STL
CONSULTING STRUCTURAL ENGINEERS

Flood Risk Assessment and Drainage Strategy

Site: Land to end of Essex Ave Didsbury

Client: Heneghan Group

Date: 26th February 2025

Job Ref: 25-6387

Prepared by: JH

Checked by:

Revisions:

The Institution of Structural Engineers

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Construction (Design & Management) Regulations 2015.

Under the C(D&M) Regs the designer's responsibility is limited to the reasonably foreseeable risks to persons involved in the construction, maintenance and repair of a structure from hazards that arise from the design. Therefore, this DRA only assesses the possible hazards that may arise from the specific structural design at this stage of the project. Should any alterations to the structure be carried out without the knowledge of the designer then no responsibility can be attributed.
It is the Contractors responsibility to use this document for the construction and future maintenance of the building as designed at this stage. This is not a Method Statement.
Under the C(D&M) Regulations 2015 it is the clients responsibility to ensure that every person designing the structure and every contractor who has been or may be appointed to work on the project is promptly provided with sufficient pre-construction information to ensure so far as is reasonably practicable the health and safety of all persons engaged in the construction work, liable to be affected by the way in which it is carried out, and who will use the structure in future.

Designers Risk Analysis.

Considerations to be given are:
During initial construction.

Noise and vibrations. Not only consider the effects these may have on workers but also neighbours.
Contamination. Where ground may be contaminated may need to consider substructure works that do not allow leaching through surface etc.
Falls from height, generally over 2m. These include around edges of deep excavations, upper floor and roof edges.
Collapse of the structure under both temporary and permanent imposed loads.
Handling of structural elements. Consideration must be given to the weight of elements specified and whether mechanical handling is feasible. Otherwise consider splicing beams and columns etc or the use of lightweight masonry if acceptable.
Fire. Although on site welding may be necessary, using this near combustible materials is not wise.

Long term.

Falls from height, generally over 2m. Consideration should be given for the future maintenance of the building such as ladder restraint to upper walls.
Collapse of the structure under the permanent imposed loads. The structural elements should be clearly marked on the drawings.

Hazard ref	Hazard Source	Risk Category	Preventative/Control Measures	Residual Risk
1	Manual handling	LOW	Use lighter sections/material where possible and keep lengths to minimum. Where necessary allow for splicing longer, heavier sections and provide details	LOW
3	Structural stability of excavations	HIGH	Design is to consider the temporary (during works) stability of the excavations Unless we have been instructed to provide the temporary works design, it is the contractors responsibility to design all temporary works to facilitate the structural alterations. Any element where risk is possible to be highlighted in our design information	MEDIUM

Risk Category/Residual Risk

Low	Medium	High
No further action required	Risk to be highlighted to contractor/end user	Action required within design to mitigate risk

Brief.

To prepare a suitable scheme that will "limit the peak discharge of storm water from the proposed development in accordance with the limits indicated in the Guidance document 'Manchester City, Salford City and Trafford council's Level 2 Hybrid Strategic Flood Risk Assessment' dated March 2010/11 and accompanying User Guide May 2010".

Introduction.

The proposal involves the construction of a new two storey detached dwelling located at the end of Essex Ave, Didsbury.

Existing Details.

The existing site is part of the rear garden to No 21 Cranmer Ave.

The site is generally laid to lawn with soil planting beds and is relatively level.

Proposed Design.

The proposal is to create a new entrance off the top of Essex Ave that leads into a driveway and three parking spaces two to the head and one to the side. The drive and parking spaces will be finished with permeable paving.

The house is to be finished with pitched roofs covered with tiles. Thus, we intend to discharge the surface water from the house into the below ground drainage system, although flow restrictors will be provided in the form of rain water butts and harvesters.

The gardens are to be turfed and thus naturally permeable, however the paved areas directly around the house will be paved with impermeable paviours but with open joints and laid to fall away from the house into the grassed areas.

