



GHBullard & Associates LLP
Civil and Traffic Engineering Consultants

Proposed Residential Development
19 Walnut Tree Road, Pirton, Hitchin, Hertfordshire

FLOOD RISK ASSESSMENT
AND DRAINAGE STRATEGY

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1. INTRODUCTION

- 1.1. This flood risk assessment and drainage strategy is being submitted to accompany a planning application (Ref: 26/00116/FP) for the erection of four detached dwellings and detached garage with associated parking, access infrastructure and landscaping at 19 Walnut Tree Road, Pirton, Hertfordshire. Site location plans are attached in **Appendix A**.
- 1.2. This report has been prepared to address the Hertfordshire County Council's (as Lead Local Flood Authority) consultee comments, attached as **Appendix B**.
- 1.3. The information provided within this report is based on the best available data currently recorded or provided by a third party. The accuracy of this report is therefore not guaranteed and does not obviate the need to make additional appropriate searches, inspections and enquiries.
- 1.4. The scope of this report is considered appropriate to the scale of the development for a full planning application.

2. POLICY CONTEXT

- 2.1. The purpose of the planning system is to contribute to the achievement of sustainable development – *NPPF, Paragraph 7*.
- 2.2. At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development which does not change the statutory status of the development plan as the starting point for decision making – *NPPF, Paragraph 12*.
- 2.3. 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 – *NPPF, Paragraph 170*.
- 2.4. North Hertfordshire Local Plan 2011 – 2031 adopted on 8 November 2022; Policy SP11: Natural Resources and sustainability; Policy NE7: Reducing Flood Risk; Policy NE8: Sustainable Drainage Systems; Policy NE9: Water quality and environment.
- 2.5. Pirton Neighbourhood Development Plan 2011 – 2031.
- 2.6. North Hertfordshire District Council Strategic Flood Risk Assessment July 2008, prepared by WSP.
- 2.7. North Hertfordshire District Council Strategic Flood Risk Assessment Update (2016).
- 2.8. Hertfordshire County Council document advises on the standards to be used at a local level which references the Local Flood Risk Management Strategy 2 (LFRMS 2) 2019-2029 and the National Standards for SuDS.
- 2.1. Defra Guidance - National standards for sustainable drainage systems (SuDS) updated 30 July 2025.
- 2.2. The SuDS Manual (C753) – Ciria Industry Best Practice Guidance.



3. EXISTING SITE INFORMATION

- 3.1. The Site is located to the south of Pirton, Hertfordshire and is bound by Cotman End (residential development) to the north, Pirton Sports and Social Club and associated playing fields to the east, residential property (No. 21 Walnut Tree Road) to the south and residential property No. 19 Walnut Tree Road, and Walnut Tree Road to the west. Refer to the Site location plans in **Appendix A**.
- 3.2. The Site is currently the garden area associated with 19 Walnut Tree Road; it is greenfield with an area of approximately 0.49 ha and comprises grassed land, trees and planting, timber decking area and a corrugated metal outbuilding. There is an existing asphalt-surfaced access along the north boundary which leads to the Sports and Social Club to the east of the Site. There is an unnamed watercourse crossing the Site from Walnut Tree Road at the west boundary to the east boundary; this is an open channel along the south boundary and is culverted beneath the garden over a length of approximately 24.5 m where it opens up at the east boundary and joins a watercourse flowing south, at the east boundary. Refer to **Appendix C** for the existing layout and watercourse location.
- 3.3. The site can be located from the following information:
 - i. Postcode: SG5 3PX
 - ii. NG Reference: TL149315
 - iii. The site levels range from 70.76 m AOD at the north boundary to 112.64 m AOD adjacent to the tank. The ground levels are approximately 67.91 m AOD at the south-east boundary. The site generally slopes from north-west to south-east at an average gradient of 1:52. Refer to the drawing in **Appendix C** for the topographical ground levels.
- 3.4. The BGS records describe the geology as:
 - i. Superficial: No information available
 - ii. Bedrock: West Melbury Marly Chalk Formation - Chalk
- 3.5. The BGS 1:50,000 scale drift maps (Figure 3.1) show the form of the Superficial deposits.
- 3.6. The British Geological Survey has a borehole record located approximately 150 m south-west of the Site, Ref: TL 13SW10 (at ground level of approximately 71 m AOD), which indicates Chalk Marl to 6 m bgl over blue clay-like chalk over Gault to 36.6 m AOD. There is also a record 830 m south-west of the Site (TL13SW13) and 570 m north of the Site (TL13SW18) which show Chalk strata and resting water levels of 58.4 m AOD and 63.7 m AOD respectfully. Refer to **Appendix D** for the borehole logs. The Phase 1 Geo-Environmental Desk Study suggests there is no hazard from potential dissolution of the chalk. It is recommended the chalk is tested for dissolution features to confirm.
- 3.7. Based on the Site geology and the existing grass surfacing, the Site area is understood to currently drain via infiltration and overland flow to the south-west towards the watercourse at the east boundary and beyond to the south-east, in high rainfall events when the ground is saturated.
- 3.8. Infiltration Testing has been undertaken in four locations at the Site which has revealed lowest infiltration rates of 1.5×10^{-5} m/s at 0.7 m depth and 3.77×10^{-6} m/s at 2 m depth. Images of the site investigation excavations indicate the ground conditions to Topsoil over Chalk, correlating



with the BGS geology mapping outlined in paragraph 3.4. Refer to the test location plan, recorded data, photographs and infiltration rate calculations in **Appendix E**.

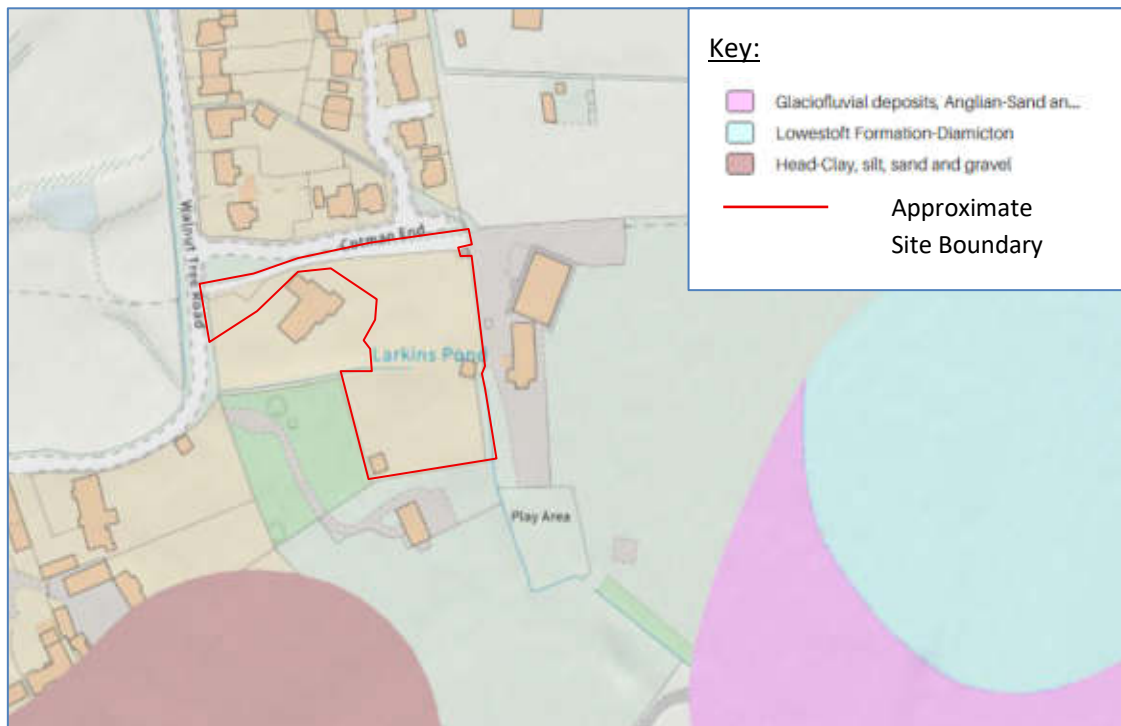


Figure 3.1 - BGS 1:50,000 Superficial Drift Map

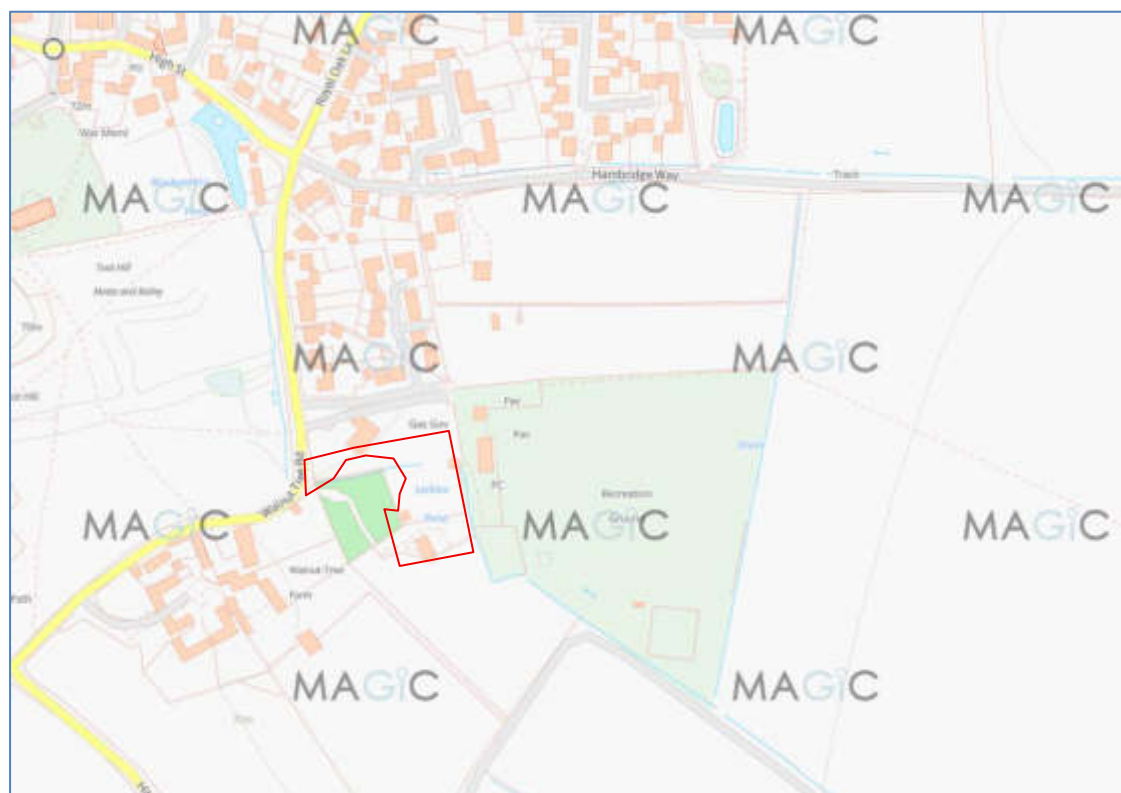


Figure 3.2 – Watercourse Route (Source: Magic Maps)

- 3.9. The nearest main river the River Purwell located approximately 3.5km east of the Site.



- 3.10. As outlined in paragraph 3.2, there is an ordinary watercourse crossing the Site. Based on commercially available mapping, the watercourse flows from Blacksmith's Pond approximately 170 m north of the Site, along the west side of Walnut Tree Road to opposite the Site, from where it is culverted beneath the road and is an open channel at the south Site boundary. Refer to Figure 3.2 and **Appendix C** for the watercourse route. Measurements indicate the culvert beneath the road is a 150 mm diameter pipe, beneath the garden is a 300 mm diameter pipe and at the east boundary outfalls to an open channel. Photographs of the watercourse and culverts are attached in **Appendix F**. Based on commercially available mapping, the watercourse at the east boundary flows south and then south-east following the south boundary of the Recreation Ground, then along a field track until it turns north and continues to flow through fields towards Holwell Road, Holwell and beyond towards the River Hiz.
- 3.11. To confirm the existing capacity of the network through the site, an assumed upstream catchment area of 0.086km², effectively the large green space to the west of the site, applied FEH catchment descriptors and calculated the peak flow for the 1% AEP + 40% climate change using ReFH2 software. This provides a peak upstream flow of 17l/s. The 150mm dia. culvert has a capacity of 15.6 l/s, the 300mm culvert capacity is 158.5 l/s and the open channel downstream is 2692 l/s capacity. The calculations are shown in **Appendix F**. The upstream culvert, under the highway is under capacity and hence with debris and lack of maintenance is likely to block. This is under the road and is therefore the Highway Authority's responsibility. The culverts through the site and beyond have capacity for the design storm event.
- 3.12. Environment Agency Aquifer (Bedrock Geology) mapping shows that the Site is located over a Principal Aquifer; Principal aquifers provide significant quantities of drinking water and water for business needs. They may also support rivers, lakes and wetlands.
- 3.13. Environment Agency Aquifer (Superficial Drift) mapping shows that the site is located over an unproductive aquifer; Unproductive strata are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.
- 3.14. The Environment Agency has mapped Source Protection Zones which shows the Site is not located over a source protection zone.



- 3.15. The Environment Agency has mapped groundwater vulnerability and Figure 3.3 shows the Site is located over a High vulnerability area with a soluble rock risk.

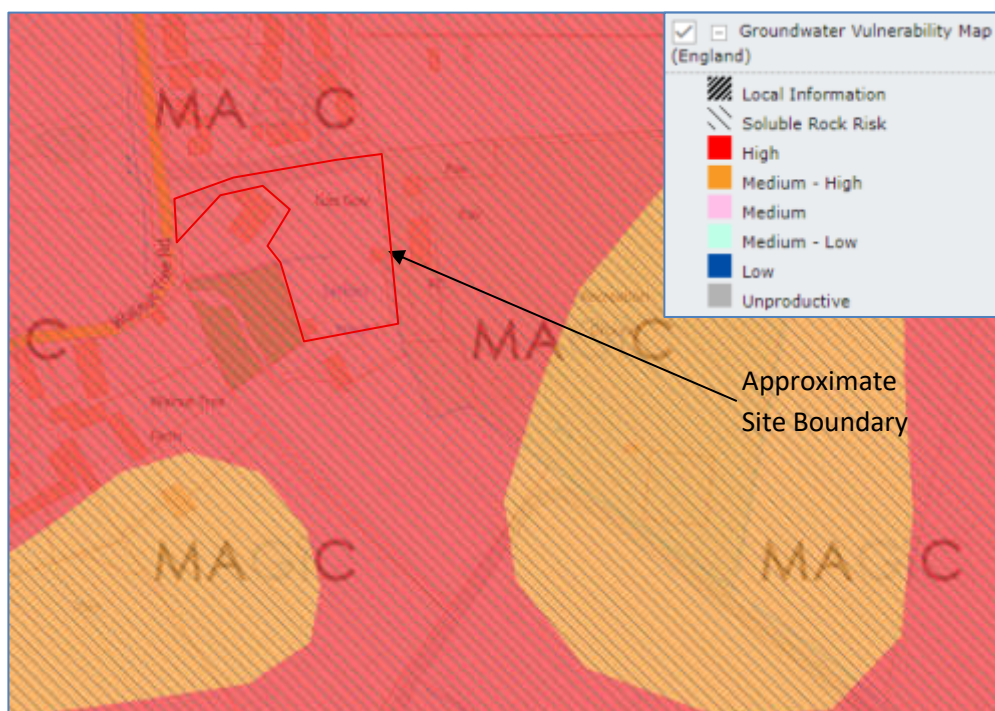


Figure 3.3 - Environment Agency Groundwater Vulnerability Zones



4. FLOOD RISK ASSESSMENT

Fluvial (river) Flood Risk

- 4.1. The Environment Agency flood map for planning (Figure 4.1) shows that the Site is located in Flood Zone 1, with a Low probability of flooding from rivers and seas.

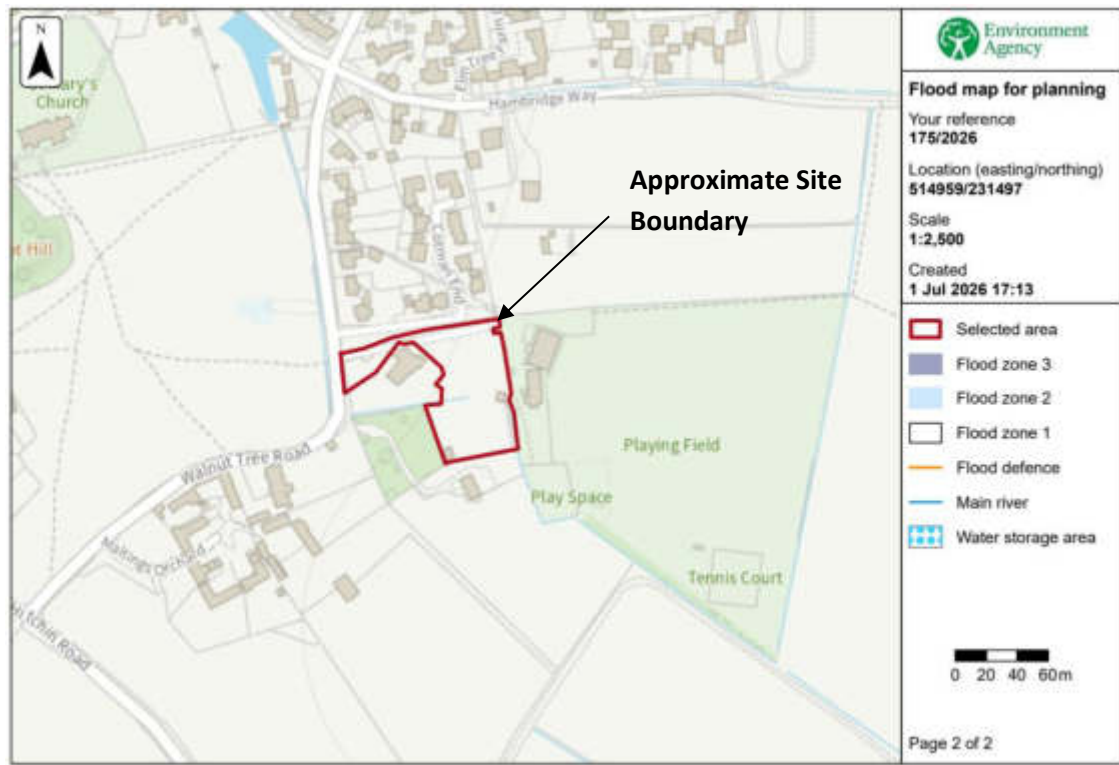


Figure 4.1 – Environment Agency Flood Map (Rivers and Seas)

Pluvial (surface water) Flood Risk

- 4.2. Pluvial flooding is a risk of overland flows and ponding associated with extreme rainfall events. This can take the form of:
- i. Sheet runoff from adjacent land (urban or rural)
 - ii. Surcharged sewers
- 4.3. The Environment Agency has produced Flood Maps for Planning which show surface water flood depths, including for climate change for 2061 to 2125, for the 1 in 30 and 1 in 100 year return periods, and these are shown in Figures 7.1 and 7.2, with the 1% AEP flood depths shown on the drawing in **Appendix C**.
- 4.4. Figure 7.1 show that the Site is not at risk of flooding in the 1 in 30 year (3.3% AEP) event other than in the location of the former pond location which is indicated to have flooding at depths <150 mm to 300 – 600 mm. This extent does not correlate with the current topographical survey and is assumed to correlate to a former pond location and ground contours; the pond was filled in 12 years ago.



- 4.5. Figure 7.2 shows that there are two localised areas of flooding during the 1% AEP plus climate change scenario; one at depths of <150 mm to 300 – 600 mm in the location of the former pond as outlined above and the other in a localised depression in ground levels at the south-east corner at depths < 150 mm to 150 mm - 300 mm depth. Localised depressions in ground levels will be levelled as part of the development, with the associated runoff intercepted and discharged as part of the development drainage strategy.

