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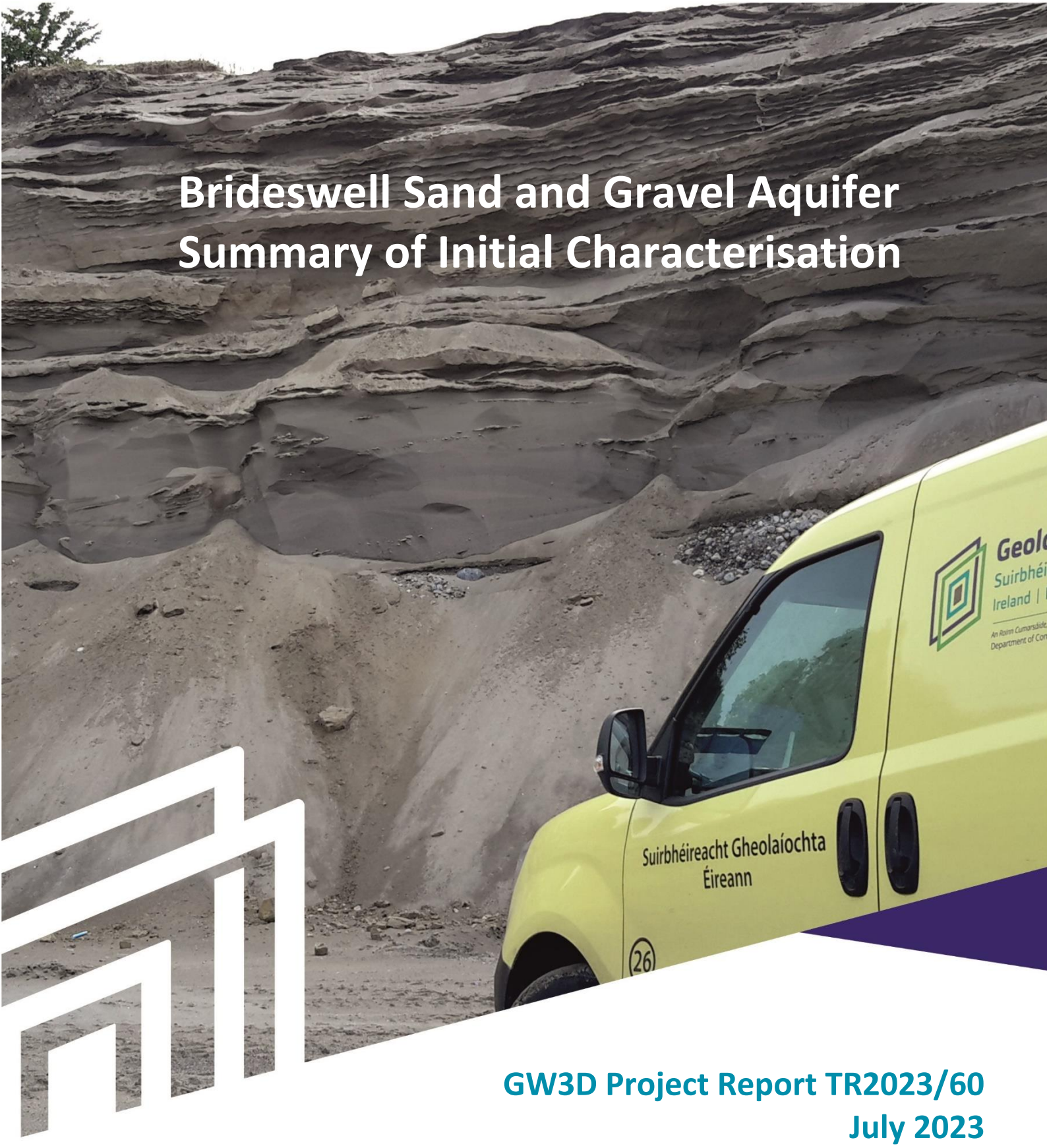

Brideswell Sand and Gravel Aquifer
Summary of Initial Characterisation

GW3D Project Report TR2023/60
July 2023

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

Brideswell Sand and Gravel Aquifer Description July 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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Brideswell Sand and Gravel Aquifer: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
26 –Shannon Upper Roscommon County Council	**Rivers:** Cross River, Barr's Drain River **Streams:** Several unnamed streams **Lakes:** None	None	4.2

