Flo

Consulting Engineers

Project_

New Office Building
Stanbridge Industrial Estate
Staplefield Lane, Staplefield

Title_

Surface Water Management Report

Project No_

845

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Contents

Appendices

1. Introduction

Flo Consult UK Ltd have prepared this surface water management report, on behalf of Moyle and Moyle Investments Ltd, in support of an application for a new office building at Stanbridge Industrial Estate, Staplefield Lane, Staplefield, RH17 6AS (hereafter referred to as 'the Site').

The report describes and demonstrates how the surface water run-off rate and volume from the post development site will be managed to adhere to National planning policies, regulations, and relevant design guidance, which include:

- National Planning Policy Framework (NPPF), July 2021, Paragraphs 153-158 and 159-169;
- National Planning Practice Guidance (NPPG) ('Flood Risk and Coastal Change' section), released in March 2014 and updated in August 2022;
- National Standards for Sustainable Drainage Systems (SuDS) set out by the Department for Environment, Food & Rural Affairs (DEFRA) (2011);
- CIRIA (2010) Planning for SuDS – Making it Happen C687;
- CIRIA SuDS Manual C753 (2015).

And local policies including:

- West Sussex County Council Local Flood Risk Management Strategy (May 2014);
- West Sussex Preliminary Flood Risk Assessment (May 2011);
- West Sussex LLFA Policy for the Management of Surface Water (November 2018);
- Mid Sussex District Plan 2014 – 2031 (Adopted March 2018);
- Mid Sussex District Council – Strategic Flood Risk Assessment (June 2015).

Subsequently, Cheshire East Council, acting as Lead Local Flood Authority (LLFA), need to be satisfied that the design and drainage principles of the proposed development:

- will address the surface water management and risk of flooding within the site;
- will ensure that the drainage is managed and maintained for its lifetime to prevent flooding;
- and will ensure that the development will not increase the risk of flooding to neighbouring land and property.

2. National / Local Policies and Water Management Guidance

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

NPPF 2021 set out the Government's national policy on development and flood risk and seeks to provide clarity on what is required at regional and local levels, to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk.

2.2. Flood and Water Management Act

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

2.3. Mid Sussex District Plan 2014 – 2031

Relevant section of Policy DP41 states:

'Sustainable Drainage Systems (SuDS) should be implemented in all new developments of 10 dwellings or more, or equivalent non-residential or mixed development unless demonstrated to be inappropriate, to avoid any increase in flood risk and protect surface and ground water quality. Arrangements for the long-term maintenance and management of SuDS should also be identified.

For the redevelopment of brownfield sites, any surface water draining to the foul sewer must be disconnected and managed through SuDS following the remediation of any previously contaminated land.

SuDS should be sensitively designed and located to promote improved biodiversity, an enhanced landscape and good quality spaces that improve public amenities in the area, where possible.

The preferred hierarchy of managing surface water drainage from any development is:

1. *Infiltration Measures*
2. *Attenuation and discharge to watercourses; and if these cannot be met,*
3. *Discharge to surface water only sewers'.*

2.4. West Sussex LLFA Policy for the Management of Surface Water

West Sussex County Council (WSCC), as LLFA is the risk management authority responsible for local flood risk defined as flooding from surface water, groundwater and ordinary watercourses. Hereafter we will refer to either West Sussex LLFA or more simply as the LLFA.

The LLFA is required to provide consultation responses on the surface water drainage provisions associated with major development (2.2.2). This policy statement sets out the requirements that the LLFA has for drainage strategies and surface water management provisions associated with applications for development.

For all developments, even small, we would expect the principles of this policy & drainage strategy to be considered. For all major developments, we would expect adherence to the full scope of this policy; the drainage strategy is to consider the topics set out in the table below and be consistent with the Sustainable Drainage Systems (SuDS) policies in Sections 5 and 6 of this document.

3. Site Setting and Description

3.1. Site Location

The Site is in rural area of Staplefield, is approximately 5km north-west of Haywards Heath, and as shown in Appendix A, is bound by a commercial building to the north, parking areas leading to undeveloped land and Staplefield Lane to the east, and agricultural fields to the south and west.

The postcode at the Site is RH17 6AS, with the co-ordinates of the centre of the Site being: Easting: 527000, Northing: 127215.

3.2. Existing Site and Topography

As detailed on the existing plans in Appendix B, the Site is part of Stanbridge Industrial Estate, and in a pre-development state, consists of a barn, with hard-standign areas (part of existing yard / car park) to the east, and grassed areas along the southern and western boundary.

The Site is developed and is therefore deemed to be a 'Brownfield Site'.

The Site is relatively flat as it mainly consists of the existing barn building, with the land around the Site (agricultural field) having a general fall to the west.

3.3. Proposed Development

The plans for the Site, in a post development state, are shown in Appendix C, with a full description of the development site being stated by the Architect.

In brief, and in relation to this surface water management report, the proposal is to demolish the existing barn, and to build a new office building to the north, with parking areas to the south, footpaths and an amenity area around the perimeter, and soft-landscaping between the building and car park.

3.4. Ground Conditions

The ground conditions can be determined by the British Geological Survey (BGS) website, where it shows the Site to have no superficial deposits, and bedrock consisting of Upper Tunbridge Wells Sand.

The BGS website also shows public borehole log data, where the relevant logs to the Site are located approximately 250m to the east and in the same bedrock strata. The borehole logs, as shown in Appendix D, shows the ground to predominantly consist of clay.

3.5. Waterbody / Rivers / Canals / Reservoirs

As detailed in Figure 1 below, there is an unnamed watercourse approximately 60m west of the Site, which flows in a northerly direction, and is a tributary of the River Ouse (approximately 350m to the north). The ground between the site and watercourse consists of an agricultural field.

Figure 1 – Unnamed Watercourse Location

3.6. On-Site Drainage / Public Sewers

As detailed on the Southern Water plan in Appendix E, the nearest known drainage to the Site is a foul water network in the yard area of Stanbridge Industrial Estate, that flows to the north and into the access road.

There are no known surface water networks at the Site, with the surface water run-off from the existing barn and yard / parking areas discharging directly onto the ground. Due to the nature of the ground, and topography of the land, the surface water run-off will flow over the agricultural field to the west and into the unnamed watercourse.

3.7. Development Areas

The Site area equates to 720m² / 0.072 ha.

The existing barn area equates to approximately 540m² / 0.054 ha, with the remaining grassed areas equating to 180m² / 0.018 ha.

Therefore, in terms of the greenfield run-off rate calculations, the Site has an urban factor of 0.75 (0.054 ha / 0.072 ha), and in terms of pre-development surface water run-off calculations the area of 0.054 ha is to be used.

The post development site will consist of the new office building, car park, footpaths and amenity area which equates to approximately 680m² / 0.068 ha, with the remaining soft-landscaping area equating to approximately 40m² / 0.004 ha.

The surface water run-off from the new office building, car park, footpaths and amenity areas will discharge to a below ground drainage network, with the surface water run-off from the remaining soft-landscaped areas to discharging off the Site at a natural / greenfield rate.

Therefore, in terms of post development surface water run-off management calculations the area of 0.068 ha is to be used.

In summary:

The Site Area	-	0.072 ha
Development Greenfield Urban Factor	-	0.75
Pre-Development Surface Water Run-Off Area	-	0.054 ha
Post Development Surface Water Run-Off Area	-	0.068 ha

4. Surface Water Management Principles

The surface water for the Site is to be managed so that it adheres to the current national regulations / guidance, and local authority requirements (as set out in West Sussex LLFA Policy for the Management of Surface Water).

4.1. West Sussex LLFA Policy for the Management of Surface Water

The local authority SuDS policies, to which the surface water management of the development will adhere to are as follows:

Policy	Summary
SuDS Policy 1	Follow the drainage hierarchy
SuDS Policy 2	Manage Flood Risk Through Design
SuDS Policy 3	Mimic Natural Flows and Drainage Flow Paths
SuDS Policy 4	Seek to Reduce Existing Flood Risk
SuDS Policy 5	Maximise Resilience
SuDS Policy 6	Design to be Maintainable
SuDS Policy 7	Safeguard Water Quality
SuDS Policy 8	Design for Amenity and Multi-Functionality
SuDS Policy 9	Enhance Biodiversity
SuDS Policy 10	Link to Wider Landscape Objectives

Details of how the surface water is to be managed to adhere to these policies and national guidance are as follows:

4.2. Run-Off Destination

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

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

4.3. The Management Train

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

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

4.4. Design Principles

The design principles for the surface water management of the development will be to:

- Ensure that people, property, and critical infrastructure are protected from flooding;
- Ensure that the development does not increase flood risk off site;
- Ensure that SuDS can be economically maintained for the development.

4.5. Peak Surface Water Flow

DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems states:

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

4.6. Volume Control

DEFRA National Non-statutory technical standards for sustainable drainage systems states:

S5 *Where reasonably practicable, for developments which have been previously developed, the run-off volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield run-off volume for the same event, but should never exceed the run-off volume from the development site prior to redevelopment for that event.*

S6 *Where it is not reasonably practicable to constrain the volume of run-off to any drain, sewer or surface water body in accordance with S4 or S5 above, the run-off volume must be discharged at a rate that does not adversely affect flood risk'.*

4.7. Flood Risk

DEFRA National Non-statutory technical standards for sustainable drainage systems states:

*'**S7** The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30-year rainfall event.*

S8 *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100-year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.*

S9 *The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property'.*

4.8. Pollution

The SuDS design for the development site will ensure that the quality of any receiving water body is not adversely affected and preferably enhanced in accordance with Ciria SuDS Manual C753, Chapter 4.

4.9. Designing for Exceedance

The development site design will be such that when SuDS features fail or are exceeded, exceedance flows do not cause flooding of properties on or off site. This will be achieved by designing suitable ground exceedance or flood pathways, and run-off will be completely contained within the drainage system (including areas designed to hold or convey water) for all events up to a 1 in 100-year event. The design of the site ensures that flows from rainfall more than a 1 in 100-year rainfall event are managed in exceedance routes that avoid risk to people and property both on and off site.

5. Surface Water Run-Off Destination

The destination of the surface water run-off from the post development site has been assessed against the prioritisation set by the Approved Document H (2010). The feasibility of the surface water run-off to the priority receptors are as follows:

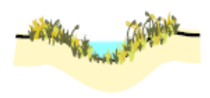
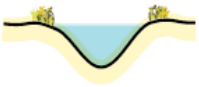
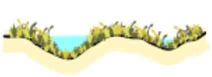
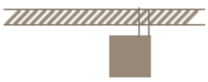
Run-Off Destination	Feasible	Description
Discharge to Ground	No	The BGS data identifies the ground at the site to predominantly consists of clay. Clay is known to have exceptionally low or no infiltration value, and therefore discharge to ground is not feasible.
Discharge to Surface Water Body	**Yes**	As the ground is not suitable for infiltration, the only alternative will be to discharge the surface water (at a restricted rate) to the unnamed watercourse approximately 60m to the west of the Site. A pipe system from the Site to the unnamed watercourse may not be possible due to land ownership. However, it is proposed to discharge the surface water to a granular trench system along the site boundary, which will disperse the surface water across the field to the unnamed watercourse. Discharging the surface water run-off across the agricultural field to the unnamed watercourse will replicate the pre-development / existing surface water flows, and therefore will not adversely affect flood risk or increase flows to the unnamed watercourse.
Discharge to Surface Water Sewer	No	There are no known surface water sewers near the Site, and therefore this destination is not feasible.
Discharge to Highway Drain or Other	No	There are no known highway or other drains near the Site, and therefore this discharge destination is not feasible.
Discharge to Combined Water Sewer	No	There are no known combined water sewers near the Site, and therefore this discharge destination is not feasible.

6. SuDS Feasibility

To reduce the surface water run-off to the greenfield rate, SuDS methods are to be introduced to the Site.

SuDS methods as per the Sustainable Drainage System (SuDS) hierarchy, and the Non-Statutory Technical Standards for Sustainable Drainage Systems – March 2015, that can be used are detailed below:

	Description	Setting	Required area
Green roofs	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated.
Rainwater harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an overground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (underground or above ground).
Soakaway	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open space	Dependant on runoff volumes and soils.
Filter Strip	Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	Open space	Minimum length 5 metres.
Permeable paving	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street/open space	Can typically drain double its area.
Bioretention area	A vegetated area with gravel and sand layers below designed to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	Street/open space	Typically surface area is 5-10% of drained area with storage below.

	Description	Setting	Required area
 Swale	Swales are vegetated shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	 Street/open space	Account for width to allow safe maintenancce typically 2-3 metres wide.
 Hardscape storage	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	 Open space	Could be above or below ground and sized to storage need.
 Pond / Basin	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	 Open space	Dependant on runoff volumes and soils.
 Wetland	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	 Open space	Typically 5-15% of drainage area to provide good treatment.
 Underground storage	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	 Open space	Dependant on runoff volumes and soils.

The feasibility of the above SuDS methods for the post developed site are summarised in the table below:

SuDS Method	Feasible Use	Description
Living Roofs	No	The proposed office building roof is pitched and has not been structurally designed for living / green roof systems. Therefore, this is not a suitable SuDS method.
Rainwater Harvesting	**Yes**	A rainwater harvesting tank could be installed where the water can be re-used for the facilities in the office building. A water butt could also be incorporated into one of the rainwater pipes, where the water can be used for irrigation.
Soakaway	**Yes**	As stated in Section 5. The BGS data identifies the ground at the site to predominantly consist of clay. Clay is known to have exceptionally low or no infiltration value, and therefore discharge to ground is not feasible.
Filter Strips	No	There is only a small area of soft-landscaping within the Site, and therefore it is deemed that there are insufficient areas for filter drains to be formed.
Permeable Paving / Surfacing	**Yes**	A permeable paving / surfacing system can be formed in the parking and footpath areas of the Site.

		The surface water will not discharge the surface water directly to ground (for reason stated above), but will convey the surface water via a perforated pipe from the sub-base to the main drainage network. A permeable paving will reduce the surface water run-off rate from the driveways and footpath areas, act as attenuation, and will act as a pollutant control at source.
Swales / Ponds	No	There is only a small area of soft-landscaping within the Site, and therefore it is deemed that there are insufficient areas for filter drains to be formed.
Hardscape Storage	No	The external areas will be used for permeable paving / surfacing, and therefore are limited areas for hardscape storage to be formed.
Raingardens	**Yes**	Raingarden can be formed in the small landscape area between the building and car park. Surface water will discharge from the rainwater pipes directly onto the raingardens. Surface water from the raingarden will not discharge the surface water directly to ground, but will convey the surface water via a perforated pipe from the sub-base (formed below planning area) to the main drainage network. Raingardens will reduce the surface water run-off rate and will act as a pollutant control at source.
Raised Planter	**Yes**	A raised planter can be installed at one of the rainwater pipe locations. The surface water from the rainwater pipe will percolate through the raised planter prior to discharge to the main drainage network. A raised planter will reduce the surface water run-off rate and will act as a pollutant control at source.
Underground Storage	**Yes**	The surface water run-off from the development site will be restricted to as low as possible. The rate will be lower than the surface water run-off rate, therefore there will be a requirement to have underground storage to prevent flooding in the form of cellular units.

7. Development Greenfield Run-Off Rate and Volumes

To minimise the surface water run-off from the new development areas of the Site, it is preferred that the post development surface water run-off be restricted to the equivalent greenfield run-off rates and volume.

7.1. Greenfield Run-Off Rate

The Flood Estimation Handbook (FEH) is often used for the calculation of the greenfield run-off rate, however, relevant documents state that to calculate the greenfield run-off rates on small catchments less than 25km², the IH 124 QBAR equation (and the equation for the instantaneous time to peak for the unit hydrograph approach) is to be used.

The IH method is based on the Flood Studies Report (FSR) approach and is developed for use on catchments less than 25km². It yields the Mean Annual Maximum Flood (QBAR). This reference also recommends the use Ciria C753 Table 24.2 to generate Growth Factors. These are used to convert QBAR to different return periods for different regions in the UK.

The input variables to establish QBAR are:

Return Period (years)	Results based on a range of return periods and the specified RP;
Area	Catchment Area (ha) which is adjusted to km2 for use in the equation;
SAAR	Average annual rainfall in mm (1941-1970) from FSR figure II.3.1;
Soil	Procedure Volume 3. Soil classes 1 to 5 have Soil Index values of 0.15, 0.3, 0.4, 0.45 and 0.5 respectively;
Urban	Proportion of area urbanised expressed as a decimal;
Region Number	Region number of the catchment based on FSR Figure I.2.4.

QBAR(l/s)

The output variables to establish QBAR are calculated using the following formula (equation yields m³/s):

QBAR = $0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

The IH 124 Variables (taken from FSR) that are specific to this site are as follows:

Area	=	50.00 ha
SAAR	=	800
Soil	=	0.450
Urban Factor	=	0.75
Region Number	=	7

Based on these variables, and the calculation results provided by the MicroDrainage computer software (Appendix F), the QBAR for a 50.00ha catchment area is:

QBAR = 657.5 l/s

This figure is for the catchment area of 50.00 ha, and is to be reduced to reflect the surface water catchment area (0.068 ha) of the Site. Therefore, the QBAR (greenfield run-off) for development area has been calculated to be:

QBAR = **0.89 l/s (13.15 l/s/ha)**

Ciria C753 Table 24.2 identifies the growth factors for each of the storm events, based on the known QBAR figure. The growth factors from the table vary depending on the site location. In this case hydrometric area (Region Number) is 7.

Based on the figures shown in the table, the growth factors, and the existing greenfield run-off rates for each of the storm events for the development areas of the site are as follows:

Storm Event	QBAR	Growth Factor (C753 Table 24.2)	Greenfield Run-off Rate
Q_1	0.89 l/s	0.88	**0.8 l/s**
Q_{30}	0.89 l/s	2.40	**2.1 l/s**
Q_{100}	0.89 l/s	3.19	**2.8 l/s**

7.2. Greenfield Run-Off Volume

The greenfield run-off volume for the 100-year, 6-hour storm event has also been calculated in the MicroDrainage software using the data from the FEH 2013, with the results shown in Appendix F.

The FEH data and variables used to calculate the greenfield run-off volume at the Site location area as follows:

Site Location = GB 527000 127215 TQ 27000 27215

Area = 0.068 ha

SAAR = 834

CWI = 118.988

SPR Host = 47.000

URBTEXT = 0.50 (actual 0.75, but 0.50 highest for calculation)

Based on these calculation results (Appendix F), the greenfield run-off volume for the surface water management area of the Site is:

$Q_{100\ (6\text{-Hour})}$ = 26.63m³ (391.56m³/ha)

8. Pre-Development Surface Water Run-Off Rates and Volume

The pre-development surface water run-off rates and volume from the existing barn and yard / parking areas are to be calculated, to ensure there is no exceedance from the post development surface water run-off rates and volume.

The calculations to determine the pre-development surface water run-off rates and volume are based on the pre-development surface water run-off area of 0.054 ha, the rainfall data given by the FEH 2013, and simulation / calculations in the MicroDrainage computer software (see Appendix G).