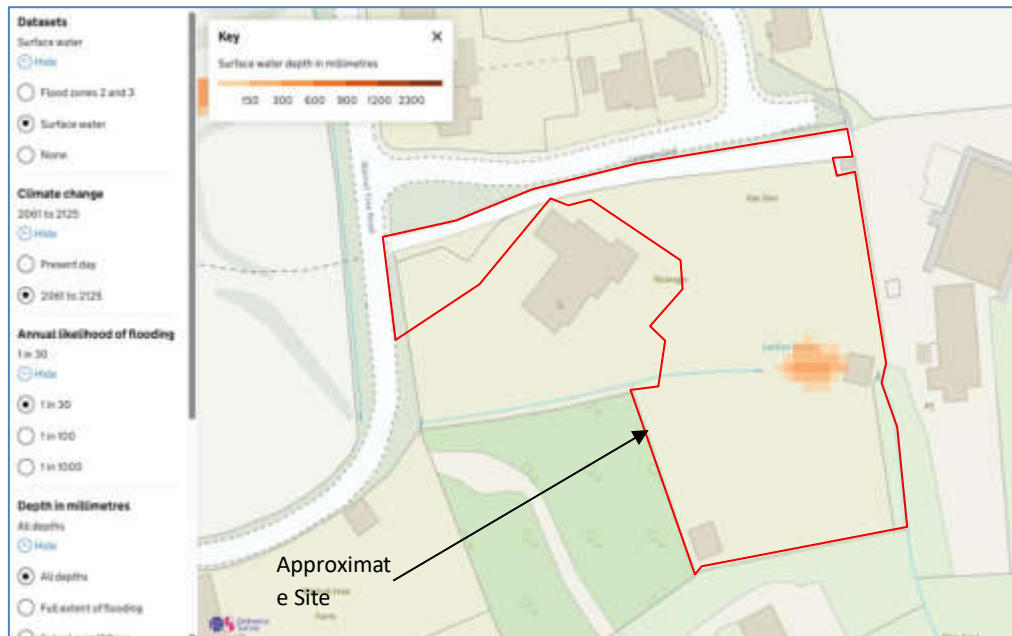


Figure 7.1: Environment Agency Flood Map for Planning - Surface Water Flood Depths 2061-2125, 1 in 30 year event

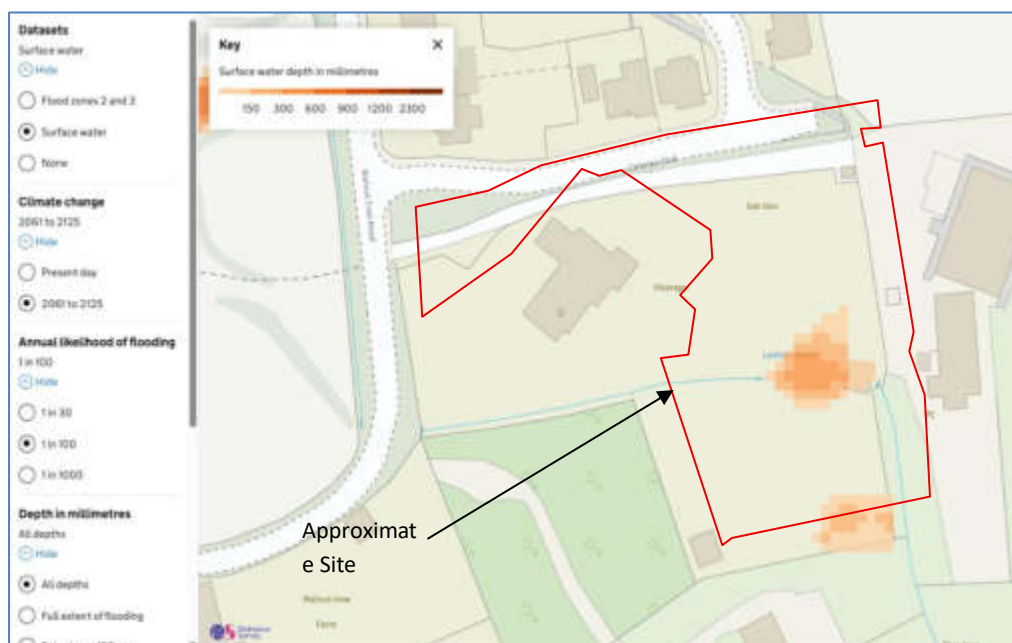


Figure 7.2: Environment Agency Flood Map for Planning - Surface Water Flood Depths 2061-2125, 1 in 100 year event



- 4.6. It is recommended that the finished floor levels of the dwellings adjacent to the watercourse are set a minimum of 300 mm above surrounding ground level, to provide a freeboard above the watercourse bank level.
- 4.7. The risk of overland flow from adjacent sites is considered to be Low based on the surface water mapping, surrounding site use, topography and boundary features. There is a risk of surface water runoff from exceedance or blockage of the culverted watercourse beneath Walnut Tree Road to the west of the Site; in this scenario, the water will flow onto the road and eventually spill over the edge of the road to the east and re-enter the watercourse to the west of the Site boundary, with the flow continuing through the Site within the watercourse as currently occurs.

Groundwater Flood Risk

- 4.8. Groundwater flooding is a risk of the water table rising after prolonged rainfall to emerge above ground level remote from a watercourse. It is most likely to occur in low lying areas underlain by aquifers of high vulnerability. The Environment Agency has mapped groundwater vulnerability (Figure 3.3) which shows the Site is located over a High vulnerability aquifer.
- 4.9. The North Hertfordshire District Council Strategic Flood Risk Assessment July 2008 and North Hertfordshire District Council Strategic Flood Risk Assessment Update (2016) do not indicate historic groundwater flooding in Pirton, with no indication of groundwater risk given within the documents.
- 4.10. The Hertfordshire County Council North Hertfordshire District Section 19 Flood Investigations Introduction includes mapping showing the Susceptibility to Groundwater Flooding which indicates the Site does not lie in an area with Susceptibility to Groundwater Flooding indicated, adjacent to an area $\geq 25\% < 50\%$. Refer to the mapping in **Appendix G**.
- 4.11. BGS Flood and GFS Data within the EPS Phase 1 Geo-Environmental Desk Study indicates the Site lies in an area with limited potential for Groundwater flooding to occur.
- 4.12. Available BGS borehole records north and south of the Site indicate that groundwater level at the Site is in the order of 61.5 m AOD, approximately 8.5 to 5.5 m bgl at the Site.
- 4.13. Based on available BGS groundwater level information, the mapped Susceptibility to Groundwater Flooding, the BGS Flood and GFS Data within the EPS Phase 1 Geo-Environmental Desk Study and location of nearby watercourses providing an outlet for groundwater, the risk of flooding from groundwater is considered to be Low. If groundwater was to emerge it would do so in the lowest levels of the Site and would likely occur in the nearby watercourses which provide a groundwater flow outlet. Floor levels will be set minimum 150 mm above surrounding ground level and 300 mm in the location of the watercourse, providing mitigation for any water emergence. There are no below ground basements proposed as part of the development.

Infrastructure Failure Flood Risk

- 4.14. Environment Agency Long Term flood maps show that the Site is not located within the extent of flooding from reservoirs.
- 4.15. The risk of flooding from blocked sewers is considered to be Low based on the surrounding Site use and the boundary features.
- 4.16. There is a risk of blockage of the culvert beneath Walnut Tree Road to the west of the Site, however, any flood water will flow onto the road and then spill into the open watercourse



channel to the west of the Site, and continue to flow within the channel as currently occurs. Maintenance of the culvert is the responsibility of the Highway Authority and will be subject to a regular maintenance regime, reducing the risk of blockage.

Historic Flooding

- 4.17. The North Hertfordshire District Council Strategic Flood Risk Assessment July 2008 and North Hertfordshire District Council Strategic Flood Risk Assessment Update (2016) do not indicate a historic flood record at the Site.
- 4.18. A review of the Environment Agency Historic Flood and Outlines Map has not identified historic flooding at the Site.
- 4.19. A review of Hertfordshire County Council's flood investigation reports does not indicate a flood investigation at the Site.
- 4.20. The Site owner has advised that flooding has been experienced on Walnut Tree Road in the location of the culverted watercourse as a result of the culvert blockage, which was addressed by the Highway Authority who are responsible for its maintenance.

5. SURFACE WATER DRAINAGE STRATEGY

- 5.1. The proposed development comprises the removal of an existing timber building, decking area and corrugated metal building from the former garden of 19 Walnut Tree Road, Pirton and the erection of four detached dwellings and detached garage with associated parking, access infrastructure and landscaping. Originally, the proposal had introduced a pond and remove a culvert for an open channel, but the pond has been replaced to allow space for an infiltration feature, and the existing culvert remains to allow a maintenance easement and is to be extended to allow for the road crossing. The proposed layout drawing is attached in **Appendix H**.
- 5.2. The site investigation found Chalk which is noted to be a low hazard to dissolution, but specific tests have not been undertaken, hence there are two drainage schemes proposed. A **primary**, which uses infiltration with a 5m buffer for point soakage and a **secondary** uses attenuation and controlled discharge to watercourse. Should the chalk testing show a risk of dissolution features, then the secondary drainage scheme will be implemented.
- 5.3. Development Site characteristics:
 - Total Development area is 0.49 ha
 - Total proposed impermeable catchment area is 0.2 ha (0.21 ha including creep). The re-surfaced access track at the north boundary has been included for at this stage as the runoff would potentially enter the network based on current levels.
 - Total proposed impermeable development area discharging to the network (including for contributing pervious areas) is 0.21 ha (0.22 ha including creep).
- 5.4. The greenfield runoff rate for the Site area using FEH Statistical (2025) Methodology, is assessed as $Q_{bar} = 0.3 \text{ l/s/ha}$ (0.06 l/s based on 0.21 ha impermeable development area). Refer to the calculation in **Appendix I**.
- 5.5. Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional



benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity– NPPF, Paragraph 182.

- 5.6. Surface water runoff from the development will be drained by making full use of Sustainable Drainage Systems (SuDS) where possible. The National Standards for Sustainable Drainage Systems (SuDS), Standards 1 to 7, outlines the design approach to be followed in the design of surface water drainage systems.

Climate Change

- 5.7. The National Planning Policy Framework (NPPF) sets out how the planning system should help to minimise vulnerability and provide resilience to the impacts of climate change.
- 5.8. The climate change allowances are predictions of anticipated change. The Environment Agency has provided peak rainfall climate change allowances by Management Catchment, which for this Site are summarised in Figure 5.1. In accordance with current Environment Agency guidance, an allowance of 35 % and 40 % will be used in the design of the drainage strategy for the 3.3% AEP and 1% AEP rainfall events respectively.

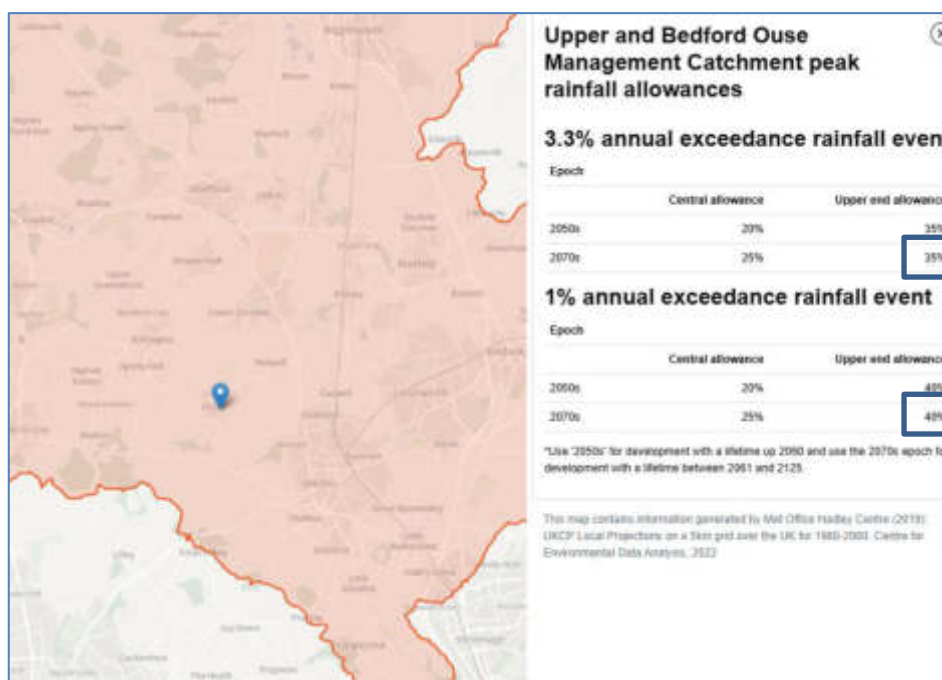


Figure 5.1: Environment Agency Peak Rainfall Allowances

Standard 1: Runoff Destinations

- 5.9. Standard 1 dictates that collection for non-potable use should be considered first (priority 1). Rainwater harvesting has been considered, however given the development type and scale, it is not considered a feasible option. Standard 1 requires infiltration to ground to be considered next. After infiltrating at source has been considered, the next priority is to discharge runoff to an above ground water body, then surface water sewer or other piped surface water system, with the lowest priority to discharge to a combined sewer.
- 5.10. Infiltration testing has indicated that discharge via infiltration is feasible at 0.7 m and 2 m depth, however the investigation revealed Topsoil over Chalk at the Site. Figure 3.3 indicates soluble



rock risk in the Site location and the phase 1 Geo-Environmental indicates no hazard from dissolution features. At this stage, the chalk density and risk of dissolution features is uncertain, and recommended testing is undertaken to confirm. Therefore, a **primary** drainage proposal is to use soakaways and specialist geotechnical testing, and advice is sought to confirm the suitability and distance of soakaways at the Site. A **secondary** drainage proposal is to discharge to watercourse, if the chalk testing results are not favourable. The drainage strategy drawing is attached in **Appendix J**.

- 5.11. The **secondary** proposal, should testing fail, is to attenuate and discharge the runoff from the development to the watercourse at the Site at a controlled rate. Based on the layout, it is proposed that attenuation storage is provided within the sub-base of lined permeable paving and within below ground cellular storage crates, lined where the 10 m clearance to buildings cannot be achieved, due to the chalk. The drainage strategy drawing is attached in **Appendix J**.
- 5.12. Table 5.1 summarises how the use of SuDS components has been considered and utilised in this drainage strategy.

SUDS Type	Component Type	Suitable	Explanation/Comments
Source Control	Rainwater Harvesting systems	No	Not proposed as part of the development, however water butts are recommended, appropriate to the scale of development.
	Green Roofs	No	Not proposed as part of the development.
	Rain gardens	No	Not proposed as part of the development. There are potential maintenance issues associated with privately maintained rain gardens.
	Permeable Paving	Yes	(Lined) Permeable paving proposed for the new access road and driveway catchments, which will also provide attenuation storage.
Infiltration	Soakaway	Yes	Proposed subject to testing dissolution features.
	Filter Drain/Strips	No	As above
	Infiltration Basin	No	As above
	Swale	No	As above
	Tree Pits	No	As above
Conveyance	Swale	No	No scope to accommodate within the layout.
	Filter Drain	No	As above
Detention	Sub-surface Storage	Yes	Cellular storage crates proposed.
	Detention Basin	No	No requirement
	Pond	No	No requirement
	Wetland	No	No requirement

Table 5.1: Table summarising the use of SuDS components.

Standard 2: Management of Everyday Rainfall (Interception)



- 5.13. The **primary** system discharges to ground and therefore interception is deemed to be provided.
- 5.14. The **secondary** system proposed catchment areas that are permeable paved (the additional access road and driveways) are considered to provide interception in accordance with 2.7 of Standard 2. The proposed roof catchment (773 m²) equates to an interception volume of 3.9 m³, which will be provided in the un-lined base of the final attenuation crate, 90 mm below the outlet, where a distance of 10 m from buildings can be achieved. Therefore, the surface water drainage system serving the proposed development is considered to be compliant Standard 2.

Standard 3: Management of Extreme Rainfall and Flooding

- 5.15. The primary system has been designed to the 1% AEP plus 40% climate change.
- 5.16. The secondary system has been designed based on a 100 mm diameter outfall to the watercourse. It is recognised that this results in discharge rates higher than Q_{bar} (0.06 l/s) and 3l/s/ha (0.63 ls/) in line with paragraph 3.18 of the National Standards for SUDS, however these rates are so low they require a very small orifice diameter at risk of blockage, and an unfeasible volume of attenuation storage.
- 5.17. Info-Drainage has been used to design the storage associated with the porous paving and cellular crates for up to the 1% AEP event plus an allowance for 40% climate change, using FEH data and a 100 mm diameter pipe orifice to the watercourse.
- 5.18. The calculations for the 1 in 2 year, 1 in 30 year plus climate change and 1 in 100 year rainfall event plus climate change are attached in **Appendix K**, with the proposed drainage layout shown on the drawing in **Appendix J**. The calculations show that there is no flooding on or off-site during rainfall events up to the 1% AEP plus climate change scenario.
- 5.19. The calculations show the following discharge rates to the watercourse;
- Q_2 (50% AEP) = 6.0 l/s
 - Q_{30} (3.3% AEP) = 10.8 l/s
 - Q_{100} (1% AEP) = 15.1 l/s
- 5.20. A review of the existing channel capacity and the downstream network has been undertaken to assess the risk of flooding on the network from the development, see 3.11 above. Based on the 300mm culvert diameter and the open channel capacity there is sufficient capacity downstream to convey the additional flow from the proposed secondary system.

Exceedance

- 5.21. In an exceedance event in which rainfall surpasses the design capacity, there should be no vulnerable buildings or infrastructure at risk of flooding.
- 5.22. Site ground levels will be locally contoured to deflect water towards the east and south-east boundaries, towards the watercourse, replicating the current flow path.
- 5.23. The exceedance paths have been shown on the layout plan in **Appendix J**.

Standard 4: Water Quality

- 5.24. The water discharging to the ground must be cleansed and therefore treatment processes are introduced through the drainage network. These should be in accordance with Chapter 26 of the Ciria SuDS Manual C753, where the hazard of low to medium is mitigated with the various



SuDS components to equal or exceed the hazard indices. Refer to the following Tables 26.2 and 26.3 which show the hazard and mitigation indices associated with the proposed drainage scheme.

- 5.25. It is proposed that the new access road catchments and the driveways will drain via permeable paving. The roof areas will initially discharge via in-line downpipe filters to intercept suspended solids prior to the permeable paving sub-base. The re-surfaced track at the north boundary will discharge via gullies where necessary, with cleansing provided by Proprietary Naylor Smart Sponges. The water will therefore be cleansed prior to the cellular attenuation storage features.
- 5.26. The tables show that the mitigation indices associated with the porous paving and the Naylor Smart Sponge exceed the hazard indices associated with the access road, driveway and roof catchment.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways; residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²



TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Standard 5 and Standard 6: Amenity and Biodiversity

- 5.27. Amenity and biodiversity are often considered together as they overlap and linkages are made.
- 5.28. Amenity is the multi-functional use that should be highlighted for any part of the SuDS landscape, which is available for use by people when not being used for drainage. This is an underlying principle of place making urban design, to make a location desirable to live and work.
- 5.29. Biodiversity encompasses the number and abundance of all species of life on earth. Locally, biodiversity reflects the character of the plants and wildlife that share the space in which humans live, work and play.
- 5.30. The use of below ground SuDS features maximises the development use of the Site.

Standard 7: Design of Drainage for Construction, Operation, Maintenance, Decommissioning and Structural Integrity

- 5.31. The drainage network will be maintained by the homeowners.
- 5.32. It is important to prevent silt from entering the drainage system during the construction phase and a Construction Surface Water Management Plan should be developed prior to commencement of works.
- 5.33. Maintenance of the system will include for frequent inspections of the network, porous paving, culvert, cellular storage and outfall, with debris removal to ensure designed levels of performance are achieved.



6. SUMMARY

- 6.1. Table 6.1 summarises the probability of the Site flooding from the five key sources as listed in PPS25.

