# FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

LAND AT
MOWBRAYS CLOSE GARAGES BLOCK
ROMFORD
RM5 3HJ

Prepared for
London Borough of Havering


Prepared By: MARK NAUMANN

Reviewed By: NICHOLAS ARCHER

Gyoury Self Partnership (St Albans) LLP
4b Parkway
Porters Wood
St Albans
Herts. AL3 6PA

Telephone: 01727 853553



Date: MAY 2022
Reference: 15795A-FRA01
Revision:
Status: For Approval

INDEX



LIST OF FIGURES

## 1.0 INTRODUCTION

Gyoury Self Partnership has been commissioned by London Borough of Havering to undertake a Flood Risk Assessment (FRA) and review the constraints at Mowbrays Close Garages Block, Romford RM5 3HJ.

This report summarises the items included in the assessment conducted by Gyoury Self. This has been produced in accordance with the National Planning Policy Framework (NPPF), Technical Guidance to the Planning Practice Guidance (PPG), the London Borough of Havering Strategic Flood Risk Assessment 21 November 2016 (SFRA), The London Plan 2021, Building Regulations Part H and CIRIA C753 'The SUDS Manual'.

Site specific information has also been sought from the Environment Agency (EA), and Thames Water.

Information published by the Environment Agency (EA), British Geological Survey (BGS), and Multi-Agency Geographic Information for the Countryside (MAGIC) have been referenced in this report.

## 2.0 SCOPE OF WORK

The scope of work that relates to this assessment is on the basis of the guidance outlined in the documents referenced above, and sets out to obtain the following;

- Hydrology activity on and around the site
- A review of the proposed plans and existing site conditions
- A review of the impact the proposed development would have on the surface water drainage, and the regime of the proposed drainage
- An assessment of the impact of severe flood events including climate change
- A safe, practical development that does not increase flood risk elsewhere using and following guidance set out by the EA.

## 3.0 SITE DESCRIPTION

The site is located at National Grid Reference TQ 50360 90525 in a residential area in the north of Romford. The River Rom is located directly to the south of the site.

The site is accessed from Mowbrays Close to the west. The site consists of existing garages and the associated concrete vehicular access. An area of landscaping is located at the north of the site along with a small pond noted on the topographic survey.

Ground levels on the site fall from the northern boundary at approximately 35.30m AOD to the southern boundary at around 34.47m AOD. There is a fall from north to south across the site of 830mm.

The south of the site is located in Flood Zone 1 Low Probability (less than 0.1% chance of flooding in any year). The indicative flood map is shown in Figure 3.

## 4.0 PROPOSED DEVELOPMENT

The development will result in a change of use of the site from garages to residential.

The scheme consists of six self-contained one-bedroom apartments and includes staff and communal facilities to enable 24-hour staff support. In addition, the site accommodates four car parking spaces of which one is wheelchair accessible, an external cycle store for three bicycles and communal garden with soft landscaping, allotment bed planters and a separate sensory garden. Architectural proposals are included in Figure 2.

The Flood Zone and Flood Risk Tables within the PPG, Table 2: Flood Risk Vulnerability Classification, identifies the vulnerability of the end users of the site. The table indicates that residential institutions are classified as 'More Vulnerable'.

As a residential development it is estimated the lifetime of the proposed scheme will be at least 100 years.

## 5.0 GEOLOGICAL SETTING

Reference to the British Geological Survey online mapping (1:50,000 scale) indicates that the site is underlain by bedrock consisting of the London Clay Formation. This is generally described as blue-grey or grey brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.

## 6.0 HYDROLOGICAL SETTING

The nearest surface water feature is the river Rom which is located approximately 600m west of the site. The river Rom is designated as a Main River and therefore the responsibility of the Environment Agency.

The Environment Agency's flood map indicates that the site is located in Flood Zone 1 Low Probability (land having a less than 1 in 1000 annual probability of fluvial flooding). The indicative flood map is shown in Figure 3.

## 7.0 DRAINAGE

Sewer records have been obtained from Thames Water and have been provided in Figure 5. The Thames water sewer records show the nearest adopted foul and storm sewers to be located at the entrance to Mowbrays Close.

**Existing Surface Water Drainage**

The site currently consists of a single row of garages and concrete hardstanding. The survey in Figure 1 indicates an existing surface water gullies located adjacent to the kerb line on the southern boundary.