Based on the FEH 2013 data and computer software results, the pre-development surface water run-off rates are as follows:

Q_2 = 8.2 l/s (15-minute storm duration)

Q_{30} = 19.2 l/s (15-minute storm duration)

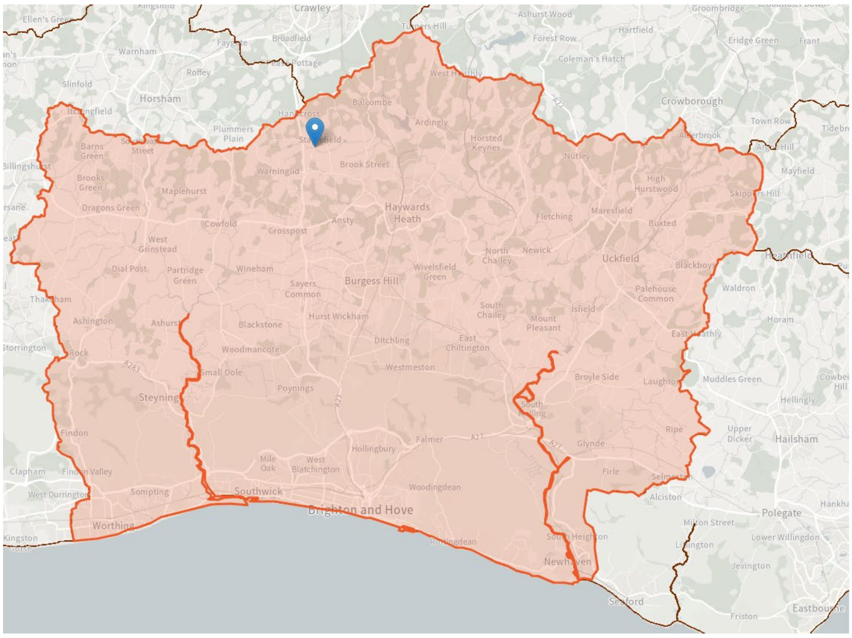
Q_{100} = 24.2 l/s (15-minute storm duration)

The surface water run-off volumes for the pre-development site have also been calculated for 1 in 100-Year the 6-hour duration within the MicroDrainage computer software (Appendix F), where:

$Q_{100\ (6\text{-hour})}$ = 30.44m³

9. Climate Change Allowance

The NPPF makes it a planning requirement to account for climate change in the proposed design of any schemes. The recommended allowances are taken from the DEFRA Climate Change Allowances interactive map as shown in Figure 2 below.



Adur and Ouse Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	20%	35%
2070s	20%	40%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	20%	45%
2070s	25%	45%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

This map contains information generated by Met Office Hadley Centre (2019): UKCP Local Projections on a 5km grid over the UK for 1980-2080. Centre for Environmental Data Analysis, 2022

Figure 2 - DEFRA – Climate Change Allowances

The lifetime of the post development Site is likely to be beyond 2061, and therefore the Epoch 2070's is to be used with Upper End Allowance (likelihood of increase rainfall). Therefore, the climate change allowance for the post development Site surface water run-off will be **40%** and **45%** for the 30-year and 100-year event, respectively.

10. Drainage Networks and Surface Water Management Calculation

10.1. Surface Water Network Calculations

The calculations to determine the post development surface water run-off rates and required infiltration structure volume, are based on the post development surface water run-off area of 0.051 ha, and the rainfall data given by the FEH 2013.

10.2. Surface Water Drainage Network Details

As shown on the below ground drainage layout drawing in Appendix H, the proposed surface water network will consist of 150mm diameter pipes, 100mm perforated pipes, 460mm inspection and silt trap chambers, permeable paving / surfacing; raingardens; a rainwater harvesting tank, a water butt, a raised planter; a 1200mm diameter flow control chamber containing a hydro-brake; and an attenuation tank in the form of cellular units.

The surface water run-off from the new office building roof areas will discharge to the main network via raingardens, a raised planter and rainwater harvesting tanks / butts, with the surface water run-off from the car park, footpath and amenity areas will discharge to the main drainage via the permeable paving / surfacing system.

The main surface water network will flow to the west of the Site where the surface water will discharge through the flow control chamber, through the infiltration trench, and then naturally agricultural field to the unnamed watercourse.

Surface water is to be restricted by the flow control prior to the discharge to the filtration trench, with restricted surface water surcharging the network and being attenuated within the cellular units and sub-base of the permeable paving / surfacing system.

The filtration trench will run along the length of western boundary, with the surface water percolating through the granular material and topsoil at top of trench before discharging across agricultural field to the unnamed watercourse.

Note that the surface water run-off destination and rate do not change or exceed pre-development conditions, and therefore, no additional flows or change in flow direction to unnamed watercourse will occur. Subsequently, SuDS methods have ensured that the Site, in terms of surface water run-off, has maintained its existing state.

10.3. Surface Water Run-Off Rate

For the surface water run-off from the Site to be at the greenfield run-off rate, they are to be restricted to 0.8 l/s for the 1 in 2-year storm event; 2.1 l/s for the 1 in 30-year storm event including 40% allowance, and 2.8 l/s for the 1 in 100-year storm event including 45% allowance.

For the surface water run-off to be a reduction of the pre-development rates, the surface water run-off from the Site is to be restricted to less than 8.2 l/s for the 1 in 2-year storm event; 19.2 l/s for the 1 in 30-year storm event including 40% allowance; and 24.2 l/s for the 1 in 100-year storm event including 45% allowance.

For the surface water run-off volume to be a betterment of the greenfield volume as a minimum (100-year,6-hour storm event), the surface water discharge rates need to be a maximum of 1.2 l/s (26.63m^3 x 1000 / 60 x 60 x 6).

For this development, and based on the greenfield rates, pre-development rates, and greenfield volume the suitable / minimum size of the flow control opening (hydro-brake) is deemed to be 49mm, with a design rate of 1.2 l/s.

As shown in the output calculation from the MicroDrainage computer software in Appendix I, if the hydro-brake opening is set at 55mm, the design flow at 1.2 l/s, with a design head of 1.2m, the maximum surface water run-off rates for each storm event will be as follows:

Storm	-	Rate	-	Critical Storm Event
Q_2	-	**0.9 l/s**	-	180-minute winter storm duration
$Q_{30 + 40\%}$	-	**1.0 l/s**	-	240-minute winter storm duration
$Q_{100 + 45\%}$	-	**1.2 l/s**	-	240-minute winter storm duration

A summary of the post development surface water run-off rates compared to the greenfield and pre-development rates are as follows:

Greenfield Rate to Post Development Rate

Storm	-	Greenfield	-	Post Dev	-	Difference
Q_2	-	0.8 l/s	-	0.9 l/s	-	13% Increase
$Q_{30 + 40\%}$	-	2.1 l/s	-	1.0 l/s	-	52% Reduction
$Q_{100 + 45\%}$	-	2.8 l/s	-	1.2 l/s	-	57% Reduction

Pre-Development Rate to Post Development Rate

Storm	-	Pre-Dev	-	Post Dev	-	Difference
Q_2	-	8.2 l/s	-	0.9 l/s	-	89% Reduction
$Q_{30 + 40\%}$	-	19.2 l/s	-	1.0 l/s	-	95% Reduction
$Q_{100 + 45\%}$	-	24.2 l/s	-	1.2 l/s	-	95% Reduction

The calculations show that the surface water run-off rates exceed the 2-year greenfield rate, but are a 52% to 7% reduction of the 30-year and 100-year greenfield rate, respectively, and between an 89% to 95% reduction of pre-development rates.

Therefore, they adhere to DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems – S3 (see Section 4.5), where the rates are as close to greenfield rates as possible and are a reduction of the pre-development rates.

10.4. Surface Water Run-Off Volume

The post development surface water run-off volume for the Site has also been calculated for 1 in 100-Year the 6-hour duration (Inc. 45% allowance) based on the peak discharge rate (Appendix I), where:

Q_{100} - 1.2 l/s x (60 x 60 x 6) - 25,920 litres - 25.92m³

A summary of the post development surface water run-off volume compared to the greenfield and pre-development volume are as follows:

Greenfield Volume to Post Development Volume

Strom	-	Greenfield	-	Post Dev	-	Difference
$Q_{100 + 45\%}$	-	26.63m³	-	25.92m³	-	**Equivalent**

Pre-Development Volume to Post Development Volume

Storm	-	Pre-Dev	-	Post Dev	-	Difference
Q_{100}	-	30.44m³	-	25.92m³	-	15% Reduction

The surface water run-off volume for the 100-year, 6-hour storm event will be equivalent to greenfield run-off volume and a 15% reduction of the pre-development run-of volume for the same storm event.

Therefore, the volume adheres to DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems – S6 (see Section 4.6), where the volume of water is discharged at a rate that does not adversely affect flood risk.

10.5. Surface Water Attenuation Calculations

As stated above, the post development run-off rates are restricted, there will be a requirement for surface water attenuation.

Ciria SuDS Manual 2015, Paragraph 10.2.4 states that: *'Exceedance flows (i.e. flows in excess of those for which the system is designed) should be managed safely in above-ground space such that risks to people and property are acceptable'.*

Attenuation structure formed of below ground attenuation tank in the form of cellular units, and sub-base material of the permeable paving / surfacing system.

As detailed in the MicroDrainage calculations (Appendix I) and demonstrated on the surface water management layout (Appendix H), the attenuation volume and details for the SuDS methods are as follows:

Cellular Units			**Permeable Paving / Surfacing**		
Unit length	-	12.00m	Permeable Area	-	400.00m²
Unit Width	-	3.50m	Sub-Base Depth	-	0.30m
Unit Area	-	42.00m²	Sub-Base Porosity	-	0.30
Depths	-	0.80m	**Volume**	**-**	**36.00m³**
Porosity	-	0.95m			
Volume	**-**	***31.92m³**			

*Total volume 33.60m³

The MicroDrainage calculations (Appendix I) show that with the cellular unit and permeable paving / surfacing sub-base volume, no flooding will occur for all storms up to and including the 100-year + 45% storm event.

Therefore, the attenuation volume is deemed to be acceptable, as they meet the requirements set out in the DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems – S7 to S9 (see Section 4.7).

11. Maintenance Requirements

The management and maintenance of the surface water drainage networks and SuDS features will be undertaken by contractors appointed by the managers / owners of the office building. Where payments for the management and maintenance will form part of the property deeds and / or rental agreements.

The management and maintenance of the drainage and SuDS features form part of the overall maintenance and management of all areas / aspects of the Site. Details of the required maintenance and management of the drainage and SuDS features ate as follows:

11.1. Drainage Networks, Cellular Units, Flow Control Chamber, and Rainwater Harvesting Tanks / Butts

Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthlies
Debris removal from manholes (where may cause risk performance)	Monthly
Where rainfall into network from above, check surface or filter for blockage or silt, algae, or other matter by jetting	As required, but at least twice a year
Remove sediment from pipework by jetting.	Annually or as required
Repair/check all inlets, outlets, and overflow pipes	As required
Inspect/check all inlets, outlets, and overflow pipes to ensure that they are in good condition and operating as designed	Annually and after large storms

11.2. Permeable Paving / Surfacing

Operation	Frequency
Inspect and identify any areas that are not operating correctly, if required, take remedial actions	Monthly for 3 months, then six monthlies
Debris removal from on surface of permeable paving / surfacing or near system (where may cause risk performance)	Monthly
Rainfall infiltration into permeable paving / surfacing is ensured working effectively.	As required, but at least twice a year

11.3. Raingardens and Raised Planters

Operation	Frequency
Inspections to identify any areas not operating correctly, eroded areas, hydrocarbon pollution, blocked outlets, and silt accumulation. Record any areas that are ponding and where water is lying for more than 48 hours.	Monthly

Collect and remove from the site all extraneous rubbish that is detrimental to the operation of the SUDS feature and appearance of the site, including paper, packaging materials, bottles, cans, and similar debris.	Monthly
Maintain grass within the specified range. Ensure that the soil and grass does not become compacted. Do not cut during periods of drought or when ground conditions or grass are wet.	As required, but at least twice a year
Scarifying and spiking	As required
Reinstate design levels, repair eroded areas or damaged areas by returfing and reseeding.	As required
Seed or sod bare eroded areas.	As required

11.4. Linked and Further Maintenance and Maintenance Activities

The maintenance of the drainage network and SuDS features are to be linked with the wider site maintenance plan for the industrial estate. A log of all maintenance activities is to be kept and made available to the local planning authority (LPA) and / or the Lead Local Flood Authority (LLFA) on request.

12. Surface Water Exceedance Design

In the unlikely event of an extreme storm greater than 100-year + 45% climate change, or poor maintenance of the SuDS features, potential flooding could occur.

Surface water will flow to the western boundary and will flow across the agricultural field into the unnamed watercourse. The surface water will not flow directly towards the office building and will not flow towards any existing properties / buildings prior to discharge to the unnamed watercourse. Therefore, no flood risk increase will occur to developed areas in an exceedance event.

13. Water Quality

The level of water treatment (for external areas subject to pollutants) is to be assessed against the details set out in Ciria SuDS Manual C753. Chapter 26 sets out the Pollution Hazard Indices for different land classifications, and how to calculate that against the SuDS mitigation indices to show suitable levels of treatment.

13.1. Roof Area Pollutant Hazard

C753 Table 26.2 Pollution Hazard Level = Low

C753 Table 26.2 Pollution Hazard Index:

- Total Suspended Solid (TSS) = 0.3
- Metals = 0.2
- Hydrocarbons = 0.05

Pollution Hazard Index = **0.55**

13.2. Building Roof Pollutant Mitigation

Mitigation Measures:

- **Raised Planters and Raingardens**

Lowest Pollutant Mitigation Indices

Total Suspended Solid (TSS)	=	0.4
Metals	=	0.4
Hydrocarbons	=	0.4
SuDS Mitigation Indices	=	**1.20**

13.3. Footpath and Car Park Pollutant Hazard

C753 Table 26.2 Pollution Hazard Level = Low

C753 Table 26.2 Pollution Hazard Index:

- Total Suspended Solid (TSS) = 0.5
- Metals = 0.4
- Hydrocarbons = 0.4

Pollution Hazard Index = **1.30**

13.4. Footpath and Car Park Pollutant Mitigation

Mitigation Measures:

- **Permeable Paving / Surfacing**

Permeable Paving / Surfacing Pollutant Mitigation Indices

Total Suspended Solid (TSS)	=	0.7
Metals	=	0.6
Hydrocarbons	=	0.7
SuDS Mitigation Indices	=	**2.00**

The mitigation indices are greater than the pollution hazard index, and therefore suitable water quality is achieved.

14. Development Management and Construction Phase

All existing drainage networks (if found) within the development area are to be maintained during construction. The drainage network, cellular units, and flow control chamber are to be the first part of the drainage network to be built.

14.1. Construction Environment Management Plan

Full details of the construction environment management plan (CEMP) has to be confirmed by the chosen contractor who have been appointed for the development. However, it will conform to the requirements of CIRIA 753 – The SuDS Manual – Chapter 31, and will include:

14.2. Construction Access

The main construction traffic will access the site from the east. The traffic and site set up areas will be limited to avoid the attenuation tank, with the permeable surfacing being installed at the end of the construction phase.

14.3. Sediments and Traps

Sediment basins and traps are to be installed before any major site earthworks take place, with further sediment traps and silt fences being installed as the earthworks progresses. This will keep sediment contained on site at appropriate locations.

14.4. Run-Off Control Measures

Run-off control measures are to be used in conjunction with sediment traps to divert water around planned earthworks areas to remove silts. Any surface water upstream of the site is to be diverted around the development areas, and to discharge to any existing drainage systems. The surface water run-off destination for the diverted surface water will continue as existing.

14.5. Main Surface Water Run-Off Systems

The main drainage network, SuDS features, and flow control chamber are to be built prior to any phase of construction of site. Surface water from each of the phased area is to discharge to the new drainage network, where the water is adequately restricted, and water quality maintained before discharging to the unnamed watercourse. Temporary inlet and outlet protection measures and appropriate silt traps are to be installed to prevent silt ingress into the main drainage network.

14.6. Clearing and Earthworks

Clearing and earthworks will only start when adequate erosion and sediment control measures are in place. Once the development areas are cleared, earthworks will follow immediately to ensure that the ground cover can be re-established quickly. Adjacent land to that being developed will be left undisturbed for as long as possible.

14.7. Surface Stabilisation Measures

Surface stabilisation measures will be applied to completed areas, channels ditches and other disturbed areas after the land is cleared and profiled. Permanent stabilisation measures will be installed as soon as possible after final profiling.

14.8. Construction of Permeable Surfacing

Construction of permeable surfacing / paving is to be left to the later stages of construction. Unsuitable sediment is to be removed from surfacing prior to installation of sand binder layer and paving.

15. Conclusion / Summary

15.1. Surface Water Discharge Destination

The surface water (at a restricted rate) will discharge to the unnamed watercourse approximately 60m to the west of the Site.

A pipe system from the Site to the unnamed watercourse may not be possible due to land ownership. However, it is proposed to discharge the surface water to a granular trench system along the site boundary, which will disperse the surface water across the field to the unnamed watercourse.

Discharging the surface water run-off across the agricultural field to the unnamed watercourse will replicate the pre-development / existing surface water flows, and therefore will not adversely affect flood risk or increase flows to the unnamed watercourse.

15.2. SuDS Principles

All feasible SuDS methods, and surface water discharge destination have been assessed, with the feasible SuDS methods being a permeable surfacing / paving system; a rainwater harvesting tank, a water butt; a raised planter; raingardens; a flow control; and an attenuation tank in the form of cellular units.

15.3. Peak Flow Control

The surface water run-off rates exceed the 2-year greenfield rate, but are a 52% to 7% reduction of the 30-year and 100-year greenfield rate, respectively, and between an 89% to 95% reduction of pre-development rates.

Therefore, they adhere to DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems – S3, where the rates are as close to greenfield rates as possible and are a reduction of the pre-development rates.

15.4. Volume Control

The surface water run-off volume for the 100-year, 6-hour storm event will be equivalent to greenfield run-off volume and a 15% reduction of the pre-development run-of volume for the same storm event.

Therefore, the volume adheres to DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems – S6, where the volume of water is discharged at a rate that does not adversely affect flood risk.

15.5. Flood Risk within the Development

The MicroDrainage calculations show that with the cellular unit and permeable paving / surfacing sub-base volume, no flooding will occur for all storms up to and including the 100-year + 45% storm event.

Therefore, the attenuation volume is deemed to be acceptable, as they meet the requirements set out in the DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems – S7 to S9.

15.6. Management and Maintenance

The management and maintenance of the surface water drainage networks and SuDS features will be undertaken by contractors appointed by the managers / owners of the office building. Where payments for the management and maintenance will form part of the property deeds and / or rental agreements.

The management and maintenance of the drainage and SuDS features form part of the overall maintenance and management of all areas / aspects of the Site.

15.7. Surface Water Exceedance Design

In the unlikely event of an extreme storm greater than 100-year + 45% climate change, or poor maintenance of the SuDS features, potential flooding could occur.

Surface water will flow to the western boundary and will flow across the agricultural field into the unnamed watercourse. The surface water will not flow directly towards the office building and will not flow towards any existing properties / buildings prior to discharge to the unnamed watercourse. Therefore, no flood risk increase will occur to developed areas in an exceedance event.

