Consulting Civil Engineers

Foul and Surface Water Drainage Report

Old Park Lodge, Warninglid

For

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Rev – **P3**

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1 Introduction

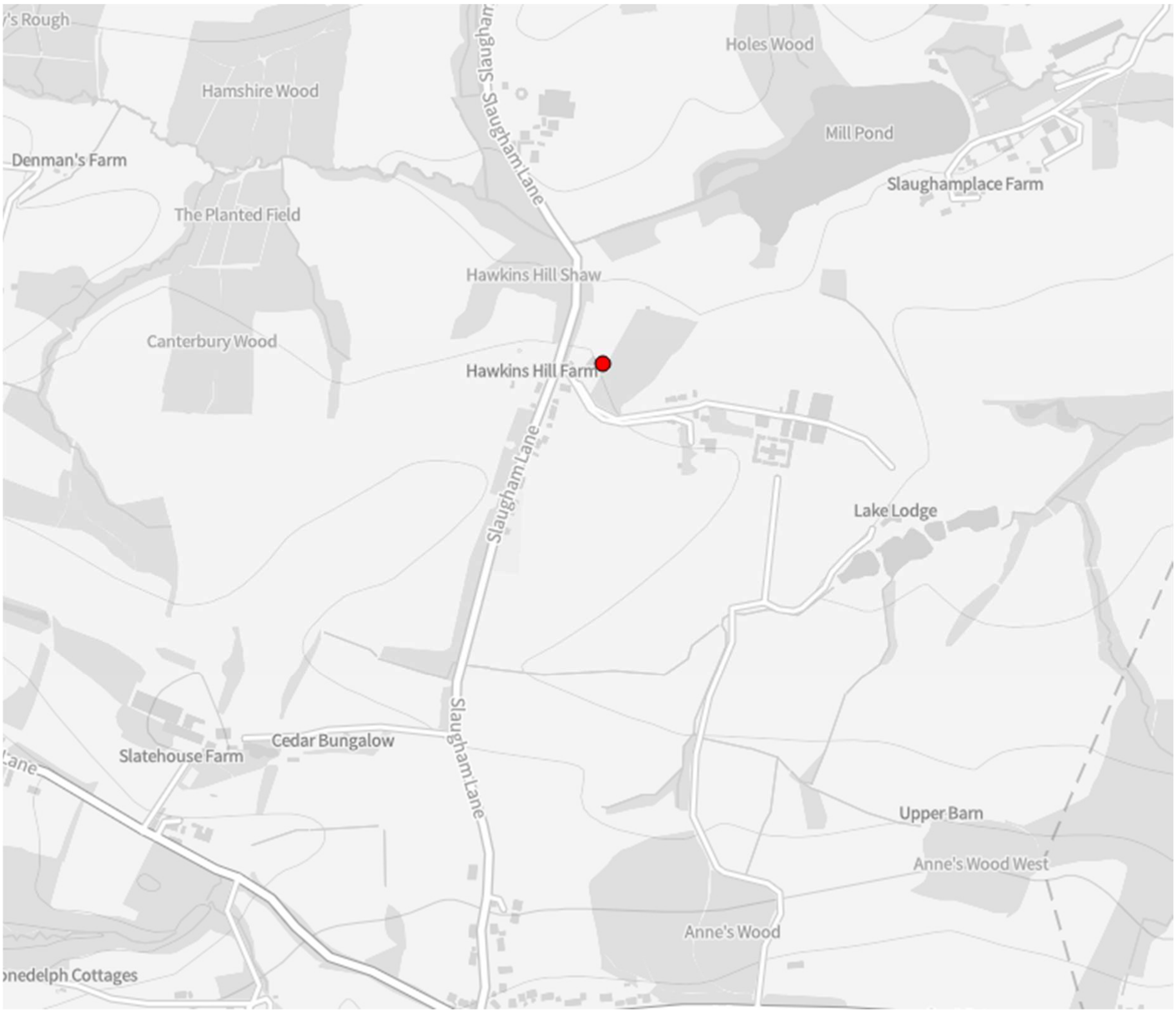
1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Old Park Lodge, Warninglid.

1.1.2 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere.

