Agents Workshop on Site Suitability Assessment for Domestic Waste Water Treatment Systems

Galway County Council

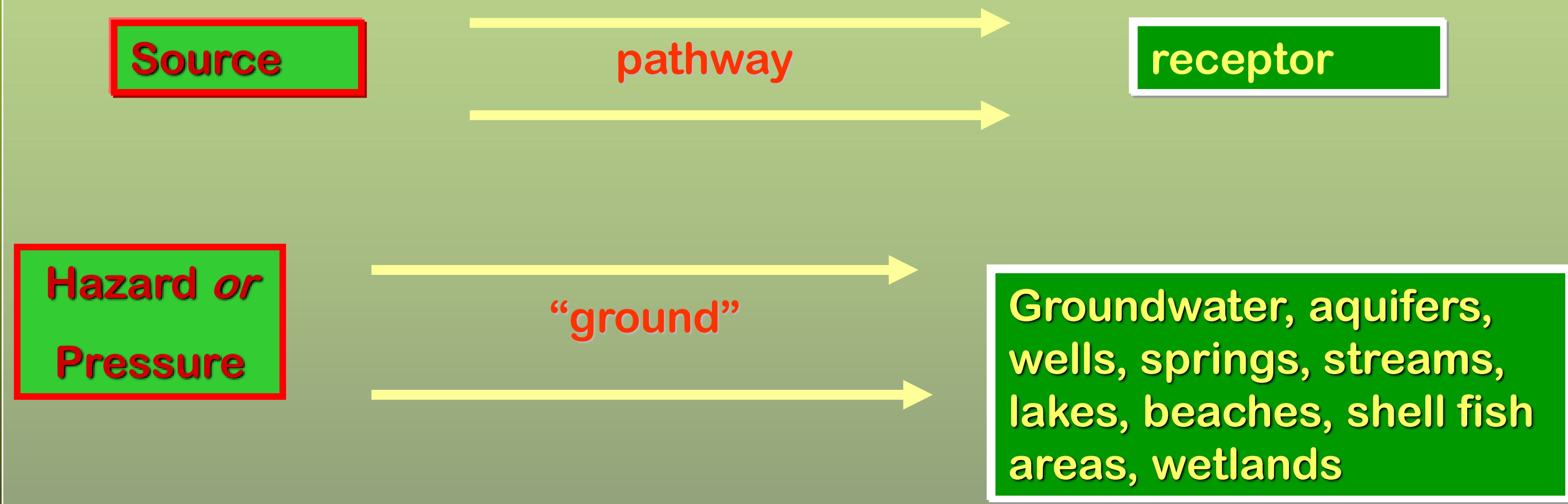
8th June 2023

Completing the Site Characterisation Form Report on a site

Completing a Site Suitability Assessment on the site

How and why we do it … back to …

Risk … and the source - pathway - receptor model.



APPENDIX A: SITE CHARACTERISATION FORM

File Reference:

1.0 GENERAL DETAILS (From planning application)

Prefix: First Name: Surname:

Address:

Site Location and Townland:

Number of Bedrooms: 4

Maximum Number of Residents: 6

Comments on population equivalent

Proposed Water Supply:

Mains ☐ Private Well/Borehole ☐ Group Well/Borehole ☐

Septic tanks … still the optimal system …

- … IF THE GROUND IS SUITABLE !!!
- Where there is 1.2m+ of suitable topsoil/subsoil above bedrock and the water table, and suitable percolation …
- Best because …
  - Better treatment
  - Less maintenance issues
  - Less odour and 'other' nuisances
  - Usually gravity-fed
  - More energy efficient
  - But only optimal in *c*. 20% of Galway


Site Assessment

Stage 1

The Desk Study

Why do we do the desk study?

The desk study allows us to …

- Examine what topography lies around the site …
- Examine what the environmental geological conditions are like
- Assume whether these may be issues with regard to rapid percolation (risk to groundwater)
- Assess if there is a risk of ponding (risk to surface water)
- Formulate in our mind what we expect the site situation might look like

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type):

Subsoil, (Specify Type):

Bedrock Type:

Aquifer Category: Regionally Important ☐ Locally Important ☐ Poor ☐

Vulnerability: Extreme ☐ High ☐ Moderate ☐ Low ☐

Groundwater Body: Status

Name of Public/Group Scheme Water Supply within 1 km:

Source Protection Area: ZOC ☐ SI ☐ SO ☐ Groundwater Protection Response:

Presence of Significant Sites (Archaeological, Natural & Historical):

Past experience in the area:

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position:

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☐

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

Existing Land Use:

Vegetation Indicators:

Groundwater Flow Direction:

Ground Condition:

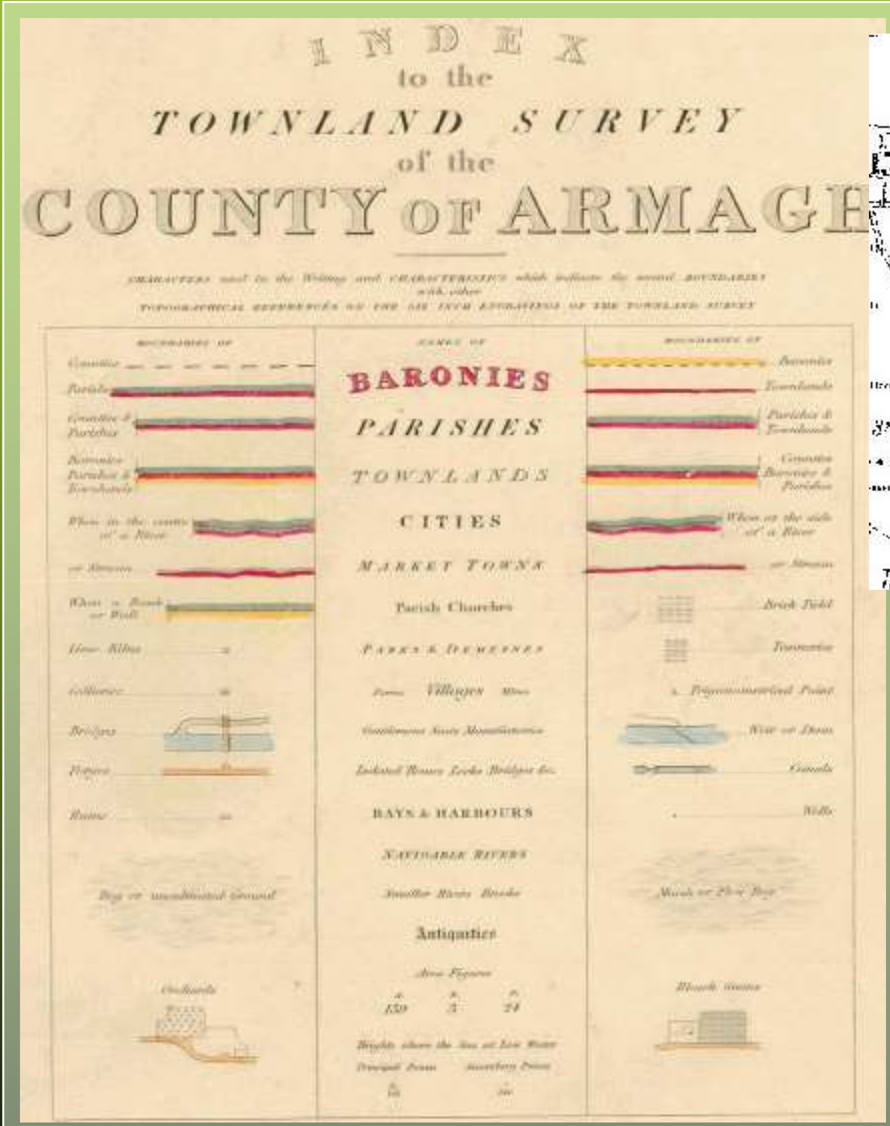
Site Boundaries:

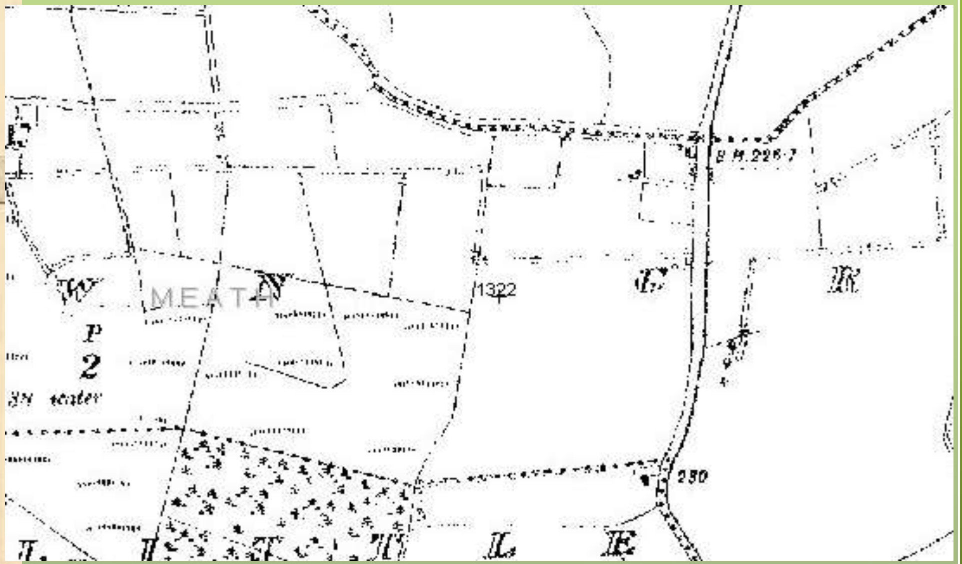
Groundwater flow in assessments … 1:50,000 Map …

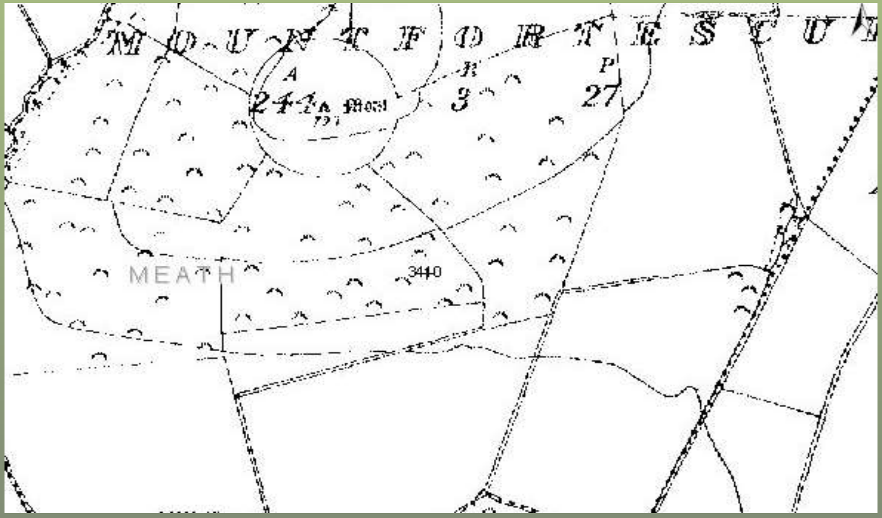
Groundwater flow direction …
Effectively perpendicular to contours, towards nearest stream and 'along' nearest stream flow!

