TEICNIUIL-PRIORY CONSULTING ENGINEERS Ltd

On-Site Soil Infiltration Testing Report

Project: Proposed 124No housing Units at Ardshanvooley, Park Rd, Killarney

Client: Wrightwood Development Ltd

ENGINEER: Matt Clarke Bsc(hons) MSc C. Build E FCABE MIEI
Chartered Building Engineer
Teicniuil-Priory Consulting Engineers Ltd

Date	Revision	Issued For	Prepared By	Checked By
		Information	MC	MC / JON

Contents

Appendices

1.0 Scope

Teicniuil-Priory Consulting Engineers Ltd have been commissioned to carry out site investigations as part of the overall Engineering Assessment Report, on behalf of Wrightwood Development Ltd.

This is a 'greenfield' site, and measures c.2.32Ha (c. 5.73 Acres), for a proposed housing development. (see fig 1, below)

This scope of this report is to determine and assess the soil characteristics for the purposes of infiltration drainage design required for Sustainable Urban Drainage System (SUDS) design.

Soil infiltration tests , will be carried out in accordance with BRE Digest 365 – Soakaway Design. (revised 2016). These calculated soil infiltration values will form the basis of design, specification, and sizing for proposed SUDs, via infiltration methods.

Infiltration test holes will be excavated at proposed locations of soakaways, as shown on the map in appendix A.

Fig 1 – Aerial Photograph – Proposed Development Site Outlined in Red – site area c.2.32Ha.

2.0 Description of the site

The land presents as a grazing farmland. (habitat: GS2 – 'dry meadows and grassy verges' – 'Guide to *Habitats in Ireland – The heritage council)*. Multiple 'site walkovers' (c. 10No) between October 2024 and April 2025, confirms that the ground is firm underfoot, and there is no evidence of water ponding, or poor drainage. The total absence of any vegetation indictors, common to poorly drained sites, (ie reeds, sedges, etc), indicates a soil with good drainage and infiltration characteristics.
(see figs 2 and 3 below).

Fig 2 – Site overview - Observer at Southeast corner of site.

Fig 3 – Site overview - Observer at Southwest corner of site

3.0 Desk Study

The writer is very familiar with this area, and from local knowledge, the soil is known to consist of a 'sandy' gravel type with good infiltration characteristics. See typical and expected infiltration coefficients in fig 4, below;

TABLE 25.1 Typical infiltration coefficients based on soil texture (after Bettess, 1996)

Soil type/texture	ISO 14688-1 description (after Blake, 2010)	Typical infiltration coefficients (m/s)
Good infiltration media		
• gravel	Sandy GRAVEL	$3 \times 10^{-4} - 3 \times 10^{-2}$
• sand	Slightly silty slightly clayey SAND	$1 \times 10^{-5} - 5 \times 10^{-5}$
• loamy sand	Silty slightly clayey SAND	$1 \times 10^{-4} - 3 \times 10^{-5}$
• sandy loam	Silty clayey SAND	$1 \times 10^{-7} - 1 \times 10^{-5}$
Poor infiltration media		
• loam	Very silty clayey SAND	$1 \times 10^{-7} - 5 \times 10^{-6}$
• silt loam	Very sandy clayey SILT	$1 \times 10^{-7} - 1 \times 10^{-5}$
• chalk (structureless)	N/A	$3 \times 10^{-6} - 3 \times 10^{-6}$
• sandy clay loam	Very clayey silty SAND	$3 \times 10^{-10} - 3 \times 10^{-7}$
Very poor infiltration media	–	
• silty clay loam	–	$1 \times 10^{-6} - 1 \times 10^{-6}$
• clay	Can be any texture of soil	$< 3 \times 10^{-6}$
• till	described above	$3 \times 10^{-9} - 3 \times 10^{-6}$
Other		
• rock* (note mass infiltration capacity will depend on the type of rock and the extent and nature of discontinuities and any infill)	N/A	$3 \times 10^{-9} - 3 \times 10^{-5}$

Fig 4 – Typical soil Infiltration coefficients - Extract from CIRIA C753 – 'The SUDs Manual'

Groundwater is considered to lie > 5.0m below the existing ground levels, from known previous adjacent boreholes.

3.1 GSI mapping

A desk study was undertaken, with reference to the data and maps published by *Geological Survey Ireland (GSI*). These maps are shown in Appendix B.

In summary, the geology and hydrology of site is summarized as follows;

Ground water aquifer: Regionally Important Gravel Aquifer

Ground water Vulnerability: High

Subsoil Permeability: High

Teasgasc EPA Soil: Shallow well Drained (A_{minsw}), Parent material: Glaciofluvial sands and gravels (GDSs)

Subsoil: Gravel derived from Devonian Sandstones (GDSs)

Bedrock: Dirtoge Limestone Formation (CDDRTG) – Bioclastic herty grey limestone

Surface Water Features: None within 250m from site perimeter

Wells and Springs: No wells or springs within 250m from site perimeter.

Groundwater Protection Scheme IE_GSI_GWPS_Rep_11

Karst Features: no karst features within 250m of site perimeter

This desk study shows that the subsoil Permeability (high) would provide good soil infiltration characteristics, as evidenced by vegetation type.

Soil and subsoil composition is as expected from local knowledge.

No water surface features are present nor karst features within the area.

The ground water aquifer a 'Regionally Important Gravel Aquifer', and cognizance of this is be to noted within the design of any infiltration drainage methods.

3.2 Flood Risk

Review of the CFRAM maps shows that there is no fluvial flooding risk within this site. No surface water features exist within 250mm of this proposed development site.

A Site Specific Flood Risk Assessment (SSFRA) has been carried out by others. There is no identified historic or predicted fluvial, coastal or groundwater flooding within the site. The reader is referred to the SSFRA report.

4.0 On-site Soil Investigation and Infiltration Testing

On-site tests were carried out on 25th March 2025.

Weather Condition: Dry, Cloud cover: 6 Oktas, temperature: 12 degrees Celsius, ground: dry

Surface soil conditions: grass vegetation, soil: firm underfoot.

Codes of practice

BRE 365 – Soakaway Design

BS 5930(1999) – Code of Practice for Site Investigation

4.1 Method of testing

Testing was carried out to *BRE 365 – Soakaway Design.*

5No trial holes were excavated, using a 'Hyundai HX 140Lc' 14tonne Excavator. The depth of these test holes ranged from 1.9m BGL to 2.65m BGL and where located in proposed 'green' areas as shown on the site map in Appendix A, and as per the coordinates given in the following table.

The soil horizons in each test hole were noted and recorded.

Trial Hole Data	**ITM Coordinates**	**Hole Dimensions**	**Fill level (at proposed invert)**
T1 Depth = 2.65m BGL	497034, 591282	1.0m x 2.0m	1.2m
T2 Depth = 2.4m BGL	497045, 591304	1.2m x 1.6m	1.1m
T3 Depth = 2.65m BGL	497088,591358	1.0m x 2.0m	1.4m
T4 Depth = 1.9m BGL	497072, 591378	1.0m x 2.0m	0.9m
T5 Depth = 2.0m BGL	4970229, 591417	1.5m x 1.8m	1.1m

Trial holes were positioned around proposed soakaway areas, using a '*Geomax Zenith 60GNSS'* (Global Navigation Satellite System) receiver, at the above coordinates.

These test holes were then filled with water; A 10,000L (10 m3) water bowser was used to fill each hole. 3No tests were carried out per trial hole. In total, 50,000L of water was used in the testing, which also allowed for pre-soaking each trial hole, prior to testing.

The time taken to drop at intervals of 100% fill level, to 75%, 50% , 25% and to 0% (ie empty) of the original fill level, was noted, as outlined in BRE365 - soakaway Design.

(see trial hole log data sheets – Appendix C, and soakaway testing data are shown in Appendix D)

The time taken for the water to drop, from interval 75% of fill to 25% of fill, were those values used in the calculations in determining the soil infiltration rate, per test hole, as follows;

Test Hole	**Soil Infiltration Rates**
Trial hole T1	71.2 x 10^{-6} m/s
Trial hole T2	81.9 x 10^{-6} m/s
Trial hole T3	58.8 x 10^{-6} m/s
Trial hole T4	103.0 x 10^{-6} m/s
Trial hole T5	122.0 x 10^{-6} m/s

Trial hole T3 is noted to have the slowest soil infiltration rate. However, this value presents good infiltration characteristics.

