Hart District Council
Strategic Flood Risk Assessment

Level 2 –Exception Test

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Contents

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1.0 Introduction

1.1 This document has been prepared as a supplement to the Hart District Council Strategic Flood Risk Assessment Level 1 (Level 1 SFRA) and in support of the Hart Local Plan Strategy and sites 2016-2032 Proposed Submission Version. The purpose of this document is to demonstrate that sites to be allocated for housing and employment, in areas of flood risk, are appropriate in the context of the Exception Test. Passing the Exception Test is required as part of the National Planning Policy Framework (NPPF) and its accompanying National Planning Practice Guidance (NPPG).

1.2 This Level 2 Strategic Flood Risk Assessment (Level 2 SFRA) should be read in conjunction with the Level 1 SFRA and Sequential Test documents (see SFRA Addendum).

1.3 Further information relating to the explanation of the Exception Test, and when this is applicable in relation to the vulnerability of the proposed use, is available in the NPPF and accompanying NPPG.

2.0 Purpose and Planning Context

2.0 The site allocations have gone through the Sequential Test process. This has highlighted that Hart District Council's development needs cannot be fully accommodated in sites that are wholly within Flood Zone 1 due to wider sustainability issues. Where an allocated site falls partly within Flood Zone 2 or 3 (depending on the proposed use), the Exception Test is triggered. This requires the need to demonstrate that the development is safe, does not increase offsite flood risk and has wider sustainability reasons for being allocated. The wider sustainability reasons are set out in the SFRA Sequential Test Addendum.

2.1 The undertaking of a Level 2 SFRA does not preclude the need for a site specific Flood Risk Assessment (FRA). Rather the Level 1 and 2 SFRAs should be used to inform the site specific FRAs. At the stage that a Level 2 SFRA is written there is often very little known about the development other than development type, number of units and occasionally an indicative layout. As a result Level 2 SFRA's have to take a high level strategic view of a development based on worst case estimates, backup options and guiding principles. A site specific FRA can then fill in the details of the development and mitigation proposed within the parameters set by the Level 2 SFRA.

3.0 Local Flood Risk Context

6.1 The Level 1 SFRA has highlighted that parts of Hart District are at risk from fluvial, surface water, groundwater and foul flooding. There are also areas with the potential to flood from artificial sources, such as embanked sections of the Basingstoke Canal and raised reservoirs. While there are many locations with a low risk of flooding, the Sequential Test has shown that some of Hart District Council's development needs will have to be accommodated on sites that have some level of flood risk. In the cases where the Exception Test has been triggered by the presence of Fluvial Flood Zones, the Level 2 SFRA has also assessed the risk of flooding to the site from all sources.

3.2 Climate change is expected to increase flood risk in Hart District over the coming years. The Level 2 SFRA has included high level mitigation from climate change within this assessment to manage the flood risk to the development over its life time.

4.0 Methodology

4.1 This Level 2 SFRA sets out to demonstrate that it is technically feasible to accommodate the proposed development safely without increasing offsite flood risk. This is being done by following a number of principles:

- **Using readily available information and data**. No new data or surveys were collected as a part of this process.

- **The Sequential Approach was applied on site** as far as possible by directing the most vulnerable elements of the development to the areas of lowest flood risk. Wherever possible built development was kept out of areas at risk of flooding from all sources.

- **Assumed worst case scenarios were used to determine land take** for built development and Sustainable Drainage Systems (SuDS). Land take for development was determined using dwelling densities and the area of the site outside of identified flood risk areas known as 'developable area'. Where possible other restrictions to development such as Tree Preservation Orders and Special Sites of Scientific Interest (SSSI) etc. were excluded from the defined 'developable area'. The land take for SuDS was determined using an assumed very conservative percentage of impermeable area (80% impermeable) and a worst case maximum attenuation storage volume for the 1 in 100 plus 40% climate change storm event when discharging at greenfield QBAR rates.

- **Suggested mitigation measures to manage flood risk onsite** are taken from best practice and recommendation set out in the Level 1 SFRA. If at the individual planning application stage it is felt that the mitigation measures suggested in this document are not needed, these deviations must be backed up with robust evidence demonstrating that either the risk is lower than anticipated or that a more appropriate form of mitigation is viable at the site.

- **The impact of climate change on the development was taken account** of by applying a 10m buffer to the Flood Zone 2 extent and raising Finished Floor Levels within 100m of Flood Zone 2 as recommend in the Level 1 SFRA. The surface water attenuation calculations included a 40% allowance for climate change. In most cases the 10m buffer was applied to the Flood Map for Planning Flood Zone 2 (1 in 1000) extent.

- **A 100m buffer was applied to raised canal embankments** in accordance with the Level 1 SFRA and built development was avoided in this area whenever possible.

- **Back up options investigated.** Where definitive mitigation cannot be determined at this stage without site specific surveys such as infiltration tests, back up options were investigated to determine that a viable option exists for the site.

- **All sources of flooding are assessed using existing mapping.** Wherever possible areas shown to flood from surface water and groundwater are avoided for built development. Where this is not possible, mitigation measures are proposed to prevent internal flooding and ensure that flood risk elsewhere is not increased. Where these areas cannot be avoided for built development it is recommended that more detailed assessment of the risk is undertaken during the planning application process for the individual site.

- **Access and egress.** Whenever possible the Flood Zones are avoided completely. Where the Flood Zones have to be crossed and there is no detailed modelling, the Environment Agency's Flood Map for Surface Water's extreme low-risk extent is used to give an estimate

of flood depths. Flood depths of less than 300mm are deemed safe to walk through (very low hazard in accordance with FD2320/TR2 extend version table 13.1). In cases where the Flood Zones have to be crossed further detailed assessment will be needed within the site specific FRA. An Emergency Flood Plan is given as the fall-back position if a safe route of access and egress cannot be found.

Where surface water flooding obstructs the site access and egress route a high level assessment is made using the Environment Agency's Flood Map for Surface Water, however, the requirements for assessing access and egress mainly stems from fluvial flooding not surface water. In circumstances where there is evidence that surface water flooding of an access route could pose a real danger to site users due to a combination of factors such as flood hazards or duration of flooding, developers may be asked to investigate this risk further.

