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FLOOD RISK ASSESSMENT AND SURFACE WATER DRAINAGE STRATEGY

AT

23 Crescent East, Hadley Wood
EN4 0EY

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Report prepared by:

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Project Engineer

1. INTRODUCTION

1.1. Mason Navarro Pledge Ltd have been commissioned to produce a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed development at 23 Crescent East, Hadley Wood.

1.2. The proposed works comprise of the demolition of and existing residential dwelling and erection of 7 apartments (use class C4) together with associated access, parking, amenity space and landscaping.

1.3. Based on the guidance in the National Planning Policy Framework (NPPF, July 2021) and associated Planning Practice Guidance (PPG, updated June 2021), developments should include an appropriate Flood Risk Assessment if any or all of the following criteria are met:

- Site is greater than 1 hectare
- Potentially located in Flood Zone 2 or 3
- Less than 1 hectare in Flood Zone 1, including a change of use in development type.
- Considered a major planning application (as defined by local planning authority)

1.4. In this case, the site is less than 1 hectare and is shown to lie within Flood Zone 1, therefore a flood risk assessment is not required to support the planning application however this report provides details of the proposed drainage strategy for the development including detailing compliance with Enfield policy DM SE8, DM SE10 and the London Plan.

1.5. This report has been prepared in accordance with the NPPF, local planning policies and the accompanying Technical Guidance.

1.6. This report has been prepared by Richard James BEng (Hons) IEng MICE.

2. POLICY CONTEXT

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.1 The latest NPPF was adopted in July 2021, one of the overarching objectives of the NPPF is the encouragement of growth and acknowledgement that decision-makers should adopt a presumption in favour of sustainable development. Paragraph 11 of the document states:

> *"For **decision-taking** this means:*
>
> - *approving development proposals that accord with an up-to-date development plan without delay; or*
> - *where there are no relevant development plan policies, or the policies which are most important for determining the application are out of date, granting permission unless:*
>
>   - *the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development or*
>   - *any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole."*

2.2 Section 14 of the NPPF seeks to address the issues of climate change, flooding and coastal change. In paragraph 155 it states: "Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

PLANNING PRACTICE GUIDANCE TO THE NATIONAL PLANNING POLICY FRAMEWORK

2.3 The Planning Practice Guidance (PPG) was first published in March 2014 and at the same time the Technical Guidance to the NPPF was withdrawn. The key difference with the new PPG is that it is a web-based resource, and each section is updated as needed.

2.4 Section 7 covers "Flood Risk and Coastal Change" and was last updated in June 2021.

2.5 The assessment of flood risk is based on the definitions in Table 1 of the PPG. This information is replicated below for ease of reference.

TABLE 1: FLOOD ZONE DEFINITIONS

Flood Zone	Annual probability of river or sea flooding
Zone 1 *Low Probability*	▪ Land having less than 1 in 1000 annual probability of river or sea flooding (<0.1%)
Zone 2 *Medium Probability*	▪ Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or ▪ Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a *High Probability*	▪ Land having a 1 in 100 or greater annual probability of river flooding; or ▪ Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b *The Functional Floodplain*	▪ This zone comprises land where water has to flow or be stored in times of flood. ▪ Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

2.6 The NPPF classifies the Flood Risk Vulnerability of various land uses in Table 2 (reproduced below). The More Vulnerable Classification encompasses usages such as hospitals and buildings used for dwellings. Less Vulnerable applies to buildings used for general industry, storage and distribution.

TABLE 2: LAND USE CLASSIFICATION

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

Classification	Land Use
	permanent residential use. ■ Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure").
More Vulnerable	■ Hospitals. ■ Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. ■ Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. ■ Non-residential uses for health services, nurseries and educational establishments. ■ Landfill and sites used for waste management facilities for hazardous waste. ■ Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	■ Buildings used for shops; financial, professional and other services, restaurants and cafes, hot ■ food takeaways, offices, general industry, storage and distribution and assembly and leisure. ■ Land and buildings used for agriculture and forestry. ■ Waste treatment (except landfill and hazardous waste facilities). ■ Minerals working and processing (except for sand and gravel working). ■ Water treatment plants and sewage treatment plants (if adequate pollution control measures are in place).

2.8 The table below, replicated from Table 3 of the PPG, indicates which Flood Zones are considered to be appropriate for different land uses based upon the Sequential Test.

TABLE 3: FLOOD RISK VULNERABILITY CLASSIFICATION

Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable (Residential)	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	×	Exception Test Required	✓
Zone 3b Functional Floodplain	Exception Test Required	✓	×	×	×

✓ Development is appropriate
× Development should not be permitted

2.9 As the site lies within Flood Zone 1, the NPPF finds the development proposal does not require the application of the Exception Test; this is in accordance with Flood risk vulnerability and flood zone 'compatibility' (extract above).

2.10 The Sequential Test is required to ensure that any other potential sites for development, in lower flood risk areas, have been considered for the development. The NPPF states that the purpose of the Sequential Test is to direct development towards areas of lowest flood risk, from all sources. The site is already in Flood Zone 1 and therefore deemed not required.

2.11 Further detail on the lifetime of development is also given in the PPG, which advises for residential development that a period of 100 years should be considered whilst for non-residential this is dependent upon the development characteristics.

2.12 The use of sustainable drainage systems is considered by the PPG to offer the following benefits:

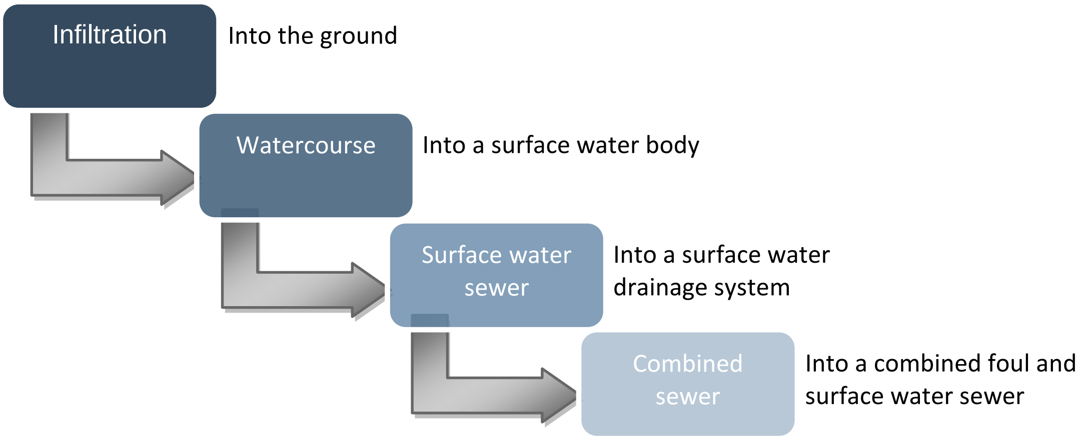
- Reduce the causes and impacts of flooding
- Remove pollutants from urban run-off at source
- Combine water management with green space with benefits for amenity, recreation and wildlife

2.13 In the consideration of major developments, sustainable drainage should be provided unless it can be demonstrated that this would be inappropriate. Major developments are defined in the Town and Country Planning Order 2015; some of these definitions encompass the following:

- Development site area of 1 hectare or more
- Provision of 10 or more residential dwellings
- Development of residential dwellings on a site having an area of 0.5 hectares or more and where the proposed no. of dwellings is not known to fall into the above criterion or not
- Provision of buildings where the floor space to be created by the development is 1,000m² or greater

2.14 The aim of sustainable drainage systems is to dispose of surface water using the following hierarchy were reasonably practicable.

SURFACE WATER DISPOSAL HIERARCHY



2.15 The assessment of what is considered to be reasonably practicable in terms of sustainable drainage system provision should consider the costs associated with the design, construction, operation and maintenance of the system, and whether these are economically proportionate in relation to the consumer costs for an effective drainage system that instead connects directly to a public sewer.

LONDON BOROUGH OF ENFIELD - STRATEGIC FLOOD RISK ASSESSMENT (SFRA)

2.16 The main purpose of the SFRA is to provide sufficient flood risk information to enable an update of any flooding policies within the Borough. In achieving this, the SFRA will achieve the objectives of:

- Influencing Council policy regarding decisions that are made
- Aiding the Council’s response to proposed developments
- Recognising means of reducing flood risk
- Inform the emergency flood plans

2.17 Enfield Level 1 Strategic Flood Risk Assessment was prepared in December 2021 and Enfield Level 2 Strategic Flood Risk Assessment was prepared in July 2013.

ADDITIONAL POLICY / GUIDANCE

2.18 The following documents were consulted to inform the drainage strategy for the site:

- Enfield Level 1 Flood Risk Assessment December 2021.
- Enfield Level 2 Flood Risk Assessment July 2013.
- Enfield Local Flood Risk Management Strategy March 2016
- London Plan 2021 SI13
- London Borough of Enfield Policy DM SE8
- London Borough of Enfield Policy DM SE10

2.19 **Policy DM SE8: Flood Risk Management** essentially sets out the aims to minimise the risk of flooding within the borough and to incorporate SuDS into developments to reduce surface water flood risk.

2.20 **Policy DM SE10: Managing Surface Water** sets out the requirements for all developments to demonstrate how proposed measures manage surface water as close to its source as possible and follow the drainage hierarchy in the London Plan.

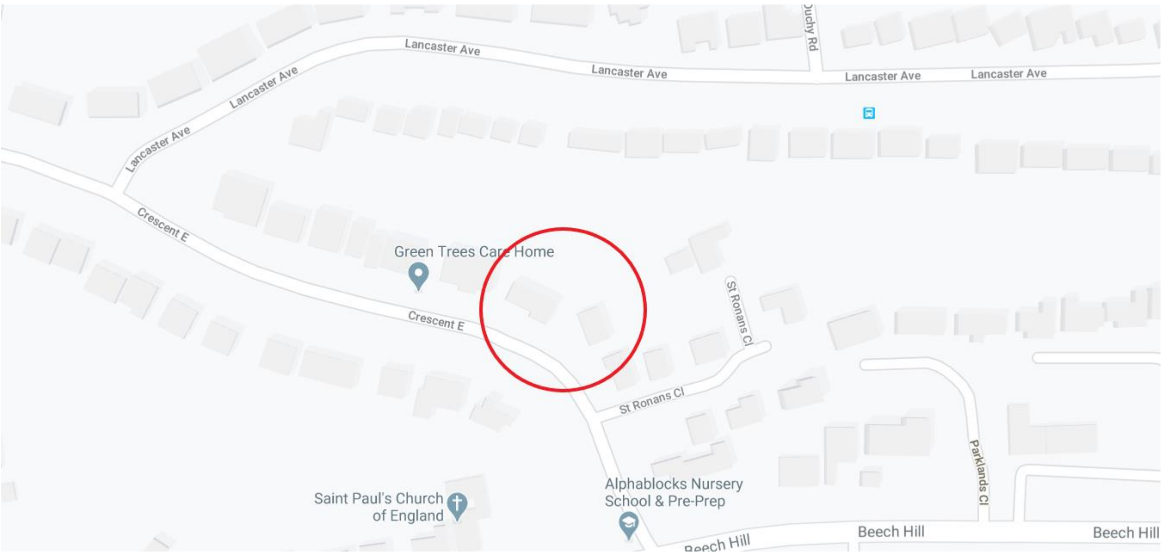
2.21 The London Plan **Policy SI 13: Sustainable Drainage** Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the drainage hierarchy.

2.22 The drainage assessment in this report will ensure that any proposals for additional drainage are assessed and mitigated, against flood risk, and incorporate good SuDS practices where possible.