(see Calculations in Appendix E)

5.0 Conclusion

Generally, a very similar soil composition was observed over all 5No trial holes, as follows;

Horizon A: c. 250mm depth of organic black topsoil
Horizon B: heterogeneous sand gavel with some minor silt content, with sporadically dispersed cobbles (<200mm dia), and of strength / compactness 'medium'
Horizon C: heterogeneous sand gavel with some increased minor silt content, with sporadically dispersed cobbles (<200mm dia), and of strength / compactness 'medium to dense'.

Horizons B and C are very similar throughout all trail holes, the small difference being a marginal increase noted in silt content within horizon C, and a small increase in the strength/compactness within this stratum.

No ground water was encountered within any trial hole. No sign of any 'mottling' or grey coloring of the soil was noted within any of the Horizons, which would be an indication of a seasonally high water table. (water table considered > 5m depth).

The soil composition was as expected from the Desk Study undertaken, and the writer's previous experience within the area.

The soil infiltration rates allow for infiltration methods for storm water drainage. Infiltration viability should be given full consideration where an infiltration rate of 10^-6 m/s or greater exists on the site. The infiltration values obtain exceed this figure, and therefore infiltration methods should be considered.

The site is located within a 'Regionally Important Gravel Aquifer', and Ground Water Vulnerability is noted to be 'high'. The design of any method of infiltration should take into account ground water protection.

A minimum of 1m depth of unsaturated soil is required between the Ground water level and the base of the infiltration system, in order to protect the Ground water. (*section 13.5 – Treatment , SUDs Manual).* The unsaturated depth of soil below the soakaway base is >3m. No karst features exist around the site, and no evidence of fractured deposits with rapid flow rates was noted.

Given the depth of the water table, as determined on site, groundwater flooding is not considered a risk.

All soakaway / infiltration systems should be located > 5m from the foundations of any building structure.

Plane infiltration systems, (infiltration blankets) are viable option. Permeable pavements, which do not take any extra catchment, may be installed adjacent to buildings.

Additionally, further ground water protection should be afforded by design of the overall SUDs system which should incorporate components such as oil interceptors, silt traps, and geotextile membranes, into the stormwater treatment train.

Signed: _____ _____

Matt Clarke
Chartered Building Engineer

Date: _____

3/4/2025

References:

The SUDS manual (CIRIA 753 2015)
BRE Digest 365, Soakaway Design 2016
BS 5930(1999) – Code of Practice for Site Investigation

Appendix A

Location of Test Holes

Trial Hole Data	ITM Coordinates	Hole Dimensions	Fill level (at proposed invert)
T1 Depth = 2.65m BGL	497034, 591282	1.0m x 2.0m	1.2m
T2 Depth = 2.4m BGL	497045, 591304	1.2m x 1.6m	1.1m
T3 Depth = 2.65m BGL	497088,591358	1.0m x 2.0m	1.4m
T4 Depth = 1.9m BGL	497072, 591378	1.0m x 2.0m	0.9m
T5 Depth = 2.0m BGL	4970229, 591417	1.5m x 1.8m	1.1m

Wrightwood Developments Ltd.

