S.A. McGREGOR

GEOTECHNICAL & ENVIRONMENTAL ONSITE SERVICES

GROUND ASSESSMENT REPORT
&
DRAINAGE RECOMMENDATIONS

PROPOSED NEW DWELLINGHOUSE
LAND AT FORMER GRANARY CONVERSION
WESTERTON OF WHITEHILL
BANFF
AB45 3ER

Agents:	Camphill Architecture
Client:	Mr & Mrs Cowie
Contract No.	2665/20
Report Issued:	09 December 2020

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APPENDIX A

GROUND ASSESSMENT & DRAINAGE RECOMMENDATION REPORT

PROPOSED NEW DWELLINGHOUSE LAND AT FORMER GRANARY CONVERSION WESTERTON OF WHITEHILL BANFF, AB45 3ER

INTRODUCTION

At the request of Camphill Architecture, a ground assessment investigation was undertaken a the former granary at, Westerton of Whitehill, Banff.

It is proposed to convert the granary to form a new dwellinghouse on the site.

The purpose of the visit was to carry out a ground investigation to determine the nature of the materials underlying the area of the site and to undertake the following: -

- to carry out percolation testing to assess the suitability of the underground strata for the disposal of effluent from a sewage treatment system to the ground via a designed sub-surface soakaway system
- to carry infiltration testing for the disposal design for surface waters from the proposed development
- assess the existing foundations

SITE LOCATION & BRIEF DESCRIPTION

The site is occupied by the existing former granary building and associated land at Westerton of Whitehill, east of Banff with access from the B9031 and local roads on land all under the ownership of the applicant, OS Grid Ref NO 77670 64213 (approx. centre of site), see Fig. 1. General & Site Location Plans.

The site is currently occupied by the former granary building surrounded by rough vegetation surrounded by open agricultural land with a slight slope to the south west.

The site is serviced by electricity, telephone and private water supply; there is no mains drainage available for this site; the nearby farmhouse and all nearby properties are seved by private sewage treatments systems.

The well used for water supply is more than 100m to the north-east of the site.

There are no watercourses within 10m of the site.

SITE WORK

Trial Pits

On the 19th November 2020, a back-actor type excavator with a 0.90m bucket excavated trial pits to carry out an assessment of the underlying ground conditions, to carry out percolation and infiltration testing in the areas of the potential foul and surface water sub-surface soakaways.

The locations of the trial pits were decided on site and are indicated on Fig. 2. Indicative Site Layout & Test Location Plan in Appendix A.

Percolation Testing

Percolation testing was carried out in test holes adjacent to observation trial pits FW1 in accordance with Section 3.9 of the Scottish Building Standards Technical Handbook (Domestic) and SEPA WAT-RM-04. The test results are shown on the following table: -

Date of Testing 19/11/20	FW1 at 1.00m
Average time taken for water to drain 3 times in each sump hole (middle 150mm)	2760
Depth of Water Table below Ground Level (m)	>2.00m
Soil Percolation Values, Vp, s/mm	**18.4**

Infiltration Testing

Infiltration tests were carried out in trial pit SW1 in accordance with BRE Digest 365. The test results are tabulated below: -

Trial Pit No.	**Pit Dimensions (W x L)m**	**Test Zone (mbegl)**	**In-Fill**	**Soil Infiltration Rate, *f* (m/s)**
SW1	0.60 – 1.10	1.00 – 2.00	Open	**4.16×10^{-5}**

GROUND ASSESSMENT

Published Geology

The British Geological Survey 1:50,000 Quaternary and Solid maps indicate that there are no superficial deposits recorded for the site. The site is underlain by Macduff Formation (Micaceous psammite, semipelite & pelite) Metamorphic bedrock formed approximately 541 to 1000 million years ago in the Dalradian Period.

Encountered Ground Conditions

FW1: Made Ground: The site is overlain by 200mm thickness of made ground, consisting of gravel. **Natural Sub-Soils:** The underlying sub-soils have an upper mantle of stiff red brown clay becoming dense grey flaggy gravel (very weak highly weathered very fractured rock) below 0.60m and proved to the maximum investigated depth of 1.70m.
SW1: Made Ground/Topsoil: The site is overlain by 1300mm thickness of made ground comprising of mixed topsoil, sub-soils, cobbles, boulders and pieces of metal and wood overlying the original topsoil, 300mm thick. **Natural Sub-Soils:** The natural underlaying sub-soils are described as stiff red brown clay becoming dense grey flaggy gravel (very weak highly weathered very fractured rock) proved to the maximum investigated depth of 2.00m.
Bedrock: In-tact bedrock was not encountered during this investigation however there was less weathering below 2.00m.

