

S.A. MCGREGOR



GROUND ASSESSMENT REPORT & DRAINAGE RECOMMENDATIONS

PROPOSED DEVELOPMENT
TULLOCH HOUSE
BY OLDMELDRUM
ABERDEENSHIRE
AB51 0AY

<i>Clients:</i>	Mr D Bain
<i>Architects:</i>	CTA (Scotland) Ltd.
<i>Contract No.:</i>	3253/22
<i>Report Re-Issued:</i>	27 October 2023

CONTENTS

Introduction

Site Location & Brief Description

Site Work

Trial Pits

Percolation Testing

Infiltration Testing

Ground Assessment

Published Geology

Encountered Ground Conditions

Groundwater Observations

Discussion

Sub-Soils

Sewage Treatment

Foul Water Discharge

SuDS & Surface Waters

Drainage Recommendations

Foul Water Discharge

SEPA

Surface Water Disposal

Proposed Drainage

System Maintenance

Sewage Treatment System

Soakaways

Regulations

Foundation Recommendations

Safe Bearing Capacity

Settlement

De-watering

APPENDIX A

Site Plans	Fig. 1. General & Site Location Plans
	Fig. 2. Test Location Plan
Trial Pit Logs	TP1 – TP7
Drainage	Fig. 3. Proposed Drainage Layout
	Fig. 4. Indicative Foul water Soakaway Construction
Certificates	Foul Water Discharges
	Surface Water Disposal

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INTRODUCTION

At the request of CTA (Scotland) Ltd. Architects, on behalf of Mr D Bain, a ground assessment investigation was undertaken on land at Tulloch House, north of Oldmeldrum, Aberdeenshire.

It is proposed to erect three new dwellinghouses 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 assess the underlying ground conditions.

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 SuDS for the proposed development.

SITE LOCATION & BRIEF DESCRIPTION

The site is located on land at Tulloch House, north of Oldmeldrum with access off the A947 and local roads on land all under the ownership of the applicant, OS Grid Ref NJ 79793 31190 (approx. centre of site), see Fig. 1. General & Site Location Plans.

The site is occupied by some wooden buildings, abandoned machinery, derelict cabins and some rocky spoil heaps with overgrown vegetation.

The site is serviced by, mains water, electricity and telephone. The existing cottages are served by a shared septic tank located in the garden to the south-east. There is no mains sewer available for the proposed development.

There are no known wells supplying potable water within 50m of the site. There are no watercourses within 10m of the site.

SITE WORK

Trial Pits

On the 26th November 2022, a tracked excavator with a 1.00m 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 and indicated development layout and are all indicated on Fig. 2. Test Location Plan in Appendix A.

Percolation Testing

Percolation testing was carried out in test holes adjacent to observation trial pits TP1A, TP3 and TP5 in accordance with Section 3.9 of the Scottish Building Standards Technical Handbook (Domestic) and SEPA CAR Regulations. The test results are shown on the following table: -

Date of Testing 26/11/22	TP1A (Plot 1)	TP3 (Plot 2)	TP5 (Plot 3)
Average time taken for water to drain 3 times in each sump hole (middle 150mm)	3660	2880	4140
Depth of Water Table below Ground Level (m)	2.50	2.30	2.50
Soil Percolation Values, V_p , s/mm	24.4	19.2	27.6

Infiltration Testing

Infiltration tests were carried out in trial pits TP4 & TP6 in accordance with BRE Digest 365. The test results are tabulated below: -

Trial Pit No.	Pit Dimensions (W x L)m	Test Zone (mbeql)	In-Fill	Soil Infiltration Rate, f (m/s)
TP2A (Plot 1)	1.40 x 2.40	1.50-2.50	Open	1.08×10^{-5}
TP6 (Plot 2)	1.50 x 2.50	0.50-1.50		1.07×10^{-5}
TP4 (Plot 3)	1.70 x 2.60	1.70-2.70		2.33×10^{-5}

GROUND ASSESSMENT

Published Geology

The British Geological Survey 1:50,000 Quaternary and Solid maps indicate that the site is overlain by Till Devensian (Diamicton) superficial deposits formed between 116 and 11.8 thousand years ago in the Quaternary Period. The site is underlain by Strichen Formation – semipelite, pelite and psammite. Metamorphic bedrock formed between 1000 and 541 million years ago between the Tonian and Ediacaran Periods.