- **Flooding issues that do not impact on the developable area.** It has been assumed that there is sufficient space to accommodate the development proposed within the site boundary if there are no onsite flooding issues. Where flooding issues do not impact on the site's developable area (e.g. only the sites access is flood or only a small proportion of the site is flooded), then it has not been deemed necessary to determine the land take of the built development or attenuation storage.

4.2 Each site has been assessed against a range of issues and all sources of flooding. This has been set out in table form with the mitigation for any potential issue placed alongside the assessment of risk. Along with the risk assessment is a series of maps for each site showing the risk for each source of flooding.

4.3 This assessment has determined the 'developable area' of each site. This is the area of the site located outside of the main sources of flood risk. Using the 'developable area' and where necessary the density of the development, as dwellings per hectare, it is possible to determine whether there is sufficient space on site to accommodate the number of units proposed. Sites with sufficient space to accommodate all units within the developable area are deemed to pass the Exception Test. Those that cannot must either have the number of proposed dwellings reduced to a level where they can be accommodated within the developable area or include further mitigation measures to make the development safe. The Level 2 SFRA sets out what further mitigation measures are needed and whether this is considered to reduce the risk to an acceptable level. Maps of the developable areas have been provided for each site.

4.4 The methodology is not there to demonstrate that a particular indicative layout produced by a potential developer is safe, but rather that it is potentially possible to develop the site safely without increasing flood risk. This approach has not used indicative site layouts from potential developers because not all sites have an indicative layout, as the layouts are indicative these are subject to change, and where layouts do exist they may not have considered all flood risk issues. This is considered a fairer approach as all sites are treated equally. The responsibility of demonstrating that a particular proposed site layout is safe and does not increase offsite risk falls to the developer and the site specific FRAs. All that is needed at this stage of the process is to demonstrate that a development of the agreed size can be safely accommodated onsite.

4.5 The only time indicative layouts have been used is where dwelling densities vary across a site. The site indicative layouts have been used to determine a single dwelling density for the whole of the site based on a weighted average density. The weightings were determined from the rough proportion of indicative layout that had been assigned a particular density.

5.0 Options being assessed

5.1 The following sites are being assessed within this Level 2 SFRA and their detailed assessments are set out in section 6:

- SHL081 Beacon Hill Road
- SHL197 Hartland Park
- H7 Eversley Storage

5.2 The Sequential Test assessment highlighted that Eversley Storage, although located wholly within Flood Zone 1 does have some surface water flooding issues. Even though this site does not trigger a Level 2 SFRA assessment we have still undertaken a high level assessment to ensure that a safe development can be achieved at this site. Eversley Storage has a surface water flow route running through it.

6.0 Individual Site Assessments

Site	**Beacon Hill Road, Church Crookham- New Employment Land**	Indicative Layout available? Y/N	Y
Site Proposal	Commercial development consisting of 6213m^2 (0.62 ha) industrial units located on part greenfield/ part brownfield site.		
Source		**Mitigation Measures**	
Fluvial	The Fleet Brook is located on the far side of Beacon Hill Road east of the site. Areas of Flood Zone 3b, Flood Zone 3a and Flood Zone 2 cover the eastern side of the site. Eastern side of site falls within the climate change buffer.	Avoid placing built development within the Flood Zones and if possible the climate change buffer. The EA may require detail modelling for the planning application. All Finished Floor Levels to be raised by 300mm above ground level when within 100m radius of the climate change buffer i.e. across the entire site. The buildings are expected to occupy 0.62ha of the site and there is 0.86ha outside of the climate change buffer so the buildings can be located outside the area of flooding. Parking areas are an acceptable used within the floodplain so could be within the flood zones if needed, although the drainage in these areas would have to be considered carefully to ensure that these work in times of river flooding.	
Surface water	There is an existing surface water overland flow route and IFPA that crosses the site from south to north. The Environment Agency's surface water flood map indicates that surface water runs down Beacon Hill Road by the roundabout and then onto the site, flooding it. A culverted ordinary watercourse runs through the western side of the site.	Site layout should avoid the areas at risk of surface water flooding if possible. As there are some areas of surface water flooding in the west of the site it is recommended that finished floor levels are raised by 300mm to minimise the risk of internal flooding. Building must not be located over the culverted watercourse. If necessary the watercourse may require diverting but this must be done in a way that will not increase flood risk. Ordinary Watercourse Consent may be required if works are undertaken to the culvert.	
Groundwater	Entire sites falls within the BGS limited potential for groundwater flooding.	N/A	
Foul	Thames Water surface water sewer located on the eastern side of the site cutting across the site from south to north. See appendix 3.	Foul drainage must be designed to sewer for adoption standards. Avoid building over the sewer or divert with Thames Water permission. Ideally an 8m easement should be provided along the sewer.	
Embanked canal	N/A	N/A	
Reservoir	N/A	N/A	
Defences	N/A	N/A	
Historic Flooding records	Nearest historic records are at the roundabout on Beacon Hill Road 70m south of the site. Flooding occurred in 1990, 2006 and 2007 and was the result of a combination of a blockage on the Fleet Brook and surface water flooding flowing off the MOD land affecting the highway and surrounding gardens.	Consider having a site maintenance plan for the onsite ordinary watercourse. As the Fleet Brook is off site, maintenance for the main river is not within the riparian land ownership for this site.	
Access & Egress issues	The site access is located within the Flood Zones.	As a commercial development with a less vulnerable use, an assessment of safe access and egress is not normally required.	
Site Drainage considerations	The site is located on Windlesham Sands with no superficial deposits. The BGS Infiltrating SUDS suitability maps indicate that there may be significant constraints to infiltration in the area. The viability of infiltration must be confirmed with infiltration test results. There are three potentially possible ways of draining the site: infiltration (although this looks doubtful), discharge to the ordinary watercourse onsite or discharge to the Fleet Brook offsite. This site is located within the causal area for Fleet so a reduction in runoff rates or the provision of some other flood risk betterment is encouraged. Discharging at greenfield QBAR rates meets this requirement. The total site area is 1.47ha. The impermeable area has been assumed as 83% so the impermeable are of the site is 1.18ha (0.62ha unit area and 0.62ha parking (taken from developers estimate). The HR Wallingford SuDS tool indicates that 1152m^3 of attenuation storage will be needed to discharge at greenfield QBAR. Assuming that storage is provided to a depth of 0.5m, this means that an area of 2304m^2 or 0.23ha is need to accommodate the attenuation storage. See appendix 4. Given that the industrial units can be accommodated within 0.62ha, and there is 0.86ha outside of the areas of flooding, there is 0.24ha available for attenuation storage outside the flooded area. The surface water storage could be provided beneath the parking areas outside of the climate change buffer. There is room for worst case drainage scenario to be accommodated on site.	Undertake infiltration tests in accordance to BRE 365. The Drainage strategy should prioritise infiltration over discharge to the watercourse, which should be prioritised over discharge to the surface water sewer. The Drainage strategy must be designed in accordance to the National SuDS Standard and use the latest climate change allowances. The Drainage strategy must utilise a wide range of SuDS measures in a treatment train in accordance with best practice. This site falls in the causal area for Fleet so will need to comply with Flood Risk Policy NBE6.	
Planning considerations	Must have a site specific FRA which includes the mitigation measures set out above. If the development at full planning stage has to deviate from the Level 2 recommendations then justification for this should be provided along with evidence that the development still passes the Exception Test. Is partly within a causal area so needs to comply with Flood Policy NBE6.		
Conclusion	The buildings and attenuation storage can avoid areas of flood risk from all sources and should be safe from internal flooding even with consideration for climate change. See appendix 1. There are three potential options for draining the site so draining the site is achievable. There is sufficient space to accommodate the 1 in 100 plus climate change storm event onsite when discharging at greenfield QBAR. The development can therefore be accommodated safely without increasing offsite flood risk. This site can comply with Flood Policy NBE6.		