Desk study … Ordnance Survey 1:2500 Series.

With the Ordnance Survey 1:2500 Series, we can begin to interpret the landscape and ground …







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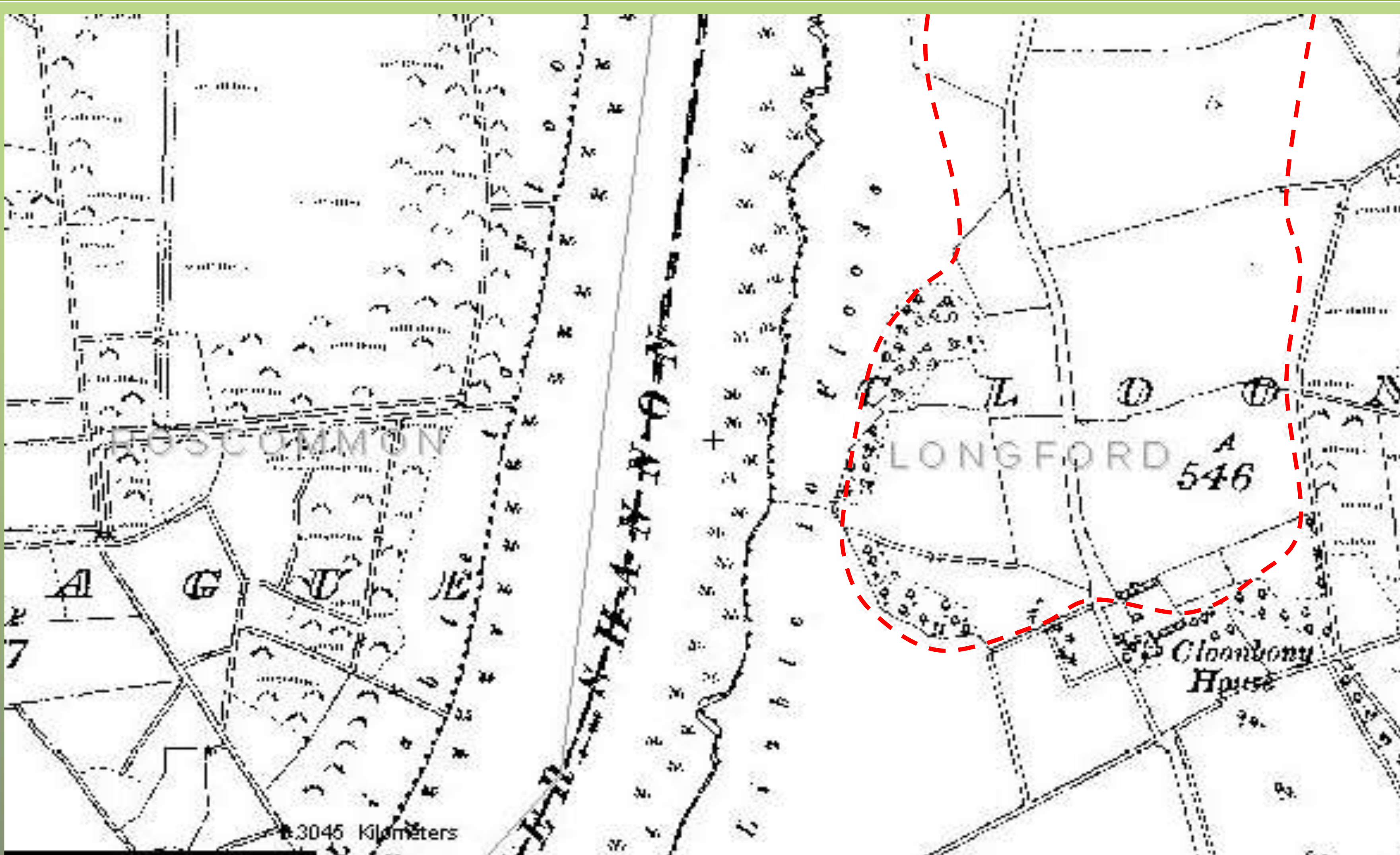
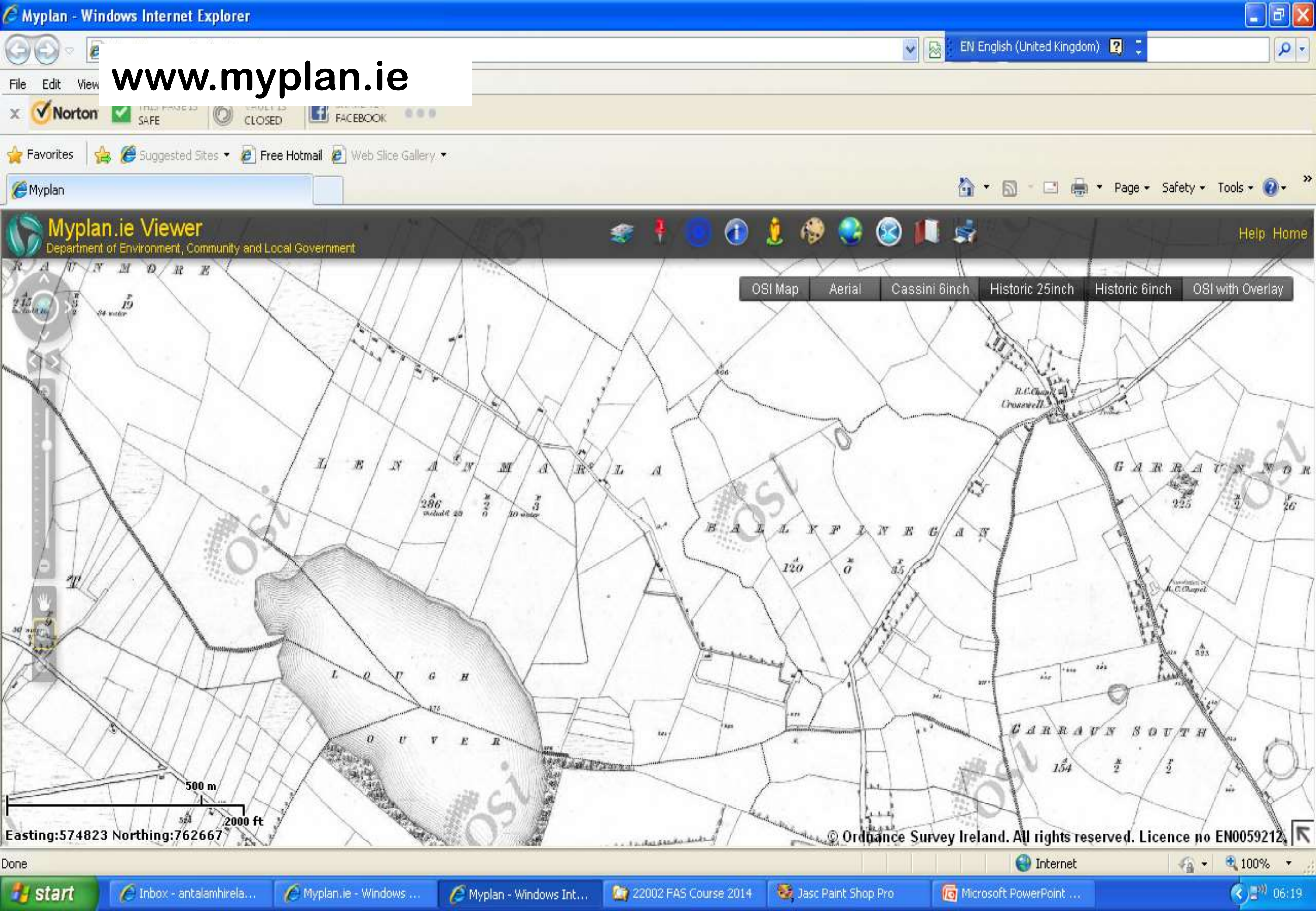


www.myplan.ie



As well as this, the floodrisk maps …

www.floodmaps.ie

also

www.cfram.ie

The O.S. Maps (and air photos) will tell us ...

- What the general topographic situation around the site is ...
- If there are roads nearby and what the network is like ...
- If there are houses in the area ...
- What the drainage pattern is like ... both natural and man-modified ... as well as flow directions ...
- If there are important, or other, archaeological features in the area ...
- Where wells may be located ...
- Where mature trees are likely to be found ...
- Where rough or wet ground lies ... and ...

- If there are drains in the area (which can allow us to assume clayey soils/subsoils if tied in with the topographic information mentioned above) ...