15.8. Water Quality

The level of water treatment (for external areas subject to pollutants) is to be assessed against the details set out in Ciria SuDS Manual C753. Chapter 26 sets out the Pollution Hazard Indices for different land classifications, and how to calculate that against the SuDS mitigation indices to show suitable levels of treatment.

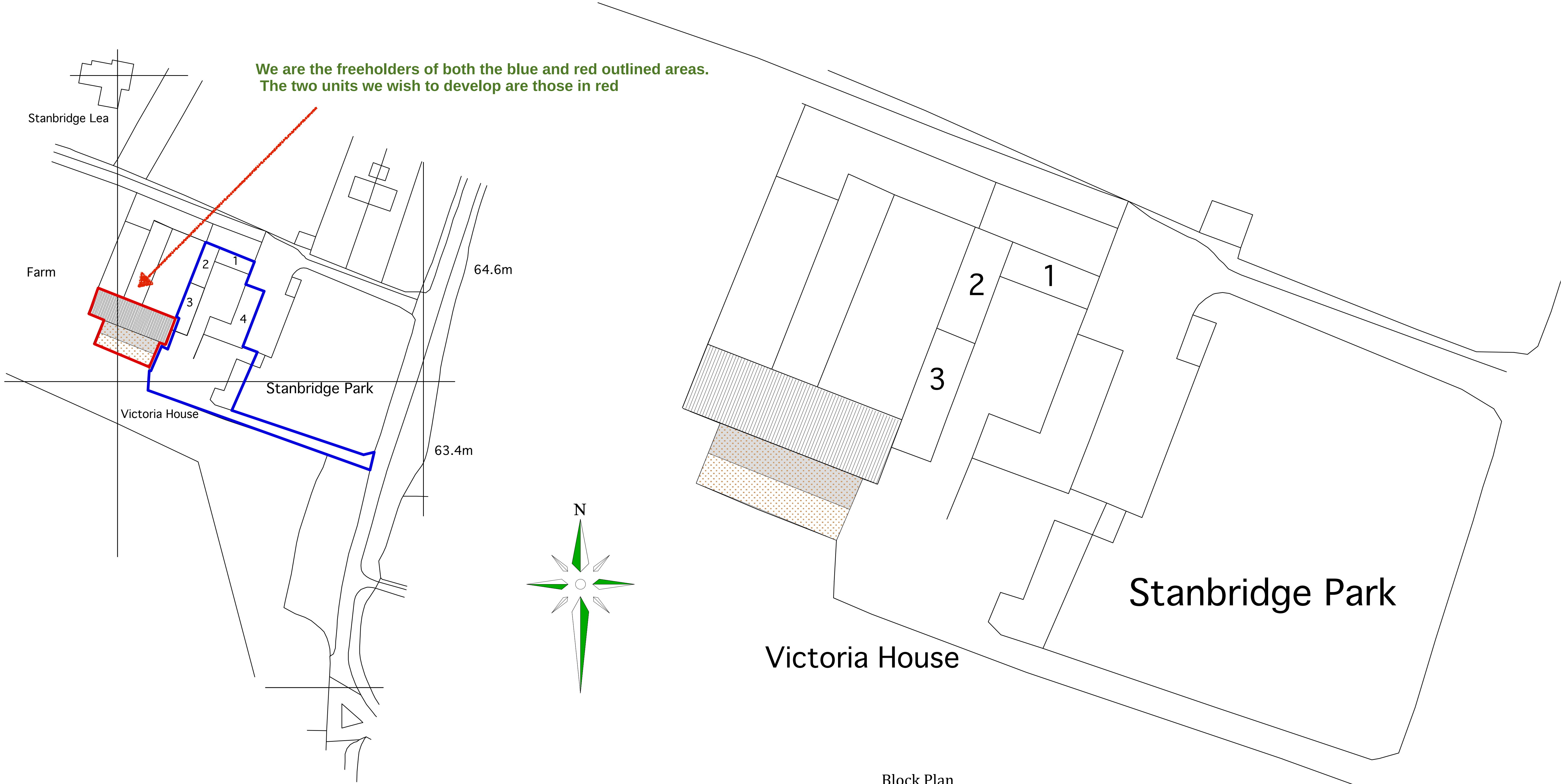
The mitigation indices are greater than the pollution hazard index, and therefore suitable water quality is achieved.

15.9. Development Management and Construction Phase

All existing drainage networks (if found) within the development area are to be maintained during construction. The drainage network, cellular units, and flow control chamber are to be the first part of the drainage network to be built.

Full details of the construction environment management plan (CEMP) has to be confirmed by the chosen contractor who have been appointed for the development. However, it will conform to the requirements of CIRIA 753 – The SuDS Manual – Chapter 31.

Appendix A Site Location Plan



Location Plan
Scale 1:1250

Block Plan
Scale 1:500

10cm = 250 Metres at scale 1:2500
10cm = 125 Metres at scale 1:1250

10cm = 50 Metres at scale 1:500
10cm = 25 Metres at scale 1:250

10cm = 10 Metres at scale 1:100
10cm = 5 Metres at scale 1:50

The Drawings supporting this application have been produced to be handled and viewed electronically and are best viewed on screen to see fine detail that may not appear on printed versions depending on the type of printer used and the size of print etc, for which Brett Incorporated Ltd accepts no liability.

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MANAGING DIRECTOR ~~~~~~~~~~ ~~~~~~~~~~ SIMON BRETT M.R.T.P.I
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REGD IN THE UK No: 4869163 VAT REG No: 823 5236 44
www.brettinc.co.uk

Client: Moyle and Moyle Investments Ltd	Drg No: 1862.1/01	Date: August 2021	
Project: B8 use of buildings adj Stanbridge Industrial Park, Staplefield Lane, Staplefield RH17 6AS	Scales: LP - 1:1250 BP - 1:500	**Original Plan Size A3**	Drawn: Gonzo
Drawing: Location and Block Plans	This drawing is the copyright of Brett Incorporated Limited. The contractor should check all dimensions on site. No dimensions are to be scaled from this drawing. It is the contractor's responsibility to ensure that all works are in compliance with the current statutory requirements. Unless otherwise stated, this drawing has been prepared for the purposes applied for.	Any Ordnance Survey plan on this document has been reproduced from the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationary Office. Crown copyright of Brett Incorporated Limited, 18 Seal Road, Selsey, Chichester, We st Sussex PO20 0HW Licence No: LIG0793	

Appendix B Existing Site Plans

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

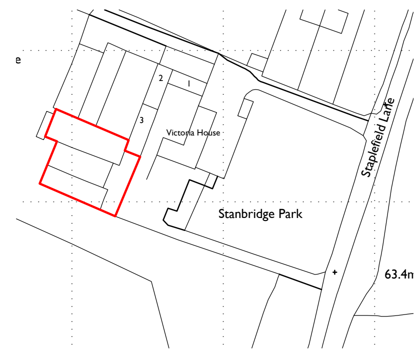
Notes

+SP Existing site plan - scale 1:200 at A3

Scale in Metres

0 1 2 3 4 5 10 15 20

N



+LP Existing location plan - scale 1:2500 at A3

Scale in Metres

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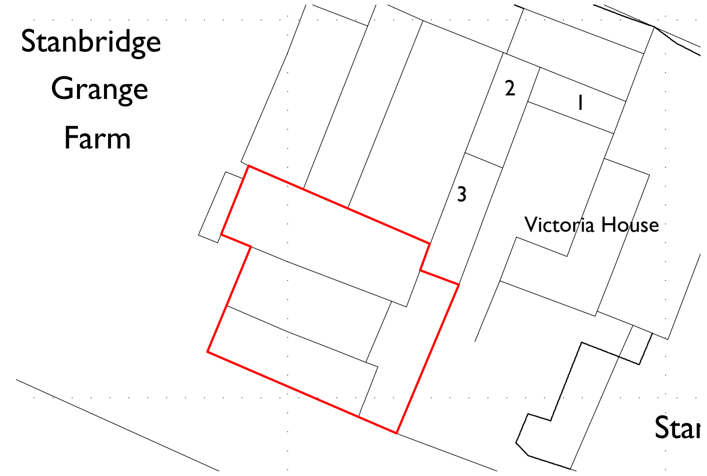


+BP Existing block plan - scale 1:1000 at A3

Scale in Metres

0 10 20 30 40 50

APPLICATION FOR DETAILED
PLANNING PERMISSION

LRA-R RETINUE

01273 446 890 WWW.LRA-RETINUE.CO.UK

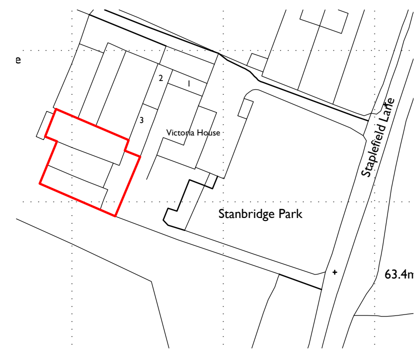
JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA
	DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 12.22
	SCALE 1:200/1000/2500 @ A3
DRAWING EXISTING SITE PLAN LOCATION PLAN AND BLOCK PLANS	REVISION
	NUMBER 2109-EX-001

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

Notes



+LP Existing location plan - scale 1:2500 at A3

Scale in Metres

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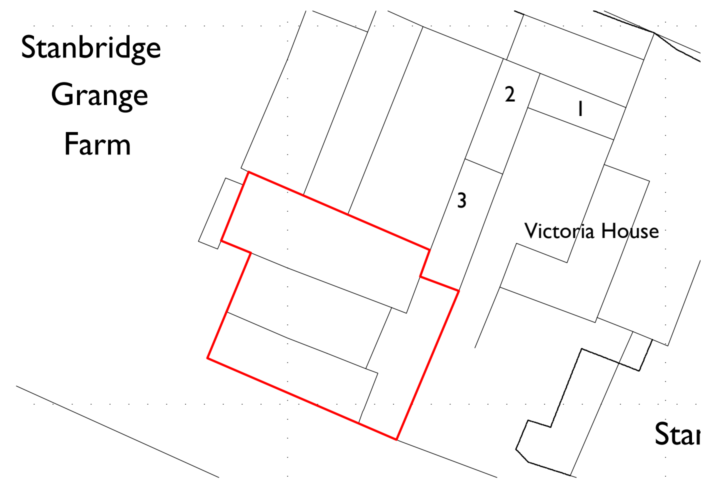

+BP Existing block plan - scale 1:1000 at A3

Scale in Metres

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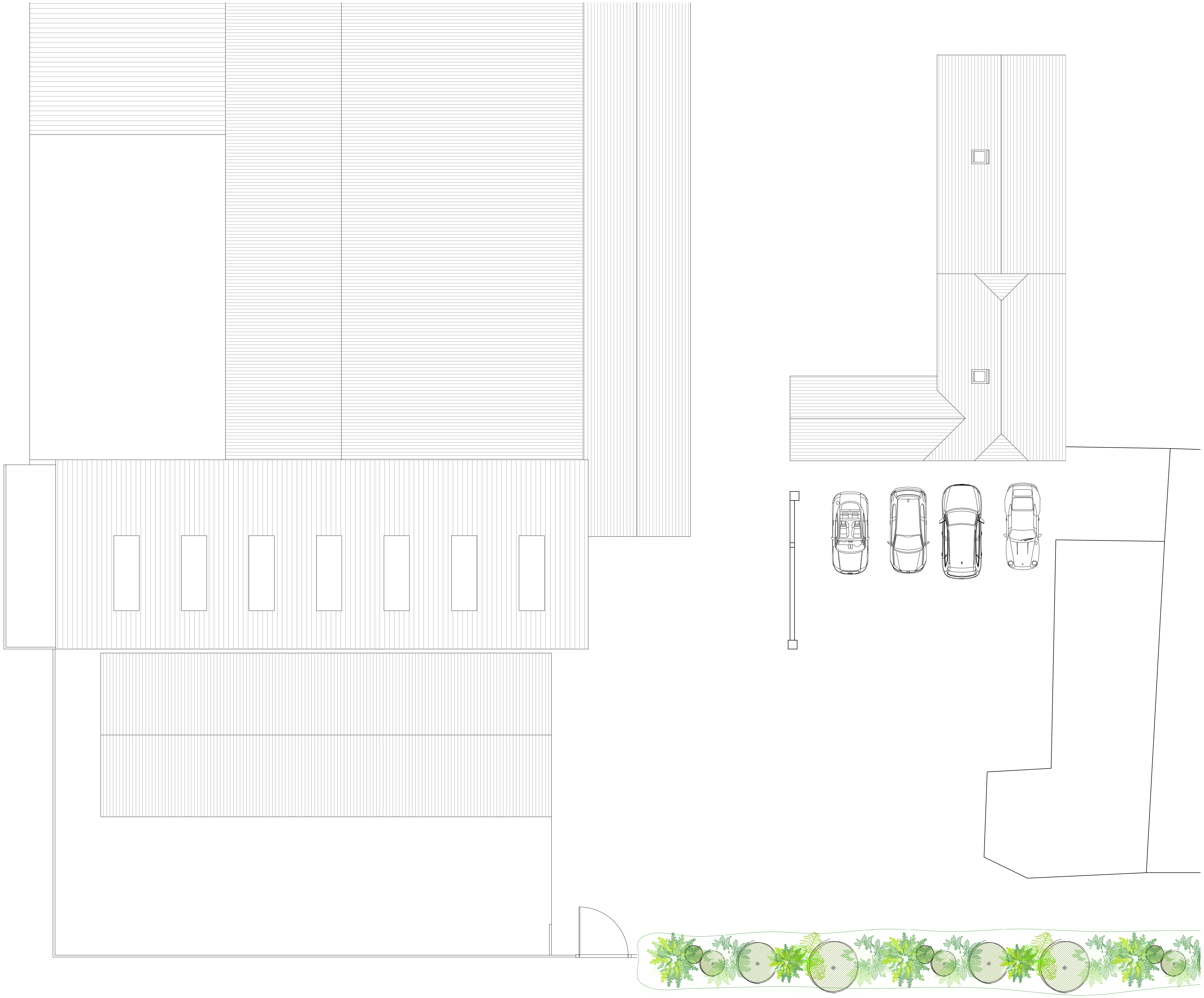


+SP Existing site plan - scale 1:200 at A3

Scale in Metres

0 1 2 3 4 5 10 15 20

N

APPLICATION FOR DETAILED
PLANNING PERMISSION

LRA-R RETINUE

01273 446 890 WWW.LRA-RETINUE.CO.UK

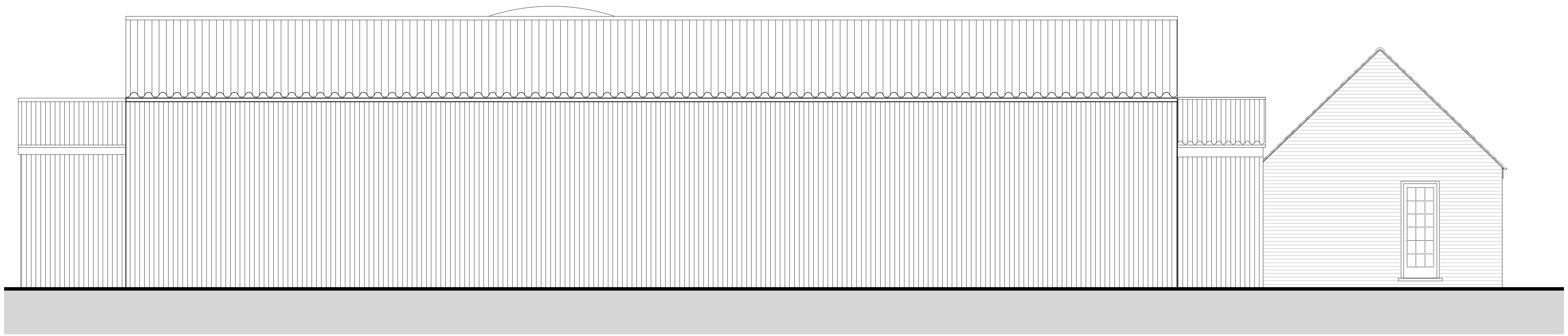
JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 12.22 SCALE 1:200/1000/2500 @ A3
DRAWING EXISTING ROOF PLAN LOCATION PLAN AND BLOCK PLANS	REVISION NUMBER 2109-EX-002

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

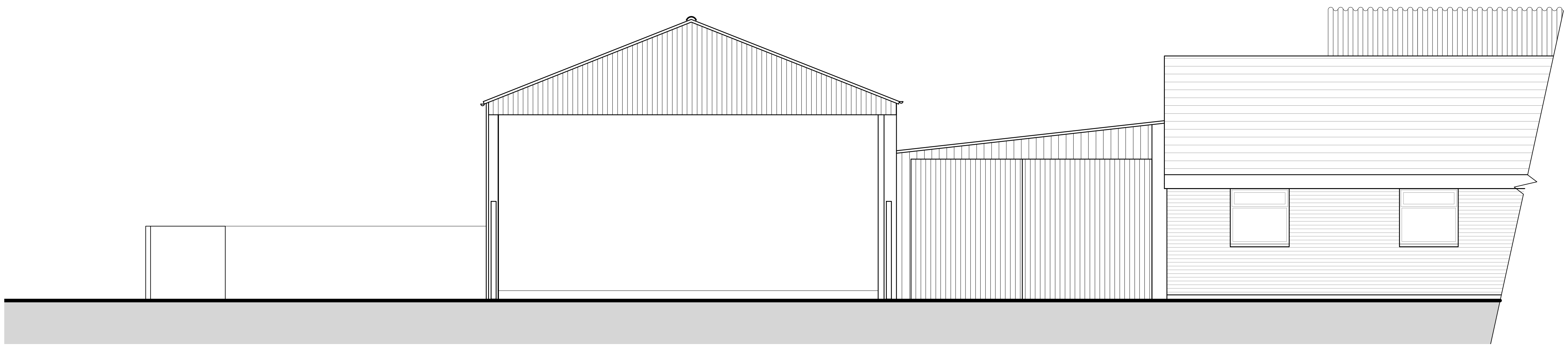
Notes



+EL Existing south elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5



+EL Existing east elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5

APPLICATION FOR DETAILED

PLANNING PERMISSION

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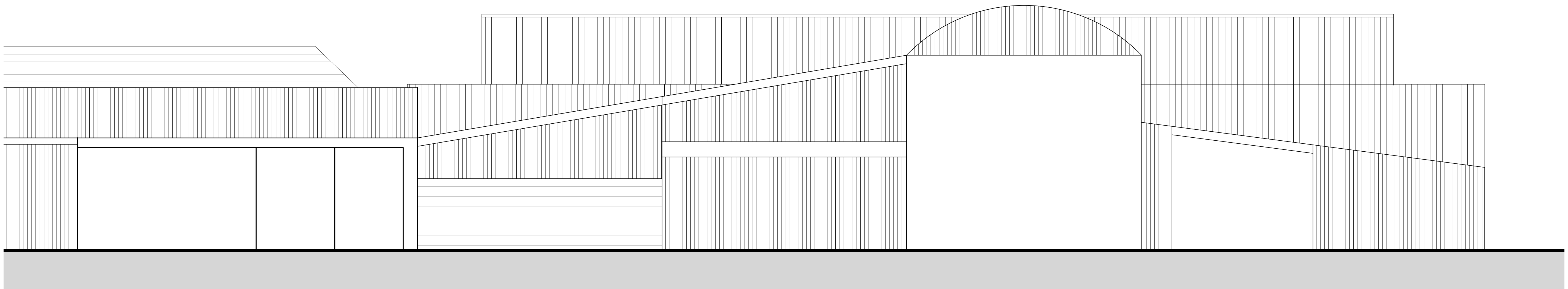
JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 12.22 SCALE 1:100 @ A3
DRAWING EXISTING SOUTH AND EAST ELEVATIONS	REVISION NUMBER 2109-EX-003

