



Powell Tolner & Associates Ltd

FLOOD RISK ASSESSMENT

Project: New Lane, Havant

PTA Project No: 9641

Document Ref: 9641-PTA-ZZ-XX-SP-C-9101

Status: For Planning

Revision: P3

Date: June 2019

Client: Kingsbridge Estates



Issued by

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Revision	Date	Description	Prepared	Reviewed
P1	14.06.2019	Issued for Comments	TA	AH
P2	20.06.2019	Issued for Planning	TA	AH
P3	25.06.2019	Drawings in Appendix Revised	TA	AH

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1 INTRODUCTION

Powell Tolner and Associates Limited (PTA) have been commissioned by Kingsbridge Estates to undertake a Flood Risk Assessment (FRA) in support of a planning application for a proposed development, comprised of 12 commercial units of 5516 m² Gross Internal Area with 134 associated parking spaces and access areas, located at 38 New Lane, Havant, PO9 2ND.

2 DEVELOPMENT DESCRIPTION

2.1 Location

The proposed development is located at 38 New Lane, Havant, PO9 2ND at a grid reference of SU 72640 07516 (Easting/Northing: 472640/107516). The site is approximately 1km North of Warblington railway station. To the West of the site is New Lane, beyond which is an unnamed watercourse which runs from North to South and to the West of this is residential houses. To the South of the site is Stanbridge Road which is proposed to provide access to the site. To the East of the site is Downley Road and to the North of the site there is a gas holder. The areas to the North, East and South of the site are primarily used for commercial and industrial purposes.

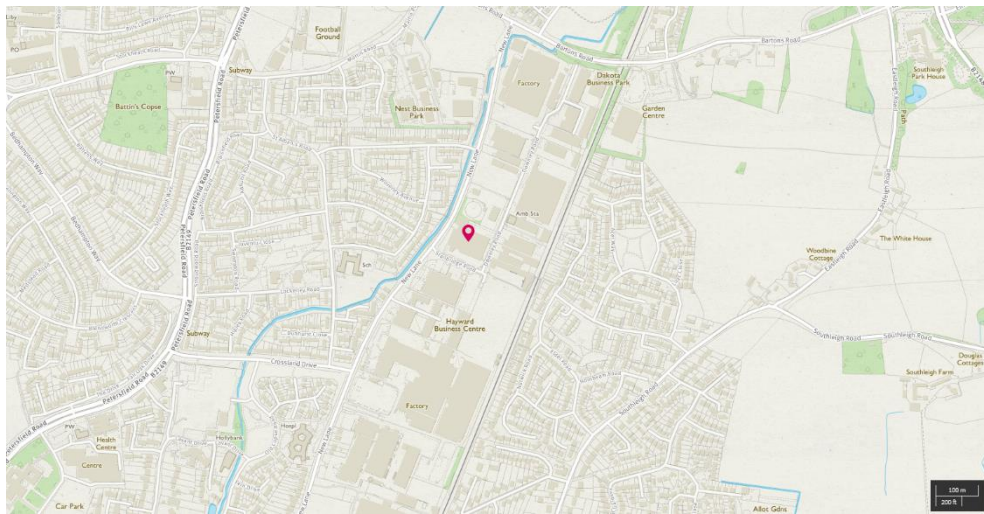


Figure 1: Site Location (Extract from OS Maps)



Figure 2: Site Location - Aerial Image (Extract from Google Maps)

2.2 Existing Site

The site is currently classified as a brownfield site and has a large central unit with associated parking and access routes. There is a total of 4 vehicle accesses, 1 onto New Lane to the West, 2 to the South onto Stanbridge Road and 1 to the East onto Downley Road. There are also soft landscaped areas within the existing site. The total site area is 10,234m² of which the building footprint amounts to 5,380m² with the external hardstanding area totalling 2,630m² to give a total existing impermeable area of 8,010m². The remaining 2,224m² is soft landscaped areas.

Roof	5,380m ²
Hardstanding	2,630m ²
Soft Landscaped	2,224m ²
Total	10,234m ²

Table 1: Existing Areas

2.3 Proposals

The site is proposed to be comprised of 12 commercial units, 6 on each side of a central hardstanding area. The central area provides access to all units via a private road which includes a turning area at the North end of the site. The hardstanding area also provides parking for the commercial units. The central road is proposed to have a flexible pavement of bituminous surface finish while the shared yard and parking area is proposed to be a reinforced concrete construction. The footway around the sides and rear of the building is proposed to be a reinforced grass paver surfacing.