It is surmised surface water runoff from the site currently discharges into surface water sewers. The existing drain should be CCTV surveyed to confirm its condition, diameter and where it discharges.

The closest Thames Water storm water sewer is a 225mm diameter sewer at the entrance to Mowbrays Close. This sewer flows to the East. The nearest Thames Manhole is referenced 3402 located just west of the entrance to Mowbrays Close and appears to be the head of the run as the sewers from this manhole are shown to drain in opposite directions. No invert level, or depth, information has been provided with the sewer record information at this time.

**Existing Foul Water Drainage**

No existing foul water drainage has been identified, either by the site survey or in the sewer records on the site.

It is assumed that there is foul drainage serving the existing properties within Mowbrays Close, but the location, diameter and condition of this foul drainage would need to be confirmed.

The closest Thames Water foul water sewer is a 225mm diameter sewer at the entrance to Mowbrays Close. This sewer flows to the East. The nearest Thames Manhole is referenced 3401 located just west of the entrance to Mowbrays Close and appears to be the head of the run as the sewers from this manhole are shown to drain in opposite directions. No invert level, or depth, information has been provided with the sewer record information at this time.

## 8.0 FLOOD RISK AND MITIGATION

**Fluvial / Tidal Flooding**

The Environment Agency's flood map (Figure 3) indicates that the south of the site is located in Flood Zone 1 Low Probability (land having a less than 1 in 1000 annual probability of fluvial flooding).

The development is residential and is therefore anticipated to be in operation for the next one hundred years. Therefore, in the consideration of climate change the flood risk

assessment has considered the total potential change anticipated for the '2080s' (2070 to 2115).

The NPPF Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table is reproduced below;

| Flood Risk Vulnerability Classification | | Essential Infrastructure | Water Compatible | Highly Vulnerable | More Vulnerable | Less Vulnerable |
|---|---|---|---|---|---|---|
| Flood Zone | Zone 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Zone 2 | ✓ | ✓ | Exception Test Required | ✓ | ✓ |
| | Zone 3a | Exception Test Required | ✓ | × | Exception Test Required | ✓ |
| | Zone 3b Functional Floodplain | Exception Test Required | ✓ | × | × | × |

**The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF.**

Please note: ✓ means development is appropriate; × means the development should not be permitted.

Using the principles of the Sequential Test outlined above, the proposed development is classed as 'More Vulnerable' under the NPPF for the residential development. The development areas are shown to be located within Flood Zone 1 as defined by the EA flood map for planning and therefore, in accordance with Table 3 of the Flood Risk and Coastal Change Planning Policy Guidance (PPG), the proposed development is appropriate for this flood zone location and does not require the application of the Exception Test.

*Proposed Mitigation*

Given the site is located within Flood Zone 1 and is designated as appropriate development for this flood zone no specific fluvial flood mitigation is necessary at the development site.

**Flooding from Sewers**

Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity.

The SFRA provides records from Thames Water indicating the number of properties that have experienced sewer flooding. The information is identified based on a postcode reference indicating the severity and frequency that properties experienced sewer flooding, and whether the flooding occurred internally or externally. Internal flooding is generally considered more disruptive than external or curtilage flooding.

Table 5-5 in the SFRA indicates the following:-

| Postcode | Internal Flooding | | | External Flooding | | | Total |
|---|---|---|---|---|---|---|---|
| | 2 in 10 | 1 in 10 | 1 in 20 | 2 in 10 | 1 in 10 | 1 in 20 | |
| RM5 | 1 | 0 | 47 | 2 | 5 | 85 | 140 |

*Proposed Mitigation*

The proposed drainage on the site will be designed to accommodate the critical 1 in 100 year event including an allowance for climate change. Any above ground flooding during an event of greater magnitude will be shallow in depth and will not affect buildings.

The floor level of the proposed building will be raised above surrounding ground levels, with gradients sloping away from the building to the south. This will preclude any flows arising from surcharged sewers from entering the building.

No basement is proposed as part of the development plans.

**Surface Water Flooding (overland flow)**

This can occur during intense rainfall events, when water is unable to soak into the ground or enter the drainage systems.

The EA surface water flood map (Figure 4) indicates the majority of the site is at very low risk of surface water flooding. The area directly north of the garages is shown to be at low to medium risk. this appears related to water being unable to flow overland around the garages.

