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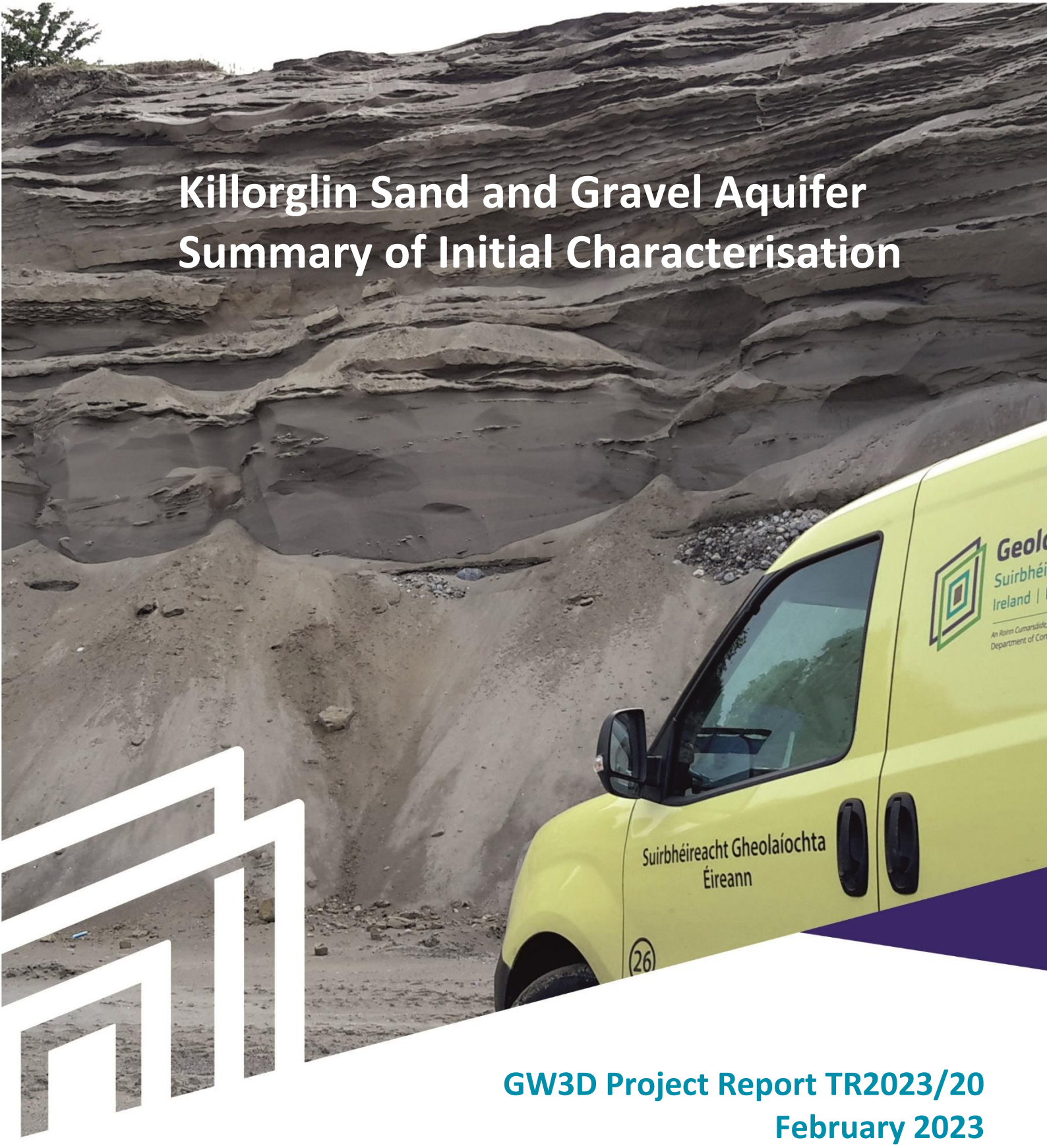

Killorglin Sand and Gravel Aquifer
Summary of Initial Characterisation

GW3D Project Report TR2023/20
February 2023

Geological Survey Ireland is a division of the Department of the Environment, Climate and Communications

Killorglin Sand and Gravel Aquifer Description February 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

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Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
22 – Laune - Maine - Dingle Bay Kerry County Council	**Rivers:** River Laune, Cottoners River, Stealroe River, Finglas River, Meanus River, Ardraw River, Brookhill River, Kilgobnet River, Claddagh River, Gaddagh River, Glasheenasheefree River **Streams:** Tullynascally Stream, Ardlaghas Stream, several unnamed streams **Lakes:** Lough Ykeel	Castlemaine Harbour SAC Castlemaine Harbour SPA Castlemaine Harbour pNHA	25.2