The building footprint amounts to 4,380m² and the hardstanding areas have an area of 4,950m², for a total impermeable area of 9,330m². With the remaining site area made up of soft landscaped areas. The proposed site plan is shown in Appendix A and the proposed landscaping site plan shown in Appendix B.

Roof	4,380m ²
Hardstanding	4,950m ²
Soft Landscaped	904m ²
Total	10,234m ²

Table 2: Proposed Areas

2.4 Flood Vulnerability Classification

From Figure 3 it is shown that the site is located within flood zone 1, this is defined as having an annual probability of flooding from the river or sea of less than 0.1%.

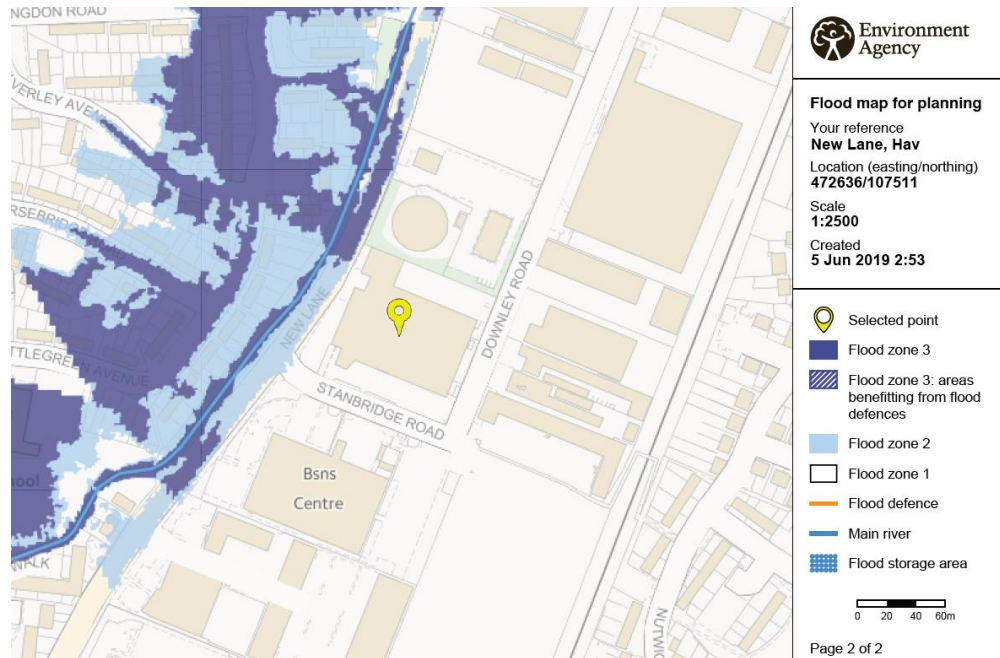


Figure 3: EA Flood Map

2.5 Flood Zone Compatibility

By consulting the National Planning Policy Framework's (NPPF) flood vulnerability classification guidance the existing site is classified as 'less vulnerable' to the effects of flooding. This is due to the commercial usage of the existing buildings.

The development's proposed use is for commercial purposes and so the proposed site is also classified as 'less vulnerable'. Also, as the site is located within flood zone 1 and classified as 'less vulnerable' the sequential and exception test are not required.

2.6 Existing Surface Water Runoff

The existing site is approximately 80% impermeable area with the remaining 20% being soft landscaped areas. For the development's existing impermeable areas, the pre-development peak run-off rates has been calculated as 64.1, 157.0 and 202.6 l/s for the 1, 30 and 100 year return period storms respectively. These values have been calculated using the modified rational method. For all the existing surface water runoff calculations, refer to Appendix C.

The existing drainage is assumed to drain positively without attenuation into the Southern Water public sewer via three outfalls, one 375mmØ that connects into the sewer than runs under Downley Road and a 450mmØ that connects to the sewer under Stanbridge Road. The third is via drainage that exits the site to the West under New Lane, this is assumed to discharge

directly into the unnamed water course which runs parallel to New Lane; which the Southern Sewers also discharge into via a headwall.

