

Top Park, Ramsbottom, Bury

Flood Risk Assessment and Outline Drainage Strategy Report

Date 17th October 2023

Notice

This report was produced by Lynas Engineers for Steve Wells Associates for the specific purpose of assessing the risk of flooding along with the outline strategy for draining the proposed development on Top Park, Bolton Road West, Ramsbottom, Bury.

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Summary

1. Lynas Engineers was commissioned by Steve Wells Associates to undertake a Flood Risk Assessment (FRA) and Drainage Strategy (DS) report in respect of the proposed development located east of Bolton Road West, Ramsbottom, Bury.
2. The overall development plan increases the site impermeable area by a total of 0.710ha; 0.635ha from the proposed AGP, 0.071ha from the car park extension, and 0.004ha from the proposed pavilion extension.
3. A location plan of the area can be found in **Appendix A**.
4. The FRA has been produced in accordance with the National Planning Policy Framework (NPPF), standing advice and general requirements of the Environment Agency (EA), and Bury Council's Local Plan 2012 – 2029.
5. The document can be viewed through this link:
<https://councildecisions.bury.gov.uk/Data/Council/201307031900/Agenda/att17935.pdf>
6. The FRA demonstrates the following:
 - The specific location designated for the surface water drainage system is located within Flood Zone 1 and is at a very low probability of fluvial flooding.
 - The proposed site is at a very low risk of flooding from surface water.
 - The proposed site is not at risk of flooding from a reservoir failure.
 - The risk of flooding elsewhere from all sources of flooding will not change from the existing situation.
7. The Outline DS demonstrates the following:
 - The potential solutions for the attenuation/disposal of surface water run-off from the proposed site.
 - The outline surface water drainage philosophy for the proposed development.
 - The foul water scenario has not changed and will therefore not be considered as part of this application.

Introduction

Development Proposal

1. The proposal is to develop the site area, which is currently occupied by grass playing fields, a concrete basketball court, a playground, 45 space car park and a pavilion with changing facilities.
2. The nearest post code to the development site is BL0 9PE.
3. The proposed development will comprise of the installation of a new artificial grass pitch, an additional 26 parking spaces, an extension to the pavilion, new fencing, and improvements to the existing entrance off Bolton Road West.
4. The overall proposed development area equates to 0.710ha.
5. **Figure 1** illustrates the proposed layout for the development, with the red line boundary indicating the proposed site extents. A larger scale layout of the proposed development can be viewed in **Appendix B**.

Figure 1 – Proposed Layout



Purpose

1. A preliminary review of the flood maps for the area indicates that the site is located wholly within Zone 1 of the Environment Agency Flood Map, which is defined as land assessed as having a less than 1 in 1000 years (<0.1% AEP) annual probability of river or sea flooding in any one year.
2. The report is intended to provide an understanding of the flood risk associated with the existing site, assess whether the proposed drainage would be susceptible to flood risk and, if so, consider whether and how that flood risk can be managed in an acceptable manner, whilst also allowing for any climate change.
3. To assess whether the proposed development would increase the risk of flooding elsewhere.
4. Assess how surface water run-off from the existing site is disposed.
5. Assess the potential solutions for the disposal of surface water run-off from the proposed development site against relevant standards.
6. Identify any constraints associated with the potential solutions and identify the preferred solution for the discharge of surface water run-off from the proposed development.
7. Outline the surface water drainage philosophy for the proposed development site.

Legislation, Policy and Guidance

National Planning Policy Framework

1. NPPF sets out the Government's national policies on different aspects of land use planning in England.
2. Section 14: Meeting the challenge of Climate Change, Flooding and Coastal Change, states that "Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development".
3. The NPPF provides the following guidance in respect of Planning and Flood Risk:
 - 3.1 Paragraph 159 states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.
 - 3.2 Paragraph 160 states that strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.
 - 3.3 Paragraph 161 states that all plans should apply a sequential, risk-based approach to the location of development – considering the current and future impacts of climate change – to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:
 - a) applying the sequential test and then, if necessary, the exception test as set out below;
 - b) safeguarding land from development that is required, or likely to be required, for current or future flood management;
 - c) using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques); and
 - d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.
 - 3.4 Paragraph 162 states the aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.
 - 3.5 Paragraph 163 states that if it is not possible for development to be in zones with a lower risk of flooding (considering wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend

on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance.

- 3.6 Paragraph 164 states the application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:
 - a) The development would provide wider sustainability benefits to the community that outweigh the flood risk; and
 - b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- 3.7 Paragraph 165 states that both elements of the exception test should be satisfied for development to be allocated or permitted.
- 3.8 Paragraph 166 states where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan making stage, or if more recent information about existing or potential flood risk should be considered.
- 3.9 Paragraph 167 states when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:
 - a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
 - b) the development is appropriately flood resistant and resilient;
 - c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
 - d) any residual risk can be safely managed; and
 - e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.
- 3.10 Paragraph 168 states that applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments.
- 3.11 Paragraph 169 states that major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
 - a) take account of advice from the lead local flood authority;
 - b) have appropriate proposed minimum operational standards;
 - c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
 - d) where possible, provide multifunctional benefits.

4. Using NPPF Technical Guidance Table 3 (see Table 2), as a simple chart, it shows whether the development should or should not be permitted and whether further information will be required for the planning application.

Table A: NPPF Technical Guidance Table 2

Vulnerability Classification	
Less Vulnerable	• Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in “more vulnerable”, and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Table B: NPPF Technical Guidance Table 3

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
Zone 3b	Exception Test Required	x	x	x	✓

Key:

✓ Development is appropriate.

x Development should not be permitted.

Local Plan – Bury Council

1. Bury Council's Local Plan 2012 - 2029 was formally adopted in 2013 and provides planning guidance for developers in the form of the core strategies and objectives.
2. The document can be viewed through this link:
3. <https://councildecisions.bury.gov.uk/Data/Council/201307031900/Agenda/att17935.pdf>
4. Sustainable development, adapting to climate change and reducing carbon emissions are central to the vision for the Borough, this vision is refined to a series of specific objectives. Figure 2 below shows the objective surrounding the environment and discusses climate change.

Figure 2 – Policy EN9 – Surface Water Management and Drainage

Environment

The Key Issues to emerge in respect of the Borough's environmental assets and environmental quality are:

- The need to adapt to the impacts of climate change and reduce carbon emissions from all sources, especially the built environment and transport.
- A significant amount of the Borough's residents travel to work by private motor vehicle and use of public transport throughout the Borough is low, both of which contribute to the Borough's high carbon emissions.
- The need for Council activities to achieve targets for reducing carbon by 35% by 2014.
- The need to manage flood risk from all sources and address particular issues associated with high risk areas in Ramsbottom, to the west of Bury town centre and between Bury and Radcliffe.
- The need to create, maintain and enhance a network of multi-functional green infrastructure.
- The need to conserve ecological and geological assets.
- The need to retain and enhance the Borough's landscape character;
- The need to retain the Borough's best and most versatile agricultural land in north Radcliffe, Fairfield and Unsworth.
- Air quality in some areas of the Borough fails to meet recognised standards, particularly in East Bury and Whitefield and Unsworth.
- The need to strive towards improved waterbodies, particularly on the River Irwell, Whittle Brook and Kirklees Brook.
- The need to conserve the Borough's built heritage.
- The need to ensure the sustainable management of minerals resources, notably at Fletcher Bank in Ramsbottom and at Pilsworth.
- The need to ensure the sustainable management of waste.

5. Policy EN9, shown below in Figure 3, discusses how Bury Council set out to reduce flood risk on-site and elsewhere, as well as the installation of SuDS within developments.

Figure 3 – Policy EN9 Surface Water Management and Drainage

SURFACE WATER MANAGEMENT AND DRAINAGE	DM Policy EN9
The Council will ensure that all new development proposals minimise the impact of development on surface water run-off, and where possible, seek to reduce it.	
The AGMA authorities are currently developing specific drainage standards for developments within Critical Drainage Areas (CDAs). In the interim the following allowable drainage rates will apply across the Borough: ▪ Development should deliver Greenfield runoff on Greenfield sites up to a 1 in 100 year storm event, considering climate change. ▪ Development should aim for a minimum reduction in surface water runoff rates of 30% (increasing to 50% within CDAs) for Brownfield sites up to a 1 in 100 year storm event, considering climate change. ▪ Development should be designed so that there is no flooding to the development in a 1 in 30 year event and no property flooding in 1 in 100 year plus climate change event.	
Drainage from new developments should incorporate storage, and residual discharge of surface water should be directed to the following networks in order of preference: a) Discharge into infiltration systems located in porous sub soils	
b) Attenuate flows into green engineering solutions such as ponds; swales or other open water features for gradual release to a watercourse and/or porous sub soils c) Attenuate by storing in tanks or sealed systems for gradual release to a watercourse d) Direct discharge to a watercourse e) Direct discharge to a surface water sewer f) Controlled discharge into the combined sewerage network ~ this option is a last resort when all other options have been discounted.	
The choice of system will be determined by local ground conditions (including groundwater levels). Whilst infiltration SuDS may be the most suitable for new development, developers must consider the risk of contamination to underlying aquifers.	

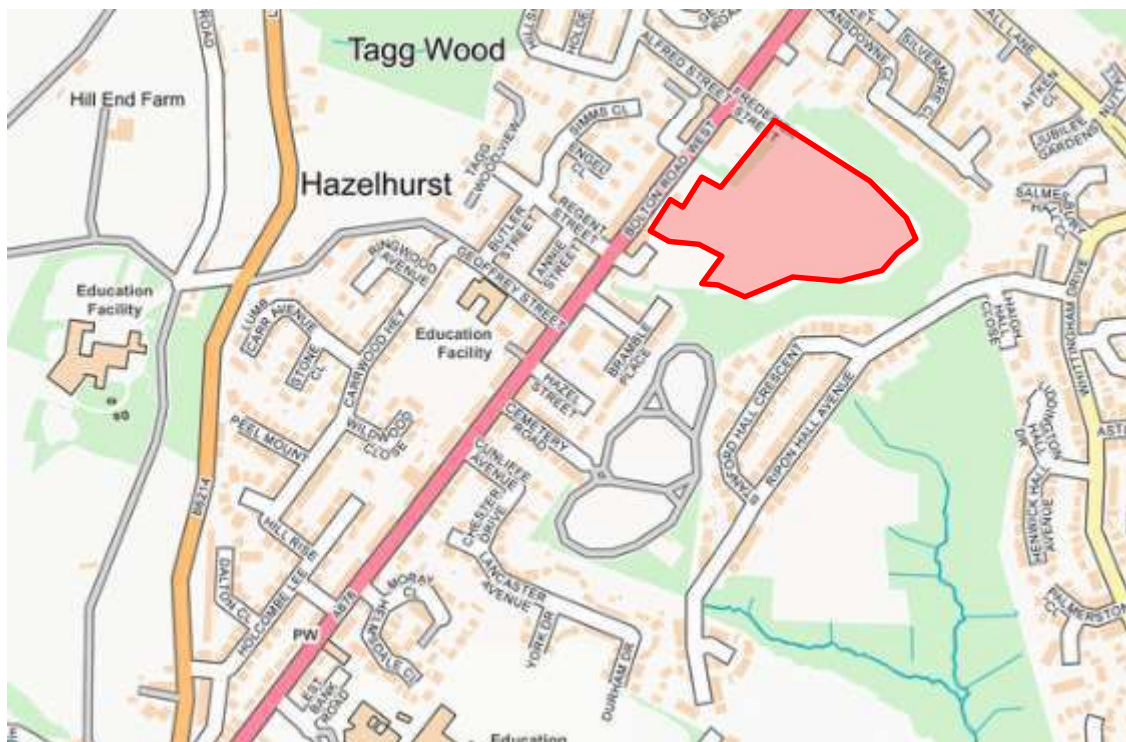
6. Local Planning Authorities are required to undertake a Strategic Flood Risk Assessment (SFRA). Such assessments will identify areas that are at risk from flooding and will also identify factors that influence both the current and future flood risk.
7. Where appropriate, evidence and recommendations from this report and the Local Plan have been incorporated into the FRA, prepared by Lynas Engineers, for the proposed development.

