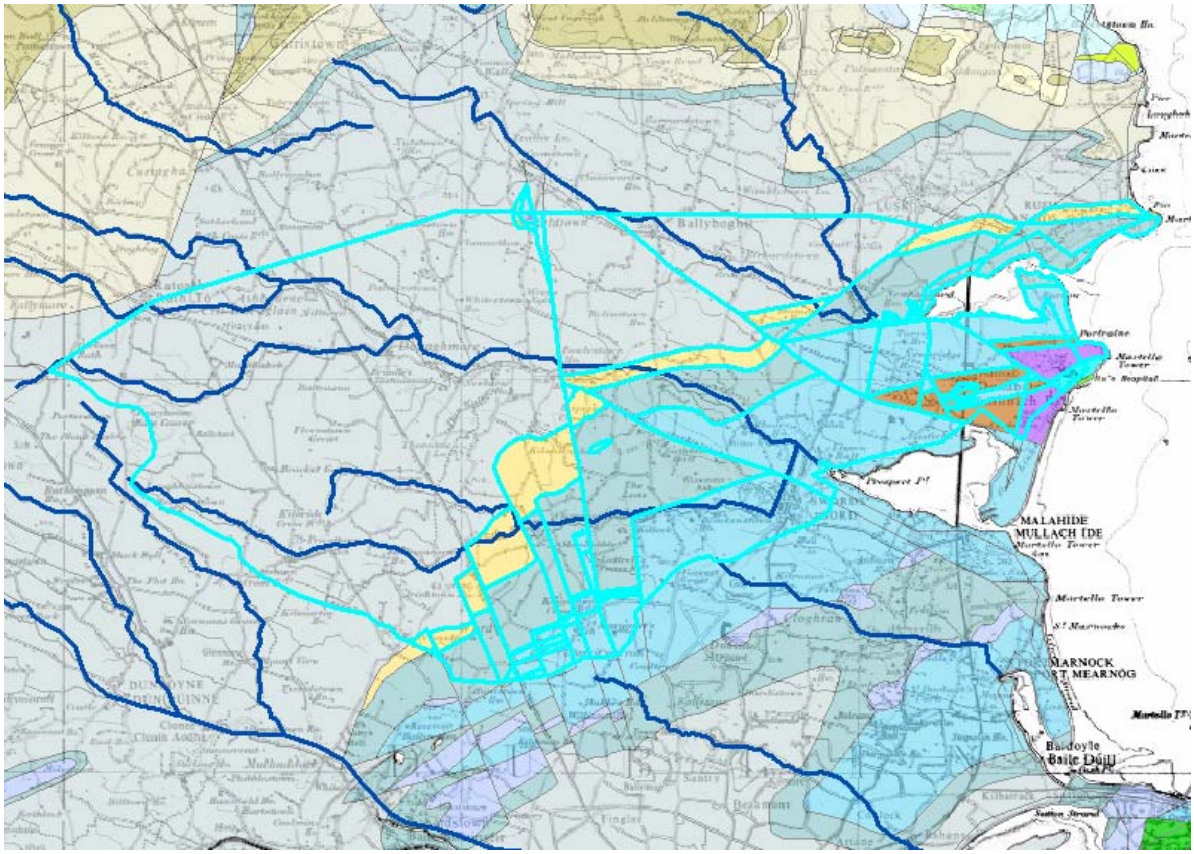
Swords GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystems	Area (km^2)
Dublin Co Co Meath Co Co Hydrometric Area 08	Braodmeadow, Fairyhouse stream, Ward, Ballyboghill, Ballyough Stream	Rogerstown Estuary (SAC 208), Malahide Estuary (SAC 205), Portrane Shore (1215)	199

Topography		This GWB is located in the north of County Dublin. Elevations range from 100m OD in the west at Ratoath, Co. Meath to sea level along the coast between Swords and Rush. The area is low lying with elevations reducing toward the east and also more locally towards the streams in the area.