The existing Southern Water public sewers adjacent to the site are shown in Appendix D and the drainage within the site is shown by a utility mapping drawing in Appendix E.

3 FLOOD RISK

In accordance with the NPPF and its Technical Guidance document the risk of flooding from varying sources need to be considered.

3.1 Rivers

To the West of the site there is an unnamed stream which runs parallel to New Lane from North to South and discharges into Langstone Harbour. It is located approximately 20m from the Western site boundary. Due to the topography of the area West of the river being lower than the East side – where the site is located – this small unnamed river does not provide any flood risk to the site. This is shown in Figure 4 below.

3.2 Tidal

The site is not located within any tidal influence zones and is not at risk from flooding from tidal sources as shown in Figure 4.

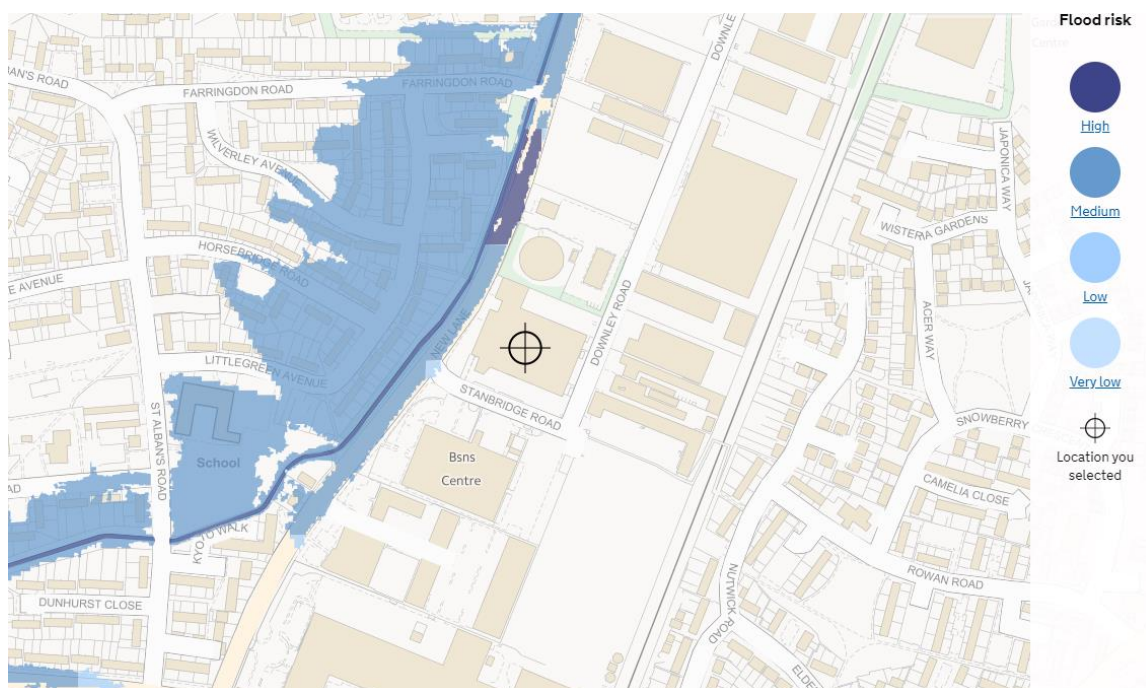


Figure 4: EA Flood Map - Extent of Flooding from Rivers or Seas

3.3 Ground Water

Borehole tests within the site show that the ground water is within the range of 3.26m to 4.37m below the ground level at around 12.5m AOD; which is significantly lower than the proposed site's surface levels and therefore the risk of flooding on site due to ground water is considered very low. Refer to Appendix F for an extract of the recent Site Investigation report for details of the groundwater levels within the development.

3.4 Overland Flows

Figure 5 below shows that the site is not at risk from surface water flooding from off-site flow paths, this is due to the site being slightly raised up above the adjacent roads which make up the overland flow paths for the surface water. There is a small area of the existing site that lies within the low and medium flood risk zones for flooding from surface water. This is shown in Figure 5 as the area to the rear of the existing building. This area is contained within the site and the flood risk will be mitigated by the proposed drainage strategy by providing falls away from the proposed buildings and adequate drainage capacity in the new on-site drainage system.