Groundwater Observations

Groundwater was not encountered during the investigation nor observed during the monitoring period. No visual (no seepages or discoloration) indication of the seasonally high or fluctuating ground water table was seen in the strata above the encountered depths of 2.00m.

Existing Foundations
Three hand pits were excavated to investigate the existing wall foundations and assess the underlying sub-soils.

The stone walls of the building rest directly onto underlying firm to stiff clays. Some 'foundation boulders' were noted but are not consistent; where visible were around 200-300mm in size below existing ground levels.

In-Situ hand shear vane tests carried out 0.50m gave shear strength in the range 78-96 kN/m^2.

DISCUSSION

Sub-Soils
The gravelly (weathered rock) nature of the underlying strata and the results from the percolation and infiltration testing confirmed the moderate draining properties of the sub-soils.

Sewage Treatment
The soil percolation value, Vp > 15 s/mm and a septic tank is suitable for the development, however to further protect the water environment is it recommended to install a package sewage treatment plant (PSTP) for the proposed development. A septic tank or PSTP with a minimum 3,800-litre capacity is required for a 4-bedroom house with a population, PE = 6.

Foul Water Discharge
A sub-surface stone-filled soakaway (infiltration system) is considered suitable for the discharge of foul waters from a septic tank or PSTP directly to the ground. The soakaway should comply with the Domestic Technical Handbook (para. 3.9.2) which sets out guidance on design in accordance with the requirements of SEPA Regulatory Method (WAT-RM-04) Indirect Sewage Discharges to Groundwater.

SuDS
The disposal of surface waters from the dwellinghouse needs to be assessed in terms of both the quantity and the quality of the discharge for Building Regulations and SEPA. Using the SIA tool, the land use run-off quality has been determined, see summary below: -

Land Use Type	**Residential Roofing**	**Residential Parking & Driveway**
Pollution Hazard Level	**Very Low**	**Low**
Pollution Hazard Indices		
TSS	0.2	0.5
Metals	0.2	0.4
Hydrocarbons	0.05	0.4
SuDS Component Proposed Component 1	**None (not discharging to watercourse)**	
SuDS Pollution Mitigation Indices		
TSS	0.4	0.4
Metals	0.4	0.4
Hydrocarbons	0.4	0.4
Groundwater Protection Type	**Infiltration Trench**	**Silt Trap for TSS Minimum 300mm permeable gravel finish**
Combined Pollution Mitigation Indices		
TSS	0.4	0.4
Metals	0.4	0.4
Hydrocarbons	0.4	0.4
Acceptability of Pollution Mitigation		
TSS	**Sufficient**	**Sufficient**
Metals	**Sufficient**	**Sufficient**
Hydrocarbons	**Sufficient**	**Sufficient**

Surface Water Disposal

The investigation carried out concludes that the underlying strata are considered suitable for the construction of an infiltration trench for the surface water run-off from the roof areas and permeable driveways/parking areas for the proposed development prior to disposal to the ground.

DRAINAGE RECOMMENDATIONS

Foul Water Discharge via a Sub-Surface Stone-filled Soakaway

To comply with the Domestic Technical Handbook (para. 3.9.2) which sets out guidance on how proposals may meet the Building Standards set out in the Building (Scotland) Regulations 2004, an infiltration system must be designed and constructed in accordance with the requirements of SEPA.

Where the average soil percolation value, ***Vp = 18.4s/mm*** in accordance with the regulations the minimum base area, A, is derived from ***A = Vp x PE x 0.25 , or a minimum base area of 25m^2,*** see the following table: -

Proposed Development	**Population Equivalent, PE** (as defined in BW COP:18.11/13)	**Min. Base Area (m^2)**
New Dwellinghouse	**6** (4-bedroom)	**28** (27.6)

Full details of the proposed sewage treatment system will be made available to the Building Standards Officer once it has been determined after consultation with suppliers which models are the most suitable for the proposed development.

SEPA

The foul water discharge will require to be registered with SEPA under CAR.

Surface Water Disposal

The size of the proposed surface water soakaway is based on the impermeable surface areas of the development i.e. the development roof areas.

Using the soil infiltration rate, ***f = 4.16 x 10^{-5} m/s***, the optimum dimensions for the surface water infiltration trench (soakaway) are shown on the following table: -

Stone-filled Infiltration Trench

Impermeabl Area (m²)	**Width (m)**	**Length (m)**	**Storage depth (m)**	**Half Empty Time (hrs)**
New House Roof Areas Up to **150m²**	1.00 2.00 **3.00** 4.00	13.60 7.70 **5.30** 4.00	1.30	0.93 1.58 1.91 1.98

These dimensions are based on a 1 in 200-year storm event with +20% climates change.
Calculations have been carried out in accordance with BRE Digest 365.

