accumulation of debris and silt and clean as necessary. • Covers and frames to be checked for damage. • Exposed concrete and adjacent surfacing to be checked for cracking and general damage. • Check condition of inlet and outlet pipes, flap valves, baffles etc.	• Clean as necessary. • All manhole and inspection chamber covers and frames to be replaced as necessary. • Repair exposed concrete and surfacing as necessary • Repair/rehabilitation of inlets, outlet, overflows and vents, as required.	• Inspect every 6 months or after large storm.
Attenuation / Tanks	• Check for accumulation of debris and silt and clean as necessary. • Check condition of inlet and outlet pipes and ventilation structures	• Clean as necessary. • Repair/rehabilitation of inlets and outlet, as required.	• Inspect every 6 months or after large storm.

5.4 Sewer Flooding

The site will form a new foul water connection point to the private Windrush Industrial Park sewer system which outfalls to the Thames Water public sewer. The peak discharge rate from the industrial development will be minimal and have limited impact on wider infrastructure.

Therefore, the risk of sewer flooding to the site post development work would remain unchanged.

5.5 Groundwater Flooding

The proposed development is likely to be constructed using shallow foundation and unlikely to impact the groundwater below the site.

Therefore, the risk from groundwater flooding will be remain as low.

5.6 Artificial Sources of Flooding

The proposed development work will not have an impact on artificial sources of flood risk.

5.7 Summary of Flood Risk from the Proposed Development

The flood risk to and from the proposed development has been assessed to remain low from all sources.

The flood risk to the development is summarised in Table 6.

Table 8: Summary of flood risk to the development

Type of Flooding	Source of Flooding	Flood Risk	Proposed Mitigation
Fluvial and Tidal	River Windrush	Low	N/A
Surface Water	Runoff from the site and surrounding land	Low	Discharge into the public sewer network via existing spur to Public Thames Water sewer at a restricted runoff rate and onsite attenuation.
Sewers	Surrounding public foul drainage systems	Low	Discharge into the existing drainage network
Ground Water	Underlying geology and groundwater levels	Low	N/A
Artificial Sources	none	Not applicable	

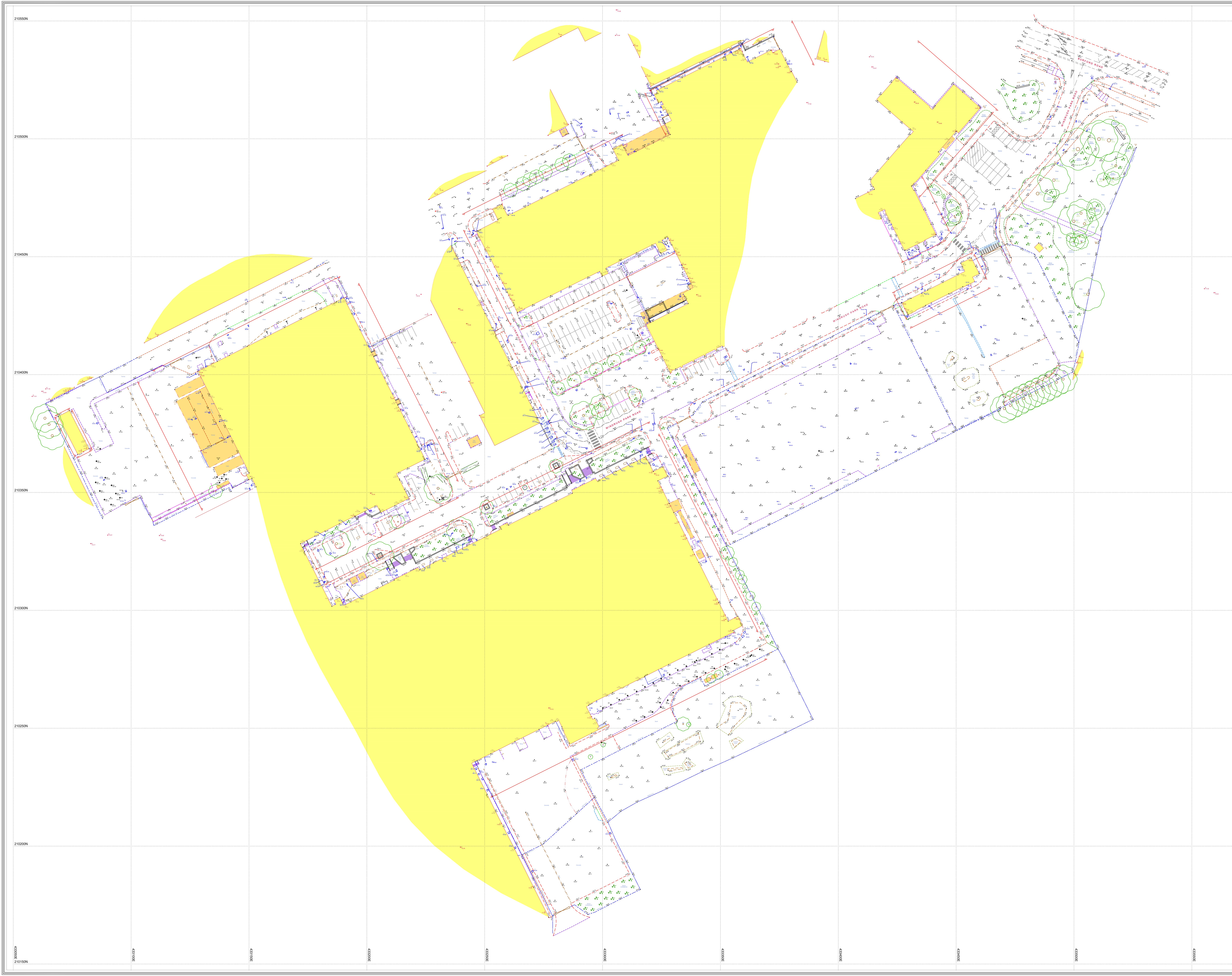
6. Conclusion

The existing flood risk to the development area from all sources has been assessed from a review of all available data. Future climate change has also been considered. Using the proposed development plan, the extent of the flood risk has been determined for the site as well as the effect that the development might have on flood risk elsewhere.

The assessment can be summarised as follows:

- The site is located in Flood Zone 1.
- The site is at low risk of flooding from all sources.
- The proposed development is classified as 'Less Vulnerable' and suitable for this location.
- The proposed development work would not increase the risk of flooding from any sources;
- A drainage strategy is proposed in consideration with the local and national standard and would not increase the flood risk;
- The site is a Brownfield site with existing drainage in place and no formal restrictions on discharge rates. The existing site is 100% impermeable! The in-situ ground is not expected to be conducive to infiltration drainage and therefore SuDS options at the proposed development are limited. The proposal therefore is to limit the discharge from the redeveloped site for from 1 in 1 year to 1 in 100-year return periods, including climate change allowances.
- The development site is expected to be underlain by soils with low infiltration capacity which limits the use of infiltration systems on site. The proposal includes SuDS measure in the form of attenuation tank and possibly porous paving for parking areas.
- In conclusion, the proposed development work will not increase the risk of flooding to the site or surrounding areas in accordance with the provisions of relevant national and local planning policies.