Encountered Ground Conditions

Topsoil: The some of the site is overlain by topsoil 300-1100mm in thickness of topsoil. The topsoil was encountered in TP3 - TP5

Natural Sub-Soils: The natural underlying sub-soils in TP3 – TP5 have an upper mantle of firm light brown and grey mottled very sandy very gravelly clay becoming medium dense orange slightly clayey sand and gravel (completely weathered rock) below approximately 1.20m and proved to the maximum investigated depth of 2.70m.

Bedrock: Bedrock was encountered during this investigation in TP1, TP2, TP3, TP6 and TP7, consisting of very weak light orange brown well fractured highly weathered bedrock.

Water Ingress Observations

Water ingress was encountered during the investigation in every trial pit apart from TP6. The water ingress is considered to be either surface water ingress or groundwater: -

TP1 - surface water ingress at 1.00m rising to 0.50m

TP2 - surface water ingress at 1.00m rising to 0.60m

TP3 – groundwater ingress at 2.50m

TP4 – groundwater ingress at 2.70m

TP5 – groundwater ingress at 2.50m

TP6 – no groundwater ingress observed above 1.50m

TP7 - surface water ingress at 1.00m rising to 0.80m

DISCUSSION

Sub-Soils

The sandy gravelly nature of the strata and below the upper clay and the results from the percolation and infiltration testing confirmed the moderate properties of the sub-soils.

Sewage Treatment

The soil percolation values are in the range 19.2-27.6 s/mm.

Due to the presence of the groundwater from 2.50m below existing ground levels and the proximity of the three proposed dwellinghouses it is recommended to provide secondary treatment prior to discharge.

A PSTP with a minimum 3,750-litre capacity is required for each 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 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 & Surface Water Disposal

The disposal of surface waters from the development needs to be assessed in terms of both the quantity and the quality of the discharge for Building Regulations and SEPA.

It is proposed to install surface water infiltration trenches for each dwellinghouse for disposal to the ground.

Using the SIA tool, the land use run-off quality has been determined, see following summary table: -

SIA Summary

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	None (not discharging to watercourse)	
Component 1		
Groundwater Protection Type	Infiltration Trench Additional Silt Traps for access road and parking areas for TSS - Minimum 300mm permeable gravel finish	
Pollution Mitigation Indices		
TSS	0.4	0.4
Metals	0.4	0.4
Hydrocarbons	0.4	0.4
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

The SIA assessment confirms that the installation of infiltration trenches provides sufficient mitigation for the surface water run-off from the roof areas and access roads and permeable driveways/parking areas for the proposed development prior to disposal to the ground.

The designed and installed infiltrations are considered to be suitable for all weather conditions and not detrimental to the water environment and private water supplies.

DRAINAGE RECOMMENDATIONS

Foul Water Discharge

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, V_p is between 15-120 s/mm in accordance with the regulations the minimum base area, A , is derived from $A = V_p \times PE \times 0.25$, or a minimum base area of $25m^2$, see the following table: -

Proposed Development	Population Equivalent, PE (as defined in BW COP:18.11/14)	Vp	Min. Base Area (m ²)
Plot 1	All 6 (each 4-bedroom)	24.4	37
Plot 2		19.2	29
Plot 3		27.6	42

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 and the potential population equivalent of the dwellinghouse.

SEPA

The final installed sewage treatment system and discharge will require to be registered with SEPA under CAR.

Surface Water Disposal

The sizes of the proposed surface water infiltration trench systems are based on the impermeable surface areas of the development i.e., the house roof, access road and driveways areas.

Using the soil infiltration rates the calculated optimum dimensions for the surface water infiltration trenches are shown on the following table: -

Stone-Filled Infiltration Trench

Impermeable Areas (m ²)	Length (m)	Width (m)	Storage depth (m)	Half Empty Time (hrs)
Plot 1 Roof Areas up to 200m ²	1.00	20.30	1.50	3.67
	2.00	10.50		6.48
	3.00	7.00		8.12
Plot 2 Roof Areas up to 200m ²	1.00	16.00	1.50	0.36
	2.00	10.00		0.64
	3.00	7.00		0.82
Plot 3 Roof Areas up to 200m ²	1.00	26.00	1.50	1.72
	2.00	14.00		3.12
	3.00	9.50		4.07
	4.00	7.20		4.59

These dimensions include for a 1 in 200-year storm event + 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 certificates all in Appendix A.