In the case of an extreme rainfall event higher than the design storm – 100 years return period storm with a 40% allowance for climate change - water will pool at the western drainage channel and leave the site via the access route to Stanbridge Road. The exceedance land flow paths for the proposed site are shown in Appendix G, all surface water is directed away from the buildings to the drainage channels.

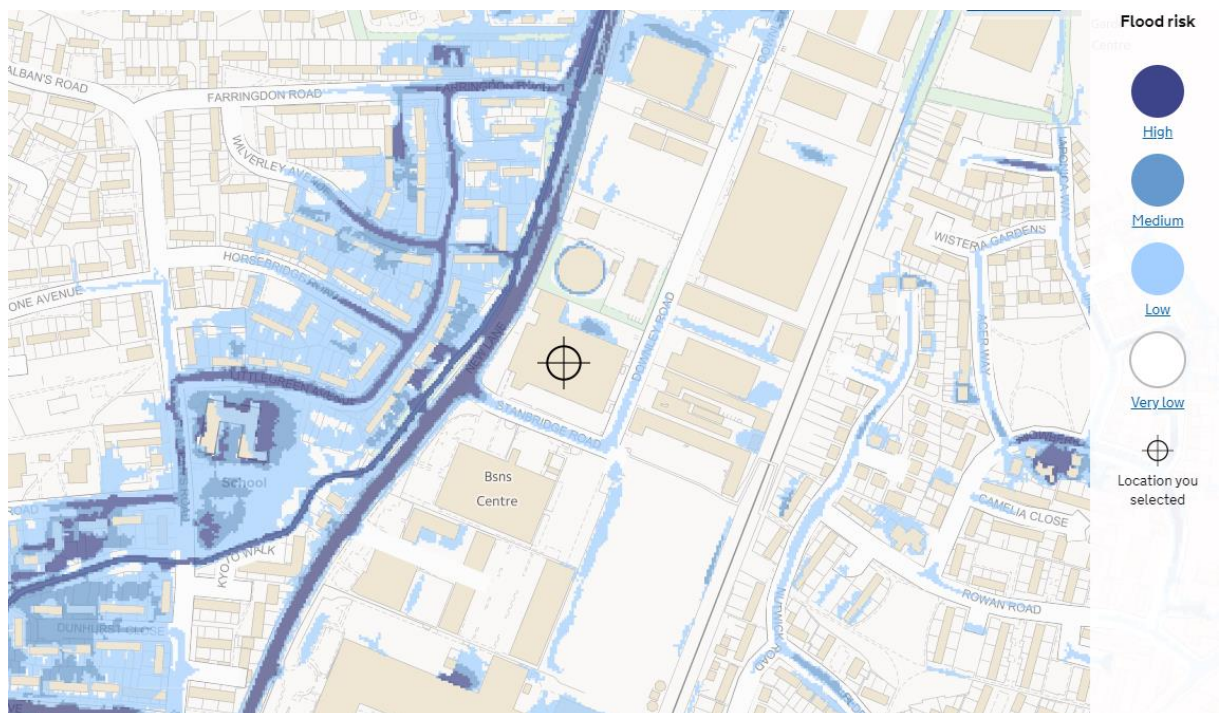


Figure 5: EA Flood Map - Extent of Flooding from Surface Water

3.5 Sewers

There are no public surface water or foul water sewers within the site. The only private sewers within the site are ones serving the existing development and so will not be in service for the proposed development. The surface water sewer that runs under Downley Road and Stanbridge Road is more susceptible to flood during extreme rainfall events. If this sewer is to surcharge to road levels, the flooding will behave as overland flows and will be kept away from

the proposed development. The risk of flooding due to sewers, both private and public, is deemed to be very low and any flooding that may occur would not affect the proposed development.

3.6 Other Sources

As shown in Figure 6, there is no risk of flooding from reservoirs. There are no other known sources of flooding within the vicinity of the site and the risk of flooding from other sources is considered very low.