Development Type	**Units**	**Dwellings per Ha (dph)**	**Developable area outside of areas flooded (ha)**	**Area needed to accommodate units (ha)**	**Attenuation storage area (ha)**	**Developable area – area needed for development**	**Exception Test Passed**
Commercial	10	N/A	0.86	0.62	0.23	0.01	Yes

Site	SHL197 Hartland Park- Residential New Community	Indicative Layout available? Y/N	Y
Site Proposal	1500 residential dwellings, 27.9 ha SANG (off site) and Green Infrastructure on brownfield land. Version 1 also includes a Health Centre. 59 dph (Density varies from 30 -100 dph so a proportional weighted average was used).Community Hub are of 0.79 ha. Residential 26.88. Brownfield site surrounded by woodland. 56ha.		
Source		**Mitigation Measures**	
Fluvial	The Gelvert Stream (a designated main river) is located about 130m west of the site and as a consequence Flood Zone 2 and 3 just clip the site boundary. The climate change buffer also only just encroaches onto the site. The majority of the site is many meters above the river level so this is not really considered to be a risk to the site.	Avoid placing built development within the Flood Zones and climate change buffer. The EA may require detail modelling for the planning application.	
Surface water	Some surface water overland flow routes cross the site, obstructed and disrupted by the existing buildings. Since this is a brownfield site, the existing buildings appears to be obstructing the surface water overland flow routes. It is hard to tell from the existing mapping where the natural overland flow routes are. Larger more frequent floods are likely to occur under climate change. Rainfall intensities are expected to increase by up to 40% over the lifetime of a new development.	Identify surface water overland flow routes and avoid placing built development in these areas.	
Groundwater	Small area of groundwater flooding at the surface (i.e. within the groundwater IFPA) in the eastern corner. The norther eastern part of the site is shown to be at risk of below ground level groundwater flooding. The rest of the site has a limited risk of groundwater flooding.	Reduced built development area to avoid the groundwater Indicative Flood Problem Areas. Landscaping should be used to help any groundwater flooding drain away from residential areas. Basements must be avoided where below ground flooding is possible and mitigation to minimise sewer flooding (such as non-return valves) should be used.	
Foul	Likely to be existing foul drainage on site. There is a Thames Water rising main at the eastern corner of the site next to the foul sewer pumping station. See appendix 3. Foul flooding could be a problem where above and below ground groundwater flooding is possible.	Avoid placing the foul sewer in areas prone to groundwater flooding as far as possible. Any new foul sewers located in areas prone to groundwater flooding (whether at surface or below ground) must be designed to minimise foul sewer flooding by including a variety of measures e.g. non-return valves on properties, measures to minimise groundwater ingress and designing the sewer to best practice.	
Embanked canal	N/A	N/A	
Reservoir	Some reservoir flooding on the western boundary possible should the Bourley Military reservoir no. 5 ever fails. Encroaches into the site by about as much as the climate change buffer.	Avoid placing built development within the climate change buffer.	
Defences	N/A	N/A	
Historic Flooding records	No reported records of flooding.	N/A	
Access & Egress issues	Can exit north into Farnborough via the A327 without crossing the Flood Zones. See appendix 2.	Access and egress will need to be discussed in the FRA.	
Site Drainage considerations	Geology: Camberley Sand across the site with a superficial deposit of sand and gravel on the western site of the site. Infiltration may be possible on parts of the site where groundwater flooding is not an issue. Soil contamination may also cause problems. There are a number of ordinary watercourses located at the site boundary so an attenuation scheme is possible even if infiltration proves not to be. This a brownfield site so there may be opportunities to reduce hardstanding. Much of this site drains towards Southwood in Rushmoor which is shown to flood from surface water. This site has a number of surface water sub-catchments. The area required to accommodate 1500 dwelling at 59 dph is 25.4ha. A further 0.79ha is needed for the community hub. Impermeable area has been assumed as 80% (conservative) so the impermeable are of the site is 20.97 ha. The HR Wallingford SuDS tool indicates that 21,299m^3 of attenuation storage will be needed to safely contained 1 in 100 plus 40% climate change storm event when discharging at greenfield QBAR. Assuming that storage is provided to a depth of 0.5m, this means that an area of 4.26ha is needed to accommodate the attenuation storage. See appendix 4. The site has an area of 56ha, 30.86ha of which are outside of areas of flooding for all sources and the forested parts of the site. 25.4ha of residential can therefore be accommodated outside of the flooded area. The community hub requires approximately 0.79ha so this leaves 4.67 ha to accommodate 4.26 ha of attenuation storage. Therefore there is sufficient space on site to safely accommodate the development without increasing off site flood risk. The above estimate is extremely conservative given that this is a brownfield site.	Undertake infiltration tests in accordance to BRE 365 and site investigations to determine if contamination is a constraint. The drainage strategy should prioritise infiltration where feasible over discharge to the watercourse. The Drainage strategy must be designed in accordance to the National SuDS Standard, use the latest climate change allowances and utilise a wide range of SuDS measures in a treatment train. Opportunities to reduce existing hardstand and discharge rates and volume should be considered. Care must be taken not to change the size of surface water sub-catchments.	
Planning considerations	Must have a site specific FRA which includes the mitigation measures set out above. If the development at full planning stage has to deviate from the Level 2 recommendations then justification for this should be provided along with evidence that the development still passes the Exception Test. Site should comply with flood policy NBE6.		
Conclusion	The dwelling can avoid areas of flood risk from all sources and should be safe from internal flooding even with consideration for climate change. See appendix 1. There are two potential options for draining the site so draining the site is achievable. There is sufficient space to accommodate the 1 in 100 plus climate change storm event onsite when discharging at greenfield QBAR. Safe Access and egress is possible by exit north into Farnborough via the A327 without crossing the Flood Zones. The development can therefore be accommodated safely without increasing offsite flood risk.		