Although no site investigations have been carried out on this site, our knowledge of this area is that the underlying soils are of a granular nature, however from investigations undertaken approx. 100m to the south of the site, percolation tests revealed that the soils are unsuitable for infiltration system due to the poorly drained nature and high water table.

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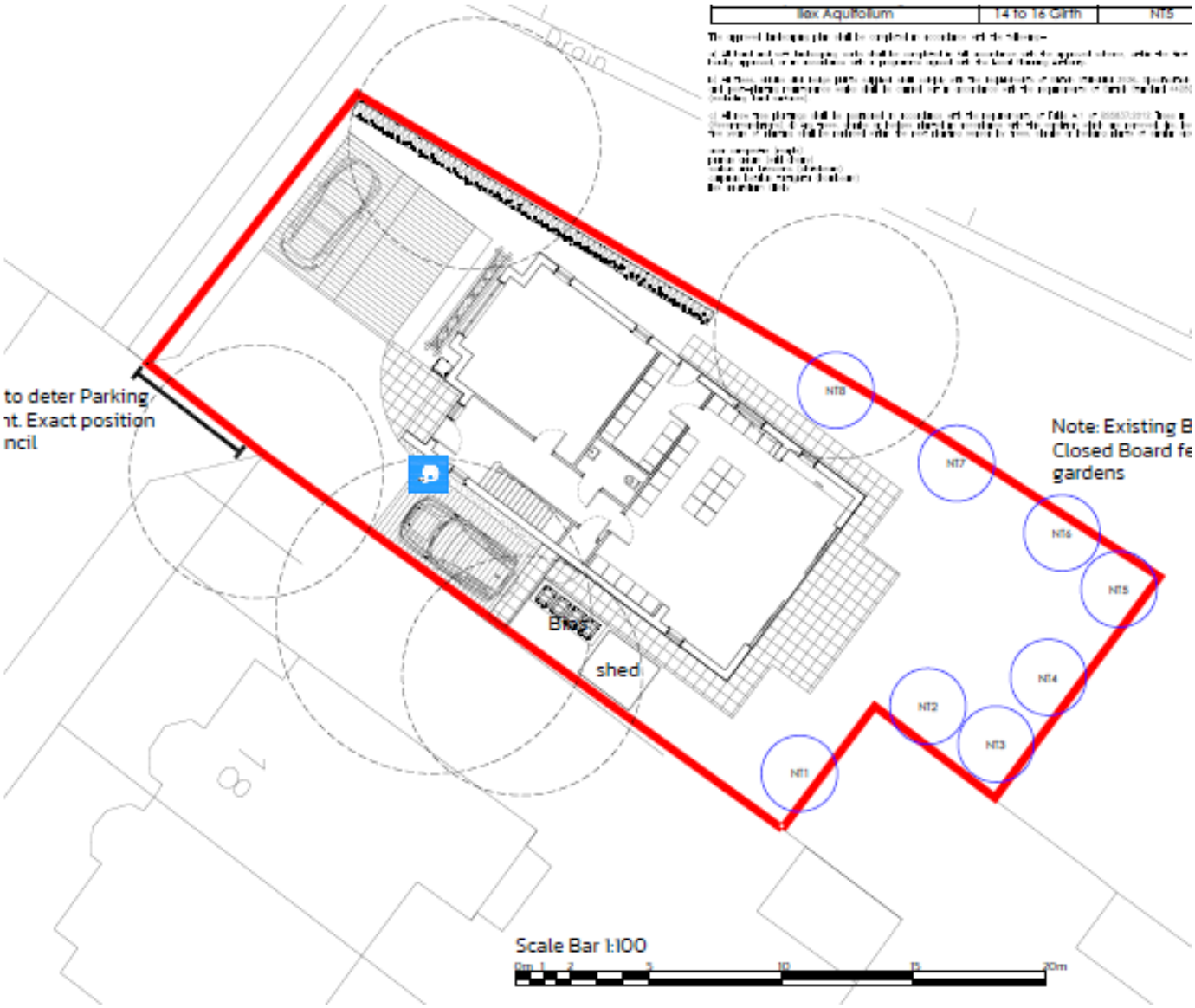
Client: Heneghan Group

Project: Land at end of Essex Ave, Didsbury

Date: 26.2.25

Ref: 25-6387

Proposed Site Plan.