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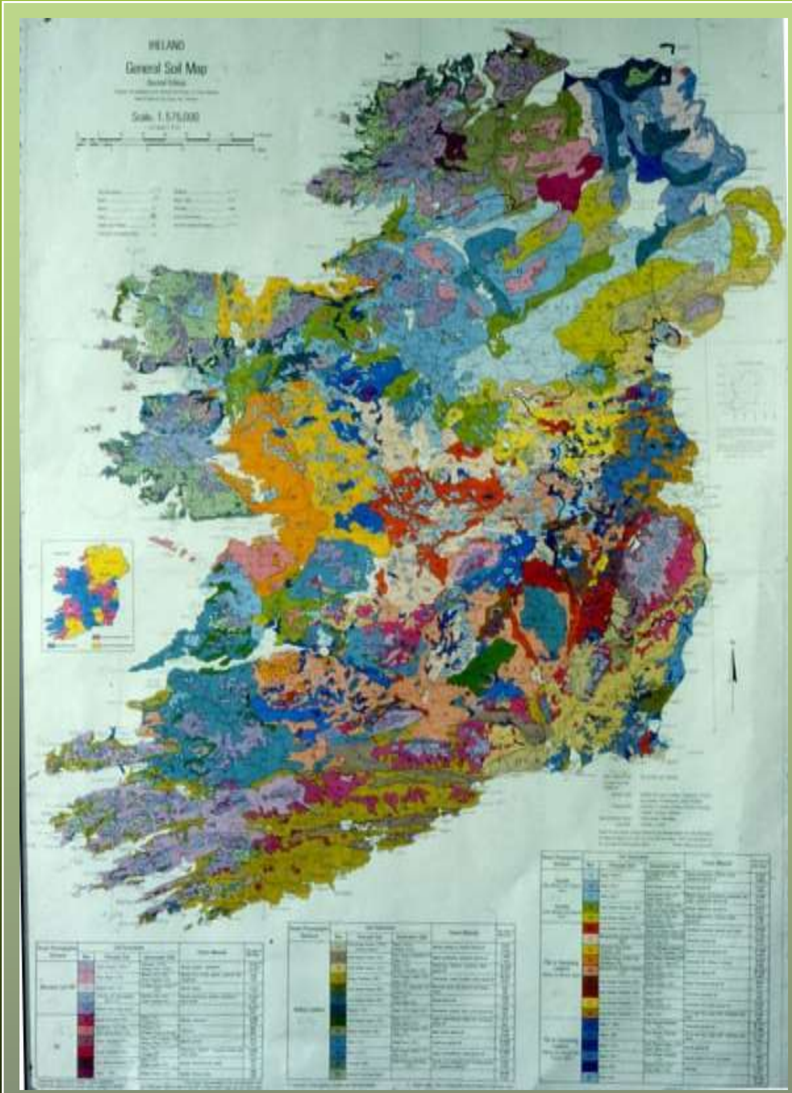
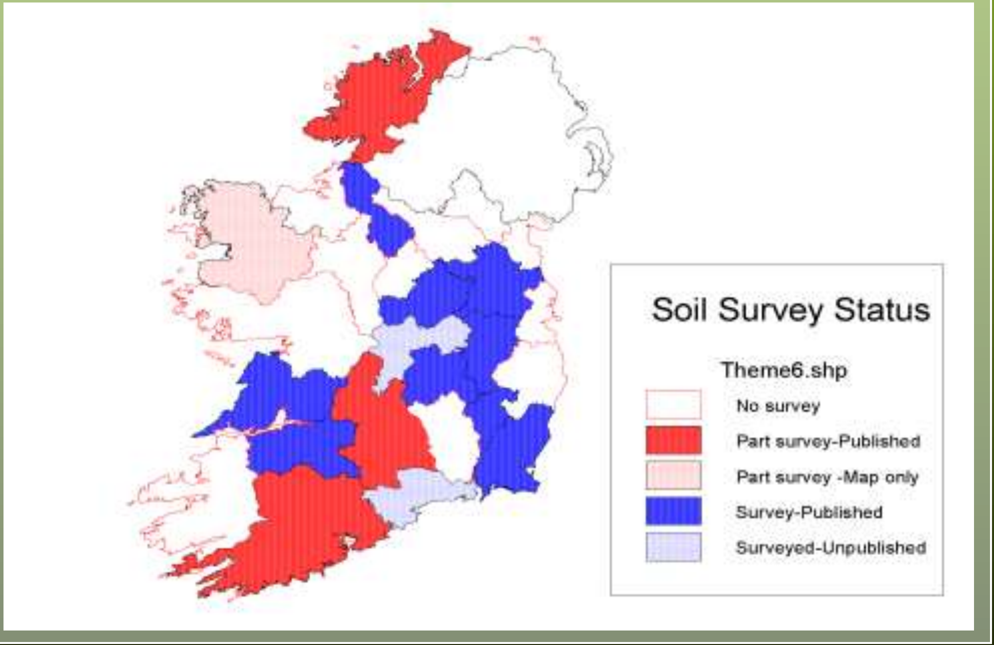
Desk study … Teagasc Soils Maps.

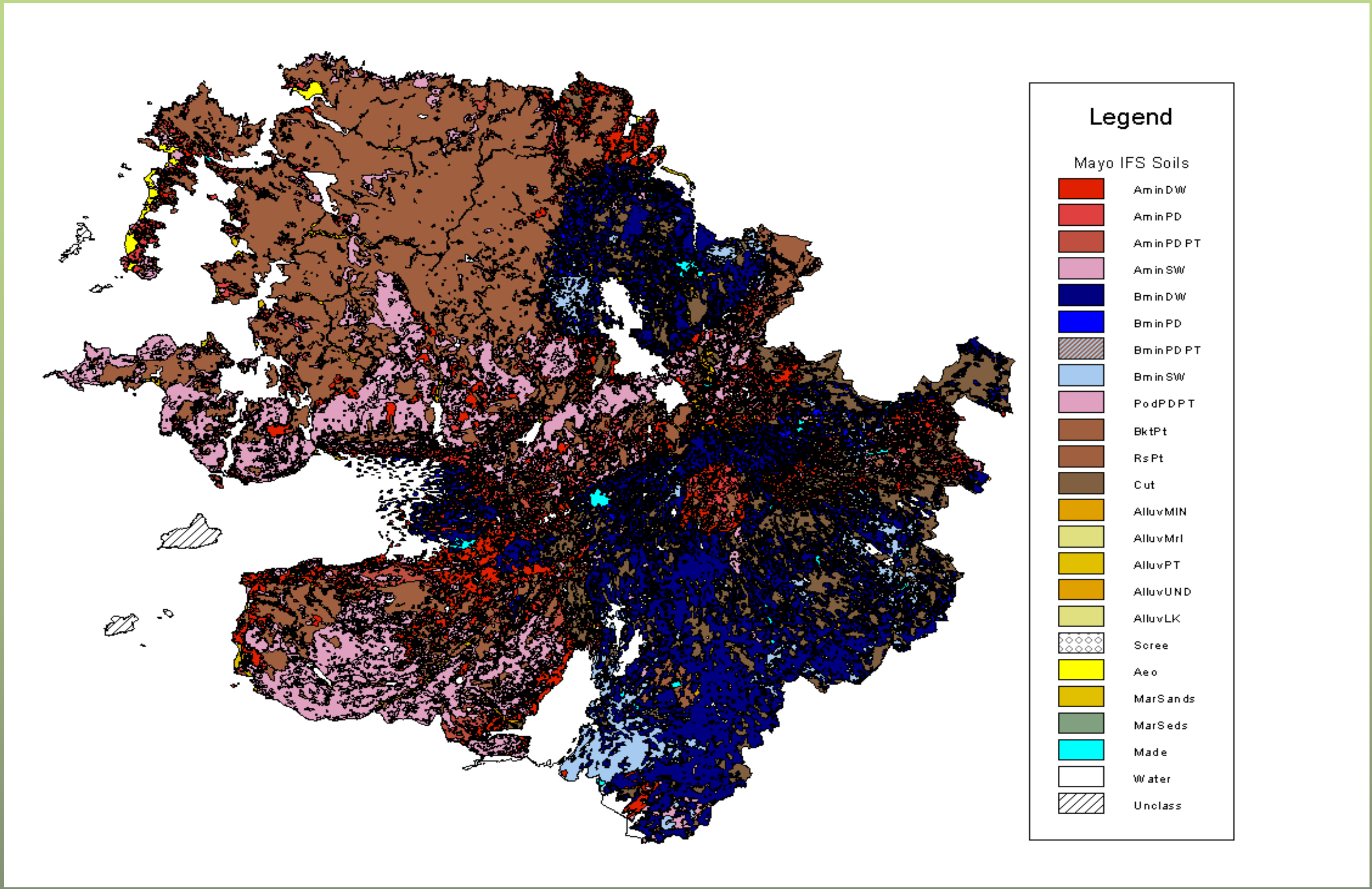


General soil map of Ireland

- **Published in 1980**
- **Entire country at 1:575,000**
- **Soils mapped as associations**
  (*e.g.* Soil unit 22: Gleys 75%, Acid Brown Earths 15%, Peats 10%)



Desk study … EPA/Teagasc Digital Soil Maps.



Desk study: the Soils Maps will tell us ...

- If the soil under the general area around the site is likely to be mineral or organic ...
- What the spatial pattern of this soil interacting with those around it is ...
- If the soil is organic, whether it is a basin, blanket or fen type peat, and whether it is intact or cut-away/reclaimed ...
- If the soil is mineral, whether it is likely to be generally deep or shallow ...
- Whether this is usually acidic or basic in chemical reaction ..
- But, perhaps most importantly, whether it is well drained or poorly drained ... *i.e.* if it is a GLEY
- If this is the case, we usually have some information to hand as to whether the gley is owing to groundwater or surface water ...

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Groundwater Protection Responses

- The responses are the for the benefit of the Local Authority AND the applicant/developer …
  - By consulting a response matrix, a planner or applicant/developer can determine
    - whether or not a development is likely to be acceptable on the site
    - the further investigations that may be necessary to reach a final decision
    - the planning and licensing conditions that may be necessary
  - Four levels of response
    - R1 … Acceptable subject to normal good practice
    - R2a, b, c … Acceptable in principle, subject to conditions in note a, b, c, *etc.*
    - R3 a, b, c …Not acceptable in principle, subject to conditions in note a, b, c, *etc.*
    - R4 … Not acceptable

R2[1]: *Acceptable subject to normal good practice. Where domestic water supplies are located nearby, particular attention should be given to the depth of subsoil over bedrock such that the minimum depths required (EPA, 2021) are met and that the likelihood of microbial pollution is minimised'.*

Response Matrix for On-Site Systems (septic tanks etc.)

VULNERABILITY RATING	SOURCE PROTECTION AREA *		RESOURCE PROTECTION Aquifer Category					
			Regionally Important		Locally Important		Poor Aquifers	
	Inner (SI)	Outer (SO)	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	R3[2]	R3[1]	R2[2]	R2[2]	R2[1]	R2[1]	R2[1]	R2[1]
High (H)	R2[4]	R2[3]	R2[1]	R1	R1	R1	R1	R1
Moderate (M)	R2[4]	R2[3]	R1	R1	R1	R1	R1	R1
Low (L)	R2[4]	R1	R1	R1	R1	R1	R1	R1

R1: Acceptable subject to normal good practice I.e. system design, installation and maintenance in accordance with EPA Code of Practice 2021.