Appendix A Topographical Survey Plan



N

Station Information:

Station	Easting (m)	Northing (m)	Level (m)
JK1	433493.739	210525.482	107.912
JK2	433457.298	210453.371	107.467
JK3	433315.399	210387.781	107.276
JK4	433262.916	210408.869	107.532
JK5	433240.329	210337.886	106.724
JK6	433366.749	210288.532	105.588
JK7	433229.132	210469.344	108.133
JK1A	433419.141	210560.766	108.588
JK5A	433231.671	210392.519	107.310
JK7A	433303.101	210502.357	107.898

OS Note:

Some services may have been omitted due to parked vehicles. The Ordnance Survey tile is to be used as a guide only.

Surveyed Buildings

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36(15) via Global Navigational Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.

The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

Buildings, Wall, Kerb line, Line marking, Drop kerb, Centre line, Top of bank, Station and Name, Overhead Cable, Concrete edge, Tarmac edge, Grass verge, Canopy/Overhang, Verge, Bottom of bank

IC Inspection chamber; PInv Pipe invert; Gy Gully; Bg Back gully; Dp Down pipe; Pipe Pipe above ground; MH Manhole; WL Water level; Bo Bollard; IB Illuminated bollard; Bin Rubbish bin; Vp Vent pipe; Grl Ground light; Lbox Letter box; Stmp Tree Stump; Sty Stile

P\R Post & Rail; P\W Post & Wire; C\L Chain Link; W\P Wooden Panels; C\B Close Boarded; S\P Steel Palisade

Wo Wash out; Re Rodding eye; BB Belisha beacon; CTV Cable tv; Mkr Marker post; Gmkr Gas marker post; So Soffit; Fh Fire hydrant; TWL Top of Wall Level; TCL Tree canopy level; G: Girth; MG Multi girth; IC Inspection chamber; CL: Cover level; IL: Invert level; UTL Unable to lift

Rev	Date	Description	Drawn	Q. Ref.
1	02.03.21	Additional topo	JK2	GH10048

greenhatch group

Topographical Surveys · Site Engineering · Utility / CCTV Surveys · Measured Building Surveys · 3D Laser Scanning · Revit & BIM Models

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London: 27, Cornwall Terrace Mews, Regents Park, London, NW1 5LL, t. (02072) 241806

CLIENT

Hale Architects Design Management

PROJECT

Windrush Industrial Estate Witney, OX29 7DX

TITLE

Topographical Survey

SCALE	DATE
A1@ 1: 500	22.02.21
DRAWN	**QUALITY REF**
JK2	GH9938

Level datum: See note
Grid orientation: See note
Job number: 39413

Drawing No.: 39413_T — Rev.: 1

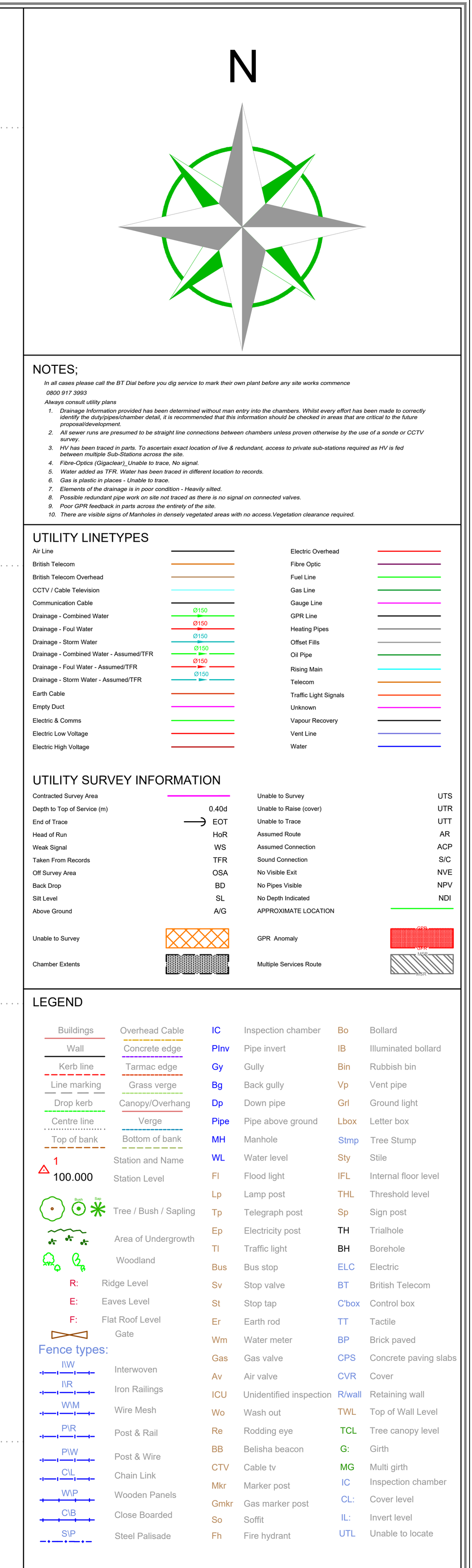
Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:



PAS 128 : 2014

SURVEY CATEGORY	QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL
TYPE B - DETECTION	QL-B4	A UTILITY SEGMENT WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED AND THEREFORE SHOWN AS AN ASSUMED ROUTE. **(NO DETECTION POSSIBLE)**
	QL-B3	POSITION OF THE UTILITY DETECTED BY ONE OF THE GEOPHYSICAL TECHNIQUES. **(EML OR GPR DETECTION WITH LIMITED CONFIDENCE IN DEPTH)**
	QL-B2	POSITION AND DEPTH OF THE UTILITY DETECTED BY ONE OF THE GEOPHYSICAL TECHNIQUES. **(EML OR GPR DETECTION WITH CONFIDENCE IN DEPTH)**
	QL-B1	POSITION AND DEPTH OF THE UTILITY DETECTED BY MULTIPLE GEOPHYSICAL TECHNIQUES. **(EML + GPR DETECTION)**

DISCLAIMER

Whilst every effort has been taken in the preparation of this drawing, the original land marks/apparatus configuration may have been altered since the survey/drawing was produced. The user shall make further enquiries and investigations to satisfy himself as to the accuracy of this drawing and position of the apparatus. The exact positions of the apparatus should be verified by the use of suitable detection devices and safe digging practices in accordance with HSG47, further advice on the location of apparatus should be recommended by the owner. No representation is made by Greenhatch Group, its agents or servants as to the accuracy, completeness, and sufficiency or otherwise of this drawing and the position of the apparatus.

