

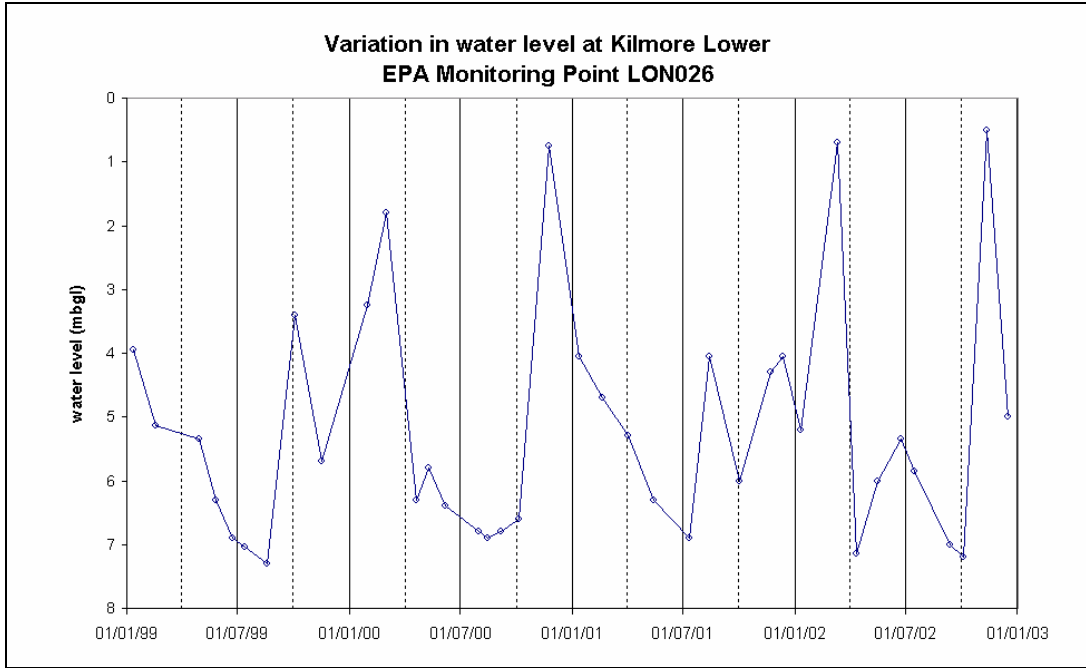
## Newtown Forbes GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface features	Associated terrestrial ecosystem(s)	Area (km <sup>2</sup> )
26 – Camlin/Rinn Longford Co. Co.	<b>Rivers:</b> Camlin, Fallan. <b>Streams:</b> Clooncoose. <b>Loughs:</b> Forbes.	(001818) Lough Forbes Complex; (000442) Brown Bog; (002103) Royal Canal.	80
<b>Topography</b>	This GWB occurs just east of Lough Forbes and the River Shannon. The land in the west of the body is flat with ground elevations of just 40-50 mAOD. The northeast of the body is part of a broad east west trending valley (50-80 mAOD), narrowing to the east, between higher ground to the north and south. The highest ground (80 mAOD) occurs along the northern boundary of the body, the land slopes down gently to the south.		
<b>Geology and Aquifers</b>	<b>Aquifer categories</b>	Rk <sup>c</sup> : Regionally important karstified aquifer dominated by conduit flow.	
	<b>Main aquifer lithologies</b>	This GWB is composed of Dinantian Pure Bedded Limestones with a small area of Dinantian Dolomitised Limestones.	
	<b>Key structures</b>	Few faults are mapped in this area; this may reflect the thick till cover and poor exposure in some areas. The dips over the GWB area are generally less than 10°. The Newtown Forbes GWB is bounded to the east by the Longford Town Inlier, a northeast trending anticline with a core of exposed Lower Palaeozoic rocks which is part of the Longford Ballinalee GWB. The northern boundary of the body is the fault-bounded contact with the Ordovician Metasediments and Dinantian Upper Impure Limestones of the Longford Ballinalee GWB.	
	<b>Key properties</b>	There are no hydrogeological data available specific to this GWB. The body is covered by thick deposits of glacial drift and peat deposits with little rock outcrop. The bedrock is mapped as Undifferentiated Visean Limestone (VIS), Dinantian Pure Bedded Limestone, which in other areas where more data is available has been found to be susceptible to karstification and dolomitisation. West of this GWB pure bedded limestones occur which are highly karstified where groundwater flow is concentrated in conduits and rapid groundwater flow velocities are recorded. The limestones of this GWB are similar in lithology however due to this thick overlying deposits no karst features are recorded and little is know about the extent of karstification of the limestones. Dinantian Pure Bedded Limestones are generally found to have well developed fracturing. Fissures are often enlarged by solution, which results in a highly permeable aquifer with rapid groundwater flow.  (data sources: Rock Unit Group Aquifer Chapters, Roscommon GWPS and Source Reports, see references)	