Source	Description	Risk	
Fluvial	Rivers	Flood Zone 1	(<0.1% AEP)
Tidal	Seas		
Pluvial	Surface Water	Very Low to Medium	(<0.1% AEP to 1% - 3.3% AEP)
Groundwater	Aquifers	Low to Medium	-
Infrastructure failure	Reservoirs	Outside extent of flooding	-
	Blocked Sewers	Very Low	

Table 6.1 – Flood Risk Summary

- 6.2. In accordance with government policy, SuDS will be used on Site where possible, and surface water drainage of the Site will be carried out in a sustainable way.
- 6.3. There are two proposed drainage schemes. The implementation depends on the testing of the chalk for dissolution features. The **primary** proposed drainage network for surface water runoff from the development will discharge to ground via rear garden crated soakaways and permeable paved driveways and access road. The components are design to the 1% AEP + 40 climate change.
- 6.4. The **secondary** drainage proposal is designed to store and discharge the runoff associated with up to the 1 in 100 year rainfall event plus an allowance of 40% climate change, without flooding within the Site. The design is based on a controlled discharge via a 100 mm diameter pipe. It is recognised that the discharge rates in the 50% AEP and 1 % AEP plus climate change are greater than Q bar and 3 l/s/ha.
- 6.5. A review of the watercourse capacity and downstream flood risk has been undertaken which shows upstream culvert, under the highway, is above capacity, but those downstream are within capacity.
- 6.6. In the event of the culverted watercourse becoming blocked, the water will be directed overland through the development to the east and south-east boundaries towards the open watercourse further downstream. It is recommended that finished floor levels in the location of the watercourse (Plots 2 and 3) at the Site are set a minimum of 300 mm above surrounding ground level.
- 6.7. It is proposed that the roof runoff will discharge initially via in-line downpipe filters to intercept any debris prior to the permeable paving sub-base. The new access road catchments and the driveways will be permeable paved, with Naylor Smart Sponges used within gullies required within the re-surfaced access track at the north boundary. The permeable paving and Naylor Smart Sponges will suitably cleanse the runoff prior to discharge to the watercourse.
- 6.8. Exceedance flow will be directed away from the dwellings towards the existing watercourse at the east and south-east boundaries, as currently occurs.
- 6.9. As long as maintenance of the new drainage systems are correctly carried out, the risk of flooding and the subsequent risks from infrastructure failure or pluvial means, is very Low.



APPENDICES



Appendix A

Site Location Plans



175/2026: 19 Walnut Tree Road, Pirton, Hitchin, Hertfordshire, SG5 3PX

Site Location Plan



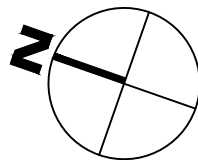
DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORKS.
ANY QUERIES REGARDING DIMENSIONS TO BE TAKEN UP WITH
PENTANGLE DESIGN GROUP. ALL DIMENSIONS OF EXISTING
BUILDINGS TO BE VERIFIED ON SITE. THIS DRAWING IS THE
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CONSENT.

NOTES



Location Plan

1:1250 scale



PLANNING
PENTANGLE
DESIGN GROUP

SUITE 1, 21 BANCROFT HITCHIN HERTS SG5 1JW
T:01462 431133 E:pdg@pentangledesign.co.uk

JOB TITLE
**Proposed Residential Development
19 Walnut Tree Road, Pirton, Hitchin**

DRAWING TITLE
Location Plan

SCALE	DRAWING NUMBER	REVISION
1:1250		
DATE		
Dec '25		
SHT SIZE		
A4		
JOB NUMBER		
3942		

CHARTERED ARCHITECTS

Appendix B

Hertfordshire County Council Consultee Response



Growth & Environment

Thomas Howe
Local Planning Authority
North Hertfordshire District Council
Council Offices
Gernon Road
Letchworth Garden City
SG6 3JF

Lead Local Flood Authority
Hertfordshire County Council
Post Point CHN215
Farnham House
Six Hills Way, Stevenage
Hertfordshire SG1 2FQ
www.hertfordshire.gov.uk

Contact: SuDS and Watercourses Team
FRMConsultations@hertfordshire.gov.uk

Your ref: 26/00116/FP
Date: 11 May 2026

Dear Thomas,

RE: 26/00116/FP - Erection of four detached dwellings and detached garage to serve plot 4 including hard and soft landscaping, parking and creation of vehicular access - 19 Walnut Tree Road, Pirton

Thank you for your consultation on the above application. We note that this application is for non-major development on which the LLFA is not a statutory consultee, however we are pleased to provide comments given the site's proximity to ordinary watercourses and recent flooding issues.

We have reviewed the information submitted with the application. We note that a flood risk assessment and drainage strategy has not been submitted, therefore at this stage would recommend that permission is not granted.

The planning statement submitted with the application identifies that the site is in Flood Zone 1 but does not discuss other sources of flood risk (such as surface water, ordinary watercourses and groundwater), nor does it consider the flood history of the area. We recommend that a flood risk assessment (FRA) is prepared that considers the ordinary watercourse running through the site and any associated flood risk, as well as surface water and groundwater risk.

A drainage strategy has not been submitted, however the site plan proposes that a new pond be constructed in the centre of the site on top of the existing ordinary watercourse. We highly recommend that a drainage strategy that contains the following information is submitted prior to the grant of planning permission. Please note that the below is not exhaustive and we may seek to provide further comments once an FRA and drainage strategy has been submitted.

- Detailed engineered design drawings demonstrating how it is proposed to capture, attenuate and discharge surface water (at either the greenfield runoff rate or to the ground via infiltration if feasible).

- The drainage design will be in accordance with the National Standards for SuDS 2025, including interception of the first 5mm of rainfall, evidence the discharge hierarchy has been explored and the use of source control SuDS.
- Supporting calculations of greenfield runoff rates and for the proposed drainage network, using FEH22 rainfall data and CV values of 1. Hydraulic calculations should be provided for all events up to and including the design event, with an appropriate allowance for climate change in the 1% and 3.33% AEP events (+40% and 35%, respectively). A 10% uplift to impermeable areas within property curtilages for urban creep shall also be included.
- Ground investigations confirming whether infiltration is feasible, including evidence of groundwater levels (a minimum 1m buffer between seasonally high groundwater levels and the base of infiltration features should be provided).
 - o It may be possible to condition infiltration testing and groundwater monitoring, with an infiltration-based strategy being the preferred approach, subject to designs for an infiltration-based ("Plan A") and restricted discharge-based ("Plan B") strategy being submitted.
- It seems it is proposed to place a pond on the ordinary watercourse. If this is the proposal, the design must include a low-flow channel so that the proper flow of water through the ordinary watercourse from upstream is not impeded by the pond / any associated flow control structures, such that flood risk upstream is not increased, and evidence to confirm that the pond's capacity would not become compromised during a storm event in which the watercourse is full and seeking to drain the wider upstream catchment. It may be simpler for the pond to be off-line from the watercourse. These proposals must be supported by an assessment of the ordinary watercourse and contributing areas including the culvert under Walnut Tree Road that connects to the watercourse from Blacksmiths Pond.
- Acknowledgement that alterations to the watercourse are likely to require consent from the LLFA under separate legislation (Section 23 of the Land Drainage Act 1991 – this is regardless of but often in addition to planning permission).
- Land drainage consent will be required for culverting the site road over the watercourse. A clear span arrangement should be considered first, which would minimise impact on the watercourse and be exempt from consent. If not possible, a short culvert would be acceptable in principle for an access crossing.
- Land drainage consent is not required at the planning application stage, but we require a flood risk assessment and evidence that the proposed culverting (and any other alterations to the watercourse) would not adversely affect flood risk up

and downstream, particularly when there have been recent issues on the upstream watercourse on Walnut Tree Road.

Informative

For further advice on what we expect to be contained within the FRA and/ or a Drainage Strategy to support a planning application, please refer to the Validation List and Proforma on our surface water drainage webpage

<https://www.hertfordshire.gov.uk/services/recycling-waste-and-environment/water/surface-water-drainage/surface-water-drainage.aspx> this link also includes HCC's Flood Risk Management policies on SuDS in Hertfordshire. We do expect the Validation List to be submitted to the Local Planning Authority and LLFA to show you have provided all information and the Proforma to the LLFA to summarise the details of the proposed development.

Erection of flow control structures or any culverting of an ordinary watercourse requires consent from the appropriate authority, which in this instance is Hertfordshire Lead Local Flood Authority. It is advised to discuss proposals for any works at an early stage of proposals.

Both FEH13 and FEH22 are currently accepted to support drainage modelling calculations. For the avoidance of doubt the use of FSR and FEH1999 data has been superseded and therefore, use in rainfall simulations are not accepted.

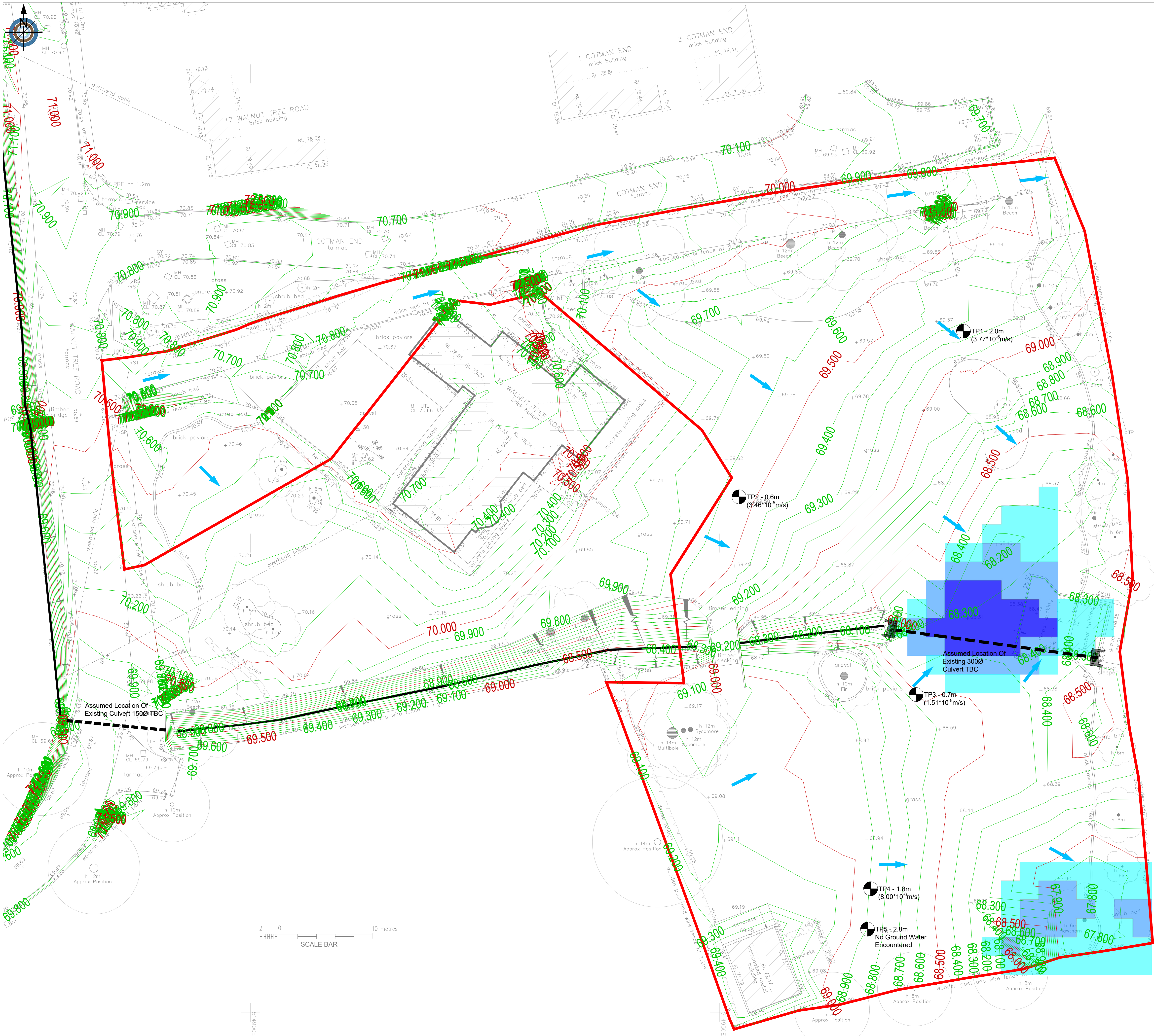
Yours sincerely,

David Uncle
Senior Flood Risk Officer
Lead Local Flood Authority
Growth and Environment

Appendix C

Existing Site Layout





- NOTES:
- This drawing is to be read in conjunction with GHB series 175/2026 drawings and documents and any other relevant project team documents.
 - Preliminary Issue - This drawing is not to be used for construction or detailed pricing purposes. Any work undertaken before approvals are received (in writing) are at risk of abortive works.
 - This drawing has been produced based upon the following information:
Topographical Survey by Terrain Survey (Ref. TS25-677-1-3D dated OCT 2025) subject to transformation of :
Scale 1 and translation (0, 0, 0) about point (0, 0, 0).
Architectural Layout by Pentangle (Ref. 3942 Site Plan - APPLICATION - NO POND dated Oct 2025) subject to transformation of : Scale 0.001, Rotation: 88.8° translation (515735, 231745, 0) about point (0, 0, 0).
 - All site levels and finished floor levels to remain indicative for planning purposes and are subject to verification following detailed design.
 - This drawing has been prepared solely for the purpose of obtaining a Planning Consent based on information available and planning requirements at the date of issue only.

LEGEND	
	Site Boundary- Area: 0.49 ha
	Overland Flowpaths
	Primary Contours (0.5m)
	Secondary Contours (0.1m)
	Existing Building Wall
	Existing Watercourse
	Existing 3000 Culverted Watercourse
	TP1 Trial Pit Location (Infiltration Rate as Detailed on Plan)
	Environment Agency Surface Water Spatial Planning 1in100 Depths Mapping: 1200-2300mm Depth
	Environment Agency Surface Water Spatial Planning 1in100 Depths Mapping: 900-1200mm Depth
	Environment Agency Surface Water Spatial Planning 1in100 Depths Mapping: 600-900mm Depth
	Environment Agency Surface Water Spatial Planning 1in100 Depths Mapping: 300-600mm Depth
	Environment Agency Surface Water Spatial Planning 1in100 Depths Mapping: 150-300mm Depth
	Environment Agency Surface Water Spatial Planning 1in100 Depths Mapping: <150mm Depth

P2	15/07/26	Updated Client Details	BAF	JAH
P1	03/07/26	Initial Issue	BAF	JAH
Rev	Rev Date	Description	Drawn	Check'd
© Copyright				
			27 Barton Road, Thurston, Suffolk, IP31 3PA	
T: (01359) 235071 F: (01359) 231138 W: http://www.ghbullard.co.uk			Partnership No. OC383830, Registered in England and Wales	
Client:			MR & MRS SHADBOLT	
Project:			19 WALNUT TREE ROAD, PIRTON, HERTFORDSHIRE	
Drawing Title:			FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY EXISTING SITE LAYOUT	
Status:			FOR PLANNING	
Scale:			1:200 @ A1	
Created:			JULY 2026	Drawn: BAF
DWG Reference:			175-2026.DWG	Checked: JAH
Drawing Number:			175/2026/010	Revision: P2
P# = Preliminary, C# = Construction, AB# = As Built				

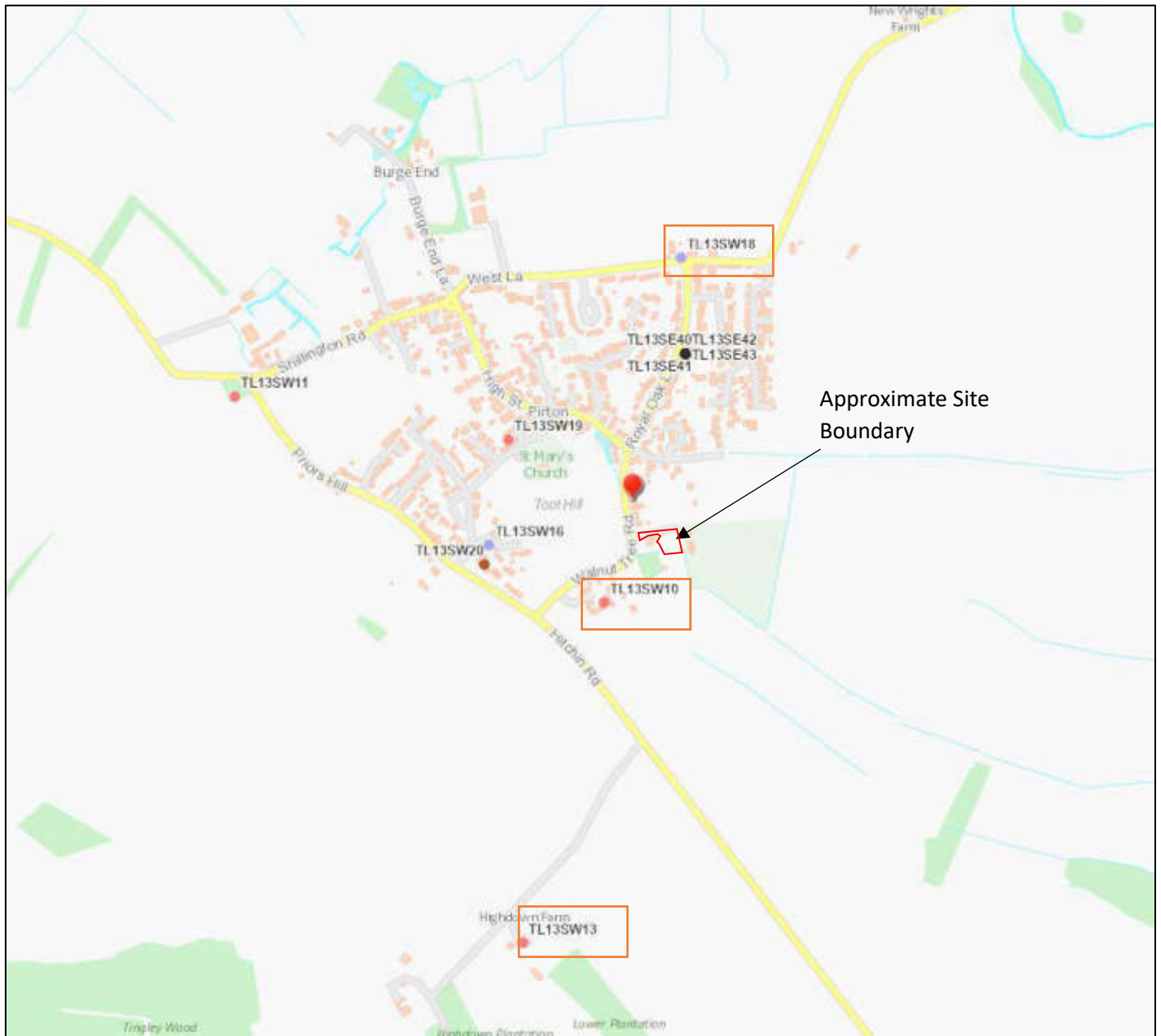
Appendix D

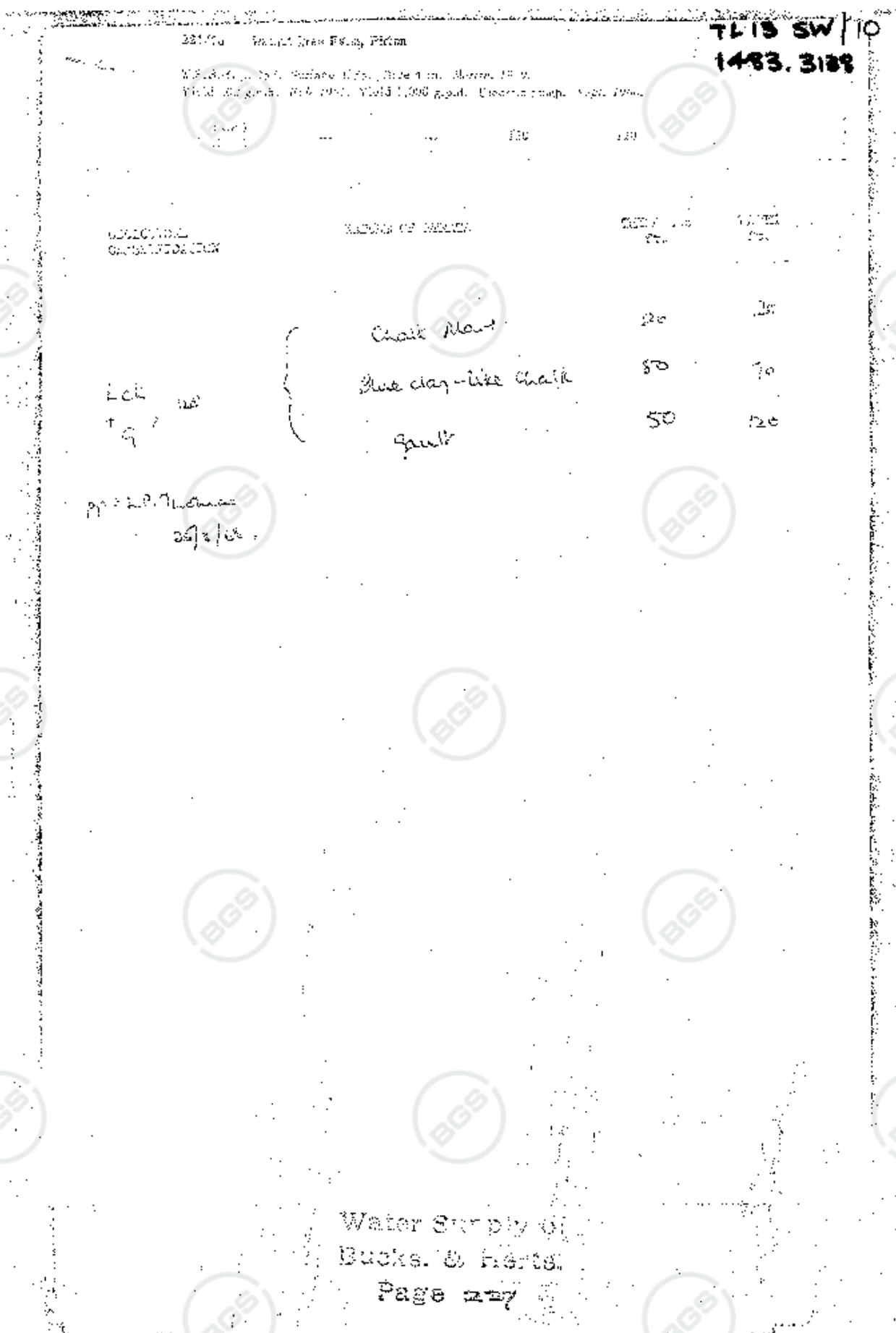
BGS Borehole Logs



175/2026: 19 Walnut Tree Road, Pirton, Hitchin, Hertfordshire, SG5 3PX

BGS Borehole Log Location Plan







221/130 Highdown Farm, Pirton		TL 13SW 13	
101-12m		1466.3067	
Surface 4400. Shale 143. 100% sandstone.			
Dip 1-1. Decreased by 1000 ft. R.W.L. -1.191%. EU 1973. Yield 180 g.p.m. 5 in. dia.			
Electric pump 100 ft.			
143	47-54	143	47-54
60	18-29	255	61-87
255	77-72	458	137-40
10	3-05	468	142-44

Geological Classification	Name of Strata	Thickness ft.	Depth ft.
143'	Chalk	143	143
60'	Chalk Marl	60	203
255'	Gault (same chalk marl)	255	458
10'	Greensand	10	468
10'	Lower Greensand		

M. L. Thomas March '68.

LOG OF STRATA OVERLEAF				
Geological Survey and Museum, South Kensington, London, S.W.7.	Section 6.	Date Received	1" O.S. Map No.	Site marked on 1" Map

221/130 Highdown Farm, Piton

Surface -331ft. Shaft 143. Date unknown.

