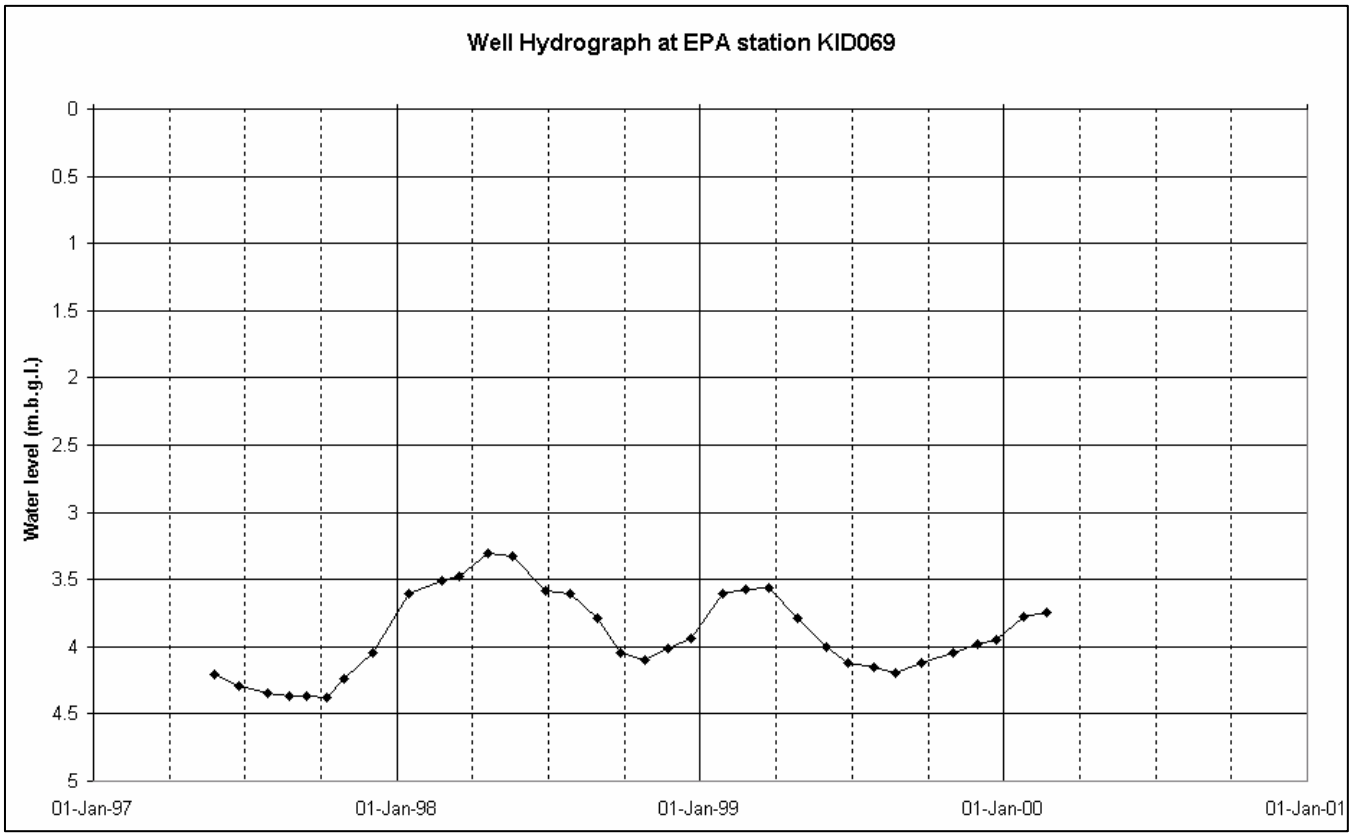
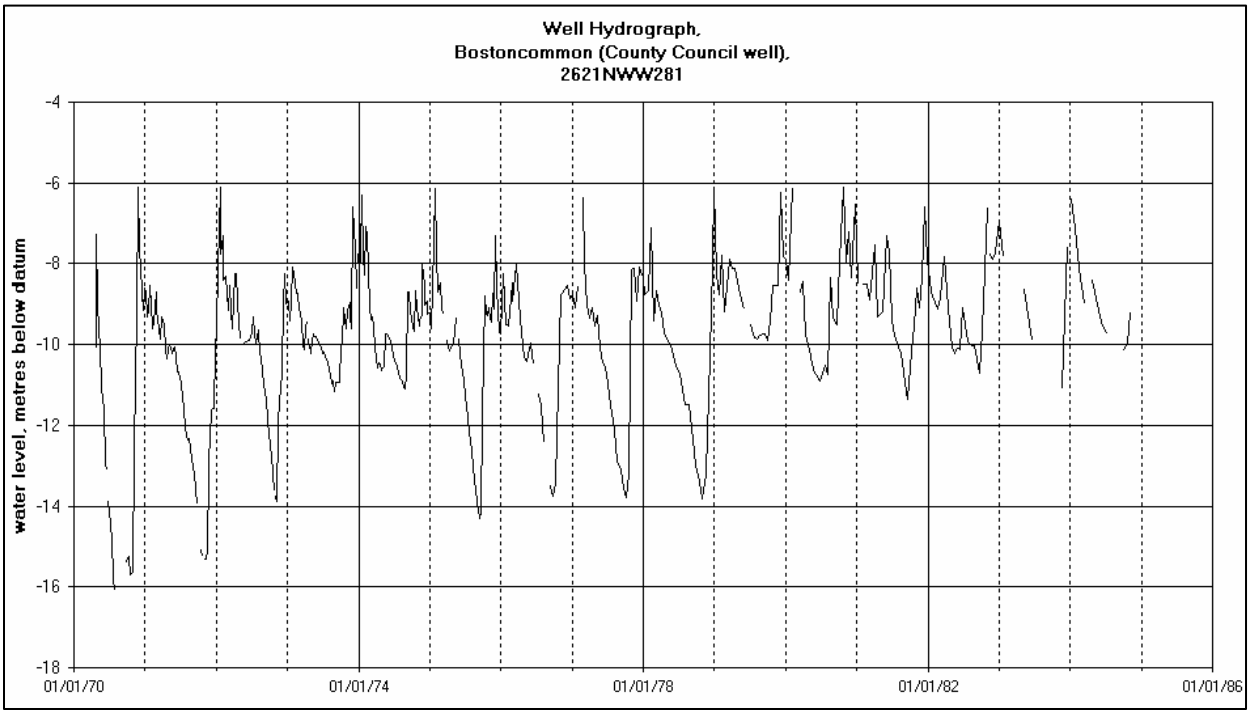
The Curragh GWB: Summary of Initial Characterisation.

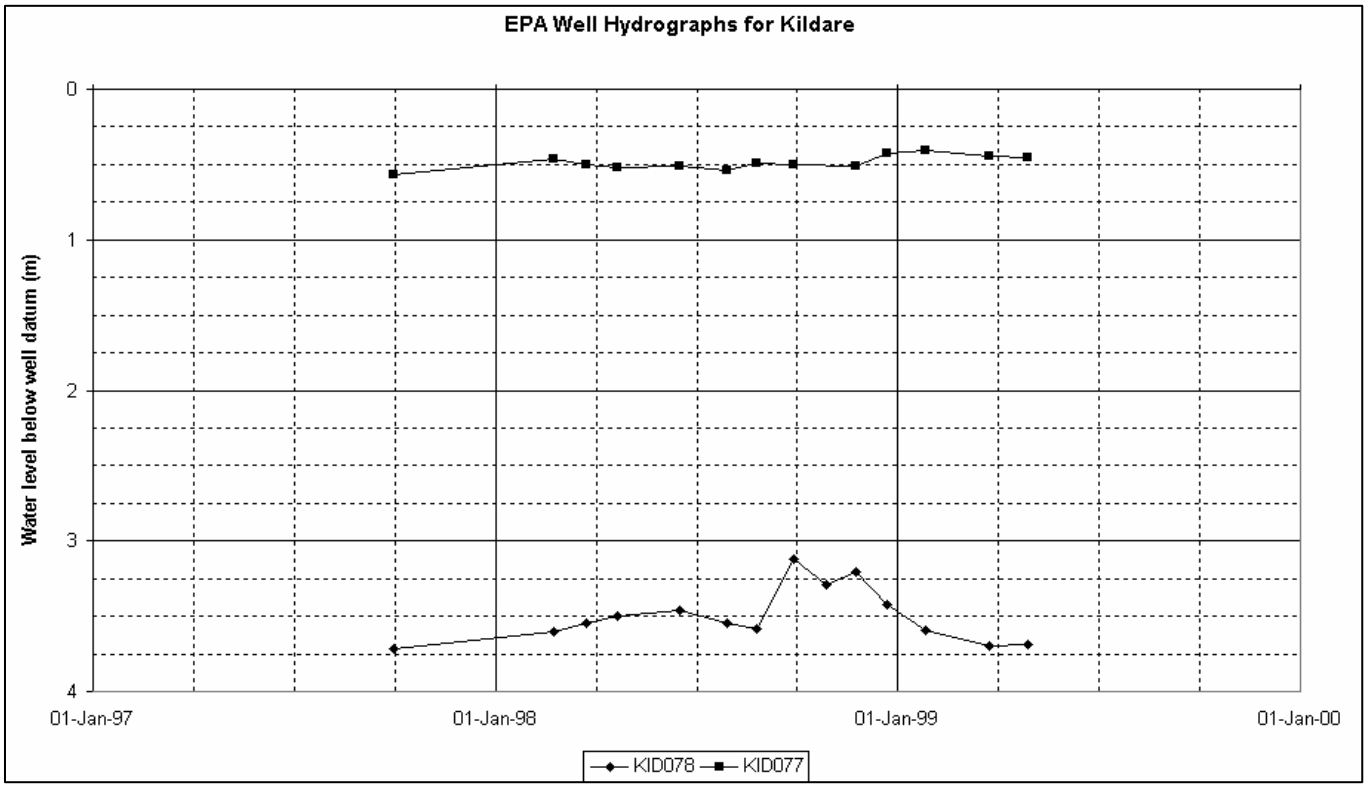
Hydrometric Area Local Authority	Associated surface water bodies	Associated terrestrial ecosystems	Area (km2)
14 – Barrow Kildare Co Co.	Liffey, Tully Stream, Cloncumber Stream	Pollardstown Fen, Moulds Bog.	108

Topography		This groundwater body is roughly ovoid in area, with a maximum length of 21 km and maximum width of 13 km, and extends from near Naas in the northeast to Nurney in the south, and from Kildare town in the west to Kilcullen in the east (Wright 1988). To the southeast the aquifer is bounded by the Lower Palaeozoic rocks (slates, etc) of the Leinster Massif, and to the northwest by the low ridge of the Chair Hills - notably Dunmurry Hill, Grange Hill, the Chair of Kildare and the Hill of Allen - again mainly composed of pre-Carboniferous rocks. The land surface is highest along the NW to SE trending boundary between the SE and E RBDs; the elevation reduces to the southwest.
Geology and Aquifers	Aquifer type(s)	Rg: Regionally Important sand/gravel aquifer.
