

S.A. MCGREGOR



**GROUND ASSESSMENT
&
DRAINAGE RECOMMENDATION REPORT**

**PROPOSED 3 NEW DWELLINGHOUSES
MEIKLE WARTLE
INVERURIE
ABERDEENSHIRE**

Clients:

Burnside Developments Ltd.

Agents:

Ken Mathieson Architectural Design
Aberdeen

Report Issued:

02 November 2017

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INTRODUCTION

At the request of Ken Mathieson, Architectural Design, on behalf of Burnside Developments Ltd visits were made to the proposed development site on land to the South East of The Glen in the village of Meikle Wartle, Inverurie.

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 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 the septic tank to the ground via a designed sub-surface soakaway system
- to carry out Infiltration Testing for the design of surface water disposal system
- to assess ground bearing capacity for foundation design

SITE LOCATION & BRIEF DESCRIPTION

The proposed development site is on land to the south east of The Glen in the village of Meikle Wartle, with access off the A920, and local roads, OS NGR NJ 72597 30689 (approx. centre of site), see Fig. 1. General & Site Location Plans in Appendix A.

The site is unoccupied and overlain by grass and currently used for grazing.

The site is un-serviced however electricity, water supply and telephone are nearby.

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

SITE WORK

Trial Pits

On the 6th October 2017, a back-actor excavator with a 0.60m bucket excavated trial pits to order to assess the underlying ground conditions and to carry out percolation and infiltration testing in the areas of the potential foul and surface water sub-surface soakaways.

The locations of the proposed soakaways were shown on the proposed development layout drawings provided by the agent and are indicated on Fig. 2. Proposed Site Layout & Test Location Plan in Appendix A. The trial pits were excavated to a maximum investigated depth of 2.00m.

Percolation Testing

Percolation testing was carried out in adjacent to observation trial pits TP1-3 in accordance with BS6297: 2007+A1:2008 and as described in Section 3.9 of the Scottish Building Standards Technical Handbook (Domestic); the test results are shown below: -

Date of Testing 6 th October 2017	Site 1	Site 2	Site 3
Average time taken for water to drain 3 times in each sump hole (middle 150mm)	8280	6440	5850
Depth of Water Table below Ground Level (m)	>2.00		
Average Soil Percolation Values, Vp, s/mm	55.2	42.9	39.0

Infiltration Testing

Infiltration testing was only carried out adjacent to trial pits TP1-3 in full accordance with BRE Digest 365; the test results are shown below: -

Trial Pit No.	Pit Dimensions (W x L)m	Test Zone (mbeql)	In-Fill	Soil Infiltration Rate, f(m/s)
Site 1	0.60 x 1.00	1-2.00	Open	8.67 x 10⁻⁶
Site 2	0.65 x 1.10	1-2.00		6.65 x 10⁻⁶
Site 3	0.60 x 1.00	1-2.00		6.13 x 10⁻⁶

GROUND ASSESSMENT

Published Geology

The British Geological Survey 1:50,000 Superficial and Solid maps indicate that the site is overlain by Till, Devensian – Diamicton. Superficial deposits formed up to 2 million years ago during the Quaternary Period. The site is underlain by the Inch Pluton (Middlezone – Norite and Gabbronorite) igneous bedrock formed approximately 444 to 485 million years ago during the Ordovician Period.

Encountered Ground Conditions

Topsoil: The site is overlain by grass onto topsoil 200-300mm in thickness.

Natural Sub-Soils: The underlying natural sub-soils are generally medium dense orange brown clayey silty sands and gravels becoming less weathered with increased depth becoming sandy angular gravels and proved to the investigated depth of 2.00m.

Bedrock: In-tact bedrock was not encountered during the investigation.

Ground Water Observations

Ground water was not encountered during the investigation or observed during the monitoring period. No visual indication of the seasonally high or fluctuating ground water table was seen in the strata above the encountered depths of 2.00m.

DISCUSSION

Sub-Soils

The sandy gravelly nature of the underlying soils and the test results confirmed the moderate draining properties of the sub-soils.