Development Site

General

1. The site lies to the east off Bolton Road West (A676), Ramsbottom, Bury.
2. The proposed site is currently occupied by grass playing fields, a concrete basketball court, a playground, 45 space car park and a pavilion with changing facilities.
3. The site is located at grid ref. SD783158 (co-ordinates X: 378318, Y: 415835) and the nearest postcode to the development site is BLO 9PE.
4. **Figure 4** below shows the approximate location of the proposed development, indicated by the red outline, in the context of the wider conurbation.

Figure 4 - Location Plan



5. The application site is 0.710hectares (ha) in area and will comprise of the installation of a new artificial grass pitch, an additional 26 parking spaces, an extension to the pavilion, new fencing, and improvements to the existing entrance off Bolton Road West.
6. In terms of the surrounding area, there are allotments bordering the southwest corner of the site, vegetation runs along the southeast, east, and northeast sides with residential units after those.

Topography

1. A topographical survey on the existing site was commissioned by Steve Wells Associates in July 2022 and is available to view in **Appendix C**.
2. All information relating to levels presented in this report have been taken from this topographical survey.
3. There is an access road into the proposed development that starts from a junction at the northwest of the site. There are several grassed areas, including trees, along most side boundaries of the site.
4. The general topography of the site falls from west to the east.
5. The highest point on the survey is 166.10m AOD along the northwestern boundary of the site and the lowest point is 159.29m AOD on the eastern border.

Hydrological Setting and Historical Flooding

1. The nearest body of water to the site is the River Irwell which is located approximately 390m to the east of site. Kay Brow Lodge, a recreation and wildlife area sits approximately 600m northeast of site.
2. The Flood and Water Management Act 2010, Section 21 requires lead Local Flood Authorities such as Greater Manchester Council to maintain a register of structures and features, which are likely to have a significant effect on flood risk within their area. At the time of writing this report, using the Level 1 Strategic Flood Risk Assessment for Greater Manchester, Lynas Engineers are not aware of any of these assets on the site.
3. The Bury Local Flood Risk Management Strategy, produced in April 2018 aims to increase awareness of local flood risks, identify how its partners can best work together to reduce this risk and provide an overview of flood risk management. This strategy combined with the Level 1 SFRA for Greater Manchester (March 2019) sets out the flood risk history of Ramsbottom and the authorities plan and strategy going forward.
4. Both reports mentioned can be viewed through the following links:

Bury Local Flood Risk Management Strategy

<https://www.bury.gov.uk/asset-library/local-flood-risk-mangement-strategy-2018.pdf>

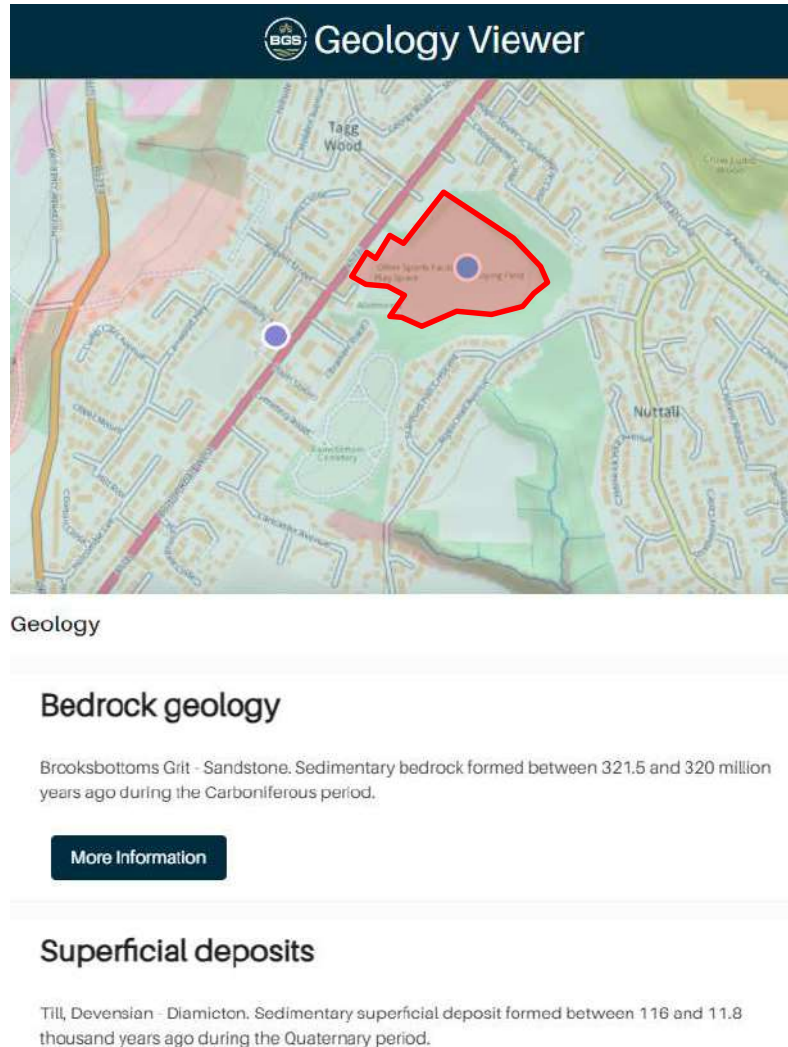
Level 1 SFRA for Greater Manchester

<https://www.greatermanchester-ca.gov.uk/GMCAFiles/PFE/Supporting%20documents/04%20Sustainable%20and%20Resilient%20Places/04.02.01%20GM%20Strategic%20Flood%20Risk%20Assessment%20Level%201%20Report.pdf>

Hydrogeological Setting

1. Figure 5 is the record from the British Geological Survey's mapping system. The development site is represented by the red outline.

Figure 5 – Combined Site Geology

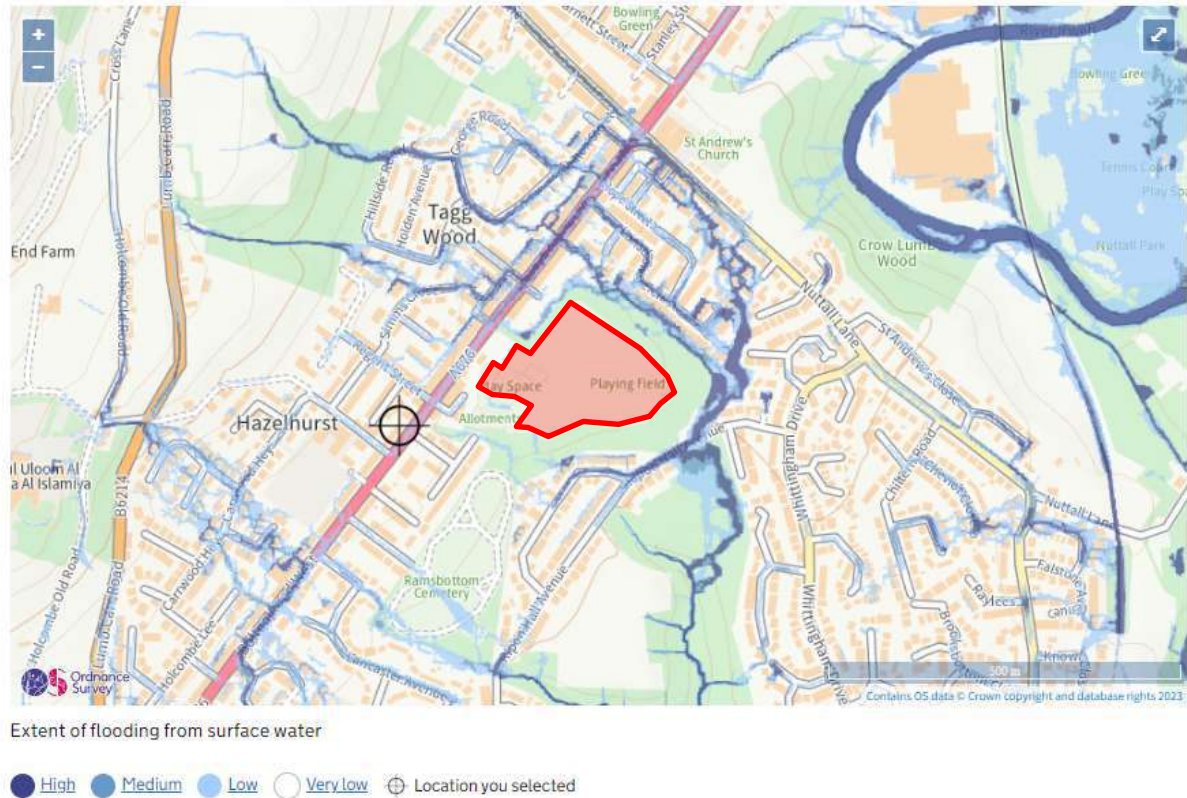


2. A review of the BGS mapping data identified that the development site is in an area which is underlain by superficial deposits of Devensian Till - Diamicton. The bedrock geology comprises of Brooksbottom Grit - Sandstone
3. Diamicton Till deposits are usually made up of a mixture of clay, sand, gravel and boulders varying in size and shape, these deposits have a slow permeability and are therefore, unlikely to be suitable for the use of infiltration as a drainage method.
4. According to the DEFRA Groundwater Vulnerability Map, the proposed development is not at risk of ground water flooding. This site has been classified as having a medium - low risk of groundwater vulnerability.