	<b>Thickness</b>	An exploration borehole drilled in the east of the body encountered just under 300 m Dinantian Pure Bedded Limestone (Tara Prospecting Ltd. 1992). Most groundwater flow in the Dinantian Pure Bedded Limestone has been found in other areas to flow in an epikarstic layer a few metres thick and in a zone of interconnected solutionally-enlarged fissures and conduits that extends approximately 30 m below this. Deeper inflows can occur in areas associated with faults or dolomitisation. During the drilling of trial wells in the adjoining Lanesborough GWB, south of Lanesborough, County Longford, significant inflows of groundwater were encountered below 50 m, associated with zones of dolomitised limestone bedrock (Cullen, K.T. & Co., 1991).	
<b>Overlying Strata</b>	<b>Lithologies</b>	The western side of this GWB is covered by extensive areas of peat, much of which is being harvested on a large scale. The peat areas are generally underlain by lacustrine clay and marl. Smaller areas of till also occur in the west of the body. There is an area of fen peat (3 km <sup>2</sup> ) north of Cloondara and the Camlin River. The north-eastern side of this GWB is primarily covered by till with frequent areas of alluvium adjacent to streams and rivers. The area of rock outcrop or rock close to the surface is very limited in this GWB although some small areas do occur within the till covered areas.  <i>Subsoil Types identified in body by Teagasc Parent Material Mapping: Cut Peat (Cut); Till – Sandstone Till (TDSs), (TLPDSs), (TLPSsS), (TLs), Alluvium (A); Rock outcrop &amp; rock close to surface (Rck); Karstified Limestone outcrop &amp; Karstified Limestone close to surface (KaRck); Fen Peat (FenPt); Alluvium (A); Clayey (AcEsk).</i> <i>[Information to be added at a later date]</i>	
	<b>Thickness</b>	There is no Groundwater Protection Scheme available for this body and therefore there are very few data available on depth to rock in this GWB. Rock outcrop and recorded shallow rock is rare within this GWB. In general the subsoil cover is thought to be quite thick, up to and greater than 10 m thick. Four points of > 10 m subsoil have been recorded just north and northeast of the centre of the body.	
	<b>% area aquifer near surface</b>	[Information to be added at a later date]	
	<b>Vulnerability</b>	A Groundwater Vulnerability Map is not currently available for County Longford. It is probable that there are few areas of Extreme vulnerability present, however categorising areas of High, Moderate and Low Vulnerability is not possible at this time. [Information to be added at a later date]	