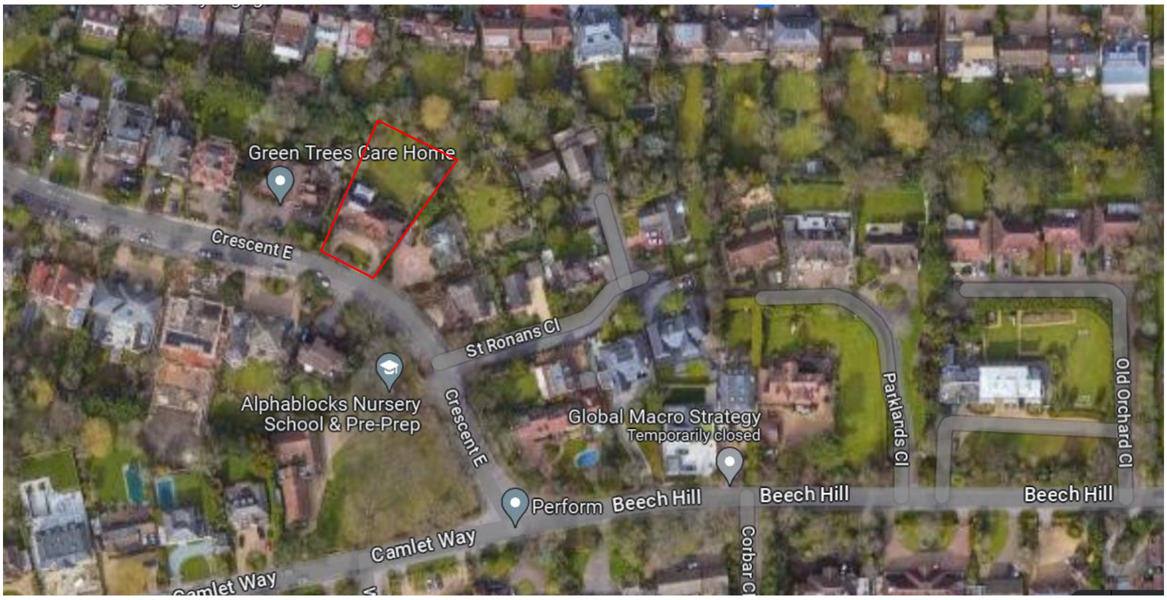
3. DEVELOPMENT DESCRIPTION

EXISTING SITE

3.1 The site is located at 23 Crescent East Hadley Wood, EN4 0EY. Please refer to images below for the site location and for an areial view of the site.



Site location Map



Site Ariel View

3.2 The site currently consists of one detached residential property with an approximate site area of 0.21 hectares.

3.3 Hadley Wood is situated in the Borough of Enfield and sits just East of the village of Monken on the northern outskirts of London. It is surrounded by a Green Belt of open land to the west, north and east. The site is located approximately 3½ miles west of Enfield town centre. The site is located upon the eastern side of the railway (Crescent East) and surrounded by large luxury homes.

PROPOSED DEVELOPMENT

3.4 The proposed works comprise of the demolition of and existing residential dwelling and erection of 7 apartments (use class C4) together with associated access, parking, amenity space and landscaping.

3.5 Refer to Appendix A for a copy of the existing site layout and Appendix B for a copy of the proposed site layout.

4 GEOLOGY & HYDROLOGY

4.1 The British Geological Survey (BGS) maps and online data for the area shows the underlying geology to comprise of solid geology of London Clay. Refer to appendix C for details on nearest borehole data.

4.2 A geotechnical site investigation was undertaken in November 2020 by Clancy Consulting for the adjacent property.

4.3 The investigation confirmed the ground conditions are as follows:

Depth	Ground
00.00m to 0.80m	Made ground / topsoil
0.8 to 5.45m	London Clay

4.4 No groundwater was encountered within the intrusive works or any borehole records close to the site and therefore shallow groundwater is unlikely to be encountered.

4.5 The geotechnical information confirms that the near surface ground conditions will consist of clay to a greater depth than that of the lower ground floor.

4.6 Clay is considered a non-aquifer, that is to say it does not store or transmit significant volumes of groundwater.

4.7 Given the likely depth to groundwater in the vicinity of the site and that the lower ground floor will be constructed entirely within the clay non aquifer, the impact of the construction on the local groundwater regime is assessed as being negligible.

4.8 Falling head tests were undertaken at the site and these confirmed that infiltration drainage is not viable.

4.9 The site is located within an Unproductive aquifer in superficial deposits.

4.10 The site is located within an Unproductive aquifer within the bedrock.

4.11 The sites groundwater vulnerability zone designation is unproductive.

4.12 The site is not located within a groundwater source protection zone.

5 FLOOD RISK

5.1 The NPPF and the SFRA identifies several potential sources of flooding that must be considered when assessing flood risk, these are considered below in the following order:-

- Flooding from rivers (fluvial flooding)
- Flooding from the sea (tidal flooding)
- Flooding from land
- Flooding from sewers
- Flooding from groundwater
- Flooding from reservoirs, canals, and other artificial sources

FLODING FROM RIVERS (FLUVIAL FLOODING) & SEA (TIDAL FLOODING)

5.2 The indicative flood maps published by the Environment Agency (EA) identify that the entirety of the site is outside an area at risk of fluvial/tidal flooding i.e. located in Flood Zone 1.

FLOODING FROM LAND & SEWERS

5.3 Maps Contained in the SFRA and Maps published by the Environment Agency indicate that the site is at Very Low risk of flooding from Surface Water. Refer to Figure 2 for a copy of the surface water food map data.

FLOODING FROM GROUNDWATER

5.4 Given the underlaying ground conditions at the site it is unlikely that the site is at risk of flooding due to groundwater.

FLOODING FROM RESERVOIRS, CANALS & OTHER ARTIFICIAL SOURCES

5.5 Environment Agency Reservoir Flood Mapping shows that flooding from reservoir failure in this area would not extend into the development site.

5.6 Also, with reference to the OS Map of the area, there are no canals or other artificial sources likely to cause flooding at the site.

6 SURFACE AND FOUL WATER DRAINAGE DESIGN

EXISTING

6.1 A Thames Water asset plan has been sourced - the water authority responsible for the public sewers in this area. Refer to Appendix D for the Thames Water Asset Plan.

6.2 The public sewer records indicate a 225mm diameter public foul water sewer in Crescent East and a public surface water sewer in Crescent East.

6.3 The records also indicate a public foul and surface water sewer running into the property boundary serving number 23.

A topographical survey of the site indicates the positions of gullies and manholes within the site boundary and it is anticipated that the site is positively drained to the public sewer in the road.

EXISTING RUNOFF RATES

6.4 In Table 5 below, is a summary of the approximate greenfield run off rates for the entire developable site (0.21Ha). Refer to Appendix E for calculations.

TABLE 5: GREENFIELD RUN OFF RATES

Event	Greenfield Run Off Rate
QBar	0.98 l/s
1 in 1 year	0.83 l/s
1 in 30 year	2.25 l/s
1 in 100 year	3.12 l/s

6.5 As the site is already developed (brownfield) the greenfield runoff rates above do not give a true representation of the current surface water discharge rates from the site. The total site area is 0.21 Ha of which it is calculated that 456sqm of the site is impermeable.

6.6 The existing development does not present any form of SuDS or attenuation systems or flow controls. The existing runoff rates are assumed as calculated with MicroDrainage (See Appendix E) and shown in the table below as existing rates. The below table outlines the existing run off rates for a number of events.

Event	Existing Rates (l/s)	Proposed Mitigated Rates (l/s)	Reduction (%)
1 in 1 year	6.6	1.0	-84.8%
1 in 30 year	14.6	1.0	-93.2%
1 in 100 year	17.7	1.0	**-94.4%**

TABLE 6 – EXISTING AND PROPOSED MITIGATED SURFACE WATER RUNOFF RATES

CLIMATE CHANGE ALLOWANCES

6.7 The guidance by the EA is replicated below in Table 7 where the drainage system is to be designed to accommodate a 20% climate change allowance on top of the 1 in 100-year storms. Applicants should apply a sensitivity test against the 40% climate change allowance to ensure that the additional runoff is wholly contained within the site and that there is no increase in the rate of runoff discharged from the site.

TABLE 7: PEAK RAINFALL INTENSITY CLIMATE CHANGE ALLOWANCE

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

LOCAL GUIDANCE

6.8 Policy DM SE8: Flood Risk Management sets out the aims to minimise the risk of flooding within the borough and to incorporate SuDS into developments to reduce surface water flood risk.

6.9 The London Plan Policy SI 13: Sustainable Drainage - Developments should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the drainage hierarchy.

6.10 We reviewed the selection of drainage/attenuation and SuDS components in line with the drainage hierarchy listed in the London Plan policy SI 13 and the table below provides the justification of the SuDS measures:

SUDS technique	Adopted	Not Adopted	Reason
Store Rainwater for later use		✗	Rainwater harvesting is not proposed on the scheme due to the provision of biodiverse roofs to the proposed buildings. In addition, the high initial installation cost does not make the provision of RWH economically viable.
Use infiltration technics		✗	Not adopted because the site is underlain by London Clay and therefore infiltration drainage is not viable.
Attenuate rainwater in ponds or open water features i.e. Filter Strips / swales	✗		The proposed drainage schemed includes Biodiverse roofs to the proposed building and lined permeable paving to proposed car park. In addition, raingardens are proposed to external landscaping. It is not possible to provide ponds and open water features on the site due to the difference in levels across the site.
Attenuate rainwater in sealed tanks	✗		Below ground attenuation is proposed to supplement the SuDS measures on site.
Discharge direct to a watercourse		✗	There are no watercourses surrounding the site.
Discharge to a surface water drain	✗		A connection to the public surface water sewer is proposed as per the existing site.
Discharge to a combined sewer		✗	There are no combined sewers surrounding the site.

PROPOSED SURFACE WATER STRATEGY

6.11 The site is already developed and considered a brownfield site. The measured greenfield rate for the site as per Table 5 is 0.98l/s. Therefore, the proposed discharge rate post development from the site is to be 1l/s for all events including up to and including the 1 in 100-year event plus an allowance of 40% for climate change. This is a significant reduction in comparison to the calculated existing discharge rates shown in Table 6.

6.12 Restricting the surface water discharge from the site to 1l/s results in the requirement for attenuation. The attenuation size shall be able to accommodate all events up to an including the 1 in 100-year event plus an allowance of 40% for climate change to ensure no flooding on the site occurs.

6.13 Based on a proposed impermeable area of 1051m^2 and a restricted discharge rate of 1l/s there is a requirement for 60m^3 of surface water attenuation. See appendix F for a copy of the microdrainage calculations

6.14 The proposed attenuation for the development will be provided through a combination of below ground attenuation, lined permeable paving to the proposed 300m^2 new car park area, a 77m^2 green roof to the new building and raingardens to landscaped areas which ensures that in addition to reducing the volume and rate of surface water discharge from the site the surface water runoff is suitably treated before it enters the drainage system.

6.15 In order to ensure water quality, it is proposed that the RWP's within the site will discharge into the permeable sub-base storage layer via a series of catchpit manholes, as well as additional RWP's will connect into the raingardens prior to discharging into the site wide drainage network.

6.16 The surface water discharge will connect to the existing surface water sewer on site which in turn connects to the public surface water sewer in Crescent East.

6.17 Drawings showing the proposed SuDS Features are included in Appendix G.

6.18 A Thames Water pre-development enquiry was submitted, in which it was confirmed that there is sufficient capacity within the public sewer network to accommodate the post development flows from the site. Refer to Appendix H for TW confirmation letter.

6.19 As part of Enfield Councils' requirements, a proforma has been completed which outlines the SUDS information. Refer to appendix I.

PROPOSED FOUL WATER STRATEGY

6.20 It is proposed to utilise as much of the existing foul drainage infrastructure post-development, this includes utilising the connections to the public foul sewer. This is subject to confirmation from an onsite drainage survey.

6.21 Any new foul water pop ups post development will be connected in to the existing foul system either through utilising existing connections or providing new pop ups and connections where practical in to the existing network.

6.22 A Thames Water pre-development enquiry was submitted, in which it was confirmed that there is sufficient capacity within the public sewer network to accommodate the post development flows from the site. Refer to Appendix H for TW confirmation letter.

7 SUDS MAINTENANCE AND MANAGEMENT

7.1 The responsibility for the enacting of this SuDS Maintenance and Management Plan will be the responsibility of the property owner.

GULLIES

7.2 Gullies provide a degree of pollution control in preventing silt and debris passing into the sewer network.

GULLY MAINTENANCE

MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
Regular maintenance	Clean and empty gullies.	Quarterly.

CATCHPITS

7.3 Catchpit chambers and manholes provide a degree of pollution control in preventing silt and debris passing forwards into the drainage network.