All apparatus shall be treated as live unless proved otherwise by the owner. It is the users responsibility to ensure that the information on the location of apparatus is provided to all persons (either direct labour or contractors) working in proximity to the apparatus.

Rev	Date	Description	Drawn	Q. Ref.
1	22.02.21	Additional topo	JK2	

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- Topographical Surveys
- Site Engineering
- Utility / CCTV Surveys
- Measured Building Surveys
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- Revit & BIM Models

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CLIENT

Hale Architects
Design Management

PROJECT

Windrush Industrial Estate
Witney, OX29 7DX

TITLE

Utility Survey

SCALE	DATE
A1@ 1: 500	**26.03.21**
DRAWN	QUALITY REF
DM / JRM	

Level datum	See note
Grid orientation	See note
Job number	39413

Drawing No.	Rev.
39413_T_UG	1

Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

Asset Location Search Sewer Map - ALS/ALS Standard/2021_4377793

SP3310SW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 433250,210250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1101	103.09	101.03
1003	102.94	100.26
1006	102.35	100.685
1001	102.82	100.9
111E	n/a	n/a
1007	102.4	100.592
1002	102.69	101.25
1004	102.63	99.78
101A	102.71	100.95
111A	103.27	101.96
2102	104.02	101.21
211A	103.99	100.96
2101	105.13	101.95
2107	105.09	101.39
2103	105.6	102.14
2106	105.61	101.7
1008	102.6	100.449
1005	102.1	99.37
0001	104.58	103.08
1102	102.05	n/a
0106	105.83	104.48
111D	n/a	n/a
111C	n/a	n/a
011C	105.75	n/a
011B	105.52	n/a
0103	103.98	n/a
0105	104.1	n/a
0102	105.3	n/a
011A	105.28	n/a
0101	104.65	n/a
0104	104.72	n/a
0204	105.92	n/a
0208	106.03	n/a
0207	106.94	n/a
0203	106.9	n/a
0206	107.12	n/a
0202	107.06	n/a
0205	107.33	n/a
0201	107.39	n/a
0303	107.53	n/a
0302	107.58	n/a
0301	107.92	n/a
031A	n/a	n/a
031B	n/a	n/a

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

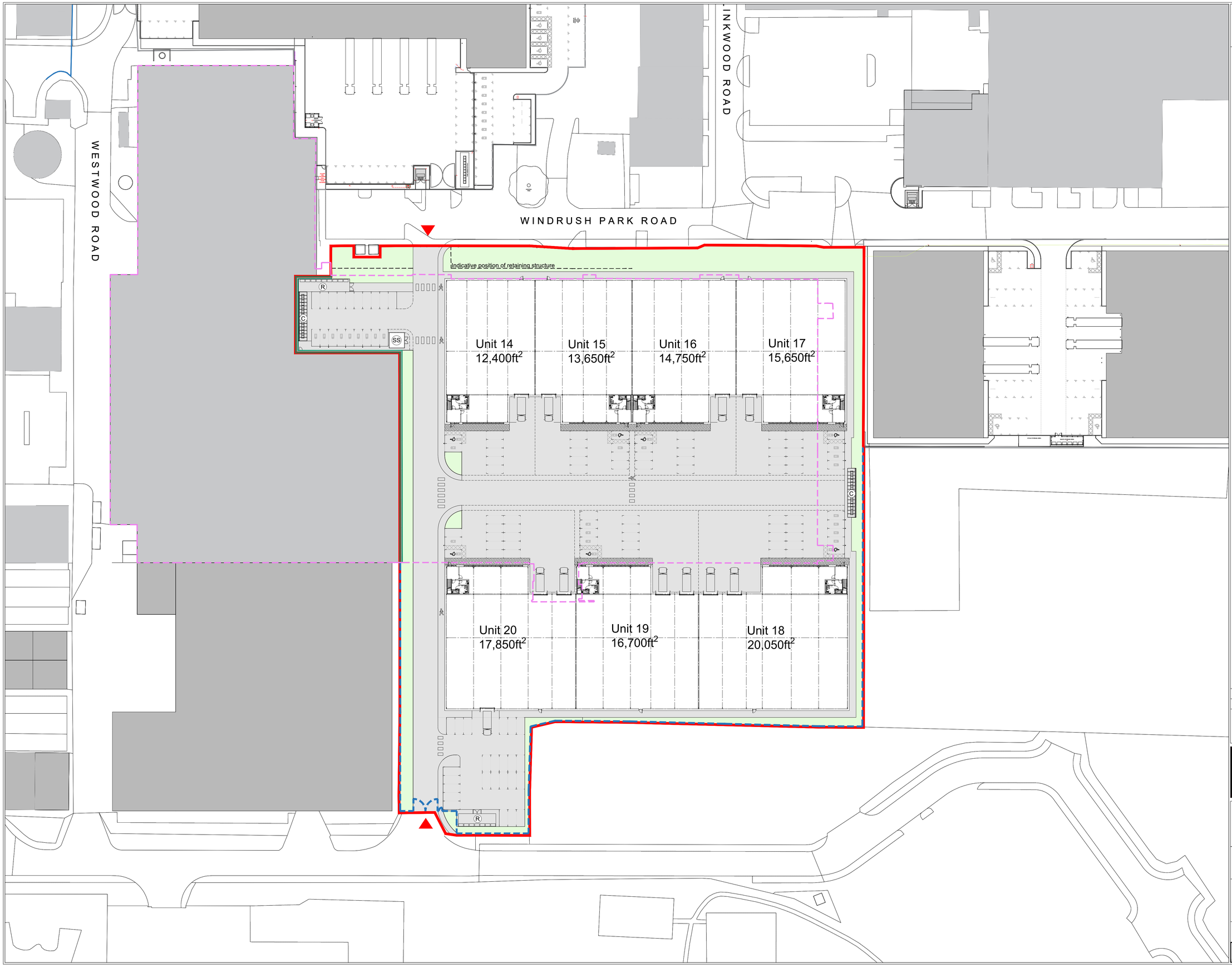
ALS/ALS Standard/2021_4377793

0 45 90 180 270 360
Meters

Scale:	1:7158
Width:	2000m
Printed By:	G1KANAGA
Print Date:	09/03/2021
Map Centre:	433316,210352
Grid Reference:	SP3310SW

Comments:

Appendix B Proposed Development Plan



Disclaimer:
Subject to survey.