1.1.3 The existing site consists of an existing dwelling and an existing garage. The proposed development involves the demolition of the existing dwelling and the construction of a new residential building. The existing garage to be retained, and the existing hardstanding will be realigned. The proposed development is located as OS Grid Reference **TQ 25161 27231** and has the post code **RH17 5TJ.**

1.1.4 The proposed site plan can be found in **Appendix A.**

Fig 1. Site Location



2 Executive Summary:

2.1.1 Surface water runoff is to be discharged into a proposed raingarden, designed to recorded infiltration rate of 1.0 x 10^{-6}m/s. To ensure compliance with the 'half time empty storage' condition, surface water to be additionally discharged into the existing shallow watercourse with at a restricted flow rate of 1.0 l/s. All hard paved areas are to be constructed from permeable surface to allow runoff to freely drain to ground via infiltration. The network will make use of a raingarden and permeable paving in order to cater for the 1 in 100-year +45% storm.

2.1.2 Foul water will be discharged into the proposed cesspool tank due to the absence of an existing drainage sewer or nearby watercourse. This approach mirrors the existing foul drainage discharge arrangement, with the onsite tank size updated to accommodate the anticipated discharge volume from the site.

3 Site Geology

3.1 British Geological Survey information

3.1.1 The British Geological Survey confirms the bedrock geology to be made up Weald Clay Formation- Mudstone. At the time of writing the British Geological Survey website does not have any recorded information of the Superficial deposits on site.

3.1.2 The British Geological survey also holds records of historical boreholes near the site which give some insight into the ground geology.

- Borehole **TQ22NW1** (Located approx. 370m South-West of the site) – Ground geology (Mudstone)

3.1.3 The British Historical Borehole Log can be found in **Appendix B.**

3.1.4 The Magic Environmental Agency confirms the proposed development site underlain by Slowly permeable seasonally wet acid but base-rich loamy and clayey soils. The Soilscape can be found in **Appendix C.**