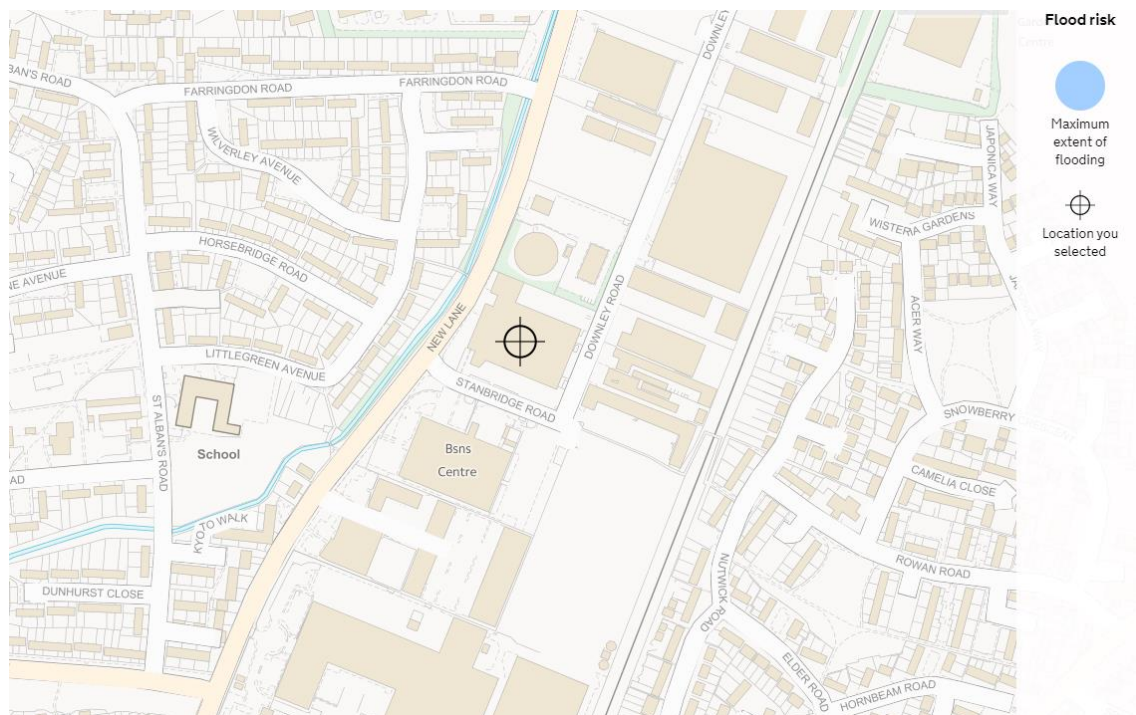


Figure 6: EA Flood Map - Extent of Flooding from Reservoirs

3.7 Climate Change

The EA, as the government's expert on flood risk, have updated the climate change allowances. Following the above, the peak rainfall intensity should be increased by 40% to account for the changes due to climate change over the course of the development's lifetime (100 years).

The projected effects of climate change are expected to lead to an increase in rainfall, river flows, raised sea level and tidal fluctuations. For this development, the only pertinent effects of climate change on this site will be the increase in rainfall and its effects on drainage systems, overland flows and sewers.

By designing the surface water drainage network to the design storm with the allowances for climate change recommended by the EA, the increase to flood risk will be mitigated as the

network is designed to account for these predicted changes, and thus the flood risk will remain low.

Because of the increases due to climate change, there will be a slight rise in the risk of flooding by overland flows and sewers, however, the risk will remain low for this development for the reasons discussed above.

3.8 Residual Risk

There are no other known residual flood risks to the development.

4 FLOOD RISK MANAGEMENT

4.1 Floor Levels

To mitigate the flood risk due to surface water, the proposed levels are designed to provide flood flow routes away from the proposed buildings. The proposed floor levels for the commercial units are proposed to be at 16.5m and 17.0m AOD for the Western and Eastern units respectively. For the proposed levels layout, refer to Appendix H.

4.2 Sustainable Drainage Techniques

The use of various sustainable drainage techniques has been investigated with respect to their potential to be used within the development to control storm water as close to the source as possible and reduce the potential increased flood risk from the development. They are reviewed in order of Most to Least Sustainable based upon the SuDS Hierarchy table from the Environment Agency.

