Knockseefin-Longstone East GWB: Summary of Initial Characterisation.

<table>
<thead>
<tr>
<th>Hydrometric Area</th>
<th>Local Authority</th>
<th>Associated surface water features</th>
<th>Associated terrestrial ecosystems</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 - Mulkear</td>
<td>Limerick Co. Co.</td>
<td>Tributaries to the Mulkear River.</td>
<td>None.</td>
<td>9.8</td>
</tr>
</tbody>
</table>

**Topography**

The GWB is very irregular in outline, shaped approximately like a ‘U’. In the western part of the GWB, where the ground is underlain by Namurian Shale and Sandstone rocks, the ground is gently hilly, with elevations typically in the range 100-130 m AOD. In the east, where Volcanic rocks underlie the ground surface, the ground is steeper and hillier, rising southwards from <100 m AOD in the north towards a ridge that rises up to 231 m AOD. Drainage is relatively poor across the GWB.

**Aquifer category(ies)**

The GWB comprises LI: Locally important aquifers which are moderately productive only in local zones.

**Main aquifer lithologies**

Approximately half the GWB is composed of Basalts and other Volcanic rocks, whilst Namurian Shales and smaller areas of Namurian Sandstones comprise the remainder.

**Key structures**

The main structures influencing groundwater flow are both primary (formed during deposition) and secondary (created by subsequent deformation). When the lavas solidified, cooling joints formed at right angles to the surface of the flow in some parts of the succession. Overall, the Volcanic and Namurian Sandstone/ Shale rocks are in the eastern and NE part of the core of a large, boat-shaped syncline whose axis is orientated ENE-WSW. Strata are tilted inwards to the centre of the fold core at angles of 15-25°. NNW-SSE trending major faults separated by about 0.5-2.5 km cross-cut the fold. Movements during the folding would also have caused some fracturing and jointing of the rocks. Deakin (1995) considers that fracturing and jointing in the area may provide high transmissivity zones in a N-S direction.

**Key properties**

Transmissivity in the Volcanic rocks in this area is thought to be variable: in some zones, columnar cooling joints provide a connected pathway for groundwater flow. In other parts, alteration of the rocks during their emplacement in shallow seas, or subsequent weathering during subaerial exposure in a tropical environment have clogged potential flow pathways (both cooling joints and tectonic fractures) with clays. At Herbertstown WS in the nearby Knockroe East GWB, transmissivity is about 100 m²/d. However, there are failed wells known in this rock unit group in this area. Transmissivity in the Namurian rocks is in the range 2–20 m²/d, with median values biased to the lower end of the range. At Glin WS in the Ballylongford GWB, a pumping test gave transmissivity of 14 m²/d [7-27 m²/d], but this may have been affected by faulting. At Glin WS, estimated groundwater gradients are 0.04 - 0.05. Over the GWB, they are likely to be in the range 0.02 – 0.07. Storativities in all rock units are low, of the order of 0.015.

**(data sources: Rock Unit Group Aquifer Chapters, Source Reports, see references; estimation from maps)**

**Thickness**

The thickness of the Basalts and other Volcanic rocks varies laterally, attaining maximum thicknesses of around 300 m and pinching out to zero. The Namurian Shales and Sandstones can attain combined thicknesses of many 100’s of metres. However, most groundwater flow is likely to take place in the top 15-25 m, in the zone that comprises a weathered layer of a few metres and a connected fractured layer below this. Deeper groundwater flow also occurs along fault zones and large fractures. Deeper water strikes are particularly noted in the layered rocks of the Namurian aquifers in other areas (e.g., west Co. Limerick), and seem to be associated with slightly better yields (moderate to good, rather than poor) and better productivities (III and IV, rather than IV and V).

**Lithologies**

Rock is at or close to the ground surface over much of the GWB. Where subsoils are thicker than ~1 m, Limestone Till predominates over the GWB. A small area (~ 0.01 km²) of Namurian ‘Head’ is also found, together with small areas of Undifferentiated Alluvium.

**% area aquifer near surface**

[Information to be added at a later date]

**Vulnerability**

Groundwater vulnerability is Extreme over nearly the entire GWB. There are small Highly vulnerable areas along small parts of the western and northern margins of the GWB.

**Main recharge mechanisms**

Diffuse recharge will occur over the entire groundwater body via rainfall percolating through the subsoil and directly to the aquifer via outcrop. 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. The drainage density indicates that a significant proportion of effective rainfall does recharge the aquifer. A high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer.

**Est. recharge rates**

[Information to be added at a later date]

**Discharge**

There are no known Excellent (> 400 m³/d) or Good yielding (100 m³/d < yield < 400 m³/d) boreholes, or High (>2,160 m³/d) yielding springs. The EPA monitor one source within the GWB at Ballyclough Co-Op. Abstraction is 45 m³/d. Yield is not known.