*Proposed Mitigation*

SuDS techniques will be incorporated to mimic Greenfield runoff and maintain natural drainage patterns, as far as possible.

The proposed drainage on the site will be designed to ensure there is no above ground flooding up to the critical 1 in 100 year plus climate change event.

Levels on the site fall to the south, away from the proposed building. It is recommended the FFL of the proposed building is set no lower than 150mm above existing ground levels to mitigate risk from overland flow where feasible. Ground levels should also be designed, where feasible, to drain runoff away from proposed buildings towards low-risk areas.

**Groundwater Flooding**

This can occur in low-lying areas when groundwater levels rise above the surface levels, or within underground structures.

Figure 111 in the SFRA indicates a map identifying the susceptibility to groundwater flooding in the borough. This is based on the British Geological Survey Groundwater Flood Susceptibility Map, showing the proportion of each 1km² grid square where geological and hydrogeological conditions show that groundwater might emerge.

The map indicates that the site is located in an area where >=25%<50% of the proportion of the 1km² grid is at risk of groundwater flooding from the superficial deposits. However the BGS mapping at the site shows no superficial deposits at the site therefore risk on the site may actually be lower than that reported by the mapping.

Figure 111 in the SFRA also indicates that no reports of groundwater flooding have been made in close proximity to the site.

*Proposed Mitigation*

No low-lying areas are proposed on the site, with proposed levels on the site falling to the southern boundary.

The proposed development does not incorporate basement levels.

**Reservoir Flooding**

The EA Long term risk of flooding mapping shows the site to be clear of potential flood extents from reservoir flooding.

**Exceedance Evets**

Should a rainfall event occur that is greater than the capacity of the drainage, or should blockage occur, the local topography is such that overland flow would be routed around the proposed development on site.

However it is proposed that finished floor levels are sited a minimum of 150mm above external ground levels, where feasible, to protect properties from overland flows in accordance with normal best practice.

Ground levels should also be designed, where feasible, to drain runoff away from proposed buildings towards low-risk areas.

## 9.0 SURFACE WATER MANAGEMENT

**Introduction**

A Surface Water Drainage Strategy, indicated in Figure 7 has been produced in accordance with the following principles.

The site currently comprises of garages and concrete hardstanding vehicular access. There are existing road gullies on site on the southern boundary that are assumed to collect surface water runoff from the site. It is surmised surface water runoff from the

site currently discharges into surface water sewers. The existing drain should be CCTV surveyed to confirm its condition, diameter and where it discharges.

The BGS mapping shows the site to be located over London Clay with no superficial deposits present. London clay is not normally suitable for infiltration of surface water.

Building Regulations Part H highlights the hierarchy for the discharge of surface water drainage:-

- Surface water drainage should discharge to a soakaway or other infiltration device where practicable.
- Where this is not practicable surface water may be discharged to a watercourse.
- Where other forms of outlet are not practicable, discharge should be made to a sewer.

Geological records indicate London Clay bedrock formation with no superficial deposits. The London Clay historically has very poor infiltration characteristics.

The proposals are therefore to utilise the existing offsite storm water drainage and provide flow control with upstream attenuation prior to outfall to the existing drainage in accordance with SUDS principles outlined in the Ciria SuDS manual C753. The existing drain should be CCTV surveyed to confirm its condition, diameter and where it discharges.

Once developed the extent of impermeable hard standing / roofs will decrease from that for the pre-developed site:

- Total Site Area: 918m²
- Pre-Development Impermeable Area: 494m²
- Post-Development Impermeable Area: 802m²

Discharge rate for the pre-development scenario has been calculated using the FEH13 rainfall model and based on an assumed 150mm pipe size for the existing storm drainage on site. Calculations are included in Figure 9.

2.78 x 0.0494 x 50 = 6.86 l/s

**Table 9.1 Brownfield Discharge Rates**

| Return Period (Years) | Brownfield Discharge Rate (l/s) 0.0494ha |
|---|---|
| 1 | 6.7 |
| 30 | 20.2 |
| 100 | 24.6 |

In accordance with PPG guidelines the proposed development considers the 1 in 100 year event with a 40% allowance for climate change. Brownfield runoff rates are calculated with no climate change allowance as these are based on present day rainfall events.