7.4 The operation and maintenance requirements are given in the table below:

CATCHPIT MAINTENANCE

MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
Regular maintenance	Clean and empty catchpits.	Quarterly.

BELOW GROUND MANHOLES AND DRAINAGE - GENERAL

7.5 Manholes and Catchpit Inspections should be frequent and regular, depending on local conditions, but at least annually. The drainage system should be cleaned / jetted as necessary.

PERMEABLE PAVING

7.6 Permeable block paving allows water to infiltrate through gaps between the blocks into a lined layer of granular material, from which it is collected and discharges into the below ground drainage network.

7.7 The operation and maintenance requirements are given the table below:

PERMEABLE PAVING MAINTENANCE

MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
Regular maintenance	Sweeping. **Note:** Any jointing material between the blocks that is lost or displaced as a result of sweeping must be replaced. New jointing material must be the same type as that removed or a suitable replacement.	Three times a year at the end of winter, mid-summer and after autumn lead fall. Also as required based on site-specific observations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas to prevent excess sediment being washing into the paving. Removal of weed.	As required
Remedial actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users. Rehabilitation of surface and underlying sand and geotextile.	As required
Monitoring	Inspect for evidence of poor operation and/or weed growth. If required take remedial action.	Monthly for three months after installation, then during regular maintenance visits.

7.8 Over time the ability of the permeable paving to infiltrate and convey surface water run-off may degrade due to clogging of the joints by silt and other sediments.

7.9 All areas of permeable pavement should be regularly inspected by those responsible, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

ATTENUATION STORAGE TANKS

7.10 The operation and maintenance requirements are given the table below:

ATTENUATION TANK MAINTENANCE

MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance.	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually.
	Remove sediment from pre-treatment structures and/or internal forebays.	Annually, as required.
Remedial actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required.

RAINWATER PLANTERS/GARDENS

7.11 Water vegetation immediately after planting and weekly during initial establishment if it does not rain.

7.12 If plants appear to be wilting, water 2-3 times per week until they return to good health.

7.13 Keep the overflow free and clear of debris such as dead leaves or trash and check it after. Keep soil and debris off of the top of the stone mulch so floatable material does not clog the overflow device.

7.14 Remove weeds as needed.

7.15 Check drainage of planter after rainstorms to make sure that the planter drains and/or water evaporates within 24 hours. If water is not draining, ensure that the underdrain valve is open sufficiently.

7.16 Inspect plants to evaluate health and replace if necessary.

7.17 Cut back or remove dead vegetation in Autumn.

7.18 Check to ensure that roof gutters leading to the downspout are free of leaves and other debris.

7.19 Check to ensure that downspout leading to the planter is properly connected to roof gutter.

7.20 In winter, check to make sure that overflow is clear of debris and snow. Periodically inspect planter to ensure ice is not accumulating.

GREEN ROOFS

7.21 The operation and maintenance requirements are given the table below:

MAINTENANCE SCHEDULE	REQUIRED ACTION	RECOMMENDED FREQUENCY
Regular inspections	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability.	Annually and after severe storms.
	Inspect soil substrate for evidence of erosion channels and identify any sediments sources.	Annually and after severe storms.
	Inspect drain inlets to ensure unrestricted runoff form the drainage layout to the conveyance or roof drainage system.	Annually and after severe storms.
	Inspect underside of roof for evidence of leakage.	Annually and after severe storms.
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Six monthly and annually or as required.
	During establishment replace dead plants as required.	Monthly.

	Post establishment replace dead plants as required.	Annually (in autumn).
	Remove fallen leaves and debris from deciduous plant foliage.	Six monthly or as required.
	Remove nuisance vegetation including weeds.	Six monthly or as required.
	Mow grass, prune shrubs and manage other planting.	Six monthly or as required.
Remedial Actions.	If erosion channels are evident these should be stabilised with extra soil substrate similar to the original material, and sources or erosion damage should be identified and controlled.	As required.
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate.	As required.

8 RECOMMENDATIONS AND CONCLUSIONS

8.1 The proposed works comprise of the demolition of and existing residential dwelling and erection of 7 apartments (use class C4) together with associated access, parking, amenity space and landscaping.

8.2 Geological conditions at the site are based on the British Geological Survey Viewer, there is no identified superficial deposits present but the site is underlain by bedrock deposits of London Clay Formation.

8.3 Shallow groundwater is unlikely to be encountered at the site and therefore the lower ground floor will not have any impact on groundwater flow routes.

8.4 The proposed site is not located in a groundwater source protection zone. Bedrock deposits are a 'unproductive' aquifer designation and the site is also located over a 'Unproductive' groundwater vulnerability zone.

8.5 The proposed development site is located entirely within Flood Zone 1 land classified as Land having less than 1 in 1000 annual probability of river or sea flooding. The site is classified as 'More Vulnerable' (Flood Risk Vulnerability Classification) and therefore, the development is classified as 'appropriate'.

8.5 Given the underlying geology it is considered unlikely that surface water from the development is disposed of by means of infiltration. The site is currently positively drained to the public sewer in Crescent East.

8.6 The site is already developed and considered a brownfield site. The measured greenfield rate for the site as per Table 5 is 0.98l/s. Therefore, the proposed discharge rate post development from the site is to be 1l/s for all events including up to and including the 1 in 100-year event plus an allowance of 40% for climate change. This provides a significant betterment over the existing situation

8.7 The proposed drainage scheme includes the provision of raingardens, a green roof, lined permeable paving to the proposed car park areas and below ground attenuation.

8.8 In order to ensure water quality, it is proposed that the RWP's within the site will discharge into the permeable sub-base storage layer via a series of catchpit manholes, as well as additional RWP's will connect into the raingardens prior to discharging into the site wide drainage network.

8.9 Given the fact that groundwater was not encountered in any boreholes on or near the site, the impact of the development on the local groundwater regime is assessed as being negligible.

8.10 It is proposed that all surface water will be conveyed through a gravity fed surface water system to the outfall location. In order to satisfy the proposed restricted discharge a vortex flow control device will be placed upstream of the discharge location. As a result of the restricted discharge rate surface water attenuation will be required on the development.

8.11 The surface water drainage design principles set out in this document will ensure that the development does not increase the risk of flooding to the surrounding area.

8.12 The proposed surface water drainage and SuDS design principles set out in this document will ensure that the development does not increase the risk of flooding to the surrounding area and will mimic the pre-development site.

8.13 Taking into account the flood risks to the site from all sources following the proposed development, the overall post-development flood risk is deemed to remain low.

