

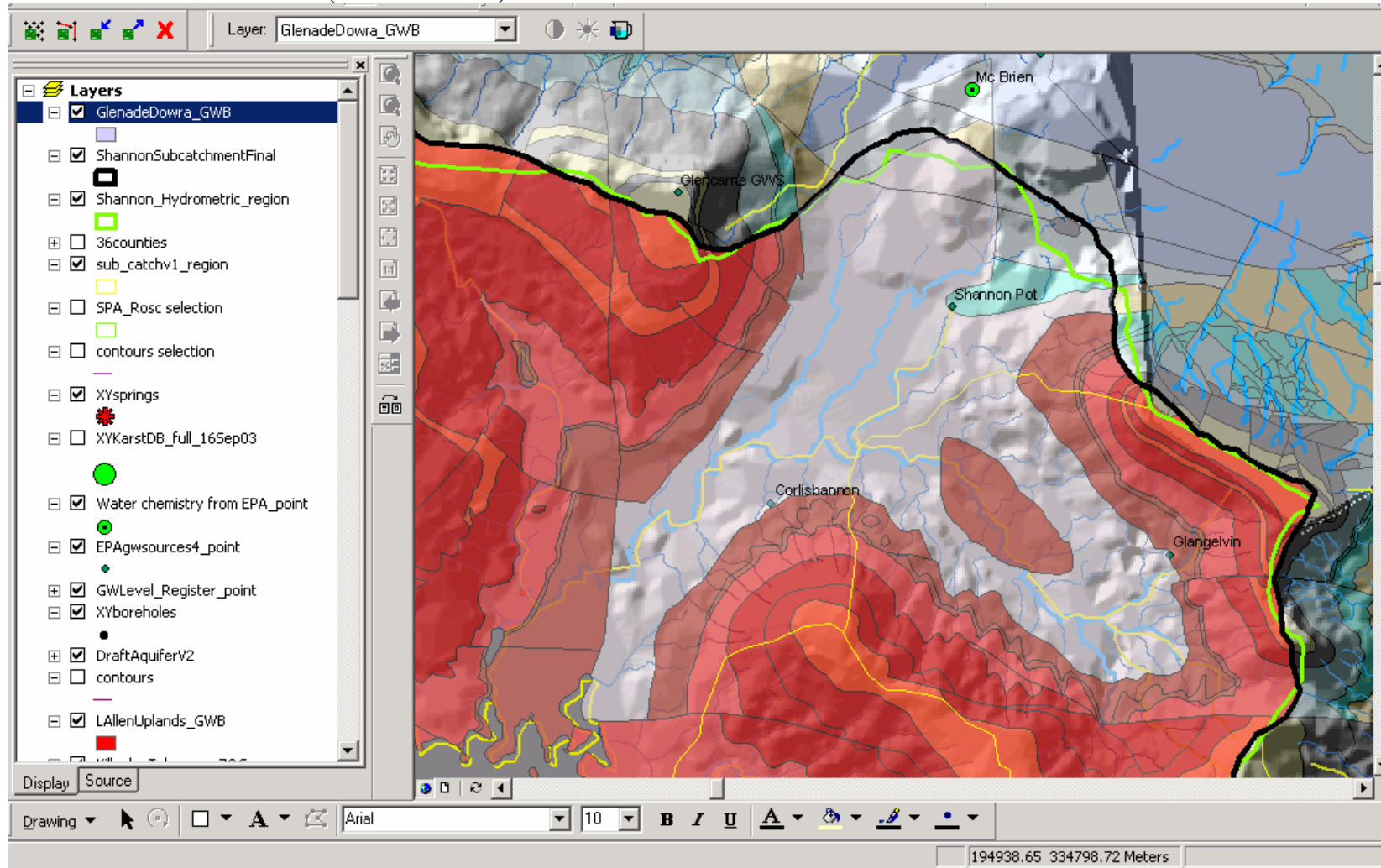
**Glenade/Dowra Groundwater Body: Summary of Initial Characterisation.**

