

Dunshaughlin GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority		Associated surface water bodies	Associated terrestrial ecosystems	Area (km ²)
Meath Co. Co. Hydrometric Area 09		Tolka, Fairyhouse Stream	None	18
Topography		This GWB lies on the southern boundary of Boyne and Liffey Catchments. The area is mostly low-lying with elevations increasing in the northwest to 150 m OD.		
Geology and Aquifers	Aquifer type(s)	Lm: Locally important aquifer, generally moderately productive		
	Main aquifer lithologies	Lucan Formation (LU) Dark Limestone and Shale (Calp)		
	Key structures.	The limestones in this area are more structurally deformed than those to the south around Dublin. Drilling near the town of Batterstown, less than a kilometre outside the area of this GWB, indicates the limestone is highly weathered to a depth of 45m. The limestone bedrock was so unstable that 150 mm steel casing had to be set down to 45m to support the well walls and groundwater inflows were recorded at various levels throughout the well (Cullen 1986).		
	Key properties	The pumping test analyses from the Dunshaughlin PWS indicated transmissivities of around 100 - 300 m ² /d from the 12-hour pumping test. Analyses of an earlier 72 hour pumping test with a final pumping rate of 1300m ³ /d and a drawdown of 54 metres indicated transmissivities of around 50-60 m ² /d. These figures are much lower than those obtained from the 12-hour test and indicate that a higher permeability zone has been developed close to the surface, possible in the upper broken limestone bedrock. Thus the upper 10 metres of the limestone have a much higher permeability and with increasing depth the permeability decreases.		
	Thickness	The driller's log (122 m deep) for the Dunshaughlin public supply well indicated 110 m of black limestone with shale bands. The upper 9 m were reported to be highly broken and were cased for support (Woods 1996). While drilling the production well, major inflows were recorded between 67 to 73 m and 103 to 110 m below ground. A borehole to the north of Batterstown found the upper 33 m of limestone to be weathered and broken, and so unstable that steel casing had to be set. Groundwater inflows were recorded at various levels.		
Overlying Strata	Lithologies	The subsoil is dominated by limestone-derived Till, with some smaller areas of Till derived from Namurian Rocks located in the northeast. Within the limestone till are small areas of lacustrine deposits, clayey to marly in texture. These lakes are now dry except for the area approximately 0.5 km northeast of Dunshaughlin.		
	Thickness	Subsoil thickness is highly variable but is generally between 5 to 10 m, with thinner subsoils in the higher areas to the west.		
	% Area aquifer near surface	Very Low < 5%		
	Vulnerability	The vulnerability is mostly Moderate with some significant areas of Extreme to the west on hillier ground.		
Recharge	Main recharge mechanisms	The dominant process in this area will be diffuse recharge. Effective rainfall will percolate through the limestone till into the rock recharging the water table. Therefore the highest recharge rates will be found where subsoil is thinnest and most permeable. In this case it can be expected that there will be a higher rate of recharge to the west where there are large outcrop areas and where rock is close to the surface.		
	Est. recharge rates	<i>[Information to be added at a later date]</i>		
Discharge	Springs and large known abstractions	Dunshaughlin (900 m outside GWB - 810m ³ /d), Belshamstown (Spring).		
	Main discharge mechanisms	Discharge from this aquifer will be to the overlying rivers as baseflow or as springs along the bank of the river. There may also be some discharge to the southeast as the limestones become less permeable.		
	Hydrochemical Signature	Although there are no hydrochemical data available for this GWB the hydrochemical analyses of groundwater at the Dunshaughlin source (only 800m away) indicates a very hard water (300-380 mg/l (CaCO ₃)), with a high alkalinity (300-330 mg/l (CaCO ₃)). Conductivities are also high ranging from 480-670 µS/cm. This groundwater can be classed as calcium bicarbonate water.		
Groundwater Flow Paths		The surface water catchment divides between the River Boyne to the north and the Broadmeadow River to the southeast runs along the northern boundary of this GWB. Groundwater flow, from the regional viewpoint, is towards the southeast from this divide, but at a more local scale, it is dependent on topography. The exact flow direction is difficult to assess due to the relative flat lying ground near the well, but seems to converge towards the centre of the GWB where the main surface water body overlies the rock. Groundwater gradients in the general area may range from approximately 0.01 to 0.02. Groundwater flow will be mostly in the upper 30 metres of the rock where a connected network of fissures and joints allow water to move at a relatively fast pace.		

Groundwater & surface water interactions	The topographic divide between the Boyne and Liffey catchments lies on along the northern boundary of this GWB. It is assumed that the groundwater divide and the surface water divides are located in the same position (there is no information to indicate otherwise). The groundwater divide may be displaced eastwards by the effects of pumping at Dunshaughlin water supply by approximately 200 metres.
Conceptual model	This GWB is located about 1 km south of Dunshaughlin, Co. Meath. There area is low-lying with some hillier areas to the northwest and northeast. The GWB is composed of moderate permeability fractured limestone. The boundaries are defined to the north by the catchment boundary of the River Tolka and to the south by the extent of a structural region (Dunphy 2003) within which the Lucan Formation has been classified as an Lm aquifer. The highest rates of recharge are likely to occur in the uplands to the west where there are thinner subsoils. This increase amount of recharge, in addition to the higher elevations, will form a recharge mound from which groundwater flow along the hydraulic gradient, that is sloping down towards the low-lying river floodplains at the center of the GWB. The majority of groundwater flow in this aquifer will be in the upper fractured layer of the rock although there is evidence of deep groundwater flow in fractures to significant depths (60 & 100 m.b.g.l.). It may be possible for the aquifer to maintain groundwater flow paths in the order of a kilometre. Discharge from the aquifer will be to the over lying rivers and as springs and there may be some discharge along the geological contact with the less permeable limestone to the southeast.
Attachments	
Instrumentation	Stream gauge: None Borehole Hydrograph: None EPA Representative Monitoring boreholes: None
Information Sources	Cullen K T (1986) <i>Report on the Drilling and Testing of Trial Well No. 2 at Batterstown, Co. Meath</i> . Report to Meath Co. Co. McConnell B, Philcox M & Geraghty M, 2001. <i>Geology of Meath: A geological description to accompany the bedrock geology 1:100,000 scale map series, Sheet 13, Meath</i> . Geological Survey of Ireland. 77 p. Woods L, Meehan R & Wright G R, 1998. <i>County Meath Groundwater Protection Scheme</i> . Report to Meath County Council. Geological Survey of Ireland. 54 p. Woods L (1996) <i>Dunshaughlin Public Water Supply, Groundwater Source Protection Zones</i> . Report to Meath County Council. Geological Survey of Ireland.
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

Formation Name	Code	Description	Rock Unit Group	Aquifer Classification
Lucan Formation	LU	Dark limestone & shale (Calp)	Dinantian Upper Impure Limestones	Lm
Loughshinny Formation	LO	Dark micrite & calcarenite, shale	Dinantian Upper Impure Limestones	Lm