SYSTEM MAINTENANCE

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

It is recommended that the foundations should be taken down through the topsoil and rest on the gravels at a minimum depth of below 0.60m, allowing for frost cover, below existing ground levels.

A safe bearing capacity of 200kN/m² can be applied for foundation design.

Settlement

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

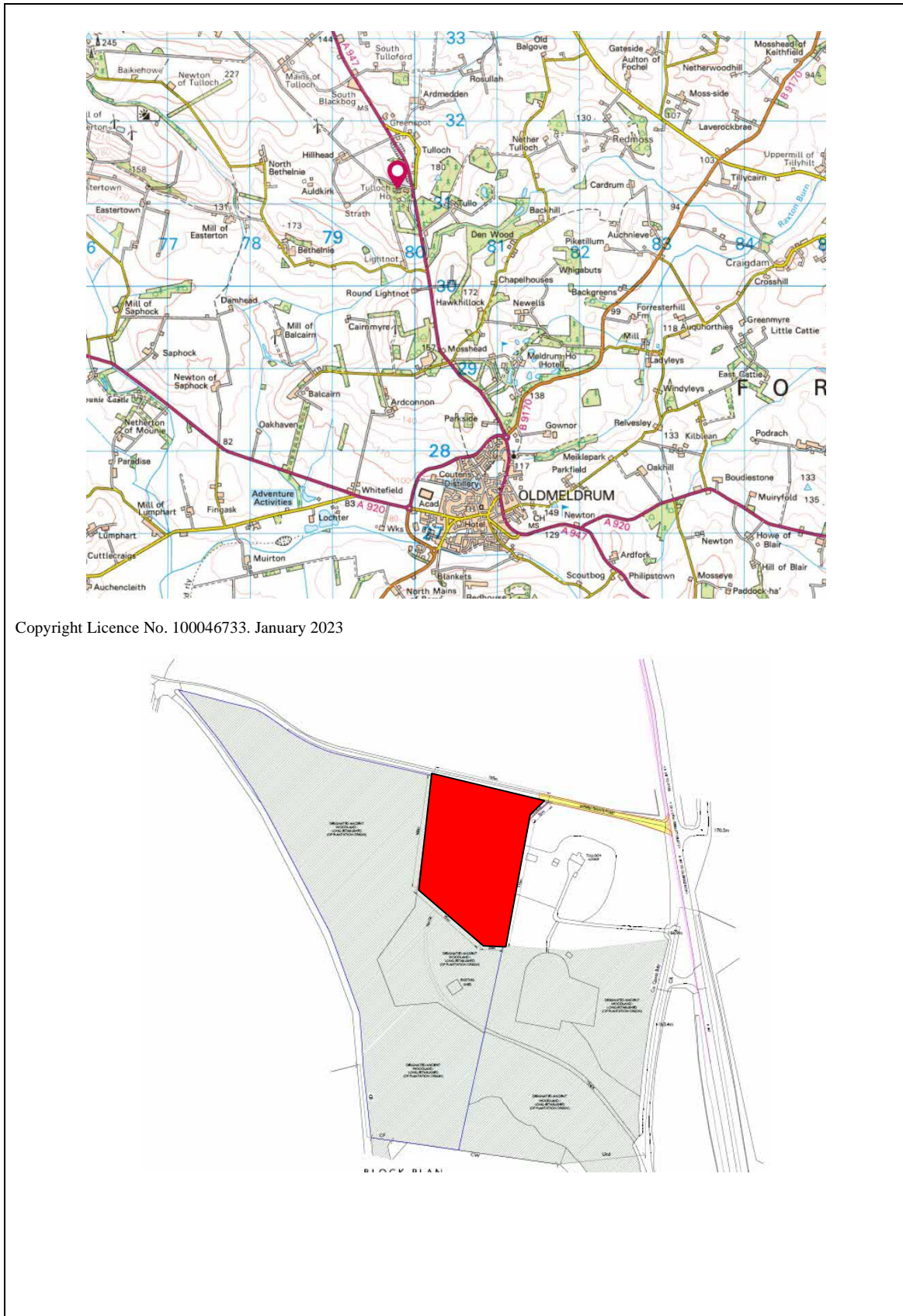
De-Watering

De-watering of excavations may be required during construction of Plot 1.