Geology and Aquifers	Aquifer type(s) Main aquifer lithologies	Mostly **Ll:** Locally important aquifer which is moderately productive only in local zones Some **Pl:** Poor aquifer which is generally unproductive except for local zones Small amounts (2% of total Area) of **Lm:** Locally important aquifer, which is generally moderately productive. Mainly – Dinantian Upper Impure Limestones Smaller amounts of - Dinantian Lower Impure Limestones Dinantian mixed sandstone, shales and limestones Dinantian Sandstones Ordovician volcanics and metasediments
	Key structures.	In the Dublin Basin minor open NE/SW folds cause strike swings in otherwise predominantly E-W striking moderate to shallow dipping strata.
	Key properties	In general permeability in this these rock units are likely to be moderate to low (1-10m^2/d) (Creighton et al). Secondary dolomitisation along faults in the Dublin area suggests that they have been, and may still be open to allow fluid migration. (ERA 1991). Pumping test analysis at the public supply boreholes at Donboyne, Co. Meath provided transmissivity values of between 10 and 150 m^2/d. (Woods 1996)
	Thickness	There is a distinct reduction in the permeabilities of these rocks with depth. Packer tests show permeabilities reduce an order of magnitude for each five metres of depth in the limestone. (Aspinwall & Company, 1979). The majority if groundwater flow will take place within the upper weathered and broken rock zone (3m) with additional isolated flow along fractures and fissures located at depths up to 50m.b.g.l.
Overlying Strata	Lithologies	There are a number of subsoil types deposited over the area of this GWB. Their distribution is related to ice flow directions during the last ice age. Along the coast and some distance inshore there are various deposits of Irish Sea Till, which is the least permeable of the various subsoils. The majority of the aquifer is overlain by limestone-derived till which came from the limestone expanses around Dublin. There are smaller gravel deposits in the area, which will be the most permeable of the subsoils, including glacial deposits and alluvial gravels.
	Thickness	The subsoil in this area is generally quite thick i.e. >5m. In Dublin subsoil mapping shows and large are where subsoil thickness is over 10m in the northern area of the GWB. There are thinner soils to the south and also along some river channels and where the elevation increases at hills.
	% Area aquifer near surface	Most outcrop occurs in the southern and central are of the GWB where there are thinner subsoils
	Vulnerability	The groundwater vulnerability is generally Moderate with areas of higher vulnerability around hill and along river channels.
Recharge	Main recharge mechanisms	Diffuse recharge will occur 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. Due to the generally low permeability of the aquifers within this GWB, a high proportion of the recharge will then discharge rapidly to surface watercourses via the upper layers of the aquifer, effectively reducing further the available groundwater resource in the aquifer. There are areas of very high drainage density, which indicates a large proportion of the effective rainfall becomes surface runoff in this area. The area is located from Swords to Donaghmore about 10 km west of there, and between the Broadmeadow and Ward Rivers.
	Est. recharge rates	*[Information will be added at a later date]*
Discharge	Springs and large known abstractions	Ratoath There are three warm springs recorded about 3km west of Dublin Airport. Typical spring temperatures range from 12.5-25°C, which is significantly above temperatures normally expected for Irish groundwater. It is thought that the groundwater issuing from these springs comes from a much deeper source than most groundwater in Ireland (Burdon, 1983). The presence of warm springs has been associated with deep faults, which would allow deeper, warmer waters to the surface rapidly, and it may be that they are more noticeable in poorer aquifers where the dilution effect of colder, shallower, younger waters is reduced.
	Main discharge mechanisms	The GWB will discharge directly to the Irish Sea along the coast and there will also be discharge to the overlying rivers, if they are in hydraulic continuity with the aquifer
	Hydrochemical Signature	The hydrochemical analyses of groundwater from the area indicate a very hard water (350 - 480 mg/l ($CaCO_3$)), with a high alkalinity (300 - 350 mg/l ($CaCO_3$)). Conductivities are also very high ranging from 550 - 900 µS/cm. This groundwater can be classed as calcium bicarbonate water.