Overland Flooding Routes

From the Environment Agency Flood Risk Maps,

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**384928/391822**	**28 Feb 2025 17:06**

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

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

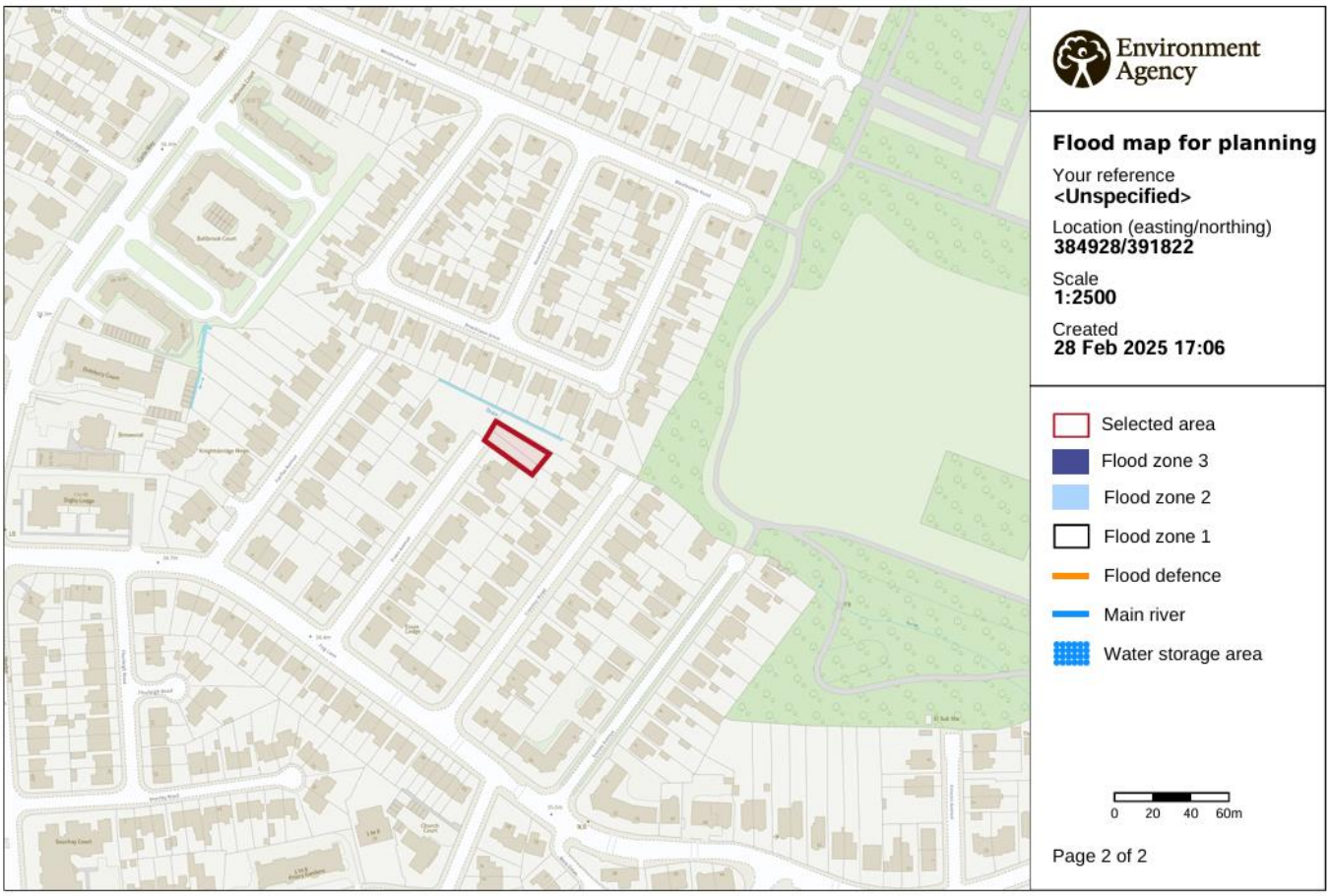
Notes

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

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

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2024 OS AC0000807064. https://flood-map-for-planning.service.gov.uk/os-terms



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The site is in a low risk area of flooding.