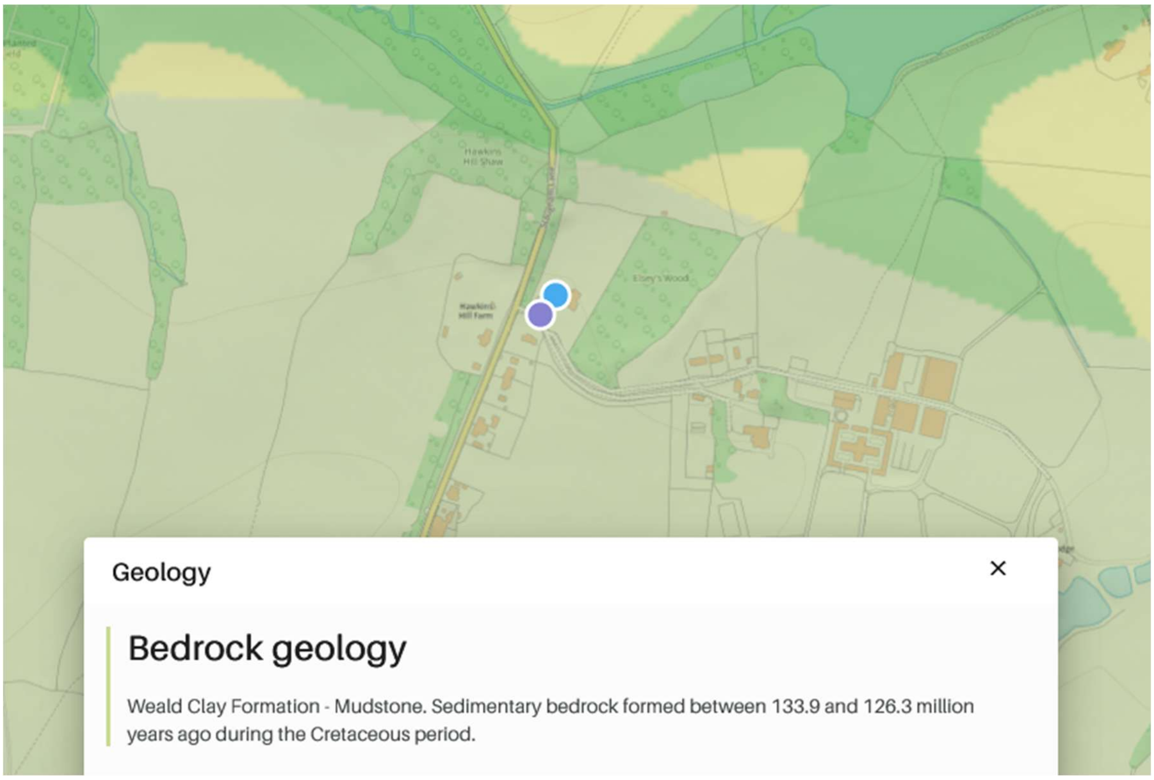


Fig 2. British Geological Survey

Snippet from BGS Website showing Bedrock geology/superficial deposits http://mapapps.bgs.ac.uk/geologyofbritain/home.html?

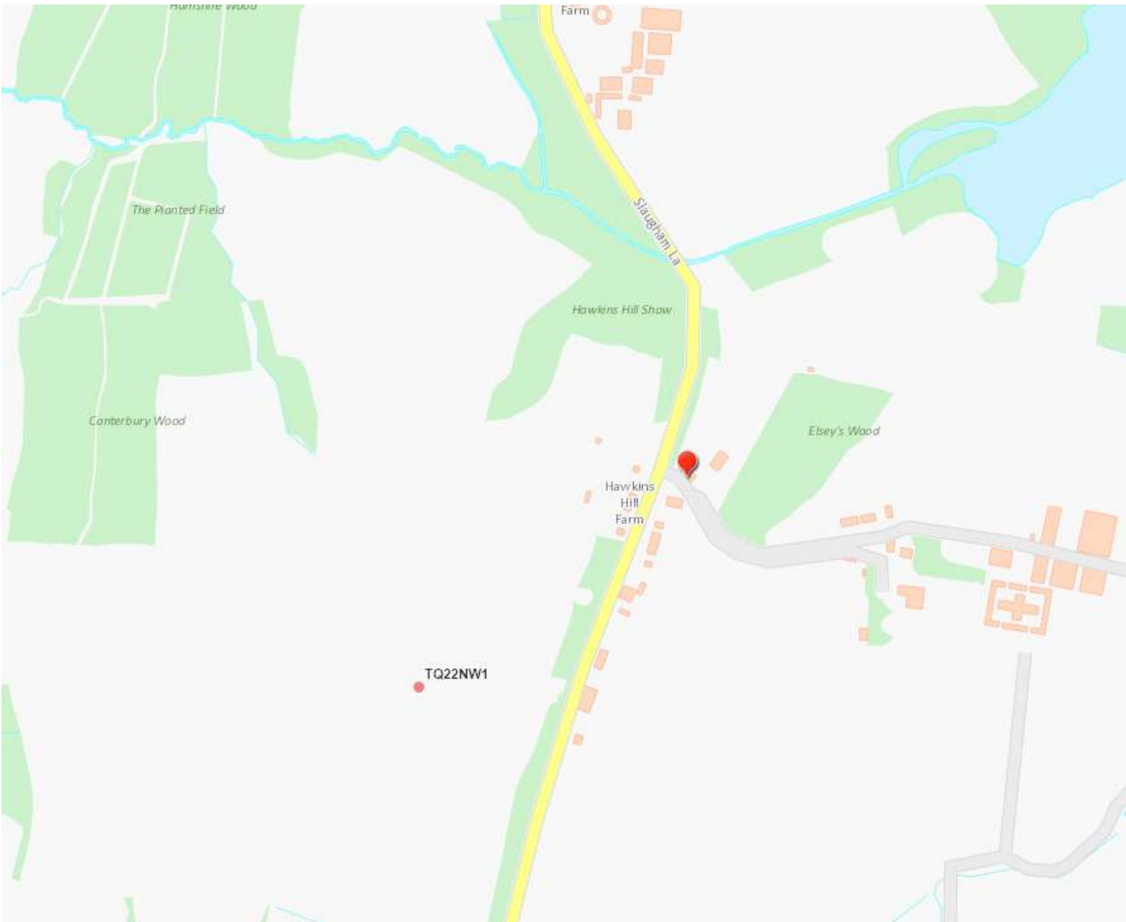


Fig 3. British Geological Survey

Snippet from BGS Website showing Historical Borehole Log location

3.2 Geological Assessment

3.2.1 An onsite preliminary infiltration test following the BRE365 method was conducted by CGS Civils in December 2024. The test, performed to a depth of 0.9m BGL, indicated infiltration rates ranging from 1.78 x 10^{-6} to 1.0 x 10^{-6} m/s. Clay soils with low infiltration potential were identified during the investigation.

