

S.A. MCGREGOR



GROUND ASSESSMENT
&
DRAINAGE RECOMMENDATION REPORT

REPLACEMENT AGRICULTURAL SHED
SAUCHENBUSH FARM
BY ECHT
ABERDEENSHIRE
AB32 7AP

Clients: Dunecht Estates

Contract No.: 3514/23

Report Issued: 06 December 2023

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INTRODUCTION

At the request of Dunecht Estates, a ground assessment investigation was undertaken on land at Sauchenbush Farm, by Echt, Aberdeenshire.

It is proposed to replace the existing fire damaged agricultural shed 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 infiltration testing for the disposal design for surface waters from the proposed development

to assess safe bearing capacity for foundation design

SITE LOCATION & BRIEF DESCRIPTION

The site is located on land at Sauchenbush Farm, north-west of Echt with access from the B9119 and local roads on land all under the ownership of the applicant, OS Grid Ref NJ 72033 06447 (approx. centre of site), see Fig. 1. General & Site Location Plans.

The area of the proposed new replacement shed is currently used for storing farm machinery and is overlain by long grass. The area is generally level. The proposed infiltration area is north of the shed in the adjacent field sloping down to the north.

The site is serviced by private water and electricity; there is no mains drainage.

There are no known wells supplying potable water within 50m of the site.

There are no surface watercourses within 10m of the site; an unnamed watercourse flows approximately 80m to the north which joins a series of watercourses joining into the Gormack Burn to the far south.

SITE WORK

Trial Pits

On the 24th November 2023, a tracked excavator a 0.60m bucket excavated trial pits to carry out an assessment of the underlying ground conditions, to carry out infiltration testing in the areas of the potential surface water sub-surface soakaways.

The locations of the trial pits were decided on site taking into account the site topography, proposed site layout on the drawings provided by Dunecht Estates and are indicated on Fig. 2. Proposed Site Layout & Test Location Plan in Appendix A.

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)
SW 1	0.60 x 1.00	0.50-1.50	Open	Water ingress test abandoned

In-Situ SPTs

In-situ SPTs were carried out between 0.50m and 1.30m below existing ground levels in the sands and gravels; see test results below: -

Trial Pit No.	Depth (m)	'N' Value
TP2	0.50	7
	1.20	14
TP3	0.70	21
	1.25	25
TP4	0.60	22
	1.30	26

GROUND ASSESSMENT

Published Geology

The British Geological Survey 1:50,000 Superficial and Solid maps indicate that the site may be overlain by Banchory Till Formation – Diamicton. Sedimentary superficial deposits formed between 116 and 11.8 thousand years ago during the Quaternary Period. The site is underlain by the Balblair Intrusion (microgranodiorite). Igneous bedrock formed between 485.4 and 443.8 million years ago during the Ordovician Period.

Encountered Ground Conditions

Made Ground and Topsoil: The areas of TP3 and TP4 are overlain by made ground, 200-230mm in thickness consisting of gravel and cobbles (yard area). The original topsoil was encountered beneath the made ground to 140-200mm in thickness to approximately 0.40m below ground level. The areas of SW1, TP1 and TP2 are overlain by topsoil 280-300mm in thickness.

Natural Sub-Soils: The natural underlying sub-soils have an upper mantle of soft/loose light grey, brown and orange mottled very silty, very sandy clay becoming firm to stiff orange very silty very gravelly sandy clay below 0.80m and proved to the maximum investigated depth of 1.50m.

Bedrock: Bedrock was not encountered during the 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 1.50m.

DISCUSSION

Sub-Soils

The clayey nature of the underlying soils and water ingress confirmed the poor draining properties of the sub-soils, $f < 1 \times 10^{-7}$ m/s.