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

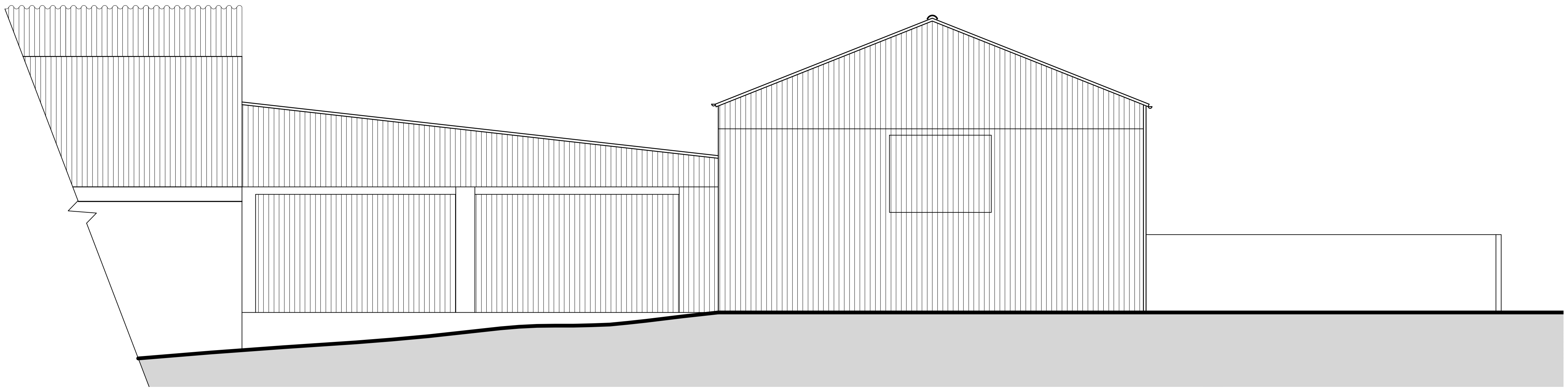
Notes



+EL Existing north elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5



+EL Existing west elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5

APPLICATION FOR DETAILED

PLANNING PERMISSION

LRA-R RETINUE

01273 446 890 WWW.LRA-RETINUE.CO.UK

JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 12.22 SCALE 1:100 @ A3
DRAWING EXISTING NORTH AND WEST ELEVATIONS	REVISION NUMBER 2109-EX-004

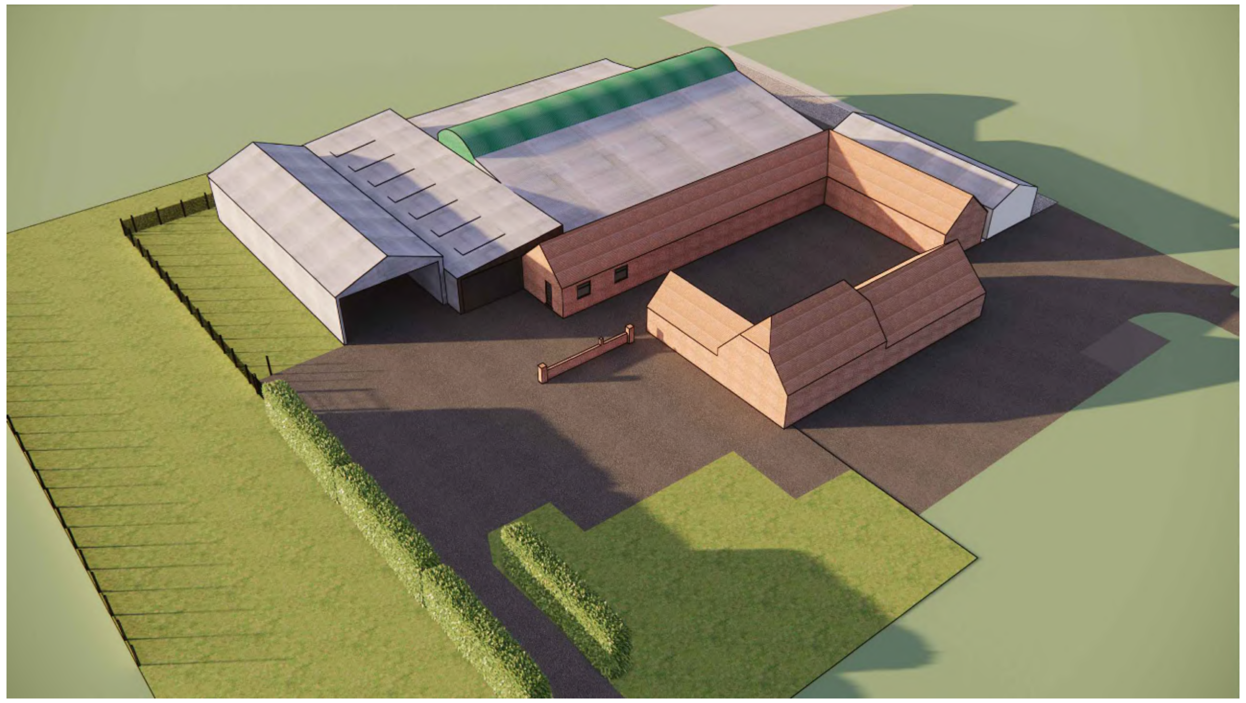
24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

Notes

+IM View 1 - existing artist's impression from south-west



+IM View 2 - existing artist's impression aerial perspective

+IM View 3 - existing artist's impression aerial perspective from north-west

+IM View 4 - existing artist's impression from east

APPLICATION FOR DETAILED
PLANNING PERMISSION

LRA-R RETINUE

01273 446 890 WWW.LRA-RETINUE.CO.UK

JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 12.22 SCALE NTS @ A3
DRAWING EXISTING ARTIST'S IMPRESSIONS	REVISION NUMBER 2109-EX-005

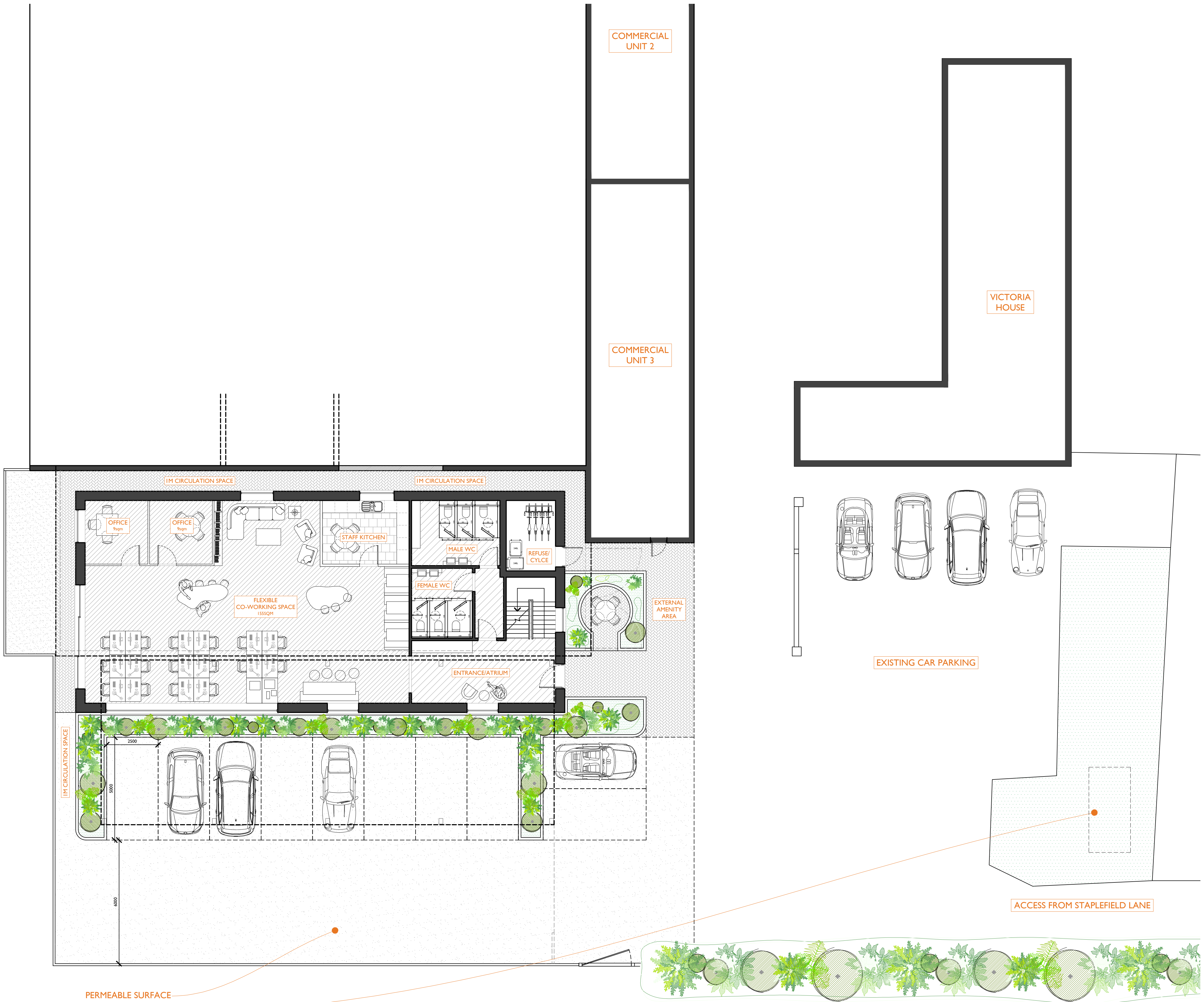
24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Appendix C Proposed Site Plans

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

Notes



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Scale in Metres

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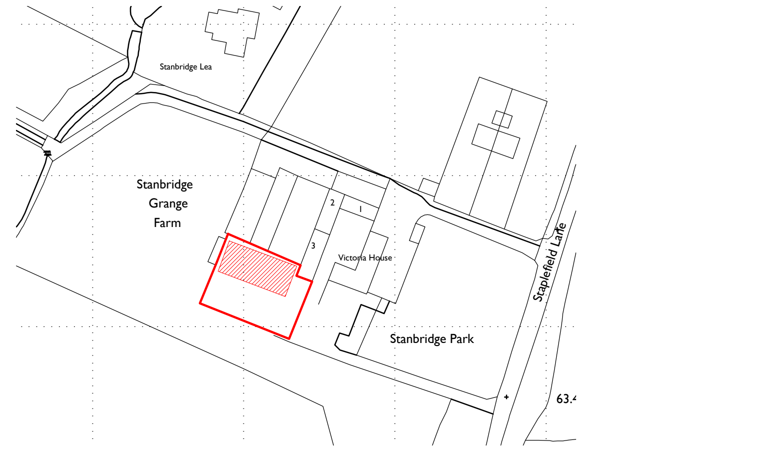

+LP Proposed location plan - scale 1:2500 at A3

Scale in Metres

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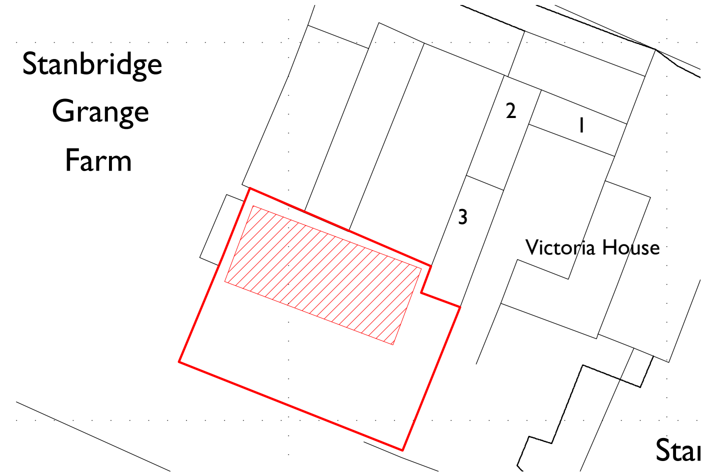


+BP Proposed block plan - scale 1:1000 at A3

Scale in Metres

0 10 20 30 40 50

Rev A 07.23 Minor alterations to fenestration BH

APPLICATION FOR DETAILED
PLANNING PERMISSION

LRA-R RETINUE

01273 446 890 WWW.LRA-RETINUE.CO.UK

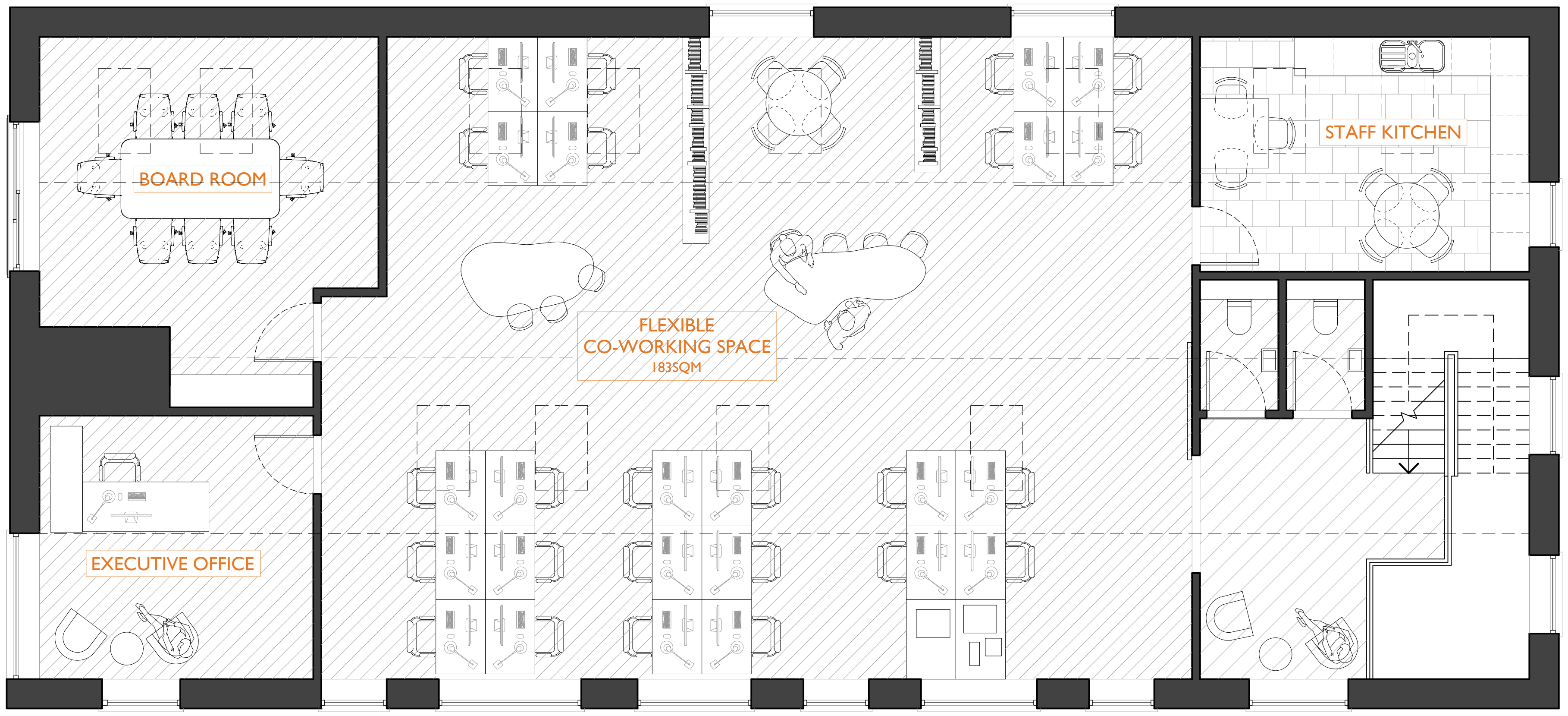
JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 07.23 SCALE 1:200/1000/2500 @ A3
DRAWING PROPOSED SITE PLAN LOCATION PLAN AND BLOCK PLANS	REVISION A NUMBER 2109-PA-010

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

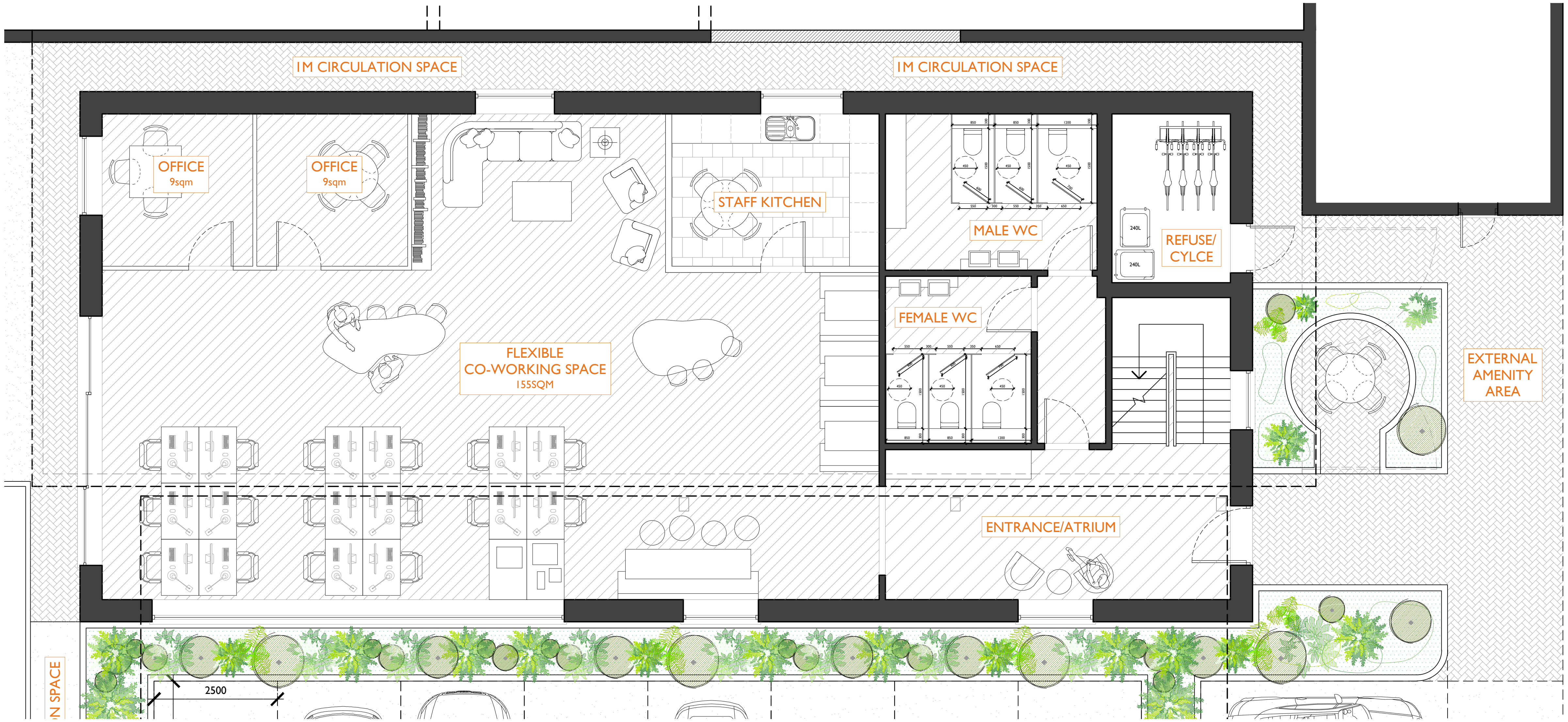
Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

