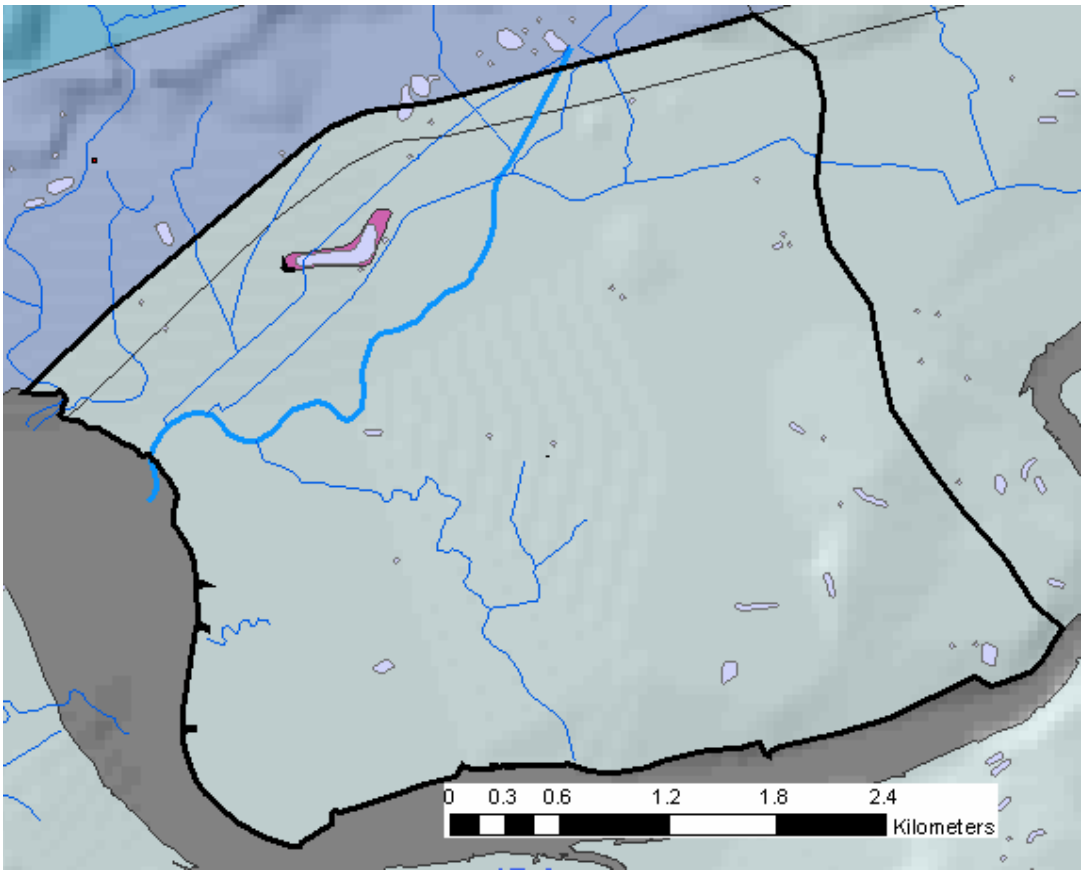
Limerick City North West GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority		Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
27 - Shannon Estuary Clare and Limerick Co. Co's.		Rivers: Shannon, Crompaun/ Meelick Creek. Cratloe Creek.	Fergus Estuary and Inner Shannon, North Shore (002048)	15.6
Topography	The GWB is very low-lying; most of the GWB is less than 10 mAOD in elevation. Slightly higher ground is found in the SE and NE, where elevations reach 10-20 mAOD. The land is generally poorly drained in the low-lying ground in the west of the GWB, next to the River Shannon, and also along the northern margin of the GWB.			
Geology and Aquifers	Aquifer categories	The GWB comprises **Lm:** Locally important aquifers which are generally moderately productive. The Basalts and other Volcanic rocks rock unit group is currently classified as **Lm**.		
	Main aquifer lithologies	Dinantian Pure Unbedded Limestone is the major rock unit group in the GWB. There is a very small area (< 0.1 km^2) of Basalts and other Volcanic rocks in the NW of the GWB.		