Lands to Ardcharnavooley, Killarney

Site Layout - Soil Investigation

JCW

MLC

1:500

A1

91-01-0-005

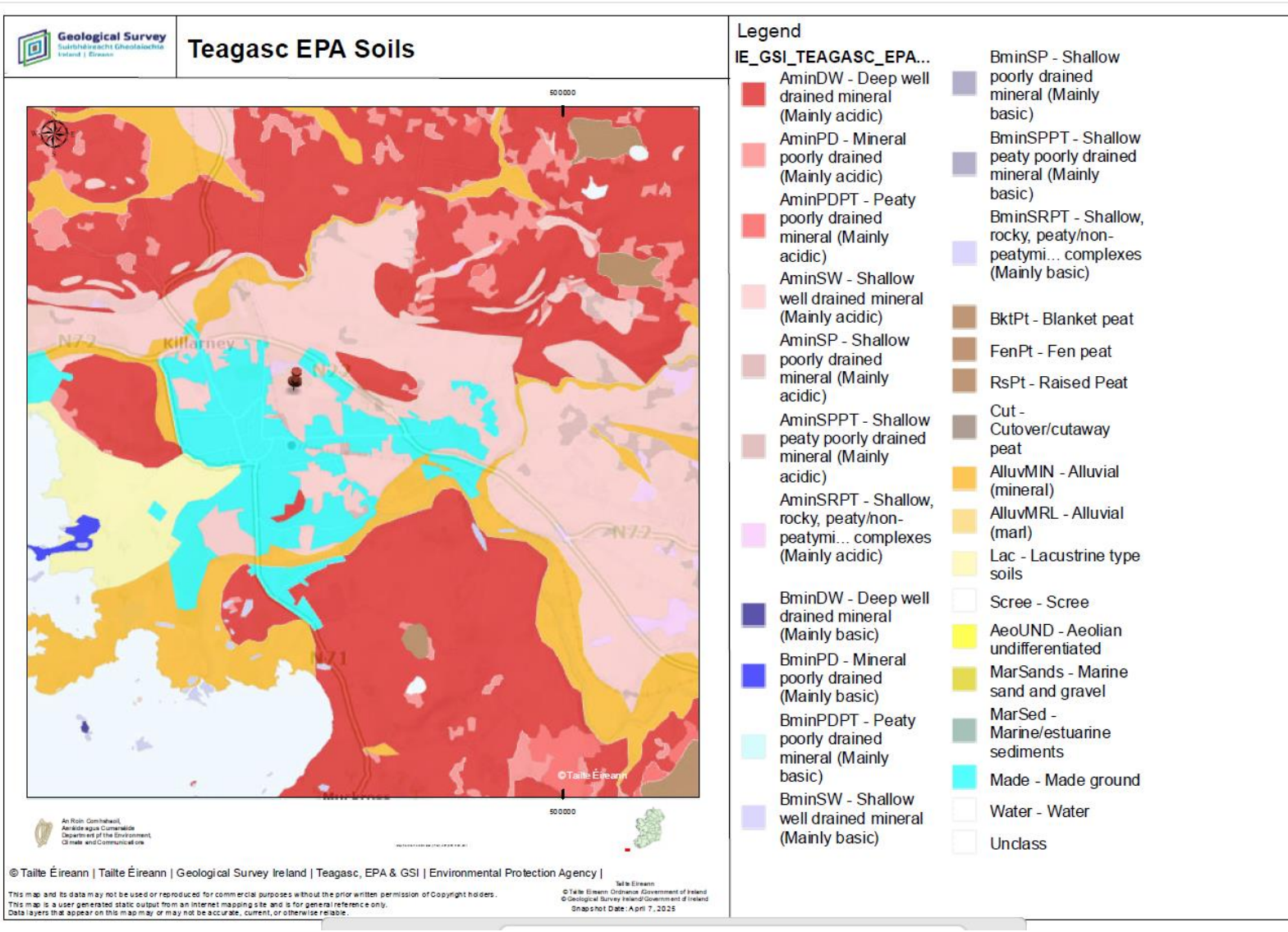
Discussion

teicniuil-priory
consulting engineers

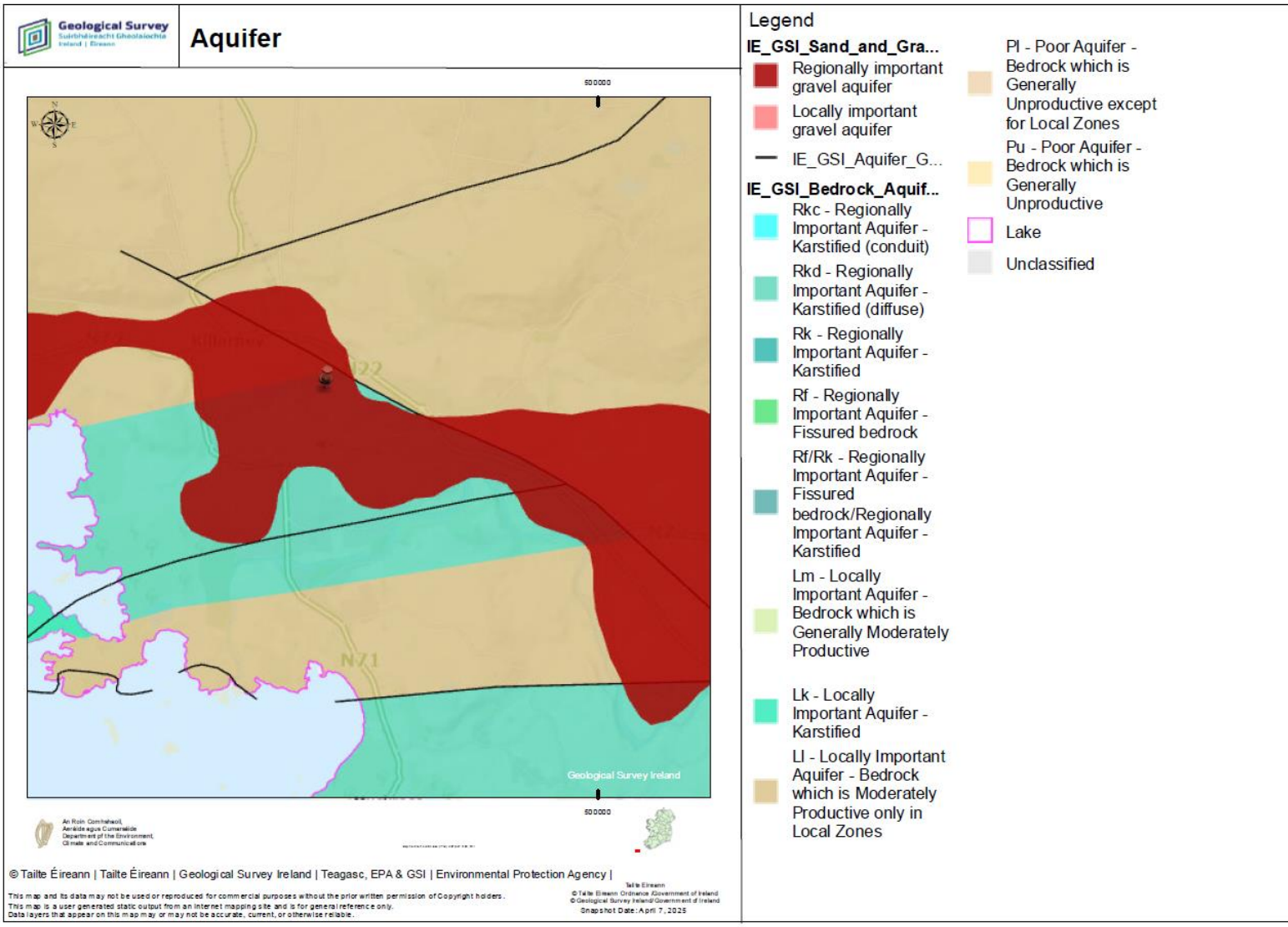
Appendix B

GSI Mapping: Geological and Hydrological Maps

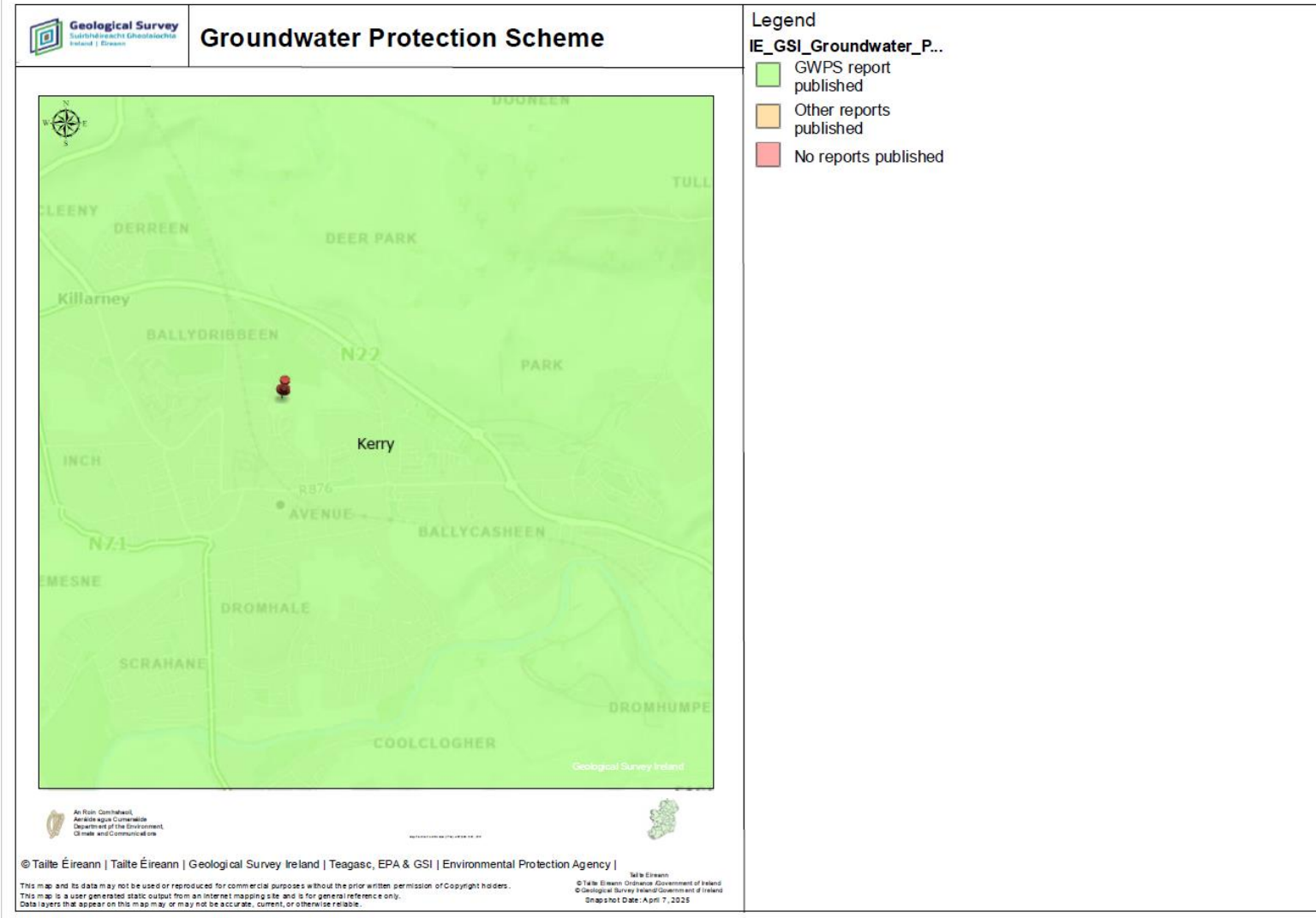
(location of site shown as a 'pin' on the following maps)