SCALE
0 5 10 25m

N

Notes:

- Plot B Application Boundary (21,075m² / 5.20 acres / 2.10 ha)
- Footprint of existing building
- Proposed palisade fence 2.2m height
- New structure and facade to exposed existing internal wall
- Soft Landscape Area Refer to BEA landscape plan
- In-situ concrete with a light brush finish
- Block Paving

AREA SCHEDULE (GIA)

UNIT 14 (GIA)	**12,400ft²**
Warehouse (Incl. office Undercroft)	10,900ft²
Office (1st Floor)	1,500ft²
Car parking spaces (incl disabled)	7
UNIT 15 (GIA)	**13,650ft²**
Warehouse (Incl. office Undercroft)	11,950ft²
Office (1st Floor)	1,700ft²
Car parking spaces (incl disabled)	9
UNIT 16 (GIA)	**14,750ft²**
Warehouse (Incl. office Undercroft)	12,850ft²
Office (1st Floor)	1,900ft²
Car parking spaces (incl disabled)	9
UNIT 17 (GIA)	**15,650ft²**
Warehouse (Incl. office Undercroft)	13,600ft²
Office (1st Floor)	2,050ft²
Car parking spaces (incl disabled)	14
UNIT 18 (GIA)	**20,050ft²**
Warehouse (Incl. office Undercroft)	17,950ft²
Office (1st Floor)	2,100ft²
Car parking spaces (incl disabled)	15
UNIT 19 (GIA)	**16,700ft²**
Warehouse (Incl. office Undercroft)	14,840ft²
Office (1st Floor)	1,860ft²
Car parking spaces (incl disabled)	10
UNIT 20 (GIA)	**17,850ft²**
Warehouse (Incl. office Undercroft)	15,800ft²
Office (1st Floor)	2,050ft²
Car parking spaces (incl disabled)	13
Additional car parking spread across all units	43
Total car parking spaces	**120**
TOTAL (GIA)	**111,050ft²**

(C) Cycle Parking

(R) Recycling/ Refuse Area

(SS) Substation

EVCP charging points
(Planning Requirement is minimum 25%)

EV charging spaces: 30
(25% of total proposed 120 car parking spaces)

Rev:	Notes:	Date:	Dwn:	Iss:
A	Planning Issue	04.03.2024	SK	HA

Suitability Code:
PLANNING

CANMOOR

hale
ARCHITECTURE
22c Leathermarket Street, London, SE1 3HP

Project:
Windrush, Witney
Plot B

Drawing Title:
Proposed Hard and Soft Landscape

Project No:	Scale @ A1/A3	Revision:
23052	1:500/1:1000	A

Drawing No:
PL-1004

Appendix C Hydraulic Calculation

Summary of Results for 30 year Return Period

Half Drain Time : 146 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	103.855	0.355	0.0	28.3	28.3	256.5	O K
30 min Summer	103.948	0.448	0.0	28.3	28.3	323.5	O K
60 min Summer	104.025	0.525	0.0	28.3	28.3	378.7	O K
120 min Summer	104.064	0.564	0.0	28.3	28.3	407.2	O K
180 min Summer	104.069	0.569	0.0	28.3	28.3	410.9	O K
240 min Summer	104.064	0.564	0.0	28.3	28.3	406.9	O K
360 min Summer	104.040	0.540	0.0	28.3	28.3	389.9	O K
480 min Summer	104.010	0.510	0.0	28.3	28.3	368.1	O K
600 min Summer	103.977	0.477	0.0	28.3	28.3	344.7	O K
720 min Summer	103.945	0.445	0.0	28.3	28.3	321.4	O K
960 min Summer	103.886	0.386	0.0	28.3	28.3	278.7	O K
1440 min Summer	103.796	0.296	0.0	27.9	27.9	213.7	O K
2160 min Summer	103.725	0.225	0.0	26.0	26.0	162.2	O K
2880 min Summer	103.694	0.194	0.0	22.1	22.1	140.1	O K
4320 min Summer	103.660	0.160	0.0	16.9	16.9	115.8	O K
5760 min Summer	103.641	0.141	0.0	13.7	13.7	101.6	O K
7200 min Summer	103.627	0.127	0.0	11.6	11.6	92.1	O K
8640 min Summer	103.618	0.118	0.0	10.2	10.2	84.9	O K
10080 min Summer	103.610	0.110	0.0	9.0	9.0	79.3	O K
15 min Winter	103.900	0.400	0.0	28.3	28.3	288.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.035	0.0	266.2	18
30 min Summer	49.499	0.0	348.4	32
60 min Summer	30.811	0.0	439.4	62
120 min Summer	18.615	0.0	531.5	108
180 min Summer	13.715	0.0	587.8	140
240 min Summer	10.995	0.0	628.4	172
360 min Summer	8.034	0.0	689.1	240
480 min Summer	6.428	0.0	735.2	308
600 min Summer	5.404	0.0	772.7	374
720 min Summer	4.687	0.0	804.3	438
960 min Summer	3.743	0.0	856.3	562
1440 min Summer	2.723	0.0	933.6	794
2160 min Summer	1.979	0.0	1021.6	1128
2880 min Summer	1.577	0.0	1084.9	1496
4320 min Summer	1.143	0.0	1178.1	2208
5760 min Summer	0.910	0.0	1254.3	2944
7200 min Summer	0.762	0.0	1312.4	3672
8640 min Summer	0.659	0.0	1361.0	4408
10080 min Summer	0.583	0.0	1401.9	5136
15 min Winter	76.035	0.0	298.9	18

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	104.006	0.506	0.0	28.3	28.3	365.4	O K
60 min Winter	104.096	0.596	0.0	28.3	28.3	430.2	O K
120 min Winter	104.148	0.648	0.0	28.3	28.3	467.7	O K
180 min Winter	104.146	0.646	0.0	28.3	28.3	466.3	O K
240 min Winter	104.135	0.635	0.0	28.3	28.3	458.4	O K
360 min Winter	104.096	0.596	0.0	28.3	28.3	430.0	O K
480 min Winter	104.046	0.546	0.0	28.3	28.3	394.5	O K
600 min Winter	103.995	0.495	0.0	28.3	28.3	357.3	O K
720 min Winter	103.945	0.445	0.0	28.3	28.3	321.3	O K
960 min Winter	103.857	0.357	0.0	28.3	28.3	257.7	O K
1440 min Winter	103.742	0.242	0.0	27.1	27.1	175.1	O K
2160 min Winter	103.689	0.189	0.0	21.4	21.4	136.7	O K
2880 min Winter	103.663	0.163	0.0	17.3	17.3	118.0	O K
4320 min Winter	103.635	0.135	0.0	12.8	12.8	97.1	O K
5760 min Winter	103.618	0.118	0.0	10.2	10.2	85.2	O K
7200 min Winter	103.607	0.107	0.0	8.6	8.6	77.1	O K
8640 min Winter	103.599	0.099	0.0	7.5	7.5	71.1	O K
10080 min Winter	103.592	0.092	0.0	6.6	6.6	66.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.499	0.0	391.0	32
60 min Winter	30.811	0.0	492.5	60
120 min Winter	18.615	0.0	595.7	116
180 min Winter	13.715	0.0	658.7	154
240 min Winter	10.995	0.0	704.2	186
360 min Winter	8.034	0.0	772.2	262
480 min Winter	6.428	0.0	823.9	334
600 min Winter	5.404	0.0	865.8	404
720 min Winter	4.687	0.0	901.3	470
960 min Winter	3.743	0.0	959.6	590
1440 min Winter	2.723	0.0	1046.3	806
2160 min Winter	1.979	0.0	1144.6	1148
2880 min Winter	1.577	0.0	1215.5	1500
4320 min Winter	1.143	0.0	1320.3	2208
5760 min Winter	0.910	0.0	1405.1	2944
7200 min Winter	0.762	0.0	1470.2	3672
8640 min Winter	0.659	0.0	1524.8	4400
10080 min Winter	0.583	0.0	1571.1	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.917

