



Rialtas na hÉireann
Government of Ireland



Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

Kilmurry Sand and Gravel Aquifer Summary of Initial Characterisation



GW3D Project Report TR2023/51
March 2023

Kilmurry Sand and Gravel Aquifer Description March 2023

This sand and gravel report forms part of a series representing the output of a body of work undertaken to re-evaluate previously mapped sand and gravel aquifers and to identify new sand and gravel aquifers. This study resulted in the refinement of existing sand and gravel aquifer mapped extents, the modification of some sand and gravel aquifer categories, and the removal of some previously mapped sand and gravel aquifers, as well as identification of new aquifers. In addition to mapping the extent and depths of the sand and gravel aquifers, the investigations consider the hydraulic properties.

The study, undertaken as part of the GW3D project (2015-2019), comprised three parts:

1) Desk study and fieldwork preparation

Sand and gravel bodies above a minimum size criterion were extracted from the GSI Quaternary Sediments 1:50,000 map. Where it was known that the surface expression of the sands and gravels was only a small portion of the subsurface body, such areas were retained. This process left several hundred sand and gravel bodies remaining as a starting point for field work.

2) Fieldwork including mapping and data collection

Field work included a visit to each of the areas which had the potential to be (at least) a Locally Important Sand and Gravel Aquifer owing to its area. In such areas, gravel pits and sand pits were visited and depth and type of sediment recorded, other exposures into the subsurface were visited and logged, wells (whether Public Supply, Group Scheme or private farm or domestic) were dipped and any information on depths recorded, and data was collected where geological and hydrogeological data existed for the area.

3) Data collation, analysis and reporting.

All field data, and information from earlier reports and studies, were compiled and analysed. Where a sand and gravel body had qualifying aquifer properties (either 10 m depth sand and gravel, or 5 m depth saturated sediments), these areas were digitised in a GIS. The aquifer area was then ascertained and drawn up. Such areas formed the basic building blocks for the sand and gravel aquifer map, which included details on the aquifer name, area, aquifer resource value (Rg or Lg), confidence level, county, and any important aspects to note for each body.

The updated mapped sand and gravel aquifers are found on the Geological Survey Ireland site <https://www.gsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx#Aquifers>

The GW3D Mapping Team involved in the current revision of delineated sand and gravel aquifers were:

Geological Survey Ireland staff:

- Dr. Sophie O'Connor, Groundwater Programme / Land Mapping Unit
- Dr. Sarah Blake, Groundwater Programme

Consultant support:

- Dr. Robbie Meehan, Talamh Ireland
- Coran Kelly, Tobin Consulting Engineers
- Damien Doherty, independent Consultant Geologist/ Tobin Consulting Engineers
- Natalie Duncan, independent Consultant Geologist
- Sara Raymond, independent Consultant Geologist
- James McAteer, Gavin and Doherty Geosolutions



Kilmurry Sand and Gravel Aquifer Description March 2023

Kilmurry Sand and Gravel Aquifer: Summary of Initial Characterisation.

