

Ballylongford GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystems	Area (km ²)
24 - Deel/ Shannon Estuary South Kerry, Limerick Co. Co.'s	Rivers: Ballyine, White, Glencorbly, Glask-anaskee Ballylongford, Beanablaya, Deel, Daar, Glencorbly, Owvane, Awbeg and Arra. Streams: Tarbert, Broadford, and Charleville.	<i>Ballylongford Bay (001332), Tarbert Bay (001386)</i>	365
Topography	Most of the ground in this GWB is generally flat-lying, with elevations from 50-70 mAOD. The body is almost Z-shaped. Between Ardagh and Broadford (which forms the upright stroke of the Z), an arc-shaped ridge bounds the GWB in the west; the steep slope off the ridge is underlain by the layered sandstones and mudstones of the Shannon Group (SHG). At the base of the ridge lie the easily-weathered Clare Shales. The ridge is more than 300 mAOD. West of Ardagh (the top stroke of the Z), the ground elevation is slightly higher. In this area, much of the ground is above 70 mAOD, and a significant proportion is above 150 mAOD; ground elevation decreases westwards from Foyne. East of Broadford (the bottom stroke of the Z), the ground decreases eastwards to around 100 mAOD.		
	Geology and Aquifers	Aquifer category(ies)	The bulk of the GWB comprises LI : Locally important aquifer which is moderately productive only in local zones. The Clare Shales, which fringe the GWB along the eastern edge are classified as a PI : Poor aquifer which is generally unproductive except for local zones.
Main aquifer lithologies		Namurian Undifferentiated and Namurian Sandstones predominate within the GWB. Namurian Shales comprise a smaller area.	
Key structures		Most of the rocks within the GWB are folded into two large WSW-plunging anticlines. There are smaller, parasitic folds on the larger structures. Strata in the limbs of the minor folds dip at about 30-50° in directions at right angles to the fold axes. There are three sets of faults: NW-SE and NE-SW cross-cutting the fold, and ENE-WSW parallel to the fold axes. Fractures may be more open on the fold axes.	
Key properties		Transmissivity is in the range 2–20 m ² /d, with median values biased to the lower end of the range. At Glin WS a pumping test gave transmissivity of 14 m ² /d [7-27 m ² /d], but this may have been affected by faulting. At Glin WS, estimated groundwater gradients are 0.04 - 0.05. Over the GWB, they are likely to be in the range 0.02 – 0.05. <i>(data sources: Rock Unit Group Aquifer Chapters, Source Report, see references; estimation from maps)</i>	
Thickness		In general, the effective thickness of this aquifer is likely to be ≤15 m, comprising a weathered zone of a few metres and a connected fractured zone below this. However, deeper water strikes (30-90 m) are noted in this aquifer, and seem to be associated with slightly better yields (moderate to good, rather than poor) and better productivities (III and IV, rather than IV and V). Permeable zones are met at deeper levels than in other rocks. In a 3 km deep exploration borehole drilled by Ambassador Oil near Doonbeg (on the north side of the Shannon Estuary), for example, water was struck at 107 m and then intermittently until a depth of 610 m.	
Overlying Strata	Lithologies	<i>[Information to be added at a later date]</i>	
	Thickness	West of Tarbert, subsoil thicknesses are in the range 10-20 m, but can reach 40 m. For most of the rest of the GWB, depth to bedrock is on the order of 5-10 m, reaching 15 m west of Newcastle West. Only around Glin are significant numbers of rock outcrops noted.	
	% area aquifer near surface	<i>[Information to be added at a later date]</i>	
	Vulnerability	<i>[Information to be added at a later date]</i>	
Recharge	Main recharge mechanisms	Diffuse recharge will occur over the entire groundwater body via rainfall soaking through the subsoil. A percentage of potential recharge will not recharge the aquifer, but will be rejected as runoff. More recharge will occur where overlying strata are thinner.	
	Est. recharge rates	<i>[Information to be added at a later date]</i>	
Discharge	Springs and large known abstractions (m ³ /d)	Glin WS (270-400 m ³ /d); Mortlestown WS (360 m ³ /d); Tarbert (208 m ³ /d); Ballylongford WS (68 m ³ /d); Loughill WS (55 m ³ /d); Carrigkerry GWS (330 m ³ /d). <i>[More Information to be added at a later date]</i>	
	Main discharge mechanisms	The main discharges are to the streams crossing and incising into the sandstone and shale rock units. Small springs and seeps issue at the stream heads or along their course. Groundwater will also discharge along the Shannon Estuary. There may be some groundwater flux along the eastern margin of the GWB to the adjacent Shanagolden GWB.	
	Hydrochemical Signature	Groundwaters sampled in this GWB are moderately hard (120-270 mg/l CaCO ₃) and have moderate alkalinities (170-240 mg/l CaCO ₃). Measured electrical conductivity ranges from ~440-560 µS/cm. Spring waters (Tarbert WS) have a calcium bicarbonate signature. Groundwater sampled from a borehole (Glin WS) has a signature varying from Ca-HCO ₃ to Na/K-HCO ₃ and alkalinities greater than total hardness. This is typical of confined waters where ion exchange has occurred. Reducing conditions may also occur. Both iron and manganese can exceed allowable concentrations, these components coming from the shales. Hydrogen sulphide may be problematic . Background chloride concentrations will be higher than in the Midlands, due to proximity to the sea. The bedrock strata of this aquifer are siliceous .	