3.2.2 The infiltration test results can be found in **Appendix D.**

4 Existing Drainage

4.1.1 According to the onsite CCTV survey, surface water runoff from the existing garage currently discharges via a positive drainage system into the onsite shallow ditch. Runoff from other buildings discharges directly onto the surrounding ground, following the site's natural topography toward the onsite ditch. During the site walkover, no positive drainage system was identified for the access road and car parking area, suggesting that surface water runoff from these hard-paved areas currently flows overland in line with the existing topography

4.1.2 The site walkover identified a shallow ditch running along the western bank, continuing northward. Part of the land to the north was observed to be waterlogged. Surface water runoff continues to flow toward third-party land, with the existing causeway track to the field acting as a barrier. This results in water pooling and creating a wetland area.

4.1.3 It has been confirmed that the existing ditch is partially overgrown and silted.

Photo 1/2
Existing Shallow Ditch located along the western boundary line.

5 Proposed Drainage Strategy

5.1 SuDS Hierarchy

5.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA's Draft National Standards for SuDS.

Table 1. SuDS Hierarchy

Discharge Destination	
Rainwater Harvesting	N/A
Discharge to Ground	All surface water from the roof and hard paved areas are to be discharged into the ground with at recorded infiltration rate of 1.0 x 10^{-6} m/s. Surface water runoff is to be discharged into the ground via infiltration.
Discharge to Watercourse	N/A
Discharge to Surface Water Sewer	N/A
Discharge to Other Sewer	N/A

5.2 Proposed Hydraulic Calculation Specifications:

Table 2. SuDS Hierarchy

Hydraulic Calculations Settings:	
Rainfall Methodology	**FEH-22**
Volumetric Run-off Coefficient Cv	**1**
CV Winter and Summer	**1**
Additional Storage (m^3 / ha)	**0.0**
Maximum Rainfall (mm/hr)	**75**
Flow Control	**N/A**
Raingarden	Base Coefficient (m/hr): **0.00360**
	Side Coefficient (m/hr): **0.00360**
	Factor of Safety: **2**
	Porosity: **100%**
	Time to Half Empty (mins): **1056**

5.3 Surface Water Drainage

5.3.1 Based on information gathered from the British Geological Survey website, onsite BRE365 infiltration test results, and the site walkover, it is proposed that all surface water runoff be discharged into the ground through infiltration at a recorded rate of 1.00×10^{-6} m/s.

5.3.2 Surface water runoff from the proposed new dwelling's roof area will be directed into bio-retention planters, where it will partially infiltrate into the ground. An overflow pipe will connect the planters to the proposed downstream rain garden. The bio-retention planters will facilitate infiltration, ensuring that surface water runoff is effectively managed, achieving a 24-hour half-empty time without overflowing.

5.3.3 The raingarden will form a shallow ground depression and will be constructed with a 350mm gravel trench beneath for improved drainage performance.

5.3.4 In the event of exceedance, surface water runoff will overtop the raingarden and flow northward, following the existing site topography. The proposed drainage system will align with the natural exceedance flow paths, mimicking the current overland flows drainage regime.

5.3.5 The bio-retention units located alongside and at the rear of the proposed dwelling will provide additional storage, interception, and filtration. These units will help slow down and reduce runoff before it reaches the proposed rain garden, thereby decreasing the half-empty time and enhancing overall surface water management. By incorporating additional bio-retention planters, surface water runoff can be effectively managed within the site without the need for an overflow. As a result, all surface water runoff will be discharged into the ground via infiltration within the proposed site.