Catchment areas.

Existing site

Garden area = 480m^2

Proposed development

House roof area = 132m^2 of which 95% is impermeable.
Driveway/Car parking area = 90m^2 of which 50% is impermeable.
Paved area = 38m^2 of which 50% is impermeable.

From the site investigations undertaken some 100m away, it has been shown that the underlying soil conditions are of poorly drained sands with a high water table. The percolation tests carried out here resulted in a very slow percolation rate with an average fall in head of 160mm in 500mins (8hours).

The approved proposal for this site was to connect the surface water into the main combined sewer using a flow restrictor and suitable attenuation.

As we expect similar ground conditions on this new site, we propose a similar system of below ground surface water drainage discharging into the existing combined sewer in Essex Ave utilising a flow control with adequate stormwater storage on site.

Assessment of Greenfield runoff.

Based upon 1:1 yr, 1:30yrs and 1:100yrs storm duration

In accordance with CIRIA publication C697 - The SUDS Manual

Tedds calculation version 1.0.02

EA_Defra method

Site characteristics

Location;	Manchester
Hydrological region;	10
Soil type (Wallingford Procedure W.R.A.P map);	4
Standard percentage runoff;	SPR = **0.47**
Average annual rainfall;	SAAR = **880** mm
5 year return period rainfall of 60 minute duration;	M5_60min = **18.0** mm
Ratio 60-minute to 2 day rainfalls of 5 year return;	r = **0.36**
Rainfall intensity increase due to global warming;	$p_{climate}$ = **45**%
Impervious area req. attenuation storage;	α = **10.0** %

Catchment details

Subcatchment	Name	Area (ha)	PIMP (%);	Impermeable. area (ha)
1;	Garden;	0.05;	10.0;	0.00;
	Total	0.05;	10.0;	0.00;

Greenfield runoff rates

Catchment area; AREA = **50.00** hectare

Greenfield runoff rate (50 hectare site);	$\bar{Q}_{rural} = 0.00108 m^3/s \times (AREA/1km^2)^{0.89} \times (SAAR/1mm)^{1.17} \times SPR^{2.17}$ = **315.5** l / s
Greenfield runoff rate;	$\bar{Q}$ = $\bar{Q}_{rural}$ / AREA × A = **0.3 l / s**
Greenfield runoff rate per unit area;	$\bar{Q}_A$ = $\bar{Q}$ / A = **6.3** l / s / hectare

Therefore, restricting the flow off site to 50% of the pre-development discharge rate to prevent flooding would reduce flow to 0.15l/s. However, this could lead to blockages in the drain due to the low run off rate so we recommend reducing the flow to 1l/s.

PROVIDE SUITABLE PROPRIETARY FLOW CONTROL DEVICE TO RESTRICT FLOW OFF SITE TO 1l/s

Drainage design.

As the ground conditions are not suitable for infiltration, a suitable storage system will be required as follows.

ATTENUATION DESIGN

In accordance with CIRIA publication C697 - The SUDS Manual

Tedds calculation version 1.0.02

EA_Defra method

Site characteristics

Location;	Manchester
Hydrological region;	10
Soil type (Wallingford Procedure W.R.A.P map);	4
Standard percentage runoff;	SPR = **0.47**
Average annual rainfall;	SAAR = **880** mm
5 year return period rainfall of 60 minute duration;	M5_60min = **18.0** mm
Ratio 60-minute to 2 day rainfalls of 5 year return;	r = **0.36**
Rainfall intensity increase due to global warming;	$p_{climate}$ = **45**%
Impervious area req. attenuation storage;	α = **90.0** %