Surface Water Flooding

1. Figure 6 shows the proposed site, outlined in red, in relation to the Environment Agency's surface water flooding records.
2. The site is in a very low risk area of surface water flooding.

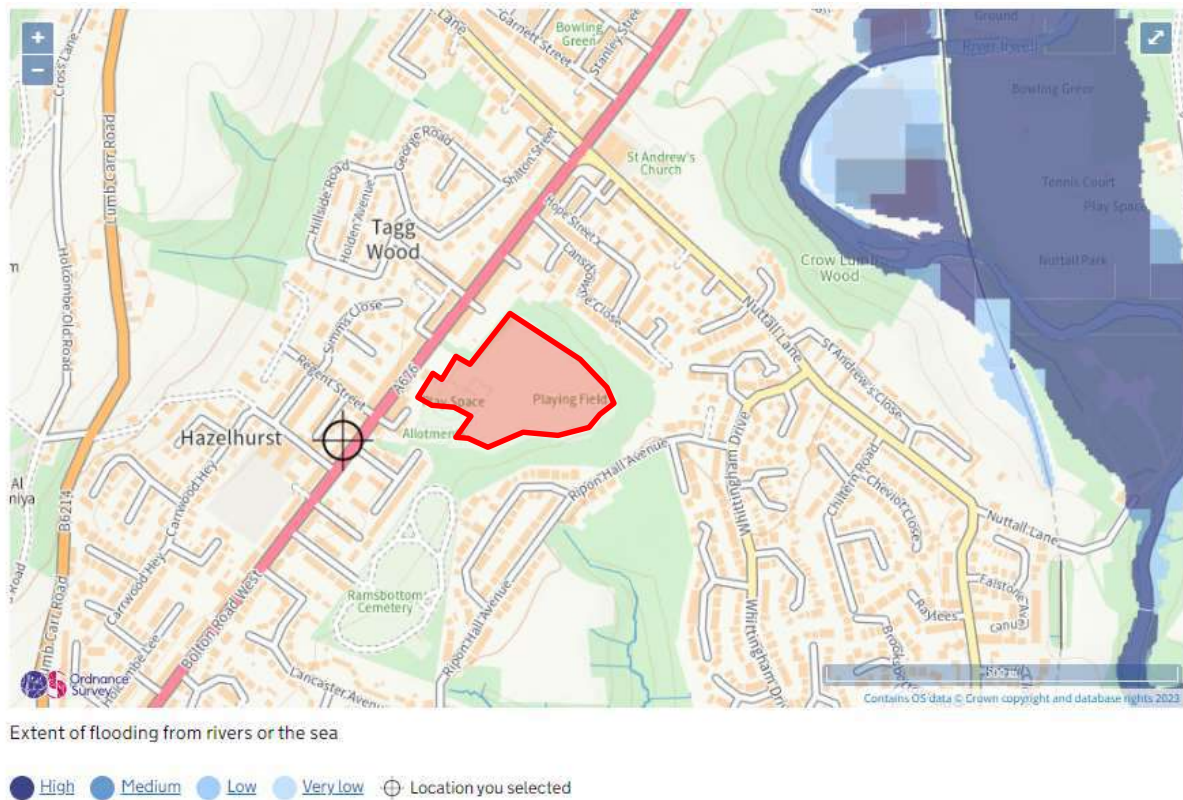
Figure 6 - Flood Risk from Surface Water



Fluvial Flooding

1. Figure 7 shows the proposed site, outlined in red, in relation to the Environment Agency's River and sea flooding records.
2. The map indicates that the site is in Flood Zone 1 which has a very low risk of flooding from the river. The development site is not in a coastal location and therefore is not at risk of flooding from the sea.

Figure 7 - Flood Risk from Rivers or the Sea



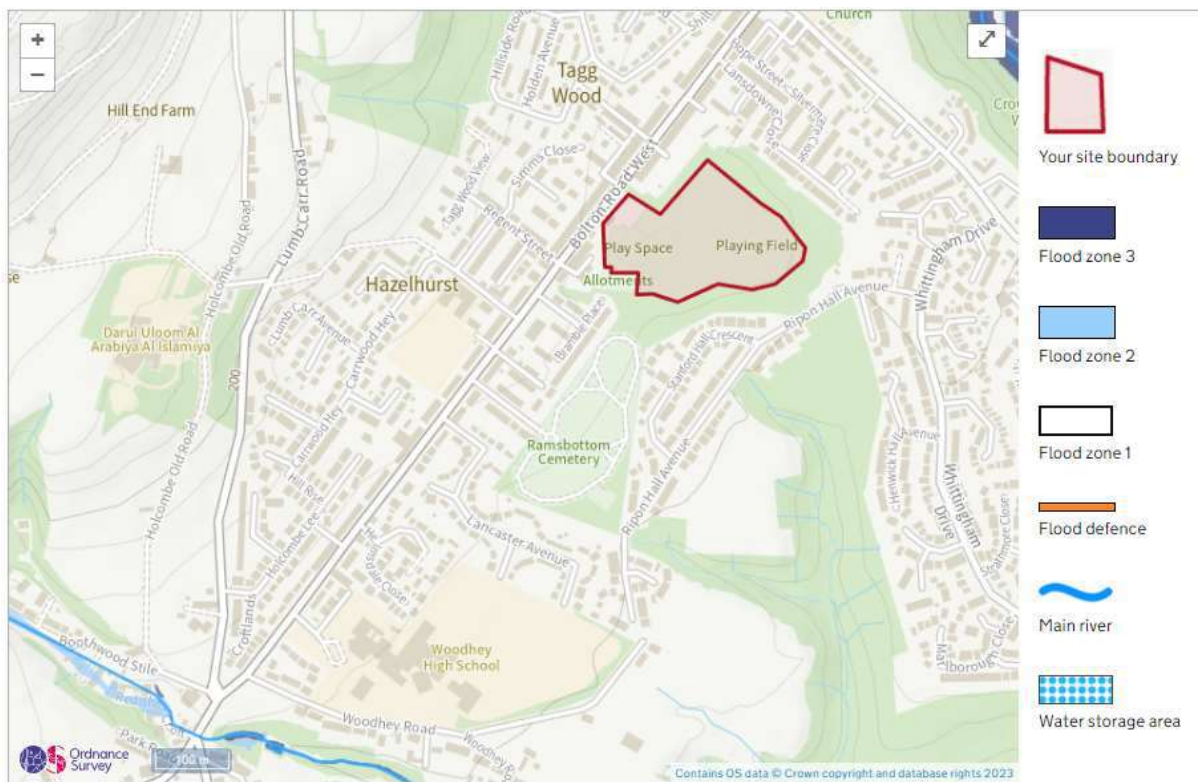
Reservoir Flooding

1. The Environment Agency website shows the development site does not lie within the flooding extents should a reservoir breach occur.
2. The site is not at risk of flooding from a reservoir failure.

Flood Zones

1. Flood zones show the probability of flooding without the presence of defences and significant man-made structures such as bridges, culverts, and rail and motorway embankments. They also show areas that may be at risk from flooding, and which might require further investigation in the form of an FRA to ascertain the exact risk of flooding the site.
2. The site sits within Flood Zone 1 which is currently defined by the Environment Agency as a low-risk zone and therefore should be treated as within a low-risk zone.
3. Figure 8 shows the Flood Zone for the proposed development. The extents of the development are outlined in red.

Figure 8 - Environment Agency Flood Zone Map



Existing Drainage

Surface Water Drainage

1. The existing United Utilities surface water drainage records are supplied in **Appendix D**.
2. Existing private surface water drainage records were not available at the time of writing this report.
3. It is assumed that the existing private surface water drainage system discharges into the adjacent UU sewer network in Bolton Road West.

Foul Water Drainage

1. The existing United Utilities foul water drainage records are supplied in **Appendix D**.
2. Existing private foul water drainage records were not available at the time of writing this report.
3. It is assumed that the existing private foul water drainage system discharges into the adjacent UU sewer network in Bolton Road West.

Proposed Drainage

Outline Surface Water Drainage Strategy

1. The Proposed Drainage Strategy drawing *23061-LE-ZZ-05-DR-D-0001* is included in Appendix E.
2. The overall proposed impermeable area within the development is 0.710ha. 0.635ha from the proposed AGP, 0.071ha from the car park extension, and 0.004ha from the proposed pavilion extension. The proposed pavilion extension, at approximately 40m², will be replacing two existing portacabins, at approximately 30m²; as this area will connect into the existing pavilion drainage system, it is deemed to be negligible and therefore not included within the MicroDrainage calculations.
3. Using the UK SuDS website's greenfield runoff tool, maximum discharge from site for a 1 in 100-year storm event was restricted to Qbar (1 in 2.3 year storm) = 8.95l/s. The greenfield runoff calculation is shown in see Appendix F.
4. Appendices G, H, I and J show the MicroDrainage Calculations, Drainage Exceedance Route, Standard Drainage Details, and SuDS Maintenance Plan, respectively.
5. The design life of the development is 20 years, therefore this falls within the central allowance for climate change as per the NPPF Climate Change guidance for peak rainfall intensity; a 35% CC rate has been used for the 1 in 30 year storm and a 40% CC rate has been used for the 1 in 100 year storm.
6. The philosophy of the surface water drainage is that the rainwater will be captured through the permeable AGP pitch which will percolate into the permeable lateral drains which will flow down to the southeast of the pitch where the flow will be directed west towards the car park.
7. The additional car park area will be captured by the means of traditional gullies and will be conveyed through a proposed petrol/oil interceptor to ensure water quality.
8. The surface water from both the pitch and car park will flow into a proposed hydrobrake chamber that will throttle discharge rates to the maximum 8.9l/s greenfield flow for a critical 1 in 100 year storm +40% CC. The flows will ultimately discharge into the United Utilities combined sewer to the west of the site, within Bolton Road West (A676).
9. The amount of storage required equates to 476m³ of volume within the AGP pitch which equates to 250mm of Type 3 clean stone with 30% voids and 40mm open textured macadam at 30% voids. This amount of storage volume negates any flooding for a critical 1 in 30-year storm +35% climate change event and a 1 in 100-year storm +40% climate change event.
10. The proposed storage also considers the additional carpark area, where flows will be backed up from the proposed hydrobrake chamber.
11. Based on the BGS mapping data it was identified that the development site is in an area which is underlain by superficial deposits of Devensian Till - Diamicton and is therefore unlikely to be suitable for the use of infiltration as a drainage method.

Sustainable Drainage Systems

1. SuDS Objectives:

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

2. SuDS Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale the SuDS should link with the individuals plot structure, planting, public open space requirements and amenity areas, gaining multiple benefits from a limited area.