Dr. 1921. Deepened by bore 6 in. R.W.L. to 191ft. ETL 1923. Wind 180. s.p.h., 5 h.p.d.

Electric pump. c. 1956.

MCh	...	...	143	143
LCh	...	...	60	203
LCh	...	...	255	458
G	...	...	10	468
LGS	...	...		

GEOLOGICAL
CLASSIFICATION

NATURE OF STRATA

THICKNESS
ft.

DEPTH
ft.

MCh	}	Chalk	143	143
LCh 143'				
LCh 60'	}	Gault (some chalk marl)	255	458
? LCh 255'				
Gault				
Lower Greensand		Greensand	10	468
10'				

Pr. L.P. Thomas March '68.

Contact BGS: ngdc@bgs.ac.uk



(For Survey use only)
GEOLOGICAL
CLASSIFICATION

NATURE OF STRATA

If measurements start below ground surface, state how far .

THICKNESS

Free Trucks

Длѣти

Final Notes

L.T. Franklin Highdown Farm Piton

This is a 5' diameter well dug originally to 120 feet deep and failed in 1921 and again in 1955. In 1955 it was deepened to 125 feet and gives an excellent supply of water. It is pumped at the rate of 800 gallons an hour to a 4,000 gallon storage tank and supplies Highdown House, seven cottages and 4 field drinking points. Over £200 was recently spent on this well.

It is anticipated that this proposed
bake will materially affect this supply and
the occupier expressed considerable concern
lest he should lose his present supply.
Information from J.W. Clayton Esq., Historic W.D.C.
is letter filed under WE/221/Offley/Goss 15/2/56 A.M.M.



221/358 Mr. Walker, Bakehouse, Holwell Road, Barton

TL13SW18
1499,3210

Surface +220. Shaft x 3. Date unknown.

R.W.L. +199%. Sept. - 1941. Dec. Handpump. 1956. R.W.L. -209. Feb. 1957.

Loc

32

32

Estimated classification

pp MJ. Cole
July 1966

LOG OF STRATA OVERLEAF.

BRITISH GEOLOGICAL SURVEY AND MUSEUM,
SOUTH KENSINGTON,
LONDON, S.W.7.

Section 6.

Date
Received

1" O.S. Map
No.

Site marked
on 1" Map

(use symbol)
on 6" Map



221/358 Mr. Walker, Bakehouse, Holwell Road, Piton

TL13/27

Surface +220. Shaft x 3. Date unknown.

R.W.L. +199%. Sept. 1941. Dec. Handpump. 1956. R.W.L. +200. Feb. 1957.

Lck

...

...

32

32

Estimated classification

pp. MJ. Calk

July 1966

TL1499 3210



(For Survey use only)
GEOLOGICAL
CLASSIFICATION

NATURE OF STRATA

If measurements start below
ground surface, state how far

THICKNESS

Feet Inches

DEPTH

Feet Inches

26m
11/01/66

3/4

Appendix E

Infiltration Test Location Plan, Data, Photographs and Calculations



Infiltration Test Outcomes;

Hole 1.

2m long 0.5m wide. 2m deep.

Water level 1.1m.

The following are the water levels at 15 min intervals:

0.9, 0.7, 0.65, 0.6, 0.6, 0.5, 0.5, 0.5,

After 2 hours 0.4, 3 more hours 0.3, 8 hours 0.2, water still present after 24 hours.

Hole 2.

1.5m long 0.5 wide. 0.6m deep.

Water level 0.4m.

The following are the water levels at 15 min intervals:

0.25, 0.2, .01, 0.

Hole 3.

1.6m long 0.5 m wide. 0.7m deep.

Water level 0.5m.

The following are the water levels at 15 min intervals.

0.3, 0.3, 0.25, 0.2, 0.2, after 30 mins 0.1 and 30 mins later 0.

Hole 4.

1.5m long 0.5m wide 1.8m deep.

Water level 1.2m.

The following are the water levels at 15 min intervals unless stated.

1.0, 0.8, 0.7, 0.6, then to 30 min intervals, 0.5, 0.45 then to hourly intervals 0.4, 0.3, 0.25, 0.2, after 2 hours .01 after 3 hours 0.05 an hour later 0.

Hole 5.

Excavate to try and find water table.

We went down to 2.8m and no water.



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This survey is intended to provide information for planning and design purposes only. It is not intended to be used for legal or engineering purposes. The client is responsible for verifying the accuracy of the information provided.

Coordinate Table

Station	Northing	Easting	Height
1	111111.111	111111.111	111.111
2	111111.111	111111.111	111.111
3	111111.111	111111.111	111.111
4	111111.111	111111.111	111.111

All points located in California Survey within GPS network, all survey control is.

DISCLAIMERS

Survey data has been made in certain cases and is not intended to be used for legal or engineering purposes. The client is responsible for verifying the accuracy of the information provided.

Copy of this data has been made in certain cases and is not intended to be used for legal or engineering purposes. The client is responsible for verifying the accuracy of the information provided.

KEY

Survey notes	Symbol	Survey notes	Symbol
North arrow	↑	Property Line	—
North arrow	↑	Property Line	—
North arrow	↑	Property Line	—
North arrow	↑	Property Line	—

ABBREVIATIONS

Abbreviation	Full Name	Abbreviation	Full Name
AD	Asphalt Driveway	AD	Asphalt Driveway
AD	Asphalt Driveway	AD	Asphalt Driveway
AD	Asphalt Driveway	AD	Asphalt Driveway
AD	Asphalt Driveway	AD	Asphalt Driveway

PENTANGALE DESIGN GROUP

Project
**19 WALNUT TREE ROAD,
PILTON, HITCHIN,
SG5 3PX**

TOPOGRAPHICAL SURVEY

Drawing Number
TS25-677-1

Revision

Revision	Description	Date	By
1	Initial Survey	10/6/26	TS

Scale

Scale	Description	Date	By
1:200 (A1)	Initial Survey	10/6/26	TS

Drawn by
TS

Checked by
PG

Date of Survey
OCT 2025

TERRAIN SURVEYS

The company is a member of the Institution of Surveyors (I.S.) and the Institution of Civil Engineers (I.C.E.).

Accreditation

ICES

The Survey

SSIP

Constructline

Acclaim

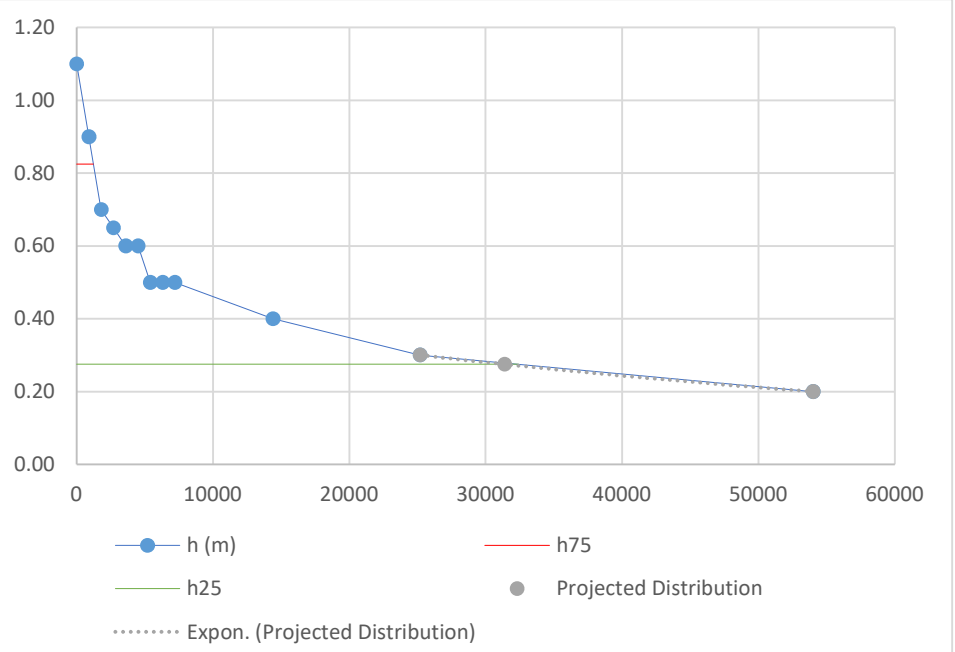




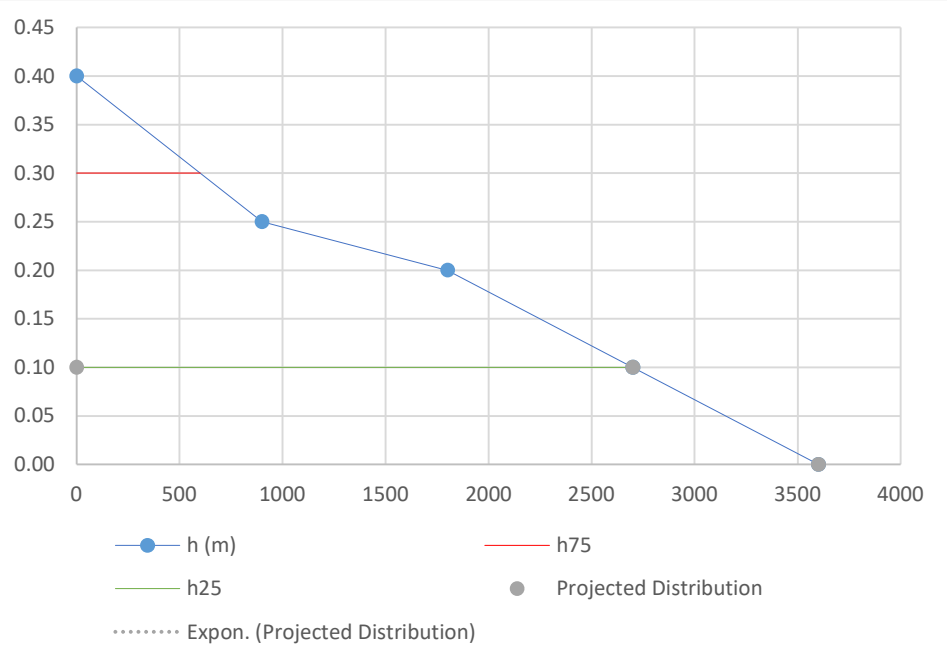


 GHBullard & Associates LLP Civil and Traffic Engineering Consultants 27 Barton Road, Thurston Suffolk, IP31 3PA Tel: 01359 235071 Fax: 01359 231138 Web-site: www.ghbullard.co.uk	<i>Project</i> Walnut Tree Road Pirton			<i>Job ref</i> 175-2026																															
	<i>Design Element</i> Determination of Infiltration Rate to DG 365			<i>Calc sheet no. ref</i> Summary																															
	<i>Drawing ref</i> N/A	<i>Calc by</i> ***	<i>Date</i> 16/06/2026	<i>Check by</i> JAH	<i>Date</i> 16/06/2026																														
	Ref			Calculations																															
			<table><thead><tr><th>Trial Pit</th><th>Test Depth (m)</th><th>Test 1 (m/s)</th><th>Test 2 (m/s)</th><th>Test 3 (m/s)</th><th>Design (m/s)</th></tr></thead><tbody><tr><td>TP1</td><td>2.00</td><td>3.77E-06</td><td></td><td></td><td>3.77E-06</td></tr><tr><td>TP2</td><td>0.6m</td><td>3.46E-05</td><td></td><td></td><td>3.46E-05</td></tr><tr><td>TP3</td><td>0.7m</td><td>1.51E-05</td><td></td><td></td><td>1.51E-05</td></tr><tr><td>TP4</td><td>1.8m</td><td>8.00E-06</td><td></td><td></td><td>8.00E-06</td></tr></tbody></table>			Trial Pit	Test Depth (m)	Test 1 (m/s)	Test 2 (m/s)	Test 3 (m/s)	Design (m/s)	TP1	2.00	3.77E-06			3.77E-06	TP2	0.6m	3.46E-05			3.46E-05	TP3	0.7m	1.51E-05			1.51E-05	TP4	1.8m	8.00E-06			8.00E-06
Trial Pit	Test Depth (m)	Test 1 (m/s)	Test 2 (m/s)	Test 3 (m/s)	Design (m/s)																														
TP1	2.00	3.77E-06			3.77E-06																														
TP2	0.6m	3.46E-05			3.46E-05																														
TP3	0.7m	1.51E-05			1.51E-05																														
TP4	1.8m	8.00E-06			8.00E-06																														
			Output																																

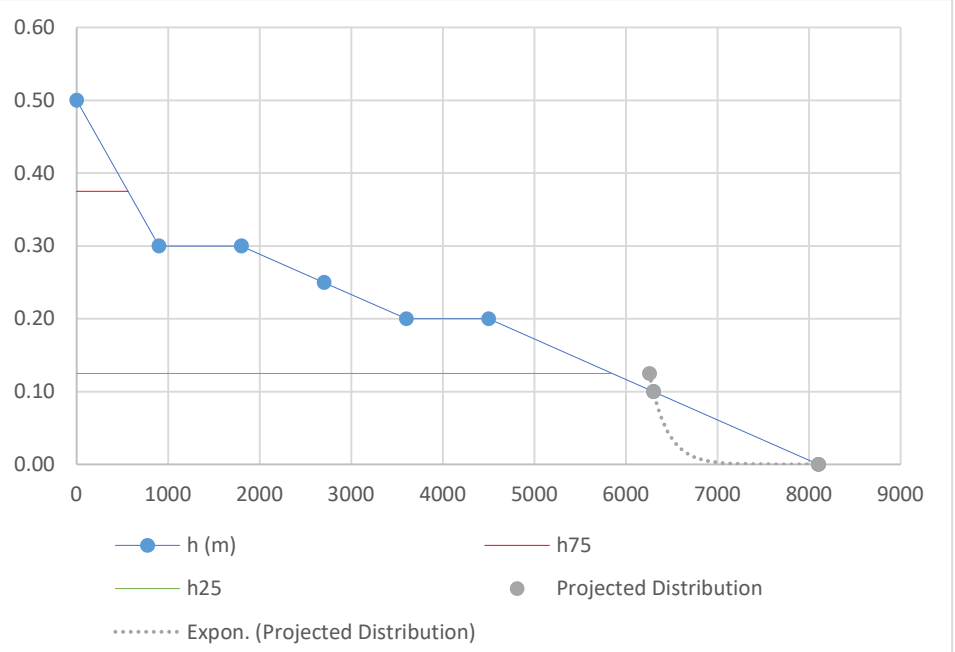
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 GHBullard & Associates LLP Civil and Traffic Engineering Consultants 27 Barton Road, Thurston Suffolk, IP31 3PA Tel: 01359 235071 Fax: 01359 231138 Web-site: www.gbullard.co.uk		Project			Job ref	
		Walnut Tree Road Pirton			175-2026	
		Design Element			Calc sheet no. ref	
		Determination of Infiltration Rate to DG 365			TP1 - Test 1	
		Drawing ref	Calc by	Date	Check by	Date
		N/A	***	16/06/2026	JAH	16/06/2026
Ref	Calculations				Output	
DG365 3.2.3	 Calculate Soil Infiltration Rate $f = \frac{V_{p75-25}}{a_{s50} \cdot t_{p75-25}}$ $V_{p75-25} = L \cdot W \cdot (z_{75} - z_{25})$ $L = 2 \text{ m}$ $W = 0.5 \text{ m}$ $= 2.0 \cdot 0.5 \cdot (0.83 - 0.28)$ $= 0.55 \text{ m}^3$ $a_{s50} = 2 \left(\frac{L \cdot D}{2} \right) + 2 \left(\frac{W \cdot D}{2} \right) + (L \cdot W)$ $D = h_{100} - h_0$ $= 1.10 - 0.00$ $= 1.10 \text{ m}$ $= 2 \left(\frac{2 \cdot 1.1}{2} \right) + 2 \left(\frac{0.5 \cdot 1.1}{2} \right) + (2 \cdot 0.5)$ $= 3.75 \text{ m}^2$ $t_{p75-25} = t_{25} - t_{75}$ $= \text{###} - 1238$ $= 31162 \text{ s}$ $= \frac{0.55}{3.75 \cdot 31162}$ $= 4.71\text{E-}06 \text{ m/s}$ Apply appropriate factor of safety $f_d = \frac{f_k}{\text{FoS}} = \frac{4.71\text{E-}06}{1.25}$ $= 3.77\text{E-}06 \text{ m/s}$				L = 2.00 m W = 0.50 m V_{p75-25} = 0.55 m³ D = 1.10 m a_{s50} = 3.75 m² t_{p75-25} = 31162 s f = 3.77E-06 m/s	