SuDS

The disposal of surface waters from the new shed 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: -

Land Use Type	New Shed Roof Inert Materials
Pollution Hazard Level	Very Low
Pollution Hazard Indices	TSS 0.3 Metals 0.2 Hydrocarbons 0.05
SuDS Component Proposed	Filter Drain (discharging to watercourse)
Groundwater Protection Type	n/a
Groundwater Pollution Mitigation Indices	TSS 0.4 Metals 0.4 Hydrocarbons 0.4
Combined Pollution Mitigation Indices	TSS 0.4 Metals 0.4 Hydrocarbons 0.4
Acceptability of Pollution Mitigation	TSS Sufficient Metals Sufficient Hydrocarbons Sufficient

The SIA assessment confirms that the installation of a filter drain prior to discharge provides sufficient quality mitigation for the surface water run-off from the roof areas of the new shed prior to disposal to the watercourse.

The design is to be effective in all-weather conditions and are not considered to pose a risk to local water supplies and the water environment.

DRAINAGE RECOMMENDATIONS

Surface Water Disposal

The quantity of the discharge must also be controlled to ensure that the proposed development does not increase the pre-development flow of the watercourse.

The size of the proposed filter drain prior to discharge to the watercourse is based on the impermeable surface area of the development i.e. the roof area of the new shed, see table below: -

Impermeable Area (m ²)	Filter Drain Width x Length (m)	Discharge
New Shed Roof Areas Up to 466m ²	1m x 13.90m With 0.50m depth filter stone	110mm dia. drain into watercourse fitted with a storm brake

These dimensions include for a 1 in 200-year storm event and SEPA +Climate Change Peak Rainfall Intensity Allowance of +37% for the North East Region of Scotland and in accordance with BRE Digest 365.

Proposed Drainage

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

SYSTEM MAINTENANCE

Soakaways

The soakaways are designed for the lifetime 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.

All the drainage and associated soakaways will remain private, to be maintained by Dunecht Estates in general accordance with maintenance activities as listed in the following table: -

Operation & Maintenance for Soakaway		
Monitoring	Inspect all associated silt traps and inspection chambers and note rate of sediment accumulation	Monthly within the first year after installation, 6 monthly thereafter unless accumulation rate indicated more frequent emptying
	Check soakaway to ensure emptying is occurring, especially after prolonged rainfall events	6 monthly
Regular Maintenance	Carry out inspection for sediment and debris in the inspection chamber, rodding eyes, and any directional change chambers	6 monthly
	Clean out all gutters and downpipes (leaves, pine needles etc.) and any filters present	Annually, especially in the autumn after leaf fall (or as required)
	Ensure no root migration encroaches soakaway and trim back when required	Annually (or as required)
Remedial Actions	If performance deteriorates or soakaway fails reconstruct the soakaway and/or replace stone fill	As required
	When necessary, replace clogged geotextile	As required

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 in-Situ SPT 'N' values are in the range 7-26.

Using the average N value at 0.50-0.70m of 16 a safe bearing capacity of 150kN/m² may be used for foundation design.

It is recommended that the foundations should be taken down through any made ground and topsoil to rest on the firm clays at a minimum depth of below 0.60m below existing ground levels.

Excavations

Due to the clayey nature of the sub-soils all excavations, if left exposed, should be protected from rain and run-off waters to maintain the soils strength.

Settlement

It is considered that the generally firm and granular nature of the clayey sub-soils will have settlement within tolerable design limits.