OUTSTANDING ISSUES –awaiting further detail on the nature of the Meenymore Formation in the vicinity of the Shannon Pot. Also the issue of the small area of Dartry Limestone to the north of the Glenade but still in Shannon RBD.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
26 – Shannon Upstream Roosky. Cavan & Leitrim Co. Co.'s	Rivers: Shannon Upper; Owenmore (Glangevlin); Black	(000584) Cuilcagh-Anierin Uplands <i>(very small area in body)</i>	50
<b>Topography</b>	This body occurs just northeast of Lough Allen. It underlies the river valley of the Upper Shannon and its tributary, the Owenmore River and part of the lower slopes of the surrounding uplands, the Lough Allen Uplands and the Cuilcagh Mountains. The highest point is 270 mAOD, the lowest point 50 mAOD. The valley bottoms and lower hillslopes are underlain by Dinantian Sandstones (Glenade Sandstone Formation). The uplands surrounding the body are composed of Namurian Shales and Sandstones (Lough Allen Uplands GWB). Numerous streams flow off the surrounding uplands into the body, joining the River Shannon and its tributaries the Owenmore River and the two Black Rivers. The River Shannon emerges from the Shannon Pot on the northeastern boundary of this groundwater body and flows across the body to the southwest towards Lough Allen.		
<b>Geology and Aquifers</b>	Aquifer categories	<b>Lm:</b> Locally important aquifer which is generally moderately productive.  <b>A very small area in the northeast of the body (0.6km<sup>2</sup>) has an aquifer category of <b>Rkc:</b> Regionally important karstified aquifer dominated by conduit flow</b>	
	Main aquifer lithologies	Dinantian Sandstones  There is very small area of Dinantian Pure Bedded Limestones in the northeast of the body (0.6km <sup>2</sup> ).	
	Key structures	Due to a lack of detailed mapping and rock exposure in the area few faults are currently mapped in this GWB, however the region is understood to have been subject to structural deformation which is likely to have resulted in faulting within the Sandstone. Recorded dips over the body range from 5-35°.	
	Key properties	No data on hydrogeological properties specific to this groundwater body are available. In general Dinantian Sandstones, given their dominant sandstone lithology which generally results in a higher fissure permeability, would be expected to have a transmissivity of greater than 10 m <sup>2</sup> /d but generally less than 50 m <sup>2</sup> /d.	
	Thickness	This groundwater body is composed solely of the Glenade Sandstone Formation (Dinantian Sandstone). In the Cuilcagh area this unit has been described as being about 75m thick. Having a dominantly sandstone lithology, the permeability of individual fractures and the degree of interconnection is expected to be generally high. Based on experience in other similar Irish aquifers this aquifer is expected to have a broken and weathered rock zone extending to within 1-2 m of the top of the rock and below this a zone of more interconnected fissures below this. Most groundwater flow is thought to occur within the top 30m of the rock, with deeper flow in areas of higher structural deformation and faulting.	
<b>Overlying Strata</b>	Lithologies	[Information will be added at a later date]	
	Thickness	There are no borehole data currently available relating to depth to bedrock. Areas of rock outcrop occur frequently within the body indicating that in general the till cover is relatively thin.	
	% area aquifer near surface	[Information will be added at a later date]	
	Vulnerability	No Groundwater Vulnerability map is currently available for County Cavan. Areas of Extreme vulnerability will occur in the vicinity of rock outcrop and shallow rock and it is expected that a large percentage of this GWB will be of Extreme Vulnerability. Collapse features which occur in the sandstone, related to weaknesses in the underlying karstified limestone, provide a direct connection to the groundwater system and are points of Extreme Vulnerability.  [Information will be added at a later date]	
<b>Recharge</b>	Main recharge mechanisms	Diffuse recharge will occur over the entire groundwater body via rainfall soaking through the subsoil. Collapse features and some stream sinks and risings have been found in the Glenade Sandstone in County Fermanagh adjacent to this GWB. It is likely that similar features may occur within this GWB enabling point recharge to the aquifer.	
	Est. recharge rates	[Information will be added at a later date]	
<b>Discharge</b>	Springs and large known abstractions (m <sup>3</sup> /d)	Corlisbannon CAV121 (No Data - EPA GW Sources List)	
	Main discharge mechanisms	The main discharges are to the River Shannon and its tributaries crossing the groundwater body, and to Lough Allen in the southwest of the body.	