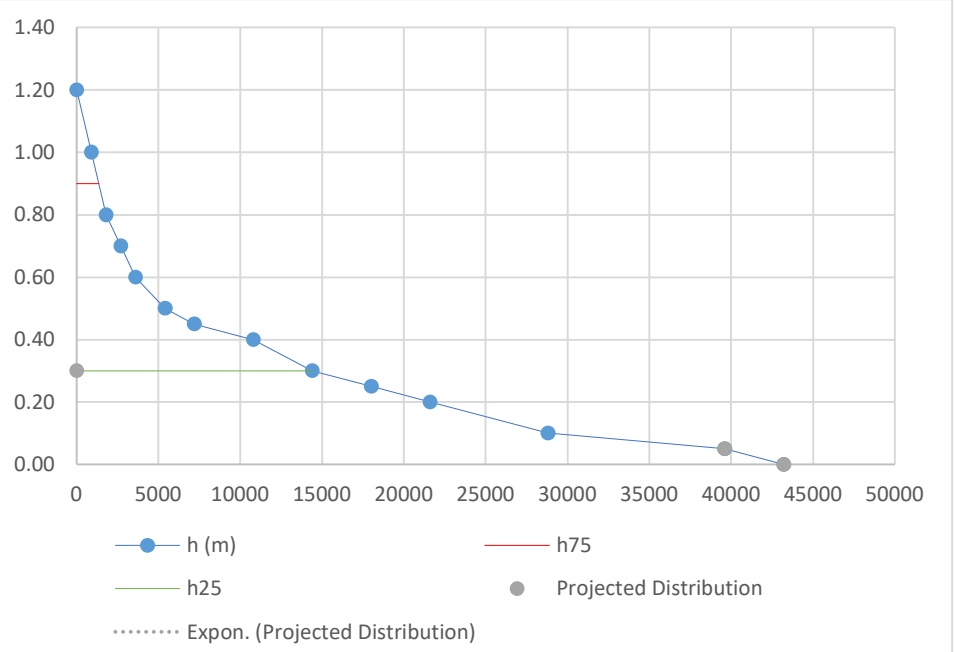
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 GHBullard & Associates LLP Civil and Traffic Engineering Consultants 27 Barton Road, Thurston Suffolk, IP31 3PA Tel: 01359 235071 Fax: 01359 231138 Web-site: www.gbullard.co.uk		Project			Job ref	
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		Design Element			Calc sheet no. ref	
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		N/A	***	16/06/2026	JAH	16/06/2026
Ref	Calculations				Output	
DG365 3.2.3	 Calculate Soil Infiltration Rate $f = \frac{V_{p75-25}}{a_{s50} t_{p75-25}}$ $V_{p75-25} = L W (z_{75} - z_{25})$ $L = 1 \text{ m}$ $W = 0.5 \text{ m}$ $= 1.0 \times 0.5 (0.30 - 0.10)$ $= 0.10 \text{ m}^3$ $a_{s50} = 2(L D / 2) + 2(W D / 2) + (L W)$ $D = h_{100} - h_0$ $= 0.40 - 0.00$ $= 0.40 \text{ m}$ $= 2(1 \times 0.4 / 2) + 2(0.5 \times 0.4 / 2) + (1 \times 0.5)$ $= 1.10 \text{ m}^2$ $t_{p75-25} = t_{25} - t_{75}$ $= 2700 - 600$ $= 2100 \text{ s}$ $= \frac{0.10}{1.10 \times 2100}$ $= 4.33\text{E-}05 \text{ m/s}$ Apply appropriate factor of safety $f_d = \frac{f_k}{\text{FoS}} = \frac{4.33\text{E-}05}{1.25}$ $= 3.46\text{E-}05 \text{ m/s}$				L = 1.00 m W = 0.50 m V_{p75-25} = 0.10 m³ D = 0.40 m a_{s50} = 1.10 m² t_{p75-25} = 2100 s f = 3.46E-05 m/s	

[illegible]

 GHBullard & Associates LLP Civil and Traffic Engineering Consultants 27 Barton Road, Thurston Suffolk, IP31 3PA Tel: 01359 235071 Fax: 01359 231138 Web-site: www.gbullard.co.uk		Project			Job ref	
		Walnut Tree Road Pirton			175-2026	
		Design Element			Calc sheet no. ref	
		Determination of Infiltration Rate to DG 365			TP3 - Test 1	
		Drawing ref	Calc by	Date	Check by	Date
		N/A	***	16/06/2026	JAH	16/06/2026
Ref	Calculations				Output	
DG365 3.2.3	 Calculate Soil Infiltration Rate $f = \frac{V_{p75-25}}{a_{s50} t_{p75-25}}$ $V_{p75-25} = L W (z_{75} - z_{25})$ $L = 1 \text{ m}$ $W = 0.5 \text{ m}$ $= 1.0 \times 0.5 (0.38 - 0.13)$ $= 0.13 \text{ m}^3$ $a_{s50} = 2(L D / 2) + 2(W D / 2) + (L W)$ $D = h_{100} - h_0$ $= 0.50 - 0.00$ $= 0.50 \text{ m}$ $= 2(1 \times 0.5 / 2) + 2(0.5 \times 0.5 / 2) + (1 \times 0.5)$ $= 1.25 \text{ m}^2$ $t_{p75-25} = t_{25} - t_{75}$ $= 5850 - 563$ $= 5287 \text{ s}$ $= \frac{0.13}{1.25 \times 5287}$ $= 1.89\text{E-}05 \text{ m/s}$ Apply appropriate factor of safety $f_d = \frac{f_k}{\text{FoS}} = \frac{1.89\text{E-}05}{1.25}$ $= 1.51\text{E-}05 \text{ m/s}$				$L = 1.00 \text{ m}$ $W = 0.50 \text{ m}$ $V_{p75-25} = 0.13 \text{ m}^3$ $D = 0.50 \text{ m}$ $a_{s50} = 1.25 \text{ m}^2$ $t_{p75-25} = 5287 \text{ s}$ $f = 1.51\text{E-}05 \text{ m/s}$	

[illegible]

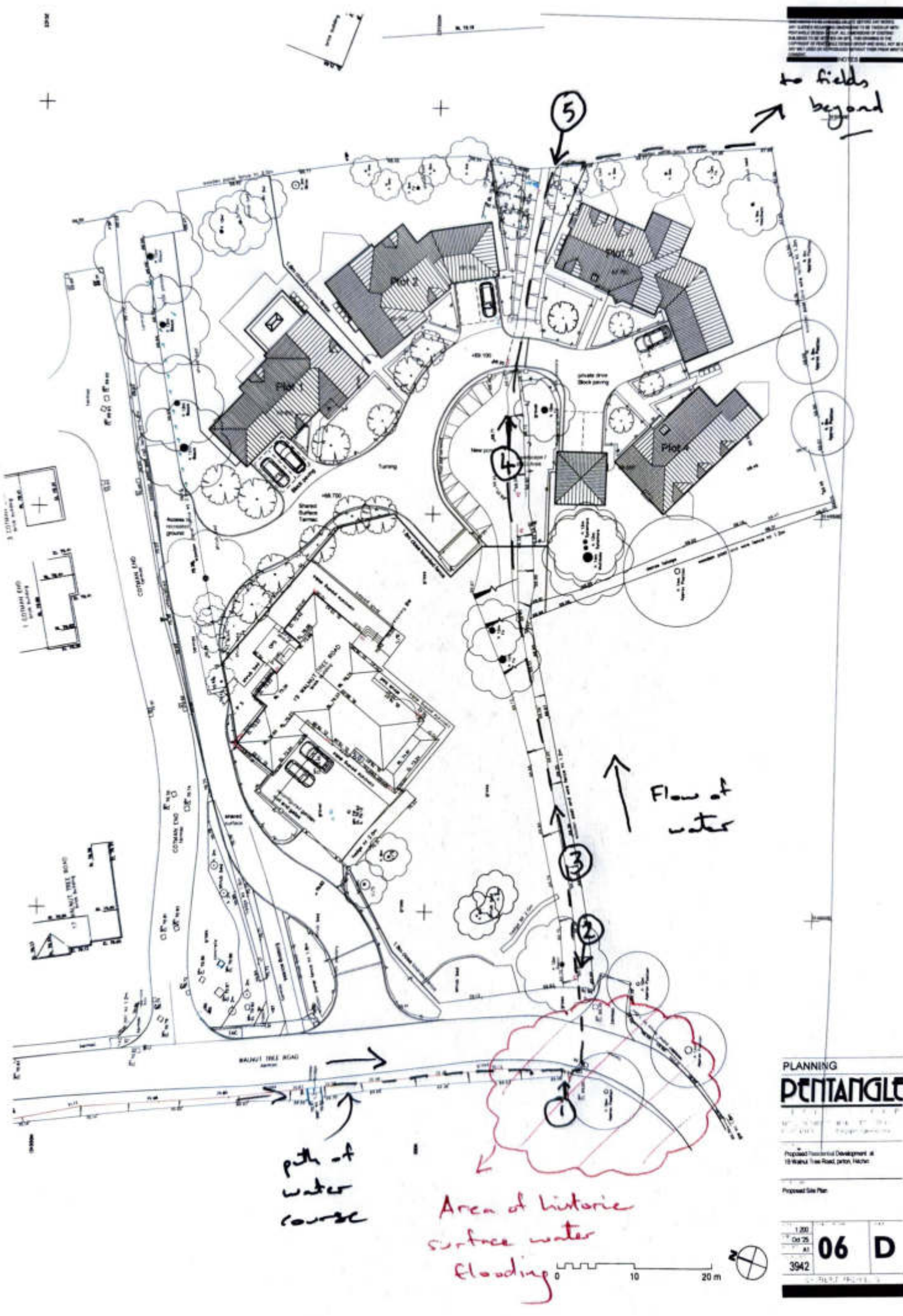
 GHBullard & Associates LLP Civil and Traffic Engineering Consultants 27 Barton Road, Thurston Suffolk, IP31 3PA Tel: 01359 235071 Fax: 01359 231138 Web-site: www.gbullard.co.uk		Project			Job ref	
		Walnut Tree Road Pirton			175-2026	
		Design Element			Calc sheet no. ref	
		Determination of Infiltration Rate to DG 365			TP4 - Test 1	
		Drawing ref	Calc by	Date	Check by	Date
		N/A	***	16/06/2026	JAH	16/06/2026
Ref	Calculations				Output	
DG365 3.2.3	 Calculate Soil Infiltration Rate $f = \frac{V_{p75-25}}{a_{s50} \cdot t_{p75-25}}$ $V_{p75-25} = L \cdot W \cdot (z_{75} - z_{25})$ $L = 1 \text{ m}$ $W = 0.5 \text{ m}$ $= 1.0 \cdot 0.5 \cdot (0.90 - 0.30)$ $= 0.30 \text{ m}^3$ $a_{s50} = 2 \left(\frac{L \cdot D}{2} \right) + 2 \left(\frac{W \cdot D}{2} \right) + (L \cdot W)$ $D = h_{100} - h_0$ $= 1.20 - 0.00$ $= 1.20 \text{ m}$ $= 2 \left(\frac{1 \cdot 1.2}{2} \right) + 2 \left(\frac{0.5 \cdot 1.2}{2} \right) + (1 \cdot 0.5)$ $= 2.30 \text{ m}^2$ $t_{p75-25} = t_{25} - t_{75}$ $= \text{###} - 1350$ $= 13050 \text{ s}$ $= \frac{0.30}{2.30 \cdot 13050}$ $= 1.00\text{E-}05 \text{ m/s}$ Apply appropriate factor of safety $f_d = \frac{f_k}{\text{FoS}} = \frac{1.00\text{E-}05}{1.25}$ $= 8.00\text{E-}06 \text{ m/s}$				L = 1.00 m W = 0.50 m V_{p75-25} = 0.30 m³ D = 1.20 m a_{s50} = 2.30 m² t_{p75-25} = 13050 s f = 8.00E-06 m/s	

Appendix F

Watercourse Images & Existing Network Capacity Calculations



NOTES
 1. ALL DIMENSIONS ARE IN METERS
 2. ALL DIMENSIONS ARE TO BE TAKEN AT THE
 3. DIMENSIONS TO BE TAKEN AT THE
 4. DIMENSIONS TO BE TAKEN AT THE
 5. DIMENSIONS TO BE TAKEN AT THE



PLANNING
PENTANGLE

Proposed Residential Development at
 10 Walnut Tree Road, Letchworth, Herts.

Proposed Site Plan
 1:200
 Oct 20
 3942
06 D

Old Vicarage, Pirton – surface water photographs

Photograph 1A – view of brook running alongside Walnut Tree Road



Photograph 1B – outlet at end of brook which crosses road into application site



Photograph 2 – pipe entering application site (looking back towards Walnut Tree Road)



Photograph 3 – water course within application site



Photograph 4 – pipe in application site



Photograph 5 – exit point of pipe from application site to land beyond



East Boundary – Open Channel Upstream



Open Channel Downstream





Project

19 Walnut Tree Road, Pirton

Design Element

Manning Channel Flow Assessment

Drawing ref

N/A

Calc by

BAF

Date

10/07/26

Job ref

175-2026

Calc sheet no. ref

01

Check by

JAH

Date

10/07/26

Ref

Calculations

Output

Hydraulic Radius Calculation

$$R = \frac{A}{P}$$

Calculation Inputs

$$A = 1.955 \text{ m}^2 \quad \text{Cross Sectional Area of Open Channel}$$

$$P = 4.88 \text{ m} \quad \text{Wetted perimeter}$$

Hydraulic Radius Calculation

$$R = \frac{1.955}{4.88}$$

Hydraulic Radius
0.40

Manning Formula for Determining Open Channel Flows

$$Q = \frac{K}{n} * R^{\frac{2}{3}} * S^{\frac{1}{2}} * A$$

Calculation Inputs

$$K = 1 \quad \text{Unit Conversion Factor}$$

$$n = 0.045 \quad \text{Mannings Roughness Coefficient}$$

$$R = 0.40 \quad \text{Hydraulic Radius}$$

$$S = 0.013 \quad \text{Slope}$$

$$A = 1.955 \text{ m}^2 \quad \text{Cross Sectional Area}$$

Manning Formula for Determining Open Channel Flows

$$Q = \frac{1}{0.045} * 0.40^{\frac{2}{3}} * 0.013^{\frac{1}{2}} * 1.955$$

Maximum Channel
Capacity

2.692 m³/s

(**2692** l/s)



Project

19 Walnut Tree Road, Pirton

Design Element

Manning Channel Flow Assessment

Drawing ref

N/A

Calc by

BAF

Date

10/07/26

Job ref

175-2026

Calc sheet no. ref

01

Check by

JAH

Date

10/07/26

Ref

Calculations

Output

Existing 1500 Culvert From Upstream Catchment Estimated Flow Capacity Based Upon 1:77 Gradient

Flow Capacity

15.5l/s

Existing 3000 Culvert From Upstream Catchment Estimated Flow Capacity Based Upon 1:77 Gradient

Flow Capacity

158.5l/s

An assessment of the Upstream Catchment Has Been Completed Using ReFH2 Software To Determine The Peak Flow Capacity Upstream of the Existing 1500 Pipe Under Walnut Tree Road Connecting Into The Existing Watercourse Within The development. Refer To Modelling Output For Additional Informaton.

Peak Upstream Flow Rate

0.017m³/s

17.0l/s



Flooding Occurs Upstream of the Existing 1500 Culvert Beneath Walnut Tree Road

The Existing 3000 Culvert Is Suitably Sized To Prevent Flooding On Site

The Existing Watercourse Is Suitably Size to Receive The Additional Runoff From The Development

—

305 cm
10 ft

— — — — —

1.61 cm
1.2 ft
1.83 cm
6 ft

+++++
+++++

Subject
Site

UK Design Flood Estimation

Generated on 09 July 2026 15:23:52 by JHorner
Printed from the ReFH2 Flood Modelling software package, version 4.1.8720.30241

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 4564-FE2B

Site name: FEH_Catchment_Descriptors_515150_231500_v5_1_0

Easting: 515150

Northing: 231500

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.09 [1.29]*

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 100 year 1.4 CC

Summary of results

Rainfall - FEH22 (mm):	80.58	Total runoff (ML):	0.25
Total Rainfall (mm):	49.48	Total flow (ML):	0.82
Peak Rainfall (mm):	16.72	Peak flow (m ³ /s):	0.02

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.62	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No
Climate change factor	1.40	Yes

Loss model parameters

Name	Value	User-defined?
Cini (mm)	48.19	No
Cmax (mm)	1298.23	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.45	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	54.65	No
BR	3.65	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Effective URBEXT2000	0.01	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	2.011	0.000	0.083	0.000	0.000	0.000
00:30:00	4.501	0.000	0.197	0.000	0.000	0.000
01:00:00	9.869	0.000	0.486	0.000	0.000	0.000
01:30:00	16.715	0.000	0.993	0.001	0.000	0.001
02:00:00	9.869	0.000	0.687	0.003	0.000	0.003
02:30:00	4.501	0.000	0.338	0.006	0.000	0.006
03:00:00	2.011	0.000	0.156	0.009	0.000	0.009
03:30:00	0.000	0.000	0.000	0.012	0.001	0.013
04:00:00	0.000	0.000	0.000	0.015	0.001	0.016
04:30:00	0.000	0.000	0.000	0.016	0.002	0.017
05:00:00	0.000	0.000	0.000	0.015	0.002	0.017
05:30:00	0.000	0.000	0.000	0.013	0.002	0.016
06:00:00	0.000	0.000	0.000	0.011	0.003	0.014
06:30:00	0.000	0.000	0.000	0.009	0.003	0.012
07:00:00	0.000	0.000	0.000	0.008	0.003	0.011
07:30:00	0.000	0.000	0.000	0.006	0.004	0.010
08:00:00	0.000	0.000	0.000	0.005	0.004	0.009
08:30:00	0.000	0.000	0.000	0.004	0.004	0.008
09:00:00	0.000	0.000	0.000	0.003	0.004	0.007
09:30:00	0.000	0.000	0.000	0.002	0.004	0.006
10:00:00	0.000	0.000	0.000	0.001	0.004	0.005
10:30:00	0.000	0.000	0.000	0.001	0.004	0.005
11:00:00	0.000	0.000	0.000	0.000	0.004	0.004
11:30:00	0.000	0.000	0.000	0.000	0.004	0.004
12:00:00	0.000	0.000	0.000	0.000	0.004	0.004
12:30:00	0.000	0.000	0.000	0.000	0.004	0.004
13:00:00	0.000	0.000	0.000	0.000	0.004	0.004
13:30:00	0.000	0.000	0.000	0.000	0.004	0.004
14:00:00	0.000	0.000	0.000	0.000	0.004	0.004
14:30:00	0.000	0.000	0.000	0.000	0.004	0.004
15:00:00	0.000	0.000	0.000	0.000	0.004	0.004
15:30:00	0.000	0.000	0.000	0.000	0.004	0.004
16:00:00	0.000	0.000	0.000	0.000	0.004	0.004
16:30:00	0.000	0.000	0.000	0.000	0.004	0.004

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:00:00	0.000	0.000	0.000	0.000	0.004	0.004
17:30:00	0.000	0.000	0.000	0.000	0.004	0.004
18:00:00	0.000	0.000	0.000	0.000	0.004	0.004
18:30:00	0.000	0.000	0.000	0.000	0.003	0.003
19:00:00	0.000	0.000	0.000	0.000	0.003	0.003
19:30:00	0.000	0.000	0.000	0.000	0.003	0.003
20:00:00	0.000	0.000	0.000	0.000	0.003	0.003
20:30:00	0.000	0.000	0.000	0.000	0.003	0.003
21:00:00	0.000	0.000	0.000	0.000	0.003	0.003
21:30:00	0.000	0.000	0.000	0.000	0.003	0.003
22:00:00	0.000	0.000	0.000	0.000	0.003	0.003
22:30:00	0.000	0.000	0.000	0.000	0.003	0.003
23:00:00	0.000	0.000	0.000	0.000	0.003	0.003
23:30:00	0.000	0.000	0.000	0.000	0.003	0.003
24:00:00	0.000	0.000	0.000	0.000	0.003	0.003
24:30:00	0.000	0.000	0.000	0.000	0.003	0.003
25:00:00	0.000	0.000	0.000	0.000	0.003	0.003
25:30:00	0.000	0.000	0.000	0.000	0.003	0.003
26:00:00	0.000	0.000	0.000	0.000	0.003	0.003
26:30:00	0.000	0.000	0.000	0.000	0.003	0.003
27:00:00	0.000	0.000	0.000	0.000	0.003	0.003
27:30:00	0.000	0.000	0.000	0.000	0.003	0.003
28:00:00	0.000	0.000	0.000	0.000	0.003	0.003
28:30:00	0.000	0.000	0.000	0.000	0.003	0.003
29:00:00	0.000	0.000	0.000	0.000	0.003	0.003
29:30:00	0.000	0.000	0.000	0.000	0.003	0.003
30:00:00	0.000	0.000	0.000	0.000	0.003	0.003
30:30:00	0.000	0.000	0.000	0.000	0.003	0.003
31:00:00	0.000	0.000	0.000	0.000	0.003	0.003
31:30:00	0.000	0.000	0.000	0.000	0.003	0.003
32:00:00	0.000	0.000	0.000	0.000	0.003	0.003
32:30:00	0.000	0.000	0.000	0.000	0.003	0.003
33:00:00	0.000	0.000	0.000	0.000	0.003	0.003
33:30:00	0.000	0.000	0.000	0.000	0.003	0.003
34:00:00	0.000	0.000	0.000	0.000	0.003	0.003