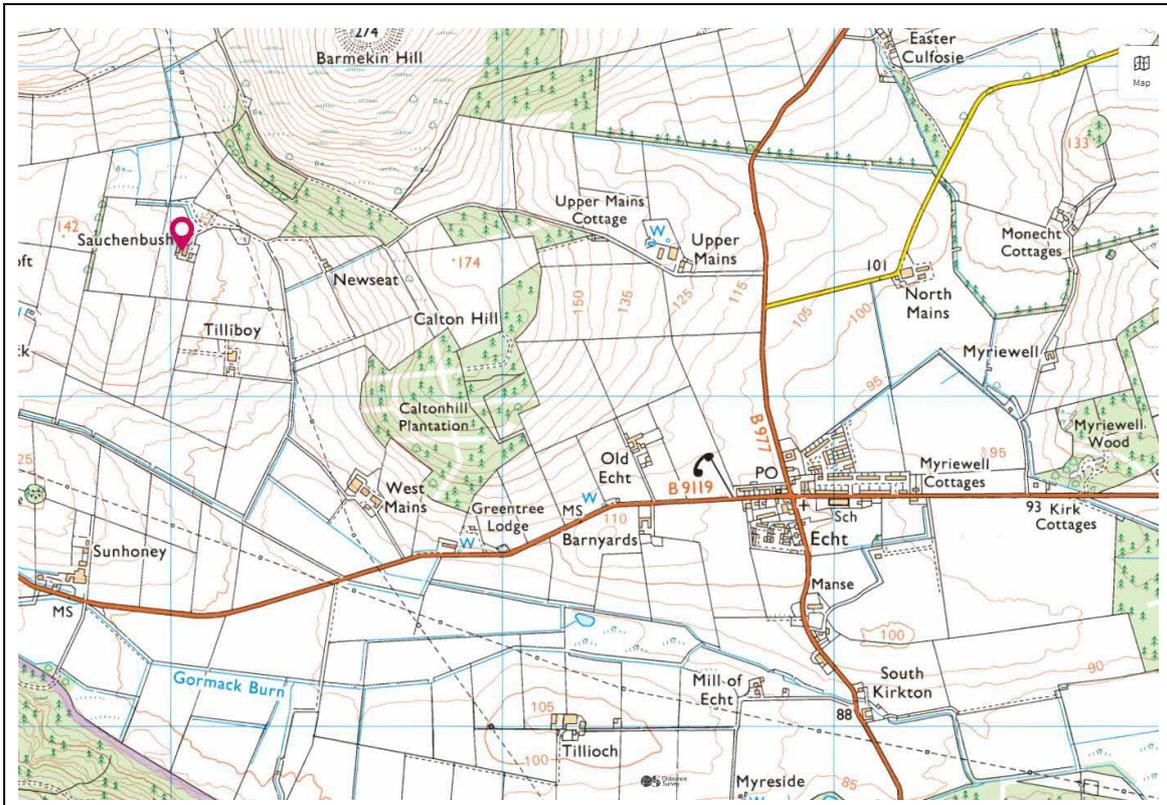
Dewatering

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

APPENDIX A

Site Plans	Fig. 1. General & Site Location Plans Fig. 2. Test Location Plan
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Fig. 1. GENERAL & SITE LOCATION PLANS



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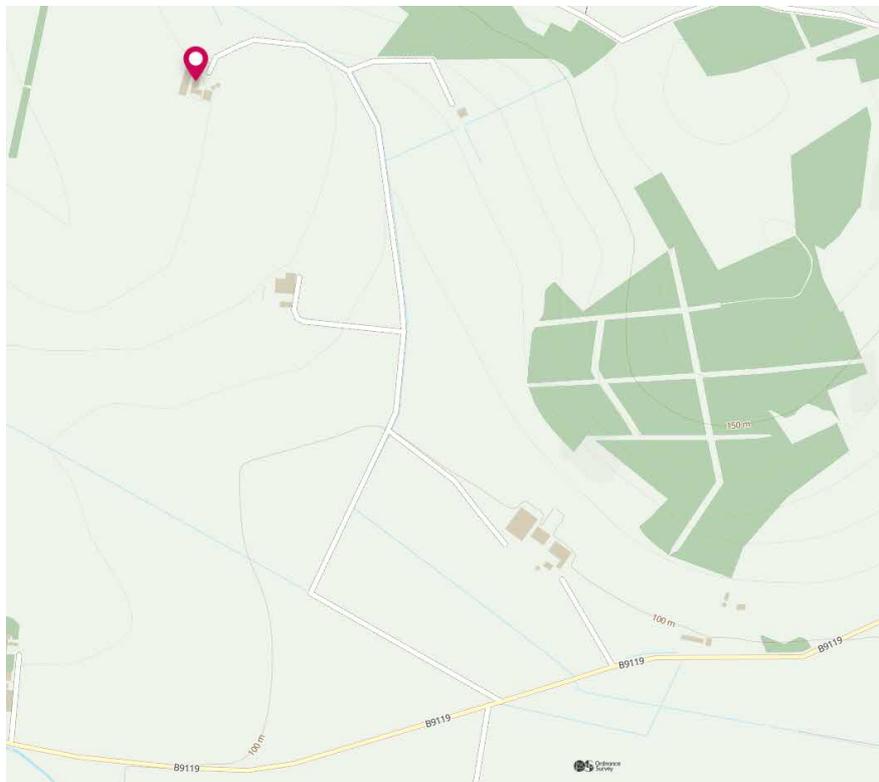
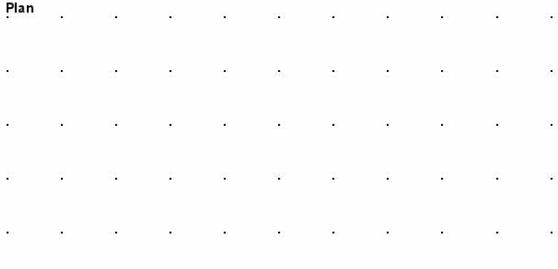