APPENDIX A

Site Plans	Fig. 1. General & Site Location Plans Fig. 2. Test Location Plan
Trial Pit Logs	TP 1-7
Drainage	Fig. 3. Proposed Drainage Layout Fig. 4. Indicative Foul Water Soakaway Construction
Certificate	Foul Water Discharges Surface Water Disposal


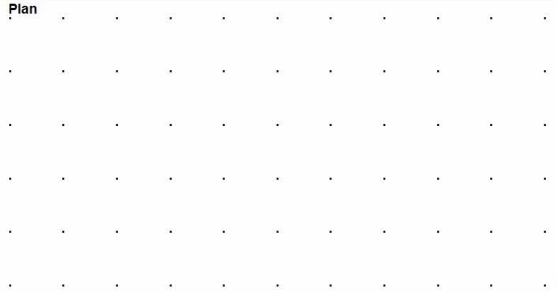
Fig. 1. GENERAL & SITE LOCATION PLANS



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Fig. 2. TEST LOCATION PLAN



Depth (m)		Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.60-1.05		SPT(C) N=0	/	Groundwater ingress at 1.00m		(1.00) 1.00	Very weak light orange brown well fractured highly weathered BEDROCK ...water ingress at 1.00 rising to 0.50m Complete at 1.00m		
Plan							Remarks		
							Scale (approx) 1:20 Logged By SAM Figure No. 3253/22.TP1		

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Excavation Method		Dimensions		Ground Level (mOD)		Client		Trial Pit Number	
Tracked excavator with 1.00m bucket		1.60 x 2.60				Mr D Bain		TP2	
		Location		Dates		Architect		Job Number	
				26/11/2022		Colin Thompson		3253/22	
								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=0	/			(1.00)	Very weak light orange brown well fractured highly weathered BEDROCK			
			Groundwater ingress at 1.00m		1.00	...water ingress at 1.00 rising to 0.60m			
						Complete at 1.00m			
Plan						Remarks			
. .									
						Scale (approx)		Logged By	
						1:20		SAM	
						Figure No.			
						3253/22.TP2			


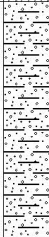
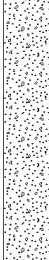
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Depth (m)		Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
1.00-1.05		SPT(C) N=13		2,2/2,3,4,4 Percolation Testing at 1.20m		(0.30) 0.30 (0.90) 1.20 (1.10) 2.30 (0.20) 2.50	TOPSOIL Firm brown, light brown and grey mottled very sandy very gravelly CLAY Medium dense dark grey brown very sandy GRAVELS (completely weathered rock) Weak brown well fractured highly weathered BEDROCK		
				Groundwater ingress at 2.50m			Complete at 2.50m		
Plan					Remarks				
. .									
			Scale (approx)		Logged By		Figure No.		
			1:20		SAM		3253/22.TP3		


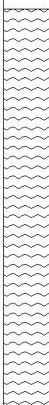
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Depth (m)		Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water		
1.00-1.05		SPT(C) N=18		2,3/3,4,5,6		(1.10)	TOPSOIL				
						1.10	Firm light brown and orange sandy gravelly CLAY				
						(0.50)					
						1.60	Medium dense orange slightly clayey SAND and GRAVEL (completely weathered rock)				
				Infiltration test zone 1.70-2.70m		(1.10)					
						2.70	Complete at 2.70m				
				Groundwater ingress at 2.70m							
Plan						Remarks					
.											
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						Scale (approx)		Logged By		Figure No.	
						1:20		SAM		3253/22.TP4	


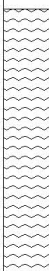
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Depth (m)		Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.60-1.05		SPT(C) N=12		2,2/2,2,4,4 Percolation testing at 1.00m Groundwater ingress at 2.50m		(0.60) 0.60 (0.90) 1.50 (1.00) 2.50	TOPSOIL Firm light brown and orange sandy gravelly CLAY Medium dense orange slightly clayey SAND and GRAVEL (completely weathered rock)	  	
<p>Plan</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>							<p>Remarks</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>		
							Scale (approx)	Logged By	Figure No.
							1:20	SAM	3253/22.TP5