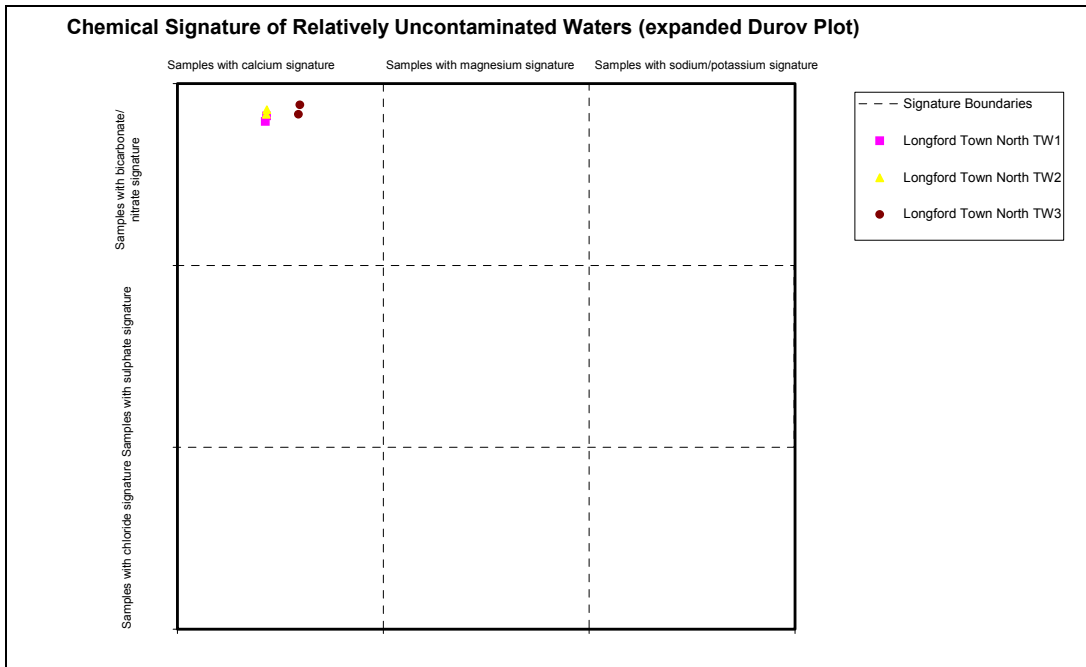
<b>Recharge</b>	<b>Main recharge mechanisms</b>	Diffuse recharge will occur over the entire GWB via rainfall percolating through the subsoil. The proportion of the effective rainfall that recharges the aquifer is largely determined by the thickness and permeability of the soil and subsoil, and by the slope. Percolation of recharge will be somewhat restricted in the west of the body due to the extensive covering of peat and the typically associated underlying lacustrine clay or clayey till. Subsoil permeability has not currently been mapped in detail in County Longford but the sub peat subsoil in the east of the body would be expected to be of 'low' permeability. Percolation of recharge in the northeast of the body will depend on the permeability of the till in that area. <i>Note: Subsoil permeability has not currently been mapped in detail in County Longford.</i> [Information to be added at a later date]
	<b>Est. recharge rates</b>	[Information to be added at a later date]
<b>Discharge</b>	<b>Large springs and high yielding wells (m<sup>3</sup>/d)</b>	Drumlish Road, Longford – Three trial wells drilled and tested for Longford County Council. Drawing from Dinantian Sandstones and Dinantian (early) Sandstones, Shales and Limestones. Estimated safe yields of 1500 m <sup>3</sup> /d for TW1, 1900 m <sup>3</sup> /d for TW2 and 1200 m <sup>3</sup> /d TW3 (K.T. Cullen & Co., 1999) (GSI Well Numbers 2027SWW119, 2027SWW120, 2027SWW121)  From GSI Borehole Database: From Limestones: 2027SWW116 Gowlan, 102 m <sup>3</sup> /d; 2027SWW109 Mullagh, 157 m <sup>3</sup> /d; 2027SWW108 Mullagh 131 m <sup>3</sup> /d
	<b>Main discharge mechanisms</b>	The main discharges are to Lough Ree and the River Shannon in the west and to some springs and streams crossing the body. There may be some groundwater discharge in 'lagg zones' at the margins of the raised bogs or at flushes within the bogs where the underlying 'low' permeability subsoils are thin or absent. .
	<b>Hydrochemical Signature</b>	There are no EPA Groundwater Monitoring data available for this GWB. Hydrochemical analyses carried out on samples trial wells just north of Longford Town in 1999 showed hardness ranging from 246-394 mg/l, alkalinity from 230-365 mg/l and EC from 445-680 mg/l. Iron and Manganese exceeded the E.U. Potable Water MAC (0.21-0.23 mg/l Fe and 0.22-0.73 mg/l Mn). The hydrochemical signature of groundwater from trial wells TW1, TW2 & TW3 is demonstrated in an expanded Durov plot in Figure 2 below.
<b>Groundwater Flow Paths</b>	Groundwater will flow through fissures, faults, joints and bedding planes. In pure bedded limestones these openings can be enlarged by karstification which significantly enhances the permeability of the rock. In pure bedded limestones fracture systems are generally well-connected and widespread and support regional-scale flow systems. Flow path lengths can be up to a several kilometres in length. Overall groundwater flow in this body will be towards the rivers crossing the body and west and northwest to the River Shannon. Groundwater may become partially confined in some areas in this GWB where there are extensive areas of peat and low permeability subsoil. Water levels in karstified limestone generally show rapid response to rainfall. Water level data for a well within this GWB are shown in Figure 1 attached. The south and south-western boundary of this body is formed by the Inny/Lough Ree-Camlin/Rinn surface water catchment boundary. The topography is very subdued at this point and the current surface water catchment boundary may not coincide with the groundwater divide. There may be some groundwater flow between the Lanesborough GWB and the Newtown Forbes GWB.	
<b>Groundwater &amp; Surface water interactions</b>	There is often a high degree of groundwater and surface water interaction in areas underlain by karstified limestone. In this GWB however there are no karst features currently recorded and there is thick subsoil cover in many areas. Where subsoil cover is thin or absent some collapse features providing a direct connection between the surface and the groundwater systems may still occur. Because of the close interaction between surface water and groundwater in karstified aquifers in areas where subsoil cover is thin or bypassed, surface water and groundwater quality are also closely linked. Any contamination of surface water is rapidly transported into the groundwater system, and vice versa. There is an area of Fen Peat north of Cloondara (Teagasc Parent Material Mapping). Fens are highly groundwater dependant ecosystems.	