3. The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
- **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

4. SuDS Site Constraints

SuDS techniques are not suitable for all sites; therefore, an assessment of the existing site is required so that SuDS limitations can be determined.

- **Land Use Characteristics:** The size and type of the development plot allows a range of source control and site control SuDS devices to be considered both above and below ground.
- **Site Characteristics:** The cohesive nature of the underlying geology indicates that soakaways are unlikely to be a viable SuDS technique.
- **Catchment Characteristics:** The site is currently undeveloped and as such greenfield runoff rates will apply.
- **Environmental and Amenity Performance:** Safety to all future users is paramount when including SuDS within the overall development and so best practice guidance will be incorporated so that these devices blend into the surroundings without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

5. SuDS Methods

Figure 12 and Figure 13, on the next pages, provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set

out options to be considered at the planning stage with consideration to time constraints, viability, and lifetime maintenance of the development.

Figure 12 - Surface SuDS Methods

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not Suitable:</u> - Although useable their benefit would be insignificant for this project. - Additional costs of installation would influence the feasibility of the development. - Not relevant to this scheme.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Not Suitable:</u> Although useable they are not necessary for this scheme.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have significant effect on viability of the development. - Running and maintenance costs would likely not be acceptable to the client. - Not relevant to this scheme.

Figure 12 Continued - Surface SuDS Methods

Method	Comment	Suitability for Development
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> - Infiltration viability unknown. - Percolation testing on-site required to confirm infiltration rate. - BGS geology is not suitable.
Permeable Surfacing	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or use of plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Suitable:</u> - Permeable surfacing is preferred due to specifics of scheme and AGP. - Stone bedding with 30% voids can be used for storage and water quality. - Infiltration in to below ground not deemed possible unless infiltration testing states otherwise.
Swales, basins and ponds	- Provide areas for above ground surface runoff storage. - Swales also allow filtering of particulate matter, improving water quality.	<u>Not Suitable:</u> - The requirement for swales, basins and ponds are not necessary. - Open green space is limited on the proposed site.
Bio-Retention	Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not Suitable:</u> Rain gardens could make an attractive feature while improving water quality but are not deemed necessary for this project.

Figure 13 - Sub-surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	- Suitable for sites with insufficient space for basins etc. - Suitable for sites where topography prevents the use of open basins etc.	<u>Not Suitable:</u> - The use of geocellular attenuation could be used to possible to retain excess storm water. Use of ponds is preferred, but not suitable due to site constraints. - Not relevant to this scheme.
Large Diameter Pipes / Culverts	- Suitable for sites with insufficient space for basins etc. - Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. - Generally suitable for adoption by the statutory water company.	<u>Suitable:</u> - The use of oversized pipes may be possible to retain excess storm water. - Used primarily on adopted drainage networks so may be suitable for this development.

6. SuDS Hierarchal Approach

Based on the SuDS assessment in **Figure 12** and **Figure 13**, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below (see **Figure 14**).

Figure 14 - SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Underlying bedrock geology contains deposits of Devensian Till (boulder clay). Infiltration highly unlikely and therefore not feasible.
Connection to Watercourse	No	No watercourses are within the existing site boundary. Connection to a watercourse would require crossing third party land which is not considered feasible.
Connection to Surface Water Sewer	Yes	Existing private surface water manhole is located to the northeast of the site but will need more investigative works to confirm as suitable discharge location.
Connection to a Combined Sewer	Yes	UU combined sewer pipe is within existing site but not the current preferred method of discharge.

7. SuDS Design Philosophy

The SuDS assessment and hierarchal approach discussed in **Figures 12, 13 and 14** have defined the overall SuDS strategy. Thus, the SuDS philosophy for the main development site is the promotion of Source Control and Site Control techniques, to reduce the risk of both site and downstream flooding.

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at any SuDS facilities.
- Site control mostly in the form an attenuation within AGP stone bedding.
- Connections into existing private drainage potentially possible downstream.

Conclusion

Flood Risk Assessment

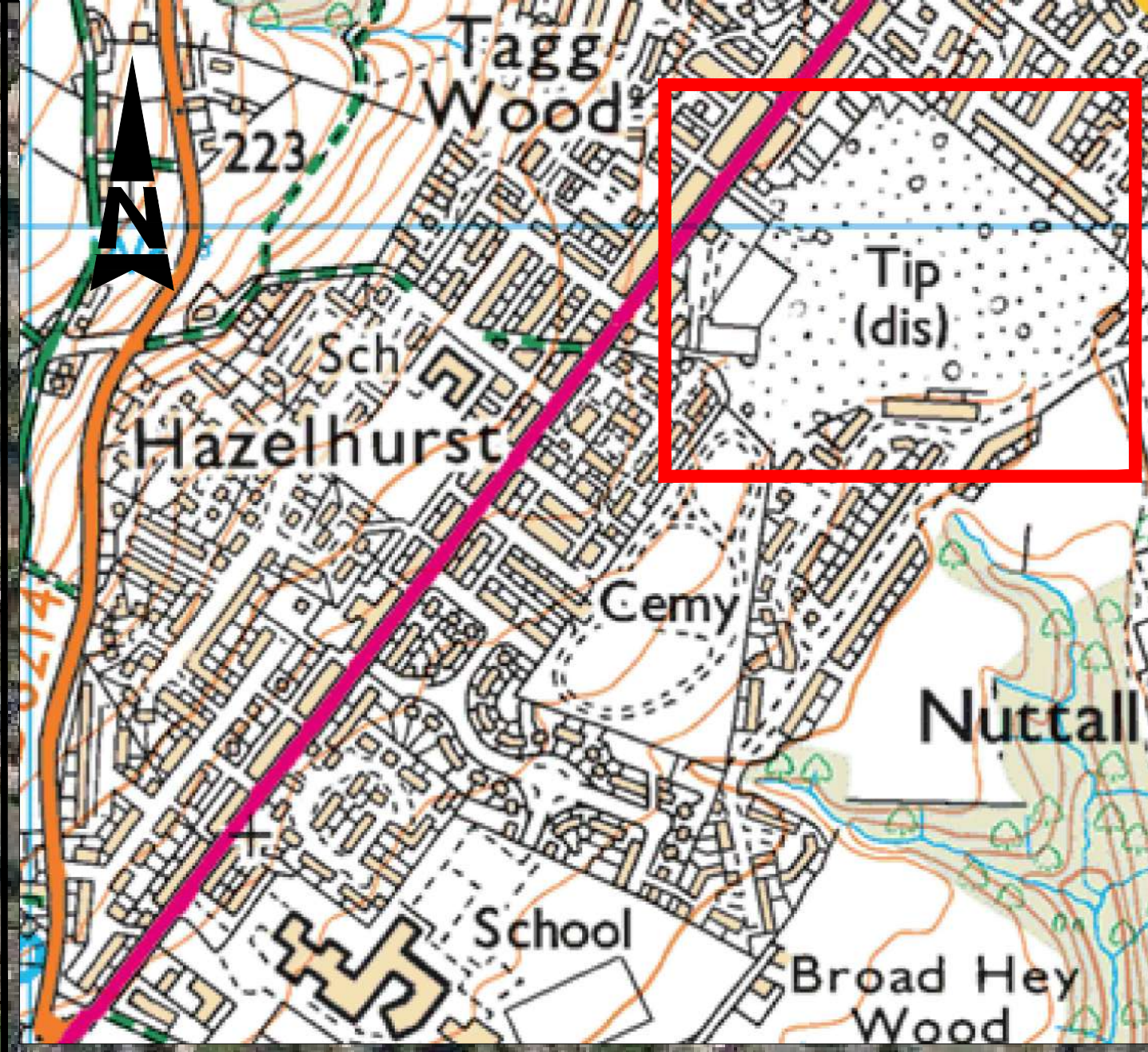
1. The risk of river, reservoir, groundwater, and surface water runoff has been assessed and measures have been recommended to minimise this flood risk to/from the site.
2. In summary:
 - The proposed development site is located inside Flood Zone 1 and is therefore currently defined as land having a less than 1 in 1,000 annual probability of river or sea flooding;
 - There are no records of fluvial flooding, or sewer surface water flooding at the existing site;
 - There is no risk of a reservoir breach flooding the site when river levels are normal;
 - The site is not affected by groundwater flooding;
 - The proposals for the site will not impact on the current flood risk.
 - The proposals have minimal impact on increasing the existing flood risk from any source, with minimal impact of causing flooding elsewhere.
 - Using Table C to determine the appropriateness of the drainage, it is concluded that the development is appropriate.

Table C. Appropriateness of Development

Source/Pathway	Significant?	Comment/Reason
Tidal/Coastal	No	The site is not located in a coastal location; therefore, the development has a very low risk of tidal/coastal flooding.
Pluvial	No	Environment Agency Mapping indicates that the probability surface water flooding is classified as very low.
Fluvial	No	Environment Agency Mapping indicates that the risk of flooding from nearby rivers is classified as very low.
Infrastructure Failure: Reservoir	No	Environment Agency Mapping indicates that the development site does not lie within the flooding extents should a reservoir breach occur when river levels are normal.

Appendices

Appendix A – Location Plan

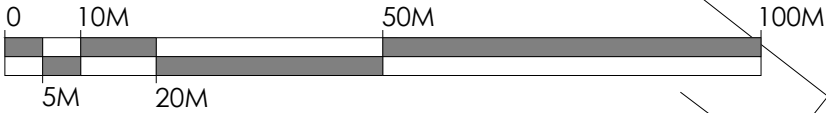


- GENERAL NOTES:
1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
 2. DO NOT SCALE FROM THIS DRAWING. WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS, SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.

