

Rathmore GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km ²)
18 Cork Co. Co. (Northern division) Kerry Co. Co. Limerick Co. Co.	Rivers: Glashawee, Dalua, Glenlara, Owenkeal, Owenanare, Allow, Brogeen, Blackwater, Clyda, Owentaraglin, Awanaskirtaun, Finnow, Owenagloo, Allow, Stream: Ballyclough, Cullavaw, Rampart.	Priory Wood (001072)?	766
Topography	Much of this GWB is a dissected upland plateau with general elevations of 160 to 240 metres OD. Highest elevations are in the northwest at over 400 metres. Lowest elevations, in the east, are about 50 metres OD.		
Geology and Aquifers	Aquifer categories	LI: Locally important aquifer which is moderately productive only in local zones (95%) PI: Poor aquifer which is generally unproductive except for local zone (2%) Pu: Poor aquifer which is generally unproductive (3%) <i>There is also a small area of limestone (0.1% - 4km²) for which classification is pending.</i>	
	Main aquifer lithologies	Namurian Undifferentiated (67%), Namurian Sandstones (23%), Namurian Shales (8%), Westphalian Shales (2%). There are also two very small areas of Dinantian Pure Unbedded Limestones (0.1% - 4 km ²)	
	Key structures		
	Key properties	The Namurian rocks are composed of a variety of thin sandstones, siltstones, flagstones, mudstones and shales. Hydrogeological data are poor for all formations except the Upper Namurian Beds. The sandstone beds within the rock groups have a slightly higher permeability than the shales due to their greater ability to fracture. Water levels have been recorded at depths of more than 20 m but in general the water table is close to the surface reflecting the low permeability of the rock. There are a number of artesian supplies where the sandstone beds are confined by the shales and mudstones. Wells are generally low yielding although some have recorded yields of more than 100 m ³ /d. Specific capacities are usually low being less than 5 m ³ /d/m.	
	Thickness		
Overlying Strata	Lithologies	<i>Subsoil Types identified in Rathmore GWB by Teagasc Parent Material Mapping (Draft): Alluvium (A); Blanket Peat (BktPt), Shales and sandstones sands and gravels (Namurian) (GNSsS); Made Ground (Made); Rock outcrop and rock close to surface (Rck); Till – Devonian Sandstone Till (TDSs), Namurian Sandstone & Shale Till (TNSSs).</i> Large areas of peat occur as blanket bogs on the higher ground in the west on the poorly drained Namurian shales and sandstones.	
	Thickness	Generally speaking, the thickest deposits are tills and till-with-gravel, found in morainic ridges which lie around the edges of the limestone plain, banked up against the upland areas of the Namurian scarp. Deposits in the area south of Newcastlewest reach thicknesses of more than 40 m.	
	% area aquifer near surface		
	Vulnerability	Namurian till is classed as having a low permeability as, although in some areas it has a stony matrix, there is still generally a high clay content due to the weathering of shale clasts.	
Recharge	Main recharge mechanisms	Since there are no karstic areas and no aquifers with regional flow systems which might include losing streams, recharge will be diffuse, from rainfall percolating through the subsoil or areas of outcropping rock. The proportion of the effective rainfall that will recharge the aquifer is determined by the permeability of the soil and subsoil, and by the slope.	
	Est. recharge rates		

