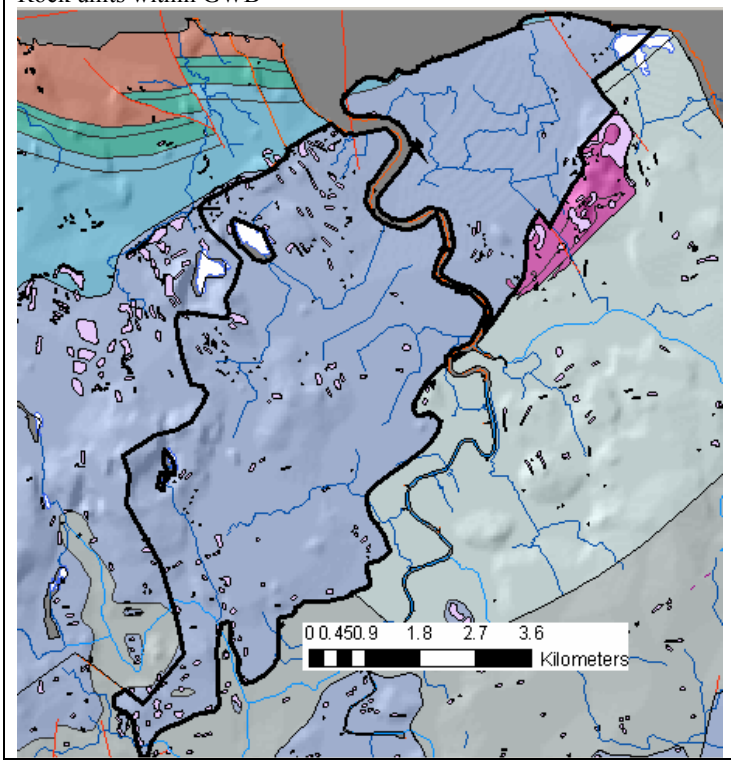
Kildimo GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
24 - Maigue/ Shannon Estuary South Limerick Co. Co.	Rivers: Maigue, Clonshire, Shannon Estuary, Ballindray Creek. Loughs: Bleach, Kilbreedy.	Inner Shannon Estuary South Shore (000435), Dromore & Bleach Loughs (001030)	41