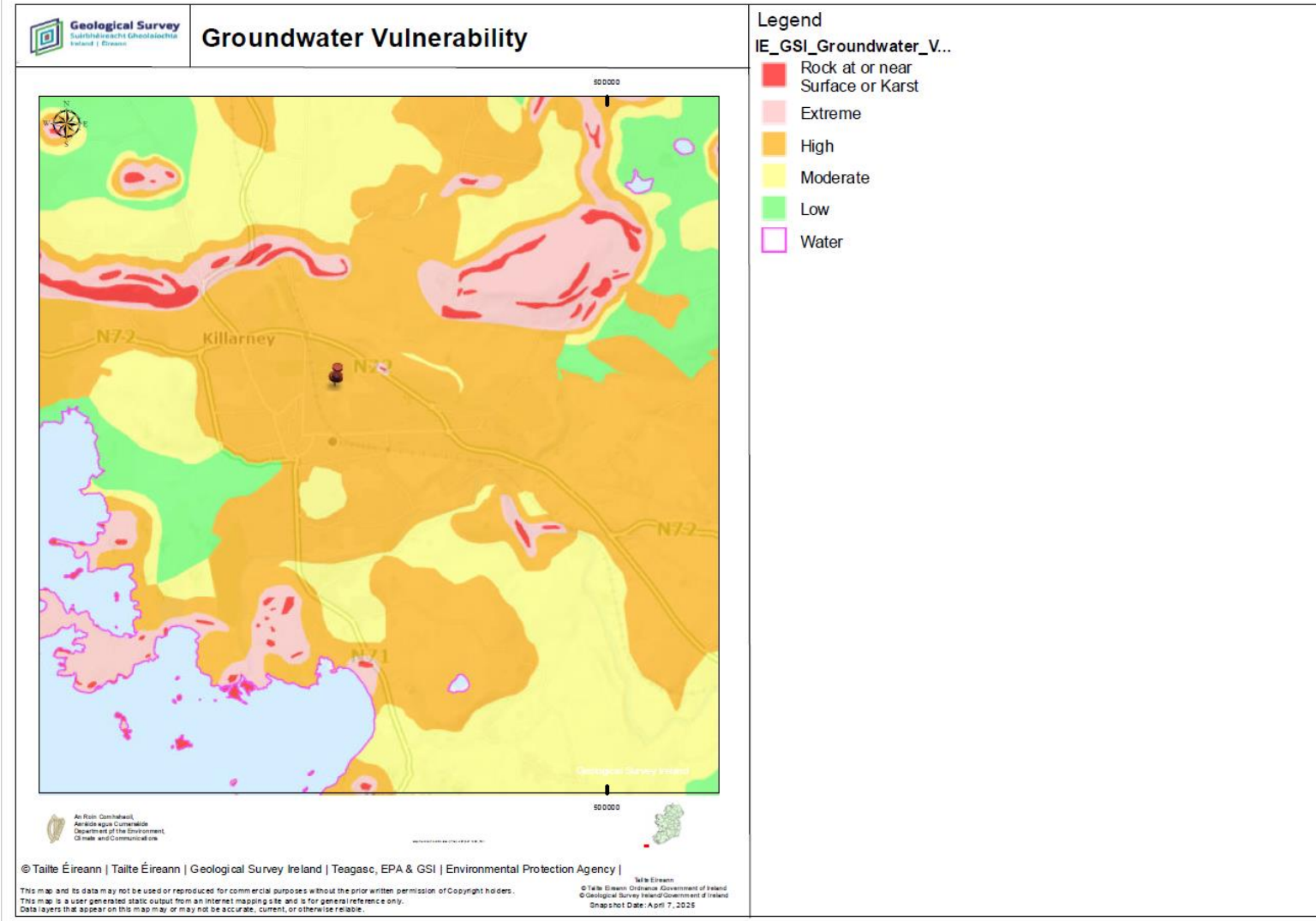
1. GPS BEDROCK GEOLOGY MAP



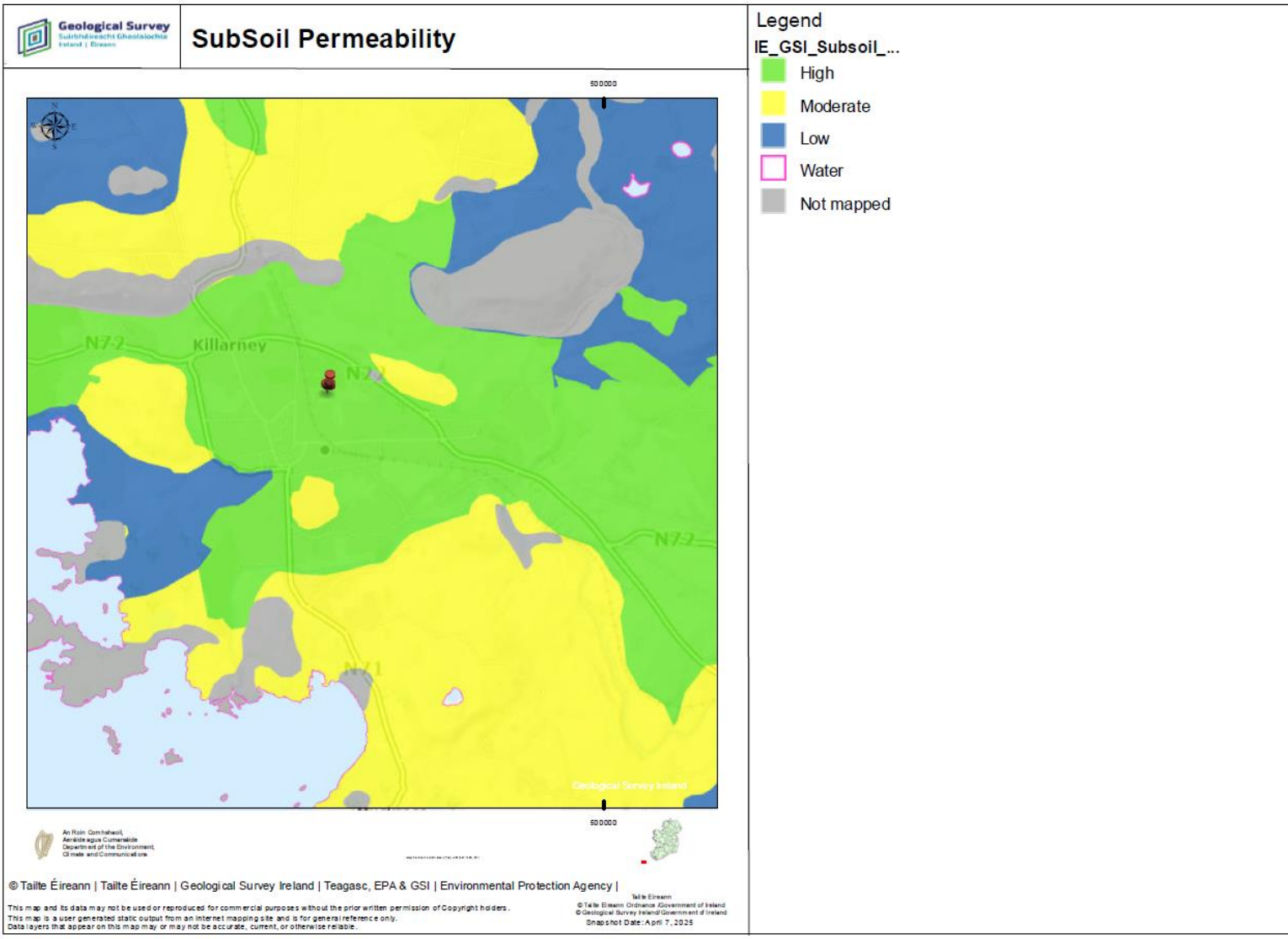
2. GSI AQUIFER MAP



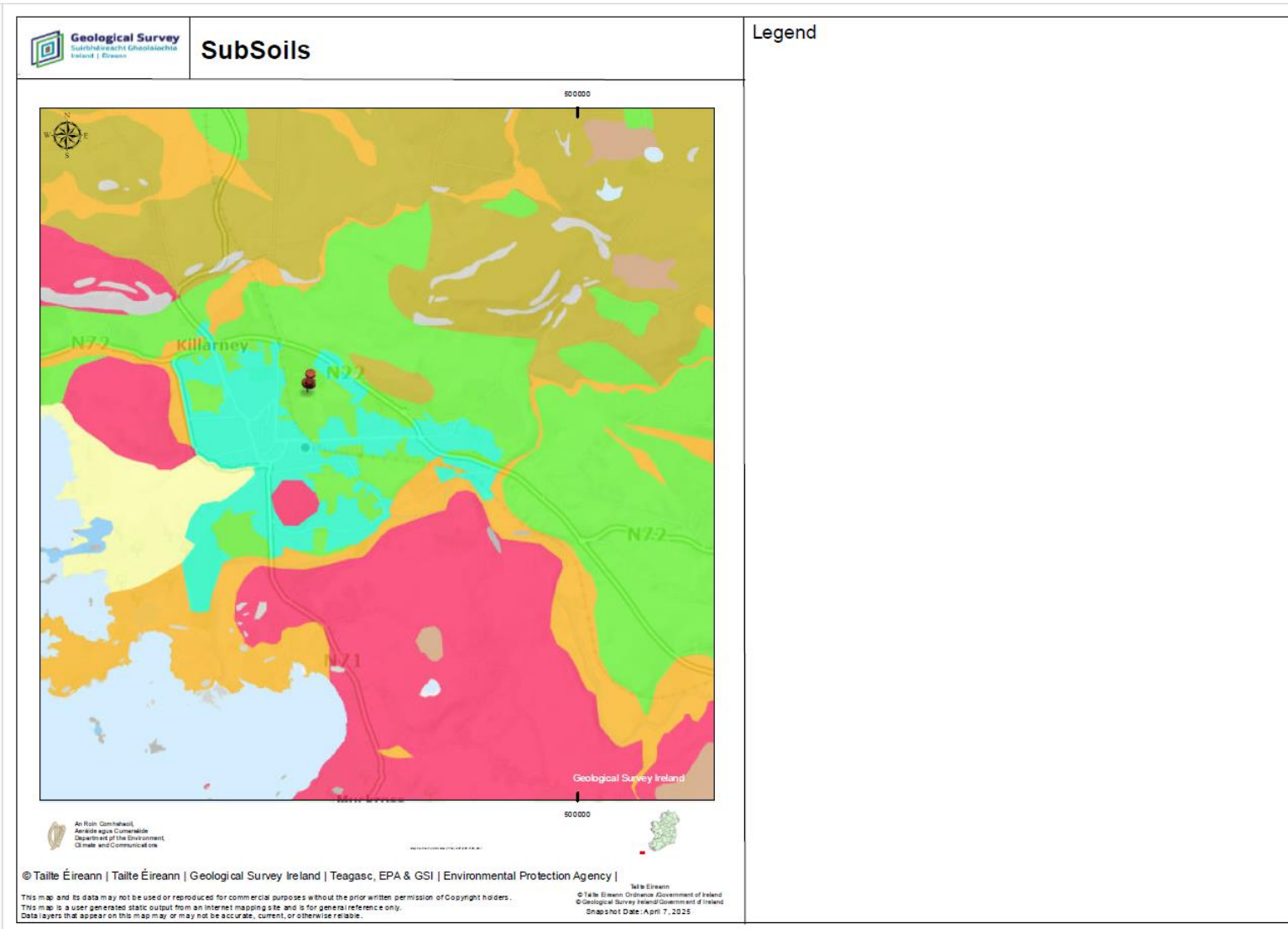
3. GSI GROUNDWATER PROTECTION SCHEME MAP



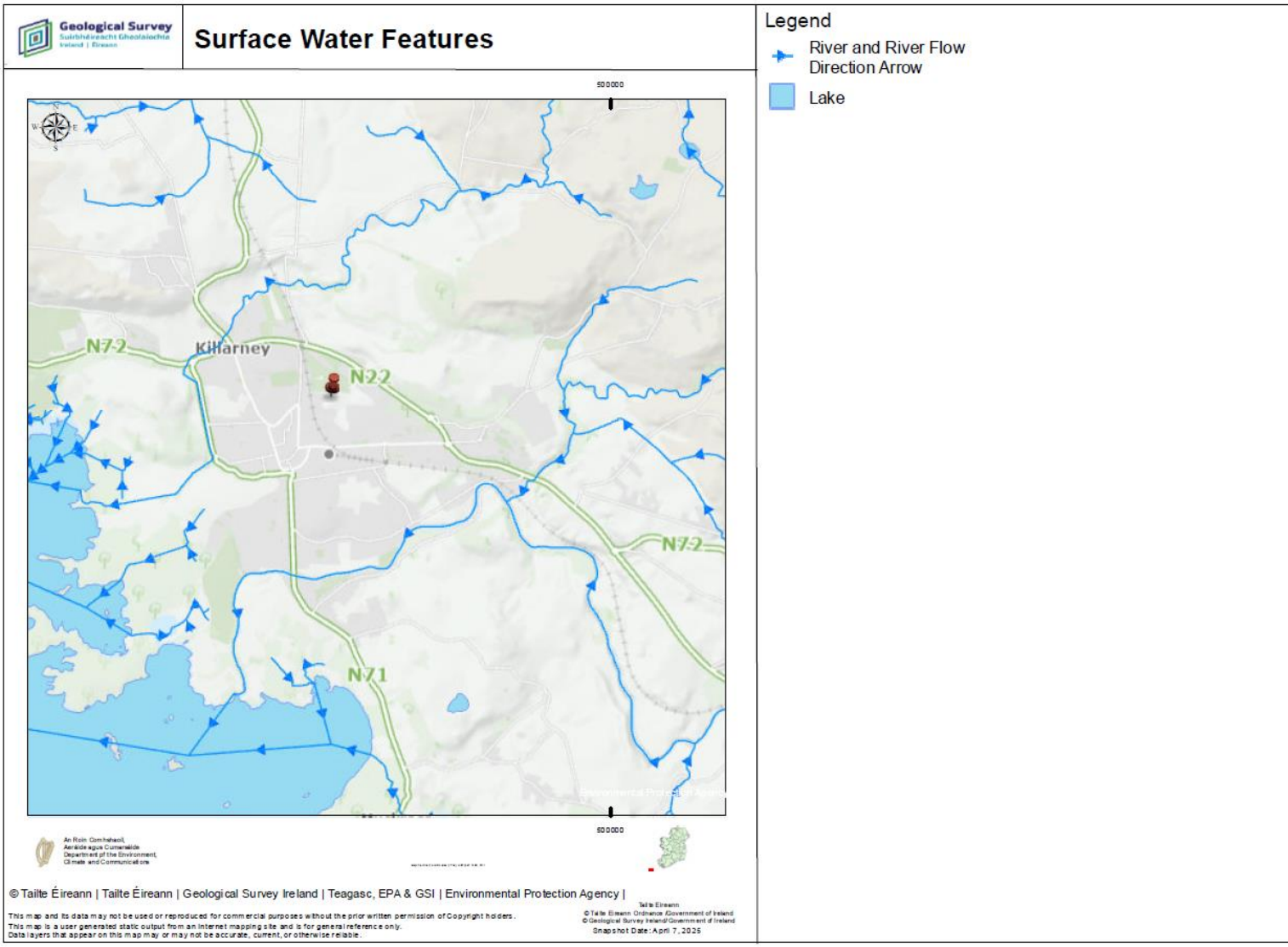
4. GSI GROUNDWATER VULNERABILITY MAP



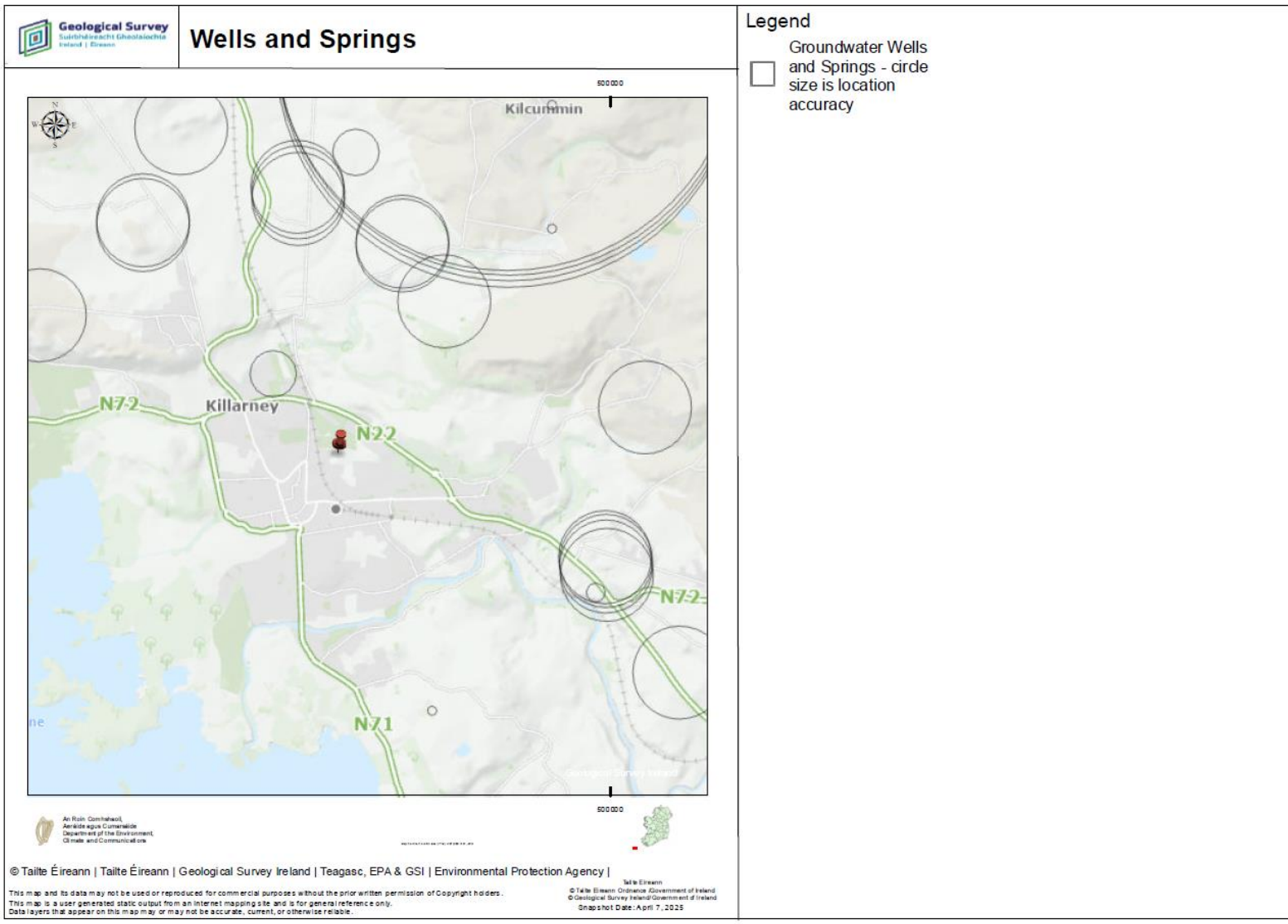
5. SUBSOIL PERMEABILITY MAP



6. GSI SUBSOILS MAP. <u>Subsoil:</u> Gravel derived from Devonian Sandstones (GDSs)



7. SURFACE WATER FEATURES MAP



8. GSI WELLS AND SPRINGS MAP

Appendix C

Trial Hole Log Data

Tekla Tedds	Project				Job Ref.	
Teicniuil-Priory Consulting Engineers Ltd Priory Grove Killarney	Ardshanavooly Housing Development				91-24	
	Section				Sheet no./rev.	
	Trial Holes Data Log TP1 to TP5				1	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	MC	14/04/2025	JoN	07/04/2025	MC	07/04/2025

TRIAL PIT LOG

Trial pit reference TP1 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.25	//////////// ////////////	(0.25) 0.25	Loose black heterogeneous ORGANIC TOP SOIL contains root system
	-0.85	: o : o : o : o : o : o : o :	(0.60) 0.85	Medium dense Some Orange hue brown slightly silty heterogeneous SAND AND GRAVEL some sporadic cobbles (<200mm dia)
	-2.65	:o:o:o:o:o o:o:o:o:o: :o:o:o:o:o o:o:o:o:o: :o:o:o:o:o o:o:o:o:o: :o:o:o:o:o o:o:o:o:o: :o:o:o:o:o	(1.80) 2.65	Medium dense to dense dark yellow/ brown yellow slightly silty heterogeneous SAND AND GRAVEL sporadic cobbles (<200mm)
				Trial pit ends

Not shown to scale

Additional notes: No Ground Water Encountered. No mottling or grey colour soil. (ie no sign of seasonally high water table)

Tekla Tedds	Project				Job Ref.	
Teicniuil-Priory Consulting Engineers Ltd Priory Grove Killarney	Ardshanavooly Housing Development				91-24	
	Section				Sheet no./rev.	
	Trial Holes Data Log TP1 to TP5				2	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	MC	14/04/2025	JoN	07/04/2025	MC	07/04/2025

TRIAL PIT LOG