Time (mins) From:	To:	Area (ha)
0	4	1.917

Model Details

Storage is Online Cover Level (m) 105.500

Cellular Storage Structure

Invert Level (m) 103.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	760.0	0.0	1.201	0.0	0.0
1.200	760.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0229-2840-1200-2840
Design Head (m)	1.200
Design Flow (l/s)	28.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	229
Invert Level (m)	103.500
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	28.4	Kick-Flo®	0.857	24.1
Flush-Flo™	0.403	28.3	Mean Flow over Head Range	-	23.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.6	1.200	28.4	3.000	44.0	7.000	66.4
0.200	22.9	1.400	30.5	3.500	47.4	7.500	68.7
0.300	27.9	1.600	32.5	4.000	50.6	8.000	70.8
0.400	28.3	1.800	34.4	4.500	53.6	8.500	73.0
0.500	28.1	2.000	36.2	5.000	56.4	9.000	75.0
0.600	27.7	2.200	37.9	5.500	59.1	9.500	77.0
0.800	25.6	2.400	39.5	6.000	61.6		
1.000	26.0	2.600	41.1	6.500	64.0		

Summary of Results for 100 year Return Period (+25%)

Half Drain Time : 270 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	104.087	0.587	0.0	28.3	28.3	424.1	O K
30 min Summer	104.257	0.757	0.0	28.3	28.3	546.7	O K
60 min Summer	104.414	0.914	0.0	28.3	28.3	660.1	O K
120 min Summer	104.525	1.025	0.0	28.3	28.3	740.1	O K
180 min Summer	104.549	1.049	0.0	28.3	28.3	757.1	O K
240 min Summer	104.539	1.039	0.0	28.3	28.3	750.5	O K
360 min Summer	104.511	1.011	0.0	28.3	28.3	729.8	O K
480 min Summer	104.477	0.977	0.0	28.3	28.3	705.3	O K
600 min Summer	104.439	0.939	0.0	28.3	28.3	677.8	O K
720 min Summer	104.398	0.898	0.0	28.3	28.3	648.6	O K
960 min Summer	104.308	0.808	0.0	28.3	28.3	583.3	O K
1440 min Summer	104.144	0.644	0.0	28.3	28.3	465.2	O K
2160 min Summer	103.955	0.455	0.0	28.3	28.3	328.5	O K
2880 min Summer	103.832	0.332	0.0	28.1	28.1	239.4	O K
4320 min Summer	103.722	0.222	0.0	25.7	25.7	160.6	O K
5760 min Summer	103.688	0.188	0.0	21.2	21.2	135.6	O K
7200 min Summer	103.667	0.167	0.0	18.0	18.0	120.6	O K
8640 min Summer	103.652	0.152	0.0	15.6	15.6	109.9	O K
10080 min Summer	103.641	0.141	0.0	13.8	13.8	101.8	O K
15 min Winter	104.161	0.661	0.0	28.3	28.3	477.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	123.351	0.0	435.7	18
30 min Summer	80.987	0.0	573.9	33
60 min Summer	50.637	0.0	724.1	62
120 min Summer	30.577	0.0	875.2	122
180 min Summer	22.454	0.0	964.3	180
240 min Summer	17.927	0.0	1026.7	218
360 min Summer	13.022	0.0	1118.9	278
480 min Summer	10.377	0.0	1189.0	344
600 min Summer	8.695	0.0	1245.3	412
720 min Summer	7.522	0.0	1292.8	484
960 min Summer	5.979	0.0	1370.2	616
1440 min Summer	4.320	0.0	1484.5	866
2160 min Summer	3.116	0.0	1610.5	1228
2880 min Summer	2.469	0.0	1700.9	1556
4320 min Summer	1.776	0.0	1832.9	2208
5760 min Summer	1.405	0.0	1937.1	2944
7200 min Summer	1.170	0.0	2016.8	3672
8640 min Summer	1.008	0.0	2083.1	4408
10080 min Summer	0.888	0.0	2138.7	5136
15 min Winter	123.351	0.0	488.7	18

Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	104.354	0.854	0.0	28.3	28.3	616.4	O K
60 min Winter	104.531	1.031	0.0	28.3	28.3	744.4	O K
120 min Winter	104.662	1.162	0.0	28.3	28.3	839.1	O K
180 min Winter	104.697	1.197	0.0	28.3	28.3	864.0	O K
240 min Winter	104.692	1.192	0.0	28.3	28.3	860.8	O K
360 min Winter	104.650	1.150	0.0	28.3	28.3	830.2	O K
480 min Winter	104.606	1.106	0.0	28.3	28.3	798.2	O K
600 min Winter	104.553	1.053	0.0	28.3	28.3	760.3	O K
720 min Winter	104.496	0.996	0.0	28.3	28.3	719.4	O K
960 min Winter	104.373	0.873	0.0	28.3	28.3	630.6	O K
1440 min Winter	104.114	0.614	0.0	28.3	28.3	443.2	O K
2160 min Winter	103.852	0.352	0.0	28.2	28.2	254.0	O K
2880 min Winter	103.732	0.232	0.0	26.9	26.9	167.4	O K
4320 min Winter	103.679	0.179	0.0	19.8	19.8	129.1	O K
5760 min Winter	103.654	0.154	0.0	15.8	15.8	110.9	O K
7200 min Winter	103.637	0.137	0.0	13.2	13.2	99.1	O K
8640 min Winter	103.626	0.126	0.0	11.4	11.4	90.7	O K
10080 min Winter	103.617	0.117	0.0	10.0	10.0	84.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	80.987	0.0	643.4	33
60 min Winter	50.637	0.0	811.4	62
120 min Winter	30.577	0.0	980.6	118
180 min Winter	22.454	0.0	1080.4	176
240 min Winter	17.927	0.0	1150.3	230
360 min Winter	13.022	0.0	1253.6	290
480 min Winter	10.377	0.0	1332.0	366
600 min Winter	8.695	0.0	1395.2	446
720 min Winter	7.522	0.0	1448.3	522
960 min Winter	5.979	0.0	1535.1	674
1440 min Winter	4.320	0.0	1663.4	924
2160 min Winter	3.116	0.0	1804.1	1256
2880 min Winter	2.469	0.0	1905.5	1524
4320 min Winter	1.776	0.0	2053.7	2244
5760 min Winter	1.405	0.0	2169.8	2944
7200 min Winter	1.170	0.0	2259.1	3672
8640 min Winter	1.008	0.0	2333.5	4408
10080 min Winter	0.888	0.0	2396.4	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+25