5.3.6 The proposed infiltration raingarden has been designed based on a recorded infiltration rate of 1.0×10^{-6} m/s with a depth of 500mm with 350mm deep gravel beneath. Its final size, depth, and location will be confirmed at the detailed design stage, subject to the Client's specifications.

5.3.7 The proposed driveway will be constructed using a porous surface, allowing water to infiltrate directly into the ground.

5.3.8 The raingarden and permeable paving have been designed to cater for the 1 in 100-year+45% storm.

5.3.9 Existing Runoff, Proposed Drainage Strategy, Contributing Area Plan, Exceedance Flow Routes and Hydraulic calculations have been carried out which can be found at **Appendix E.**

5.4 Water Quality

5.4.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution.

5.4.2 Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals, and various organic and inorganic contaminants) Therefore the first 5-10mm of rainfall should be adequately treated with SuDS.

5.4.3 The new SuDS Manual (Ciria C753, November 2015) introduces slightly different approach compared to the previous version for the water quality management of surface water. The Manual describes risks posed by the surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e., the pollution source)
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels
- The sensitivity of the receiving environment

5.4.4 The EA website indicates that the site does not lie within a Source Protection Zone.

5.4.5 The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.

Table 26.1 from SuDS manual. Approaches to Water Quality Risk Management

Table 26.1 Approaches to Water Quality Risk Management			
Design method	**Hazard Characterisation**	**Risk Reduction**	
		For Surface Water	**For Groundwater**
Simple Index Approach	Simple pollution hazard indices based on land use (Table 26.2)	Simple SuDS hazard mitigation indices (Table 26.3)	Simple SuDS hazard mitigation indices (Table 26.4)
Risk Screening	Factors characterising traffic density and extent of infiltration likely to occur (Table 26.5)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (Table 26.5)
Detailed Risk Assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in even mean discharge concentrations and total annual load reductions delivered by the system	

5.4.6 As per Table 26.1 Simple Index approach will be used as a design method for this site.

5.4.7 Table 26.2 will provide hazard classification of different land uses. The land uses for the surface water drainage for this site are.

- Residential Roofs
- Individual Property driveways and residential car parks

5.4.8 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following must be achieved for the surface running off the site.

Total SuDS mitigation index >=pollution hazard index

5.4.9 Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual;

Table 26.2 from SuDS manual. Pollution Hazard Indices for Different Land Use Classifications

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 (e.g., cul-de-sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., 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	High	0.8	0.8	0.9

5.4.10 From Table 26.2 the following information is tabulated in Table 1

Table 3: **Pollution hazard index and destination of runoff for the proposed site**

Table 3: Pollution Hazard Index and Destination of runoff for the proposed Site					
Land Use	**Destination of Runoff**	**Pollution Hazard Level**	**Total Suspended Solids**	**Metals**	**Hydrocarbons**
Residential Roof	Ground Water	Very Low	0.2	0.2	0.05
Individual driveways, residential car parks and low traffic roads	Ground water	Low	0.5	0.4	0.4

5.4.11 The SuDS mitigation index will be obtained from Table 26.4 (for groundwater) of the SuDS manual.

Table 26.4 from SuDS manual. Indicative SuDS Mitigation Indices for discharges to ground waters.

5.4.12 SuDS mitigation index are tabulated in Table 5 as followed.

Table 26.4 Indicative SuDS mitigation indices for discharges to groundwater			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates	**TSS**	**Metals**	**Hydrocarbons**
A layer of dense vegetation underlain by a soil with good containment attenuation potential of at least 300mm in depth	0.6	0.5	0.6
A soil with good contaminant attenuation potential of at least 300mm in depth	0.4	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, i.e., graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20mm gravel) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.	0.4	0.4	0.4
Constructed permeable pavement (where a suitable filtration later is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential of at least 300mm in depth	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area		

Table 4: SuDS mitigation index

Table 4 Mitigation Indices						
Runoff Source	**Destination of Runoff**	**Mitigation Index Source**	**Type of SuDS Component**	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Individual driveways, residential car parks and low traffic roads	Ground water	Table 26.4 (for ground waters)	Permeable Pavement	0.7	0.6	0.7
Roofs	Ground water	Table 26.4 (for ground waters)	Bioretention-Raingarden	0.8	0.8	0.8

5.4.13 The above analysis demonstrates that the SuDS devices within the design will mitigate any pollution present within the surface water system.

