Glenfarne GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority		Associated surface water bodies	Associated terrestrial ecosystems	Area (km^2)
Hydrometric Area 36 Cavan Co. Co. Leitrim Co. Co.		***Rivers:*** Cornavannoge, Roo ***Streams:*** 161 unnamed ***Lakes:*** L. Cullentragh, L Naweeloge, L. Nagingare, L. Adereen.	Boleybrack Mountain (O'Riain, 2004)	53
Topography		Located between the peaks of Thur Mountain (440 mAOD), Dough Mountain (460 mAOD) and Boleybrack (440 mAOD), topographic divides are the basis for the northern, western and southern GWB boundaries (Hydrometric Area 35). The eastern boundary comprises a more productive (Lm) aquifer. The topography is mountainous along the northern and southern boundaries with an E-W orientated river valley between the two. Surface water flows downslope to the valley and is then channelled in an easterly direction towards Lough Macnean Upper.		
Geology and Aquifers	**Aquifer type(s)**	The central/western GWB area comprises bands of **Pl:** Poor aquifer, unproductive except for local zones (c.47%), and **Pu:** Poor aquifer, generally unproductive (37%), which alternate down the sides of the mountains. To the east and west, the poor aquifers are flanked by thin bands of **Ll:** Locally important aquifer, moderately productive only in local zones (c.10%), and then a thicker band of **Lm:** Locally important aquifer, generally moderately productive (4%) along the western boundary. There is a small pocket of **Rkc:** Regionally important karst aquifer, dominated by conduit flow, also along the western boundary.		
	Main aquifer lithologies	Layers of Namurian Shales (37.72%) and Namurian Sandstones (15.97%) cover the upper mountain areas, with the valley predominantly underlain by Dinantian Shales and Limestones (31.28%). Thin bands of Dinantian mixed Sandstones, Shales and Limestones (10.09%) occur to the east and west, which are adjacent thicker bands of Dinantian Sandstones (4.51%). Small areas of Dinantian Pure Bedded Limestones (<0.5%) are mapped along the western boundary. Refer to Table 1 for details.		
	Key structures.	The deformation in this region has resulted in a number of E-W, and associated perpendicular, faults that cut the GWB, and the rocks dipping in various directions mainly by 5-10°.		
	Key properties	No hydrogeological data are available for this GWB although transmissivity values for the Pu/Pl and Ll aquifers are expected to be <20 m^2/d, and possibly <10 m^2/d in the shale-dominated lithologies (e.g. Namurian Shales). Storativity is also expected to be low. Sandstones (Lm aquifer) generally have a higher fissure permeability and therefore, the potential to have relatively high transmissivity values – in the order of 10-50 m^2/d, although they may be higher in the vicinity of faults (c.100-150 m^2/d). Accordingly, storativity is also expected to be slightly higher. In the low permeability rocks (Pu, Pl), groundwater gradients are expected to be greater than c.0.01, especially given the mountainous terrain. Less steep gradients are expected in the more productive Lm aquifers. *(Namurian Aquifer Chapter; Dinantian Shales and Limestones Aquifer Chapter)*		
	Thickness	Most groundwater flux in all of the rock groups is expected to be in the uppermost part of the aquifer. This is thought to comprising a broken and weathered zone typically less than 3 m thick, a zone of interconnected fissuring, and a zone of isolated poorly connected fissuring typically less than 150 m. The zone of interconnected fissuring is likely to be in the region of 10-15 m thick in most of the rock groups however, fissure permeability is generally expected to be more developed in the Sandstone rock group. Therefore, this zone may extend to between 30-40 m thick. The deep zone of isolated, poorly connected fissuring is less likely to be associated with the Pu aquifers.		
Overlying Strata	**Lithologies**	Subsoil data are unavailable over 93% of this GWB (Leitrim). The remaining area mainly comprises peat (4%) and till (2%).		
	Thickness	From the available outcrop and topographic information (Leitrim), subsoil is expected to be absent or thin (<3 m thick) over a large proportion of this GWB, especially at higher elevations. Deeper subsoil is often found in valley, however there are no data to substantiate this.		
	% area aquifer near surface	*[Information will be added at a later date]*		
	Vulnerability	Although vulnerability data are not available, a large proportion of the GWB is expected to be extremely vulnerability as subsoil is likely to be thinner over the higher areas to the north and south of the body.		
Recharge	**Main recharge mechanisms**	Diffuse recharge occurs via rainfall percolating through the subsoil and rock outcrops. Due to the low permeability of some subsoil deposits and the aquifers, a high proportion of the effective rainfall will discharge to the streams in the GWB. In addition, the steep mountainous slopes will promote surface runoff. The relatively high stream density is likely to be influenced by the lower permeability rocks.		
	Est. recharge rates	*[Information will be added at a later date]*		