	Key structures	The rocks occur on the northern limb of a large syncline, whose axis is oriented ENE-WSW. Bedding dips to the SE at shallow angles ranging between 5^o to 15^o.		
	Key properties	Transmissivities are likely to be in the range 5-150 m^2/d, with the median value towards the lower-middle end of the range. Transmissivity in the limestone aquifer of the Pallas Grean GWB, 24 km to the SE, was estimated as 26 m^2/d. In the Volcanic rocks, transmissivities will be similar, with median values towards the lower end of the range. At Herbertstown WS in the nearby Knockroe SW GWB, transmissivity in the volcanics is about 100 m^2/d. However, there are failed wells known in this rock unit group. Because of flat-lying terrain, groundwater gradients will be very low (~0.005-0.01) over the GWB. *(data sources: Rock Unit Group Aquifer Chapters, GWPS Reports, Source Reports, see references; estimation from maps)*		
	Thickness	The Dinantian Pure Bedded Limestones vary laterally in maximum thicknesses from 150 m to up to 500 m. However, most groundwater flow is likely to take place in the top ~30 m, in the zone that comprises a weathered layer of a few metres (epikarst) and a connected fractured layer below this. Deeper groundwater flow occurs along fault zones and large fractures. In the volcanic rocks, most groundwater flux is likely to be in the top ≤ 20-30 m, in the zone comprising a weathered layer of a few metres and a connected fractured zone below this. However, more isolated water-bearing joints or faults can be intercepted at greater depths.		
Overlying Strata	Lithologies	In general, the GWB is covered by Limestone Till subsoils in the east and by Undifferentiated Alluvium in the west, although Limestone Till can occur in the west, and alluvium in the east.		
	Thickness	There are no subsoil thickness data currently available to assess this GWB. There is outcropping rock and rock close to surface across the GWB, particularly in the east.		
	% area aquifer near surface	*[Information will be added at a later date]*		
	Vulnerability	Groundwater vulnerability is mainly Extreme and High. Extreme vulnerability predominates in the eastern and SE part of the GWB, whilst High vulnerability predominates in the north and next to the Shannon. Low vulnerability is indicated in the NW, adjacent to the Shannon.		
Recharge	Main recharge mechanisms	Diffuse recharge will occur over most of the GWB via rainfall soaking through the subsoil and directly to the aquifer via outcrop. Where the water table is very close to ground surface, recharge may be rejected. Recharge will be inhibited in urban, paved areas, such as in the SE of the GWB, and at Shannon Airport in the SW of the GWB.		
	Est. recharge rates	*[Information will be added at a later date]*		
Discharge	Important springs and high yielding wells (m^3/d)	There is no information available for this GWB on springs or borehole yields.		
	Main discharge mechanisms	The main discharges are to the streams and rivers crossing the GWB, and to the River Shannon that forms the western and southern boundaries of the GWB. Regions in which groundwater is discharging are indicated by high stream densities, i.e. in the north and SW of the GWB.		
	Hydrochemical Signature	No relevant hydrochemical data are available for the limestone aquifer in this GWB for assessment. By analogy with other pure limestone aquifers, the groundwater is likely to be hard to very hard, with corresponding high alkalinity and conductivity, and a neutral pH. It is likely to have a calcium–bicarbonate signature. In general, background chloride concentrations will be higher than in the Midlands, due to proximity to the sea.		

