

*1<sup>st</sup> Draft Easky East Description – July 2004*

**Easky “Right” GWB: Summary of Initial Characterisation.**

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
35 Sligo Co. Co.	<b>Rivers:</b> Easky, Buncrowey, Ballybeg, Finned, Gowlan. <b>Lakes:</b> Black, Fiddanagarrode, Ahusey, Aletter, Atower, Ilra, Ioe, Minna, Nacreeva, Salaghan.	Easky River (001665), Ox Mountain Bogs (002006).	93
<b>Topography</b>	The GWB occupies an area in the vicinity of Easky, which is located on the northern edge of the GWB. The land surface is relatively subdued and low-lying. The lower flanks of the Ox Mountains occupy the southern tip of the GWB. Elevations range from sea level to 170 mAOD. The GWB is bounded by the coastline to the north. The western boundary is a surface water divide with hydrometric area 34. The southern and eastern boundary is the contact with the Collooney GWB. The Easky and Finned rivers are the principal drainage features, flowing in a northerly direction across the GWB.		
	<b>Geology and Aquifers</b>	<b>Aquifer categories</b>	<b>Rk:</b> Regionally important karstified aquifer. <b>LI:</b> Locally important aquifer, moderately productive only in local zones. (see below)
<b>Main aquifer lithologies</b>		Dinantian Pure Bedded Limestones, Dinantian Upper Impure Limestones (0.2% of GWB)	
<b>Key structures</b>		The beds dip 3-10°, generally to the southwest. The GWB occupies the westerly limb of a N-S trending anticline.	
<b>Key properties</b>		There are no transmissivity data specific to the GWB. The Ballina GWB is composed of the same rock and aquifer type, thus the available data are used to imply transmissivities and storativity. Transmissivity is estimated to range from 1 m <sup>2</sup> /d to greater than 200 m <sup>2</sup> /d. Storativity is likely to be in the range of 1-2%. Water levels vary from 0-10 m below ground level. The data are inadequate to calculate groundwater gradients, but these are expected to be greater than 0.0005. There is one reported karst spring just outside Easky.	
<b>Thickness</b>		Most groundwater flux is likely to be in the upper part of the aquifer, comprising three broad zones: a zone comprising a broken and weathered zone typically less than 3 m thick; a zone of interconnected fissuring up to 30 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m.	
<b>Overlying Strata</b>	<b>Lithologies</b>	The subsoils are predominantly blanket peat (60%) in the southern two thirds of the GWB. Till begins to dominate approximately 2-4 km inland. The presence of blanket peat is unexpected over the karstified limestone. It may be due to the presence of low permeability till.	
	<b>Thickness</b>	Data are sparse. Depth to rock varies from 0-6 m, generally increasing in thickness toward the coastline.	
	<b>% area aquifer near surface</b>	<i>[Information to be added at a later date]</i>	
	<b>Vulnerability</b>	<i>[Information to be added at a later date]</i>	
<b>Recharge</b>	<b>Main recharge mechanisms</b>	Diffuse recharge occurs via rainfall percolating through permeable subsoil and rock outcrops. Due to the low permeability of much of the subsoil (blanket peat), a high proportion of the available recharge will discharge to the streams. In addition, the steeper slopes in the southerly areas will promote surface runoff. The stream density is high indicating the high proportion of surface runoff. Although there are few records of karst features it is expected that point recharge may occur via small sinks that may be present in the low permeability areas where the subsoil is breached and also through any karst features that are currently unmapped.	
	<b>Est. recharge rates</b>	<i>[Information to be added at a later date]</i>	
<b>Discharge</b>	<b>Large springs and high yielding wells (m<sup>3</sup>/d)</b>	There are no large springs or wells identified.	
	<b>Main discharge mechanisms</b>	The main discharges are to the small springs, streams, rivers and lakes. The stream density is relatively high, particularly for an area dominated by pure limestones. This is probably a reflection of the subsoils overlying the GWB.	
	<b>Hydrochemical Signature</b>	There are no data for this GWB available. However, based on data for the Ballina GWB, alkalinities and hardness are expected to be high, in the order of 300 mg/l. Conductivity is also expected to be high, in the order of 650-750 µS/cm. Elevated iron, manganese and sulphur can occur.	