The development is residential use and is therefore anticipated to be in operation for the next one hundred years. Therefore, for the purposes of this assessment, taking into account the recommended national precautionary sensitivity ranges for peak rainfall intensity (Table 4-2 in the SFRA), a 40% increase in rainfall intensity has been included as climate change allowance, which caters for the total potential change anticipated for the '2080s' (2070 to 2115).

Policy SI 13 of The London Plan states that development should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible.

Discharge rates for the greenfield scenario have been calculated in accordance with the IH Report 124, Flood Estimate for Small Catchments, see Figure 6 (calculated at the minimum drained area of 0.1ha) and indicated in Table 9.2 (factored for the drained area of 0.802ha).

**Table 9.2 Greenfield Discharge Rates**

| **Return Period (Years)** | **Pre-Development Discharge Rate (l/s) 0.0802ha** |
|---|---|
| QBAR | 0.31 |
| 1 | 0.26 |
| 30 | 0.71 |
| 100 | 1.00 |

It is proposed that surface water drainage for the site will be controlled with a Hydro-Brake to 1.0 l/s, which is identified in the calculations (Figure 7) as having an outlet diameter of 50mm. It is recommended the rate is not reduced to less than 1.0 l/s, as it is considered any outlet of less than 50mm diameter will be a significant maintenance liability and prone to blockage. The Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England states : 'static controls should have a minimum opening size of 50 mm'

A post-development discharge rate of 1.0 l/s provides a significant betterment from the pre-development discharge rate.

**Consideration of Sustainable Urban Drainage Systems**

*Pervious Pavement*

Pervious pavements limit the pollutants entering the drainage system by capturing hydrocarbons and other organic materials in the upper layers of the construction, which are then degraded by micro-organisms.

The proposed car park will be a permeable paved construction, to provide treatment and to attenuate surface water runoff. The construction will be lined with an impermeable membrane and connected to the surface water drainage system.

*Swales, detention basins and ponds*

The development does not provide sufficient space for the incorporation of swales, detention basins and ponds.

*Soakaways*

As described above, infiltration has not been proposed on the scheme due to the London Clay formation soil present.

*Green Roofs*

Green roofs provide interception of runoff, retaining the first 5mm of a rainfall event. The soil and root zone filters airborne pollutants and pollutants entrained within rainwater.

Green roofs help combat the urban heat island effect and improve air quality by capturing dust particles.

A sedum green roof is proposed on the architectural roof plans to be provided to the flat roof elements at the front of the building.

*Rainwater Harvesting*

The attenuation benefits provided through the use of rainwater harvesting are considered to be limited, and would only be realised when the tanks were not full.

The proposed development is for high density occupancy of eight units and staff facilities, with demand far outweighing yield, which is exacerbated with the incorporation of a green roof. Additionally, there is the added capital cost of providing a metered recycled water supply to each unit and a recycled water distribution system, plus the ongoing maintenance costs for a rainwater harvesting system.

Pumped or bespoke Rainwater harvesting is not proposed for this site although rainwater butts can be provided for use in garden areas if appropriate.

*Attenuation Storage Tanks*

An underground tank can be incorporated adjacent to the surface water control to attenuate surface water runoff should it be required. At present the storage is proposed to be accommodated within the pervious pavement sub base areas at the front and rear of the site.

**Conceptual Surface Water Drainage Scheme**

As described previously, infiltration is not being proposed for the disposal of surface water, due to the London Clay formation. The proposals are therefore to utilise the existing offsite storm water drainage and provide flow control with upstream attenuation prior to outfall to the existing drainage in accordance with SUDS principles outlined in the

Ciria SuDS manual C753. The existing drain should be CCTV surveyed to confirm its condition, diameter and where it discharges.

Permeable paving will be provided to the car park, providing localised interception of hydrocarbons, to reduce the rate of surface water runoff. The construction will be lined with an impermeable membrane and connected to the surface water drainage system.

A sedum green roof is proposed on the architectural roof plans to be provided to the flat roof elements at the front of the building.

Attenuation storage is proposed to be accommodated within the pervious pavement sub base areas at the front and rear of the site.

Discharge will be controlled with a Hydro-Brake to 1.0 l/s and attenuated accordingly. This is considered to provide betterment on the existing scenario and is significantly less than the pre-development one-year peak flow rate.

The proposed drainage will be designed to accommodate all storm events up to the critical 100 year event including a 40% allowance for climate change.