Groundwater Flow Paths	The general groundwater flow direction in this aquifer is towards the coast and also towards the overlying rivers. This aquifer is not expected to maintain regional groundwater flow paths. Groundwater circulation from recharge to discharge points will more commonly take place over a distance of less than a kilometre. The majority of groundwater flow will be a rapid flow in to upper weathered zone but flow in conduits is commonly recorded at depths of 30 to 50 m b.g.l. . The aquifer is not considered to have any primary porosity and flow will be through fractures, some of which will have been enlarged by karstification and dolomitisation. The fissured nature and the moderate permeability of the bedrock close to the surface imply that water will move at high velocities.
Groundwater & surface water interactions	There are two springs located 1km south of Lusk and also there are springs located at along the coast.
Conceptual model	This GWB is located in the north of County Dublin. Elevations range from 100 m OD in the west at Ratoath, Co. Meath to sea level along the coast between Swords and Rush. The area is low lying with elevations reducing toward the east and also more locally towards the streams in the area. The GWB is composed of moderate permeability karstified limestone. The extent of this GWB is defined to the south by the boundary of Hydrometric Area 08 and to the north by a structural region boundary beyond which the Lucan formation is considered to be an Lm aquifer (Dunphy 2003). Very small areas of low permeability impure limestones are incorporated with this GWB, since they are isolated and do not alter significantly the flow system. Groundwater flow occurs along fractures, joints and major faults. There are a number of warm springs located within this GWB, which suggest deep groundwater circulation is possible. Recharge occurs diffusely through the subsoils and via outcrops. The aquifers within the GWB are generally unconfined, but may become locally confined where the subsoil is thicker and/or lower permeability. Most flow in this aquifer will occur near the surface. In general, the majority of groundwater flow occurs in the upper 10 m, comprising a weathered zone of a few metres and a connected fractured zone below this. However, deep-water strikes are commonly found in more isolated faults/ fractures at depths of 30 – 50 m.b.g.l. Flow path lengths are not considered to be on a regional scale, and are typically less than 1km in length. Groundwater discharges to the numerous streams and rivers crossing the aquifer, and to the springs and seeps towards the coast.
Attachments	
Instrumentation	Stream gauge: 08001, 08003, 08004, 08007, 08008, 08009, 08012, and 08013. Borehole Hydrograph: None EPA Representative Monitoring boreholes: None
Information Sources	Aspinwall and Company (1979) *Hydrogeological survey of proposed waste disposal site at Gollierstown, Co. Dublin*. Report prepared for Dublin Co. Co. Creighton J R, Daly D & Reilly T A (1979) *The Geology and Hydrogeology of County Dublin with Particular Reference to the location of Waste Disposal Sites*. Unpublished GSI Report. pp 48 Burdon D J (1983) *Irish Groundwater Resources in Relation to Geothermal Energy Investigations*. Minerex Ltd report to GSI, 275pp. McConnell B, Philcox M & Geraghty M, 2001. *Geology of Meath: A geological description to accompany the bedrock geology 1:100,000 scale map series, Sheet 13, Meath*. Geological Survey of Ireland. 77 p. Woods L, Meehan R & Wright G R, 1998. *County Meath Groundwater Protection Scheme*. 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

Formation Name	**Code**	**Description**	**Rock Unit Group**	**Aquifer Classification**
Donabate Formation	DE	Red coarse sandstone & conglomerate	Dinantian Sandstones	Lm
Lucan Formation	LU	Dark limestone & shale (`Calp)	Dinantian Upper Impure Limestones	Ll
Malahide Formation	ML	Argillaceous bioclastic limestone, shale	Dinantian Lower Impure Limestones	Ll
Portrane Limestone Formation	PL	Thinly bedded bioclastic limestone	Ordovician Metasediments	Pl
Portrane Volcanic Formation	PV	Andesite, tuff, pebbly mudstone, shale	Ordovician Volcanics	Pl
Rush Conglomerate Formation	RU	Conglomerate, shale, limestone	Dinantian Mixed Sandstones, Shales and Limestones	Ll
Tober Colleen Formation	TC	Calcareous shale, limestone conglomerate	Dinantian Upper Impure Limestones	Pl
Waulsortian Limestones	WA	Massive unbedded lime-mudstone	Dinantian Pure Unbedded Limestones	Ll


MALAHIDE
MULLACH IDE
MARNOCK
ST. MEARNOG
Baldoyle
Baile Dúill