Sewage Treatment

Connection to the mains sewer is not available for this development, therefore it is proposed to install individual private sewage treatment systems to serve the proposed dwellinghouses.

In accordance with WAT-RM-04 secondary treatment is not required where the soil percolation value, Vp 15-100secs/mm, however due to the type of development with nearby properties and to further protect the environment it is recommended to install package sewerage treatment plants.

Foul Water Discharge

A standard sub-surface stone-filled soakaway (infiltration system) is calculated with a base area, $A = Vp \times PE \times 0.2$ or a minimum base area of 25m².

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 as 'Very Low', see summary below: -

Land Use Type	Residential Roofing (& permeable gravel hardstanding)
Pollution Hazard Level	Very Low
Pollution Hazard Indices	TSS 0.2 Metals 0.2 Hydrocarbons 0.05
Surface Water Protection (SuDS)	None (no discharge to waterbody)
SuDS Pollution Mitigation Indices	TSS 0.4 Metals 0.4 Hydrocarbons 0.4
Groundwater Protection Type	Infiltration Trench Min. 300mm depth
Combined Pollution Mitigation Indices	TSS 0.4 Metals 0.4 Hydrocarbons 0.4
Acceptability of Pollution Mitigation	TSS Sufficient Metals Sufficient Hydrocarbons Sufficient

Surface Water Disposal

The investigation carried out concludes that the underlying strata are suitable for discharge to the ground via an infiltration trench.

DRAINAGE RECOMMENDATIONS

Sewage Treatment & 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, a discharge system must be designed and constructed in accordance with the requirements of SEPA and WAT-RM-04, Indirect Sewage Discharges to Groundwater.

It is recommended to install package sewage treatment plants (PSTPs) tested and certified to EN12566 Part 3.

The proposed development comprises a 4-bedroom dwellinghouses. Therefore, the PSTPs should have the capacity to serve a population of 6PE per dwellinghouse, see table below: -

Proposed Development	Population Equivalent, PE (as defined in BW COP:18.11/13)	Min. Base Area With Secondary Treatment, PSTP (m ²)
Site 1	6 (up to 4-bedroom)	67
Site 2		52
Site 3		47

Full details of the proposed sewage treatment systems will be made available to the Building Standards Officer once it has been determined after consultation with suppliers which model is the most suitable for the proposed developments and the potential population equivalent of each dwellinghouse.

SEPA

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

Surface Water Disposal

The infiltration trench design is based on the roof areas of the proposed dwellinghouses. Using the lower soil infiltration rate, $f = 6.13 \times 10^{-6} \text{m/s}$ the following optimum dimensions are shown on the table below: -

Impermeable Areas (m ²)	Width (m)	Length (m)	Filter Stone Depth (m)	Half Empty Time (hours)
Each Dwellinghouse Roof Areas up to 200m ²	1.00	21.20	1.50	6.49
	2.00	10.80		11.46
	3.00	7.20		14.40
	4.00	5.40		15.64

All the above dimensions are based on a 30-year return period of storm duration of 60 minutes. Calculations have been carried out in accordance with BRE Digest 365

Indicative Drainage Layout

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

SYSTEM MAINTENANCE

Sewage Treatment System

The sewerage treatment system should be fully maintained in accordance with the manufacturer's literature, should be regularly inspected by the house owner and 'desludged' (emptied) when appropriate to ensure solids and silts do not 'clog' the soakaway.

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.

Silt traps should be installed before surface waters enter the soakaway where there are large paved/tarmac covered impermeable areas. The silt taps should be regularly inspected and emptied.

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 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 a building
- 5m from a boundary (*unless the adjacent land owner under certain circumstances may legally agree to the soakaway being within 5m if it is not detrimental to the neighbouring property*)

FOUNDATION RECOMMENDATIONS

Safe Bearing Capacity

All foundation footings must be taken through the topsoil layer and rest on the medium dense clayey sands and gravel which have a safe bearing capacity of 200kN/m² for 600mm wide strip footings.