The development site is 'tight' for space therefore an alternative using storm cells may be considered, see the following table: -

Storm Cells

Impermeable Areas	Storage Volume Required (m^3)	Storm Crates L x W x D (m)	No. Cells
New House Roof Areas Up to **150m²**	5.30	9.00 x 0.50 x 1.20	**27** [9(1.00) x 1(0.50) x 3(0.40)]

Indicative Drainage Layout

The indicative drainage layout is shown on Fig 3. with indicative soakaway construction shown on Fig. 4. along with the certificates all in Appendix A.

SYSTEM MAINTENANCE

Sewage Treatment System

All servicing and maintenance should be undertaken in full accordance with the manufacturer's literature or by a responsible qualified person. The PSTP should be regularly inspected and 'desludged' (emptied) when appropriate to ensure solids and silts do not 'clog' the soakaway or make their way to the discharge outlet.

Soakaways

The soakaways are designed for the life time of the proposed development if they are not allowed to silt up nor the pipework to be blocked.

If a soakaway fails to due blockages or silting it should be excavated and reconstructed with fresh clean stone, new pipework and renewed terram.

During the development of the site, and the excavation of the soakaways, should any field drains be found within 10m of the soakaway they should be realigned or relocated accordingly.

REGULATIONS

SEPA and Building Regulations require that infiltration systems (soakaways) are located at least:
-

- 50m from any spring, well or borehole used as drinking water supply
- 10m horizontally from any water course (including any inland or coastal waters), permeable drain (including culvert), road or railway
- 5m from all buildings
- 5m from boundaries *(reduced distance to boundaries may also be subject to agreement from adjacent land owners where the soakaway is considered not to be detrimental to the adjacent property).*

FOUNDATION RECOMMENDATIONS

Safe Bearing Capacity

The existing building rests are firm to stiff clays with a safe bearing capacity of 100kN/m^2 which can be applied for any further foundation design.

De-Watering

It is not anticipated that de-watering of excavations will be required during construction.

APPENDIX A

Site Plans	Fig. 1. General & Site Location Plans
	Fig. 2. Test Location Plan
Trial Pit Logs	FW1, SW1 and HP1-3
Drainage	Fig. 3. Indicative Drainage Layout
	Fig. 4. Indicative Sub-Surface Soakaway Construction
	Fig. 5. Indicative Storm Cell Configuration
Certificates	Foul Water Discharge
	Surface Water Disposal

Fig. 1. GENERAL & SITE LOCATION PLANS

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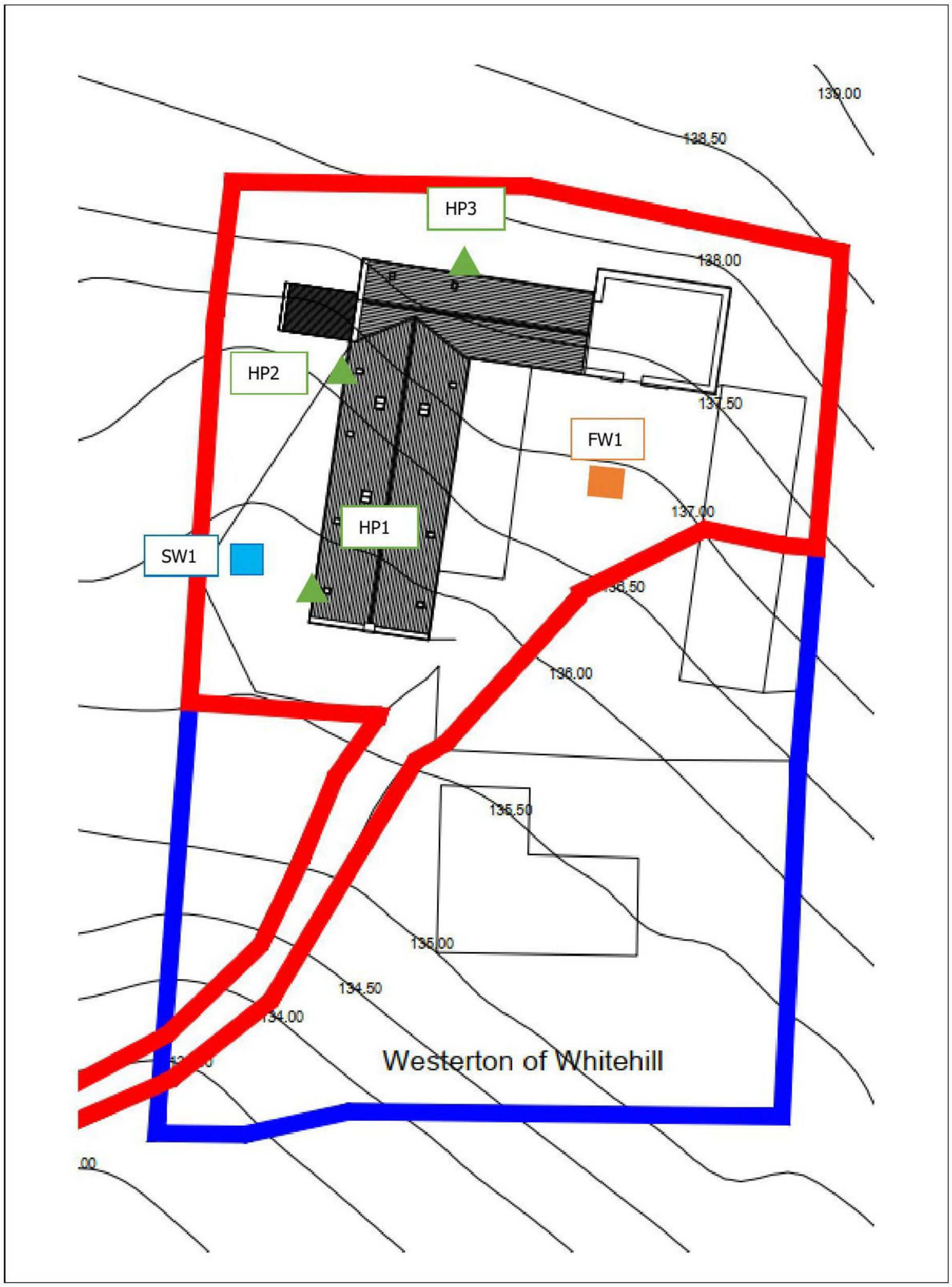
Fig. 2. TEST LOCATION PLAN