Development Type	Units	Dwellings per ha (dph)	Developable area outside of areas flooded (ha)	Area needed to accommodate units (ha)	Attenuation storage area (ha)	Developable area – area needed for development	Exception Test Passed
Residential	1500	59 (weighted)	30.86	25.4	4.26	0.41 = 30.86-(25.4+0.79+4.26)	Yes
Community Hub				0.79			

Site	Eversley Storage- New Employment Land			Indicative Layout available? Y/N			N
Site Proposal	Employment						
Source							**Mitigation Measures**
Fluvial	Flood Zone 1						N/A
Surface water	A surface water overland flow route flows across the site along the southern boundary. The majority of the site is unaffected. 2.7ha of the site are dry out of 3 ha i.e. 90% of the development is available for development.						Avoid placing any buildings within the surface water flow route. The flow route should be left open to ensure that flood waters are not obstructed or deflected elsewhere.
Groundwater	Entire sites falls within the BGS limited potential for groundwater flooding.						N/A
Foul	There are no Thames Water foul or surface water sewers in this area.						N/A
Embanked canal	N/A						N/A
Reservoir	N/A						N/A
Defences	N/A						N/A
Historic Flooding records	N/A						N/A
Access & Egress issues	The surface water flooding doesn't affect the site access.						N/A
Site Drainage considerations	The site geology is Bracklesham Sands overlaid by sands and gravel so infiltration may be viable but this will need to be confirmed by infiltration test. The site is located in an area according to the BGS Drainage summary layer shown to be likely highly compatible for infiltrating SUDS. Furthermore the existing site (as shown by plans submitted under 00/01314/FUL) uses soakaways. It is therefore very likely that infiltration is possible at the site.						Undertake infiltration tests in accordance to BRE 365. The Drainage strategy must be designed in accordance to the National SuDS Standard and use the latest climate change allowances. The Drainage strategy must utilise a wide range of SuDS measures in a treatment train in accordance with best practice.
Planning considerations	This site is over 1 ha so a site specific Floor Risk Assessment and drainage strategy will be needed which includes the mitigation measures set out above. If the development at full planning stage has to deviate from the Level 2 recommendations then justification for this should be provided along with evidence that the development still be safe and not increase flood risk elsewhere. Site should comply with flood policy NBE6.						
Conclusion	There is sufficient space outside of the flooded area to accommodate the development. Given that the existing site uses infiltration we are confident that a viable form of drainage exists for the site.						
Development Type	**Units**	**Dwellings per Ha (dph)**	**Developable area outside of areas flooded (ha)**	**Area needed to accommodate units (ha)**	**Attenuation storage area (ha)**	**Developable area – area needed for development**	**Exception Test Passed**
Employment	Given that only 0.3ha of the site is being lost to surface water flooding and 90% of the site is available for built development, surface water flooding is not considered a major constraining factor. It is considered that there is sufficient space to safely accommodate the proposed development.						Yes

7.0 Conclusion

7.1 The Level 2 SFRA has assessed three sites. Two sites that triggered a level two assessment (Hartland Park and Beacon Hill Road) and one that, while it does not strictly trigger a level 2 as it is located in Flood Zone 1, still has flooding issues that should be assessed. This Exception Test document shows that there is sufficient space on each site to allocated the number of units proposed within the identified 'developable area' (lowest area of risk) for both sites. These sites are therefore considered to be safe and have passed the Exception Test as long as the recommended mitigations measures are applied.

7.2 As the assessment made within this SFRA has not used indicative layouts, there will be sites where a developer's indicative layouts do not coincide with the level 2 SFRA layout assumptions. This approach was deemed pragmatic as it demonstrated that a safe layout is possible while treating all sites in a consistent manner regardless of the level of detail available. Where a developer's layout varies from the assumptions in this SFRA, this will need to be addressed in the site specific FRA. This can be done by either revising the site layout so that the areas of flood risk are avoided, or by providing robust evidence for why the development has to be allocated in an at risk area, and demonstrating that further mitigation can be provided to ensure that the development is safe and won't increase flood risk elsewhere.

7.3 It should be noted that the BGS susceptibility to groundwater flooding map is an indication that groundwater flooding is possible but does not indicate how likely the site is to flood in any one year. As such, it is strongly recommended that sites wishing to allocate built development in areas at risk of groundwater flooding at the surface should undertake a thorough assessment of the groundwater flooding risks at the site and apply suitable mitigation within the site specific FRA.

7.4 Given the above, we are satisfied that there is sufficient space on site to accommodate the level of development proposed without increasing offsite flood risk. As such, all development sites assessed within this level 2 SFRA are considered to be able to pass the Exception Test and comply with Flood Policy NBE6.