FIGURES

FIGURE 1

Risk of Flooding from Rivers or Sea

Environment Agency Website

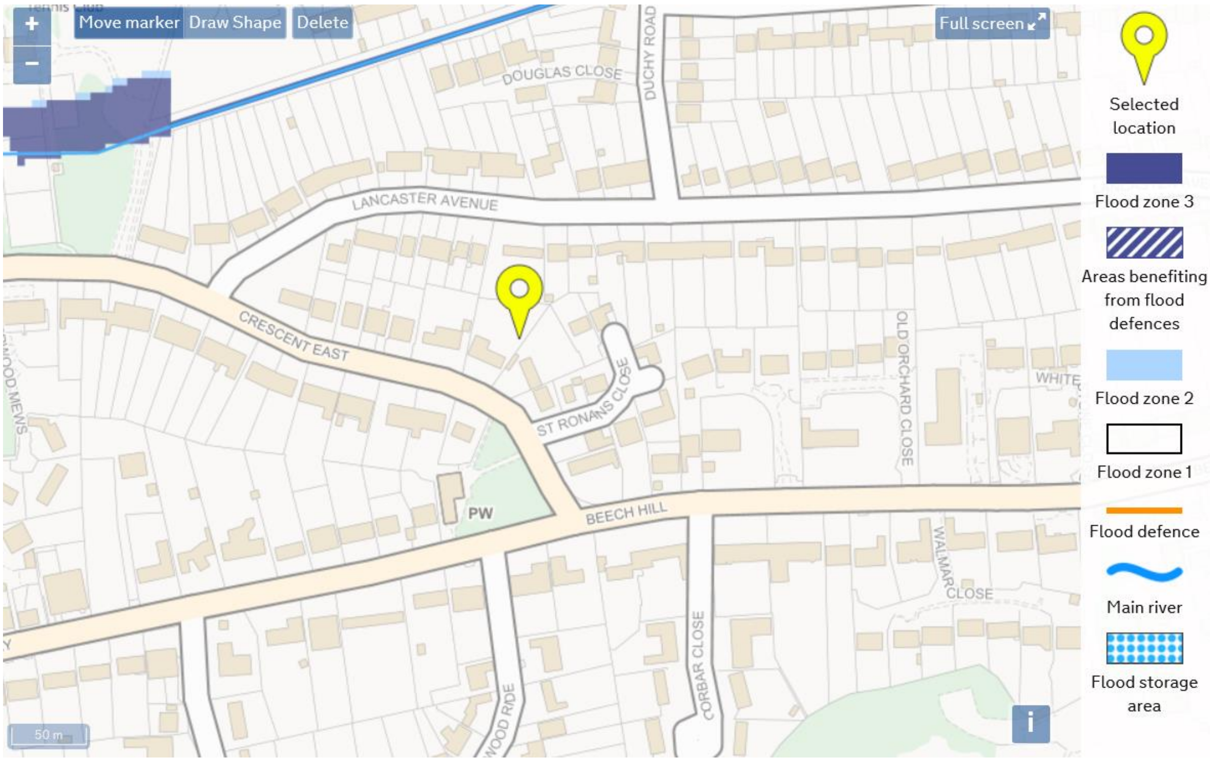


FIGURE 2

Surface Water Flood Risk

Environment Agency Website

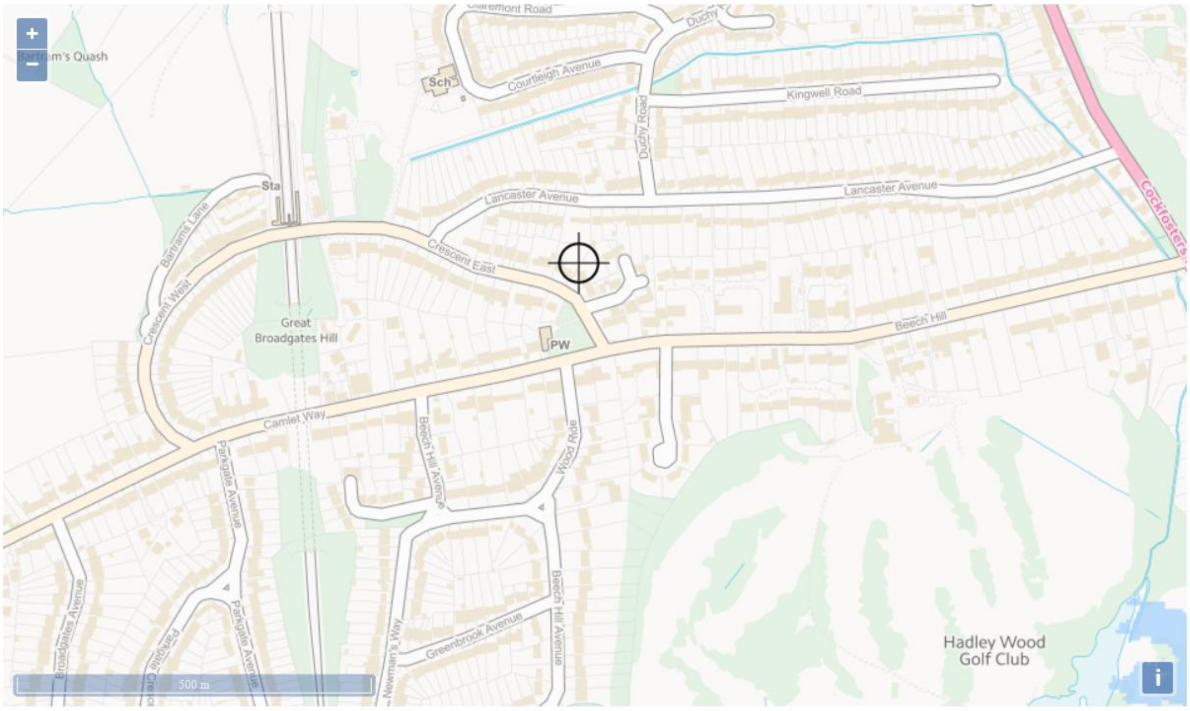
Extent of flooding from surface water

High Medium Low Very low Location you selected

FIGURE 3

Extent of Flooding from Reservoirs

Environment Agency Website



Extent of flooding from reservoirs

Maximum extent of flooding   Location you selected

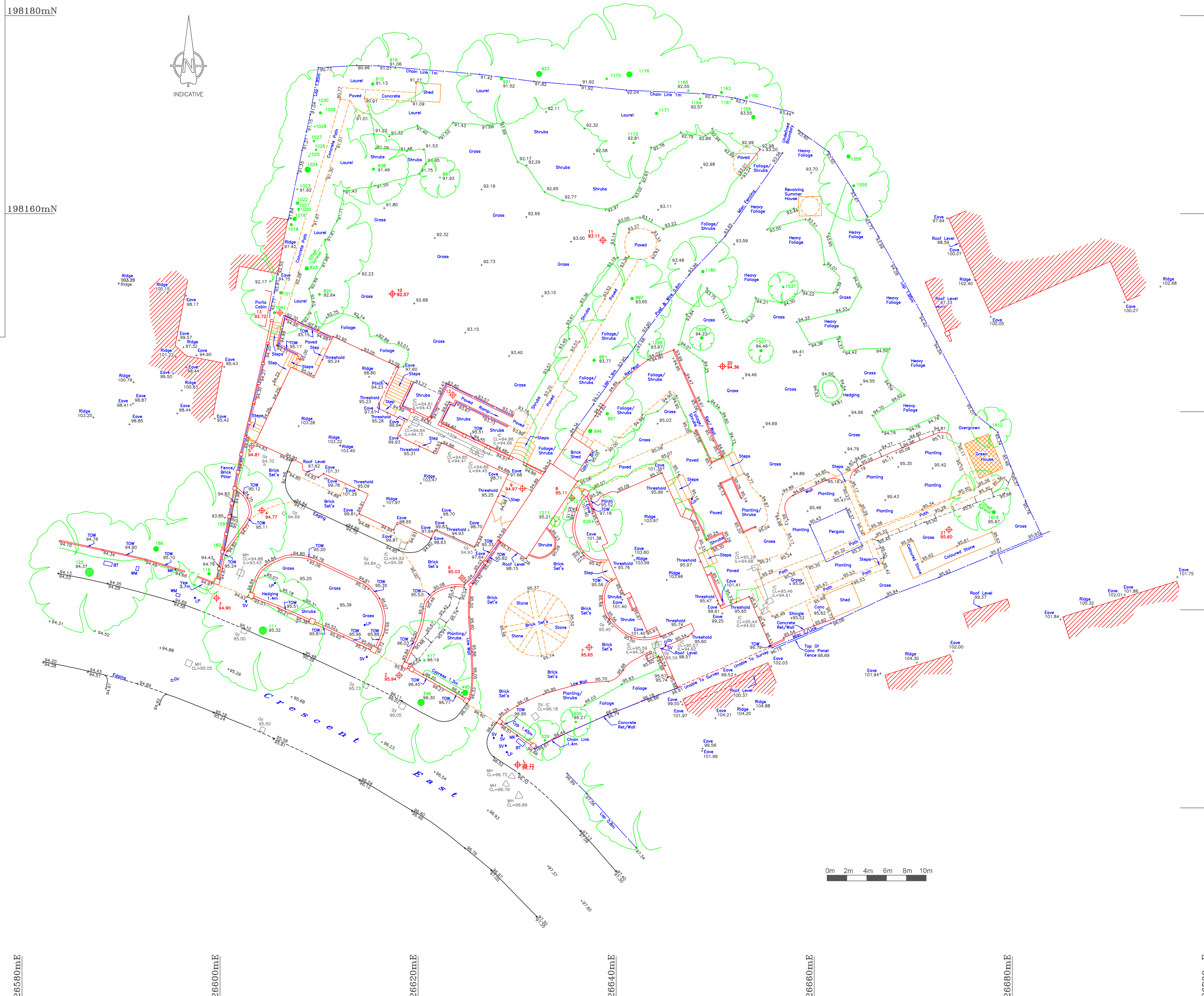
APPENDICES

APPENDIX A

Existing Site Layout

Tree Schedule

ID	Girth	Spread	Height	Species
111	2.50	12.00	18.00	Lime
116	0.90	4.00	16.00	Cypress
125	2.70	12.00	17.00	Lime
159	0.30	12.00	4.00	Unknown
160	0.40	3.00	7.00	Laurel MB
186	1.60	6.00	18.00	Cypress
346	2.10	12.00	17.00	Lime
417	0.60	8.00	7.00	Fruit
495	1.80	–	–	Stump
529	0.60	4.00	4.00	Beech
605	0.60	3.00	6.00	Yew
629	0.50	6.00	7.00	MG
820	0.70	6.00	7.00	Fruit
823	1.20	9.00	8.00	Cherry
838	0.80	7.00	6.00	Fruit
861	0.90	8.00	8.00	Willow MB
881	0.40	4.00	3.00	MG
897	0.90	8.00	7.00	Fruit
915	0.90	6.00	16.00	Cypress
916	0.60	7.00	15.00	Ash
921	0.90	9.00	13.00	Sycamore
923	1.80	7.00	16.00	Pine
996	1.20	7.00	11.00	Cypress MB
997	0.90	7.00	11.00	Cypress
1017	0.90	8.00	9.00	Laurel
1018	0.80	8.00	11.00	Cherry
1019	1.20	5.00	13.00	Cypress
1020	0.30	3.00	3.00	Cherry
1021	0.60	8.00	12.00	Laurel
1022	0.90	4.00	13.00	Cypress MB
1023	0.40	3.00	8.00	Laurel MB
1024	1.80	7.00	17.00	Pine MB
1025	0.30	4.00	6.00	Laurel
1026	0.60	7.00	6.00	Laurel
1027	0.60	7.00	6.00	Laurel
1028	0.30	2.00	7.00	Laurel
1029	0.80	7.00	8.00	Laurel
1030	0.30	7.00	6.00	Laurel MB
1041	0.80	3.00	6.00	Laurel
1159	1.20	6.00	14.00	Fir
1160	0.80	7.00	13.00	Sycamore MB
1161	0.50	7.00	12.00	Sycamore
1163	0.80	7.00	7.00	Unknown MB
1164	0.60	7.00	9.00	Sycamore
1165	0.50	7.00	9.00	Sycamore
1170	0.60	8.00	7.00	Fruit
1171	0.80	8.00	9.00	Unknown MB
1172	0.60	7.00	15.00	Silver Birch
1176	1.80	14.00	18.00	Willow
1180	0.90	7.00	8.00	Sycamore
1211	0.50	1.00	4.00	Yew
1216	0.30	3.00	3.00	Laurel
1299	0.50	3.00	7.00	Holly MB
1507	0.60	2.50	2.60	Acer
1508	0.33	2.50	2.00	Acer
1537	0.60	3.00	3.00	Cypress MB
1555	0.80	7.00	9.00	Fruit
1556	1.20	5.00	12.00	Cypress
1612	0.60	4.00	7.00	Cypress
1619	1.10	6.00	B7	Laurel



NOTES:

Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.

Grid coordinates are based on Ordnance Survey National Grid.

ABBREVIATION KEY – TOPOGRAPHIC SURVEY

AV	Air Valve
BO	Bollard
BIG	Back Inlet Gully
BT	British Telecom
CPS	Concrete Paving Slabs
CL=	Cover Level
CATV	Cable Television Cover
DY	Double Yellow Line
DR	Double Red Line
DW	Dashed White Line
ECB	Electric Cable Cabinet
ECP	Electric Cable Pit
EP	Electricity Pole
ER	Earth Rod
FAI	Fresh Air Inlet
FH	Fire Hydrant
F/B	Flower Bed
GV	Gas Valve
Gy	Gully
IL=	Invert Level
LC	Lamp Column
LP	Lamp Post
MB	Multi Bole
MK	Service Marker
PM	Parking Meter
RE	Rodding Eye
RS	Road Sign
RWP	Rain Water Pipe
SC	Stop Cock
SW	Single White Line
SY	Single Yellow Line
SV	Stop Valve
SVP	Soil and Vent Pipe
TCB	Telephone Cable Cabinet
TP	Telephone Pole
UTL	Unable To Lift
WG	Weir Gully
WM	Water Meter
WO	Wash Out

ABBREVIATION KEY – BUILDING SURVEY

⬭	Floor To Ceiling
▭	Floor To False Ceiling
AB	Air Brick
DS	Double Socket
Dh	Door Head Level
Ceil HT	Ceiling Level
FA	Fire Alarm
FL	Floor Level
FS–	Floor To Sill
FS	Fuse Box
GL	Ground Line
Ht=	Height
LS	Light Switch
RWP	Rain Water Pipe
SA	Smoke Alarm
SD	Smoke Detector
SH–	Sill To Head
SS	Single Socket
Stat	Thermostat
SW	Switch
Tel	Telephone/Outlet
TV	Arial/Cable Socket
UA=	Under Arch (center)
UO=	Under Opening
UB=	Under Beam
UD=	Under Duct
UP=	Under Pipe
WL	Wall Light
Wh=	Window Head Level
Ws=	Window Sill Level

Co-ordinate Table

ID	Easting	Northing	Height
1	526630.057	198104.344	96.717
2	526618.081	198113.387	95.939
3	526599.645	198121.190	94.901
4	526604.217	198130.028	94.768
5	526603.200	198136.564	94.809
6	526624.432	198123.226	95.032
7	526637.272	198116.215	95.649
8	526635.527	198131.292	95.114
9	526630.539	198132.239	94.974
10	526617.397	198151.907	92.567
11	526638.655	198157.327	93.114
12	526623.499	198141.692	94.583
13	526606.052	198149.987	92.720
20	526650.741	198144.581	94.362
21	526673.609	198128.096	95.601

REV. SUFFIX	DATE	INITIAL	REVISION DETAILS

LEVELING DATUM
Related To Ordnance Survey Utilising GPS

CAD OPERATOR	CDH	APPROVED BY	BED	DATE	07.12.2019

Survey and Engineering Services Ltd

Land, Architectural and Engineering Surveyors

CLIENT
Jason Asbury
Blue Yonder

LOCATION
23–25 Crescent East
Hadley Wood
EN4 0EY

DRAWING TITLE
Detail Survey

ORIGINAL JOB No.		JOB No.	*041219*
DRAWING No.	*041219/topo*	REVISION SUFFIX	
SCALE	*1:200 (A1 sheet)*	DATE	*7th Dec 2019*

Registered Company No: 5366478
The Granary
Lee Farm
Lee Lane
Pinkneys Green
Maidenhead
SL6 6PE
Tel No / Fax: +44 (0) 1628 675 781
e-mail: mail@ses-surveyors.co.uk