Topography	The Killorglin sand and gravel aquifer stretches for a linear distance of 12 km, along a southeast-northeast orientation along the valley of the River Laune in County Kerry (Figure 1). The body passes through Killorglin Town at its northeastern end, and the aquifer extent ceases approx. 1 km short of the Laune Estuary and Castlemaine Harbour. The aquifer topography is classified as a 'flat alluvial-glaciofluvial plain' (GSI, 2023a), and comprises a number of relatively flat to hummocky terraces, at elevations between sea level and 52 m AOD. The higher elevations are found on the eastern side of the aquifer. The surrounding landscape to the north is characterised as 'hill to rolling lowland' topography (GSI, 2023a) which rises to approx. 100 m AOD, and that to the south is characterised as 'mountain ice-sculpted ridge' topography (GSI, 2023a), which form the foothills of the MacGillycuddy's Reeks.	
Geology and Aquifers	**Aquifer categories**	There are 19 geotechnical data points available within, and adjacent to, the sand and gravel aquifer. The aquifer easily exceeds the groundwater throughput threshold of 1,000 m^3/d. Based on its areal extent, inferred thickness, inferred saturated thickness, groundwater throughput and position in the landscape the deposit is classified as a **Regionally Important Sand and Gravel Aquifer (Rg)** (DELG/EPA/GSI, 1999; GSI, 2017).
	Main aquifer lithologies	Flat to hummocky, glaciofluvial sands and gravels derived chiefly from Devonian sandstones (GDSs).
	Key structures	Exposure is poor within this sand and gravel body, and few good profiles were noted during fieldwork; this is partially due to the shallow groundwater levels throughout 60% of the area of the aquifer.
	Key properties	There are five desk study data points which have groundwater level data, and 20 discrete groundwater levels were measured in the field. Using these data, along with the streams and rivers, it has been inferred that approx. 51% of the aquifer area has a depth of saturated sands and gravels greater than 5 m (Figure 2). Particle size distribution analyses are available for three borehole logs, in a small area north of Killorglin Town; each of the three boreholes contain less than 1% fines (GSI, 2023b). In general, sand and gravel aquifers consist of unconsolidated coarse grained material, usually containing less than 8% fines (Ó'Súilleabháin, 2000).
	Thickness	Proven depth to bedrock within and adjacent to the aquifer ranges from 0 m to 62 m below ground level, with eight records having at least 8 m depth of subsoils present. Using 19 desk study depth to bedrock data points, and inferences between them, the thicknesses of the subsoils are expected to be at least 10 m throughout the majority of the area of the aquifer.
Overlying Strata	**Lithologies**	Approximately 45% of the aquifer is overlain with cutover raised peat, alluvium and (urban) 'Made' ground, with sand and gravel inferred beneath.
	Thickness	The thickness of the alluvium has been measured at 3.7 m at one point locality at Clooncarrig Townland (GSI, 2023b). The thickness of the cutover raised peat, (urban) 'Made' ground and the majority of the alluvium are inferred to be less than 3 m thick.
	% area aquifer near surface	Approximately 55% of the sand and gravel aquifer is at the surface, with the remainder beneath 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 60% of the aquifer area. In all other areas where the water table is at a depth > 3 m, the vulnerability is classed as 'High' (40% of the aquifer area, Figure 3).
Recharge	**Main recharge mechanisms**	Diffuse recharge occurs *via* 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. In the areas of the aquifer that is covered by the overlying strata a much lower proportion of the available recharge will percolate downwards. No rejected recharge has been conceptualised in this aquifer, as the majority of the aquifer area is underlain by karstified bedrock and where the bedrock is not karstified, gradients conduct groundwater towards surface watercourses.
	Est. recharge rates	The annual average rainfall for the aquifer is 1,430 mm (Walsh, 2012), thus providing an estimated diffuse groundwater recharge of 490 mm/yr. The minimum groundwater throughput in the aquifer is consequently estimated to be 17,136 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 inferred to discharge into the streams and rivers which flow through the aquifer.
	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, regionally important sand and gravel aquifers are expected to have relatively long flow paths *i.e.* perhaps up to several kilometres. The geomorphology of this sand and gravel aquifer and the pattern of streams and rivers within it would suggest, however, that groundwater flow paths are unlikely to exceed 1 km in length.
Groundwater & Surface water interactions		Groundwater is inferred to discharge *via* lowlying springs as seen on OSI 6 inch raster map (1830s -1930s) into areas of cutover raised peat at Brookhill, Kilcoolaght and Meanus Townlands. Groundwater is also expected to discharge into the streams and rivers that flow through the aquifer body.
Conceptual model		• The aquifer topography is characterised as a 'flat alluvial-glaciofluvial plain' (GSI, 2023a), though the body comprises low terraces and some hummocky topography, found at elevations between sea level and 52 m AOD; the higher elevations are on the eastern side of the aquifer. • Proven depth to bedrock, within and adjacent to the aquifer, range from 0 m to 62 m below ground level. • Using groundwater level data, it is inferred that approx. 51% of the aquifer area has a depth of saturated sand and gravel greater than 5 m. • Approximately 45% of the aquifer is overlain with cutover raised peat, alluvium and (urban) 'Made' ground with sand and gravel inferred beneath. • Groundwater is inferred to be within 3 m of the ground surface across 60% of the aquifer area – *i.e.* approx. 15 km^2. • The annual average rainfall for the aquifer is 1,430 mm (Walsh, 2012) thus providing an estimated groundwater recharge of 490 mm/yr. • The minimum groundwater throughput in the aquifer is consequently estimated to be 17,136 m^3/d.
Attachments		Figure 1: Location and extent Figure 2: Cross section Figure 3: Groundwater vulnerability