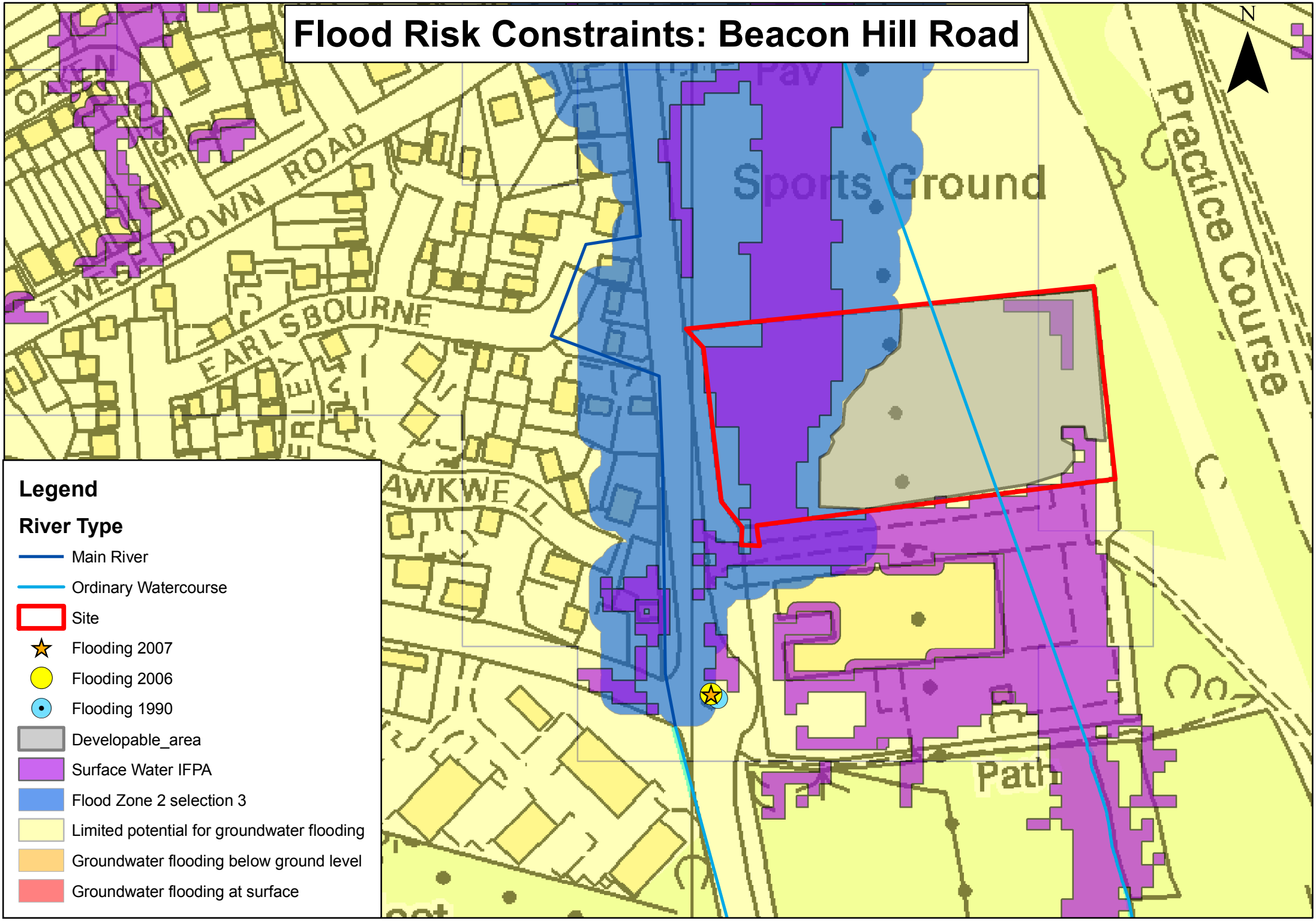
7.5 A site specific Flood Risk Assessment will still be required for all sites assessed within this document. These site specific Flood Risk Assessments will need to demonstrate that the proposed development designs are being carried out in a manner that meets the requirements of the Exception Test, that the recommendations from the Level 1 and 2 SFRA have been incorporated, and that the development complies with Flood Risk Policy NBE6.