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			S.A. MCGREGOR			Site Tulloch House, Oldmeldrum		Trial Pit Number TP6	
Excavation Method Tracked excavator with 1.00m bucket		Dimensions 1.50 x 2.50		Ground Level (mOD)		Client Mr D Bain		Job Number 3253/22	
		Location		Dates 26/11/2022		Architect Colin Thompson		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=0	/	Infiltration test zone 1.00-1.50m No groundwater ingress		(1.50) 1.50	Very weak light orange brown well fractured highly weathered BEDROCK Complete at 1.50m			
Plan						Remarks			
. .									
						Scale (approx) 1:20	Logged By SAM	Figure No. 3253/22.TP6	

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		S.A. MCGREGOR		Site Tulloch House, Oldmeldrum		Trial Pit Number TP7			
Excavation Method Tracked excavator with 1.00m bucket		Dimensions 1.60 x 2.60		Ground Level (mOD)		Client Mr D Bain			
		Location		Dates 26/11/2022		Architect Colin Thompson			
						Job Number 3253/22			
						Sheet 1/1			
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.50-1.05	SPT(C) N=0	/	Groundwater ingress at 1.00m		(1.00) 1.00	Very weak light orange brown well fractured highly weathered BEDROCK ...water ingress at 1.00 rising to 0.80m Complete at 1.00m			
Plan				Remarks					
. .				. .					
				Scale (approx) 1:20		Logged By SAM		Figure No. 3253/22.TP7	

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Fig. 3. PROPOSED DRAINAGE LAYOUT