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:30:00	0.000	0.000	0.000	0.000	0.003	0.003
35:00:00	0.000	0.000	0.000	0.000	0.003	0.003
35:30:00	0.000	0.000	0.000	0.000	0.003	0.003
36:00:00	0.000	0.000	0.000	0.000	0.003	0.003
36:30:00	0.000	0.000	0.000	0.000	0.003	0.003
37:00:00	0.000	0.000	0.000	0.000	0.002	0.002
37:30:00	0.000	0.000	0.000	0.000	0.002	0.002
38:00:00	0.000	0.000	0.000	0.000	0.002	0.002
38:30:00	0.000	0.000	0.000	0.000	0.002	0.002
39:00:00	0.000	0.000	0.000	0.000	0.002	0.002
39:30:00	0.000	0.000	0.000	0.000	0.002	0.002
40:00:00	0.000	0.000	0.000	0.000	0.002	0.002
40:30:00	0.000	0.000	0.000	0.000	0.002	0.002
41:00:00	0.000	0.000	0.000	0.000	0.002	0.002
41:30:00	0.000	0.000	0.000	0.000	0.002	0.002
42:00:00	0.000	0.000	0.000	0.000	0.002	0.002
42:30:00	0.000	0.000	0.000	0.000	0.002	0.002
43:00:00	0.000	0.000	0.000	0.000	0.002	0.002
43:30:00	0.000	0.000	0.000	0.000	0.002	0.002
44:00:00	0.000	0.000	0.000	0.000	0.002	0.002
44:30:00	0.000	0.000	0.000	0.000	0.002	0.002
45:00:00	0.000	0.000	0.000	0.000	0.002	0.002
45:30:00	0.000	0.000	0.000	0.000	0.002	0.002
46:00:00	0.000	0.000	0.000	0.000	0.002	0.002
46:30:00	0.000	0.000	0.000	0.000	0.002	0.002
47:00:00	0.000	0.000	0.000	0.000	0.002	0.002
47:30:00	0.000	0.000	0.000	0.000	0.002	0.002
48:00:00	0.000	0.000	0.000	0.000	0.002	0.002
48:30:00	0.000	0.000	0.000	0.000	0.002	0.002
49:00:00	0.000	0.000	0.000	0.000	0.002	0.002
49:30:00	0.000	0.000	0.000	0.000	0.002	0.002
50:00:00	0.000	0.000	0.000	0.000	0.002	0.002
50:30:00	0.000	0.000	0.000	0.000	0.002	0.002
51:00:00	0.000	0.000	0.000	0.000	0.002	0.002
51:30:00	0.000	0.000	0.000	0.000	0.002	0.002

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:00:00	0.000	0.000	0.000	0.000	0.002	0.002
52:30:00	0.000	0.000	0.000	0.000	0.002	0.002
53:00:00	0.000	0.000	0.000	0.000	0.002	0.002
53:30:00	0.000	0.000	0.000	0.000	0.002	0.002
54:00:00	0.000	0.000	0.000	0.000	0.002	0.002
54:30:00	0.000	0.000	0.000	0.000	0.002	0.002
55:00:00	0.000	0.000	0.000	0.000	0.002	0.002
55:30:00	0.000	0.000	0.000	0.000	0.002	0.002
56:00:00	0.000	0.000	0.000	0.000	0.002	0.002
56:30:00	0.000	0.000	0.000	0.000	0.002	0.002
57:00:00	0.000	0.000	0.000	0.000	0.002	0.002
57:30:00	0.000	0.000	0.000	0.000	0.002	0.002
58:00:00	0.000	0.000	0.000	0.000	0.002	0.002
58:30:00	0.000	0.000	0.000	0.000	0.002	0.002
59:00:00	0.000	0.000	0.000	0.000	0.002	0.002
59:30:00	0.000	0.000	0.000	0.000	0.002	0.002
60:00:00	0.000	0.000	0.000	0.000	0.002	0.002
60:30:00	0.000	0.000	0.000	0.000	0.002	0.002
61:00:00	0.000	0.000	0.000	0.000	0.002	0.002
61:30:00	0.000	0.000	0.000	0.000	0.002	0.002
62:00:00	0.000	0.000	0.000	0.000	0.002	0.002
62:30:00	0.000	0.000	0.000	0.000	0.002	0.002
63:00:00	0.000	0.000	0.000	0.000	0.002	0.002

Appendix

Catchment descriptors *

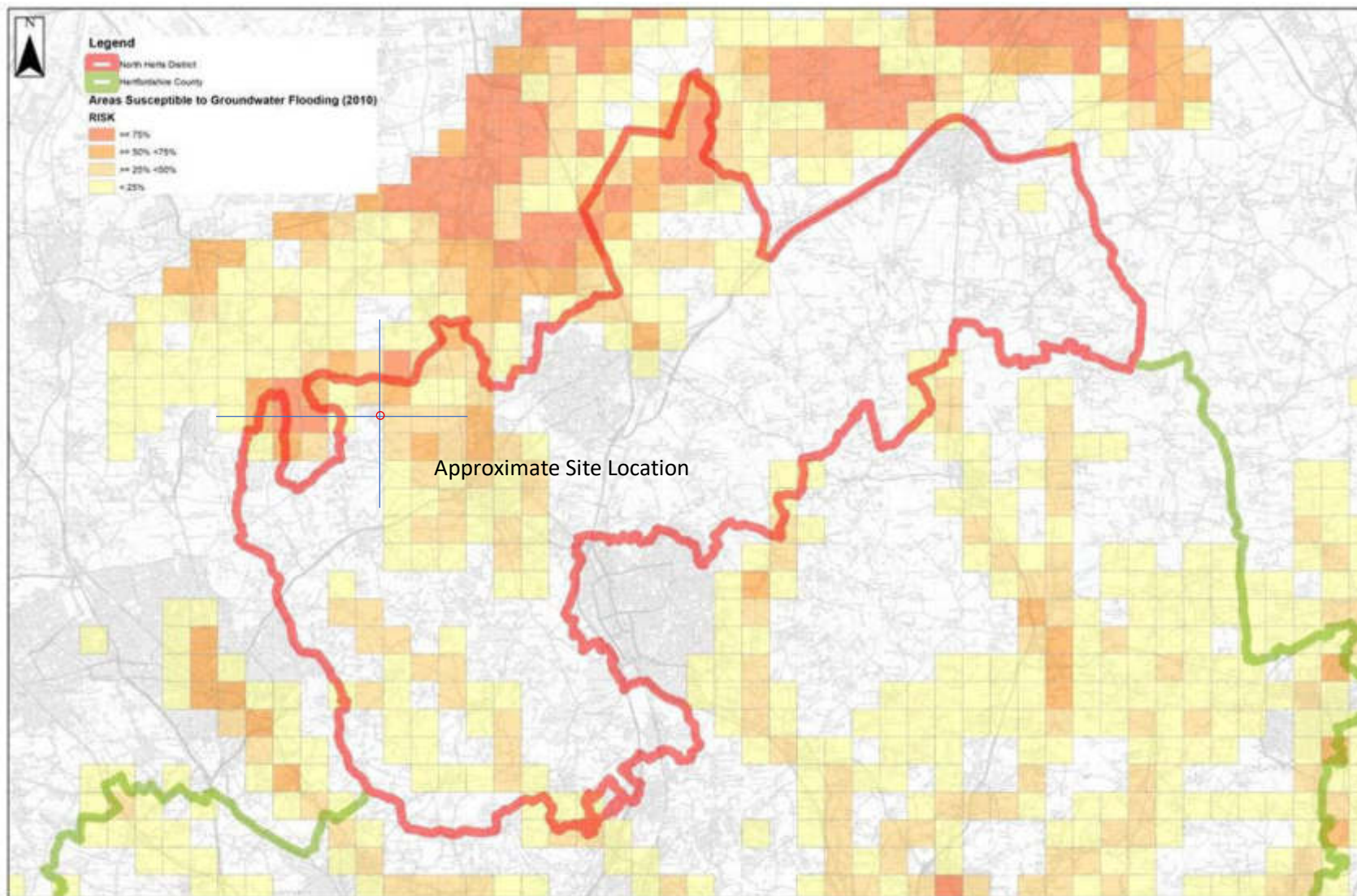
Name	Value	User-defined value used?
Area (km ²)	0.09 [1.29]	Yes
ALTBAR	95	No
ASPBAR	38	No
ASPVAR	0.7	No
BFIHOST	0.96	No
BFIHOST19	0.94	No
DPLBAR (km)	1.3	No
DPSBAR (mkm ⁻¹)	55.9	No
FARL	1	No
LDP	2.58	No
PROPWET	0.3	No
RMED1H	10.4	No
RMED1D	29.6	No
RMED2D	35.5	No
SAAR (mm)	603	No
SAAR4170 (mm)	610	No
SPRHOST	5.12	No
URBEXT2000	0.01	No
URBEXT1990	0.01	No
URBCONC	0.71	No
URBLOC	0.47	No
DDF parameter C	-0.03	No
DDF parameter D1	0.32	No
DDF parameter D2	0.3	No
DDF parameter D3	0.32	No
DDF parameter E	0.32	No
DDF parameter F	2.43	No
DDF parameter C (1km grid value)	-0.03	No
DDF parameter D1 (1km grid value)	0.32	No
DDF parameter D2 (1km grid value)	0.29	No
DDF parameter D3 (1km grid value)	0.33	No
DDF parameter E (1km grid value)	0.32	No
DDF parameter F (1km grid value)	2.43	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

Appendix G

Hertfordshire County Council North Hertfordshire District Section 19 Flood Investigations – Susceptibility to Groundwater Flooding Mapping





North Herts District Susceptibility to Groundwater Flooding

OS 50K Greyscale

0 2,000 4,000 Meters

floodandwatermanagement@hertfordshire.gov.uk
HCC General Enquiries: 01992 556470

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Scale: 1:120,000

Date: 29/04/2021

Appendix H

Proposed Development Layout





PLANNING

PENTANGLE
DESIGN GROUP

SUITE 1, 21 BANCROFT HITCHIN HERTS SG5 1JW
T:01462 431133 E:pdg@pentangledesign.co.uk

Proposed Residential Development at
19 Walnut Tree Road, Pirton, Hitchin

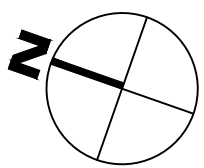
Proposed Site Plan

SCALE	1:200	DRAWING NUMBER	REVISION
DATE	Oct '25		
SHEET SIZE	A1		
JOB NUMBER	3942		

06 H

CHARTERED ARCHITECTS

0 10 20 m



Appendix I

Greenfield Runoff Rate Calculation



175/2026: 19 Walnut Tree Road, Pirton, Hitchin, Hertfordshire, SG5 3PX

FEH Data

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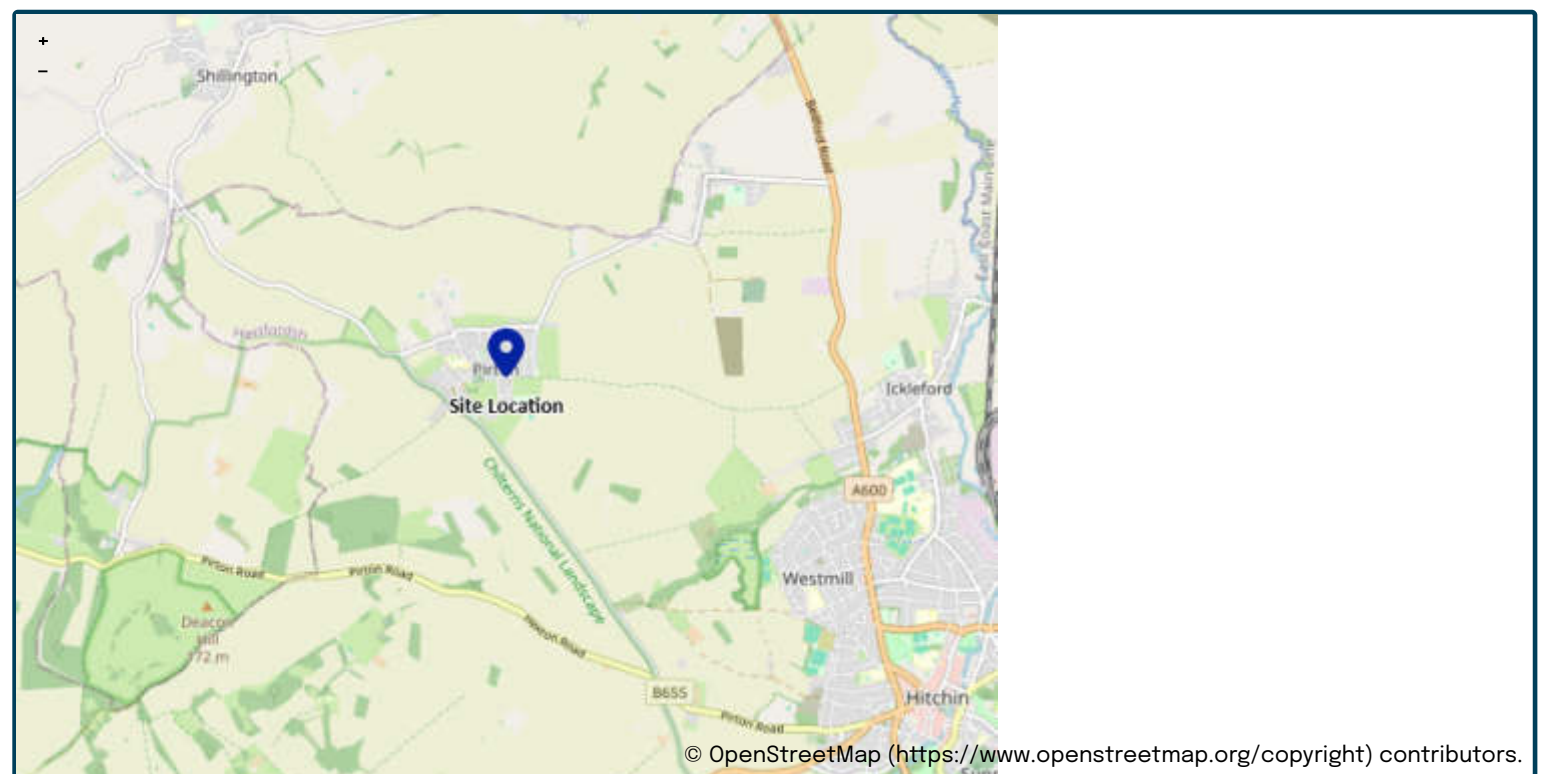
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	03/07/2026
Calculated by	BAF
Reference	175-2026
Model version	2.2.3

Location

Site name	19 Walnut Tree Road
Site location	Pirton



Site easting (British National Grid)	514944
Site northing (British National Grid)	231514

Site details

Total site area (ha)	1	ha
----------------------	--------------------------------	----

Greenfield runoff

Method

Method	FEH statistical (2025)
--------	------------------------

FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	612	mm
BFIHOST19scaled	0.906	
QMed-QBar conversion	1.124	1.124
QMed (l/s)	0.3	l/s
QBar (FEH statistical 2025) (l/s)	0.3	l/s

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	5	5
1 year growth factor	0.87	
2 year growth factor	0.89	
10 year growth factor	1.65	
30 year growth factor	2.45	
100 year growth factor	3.56	
200 year growth factor	4.21	

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	0.3
Flow rate 2 year (l/s)	0.3
Flow rate 10 years (l/s)	0.5
Flow rate 30 years (l/s)	0.7
Flow rate 100 years (l/s)	1.1
Flow rate 200 years (l/s)	1.3

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

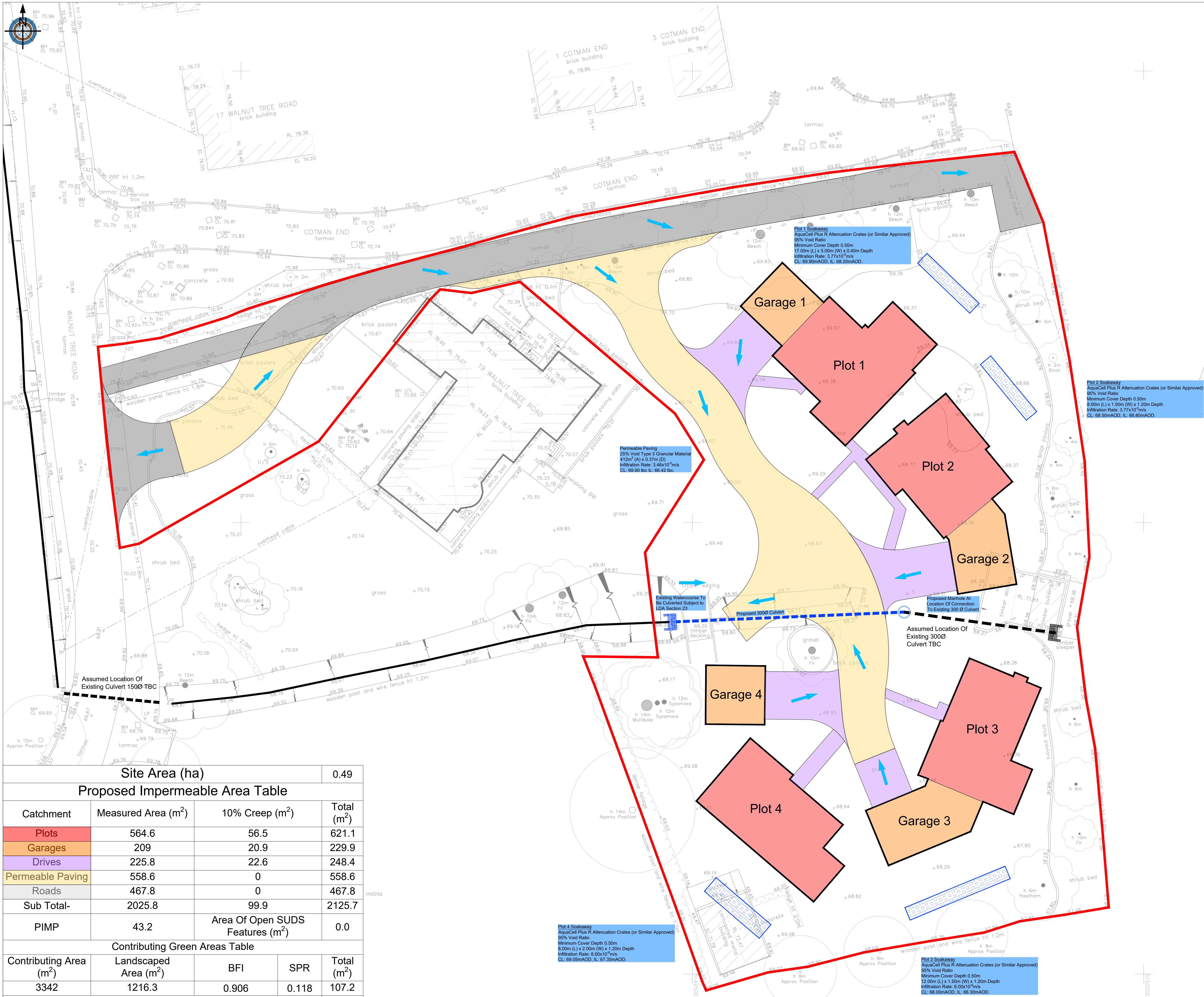
This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix J

Proposed Drainage Strategy Drawing

Primary Drainage System





- NOTES:
- This drawing is to be read in conjunction with GHB series 175/2026 drawings and documents and any other relevant project team documents.
 - Preliminary Issue - This drawing is not to be used for construction or detailed pricing purposes. Any work undertaken before approvals are received (in writing) are at risk of abortive works.
 - This drawing has been produced based upon the following information:
Topographical Survey by Terrain Survey (Ref. TS25-677-1-3D dated OCT 2025) subject to transformation of :
Scale 1 and translation (0, 0, 0) about point (0, 0, 0).
Architectural Layout by Pentangle (Ref. 3942 Site Plan - APPLICATION - NO POND dated Oct 2025) subject to transformation of : Scale 0.001, Rotation: 88.8° translation (515735, 231745, 0) about point (0, 0, 0).
 - All site levels and finished floor levels to remain indicative for planning purposes and are subject to verification following detailed design.
 - This drawing has been prepared solely for the purpose of obtaining a Planning Consent based on information available and planning requirements at the date of issue only.

