Kingscourt GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystems	Area (km^2)
Hydrometric Area 06 Cavan Co. Co. Meath Co. Co. Monaghan Co. Co.	***Rivers:*** Kilmainham, Lagan, Glyde, Dee, Proules. ***Lakes:*** Bougagh, Fea, Newcastle, Bursk, Descart.	None identified (O'Riain, 2004)	41

Topography	This is an N-S elongated GWB extending from west of Carrickmacross in Co. Monaghan to west of Nobber, Co. Meath (Figure 1). The GWB is surrounded by different aquifer types; lower permeability to the west, south and southeast, and karstic rocks to the north and northeast. Drumlins are common in the north of the GWB but become less frequent in the south, which has a more gently sloping topography. In the southern half of the body, general elevations increase from west to east (60-140 mAOD) and in the northern half, they increase from east to west (40-110 mAOD). The main surface water flow direction is eastwards across the GWB, to eventually discharge into Dundalk Bay.	
Geology and Aquifers	**Aquifer type(s)**	This GWB is predominantly underlain by **Lm:** Locally important aquifer which is generally moderately productive. Just under !% of the areas is Rk^d: Regionally important karstified aquifer that is dominated by diffuse flow.
	Main aquifer lithologies	Namurian sandstones and shales constitute over 65% of this groundwater body, with a further 32% Permo-Triassic sandstones in the northeast. A small area of Dinantian Pure Bedded Limestones (<1%) lie along the eastern boundary.
	Key structures.	The rock succession dips to the west/northwest by 15-20°. The GWB is delineated by the Kingscourt Fault along its western boundary and there are a number of N-S trending faults mainly over the western half of the body.
	Key properties	The dominant sandstone lithology of this GWB will generally results in a higher fissure permeability and therefore, the potential to have moderate to high transmissivity values – 10-50 m^2/d at the lower end of the scale to c.100-150 m^2/d in the vicinity of faults. A transmissivity value of 100 m^2/d has been estimated for similar rocks in NI (Swartz and Daly, 2002). Discharge data are available for 11 wells, – 200-2072 m^3/d (averaging 993 m^3/d)*. Specific capacity values are available for 8 of these wells, ranging from 6-377 $m^3/d/m$ (averaging c.82 $m^3/d/m$). These data provide further evidence that these rocks are capable of sustaining good yields. Storativity is also expected to be reasonable good. Of the 67 available groundwater water level locations, 70% are less than 5 m below ground level, although 3 wells consistently have water levels between 30-50 m below ground. Groundwater gradients cannot be calculated although groundwater flow directions are likely to be eastwards in the northern half of the GWB and northwards in the southern half. * An additional well has a recorded discharge of 7200 m3/d however, the comments suggest that this is associated with the pumping out of a mine shaft. *(Namurian Aquifer Chapter; Monaghan GWPS*)
	Thickness	Most groundwater flux is likely to be in the upper part of the aquifer, comprising three broad zones: broken and weathered rock, typically less than 3 m thick; interconnected fissuring up to 30-50 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m. Fissure permeability is generally expected to be more developed in the top 20-30 m of fractured weathered rock and close to fault zones. Deeper flows are supported by the recorded water strikes: 15 strikes ranging from 24-133 m below ground recorded in 7 boreholes, 10 of which are greater than 50 m below ground.
Overlying Strata	**Lithologies**	The GWB is predominantly covered by till (c.75%), with a smaller proportions of alluvium (11%), peat (6%) and sand/gravel (5%).
	Thickness	From the available outcrop and depth to bedrock data, subsoil cover is thin (<3 m) or absent on the higher areas i.e. to the north and southeast. Thicker deposits (>3 m) are generally associated with drumlin zones and the thickest deposits (>10 m) are mainly in the central eastern portion of the GWB.
	% area aquifer near surface	*[Information will be added at a later date]*
	Vulnerability	From the Monaghan and Meath GWPS, the vulnerability ranges from Extreme where subsoil deposits are thin (higher areas) to Low in the central eastern area, over the thicker, drumlin deposits. There are significant areas of High vulnerability in the south and west. The western area is mainly due to high permeability subsoil deposits.