APPENDIX A

Site Plans	Fig. 1. General & Site Location Plans Fig. 2. Trial Pit & Test Location Plan
Trial Pit Logs	TP 1- 3
Drainage	Fig. 3. Indicative Soakaway Locations Fig. 4. Indicative Soakaway Construction Sketch
Certificates	Foul Water Soakaway Discharge Surface Water Soakaway Disposal

Fig. 1. GENERAL & SITE LOCATION PLANS

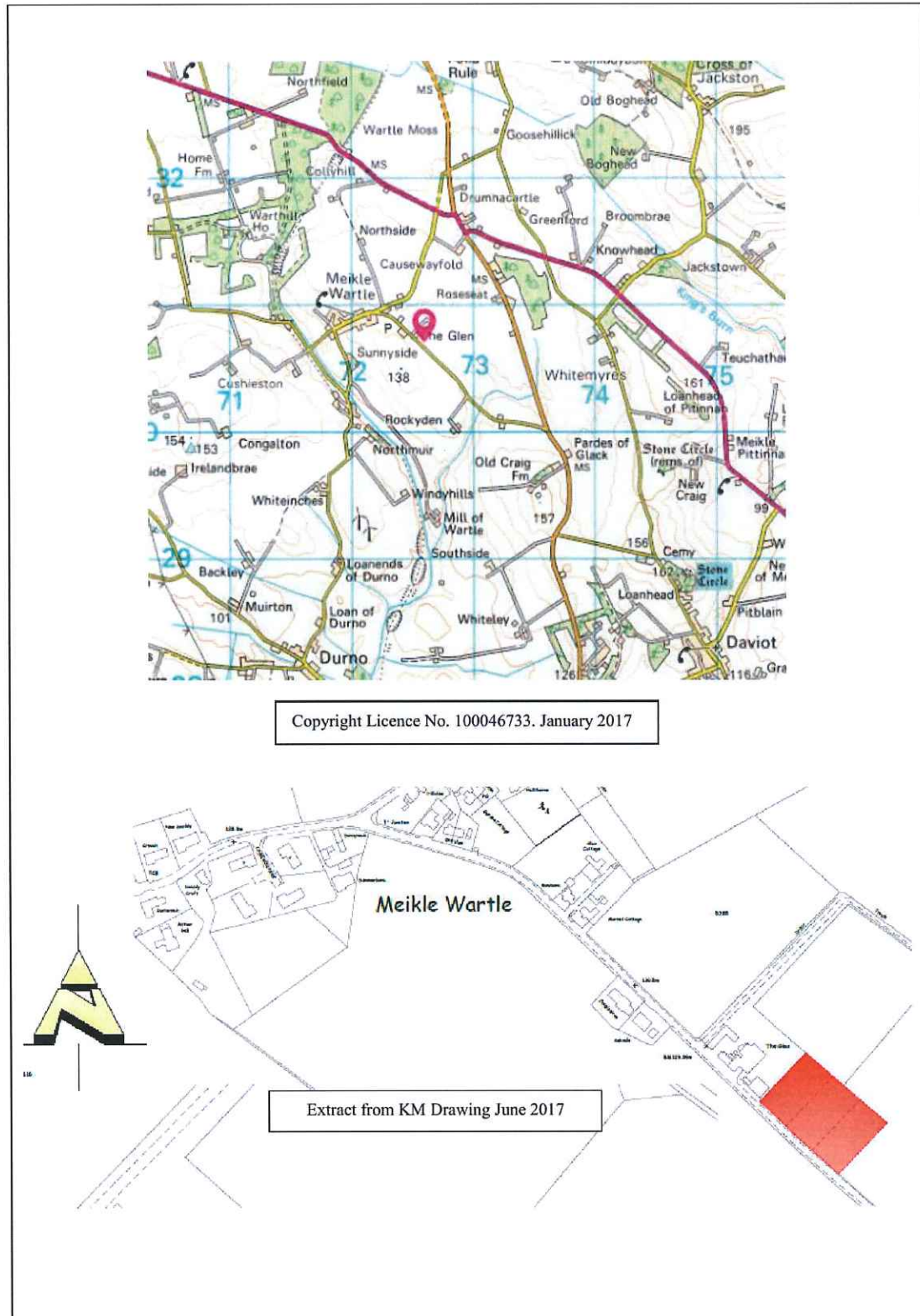



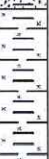



Fig. 2. TRIAL PIT & TEST LOCATION PLAN



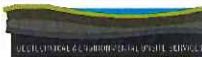




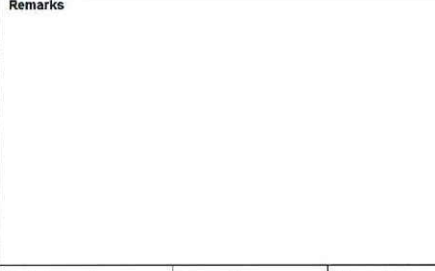
Extract from Ken Mathieson Drawing June 2017

 S.A. MCGREGOR				Site Meikle Wartle, Inverurie		Trial Pit Number TP1		
Excavation Method Back Actor Digger with 0.60m bucket		Dimensions 0.50 x 0.85m		Ground Level (mOD)		Client Burnside Developments		
Location see site plan		Dates 08/10/2017		Engineer Ken Mathieson		Job Number 1964/17		
Sheet 1/1								
Depth (rh)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (rh) (Thickness)	Description	Legend	Water
					(0.20)	Grass onto TOPSOIL		
					0.20	Fine orange brown sandy, slightly gravelly CLAY		
					(0.30)			
					0.50	Red orange brown light grey very silty CLAY		
					(0.60)			
					1.10	Medium dense orange brown slightly clayey, sandy GRAVEL (completely weathered rock)		
					(0.90)			
			No Groundwater Ingress		2.00	Complete at 2.00m		
Plan						Remarks		
. .						. .		
				Scale (approx) 1:20	Logged By SAM	Figure No. 1964/17.TP1		





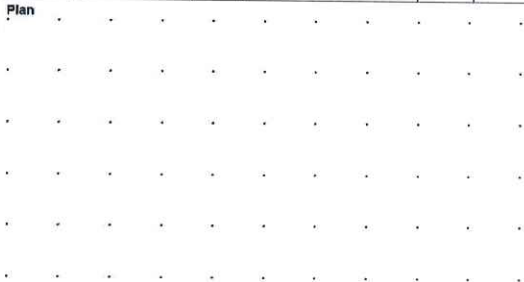