<b>Conceptual model</b>	<ul style="list-style-type: none"> <li>• This GWB is bounded to the north west by the River Shannon and Lough Forbes. It is bounded to the north and east by the Ordovician Metasediments and Dinantian Upper Impure Limestones of the Longford Ballinalee GWB. It is bounded to the south and southwest by the Inny/Lough Ree-Camlin/Rinn surface water catchment boundary. However the topography is quite subdued at this point and it is possible that this surface water catchment boundary does not coincide with a groundwater divide. There may be some groundwater flow between the Newtown Forbes GWB and the Lanesborough GWB.</li> <li>• The GWB is generally flat and low-lying with large areas of peat land in the west of the body. Ground elevations range from 40-80 mAOD.</li> <li>• This GWB is composed of primarily pure bedded limestones where are generally highly permeable and in other areas have been found to be highly susceptible to karstification.</li> <li>• Groundwater flows along interconnected fractures, joints, faults and bedding planes. In pure bedded limestones these openings can be enlarged by karstification which significantly enhances the permeability of the rock. West of this GWB pure bedded limestones occur which are highly karstified where groundwater flow is concentrated in conduits and rapid groundwater flow velocities are recorded. The limestones of this GWB are similar in lithology however due to this thick overlying deposits no karst features are recorded and little is know about the extent of karstification of the limestones.</li> <li>• Diffuse recharge will occur over the entire GWB via rainfall percolating through the subsoil. Percolation of recharge will be somewhat restricted in the west of the body due to the extensive covering of peat and the typically associated underlying lacustrine clay or clayey till.</li> <li>• Groundwater may become partially confined in some areas in this GWB where there are extensive areas of peat and low permeability subsoil</li> <li>• Groundwater flow in this body is expected to be concentrated in an upper weathered and epickarstic zone and an underlying zone of interconnected fissures generally extending to a depth of 30 m, some of which may be enlarged by karstification.</li> <li>• In pure bedded limestones the degree of interconnection between fractures zones is high and they support regional scale flow systems. Flow paths can potentially be several kilometres in length. Groundwater storage is generally low.</li> <li>• Groundwater will discharge to Lough Ree and the River Shannon in the west and to some springs, streams and rivers crossing the body.</li> <li>• In areas underlain by karstified limestone there is the potential for a high degree of interaction between surface water and groundwater, however large areas in this GWB are covered by thick layers of subsoil and peat underlain by low permeability till. There is an area of Fen Peat north of Cloondara. Fens are highly groundwater dependant ecosystems.</li> </ul>
<b>Attachments</b>	Groundwater hydrographs (Figure 1); Hydrochemical Signature (Figure 2)
<b>Instrumentation</b>	<b>Stream gauges:</b> 26019, 26022, 26213 <b>EPA Water Level Monitoring boreholes:</b> Kilmore Lower (LON 026), Kilmore Upper (LON 028) EPA Representative Monitoring boreholes: None
<b>Information Sources</b>	K.T.Cullen & Co. Ltd. Report on the Drilling and Testing of Trial Wells in the Longford Town – Newtown Forbes Area, Co. Longford. January 1999. Report for Longford County Council. K.T. Cullen & Co., 1991. Consultant Hydrogeologist's Reports on Carrowroe Aquifer and Aquifer Protection Plan. Lanesborough Regional Water Supply. From <i>Lanesborough Regional Water Supply- Preliminary Report - Appendix B</i> , P.H. McCarthy Son & Partners Consulting Engineers March 1991. Prepared for Longford County Council. Lee, M. and Kelly, C. (2003) Roscommon Central Regional Water Supply Scheme (Ballinagard Spring and Proposed Production Boreholes) Groundwater Source Protection Zones. Geological Survey of Ireland Report to Roscommon Co. Co., 14 pp. Morris J.H., Somerville I.D. and MacDermot C.V. (2002). <i>Geology of Longford-Roscommon</i> . A Geological Description to Accompany the Bedrock Geology 1:100,000 Bedrock Series Sheet 12. With contributions by D.G. Smith, M. Geraghty, B. McConnell, K. Carlingbold, W. Cox, D. Daly. Geological Survey of Ireland, 121pp. (Publication Pending) Tara Prospecting Ltd. 1992. Renewal report for PL 2780 for the year ending 1992 – Diamond drill hole 2780/1.
<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