Source Protection Areas …

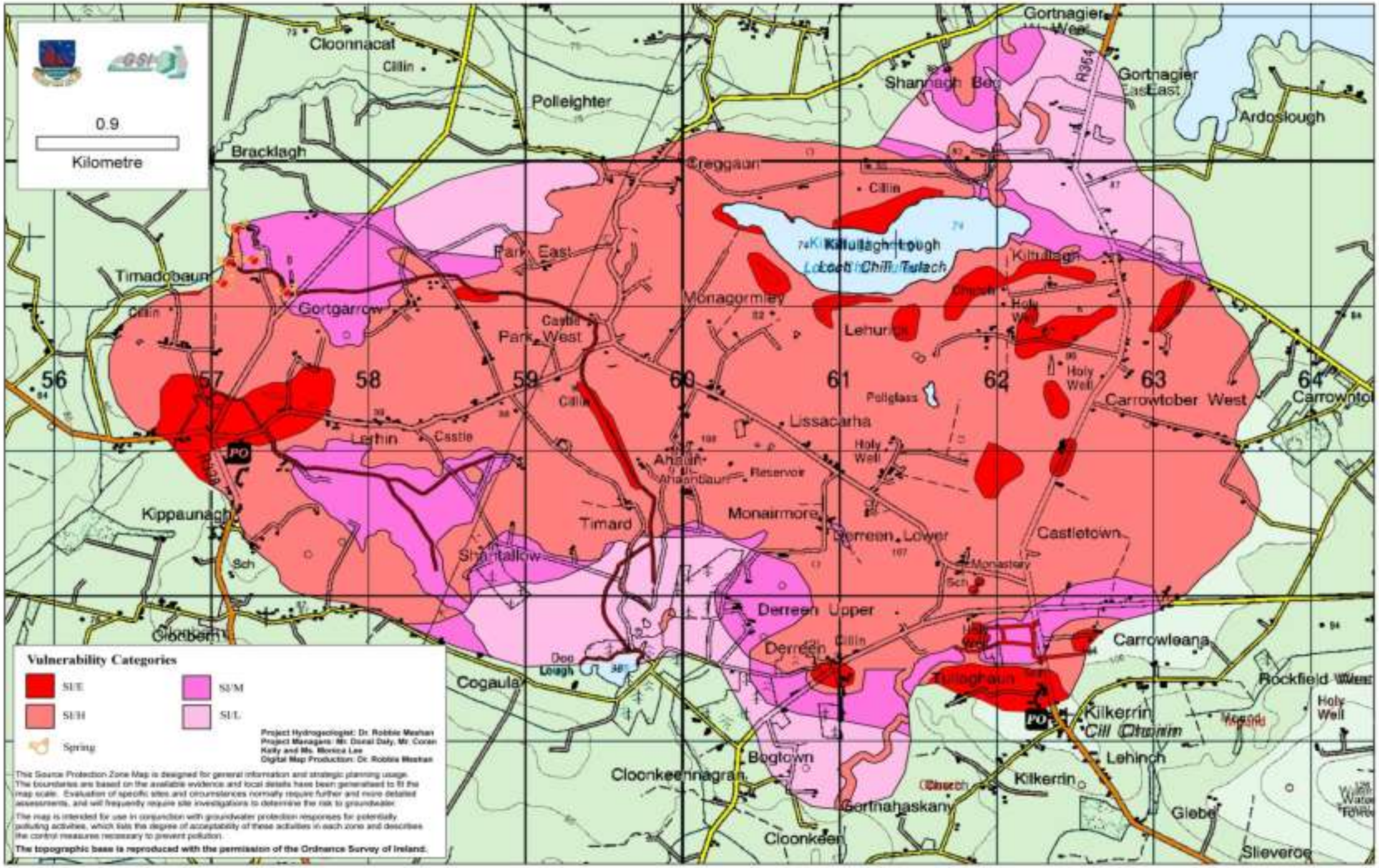

Figure 8: Source Protection Zones for Gortgarrow Springs.

Desk study: the GSI Bedrock, Subsoil, Aquifer and Vulnerability Maps will tell us …

- What the bedrock type is like in an area … *e.g.* sandstone, granite, limestone, shale, quartzite …
- What the structure of this rock is like …
- What type of subsoils lie above these rocks …
- If a GWPS is available, what depth the subsoils are likely to be …
- What aquifer category the site falls into, owing to the underlying rock/subsoil …
- Its general vulnerability to groundwater pollution, owing to the depths and thicknesses of subsoils
- The groundwater protection response, based on this vulnerability and the aquifer category

- Combined with the soils info, we now usually know what conditions to expect underfoot on site … how this relates to the area around it …

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Subsoil, (Specify Type): [ ]

Bedrock Type: [ ]

Aquifer Category: Regionally Important [ ] Locally Important [ ] Poor [ ]

Vulnerability: Extreme [ ] High [ ] Moderate [ ] Low [ ]

Groundwater Body: [ ] Status [ ]

Name of Public/Group Scheme Water Supply within 1 km: [ ]

Source Protection Area: ZOC [ ] SI [ ] SO [ ] Groundwater Protection Response: [ ]

Presence of Significant Sites (Archaeological, Natural & Historical): [ ]

Past experience in the area: [ ]

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

[ ]

Note: Only information available at the desk study stage should be used in this section.

A word on scale and accuracy in the desk study …

- Scale and resolution are related … different scales portray different levels of information

- Different models are appropriate at different scales …

- 5 Natural scales in landscape ecology and geology …
  - Individual unit (field)
  - Sub-catchment (watershed)
  - Catchments
  - Multiple catchments (regions)
  - National


Milford, County Donegal

Site Assessment

Stage 2

The Visual Assessment
(visiting the site)

But why use the visual assessment … what about the desk study?

- We can assess site restriction issues … setback distances
- We can locate visible potential receptors/targets at risk
- We can provide an indirect means of assessing percolation rate (this helps confirm that the test results are reasonable)
- We use it to view/conceptualise both the 2-D and 3-D physical context of the proposed installation

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position:

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☐

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

Existing Land Use:

Vegetation Indicators:

Groundwater Flow Direction:

Ground Condition:

Site Boundaries:

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Roads:

Outcrops (Bedrock And/Or Subsoil):

Surface Water Ponding:

Lakes:

Beaches/Shellfish Areas:

Wetlands:

Karst Features:

Watercourses/Streams:*

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Drainage Ditches:*

Springs:*

Wells:*

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

Slope breaks …

… mentioned in the EPA Code of Practice … there is a separation distance from slope breaks of 4m … SEEPS !

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position:

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☐

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

Existing Land Use:

Vegetation Indicators:

Groundwater Flow Direction:

Ground Condition:

Site Boundaries:

Houses ...

- Houses in the immediate vicinity should be noted.
- Measure the distance, orientation … note this on (sketch) map.

- If you can, check and see what type of treatment system they use?
- Are these working?

- Use the Groundwater Protection Responses for Separation Distances !

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Drainage Ditches:*

Springs:*

Wells:*

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

Find that water ! And note the levels, flows, depths

Levels, flows, depths

Find that water … drains !

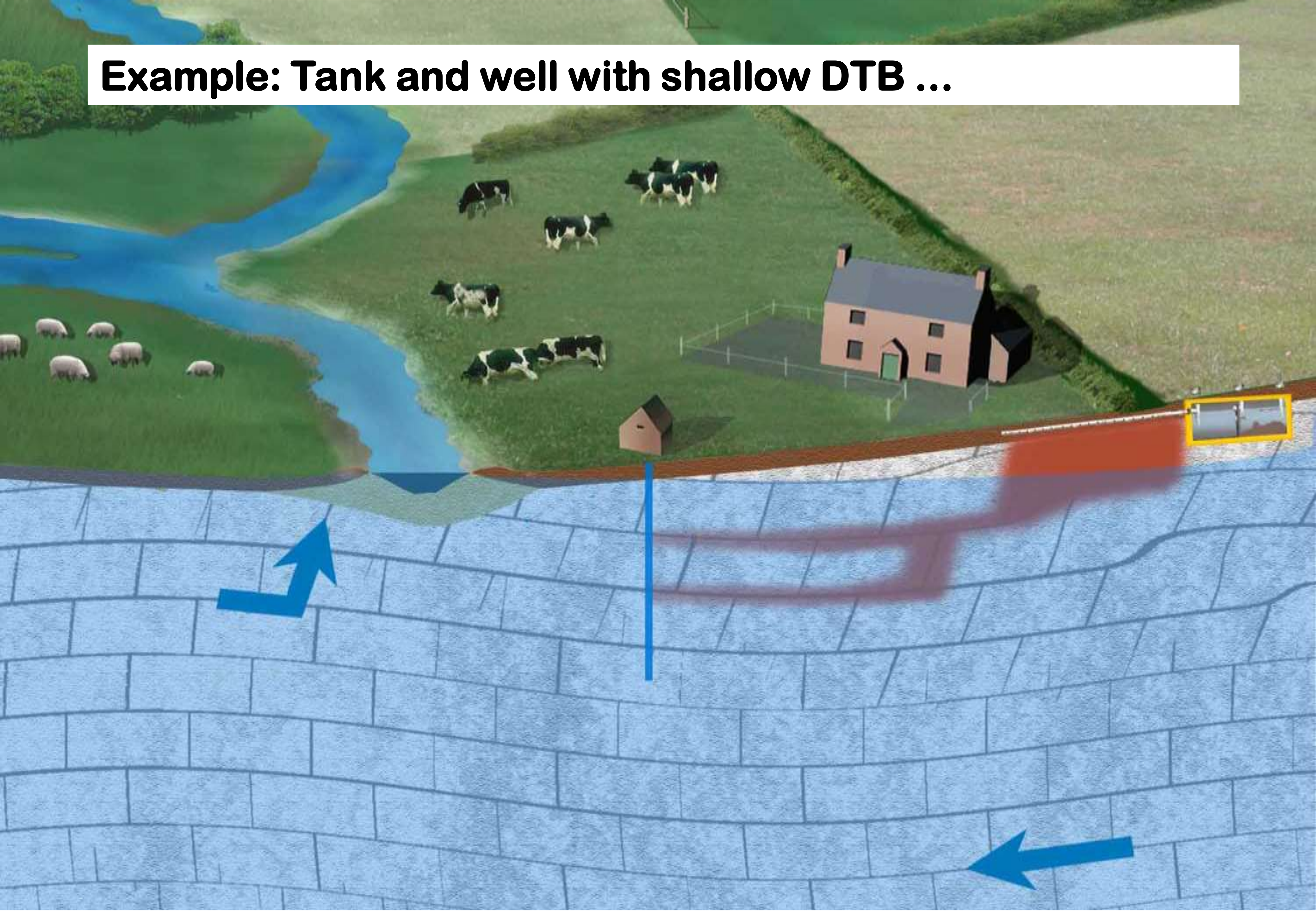
Find that water … drains !