Fig. 2. TEST LOCATION PLAN

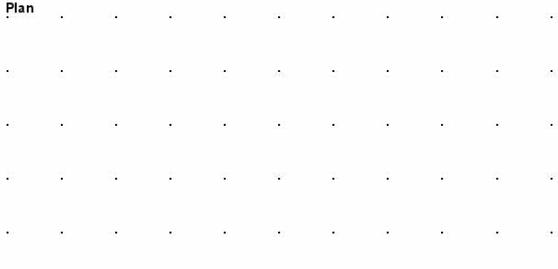


 S.A. MCGREGOR <small>GEOTECHNICAL & ENVIRONMENTAL ONSITE SERVICES</small>		Site Sauchenbush, Echt		Trial Pit Number SW1					
Excavation Method Tracked excavator with 0.60m bucket		Dimensions 0.60 x 1.00		Ground Level (mOD)					
Location		Dates 24/11/2023		Client Dunecht Estates					
Job Number 3514/23		Engineer		Sheet 1/1					
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
					0.30	Stubble onto TOPSOIL			
			Surface water ingress from 0.50m beg! Infiltration test zone 0.60-1.00m		0.30	Soft to firm brown, grey orange mottled sandy gravelly CLAY			
			No groundwater ingress		(1.20)	...water seepages below 0.50m			
					1.50	Infiltration abandoned due to water ingress $f < 1 \times 10^{-6}$ Complete at 1.50m			
Plan 				Remarks 					
				Scale (approx) 1:20		Logged By SAM		Figure No. 3514/23.SW1	

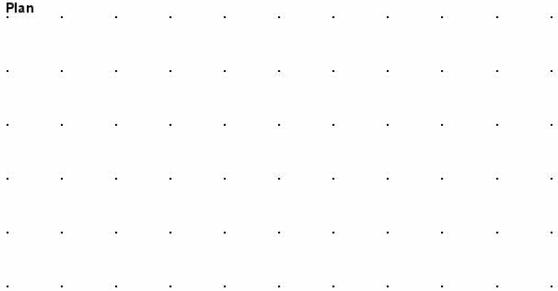
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 S.A. MCGREGOR <small>GEOTECHNICAL & ENVIRONMENTAL ONSITE SERVICES</small>				Site Sauchenbush, Echt		Trial Pit Number TP1	
Excavation Method Tracked excavator with 0.60m bucket		Dimensions 0.60 x 1.10		Ground Level (mOD)		Client Dunecht Estates	
Location		Dates 24/11/2023		Engineer		Job Number 3514/23	
Depth (m)		Water Depth (m)		Level (mOD)		Sheet 1/1	
Sample / Tests		Field Records		Depth (m) (Thickness)		Description	
						Legend	
						Water	
					0.28	TOPSOIL	
					0.28		
					0.19	Firm/ medium dense grey, orange and brown mottled very silty very sandy CLAY/ very clayey SAND and many sub-angular to sub-rounded gravels and cobbles	
					0.47	Firm to stiff orange and brown very sandy, very gravelly CLAY	
					0.53	... water seepages below 0.60m	
					1.00		
					0.20	Stiff grey very silty very sandy very gravelly CLAY	
					1.20	Complete at 1.20m	
			No groundwater ingress				
Plan				Remarks			
. .				. .			
				Scale (approx) 1:20		Logged By SAM	
						Figure No. 3514/23.TP1	