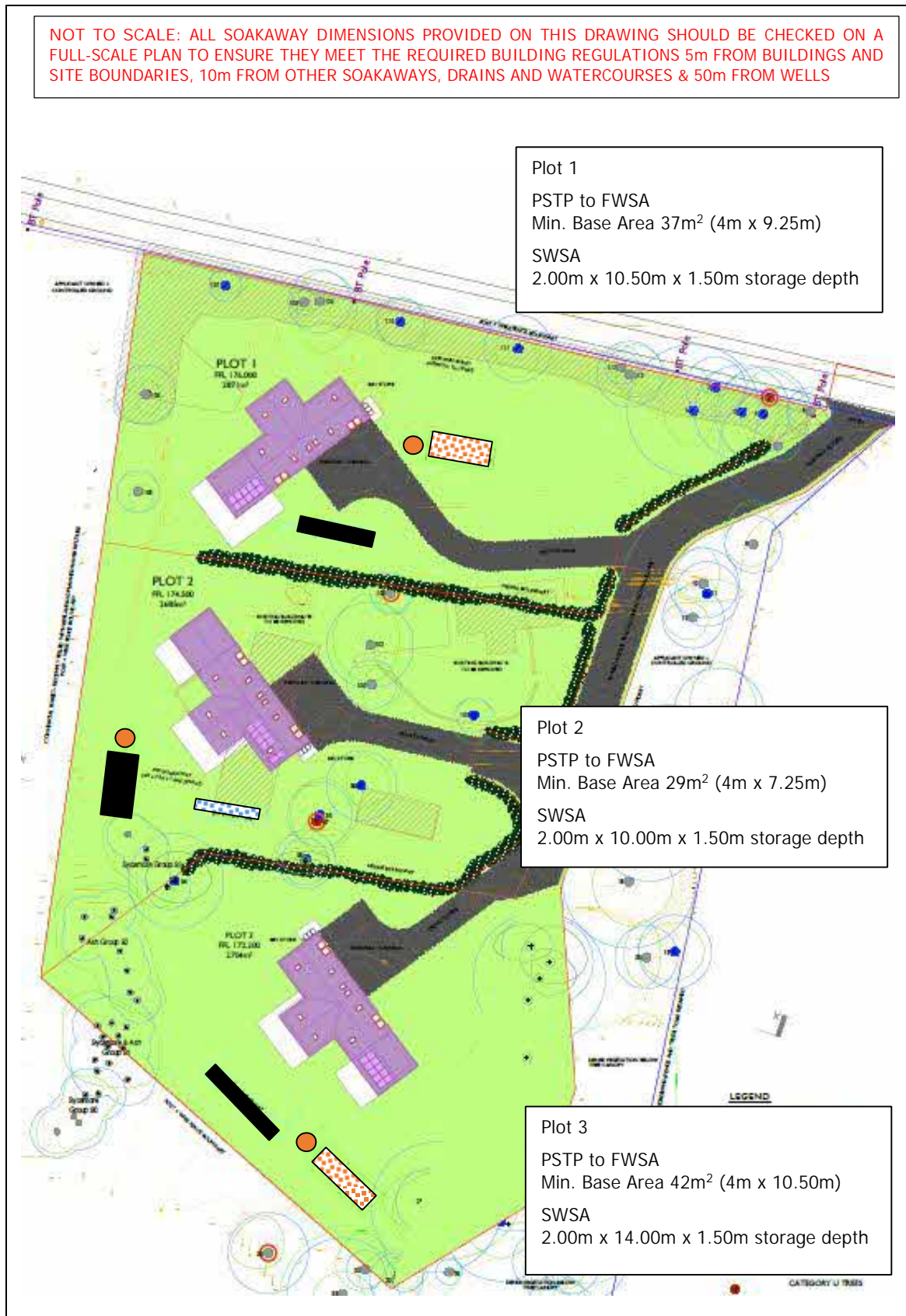
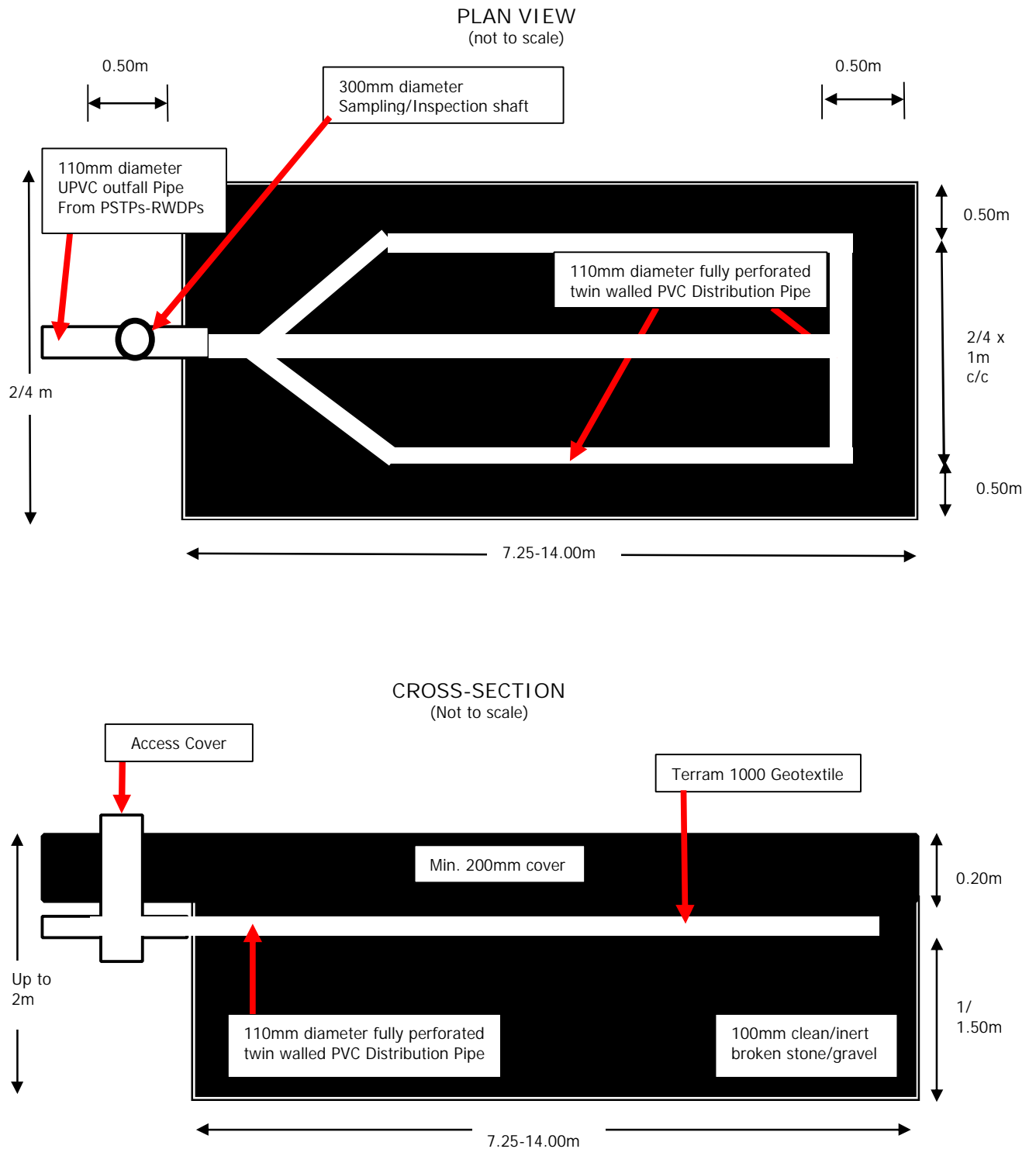


