Kiltyclogher GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority		Associated surface water bodies	Associated terrestrial ecosystems	Area (km^2)
Hydrometric Area 36 Leitrim Co. Co.		***Rivers:*** 3 unnamed rivers ***Streams:*** 12 unnamed streams. ***Lakes:*** None identified.	None identified (O'Riain, 2004)	24
Topography		This GWB is located in the north-eastern slopes of Dough and Thur Mountains, extending down into the middle of the County River valley. The north and western boundaries comprise more productive (karst) aquifers, and the southern and eastern boundaries are topographic divides. The topography is mountainous (maximum of 460 mAOD) in the southern half of the body but becomes flatter and lower-lying in the valley area to the north (c.70 mAOD). Surface water flows downslope, in an north-easterly direction, to the valley.		
Geology and Aquifers	**Aquifer type(s)**	The upper mountain slopes are underlain by alternating bands of **Pl:** Poor aquifer, unproductive except for local zones, and **Pu:** Poor aquifer, generally unproductive (totalling 36%), which is flanked by a thin band of **Ll:** Locally important aquifer, moderately productive only in local zones. Ll aquifers are also located along the eastern boundary. The remaining northern area comprises **Lm:** Locally important aquifer, generally moderately productive (45%).		
	Main aquifer lithologies	Layers of Namurian Shales (18.28%) and Namurian Sandstones (4.36%) cover the uppermost mountain areas, with Dinantian rocks underlying the remaining areas: Shales and Limestones (13.44%) and mixed Sandstones, Shales and Limestones (12.55%) on the lower slopes; Sandstones (44.62%) under the northern portion of the valley; and Pure Unbedded Limestones (6.48%) along the eastern boundary. Refer to Table 1 for details.		
	Key structures.	The deformation in this region has resulted in a number of SW-NE faults cutting through and delineating the GWB, and the rocks mainly dipping to the SSW 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 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 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 deeper zone of isolated, poorly connected fissuring is less likely to be associated with the Pu aquifers.		
Overlying Strata	**Lithologies**	No subsoil data are available for this GWB.		
	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, areas of extremely vulnerability are expected over the higher areas, where subsoil.		
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 high stream density is likely to be influenced by the low 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 generally short groundwater flow paths in the lower permeability aquifers. Small springs and seeps are likely to issue at the stream heads and along their course. Groundwater may also discharge into the adjacent, higher permeability karstic 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.
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		• The southern and eastern boundaries of this GWB are topographic divides. The remaining boundaries comprise more productive karst aquifers. The topography is steep and mountainous to the south, but flattens to a valley along the northern boundary. Elevations ranging from c.70-460 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 in the Pu/Pl and Ll aquifers, although up to 30-40 m in the Lm aquifers; 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 northwards, towards the valley.

Attachments	Figure 1. Table 1.
Instrumentation	**Stream gauges:** None identified. **EPA Water Level Monitoring boreholes:** None identified. **EPA Representative Monitoring points:** None identified.
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 calculation 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 Kiltyclogher GWB

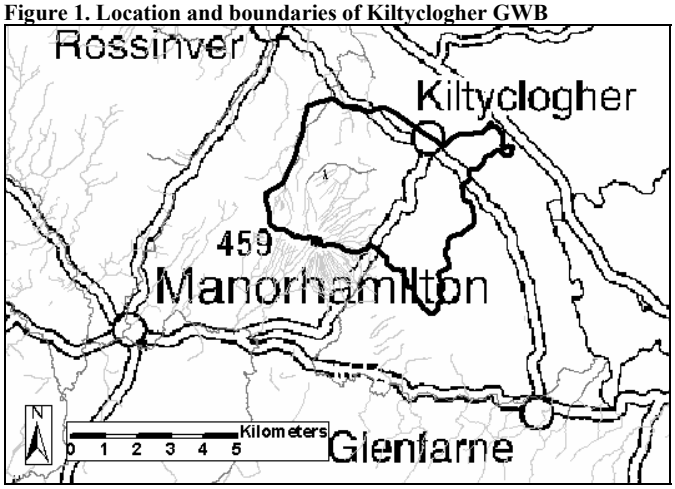

Table 1. List of Rock units in Kiltyclogher GWB

Rock Unit Name	Code	Description	Rock Unit Group	**Aquifer Class.**	% Area
Glenade Sandstone Formation	GD	Pale orthoquartzitic sandstone	Dinantian Sandstones	Lm	44.62%
Dergvone Shale Formation	DE	Shale & minor turbiditic sandstone	Namurian Shales	Pu	18.28%
Carraun Shale Formation	CN	Grey/black shale with minor limestone	Dinantian Shales and Limestones	Pl	13.44%
Bellavally Shale Formation	BE	Grey micrite, shale, laminite evaporite	Dinantian Mixed Sandstones, Shales and Limestones	Ll	7.14%
Mudbank Limestones	mk	Massive grey micritic limestone	Dinantian Pure Unbedded Limestones	Ll	6.48%
Meenymore Formation	ME	Shale, laminated carbonate, evaporite	Dinantian Mixed Sandstones, Shales and Limestones	Ll	5.35%
Lacoon Flagstone Member	DEln	Interbedded sandstone & thin shale	Namurian Sandstones	Pl	3.87%
Briscloonagh Sandstone Formation	BR	Fine-grained sandstone, minor shale	Namurian Sandstones	Pl	0.76%
Doobally Sandstone	BEdo	Medium-grained sandstone	Dinantian Mixed Sandstones, Shales and Limestones	Ll	0.06%