Hydrometric Area Local Authority		Associated surface water features	Associated terrestrial ecosystem(s)	Area (km ²)
07 – Boyne Meath County Council Kildare County Council		Rivers: River Blackwater, Togher River Streams: Several unnamed streams Lakes: None	Royal Canal pNHA	3.86
Topography	The Kilmurry sand and gravel aquifer covers a portion of the valley floor of the River Blackwater, along the county boundary between southwest County Meath and north County Kildare, as well as a small, tributary valley. The body's topography is characterised as hummocky sands and gravels, and constitutes a number of wide, flat-topped plateaux, which coalesce to form the outwash sandur of the deglacial Blackwater River. The Blackwater Valley is orientated generally northwest to southeast, and is set among relatively low-lying, bedrock-cored ridges at Moyvalley and Newcastle. The ground level across the delineated aquifer extent is situated approximately 30 m below the level of outcropping 'Dinantian Upper Impure Limestones' bedrock to the northwest at Moyvalley, and between 5 and 10 m below the level of the till ridges to the southeast.			
Geology and Aquifers	Aquifer categories	Based on its areal extent, inferred thickness, saturated thickness, groundwater throughput and position in the landscape the deposit is classified as Locally Important Sand and Gravel Aquifer (Lg) (DELG/EPA/GSI, 1999; GSI, 2017). There are 12 borehole data points available from within the area of this sand and gravel body, with the majority containing geotechnical logs.		
	Main aquifer lithologies	Hummocky, glaciofluvial sand and gravel deposits derived chiefly from limestones (GLs), which are basic in chemical reaction. Alluvium (A) also occurs as a narrow band through the central area of the deposit.		
	Key structures	Exposure is poor within this sand and gravel body, and no sand and gravel structures were noted during fieldwork.		
	Key properties	There are 11 groundwater level data points available from within the sand and gravel aquifer extent, along with a number of water levels from streams that join with the River Blackwater. It is inferred that approx. 45% of the aquifer area has a depth of saturated sands and gravels greater than 5 m (Figure 2). Particle size analysis plots are available for sediments from a number of the boreholes drilled within the body. The percentage of sand and gravel greater than 63 µm varies between 50% in the alluvial deposits to up to 100% in some sand and gravel samples (Geotech, 2000). Sand and gravel aquifers generally consist of unconsolidated coarse grained material, usually containing less than 8% fines (Ó'Súilleabháin, 2000).		
Overlying Strata	Thickness	One borehole, in Kilmorebrannagh Townland, contains 21 m depth of sands and gravels, with 17 m of this depth fully saturated (Geotech, 2000, Figure 1). All of the remaining boreholes indicate that the subsoil thickness is likely to be at least 10 m deep over the entire delineated aquifer area.		
	Lithologies	Approximately 21% of the aquifer is overlain with lake sediments and/or alluvial deposits, with sands and gravels assumed beneath.		
	Thickness	Borehole logs have recorded thicknesses of alluvial deposits of 0.3 m to 1.3 m at two point localities in Martinstown Townland (Geotech, 2000). The lake sediments and remainder of the alluvial deposits are inferred to be less than 3 m thick.		
	% area aquifer near surface	Approximately 79% of the sand and gravel aquifer is at the surface, with the remainder underneath the lake sediments and/or alluvial deposits.		
Overlying Strata	Vulnerability	The groundwater vulnerability of the sand and gravel is 'Extreme' where the water table is inferred to be < 3 m from the surface, this accounts for 92% of the aquifer area. In all other areas where the water table is at a depth > 3 m, the vulnerability is classed as 'High' (8% of the area, Figure 3).		



Kilmurry Sand and Gravel Aquifer Description March 2023

Recharge	Main recharge mechanisms	Diffuse recharge occurs <i>via</i> rainfall percolating through the unsaturated sands and gravels. Due to the high permeability of sand and gravel, a high proportion of the available recharge will percolate down to the water table. Where lacustrine deposits or alluvium overlie the sands and gravels, the proportion of rainfall that recharges the water table will be significantly less.	
	Est. recharge rates	The annual average rainfall for the aquifer is 866 mm (Walsh, 2012), thus providing an estimated diffuse groundwater recharge rate of 272 mm/yr. The minimum direct groundwater throughput in the aquifer is consequently estimated to be 1,311 m ³ /d.	
Discharge	Large springs and large known abstractions (m ³ /d)	There are no known large springs or abstractions from this aquifer body.	
	Main discharge mechanisms	Groundwater is expected to discharge into the streams that flow through the aquifer. Some small lowlying springs are seen on OSI 6 inch raster map (1830s – 1930s) in, for example, Johnstown and Kilmore Townlands.	
	Hydrochemical Signature	There are no data readily available to assess the hydrochemistry of this aquifer, but the groundwater is likely to have a calcium bicarbonate (CaHCO ₃) signature.	
Groundwater Flow Paths		The length of flow paths depend on the extent of the sand and gravel deposit. In general, locally important sand and gravel aquifers are expected to have relatively short flow paths <i>i.e.</i> up to several hundred metres. Given the geomorphology of the sand and gravel body at Kilmurry, and the pattern of streams, this is also expected to be the case here.	
Groundwater & Surface water interactions		Groundwater is believed to discharge to the River Blackwater and its tributaries that flow through the aquifer, therefore connectivity between the groundwater and surface water is expected to be relatively high.	
Conceptual model	• The aquifer body topography is characterised as hummocky sands and gravels, and constitutes a number of wide, flat-topped plateaux. • The deposits stand within the gently undulating to hummocks valley floor of the River Blackwater at elevations between 68 m and 81 m AOD. • Particle size distribution charts prove the hydraulic properties of the aquifer, with some samples containing solely sand and gravel sized particles <i>i.e.</i> all particles are greater than 63 µm. • Borehole data are available from within the aquifer area, with one log in Kilmorebrannagh Townland suggesting a sand and gravel thickness of 21 m, with 17 m of this depth saturated (Geotech, 2000, Figure 1). • Approximately 45% of the area of the aquifer is inferred to have greater than 5 m depth of saturated sands and gravels, with the remainder inferred to have a saturated thickness less than this. • Diffuse groundwater recharge is estimated to be approx. 272 mm/yr. • The minimum groundwater throughput in the aquifer is estimated to be 1,311 m³/d.		
Attachments	Figure 1: Location and extent Figure 2: Cross section Figure 3: Groundwater vulnerability		
Instrumentation	Hydrometric gauges: National Water Monitoring Stations; Rivers: Groundwater:	None present RS07B020200 (Blackwater Bridge) None present	