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<b>Groundwater Flow Paths</b>	These rocks are generally devoid of intergranular permeability. Groundwater flows through fissures, faults, joints and bedding planes. In pure bedded limestones these openings are enlarged by karstification which significantly enhances the permeability of the rock. Two sub-types of karst aquifers are recognised, termed <b>Rk<sup>c</sup></b> and <b>Rk<sup>d</sup></b> . The data are not adequate to determine which sub-type it belongs to. Groundwater flow through karst areas is extremely complex and difficult to predict. As flow pathways are often determined by discrete conduits, actual flow directions will not necessarily be perpendicular to the assumed water table contours. Flow velocities can be rapid and variable, both spatially and temporally. Rapid groundwater flow velocities indicate that a large proportion of groundwater flow takes place in enlarged conduit systems. Flow path lengths can be up to a several kilometres in length. Overall groundwater flow will be towards the rivers and lakes, but the highly karstified nature of the bedrock means that locally, groundwater flow directions can be highly variable.
<b>Groundwater &amp; Surface water interactions</b>	The area is principally drained by several rivers which originate to the south of the GWB. Generally, there is a high degree of interconnection between groundwater and surface water in karstified limestone areas. The close interaction between surface water and groundwater in karstified aquifers is reflected in their closely linked water quality. Any contamination of surface water is rapidly transported into the groundwater system, and vice versa. There are a number of terrestrial ecosystems with varying dependence on groundwater (Duchas National Heritage data).
<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• The GWB occupies an area in the vicinity of Easky, which is located on the northern edge of the GWB. The GWB is bounded by the coastline to the north. The western boundary is a surface water divide with hydrometric area 34. The southern and eastern boundary is the contact with the Collooney GWB. The Easky and Finned rivers are the principal drainage features, flowing in a northerly direction across the GWB.</li> <li>• The land surface is relatively subdued and low-lying. The lower flanks of the Ox Mountains occupy the southern tip of the GWB. Elevations range from sea level to 170 mAOD.</li> <li>• The aquifer is a Regionally important karstified aquifer (<b>Rk</b>).</li> <li>• Transmissivity is estimated to range from 1 m<sup>2</sup>/d to greater than 200 m<sup>2</sup>/d. Storativity is in the range of 1-2%.</li> <li>• Most groundwater flux is likely to be in the upper part of the aquifer.</li> <li>• The subsoils are predominantly blanket peat. Between Easky and Lendoon Head there is a small portion of Limestone Till.</li> <li>• Diffuse recharge occurs via rainfall percolating through permeable subsoil and rock outcrops. It is possible that point recharge occurs.</li> <li>• The main discharges are to the small springs, streams, rivers and lakes. The stream density is relatively high, probably due to the subsoils overlying the GWB.</li> <li>• The groundwater has a calcium bicarbonate signature.</li> <li>• There is a high degree of interconnection between groundwater and surface water.</li> </ul>
<b>Attachments</b>	Table 1 and Figure 1.
<b>Instrumentation</b>	<b>Stream gauges:</b> 35007. <b>EPA Water Level Monitoring boreholes:</b> None <b>EPA Representative Monitoring points:</b> None
<b>Information Sources</b>	Mac Dermot, C.V., Long, B., Harney, S.J. (1996). ). <i>A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 7, Sligo-Leitrim</i> . Geological Survey of Ireland Map Series Report. Geological Survey of Ireland: The Dinantian (early) Sandstones, Shales and Limestones, The Dinantian Upper Impure Limestones, Precambrian Aquifer Chapters. Unpublished.
<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.

**Table 1. List of Rock units in GWB**

<b>Rock unit name and code</b>	<b>Description</b>	<b>Rock unit group</b>	<b>Aquifer Classification</b>
Ballina Limestone Formation (Upper) (BU)	Grey limestone, thin shale	Dinantian Pure Bedded Limestones	Rk
Ballina Limestone Formation (Lower) (BL)	Dark fine-grained limestone & shale	Dinantian Upper Impure Limestones	LI

Figure 1 Location and boundaries of GWB.