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Excavation Method Back-actor with 00.90m bucket	**Dimensions** 0.90 x 1.50	**Ground Level (mOD)**	**Site** Westerton of Whitehill	**Trial Pit Number** FW1
	Location	**Dates** 19/12/2020	**Client** Mr and Mrs Cowie	**Job Number** 2665/20
			Architect Camphill Architecture	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	MADE GROUND - Gravel		
					(0.40) 0.60	Stiff red brown CLAY		
			Percolation testing at 1.00m		(1.10) 1.70	Dense grey flaggy GRAVEL (Very weak highly weathered very fractured rock)		
			No groundwater ingress			Complete at 1.70m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:20	SAM	2665/20.FW1

GEOTECHNICAL & ENVIRONMENTAL ON SITE SERVICES

S.A. McGREGOR

Excavation Method Back-actor with 00.90m bucket	**Dimensions** 0.90 x 1.60	**Ground Level (mOD)**	**Client** Mr and Mrs Cowie
	Location	**Dates** 19/12/2020	**Architect** Camphill Architecture

Site
Westerton of Whitehill

Trial Pit Number
SW1

Job Number
2665/20

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(1.30)	MADE GROUND - mixed topsoil, sub-soils, cobbles, boulders pieces metal and wood		
			Infiltration test zone 1.00-2.00m		1.30 (0.30)	Original TOPSOIL		
					1.60 (0.40)	Dense grey flaggy GRAVEL (Very weak highly weathered very fractured rock)		
			No groundwater ingress		2.00	Complete at 2.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:20	SAM	2665/20.SW1

Fig. 3. INDICATIVE DRAINAGE LAYOUT

NOT TO SCALE: ALL SOAKAWAY DIMENSIONS PROVIDED ON THIS DRAWING SHOULD BE CHECKED ON A FULL-SCALE PLAN TO ENSURE THEY MEET THE REQUIRED BUILDING REGULATIONS 5m FROM BUILDINGS AND SITE BOUNDARIES, 10m FROM OTHER SOAKAWAYS, DRAINS AND WATERCOURSES & 50m FROM WELLS