Kilmurry Sand and Gravel Aquifer Description March 2023

Information Sources	• DELG/EPA/GSI (1999). Groundwater Protection Schemes. Department of the Environment and Local Government, Environmental Protection Agency and Geological Survey Ireland. • EPA map viewer. https://gis.epa.ie/EPAMaps/ • Geotech Specialists Limited (2000). N4: Kinnegad-Enfield-Kilcock, Preliminary Site Investigation, Factual Report. Carried out for Westmeath County Council. • GSI (2017). A description of Irish aquifer categories. 3 pp. Available from: https://www.gsi.ie/documents/GSI%20Aquifer%20Category%20Descriptions.pdf • NPWS viewer. http://webgis.npws.ie/npwsviewer/ • Ó'Súilleabháin, C. (2000). Assessing the boundary between high and moderately permeable subsoils. Unpublished MSc., University of Dublin. Department of Civil, Structural and Environmental Engineering, Trinity College Dublin. • Walsh, S. (2012). A Summary of Climate Averages 1981-2010 for Ireland, Climatological Note No.14, Met Éireann, Dublin.
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations and assumptions based on the information sources described above and established hydrogeological formulae. Figures 1, 2, 3 and 4 are used for illustrative purposes only.

Kilmurry Sand and Gravel Aquifer Description March 2023

Kilmurry Sand and Gravel Aquifer

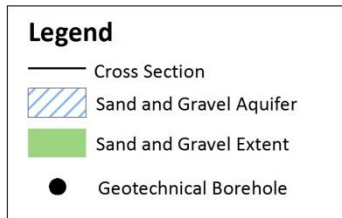
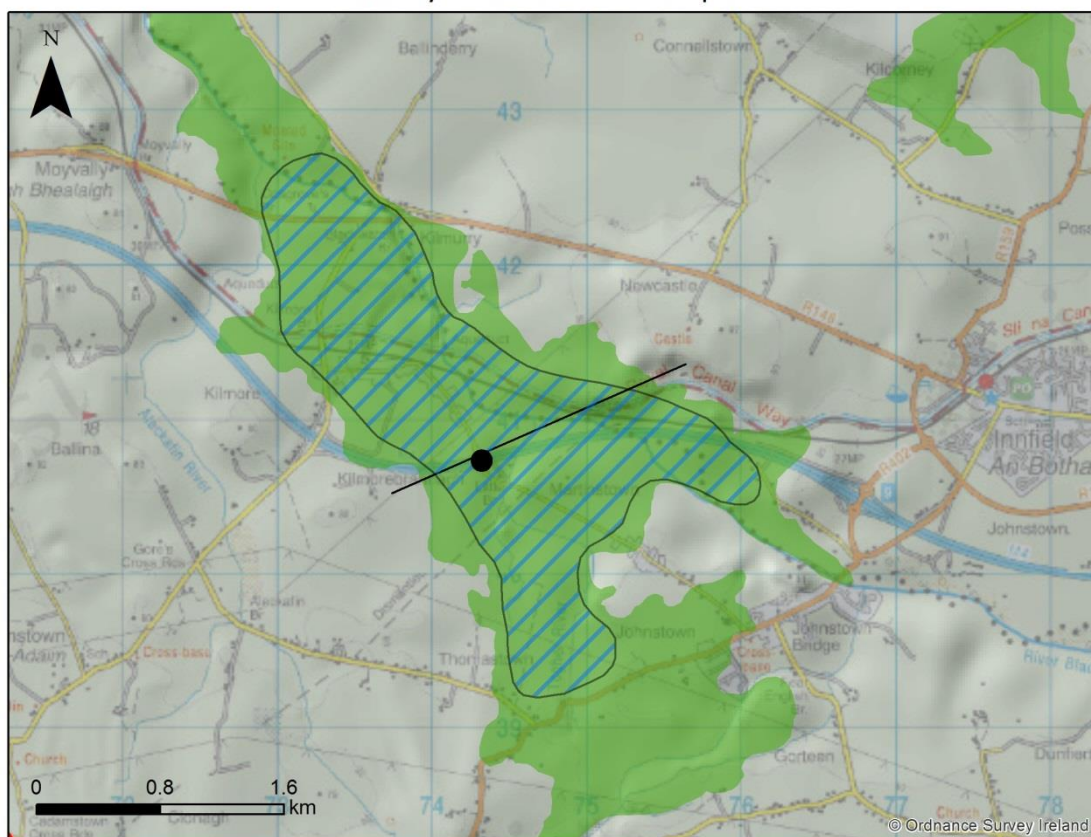