Instrumentation	**Hydrometric gauges:** **National Water Monitoring Stations;** **River:** **Groundwater:**	22019 (Ownagarry) 22030 (Gaddagh Bridge) RS22L010540 (Cloon Island) RS22L010510 (Laune – Rly Bridge) RS22L010500 (Laune – Killorglin Bridge) TW13003210CC1001 (River Laune) RS22C050600 (Bridge u/s Laune) RS22C050500 (Cottoners – Ownagarry Bridge) RS22F030700 (Finglas) RS22L010470 (Laune – SW of Glebe House) RS22L010300 (Ballymalis Castle) RS22G010500 (Gortnaskarry Bridge) RS22G010400 (Gaddagh Bridge) None present
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/ • GSI (2017). A description of Irish aquifer categories. 3 pp. Available from: https://www.gsi.ie/documents/GSI%20Aquifer%20Category%20Descriptions.pdf • GSI (2023a). Geological Survey Ireland, Spatial Resources Viewer: Quaternary geomorphology Map. https://www.gsi.ie/en-ie/data-and-maps/Pages • GSI (2023b). Geological Survey Ireland, Internal geotechnical borehole databases. • Hunter-Williams, N.H., Misstear, B.D.R., Daly, D. and Lee, M. (2011). (2011). Development of a national groundwater recharge map for the Republic of Ireland. Quarterly Journal of Engineering Geology and Hydrogeology, 46(4):493-506. • 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, and 3 are used for illustrative purposes only.	