5.5 Foul water drainage

5.5.1 Given the site's location outside an area served by public sewers, its low permeability, and the existing cesspool discharge setup, it is proposed that foul water from the new dwelling be collected and discharged into a new onsite cesspool tank mimicking the current onsite foul drainage arrangement.

5.5.2 The proposed cesspool tank will have a minimum storage capacity of 18,000 litres, equipped with a high-level alarm for monitoring. Scheduled emptying is planned on a monthly basis. The storage capacity has been calculated following British Water guidelines outlined in *Flow and Loads – 4: Sizing Criteria, Treatment Capacity for Sewage Treatment Systems*, which recommend an average flow rate of 150 litres per person per day.

5.5.3 In addition to the cesspool tank option, the use of a drainage field was considered. However, due to poor infiltration rates (VP value > 100), this is not a viable solution. Instead, a drainage mound was assessed as a potential option for foul drainage disposal.

5.5.4 The onsite infiltration test was conducted at a depth of 0.9m BGL, whereas for the drainage mound, infiltration testing would need to be performed at a shallower depth of approximately 0.3m BGL. Based on this, and assuming an achievable infiltration rate of 2×10^{-6} m/s, the proposed drainage mound has been calculated for a total capacity of six persons, requiring an area of 200m². This results in an approximate bed size of 30m × 7m and a filtration system of 17m × 3m.