Recharge	**Main recharge mechanisms**	Diffuse recharge occurs via rainfall percolating through the subsoil and rock outcrops. A proportion of the effective rainfall will discharge to the streams in the GWB, especially where thicker, low permeability subsoil is present (central eastern areas). In addition, the steep slopes of drumlins will promote surface runoff. However, a reasonable proportion of recharge is expected over the areas of thin and/or high permeability subsoil, given that the aquifer has a relatively high permeability.
	Est. recharge rates	*[Information will be added at a later date]*

Discharge	**Important springs and high yielding wells**	Sources: None identified. Springs: None identified. Excellent Wells: Descart (2072 m^3/d), Lossets (1861 m^3/d), Dunheeda (1853 m^3/d), Rolagh (1211 m^3/d), Cornahoova (1014 m^3/d), Lisnakeeny (872 m^3/d), Corratober (731 m^3/d), Mullantra (635 m^3/d). Good Wells: Kilmainhamwood (240 m^3/d), Carrickleck (200 m^3/d, 240 m^3/d).
	Main discharge mechanisms	The main groundwater discharges are to the streams, rivers, lakes and any springs within the GWB. Given the higher transmissivities associated with Lm aquifer, the baseflow proportion of the total streamflow is expected to be higher in this GWB than for the adjacent Pl/Pu GWB.
	Hydrochemical Signature	***National classification:*** Namurian Sedimentary Rocks Calcareous. Generally Ca-HCO_3 signature, but ranges from 'fresh' signatures (Mg-HCO_3, Na/K- HCO_3, Na/K-SO_4) to signatures reflecting long flow path/residence time (Mg-Na/K-Cl). Groundwater close to recharging outcrop areas will have Ca-Mg- HCO_3 signatures. Alkalinity (mg/l as $CaCO_3$): range of 4-436; mean of 167 ('non-limestone till' 107 data points) Total Hardness (mg/l): range of 11-473; mean of 173 ('non-limestone till' 108 data points) Conductivity (μS/cm): range of 76-869; mean of 418 ('non-limestone till' 112 data points) ***National classification:*** Permo-Triassic Sandstones Calcareous. Generally Ca-HCO_3 signature. Alkalinity (mg/l as $CaCO_3$): range of 33-324; mean of 187 (37 data points) Total Hardness (mg/l): range of 61-364; mean of 200 (36 data points) Conductivity (μS/cm): range of 128-720; mean of 441 (37 data points) *(Calcareous/Non calcareous classification of bedrock in the Republic of Ireland report)*
Groundwater Flow Paths		In the absence of inter-granular permeability, groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. The water levels are mainly 0-5 mbgl, although deeper levels are noted. Groundwater flow is thought to be unconfined and of a regional scale i.e. long flow path lengths (up to 2000 m) would be expected although are likely to be shorter in discharge areas (c.100-300 m). Overall, the flow direction will be eastwards, as determined by topography.
Groundwater & surface water interactions		Groundwater is expected to contribute a large proportion of baseflow to the streams and rivers flowing across this GWB due to the relatively high transmissivity of the aquifer.
Conceptual model		• The GWB is surrounded by differing aquifer types: lower permeability to the west, south and southeast and karstic rocks to the north and northeast. The topography changes from gently sloping in the south to drumlin landscape in central areas. Elevations ranging from 40-140 mAOD. • The Namurian rocks and Permo-Triassic Sandstones, which make up c.99% of the GWB, are considered to have the potential for relatively high fissure permeability. Most of the unconfined 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 typically less than 30-50 m, and a zone of isolated fissuring typically less than 150 m. • Transmissivity values are generally expected to be from 10-50 m^2/d, to 100-150 m^2/d, especially in the vicinity of the frequent faults. Storativity is also likely to be good. • High fissure permeability aquifers can generally support regional scale flow systems. Long flow paths (e.g. 2000 m) can be expected although are likely to be shorter is discharge areas (100-300 m). Recharge will occur diffusely through the subsoil and rock outcrops. A high proportion of the effective rainfall is expected to recharge the aquifer, especially where the subsoil is thinner and/or permeable. • The main discharges are to the streams, rivers and lakes within the GWB. Overall, the flow direction is thought to be eastwards, as determined by topography.