LEGEND

- Site Boundary- Area: 0.49 ha
- Proposed Exceedance Flowpath
- Proposed Soakaway
- Indicative Surface Water Network
- Proposed Culverted Watercourse
- Existing Watercourse
- Existing 300Ø Culverted Watercourse

P2	15/07/26	Revised Based Upon Client Comments	BAF	JAH
P1	03/07/26	Initial Issue	BAF	JAH
Rev	Rev Date	Description	Drawn	Chck'd

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W: <http://www.ghbullard.co.uk>

Partnership No. OC383830, Registered in England and Wales

Client: **MR & MRS SHADBOLT**

Project: **19 WALNUT TREE ROAD, PIRTON, HERTFORDSHIRE**

Drawing Title: **FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY
PROPOSED SITE LAYOUT
PRIMARY DRAINAGE
SYSTEM - INFILTRATION**

Status: **FOR PLANNING**

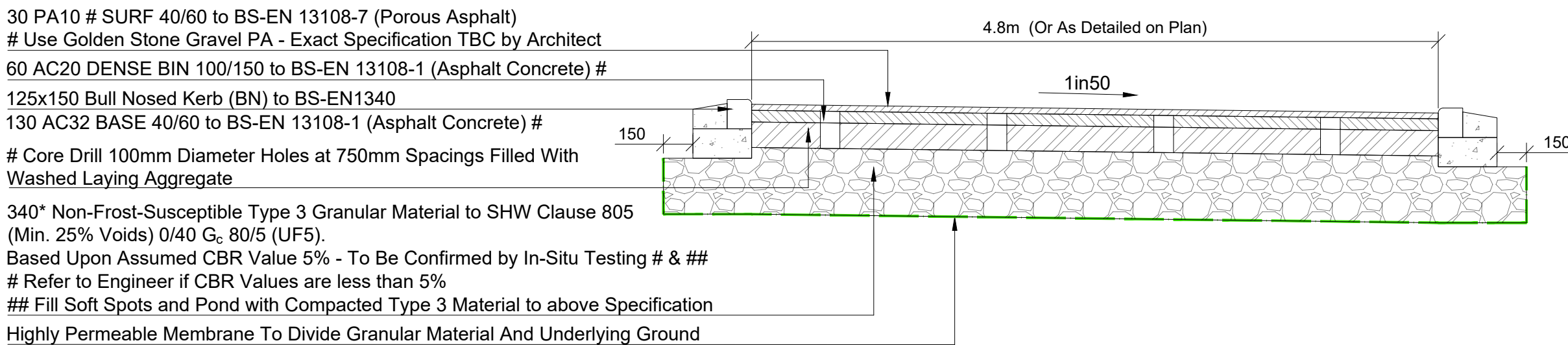
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Created: **JULY 2026** Drawn: **BAF**

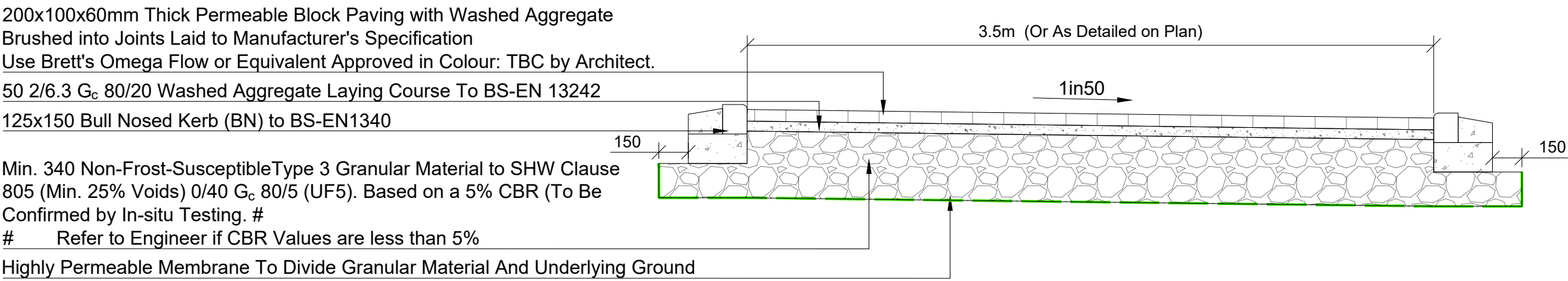
DWG Reference: **175-2026.DWG** Checked: **JAH**

Drawing Number: **175/2026/013** Revision: **P2**

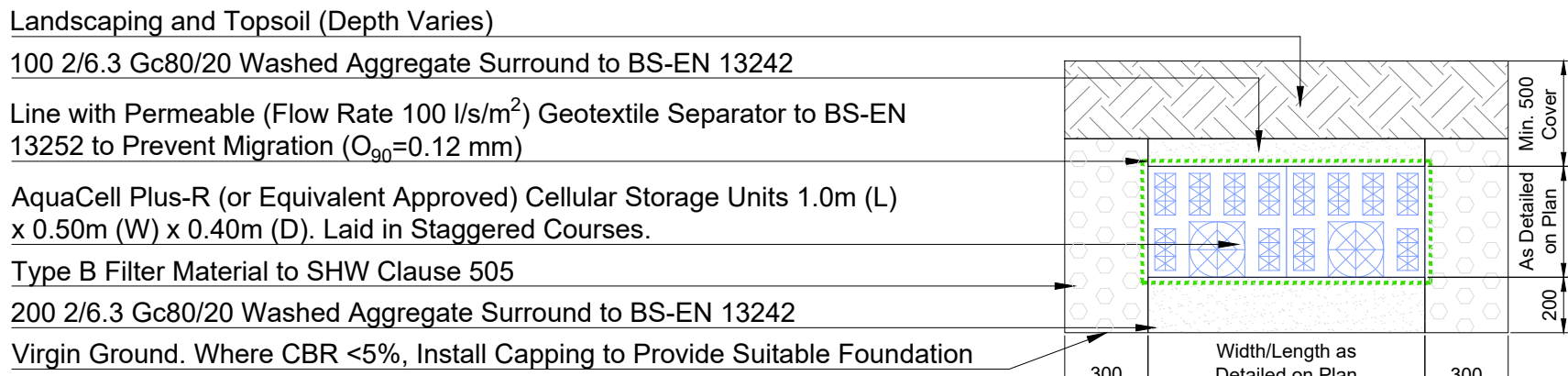
PI# = Preliminary, CI# = Construction, AB# = As Built



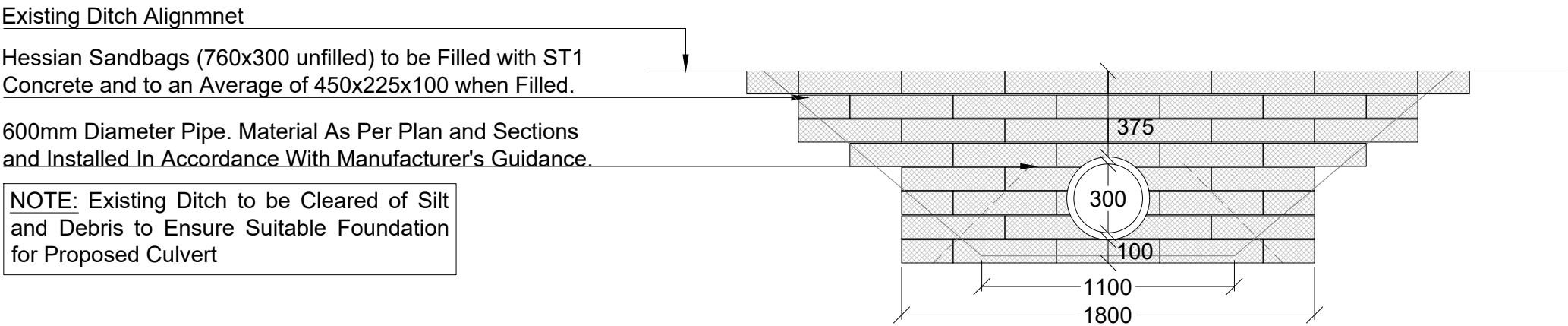
TYPICAL PERMEABLE ASPHALT ACCESS ROAD CONSTRUCTION DETAIL



TYPICAL PERMEABLE BLOCK PAVED DRIVE CONSTRUCTION DETAIL (NO HEAVY VEHICLE LOADING)



TYPICAL AQUACELL PLUS-R SOAKAWAY CRATES (IN NON-TRAFFICKED AREAS) CONSTRUCTION DETAIL



TYPICAL 300Ø CONCRETE FILLED SANDBAG HEADWALL CONSTRUCTION DETAIL

- NOTES:
- This drawing is to be read in conjunction with GHB series 175/2026 drawings and documents and any other relevant project team documents.
 - Preliminary Issue - This drawing is not to be used for construction or detailed pricing purposes. Any work undertaken before approvals are received (in writing) are at risk of abortive works.
 - This drawing has been produced based upon the following information:
Topographical Survey by Terrain Survey (Ref. TS25-677-1-3D dated OCT 2025) subject to transformation of :
Scale 1 and translation (0, 0, 0) about point (0, 0, 0).
Architectural Layout by Pentangle (Ref. 3942 Site Plan - APPLICATION - NO POND dated Oct 2025) subject to transformation of : Scale 0.001, Rotation: 88.8° translation (515735, 231745, 0) about point (0, 0, 0).
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P2	15/07/26	Revised Based Upon Client Comments	BAF	JAH	
P1	09/07/26	Initial Issue	BAF	JAH	
Rev	Rev Date	Description	Drawn	Chck'd	

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Partnership No. OC383830, Registered in England and Wales

Client:

MR & MRS SHADBOLT

Project:

19 WALNUT TREE ROAD, PIRTON,
HERTFORDSHIRE

Drawing Title:

FLOOD RISK ASSESSMENT
AND DRAINAGE STRATEGY
CONSTRUCTION DETAILS
PRIMARY DRAINAGE
SYSTEM - INFILTRATION

Status:

FOR PLANNING

Scale:

NOT TO SCALE

Created:

JULY 2026

Drawn:

BAF

DWG Reference:

175-2026.DWG

Checked:

JAH

Drawing Number:

175/2026/014

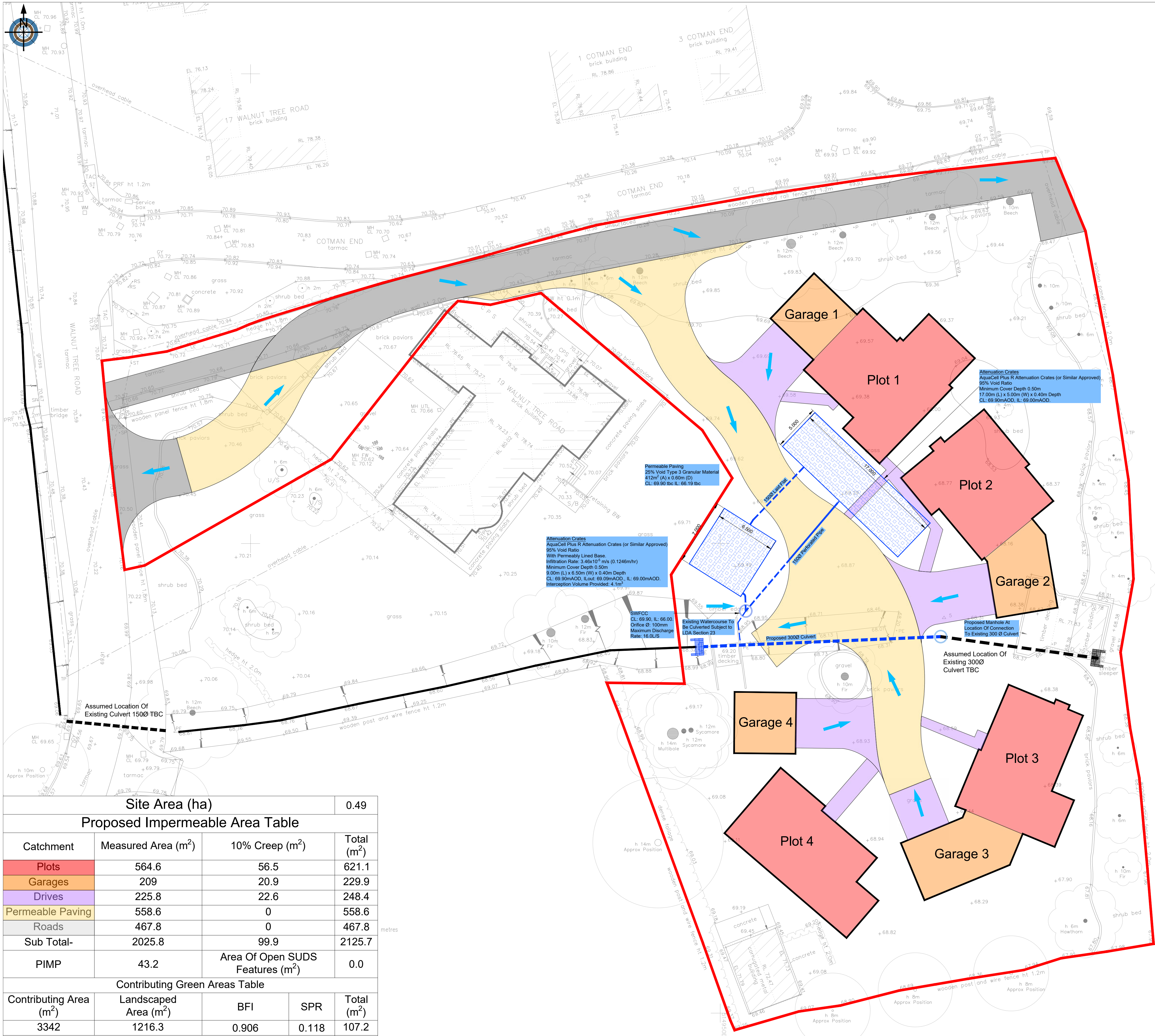
Revision:

P2

P# = Preliminary, C# = Construction, AB# = As Built

Secondary Drainage System





Site Area (ha)				0.49
Proposed Impermeable Area Table				
Catchment	Measured Area (m ²)	10% Creep (m ²)		Total (m ²)
Plots	564.6	56.5		621.1
Garages	209	20.9		229.9
Drives	225.8	22.6		248.4
Permeable Paving	558.6	0		558.6
Roads	467.8	0		467.8
Sub Total-	2025.8	99.9		2125.7
PIMP	43.2	Area Of Open SUDS Features (m ²)		0.0
Contributing Green Areas Table				
Contributing Area (m ²)	Landscaped Area (m ²)	BFI	SPR	Total (m ²)
3342	1216.3	0.906	0.118	107.2
Combined Total Areas				2232.9

- NOTES:
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 - Preliminary Issue - This drawing is not to be used for construction or detailed pricing purposes. Any work undertaken before approvals are received (in writing) are at risk of abortive works.
 - This drawing has been produced based upon the following information:
Topographical Survey by Terrain Survey (Ref. TS25-677-1-3D dated OCT 2025) subject to transformation of :
Scale 1 and translation (0, 0, 0) about point (0, 0, 0).
Architectural Layout by Pentangle (Ref. 3942 Site Plan - APPLICATION - NO POND dated Oct 2025) subject to transformation of : Scale 0.001, Rotation: 88.8° translation (515735, 231745, 0) about point (0, 0, 0).
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 - This drawing has been prepared solely for the purpose of obtaining a Planning Consent based on information available and planning requirements at the date of issue only.

LEGEND	
	Site Boundary- Area: 0.49 ha
	Proposed Exceedance Flowpath
	Proposed Attenuation Crates
	Indicative Surface Water Network
	Proposed Culverted Watercourse
	Existing Watercourse
	Existing 3000 Culverted Watercourse

P3	15/07/26	Revised Based Upon Client Comments	BAF	JAH
P2	09/07/26	Alternative Drainage Strategy Options Provided	BAF	JAH
P1	03/07/26	Initial Issue	BAF	JAH
Rev	Rev Date	Description	Drawn	Chck'd

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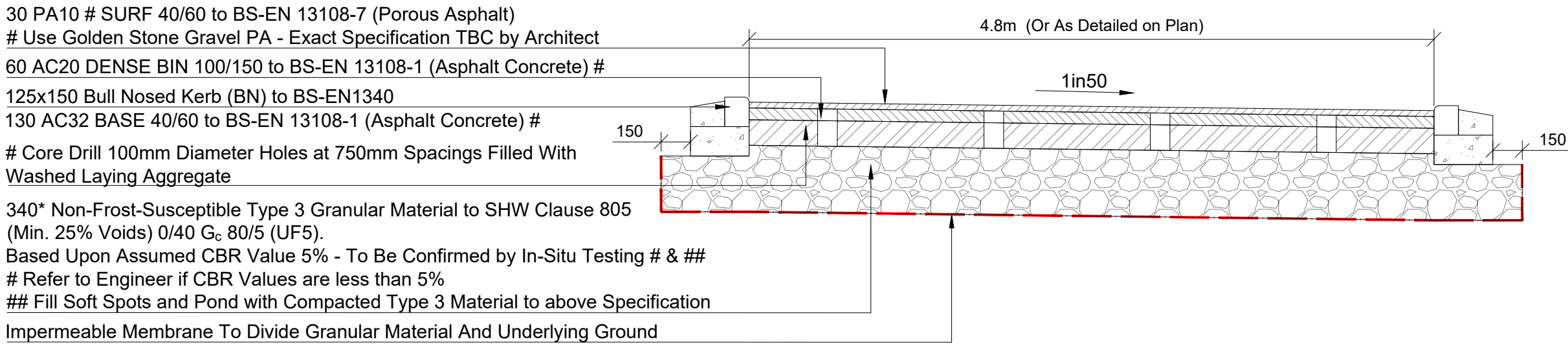
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Civil and Traffic Engineering Consultants

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IP31 3PA

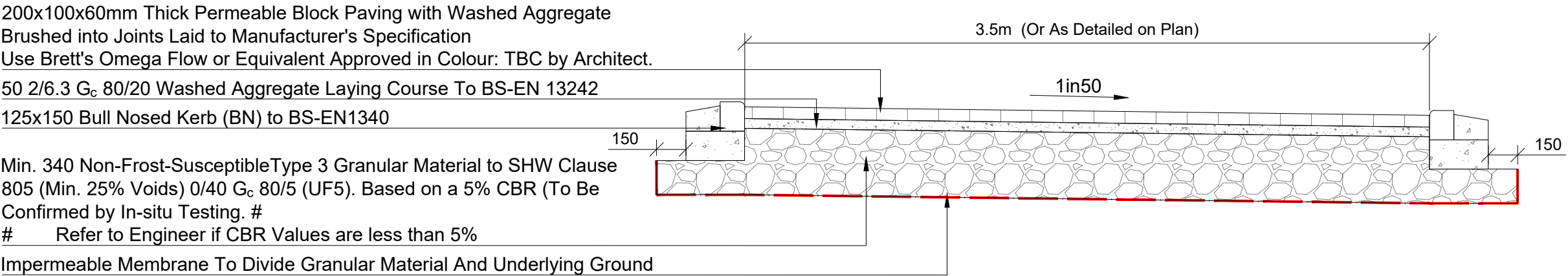
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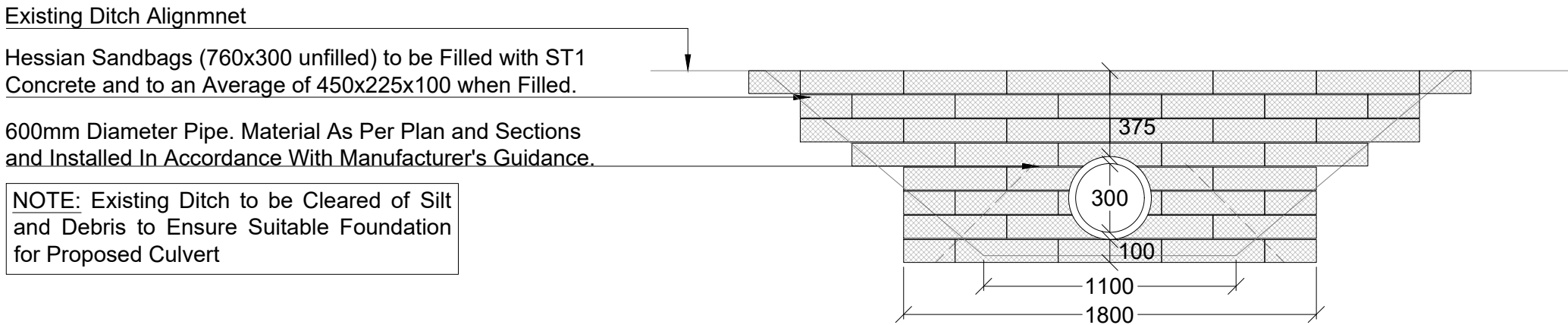
Client:	MR & MRS SHADBOLT		
Project:	19 WALNUT TREE ROAD, PIRTON, HERTFORDSHIRE		
Drawing Title:	FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY PROPOSED SITE LAYOUT SECONDARY DRAINAGE SYSTEM - ATTENUATION		
Status:	FOR PLANNING		
Scale:	1:200 @ A1		
Created:	JULY 2026	Drawn:	BAF
DWG Reference:	175-2026.DWG	Checked:	JAH
Drawing Number:	175/2026/011	Revision:	P3



