A description of Irish Aquifer Categories

The aquifer categories defined in *Groundwater Protection Schemes* (DELG/EPA/GSI, 1999) are intended to describe both resource potential (Regionally or Locally important, or Poor) and groundwater flow type (through fissures, karst conduits or intergranular).

Regionally Important Bedrock Aquifers:

Bedrock aquifer unit is capable of supplying regionally important abstractions (e.g. large public water supplies), or *'excellent'* yields (>400 m^3/d). The continuous aquifer unit generally has an area of >25 km^2. Groundwater flow predominantly occurs through fractures, fissures and joints.

Rf Regionally Important Fissured Bedrock Aquifer:

Aquifer in which the network of fractures, fissures and joints, through which groundwater flows, is well connected and widely dispersed, resulting in a relatively even distribution of highly permeable zones. There is good aquifer storage and groundwater flow paths can be up to several kilometres in length. There is likely to be substantial groundwater discharge to surface waters ('baseflow') and large (>2,000 m^3/d), dependable springs may be associated with these aquifers.

Rk Regionally Important Karstified Bedrock Aquifer:

'Karstification' is the process whereby limestone is slowly dissolved away by percolating waters. It most often occurs in the upper bedrock layers and along certain fractures, fissures and joints, at the expense of others. Karstification frequently results in the uneven distribution of permeability through the rock, and the development of distinctive karst landforms at the surface (e.g. swallow holes, caves, dry valleys), some of which provide direct access for recharge/surface water to enter the aquifer. The landscape is characterised by largely underground drainage, with most flow occurring through the more permeable, solutionally-enlarged, interconnected fissure/conduit zones, which may be several kilometres long. Groundwater velocities through fissures/conduits may be high and aquifer storage is frequently low. Groundwater often discharges as large springs (>2,000 m^3/d), which range from regular and dependable to highly variable ('flashy'). There is strong interconnection between surface water and groundwater.

The degree of karstification ranges from slight to intense. GSI recognises two types of karst aquifer: those dominated by diffuse flow (Rk^d) and those dominated by conduit flow (Rk^c).

Rg Regionally Important Sand/Gravel Aquifer:

A sand/gravel aquifer is classed as **regionally important** if it can supply regionally important abstractions (e.g. large public water supplies), or *'excellent'* yields (>400 m^3/d). It is highly permeable, more than 10 m thick or has a saturated thickness of at least 5 m, and normally extends over *at least* 10 km^2.

Groundwater flows through the pore spaces between sand/gravel grains, and the permeability is mainly determined by the grain size (larger grains give larger pore spaces), and the 'sorting' of the material (the more uniform, the higher the permeability). There is a relatively uniform distribution of

groundwater, good aquifer storage and long groundwater flow paths, typically limited by the aquifer's extent.

Groundwater gradients are typically low ('flatter' water tables), giving relatively low groundwater velocities. There is generally a strong interaction between surface water and groundwater, with groundwater discharging into streams if the water table is high, or conversely, the surface water moving into the aquifer, if the surface water level is high. Large, dependable springs (>2,000 m^3/d) are often associated with sand/gravel aquifers, especially in low-lying areas or at the periphery of the aquifer.

Locally Important Bedrock Aquifer:

Bedrock aquifer unit capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or *'good'* yields (100-400 m^3/d). Groundwater flow occurs predominantly through fractures, fissures and joints.

Lm Locally Important Bedrock Aquifer, Generally Moderately Productive:

Aquifer in which the network of fractures, fissures and joints, through which groundwater flows, is reasonably well connected and dispersed throughout the rock, giving a *moderate* permeability and groundwater throughput. Aquifer storage is moderate and groundwater flow paths can be up to several kilometres in length. There is likely to be a substantial groundwater contribution to surface waters ('baseflow') and large (>2,000 m^3/d), dependable springs may be associated with these aquifers.

This classification also includes aquifers similar to the ***Regionally Important Fractured Bedrock Aquifer (Rf)***, but with a smaller continuous area (<c.25 km^2). Although the aquifer may supply *'excellent'* yields, the small size limits the amount of recharge available to meet abstractions.

Ll Locally Important Bedrock Aquifer, Moderately Productive only in Local Zones:

Aquifer with a limited and relatively poorly connected network of fractures, fissures and joints, giving a *low* fissure permeability which tends to decrease further with depth. A shallow zone of higher permeability may exist within the top few metres of more fractured/weathered rock, and higher permeability may also occur along fault zones. These zones may be able to provide larger 'locally important' supplies of water. In general, the lack of connection between the limited fissures results in relatively poor aquifer storage and flow paths that may only extend a few hundred metres.

Due to the low permeability and poor storage capacity, the aquifer has a low 'recharge acceptance'. Some recharge in the upper, more fractured/weathered zone is likely to flow along the relatively short flow paths and rapidly discharge to streams, small springs and seeps. Groundwater discharge to streams ('baseflow') can significantly decrease in the drier summer months.

Lk Locally Important Karstified Bedrock Aquifer:

Essentially similar to the ***Regionally Important Karstified Bedrock Aquifer (Rk)***, but with a smaller continuous area (<c. 25 km^2). Although the properties imply that this aquifer can supply *'excellent'* yields, the smaller size limits the amount of recharge available to meet abstractions.

Lg Locally Important Sand/Gravel Aquifer:

Similar to a ***Regionally Important Sand/Gravel Aquifer (Rg)***, but with a smaller continuous area (c. 1-10 km^2) and/or less consistent permeability. Although the aquifer may supply *'excellent'* yields, the smaller size limits the amount of recharge available to meet abstractions.

Poor Bedrock Aquifer:

Bedrock aquifer capable of supplying small abstractions (e.g. domestic supplies, small group schemes), or *'moderate'* to *'low'* yields (<100 m^3/d). Groundwater flow occurs predominantly through a limited and poorly-connected network of fractures, fissures and joints.

Pl Poor Bedrock Aquifer, Moderately Productive only in Local Zones:

Similar to a ***Locally Important Bedrock Aquifer, Moderately Productive only in Local Zones (Ll)***, but with fewer and more poorly-connected fractures, fissures and joints, and with less permeable and/or more limited zones of higher permeability. Overall permeability, storage capacity, recharge acceptance, length of flow path and baseflow are likely to be less than in ***Ll*** aquifers.

Pu Poor Bedrock Aquifer, Generally Unproductive:

Aquifer with generally few and poorly connected fractures, fissures and joints. This *low* fissure permeability tends to decrease further with depth. A shallow zone of slightly higher permeability may exist within the top few metres of more fractured/weathered rock, and higher permability may rarely occur along large fault zones. In general, the poor fissure network results in poor aquifer storage, short flow paths (tens of metres) and low 'recharge acceptance'. Groundwater discharge to streams ('baseflow') is very limited.

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Version 1. December 2005
Version 1.1 October 2017