Produced by the GEOtechnical DATabase SYstem (GEODASY) (C) all rights reserved

Excavation Method		Dimensions		Ground Level (mOD)		Client		Trial Pit Number	
Back Actor Digger with 0.60m bucket		0.50 x 0.90m				Burnside Developments		TP2	
		Location		Dates		Engineer		Job Number	
		see site plan		06/10/2017		Ken Mathieson		1964/17	
								Sheet	
								1/1	
Depth (rh)	Sample / Tests	Water Depth (rh)	Field Records	Level (mOD)	Depth (rh) (Thickness)	Description	Legend	Water	
					(0.24)	Grass onto TOPSOIL			
					0.24	Orange brown very clayey SAND with some gravel			
					(1.36)				
					1.60	Very gravally (completely weathered rock)			
					(0.40)				
			No Groundwater Ingress		2.00	Complete at 2.00m			
Plan						Remarks			
Scale (approx)		Logged By		Figure No.					
1:20		SAM		1964/17.TP2					

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 S.A. MCGREGOR				Site		Trial Pit Number			
Excavation Method		Dimensions		Ground Level (mOD)		Client			
Back Actor Digger with 0.60m bucket		0.50 x 0.80m				Burnside Developments			
		Location		Dates		Engineer			
		see site plan		06/10/2017		Ken Mathieson			
						Job Number			
						1964/17			
						Sheet			
						1/1			
Depth (rh)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (rh) (Thickness)	Description	Legend	Water	
			No water ingress		(0.30)	Grass onto TOPSOIL			
					0.30 (0.20)	Mottled brown grey orange silty, clayey SAND			
					0.50	Completely weathered rock as angular GRAVELS			
					(1.50)				
					2.00	Complete at 2.00m			
Plan				Remarks					
									