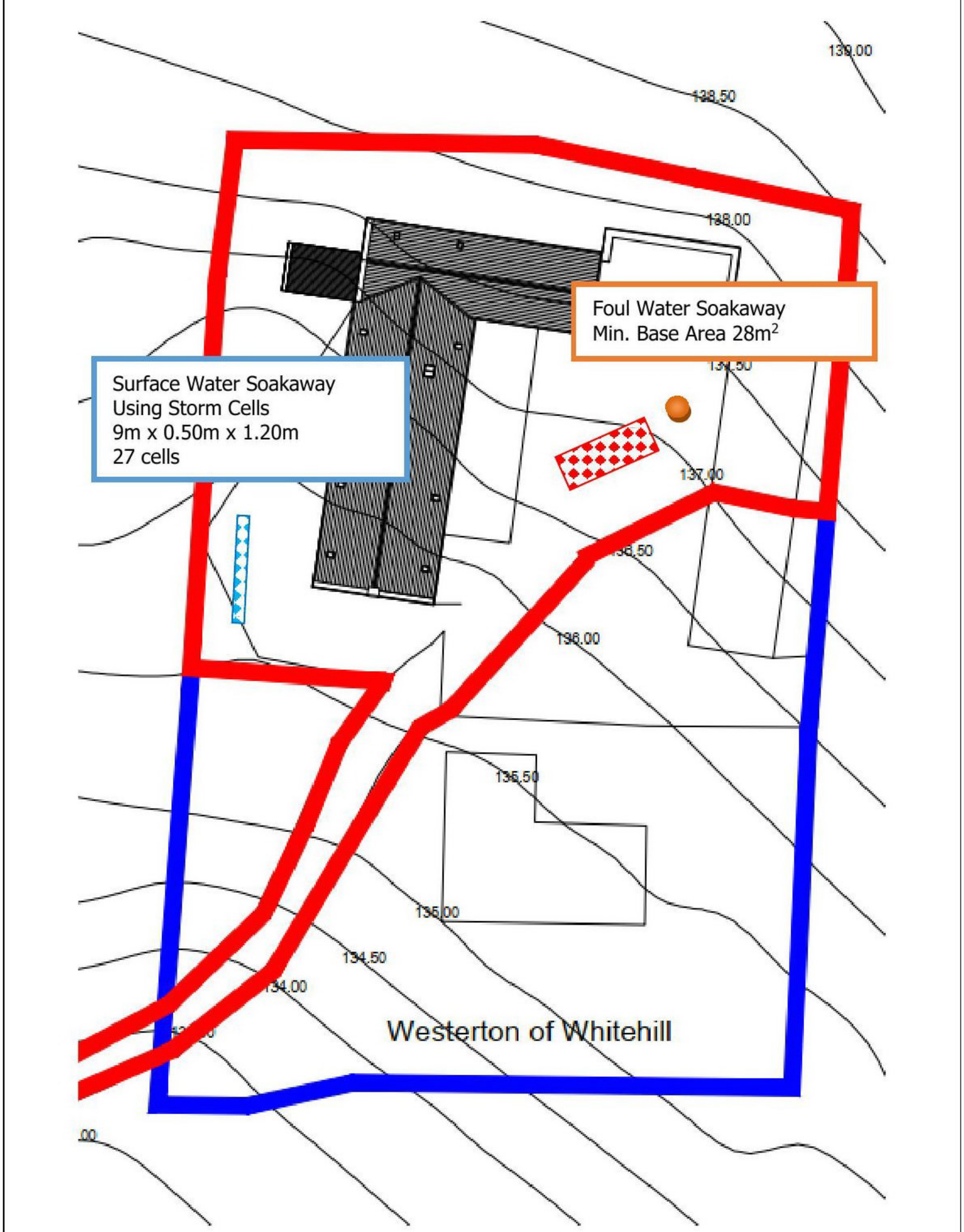