8.0 Glossary

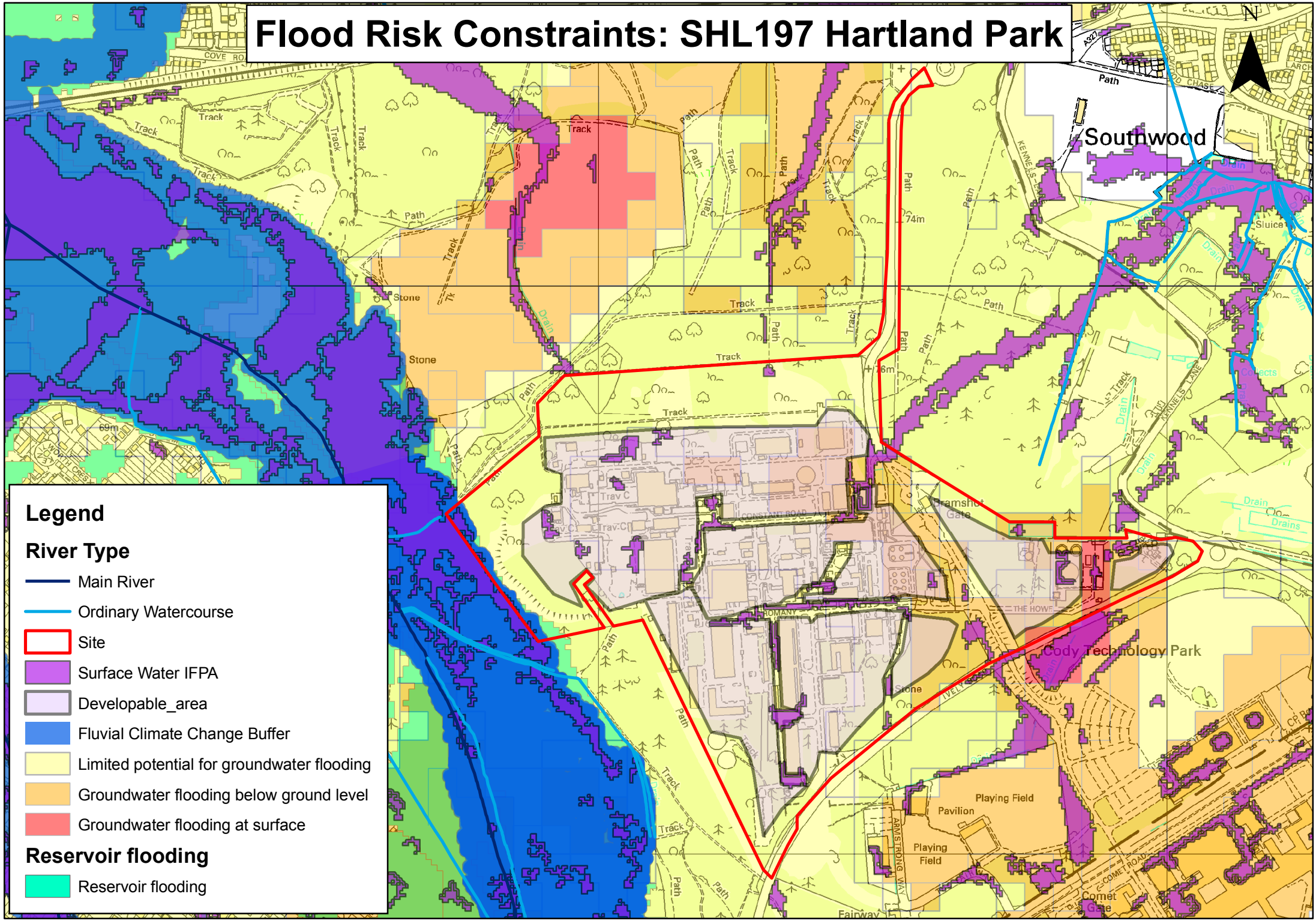
Term	Definition
Annual Exceedance Probability (AEP)	The probability of an event occurring within any one given year.
Attenuation	In the context of this report - the storing of water to reduce peak discharge of water
Breach	An opening – For example in the sea defences
Brownfield	Previously developed land, usually of industrial land use within inner city areas.
Culvert/culverted	A channel or pipe that carries water below the level of the ground.
EA Flood Zone 1	Low probability of flooding (the probability of flooding is less than 1 in 1000/ 0.1 % AEP)
EA Flood Zone 2	Medium probability of flooding. Probability of fluvial flooding is 0.1% (1 in 1000 years) – 1% (1 in 100 years). Probability of tidal flooding is 0.1 (1 in 1000 years) – 0.5 % (1 in 200 years)
EA Flood Zone 3a	High probability of flooding. Probability of fluvial flooding is 1% (1 in 100 years) or greater. Probability of tidal flooding is 0.5%(1 in 200 years)
EA Flood Zone 3b	Functional floodplain
Exception Test	The exception test should be applied following the application of the Sequential Test. Conditions need to be met before the exception test can be applied.
Flood defence	Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Floodplain	Area adjacent to river, coast or estuary that is naturally susceptible to flooding.
Flood Resilience	Resistance strategies aimed at flood protection
Flood Risk	The level of flood risk is the product of the frequency or likelihood of the flood events and their consequences (such as loss, damage, harm, distress and disruption)
Flood Risk Assessment	Considerations of the flood risks inherent in a project, leading to the development actions to control, mitigate or accept them.
Flood Zone	The extent of how far flood waters are expected to reach.
Fluvial flooding	Flooding by a river or a watercourse.
Freeboard	Height of flood defence crest level (or building level) above designed water level
Functional Floodplain	Land where water has to flow or be stored in times of flood.
Greenfield	Previously undeveloped land.
Groundwater	Water that is in the ground, this is usually referring to water in the saturated zone below the water table.
Highly Vulnerable Developments	Developments where the consequence of flooding is greatest.

