Anierin-Cuilcagh East 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. N.I.		***Rivers:*** Yellow, Blackwater, Aghacashlaun, Swanlibar, Owensallagh ***Streams:*** Annadale, 94 unnamed streams. ***Lakes:*** Alona, Bartonny.	Cuilcagh-Anierin Uplands (O'Riain, 2004)	90
Topography		This slightly curved, N-S elongated GWB is located on the eastern flank of the Anierin-Cuilcagh Mountain range. Accordingly, the topography is mainly steep and mountainous, with elevations sharply increasing from c.100 mAOD along the eastern boundary to 585 mAOD (Slieve Anierin) and 665 mAOD (Cuilcagh) along the western boundary. Drumlins feature on the lower, slightly flatter south to south-eastern area. More productive aquifers bound the majority of the body – karstic in the south/southeast boundary and fractured in the north/northeast. The western boundary is a topographic divide (Hydrometric Area 26). Surface water flows downslope to the north, south and east, with channels radiating out from the summit.		
Geology and Aquifers	**Aquifer type(s)**	The majority of the central/western GWB area comprises **Pu:** Poor aquifer, generally unproductive (c.38%), which is surrounded by a thin band of **Pl:** Poor aquifer, unproductive except for local zones (34%). The rocks along the eastern boundary are categorised as **Ll:** Locally important aquifer, moderately productive only in local zones (c.26%), which includes a thin band of **Lm:** Locally important aquifer, generally moderately productive.		
	Main aquifer lithologies	A large proportion of the GWB is underlain by Namurian Shales (38.67%), with a thin band of Namurian Sandstones along the western boundary (9.69%). The eastern part of the GWB comprises Dinantian age rocks: Shales and Limestones (24.65%); mixed Sandstones, Shales and Limestones (1.55%); and a small area of Sandstones (0.44%). Refer to Table 1 for details.		
	Key structures.	The rock succession in this particular area are dipping predominantly to the west by between 2-10°. There are also a number of NW-SE/E-W orientated faults, that become more numerous towards the north of the GWB.		
	Key properties	Data are minimal for this GWB, with only 1 yield available: 109 m^3/d. Transmissivity values for all of the rock units 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. Groundwater levels were measured at 3.6 and 19.8 m below ground level, which are inconclusive. However, in the low permeability rocks (Pu, Pl), groundwater gradients are expected to be relatively steep, especially given the mountainous terrain. Gradients are possibly less steep in the more productive Ll aquifers. *(Namurian Aquifer Chapter; Dinantian Shales and Limestones Aquifer Chapter)*		
	Thickness	Most groundwater flux is expected 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 no more than 10-15 m thick. Deeper, isolated, poorly connected fissuring may also exist up to 150 m, although are less likely in the Pu aquifers.		
Overlying Strata	**Lithologies**	Just over a quarter of the GWB is covered by peat subsoil (27%) with smaller proportions of till (7%). Data are not available for 60% of the GWB (Letrim and NI), although given the toppogrpahy, similar proportions would be expected.		
	Thickness	From the available outcrop and topographic information (Cavan and Leitrim), subsoil is expected to be absent or thin (<3 m thick) over a large proportion of this GWB, especially at higher elevations. Toward the base of the slopes i.e. along the eastern border, deeper subsoil is more likely, and drumlins (southeast) often represent thick pockets of till (>10 m). This is also likely to reflect the pattern of subsoil thickness in N.I., where data are absent.		
	% 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 west 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 the thicker peat deposits and the aquifers, a high proportion of the effective rainfall will quickly discharge to the streams in the GWB. In addition, the steep slopes in the upland areas 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: Altinure-109 m^3/d		

	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 and Rkc GWBs (Claddagh-Swanlibar and Newtown-Ballyconnell respectively).
	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) *(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. Groundwater flow directions are expected to follow topography i.e. radiating out from the mountain summits to the north, south and east.
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 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.
Conceptual model		• This GWB is bounded by more productive aquifers to the north, east and south and by a topographic divide (Hydrometric Area 26) to the west. The topography is steep and mountainous, with elevations ranging from 100-665 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 more likely to be associated with the more productive aquifers. • Recharge occurs diffusely through the subsoil and rock outcrops, although is limited by any thicker low permeability subsoil and the low permeability bedrock. Therefore, most of the effective rainfall is not expected to recharge the aquifer. • Flow paths are likely to be short (30-300 m) with groundwater discharging rapidly to the streams crossing the aquifer, and to small springs and seeps. Overall, the flow directions are expected to be to the north, south and east, 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:** (CAV 39)
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 GWB.

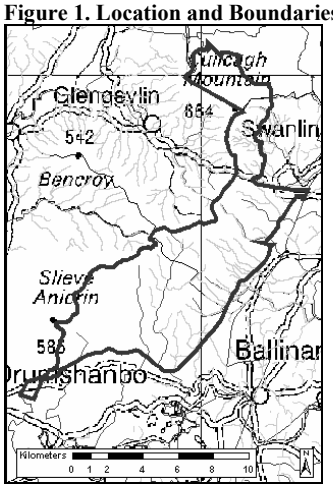

Table 1. List of Rock units in GWB

Rock Unit Name	Code	Description	Rock Unit Group	**Aquifer Class.**	% Area
Carraun Shale Formation	CN	Grey/black shale with minor limestone	Dinantian Shales and Limestones	Pl	24.65%
Dergvone Shale Formation	DE	Shale & minor turbiditic sandstone	Namurian Shales	Pu	20.65%
Gowlaun Shale Formation	GO	Dark grey silty sideritic shale	Namurian Shales	Pu	17.61%
Bellavally Shale Formation	BE	Grey micrite, shale, laminite evaporite	Dinantian Mixed Sandstones, Shales and Limestones	Ll	15.67%
Meenymore Formation	ME	Shale, laminated carbonate, evaporite	Dinantian Mixed Sandstones, Shales and Limestones	Ll	9.33%
Lackagh Sandstone Formation	LH	Cyclothemic sandstone, siltstone, coal	Namurian Sandstones	Pl	7.91%
Briscloonagh Sandstone Formation	BR	Fine-grained sandstone, minor shale	Namurian Sandstones	Pl	1.66%
Doobally Sandstone	BEdo	Medium-grained sandstone	Dinantian Mixed Sandstones, Shales and Limestones	Ll	1.55%
Glenade Sandstone Formation	GD	Pale orthoquartzitic sandstone	Dinantian Sandstones	Lm	0.44%
Bencroy Shale Formation	BH	Black shale, silty shale, ironstone beds	Namurian Shales	Pu	0.41%
Bencroy Sandstone Member	BHss	Sandstone, sandy shale & shale	Namurian Sandstones	Pl	0.13%