Figure 1: Kilmurry Sand and Gravel Aquifer extent with cross section location.

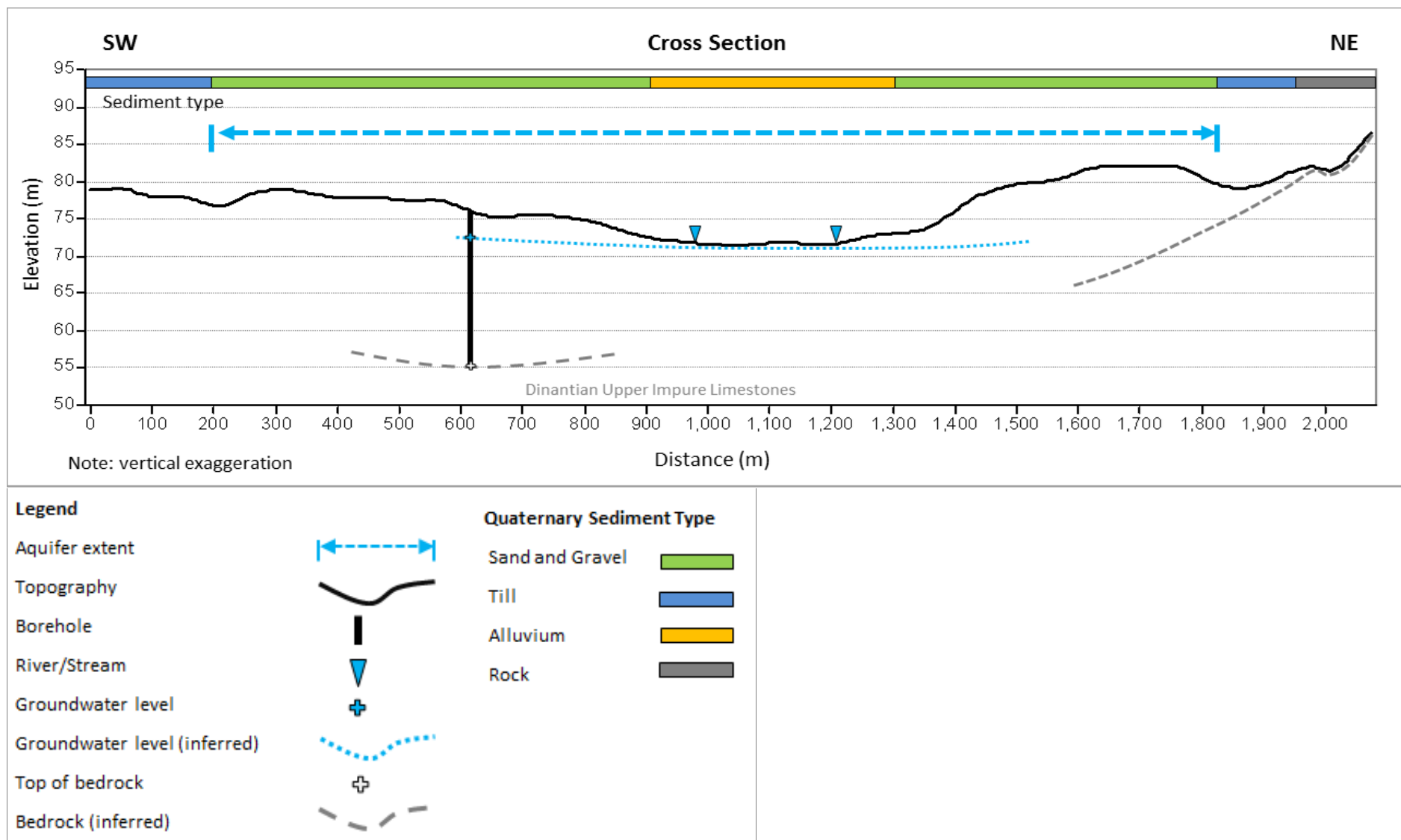


Figure 2: Cross section through the Kilmurry Sand and Gravel Aquifer body.

Kilmurry Sand and Gravel Aquifer Description March 2023