Groundwater Flow Paths	These rocks are devoid of intergranular permeability; groundwater flow occurs in fractures and faults. In the pure limestone aquifers, groundwater flows through an epikarstic layer and a zone in which fractures are more dense and open. The epikarst is thought to be relatively modern, being formed after the last ice age. The groundwater flow regimes in the epikarst and fractured zones will be hydraulically connected, with the degree of interconnection depending on the faults and joints associated with the structural deformation. Within the volcanic rocks, groundwater flows through the weathered zone and the connected fractured zone below this. Groundwater flows through fractures and faults and may also flow through primary structures formed when lava flows cooled causing jointing. Groundwater flux is thought to be concentrated in the top 30 m or so of the aquifers. The GWB is considered to be generally unconfined, with the rivers and streams in hydraulic continuity with the aquifer, which therefore represent the water table elevation. Groundwater levels are generally shallow, ranging from near ground level near streams and rivers, up to around 5-15 mbgl away from surface water bodies, depending upon ground elevation. The water table will generally follow the topography. Local groundwater flow will be from the higher ground between surface water bodies to the rivers and streams, where it discharges. Regional groundwater flow directions are generally westwards and southwards to the Shannon, and oblique to the E-W flowing major river within the GWB. Groundwater flow path lengths are on the order of 500–1500 m over the bulk of the GWB. In discharge zones, flow paths will be much shorter, at around 100–300 m.
Groundwater & Surface water interactions	Groundwater sustains flows in the gaining rivers and streams crossing the GWB. Groundwater will flow into the NHA Inner River Shannon as direct baseflow, and via baseflow to the Crompaun River which flows into the Shannon.
Conceptual model	• The groundwater body is bounded to the west and south by the River Shannon, to the north by the contact with the karstified Pure Unbedded Limestones of Cratloe GWB, and to the east by a surface water catchment boundary which is an implied groundwater divide. The terrain is gently undulating over much of the GWB, with very small hills occurring in the NE and SE. • Groundwater flow occurs along fractures, joints and faults in the limestones and volcanic rocks. There is likely to be an epikarstic layer at the top of the limestones, which acts to redistribute recharge in the subsurface and, in high water table conditions, is a very high transmissivity layer. The aquifers have low storativity. • Recharge occurs diffusely through the subsoils and at outcrop. Potential recharge may be rejected in areas where the water table is very close to the surface. Recharge will be inhibited by urban made ground in the north of the GWB. • Groundwater flux in the limestone aquifer will be concentrated in an approximately 30 m zone at the top of the bedrock. This zone comprises an epikarstic layer of a few metres, below which is a network of joints, fractures and faults. Deeper groundwater flow can occur along permeable fault zones or deeper fractures. The flow regime in the volcanic aquifer is similar, excepting the epikarstic layer. • The aquifers in the GWB are generally unconfined. Near rivers and streams, the water table is close to the surface. Beneath higher ground, significant unsaturated zones may exist. Depending upon topography, the water table can vary between 2 metres up to ~15 m below ground surface. Water table fluctuations in discharge areas will be relatively low (on the order of 1-2 m) whereas under local topographic highs in the limestones, the water table elevation may vary by up to 5 m. • Flow path lengths are generally long (up to 1500 m). In discharge zones, flow paths will be much shorter, at around 100–300 m. On a local scale, groundwater discharges to the streams and smaller rivers crossing the aquifer. Local groundwater flow directions are determined by topography and local drainage patterns. Regional groundwater flow directions are roughly westwards and southwards, directed towards the Shannon. • Groundwater discharges to the gaining rivers and streams crossing the GWB, and to the Shannon at the south and west of the GWB.
Attachments	None.
Instrumentation	None.
Information Sources	Deakin, J. (1995) *Herbertstown Public Supply, Groundwater Source Protection Zones*. Geological Survey of Ireland Report to Limerick Co. Co., 6 pp. Deakin, J., Daly, D. and Coxon, C. (1998) *County Limerick Groundwater Protection Scheme*. Geological Survey of Ireland Report to Limerick Co. Co., 72 pp. Deakin, J. and Daly, D. (2000) *County Clare Groundwater Protection Scheme.* Geological Survey of Ireland Report to Clare Co. Co., 67 pp. Aquifer Chapters: Pure Bedded Limestones, Basalts and other Volcanic rocks.
Disclaimer	Note that all calculations and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae



Rock units in GWB

Rock unit name and code	Description	Rock unit group
Visean Limestones (Undifferentiated)		Dinantian Pure Bedded Limestones
Volcaniclastic Rocks (V)		Basalts and other Volcanic rocks
Basalt (B)		Basalts and other Volcanic rocks
Waulsortian Limestones (WA)	Massive unbedded lime-mudstone	Dinantian Pure Unbedded Limestones