**Management and maintenance**

All onsite SuDS and drainage systems will be privately maintained. A long-term maintenance regime should be agreed with the site owners before adoption.
In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction.

The property owner will be responsible for the management and maintenance of SuDS devices.

General maintenance of key SuDS components are provided in Figure 8

## 10.0 FOUL WATER DRAINAGE

No existing foul water drainage has been identified, either by the site survey or in the sewer records on the site.

It is assumed that there is foul drainage serving the existing properties within Mowbrays Close but the location, diameter and condition of this foul drainage would need to be confirmed.

It may be necessary to pump foul water from the proposed development but until the nearest existing foul drainage connection location within Mowbrays Close is located this cannot be confirmed.

The closest Thames Water foul water sewer is a 225mm diameter sewer at the entrance to Mowbrays Close. This sewer flows to the East. The nearest Thames Manhole is referenced 3401 located just west of the entrance to Mowbrays Close and appears to be the head of the run as the sewers from this manhole are shown to drain in opposite directions. No invert level, or depth, information has been provided with the sewer record information at this time.

A pre-development enquiry should be submitted to Thames Water to confirm if there is sufficient capacity in the local sewer system to accommodate foul flows from the proposed development.

A Section 106 sewer connection application will need to be submitted to Thames Water in due course prior to construction of any foul drainage.

## 11.0 SPECIFIC POLICY CONSIDERATIONS

**Sequential Test**

The PPG states that the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding.

An assessment of the site levels and flood modelling has identified that the site is located entirely within Flood Zone 1 and therefore meets the requirements of the Sequential Test.

**The Exception Test**

According to Table 3 in the PPG, 'more vulnerable' developments are considered appropriate within Flood Zone 1 without the requirement to apply the Exception Test. Therefore, application of the Exception Test is not required for the proposed development.

## 12.0 SUMMARY AND CONCLUSIONS

The aim of the Flood Risk Assessment is to outline the potential for the site to be impacted by flooding, the potential impacts of the development on flooding both on-site and in the vicinity and the proposed measures which can be incorporated into the development to mitigate the identified risks. The report has been produced in accordance with the guidance detailed in the PPG.

An assessment of the site levels and flood modelling has identified that the site is located entirely within Flood Zone 1 Low Probability (land having a less than 1 in 1000 annual probability of fluvial flooding).

The risk of flooding from surface water, groundwater and other sources is considered to be low.

The FFL of the proposed building will be raised above ground levels at the south of the site, but at a level to provide Part M access to the building entrances. It is recommended the FFL of the proposed building is set 150mm above existing ground levels where feasible.

Sustainable drainage techniques for the proposed drainage will be provided, in the form of a permeable paving car park, permeable amenity paving and sedum green roof for localised interception and treatment of surface water runoff.

Discharge will be controlled with a Hydro-Brake to 1.0 l/s and attenuated accordingly. This is considered to provide betterment on the existing scenario and is significantly less than the pre-development one-year peak flow rate.

The proposed drainage will be designed to accommodate all storm events up to the critical 100 year event including an appropriate allowance for climate change. Attenuation storage is proposed to be accommodated within the pervious pavement sub base areas at the front and rear of the site.

As described previously, infiltration is not being proposed for the disposal of surface water, due to the London Clay formation. The proposals are therefore to utilise the existing offsite storm water drainage and provide flow control with upstream attenuation prior to outfall to the existing drainage in accordance with SUDS principles outlined in the Ciria SuDS manual C753. The existing drain should be CCTV surveyed to confirm its condition, diameter and where it discharges.

It is assumed that there is foul drainage serving the existing properties within Mowbrays Close but the location, diameter and condition of this foul drainage would need to be confirmed. It may be necessary to pump foul water to connect to the existing drainage within Mowbrays Close from the proposed development but until the nearest existing foul drainage connection location within Mowbrays Close is located this cannot be confirmed.

Overall it can be demonstrated that the development would be safe without increasing flood risk elsewhere and runoff from the proposed development can be managed using sustainable drainage systems to mitigate risks to others as a result of development.