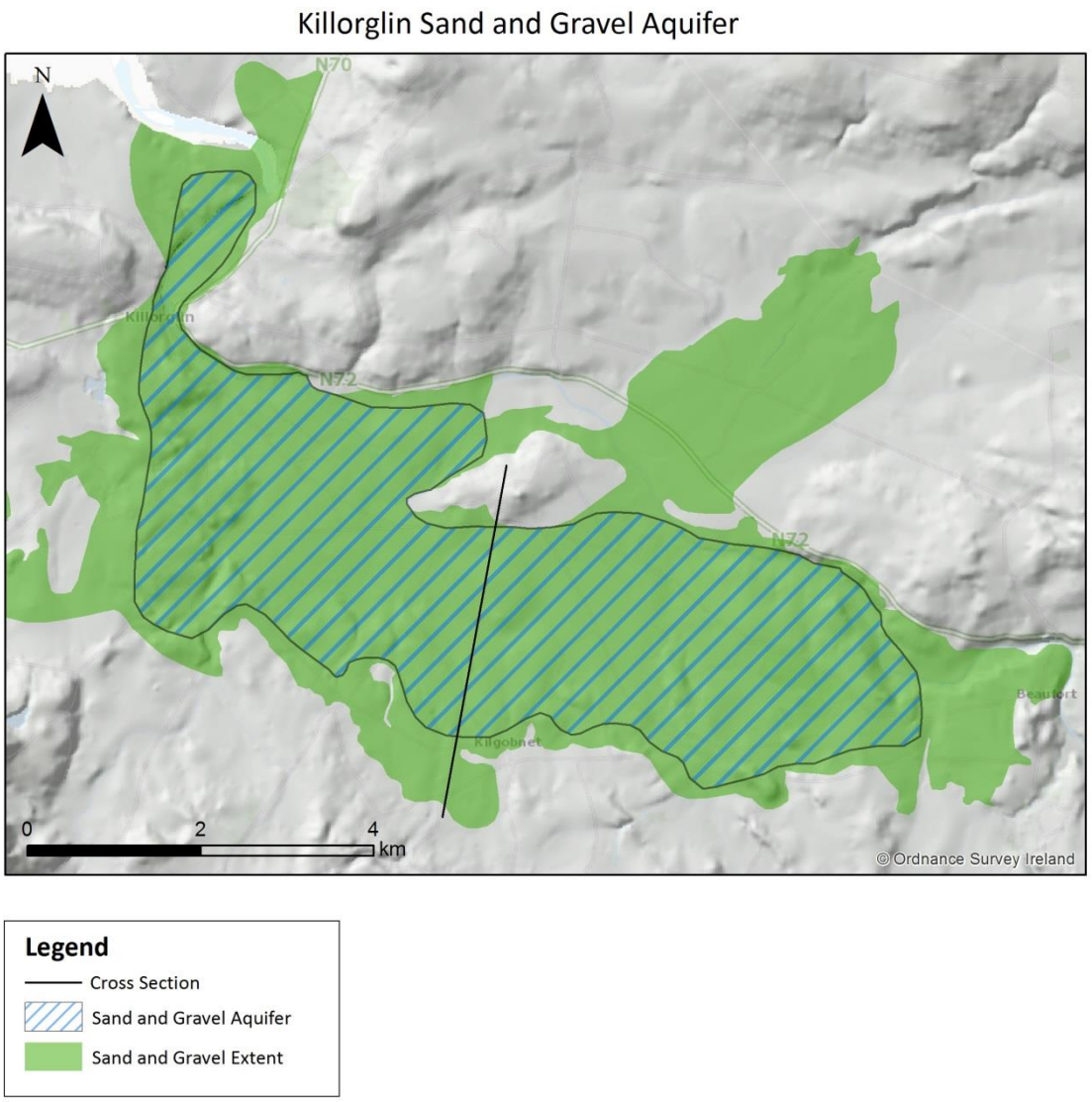

Figure 1: Killorglin Sand and Gravel Aquifer extent with cross section location.

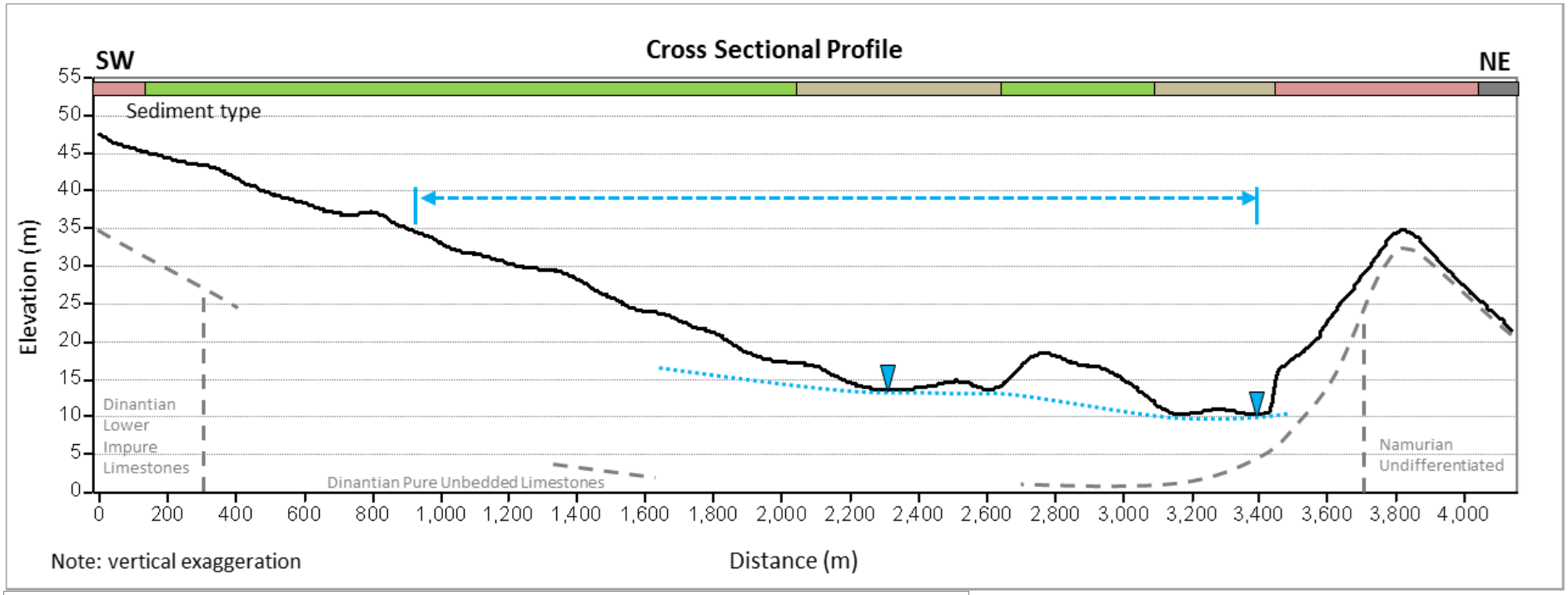

Figure 2: Cross section through the Killorglin Sand and Gravel Aquifer body.