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Discharge	Large springs and high yielding wells (m³/d)	<p><i>Note: The following data needs to be checked and updated by RBD Project Consultants.</i></p> <p>Data from GSI Well Database:</p> <p>Ballinatona RWSS Springs, Meelin (warm springs) (EPA CON 2): 6362 m³/d – <i>NB these springs issue from a small limestone aquifer enclosed by the Namurian rocks. (Another warm spring (though with a very small flow) occurs just outside Newmarket town – Trinity Well).</i></p> <p>Additional data from EPA Groundwater Sources List:</p>
	Main discharge mechanisms	Due to the generally low permeability of the aquifers within this GWB and the high slopes, a high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer.
	Hydrochemical Signature	<p>Groundwater emanating from the Namurian rocks is generally slightly hard, with an average total hardness of about 110 mg/l. Trilinear diagrams show a variable water type classification, varying from calcium-magnesium-sodium bicarbonate to sodium bicarbonate, reflecting the high ion exchange capacity of the rocks (Deakin, 1994).</p> <p>The magnesium/calcium ratios are high and are a consequence of ion exchange as calcium is removed from solution, leaving higher relative proportions of magnesium. Sodium varies from 3 – 100 mg/l and this variability may also be due to the ion exchange or be a consequence of the high rainfall.</p> <p>The main groundwater quality problems due to the natural conditions in the ground and the natural chemistry of groundwater are caused by iron (Fe). A high proportion of wells in the Namurian rocks have high iron concentrations (more than 20 mg/l (total Fe) in places) and to a lesser extent manganese (Mn) (up to 0.53 mg/l).</p>
Groundwater Flow Paths		These rocks have no intergranular permeability; groundwater flow occurs in fractures and faults. Permeability is highest in the upper few metres but generally decreases rapidly with depth. In general, groundwater flow is concentrated in the upper 15 m of the aquifer, although deeper inflows from along fault zones or connected fractures can be encountered. Significant yields can be obtained where boreholes are drilled into known fault zones. However, yields are not necessarily sustainable, as the fracture networks are generally not extensive or well connected but primarily concentrated in the vicinity of the fault zones. Springs occur in some instances on fault zones. Groundwater levels are about 1.5-15 m below ground level, and will generally follow the topography. Close to the rivers and streams, water levels will be near ground level. Surface water features are considered to be in hydraulic continuity with the water table. Groundwater flow will be local. Groundwater flow paths are generally short, typically 30-300 m, with groundwater discharging to small springs, or to the streams and rivers that traverse the aquifer. Flow directions are expected to approximately follow the local surface water catchments. Groundwater is generally unconfined.
Groundwater & Surface water interactions		<p>Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.</p> <p><i>Ballinatona RWSS Springs, Meelin, are an exception to this general picture, and represents a different flow system from a karstic limestone aquifer at depth.</i></p>
Conceptual model	<ul style="list-style-type: none"> • The groundwater body is bounded to the west and north by the topographic high and surface water divide which forms the boundary with and other GWBs. • The topography of this body is mainly upland, with ground level rising from about 50 metres OD to the highest elevations. Of 400 metres OD on the catchment boundary. • The groundwater body is comprised of rocks with low transmissivity and storativity, although localised zones of enhanced permeability occur along fault zones. • Flow occurs along fractures, joints and major faults. Flows in the aquifer are generally concentrated in a thin zone at the top of the rock, although deeper groundwater flows along faults and major fractures. • Diffuse recharge occurs across the GWB through the subsoils and rock outcrops. Due to the generally low permeability of the aquifers within this GWB and the high slopes, a high proportion of effective rainfall will runoff, or discharge rapidly to surface water courses via interflow and shallow flow. Where water levels within the unconfined aquifer are high, potential recharge will also be rejected. • The water table can vary between a few metres up to more than 10 m below ground surface, depending upon topography. Groundwater is generally unconfined. Flow path lengths are generally short, ranging 30-300 m. Local groundwater flow directions are controlled by local topography. Overall, groundwater flows to south and east from the topographic highs. • Groundwater discharges to the numerous streams and rivers crossing the aquifer, which are gaining, and to springs. A small volume of groundwater may cross-flow into the adjacent GWBs. 	

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Attachments	Hydrochemical Signature (Figure 1); Groundwater Hydrograph (Figure 2)
Instrumentation	<p>Stream gauges: 18009*, 18010*, 18012*, 18014, 18016*, 18017*, 18025, 18034, 18038, 18050, 18051, 18054. * Dry Water Flow Data available</p> <p>EPA Water Level Monitoring boreholes: Ballyvinitier GWS (CON 9), Roskeen (CON 76), Tawr GWS (CON 78), Newmarket Co-op (CON 113) & (CON 132), (CON 115), Dairygold-Mallow (CON 133), Ballyclough Co-op (CON 142)</p> <p>EPA Representative Monitoring points: Ballinatona RWS (CON 2), Millstreet WS (CON 62), Dairygold Co-op Mallow (CON 133)</p>
Information Sources	<p>Deakin J, Daly D, Coxon C (1998) <i>County Limerick Groundwater Protection Scheme</i>. Geological Survey of Ireland, 61 pp.</p> <p>Pracht M (1997) <i>Geology of Kerry-Cork: a geological description, to accompany bedrock geology 1:100,000 scale map, Sheet 21, Kerry - Cork</i>. Geological Survey of Ireland. 70pp</p> <p>Wright GR (1979) <i>Groundwater in the South Munster Synclines</i>. In: Hydrogeology in Ireland, Proceedings of a Hydrogeological Meeting and associated Field Trips held in the Republic of Ireland from 22 to 27 May, 1979. Published by the Irish National Committee of the International Hydrological Programme.</p>
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

List of Rock units in Rathmore GWB

Rock unit name and code	Description	Rock unit group	Aquifer Classification
Westphalian (undifferentiated) (WES)	Grey shale, thin siltstone & sandstone	Westphalian Shales	Pu
Namurian (undifferentiated) (NAM)	Black shale & sandstone	Namurian Undifferentiated	Ll
Feale Sandstone Formation (FS)	Sandstone, siltstone & shale	Namurian Sandstones	Ll
Glenoween Shale Formation (GN)	Grey silty mudstone	Namurian Shales	Ll
Cloone Flagstone Formation (CF)	Greywacke, siltstone & silty shale	Namurian Sandstones	Ll
Clare Shale Formation (CS)	Mudstone, cherty at base	Namurian Shales	Pu
Annabella Formation (AN)	Interbedded siltstone & sandstone	Namurian Sandstones	Ll
Dinantian limestones (undifferentiated) (DIN)	Undifferentiated limestone	Namurian Undifferentiated	Pending Classification

Rathmore GWB (For reference only)