Catchment details

Subcatchment	Name	Area (ha)	PIMP (%);	Impermeable. area (ha)
1;	Roof;	0.01;	95.0;	0.01;
2;	Pavings;	0.00;	50.0;	0.00;
3;	Drive/parking;	0.01;	50.0;	0.00;
	Total	0.03;	72.8;	0.02;

Greenfield runoff rates

Catchment area;	AREA = **50.00** hectare
Greenfield runoff rate (50 hectare site);	$\bar{Q}_{rural}$ = 0.00108m^3/s ´ $(AREA/1km^2)^{0.89}$ ´ $(SAAR/1mm)^{1.17}$ ´ $SPR^{2.17}$ = **315.5** l / s
Greenfield runoff rate;	$\bar{Q}$ = $\bar{Q}_{rural}$ / AREA ´ A = **0.2** l / s
Greenfield runoff rate per unit area;	$\bar{Q}_A$ = $\bar{Q}$ / A = **6.3** l / s / hectare

Estimated site discharges

FSR growth rate (1 year);	FSR_{1yr} = **0.87**
Discharge (1 year);	Q_{1yr} = $\bar{Q}$ ´ FSR_{1yr} = **0.1** l/s
FSR growth rate (30 year);	FSR_{30yr} = **1.70**
Discharge (30 year);	Q_{30yr} = $\bar{Q}$ ´ FSR_{30yr} = **0.3** l/s
FSR growth rate (100 year);	FSR_{100yr} = **2.08**
Discharge (100 year);	Q_{100yr} = $\bar{Q}$ ´ FSR_{100yr} = **0.3** l/s

Estimated attenuation volume - 1 year

Attenuation storage vol (fig A7.1 - A7.8);	$Uvol_{1yr}$ = **74.0** m^3 / hectare
Basic storage volume ;	BSV_{1yr} = $Uvol_{1yr}$ ´ α ´ A = **1.73** m^3
FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4);	FF_{1yr} = **1.00**
Storage volume ratio (fig A8.1 - A8.8);	SVR_{1yr} = **1.67**

Adjusted storage volume;	$ASV_{1yr} = SVR_{1yr} \times BSV_{1yr} =$ **2.90** m^3
Hydrological regional volume ratio (fig A9.1);	$HR_{1yr} =$ **1.00**
Final estimated attenuation storage;	$Vol_{1yr} = HR_{1yr} \times ASV_{1yr} =$ **2.90** m^3

Library item: Estimated attenuation output

Estimated attenuation volume - 30 year

Attenuation storage vol (fig A7.1 - A7.8);	$Uvol_{30yr} =$ **182.6** m^3 / hectare
Basic storage volume ;	$BSV_{30yr} = Uvol_{30yr} \times \alpha \times A =$ **4.27** m^3
FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4);	$FF_{30yr} =$ **0.95**
Storage volume ratio (fig A8.1 - A8.8);	$SVR_{30yr} =$ **1.76**
Adjusted storage volume;	$ASV_{30yr} = SVR_{30yr} \times BSV_{30yr} =$ **7.50** m^3
Hydrological regional volume ratio (fig A9.1);	$HR_{30yr} =$ **1.10**
Final estimated attenuation storage;	$Vol_{30yr} = HR_{30yr} \times ASV_{30yr} =$ **8.25** m^3

Library item: Estimated attenuation output

Estimated attenuation volume - 100 year

Attenuation storage vol (fig A7.1 - A7.8);	$Uvol_{100yr} =$ **237.4** m^3 / hectare
Basic storage volume ;	$BSV_{100yr} = Uvol_{100yr} \times \alpha \times A =$ **5.56** m^3
FEH rainfall factor (figs A11.1, A6.1.1 - A6.3.4);	$FF_{100yr} =$ **0.90**
Storage volume ratio (fig A8.1 - A8.8);	$SVR_{100yr} =$ **1.76**
Adjusted storage volume;	$ASV_{100yr} = SVR_{100yr} \times BSV_{100yr} =$ **9.75** m^3
Hydrological regional volume ratio (fig A9.1);	$HR_{100yr} =$ **1.15**
Final estimated attenuation storage;	$Vol_{100yr} = HR_{100yr} \times ASV_{100yr} =$ **11.18** m^3