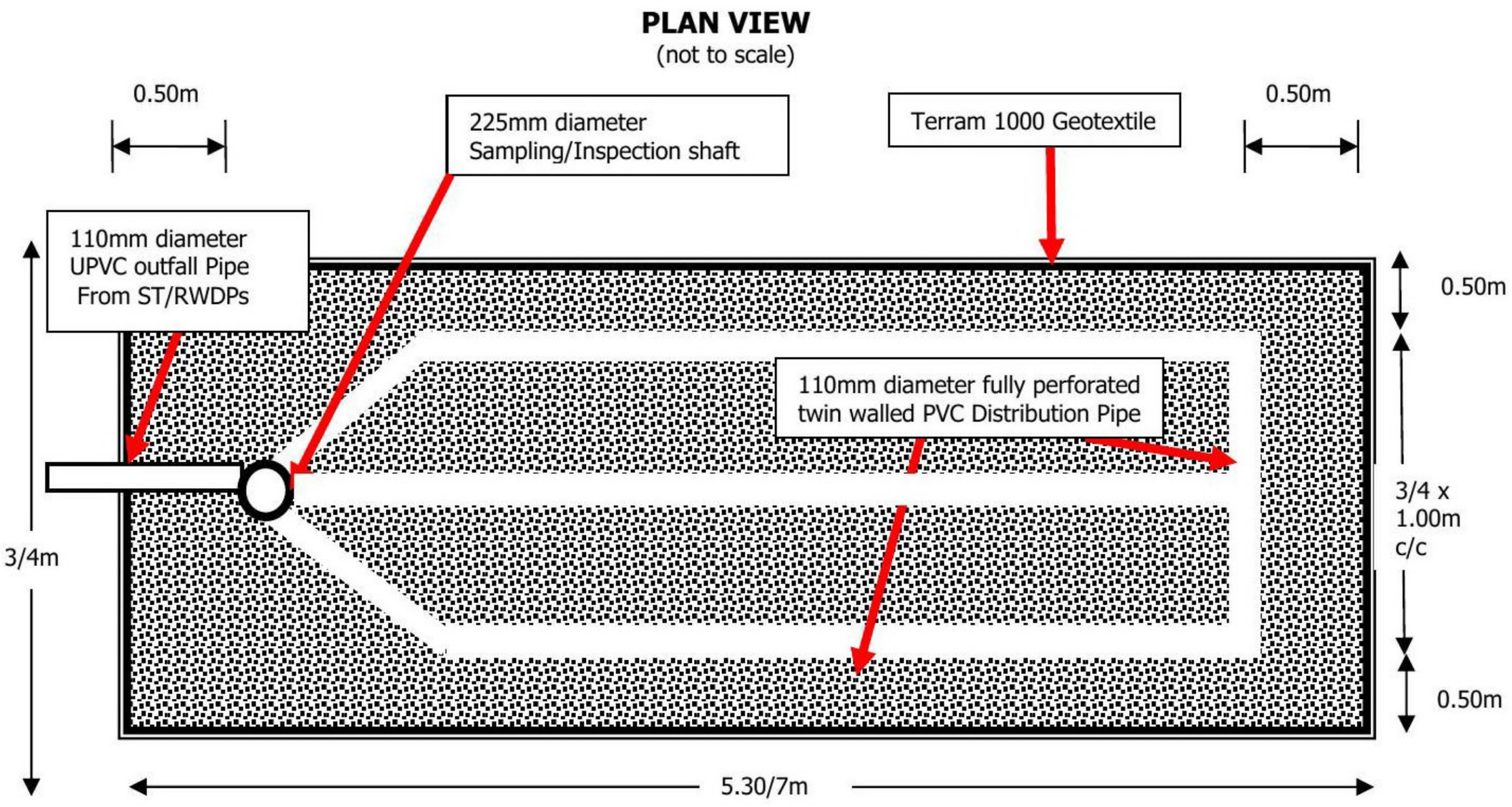