Time Area Diagram

Total Area (ha) 1.917

Time (mins) From:	To:	Area (ha)
0	4	1.917

Model Details

Storage is Online Cover Level (m) 105.500

Cellular Storage Structure

Invert Level (m) 103.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	760.0	0.0	1.201	0.0	0.0
1.200	760.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0229-2840-1200-2840
Design Head (m)	1.200
Design Flow (l/s)	28.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	229
Invert Level (m)	103.500
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	28.4	Kick-Flo®	0.857	24.1
Flush-Flo™	0.403	28.3	Mean Flow over Head Range	-	23.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.6	1.200	28.4	3.000	44.0	7.000	66.4
0.200	22.9	1.400	30.5	3.500	47.4	7.500	68.7
0.300	27.9	1.600	32.5	4.000	50.6	8.000	70.8
0.400	28.3	1.800	34.4	4.500	53.6	8.500	73.0
0.500	28.1	2.000	36.2	5.000	56.4	9.000	75.0
0.600	27.7	2.200	37.9	5.500	59.1	9.500	77.0
0.800	25.6	2.400	39.5	6.000	61.6		
1.000	26.0	2.600	41.1	6.500	64.0		

PROPOSED PLOT B - Windrush, Witney - EXISTING SITE Runoff Calculation

Date: 27-Jul-23
By: RM

I&L CONSULTING ltd.

DESIGN PARAMETERS

Impermeable areas		
Roof & Externals	21,075	m2
Proposed Green Areas	-	m2
Total area of the site	21,075	m2
Runoff Coefficient	100%	*assuming no loss to*

Surface water system designed to the 1 in 30 year storm

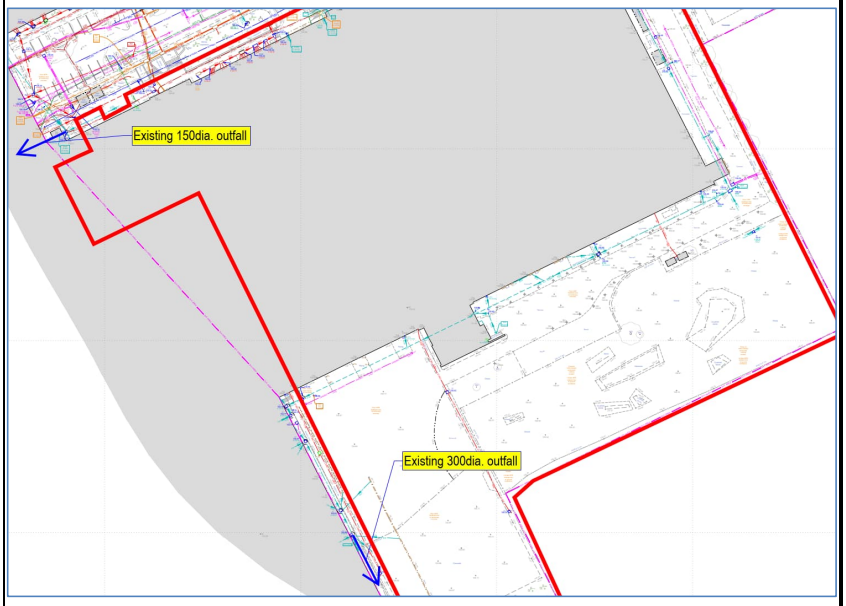
RAINFALL

In accordance with 'Design and analysis of Urban Storm Drainage – Wallingford Procedure Volume 4 – The Modified Rational Method'.

UK Sustainable Drainage Tool M5-60 =

20 mm — Figure A.1 *(vol. 4 Modified Rational Method)*

r = 0.42 — Figure A.2 *(vol. 4 Modified Rational Method)*



Extract From site topographical survey

Storm	Z1	Rainfall (mm)
M5-5	0.39	8
M5-10	0.53	11
M5-15	0.65	13
M5-30	0.8	16
M5-60	1	20
M5-120	1.2	24
M5-240	1.4	28
M5-360	1.6	32
M5-600	1.8	36
M5-1440	2.2	44

Using Table A1 for 1 in 30 storm: *(vol. 4 Modified Rational Method)*

Storm	Z2	Rainfall (mm)	Rainfall Intensity (mm/hr)	Qmax (L/s)	Volume (m3)
M1-30	0.62	5	9.7	56.6	101.9

Storm	Z2	Rainfall (mm)	Rainfall Intensity (mm/hr)	Qmax (L/s)	Volume (m3)
M2-5	0.79	6	73.9	432.9	129.9
M2-10	0.79	8	50.4	294.9	176.9
M2-15	0.80	10	41.4	242.3	218.1
M2-30	0.80	13	25.7	150.2	270.4
M2-60	0.81	16	16.2	94.8	341.4
M2-120	0.82	20	9.8	57.5	413.7
M2-240	0.83	23	5.8	33.8	487.4
M2-360	0.83	27	4.4	26.0	561.1
M2-600	0.84	30	3.0	17.6	634.3
M2-1440	0.84	37	1.5	9.1	782.6

PROPOSED PLOT B - Windrush, Witney - EXISTING SITE Runoff Calculation

Date: 27-Jul-23
By: RM

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Storm	Z2	Rainfall (mm)	Rainfall Intensity (mm/hr)	Qmax (L/s)	Volume (m3)
M30-5	1.46	11	136.9	801.2	240.4
M30-10	1.49	16	95.0	556.4	333.8
M30-15	1.51	20	78.6	460.3	414.3
M30-30	1.53	24	49.0	286.6	515.9
M30-60	1.54	31	30.9	180.7	650.5
M30-120	1.54	37	18.4	107.9	776.6
M30-240	1.52	43	10.6	62.3	897.7
M30-360	1.50	48	8.0	47.0	1014.3
M30-600	1.49	53	5.3	31.3	1126.9
M30-1440	1.45	64	2.7	15.5	1342.7

Storm	Z2	Rainfall (mm)	Rainfall Intensity (mm/hr)	Qmax (L/s)	Volume (m3)
M100-5	1.86	15	174.3	1020.3	306.1
M100-10	1.93	20	122.5	717.1	430.3
M100-15	1.96	25	101.8	596.0	536.4
M100-30	2.00	32	63.9	374.3	673.7
M100-60	2.03	41	40.6	237.7	855.6
M100-120	2.01	48	24.2	141.5	1018.7
M100-240	1.99	56	13.9	81.4	1171.9
M100-360	1.95	62	10.4	60.8	1312.4
M100-600	1.91	69	6.9	40.3	1452.2
M100-1440	1.83	80	3.3	19.6	1693.2