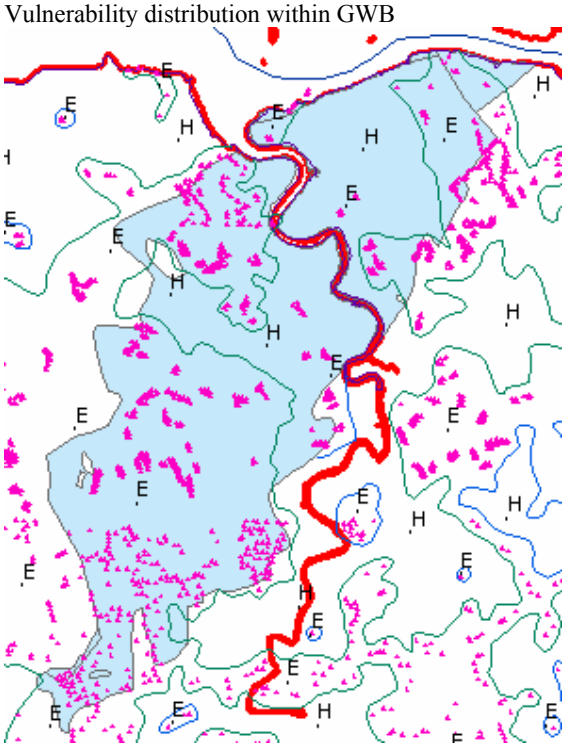
Topography	The GWB is roughly diamond shaped and is elongated north-south. The ground elevation decreases from 76 maOD west of Kilbreedy Loughs (which are in the southwest of the GWB) to sea level along the Shannon Estuary at the northern boundary of the GWB. Much of the ground is gently undulating, and approximately 5-20 maOD. The rivers are gently meandering across gently sloped ground. There are numerous drainage streams, especially north of the River Maigue.	
Geology and Aquifers	Aquifer categories	The bulk of the GWB comprises karstified limestone. Aquifer categories are **Rk^c**: Regionally important karstified aquifer dominated by conduit flow west of the Maigue River, and **Rk^d**: Regionally important karstified aquifer dominated by diffuse flow east of the Maigue River. There are very small areas of **Ll:** Locally important aquifers which are moderately productive only in local zones.
	Main aquifer lithologies	The majority of the GWB comprises Dinantian Pure Unbedded Limestones. There are very small areas of Dinantian Upper Impure Limestones and Dinantian Lower Impure Limestones in the very north and south of the GWB, respectively.
	Key structures	The rocks occur near the core of a WSW–ENE oriented syncline. Faults approximately parallel and at right angles to the fold axis are mapped near the margins of the groundwater body; they are likely to occur within the GWB also. North-easterly faults are noted at Aughinish (in the adjacent Askeaton GWB); here, fault zones are up to 20 m wide and are associated with dolomitisation and solution. Bedding dips range between 15^o and 50^o, with the steepness probably reflecting the steep pre-folding bedding surfaces and not only deformation.
	Key properties	Transmissivity in the karstic aquifer will be in the range 200–2000 m^2/d. The median value will be towards the lower-middle end of the range. In the impure limestones, transmissivities will be of the order 2–30 m^2/d, with median values towards the lower end of the range. Groundwater gradients within the karstic aquifer will be low, ranging from 0.001 to 0.008. *(data sources: Rock Unit Group Aquifer Chapters, Limerick GWPS Report, see references; estimation from maps)*
	Thickness	The Dinantian Pure Unbedded Limestones (Waulsortian Limestones) attain maximum thicknesses of more than 1200 m. However, the effective flowing thickness is likely to be about 30 m. An epikarstic layer of a couple of metres is likely to exist at the top of the aquifer; fieldwork is required to verify this. Deep karst conduits (60 mbsl) may exist, but the flux within the conduits is not known.
Overlying Strata	Lithologies	*[Information to be added at a later date]*
	Thickness	Subsoil thicknesses are typically in the range 0–10 m, with much rock exposed, especially in the south and northwest of the GWB. Depth to bedrock reaches 20 m near the River Maigue.
	% area aquifer near surface	*[Information to be added at a later date]*
	Vulnerability	Groundwater Vulnerability ranges from Extreme to High. Extreme vulnerability areas cover the south, northwest and northeast of the GWB; the remaining central area is predominantly High vulnerability, although there are smaller areas of Extreme vulnerability in this region.
Recharge	Main recharge mechanisms	Recharge will occur directly to the aquifer via outcrops, and by percolating through the shallow subsoil. There is likely to be an epikarst layer which will readily accept recharge, which will then redistribute the groundwater in the subsurface before it enters the main aquifer body. Where the water table intersects the surface and fen areas are formed, potential recharge may be rejected.
	Est. recharge rates	*[Information to be added at a later date]*
Discharge	Springs and large known abstractions (m^3/d)	*[Information to be added at a later date]*
	Main discharge mechanisms	The main discharge zone of the aquifer is the Shannon Estuary and the River Maigue to the north, and the tributary to the Greananagh River in the south of the GWB. In winter, loughs act as temporary discharge zones. There are numerous springs along the southern boundary, at the contact with the Upper Impure Limestones of the Patrickswell GWB.
	Hydrochemical Signature	No hydrochemical data are available for this GWB. The hydrochemistry of the Waulsortian limestone aquifer near Croom, 1 km southeast of New Kildimo, shows a very hard (370–400 mg/l $CaCO_3$), calcium bicarbonate type water with high alkalinity (330–350 mg/l $CaCO_3$). Background chloride concentrations will be higher than in the Midlands, due to proximity to the sea. There may be saltwater intrusion near the shore at high tide. The bedrock strata of this aquifer are **calcareous**.