APPENDIX B

Proposed Site Layout

PLANNING

KEY

EV CHARGIN POINTS

EXISTING HOUSE TO BE DEMOLISHED

SCHEME SUBMITTED FOR PRE APP REF 22/04197/PREAPP

SCHEME SUBMITTED FOR DESIGN REVIEW PANEL

1.8M HIGH ACOUSTIC FENCE

LANDSCAPING BY OTHERS

18 BIKE BIKE STORAGE IN TIMBER SHED BICYCLE RACK SEMI VERTICAL SPACE SAVING TYPE

FALCOLOK-CARGO BIKE STORE

HARDSTANDING BY OTHERS

REFUSE SHED

NEW BUILDING

EXG TREE

SCALE AT 1:100

No.	Date	By	Contents

Revisions

Site Address

23 CRESCENT EAST
HADLEY WOOD
EN40EY

Job Title

DEMOLTION OF EXG HOUSE AND ERECTION OF 7 FLATS

Drawing Title

SITE PLAN PROPOSED

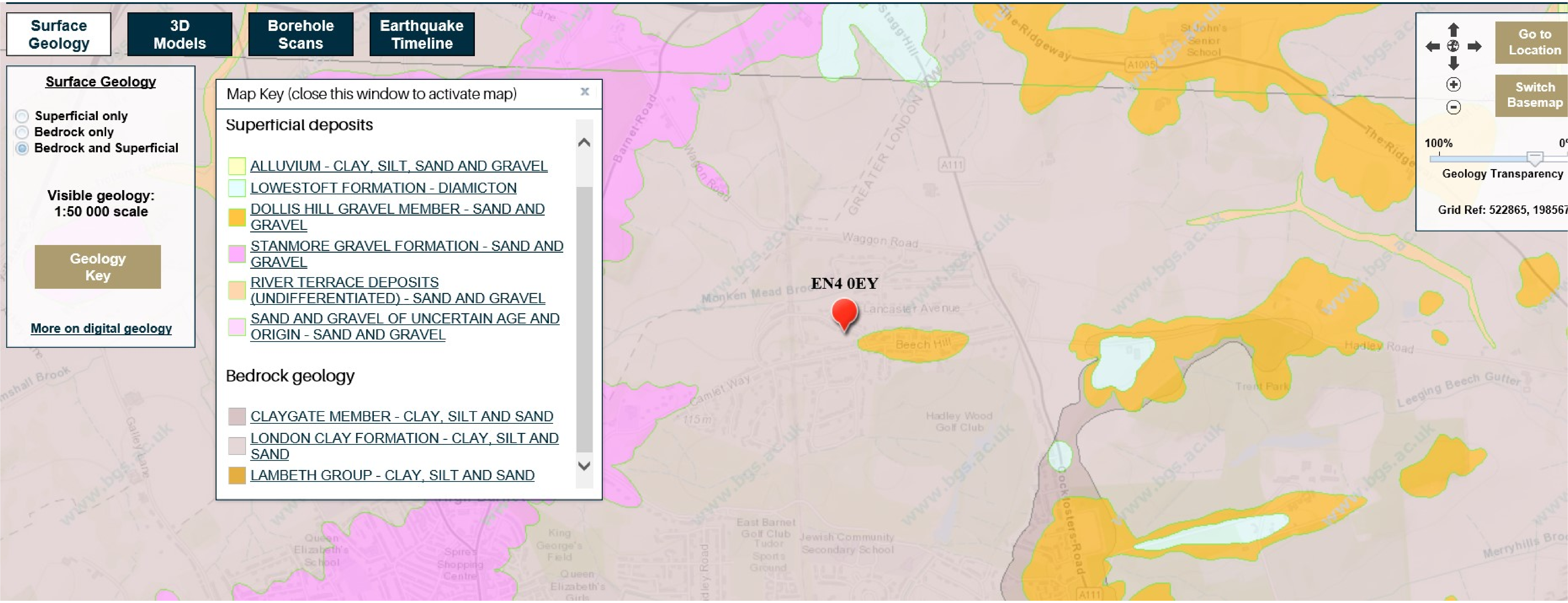
Scale	Date	Drawn by
1.100 @ a1	07/23	sjl

Alan Cox associates
Architectural & Planning Consultants
TEL: 020 - 8440 - 7777
FAX: 020 - 8364 - 9556

Drg.No.	Rev.
521022-24	

APPENDIX C

Geotechnical Information


Surface Geology
3D Models
Borehole Scans
Earthquake Timeline
Surface Geology
Superficial only
Bedrock only
Bedrock and Superficial
Visible geology:
1:50 000 scale
Geology Key
More on digital geology
Map Key (close this window to activate map)
Superficial deposits
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
LOWESTOFT FORMATION - DIAMICTON
DOLLIS HILL GRAVEL MEMBER - SAND AND GRAVEL
STANMORE GRAVEL FORMATION - SAND AND GRAVEL
RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL
SAND AND GRAVEL OF UNCERTAIN AGE AND ORIGIN - SAND AND GRAVEL
Bedrock geology
CLAYGATE MEMBER - CLAY, SILT AND SAND
LONDON CLAY FORMATION - CLAY, SILT AND SAND
LAMBETH GROUP - CLAY, SILT AND SAND
EN4 0EY
Lancaster Avenue
Beech Hill
Waggon Road
Hadley Road
Trent Park
Hadley Wood Golf Club
Leeging Beech Gutter
East Barnet Golf Club
Jewish Community Secondary School
Go to Location
Switch Basemap
100%
Geology Transparency
Grid Ref: 522865, 198567

APPLiED GEOLOGY
Talisman House
11 Talisman Square
KENILWORTH
CV8 1JB
Tel: 01926 851113 Fax: 01926 851394

Job No. **AG518**

Site : 4 Duchy Road, Hadley Wood

Client : Banner Homes Ltd.

Engineer :

BOREHOLE

BH 1

Sheet 1 of

Method	Date	Drilling Crew	Logged By	Scale
Light Cable Percussion.	21/12/06 - 21/12/06	D Fielding	HF	1:50

Dia (mm) 150 | Coord | Ground Level m. 82.00

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata
							TOPSOIL (drillers' description)
	0.50	D				0.30	Firm brown CLAY with roots and gravel (drillers' description). (POSSIBLE REWORKED OR DISTURBED LONDON CLAY)
	0.80	D				0.70	Soft to firm brown grey orange slightly gravelly CLAY. Gravel is fine to coarse, subangular, mainly quartzite with some flint. (REWORKED OR DISTURBED LONDON CLAY)
1.50	1.20 - 1.60	U(60)					
	1.70	D				1.60	Firm orange brown grey CLAY with occasional gypsum crystals. (LONDON CLAY)
	2.00	D					
1.50	2.00 - 2.45	SPT		11N			
	3.00	D					
1.50	3.00 - 3.45	SPT		10N			
	4.00	D					
1.50	4.00 - 4.45	SPT		11N			
	5.00	D					
1.50	5.00 - 5.45	SPT		14N			
	6.00	D					
	6.50	D					
1.50	6.50 - 6.95	SPT		18N			...becoming stiff from 6.50m bgl.
	7.00	D					
	8.00	D					
	8.00	SV		>120			
1.50	8.00 - 8.45	SPT		20N			
	9.00	D				9.00	Stiff grey CLAY with occasional gypsum crystals. (LONDON CLAY)
	9.00	SV		>120			
	9.50	D					
1.50	9.50 - 9.95	SPT		25N			
	10.00	D					

Remarks
1/ Services pit hand dug to 1.2m bgl.
2/ No groundwater encountered during drilling.
3/ Borehole backfilled with arisings.
4/ SV = Hand held shear vane

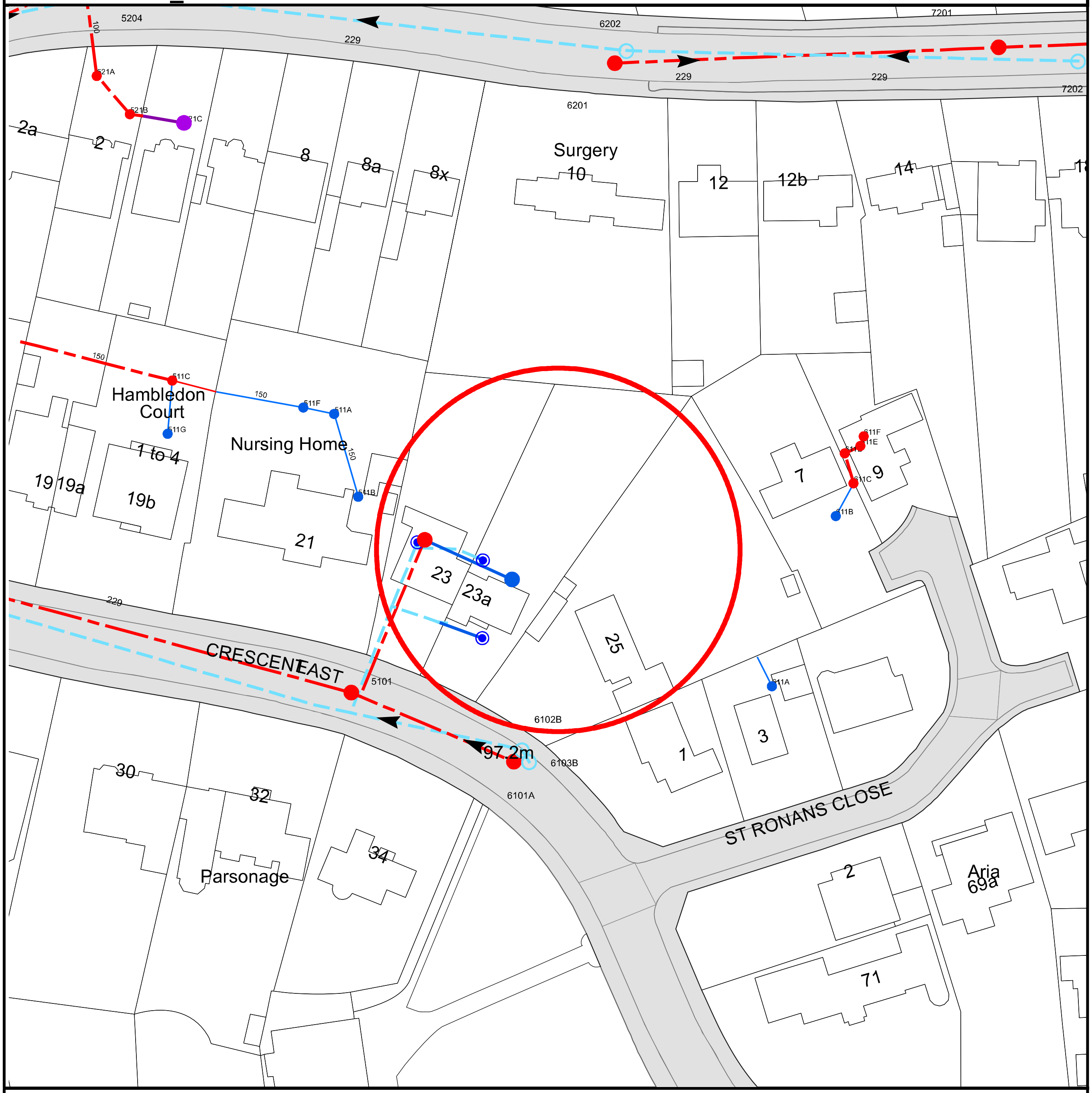
GROUNDWATER

Struck	Cased	20 mins	Sealed	Remarks

APPENDIX D

Thames Water Public Sewer Records

Residential CON29DW Drainage & Water Search Sewer Map-DWS/DWS Standard/2019_4033213



The width of the displayed area is 200m

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.