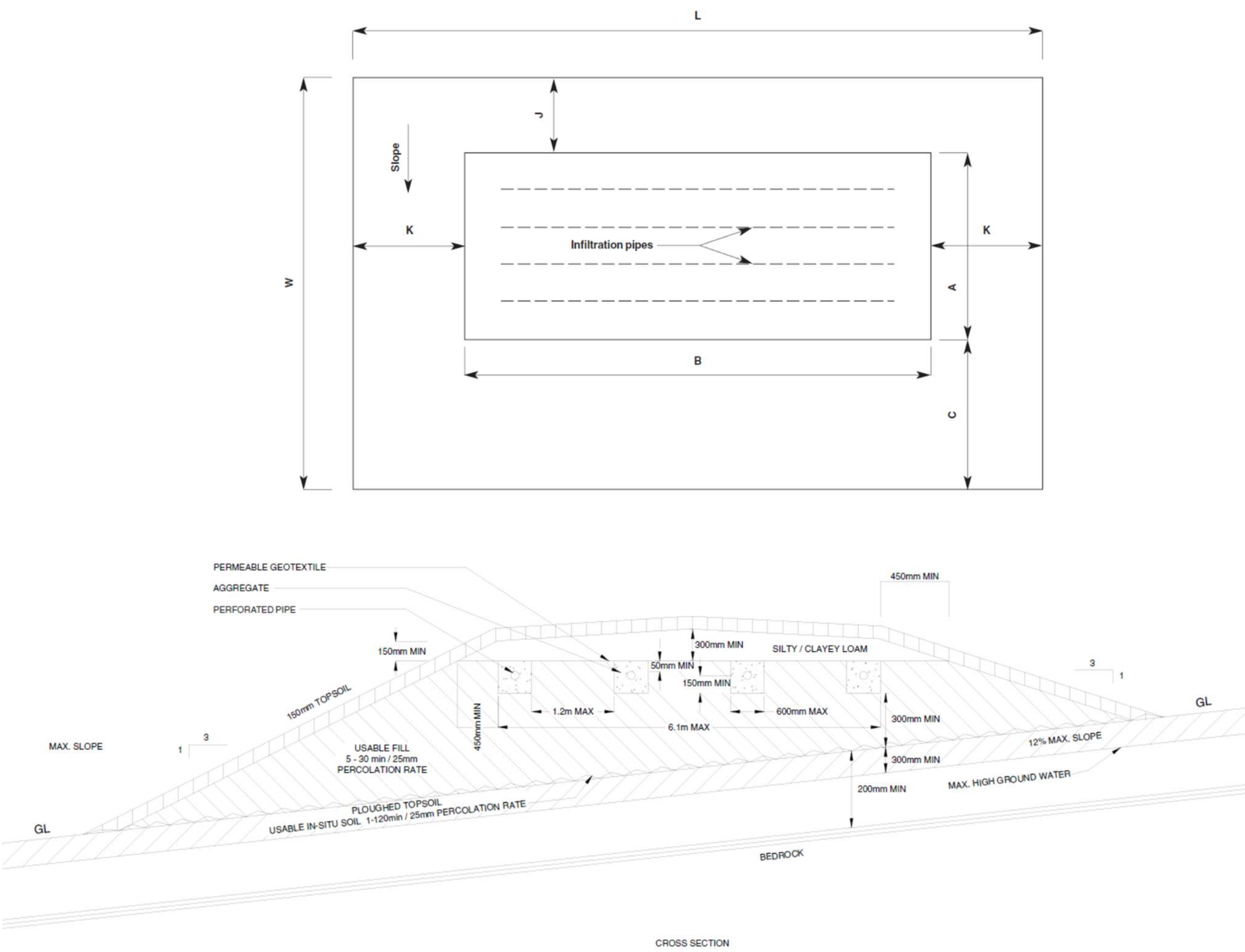


Fig 4. Proposed Drainage Mound filter with distribution layer trenches

5.5.5 Given that the existing house currently discharges foul water into a cesspool tank and that additional infiltration testing is required for the proposed drainage mound, it is recommended that foul runoff be directed to an upgraded cesspool tank, with waste being periodically removed. The potential for a drainage mound will be further evaluated at the detailed design stage.

5.6 Construction Phase Drainage

5.6.1 It is an offence to cause or knowingly permit the entry of any polluting, poisonous or noxious material in the water environment. If the pollution is serious enough to lower the ecological status of the water body as set out in terms by the Water Framework Directive (2000/60/EC) than prosecution may occur.

5.6.2 Remediation of any damage caused will not require the polluter to be prosecuted first. If the water pollution is serious enough to be classed an environmental damage, the damage will require to be remediated such that the area is returned to the condition it would have been in if the damage had not occurred.

5.6.3 If any pollution has not been reported or the polluter has not taken actions to prevent any further damage; they would then be causing an offence. Third parties (e.g., Private water supply users, landowners, recreation users and the public) who may be affected by possible damage may also report the risk of any environmental damage to the enforcing authority.

5.6.4 The principles of SuDS (Sustainable Drainage Systems) shall be applied to all components of design and construction regarding surface water management. Any design or site works that may impact on the site drainage or the water quality shall:

- Soakaway where soils allow
- Consider and manage erosion
- Remove pollutants in surface water
- Retain any silts on site and prevent silts from discharging to watercourses or drains
- Keep runoff rates at existing greenfield runoff
- Prevent accidental spillages reaching watercourse

5.6.5 As infiltration on site is confirmed to be low rates, the temporary drainage for the development will be in the form of land drains which will discharge partially into the ground and partially into the existing ditch.

5.6.6 Pollution will be controlled via the use of catchpit manholes and geotextiles.

5.6.7 Any potential hazardous substances will be within a controlled compound with a separate drainage system that will contain a penstock valve / containment kit in the event of a spillage.

6 Summary and Conclusions

6.1.1 CGS Civils has been instructed to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for new residential dwelling.

6.1.2 Surface water will discharge into the ground through the proposed bio-retention planers and infiltration raingarden, designed with a recorded infiltration rate of 1.0×10^{-6} m/s.

6.1.3 The Foul water will discharge into the proposed cesspool tank and is to be tanked away once per month mimicking the existing foul drainage discharge regime.

6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water and foul drainage can be achieved for the proposed development.

6.1.5 A maintenance schedule has been written up for the drainage network including the SuDS features and can be found within **Appendix F.**

7 Appendices

7.1 Appendix A – Site Plan

7.2 Appendix B – Borehole Logs

7.3 **Appendix C – Soilscape**

7.4 Appendix D – Infiltration test results report

7.5 Appendix E – Existing Runoff, Proposed Drainage Strategy, Contributing Area Plan, Exceedance Flow Routes and Hydraulic Calculations

7.6 Appendix F – Maintenance Schedule