Find that water ! … wells …

The mains !

If there is mains supply … it should not be assumed that there are no wells at risk …

Example: Tank and well with shallow DTB …



Integration of visual assessment into comments ...

- Where is the site EXACTLY within the landscape?
- Where is the proposed percolation area going in respect of roads, houses, boundaries?
- What is the site used for now, and can I infer anything about this?
- Are there outcrops helping my initial 3-D visualisation of the site?
- Does water pond? Are there lakes nearby? Or wetlands? Or shellfish areas?
- What about stream flow ... is it fitting in with what I expected?
- Has the land been drained? Has this helped?
- Are there wells in the area? Where, and what depth are they?
- What about karst features and springs? Where are they, and what depths can I infer?
- Is the vegetation telling me anything?
- Or the ground condition?

- **What is my 3-D mental model of the underground conditions?**

Integration of visual assessment into comments …

- So … we have moved from, after the desk study, an idea of whether groundwater as a resource, wells and/or surface water are LIKELY to be at risk, or not …
- … to one where we know with more certainty if these are at risk, how, where, and why …
- which will help us decide where BEST to install the system on the site …
- And we need to state this for the planner/reviewer! We need to convey to them our thoughts …

  … FOLLOWING THE VISUAL ASSESSMENT ONLY … WE DON'T BRING INFO COLLECTED IN THE TRIAL HOLE OR PERCOLATION TEST RESULTS INTO THIS … AT MOST WE COMPARE WITH DESK STUDY …

Site Assessment

Stage 3

The Trial Hole(s) Assessment

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): ☐

Depth from ground surface to bedrock (m) (if present): ☐

Depth from ground surface to water table (m) (if present): ☐

Depth of water ingress: ☐ Rock type (if present): ☐

Date and time of excavation: ☐ ☐ Date and time of examination: ☐ ☐

Depth of Surface and Subsurface Percolation Tests		Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m							
0.2 m							
0.3 m							
0.4 m							
0.5 m							
0.6 m							
0.7 m							
0.8 m							
0.9 m							
1.0 m							
1.1 m							
1.2 m							
1.3 m							
1.4 m							
1.5 m							
1.6 m							
1.7 m							
1.8 m							
1.9 m							
2.0 m							
2.1 m							
2.2 m							
2.3 m							
2.4 m							
2.5 m							
2.6 m							
2.7 m							
2.8 m							
2.9 m							
3.0 m							
3.1 m							
3.2 m							
3.3 m							
3.4 m							
3.5 m							

Likely Subsurface Percolation Value: ☐

Likely Surface Percolation Value: ☐

Note: *Depth of percolation test holes should be indicated on log above. (*Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.

Following the visual assessment … integrate the trial hole information …

When completing the trial hole assessment, there are three critical questions …

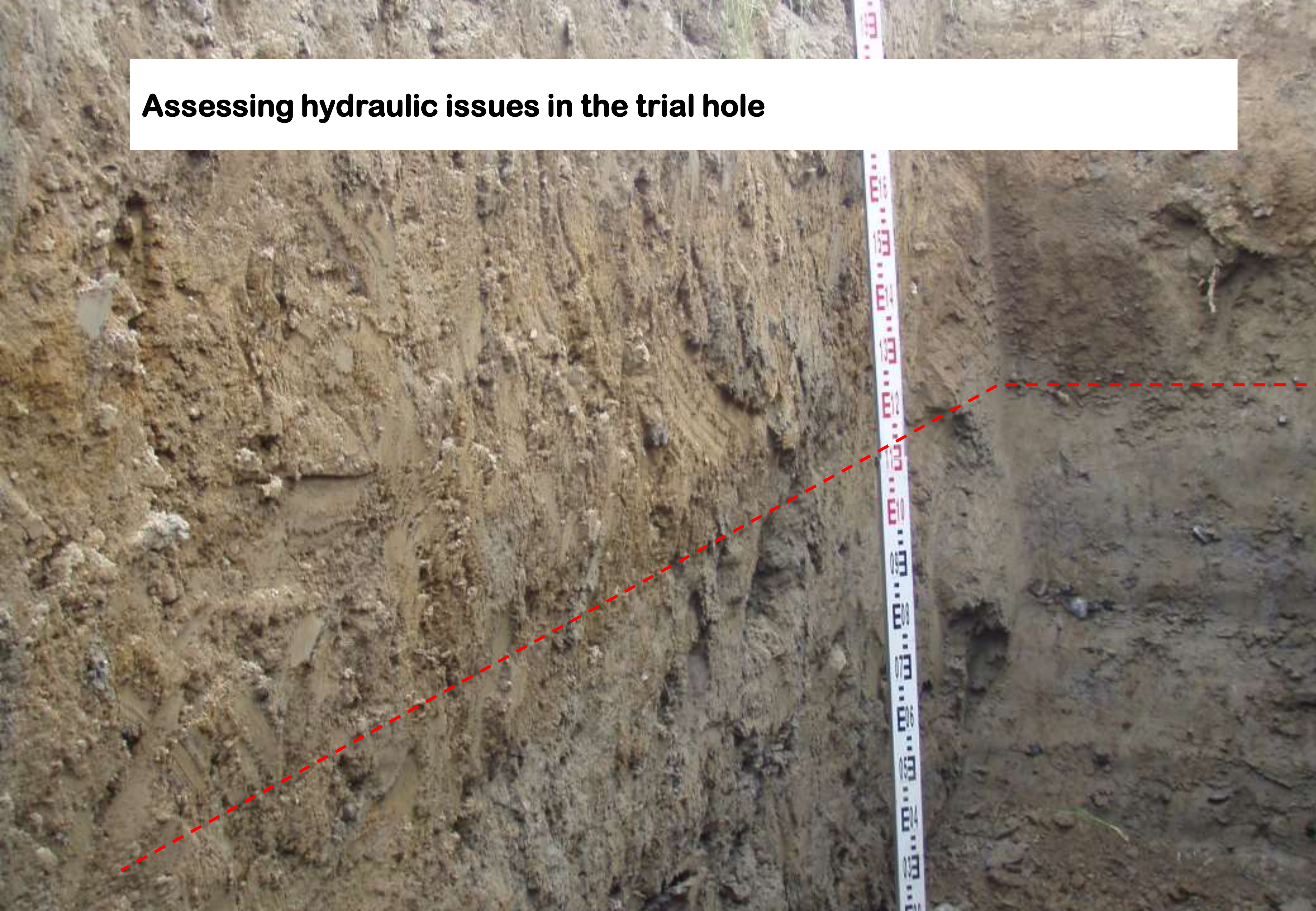
1) Where is the water table at various times of the year?

2) What is the depth to bedrock?

3) What are the characteristics of the soil and subsoil?

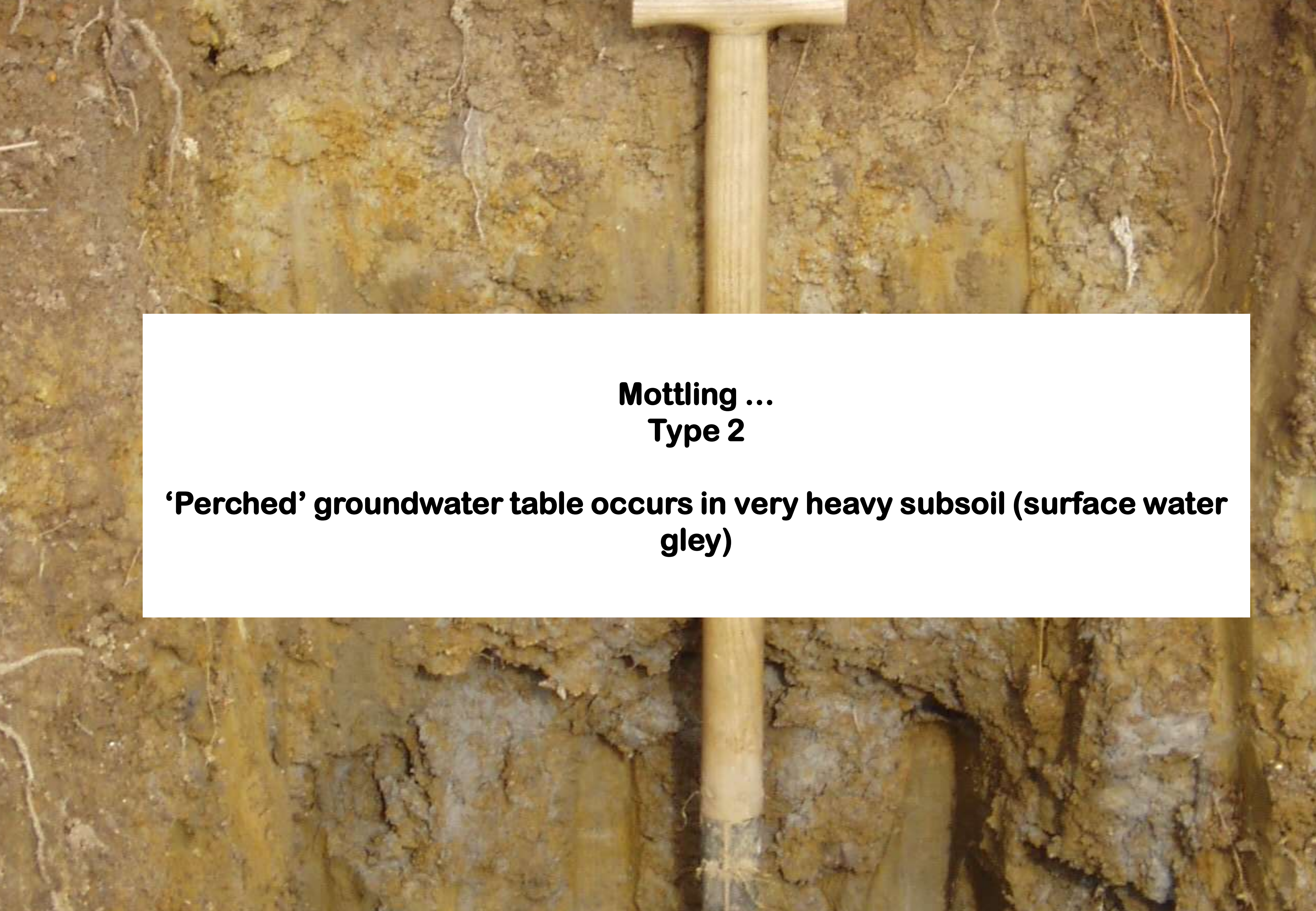
Assessing hydraulic issues in the trial hole