				Scale (approx)		Logged By		Figure No.	
				1:20		SAM		1964/17.TP3	

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 S.A. MCGREGOR				Site Meikle Wartle, Inverurie		Trial Pit Number TP3		
Excavation Method Back Actor Digger with 0.60m bucket		Dimensions 0.50 x 0.80m		Ground Level (mOD)		Client Burnside Developments		
Location see site plan		Dates 06/10/2017		Engineer Ken Mathieson		Job Number 1964/17		
Sheet 1/1								
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Grass onto TOPSOIL		
					0.30 (0.20)	Mottled brown grey orange silty, clayey SAND		
			No water ingress		0.50	Completely weathered rock as angular GRAVELS		
					(1.50)			
					2.00	Complete at 2.00m		
Plan				Remarks				
				Scale (approx) 1:20				
				Logged By SAM		Figure No. 1964/17.TP3		

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Fig. 3. INDICATIVE SOAKAWAY LOCATIONS

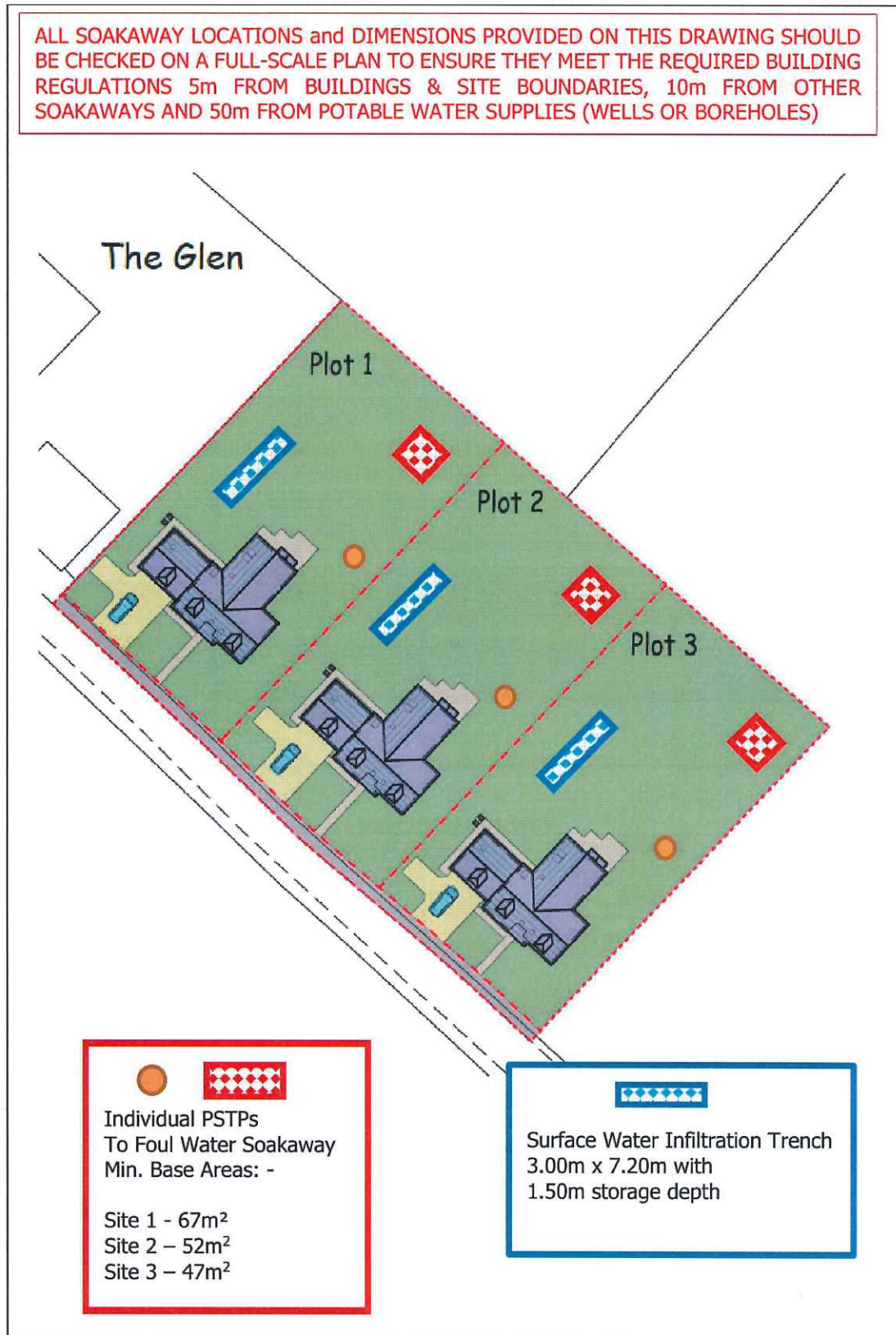
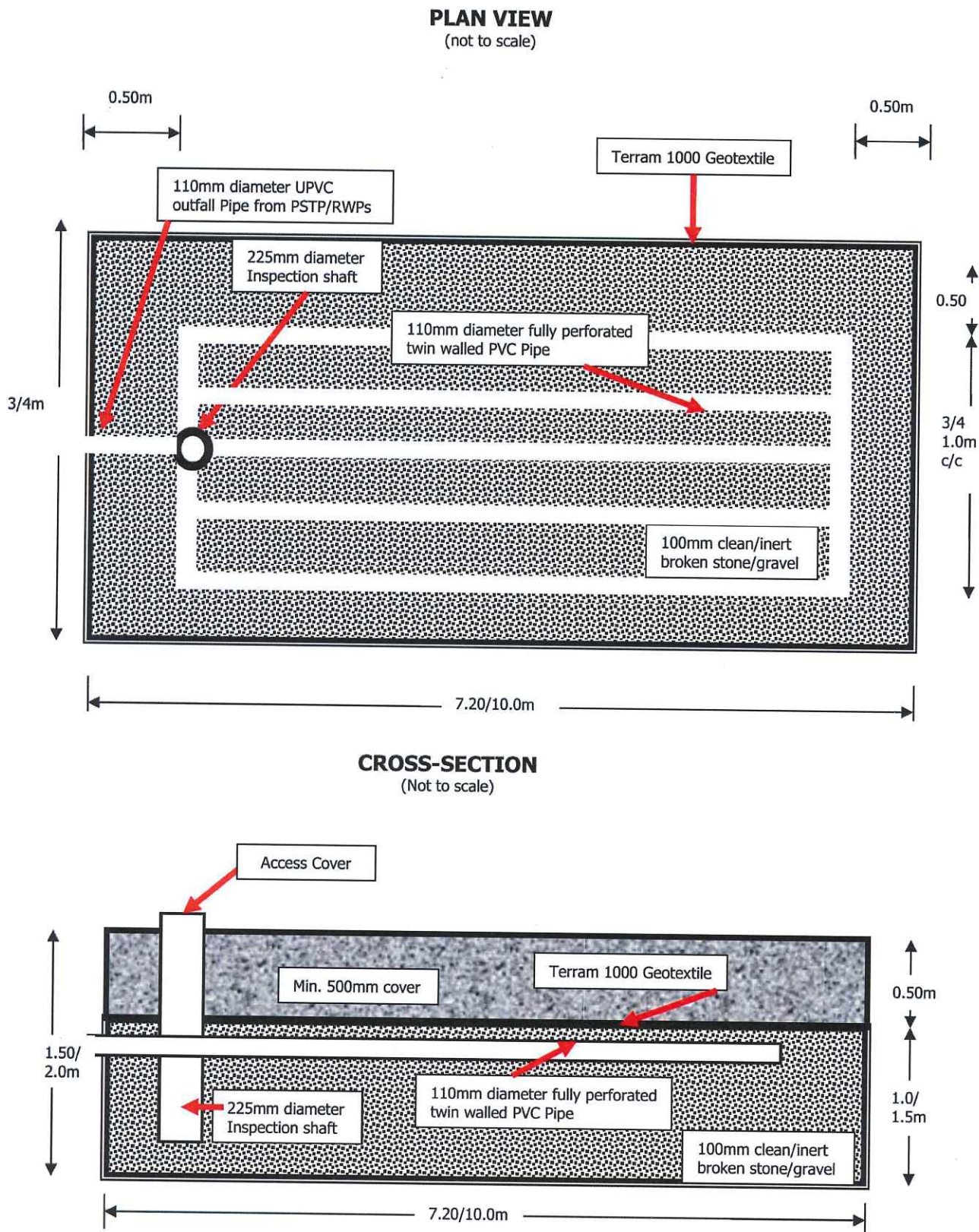