Notes



+01 Proposed first floor plan - scale 1:100 at A3



+00 Proposed ground floor plan - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5

N

Rev A	07.23	Alterations to fenestration	BH

APPLICATION FOR DETAILED
PLANNING PERMISSION

LRA-R RETINUE

01273 446 890 WWW.LRA-RETINUE.CO.UK

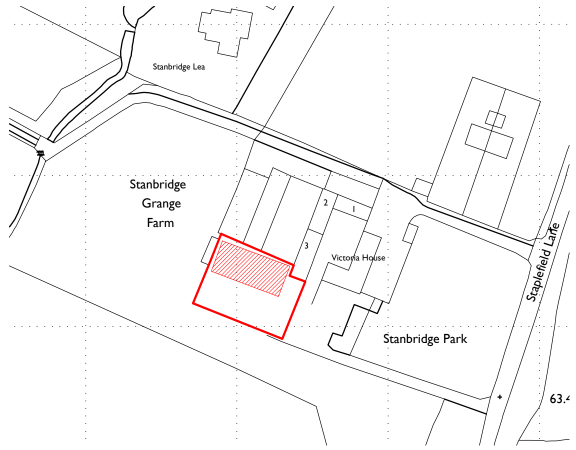
JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 07.23 SCALE 1:100@ A3
DRAWING PROPOSED GROUND AND FIRST FLOOR PLANS	REVISION A NUMBER 2109-PA-011

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

Notes

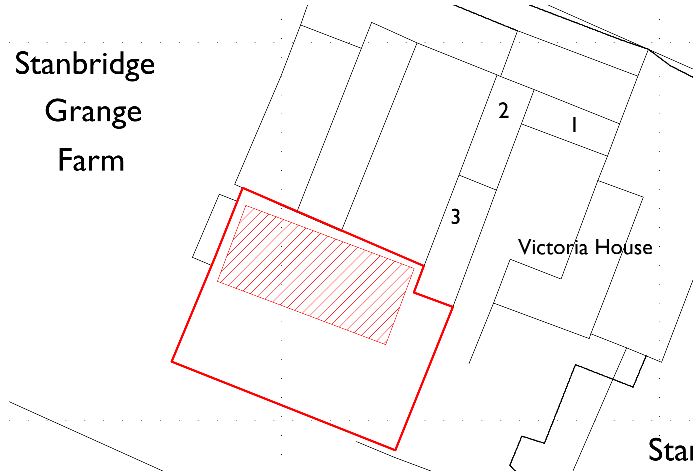


+LP Proposed location plan - scale 1:2500 at A3

Scale in Metres

0 20 50 100 200

N



+BP Proposed block plan - scale 1:1000 at A3

Scale in Metres

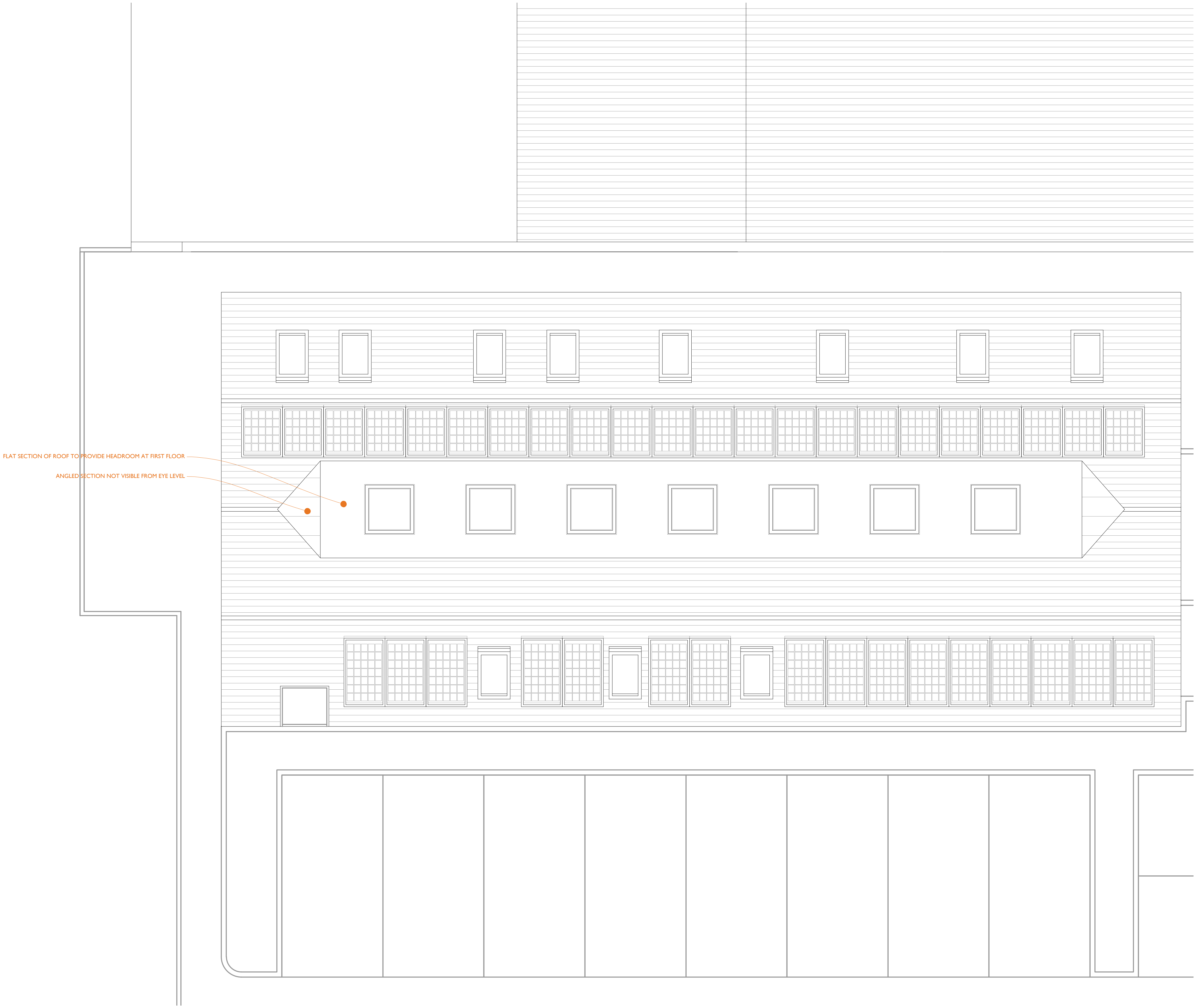
0 10 20 30 40 50

Rev A	07.23	Minor alterations to fenestration	BH

APPLICATION FOR DETAILED
PLANNING PERMISSION

01273 446 890 WWW.LRA-RETINUE.CO.UK

JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 07.23 SCALE 1:100/1000/2500 @ A3
DRAWING PROPOSED ROOF PLAN LOCATION PLAN AND BLOCK PLANS	REVISION A NUMBER 2109-PA-012



+RP Proposed roof plan - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5 10 15 20

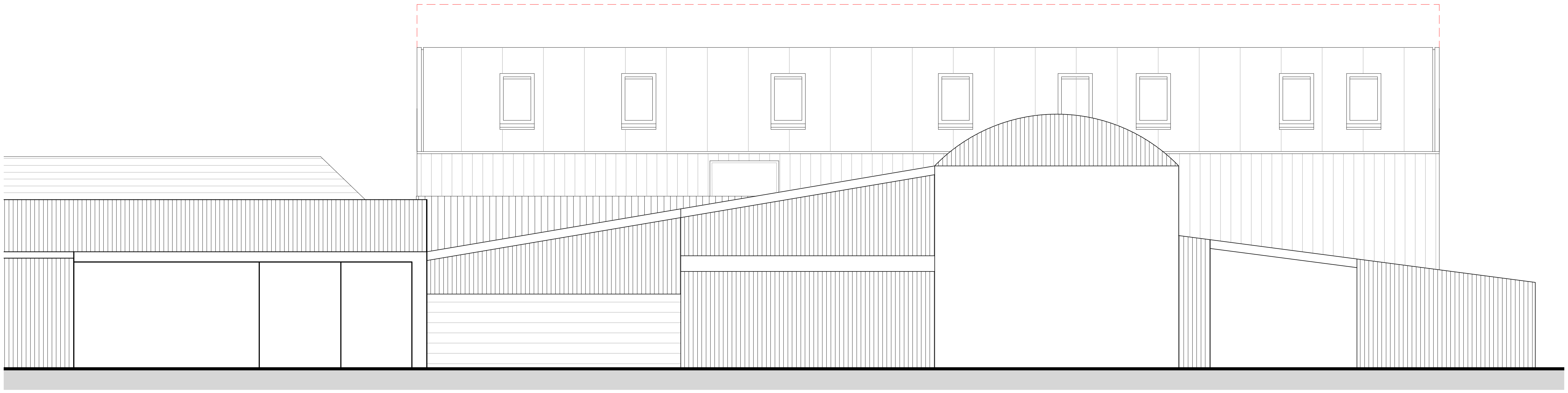
N

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

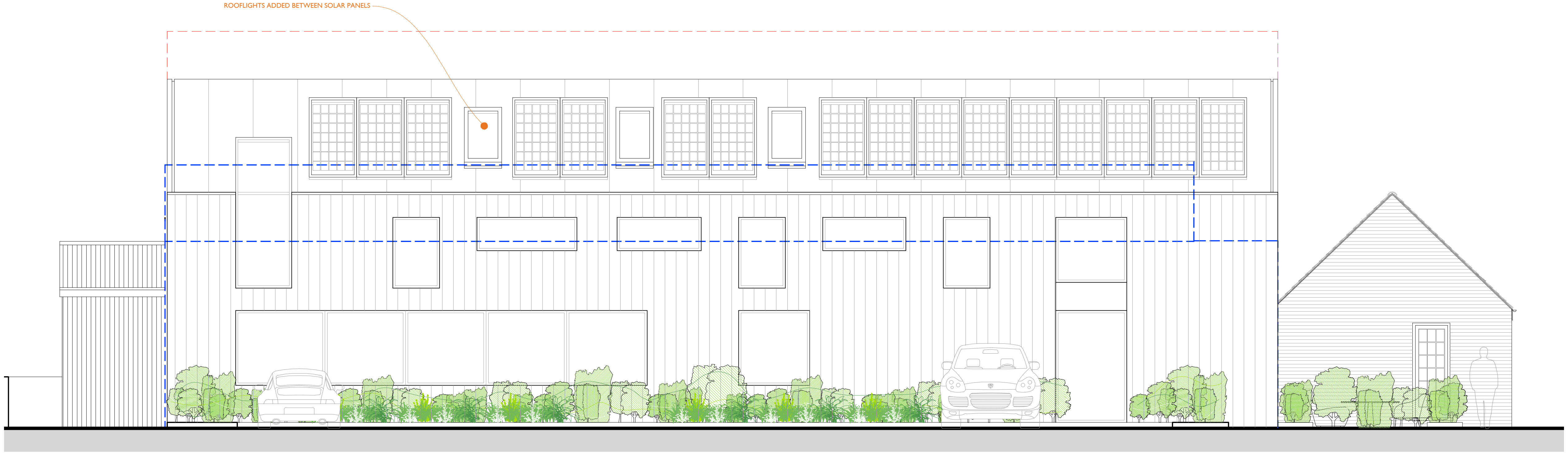
Notes



+EL Proposed north elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5



+EL Proposed south elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5

Rev A	07.23	Minor alterations to fenestration	BH

APPLICATION FOR DETAILED
PLANNING PERMISSION

LRA-R RETINUE

01273 446 890 WWW.LRA-RETINUE.CO.UK

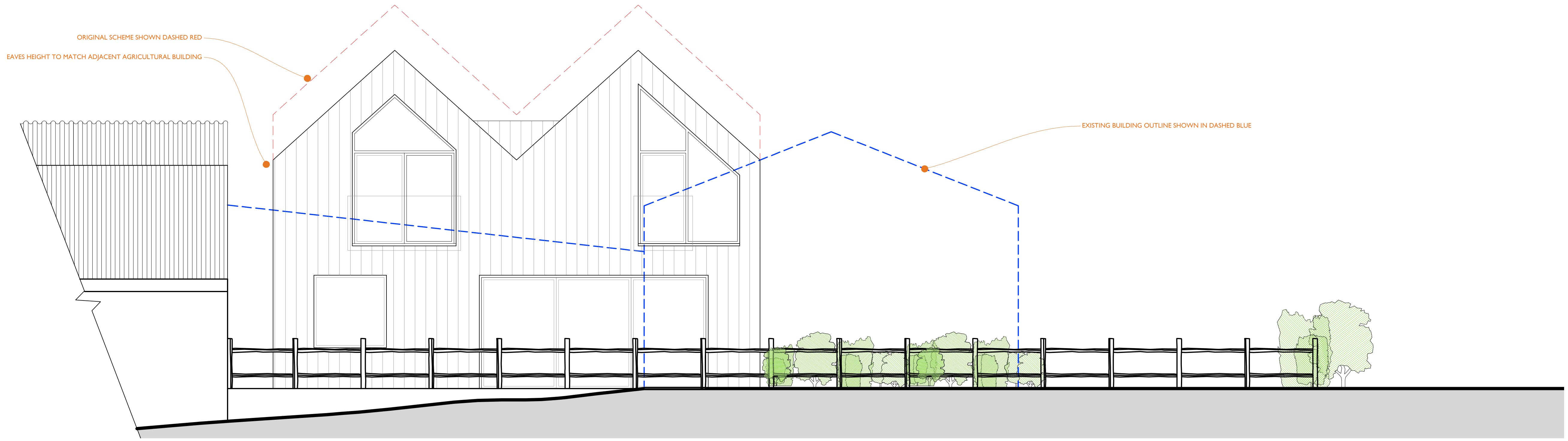
JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED LRA DRAWN BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE 07.23 SCALE 1:100 @ A3
DRAWING PROPOSED NORTH AND SOUTH ELEVATIONS	REVISION A NUMBER 2109-PA-013

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Only figured dimensions are to be used. All dimensions to be checked on site.

Please note: Refer to 'type' of drawing below; planning drawings should only be treated as such.

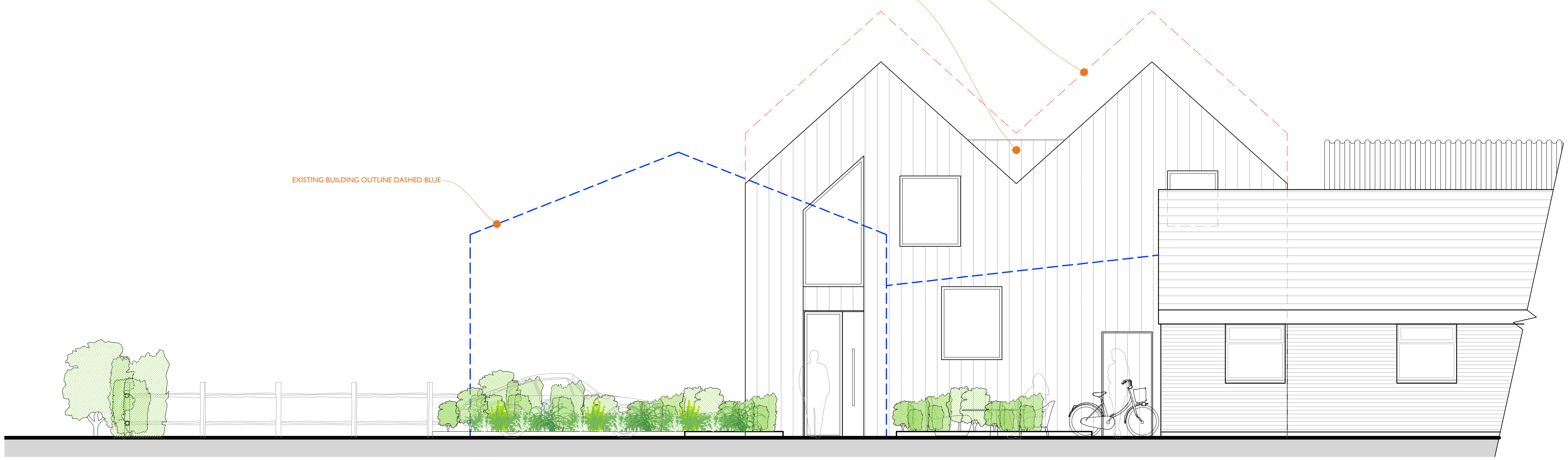
Notes



+EL Proposed west elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5



+EL Proposed east elevation - scale 1:100 at A3

Scale in Metres

0 1 2 3 4 5

Rev	Date	Description	By
Rev A	07.23	Minor alterations to fenestration	BH

APPLICATION FOR DETAILED

PLANNING PERMISSION

01273 446 890 WWW.LRA-RETINUE.CO.UK

JOB STANBRIDGE INDUSTRIAL PARK STAPLEFIELD LANE STAPLEFIELD RH17 6AS	CHECKED: LRA DRAWN: BH
CLIENT MOYLE AND MOYLE INVESTMENTS LTD	DATE: 07.23 SCALE: 1:100 @ A3
DRAWING PROPOSED EAST AND WEST ELEVATIONS	REVISION: A NUMBER: 2109-PA-014

24 Windlesham Road, Brighton, East Sussex BN1 3AG, UK
LRA-Retinue registered in England and Wales 12353276

Appendix d British Geological Survey Data

TQ22NE 14

RECORD of WELL or BORING

Survey No. 302
1" N.S.
1" O.S. TQ22/12

at (house or farm) Little Stanbridge Nursery 2652 2728

Town, Village, &c. Handcross, County Sussex. Six inch map XXV. N.E

Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on maps). On West side of London to Brighton Road, opposite Stanbridge Farm.

Popular Edition of one inch map. Sheet ... Square ...

Surface level of ground 222 ft. above Ordnance Datum. Well or Bore commenced at ... ft. below surface level of ground.

Sunk 26 ft., diameter ... ft. Bored to 97 ft.; diameter of boring: at top 4½ in., at bottom 4½ in.

Details of lining tubes (internal diameters preferred) 4½ Tubes to 72' 0" perforations from 37' to 47' 9"

Water struck at depths of (feet) 40 ft. small quantity and at 87' 0"

Rest-level of water below top of well or bore 31 ft. Pumping level 31 ft. Time of recovery - hours.