Trial pit reference TP2 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.25	////////////// //////////	(0.25) 0.25	Loose black ORGANIC TOP SOIL
	-0.75	: o : o : o : o : o : : o : o :	(0.50) 0.75	Medium dense slightly Orange brown slightly silty heterogeneous SAND AND GRAVEL Sporadic cobbles <200mm
	-2.40	:o:o:o: o:o:o o :o:o:o: o:o:o o :o:o:o: o:o:o o :o:o:o: o:o:o o :o:o:o:	(1.65) 2.40	Medium dense to dense brown slightly silty SAND AND GRAVEL Sporadic Cobbles < 200mm
				Trial pit ends

Not shown to scale

Additional notes: No Ground Water Encountered. No Mottling or grey colour. (ie no sign of seasonally high water table)

Tekla Tedds	Project				Job Ref.	
Teicniuil-Priory Consulting Engineers Ltd Priory Grove Killarney	Ardshanavooly Housing Development				91-24	
	Section				Sheet no./rev.	
	Trial Holes Data Log TP1 to TP5				3	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	MC	14/04/2025	JoN	07/04/2025	MC	07/04/2025

TRIAL PIT LOG

Trial pit reference TP3 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.25	////////// //////////	(0.25) 0.25	Loose black heterogeneous ORGANIC TOP SOIL Root system visible
	-0.75	: o : o : o : o : o : o :	(0.50) 0.75	Medium dense brown slightly silty heterogeneous SAND AND GRAVEL some sporadic Cobbles (<200mm)
	-2.65	:o:o:o:o:o: o:o:o:o:o: :o:o:o:o:o: o:o:o:o:o: :o:o:o:o:o: o:o:o:o:o: :o:o:o:o:o: o:o:o:o:o:	(1.90) 2.65	Medium dense to dense dark brown brown slightly silty heterogeneous SAND AND GRAVEL some sporadic cobbles (<200mm)
				Trial pit ends

Not shown to scale

Additional notes: No Ground Water Encoutered. No mottling / grey colour encounter (ie no seasonal high water table)

Tekla Tedds	Project				Job Ref.	
Teicniuil-Priory Consulting Engineers Ltd Priory Grove Killarney	Ardshanavooly Housing Development				91-24	
	Section				Sheet no./rev.	
	Trial Holes Data Log TP1 to TP5				4	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	MC	14/04/2025	JoN	07/04/2025	MC	07/04/2025

TRIAL PIT LOG