**Figure 1: Groundwater hydrographs  
(EPA Groundwater Level Monitoring)**

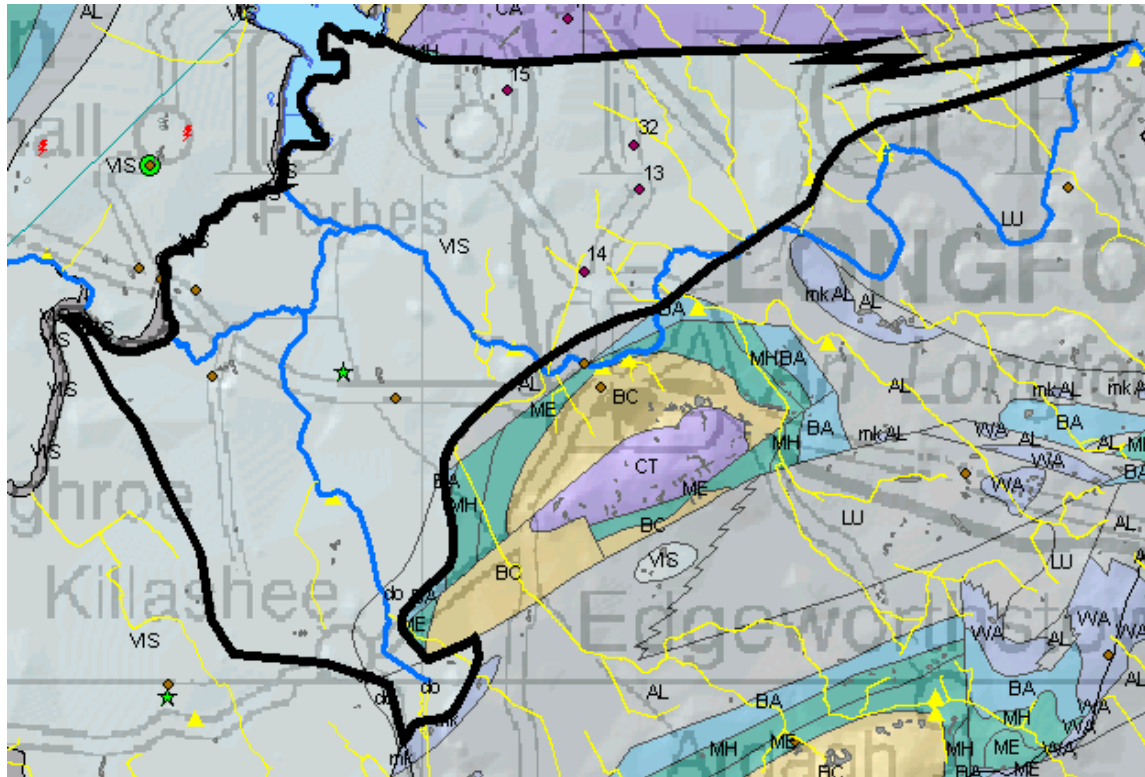


**Figure 2: Hydrochemical signature  
(K.T. Cullen & Co 1999 Hydrochemical Monitoring of Trial Wells\*)**



\*K.T.Cullen & Co. Ltd. Report on the Drilling and Testing of Trial Wells in the Longford Town – Newtown Forbes Area, Co. Longford. January 1999. Report for Longford County Council.

**Newtown Forbes GWB (For Reference)**



**List of Rock units in Newtown Forbes GWB**

Rock unit name and code	Description	Rock unit group
Visean Limestones (undifferentiated) (VIS)	Undifferentiated limestone	Dinantian Pure Bedded Limestones
Dolomitised Limestone (do)		Dinantian Dolomitised Limestone
<p><i>Note: Dinantian Sandstones and Dinatian (early) Sandstones, Shales and Limestones unmapped but encountered in trial drilling north of Longford Town.</i></p>		