Suction at ... ft. depth. Yield: (i) on test 600 galls. per hour (ii) normal 400 galls. per hr. no depression

Quality (attach copy of analysis if available) see below:-

Made by Duke & Ockenden Ltd. for Mr Handcross Nursery Co. Ltd. Date of boring May, 1934

Information from Duke & Ockenden Ltd., Littlehampton and London.

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Tunbridge Wells Sand.	Dug Well	26	0	26	0
	Sand and Clay	4	0	30	0
	White Clay	2	0	32	0
	Hard Sand Rock	4	0	36	0
	White Clay and Sandstone, a little water	10	0	46	0
	Rock	8	0	54	0
	Green Clay	4	0	58	0
	Rock	6	0	64	0
	Clay	2	0	66	0
	White Clay	6	0	72	0
	Rock	10	0	82	0
	Soft Clay	2	0	84	0
HB 6/9/34	Rock — Water at 87' 0" Water level dropped from 24'0" to 31'0"	13	0	97	0

Duke & Ockenden Ltd.,
Engineers For Water Supply,
126, Southwark Street,
London, S.E.

Analyses.

Total solids	8.0 grs. per gal.
Chlorine	1.7
Ammonia	0.0042 "
Manganese	Trace
Iron	0.81
Total Hardness	4.0°
Large mineral deposit	

Rest water level 90' below well top.
Average yield 1,000 g.p.day in summer
(supplies also the house & cottages).
Visited. 17.7.47. [illegible]

1

302/2 **Messrs. Handcross Nursery Co., Ltd., Little Stanbridge Nursery, Slaugham**

TQ 22/12

Surface +222. Shaft 26; rest bore. Lining tubes: 72 x 4½ in from surface (perforated 37 to 47¾). Water struck at +182 and +135. R.W.L. +191. P.W.L. +191. Yield 600 g.p.h. (test); 400 g.p.h. (normal). Hardness: total 57. Anal. *Dando, May 1934*.
R.W.L. +132. Yield 4,000 g.p.d. (summer). *July 1947*.

UTW 97 97

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks) 302/2	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Tunbridge Wells Sand.	Dug Well	26	0	26	0
	Sand and Clay	4	0	30	0
	White Clay	2	0	32	0
	Hard Sand Rock	4	0	36	0
	White Clay and Sandstone, a little water	10	0	46	0
	Rock	8	0	54	0
	Green Clay	4	0	58	0
	Rock	6	0	64	0
	Clay	2	0	66	0
	White Clay	6	0	72	0
	Rock	10	0	82	0
	Soft Clay	2	0	84	0
	Rock Water at 87' 0" Water level dropped from 24'0" to 31'0"	13	0	97	0

WB 5/7/39
Agreed RGF 2.12.64

RECORD of WELL or BORING

TQ 2653 2726 | TQ 22/12

Survey No. 302 | 1" N.S. | 1" O.S.

302 / 2

at (house or farm) Little Stanbridge Nursery

Town, Village, &c. Handcross, County Sussex. Six-inch map XXV. N.E.

Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on maps). On West side of London to Brighton Road, opposite Stanbridge Farm.

Popular Edition or one-inch map. Sheet Square

Surface level of ground 222 ft. above Ordnance Datum. Well or Bore commenced at ft. below surface level of ground.

Sunk 26 ft., diameter ft. Bored to 97 ft.; diameter of boring: at top 4½ in., at bottom 4½ in.

Details of lining tubes (internal diameters preferred) 4½ Tubes to 72' 0" perforations from 37' to 47' 9"

Water struck at depths of (feet) 40 ft. small quantity and at 87' 0"

Rest-level of water below top of well or bore 31 ft. Pumping level 31 ft. Time of recovery - hours.

Suction at ft. depth. Yield: (i) on test 600 galls. per hour; no depression (ii) normal 400 galls. per hr.

Quality (attach copy of analysis if available) see below:-

Made by Duke & Ockenden Ltd. for Mr Handcross Nursery Co. Ltd. Date of boring May, 1934

Information from Duke & Ockenden Ltd., Littlehampton and London.

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS Feet.	THICKNESS Inches.	DEPTH Feet.	DEPTH Inches.
Tunbridge Wells Sand.	Dug Well	26	0	26	[illegible]
	Sand and Clay	4	0	30	[illegible]
	White Clay	2	0	32	[illegible]
	Hard Sand Rock	4	0	36	[illegible]
	White Clay and Sandstone, a little water	10	0	[illegible]	0
	Rock	8	0	54	0
	Green Clay	4	0	58	[illegible]
	Rock	6	0	[illegible]	[illegible]
	Clay	2	0	66	[illegible]
	White Clay	6	0	72	[illegible]
	Rock	10	0	82	[illegible]
	Soft Clay	2	0	84	0
	Rock — Water at 87' 0". Water level dropped from 24'0" to 31'0"	13	0	97	0

SHB 5/9/34
Agreed RoT 2.12.64

Duke & Ockenden Ltd.,
Engineers For Water Supply,
126, Southwark Street,
London, S.E.

Analyses.

Total solids	8.0 grs. per gal.
Chlorine	1.7
Ammonia	0.0042 "
Manganese	Trace
Iron	0.81
Total Hardness	4.0°
Large mineral deposit	

Rest-water level 90' below well top.
Average yield 4,000 g.p.day in summer (supplies also the house & cottages).
Sited. 17.7.47. [initials]

DATA Bank

For Survey use only.

Date received.	G.S.M.	M. of H. notified.	Site marked on 1" map.

Geological Survey and Museum, South Kensington, London, S.W.7.

(66237B) Wt 28270/58 2,500 2/35

ORDER No. 19047 **BOREHOLE SECTION SHEET.** FORM No. 1.

302 TQ22/3

LE GRAND, SUTCLIFF & GELL, LTD.

JOB NAME SLAUGHAM

37

Slaugham—Maps O.S.G. 9, N.S. 302.

420. STANBRIDGE FARM, 1 mile S.E. of church. 1919. Ht. above O.D. 210 ft. Map 25 N.E.

		Thickness Ft.	Depth Ft.
	Dug well	30	30
Tunbridge Wells Sand	Sandstone	28	58

R.L.W. 29 ft. down. Yield 360 g. p. hour. Lined 30 ft. of 4 in. tubes, top 2 ft. below surface.

Information from Messrs. LeGrand, Sutcliff and Gell, Ltd.

2680 2729

TQ22NE 15

County Sussex.

Yield 360 G.P.H.

1919

COMPLETED.

STRATA	Thickness Feet	Thickness Inches	Depth Feet	Depth Inches
Dug Well	30	0	30	0
Tunbridge Wells Sand — Sandstone	28	0	58	0
Total Depth.	58	0	58	0

R.L.W. 29 ft down. Yield 360 g.p.h.

~~GSD/AMP. 3/555~~

Published in 'Wells & Springs of Sussex,' page 187 well 420

& Information from Messrs LeGrand, Sutcliff & Gell Ltd.

Dowsed

Visited S Buchan 20.3.40.

Listed. 17.7.47

Use other side if necessary. Foreman's Signature Date 6/3/20

1 302/37 **Stanbridge Farm, Slaugham.** (Disused) TQ 22|3

W.S.Sx.III, p. 187. Surface +210. Shaft 30; rest bore. Lining tubes: 30 × 4 in from 2 down. R.W.L. +181. Yield 360 g.p.h. *LeGrand, May 1919.*

UTW ... ... 58 , 58

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS	DEPTH
	DUG WELL	30'	30'
T.W.S. =	SANDSTONE	28'	58'

ORDER NO. 19047 TQ 2680 2729 TQ 22/3

BOREHOLE SECTION SHEET. FORM NO. 1.

LE GRAND, SUTCLIFF & GELL LTD.

JOB NAME SLAUGHAM 37

Slaugham—Maps O.S.G. 9, N.S. 302.

420. STANBRIDGE FARM, 1 mile S.E. of church. 1919. Ht. above O.D. 210 ft. Map 25 N.E.

		Thickness Ft.	Depth Ft.
	Dug well	30	30
Tunbridge Wells Sand	Sandstone	28	58

R.L.W. 29 ft. down. Yield 360 g. p. hour. Lined 30 ft. of 4 in. tubes, top 2 ft. below surface.

Information from Messrs. LeGrand, Sutcliff and Gell, Ltd.

County Sussex.

Yield 360 G.P.H.

May 1919 Sussex 25NE/E

surface.

THIS FORM TO BE RETURNED TO HEAD OFFICE IMMEDIATELY JOB IS COMPLETED.

STRATA		Thickness Feet	Thickness Inches	Depth Feet	Depth Inches
Dug Well	....	30	0	30	0
Tunbridge Wells Sand — Sandstone	....	28	0	58	0
Total Depth.		58	0	58	0

R.L.W. 29 ft down. Yield 360 g p hour

~~GSD/AMP. 5/553~~

Information from Messrs ~~For~~ LeGrand, Sutcliff & Gell Ltd.

Published in 'Wells & Springs of Sussex,' (III) page 187 well 420

UTW 58 58

Dicound

visited S Buchan 20.2.40.

Listed. 18.7.47

DATA Bank

Use other side if necessary. *Foreman's Signature* *Date* 6/3/26

ADD. INFO.

WATER LEVELS. 302/37

IGS REF: 302/37

1976 R.W.L.

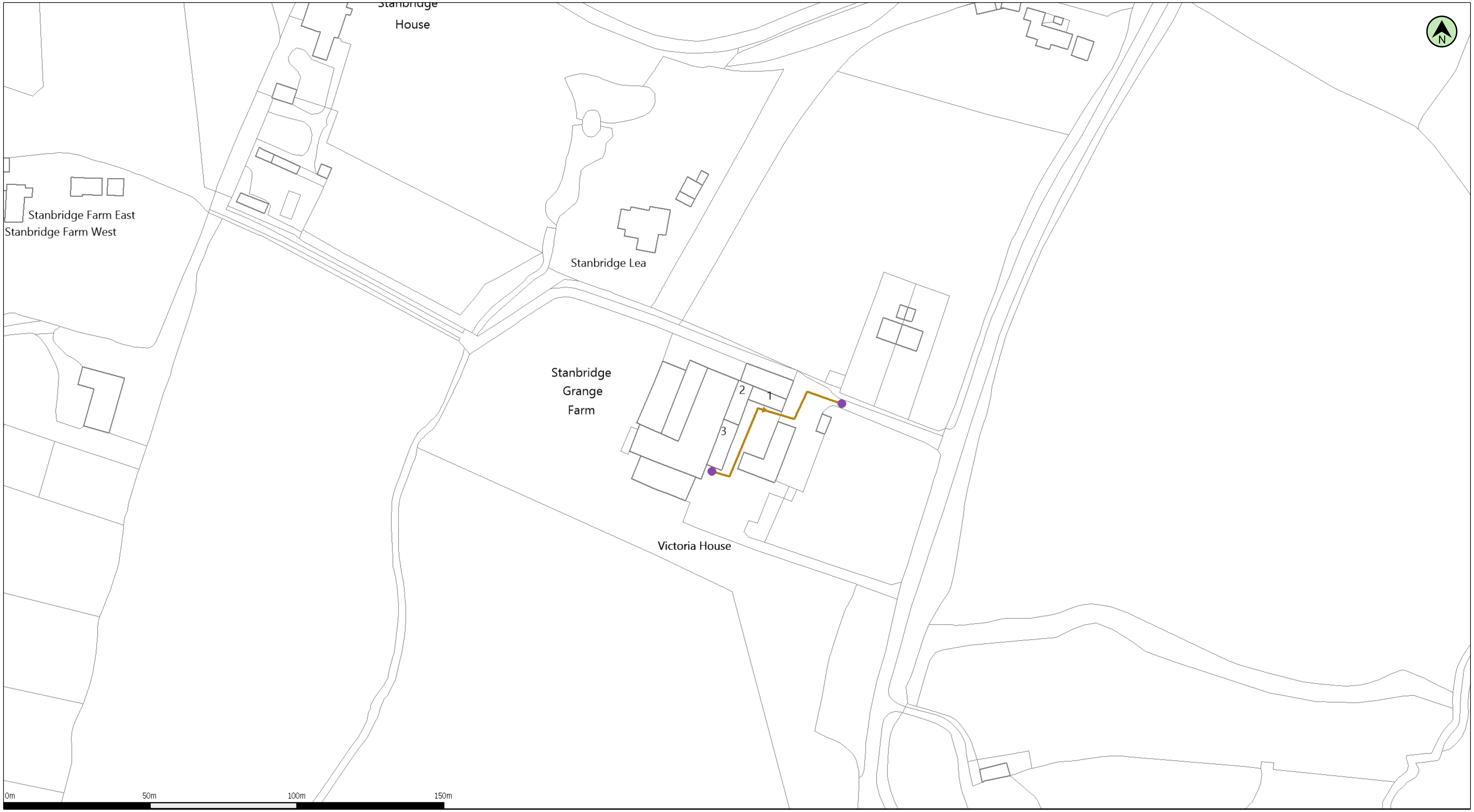
MAX : 59.96 M O.D.

MIN : DRY

} water levels abstracted from W.A. returns.

S.D. 2/79

Appendix e Southern Water Asset Plans

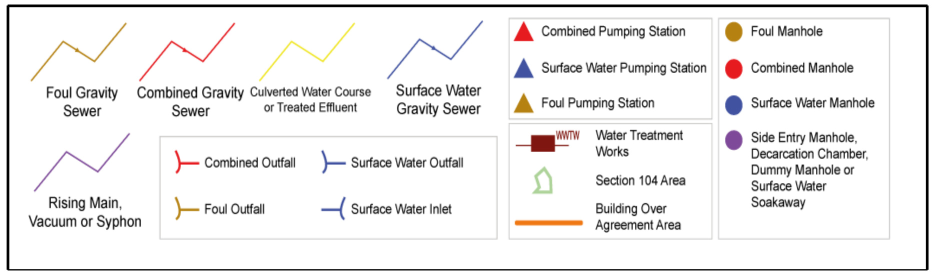


 Date: 13/10/23 Scale: 1:1250 Map Centre: 527028,127237 Data updated: 21/08/23 Our Ref: 1296550 - 1 Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2023 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



mark@flo-consult.co.uk

Staplefield Lane

WATER for LIFE from Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix F Greenfield Run-Off Calculations

IH 124 Mean Annual Flood

Input

Return Period (years)	2	SAAR (mm)	800	Urban	0.750
Area (ha)	50.000	Soil	0.450	Region Number	Region 7

Results	**l/s**
QBAR Rural	256.8
QBAR Urban	657.5
Q2 years	667.5
Q1 year	558.8
Q2 years	667.5
Q5 years	884.9
Q10 years	998.8
Q20 years	1096.7
Q25 years	1121.9
Q30 years	1141.9
Q50 years	1206.6
Q100 years	1333.3
Q200 years	1445.6
Q250 years	1479.6
Q1000 years	1718.9

Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	0.068
SAAR (mm)	834
CWI	118.988
SPR Host	47.000
URBEXT (USER)	0.5000

Results

Percentage Runoff (%)	56.17
Greenfield Runoff Volume (m^3)	25.626

Appendix G Pre-Development SW Run-Off Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840

Synthetic Rainfall Details

Storm Duration (mins) 30

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

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000
Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coeffiecient 0.800
Flow per Person per Day (l/per/day) 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	FEH
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 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	2	+0%	30/15 Summer				10.065
1.001	2	15 Winter	2	+0%	30/15 Summer				10.033

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	-0.085	0.000	0.39			5.4	OK	
1.001	2	-0.067	0.000	0.58			8.2	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	FEH
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 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				10.179
1.001	2	15 Winter	30	+0%	30/15 Summer				10.141

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	0.029	0.000	0.87			12.1	SURCHARGED	
1.001	2	0.041	0.000	1.37			19.2	SURCHARGED	

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	FEH
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 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				10.259
1.001	2	15 Winter	100	+0%	30/15 Summer				10.199

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	0.109	0.000	1.10			15.4	SURCHARGED	
1.001	2	0.099	0.000	1.73			24.2	SURCHARGED	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Summary Wizard of 360 minute 100 year Winter I+0% 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	FEH
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

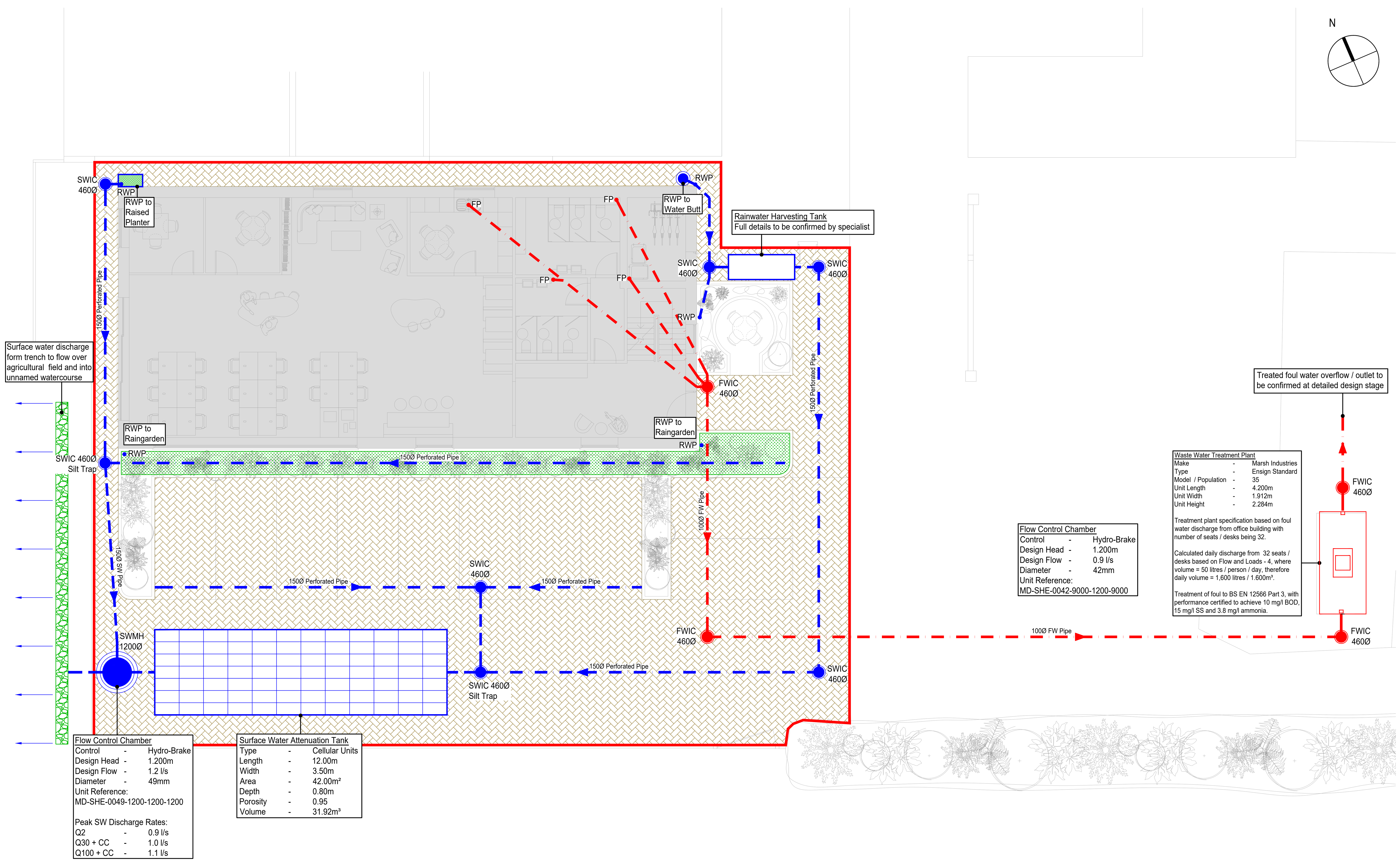
Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	360 minute 100 year Winter I+0%	11.000	10.040	-0.110	0.000	0.16
1.001	2	360 minute 100 year Winter I+0%	11.000	10.001	-0.099	0.000	0.25

PN	US/MH Name	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	1		19.162	2.2	OK
1.001	2		30.442	3.5	OK

Appendix H Surface Water Management Layout and Details



Flow Control Chamber

Control	-	Hydro-Brake
Design Head	-	1.200m
Design Flow	-	0.9 l/s
Diameter	-	42mm
Unit Reference:		MD-SHE-0042-9000-1200-9000

Waste Water Treatment Plant

Make	-	Marsh Industries
Type	-	Ensign Standard
Model / Population	-	35
Unit Length	-	4.200m
Unit Width	-	1.912m
Unit Height	-	2.284m

Treatment plant specification based on foul water discharge from office building with number of seats / desks being 32.