Kilmurry Sand and Gravel Aquifer Vulnerability

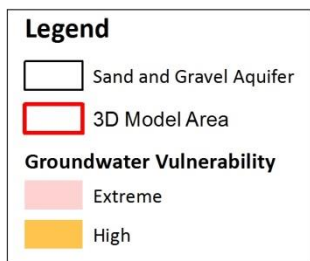
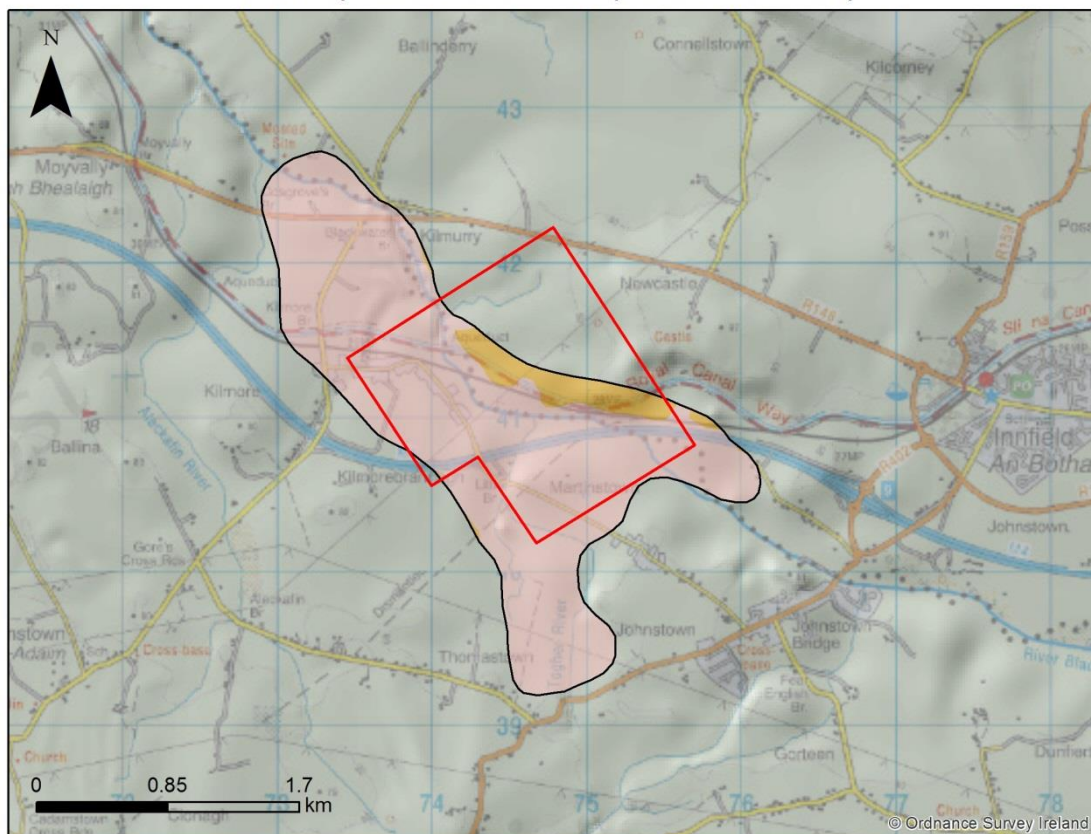


Figure 3: Groundwater vulnerability across the Kilmurry Sand and Gravel Aquifer, with location of 3D Model following also shown.