<i>Most Sustainable</i>	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		
<i>Least Sustainable</i>				

Table 3: The SuDS Hierarchy

4.2.1 Living Roofs

Living/ Green roofs are not recommended for this development due to the following severe implications of adopting these systems on this a steel framed warehouse:

- **Structural:** Even an extensive green roof system with a 100mm thick growing media will impose considerable loading to a typical lightweight roof system, used on these units, thus substantially increasing the overall structural requirements.
- **Slope:** Green roofs are typically installed on flat roofs. The proposed lightweight roof system has a significant slope, and as such specific proprietary roofing systems will have to be implemented.
- **Maintenance:** Any regular or irregular maintenance to the proposed units' high roofs is likely to require mobilisation of elevated platforms and trained personnel.
- **Damage and Leaks:** Although these systems are waterproof, extreme weather factors or human error can result in a leak in the roof. In these restricted conditions, finding and repairing such a failure in a complex roof system will be a challenging process.

Although a green roof should always be considered, for this development, the complexity and disadvantaged of implementing a green roof system are far greater than the potential benefits it would provide.

4.2.2 Basins and Ponds

The proposed development layout consists of a high percentage of hardstanding areas which restrict the use of large control systems at ground level which would take up a lot of already allocated space.

4.2.3 Filter Strips and Swales

The proposed development does not allow for the implementation of filter strips or swales as these systems require a large free soft landscaped area, which is not available within the proposed site layout.

4.2.4 Infiltration Devices

The site is located in Source Protection Zone 1c (SPZ1c) for the Havant and Bedhampton springs. Due to the sensitivity of the ground water in this area, discharge into the ground via infiltration is not recommended within the SPZ. As such, the drainage strategy is not proposing to discharge via infiltration.

Recent soakage tests have also been carried out for the site, and they have been attached in Appendix I. The worst infiltration rate (the design infiltration rate) for this site was measured as 1.43E-07 m/sec, this rate is very low and even if the site was not located in a SPZ1c, discharging the surface water via infiltration would not be feasible.

4.2.5 Permeable Paving

As discussed in the above section, the use of infiltration devices are not proposed within the drainage strategy for this development. Further to this, the nature of the development is that HGVs will be entering and manoeuvring around the site. Permeable paving generally does not structurally perform well under heavy traffic loading, particularly the loads imposed by HGVs turning. Therefore, we are not proposing to include any permeable paving within the development.

4.2.6 Tanked Systems

Considering the proposed site layout, a below ground storage system to attenuate the flow will likely provide the most practical and cost-effective solution without substantial implications to the proposed site layout. The implementation of a tanked system with a flow control device will allow the surface water discharge rate to be lowered to its existing rate and therefore reducing the offsite flood risk of the development.

4.3 Proposed Surface Water Drainage Strategy

The proposed drainage strategy for this site will be to discharge the surface water to the Southern Water surface water sewer via a new connection into the public sewer, at manhole chamber reference number 5450 located within Stanbridge Road.

The proposed network relies on the use of drainage channels, pipework, silt traps/ catchpits and manholes to convey the rainfall runoff to below ground attenuation tanks within the central hardstanding area. There will be a flow control device to limit the surface water discharge rate to 47 l/s. For this discharge rate the surface water attenuation that is required is 360m³ – The network has been modelled using microdrainage and the results of this are attached in Appendix J

The existing peak surface water flow rate from the site is 64.1 l/s for the 1 in 1 year storm, so by limiting the proposed discharge rate to 47 l/s, the offsite impact of the surface water has been mitigated by reducing the peak flow rate discharging from the site. For the 1 in 100 year return period storm, the existing peak surface water flow rate is 202.6 l/s, so for this storm there is an over 75% reduction in the discharge rate, reducing the offsite impact of the site.

For the Proposed Drainage Layout, refer to drawing 9641-PTA-SW-XX-DR-C-8101 - Appendix K

4.4 Proposed Foul Water Drainage

The proposed foul drainage strategy for this development is a positive gravity drained network, that discharges to the Southern Water foul sewer via a new manhole on the existing public sewer under Stanbridge Road.

As the site is located within in a SPZ1c, the foul water network is to use the highest specification pipework and designed to minimise leakage.

For the Proposed Drainage Layout, refer to drawing 9641-PTA-SW-XX-DR-C-8101 - Appendix K

For the proposed development, the peak foul water flow rate has been calculated as 3.8 l/s, for the calculations refer to Appendix L.

A pre-planning enquiry application has been submitted for the proposed development and Southern Water have confirmed that there is adequate capacity within the public sewer network for the development to connect into. This confirmation of capacity for the foul water flow is attached in Appendix M.