FIGURE 1

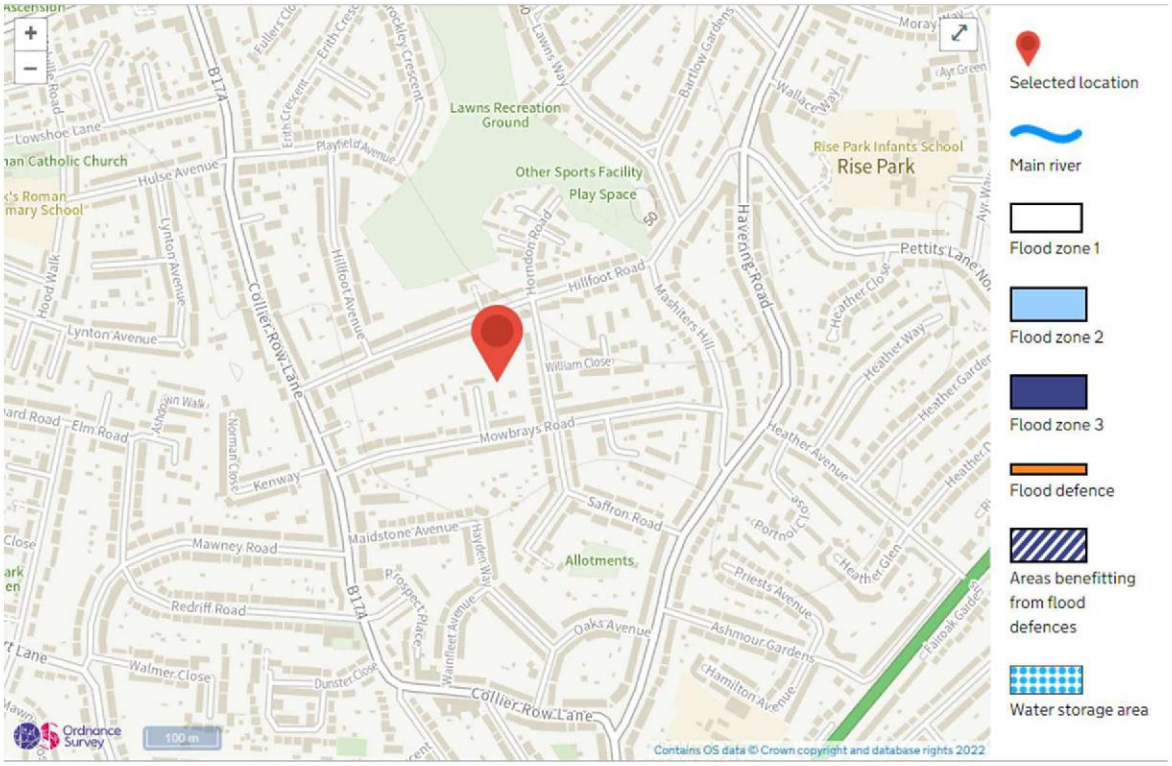
SITE SURVEY

FIGURE 2

PROPOSED LAYOUT

**FIGURE 3**

**EA RIVER FLOOD MAP**




## EA Flood map for planning

**FIGURE 4**

**EA SURFACE WATER FLOOD MAP**

Flood risk

Extent of flooding

Location

Enter a place or postcode


Extent of flooding from surface water

High Medium Low Very low Location you selected

FIGURE 5

THAMES WATER SEWER RECORDS

FIGURE 6

GREENFIELD RUNOFF ESTIMATION

**FIGURE 7**

**DRAINAGE STRATEGY AND CALCULATIONS**

**FIGURE 8**

**DRAINAGE MAINTENANCE PLAN**

| PROPOSED SCHEDULE OF MAINTENANCE FOR BELOW GROUND DRAINAGE | | | | |
|---|---|---|---|---|
| **Item** | **Visual Inspection** | **Cleanse / De-sludge** | **CCTV Survey** | **Comments** |
| **Foul Drainage System (pipework, chambers etc.)** | 5 years | 10 years | 10 years | Cleansing to be carried as necessary |
| **Surface Water Drainage System (pipework, chambers etc.)** | 5 years | 10 years | 10 years | Cleansing to be carried as necessary |
| **Gullies/Channels** | 1 year | 1 year | N/A | Cleansing to be carried as necessary |
| **Hydrobrake** | 1 year | As required | | Cleansing to be carried as necessary |
| **Permeable Block Paving** | 1 year | 'Swept' clean of debris every 2 years. | N/A | Refer to block manufacturers guidance for long term maintenance requirements. |

*Schedule of maintenance for below ground drainage*

**FIGURE 9**

**Brownfield runoff rate calculations**