Topography	The Brideswell sand and gravel body is located just east of Brideswell Village, on either side of the Cross River, in southern County Roscommon (Figure 1). This area of sands and gravels lies within the wider Rooskagh esker system (Delaney, 2001). The sand and gravel body is quite haphazard topographically and has a hummocky appearance, with many marked and deep hollows in otherwise dry topography, all at elevations between 48 m and 77 m AOD. The landscape immediately around the area of the delineated aquifer body has cutover raised peat and glacial till as the predominant subsoil types.	
Geology and Aquifers	**Aquifer categories**	Based on its areal extent, 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).
	Main aquifer lithologies	The sand and gravel body comprises glaciofluvial sands and gravels derived chiefly from limestones (GLs), and associated esker sands and gravels which are basic in chemical reaction (BasEsk).
	Key structures	Exposure is poor within this sand and gravel body, and no stratigraphic or sedimentological information on the sands and gravels were noted during fieldwork.
	Key properties	Three groundwater level data points are available from within the area of the aquifer. Using these data, data from test pumping in the locality and water levels from the river and streams, it is estimated that approx. 50% of the aquifer area has a depth of saturated sands and gravels greater than 5 m. Sand and gravel aquifers generally consist of unconsolidated, coarse grained material, usually containing less than 8% fines (Ó'Súilleabháin, 2000).
	Thickness	There are some borehole data available on the thicknesses of the sand and gravel deposit, with borehole logs at Corrantotan Townland indicating between 5 m (WYG, 2004) and 17 m (EPA, 2011) depth of subsoils. The thicknesses of the remainder of the sands and gravels are likely to be greater than 10 m.
Overlying Strata	**Lithologies**	Approximately 11% of the area of the aquifer is overlain with cutover raised peat, alluvium and/or lake deposits, with sand and gravel inferred beneath. Approximately 5% of the aquifer is made up of tunnel fill esker deposits, which are inferred to continue beneath the flanking, associated glaciofluvial sands and gravels in places.
	Thickness	The thicknesses of the lake sediments and the alluvial deposits are estimated to be less than 3 m.
	% area aquifer near surface	Approximately 89% of the sand and gravel aquifer is at the surface, with the remainder beneath the 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 only 27% of the aquifer area. In all other areas where the water table is at a depth > 3 m, the vulnerability is classed as 'High' (73% of the 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 sands and gravels, a high proportion of the available recharge will percolate down to the water table. The amount of rainfall recharging is less in the areas covered by alluvium and/or lake sediments.
	Est. recharge rates	The annual average rainfall for the aquifer is 975 mm (Walsh, 2012), thus providing an estimated groundwater recharge rate of 384 mm/yr. The minimum direct groundwater throughput in the aquifer is estimated to be 2,237 m^3/d.

Brideswell Sand and Gravel Aquifer Description July 2023

Discharge	**Large springs and large known abstractions (m^3/d)**	At Lisbrock, the South Roscommon Public Water Supply (Figures 1 and 2) has seven boreholes in the vicinity of a water treatment plant. The plant capacity is 4,000 m^3/d (EPA, 2015), with the majority of the water feeding it assumed to come from the Regionally Important Karstified Bedrock Aquifer **(Rkc)** resource mapped as beneath the sand and gravel aquifer. The discharge from four springs at Mullagh Townland, in the central portion of the aquifer body, was measured in November 2003; the measured discharge was 154 l/s (WYG, 2004). It is unknown what proportion of this spring flow is from the bedrock or the sands and gravels.
	Main discharge mechanisms	A number of springs are known to issue from the sand and gravel along the path of the Cross River, including those at Lisbrock Public Water Supply, and at Mullagh Townland. Groundwater is also considered to discharge *via* small lowlying springs, as seen at Ballycreggan Townland on the OSI 6 inch raster map (1830s – 1930s).
	Hydrochemical Signature	Data from drinking water returns sampled at Lisbrock Springs show that the groundwater hydrochemistry of the aquifer has 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.e*. up to several hundred metres. Given the geomorphology of the sand and gravel at Brideswell, and the stream pattern, this is also expected to be the case here.
Groundwater & Surface water interactions		Groundwater is known to discharge *via* small lowlying springs, and It is also thought to discharge directly into the Cross River and a number of unnamed streams which dissect the area of the aquifer.
Conceptual model		• The aquifer is topographically haphazard and is categorised as hummocky sands and gravels and associated eskers (GSI, 2023), at all elevations between 48 m and 77 m AOD. • Borehole logs at Corrantotan Townland indicate between 5 m (WYG, 2004) and 17 m (EPA, 2011) depth of subsoils above bedrock. • It is inferred that approx. 50% of the aquifer area has a depth of saturated sands and gravels greater than 5 m, with the remainder inferred to have a saturated thickness less than this. • Approximately 89% of the sand and gravel aquifer is at the surface, with the remainder underneath overlying strata of alluvium, lake sediments and cutover peat. • The discharge from springs at Mullagh Townland are relatively large, though the Regionally Important Karstified Bedrock Aquifer **(Rkc)** is considered to contribute to this discharge rate. It is not known what the varying proportions between the shallow sand and gravel aquifer and the deeper bedrock aquifer are. • Diffuse groundwater recharge is estimated to be approx. 384 mm/yr. • The minimum direct groundwater throughput in the aquifer is estimated to be 2,237 m^3/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 RS26C100100 (Cross – Bridge at Corrantotan) RS26C100070 (Cross – Bridge SW of Milltown Pass) None present