	Hydrochemical Signature	No relevant hydrochemical data are available in this GWB for assessment. The body is composed of Dinantian Sandstone. Lithological description for the rocks in the area says the sandstones are occasionally weakly calcareous (MacDermot et. al 1996).
	<b>Groundwater Flow Paths</b>	Groundwater flow in the Dinantian Sandstones is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. The dominant sandstone lithology and limited shale content will generally result in higher frequency of more open fractures and consequently higher fissure permeability. Where there has been more intense faulting and folding these zones of high permeability will be more common. The degree of interconnection of fissures is expected to be relatively high in Dinantian Sandstones, enabling an element of regional groundwater flow. Overall groundwater flow is expected to be towards the River Shannon and southwest to Lough Allen. On a more local scale flow will be generally to the streams and rivers crossing the body.
	<b>Groundwater &amp; Surface water interactions</b>	The Dinantian Sandstones of the Glenade/Dowra GWB are expected to have a higher permeability than the Namurian Shales and Dinantian Shales and Limestones of the surrounding Lough Allen GWB due to their dominant sandstone lithology. They are however less permeable than the highly karstified limestones that occur to the northeast of the body. The River Shannon re-emerges from the Shannon pot at the boundary of this GWB and the adjoining karstified GWB. Having flowed through an underground karst conduit system in the Dinantian Pure Bedded Limestones, the river is forced to the surface on contact with the less permeable rocks of the Dinantian Mixed Sandstone, Shales and Limestones (Meenymore Formation) and the Dinantian Sandstones (Glenade Sandstone Formation). Some stream sinks and risings have been observed in the Glenade Sandstone in County Fermanagh indicating that there is interconnection between surface water and groundwater in this GWB.
<b>Conceptual model</b>		<ul style="list-style-type: none"> <li>• This groundwater body underlies the valleys of the upper River Shannon and its main tributary, the Owenmore, northeast of Lough Allen. Its boundaries are formed by its contact with the low permeability shales and sandstones of the surrounding Lough Allen Uplands GWB and by topographic highs which form the boundary of the surface water catchment of the Shannon RBD.</li> <li>• The groundwater body is composed of Dinantian Sandstone (Glenade Sandstone Formation) which overlies the Dinantian Mixed Sandstone, Shale and Limestones (Meenymore Formation) of the Lough Allen Uplands GWB. The Dinantian Sandstones are considered to have the potential for relatively high fissure permeability. The dominant sandstone lithology means that fractures where they occur are more likely to remain open. The Dinantian Sandstones are however less permeable than the Karstic Dinantian Pure Bedded Limestone to the north.</li> <li>• Groundwater flow will occur along fractures, joints and major faults.</li> <li>• Recharge occurs diffusely through the subsoils and via outcrops. Point recharge can occur through collapse features in the sandstone related to weaknesses in the underlying karstified limestone.</li> <li>• Groundwater within the body is generally unconfined. Most flow in this aquifer will occur in a zone near the surface of the rock. In general the effective thickness of this aquifer is likely to be about 30m, comprising a weathered zone of a few metres and a connected fracture zone below this. However, deep-water strikes in more isolated faults/fractures can be encountered. Regional groundwater flow is expected to be towards the River Shannon and southwest towards Lough Allen. On a local scale, groundwater flow will be influenced by local topography and generally flow towards the streams and rivers crossing the aquifer.</li> <li>• Groundwater discharges are to the River Shannon and its tributaries and to Lough Allen in the southwest.</li> </ul>
<b>Attachments</b>		None
<b>Instrumentation</b>		Stream Gauges: 26029(River Shannon, Dowra) EPA Water Level Monitoring boreholes: n/a EPA Representative Monitoring boreholes:
<b>Information Sources</b>		MacDermot, C.V. Long C.B. and Harney S.J (1996) <i>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</i> . With contributions from K. Carlingbold, G. Stanley, D. Daly and R. Meehan. Geological Survey of Ireland, 100pp. Aquifer Chapters: Dinantian Sandstones
<b>Disclaimer</b>		Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

### GROUNDWATER BODY (For Reference)



**List of Rock units in Glenade/Dowra Groundwater Body**

<b>Rock unit name and code</b>	<b>Description</b>	<b>Rock unit group</b>
Glenade Sandstone Formation (GD)	Pale orthoquartzitic sandstone	Dinantian Sandstones

**NOTES ON GWB DESCRIPTION****NOTES**

<b>Area (km<sup>2</sup>)</b>
50.5

**Chemistry from Dinantian Sandstones Chapter****1.1.1 Hydrochemistry**

The quality of the water from the Mullaghmore Sandstone is liable to be high in iron (Aldwell, 1981). The results of a water sample take from a GSI investigation borehole near Sligo town (Daly 1975) are shown in Table 1.

**Table 1 Hydrochemistry of the Dinantian Sandstones**

Source	Sample date	pH	Total Hardness (mg/l CaCO <sub>3</sub> )	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)	Total Alkalinity (mg/l CaCO <sub>3</sub> )	Sulphate (mg/l)	Chloride (mg/l)	EC(µS/cm)	Iron (mg/l)	Manganese (mg/l)
BH 3/1433NEW002 GSI Investigation near Sligo Town	Autumn 1974	8.75	44	25	19			328	140	35		28.0	nil