Fig. 7. Map showing location of stratigraphic columns within NZMS 260 Sheet V20.
**Stratigraphic Column No:** 83  
**GPS Waypoint No(s):** Wp 517-518  
**Region:** Glengarry  
**Location:** Mangaone River upstream of Olsen’s farm.

**NZMS 260 Sheet:** V20 Esk  
**Grid Reference:**  
**E:** 2830375  
**N:** 6197087  
**Altitude:** 98 m

**NZMS 260 Sheet:** V20 Esk  
**Page 1 of 2**  
**Author:** K. Bland  
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<table>
<thead>
<tr>
<th>Age</th>
<th>Strat. Unit</th>
<th>Sampling interval</th>
<th>Lithology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Pliocene</td>
<td>Lower Nukumaruan Group/Matahorua Formation</td>
<td></td>
<td></td>
<td>Non fossiliferous slightly cemented massive to crudely laminated greywacke conglomerate. Moderately sorted with granule to cobble-sized clasts. Clasts are sub to well rounded, spheroid to oblate in shape and up to 100 mm across (rare), typically 10-20 mm across. The coarser clasts display crude imbrication. The bed fines-upwards into a better laminated, granule-dominated bed with coarser-grained layers capping finer-grained beds. These alternating beds are 0.1-0.3 m thick, with finer-grained beds typically thicker than coarser-grained ones.</td>
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<tbody>
<tr>
<td>Papakiri Member</td>
<td></td>
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</tbody>
</table>

![Diagram of stratigraphic column]

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**Remarks:**
- **Extensive Note:** Additional notes or comments about the stratigraphic column or field observations could be included here.
- **References:** Citations to relevant literature or additional data sources that support the content of the column.
- **Figures:** Any images, charts, or graphs that help illustrate the stratigraphic data.
Blue-grey, non fossiliferous siltstone, gradationally overlying fossiliferous greywacke conglomerate. The lower 0.2 m of this bed contains scattered very well sorted greywacke granules.

Moderately well sorted moderately fossiliferous greywacke conglomerate bed. Fauna are dominated by redeposited valves of *Paphies australis*. This conglomerate sharply overlies the underlying sandstone bed.

Non cemented fine sandstone with rare greywacke granules.

Fine-grained slightly cemented non fossiliferous granule-sized greywacke conglomerate. Overlain by a 0.1 m-thick fossiliferous bed rich in *Austrovenus* valves, and in turn by a 0.2 m-thick greywacke granule-rich shelly fine sandstone with abundant *Austrovenus* valves.
369m-0.5 m-thick, highly-ossiferous greywacke conglomerate bed dominated by Phialopecten triphooki and Glycymeris sp., with common Purpurocardia purpurata in the lower half. Occasional Maoricolpus, Tucetona laticostata, Alcithoe sp., and Zeacolpus are present, as well as rare Ostrea chilensis valves. The conglomerate is poorly to moderately sorted, with clasts from granule to pebble in size (up to 60mm diameter) that are moderately to well rounded and spherical to oblate in shape. Phialopecten triphooki is more common in the middle half of the unit. Also contains rare abraded Austrovenus stutchburyi.

Crudely-bedded, poorly to well sorted greywacke conglomerate bed with common fine to medium sandstone lenses and stringers up to 0.3 m thick and 2 m in length. Average thickness of sandstone lenses is 0.1 m thick by 1.5 m in length, with lenses more common in lower portions of the exposure. Greywacke clasts are well rounded and dominantly oblate in shape, and range from medium pebble to medium cobble in size. Unit is underlain by a silty sandstone very rich in fossilised plant leaves.

Creamy to rusty-coloured, massive to laminated siltstone with abundant, very well preserved leaves and leaf impressions.
White, non cemented tephra bed very sharply overlying light-brown, non cemented, bioturbated fine to medium sandstone. Burrows are highlighted by tephra incorporated into the unit. This then grades into approximately 1.5 m of laminated to trough cross-bedded tephric sandstone with medium ash-sized clasts. The tephric units are then over lain by the same fine to medium siliciclastic sandstone that underlies them.

While not exposed at this locality, nearby exposures show that this interval is represented by light-brown, non to well cemented, non fossiliferous, slightly micaceous fine to medium siliciclastic sandstone with rare concretions up to 1 m in diameter.

Poorly to very well sorted non to slightly cemented granule to cobble-sized greywacke conglomerate. Common fine to medium sandstone beds and lenses in the lower 1 m of the unit that display fine-scale laminations and low-angle, small-scale cross-bedding. Moderate-scale, moderate-angle trough cross-bedding is visible in the lower third of the unit. Lower portions of the conglomerate are clast supported with no matrix present in coarser-grained beds. Clasts are moderately to well rounded.
Fluvial gravel beds consisting of non-fossiliferous, non-carbonate, planar laminated pebbly sands with thin muddy horizons that contain lignitic debris.