Discharge	**Important springs and high yielding wells**	Springs: None identified. Sources: None identified. Excellent Wells: None identified. Good Wells: None identified.
	Main discharge mechanisms	The main groundwater discharges are to the rivers and streams crossing the GWB, reflecting short groundwater flow paths. Small springs and seeps are likely to issue at the stream heads and along their course. Groundwater may also flow into the adjacent, higher permeability Lm GWB.
	Hydrochemical Signature	No available data within this particular GWB. ***National classification:*** Namurian Rocks Calcareous. Generally $CaHCO_3$ signature, although also ranges from $MgHCO_3$, $Na/KHCO_3$, Na/KSO_4 to MgNa/KCl where groundwater has longer residence time. Alkalinity (mg/l as $CaCO_3$): range of 4-436; mean of 107 (107 'non-limestone subsoil' data points) Total Hardness (mg/l): range of 11-473; mean of 173 (108 'non-limestone subsoil' data points) Conductivity (μS/cm): range of 76-869; mean of 418 (112 'non-limestone subsoil' data points) ***National classification:*** Dinantian Rocks (excluding Sandstones) Calcareous. Generally $CaHCO_3$ signature. Alkalinity (mg/l as $CaCO_3$): range of 10-990; mean of 283 (2454 data points) Total Hardness (mg/l): range of 10-1940; mean of 339 (2146 data points) Conductivity (μS/cm): range of 76-2999; mean of 691 (2663 data points) ***National classification:*** Dinantian Sandstones Calcareous. Generally $Ca\text{-}HCO_3$ signature. Alkalinity (mg/l as $CaCO_3$): range of 5-524; mean of 153 (65 'non limestone subsoils' data points) Total Hardness (mg/l): range of 5-502; mean of 162 (67 'non limestone subsoils' data points) Conductivity (μS/cm): range of 39-1184; mean of 408 (69 'non limestone subsoils' data points) *(Calcareous/Non calcareous classification of bedrock in the Republic of Ireland report)*
Groundwater Flow Paths		In the absence of inter-granular, groundwater flow is expected to be concentrated in upper fractured and weathered zones and in the vicinity of fault zones. Unconfined flow paths are likely to be short (30-300 m), with groundwater discharging rapidly to nearby streams and small springs from the Pu/Pl and Ll aquifers. In the Sandstones (Lm aquifer), flow is of a regional scale i.e. long flow path lengths (up to 2000 m) would be expected although are likely to be shorter in discharge areas (c.100-300 m). Groundwater flow directions are expected to follow topography i.e. downslope from the mountain summits to the valley, and then east, towards Lough Macnean Upper.
Groundwater & surface water interactions		Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of most 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, although might be higher across the Lm aquifers.
Conceptual model		• Topographic divides (Hydrometric Area 35) provide the north, south and west boundaries for the Glenfarne GWB. The eastern boundary comprises a more productive Lm aquifer. The topography is steep and mountainous to the north and south, with an E-W orientated valley in between. Elevations ranging from 60-460 mAOD. • The GWB is composed primarily of low transmissivity rocks. Most of the groundwater flux is likely to be in the uppermost part of the aquifer comprising: a broken and weathered zone typically less than 3 m thick; a zone of interconnected fissuring typically less than 10-15 m; and a zone of isolated fissuring typically less than 150 m, although this third zone is less likely to be associated with the Pu aquifers. • Higher transmissivity (10-50 m^2/d – although may be as high as 100-150 m^2/d in the vicinity of faults) and storativity values are expected in the Sandstones. • Recharge occurs diffusely through the subsoil and rock outcrops, although is limited by any thicker low permeability subsoil and bedrock itself. Most of the effective rainfall over the Pu/Pl and Ll aquifers is not expected to recharge the aquifer. • Flow paths are likely to be short (30-300 m) in the lower permeability rocks, with groundwater discharging rapidly to the streams crossing the aquifer, and to small springs and seeps. Longer flow paths (up to 2000 m, although shorter in discharge areas) would be expected in the Sandstones rock group. Overall, the flow directions are expected to be towards Lough Macnean Upper, as determined by the topography.
Attachments		Figure 1. Table 1.
Instrumentation		**Stream gauges:** None identified. **EPA Water Level Monitoring boreholes:** None identified. **EPA Representative Monitoring points:** LEI26
Information Sources		MacDermot, C.V. Long C.B. and Harney S.J (1996) *Geology of Sligo-Leitrim: A geological description of Sligo, Leitrim and adjoining parts of Cavan, Fermanagh, Mayo and Roscommon, to accompany bedrock geology 1:100,000 scale map, Sheet 7, Sligo - Leitrim*. With contributions from K. Carlingbold, G. Stanley, D. Daly and R. Meehan. Geological Survey of Ireland, 100pp. O' Riain, G. 2004. *Water Dependent Ecosystems and Subtypes (Draft)*. Compass Informatics in association with National Parks and Wildlife (DEHLG). WFD support projects.