EASTINGS: 378703, NORTHINGS: 415953
NEAREST POSTCODE: BL0 9NX
GRID REF: SD787159

S2	FOR INFORMATION		03.10.23	WF	
Stat	Purpose of Issue		Date	Auth	
P01	FIRST ISSUE	WO	03.10.23	WF	WF
Rev	Description	By	Date	Chk'd	Auth
LYNAS ENGINEERS Lynas Engineers Wilton Centre Redcar TS10 4RF Tel: +44 (0)1642 438273 www.lynasengineers.com Copyright © Lynas Engineers Limited (2020)					
Client STEVE WELLS ASSOCIATES making sport happen					
Project TOP PARK, BURY					
Title SITE LOCATION PLAN					
Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised	
A1	1:1000	WO	WF	WF	
		Date 03.10.23	Date 03.10.23	Date 03.10.23	
Status	Drawing Number				Rev
S2	23061-LE-ZZ-00-DR-D-0001				P01

Appendix B – Proposed Development Layout



Copyright Notice: This drawing is the copyright of Steve Wells Associates and shall not be reproduced without permission. © 2023 Dwg, PurposeFeasibility			Project Proposed AGP and Pavilion Extension Top Park, Bolton Road West Ramsbottom, Bury BL0 9PE			Client Bury Council Dwg, Title Proposed Site Plan - Option B		
A	Sheffield hoops added	10/23						
No.	Revision / Issue	Date						

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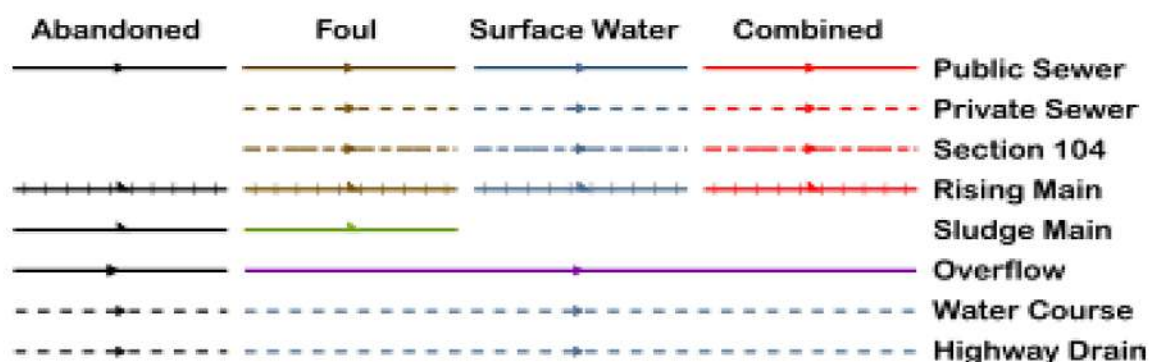
Churchill House, Mill Hill, Pontefract, West Yorkshire,
WF8 4HY t : 01977 797258 e : mail@stevewells-associates.com

Dwg. No. 205-087-1008		Rev. A	
Scale 1:1000 @ A3	Date August 2023		
Drawn by GSB	Checked DKW		

Appendix C – Topographical Survey Plan

Appendix D – Existing United Utilities Drainage Layout

Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	
Drop Shaft	Change of Characteristic
Orifice Plate	

Appendix E – Proposed Drainage Layout

Appendix F – Greenfield run-off Calculation

Calculated by:	Max Robson
Site name:	Top Park
Site location:	Bury

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

Site Details

Latitude:	53.64022° N
Longitude:	2.3236° W
Reference:	3833461790
Date:	Oct 03 2023 15:49

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.706
-----------------------	-------

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	5	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.53	0.53

Hydrological characteristics

	Default	Edited
SAAR (mm):	1278	1278
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is $SPR/SPRHOST \leq 0.3$?

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

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):	8.95	8.95
1 in 1 year (l/s):	7.78	7.78
1 in 30 years (l/s):	15.21	15.21
1 in 100 year (l/s):	18.61	18.61
1 in 200 years (l/s):	21.2	21.2

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix G – MicroDrainage Calculations

Lynas Engineers		Page 1
Wilton Centre	Top Park, Bury	
Redcar	Surface Water	
TS10 4RF	Drainage Design Rev-P02	
Date 16/10/2023	Designed by MR	
File 23061-LE-ZZ-05-CA-D-0001-SURFAC...	Checked by WF	
XP Solutions	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales			
Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	40
Ratio R	0.250	Minimum Backdrop Height (m)	20.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	20.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
SW1.000	2.600	0.006	433.3	0.000	5.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.001	10.000	0.020	500.0	0.071	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.002	10.000	0.020	500.0	0.063	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.003	10.000	0.020	500.0	0.062	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.004	10.000	0.020	500.0	0.061	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.005	10.000	0.020	500.0	0.063	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.006	10.000	0.020	500.0	0.063	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.007	10.000	0.020	500.0	0.063	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.008	10.000	0.020	500.0	0.069	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.009	10.000	0.020	500.0	0.061	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.010	5.200	0.010	520.0	0.063	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.011	91.125	0.228	400.0	0.000	0.00	0.0	0.600	o	160	Pipe/Conduit	
SW1.012	50.202	0.126	400.0	0.040	0.00	0.0	0.600	o	160	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SW1.000	50.00	5.09	162.646	0.000	0.0	0.0	0.0	0.50	10.0	0.0
SW1.001	50.00	5.45	162.640	0.071	0.0	0.0	3.9	0.46	9.3«	13.5
SW1.002	50.00	5.81	162.620	0.134	0.0	0.0	7.3	0.46	9.3«	25.5
SW1.003	50.00	6.17	162.600	0.197	0.0	0.0	10.6	0.46	9.3«	37.3
SW1.004	50.00	6.53	162.580	0.258	0.0	0.0	14.0	0.46	9.3«	48.9
SW1.005	50.00	6.89	162.560	0.321	0.0	0.0	17.4	0.46	9.3«	60.9
SW1.006	50.00	7.25	162.540	0.385	0.0	0.0	20.8	0.46	9.3«	72.9
SW1.007	50.00	7.61	162.520	0.448	0.0	0.0	24.3	0.46	9.3«	84.9
SW1.008	50.00	7.97	162.500	0.517	0.0	0.0	28.0	0.46	9.3«	98.0
SW1.009	50.00	8.33	162.480	0.578	0.0	0.0	31.3	0.46	9.3«	109.7
SW1.010	50.00	8.52	162.470	0.641	0.0	0.0	34.7	0.45	9.1«	121.6
SW1.011	50.00	11.46	162.460	0.641	0.0	0.0	34.7	0.52	10.4«	121.6
SW1.012	50.00	13.07	162.232	0.681	0.0	0.0	36.9	0.52	10.4«	129.2

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SWS1.01	163.187	0.541	Open Manhole	1200	SW1.000	162.646	160				
SWS1.02	163.165	0.525	Junction		SW1.001	162.640	160	SW1.000	162.640	160	
SWS1.03	163.165	0.545	Junction		SW1.002	162.620	160	SW1.001	162.620	160	
SWS1.04	163.165	0.565	Junction		SW1.003	162.600	160	SW1.002	162.600	160	
SWS1.05	163.165	0.585	Junction		SW1.004	162.580	160	SW1.003	162.580	160	
SWS1.06	163.165	0.605	Junction		SW1.005	162.560	160	SW1.004	162.560	160	
SWS1.07	163.165	0.625	Junction		SW1.006	162.540	160	SW1.005	162.540	160	
SWS1.08	163.165	0.645	Junction		SW1.007	162.520	160	SW1.006	162.520	160	
SWS1.09	163.165	0.665	Junction		SW1.008	162.500	160	SW1.007	162.500	160	
SWS1.10	163.165	0.685	Junction		SW1.009	162.480	160	SW1.008	162.480	160	
SWS1.11	163.165	0.705	Junction		SW1.010	162.470	160	SW1.009	162.460	160	
SWS1.12	163.215	0.755	Open Manhole	1200	SW1.011	162.460	160	SW1.010	162.460	160	
SWS1.13	164.865	2.633	Open Manhole	1200	SW1.012	162.232	160	SW1.011	162.232	160	
SW	166.100	3.994	Open Manhole	0		OUTFALL		SW1.012	162.106	160	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW1.000	o	160	SWS1.01	163.187	162.646	0.381	Open Manhole	1200
SW1.001	o	160	SWS1.02	163.165	162.640	0.365	Junction	
SW1.002	o	160	SWS1.03	163.165	162.620	0.385	Junction	
SW1.003	o	160	SWS1.04	163.165	162.600	0.405	Junction	
SW1.004	o	160	SWS1.05	163.165	162.580	0.425	Junction	
SW1.005	o	160	SWS1.06	163.165	162.560	0.445	Junction	
SW1.006	o	160	SWS1.07	163.165	162.540	0.465	Junction	
SW1.007	o	160	SWS1.08	163.165	162.520	0.485	Junction	
SW1.008	o	160	SWS1.09	163.165	162.500	0.505	Junction	
SW1.009	o	160	SWS1.10	163.165	162.480	0.525	Junction	
SW1.010	o	160	SWS1.11	163.165	162.470	0.535	Junction	
SW1.011	o	160	SWS1.12	163.215	162.460	0.595	Open Manhole	1200
SW1.012	o	160	SWS1.13	164.865	162.232	2.473	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW1.000	2.600	433.3	SWS1.02	163.165	162.640	0.365	Junction	
SW1.001	10.000	500.0	SWS1.03	163.165	162.620	0.385	Junction	
SW1.002	10.000	500.0	SWS1.04	163.165	162.600	0.405	Junction	
SW1.003	10.000	500.0	SWS1.05	163.165	162.580	0.425	Junction	
SW1.004	10.000	500.0	SWS1.06	163.165	162.560	0.445	Junction	
SW1.005	10.000	500.0	SWS1.07	163.165	162.540	0.465	Junction	
SW1.006	10.000	500.0	SWS1.08	163.165	162.520	0.485	Junction	
SW1.007	10.000	500.0	SWS1.09	163.165	162.500	0.505	Junction	
SW1.008	10.000	500.0	SWS1.10	163.165	162.480	0.525	Junction	
SW1.009	10.000	500.0	SWS1.11	163.165	162.460	0.545	Junction	
SW1.010	5.200	520.0	SWS1.12	163.215	162.460	0.595	Open Manhole	1200
SW1.011	91.125	400.0	SWS1.13	164.865	162.232	2.473	Open Manhole	1200
SW1.012	50.202	400.0	SW	166.100	162.106	3.834	Open Manhole	0

Lynas Engineers		Page 4
Wilton Centre Redcar TS10 4RF	Top Park, Bury Surface Water Drainage Design Rev-P02	
Date 16/10/2023 File 23061-LE-ZZ-05-CA-D-0001-SURFAC...	Designed by MR Checked by WF	
XP Solutions	Network 2018.1	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	User	-	100	0.071	0.071	0.071
1.002	User	-	100	0.063	0.063	0.063
1.003	User	-	100	0.062	0.062	0.062
1.004	User	-	100	0.061	0.061	0.061
1.005	User	-	100	0.063	0.063	0.063
1.006	User	-	100	0.063	0.063	0.063
1.007	User	-	100	0.063	0.063	0.063
1.008	User	-	100	0.069	0.069	0.069
1.009	User	-	100	0.061	0.061	0.061
1.010	User	-	100	0.063	0.063	0.063
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.040	0.040	0.040
				Total	Total	Total
				0.681	0.681	0.681

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SW1.012	SW	166.100	162.106	162.000	0	0

Lynas Engineers		Page 5
Wilton Centre	Top Park, Bury	
Redcar	Surface Water	
TS10 4RF	Drainage Design Rev-P02	
Date 16/10/2023	Designed by MR	
File 23061-LE-ZZ-05-CA-D-0001-SURFAC...	Checked by WF	
XP Solutions	Network 2018.1	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SWS1.13, DS/PN: SW1.012, Volume (m³): 4.8