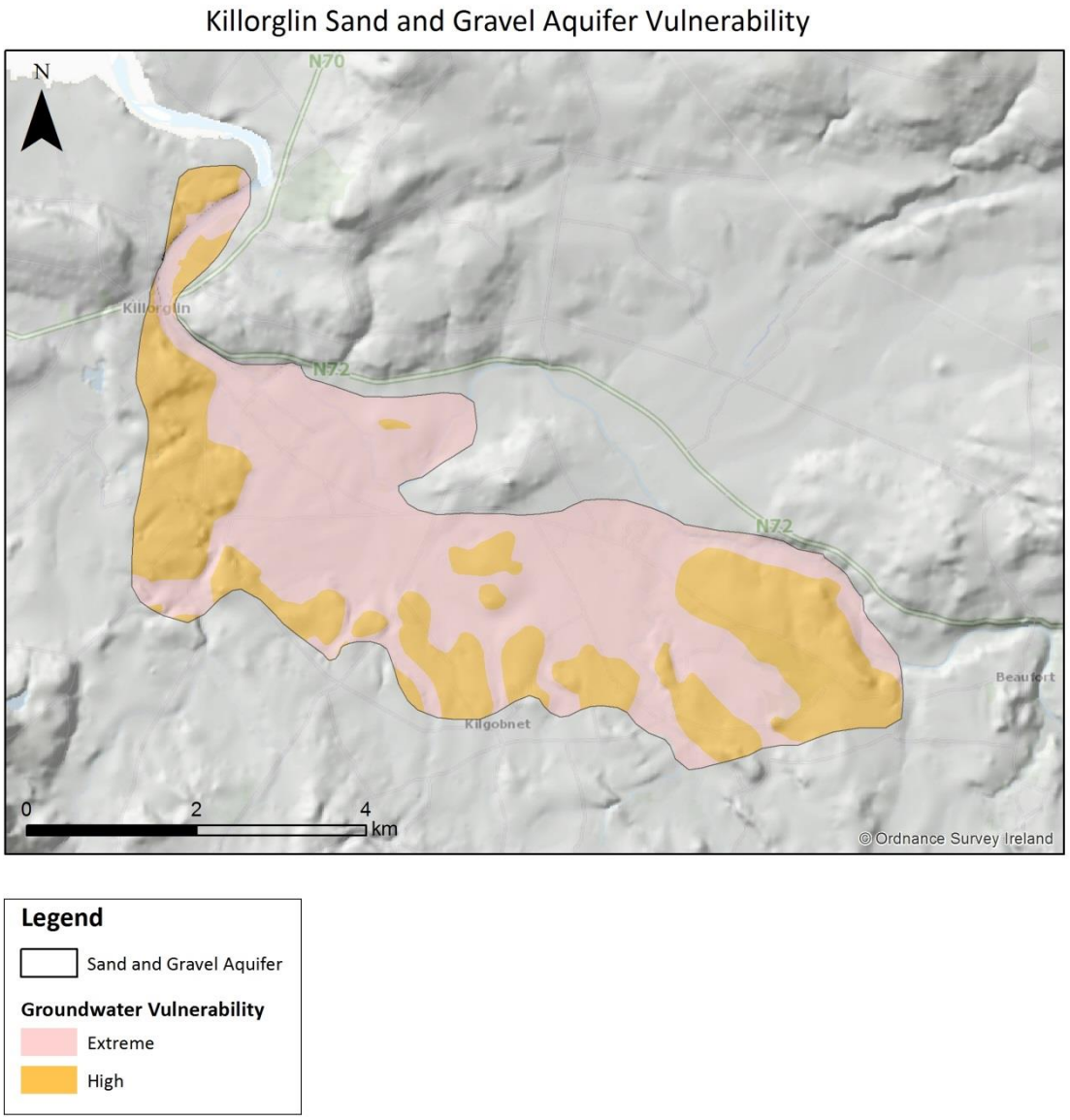

Figure 3: Groundwater vulnerability across the Killorglin Sand and Gravel Aquifer.