Assessing hydraulic issues in the trial hole



Mottling …
Type 1

Deep groundwater table rising and falling seasonally (Groundwater gley)



Mottling …
Type 2

‘Perched’ groundwater table occurs in very heavy subsoil (surface water gley)

Soil Colour - Munsell charts

Subsoil Texture

- The term refers to the feel of moist soil when rubbed between fingers and thumb; basically refers to the fineness or coarseness of the material …

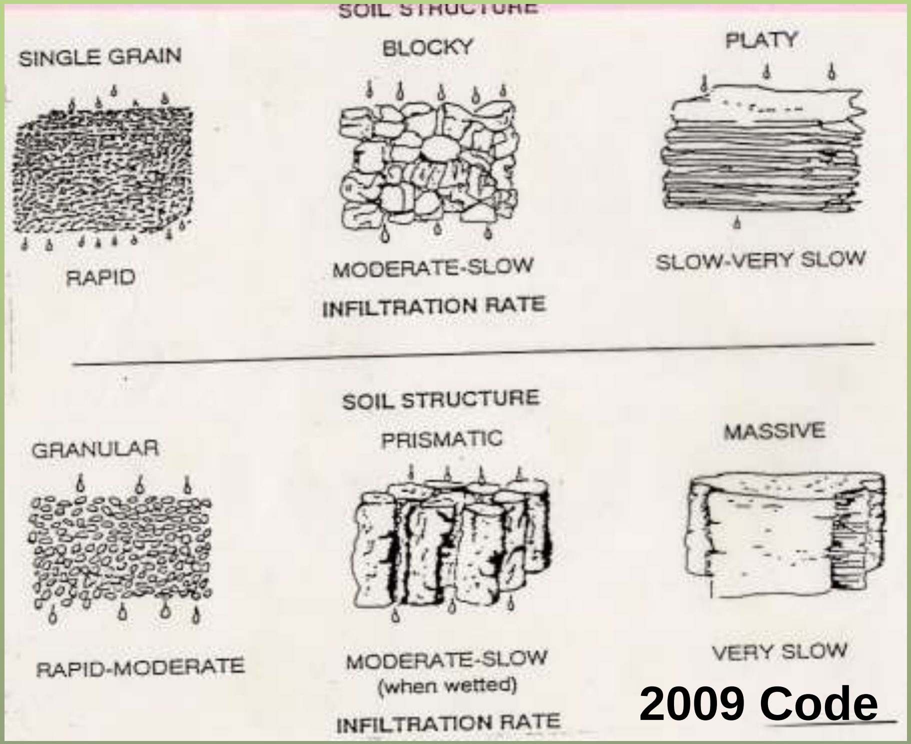
- Or … the relative proportions of the various size particles in the mineral fraction of the soil, these particles are sand, silt and clay < 2mm in diameter

- Mineral particles vary in size from those easily seen to those below the range of high-powered microscope

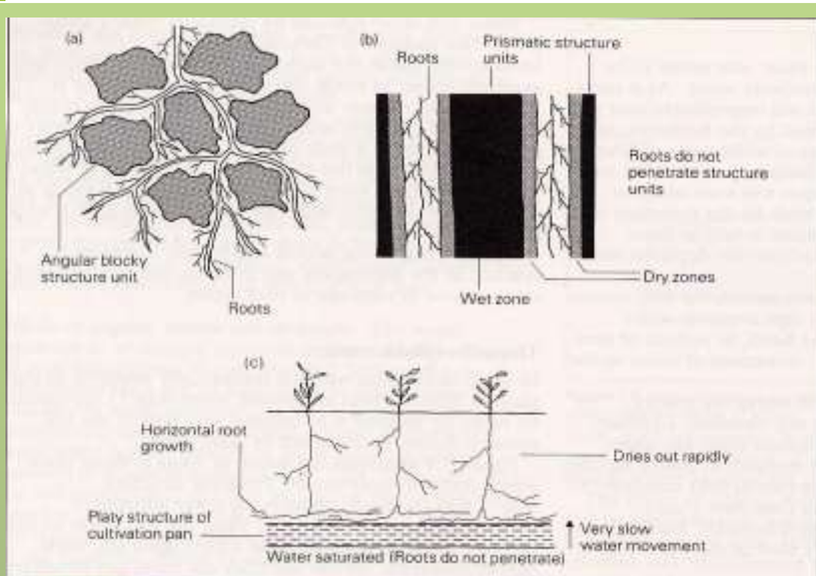
- **The material is classified using the British Standard method, BS 5930**

Soil Structure

- Crumb (1)
- Blocky (2)
- Granular (3)
- Prismatic
- Platy
- Structureless, or massive (3)



Preferential flowpaths … roots … a note …



Try to do the test(s) away from root zones

Groundwater Data Viewer
Display Issue Help
Data Download
Groundwater Programme
Geological Survey Ireland
DECC
Enter Address, Eircode or T
Legend
Groundwater Vulnerability
Groundwater Vulnerability
Rock at or near Surface or Karst
Extreme
High
Moderate
Low
Water
SITE
0.6km
659,663.204 795,037.750 Meters
tains Irish Public Sector Data (Geological Survey Ireland) license

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Depth of water ingress: [ ]

Rock type (if present): [ ]

Date and time of excavation: [ ] [ ]

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3.3 m						
3.4 m						
3.5 m						

Likely Subsurface Percolation Value: [ ]

Likely Surface Percolation Value: [ ]

Note: *Depth of percolation test holes should be indicated on log above. (*Enter Surface or Subsurface at depths as appropriate).
** See Appendix E for BS 5930 classification.

3.2 Trial Hole (contd.) Evaluation:

3.3(a) Subsurface Percolation Test for Subsoil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm) (A)			
Depth from ground surface to base of hole (mm) (B)			
Depth of hole (mm) [B - A]			
Dimensions of hole [length x breadth (mm)]	x	x	x

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time			
2nd pre-soak start	Date			
	Time			

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test			
Time filled to 400 mm			
Time water level at 300 mm			
Time to drop 100 mm (T_{100})			
Average T_{100}			

If T_{100} > 480 minutes then Subsurface Percolation value >120 – site unsuitable for discharge to ground
If $T_{100} \leq$ 210 minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Design then based on 'Extreme' Vulnerability, and appropriate response using 'E' or 'X'

Site Assessment

Stage 4

The Percolation Tests

5.4.3 Percolation Tests

A percolation test assesses the hydraulic assimilation capacity of the subsoil, i.e. the ability for water to move vertically downwards and laterally through side walls of a trench or bed, into the soil and/or subsoil. This test is assessed by recording the length of time for the water level to drop in the percolation test hole by a specified distance. The objective of the percolation test is to determine the ability of the soil and/or subsoil to hydraulically transmit the treated effluent through the material to groundwater. The test also indicates the likely residence time of the treated effluent in the upper subsoil layers and therefore the ability of the soil and/or subsoil to treat the residual pollutants contained in the treated effluent. Details of how to conduct a percolation test are provided in Appendix D.

Percolation tests may be completed at the subsurface (previously known as a T-test) and the surface (previously known as a P-test).

If the trial hole assessment shows that the site has sufficient depth of suitable unsaturated soil and/or subsoil for a septic tank and percolation area, intermittent filter or soil polishing filter discharging at depth (>400 mm), the subsurface test is used and is carried out below the invert of the percolation pipe or at the basal gravel layer in the case of a sand filter with underlying polishing filter.

Both a subsurface (where depth allows) and a surface percolation test are required to establish a percolation value for soils that are being considered to be used for constructing a raised/mounded percolation area (e.g. Figure 7.4), raised intermittent filter, raised polishing filter, low-pressure pipe distribution system or drip dispersal system discharging at or above the ground surface. The surface test will establish whether the soil at the point of discharge has suitable percolation and the subsurface test will confirm the suitability of the underlying soil to ensure adequate infiltration through the subsoil.

Where experience indicates that the site may be borderline, both tests should be carried out at the same time.

To test the percolation value of any site, a minimum depth of 0.5 m of unsaturated soil and/or subsoil is required. The depths required for the various types of DWWTS and the relevant acceptable percolation values for the utilisation of these are shown in Tables 6.3 and 6.4.

Each percolation test is carried out in triplicate, i.e. based on the average of three test holes.

APPENDIX D: PERCOLATION TEST PROCEDURE

Step 1: Three percolation test holes are dug adjacent to the proposed percolation area, but not in the proposed area.

Each hole should be 300 mm x 300 mm x 400 mm deep[2] and the top of the hole should be located as close as possible to the invert of the percolation pipe (or the basal gravel layer in the case of a sand filter with underlying polishing filter), meaning that the base of the hole will be at approximately 950 mm depth if the pipe invert will be at 550 mm (Figure D1). Otherwise the depth of hole should reflect testing the subsoil above the water table or the bedrock in the case of relatively shallow depths of unsaturated soil and/or subsoil.

The exact dimensions of the holes should be noted on the site characterisation form. When initially excavated, the bottom and sides of the hole should be scratched with a knife or wire brush to remove any compacted or smeared soil surfaces and to expose the natural soil surface.

Step 2: The hole should be pre-soaked **twice** from 4 to 24 hours before the start of the percolation test by carefully pouring clear water into the hole to fill it to the full height of **400 mm**. Any soil matrix that falls into the bottom of the test holes during the carrying out of the pre-soakage should be removed prior to refilling. If the water in the hole fully percolates in less than 10 minutes **twice**, proceed to step 3 immediately; otherwise, step 3 commences the next day.

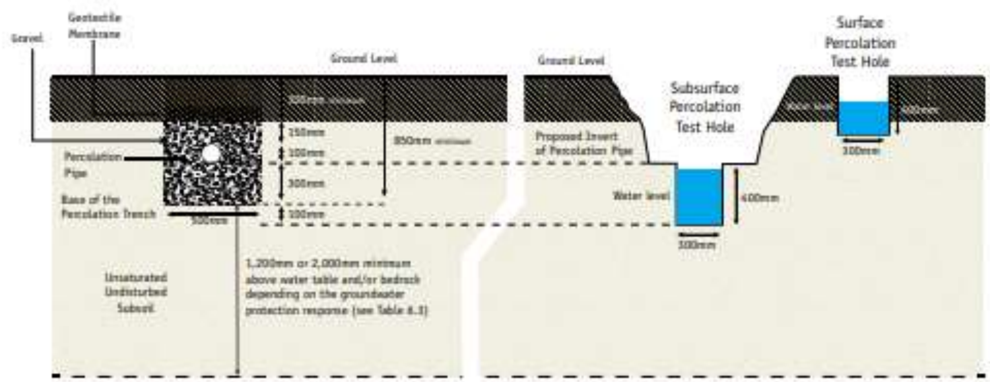


Figure: D1

Step 3: After the hole has been pre-soaked (step 2), it is filled once again to the full height of 400 mm. The time that the hole is filled is noted. The water should be allowed to drop to 300 mm and the time noted.