Calculated daily discharge from 32 seats / desks based on Flow and Loads - 4, where volume = 50 litres / person / day, therefore daily volume = 1,600 litres / 1.600m³.

Treatment of foul to BS EN 12566 Part 3, with performance certified to achieve 10 mg/l BOD, 15 mg/l SS and 3.8 mg/l ammonia.

Flow Control Chamber

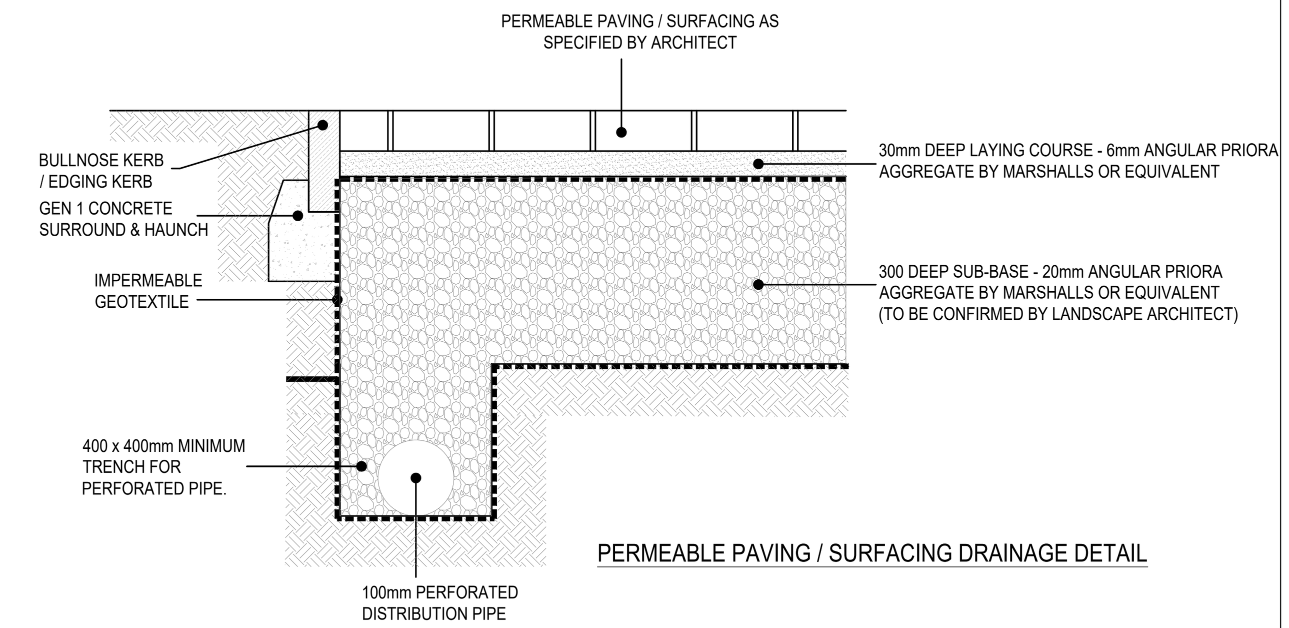
Control	-	Hydro-Brake
Design Head	-	1.200m
Design Flow	-	1.2 l/s
Diameter	-	49mm
Unit Reference:		MD-SHE-0049-1200-1200-1200

Peak SW Discharge Rates:

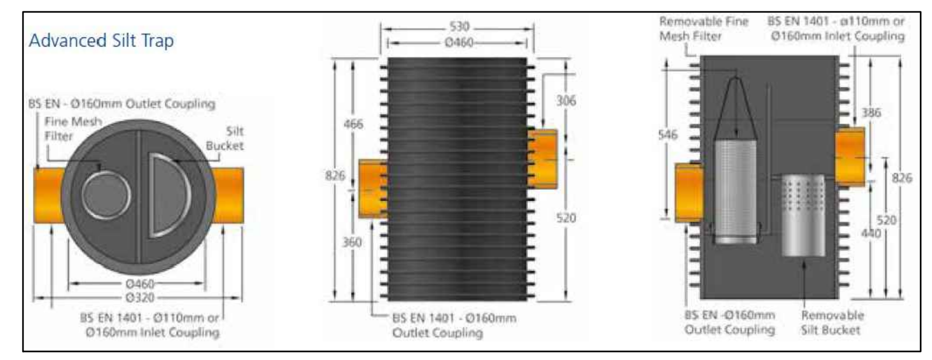
Q2	-	0.9 l/s
Q30 + CC	-	1.0 l/s
Q100 + CC	-	1.1 l/s

Surface Water Attenuation Tank

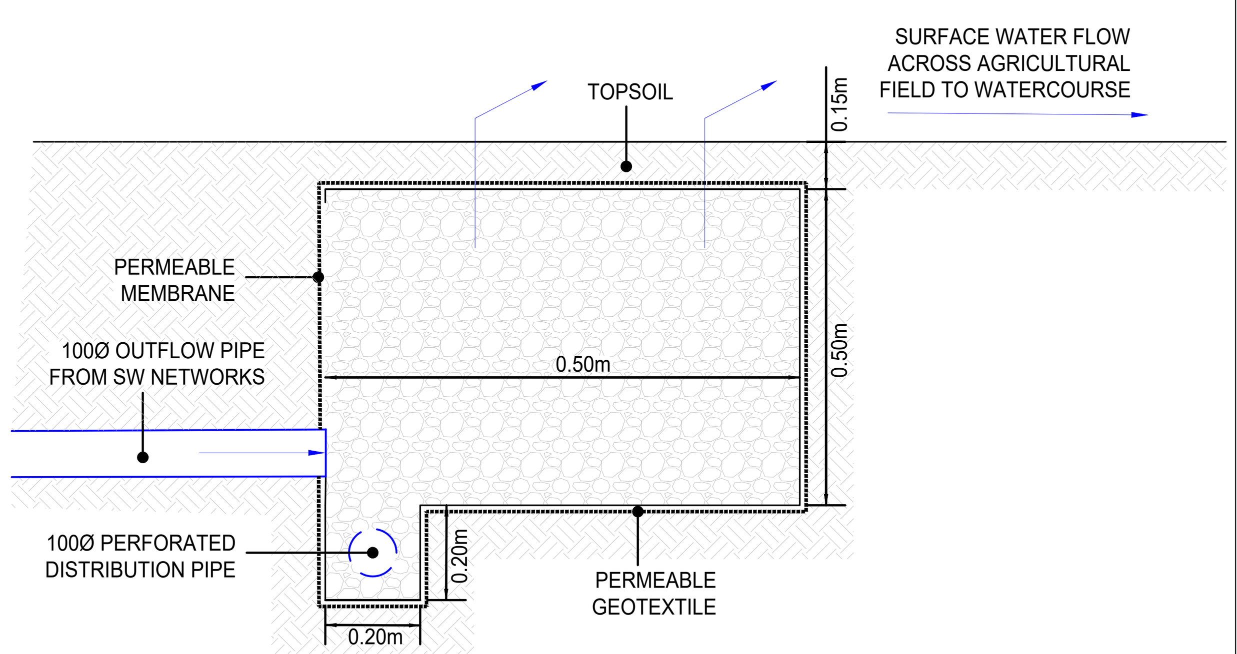
Type	-	Cellular Units
Length	-	12.00m
Width	-	3.50m
Area	-	42.00m²
Depth	-	0.80m
Porosity	-	0.95
Volume	-	31.92m³



PERMEABLE PAVING / SURFACING DRAINAGE DETAIL

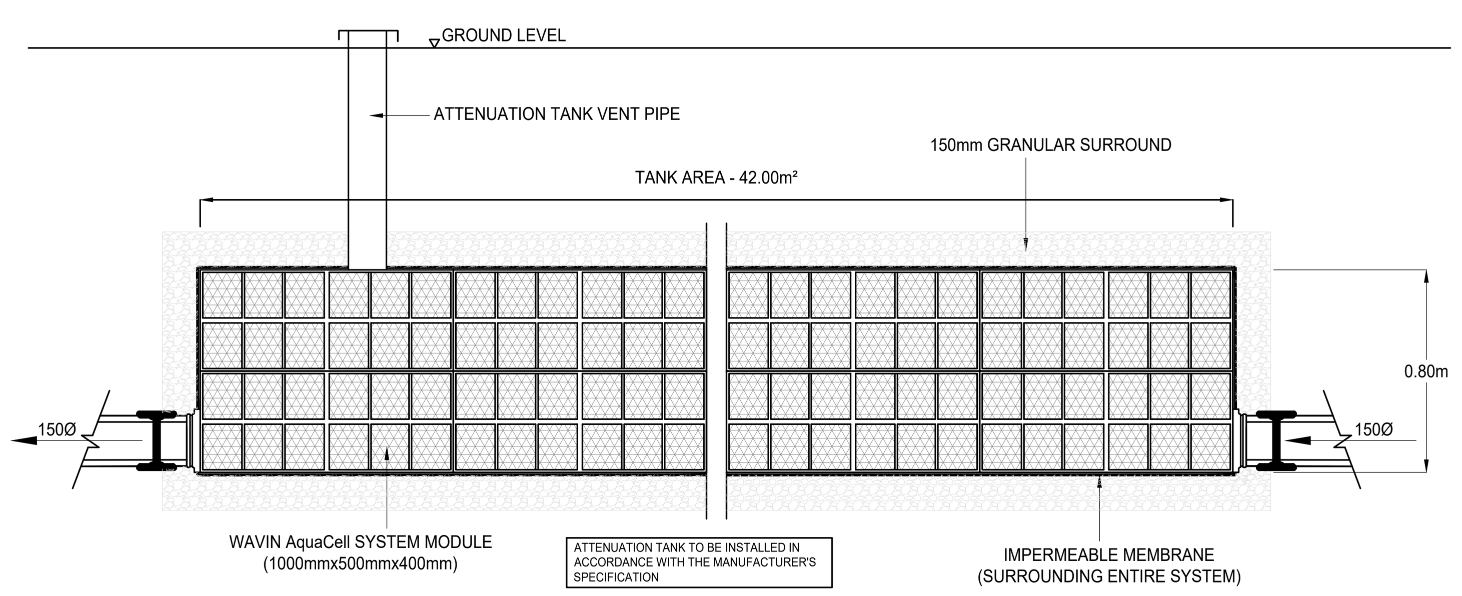


SILT TRAP DETAIL

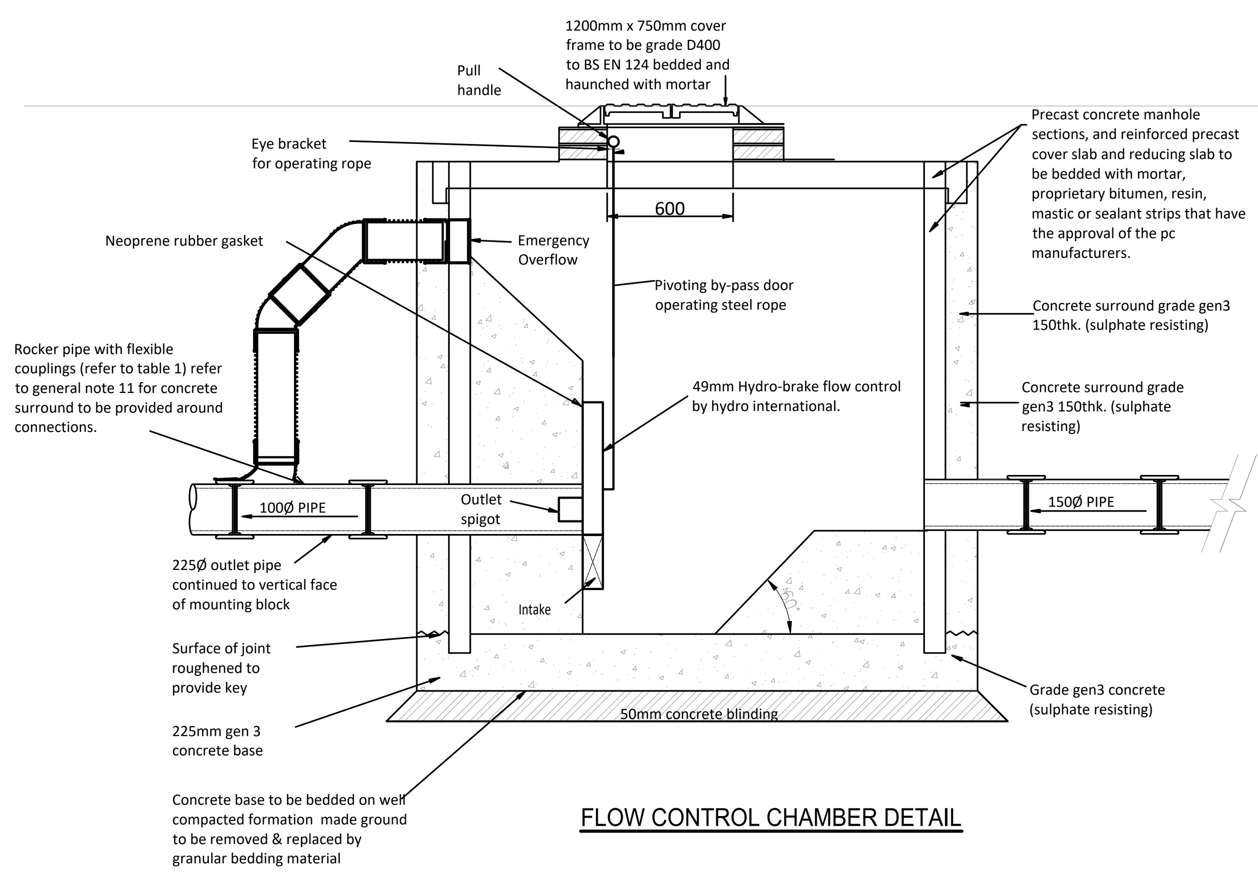


Drainage Key:

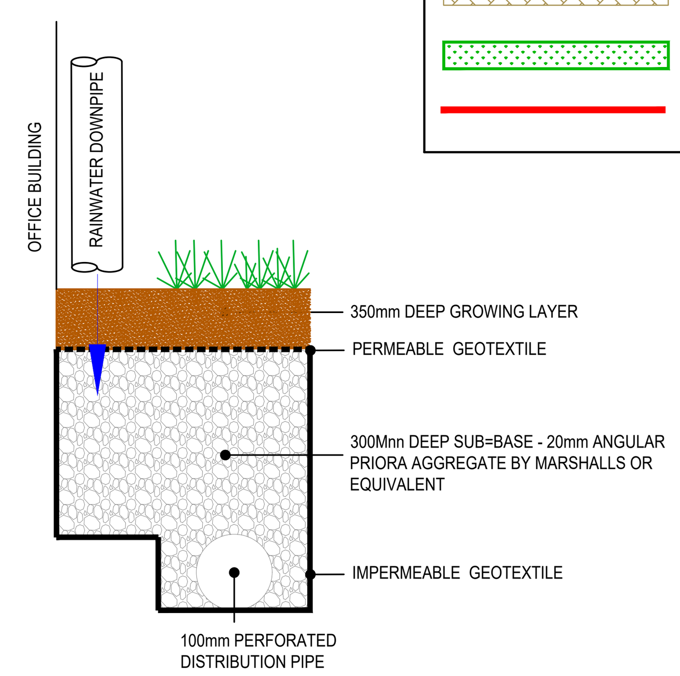
- Surface Water Pipes - Solid
- Proposed perforated Pipe
- Foul Water Pipes
- Permeable Paving
- Raingardens
- SW Management Boundary



ATTENUATION TANK DETAIL



FLOW CONTROL CHAMBER DETAIL



RAINGRADEN DETAIL

Rev	Description	Drn	Chk	Date
P1	Issued for Approval	MDS	NC	20.10.23

Client
MOYLE AND MOYLE INVESTMENTS LTD

Project
NEW OFFICE BUILDING
STANBRIDGE INDUSTRIAL ESTATE
STAPLEFIELD LANE, STAPLEFIELD

Drawing
OUTLINE DRAINAGE LAYOUT AND SuDS DETAILS

Scale	Date	Drawn by	Checked
1:100@A1	20.10.23	MDS	NC

Status
APPROVAL

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Chiltern View Studio
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Job No.	Drg. No.	Rev
983	DR-100	P1

Appendix I Surface Water Management Calculations

Summary of Results for 2 year Return Period

Half Drain Time : 73 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	8.592	0.092	0.0	0.8	0.8	3.7	O K
30 min Summer	8.618	0.118	0.0	0.9	0.9	4.7	O K
60 min Summer	8.637	0.137	0.0	0.9	0.9	5.5	O K
120 min Summer	8.663	0.163	0.0	0.9	0.9	6.5	O K
180 min Summer	8.671	0.171	0.0	0.9	0.9	6.8	O K
240 min Summer	8.671	0.171	0.0	0.9	0.9	6.8	O K
360 min Summer	8.664	0.164	0.0	0.9	0.9	6.5	O K
480 min Summer	8.652	0.152	0.0	0.9	0.9	6.1	O K
600 min Summer	8.639	0.139	0.0	0.9	0.9	5.6	O K
720 min Summer	8.628	0.128	0.0	0.9	0.9	5.1	O K
960 min Summer	8.608	0.108	0.0	0.9	0.9	4.3	O K
1440 min Summer	8.581	0.081	0.0	0.8	0.8	3.2	O K
2160 min Summer	8.562	0.062	0.0	0.7	0.7	2.5	O K
2880 min Summer	8.553	0.053	0.0	0.6	0.6	2.1	O K
4320 min Summer	8.543	0.043	0.0	0.5	0.5	1.7	O K
5760 min Summer	8.538	0.038	0.0	0.4	0.4	1.5	O K
7200 min Summer	8.535	0.035	0.0	0.4	0.4	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	35.854	0.0	4.3	26
30 min Summer	23.514	0.0	5.7	37
60 min Summer	14.879	0.0	7.4	58
120 min Summer	10.066	0.0	10.0	94
180 min Summer	7.830	0.0	11.7	128
240 min Summer	6.501	0.0	13.0	164
360 min Summer	4.955	0.0	14.9	230
480 min Summer	4.059	0.0	16.3	296
600 min Summer	3.468	0.0	17.4	360
720 min Summer	3.045	0.0	18.4	422
960 min Summer	2.478	0.0	19.9	542
1440 min Summer	1.853	0.0	22.3	774
2160 min Summer	1.393	0.0	25.2	1128
2880 min Summer	1.146	0.0	27.6	1480
4320 min Summer	0.883	0.0	31.8	2208
5760 min Summer	0.743	0.0	35.7	2936
7200 min Summer	0.655	0.0	39.3	3672