Unit Reference	MD-SHE-0123-8900-2000-8900
Design Head (m)	2.000
Design Flow (l/s)	8.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	123
Invert Level (m)	162.232
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	8.9	Kick-Flo®	1.101	6.7
Flush-Flo™	0.536	8.5	Mean Flow over Head Range	-	7.6

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)	Depth (m)	Flow (l/s)
0.100	4.4	0.800	8.2	2.000	8.9	4.000	12.4	7.000	16.1
0.200	7.3	1.000	7.5	2.200	9.3	4.500	13.1	7.500	16.7
0.300	8.0	1.200	7.0	2.400	9.7	5.000	13.7	8.000	17.2
0.400	8.4	1.400	7.5	2.600	10.1	5.500	14.4	8.500	17.7
0.500	8.5	1.600	8.0	3.000	10.8	6.000	15.0	9.000	18.2
0.600	8.5	1.800	8.5	3.500	11.6	6.500	15.6	9.500	18.7

Volume Summary (Static)

Length Calculations based on Centre-Centre

Storage			
Pipe Number	USMH Name	Structure Volume (m³)	Total Volume (m³)
SW1.000	SWS1.01	0.000	0.000
SW1.001	SWS1.02	53.250	53.250
SW1.002	SWS1.03	47.250	47.250
SW1.003	SWS1.04	46.500	46.500
SW1.004	SWS1.05	45.750	45.750
SW1.005	SWS1.06	47.250	47.250
SW1.006	SWS1.07	47.250	47.250
SW1.007	SWS1.08	47.250	47.250
SW1.008	SWS1.09	51.750	51.750
SW1.009	SWS1.10	45.750	45.750
SW1.010	SWS1.11	47.250	47.250
SW1.011	SWS1.12	0.000	0.000
SW1.012	SWS1.13	0.000	0.000
Total		479.250	479.250

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

Simulation Criteria			
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	1	Number of Storage Structures	10
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0
Synthetic Rainfall Details			
Rainfall Model	FSR M5-60 (mm)	19.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R	0.250
		Cv (Winter)	0.850
Margin for Flood Risk Warning (mm)			300.0
Analysis Timestep	2.5	Second Increment (Extended)	
DTS Status			ON
DVD Status			OFF
Inertia Status			OFF
Profile(s)		Summer and Winter	
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440		
Return Period(s) (years)		1, 30, 100	
Climate Change (%)		0, 35, 40	

										Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	
SW1.000	SWS1.01	240 Winter	1	+0%	1/15 Summer				162.835	0.029	0.000	
SW1.001	SWS1.02	240 Winter	1	+0%	1/15 Summer				162.835	0.035	0.000	
SW1.002	SWS1.03	240 Winter	1	+0%	1/15 Summer				162.834	0.054	0.000	
SW1.003	SWS1.04	240 Winter	1	+0%	1/15 Summer				162.832	0.072	0.000	
SW1.004	SWS1.05	240 Winter	1	+0%	1/15 Summer				162.830	0.090	0.000	
SW1.005	SWS1.06	120 Winter	1	+0%	1/15 Summer				162.826	0.106	0.000	
SW1.006	SWS1.07	120 Winter	1	+0%	1/15 Summer				162.823	0.123	0.000	
SW1.007	SWS1.08	120 Winter	1	+0%	1/15 Summer				162.819	0.139	0.000	
SW1.008	SWS1.09	60 Winter	1	+0%	1/15 Summer				162.815	0.155	0.000	
SW1.009	SWS1.10	60 Winter	1	+0%	1/15 Summer				162.809	0.169	0.000	
SW1.010	SWS1.11	30 Winter	1	+0%	1/15 Summer				162.804	0.174	0.000	
SW1.011	SWS1.12	30 Winter	1	+0%	1/15 Summer				162.808	0.188	0.000	
SW1.012	SWS1.13	30 Winter	1	+0%	1/15 Summer				162.833	0.441	0.000	

Pipe						
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SWS1.01	0.03		0.4	SURCHARGED	
SW1.001	SWS1.02	0.86		6.3	SURCHARGED*	
SW1.002	SWS1.03	0.95		6.9	SURCHARGED*	
SW1.003	SWS1.04	1.01		7.3	SURCHARGED*	
SW1.004	SWS1.05	1.04		7.6	SURCHARGED*	
SW1.005	SWS1.06	1.06		7.7	SURCHARGED*	
SW1.006	SWS1.07	1.08		7.9	SURCHARGED*	
SW1.007	SWS1.08	1.09		7.9	SURCHARGED*	
SW1.008	SWS1.09	1.20		8.8	SURCHARGED*	
SW1.009	SWS1.10	1.34		9.7	SURCHARGED*	
SW1.010	SWS1.11	0.98		12.5	SURCHARGED*	
SW1.011	SWS1.12	1.05		10.7	SURCHARGED	
SW1.012	SWS1.13	0.83		8.5	SURCHARGED	

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 Online Controls	1	Number of Storage Structures	10
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0
Synthetic Rainfall Details			
Rainfall Model	FSR M5-60 (mm)	19.000	Cv (Summer) 0.750
Region	England and Wales	Ratio R	0.250
		Cv (Winter)	0.850
Margin for Flood Risk Warning (mm)			300.0
Analysis Timestep	2.5	Second Increment (Extended)	
DTS Status			ON
DVD Status			OFF
Inertia Status			OFF
Profile(s)		Summer and Winter	
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440		
Return Period(s) (years)		1, 30, 100	
Climate Change (%)		0, 35, 40	

										Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	
SW1.000	SWS1.01	360 Winter	30	+35%	1/15 Summer				162.963	0.157	0.000	
SW1.001	SWS1.02	360 Winter	30	+35%	1/15 Summer				162.963	0.163	0.000	
SW1.002	SWS1.03	360 Winter	30	+35%	1/15 Summer				162.961	0.181	0.000	
SW1.003	SWS1.04	360 Winter	30	+35%	1/15 Summer				162.958	0.198	0.000	
SW1.004	SWS1.05	360 Winter	30	+35%	1/15 Summer				162.952	0.212	0.000	
SW1.005	SWS1.06	360 Winter	30	+35%	1/15 Summer				162.946	0.226	0.000	
SW1.006	SWS1.07	360 Winter	30	+35%	1/15 Summer				162.937	0.237	0.000	
SW1.007	SWS1.08	360 Winter	30	+35%	1/15 Summer				162.927	0.247	0.000	
SW1.008	SWS1.09	360 Winter	30	+35%	1/15 Summer				162.915	0.255	0.000	
SW1.009	SWS1.10	240 Winter	30	+35%	1/15 Summer				162.901	0.261	0.000	
SW1.010	SWS1.11	240 Winter	30	+35%	1/15 Summer				162.885	0.255	0.000	
SW1.011	SWS1.12	360 Winter	30	+35%	1/15 Summer				162.945	0.325	0.000	
SW1.012	SWS1.13	15 Winter	30	+35%	1/15 Summer				163.649	1.257	0.000	

				Pipe			Level
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Level Exceeded	
SW1.000	SWS1.01	0.00		0.0	FLOOD RISK		
SW1.001	SWS1.02	0.14		1.0	FLOOD RISK*		
SW1.002	SWS1.03	0.26		1.9	FLOOD RISK*		
SW1.003	SWS1.04	0.39		2.8	FLOOD RISK*		
SW1.004	SWS1.05	0.52		3.8	FLOOD RISK*		
SW1.005	SWS1.06	0.66		4.8	FLOOD RISK*		
SW1.006	SWS1.07	0.80		5.9	FLOOD RISK*		
SW1.007	SWS1.08	0.96		7.0	FLOOD RISK*		
SW1.008	SWS1.09	1.23		9.0	FLOOD RISK*		
SW1.009	SWS1.10	1.16		8.5	FLOOD RISK*		
SW1.010	SWS1.11	0.75		9.5	FLOOD RISK*		
SW1.011	SWS1.12	0.85		8.7	FLOOD RISK		
SW1.012	SWS1.13	0.84		8.5	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 1

Number of Storage Structures 10

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000

Cv (Summer) 0.750

Region England and Wales

Ratio R 0.250

Cv (Winter) 0.850

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

DVD Status OFF

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 35, 40

									Water	Surcharged	Flooded	
	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)
SW1.000	SWS1.01	480	Winter	100	+40%	1/15	Summer			163.037	0.231	0.000
SW1.001	SWS1.02	480	Winter	100	+40%	1/15	Summer			163.037	0.237	0.000
SW1.002	SWS1.03	480	Winter	100	+40%	1/15	Summer			163.035	0.255	0.000
SW1.003	SWS1.04	480	Winter	100	+40%	1/15	Summer			163.031	0.271	0.000
SW1.004	SWS1.05	480	Winter	100	+40%	1/15	Summer			163.025	0.285	0.000
SW1.005	SWS1.06	480	Winter	100	+40%	1/15	Summer			163.017	0.297	0.000
SW1.006	SWS1.07	360	Winter	100	+40%	1/15	Summer			163.008	0.308	0.000
SW1.007	SWS1.08	360	Winter	100	+40%	1/15	Summer			162.997	0.317	0.000
SW1.008	SWS1.09	360	Winter	100	+40%	1/15	Summer			162.984	0.324	0.000
SW1.009	SWS1.10	360	Winter	100	+40%	1/15	Summer			162.968	0.328	0.000
SW1.010	SWS1.11	360	Winter	100	+40%	1/15	Summer			162.951	0.321	0.000
SW1.011	SWS1.12	960	Winter	100	+40%	1/15	Summer			162.984	0.364	0.000
SW1.012	SWS1.13	15	Winter	100	+40%	1/15	Summer			164.059	1.667	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
SW1.000	SWS1.01	0.00		0.0	FLOOD RISK
SW1.001	SWS1.02	0.13		0.9	FLOOD RISK*
SW1.002	SWS1.03	0.24		1.8	FLOOD RISK*
SW1.003	SWS1.04	0.36		2.6	FLOOD RISK*
SW1.004	SWS1.05	0.47		3.4	FLOOD RISK*
SW1.005	SWS1.06	0.58		4.2	FLOOD RISK*
SW1.006	SWS1.07	0.74		5.4	FLOOD RISK*
SW1.007	SWS1.08	0.87		6.4	FLOOD RISK*
SW1.008	SWS1.09	1.01		7.4	FLOOD RISK*
SW1.009	SWS1.10	1.14		8.3	FLOOD RISK*
SW1.010	SWS1.11	0.78		9.9	FLOOD RISK*
SW1.011	SWS1.12	0.86		8.8	FLOOD RISK
SW1.012	SWS1.13	0.84		8.5	SURCHARGED

Appendix H – Exceedance Route

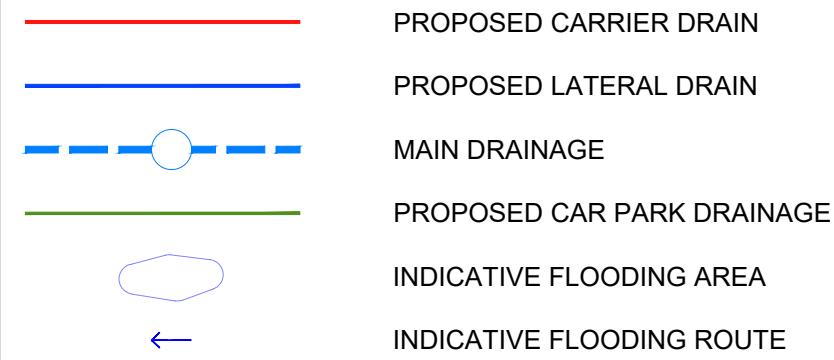


EXCEEDANCE PLAN
SCALE 1:250

GENERAL NOTES:

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING. WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN METRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS, SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.
3. CARRIER DRAIN WILL BE A CONTINUOUS PIPE FROM PIPE S1.001-S1.010. INDIVIDUAL PIPES ARE SHOWN TO DISPLAY LATERAL DRAINAGE CONNECTIONS.