	Main aquifer lithologies	Sand and Gravel - Grain size data are available for eight of 26 samples taken from a well drilled by the GSI in 1980 at the Curragh Camp. The particle size distribution curves have fines of less than 8%. This borehole also shows the variability of the aquifer material, consisting largely of sand & gravel with occasional till horizons.
	Key structures.	
	Key properties	Porosities are estimated to be in the order of 30-40% (Hayes, 2001). Permeabilities are estimated from test pumping to be in the order of 15-50 m d^{-1}. The bulk permeability of the aquifer is estimated to be 100 m d^{-1} for the purpose of modelling the aquifer (Hayes, 2001).
	Thickness	The Mid-Kildare Gravel Aquifer lies in a shallow trough, oriented NE-SW, in the surface of the limestone bedrock. It is the bedrock surface topography which primarily controlled the depth of this aquifer. The areas of greatest thickness are to the northeast along the drainage divide where it can be up to 70 m thick in places. This thickness reduces away from this area of higher elevation.
Overlying Strata	Lithologies	At the surface there are large areas of till capping the sand & gravel aquifer
	Thickness	White Young Green (2002) indicate that the thickness of the tills is generally less than 3 m
	% area aquifer near surface	There is a relatively high proportion of sand and gravel near the surface because the till overlying the aquifer is quite thin.
	Vulnerability	HIGH.
Recharge	Main recharge mechanisms	Diffuse recharge occurs over most of the land surface through the permeable gravel & till.
	Est. recharge rates	Detailed recharge estimates modelled for the Mid-Kildare Aquifer as part of the hydrogeological investigation for the Kildare By-pass are in the order of 415 mm/year for the area of the Curragh Camp (White Young Green, 2002).
Discharge	Springs and large known abstractions (m^3/d)	Curragh Camp Supply Boreholes (McDonagh (800)), Hare Park (1100)), Kildare Chilling Co. (700), Tully Springs, Maddenstown, Eaglehill, Pollardstown Fen (Spring), Osborne Lodge
	Main discharge mechanisms	The main discharge mechanisms present are baseflow discharge to rivers, seepages at the extremities of the body and discharge via springs. Where the water table is sufficiently close to the surface such that the riverbed elevation is lower than it is, the aquifer will contribute groundwater to the river. This is supported by high Dry Weather Flow values observed at river gauges within the aquifer. It is considered that the discharges from the main springs began as small seepages, which were then altered by man to increase the flow. Natural processes can also lead to the convergence of flow at these springs.