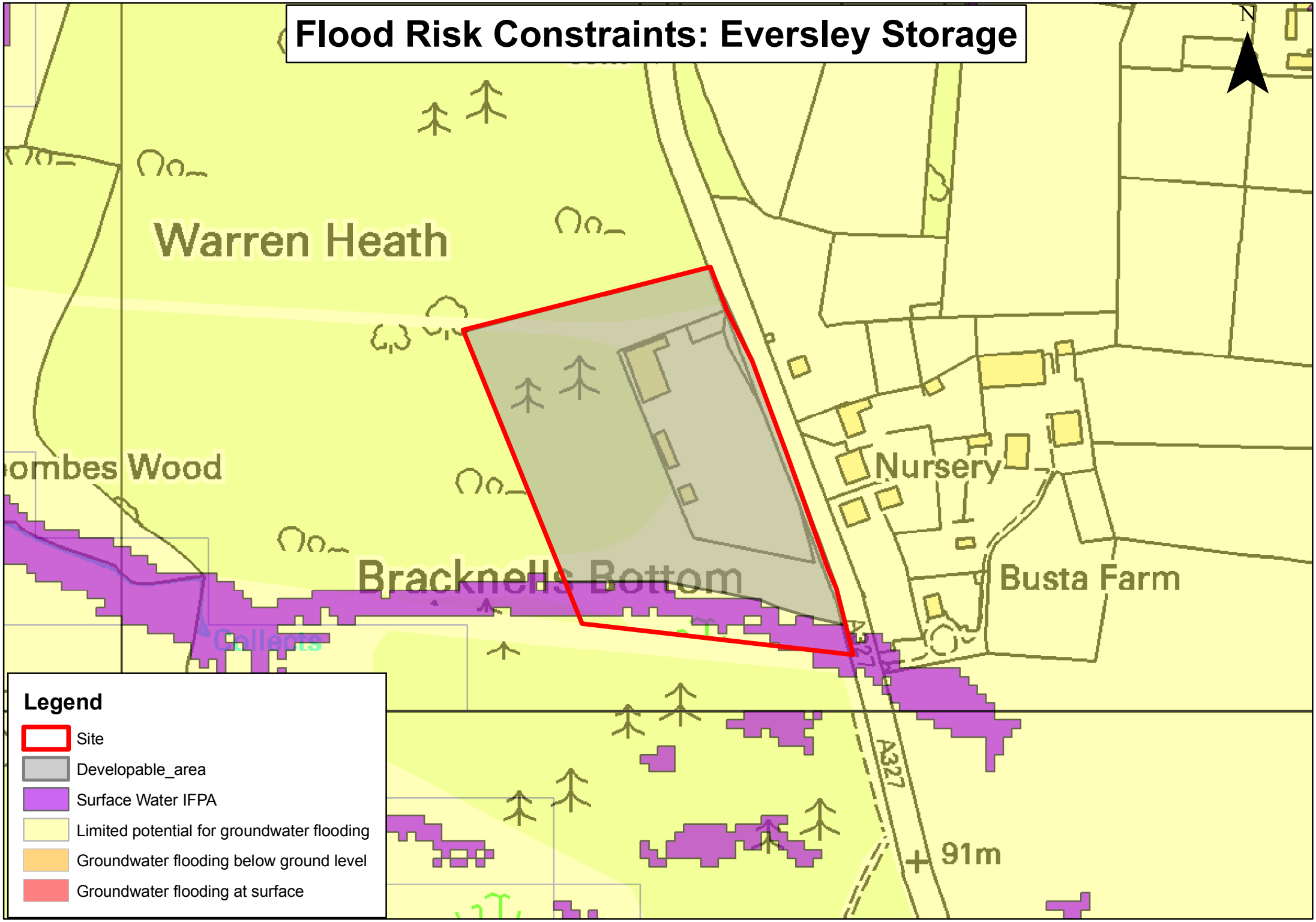
Hydraulic Modelling	A computerised model of a watercourse and floodplain to simulate water flows in rivers too estimate water levels and flood extents.
Infrastructure	Physical structures that form the foundation for development.
LiDAR	Light Detection And Ranging – uses airborne scanning laser to map the terrain of the land.
Local Planning Authority	Body that is responsible for controlling planning and development through the planning system.
Main River	Watercourse defined on a 'Main River Map' designated by DEFRA. The environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only.
Mitigation measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
Overland Flow	Flooding caused when intense rainfall exceeds the capacity of the drainage systems or when, during prolonged periods of wet weather, the soil is so saturated such that it cannot accept any more water.
Residual Flood Risk	The remaining flood risk after risk reduction measures have been taken into account.
Return Period	The average time period between rainfall or flood events with the same intensity and effect.
Risk	The probability or likelihood of an event occurring.
River Catchment	The areas drained by a river
Sequential Test	Aims to steer development sites to areas of lowest flood risk.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Source Protection Zone	Defined areas in which certain types of development are restricted to ensure that groundwater sources remain free from contaminants.
Standard of Protection	The flood event return period above which significant damage and possible failure of the flood defences could occur.
Sustainability	To preserve /maintain a state or process for future generations.
Sustainable drainage system	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations meeting their own needs
Topographic survey	A survey of ground levels.
1 in 100 year event	Event that on average will occur once every 100 years. Also expressed as an event, which has a 1% probability of occurring in any one year.
1 in 100 year design standard	Flood defence that is designed for an event, which has an annual probability of 1%.In events more severe than this the defence would be expected to fail or to allow flooding.

Appendix 1- Site Constraints Maps


Flood Risk Constraints: Beacon Hill Road
N
Sports Ground
Practice Course
Path
EARLSBOURNE
DOWN ROAD
Legend
River Type
Main River
Ordinary Watercourse
Site
Flooding 2007
Flooding 2006
Flooding 1990
Developable_area
Surface Water IFPA
Flood Zone 2 selection 3
Limited potential for groundwater flooding
Groundwater flooding below ground level
Groundwater flooding at surface

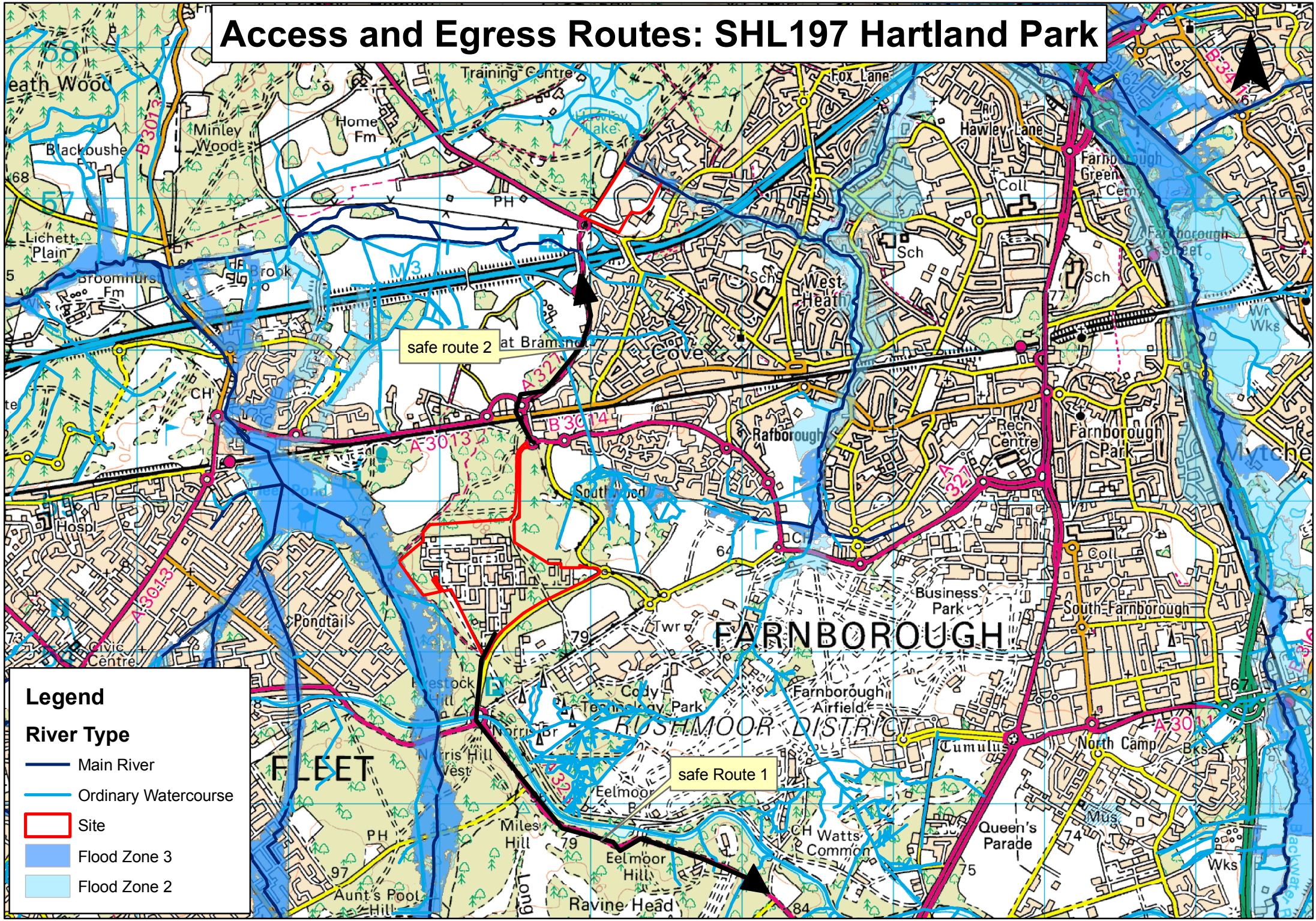
Flood Risk Constraints: SHL197 Hartland Park