Information Sources	• Delaney, C. (2001). Morphology and sedimentology of the Rooskagh Esker, Co. Roscommon. Irish Journal of Earth Sciences, 19, pp. 5-22. • 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/ • EPA (2011). Groundwater Monitoring Programme Site Information Lisbrock (South Roscommon). Completed by the Environmental Protection Agency. • EPA (2015). Drinking Water Audit Report, Lisbrock Drinking Water Treatment Plant. • GSI (2017). A description of Irish aquifer categories. 3 pp. Available from: https://www.gsi.ie/documents/GSI%20Aquifer%20Category%20Descriptions.pdf • GSI (2023). Geological Survey Ireland, Spatial Resources Viewer. https://www.gsi.ie/en-ie/data-and-maps/Pages • 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. • WYG (2004). Trial Well Drilling & Testing Programme Interim Report, Roscommon Regional Water Supply Scheme Project. Completed by White Young Green for Roscommon County Council.
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.

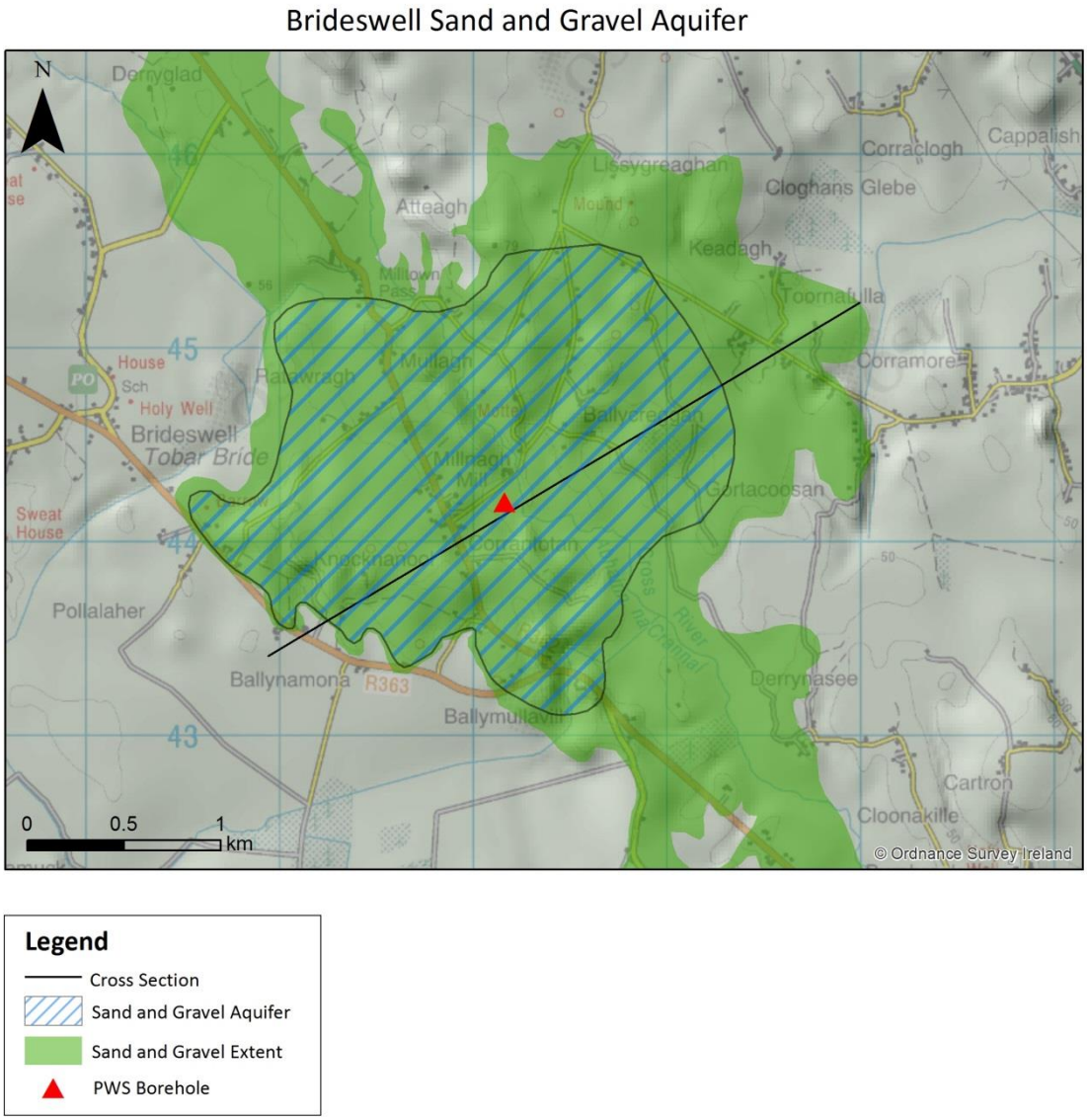

Figure 1: Brideswell Sand and Gravel Aquifer extent with cross section location.

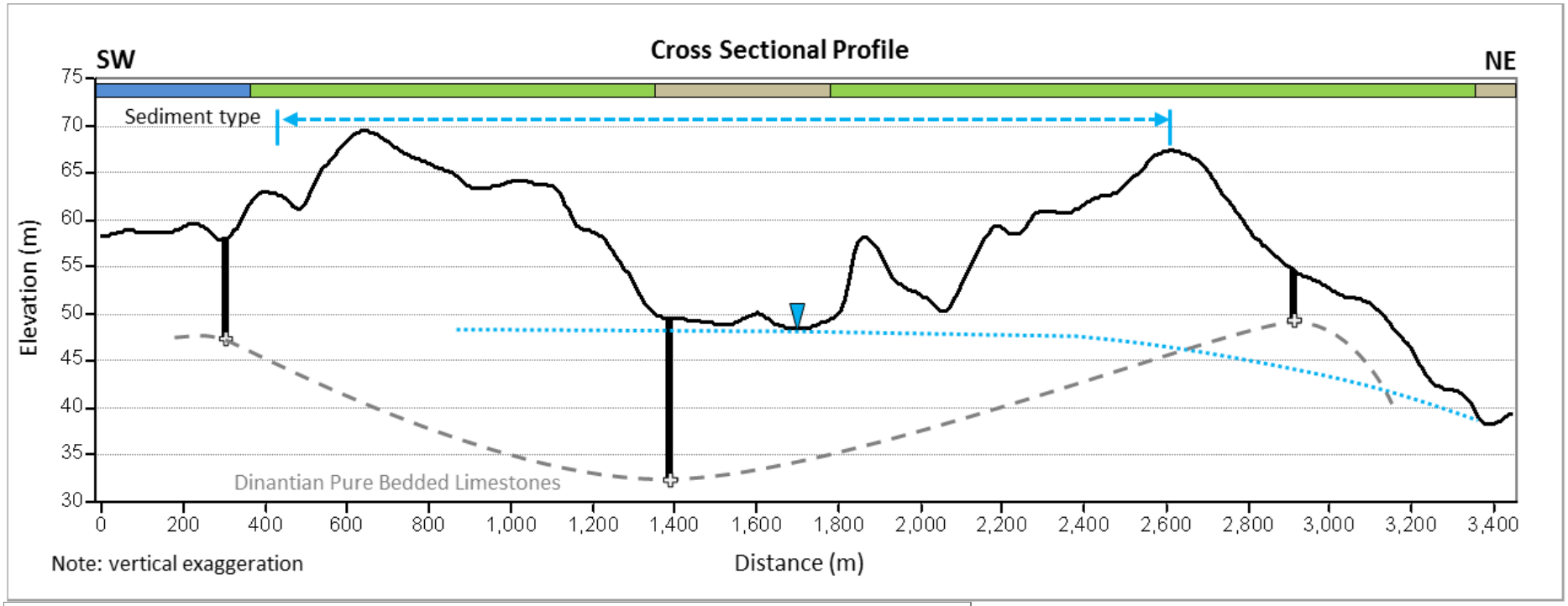

Figure 2: Cross section through the Brideswell Sand and Gravel Aquifer body.