Disclaimer	Note that all calculations and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.

Figure 1. Location and boundaries of Glenfarne GWB

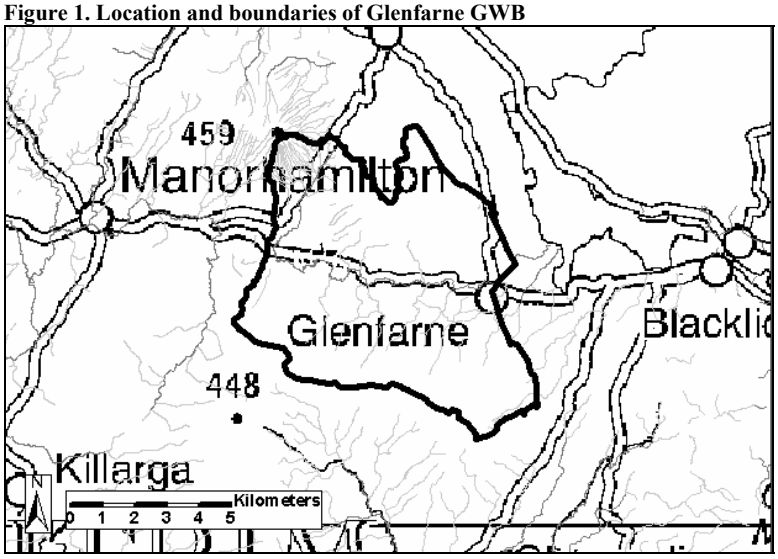

Table 1. List of Rock units in Glenfarne GWB

Rock Unit Name	Code	Description	Rock Unit Group	**Aquifer Class.**	% Area
Dergvone Shale Formation	DE	Shale & minor turbiditic sandstone	Namurian Shales	Pu	35.12%
Carraun Shale Formation	CN	Grey/black shale with minor limestone	Dinantian Shales and Limestones	Pl	31.28%
Briscloonagh Sandstone Formation	BR	Fine-grained sandstone, minor shale	Namurian Sandstones	Pl	11.48%
Bellavally Shale Formation	BE	Grey micrite, shale, laminite evaporite	Dinantian Mixed Sandstones, Shales and Limestones	Ll	9.68%
Glenade Sandstone Formation	GD	Pale orthoquartzitic sandstone	Dinantian Sandstones	Lm	4.51%
Gowlaun Shale Formation	GO	Dark grey silty sideritic shale	Namurian Shales	Pu	2.60%
Lackagh Sandstone Formation	LH	Cyclothemic sandstone, siltstone, coal	Namurian Sandstones	Pl	2.44%
Lacoon Flagstone Member	DEln	Interbedded sandstone & thin shale	Namurian Sandstones	Pl	2.05%
Dartry Limestone Formation	DA	Dark fine-grained cherty limestone	Dinantian Pure Bedded Limestones	Rkc	0.43%
Doobally Sandstone	BEdo	Medium-grained sandstone	Dinantian Mixed Sandstones, Shales and Limestones	Ll	0.32%
Meenymore Formation	ME	Shale, laminated carbonate, evaporite	Dinantian Mixed Sandstones, Shales and Limestones	Ll	0.09%