Flood Risk Constraints: Eversley Storage
N
Warren Heath
ombes Wood
Bracknells Bottom
Nursery
Busta Farm
A327
91m
Legend
Site
Developable_area
Surface Water IFPA
Limited potential for groundwater flooding
Groundwater flooding below ground level
Groundwater flooding at surface

Appendix 2- Access and Egress Maps

Access and Egress Routes: SHL197 Hartland Park



Appendix 3- Thames Water sewers

Date: 14/12/17 Scale: 1:3120 Map Centre: 482301,151712 Data updated: 10/11/17 Wastewater Plan A4

Foul Sewer	Foul Manhole
Surface Sewer	Surface Manhole
Combined Sewer	Combined Manhole
Abandoned Sewer	Abandoned Manhole
Pressure Main	Other Manhole
Private Asset (Colour denotes effluent type)	End Item
Proposed Asset (Colour denotes effluent type)	S104 Boundary

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Beacon Hill Road

Date: 14/03/17 Scale: 1:7509 Map Centre: 483414,154473 Data updated: 01/02/17 Wastewater Plan A4

Foul Sewer	Foul Manhole
Surface Sewer	Surface Manhole
Combined Sewer	Combined Manhole
Abandoned Sewer	Abandoned Manhole
Pressure Main	Other Manhole
Private Asset (Colour denotes effluent type)	End Item
Proposed Asset (Colour denotes effluent type)	S104 Boundary

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SHL197 Hartland Park

Thames Water

Appendix 4- Surface water drainage calculations

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Susanna Hope
Site name:	SHL197 Hartland Park
Site location:	Iverly Road, Fleet

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates

Latitude:	51.28321° N
Longitude:	0.80686° W

Reference:	5904460
Date:	2017-03-13T17:17:01

Methodology	IH124

Site characteristics

Total site area (ha)	56
Significant public open space (ha)	29.8
Area positively drained (ha)	26.2
Pervious area contribution (%)	30
Impermeable area (ha)	20.97
Percentage of drained area that is impermeable (%)	80
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	26.2
Net impermeable area for storage volume design (ha)	21.55

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Flow control to max of 2 l/s/ha or

	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1	1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
Qbar total site area (l/s)	159.8	--
SOIL type	3	3
HOST class	N/A	N/A
SPR	0.37	0.37

Hydrology

	Default	Edited
SAAR (mm)	696	696
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.4	0.4
Rainfall 100 yrs 6 hrs	63	
Rainfall 100 yrs 12 hrs	91.63	
FEH/FSR conversion factor	1.19	1.19
Hydrological region	6	
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 10 year	1.62	1.62
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	159.8	159.8
Qbar net site area (l/s)	74.76	74.76
1 in 1 year (l/s)	63.5	63.5
1 in 30 years (l/s)	74.8	74.8
1 in 100 years (l/s)	74.8	74.8

Estimated storage volumes

	Default	Edited
Interception storage (m^3)	839	839
Attenuation storage (m^3)	20460	20460
Long term storage (m^3)	0	0
Treatment storage (m^3)	2516	2516
Total storage *(excluding treatment)* (m^3)	21299	21299

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Susanna Hope
Site name:	Beacon Hill Road
Site location:	Beacon Hill Road, Church Crookham, Fleet, GU5

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Site coordinates

Latitude:	51.25865° N
Longitude:	0.82501° W

Reference:	6200886
Date:	2017-12-15T11:06:52

Methodology	IH124

Site characteristics

Total site area (ha)	1.47
Significant public open space (ha)	0
Area positively drained (ha)	1.47
Pervious area contribution (%)	30
Impermeable area (ha)	1.22
Percentage of drained area that is impermeable (%)	83
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	1.47
Net impermeable area for storage volume design (ha)	1.25

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Use long term storage

	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
Qbar total site area (l/s)	4.44	--
SOIL type	3	3
HOST class	N/A	N/A
SPR	0.37	0.37

Hydrology

	Default	Edited
SAAR (mm)	730	730
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.4	0.4
Rainfall 100 yrs 6 hrs	63	
Rainfall 100 yrs 12 hrs	90.86	
FEH/FSR conversion factor	1.18	1.18
Hydrological region	6	
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 10 year	1.62	1.62
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Site discharge rates

	Default	Edited
Qbar total site area (l/s)	4.44	4.44
Qbar net site area (l/s)	4.44	4.44
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	10.2	10.2
1 in 100 years (l/s)	14.1	14.1

Estimated storage volumes

	Default	Edited
Interception storage (m^3)	49	49
Attenuation storage (m^3)	936	936
Long term storage (m^3)	167	167
Treatment storage (m^3)	146	146
Total storage *(excluding treatment)* (m^3)	1152	1152