Library item: Estimated attenuation output

Attenuation storage required

Vol. increase due to head-discharge relationship;	$p_{hydro} =$ **1.25**
Maximum attenuation storage required;	$V_{req_max} = Vol_{30yr} \times p_{hydro} =$ **10.3** m^3

Interception storage

Interception rainfall depth;	$d_{int} =$ **5** mm
Volume of interception storage required;	$V_{int_req} = 0.8 \times A_{imp} \times d_{int} =$ **0.76** m^3

Long term storage

Proportion of paved area draining in to network;	$\alpha =$ **0.9**
Proportion of pervious area draining in to network;	$\beta =$ **0.5**
Rainfall depth for 100years, 6 hour event;	RD = M100_360 = **81.1** mm
Extra runoff vol of dev.runoff over greenfield runoff;	$Vol_{xs} = \max(RD \times A \times (PIMP \times \alpha \times 0.8 + ((1 - PIMP) \times \beta \times SPR) - SPR), 0m^3) =$ **2.50** m^3

Treatment volume

Treatment volume (assume 80% runoff);	$T_{vol} = 0.8 \times A \times 15mm \times PIMP =$ **2.27** m^3

STORAGE / ATTENUATION
PROVIDE MINIMUM 12m³ ATTENUATION TANK TO ACCEPT 100 YEAR STORM SITUATION

Drainage Maintenance Management

Maintenance of the drainage system will be undertaken by the Contractor until adopted and/or transferred to the owner of the property.

Documents are to be prepared when the legal papers are prepared for the sale of the property.
The management document should include the following

a- All drainage on site to be maintained regularly with agreement written into the lease documents
b- All costs associated with the maintenance of the drainage system to be included within the service charges for all owners/tenants.
c- Service charges and maintenance costs to be administered by the Landlords or Property Management company.

The Drainage Maintenance Agreement to include and is not restricted to the following

1-	Cleaning and checking gullies and silt trap manholes	6 month intervals
2-	Inspecting attenuation tanks and flow control	12 month intervals
3-	Cleaning main drive and parking areas to reduce silt/ grit/ debris build-up	monthly.

4- Defining responsibility for reporting defects or blockages to landlords or management company.
5- Emergency procedures specified and set out to deal with spillages of hazardous liquids (petrol/diesel/turpentine etc).
6- Emergency clean up kit to be provided in an accessible location on site and all occupants/tenants to be advised of location with clear guidance for use.

Conclusions.

The redevelopment of the existing site involves the erection of a two storey detached dwelling with associated driveway, parking area and gardens.

Investigations carried out nearby show that although the ground conditions are of a granular nature the high water table in the area results in a poorly drained soil matrix, thus the percolation tests that were undertaken resulted in a very slow permeability. Therefore, using this information, we propose to discharge the surface water from the new property into the combined sewer at the head of Essex Ave via a suitable flow restrictor and incorporating an attenuation tank within the driveway to accommodate the additional flows that may occur during heavy periods of rainfall.

We have calculated the surface water runoff from the roofs to be less than 1.0l/s under 1:100 year storm but we propose to reduce this by 2/3rd by installing suitable rainwater storage tanks in line with the existing rain water down pipes. These will obviously require draining down where not fully used for watering the garden etc to prevent overflowing during periods of heavy rain.

The drive and parking surfaces will be recovered with permeable surface treatment that will allow surface water to penetrate through into the granular subbase beneath.

Our calculations show that under 1:100 year storm duration, the subsoils are sufficient to accept the expected run off without causing surface flooding and the total surface water discharge from the site into the existing sewer would be less than 1l/s, which complies with the Councils Level 2 Hybris Strategic Flood Risk Assessment document.

Yours sincerely

[redacted]

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