4.5 Proposed Surface Water Treatment

Surface water run-off from roof areas is considered to be significantly less polluted than a road surface and considered to impose a very small risk of pollution to the receiving ground, and it is considered to not require any specific treatment other than capturing sediments in the catchpit manholes.

The commercial yard, delivery areas and parking areas are considered to have a medium pollution hazard level which equates to the following pollution hazard indices:

Area	Pollution Hazard Level	SuDS Indices			
		Type	Total Suspended Solids (TTS)	Metals	Hydrocarbons
Industrial / delivery yard	Medium	Pollution	0.7	0.6	0.7

Table 4: SuDs Pollution Indices in accordance to The SuDS Manual C753

A proprietary surface water treatment system will be installed and will need to provide mitigation indices equal or higher than what is shown in table 4 to provide a level of surface water treatment complying with The SuDS Manual C753.

5 OFFSITE IMPACT

The proposed redevelopment of this site results in a slight increase in hardstanding area, and thus surface water run-off. This increase in surface water run-off has been mitigated by implementing attenuation tanks and a flow control device to limit the surface water discharge from the site and therefore reducing the offsite impact of the site.

The surface water drainage network will be designed to cater for storm events up to and including the 1 in 100 year return period rainfall events with allowances for climate change without flooding thus minimising the offsite impact.

6 MAINTENANCE STRATEGY

6.1 Manholes, Inspection Chambers, Pipe Work and Drainage Channels

The surface water drainage system should be inspected and maintained periodically, primarily to check for silt sedimentation within the system or ingress of any detritus or debris which would decrease system performance. Table 5 sets out the recommended maintenance actions and frequency.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove manhole and chamber covers to sewers and flow control on network– inspect to ensure water is flowing freely and that the water flow route is unobstructed. Remove debris and silt as required.	Biannually Undertake one of these inspections after leaf fall in autumn
Occasional Maintenance	None required	
Remedial Actions	Re-line or replace pipework if unable to clear blockages by jetting.	As required
Monitoring	Inspect chambers for build-up of silt and debris	Biannually

Table 5 – Operation & maintenance requirements for pipe network, manholes & inspection chambers, drainage channels & gullies.

6.2 Attenuation Tanks

Geocellular tanks are proposed, they are modular storage systems made with plastic units. These units can be assembled to achieved re required volume and usually on multiple layers.

Generally, the units have 95% of voids content and are used to create an efficient below ground structure to store surface water.

Table 6 sets out the recommended maintenance actions and frequency.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris form the catchment surface (where it may cause risks to performance).	Monthly.
	Remove sediments from pre-treatment structures and/or internal forebays.	Annually, or as required.
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.

Table 6 – Operation & maintenance requirements for attenuation storage tanks - Based on CIRIA SuDS Manual 2015

6.3 Proprietary Surface Water Treatment Systems

These are manufactured products to provide a treatment to the surface water by removing specific pollutants.

Table 7 sets out the recommended maintenance actions and frequency. Manufacture guidance/recommendations should always be used when available.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation.	Monthly for 3 months, then annually.
	Change the filter media.	As recommended by manufacturer.
	Remove sediment, oil grease and floatables.	As necessary – indicated by system inspections or immediately following significant spill.
Remedial Actions	Replace malfunctioning parts or structures.	As required.
Monitoring	Inspect for evidence of poor operation.	Biannually
	Inspect filter media and establish appropriate replacement frequencies.	Biannually
	Inspect sediment accumulation rates and establish removal frequencies.	Monthly during first half year of operation, then every six months.

Table 7 – Operation & maintenance requirements for proprietary surface water treatment systems - Based on CIRIA SuDS Manual 2015

7 CONCLUSION

The FRA has considered the potential flood risk to the proposed development and its potential impact on flood risk:

- The development is located in Flood Zone 1.
- The site is located within in Source Protection Zone 1c
- The site is at a very low risk of flooding via groundwater, surface water, tidal sources, sewers and reservoirs.
- The development drainage system and levels are designed to accommodate the 100-year rainfall event with a 40% allowance for climate change.

The proposed development's drainage regime will reduce the offsite flood risk by controlling the surface water onsite before discharging it at a lower rate than the existing site.

Therefore, the development has an overall low flood risk both on and offsite.