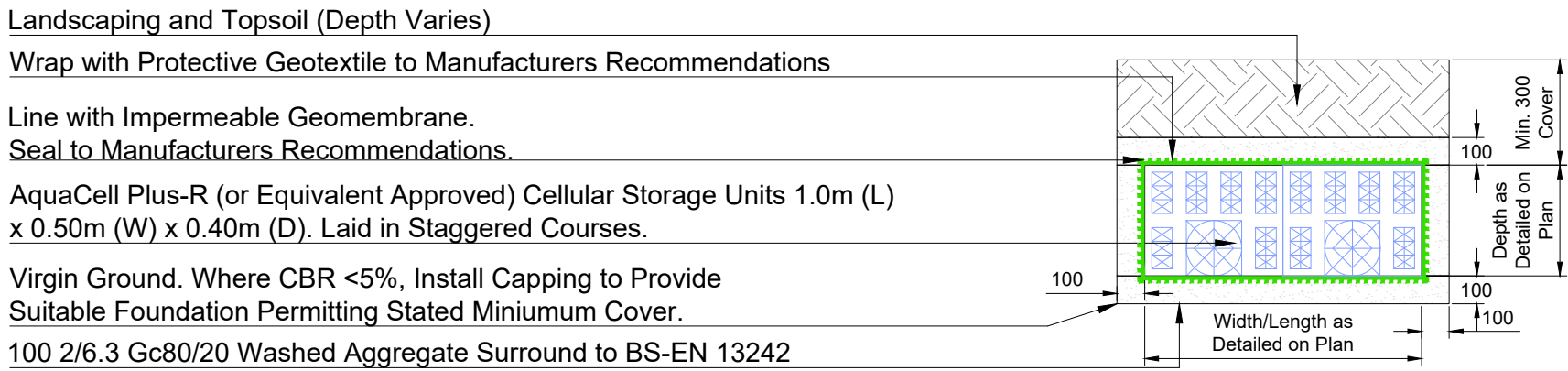
TYPICAL TANKED PERMEABLE ASPHALT ACCESS ROAD CONSTRUCTION DETAIL



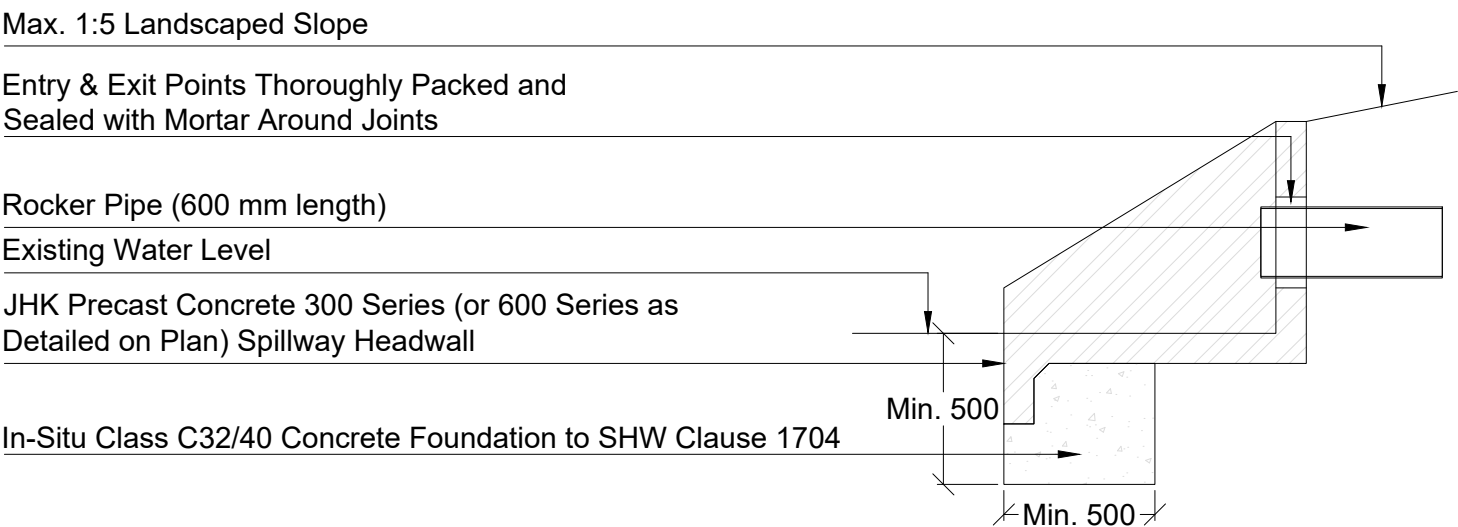
TYPICAL TANKED PERMEABLE BLOCK PAVED DRIVE CONSTRUCTION DETAIL (NO HEAVY VEHICLE LOADING)



TYPICAL 3000Ø CONCRETE FILLED SANDBAG HEADWALL CONSTRUCTION DETAIL



TYPICAL AQUACELL PLUS-R ATTENUATION CRATES (IN NON-TRAFFICKED AREAS) CONSTRUCTION DETAIL



TYPICAL HEADWALL DETAIL

- NOTES:
- This drawing is to be read in conjunction with GHB series 175/2026 drawings and documents and any other relevant project team documents.
 - Preliminary Issue - This drawing is not to be used for construction or detailed pricing purposes. Any work undertaken before approvals are received (in writing) are at risk of abortive works.
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Scale 1 and translation (0, 0, 0) about point (0, 0, 0).
Architectural Layout by Pentangle (Ref. 3942 Site Plan - APPLICATION - NO POND dated Oct 2025) subject to transformation of : Scale 0.001, Rotation: 88.8° translation (515735, 231745, 0) about point (0, 0, 0).
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P3	15/07/26	Revised Based Upon Client Comments		BAF	JAH
P2	09/07/26	Alternative Drainage Strategy Options Provided		BAF	JAH
P1	03/07/26	Initial Issue		BAF	JAH
Rev	Rev Date	Description		Drawn	Chck'd

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Partnership No. OC383830, Registered in England and Wales

Client:	MR & MRS SHADBOLT		
Project:	19 WALNUT TREE ROAD, PIRTON, HERTFORDSHIRE		
Drawing Title:	FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY CONSTRUCTION DETAILS SECONDARY DRAINAGE SYSTEM - ATTENUATION		
Status:	FOR PLANNING		
Scale:	NOT TO SCALE		
Created:	JULY 2026	Drawn:	BAF
DWG Reference:	175-2026.DWG	Checked:	JAH
Drawing Number:	175/2026/012		Revision: P3

Appendix K

Info-Drainage Calculations

Primary Drainage System



Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 10/07/2026			
Report Details: Type: Stormwater Controls Storm Phase: Phase	Designed by: BAF	Checked by: JAH	Approved By:	
Company Address:				



Porous Paving

Type : Porous Paving

Dimensions

Exceedance Level (m)	69.900
Depth (m)	0.480
Base Level (m)	69.420
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	3.0
Porosity (%)	25
Length (m)	31.615
Long. Slope (1:X)	60.00
Width (m)	20.600
Total Volume (m³)	60.242

Advanced

Base Infiltration Rate (m/hr)	0.0414
Safety Factor	1.5
Conductivity (m/hr)	300.0

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 10/07/2026			
Report Details: Type: Stormwater Controls Storm Phase: Phase	Designed by: BAF	Checked by: JAH	Approved By:	
Company Address:				



Plot 1 Soakaway

Type : Cellular Storage

Dimensions

Exceedance Level (m)	69.250
Depth (m)	1.200
Base Level (m)	67.550
Number of Crates Long	8
Number of Crates Wide	3
Number of Crates High	3
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	14.180

Advanced

Base Infiltration Rate (m/hr)	0.1357
Side Infiltration Rate (m/hr)	0.1357
Safety Factor	3.0



Plot 2 Soakaway

Type : Cellular Storage

Dimensions

Exceedance Level (m)	69.250
Depth (m)	1.200
Base Level (m)	67.550
Number of Crates Long	8
Number of Crates Wide	3
Number of Crates High	3
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	14.180

Advanced

Base Infiltration Rate (m/hr)	0.1357
Side Infiltration Rate (m/hr)	0.1357
Safety Factor	3.0

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 10/07/2026			
Report Details: Type: Stormwater Controls Storm Phase: Phase	Designed by: BAF	Checked by: JAH	Approved By:	
Company Address:				



Plot 3 Soakaway

Type : Cellular Storage

Dimensions

Exceedance Level (m)	69.250
Depth (m)	1.200
Base Level (m)	67.550
Number of Crates Long	12
Number of Crates Wide	3
Number of Crates High	3
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	21.020

Advanced

Base Infiltration Rate (m/hr)	0.0288
Side Infiltration Rate (m/hr)	0.0288
Safety Factor	3.0



Plot 4 Soakaway

Type : Cellular Storage

Dimensions

Exceedance Level (m)	69.250
Depth (m)	1.200
Base Level (m)	67.550
Number of Crates Long	10
Number of Crates Wide	3
Number of Crates High	3
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	17.600

Advanced

Base Infiltration Rate (m/hr)	0.0288
Side Infiltration Rate (m/hr)	0.0288
Safety Factor	3.0

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 10/07/2026		
Report Details: Type: Inflow Summary Storm Phase: Phase		Designed by: BAF	Checked by: JAH	
		Approved By:		
		Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Porous Paving		Time of Concentration	0.011	100	0	100	0.011
Catchment Area (1)	Porous Paving		Time of Concentration	0.073	100	0	100	0.073
Garage 4	Plot 4 Soakaway		Time of Concentration	0.004	100	10	110	0.005
Plot 1	Plot 1 Soakaway		Time of Concentration	0.020	100	10	110	0.022
Plot 2	Plot 2 Soakaway		Time of Concentration	0.019	100	10	110	0.020
Plot 3	Plot 3 Soakaway		Time of Concentration	0.021	100	10	110	0.023
Plot 4	Plot 4 Soakaway		Time of Concentration	0.014	100	10	110	0.015
TOTAL		0.0		0.161				0.169

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 10/07/2026			
Report Title: Rainfall Analysis Criteria	Designed by: BAF	Checked by: JAH	Approved By:	
Company Address:				

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Use Catchment Values
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH		Type: FEH
Site Location	GB 514952 231504 TL 14952 31504	
Rainfall Version	2022	
Summer	☒	
Winter	☒	

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	30.000
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 10/07/2026		
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Designed by: BAF	Checked by: JAH	
		Approved By:		
		Company Address:		



FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Plot 1 Soakaway	FEH: 2 years: +0 %: 240 mins: Winter	67.816	67.816	0.266	0.266	0.9	3.031	0.000	5.158	0.0	0.000	OK
Plot 2 Soakaway	FEH: 2 years: +0 %: 180 mins: Winter	67.796	67.796	0.246	0.246	1.1	2.804	0.000	3.898	0.0	0.000	OK
Plot 3 Soakaway	FEH: 2 years: +0 %: 480 mins: Winter	67.854	67.854	0.304	0.304	0.6	5.199	0.000	3.571	0.0	0.000	OK
Plot 4 Soakaway	FEH: 2 years: +0 %: 360 mins: Winter	67.872	67.872	0.322	0.322	0.6	4.587	0.000	2.294	0.0	0.000	OK
Porous Paving	FEH: 2 years: +0 %: 15 mins: Summer	69.965	69.440	0.018	0.020	15.9	3.108	0.000	7.207	0.0	0.000	OK

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 10/07/2026			
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Designed by: BAF	Checked by: JAH		Approved By:
		Company Address:			



FEH: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Plot 1 Soakaway	FEH: 30 years: +30 %: 240 mins: Winter	68.419	68.419	0.869	0.869	2.4	9.904	0.000	8.114	0.0	0.000	OK
Plot 2 Soakaway	FEH: 30 years: +30 %: 240 mins: Winter	68.360	68.360	0.810	0.810	2.2	9.235	0.000	7.834	0.0	0.000	OK
Plot 3 Soakaway	FEH: 30 years: +30 %: 600 mins: Winter	68.376	68.376	0.826	0.826	1.2	14.119	0.000	6.390	0.0	0.000	OK
Plot 4 Soakaway	FEH: 30 years: +30 %: 600 mins: Winter	68.422	68.422	0.872	0.872	1.0	12.424	0.000	5.522	0.0	0.000	OK
Porous Paving	FEH: 30 years: +30 %: 30 mins: Winter	70.045	69.556	0.098	0.136	30.2	18.674	0.000	17.266	0.0	0.000	OK

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 10/07/2026			
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Designed by: BAF	Checked by: JAH		Approved By:
		Company Address:			



FEH: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Plot 1 Soakaway	FEH: 100 years: +40 %: 240 mins: Winter	68.824	68.824	1.274	1.274	3.1	13.755	0.000	9.745	0.0	0.000	OK
Plot 2 Soakaway	FEH: 100 years: +40 %: 240 mins: Winter	68.678	68.678	1.128	1.128	3.0	12.856	0.000	9.351	0.0	0.000	OK
Plot 3 Soakaway	FEH: 100 years: +40 %: 600 mins: Winter	68.669	68.669	1.119	1.119	1.6	19.139	0.000	7.487	0.0	0.000	OK
Plot 4 Soakaway	FEH: 100 years: +40 %: 600 mins: Winter	68.739	68.739	1.189	1.189	1.4	16.939	0.000	6.529	0.0	0.000	OK
Porous Paving	FEH: 100 years: +40 %: 60 mins: Winter	70.093	69.662	0.146	0.242	30.3	29.702	0.000	34.368	0.0	0.000	OK

Secondary Drainage System



Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 02/07/2026			
Report Details: Type: Junctions Storm Phase: Phase		Designed by: BAF	Checked by: JAH		Approved By:
		Company Address:			

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
Manhole	Manhole	514945.947	231490.419	69.900	0.900	69.000	Circular	1.200

Name	Lock
Manhole	None

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
Manhole	Outlet	(None)	Orifice
	Diameter (m)	0.100	
	Coefficient of Discharge	0.600	
	Invert Level (m)	69.000	

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 02/07/2026			
Report Details: Type: Stormwater Controls Storm Phase: Phase	Designed by: BAF	Checked by: JAH	Approved By:	
	Company Address:			



Porous Paving

Type : Porous Paving

Dimensions

Exceedance Level (m)	69.900
Depth (m)	0.710
Base Level (m)	69.190
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	3.0
Porosity (%)	25
Length (m)	31.615
Long. Slope (1:X)	60.00
Width (m)	20.600
Total Volume (m³)	97.690

Advanced

Conductivity (m/hr)	300.0
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Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 02/07/2026			
Report Details: Type: Stormwater Controls Storm Phase: Phase	Designed by: BAF	Checked by: JAH		Approved By:
Company Address:				



Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	69.900
Depth (m)	0.400
Base Level (m)	69.000
Number of Crates Long	7
Number of Crates Wide	13
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	17.790

Advanced

Base Infiltration Rate (m/hr)	0.1246
Safety Factor	3.0



Cellular Storage (1)

Type : Cellular Storage

Dimensions

Exceedance Level (m)	69.900
Depth (m)	0.400
Base Level (m)	69.000
Number of Crates Long	17
Number of Crates Wide	10
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	1
Crate Width (m)	0.5
Crate Height (m)	0.4
Total Volume (m³)	32.800

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 02/07/2026			
Report Details: Type: Inflow Summary Storm Phase: Phase		Designed by: BAF	Checked by: JAH		Approved By:
		Company Address:			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Cellular Storage (1)		Time of Concentration	0.020	100	10	110	0.022
Catchment Area (1)	Cellular Storage		Time of Concentration	0.019	100	10	110	0.020
Catchment Area (2)	Cellular Storage (1)		Time of Concentration	0.021	100	10	110	0.023
Catchment Area (3)	Cellular Storage		Time of Concentration	0.014	100	10	110	0.015
Catchment Area (4)	Cellular Storage		Time of Concentration	0.004	100	10	110	0.005
Catchment Area (5)	Cellular Storage (1)		Time of Concentration	0.002	100	10	110	0.003
Catchment Area (6)	Cellular Storage		Time of Concentration	0.005	100	10	110	0.006
Catchment Area (7)	Cellular Storage		Time of Concentration	0.005	100	10	110	0.005
Catchment Area (8)	Porous Paving		Time of Concentration	0.005	100	10	110	0.006
Catchment Area (9)	Cellular Storage (1)		Time of Concentration	0.001	100	10	110	0.002
Catchment Area (10)	Porous Paving		Time of Concentration	0.001	100	10	110	0.002
Catchment Area (11)	Porous Paving		Time of Concentration	0.002	100	10	110	0.002
Catchment Area (12)	Porous Paving		Time of Concentration	0.002	100	10	110	0.002
Catchment Area (13)	Porous Paving		Time of Concentration	0.073	100	0	100	0.073
Catchment Area (14)	Cellular Storage		Time of Concentration	0.035	100	0	100	0.035
Catchment Area (15)	Cellular Storage (1)		Time of Concentration	0.003	100	0	100	0.003
TOTAL		0.0		0.213				0.223

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 02/07/2026			
Report Title: Rainfall Analysis Criteria	Designed by: BAF	Checked by: JAH	Approved By:	
Company Address:				

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Use Catchment Values
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH		Type: FEH
Site Location	GB 514952 231504 TL 14952 31504	
Rainfall Version	2022	
Summer	☒	
Winter	☒	

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	30.000
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 02/07/2026			
Report Details: Type: Junctions Summary Storm Phase: Phase	Designed by: BAF	Checked by: JAH	Approved By:	
Company Address:				



FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Outflow

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FEH: 2 years: +0 %: 180 mins: Summer	69.90 0	69.00 0	69.133	0.133	6.0	0.150	0.000	6.0	22.160	OK

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 02/07/2026			
Report Details: Type: Junctions Summary Storm Phase: Phase		Designed by: BAF	Checked by: JAH	Approved By:	
		Company Address:			



FEH: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Outflow

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FEH: 30 years: +30 %: 120 mins: Summer	69.900	69.000	69.316	0.316	10.8	0.358	0.000	10.8	78.209	OK

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1	Date: 02/07/2026			
Report Details: Type: Junctions Summary Storm Phase: Phase	Designed by: BAF	Checked by: JAH	Approved By:	
Company Address:				



FEH: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Outflow

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FEH: 100 years: +40 %: 120 mins: Summer	69.90 0	69.00 0	69.575	0.575	15.9	0.650	0.000	15.1	110.538	OK

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 02/07/2026			
		Designed by: BAF	Checked by: JAH		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address:			



FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Porous Paving	FEH: 2 years: +0 %: 360 mins: Summer	69.772	69.212	0.055	0.022	4.1	12.489	0.000	0.000	1.3	22.595	OK
Cellular Storage	FEH: 2 years: +0 %: 180 mins: Summer	69.153	69.153	0.153	0.153	8.1	6.601	0.000	11.264	6.0	26.398	OK
Cellular Storage (1)	FEH: 2 years: +0 %: 180 mins: Summer	69.153	69.153	0.153	0.153	7.2	12.343	0.000	0.000	2.2	8.031	OK

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 02/07/2026			
		Designed by: BAF	Checked by: JAH		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address:			



FEH: 30 years: Increase Rainfall (%): +30: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Porous Paving	FEH: 30 years: +30 %: 180 mins: Summer	69.886	69.364	0.169	0.174	17.2	33.774	0.000	0.000	3.7	37.807	OK
Cellular Storage	FEH: 30 years: +30 %: 120 mins: Summer	69.363	69.363	0.363	0.363	24.1	15.698	0.000	7.535	10.8	86.596	OK
Cellular Storage (1)	FEH: 30 years: +30 %: 120 mins: Summer	69.363	69.363	0.363	0.363	18.8	29.356	0.000	0.000	4.1	25.651	OK

Project: 175-2026 19 Walnut Tree Road, Pirton CD_M-P1		Date: 02/07/2026			
		Designed by: BAF	Checked by: JAH	Approved By:	
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address:			



FEH: 100 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By:
Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Porous Paving	FEH: 100 years: +40 %: 180 mins: Summer	69.948	69.644	0.231	0.454	30.1	53.599	0.000	0.000	7.9	55.266	OK
Cellular Storage	FEH: 100 years: +40 %: 120 mins: Summer	69.661	69.661	0.661	0.661	38.9	17.553	0.000	7.540	15.9	129.119	OK
Cellular Storage (1)	FEH: 100 years: +40 %: 120 mins: Summer	69.665	69.665	0.665	0.665	21.5	32.581	0.000	0.000	19.1	31.287	OK