Trial pit reference TP4 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.25	////////// //////////	(0.25) 0.25	Loose black ORGANIC TOP SOIL
	-0.75	: o : o : o : o : o : o : o :	(0.50) 0.75	Medium dense brown slightly silty heterogeneous SAND AND GRAVEL some spordic cobbles (<200mm)
	-1.90	: o : o : o : o : o : o : o : o : o : o : o : o : o : o : o	(1.15) 1.90	Medium dense brown slightly silty heterogeneous SAND AND GRAVEL some sporadic cobbles (<200mm)
				Trial pit ends

Not shown to scale

Additional notes: No Ground Water. No mottling or grey colour present (ie no seasonally high water table)

Tekla Tedds	Project				Job Ref.	
Teicniuil-Priory Consulting Engineers Ltd Priory Grove Killarney	Ardshanavooly Housing Development				91-24	
	Section				Sheet no./rev.	
	Trial Holes Data Log TP1 to TP5				5	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	MC	14/04/2025	JoN	07/04/2025	MC	07/04/2025

TRIAL PIT LOG

Trial pit reference TP5 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.25	//////////// ////////////	(0.25) 0.25	Loose black heterogeneous ORGANIC TOP SOIL Root system visible
	-0.75	: o : o : o : o : o : o : o :	(0.50) 0.75	Medium dense brown slightly silty heterogeneous SAND AND GRAVEL some sporadic cobbles (<200mm)
	-2.00	:o:o:o:o: o:o:o:o:o :o:o:o:o: o:o:o:o:o :o:o:o:o: o:o:o:o:o :o:o:o:o:	(1.25) 2.00	Medium dense to dense dark Brown brown slightly silty heterogeneous SAND AND GRAVEL some sporadic cobbles
				Trial pit ends

Not shown to scale

Additional notes: No Ground Water Encoutered. No Mottling or grey colour. (ie no sign of seasonally high water table)

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Appendix D

Soakaway Testing Data

Soakaway Testing Schedule

Project: **Proposed Housing Development**

Location **Arshanavooley, Killarney, Co Kerry**

Date of Testing **25th March 2025**

Teicniuil-Priory Consulting Engineers Ltd

The following is to be read in conjunction with the soil infiltration report and soakaway testing site layout plan, and photographic schedule for this site.