Fig. 4. INDICATIVE SOAKAWAY CONSTRUCTION (sketch only, not to scale)



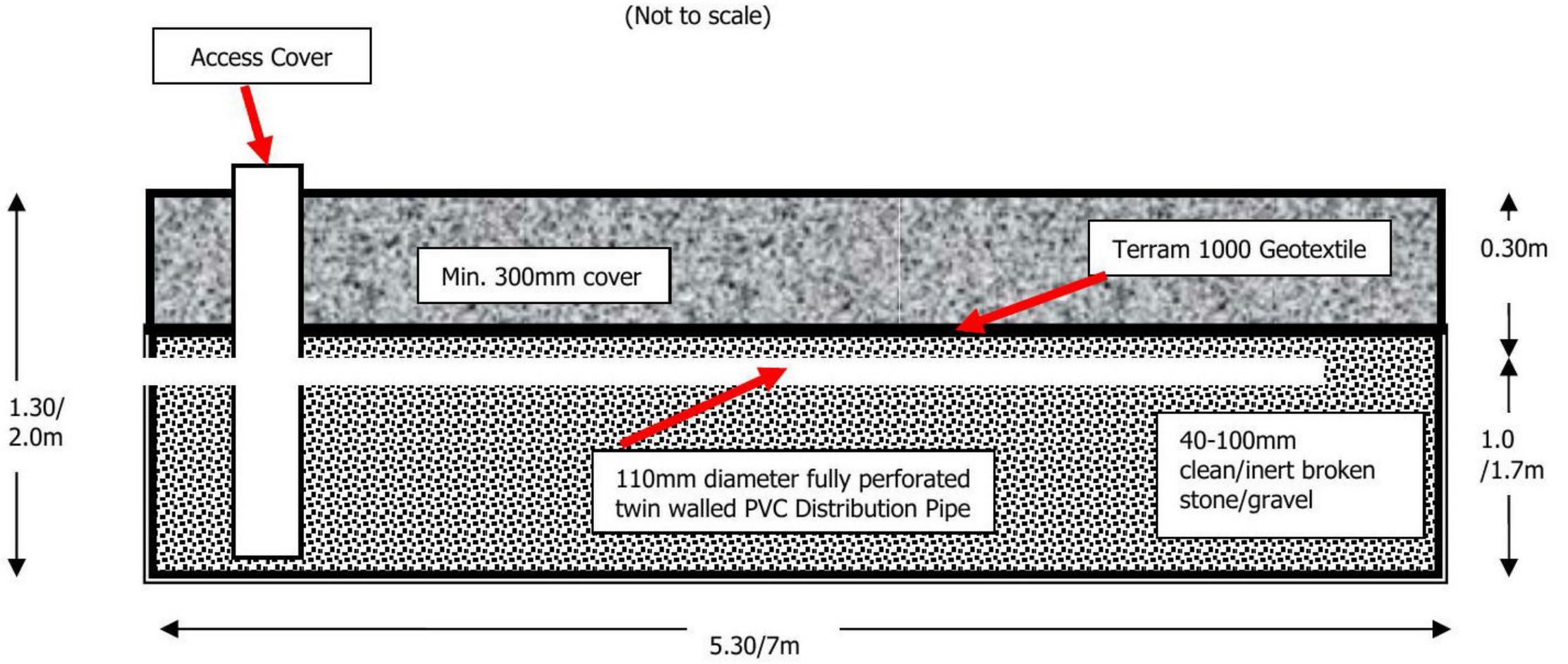
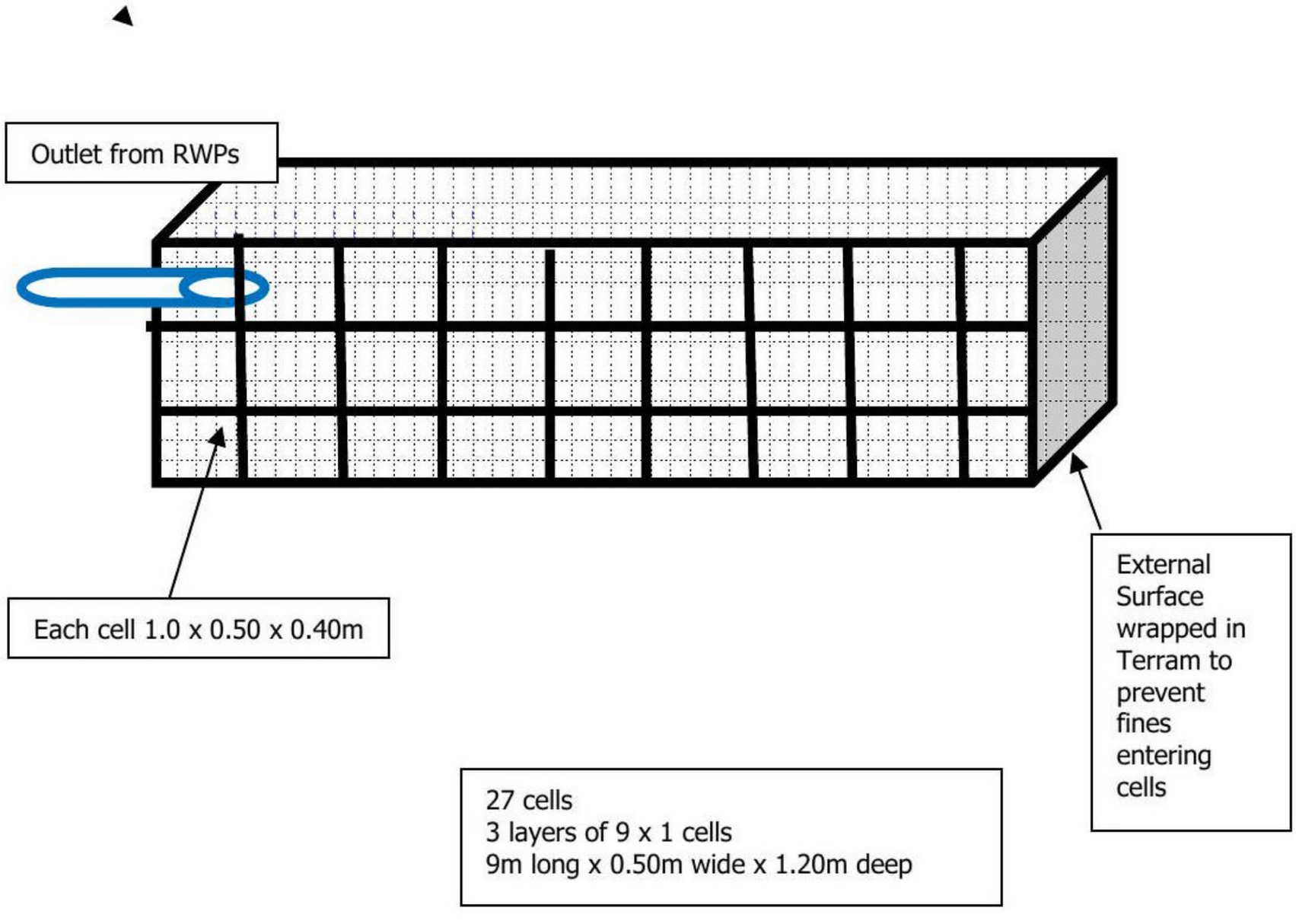


