

**1<sup>st</sup> Draft MOY Gravel GWB Group Description November 2004**

**Moy Gravel GWB Group: Summary of Initial Characterisation.**

<b>Hydrometric Area Local Authority</b>	<b>Associated surface water features</b>	<b>Associated terrestrial ecosystem(s)</b>	<b>Area (km<sup>2</sup>)</b>
34 Mayo Co. Co.	<b>Rivers:</b> Mannin, Mullaghanoe, Sonnagh, Castlehill, Deel and Brusna. <b>Lakes:</b> Island Lake, Mannin Lake, Lough Coghlan, Lough Agawna, Loughmore, Lough Doo, Blind Lough, Lough Fadda, Trout Lough, Lough Carha and Laugh Creeve.	River Moy SAC (O Riain, 2004).	88
<b>Topography</b>	Within the Moy catchment there are several extensive sand/gravel deposits, located in the vicinity of Crossmolina, Bunnyconnellan, Swinford, Kilkelly and Ballyhaunis. They are considered together because they have a similar configuration, i.e., similar morphology, located within the same catchment, located in low-lying areas with similar land use patterns. The deposits are located in a relatively low-lying flat area, situated between 20 and 110 m OAD. The land surface slopes gently to toward L. Conn. The surface drainage is largely to the north toward L. Conn. The location of the deposits are shown in Figure 1.		
<b>Geology and Aquifers</b>	<b>Aquifer categories</b>	The sand/gravel deposits are greater than 10 km <sup>2</sup> , however they do not appear to have greater than 5 m saturated thickness in all places, thus are classified as <b>Locally Important Sand and Gravel Aquifers (Lg)</b> (DELG/EPA/GSI (1999).	
	<b>Main aquifer lithologies</b>	Glaciofluvial sand/gravel deposits and alluvial sand/gravel deposits (Meehan, 2004). At Crossmolina the deposits consist of pure sand lenses up to 1 m thick, interbedded with large units of cobble dominantly limestone and sandstone with some metamorphics (Doak, 1995).	
	<b>Key structures</b>	N/A	
	<b>Key properties</b>	Total average discharge of approximately 1500 m <sup>3</sup> /d and 3300 m <sup>3</sup> /d have been estimated from two springs located in the GWB at Crossmolina and Kilkelly (Doak, 1995). At Killeen, approximately 6 km south of Crossmolina a spring located in the sand/gravel aquifer has an estimated discharge of approximately 2300 m <sup>3</sup> /d (O'Neill, 2001). Transmissivity is estimated to be approximately 500 m <sup>2</sup> /d at Killeen. Sand/gravel aquifers generally consist of unconsolidated coarse grained material, usually containing less than 8% fines (O'Suilleabhain, 2000). Typically transmissivity is generally greater, ranging from 200 – 1500 m <sup>2</sup> /d. Storativity is expected to be high (10%).  Water levels in the Crossmolina aquifer vary from ground level at the springs to 6 m below ground at MAY074 (Crossmolina), shown in Figure 2. The hydrograph shown in Figure 2 indicates that the water level varies less than 2 m annually.  Groundwater is likely to be unconfined. The data are inadequate to calculate groundwater gradients, but these are expected to be greater than 0.001 and are expected to be similar to the gradient along the rivers. Along the river Deel in the Crossmolina aquifer gradients are approximately 0.004.	
<b>Thickness</b>	At Crossmolina, thickness is generally greater than 10 m, with one record of 23 m. Thicknesses greater than 20 m are recorded in the deposits at Kilkelly (Doak, 1995).		
<b>Overlying Strata</b>	<b>Lithologies</b>	Alluvium, cutover peat and lacustrine deposits occupy areas within the sand/gravel deposits. According to Doak (1995) there is a small area of Fen peat located immediately beside the spring. Generally, alluvium is present in narrow strips along streams and rivers.	
	<b>Thickness</b>	The thickness of alluvium, cutover peat and lacustrine deposits are generally less than 3 m.	
	<b>% area aquifer near surface</b>	[Further Information to be added at a later date]	
	<b>Vulnerability</b>	[Further Information to be added at a later date]	
<b>Recharge</b>	<b>Main recharge mechanisms</b>	Diffuse recharge occurs via rainfall percolating through the unsaturated sand/gravel. Due to the high permeability of sand/gravel, a high proportion of the available recharge will percolate down to the water table. The rivers flowing through the aquifers such as the River Deel at Crossmolina may also provide additional recharge.	
	<b>Est. recharge rates</b>	[Information to be added to and checked]	
<b>Discharge</b>	<b>Large springs and large known abstractions (m<sup>3</sup>/d)</b>	Crossmolina 1500 m <sup>3</sup> /d Kilkelly 3300 m <sup>3</sup> /d	
	<b>Main discharge mechanisms</b>	Groundwater discharges to small and large springs, rivers/streams that flow through the deposits.	