ON-SITE SOAKAWAY TESTING TO BRE365 - SOAKAWAY DESIGN (Rev 2016)					Time taken for water level to drop (minutes)						
					level of fill (L)	0.75 x L	0.5 x L	0.25 x L	empty 0 x L	Time Taken from 75% to 25%	infiltration time to be used in calcs (mins)
Trial hole Number	Trial Hole Co-ords ITM	Trial hole dims w = width l = length d = depth	Level of Fill (L)	Fill No	100%	75%	50%	25%	0%		
T1	497034, 591282	w = 1.0m l = 2.0m d = 2.65m	1.2m	1	0	11	31	53	81	42	
				2	0	10	30	55	80	45	
				3	0	10	34	64	92	54	54
T2	497045, 591304	w = 1.2m l = 1.6m d = 2.4m	1.1m	1	0	10	25	50	78	40	
				2	0	12	28	55	80	43	43
				3	0	12	28	54	81	42	
T3	497088, 591358	w = 1.0m l = 2.0m d = 2.65m	1.4m	1	0	21	46	80	115	59	
				2	0	21	50	85	119	64	64
				3	0	22	50	85	120	63	
T4	497072, 591378	w = 1.0m l = 2.0m d = 1.9m	0.9m	1	0	11	20	34	46	23	
				2	0	13	25	41	57	28	
				3	0	13	26	44	60	31	31
T5	497029, 591417	w = 1.5m l = 1.8m d = 2.00m	1.1m	1	0	10	22	37	52	27	
				2	0	10	24	40	58	30	
				3	0	12	27	44	62	32	32

Soakaway Testing Carried out by:

Name: Matt Clarke Position: Principal Engineer
Chartered Building Engineer

Signed: _____

Date:

on behalf on Teicniuil-Priory Consulting Engineers Ltd

Teicniuil-Priory Consulting Engineers Ltd

Appendix E

Soil Infiltration Calculations (trial holes T1 to T5)

Tekla Tedds	Project				Job Ref.	
Teicniuil-Priory Consulting Engineers Ltd The Courtyard Killarney	Housing Development - Ardshanavooley				91-24	
	Section				Sheet no./rev.	
	Infiltration Testing Trial Hole T3				1	
	Calc. by	Date	Chk'd by	Date	App'd by	Date
	MC	14/04/2025				

Soakaway Testing : Trial Hole T1

Soil infiltration rate (BRE digest 365)

Length of trial pit;	l_{trial} = **2000** mm
Width of trial pit;	b_{trial} = **1200** mm
Depth of trial pit (below invert);	d_{trial} = **1200** mm
Free volume (if fill used);	V_{trial} = **100** %;
75% depth of pit;	d_{75} = (d_{trial} × 0.75) = **900.00** mm
50% depth of pit;	d_{50} = (d_{trial} × 0.50) = **600.00** mm
25% depth of pit;	d_{25} = (d_{trial} × 0.25) = **300.00** mm
Test 1 - time to fall from 75% depth to 25% depth;	T1 = **42** min
Test 2 - time to fall from 75% depth to 25% depth;	T2 = **45** min
Test 3 - time to fall from 75% depth to 25% depth;	T3 = **54** min
Longest time to fall from 75% depth to 25% depth;	t_g = max(T1, T2, T3) = **54** min
Storage volume from 75% to 25% depth;	V_{p75_25} = (l_{trial} × b_{trial} × (d_{75} - d_{25})) × V_{trial} = **1.44** m^3
Internal surface area to 50% depth;	a_{p50} = ((l_{trial} × b_{trial}) + (l_{trial} + b_{trial}) × 2 × d_{50}) = **6.24** m^2
Surface area of soakaway to 50% storage depth;	A_{s50} = 2 × (l_{trial} + b_{trial}) × d_{trial} / 2 = **3.840** m^2
Wetted area of pit 50% full;	a_{s50} = l × d + w × d = **50000000** mm^2
Soil infiltration rate;	**f = V_{p75_25} / (a_{p50} × t_g) = 71.2×10^{-6} m/s**

Soakaway Testing : Trial Hole T2

Soil infiltration rate (BRE digest 365)

Length of trial pit;	l_{trial} = **1600** mm
Width of trial pit;	b_{trial} = **1200** mm
Depth of trial pit (below invert);	d_{trial} = **1100** mm
Free volume (if fill used);	V_{trial} = **100** %;
75% depth of pit;	d_{75} = (d_{trial} × 0.75) = **825.00** mm
50% depth of pit;	d_{50} = (d_{trial} × 0.50) = **550.00** mm
25% depth of pit;	d_{25} = (d_{trial} × 0.25) = **275.00** mm
Test 1 - time to fall from 75% depth to 25% depth;	T1 = **40** min
Test 2 - time to fall from 75% depth to 25% depth;	T2 = **43** min
Test 3 - time to fall from 75% depth to 25% depth;	T3 = **42** min
Longest time to fall from 75% depth to 25% depth;	t_g = max(T1, T2, T3) = **43** min
Storage volume from 75% to 25% depth;	V_{p75_25} = (l_{trial} × b_{trial} × (d_{75} - d_{25})) × V_{trial} = **1.06** m^3
Internal surface area to 50% depth;	a_{p50} = ((l_{trial} × b_{trial}) + (l_{trial} + b_{trial}) × 2 × d_{50}) = **5.00** m^2
Surface area of soakaway to 50% storage depth;	A_{s50} = 2 × (l_{trial} + b_{trial}) × d_{trial} / 2 = **3.080** m^2
Wetted area of pit 50% full;	a_{s50} = l × d + w × d = **50000000** mm
Soil infiltration rate;	**f = V_{p75_25} / (a_{p50} × t_g) = 81.9×10^{-6} m/s**

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Soakaway Testing : Trial Hole T3

Soil infiltration rate (BRE digest 365)

Length of trial pit;	l_{trial} = **2000** mm
Width of trial pit;	b_{trial} = **1000** mm
Depth of trial pit (below invert);	d_{trial} = **1400** mm
Free volume (if fill used);	V_{trial} = **100** %;
75% depth of pit;	d_{75} = (d_{trial} × 0.75) = **1050.00** mm
50% depth of pit;	d_{50} = (d_{trial} × 0.50) = **700.00** mm
25% depth of pit;	d_{25} = (d_{trial} × 0.25) = **350.00** mm
Test 1 - time to fall from 75% depth to 25% depth;	T1 = **59** min
Test 2 - time to fall from 75% depth to 25% depth;	T2 = **64** min
Test 3 - time to fall from 75% depth to 25% depth;	T3 = **63** min
Longest time to fall from 75% depth to 25% depth;	t_g = max(T1, T2, T3) = **64** min
Storage volume from 75% to 25% depth;	V_{p75_25} = (l_{trial} × b_{trial} × (d_{75} - d_{25})) × V_{trial} = **1.40** m^3
Internal surface area to 50% depth;	a_{p50} = ((l_{trial} × b_{trial}) + (l_{trial} + b_{trial}) × 2 × d_{50}) = **6.20** m^2
Surface area of soakaway to 50% storage depth;	A_{s50} = 2 × (l_{trial} + b_{trial}) × d_{trial} / 2 = **4.200** m^2
Wetted area of pit 50% full;	a_{s50} = l × d + w × d = **50000000** mm^2
Soil infiltration rate;	**f = V_{p75_25} / (a_{p50} × t_g) = 58.8×10^{-6} m/s**

Soakaway Testing : Trial Hole T4

Soil infiltration rate (BRE digest 365)

Length of trial pit;	l_{trial} = **2000** mm
Width of trial pit;	b_{trial} = **1000** mm
Depth of trial pit (below invert);	d_{trial} = **900** mm
Free volume (if fill used);	V_{trial} = **100** %;
75% depth of pit;	d_{75} = (d_{trial} × 0.75) = **675.00** mm
50% depth of pit;	d_{50} = (d_{trial} × 0.50) = **450.00** mm
25% depth of pit;	d_{25} = (d_{trial} × 0.25) = **225.00** mm
Test 1 - time to fall from 75% depth to 25% depth;	T1 = **23** min
Test 2 - time to fall from 75% depth to 25% depth;	T2 = **28** min
Test 3 - time to fall from 75% depth to 25% depth;	T3 = **31** min
Longest time to fall from 75% depth to 25% depth;	t_g = max(T1, T2, T3) = **31** min
Storage volume from 75% to 25% depth;	V_{p75_25} = (l_{trial} × b_{trial} × (d_{75} - d_{25})) × V_{trial} = **0.90** m^3
Internal surface area to 50% depth;	a_{p50} = ((l_{trial} × b_{trial}) + (l_{trial} + b_{trial}) × 2 × d_{50}) = **4.70** m^2
Surface area of soakaway to 50% storage depth;	A_{s50} = 2 × (l_{trial} + b_{trial}) × d_{trial} / 2 = **2.700** m^2
Wetted area of pit 50% full;	a_{s50} = l × d + w × d = **50000000** mm^2
Soil infiltration rate;	**f = V_{p75_25} / (a_{p50} × t_g) = 103.×10^{-6} m/s**