Fig. 5. INDICATIVE INSTALLATION CONFIGURATION (SKETCH ONLY)



CERTIFICATE FOR PROPOSED FOUL WATER SUB-SURFACE DISCHARGE

Two tests are normally required to demonstrate the suitability of the proposed drainage scheme:

1. A trial pit must be excavated to a depth of 1 metre below the proposed invert of the drain to establish whether the water table will interfere with the operation of the soakaway

and

2. A percolation test must be carried out to determine the area of the ground required.

Certificate

Client: Mr & Mrs Cowie

Agents: Camphill Architecture

Site Address: New House, Westerton of Whitehill, Banff, AB45 3ER.

Date of Test: 19th November 2020 **Weather:** Light rain

Encountered Ground Conditions

Made Ground: The site is overlain by 200mm thickness of made ground, consisting of gravel. **Natural Sub-Soils:** The natural underlying sub-soils have an upper mantle of stiff red brown clay becoming dense grey flaggy gravel (very weak highly weathered very fractured rock) below 0.60m and proved to the maximum investigated depth of 1.70m. **Bedrock:** In-tact bedrock was not encountered during this investigation.

Groundwater Observations

Groundwater was not encountered during the investigation nor observed during the monitoring period. No visual (no seepages or discoloration) indication of the seasonally high or fluctuating ground water table was seen in the strata above the encountered depths of 1.70m.

Wells: no known wells used for supply of potable water within 50m of site.

Percolation Tests	**FW1**
Depth of Drains	1.00m
Depth of Excavations	1.70m
Time Taken (mean of three times), secs	2760
Average Soil Percolation Values, Vp, s/mm	18.4
Population Equivalent	6 (4-bedroom)
Minimum Floor Area of Soakaway	**28m²**

I hereby certify that I have carried out the above assessment in accordance with procedures specified within the Domestic Scottish Building Standards Technical Handbook (Environmental Standard 3.9 Infiltration Systems) and SEPA A WAT-RM-04, the results of which are tabulated above, and that the proposed drainage scheme detailed on the attached plans and report has been designed considering the recommendations in the standards and regulatory standards.

Signed [redacted] Date…09 December 2020
Name / Company S. A. McGregor
Address Serenje, Kingsford Steadings, Alford, Aberdeenshire, AB33 8HN
Qualification B.Eng (Civil Engineering).

CERTIFICATE FOR PROPOSED SURFACE WATER DISPOSAL

Client: Mr & Mrs Cowie

Agents: Camphill Architecture

Site Address: New House, Westerton of Whitehall, Banff, AB45 3ER.

Date of Test: 19th November 2020 **Weather:** Light rain

Encountered Ground Conditions

Made Ground/Topsoil: The site is overlain by 1300mm thickness of made ground comprising of mixed topsoil, sub-soils, cobbles, boulders and pieces of metal and wood overlying the original topsoil, 300mm thick. **Natural Sub-Soils:** The natural underlaying sub-soils are described as stiff red brown clay becoming dense grey flaggy gravel (very weak highly weathered very fractured rock) proved to the maximum investigated depth of 2.00m.**Bedrock:** In-tact bedrock was not encountered during this investigation.

Groundwater Observations

Groundwater was not encountered during the investigation nor observed during the monitoring period. No visual (no seepages or discoloration) indication of the seasonally high or fluctuating ground water table was seen in the strata above the encountered depths of 2.00m.

Wells: no known wells used for supply of potable water within 50m of site.

Infiltration Test	**SW1**
Infiltration Test Zone (m)	1.00 – 2.00
Soil Infiltration Rate, *f* (m/s)	4.16×10^{-5}
Surface Area of Development	up to **150m²**

Recommendation:

Infiltration System

Surface Water Infiltration System using 27 Storm Cells
9m x 0.50m with 1.20m storage depth

I hereby certify that I have carried out the above tests and calculations in accordance with BRE Digest 365 and in conjunction with the full requirements set out within the Domestic Scottish Building Standards Technical Handbook. The results of which are tabulated above, and that the proposed drainage scheme detailed within this report has been designed considering the recommendations in the standards.

Signed .[redacted]..... Date…09 December 2020
Name / Company S. A. McGregor
Address Serenje, Kingsford Steadings, Alford, Aberdeenshire, AB33 8HN
Qualification B.Eng (Civil Engineering).