Percolation test hole	1			2			3		
Fill no.	Start time (at 400 mm)	Finish time (at 300 mm)	Δt (min)	Start time (at 400 mm)	Finish time (at 300 mm)	Δt (min)	Start time (at 400 mm)	Finish time (at 300 mm)	Δt (min)
1									

There are three possible scenarios after this stage of the test, namely:

Scenario 1: If the initial drop from 400 mm to 300 mm is greater than eight hours this means the percolation value will be greater than 120. There is no requirement to complete the test and the trial hole location is not suitable for discharge to ground at the level of that percolation test, as stated in Section 6.3 of I.S. CEN/TR 12566-2:2005.

Scenario 2: If the initial drop from 400 mm to 300 mm in all or any of the holes is less than or equal to 210 minutes then the test should be continued for that hole using the standard method given in step 4.

Scenario 3: If initial drop from 400 mm to 300 mm in all or any of the holes is greater than 210 minutes then skip step 4 and continue using the modified method given in Step 5.

Step 4: Continue to let the level of water drop to 200 mm, recording the times at 300 mm and 200 mm. The time to drop this 100 mm in depth is calculated (Dt). The hole is then refilled again to the 300 mm level and the time for the water level to drop to 200 mm is recorded and Dt is calculated (Table D1). The hole should then be refilled once more and the time is recorded for the water level to drop to 200 mm and Dt is calculated. This means that three tests are carried out in the hole and the hole is refilled twice. The average Dt is calculated for the hole. The average Dt is divided by 4, giving the average time for the water level to fall 25 mm, which gives a percolation value for that hole. This procedure is repeated in each of the test holes. The percolation values for each hole are then added together and divided by 3 to give the overall percolation value for the site.

Table D1: Standard Method

STEP 4: Standard method (where $time_{100} \leq 210$ minutes)											
Percolation test hole	**1**				**2**				**3**		
Fill no.	Start time (at 400 mm)	Finish time (at 300 mm)	Δt (min)	Start time (at 400 mm)	Finish time (at 300 mm)	Δt (min)	Start time (at 400 mm)	Finish time (at 300 mm)	Δt (min)	Finish time (at 200 mm)	Δt (min)
1											
2											
3											
Average Δt value											
Average Δt/4 = [hole no.1] __________(t_1)				Average Δt/4 = [hole no.2] ________(t_2)				Average Δt/4 = [hole no.3] _____(t_3)			

Percolation value* = $(t_1 + t_2 + t_3)/3$ = _______(min/25 mm)

Result of test: percolation value =

COMMENTS:

Step 5: Continue to let the level of water drop to 100 mm, recording the time at 250 mm, 200 mm, 150 mm and 100 mm (Tm) (Table D2). The time factor (Tf) is then divided by the time for each drop to give a modified hydraulic conductivity (Kfs). The equivalent percolation value is calculated by dividing 4.45 by the Kfs. Take the average of the four values from 300 to 100 mm. This is repeated for each relevant percolation hole and the percolation values for each hole are added together and divided by 3 to give the overall percolation value for the site.

Table D2: Modified Method

STEP 5: Modified method (where $time_{100} > 210$ minutes)												
Percolation test hole	**1**				**2**				**3**			
Fall of water in hole (mm)	Time factor $= T_f$	Time of fall (min) $= T_m$	$K_{fs} = T_f/T_m$	T-value $= 4.45/K_{fs}$	Time factor $= T_f$	Time of fall (min) $= T_m$	$K_{fs} = T_f/T_m$	T-value $= 4.45/K_{fs}$	Time factor $= T_f$	Time of fall (min) $= T_m$	$K_{fs} = T_f/T_m$	T-value $= 4.45/K_{fs}$
300–250	8.1				8.1				8.1			
250–200	9.7				9.7				9.7			
200–150	11.9				11.9				11.9			
150–100	14.1				14.1				14.1			
Average percolation value	**Percolation value hole 1 = (t_1)**				**Percolation value hole 2 = (t_2)**				**Percolation value hole 3 = (t_3)**			

Percolation value* $= (t_1 + t_2 + t_3)/3 =$ ______(min/25 mm)

Result of test: percolation value =

COMMENTS:

3.3(a) Subsurface Percolation Test for Subsoil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm) (A)			
Depth from ground surface to base of hole (mm) (B)			
Depth of hole (mm) [B - A]			
Dimensions of hole [length x breadth (mm)]	x	x	x

Step 2: Pre-Soaking Test Holes

Pre-soak start	Date			
	Time			
2nd pre-soak start	Date			
	Time			

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test			
Time filled to 400 mm			
Time water level at 300 mm			
Time to drop 100 mm (T_{100})			
Average T_{100}			

If T_{100} > 480 minutes then Subsurface Percolation value >120 – site unsuitable for discharge to ground
If $T_{100} \leq$ 210 minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1									
2									
3									
Average Δt Value									
	Average Δt/4 = [Hole No.1]		(t_1)	Average Δt/4 = [Hole No.2]		(t_2)	Average Δt/4 = [Hole No.3]		(t_3)

Result of Test: Subsurface Percolation Value = ______ (min/25 mm)

Comments:

Step 5: Modified Method (where $T_{100} > 210$ minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor $= T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	$K_{fs} = T_f / T_m$	T-Value $= 4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 1 = (T_1)			

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor $= T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	$K_{fs} = T_f / T_m$	T-Value $= 4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 2 = (T_2)			

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor $= T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	$K_{fs} = T_f / T_m$	T-Value $= 4.45 / K_{fs}$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 3 = (T_3)			

Result of Test: Subsurface Percolation Value = ______ (min/25 mm)

Comments:

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)			
Depth from ground surface to base of hole (mm)			
Depth of hole (mm)			
Dimensions of hole [length x breadth (mm)]	x	x	x

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date			
	Time			
2nd pre-soak start	Date			
	Time			

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test			
Time filled to 400 mm			
Time water level at 300 mm			
Time to drop 100 mm (T_{100})			
Average T_{100}			

If T_{100} > 480 minutes then Surface Percolation value >90 – site unsuitable for discharge to ground
If $T_{100} \leq 210$ minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)
1									
2									
3									
Average ΔT Value									
	Average ΔT/4 = [Hole No.1]		(T_1)	Average ΔT/4 = [Hole No.2]		(T_2)	Average ΔT/4 = [Hole No.3]		(T_3)

Result of Test: Surface Percolation Value = ______ (min/25 mm)

Comments:

Step 5: Modified Method (where T_{100} > 210 minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor $= T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	$K_s = T_f / T_m$	T - Value $= 4.45 / K_s$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 1 = (T_1)			

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor $= T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	$K_s = T_f / T_m$	T - Value $= 4.45 / K_s$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 2 = (T_2)			

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor $= T_f$	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) $= T_m$	$K_s = T_f / T_m$	T - Value $= 4.45 / K_s$
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 3 = (T_3)			

Result of Test: Surface Percolation Value =

______ (min/25 mm)

Comments:

6.5 Interpreting the Percolation Values of the Soil and Subsoil

The subsoil classifications from the trial hole should be broadly equivalent to the expected percolation test results. If there is not a good correlation then further examination should be undertaken to determine which assessment accurately reflects the suitability of the site to treat and dispose of the effluent. Design should then be based on the more appropriate of the two methods.

Following the determination of the percolation values for the site, Table 6.4 outlines the options available.

Table 6.4: Percolation Values

DWWTS		Percolation value
Septic tank and percolation area		3–50
Secondary treatment system and soil polishing filter	Pumped or underlying gravity discharge (Options 1 and 2) Gravity discharge, 500 mm wide trenches (Option 3)	3–75 (if installed at the surface, the subsurface PV must be 3–90)
	Low-pressure pipe, 300 mm wide trenches (Option 4)	3–90
	Drip dispersal system (Option 5)	3–120
Tertiary treatment system and infiltration area		3–75 (if installed at the surface, the subsurface PV must be 3–90)

If the percolation value is less than 3, the retention time in the soil and/or subsoil is too short to provide satisfactory treatment. Site improvement works comprising importation of soil and/or subsoil with a slower percolation rate and installation of a suitable DWWTS could be considered. Discharge to surface water may be an alternative but requires a Water Pollution Act licence from the local authority.

If the percolation value is greater than 120, the site is unsuitable for a DWWTS discharging to ground. Discharge to surface water may be an alternative but requires a Water Pollution Act licence from the local authority.

Standard and Modified Surface and Subsurface Percolation Tests

The standard percolation test (see Steps 1–4, Appendix D) should be carried out at all sites where the subsoil characteristics suggest that the percolation result might be less than or equal to 50.

In the case of CLAY or SILT/CLAY subsoil, where the percolation value is likely to be greater than 50, a modified percolation test may need to be carried out. This test is outlined in Step 5 of Appendix D and is a modification of the standard method whereby an approximation of the percolation value for relatively poorly permeable sites can be made in a shorter time frame, thus reducing to a degree the time spent on site.


30 minutes


60 minutes


90 minutes


220 minutes

250mm – 340 minutes

200mm – 560 minutes


100mm – 1060 minutes

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1									
2									
3									
Average Δt Value									
	Average Δt/4 = [Hole No.1]		(t_1)	Average Δt/4 = [Hole No.2]		(t_2)	Average Δt/4 = [Hole No.3]		(t_3)

Result of Test: Subsurface Percolation Value = (min/25 mm)

Comments:

Step 5: Modified Method (where $T_{100} > 210$ minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T-Value = 4.45 / K_{fs}
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 1 = (T_1)			

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T-Value = 4.45 / K_{fs}
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 2 = (T_2)			

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T-Value = 4.45 / K_{fs}
300 - 250	8.1					
250 - 200	9.7					
200 - 150	11.9					
150 - 100	14.1					
Average	T- Value		T- Value Hole 3 = (T_3)			

Result of Test: Subsurface Percolation Value = (min/25 mm)

Comments:

CLAY dominated subsoil …

Scraping out sediment …?

Step 2: The hole should be pre-soaked **twice** from 4 to 24 hours before the start of the percolation test by carefully pouring clear water into the hole to fill it to the full height of **400 mm**. Any soil matrix that falls into the bottom of the test holes during the carrying out of the pre-soakage should be removed prior to refilling. If the water in the hole fully percolates in less than 10 minutes **twice**, proceed to step 3 immediately; otherwise, step 3 commences the next day.