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	MC	14/04/2025				

Soakaway Testing : Trial Hole T5

Soil infiltration rate (BRE digest 365)

Length of trial pit;	l_{trial} = **1800** mm
Width of trial pit;	b_{trial} = **1500** mm
Depth of trial pit (below invert);	d_{trial} = **1100** mm
Free volume (if fill used);	V_{trial} = **100** %;
75% depth of pit;	d_{75} = (d_{trial} × 0.75) = **825.00** mm
50% depth of pit;	d_{50} = (d_{trial} × 0.50) = **550.00** mm
25% depth of pit;	d_{25} = (d_{trial} × 0.25) = **275.00** mm
Test 1 - time to fall from 75% depth to 25% depth;	T1 = **27** min
Test 2 - time to fall from 75% depth to 25% depth;	T2 = **30** min
Test 3 - time to fall from 75% depth to 25% depth;	T3 = **32** min
Longest time to fall from 75% depth to 25% depth;	t_{lg} = max(T1, T2, T3) = **32** min
Storage volume from 75% to 25% depth;	V_{p75_25} = (l_{trial} × b_{trial} × (d_{75} - d_{25})) × V_{trial} = **1.49** m^3
Internal surface area to 50% depth;	a_{p50} = ((l_{trial} × b_{trial}) + (l_{trial} + b_{trial}) × 2 × d_{50}) = **6.33** m^2
Surface area of soakaway to 50% storage depth;	A_{d50} = 2 × (l_{trial} + b_{trial}) × d_{trial} / 2 = **3.630** m^2
Wetted area of pit 50% full;	a_{s50} = l × d + w × d = **50000000** mm^2
Soil infiltration rate;	**f = V_{p75_25} / (a_{p50} × t_{lg}) = 122.×10^{-8} m/s**

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Appendix F

Photographic Schedule

Photo No 1 - Site Overview – Trial holes (from left to right), T4, T3, T2, and T1. Observer at NW corner of site.

Photo No 2 – Excavator (Hyundai HX 140Lc). Excavated spoil from Trial Hole T5.

Photo 3 – Tractor with 10,000L water bowser. (5No trips : 50,000L in total)

Trial Hole T1

Photo 4 Soil Strata – Trial Hole T1, depth = 2.65m (see Trial hole Data log)
(hole dimensions: width = 1.0m, length = 2.0m.)

Photo 5 – Trial Hole T1 Water Fill: Level of effective depth at proposed invert (100% level of fill).
Water level = 1.2m deep.

Photo 6 – Trial Hole T1 Water Fill: Level of effective depth at proposed invert (75% level of fill). Water level = 0.9m deep

Photo 7 – Trial Hole T1 Water Fill: Level of effective depth at proposed invert (50% level of fill). Water level = 0.6m deep

Photo 8 – Trial Hole T1 Water Fill: Level of effective depth at proposed invert (25% level of fill). Water level = 0.3m deep

Trial Hole T2

Photo 9 – Trial Hole T2 – during water fill process. (2.4m deep)

Photo 10 – Trial Hole T2; Water Fill: Level of effective depth at proposed invert (100% level of fill).
Water level = 1.1m deep.
(dimensions 1.2m wide x 1.6m long)

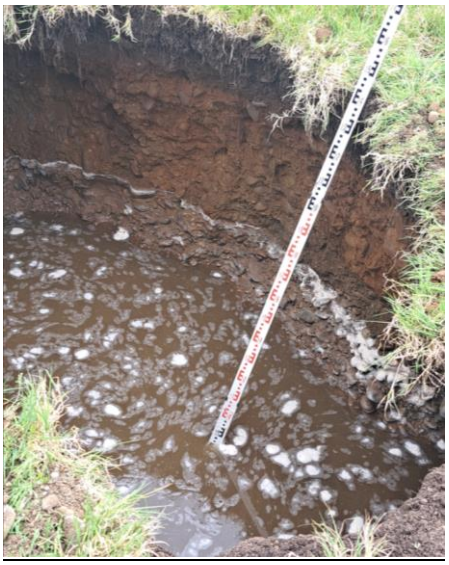

Photo 11– Trial Hole T2; Water Fill: Level of effective depth at proposed invert (75% level of fill).
Water level = 0.825m deep.
(dimensions 1.2m wide x 1.6m long)

Photo 12– Trial Hole T2; Water Fill: Level of effective depth at proposed invert (50% level of fill). Water level = 0.550m deep.
(dimensions 1.2m wide x 1.6m long)

Photo 13– Trial Hole T2; Water Fill: Level of effective depth at proposed invert (25% level of fill). Water level = 0.275m deep.
(dimensions 1.2m wide x 1.6m long)

Trial Hole T3

Photo 14– Trial Hole T3 depth = 2.65m (see Trial hole Data log)
(hole dimensions: width = 1.0m, length = 2.0m.)

Photo 15– Trial Hole T3; Water Fill: Level of effective depth at proposed invert (100% level of fill).
Water level = 1.4m deep.

Photo 16– Trial Hole T3; Water Fill: Level of effective depth at proposed invert (75% level of fill). Water level = 1.05m deep.
(dimensions 1.0m wide x 2.0m long)

Photo 17– Trial Hole T3; Water Fill: Level of effective depth at proposed invert (50% level of fill). Water level = 0.75m deep.
(dimensions 1.0m wide x 2.0m long)

Photo 18– Trial Hole T3; Water Fill: Level of effective depth at proposed invert (25% level of fill).
Water level = 0.350m deep.
(dimensions 1.0m wide x 2.0m long)

Trial Hole T4

Photo 19– Trial Hole T4; Water Fill: Level of effective depth at proposed invert (100% level of fill).
(1.9m deep)
Water level = 0.9m deep.
(dimensions 1.0m wide x 2.0m long)

Photo 20– Trial Hole T4; Water Fill: Level of effective depth at proposed invert (75% level of fill).
Water level = 0.675m deep.
(dimensions 1.0m wide x 2.0m long)

Photo 21– Trial Hole T4; Water Fill: Level of effective depth at proposed invert (50% level of fill).
Water level = 0.550m deep.
(dimensions 1.0m wide x 2.0m long)

Photo 22– Trial Hole T4; Water Fill: Level of effective depth at proposed invert (25% level of fill).
Water level = 0.275m deep.
(dimensions 1.0m wide x 2.0m long)

Trial Hole T5

Photo 23– Trial Hole T5; Water Fill: Level of effective depth at proposed invert (100% level of fill).
(2.0m deep)
Water level = 1.1m deep.
(dimensions 1.5m wide x 1.8m long)

Photo 24– Trial Hole T5; Water Fill: Level of effective depth at proposed invert (75% level of fill). Water level = 0.825m deep.
(dimensions 1.5m wide x 1.8m long)

Photo 25– Trial Hole T5; Water Fill: Level of effective depth at proposed invert (50% level of fill). Water level = 0.55m deep.
(dimensions 1.5m wide x 1.8m long)

Photo 26– Trial Hole T5; Water Fill: Level of effective depth at proposed invert (25% level of fill). Water level = 0.275m deep.
(dimensions 1.5m wide x 1.8m long)

Photo 27– Trial Hole T1; Spoil from excavation: heterogenous soil: sandy gravel with minor silt content. Some sporadic cobbles (<200mm). No boulders present.

Photo 28– Trial Hole T3; Spoil from excavation: heterogenous soil: sandy gravel with minor silt content. Some sporadic cobbles (<200mm). No boulders present.

Photo 29– Trial Hole T5; Spoil from excavation: heterogenous soil: sandy gravel with minor silt content. Some sporadic cobbles (<200mm). No boulders present.

END