Storm +40% climate change	Rainfall (mm)	Rainfall Intensity (mm/hr)	Qmax (L/s)	Volume (m3)
M100-5 +40%	20.3	244.0	1428.4	428.5
M100-10 + 40%	28.6	171.5	1003.9	602.4
M100-15 + 40%	35.6	142.5	834.5	751.0
M100-30 + 40%	44.8	89.5	524.0	943.2
M100-60 + 40%	56.8	56.8	332.8	1197.9
M100-120 + 40%	67.7	33.8	198.1	1426.2
M100-240 + 40%	77.9	19.5	113.9	1640.7
M100-360 + 40%	87.2	14.5	85.1	1837.3
M100-600 + 40%	96.5	9.6	56.5	2033.0
M100-1440 + 40%	112.5	4.7	27.4	2370.5

PLOT B - Windrush, Witney - Existing Pipe Flow Capacities

Date: 27-Jul-23
By: RM

I&L CONSULTING ltd.

SURFACE RUNOFF FROM EXISTING PIPES

Existing site has a 225 mm diameter and a 150 dia surface water outfall pipes which connect to the public sewer.

Colebrook-White Roughness Coefficient (k)	
Pipe Material	Typical values for k, mm
Copper, Copper alloys, Stainless Steel	0.015
All Plastic Piplines having a smooth (non-profiled) internal bore	0.015
Fibre-reinforced concrete (FRC)	0.15
Cast iron, ductile iron, galvanised steel and malleable cast iron	0.6
Vitrified clay, precast concrete	0.6
Corrugated aluminium and steel	3.0

Colebrook-White Formula

$$V = -2(2gDS)^{0.5}\log\left(\frac{k}{3.7D}+\frac{2.5\nu}{D(2gDS)^{0.5}}\right)$$

k = Colebrook-White roughness coefficient, in metres
V = velocity, in metres per second
D = circular cross-section pipe, inside diameter, in metres
S = slope, in metres per metre
ν = kinematic viscosity of water, in square metres per second.

g = Gravity = 9.81 m/s2
n = kinematic viscosity of water = 1.010E-06 m2/s

1 no. 225mm diameter pipes at grades of 1 in 150:

k = Colebrook-White roughness coeff = 0.600 mm = 6.000E-04 m
D = Inside diameter = 225 mm = 0.225 m
S = Slope, in metres per metre = 0.666% = 0.0067 m/m = 0.666 m/100m = 1 : 150
= (Hydraulic Gradient)
V = Velocity = 1.06 m/s

Discharge:
Q = V x A
A = 0.040 m2
Q = 0.0423 m/s = 42.3 L/s

1 no. 150mm diameter pipes at grades of 1 in 150:

k = Colebrook-White roughness coeff = 0.600 mm = 6.000E-04 m
D = Inside diameter = 150 mm = 0.150 m
S = Slope, in metres per metre = 0.666% = 0.0067 m/m = 0.666 m/100m = 1 : 150
= (Hydraulic Gradient)
V = Velocity = 0.82 m/s

Discharge:
Q = V x A
A = 0.018 m2
Q = 0.0144 m/s = 14.4 L/s

TOTAL SURFACE WATER DISCHARGE CAPACITY FROM EXISTING PIPES = = 56.8 L/s

RESTRICTED DISCHARGE = 50% OF TOTAL FLOW 28.38

24.5 PREVIOUSLY DEVELOPED SITES: PEAK RUNOFF RATE AND RUNOFF VOLUME ESTIMATION

Where a site has been previously developed, there may be agreement that discharge limits can correspond to rates that exist for the current state of the site (or a proportion of those rates). The preferred position should be to aspire to meet greenfield runoff rates and volumes, and any relaxation of this should be subject to an assessment of the current and future capacity of the receiving sewer or watercourse and agreement with the environmental regulator, drainage approving body and/or relevant sewerage company. In many cases, runoff volume may be as important as flow rate in terms of protecting receiving water body flood risk. Local policies, specifically strategic Flood Risk Assessments should be checked with respect to runoff control requirements for previously developed sites.

Runoff characteristics for a previously developed site can be estimated in a number of ways:

1 Any land that has been previously developed is likely to have had a system in place to drain surface water runoff from the site. This drainage system may or may not have included storage and flow control systems. Where any drainage system is still operational, peak flow rates at the outfall for the relevant return periods (usually 1:1 year, 1:30 year and 1:100 year) can be demonstrated by producing a simulation model that includes an accurate representation of the drainage system and site area contributions – thus allowing derivation of an appropriate head–discharge relationship at the outfall.

It is recognised that existing drainage systems will probably be overwhelmed for the 1:30 and 1:100 year events and therefore the actual rate of discharge from the site in such scenarios is likely to be increased by overland flow contributions or surcharging. However, these effects should not be accounted for, and the discharge limit should be based solely on the flow rate from the piped system (thus providing a conservative estimate).

2 Where records of the previously developed system are not available (so that the hydraulic characteristics of the system cannot be determined) or where the drainage system is not in reasonable working order (ie broken, blocked or no longer operational for other reasons), then one of the following approaches can be adopted:

a The first approach assumes that the runoff from the site is represented by greenfield response from impermeable soils. The methods for greenfield peak runoff estimation (Section 24.3) and volume estimation (Section 24.4) should therefore be applied using a high runoff soil type that

Appendix D Proposed Drainage Strategy Layout

WINDRUSH PARK ROAD

PI

SURFACE WATER TANK (DESIGNED FOR 100 YEAR + 25%CC)
760m² X 1.2m DEEP TANK = 912m³
WATER VOLUME (95% POROSITY) = 866m³
DRAINED AREA = 19,175m²

FLOW CONTROL
RESTRICTED TO 28.4 l/s

STORM WATER TO DRAIN TO THE NEAREST EXISTING SW PUBLIC NETWORK.

EX.MH 2103
CL 105.60
IL 102.14

FOUL WATER TO DRAIN TO THE NEAREST EXISTING FW PUBLIC NETWORK.

EX.MH 2106
CL 105.61
IL 101.70

STRATEGY

1. THIS DRAWING SHOULD ONLY USED TO SUPPORT A PLANNING APPLICATION AND MAY FORM PART OF A FLOOD RISK ASSESSMENT. IT FORMS AN INTENDED STRATEGY THAT WILL BE DEVELOPED IN MORE DETAIL.

2. DO NOT USE THIS DRAWING FOR DETAILED COST ESTIMATES OR TENDER PURPOSES.

PRE-DEVELOPMENT:
3. THE EXISTING SITE IS PRE-DEVELOPED AND DISCHARGES INTO AN EXISTING NETWORK VIA 1NO. Ø150mm AND 1NO. Ø225mm PIPES.