	Hydrochemical Signature	The majority of sediments in this aquifer are **Calcareous;** there is some sediment derived from granites reported at depth but their effect on surface water bodies will be negligible. The analyses indicate a hard to very hard water for both Curragh Camp supply boreholes (250 - >350 mg/l) Average electrical conductivity in this area is 665 µS/cm, which is considered high.
Groundwater Flow Paths		This gravel aquifer has intergranular primary porosity. Variability in the aquifer material influences the hydrogeological behaviour of the aquifer. The aquifer is unconfined in most places. Groundwater gradients are estimated from the water table contours produced by Wright (1988) and White Young Green (2002) to be in the order of 0.002. The velocity of groundwater flow is considered to be 1m/day.
Groundwater & surface water interactions		The Mid-Kildare aquifer is a feeder for the Grand Canal and is an important source of baseflow for the streams and rivers. This is supported by the estimated flow from the aquifer to the Milltown Feeder at Pollardstown Fen of approximately 25,000 m^3/day (Daly, D. 1981). It is also supported by high specific dry weather flow for the Tully Stream which is calculated as 3.9 l/sec/km^2 (figures in excess of 2 l/sec/km^2 are considered to indicate significant baseflow). The aquifer provides baseflow for the major river catchments in Kildare, namely the Liffey, the Barrow and the Boyne. Pollardstown Fen, and important Natural heritage Site, also derives its water from the aquifer.

Conceptual model	The boundaries of the aquifer are quite well defined on its northwest and southeast sides but to the northeast and southwest they are much harder to make out. For the purposes of this evaluation the aquifer has been defined by the existence of at least 5 metres of saturated sand/gravel as seen from the borehole evidence. The aquifer has intergranular permeability. The permeability and thickness of the deposits and the water table gradient control the flow of groundwater. The aquifer is considered to be highly permeable since the covering of till over the gravel is not substantial in the majority of the area. Groundwater recharge is disperse and autogenic, these recharging waters flow to three sub catchments within the Barrow and discharge via springs or as baseflow to rivers.
Attachments	Figures (1 – 3) Well Hydrographs.
Instrumentation	Stream gauge: 14031, *14030,* Borehole Hydrograph: 2621SWW288, KID078, KID077, KID069 *There are up to 20 years monitoring well data available for two wells located in the eastern and western part of the aquifer. In addition, as part of the current work being done on the Kildare By-pass there is regular monitoring of wells around the aquifer to provide information on the aquifers response to the construction of the by-pass.* EPA Representative Monitoring boreholes: Pollardstown Fen (#23 - N772154), Osborne Lodge (#74 - N755146), McDonagh (Curragh Camp) (#50 - N788117), Hare Park (Curragh Camp) (#42 – N770115)
Information Sources	Daly D (1981) Pollardstown Fen. Hydrogeological Assessment of the Effects of Drainage on the Water Supply to the Grand Canal. Internal Report, Geological Survey of Ireland, 40pp. Hayes T, Sutton S, Cullen K, Faherty J (2001) The Curragh Aquifer. Current Conceptual Understanding & Numerical Modelling. Paper presented at the Proceedings of the Annual Groundwater Seminar, IAH (Irish Group) 16th-17th October 2001 Tullamore. KT Cullen - White Young Green Ltd. (2000) Groundwater Abstraction at Kilkea Lodge Farm. Kelly C, Fitzsimons V (2002) County Kildare Groundwater Protection Scheme. GSI report for Kildare County Council McConnell B, Philcox, M, Sleeman AG, Stanley G, Flegg AM, Daly EP, Warren WP (1994) *A Geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 16, Kildare-Wicklow*. Geological Survey of Ireland, 70 pp. Wright GR (1988) *The Mid-Kildare Gravel Aquifer*. Paper presented to the IAH Irish Group, 8th Annual Seminar, Portlaoise, 10pp.
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae




Well Hydrograph,
Bostoncommon (County Council well),
2621NWW281
water level, metres below datum
-4
-6
-8
-10
-12
-14
-16
-18
01/01/70
01/01/74
01/01/78
01/01/82
01/01/86


EPA Well Hydrographs for Kildare
Water level below well datum (m)
0
1
2
3
4
01-Jan-97
01-Jan-98
01-Jan-99
01-Jan-00
KID078
KID077