**Important springs and high yielding wells**

The main discharges are to the streams crossing the GWB and to the small springs and seeps that issue at the stream heads.
Groundwater Flow Paths

These rocks are devoid of intergranular permeability; groundwater flow occurs in fractures and faults. Flows in the aquifer are likely to be concentrated in a thin zone at the top of the rock; the weathered zone may be up to 3 m thick, with a connected fractured zone a further 10-20 m, below which is a generally poorly fractured zone. The aquifers are generally unconfined, with the water table following the topography and in hydraulic continuity with the streams. In lower-lying areas, the water table will be shallow. In the Namurian aquifers, groundwater levels are likely to be relatively shallow (< 6 m), even in elevated areas. Deeper water levels (up to 15 m) are likely, however, in some of the elevated areas underlain by volcanic rock aquifers, indicating that they are more transmissive, at least in some areas, than the Namurian rocks. In areas where Namurian aquifers are extensive, deep inflow levels and groundwater hydrochemistry indicates that some of the aquifer is confined. In all aquifers, unconfined groundwater flow paths are short (30-300 m), with groundwater discharging to the streams. Confined flow paths in the Namurian may be longer. Local groundwater flow will be from the higher ground between surface water bodies to the rivers and streams. There is no regional groundwater flow system.

Groundwater & Surface Water Interactions

Due to the shallow groundwater flow over much of the GWB, the groundwater and surface waters are closely linked. The streams originating within and crossing the GWB are gaining. Low summer baseflow (< 0.5 l/s/km²) is expected.

Conceputal model

- The GWB is very irregular in outline and shaped approximately like a ‘U’. It is bounded on its northern and eastern boundaries by the contact with the Pure Bedded Limestones of the Pallas Grean GWB. The southern, SW and western boundaries are coincident with surface water catchments that are implied groundwater highs. The terrain over the western part of the GWB is gently hilly. In the SE, the ground rises steeply to a higher ridge that defines the south and SE boundaries.
- The groundwater body is composed primarily of low transmissivity rocks, although localised zones of enhanced permeability do occur along faults. The Volcanic rocks are more permeable in places than the Namurian aquifers. Groundwater flows along fractures, joints and major faults. Aquifer storativities are low.
- Recharge occurs diffusely through the subsoils and via outcrops. A high proportion of the recharge will discharge rapidly to surface watercourses via the upper layers of the aquifer.
- The aquifers within this GWB are both unconfined and confined. Most flow in the volcanic and sedimentary rock aquifers will be unconfined and occur near the surface in a narrow zone comprising a weathered zone of a few metres and a connected fractured zone below this. The water table is from 0 m to around 10-15 m below ground level and follows topography. Groundwater levels tend to be closer to the surface in the Namurian strata than in some areas of the volcanic rocks. Deeper inflow levels will occur where fractures/ faults or jointed zones are intercepted.
- Within the Namurian rock aquifer, deep inflows and hydrochemistry data indicate confined conditions can occur in higher permeability strata from which better yields can be obtained.
- Unconfined flow path lengths are relatively short, and in general are between 30 and 300 m. Confined flow path lengths may be longer, up to 1000 m. North-south fracturing and faulting may cause transmissivity anisotropy.
- Groundwater discharges to the streams crossing the aquifer, and to springs and seeps. Deeper flowing groundwater may discharge up the N-S fault zones. Unconfined flow directions are controlled by local topography.
- Due to the shallow groundwater flow in this aquifer the groundwater and surface waters are closely linked. This interaction is rapid and seasonal; due to low storage and the local nature of the flow paths, summer baseflows to the rivers are low.

Attachments

None.

Instrumentation

None.

Information Sources

Aquifer Chapter: Basalts and other Volcanic rocks; Namurian Sandstone; Namurian Shale.

Disclaimer

Note that all calculations and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.
### Rock units in GWB

<table>
<thead>
<tr>
<th>Rock unit name and code</th>
<th>Description</th>
<th>Rock unit group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knockseefin Volcanic Formation (KV)</td>
<td>Ankaramitic lavas, tuffs &amp; intrusions</td>
<td>Basalts &amp; other Volcanic rocks</td>
</tr>
<tr>
<td>Knockseefin Lava Flow Member (KVf)</td>
<td>Ankaramitic lava flows (alkali basalt)</td>
<td>Basalts &amp; other Volcanic rocks</td>
</tr>
<tr>
<td>Knockseefin Vitric Tuff Member (KVv)</td>
<td>Ankaramitic vitric tuffs (alkali basalt)</td>
<td>Basalts &amp; other Volcanic rocks</td>
</tr>
<tr>
<td>Knockseefin Lithic Tuff Member (KVI)</td>
<td>Ankaramitic lithic tuffs (alkali basalt)</td>
<td>Basalts &amp; other Volcanic rocks</td>
</tr>
<tr>
<td>Longstone Shale Member (LOsh)</td>
<td>Olive, flaggy mudstone &amp; shale</td>
<td>Namurian Shales</td>
</tr>
<tr>
<td>Longstone Flagstone Member (LOfg)</td>
<td>Parallel laminated fine sandstone</td>
<td>Namurian Sandstones</td>
</tr>
</tbody>
</table>