APPENDIX E

Greenfield Runoff Rate and Existing Runoff Rates

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

hr wallingford

Calculated by:	Andrew Dushyanthan
Site name:	23 Crescent East
Site location:	Enfield

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.66774° N
Longitude:	0.17052° W
Reference:	3668177223
Date:	Aug 18 2023 16:22

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 0.21

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	679	679
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default	Edited

Q_{BAR} (l/s):	0.98	0.98
1 in 1 year (l/s):	0.83	0.83
1 in 30 years (l/s):	2.25	2.25
1 in 100 year (l/s):	3.12	3.12
1 in 200 years (l/s):	3.66	3.66

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.448	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.035	4-8	0.011

Total Area Contributing (ha) = 0.046

Total Pipe Volume (m³) = 0.147

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	7.500	0.350	21.4	0.046	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	5.000	0.063	79.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.07	99.100	0.046	0.0	0.0	0.0	1.68	13.2	6.2
1.001	50.00	5.15	98.700	0.046	0.0	0.0	0.0	1.13	20.0	6.2

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.448
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+0%	30/15 Summer				99.154
1.001	2	15 Winter	1	+0%	100/15 Summer				98.768

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.046	0.000	0.55			6.6	OK	
1.001	2	-0.082	0.000	0.42			6.6	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.448
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%	30/15 Summer				99.372
1.001	2	15 Winter	30	+0%	100/15 Summer				98.814

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.172	0.000	1.21			14.5	SURCHARGED	
1.001	2	-0.036	0.000	0.93			14.6	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.448
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+0%	30/15 Summer				99.636
1.001	2	15 Winter	100	+0%	100/15 Summer				98.859

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.436	0.000	1.48			17.7	SURCHARGED	
1.001	2	0.009	0.000	1.13			17.7	SURCHARGED	

APPENDIX F

Microdrainage Surface Water Calculations

Cascade Summary of Results for Proposed Volume.SRCX

Upstream Structures	Outflow To	Overflow To
Volume Required (PP).SRCX	(None)	(None)

Half Drain Time : 476 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	98.973	0.473	0.0	1.0	1.0	27.0	O K
30 min Summer	99.105	0.605	0.0	1.0	1.0	34.5	O K
60 min Summer	99.223	0.723	0.0	1.0	1.0	41.2	O K
120 min Summer	99.316	0.816	0.0	1.0	1.0	46.5	O K
180 min Summer	99.348	0.848	0.0	1.0	1.0	48.4	O K
240 min Summer	99.355	0.855	0.0	1.0	1.0	48.8	O K
360 min Summer	99.336	0.836	0.0	1.0	1.0	47.6	O K
480 min Summer	99.307	0.807	0.0	1.0	1.0	46.0	O K
600 min Summer	99.280	0.780	0.0	1.0	1.0	44.5	O K
720 min Summer	99.254	0.754	0.0	1.0	1.0	43.0	O K
960 min Summer	99.204	0.704	0.0	1.0	1.0	40.1	O K
1440 min Summer	99.112	0.612	0.0	1.0	1.0	34.9	O K
2160 min Summer	98.991	0.491	0.0	1.0	1.0	28.0	O K
2880 min Summer	98.886	0.386	0.0	1.0	1.0	22.0	O K
4320 min Summer	98.728	0.228	0.0	1.0	1.0	13.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	143.730	0.0	28.1	26
30 min Summer	92.556	0.0	36.3	40
60 min Summer	56.713	0.0	44.5	70
120 min Summer	33.608	0.0	52.7	128
180 min Summer	24.451	0.0	57.6	186
240 min Summer	19.415	0.0	61.0	244
360 min Summer	13.949	0.0	65.7	360
480 min Summer	11.040	0.0	69.3	410
600 min Summer	9.202	0.0	72.3	470
720 min Summer	7.927	0.0	74.7	530
960 min Summer	6.261	0.0	78.7	662
1440 min Summer	4.484	0.0	84.5	930
2160 min Summer	3.208	0.0	90.6	1324
2880 min Summer	2.527	0.0	95.2	1704
4320 min Summer	1.803	0.0	101.8	2388

Cascade Summary of Results for Proposed Volume.SRCX

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
5760 min Summer	98.634	0.134	0.0	1.0	1.0	7.7	O K
7200 min Summer	98.597	0.097	0.0	1.0	1.0	5.5	O K
8640 min Summer	98.585	0.085	0.0	0.8	0.8	4.8	O K
10080 min Summer	98.575	0.075	0.0	0.7	0.7	4.3	O K
15 min Winter	99.033	0.533	0.0	1.0	1.0	30.4	O K
30 min Winter	99.181	0.681	0.0	1.0	1.0	38.8	O K
60 min Winter	99.317	0.817	0.0	1.0	1.0	46.6	O K
120 min Winter	99.428	0.928	0.0	1.0	1.0	52.9	O K
180 min Winter	99.471	0.971	0.0	1.0	1.0	55.3	O K
240 min Winter	99.485	0.985	0.0	1.0	1.0	56.2	O K
360 min Winter	99.475	0.975	0.0	1.0	1.0	55.6	O K
480 min Winter	99.446	0.946	0.0	1.0	1.0	53.9	O K
600 min Winter	99.408	0.908	0.0	1.0	1.0	51.8	O K
720 min Winter	99.375	0.875	0.0	1.0	1.0	49.9	O K
960 min Winter	99.308	0.808	0.0	1.0	1.0	46.1	O K
1440 min Winter	99.174	0.674	0.0	1.0	1.0	38.4	O K
2160 min Winter	98.991	0.491	0.0	1.0	1.0	28.0	O K
2880 min Winter	98.836	0.336	0.0	1.0	1.0	19.2	O K
4320 min Winter	98.630	0.130	0.0	1.0	1.0	7.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	1.419	0.0	106.7	3056
7200 min Summer	1.177	0.0	110.6	3680
8640 min Summer	1.010	0.0	113.9	4408
10080 min Summer	0.888	0.0	116.6	5144
15 min Winter	143.730	0.0	31.5	26
30 min Winter	92.556	0.0	40.6	40
60 min Winter	56.713	0.0	49.8	68
120 min Winter	33.608	0.0	59.1	126
180 min Winter	24.451	0.0	64.5	182
240 min Winter	19.415	0.0	68.3	240
360 min Winter	13.949	0.0	73.6	352
480 min Winter	11.040	0.0	77.7	458
600 min Winter	9.202	0.0	80.9	542
720 min Winter	7.927	0.0	83.7	570
960 min Winter	6.261	0.0	88.1	720
1440 min Winter	4.484	0.0	94.7	1016
2160 min Winter	3.208	0.0	101.5	1428
2880 min Winter	2.527	0.0	106.6	1792
4320 min Winter	1.803	0.0	114.1	2384

Cascade Summary of Results for Proposed Volume.SRCX

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
5760 min Winter	98.587	0.087	0.0	0.9	0.9	4.9	O K
7200 min Winter	98.572	0.072	0.0	0.7	0.7	4.1	O K
8640 min Winter	98.562	0.062	0.0	0.6	0.6	3.5	O K
10080 min Winter	98.555	0.055	0.0	0.5	0.5	3.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Winter	1.419	0.0	119.6	2952
7200 min Winter	1.177	0.0	124.0	3680
8640 min Winter	1.010	0.0	127.6	4408
10080 min Winter	0.888	0.0	130.7	5144

Cascade Rainfall Details for Proposed Volume.SRCX

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	0.448	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.075

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	4	0.025	4	8	0.025	8	12	0.025

Cascade Model Details for Proposed Volume.SRCX

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.500 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	60.0	60.0	1.001	0.0	91.0
1.000	60.0	91.0			

Pump Outflow Control

Invert Level (m) 98.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0000	0.900	1.0000	1.700	1.0000	2.500	1.0000
0.200	1.0000	1.000	1.0000	1.800	1.0000	2.600	1.0000
0.300	1.0000	1.100	1.0000	1.900	1.0000	2.700	1.0000
0.400	1.0000	1.200	1.0000	2.000	1.0000	2.800	1.0000
0.500	1.0000	1.300	1.0000	2.100	1.0000	2.900	1.0000
0.600	1.0000	1.400	1.0000	2.200	1.0000	3.000	1.0000
0.700	1.0000	1.500	1.0000	2.300	1.0000		
0.800	1.0000	1.600	1.0000	2.400	1.0000		

Cascade Summary of Results for Volume Required (PP).SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Proposed Volume.SRCX	(None)

Half Drain Time : 0 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	99.731	0.331	0.0	10.4	10.4	0.3	Flood Risk
30 min Summer	99.745	0.345	0.0	10.7	10.7	0.3	Flood Risk
60 min Summer	99.681	0.281	0.0	9.4	9.4	0.3	O K
120 min Summer	99.575	0.175	0.0	6.9	6.9	0.2	O K
180 min Summer	99.527	0.127	0.0	5.4	5.4	0.1	O K
240 min Summer	99.511	0.111	0.0	4.4	4.4	0.1	O K
360 min Summer	99.492	0.092	0.0	3.3	3.3	0.1	O K
480 min Summer	99.482	0.082	0.0	2.7	2.7	0.1	O K
600 min Summer	99.473	0.073	0.0	2.3	2.3	0.1	O K
720 min Summer	99.465	0.065	0.0	1.9	1.9	0.1	O K
960 min Summer	99.457	0.057	0.0	1.5	1.5	0.1	O K
1440 min Summer	99.449	0.049	0.0	1.1	1.1	0.0	O K
2160 min Summer	99.442	0.042	0.0	0.8	0.8	0.0	O K
2880 min Summer	99.437	0.037	0.0	0.6	0.6	0.0	O K
4320 min Summer	99.431	0.031	0.0	0.4	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	143.730	0.0	7.9	15
30 min Summer	92.556	0.0	10.3	22
60 min Summer	56.713	0.0	12.6	36
120 min Summer	33.608	0.0	15.0	66
180 min Summer	24.451	0.0	16.3	98
240 min Summer	19.415	0.0	17.3	126
360 min Summer	13.949	0.0	18.7	188
480 min Summer	11.040	0.0	19.7	248
600 min Summer	9.202	0.0	20.5	308
720 min Summer	7.927	0.0	21.2	366
960 min Summer	6.261	0.0	22.3	488
1440 min Summer	4.484	0.0	24.0	722
2160 min Summer	3.208	0.0	25.7	1092
2880 min Summer	2.527	0.0	27.0	1464
4320 min Summer	1.803	0.0	28.8	2200

Cascade Summary of Results for Volume Required (PP).SRCX

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
5760 min Summer	99.427	0.027	0.0	0.4	0.4	0.0	O K
7200 min Summer	99.425	0.025	0.0	0.3	0.3	0.0	O K
8640 min Summer	99.423	0.023	0.0	0.3	0.3	0.0	O K
10080 min Summer	99.422	0.022	0.0	0.2	0.2	0.0	O K
15 min Winter	99.806	0.406	0.0	11.7	11.7	0.4	Flood Risk
30 min Winter	99.795	0.395	0.0	11.5	11.5	0.4	Flood Risk
60 min Winter	99.654	0.254	0.0	8.9	8.9	0.3	O K
120 min Winter	99.536	0.136	0.0	5.7	5.7	0.1	O K
180 min Winter	99.508	0.108	0.0	4.2	4.2	0.1	O K
240 min Winter	99.494	0.094	0.0	3.4	3.4	0.1	O K
360 min Winter	99.478	0.078	0.0	2.5	2.5	0.1	O K
480 min Winter	99.466	0.066	0.0	2.0	2.0	0.1	O K
600 min Winter	99.459	0.059	0.0	1.7	1.7	0.1	O K
720 min Winter	99.455	0.055	0.0	1.4	1.4	0.1	O K
960 min Winter	99.450	0.050	0.0	1.2	1.2	0.0	O K
1440 min Winter	99.442	0.042	0.0	0.8	0.8	0.0	O K
2160 min Winter	99.435	0.035	0.0	0.6	0.6	0.0	O K
2880 min Winter	99.431	0.031	0.0	0.5	0.5	0.0	O K
4320 min Winter	99.426	0.026	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	1.419	0.0	30.1	2920
7200 min Summer	1.177	0.0	31.2	3552
8640 min Summer	1.010	0.0	32.0	4384
10080 min Summer	0.888	0.0	32.8	5104
15 min Winter	143.730	0.0	8.9	15
30 min Winter	92.556	0.0	11.5	22
60 min Winter	56.713	0.0	14.1	36
120 min Winter	33.608	0.0	16.8	66
180 min Winter	24.451	0.0	18.3	96
240 min Winter	19.415	0.0	19.4	124
360 min Winter	13.949	0.0	20.9	186
480 min Winter	11.040	0.0	22.1	242
600 min Winter	9.202	0.0	23.0	312
720 min Winter	7.927	0.0	23.8	366
960 min Winter	6.261	0.0	25.0	484
1440 min Winter	4.484	0.0	26.9	750
2160 min Winter	3.208	0.0	28.8	1116
2880 min Winter	2.527	0.0	30.2	1444
4320 min Winter	1.803	0.0	32.3	2128

Cascade Summary of Results for Volume Required (PP).SRCX

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
5760 min Winter	99.423	0.023	0.0	0.3	0.3	0.0	O K
7200 min Winter	99.421	0.021	0.0	0.2	0.2	0.0	O K
8640 min Winter	99.420	0.020	0.0	0.2	0.2	0.0	O K
10080 min Winter	99.418	0.018	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Winter	1.419	0.0	33.8	2992
7200 min Winter	1.177	0.0	35.0	3680
8640 min Winter	1.010	0.0	36.0	4384
10080 min Winter	0.888	0.0	36.8	5008

Cascade Rainfall Details for Volume Required (PP).SRCX

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	0.448	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.030

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	4	0.010	4	8	0.010	8	12	0.010

Cascade Model Details for Volume Required (PP).SRCX

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	3.0
Max Percolation (l/s)	8.3	Slope (1:X)	12.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.400	Membrane Depth (m)	600

Pipe Outflow Control

Diameter (m)	0.100	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	5.000	Upstream Invert Level (m)	99.400
Roughness k (mm)	0.600		

APPENDIX G

Proposed Drainage Strategy

2020 Mason Navarro Pledge

General Drainage Specification

1. All private drains shall be constructed and commissioned in accordance with the relevant sections of the Building Regulations Approved Documents and relevant British Standards.