Fossiliferous conglomerate containing mud and Torlesse pebbles, oysters and various unidentified bivalves. The upper contact is sharp and is marked by a shell concentration including scattered large oyster shells.

Reconfinement surface.

Siliceous grading into sandstone.

Same as below. Sharp-based.

Coumung-upwards facies from planar laminated tergenous packstone to coarse pebbly barnacle grainstone. Moderately sorted, moderately to well-cemented.

Well-cemented, sharp-based shell bed consisting of scattered Torlesse pebbles, oysters and sparse Phialopecten thomsoni valves.

Pebbly and barnacle-rich grainstone, containing common, well-rounded Torlesse pebbles and granules up to 1 cm across. The interval is organized in thickening-upwards tabular bed sets that exhibit internal low-angle planar and tangential cross-stratifications. Poorly-sorted, moderately to well-cemented.

Poorly exposed silty sandstone.

Poorly exposed gravelly silty sandstone coarsens upward into silty sandstone.

Calcarenite sandstone grading into silstone.

Fine-grained planar-beded soft bioclastic sand sharply overlain by a thin (30 cm) shell concentration packed with oysters and pectinids.

Stacked bioclastic bodies, 2-3 m thick each. Medium-scale trough and sigmoidal cross-stratifications occur within moderately cemented coarse barnacle-rich grainstones. Interlayered mud joints with small-scale sigmoidal cross-laminated skeletal beds are common up-section.

Alternating barnacle-rich grainstone and tergenous packstone organized in horizontal tabular bed sets, 20-30 cm thick. Internal sedimentary structures include low-angle planar and tangential cross-stratifications. Fine- to medium-grained, well-sorted, moderately to well-cemented. Intensively bioturbated.
Moderately to well sorted alternating bodies 20-30 cm thick of barnacles-rich grainstone and siliciclastic packstone arranged in horizontal tabular sets. Beds are typically well sorted and fine to medium-grained. Internal sedimentary structures include low-angle planar cross-stratification. Intensively bioturbated.

Calcareous sandstone grading into siltstone.

Laminated to planar cross-bedded bioclastic fine sandstone capped by a thin shellbed packed with oysters and pectinids.

Stacked bioclastic-dominated bodies 2-3 m thick. Medium-scale trough and sigmoidal cross-stratifications occur within moderately cemented coarse-grained barnacle-rich grainstones.

Poorly exposed greyish siltstone. Coarsens upsection and passes into silty sandstone.
Siltstone grading into sandstone, in turn overlain by fossiliferous greywacke conglomerate and fluvial gravel beds. This interval is partially exposed on Mount Hassal north of this section.

Moderately to well cemented, moderately sorted coarsening-upwards package from laminated siliciclastic packstone to coarse-grained barnacle-rich grainstone. Beds are 0.3-0.4 m thick and moderately bioturbated. Sharply overlies similar package below.

Well cemented, sharp based shellbed containing scattered greywacke pebbles, oyster and sparse *Phialopecten thomsoni* valves.

Poorly sorted, moderately to well cemented pebbly and barnacle-rich grainstone containing common, well rounded Torlesse greywacke granules and pebbles up to 1 cm across. This package comprises thickening-upwards tabular sets that display low-angle planar and tangential cross-stratifications.

Coarsening-upwards successions from alternating, discontinuous medium-grained skeletal lenses and interlayered, laminated siliciclastic packstone to horizontal tabular sets of alternating grainstone and packstone. Section capped by a coarse grainstone comprising shell and barnacle fragments and Torlesse greywacke pebbles.
This section is inferred to immediately overlie the succession exposed in The Gorges approximately 2 km to the southeast.

Non cemented, laminated, well sorted non cemented greywacke conglomerate with some sandstone lenses. Some thin muddy horizons are present that contain lignite debris.

Pebbly limestone to greywacke conglomerate with a bioclastic sandstone matrix. Clasts are moderately to well supported, dominated by Torlesse greywacke but with some Tertiary mudstone clasts. Contains common Zethalia ?zelandica, especially in lower parts of the bed. Specimens are abraded and it is difficult to tell whether they are Z. coronata (Wm) or Z. zelandica (Wn-R). Also contains Dosinia sp. and Panopea. Abundant biomoulds are present and the matrix throughout is composed of bioclastic shellhash sandstone. Sharply overlies non cemented sandstone. The upper surface is sharp and marked by a concentration of bivalves and scattered large oyster shells.

Non cemented, clean well sorted, non fossiliferous, massive, burrowed, fine to medium sandstone.