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	<b>Hydrochemical Signature</b>	<p>Data available for springs at Crossmolina, Kilkelly and Charlestown indicate that the GWB has a calcium bicarbonate signature. The average and the range are given below for certain parameters in springs located in the sand/gravel aquifers in the GWB.</p> <table border="1" data-bbox="407 262 1489 401"> <thead> <tr> <th></th> <th>Alkalinity</th> <th>Hardness</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Crossmolina (n=13)</td> <td>306; 100-388</td> <td>335;138-404</td> <td>755; 680-801</td> </tr> <tr> <td>Kilkelly (n=14)</td> <td>224;86-280</td> <td>231;100-300</td> <td>524;478-556</td> </tr> <tr> <td>Charlestown (n=11)</td> <td>232;92-268</td> <td>232;114-284</td> <td>532;496-560</td> </tr> </tbody> </table>		Alkalinity	Hardness	Conductivity	Crossmolina (n=13)	306; 100-388	335;138-404	755; 680-801	Kilkelly (n=14)	224;86-280	231;100-300	524;478-556	Charlestown (n=11)	232;92-268	232;114-284	532;496-560
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	<b>Groundwater Flow Paths</b>	<p>The length of flow paths depend on the size of the sand/gravel deposit. In general, locally important sand/gravel aquifers are expected to have relatively short flow paths, i.e., up to several hundreds of metres and regionally important sand/gravel aquifers are likely to have longer flow paths, perhaps up to several kilometres. Generally the drainage density is low over sand/gravel areas.</p>																
	<b>Groundwater &amp; Surface water interactions</b>	<p>In general groundwater from sand/gravel deposits located in river valleys discharges to the streams/rivers flowing through the valley. Hydraulic connection between the groundwater in the aquifer and the stream is expected to be high, thus water will be able move into and out of the aquifer depending on the river stage.</p>																
<b>Conceptual model</b>		<ul style="list-style-type: none"> <li>• The GWB consists of extensive sand/gravel deposits, located in the vicinity of Crossmolina, Bunnyconnellan, Swinford, Kilkelly and Ballyhaunis.</li> <li>• The deposits are located in a relatively low-lying flat area, situated between 20 and 110 m OAD. The surface drainage is largely to the north toward L. Conn.</li> <li>• The aquifers comprise glaciofluvial sand/gravel deposits and alluvial sand/gravel deposits.</li> <li>• Transmissivity is estimated to be approximately 500 m<sup>2</sup>/d at Killeen and is expected to range from 200 to 1500 m<sup>2</sup>/d.</li> <li>• Several large springs issue from the sand/gravel aquifers, with estimated discharges between 1500-3300 m<sup>3</sup>/d.</li> <li>• The sand/gravel aquifers are generally greater than 10 m thick.</li> <li>• The data are inadequate to calculate groundwater gradients, but these are expected to be generally greater than 0.001.</li> <li>• Diffuse recharge occurs via rainfall percolating through the unsaturated sand/gravel.</li> <li>• Groundwater discharges to small and large springs, rivers/streams that flow through the deposits.</li> <li>• The groundwater has a calcium bicarbonate signature.</li> <li>• The length of the flow paths is variable – depending on the extent of the sand/gravel aquifers; ranging from several hundred metres to over 1 km.</li> </ul>																
<b>Attachments</b>		<p>Figure 1 and 2.</p>																
<b>Instrumentation</b>		<p><b>Stream gauges:</b> 34041, 34053, 34054, 34007, 34051  <b>EPA Water Level Monitoring boreholes:</b> MAY098, MAY099, MAY074  <b>EPA Representative Monitoring points:</b> MAY048, MAY047, MAY016</p>																
<b>Information Sources</b>		<p>DELG/EPA/GSI (1999) <i>Groundwater Protection Schemes</i>. Department of the Environment and Local Government, Environmental Protection Agency and Geological Survey of Ireland.  Doak, M.J., (1995). <i>The Vulnerability to Pollution and Hydrochemical Variation of Eleven Springs (catchments) in the Karst Lowlands of the West of Ireland</i>. MSc Sligo Regional Technical College.  O'Neill, S., (2001). <i>Assessment of Sustainable Yield of Spring Source of Water for Killeen/Errew Group Water Scheme</i>. Project Number 760101/1, O'Neill Groundwater Engineering.  O' Riain, G., (2004). <i>Water Dependent Ecosystems and Subtypes Draft Report</i>. WFD Support Projects. Compass Informatics in association with National Wildlife and Parks Service (DEHLG).  O'Suilleabhain, C., (2000). <i>Assessing the boundary between high and moderately permeable subsoils</i>. Unpublished MSc., University of Dublin. Department of Civil, Structural and Environmental Engineering, Trinity College Dublin.  Meehan, R.T., (2004) <i>Subsoils Map for county Mayo</i>. Map produced as part of EPA Soil and Subsoil Mapping Project (formerly FIPS-IFS). Teagasc, Kinsealy.</p>																
<b>Disclaimer</b>		<p>Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae</p>																