Fig. 4. INDICATIVE SOAKAWAY CONSTRUCTION



CERTIFICATE FOR PROPOSED FOUL WATER SUB-SURFACE SOAKAWAY

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 or not 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

Applicant's Name Burnside Developments Ltd.....
 (name of person applying for planning permission)

Address c/o Ken Mathieson Architectural Design.

Site Address 3 House Sites, Meikle Wartle, Inverurie

Date of Test.....6th October 2017 Time.....from 09:260am Weather ...Dry & sunny....

Encountered Ground Conditions

Topsoil: The site is overlain by grass onto topsoil 200-300mm in thickness.

Natural Sub-Soils: The underlying natural sub-soils are generally medium dense orange brown clayey silty sands and gravels becoming less weathered with increased depth becoming sandy angular gravels and proved to the investigated depth of 2.00m.

Bedrock: In-tact bedrock was not encountered during the investigation.

Ground Water Observations

Ground water was not encountered during the investigation or observed during the monitoring period. No visual 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 within 50m

Depth of Drain ...1.00m..... Depth of Excavations ...up to 2.00m.....

Percolation Test

	Site 1	Site 2	Site 3
Time Taken (mean of three times), s	8280	6440	5850
Soil Percolation Value, Vp, s/mm	55.2	42.9	39.0
Population Equivalentup to 6 (4-bedroom).....		

Minimum Floor Area of Soakaway

67m² 52m² 47m²
Each with PSTP only

I hereby certify that I have carried out the above tests in accordance with procedures specified in British Standard BS6297:2007+ A1 2008, and in conjunction with the full requirements set out within the Domestic Scottish Building Standards Technical Handbook (Environmental Standard 3.9 Infiltration Systems), the results of which are tabulated above, and that the proposed drainage scheme detailed on the attached plans and report has been designed taking into account the recommendations in the aforementioned standards.

Signed ..  ..
 Name / Company
 Address
 Qualification

S. A. McGregor
 Fairmead, Tough Alford, Aberdeenshire, AB33 8EQ
 B.Eng (Civil Engineering).

Date...02 November 2017

CERTIFICATE FOR PROPOSED SURFACE WATER SOAKAWAY

Applicant's Name Burnside Developments Ltd.....
(name of person applying for planning permission)

Address c/o Ken Mathieson Architectural Design.

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Wells: No known wells within 50m

Depth of Drain ...1.00m..... Depth of Excavations ...up to 2.00m.....

Infiltration Test

	Site 1	Site 2	Site 3
Infiltration Test Zones1.00-2.00m.....		
Average Soil Infiltration Rate, f m/s	8.67×10^{-6}	6.65×10^{-6}	6.13×10^{-6}
Surface Areas of Development	up to 200m ² each		

Recommendation: -

Infiltration Trench

3.00m x 7.20m with 1.50m 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 ... 

Date...02 November 2017

Name / Company

S. A. McGregor

Address

Fairmead, Tough, Alford, Aberdeenshire, AB33 8EQ

Qualification

B.Eng (Civil Engineering).