2. All pipework to be 100Ø minimum unless noted otherwise.

3. Private surface water drains shall be laid at a minimum gradient of 1 in 100 or to the gradients and invert levels shown.

4. Private foul water drains shall be laid at a minimum gradient of 1 in 80 or to the gradients and invert levels shown

5. Foul pipework connections to first access point shall be laid at a minimum gradient of 1 in 40 or to the levels shown.

6. All connections to be made soffit to soffit unless noted otherwise.

7. Pipe bedding to be Class 'B' bedding for rigid pipes and Class 'T' bedding for flexible pipes (100 mm granular bed and surround).

8. Where cover to soffit of pipe is less than 600 mm in private areas, the following shall apply:-
   a) Vitrified clay pipes - provide a 100 mm min. thick concrete bed and surround (instead of class 'B' & 'T' bedding) and a 13 mm thick compressible filler at each joint.
   b) uPVC pipes - provide a concrete bridging (in addition to class 'B' or 'T' bedding) in accordance with appendix A15, Building Regulations part 'H'.

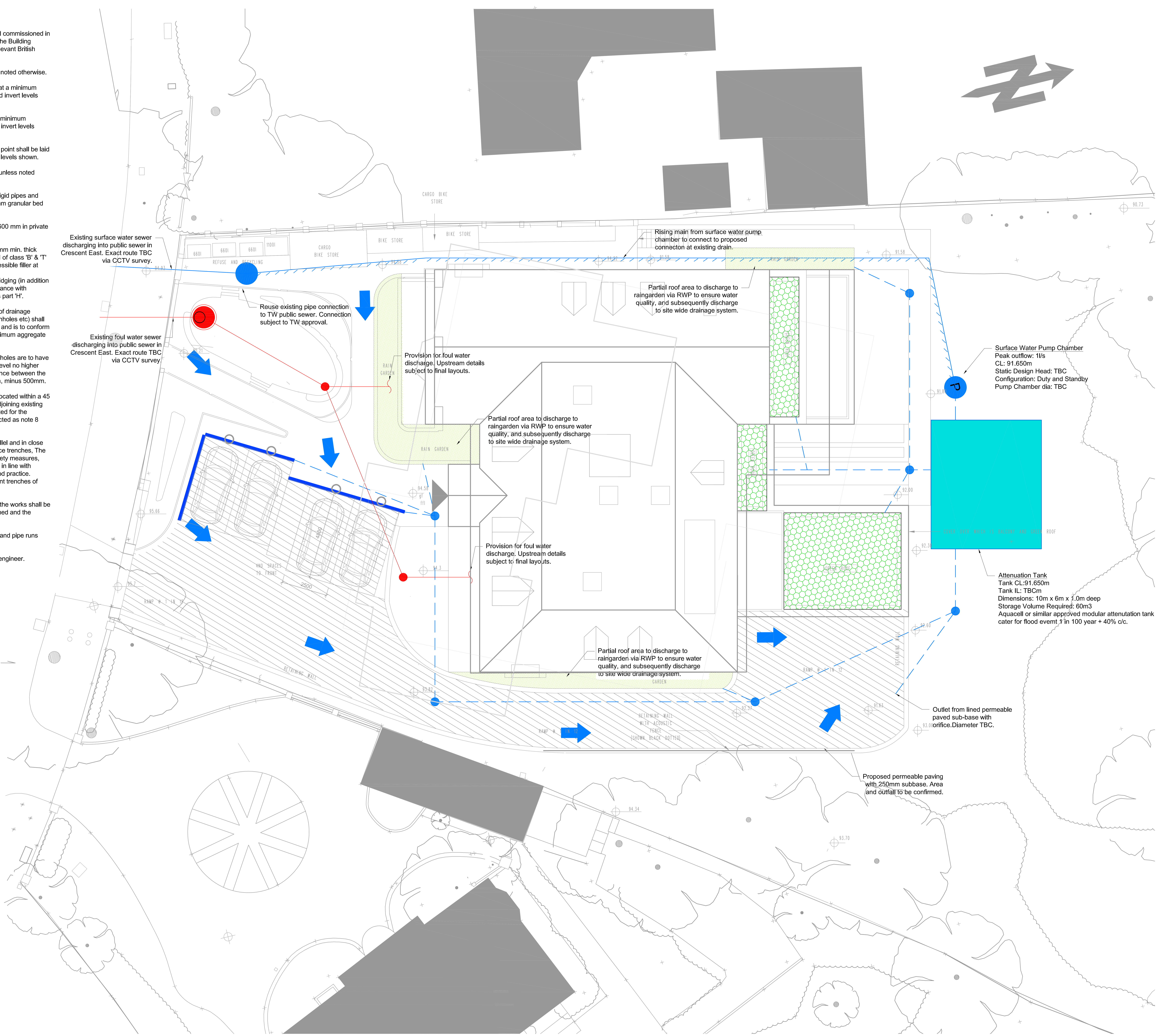
9. All concrete indicated in the construction of drainage infrastructure (pipe bedding, bridging, manholes etc) shall be standardised prescribed concrete ST2 and is to conform to BS EN 206-1 and BS 8500-2. The maximum aggregate size shall be 20mm.

10. Foundations adjacent to pipe runs or manholes are to have their formation level set above the invert level no higher than the equivalent of the horizontal distance between the pipe/excavation trench and the foundation, minus 500mm.

11. Excavations for manholes, pipe runs etc located within a 45 degree load distribution splay from any adjoining existing foundations, are to be adequately supported for the duration of the works and pipe runs protected as note 8 above.

12. Where excavations for pipe runs are parallel and in close proximity to each other and/or other service trenches, The Contractor shall ensure that adequate safety measures, including temporary shoring, are provided in line with current health & safety legislation and good practice. Particular attention is to be paid to adjacent trenches of differing invert levels.

13. All existing drainage found on site during the works shall be investigated, its operational status confirmed and the following applied:-
   a) Inoperative drainage shall be cut back and pipe runs filled with concrete grout.
   b) 'Live' drainage shall be advised to the engineer.



General

1.1 This drawing is to be read in conjunction with all Architect's, Engineer's and Services Engineer's drawings and specifications.
1.2 Do not scale from any of the structural drawings. All dimensions to be verified on site and any discrepancies should be highlighted.
1.3 The contractor is responsible for the stability of the building and adjoining structures during construction and shall design, install, adapt and maintain all necessary propping and temporary works. A method statement for the temporary works must be submitted to the contractor administrator for comment before work begins.
1.4 All materials to comply with the relevant British Standard.

Surface Water	Description
	Permeable Paved Surfacing
	New surface water drain
	New shallow inspection chamber (typ. 225mmØ) upto 600mm deep
	New shallow inspection chamber (typ. 450mmØ)
	New surface water manhole (Size indicated on Manhole Schedule)
	New modular storage tank
P	Surface water pump chamber (Size indicated on Manhole Schedule)
RWP	New rain water down pipe
	New surface water rising main
	Existing surface water sewer
	Green Roof Area
	Raingarden
	Flow route direction arrow
	Linear drainage channel
Foul	**Description**
	New foul water drain
	New shallow foul inspection chamber (typ. 225mmØ) upto 600mm deep
	New shallow foul inspection chamber (typ. 450mmØ)
	New foul water manhole (Size indicated on Manhole Schedule)
	Existing foul water sewer

REV	COMMENTS	DATE	CHK
P03	Preliminary Issue	03.11.23	RJ
P02	Preliminary Issue Background layout amended	12.10.23	RJ
P01	Preliminary Issue	25.08.23	RJ

STATUS

PRELIMINARY

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mason navarro pledge
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CLIENT

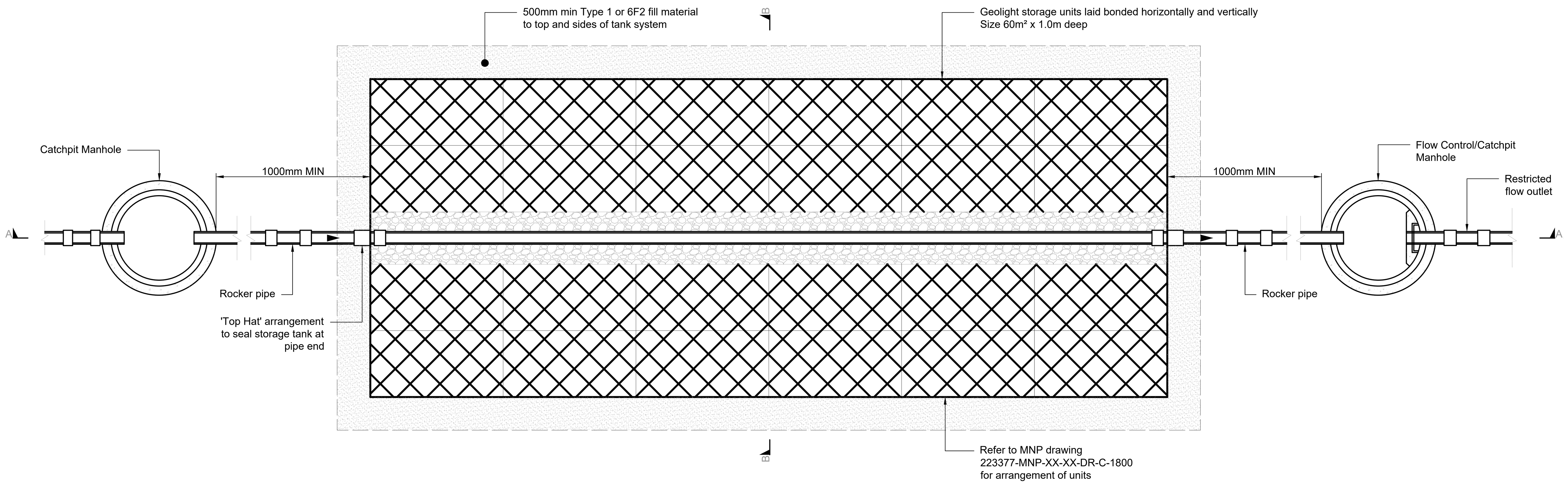
PROJECT
23 CRESCENT EAST

DRAWING TITLE
OUTLINE DRAINAGE STRATEGY

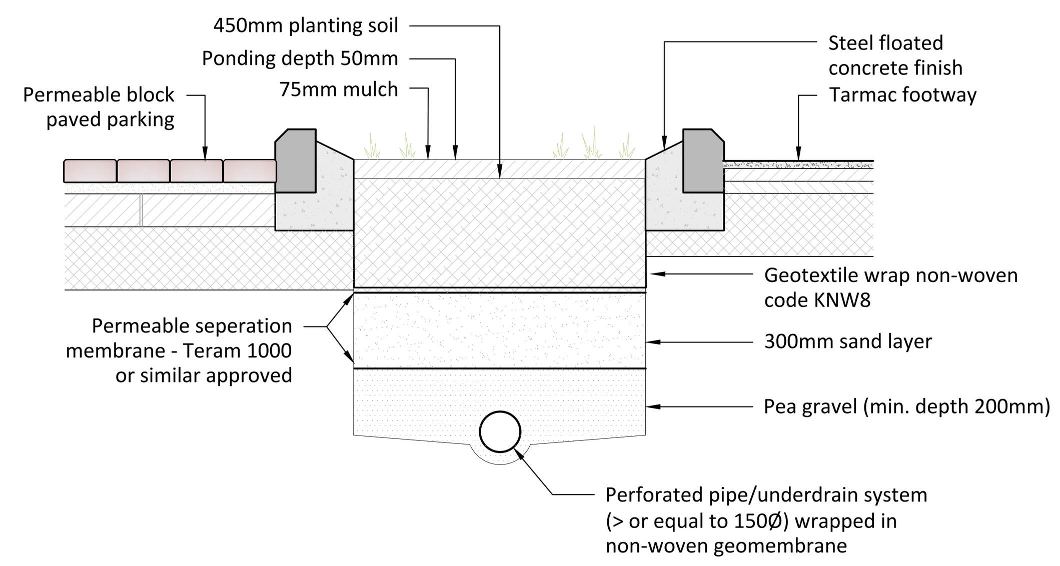
SCALE @ A1	DRAWN BY	DATE
1:200 @ A1	AGD	November 2023
MNP No.	**STATUS CODE**	**REV**
223377	S2	P03