Groundwater Flow Paths	The karstic flow regimes south and north of the River Maigue are contrasting: south of the Maigue, flow is concentrated in conduits; north of the Maigue, groundwater flow is through a more diffuse network of solutionally-enlarged fissures. South of the Maigue, the flow regime is similar to that in the Askeaton GWB that lies immediately to the west. Site investigations in the Aughinish area (in the adjacent Askeaton GWB) have shown extensive karstification (solution) of the limestone and large variations in permeability (Ercon, 1974; Gutmanis, 1981; Clarke et al., 1981). There is evidence of permeability variations with depth: two unconnected sets of water bearing fissures were observed – one at sea level and one at approximately 60 m below present day sea level. Failed wells adjacent to productive ones, cavities recorded in boreholes, and the presence of turloughs indicate concentration of groundwater into conduits. Annual groundwater fluctuations at Aughinish are reported by Ercon (1974) to be about 6 m. Groundwater levels are typically 3–9 mbgl. However, some SWLs are significantly deeper (15 – 25 mbgl, i.e., below sea level), and are likely to be tapping a deeper conduit system. In the area north of the Maigue River, groundwater flow is thought to be through a diffuse network of fractures and small conduits. Groundwater level fluctuation will be less than in the conduit karst aquifer. From consideration of the drainage pattern, the water table is very close to the surface. Groundwater flow paths in this aquifer are generally long, and can be up to km's long. Groundwater may also discharge locally to surface water features or springs, however, if the topography is variable. In the area north of the River Maigue, groundwater flow paths lengths are probably a combination of regional flow north or southwest towards the Shannon or Maigue rivers, plus local flow to the drainage channels. South of the Maigue, groundwater flow is westwards to the River Maigue, or south towards a tributary of the Clonshire River.
Groundwater & Surface water interactions	The nature of the karstic system leads to rapid interchanges of water between surface and underground. Swallow holes and caves receive surface water, and groundwater is discharged to surface as springs or as baseflow to rivers crossing the groundwater body. The loughs act as groundwater stores – seasonal water levels can vary significantly. Data do not exist to assess the contribution by the aquifer to river flows, or vice versa. Dromore and Bleach Loughs (NHA 001030) are likely to be almost entirely groundwater fed, with their alkalinity determined by the nature of the bedrock. There are fens surrounding the loughs which are dependent on groundwater.
Conceptual model	• The groundwater body is elongated north-south and is roughly diamond-shaped. The northern boundary is formed by the Shannon Estuary, the western boundary is a surface water catchment boundary, and the southern and eastern boundaries are contacts with impure limestones and moderately productive pure limestone aquifers (the Patrickswell and Southwest Limerick City GWBs respectively). The area is generally very low-lying, and topography is gently undulating. • The groundwater body is comprised of both conduit karst and diffusely karstified limestone aquifers. These are highly transmissive limestones, with low storativity. • Recharge occurs only where subsoil thickness and permeability permit, and directly to the aquifer via outcrop. Cross-flow from the upstream aquifers within the Charleville GWB may occur. • The entire aquifer is unconfined. The degree of karstification is thought to decrease eastwards, such that the aquifer categories are Rk^c west of the River Maigue, and Rk^d northeast of it. • West of the Maigue River, there can be large variations in well yields, indicating concentration of groundwater flow in karstified zones. There are two levels of conduits – one set is at sea level and one set is at around 40-60 m below sea level. The more active conduit system is likely to be the upper one, with the lower system reflecting ancient lower sea levels. • Northeast of the Maigue River, groundwater flow is through a more diffuse network of fractured bedrock. Flow velocities within the conduits will be significant (100's m/d), but will be lower in the fracture-dominated eastern part of the GWB. • Groundwater discharges to the streams and rivers crossing the GWB, particularly to the lower reaches of the Maigue, and to the springs within the GWB. At the southern edge of the GWB, groundwater in the karstic aquifer is forced to the surface at the contact with the low transmissivity impure limestones of the Patrickswell GWB. At the northern margin of the GWB, groundwater discharges to the Shannon Estuary. • Dromore and Bleach Loughs (NHA 001030) are likely to be almost entirely groundwater fed, with their alkalinity determined by the nature of the bedrock. There are fens surrounding the loughs which are likely to be dependent on groundwater.
Attachments	None.
Instrumentation	None recorded.
Information Sources	Clarke, R. G., *et al*. (1981*). Engineering geology for a major industrial complex at Aughinish Island, Limerick, Ireland*. Quat. J. Eng. Geol., Vol. 14, pp. 231–39. Deakin, J., Daly, D. and Coxon, C. (1998) *County Limerick Groundwater Protection Scheme*. Geological Survey of Ireland Report to Limerick Co. Co., 72 pp. Ercon (1974) *Report on hydrogeological investigation, Bauxite benefication plant, Aughinish*. Report No. 6488, 19 pp. Gutmanis, J. C. (1981) *The geology of Aughinish Island and the preservation of probable Tertiary deposits in an ancient karst system*. Paper for submission to the Journal of Earth Sciences. Aquifer chapters: Dinantian Pure Unbedded Limestones.
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 within GWB



Vulnerability distribution within GWB



Rock units in GWB

Rock unit name and code	Description	Rock unit group
Waulsortian Limestones (WA)		Dinantian Pure Unbedded Limestones
Rathkeale Formation (RK)		Dinantian Upper Impure Limestones
Ballysteen Formation (BA)		Dinantian Lower Impure Limestones