PROPOSAL:
4. THE NEW DEVELOPMENT SHALL BE RESTRICTED TO 28.4l/s. THIS IS BASED ON A 50% REDUCTION OF THE CAPACITY OF EXISTING Ø150mm& Ø225mm PIPES.

5. TOTAL ATTENUATION FOR 100Yr+25% CLIMATE CHANGE STORED BELOW GROUND = 866m³.

HYDRAULIC DESIGN:
6. THE SURFACE WATER NETWORK, FLOW CONTROL AND ATTENUATION HAS BEEN DESIGNED USING MICRODRAINAGE SOFTWARE WITH FSR RAINFALL DATA.

FINAL DRAINAGE CONNECTIONS:
7. DISCHARGE POINTS SHOWN MAY NEED TO BE FURTHER INVESTIGATED IN TERMS OF LOCATING AND INVERT LEVELS.

8. APPROVAL SHALL BE OBTAINED FOR INTENDED DISCHARGE INTO THE PUBLIC SEWER.

MAINTENANCE:
9. THE NETWORK AND ALL ANCILLARY COMPONENTS SHALL RECEIVE REGULAR MAINTENANCE AS OUTLINED IN SEPARATE SCHEDULE.

AREAS:

SITE AREA	2.108 ha
EXISTING IMPERMEABLE AREA	1.991 ha
PROPOSED IMPERMEABLE AREA	1.918 ha

LEGEND

- SITE BOUNDARY (2.11ha)
- EXISTING FW PUBLIC SEWER
- EXISTING SW PUBLIC SEWER
- NEW STORM WATER RUN
- NEW FOUL WATER RUN

PI — PETROL INTERCEPTOR
SERVICE YARD AND OTHER VEHICULAR ACCESSED AREAS TO PASS THROUGH PETROL INTERCEPTOR BEFORE DRAINING TO TANK.

Rev.	Date	Description	Technician	Reviewer
P3	29.03.24	REVISED TO SUIT NEW LAYOUT	GB	GV
P2	08.02.24	REVISED TO SUIT NEW LAYOUT	GB	GV
P1	01.08.23	PRELIMINARY ISSUE	RM	GV

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Project: WINDRUSH PARK ROAD
WITNEY- PLOT B

Drawing: DRAINAGE PLANNING STRATEGY

Drawing Set	Drawing Status	Scale	Project Number	Drawing Number	Revision
DRAINAGE	PRELIMINARY	1:250 @ A0 1:500 @ A2	23-011-I&L	D00	P3

Appendix E SuDS Flows and Volumes - LLFA Technical Assessment Pro-forma

SuDS Flows and Volumes - LLFA Technical Assessment Pro-forma

This form identifies the information required by Oxfordshire County Council LLFA to enable technical assessment of flows and volumes determined as part of drainage I SuDS *calculations.*

*Note : * means delete as appropriate; Numbers in brackets refer to accompanying notes.*

SITE DETAILS

1.1 Planning application reference

1.2 Site name

1.3 Total application site area (1 ..... 21,075 m² ..... 2.1 ha

1.4 Is the site located in a CDA or LFRZ ~~Y~~/N

1.5 Is the site located in a SPZ ~~Y~~/N

VOLUME AND FLOW DESIGN INPUTS

2.1 Site area which is positively drained by SuDS (2 ..... 21,075 m²

2.2 Impermeable area drained pre development (3 ..... 21,075 m²

2.3 Impermeable area drained post development (3] ..... 21,075 m²

2.4 Additional impermeable area (2.3 minus 2.2) ..... 0 m²

2.5 Predevelopment use (4 ~~Greenfield~~ / Brownfield / ~~Mixed~~*

2.6 Method of discharge (5 ~~Infiltration~~ / ~~waterbody~~ / storm sewer/ ~~combined sewer~~*

2.7 Infiltration rate (where applicable) ..... N/A ..... m/hr

2.8 Influencing factors on infiltration

2.9 Depth to highest known ground water table..... unknown .....mAOD

2.10 Coefficient of runoff (Cv) (6 95%

2.11 Justification for Cv used Existing site is used as carpark which is tarmac with positive drainage

2.12 FEH rainfall data used (Note that FSR is no longer the preferred rainfall calculation method) Y/N

2.13 Will storage be subject to surcharge by elevated water levels in watercourse/ sewer ~~Y~~/N

2.14 Invert level at outlet (invert level of final flow control) ..... 103.00 .....mAOD

2.15 Design level used for surcharge water level at point of discharge(14] ..... 105.00 .....mAOD

SuDS Flows and Volumes - LLFA Technical Assessment Pro-forma

CALCULATION OUTPUTS

Sections 3 and 4 refer to site where storage is provided by attenuation and I or partial infiltration. Where all flows are infiltrated to ground omit Sections 3 -5 and complete Section 6.

		EXISTING SITE	PROPOSED SITE
3.0	**Defining rate of runoff from the site**		
3.2	Max. discharge for 1 in 1 year rainfall	.....l/s/ha, 56.6 .....l/s for the site	28.4
3.2	Max. discharge for Qmed rainfall	.....l/s/ha, 150.2 .....l/s for the site	28.4
3.3	Max. discharge for 1 in 30 year rainfall	.....l/s/ha, 286.6 .....l/s for the site	28.4
3.4	Max. discharge for 1 in 100 year rainfall	.....l/s/ha, 374.3 .....l/s for the site	28.4
3.5	Max. discharge for 1 in 100 year plus 40%CC	.....l/s/ha, 524 .....l/s for the site	28.4

4.0 Attenuation storage to manage peak runoff rates from the site

4.1	Storage - 1 in 1 year	80 .....m^3 .....m^3/m^2 (of developed impermeable area)
4.2	Storage -1in 30 year (7	211.5 m^3 .....m3/m2
4.3	Storage -1in 100 year (8)	310.5 m^3 .....m3/m2
4.4	Storage - 1 in 100 year plus 40%CC (9)	448.4 m3 .....m3/m2

5.0 Controlling volume of runoff from the site

5.1	Pre development runoff volume(10)	673.7 ..... m^3 for the site	Existing 100yr, 30min
5.2	Post development runoff volume (unmitigated) (10)	546.7 m^3 for the site	Proposed 100yr, 30min
5.3	Volume to be controlled/does not leave site (5.2-5.1)	127 ..... m^3 for the site	

5.4 Volume control provided by

Interception losses(11)	.....m3
Rain harvesting(12)	.....m3
Infiltration (even at very low rates)	.....m3
Separate area designated as long term storage(13)	.....m3

5.5 Total volume control (sum of inputs for 5.4) ...0.....m3 (15)

6.0 Site storage volumes (full infiltration only)

6.1	Storage - 1in 30 year (7	866 .....m^3 .....m^3/m^2 (of developed impermeable area)
6.2	Storage - 1 in 100 year plus CC (9	866.....m3 .....m3/m2