Brideswell Sand and Gravel Aquifer Vulnerability

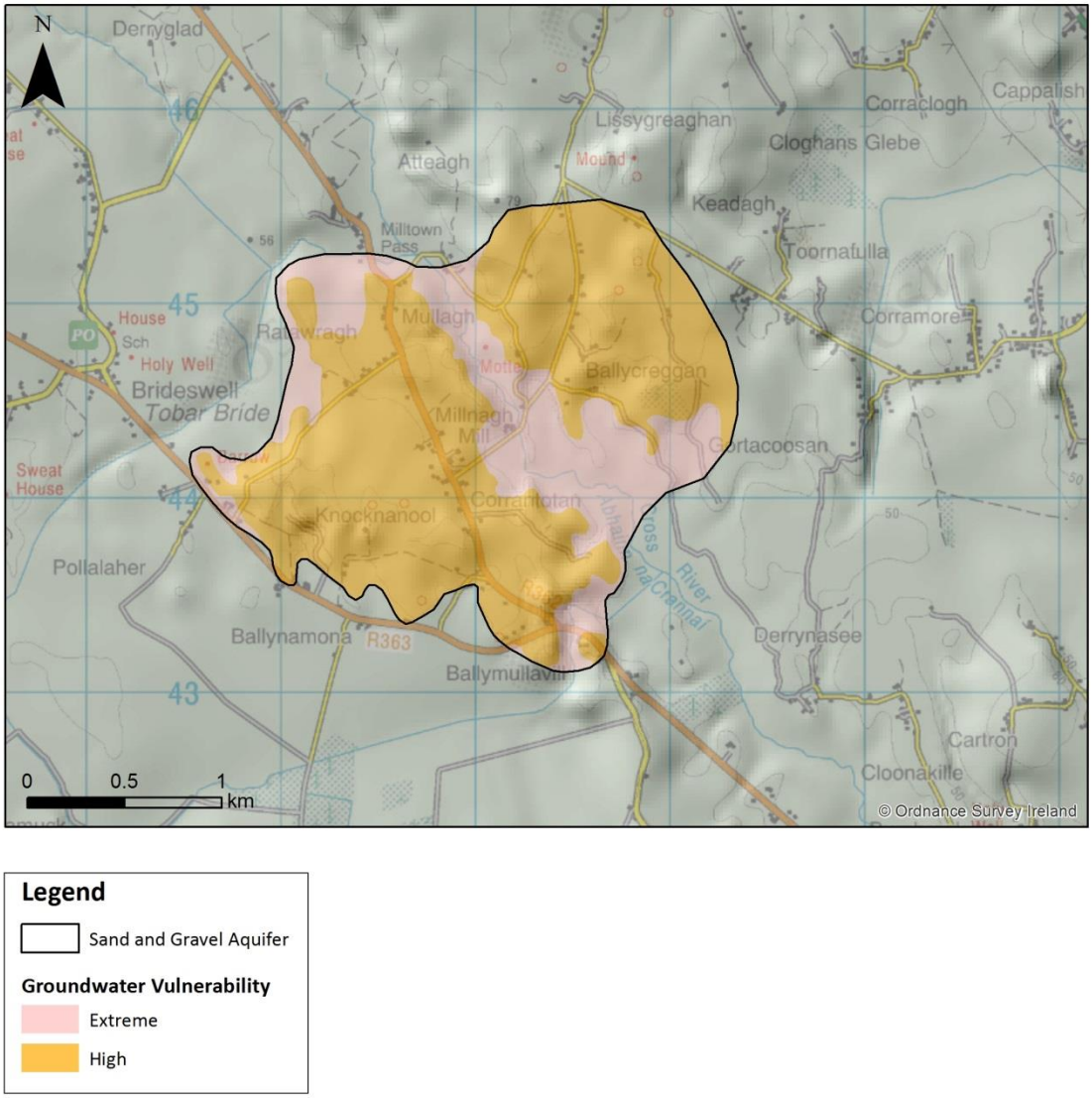

Figure 3: Groundwater vulnerability across the Brideswell Sand and Gravel Aquifer.