Attachments		Figure 1. Figure 2. Table 1.
Instrumentation		**Stream gauges:** 06054 **EPA Water Level Monitoring boreholes:** (CAV 122), (CAV 150), (MEA 160). **EPA Representative Monitoring points:** (CAV 016), (CAV 021), (CAV 046), (MEA 015), (MON 153)
Information Sources		Geraghty, M., Farrelly, I., Claringbold, K., Jordan, C., Meehan, R., and Hudson, M., 1997. *Geology of Monaghan-Carlingford. A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 8/9, Monaghan-Carlingford*. Geraghty, M. (ed.). Geological Survey of Ireland. 60 p. McConnell, B., Philcox, M. and Geraghty, M., 2001. *Geology of Meath: A geological description to accompany the bedrock geology 1:100,000 scale map series, Sheet 13, Meath*. With contributions from J. Morris, W. Cox, G. Wright, and R. Meehan. Geological Survey of Ireland. 77 p. O' Riain, 2004. *Water Dependent Ecosystems and Subtypes (Draft)*. Compass Informatics in association with National Parks and Wildlife (DEHLG). WFD support projects. Swartz, M and Daly, D. (2002) *County Monaghan Groundwater Protection Scheme Report*. Main Report. Final Report to Monaghan County Council. Geological Survey of Ireland Woods, L., Meehan, R. and Wright, G. R., 1998. *County Meath Groundwater Protection Scheme*. Main report. Final report to Meath County Council. Geological Survey of Ireland. 54 p.
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.

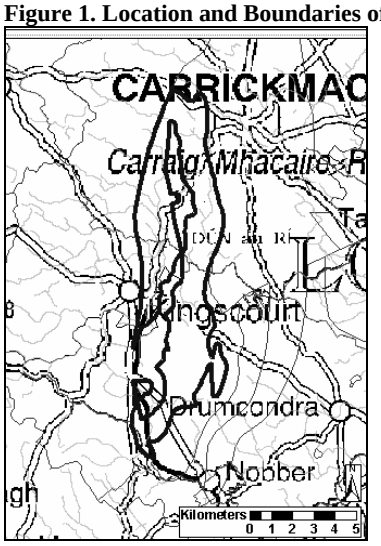
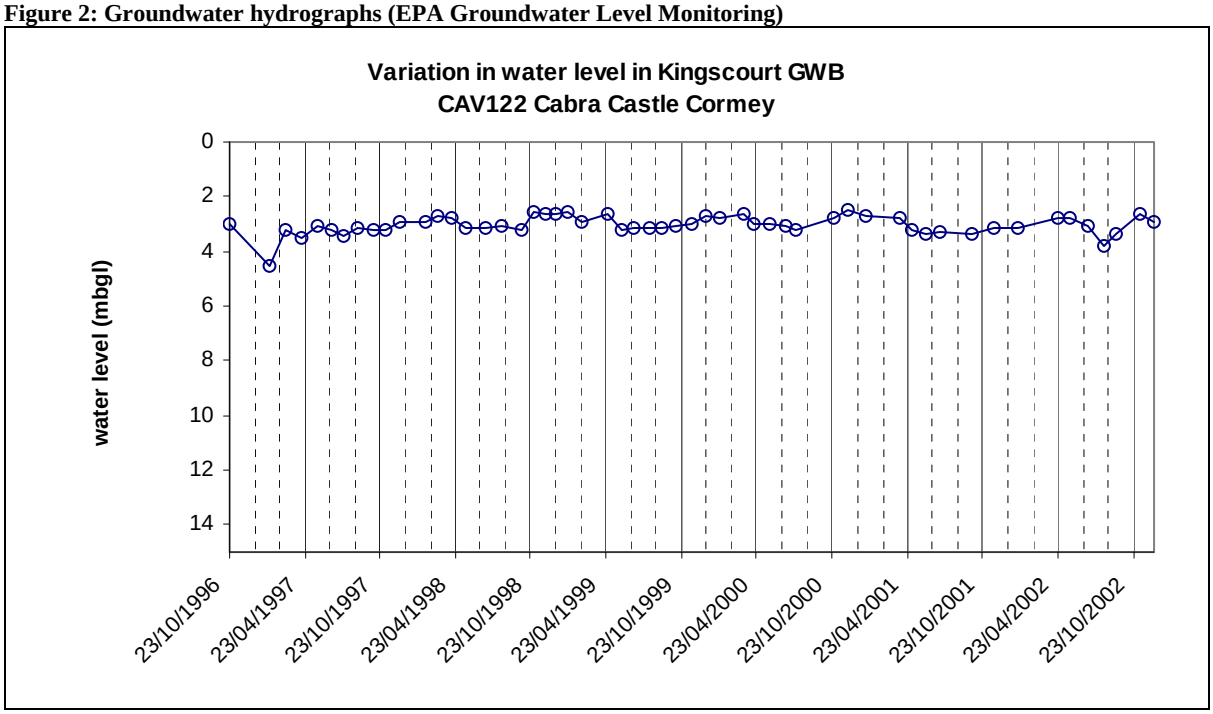
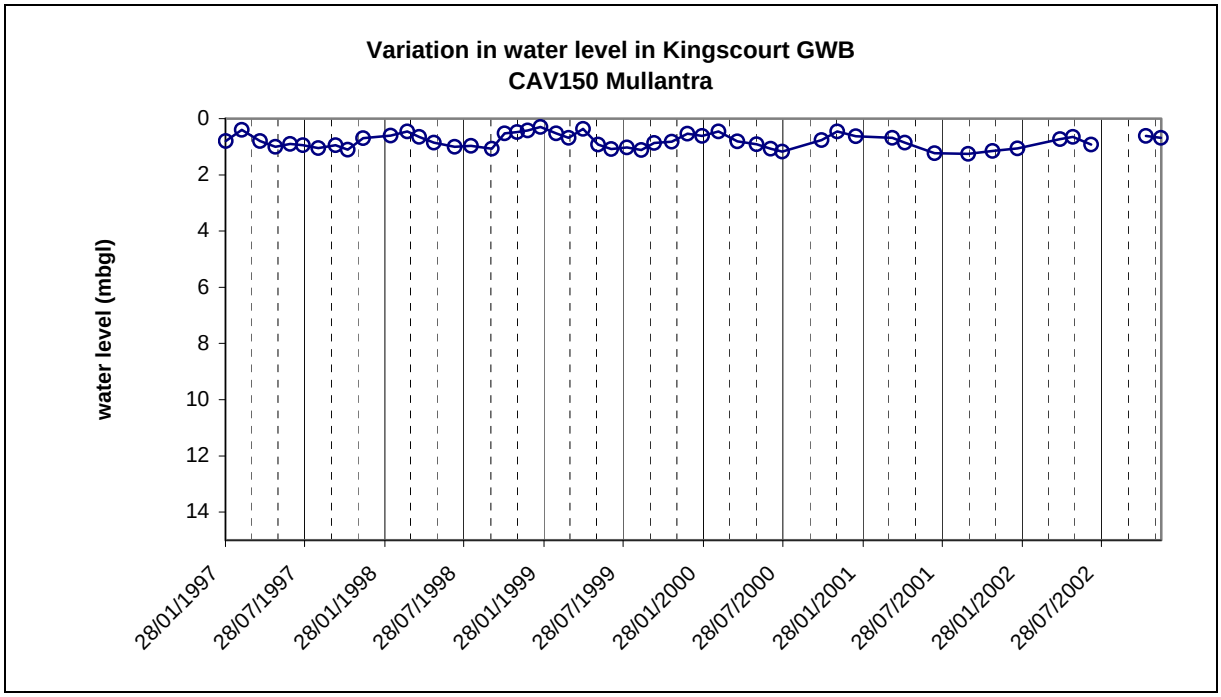


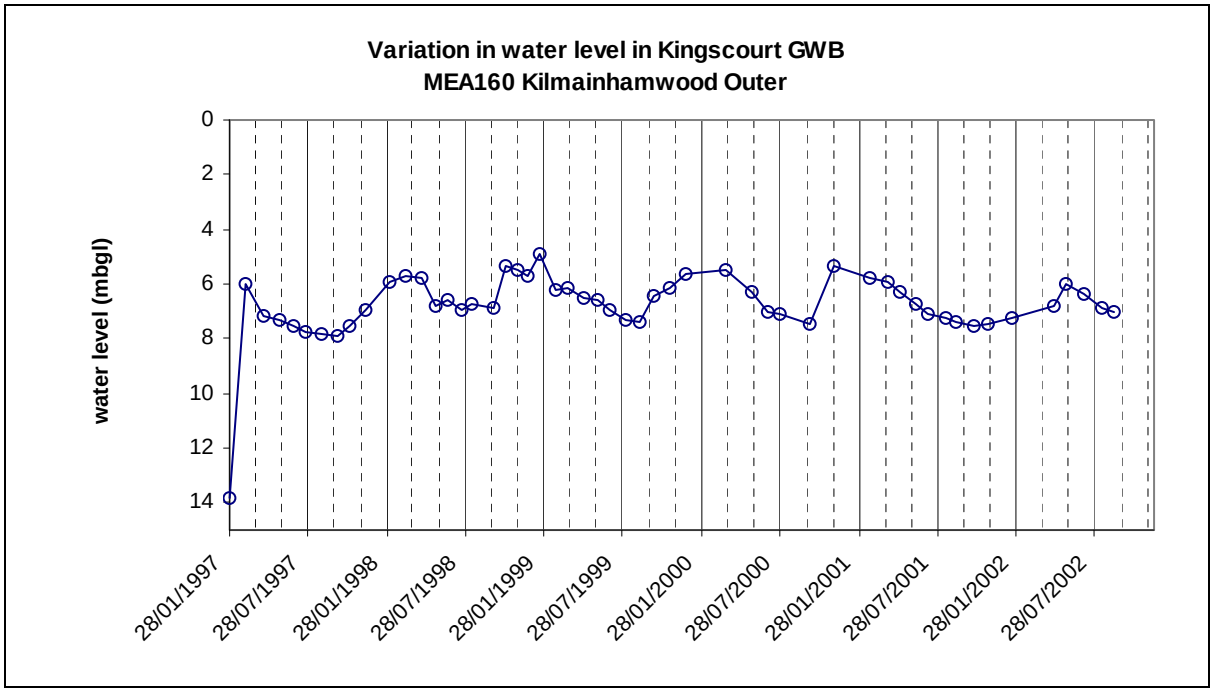
Table 1. List of Rock units in Kingscourt GWB

Rock Unit Name	Code	Description	Rock Unit Group	**Aquifer Class.**	% Area
Cabra Formation	CB	Interbedded sandstone & shale	Namurian Undifferentiated	Lm	57.36%
Kingscourt Sandstone Formation	KS	Red sandstone	Permo-Triassic Sandstones	Lm	32.34%
Carrickleck Sandstone Member	CRcg	Buff coloured sandstone	Namurian Sandstones	Lm	9.33%
Milverton Group (undifferentiated)	MLV	Micrite, crinoidal grainstone/ packstone	Dinantian Pure Bedded Limestones	Rkd	0.97%

Figure 2: Groundwater hydrographs (EPA Groundwater Level Monitoring)




Variation in water level in Kingscourt GWB
CAV150 Mullantra
water level (mbgl)
0
2
4
6
8
10
12
14
28/01/1997
28/07/1997
28/01/1998
28/07/1998
28/01/1999
28/07/1999
28/01/2000
28/07/2000
28/01/2001
28/07/2001
28/01/2002
28/07/2002


Variation in water level in Kingscourt GWB
MEA160 Kilmainhamwood Outer
water level (mbgl)
0
2
4
6
8
10
12
14
28/01/1997
28/07/1997
28/01/1998
28/07/1998
28/01/1999
28/07/1999
28/01/2000
28/07/2000
28/01/2001
28/07/2001
28/01/2002
28/07/2002