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	8.533	0.033	0.0	0.3	0.3	1.3	O K
10080 min Summer	8.532	0.032	0.0	0.3	0.3	1.3	O K
15 min Winter	8.605	0.105	0.0	0.9	0.9	4.2	O K
30 min Winter	8.634	0.134	0.0	0.9	0.9	5.3	O K
60 min Winter	8.656	0.156	0.0	0.9	0.9	6.2	O K
120 min Winter	8.684	0.184	0.0	0.9	0.9	7.3	O K
180 min Winter	8.690	0.190	0.0	0.9	0.9	7.6	O K
240 min Winter	8.687	0.187	0.0	0.9	0.9	7.5	O K
360 min Winter	8.671	0.171	0.0	0.9	0.9	6.8	O K
480 min Winter	8.651	0.151	0.0	0.9	0.9	6.0	O K
600 min Winter	8.632	0.132	0.0	0.9	0.9	5.3	O K
720 min Winter	8.615	0.115	0.0	0.9	0.9	4.6	O K
960 min Winter	8.589	0.089	0.0	0.8	0.8	3.5	O K
1440 min Winter	8.564	0.064	0.0	0.7	0.7	2.5	O K
2160 min Winter	8.549	0.049	0.0	0.5	0.5	1.9	O K
2880 min Winter	8.541	0.041	0.0	0.5	0.5	1.6	O K
4320 min Winter	8.535	0.035	0.0	0.4	0.4	1.4	O K
5760 min Winter	8.531	0.031	0.0	0.3	0.3	1.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.595	0.0	42.8	4376
10080 min Summer	0.551	0.0	46.1	5120
15 min Winter	35.854	0.0	4.9	26
30 min Winter	23.514	0.0	6.5	37
60 min Winter	14.879	0.0	8.3	60
120 min Winter	10.066	0.0	11.3	100
180 min Winter	7.830	0.0	13.2	140
240 min Winter	6.501	0.0	14.6	176
360 min Winter	4.955	0.0	16.7	248
480 min Winter	4.059	0.0	18.3	316
600 min Winter	3.468	0.0	19.5	380
720 min Winter	3.045	0.0	20.6	440
960 min Winter	2.478	0.0	22.3	556
1440 min Winter	1.853	0.0	25.0	780
2160 min Winter	1.393	0.0	28.3	1128
2880 min Winter	1.146	0.0	31.0	1484
4320 min Winter	0.883	0.0	35.7	2232
5760 min Winter	0.743	0.0	40.0	2928

Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Winter	8.529	0.029	0.0	0.3	0.3	1.1	O K
8640 min Winter	8.527	0.027	0.0	0.2	0.2	1.1	O K
10080 min Winter	8.526	0.026	0.0	0.2	0.2	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.655	0.0	44.1	3624
8640 min Winter	0.595	0.0	48.0	4360
10080 min Winter	0.551	0.0	51.8	5152

Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.068

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.017	4	8	0.017	8	12	0.017	12	16	0.017

Model Details

Storage is Online Cover Level (m) 10.000

Complex Structure

Cellular Storage

Invert Level (m) 8.500 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	42.0	0.0	2.600	0.0	0.0
0.200	42.0	0.0	2.800	0.0	0.0
0.400	42.0	0.0	3.000	0.0	0.0
0.600	42.0	0.0	3.200	0.0	0.0
0.800	42.0	0.0	3.400	0.0	0.0
1.000	0.0	0.0	3.600	0.0	0.0
1.200	0.0	0.0	3.800	0.0	0.0
1.400	0.0	0.0	4.000	0.0	0.0
1.600	0.0	0.0	4.200	0.0	0.0
1.800	0.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	11.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.500	Cap Volume Depth (m)	0.300

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0049-1200-1200-1200
Design Head (m)	1.200
Design Flow (l/s)	1.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes

Hydro-Brake® Optimum Outflow Control

Diameter (mm)	49
Invert Level (m)	8.500
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.2	Kick-Flo®	0.438	0.8
Flush-Flo™	0.215	0.9	Mean Flow over Head Range	-	0.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	1.200	1.2	3.000	1.8	7.000	2.7
0.200	0.9	1.400	1.3	3.500	2.0	7.500	2.8
0.300	0.9	1.600	1.4	4.000	2.1	8.000	2.9
0.400	0.8	1.800	1.4	4.500	2.2	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.3	9.000	3.0
0.600	0.9	2.200	1.6	5.500	2.4	9.500	3.1
0.800	1.0	2.400	1.6	6.000	2.5		
1.000	1.1	2.600	1.7	6.500	2.6		

Summary of Results for 30 year Return Period (+40%)

Half Drain Time : 266 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	8.826	0.326	0.0	0.9	0.9	13.0	O K
30 min Summer	8.934	0.434	0.0	0.9	0.9	17.3	O K
60 min Summer	9.038	0.538	0.0	0.9	0.9	21.5	O K
120 min Summer	9.100	0.600	0.0	0.9	0.9	23.9	O K
180 min Summer	9.117	0.617	0.0	0.9	0.9	24.6	O K
240 min Summer	9.116	0.616	0.0	0.9	0.9	24.6	O K
360 min Summer	9.101	0.601	0.0	0.9	0.9	24.0	O K
480 min Summer	9.082	0.582	0.0	0.9	0.9	23.2	O K
600 min Summer	9.063	0.563	0.0	0.9	0.9	22.5	O K
720 min Summer	9.043	0.543	0.0	0.9	0.9	21.7	O K
960 min Summer	9.005	0.505	0.0	0.9	0.9	20.1	O K
1440 min Summer	8.922	0.422	0.0	0.9	0.9	16.9	O K
2160 min Summer	8.814	0.314	0.0	0.9	0.9	12.5	O K
2880 min Summer	8.737	0.237	0.0	0.9	0.9	9.4	O K
4320 min Summer	8.642	0.142	0.0	0.9	0.9	5.7	O K
5760 min Summer	8.595	0.095	0.0	0.8	0.8	3.8	O K
7200 min Summer	8.573	0.073	0.0	0.8	0.8	2.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	112.499	0.0	14.1	29
30 min Summer	74.919	0.0	18.8	43
60 min Summer	47.823	0.0	24.2	70
120 min Summer	28.783	0.0	29.1	126
180 min Summer	21.311	0.0	32.4	182
240 min Summer	17.179	0.0	34.8	226
360 min Summer	12.618	0.0	38.4	286
480 min Summer	10.122	0.0	41.0	352
600 min Summer	8.534	0.0	43.2	422
720 min Summer	7.426	0.0	45.2	492
960 min Summer	5.978	0.0	48.5	630
1440 min Summer	4.420	0.0	53.7	902
2160 min Summer	3.307	0.0	60.3	1264
2880 min Summer	2.705	0.0	65.8	1616
4320 min Summer	2.045	0.0	74.5	2296
5760 min Summer	1.681	0.0	81.6	2992
7200 min Summer	1.441	0.0	87.4	3672

Summary of Results for 30 year Return Period (+40%)

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
8640 min Summer	8.564	0.064	0.0	0.7	0.7	2.5	O K
10080 min Summer	8.557	0.057	0.0	0.6	0.6	2.3	O K
15 min Winter	8.869	0.369	0.0	0.9	0.9	14.7	O K
30 min Winter	8.991	0.491	0.0	0.9	0.9	19.6	O K
60 min Winter	9.109	0.609	0.0	0.9	0.9	24.3	O K
120 min Winter	9.184	0.684	0.0	0.9	0.9	27.3	O K
180 min Winter	9.210	0.710	0.0	0.9	0.9	28.3	O K
240 min Winter	9.213	0.713	0.0	1.0	1.0	28.5	O K
360 min Winter	9.193	0.693	0.0	0.9	0.9	27.6	O K
480 min Winter	9.168	0.668	0.0	0.9	0.9	26.7	O K
600 min Winter	9.140	0.640	0.0	0.9	0.9	25.5	O K
720 min Winter	9.111	0.611	0.0	0.9	0.9	24.4	O K
960 min Winter	9.052	0.552	0.0	0.9	0.9	22.0	O K
1440 min Winter	8.924	0.424	0.0	0.9	0.9	16.9	O K
2160 min Winter	8.756	0.256	0.0	0.9	0.9	10.2	O K
2880 min Winter	8.659	0.159	0.0	0.9	0.9	6.3	O K
4320 min Winter	8.578	0.078	0.0	0.8	0.8	3.1	O K
5760 min Winter	8.561	0.061	0.0	0.7	0.7	2.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.272	0.0	92.5	4408
10080 min Summer	1.147	0.0	97.2	5136
15 min Winter	112.499	0.0	15.8	29
30 min Winter	74.919	0.0	21.1	43
60 min Winter	47.823	0.0	27.1	70
120 min Winter	28.783	0.0	32.6	124
180 min Winter	21.311	0.0	36.3	180
240 min Winter	17.179	0.0	39.0	234
360 min Winter	12.618	0.0	43.0	300
480 min Winter	10.122	0.0	46.0	374
600 min Winter	8.534	0.0	48.5	452
720 min Winter	7.426	0.0	50.6	530
960 min Winter	5.978	0.0	54.3	684
1440 min Winter	4.420	0.0	60.2	976
2160 min Winter	3.307	0.0	67.6	1316
2880 min Winter	2.705	0.0	73.7	1644
4320 min Winter	2.045	0.0	83.5	2256
5760 min Winter	1.681	0.0	91.5	2944

Summary of Results for 30 year Return Period (+40%)

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
7200 min Winter	8.551	0.051	0.0	0.6	0.6	2.1	O K
8640 min Winter	8.546	0.046	0.0	0.5	0.5	1.8	O K
10080 min Winter	8.542	0.042	0.0	0.5	0.5	1.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.441	0.0	98.0	3680
8640 min Winter	1.272	0.0	103.7	4392
10080 min Winter	1.147	0.0	109.0	5032

Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.068

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	4	0.017	4	8	0.017	8	12	0.017	12	16	0.017

Model Details

Storage is Online Cover Level (m) 10.000

Complex Structure

Cellular Storage

Invert Level (m) 8.500 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	42.0	0.0	2.600	0.0	0.0
0.200	42.0	0.0	2.800	0.0	0.0
0.400	42.0	0.0	3.000	0.0	0.0
0.600	42.0	0.0	3.200	0.0	0.0
0.800	42.0	0.0	3.400	0.0	0.0
1.000	0.0	0.0	3.600	0.0	0.0
1.200	0.0	0.0	3.800	0.0	0.0
1.400	0.0	0.0	4.000	0.0	0.0
1.600	0.0	0.0	4.200	0.0	0.0
1.800	0.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	11.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.500	Cap Volume Depth (m)	0.300

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0049-1200-1200-1200
Design Head (m)	1.200
Design Flow (l/s)	1.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes

Hydro-Brake® Optimum Outflow Control

Diameter (mm)	49
Invert Level (m)	8.500
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.2	Kick-Flo®	0.438	0.8
Flush-Flo™	0.215	0.9	Mean Flow over Head Range	-	0.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	1.200	1.2	3.000	1.8	7.000	2.7
0.200	0.9	1.400	1.3	3.500	2.0	7.500	2.8
0.300	0.9	1.600	1.4	4.000	2.1	8.000	2.9
0.400	0.8	1.800	1.4	4.500	2.2	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.3	9.000	3.0
0.600	0.9	2.200	1.6	5.500	2.4	9.500	3.1
0.800	1.0	2.400	1.6	6.000	2.5		
1.000	1.1	2.600	1.7	6.500	2.6		

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 320 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	8.939	0.439	0.0	0.9	0.9	17.5	O K
30 min Summer	9.089	0.589	0.0	0.9	0.9	23.5	O K
60 min Summer	9.235	0.735	0.0	1.0	1.0	29.3	O K
120 min Summer	9.310	0.810	0.0	1.0	1.0	32.3	O K
180 min Summer	9.342	0.842	0.0	1.0	1.0	33.3	O K
240 min Summer	9.346	0.846	0.0	1.0	1.0	33.4	O K
360 min Summer	9.322	0.822	0.0	1.0	1.0	32.7	O K
480 min Summer	9.302	0.802	0.0	1.0	1.0	32.0	O K
600 min Summer	9.285	0.785	0.0	1.0	1.0	31.3	O K
720 min Summer	9.268	0.768	0.0	1.0	1.0	30.6	O K
960 min Summer	9.237	0.737	0.0	1.0	1.0	29.4	O K
1440 min Summer	9.179	0.679	0.0	0.9	0.9	27.1	O K
2160 min Summer	9.100	0.600	0.0	0.9	0.9	24.0	O K
2880 min Summer	9.020	0.520	0.0	0.9	0.9	20.7	O K
4320 min Summer	8.823	0.323	0.0	0.9	0.9	12.9	O K
5760 min Summer	8.701	0.201	0.0	0.9	0.9	8.0	O K
7200 min Summer	8.633	0.133	0.0	0.9	0.9	5.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	147.926	0.0	18.6	29
30 min Summer	99.488	0.0	25.1	43
60 min Summer	63.900	0.0	32.4	72
120 min Summer	37.646	0.0	38.2	128
180 min Summer	27.612	0.0	42.0	184
240 min Summer	22.150	0.0	44.9	240
360 min Summer	16.214	0.0	49.4	300
480 min Summer	13.018	0.0	52.8	364
600 min Summer	10.999	0.0	55.8	432
720 min Summer	9.598	0.0	58.4	502
960 min Summer	7.773	0.0	63.1	642
1440 min Summer	5.818	0.0	70.8	920
2160 min Summer	4.396	0.0	80.3	1328
2880 min Summer	3.605	0.0	87.8	1736
4320 min Summer	2.710	0.0	98.9	2428
5760 min Summer	2.202	0.0	107.1	3104
7200 min Summer	1.864	0.0	113.3	3752

Summary of Results for 100 year Return Period (+45%)

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
8640 min Summer	8.595	0.095	0.0	0.8	0.8	3.8	O K
10080 min Summer	8.575	0.075	0.0	0.8	0.8	3.0	O K
15 min Winter	8.996	0.496	0.0	0.9	0.9	19.8	O K
30 min Winter	9.164	0.664	0.0	0.9	0.9	26.5	O K
60 min Winter	9.338	0.838	0.0	1.0	1.0	33.2	O K
120 min Winter	9.671	1.171	0.0	1.2	1.2	36.6	O K
180 min Winter	9.770	1.270	0.0	1.2	1.2	37.8	Flood Risk
240 min Winter	9.787	1.287	0.0	1.2	1.2	38.0	Flood Risk
360 min Winter	9.729	1.229	0.0	1.2	1.2	37.3	Flood Risk
480 min Winter	9.669	1.169	0.0	1.2	1.2	36.6	O K
600 min Winter	9.599	1.099	0.0	1.2	1.2	35.8	O K
720 min Winter	9.525	1.025	0.0	1.1	1.1	34.9	O K
960 min Winter	9.334	0.834	0.0	1.0	1.0	33.1	O K
1440 min Winter	9.234	0.734	0.0	1.0	1.0	29.3	O K
2160 min Winter	9.102	0.602	0.0	0.9	0.9	24.0	O K
2880 min Winter	8.961	0.461	0.0	0.9	0.9	18.4	O K
4320 min Winter	8.691	0.191	0.0	0.9	0.9	7.6	O K
5760 min Winter	8.598	0.098	0.0	0.8	0.8	3.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.624	0.0	118.3	4416
10080 min Summer	1.444	0.0	122.6	5144
15 min Winter	147.926	0.0	20.9	29
30 min Winter	99.488	0.0	28.1	43
60 min Winter	63.900	0.0	36.3	70
120 min Winter	37.646	0.0	42.8	124
180 min Winter	27.612	0.0	47.1	180
240 min Winter	22.150	0.0	50.4	234
360 min Winter	16.214	0.0	55.3	298
480 min Winter	13.018	0.0	59.2	374
600 min Winter	10.999	0.0	62.5	454
720 min Winter	9.598	0.0	65.5	532
960 min Winter	7.773	0.0	70.7	692
1440 min Winter	5.818	0.0	79.4	992
2160 min Winter	4.396	0.0	90.0	1428
2880 min Winter	3.605	0.0	98.4	1872
4320 min Winter	2.710	0.0	110.9	2432
5760 min Winter	2.202	0.0	120.1	3056

Summary of Results for 100 year Return Period (+45%)

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
7200 min Winter	8.569	0.069	0.0	0.7	0.7	2.8	O K
8640 min Winter	8.559	0.059	0.0	0.7	0.7	2.3	O K
10080 min Winter	8.552	0.052	0.0	0.6	0.6	2.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.864	0.0	127.0	3672
8640 min Winter	1.624	0.0	132.6	4376
10080 min Winter	1.444	0.0	137.5	5088

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 527000 127215 TQ 27000 27215
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.068

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.017	4	8	0.017	8	12	0.017	12	16	0.017

Model Details

Storage is Online Cover Level (m) 10.000

Complex Structure

Cellular Storage

Invert Level (m) 8.500 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	42.0	0.0	2.600	0.0	0.0
0.200	42.0	0.0	2.800	0.0	0.0
0.400	42.0	0.0	3.000	0.0	0.0
0.600	42.0	0.0	3.200	0.0	0.0
0.800	42.0	0.0	3.400	0.0	0.0
1.000	0.0	0.0	3.600	0.0	0.0
1.200	0.0	0.0	3.800	0.0	0.0
1.400	0.0	0.0	4.000	0.0	0.0
1.600	0.0	0.0	4.200	0.0	0.0
1.800	0.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	11.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	9.500	Cap Volume Depth (m)	0.300

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0049-1200-1200-1200
Design Head (m)	1.200
Design Flow (l/s)	1.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes

Hydro-Brake® Optimum Outflow Control

Diameter (mm)	49
Invert Level (m)	8.500
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.2	Kick-Flo®	0.438	0.8
Flush-Flo™	0.215	0.9	Mean Flow over Head Range	-	0.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	1.200	1.2	3.000	1.8	7.000	2.7
0.200	0.9	1.400	1.3	3.500	2.0	7.500	2.8
0.300	0.9	1.600	1.4	4.000	2.1	8.000	2.9
0.400	0.8	1.800	1.4	4.500	2.2	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.3	9.000	3.0
0.600	0.9	2.200	1.6	5.500	2.4	9.500	3.1
0.800	1.0	2.400	1.6	6.000	2.5		
1.000	1.1	2.600	1.7	6.500	2.6		