PROPOSED DRAINAGE KEY:



DRAINAGE NOTES:

1. PROPOSED AGP TO BE CONSTRUCTED WITH 250mm OF TYPE B CLEAN STONE WITH 30% VOIDS.

S2	FOR INFORMATION		16.10.23	WF	
S2	FOR INFORMATION		25.09.23	WF	
Stat	Purpose of Issue		Date	Auth	
P02	DRAINAGE LAYOUT AMENDED	MR	16.10.23	WF	WF
P01	FIRST ISSUE	MR	25.09.23	WF	WF



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Project

TOP PARK, BURY

Title

EXCEEDANCE PLAN

Sheet Size A1	Original Scale AS SHOWN	Designed/Drawn	Checked	Authorised
		MR	WF	WF
	Date 25.09.23	Date 25.09.23	Date 25.09.23	
Status	Drawing Number			Rev
S2	23061-LE-ZZ-05-DR-D-0002			P02

Appendix I – Standard Drainage Details



1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
2. DO NOT SCALE FROM THIS DRAWING. WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS, SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.



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Title

PROPOSED DRAINAGE LAYOUT

Sheet Size A1	Original Scale AS SHOWN	Designed/Drawn MR	Checked WF	Authorised WF
		Date 25.09.23	Date 25.09.23	Date 25.09.23
Status S2	Drawing Number 23061-LE-ZZ-05-DR-D-0003			Rev P01

MORTAR BEDDING AND HAUNCHING TO COVER AND FRAME (UNDER VEHICULAR AREAS, MORTAR TO BE POLYESTER RESIN).

MINIMUM 2 COURSES OF CLASS B ENGINEERING BRICKS OR PRECAST CONCRETE COVER FRAME SEATING RINGS.

675 MM MAXIMUM TO FIRST STEP RUNG FROM COVER LEVEL.

150 MM CONCRETE SURROUND, CLASS GEN3 (DESIGNED TO BRE SPECIAL DIGEST 1, CONCRETE IN AGGRESSIVE GROUND).

LIFTING EYES IN CONCRETE RINGS TO BE POINTED.

HIGH STRENGTH CONCRETE TOPPING TO BE BROUGHT UP TO A DENSE, SMOOTH FACE.

INLET PIPE SEE DRAINAGE PLAN

INVERT LEVEL

60°

200

THE BOTTOM OF THE PRECAST MANHOLE RING TO BE BUILT INTO BASE CONCRETE, MINIMUM 75 MM.

225 MM MINIMUM THICKNESS GEN3 CONCRETE BASE ON 50MM BLINDING.

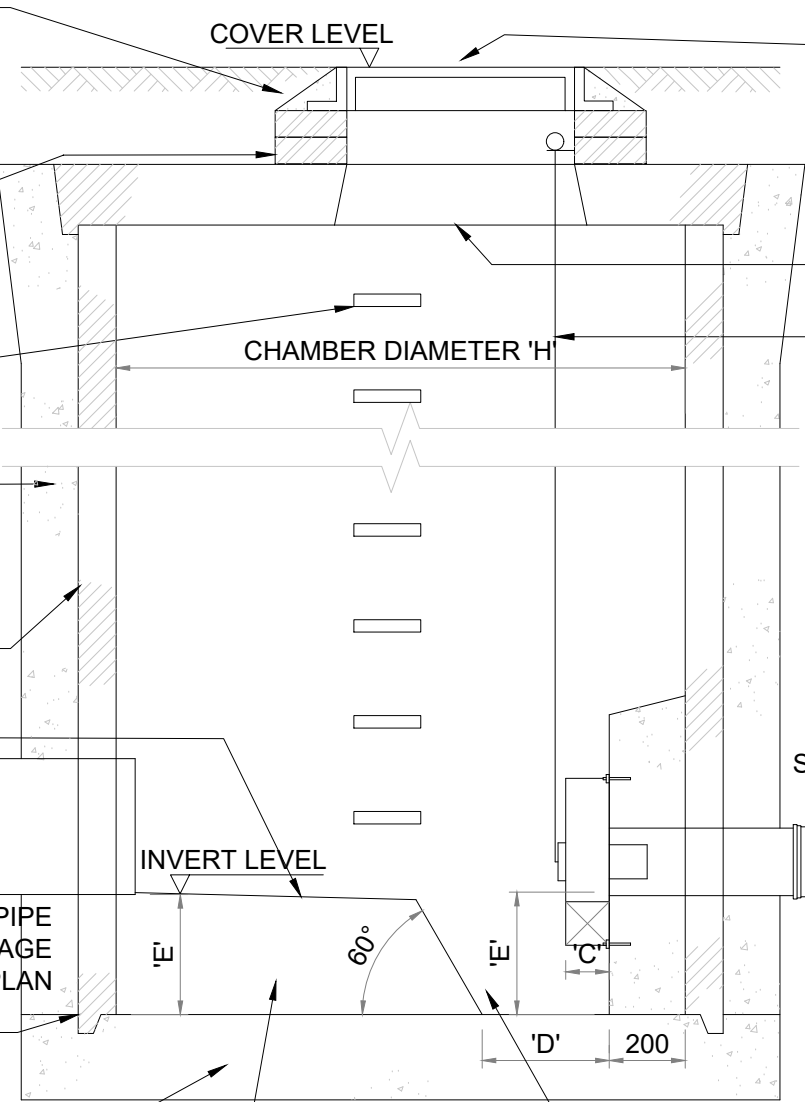
MASS CONCRETE GEN3

PRECAST CONCRETE MANHOLE SECTIONS AND COVER SLAB TO BE BEDDED WITH MORTAR, PLASTOMERIC OR ELASTOMERIC SEAL CONFORMING TO BS EN 1917 AND BS 5911-3.

INLET PIPE SEE DRAINAGE PLAN

ROCKER PIPE

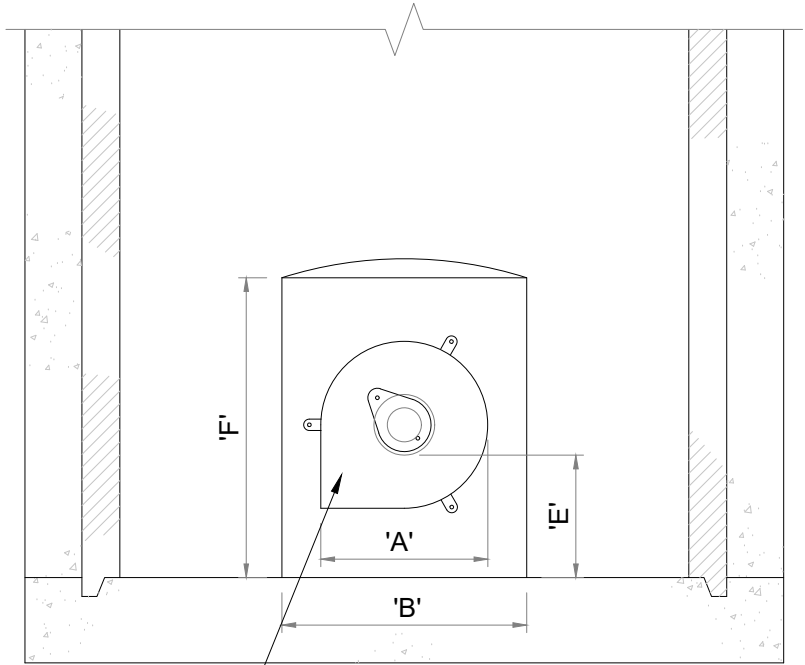
INLET PIPE TO TERMINATE 50 MM BEYOND FACE OF CONCRETE CHAMBER.



600 X 600 MM CLEAR OPENING COVER COMPLYING WITH BS 124 AND BS 7903. REFER TO MANHOLE SCHEDULE FOR DETAILS.

MINIMUM CLEAR ACCESS 600 MM

PIVOTING BYPASS DOOR OPERATING STEEL ROPE.