Fig. 4. INDICATIVE CONSTRUCTION (sketch only, not to scale)



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.

Applicants: Mr D Bain
Address: c/o CTA (Scotland) Ltd., Architects
Site Address: Tulloch House, by Oldmeldrum, Aberdeenshire, AB51 0AY

Date of Test: 26th November 2022 **Time:** from 10am **Weather:** Dry and sunny

Encountered Ground Conditions

Topsoil: The some of the site is overlain by topsoil 300-1100mm in thickness of topsoil. The topsoil was encountered in TP3 - TP5. **Natural Sub-Soils:** The natural underlying sub-soils in TP3 – TP5 have an upper mantle of firm light brown and grey mottled very sandy very gravelly clay becoming medium dense orange slightly clayey sand and gravel (completely weathered rock) below approximately 1.20m and proved to the maximum investigated depth of 2.70m. **Bedrock:** Bedrock was encountered during this investigation in TP1, TP2, TP3, TP6 and TP7, consisting of very weak light orange brown well fractured highly weathered bedrock.

Groundwater Observations

Groundwater ingress was encountered during the investigation in every trial pit apart from TP6.

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

Percolation Tests

Development	TP1A (Plot 1)	TP3 (Plot 2)	TP5 (Plot 3)
Average time taken, seconds	3660	2880	4140
Soil Percolation Values, Vp, s/mm	24.4	19.2	27.6
Population Equivalent, PE	6 (All 4-bedroom)		
Minimum Soakaway Base Area	37	29	42

*** secondary treatment (PSTP) recommended**

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  Date...27 October 2023
Name / Company 
Address Serenje, Kingsford Steadings, Alford, Aberdeenshire, AB33 8HN
Qualification B.Eng (Civil Engineering).

CERTIFICATE FOR PROPOSED SURFACE WATER DISPOSAL

Applicants: Mr D Bain
Address: c/o CTA (Scotland) Ltd., Architects
Site Address: Tulloch House, by Oldmeldrum, Aberdeenshire, AB51 0AY

Date of Test: 26th November 2022 **Time:** from 10am **Weather:** Dry and sunny

Encountered Ground Conditions

Topsoil: The some of the site is overlain by topsoil 300-1100mm in thickness of topsoil. The topsoil was encountered in TP3 - TP5. **Natural Sub-Soils:** The natural underlying sub-soils in TP3 – TP5 have an upper mantle of firm light brown and grey mottled very sandy very gravelly clay becoming medium dense orange slightly clayey sand and gravel (completely weathered rock) below approximately 1.20m and proved to the maximum investigated depth of 2.70m. **Bedrock:** Bedrock was encountered during this investigation in TP1, TP2, TP3, TP6 and TP7, consisting of very weak light orange brown well fractured highly weathered bedrock.

Groundwater Observations

Groundwater ingress was encountered during the investigation in every trial pit apart from TP6.

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

Infiltration Testing

Development	TP2A	TP4	TP6
Infiltration Test Zone (m)	1.50-2.50	1.70-2.60	0.50-1.50
Soil Infiltration Rate, <i>f</i> (m/s)	1.08 x 10 ⁻⁵	2.33 x 10 ⁻⁵	1.07 x 10 ⁻⁵
Surface Area of Development	All up to 200m²		

Recommendation: -

Development	Plot 1	Plot 2	Plot 3
W x L (m) All with 1.50m depth storage	2.00 x 10.50	2.00 x 10.00	2.00 x 14.00

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 

Date...27 October 2023

Name / Company S. A. McGregor
 Address Serenje, Kingsford Steadings, Alford, Aberdeenshire, AB33 8HN
 Qualification B.Eng (Civil Engineering).