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 S.A. MCGREGOR <small>GEOTECHNICAL & ENVIRONMENTAL ONSITE SERVICES</small>				Site Sauchenbush, Echt		Trial Pit Number TP3	
Excavation Method Tracked excavator with 0.60m bucket		Dimensions 0.60 x 1.10		Ground Level (mOD)		Client Dunecht Estates	
Location		Dates 24/11/2023		Engineer		Job Number 3514/23	
Depth (m)		Sample / Tests		Water Depth (m)		Field Records	
Level (mOD)		Depth (m) (Thickness)		Description		Legend	
0.70-1.15	SPT(C) N=21		4,5/5,5,5,6	(0.23)	MADE GROUND - gravels and cobbles (yard area)		Water
				0.23 (0.14)	Original TOPSOIL		
				0.37	Firm grey very silty, very sandy, very gravelly CLAY		
				(0.88)	...firm to stiff below 0.70m		
1.25-1.70	SPT(C) N=25		No groundwater ingress 6,6/6,6,6,7	1.25	Complete at 1.25m		
Plan 				Remarks 			
Scale (approx) 1:20		Logged By SAM		Figure No. 3514/23.TP3			

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 S.A. MCGREGOR GEOTECHNICAL & ENVIRONMENTAL ONSITE SERVICES				Site Sauchenbush, Echt		Trial Pit Number TP4			
Excavation Method Tracked excavator with 0.60m bucket		Dimensions 0.70 x 1.20		Ground Level (mOD)		Client Dunecht Estates			
		Location		Dates 24/11/2023		Engineer			
						Job Number 3514/23			
						Sheet 1/1			
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.60-1.05	SPT(C) N=22		3,5/5,6,5,6		(0.20) MADE GROUND - gravels and cobbles (yard area) 0.20 Original TOPSOIL (0.20) 0.40 Firm grey very silty, very sandy, very gravelly CLAY ..firm to stiff below 0.60m (0.90)	  			
1.30-1.75	SPT(C) N=26		No groundwater ingress 5,6/6,6,7,7		1.30 Complete at 1.30m				
Plan 				Remarks 					
				Scale (approx) 1:20		Logged By SAM		Figure No. 3514/23.TP4	