Groundwater Flow Paths	These rocks are devoid of intergranular permeability; groundwater flow occurs in fractures and faults. Generally, groundwater levels are 0-10 m below ground level (median SWL 6 m), and follow the topography. Flows in the aquifer are likely to be concentrated in a thin zone at the top of the rock; the weathered zone may be up to 3 m thick, with a connected fractured zone a further 10 m, below which is a generally poorly fractured zone. Deeper water levels (up to 20 m) are observed, however, which indicate that there may be zones that are hydraulically isolated from the shallow aquifer. Deep inflow levels and groundwater hydrochemistry indicates that some of the aquifer is confined. Unconfined groundwater flow paths are short (30-300 m), with groundwater discharging to the streams. Confined flow paths may be significantly longer. General groundwater flow directions in the northern part of the GWB are northwards to the Shannon Estuary. In the rest of the GWB, groundwater flow directions are generally towards the inner margin of the GWB.
Groundwater & Surface water interactions	Due to the shallow groundwater flow in this aquifer the groundwater and surface waters are closely linked. Groundwater level data suggest that at least lower parts of perennial streams are being fed by baseflow during the summer months. However, dry weather flows are low (0.1 to 0.5 l/s/km ² at 5 stations in the adjacent GWB, and 0.08 at Ballyhahill), indicating that the aquifer is not capable of sustaining a significant flow.
Conceptual model	<ul style="list-style-type: none"> • The groundwater body is bounded on its southern boundaries by topographic highs, in the northwest by the Shannon Estuary, and to the east by the contact with the Dinantian Upper Impure Limestones of the Shanagolden GWB. The terrain is gently undulating, apart from the steep scarp defining the western boundary. • The groundwater body is composed primarily of low transmissivity rocks, although localised zones of enhanced permeability do occur along faults. Groundwater flows along fractures, joints and major faults. • Recharge occurs diffusely through the subsoils and via outcrops. It occurs especially in upland areas where the subsoil is thinner and rainfall higher. • The aquifers within this GWB are both unconfined and confined. Most flow in this aquifer will occur near the surface; the effective thickness of this aquifer is likely to be about 15 m, comprising a weathered zone of a few metres and a connected fractured zone below this. The water table is from 0-10 m below ground level and follows topography. Deep inflow levels and hydrochemistry indicates confined conditions in higher permeability strata from which better yields can be obtained. Unconfined flow path lengths are relatively short, and in general are between 30 and 300 m. Low DWFs indicate that aquifer storage is low. • Three delineated gravel aquifers overlie the GWB: Carrigkerry, Ballycolane and Strand. • Groundwater discharges to the streams crossing the aquifer, and to springs and seeps. Unconfined flow directions are controlled by local topography. Overall, flow directions are to the Shannon Estuary (north) in the northern part of the GWB and to the east/northeast in the rest of the GWB. • Due to the shallow groundwater flow in this aquifer the groundwater and surface waters are closely linked. This interaction is rapid and seasonal; due to low storage and the local nature of the flow paths, summer baseflows to the rivers are low.
Attachments	Hydrochemical signature (Figure 1)
Instrumentation	Stream gauges: 24018, 24032, 24033*, 24035, 24041. (* denotes specific dry weather flow calculated for this station.) EPA Water Level Monitoring boreholes: N/A. EPA Representative Monitoring boreholes: Tarbert WS (KER 58); Glin WS (LIM 49).
Information Sources	Conlon, V. and Wright, G. (1998) <i>County Kerry Aquifer Classification (draft)</i> . Geological Survey of Ireland Report to Kerry Co. Co., 18 pp. Deakin, J., Daly, D. and Coxon, C. (1998) <i>County Limerick Groundwater Protection Scheme</i> . Geological Survey of Ireland Report to Limerick Co. Co., 72 pp. Hudson, M. (1995) <i>Glin WS: Groundwater Source Protection Zones</i> . Geological Survey of Ireland Report to Limerick Co. Co., 8 pp. Aquifer Chapter: Namurian Undifferentiated, Sandstone and Shale.
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

Figure 1: Hydrochemical signature

Chemical Signature of Relatively Uncontaminated Waters (expanded Durov Plot)