Ref No.
223377-MNP-XX-XX-DR-C-1800

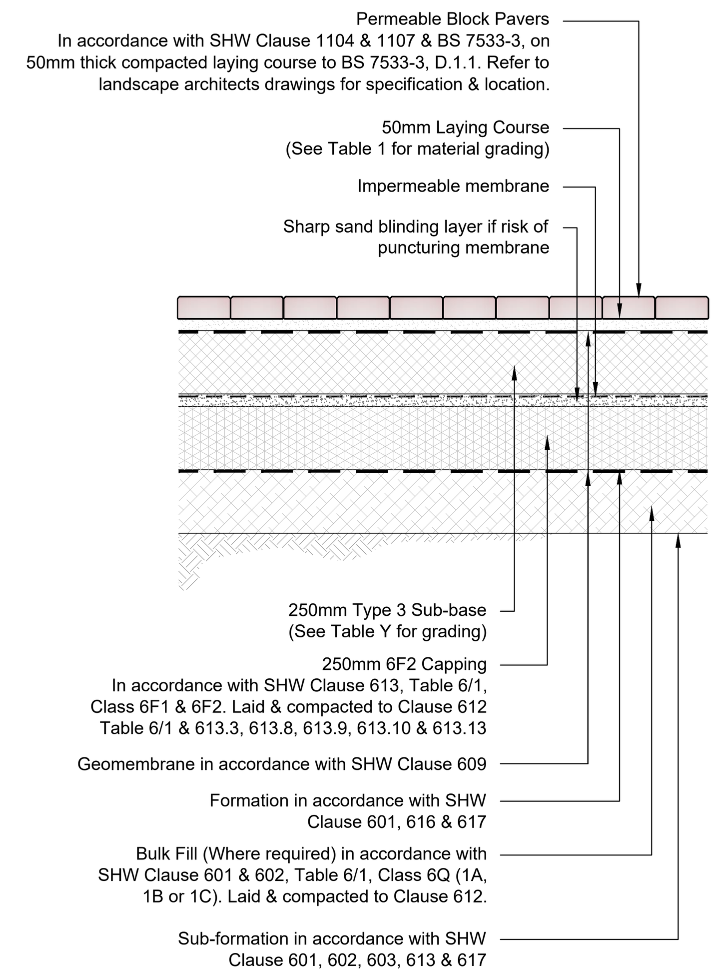
General
1.1 This drawing is to be read in conjunction with all Architect's, Engineer's and Services Engineer's drawings and specifications.
1.2 Do not scale from any of the structural drawings. All dimensions to be verified on site and any discrepancies should be highlighted.
1.3 The contractor is responsible for the stability of the building and adjoining structures during construction and shall design, install, adapt and maintain all necessary propping and temporary works. A method statement for the temporary works must be submitted to the contractor administrator for comment before work begins.
1.4 All materials to comply with the relevant British Standard.

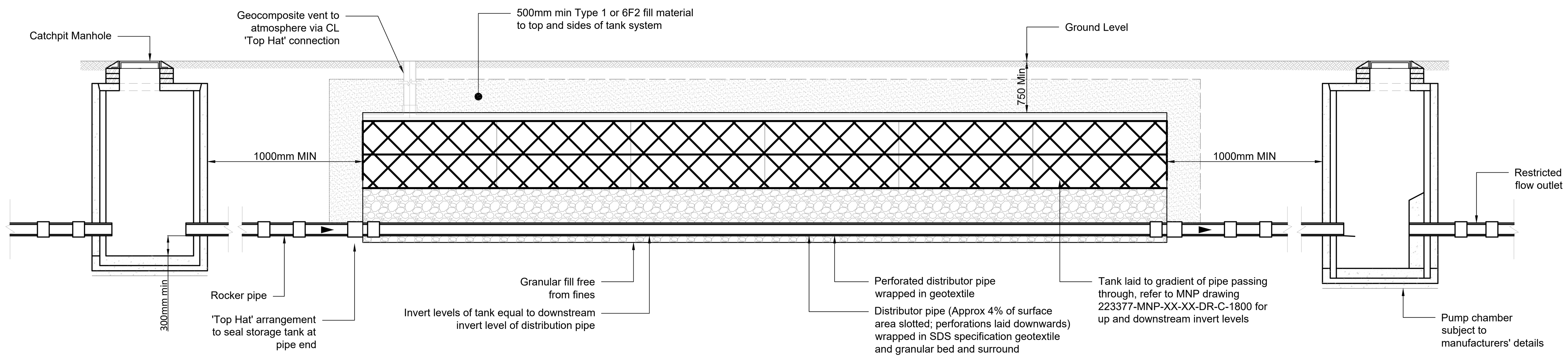


Modular Storage Detail with Catchpit Chamber
(Scale 1:50)

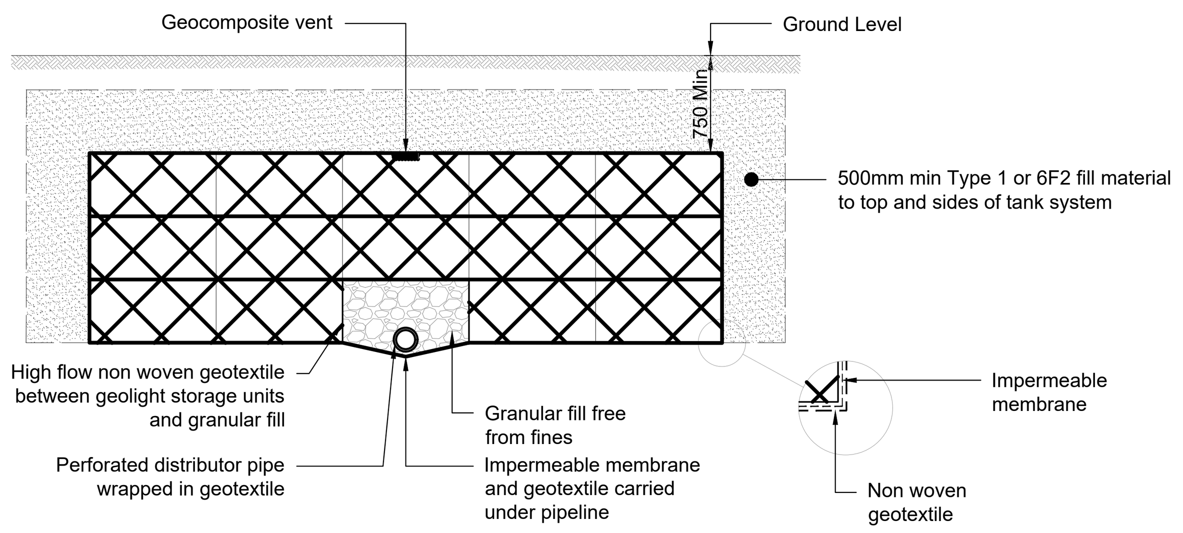


Bioretention/Rain Garden Area Detail
(Scale 1:25)

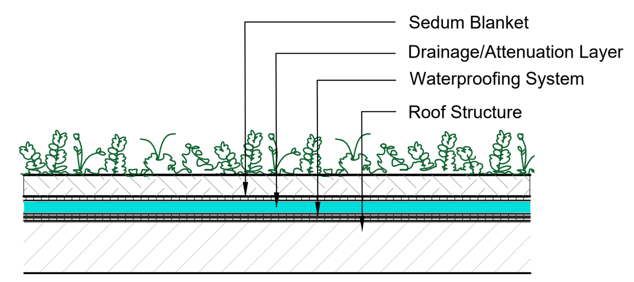




Modular Storage Section A-A



Modular Storage Section B-B



Typical Sedum Blanket Green Roof Detail
(Scale 1:25)

REV	COMMENTS	DATE	CHK
P01	Preliminary Issue	25.08.23	RJ

STATUS
PRELIMINARY

mnp
mason navarro pledge
Consulting Civil and Structural Engineers
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CLIENT
Alan Cox Associates

PROJECT
23 Crescent East

DRAWING TITLE
SUDS Drainage Details
Sheet 1

SCALE @ A1	DRAWN BY	DATE
1:25	AGD	August 2023
MNP No.	STATUS CODE	REV
223377	S2	P01

Ref No.
223377-MNP-XX-XX-DR-C-2800

APPENDIX H

PRE-DEVELOPMENT CAPACITY LETTER

Mr Andrew Gnanakumar Dushyanthan
Mason Navarro Pledge
1st Floor, Bevan House
9-11 Bancroft Court
Hitchin
Hertfordshire
SG5 1LH

Wastewater pre-planning
Our ref DS6108406

09 October 2023

Pre-planning enquiry: Confirmation of sufficient capacity

Site: 23 Crescent East, Hadley Wood, Barnet, EN4 0EY

Dear Mr Dushyanthan,

Thank you for Pre-planning application for the construction of 7 residential flats.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul and surface water sewer network to serve your development.

Foul Water
Proposed foul water to discharge via gravity flow into an existing 225mm foul water sewer downstream from existing manhole chamber referenced TQ2698 located within Crescent East.

Surface Water
Proposed surface water to discharge via gravity flow into an existing assumed 305mm surface water sewer upstream from existing manhole chamber referenced TQ2698 6102B located within Crescent East.

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable.

Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1. store rainwater for later use.
2. use infiltration techniques where possible.
3. attenuate rainwater in ponds or open water features for gradual release.
4. attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. discharge rainwater direct to a watercourse.
6. discharge rainwater to a surface water sewer/drain.
7. discharge rainwater to the combined sewer.
8. discharge rainwater to the foul sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of **2.0 litres/sec** for all storm events up to and including 1:100yr+40%CC, then Thames Water would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information.

Diversion

From our records we don't anticipate that any wastewater assets need to be diverted to accommodate your proposals.

What happens next?

Please make sure you submit your **S106 Connection Application**, giving us at least 21 days' notice of the date you wish to make your new connection(s).

If you've any further questions, please do not hesitate to contact me.
Yours sincerely,

Colins Akemche
Clean & Waste Pre-Planning Engineer
Adoption Team - Service Delivery

APPENDIX I

SUDS Proforma

ENFIELD Council

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	23 Crescent East
Address & post code	23 Crescent East, Hadley Wood, EN4 0EY
OS Grid ref. (Easting, Northing)	E 526616 N 198133
LPA reference (if applicable)	
Brief description of proposed work	Demolition of and existing residential dwelling and erection of 7 apartments (use class C4) together with associated access, parking, amenity space and landscaping
Total site Area	2100 m^2
Total existing impervious area	456 m^2
Total proposed impervious area	1051 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Connection into existing public sewer (TW)
Designer Name	Andrew G Dushyanthan
Designer Position	Project Engineer
Designer Company	Mason Navarro Pledge

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Made Ground
Bedrock geology classification	London Clay
Site infiltration rate	N/A m/s
Depth to groundwater level	N/A m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	Existing TW sewer. Refer to drawing
Has the owner/regulator of the discharge location been consulted?	Pre-development enquiry to be completed.

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.98			
1 in 1	0.83	6.6	9	1
1 in 30	2.25	14.6	21	1
1 in 100	3.12	17.7	27	1
1 in 100 + CC			60	1
Climate change allowance used		40%		

3b. Principal Method of Flow Control	Pump Chamber

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^3)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	77	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	300	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	674		60
Total	**1051**	**0**	**60**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 4, page 12
Drainage hierarchy (2b)	Section 6, page 16
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Section 6, page 17
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix E and F
Proposed SuDS measures & specifications (3b)	Section 7

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix G
Detailed drainage design drawings, including exceedance flow routes	Appendix G
Detailed landscaping plans	Appendix B
Maintenance strategy	Section 7
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	Section 6
b) biodiversity?	Section 6
c) amenity?	Section 6