Both a subsurface (where depth allows) and a surface percolation test are required to establish a percolation value for soils that are being considered to be used for constructing a raised/mounded percolation area (e.g. Figure 7.4), raised intermittent filter, raised polishing filter, low-pressure pipe distribution system or drip dispersal system discharging at or above the ground surface. The surface test will establish whether the soil at the point of discharge has suitable percolation and the subsurface test will confirm the suitability of the underlying soil to ensure adequate infiltration through the subsoil.

Where experience indicates that the site may be borderline, both tests should be carried out at the same time.

Percolation tests – water supply …

- Assume both surface and subsurface tests are being carried out on a site
- That means six holes, each 300 mm x 300 mm x 400 mm (or 0.3m x 0.3m x 0.4m)
- Each therefore has a volume of $0.036m^3$, or 36 litres
- So (36 x 6) = 216 litres to fill all the holes
- Each hole has to be pre-soaked twice between 4 and 24 hours before the start of the test …
    - 216 + 216 litres = 432 litres
- While testing, holes are once again filled to full height of 400 mm
    - 216 litres
    - And topped up twice by 100 mm (0.1m) = 54 litres x 2 = 108 litres
- Full water volume needed, assuming no spillage, is
    - 216 litres + 216 litres + 216 litres + 108 litres
    - = 756 litres = $0.756\ m^3$

Percolation tests – weather / safety…

The trial hole should remain open for a minimum period of 48 hours to allow the water table (if present) to establish itself. It should be securely fenced off for safety reasons and should be covered over to prevent the ingress of surface water or rainwater. If on a sloping site, a small drainage channel should be dug on the up-slope side of the hole to prevent any surface water inflow into the trial hole.

The health and safety aspects of placing a trial hole on the site should be borne in mind. A trial hole is a deep, steep-sided excavation that may contain water and that may be difficult to exit from if improperly constructed. A risk of collapse of the side walls of the trial hole may exist in some situations. As soon as the assessment has been completed, the trial hole and percolation test holes should be backfilled as they may fill following heavy rainfall and pose an even greater health and safety risk.

Percolation tests – weather …

Sunday, Jan. 24

07	0°		1
08	0°	0.1	1
09	0°	0.1	2
10	0°	0.2	2
11	0°	0.2	3
12	1°	0.3	3
13	1°	0.2	3
14	1°	0.1	3
15	1°		2
16	1°		2
17	-1°		3
18	-2°		3
19	-2°		3
20	-2°		3

Site Assessment

Stage 5

The Conclusions and Recommendations

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area: ☐

Are all minimum separation distances met? ☐

Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system) ☐

Percolation test result: Surface: ☐ Sub-surface: ☐

Not Suitable for Development ☐ **Suitable for Development** ☐

Identify all suitable options

1. Septic tank system (septic tank and percolation area) **(Chapter 7)** ☐
2. Secondary Treatment System **(Chapters 8 and 9)** and soil polishing filter **(Section 10.1)** ☐
3. Tertiary Treatment System and Infiltration / treatment area **(Section 10.2)** ☐

Discharge Route [1]

5.0 SELECTED DWWTS

Propose to install: ☐

and discharge to: ☐

Invert level of the trench/bed gravel or drip tubing (m) ☐

Site Specific Conditions (e.g. special works, site improvement works testing etc.

[1] A discharge of sewage effluent to "waters" (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m^3) ☐

Percolation Area		Mounded Percolation Area	
No. of Trenches	☐	No. of Trenches	☐
Length of Trenches (m)	☐	Length of Trenches (m)	☐
Invert Level (m)	☐	Invert Level (m)	☐

SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m^2)*	Depth of Filter	Invert Level
Sand/Soil	☐	☐	☐
Soil	☐	☐	☐
Constructed Wetland	☐	☐	☐
Other	☐	☐	☐

Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type ☐

Capacity PE ☐

Sizing of Primary Compartment ☐ m^3

Polishing Filter*: (Section 10.1)

Surface Area (m^2)* ☐

Option 1 - Direct Discharge Surface area (m^2) ☐

Option 2 - Pumped Discharge Surface area (m^2) ☐

Option 3 - Gravity Discharge Trench length (m) ☐

Option 4 - Low Pressure Pipe Distribution Trench length (m) ☐

Option 5 - Drip Dispersal Surface area (m^2) ☐

SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information

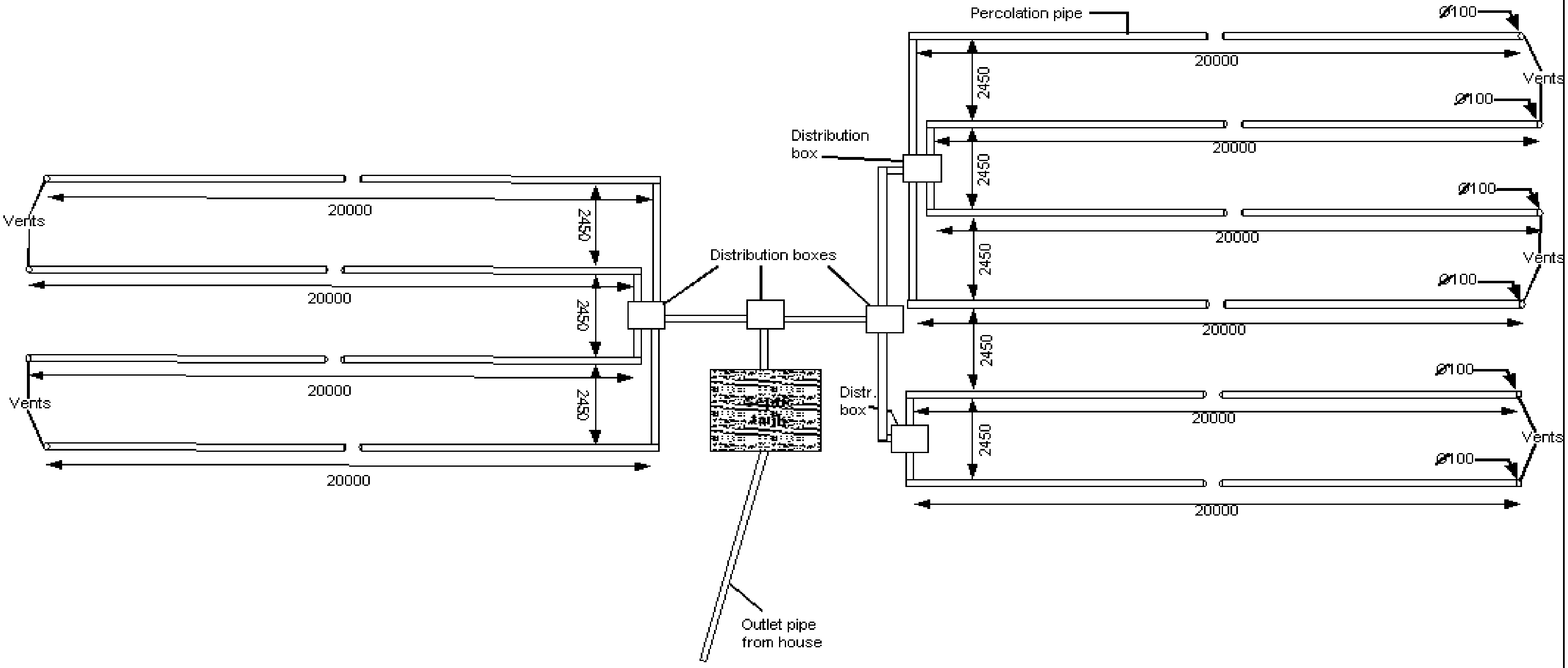
DISCHARGE ROUTE:

Groundwater ☐ Hydraulic Loading Rate * ($l/m^2.d$) ☐ Surface area (m^2) ☐

Surface Water ** ☐ Discharge Rate (m^3/hr) ☐

* Hydraulic loading rate is determined by the percolation rate of subsoil

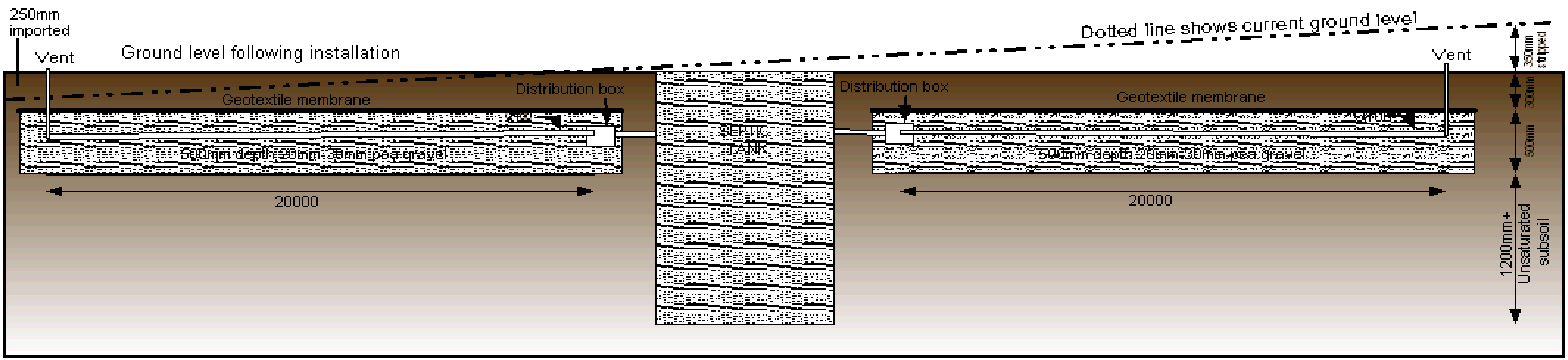
SCALE 1:200
Only figured dimensions to be taken from this drawing. Any queries should be brought to the attention of ______________ before the works are carried out.



SCALE 1:200
Only figured dimensions to be taken from this drawing. Any queries should be brought to the attention of ______________ before the works are carried out.

NOTES
Percolation pipes between 450mm and 550mm below ground level.

Base of trench at 800mm below final ground level



Site Characterisation has <u>5</u> sections

1. Desk Study
2. Visual Assessment
3. Trial hole
4. Percolation Tests
5. System Design

Site Characterisation Form has <u>7</u> sections

All above plus General Details at the start and Site Assessor Details at the end

Complete all <u>fully</u>