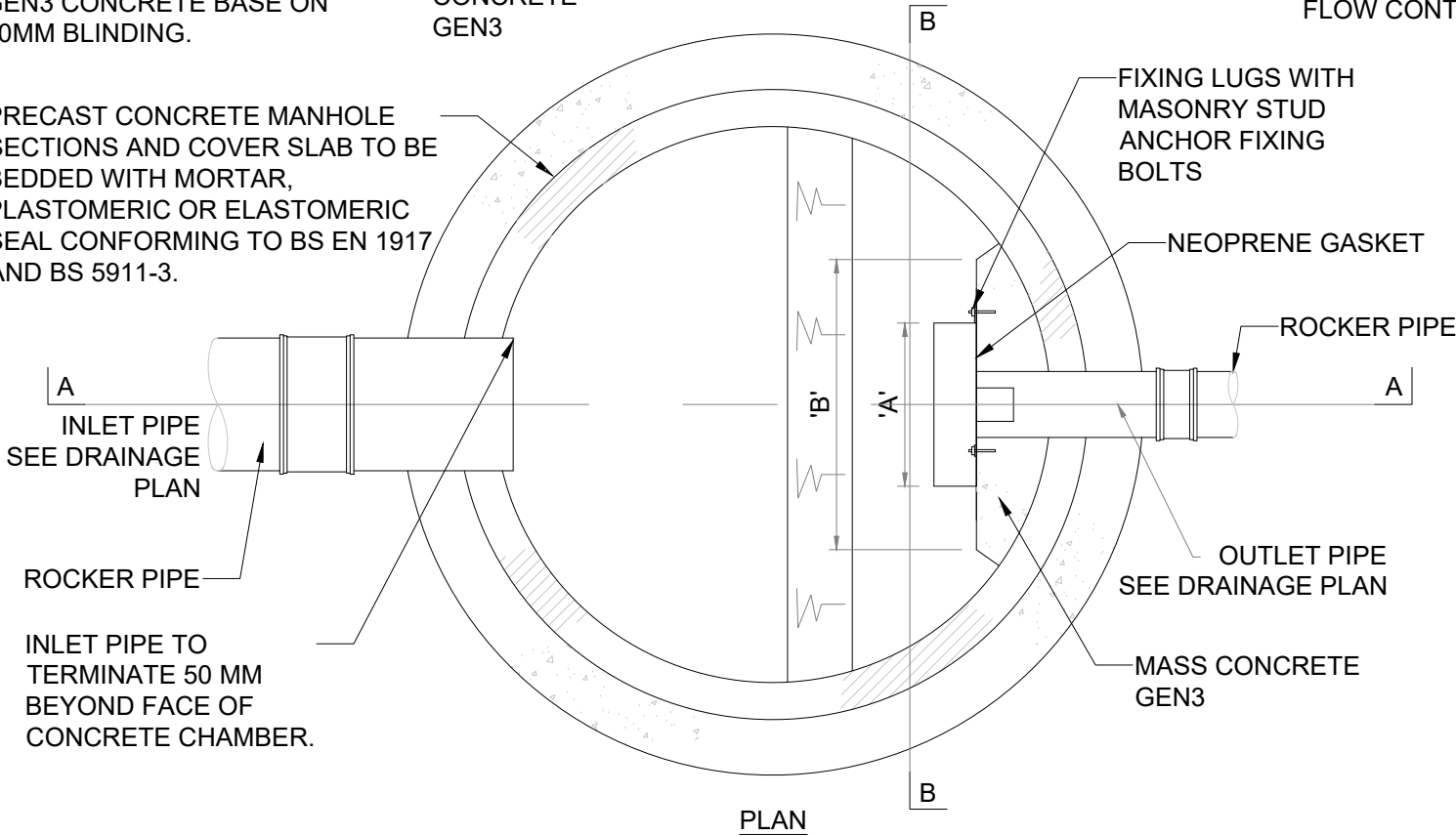
HYDROBRAKE OR EQUIVALENT VORTEX FLOW CONTROL DEVICE.

SECTION B-B

HYDROBRAKE TECHNICAL SPECIFICATION

GRADE 304 STAINLESS STEEL VORTEX FLOW CONTROL UNIT WITH INTEGRAL STAINLESS STEEL PIVOTING BYPASS DOOR ALLOWING CLEAR LINE OF SIGHT THROUGH TO OUTLET, C/W STAINLESS STEEL OPERATING ROPE. STAINLESS STEEL FIXINGS AND NEOPRENE GASKET SEAL TO OUTLET.

Manhole Reference:		S1.13	
Cover Level (m):	164.865	Invert Level (m):	162.232
Hydrobrake Reference:		SHE-0123-8900-2000-8900	
Design Head (m):		2.0	
Design Flow (l/s):		8.9	
Inlet Pipe diameter (mm):		160	
Outlet Pipe diameter (mm):		160	
Dimension 'A' (mm):	745	Dimension 'E' (mm):	435
Dimension 'B' (mm):	950	Dimension 'F' (mm):	1095
Dimension 'C' (mm):	130	Dimension 'G' (mm):	N/A
Dimension 'D' (mm):	260	Dimension 'H' (mm):	1500



PLAN
HYDROBRAKE MANHOLE
SCALE 1:20

GENERAL NOTES:

- DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
- DO NOT SCALE FROM THIS DRAWING, WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS, SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.

S2	FOR INFORMATION			16.10.23	W																																																																
S2	FOR INFORMATION			25.09.23	W																																																																
Stat	Purpose of Issue			Date	Aut																																																																
P02	HYDROBRAKE DETAIL AMENDED	MR	16.10.23	WF	W																																																																
P01	FIRST ISSUE	MR	25.09.23	WF	W																																																																
Rev	Description	By	Date	Chk'd	Aut																																																																
 Lynas Engineers Wilton Centre Redcar TS10 4RF Tel: +44 (0)1642 438273 www.lynasengineers.com Copyright © Lynas Engineers Limited (2023) <tr><td colspan="6">Client</td></tr> <tr><td colspan="6">  </td></tr> <tr><td colspan="6">Project</td></tr> <tr><td colspan="6">TOP PARK, BURY</td></tr> <tr><td colspan="6">Title</td></tr> <tr><td colspan="6">S1.13 - PROPOSED HYDROBRAKE CONTROL MANHOLE DETAIL</td></tr> <tr><td>Sheet Size</td><td>Original Scale</td><td>Designed/Drawn</td><td>Checked</td><td colspan="2">Authorised</td></tr> <tr><td rowspan="2">A3</td><td rowspan="2">As Shown</td><td>MR</td><td>WF</td><td colspan="2">WF</td></tr> <tr><td>Date 25.09.23</td><td>Date 25.09.23</td><td colspan="2">Date 25.09.23</td></tr> <tr><td>Status</td><td colspan="4">Drawing Number</td><td>Rev</td></tr> <tr><td>S2</td><td colspan="4">23035-LE-ZZ-05-DR-D-0004</td><td>P02</td></tr>						Client												Project						TOP PARK, BURY						Title						S1.13 - PROPOSED HYDROBRAKE CONTROL MANHOLE DETAIL						Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised		A3	As Shown	MR	WF	WF		Date 25.09.23	Date 25.09.23	Date 25.09.23		Status	Drawing Number				Rev	S2	23035-LE-ZZ-05-DR-D-0004				P02
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Status	Drawing Number				Rev																																																																
S2	23035-LE-ZZ-05-DR-D-0004				P02																																																																

Appendix J – SuDS Maintenance Schedule

Top Park, Bury: ARTIFICIAL GRASS PITCH (AGP)

Sustainable Drainage Systems (SuDS): Maintenance Plan

Introduction

This document sets out the principles for the long-term management and maintenance of the proposed AGP; specifically with respect to the stone sub-base, which doubles up as the SuDS attenuation for the site; at the proposed development works, Top Park, Bury. Many of the guidance points contained within this document relate directly to CIRIA C753: The SuDS Manual.

For the purpose of this report, we have referred to the AGP SuDS feature as pervious paving due to the nature of the collection, conveyance, and storage of stormwater throughout the system.

The objective of this document is to set out the basis of the development SuDS Maintenance Plan and ensure that the proposed pervious paving is provided with a robust inspection and maintenance programme, ensuring the optimum operation of the surface water drainage network. The pervious paving is to be maintained for the lifetime of the development and to prevent the increased risk of flooding, both on and off site, in accordance with the National Planning Policy Framework (NPPF).

The activities listed in this document are generic to the proposed SuDS AGP pervious paving and represent the minimum maintenance and inspection needed; however, additional tasks or a varied maintenance frequency may be required. The specific maintenance needs of the pervious paving should be monitored, and the maintenance schedules should be adjusted to suit the requirements.

All maintenance procedures listed within this report, including lone working, should follow the relevant Health and Safety legislation (Health and Safety at Work Regulations, 1999). Appropriate risk assessments should always be undertaken.

The pervious paving shall be maintained periodically in accordance with the schedules listed in this report. Inspection checks shall be carried out by a competent person, at the minimum intervals listed within the schedules, and the appropriate work should be carried out.

05.10.23	P01	S2	MR	WF	WF
Date	Rev	Status	Author	Reviewer	Authoriser

SuDS AGP Pervious Paving Layout and Design

The storm water drainage strategy for the proposed development utilises a SuDS pervious paving feature to intercept and store all pluvial surface water runoff. The design of the pervious paving aims to attenuate the runoff within the sub-base of the AGP, suspend any solids and significantly improve water quality.

There are three categories of maintenance activates referred to in this report:

- **Regular Maintenance (including inspections and monitoring)**
 - Consists of basic tasks done on a frequent and predictable schedule, including sweeping/power brushing, litter/debris removal and inspection.
- **Occasional Maintenance**
 - Comprises tasks that are likely to be required periodically but on a much less frequent and predictable basis than the routine tasks (e.g. vegetation/sediment removal).
- **Remedial Maintenance**
 - Comprises intermittent tasks that may be required to rectify faults associated with the system (note – the likelihood of faults is minimised by good design and construction methods).

SuDS Management and Maintenance

The proposed SuDS drainage system, inclusive of pervious surfacing, pipework, and chambers will be subject to a routine monitoring and maintenance schedule as part of the general site management. The following guidelines are offered as an initial regime but may be either increased or decreased depending on the local environment and any external contributing factors.

The key maintenance requirement for pervious paving and its associated pipework will be the inspection of the surface and monitoring the operation of the system. Regular sweeping/power brushing is also recommended. General maintenance will include the removal of any accumulated sediments and collection of litter and debris.

During the inspections the general operation, structural condition, and any issues relating to the chambers should be identified and addressed as required.

Any vegetation found to be developing within the pervious surface should be removed/trimmed and treated with immediately with an appropriate herbicide. Cuttings from any localised clearance work should be removed from the pervious surface to avoid it causing any issues to the operation of the system.

Any build-up of sediments should be removed from the surface as required. The frequency of this operation can vary depending on local conditions (wind, dust, nearby trees, footfall, etc.) though regular inspection of the surface will identify any unacceptable build-up.

The relevant table for the operation and maintenance of the proposed pervious paving can be found on the following page.

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For layout and details of proposed AGP SuDS pervious paving please refer to accompanying drawing numbers 23061-LE-ZZ-05-DR-D-0001, 23061-LE-ZZ-05-DR-D-0002, 23061-LE-ZZ-05-DR-D-0003 and 23061-LE-ZZ-05-DR-D-0004.

Table 1: Pervious paving Operation and Maintenance

TABLE 20.15 Operation and maintenance requirements for pervious pavements			
Maintenance schedule	Required action	Typical frequency	
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment	
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required	
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements	
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required	
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required	
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)	
Monitoring	Initial inspection	Monthly for three months after installation	
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months	
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually	
	Monitor inspection chambers	Annually	

Table 2: Pipework and Manholes Operation and Maintenance

Maintenance schedule	Required action	Recommended frequency
Occasional maintenance	Visual inspection of covers, gratings and manhole chambers.	Annually or as required.
	Cleaning out manholes.	Annually or as required.
	CCTV inspection of drainage pipes.	Annually or as required.
Remedial actions	Reactive cleaning of manholes and drains.	During flooding events.
	Cleaning out drains by water jetting.	As required.
	Replace damaged covers, grating and manhole components.	As required.
	Rehabilitation – repairs, relining or replacement.	As determined by inspections.

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