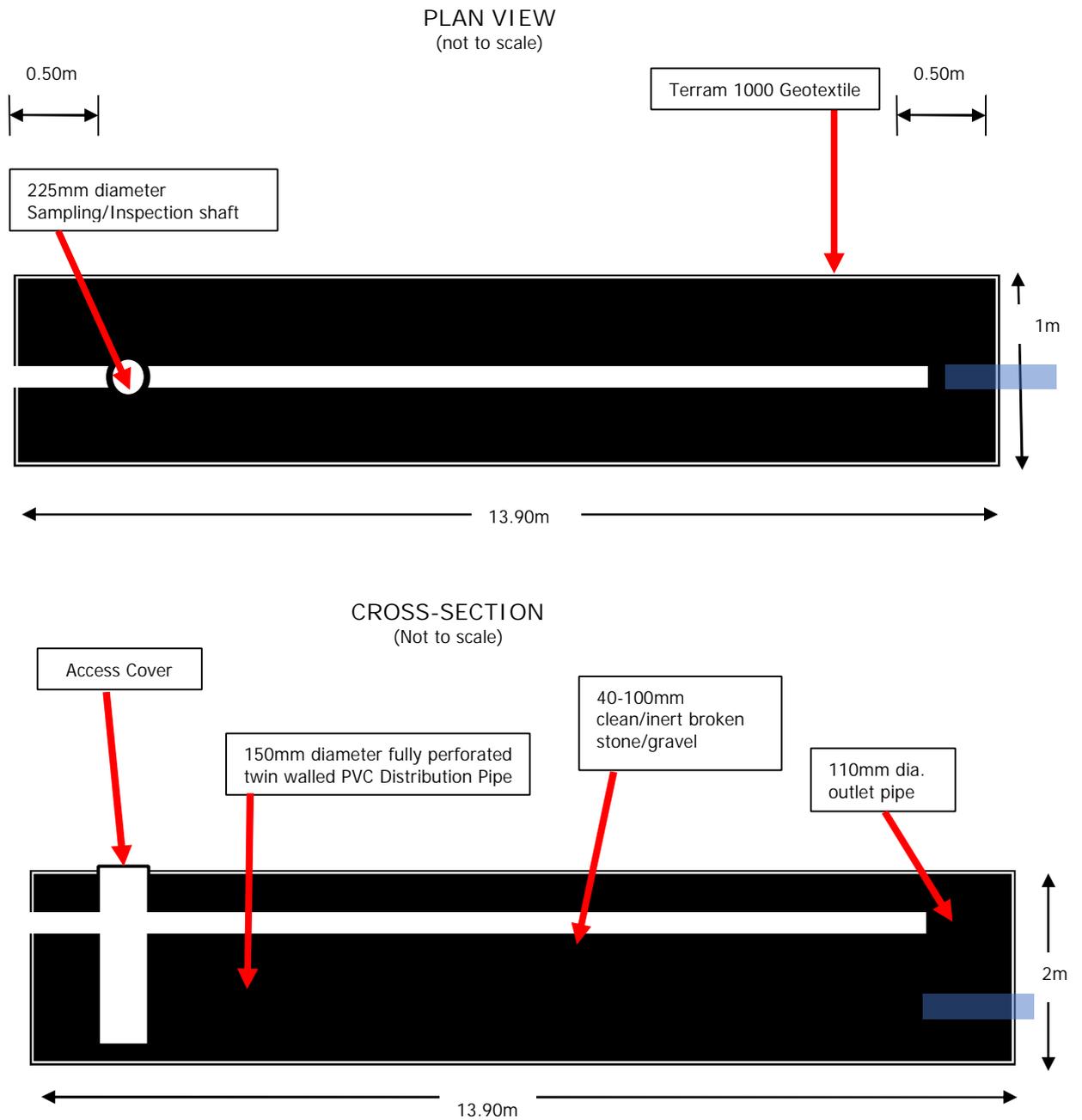
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Fig. 3. PROPOSED DRAINAGE LAYOUT



Fig. 5. INDICATIVE FILTER DRAIN INSTALLATION

(sketch only, not to scale)



CERTIFICATE FOR PROPOSED SURFACE WATER DISPOSAL			
Applicants Name	Dunecht Estates		
Site Address	Sauchenbush Farm, by Echt, Aberdeenshire, AB32 7AP		
Date of Assessment	24 th November 2023		
Weather Conditions	Light rain		
<p>Encountered Ground Conditions: Made Ground and Topsoil: The areas of TP3 and TP4 are overlain by made ground, 200-230mm in thickness consisting of gravel and cobbles (yard area). The original topsoil was encountered beneath the made ground to 140-200mm in thickness to approximately 0.40m below ground level. The areas of SW1, TP1 and TP2 are overlain by topsoil 280-300mm in thickness. Natural Sub-Soils: The natural underlying sub-soils have an upper mantle of soft/loose light grey, brown and orange mottled very silty, very sandy clay becoming firm to stiff orange very silty very gravelly sandy clay below 0.80m and proved to the maximum investigated depth of 1.50m. Bedrock: Bedrock was not encountered during the investigation.</p>			
Groundwater Observations: Not encountered during the ground investigation			
Wells / Boreholes: No known potable water supply wells/boreholes within 50m of the proposed infiltration fields			
Infiltration Testing	SW1 (test abandoned due to water ingress)	Open	
Infiltration Test Zone	0.50 – 1.50	mbegl	
Soil Infiltration Rate, f	1 < 10⁻⁷	m/s	
SuDS Design	Filter Drain and discharge to watercourse		
Proposed Development	Replacement Agricultural Shed		
Impermeable Areas	Shed Roof Areas	Up to 466 m²	
Design Dimensions, L x W	13.90m	1.00m	0.50m Stone Storage depth
<p>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.</p>			
Signed			Date 06 December 2023
Name / Company	S. A. McGregor		
Address	Serenje, Kingsford Steadings, Alford, Aberdeenshire, AB33 8HN		
Qualification	B.Eng (Civil Engineering)		