Figure 1 Location and extent of Moy Gravel GWB Group

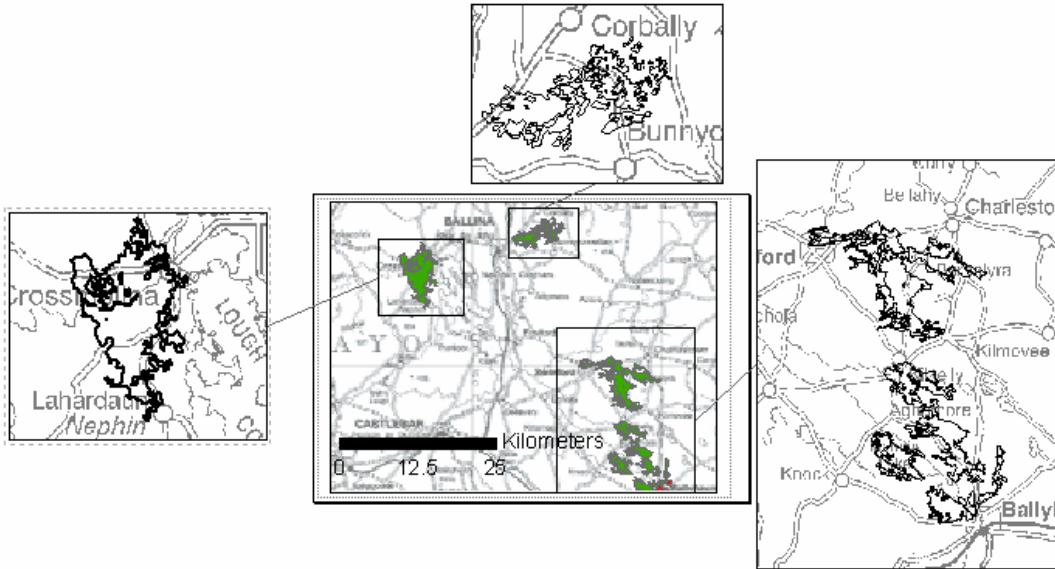


Figure 2 Water levels at Crossmolina

