Fig. 7. Map showing location of stratigraphic columns within NZMS 260 Sheet V20.
Blue-grey to tan, non cemented, laminated to trough cross-bedded, concretionary fine sandstone. Common thin shell and granule/pebble beds are present. Greywacke conglomerate lenses are common up to 0.3 m thick and continuous up to several metres. Large spheroid concretions are occasionally present, are up to 0.5 m across and are common in the upper 4 m of the bed.
Shellhash dominated limestone, with scattered Torlesse pebbles, rare intact *Ostrea chilensis* valves. Displays metre-scale cross bedding.

Well sorted medium sandstone with scattered shellhash. Upper 0.6 m is intensely bioturbated, with common Torlesse gravel-filled burrows. Small- to moderate-scale cross-bedding is present, trough dominates although tabular is present. Siltstone stringers occur through unit. Sharply overlain by pebbly limestone.

Oyster-rich pebbly limestone with abundant shellhash overlying bioclast dominated sandy limestone. This unit contains between 50 and 60% well rounded, well sorted lensoidal to spherical shaped greywacke pebbles between 15mm and 35mm in diameter.
Shellhash-dominated limestone, with scattered Torlesse pebbles, rare intact Ostrea chilensis valves. Displays metre-scale cross bedding.

Blue-grey non cemented silty sandstone. Slightly micaceous, massive to laminated with rare plant fossils in some concretions. Grades into overlying sandy limestone.
Blue-grey, non cemented, non fossiliferous massive to laminated siltstone with rare water escape structures.

Non fossiliferous greywacke conglomerate with grainle to pebble-sized clasts. Lensoidal-shaped grains dominate with common oblate clasts.

White to pink-coloured pumiceous bed. Fine ash to lapilli-sized clasts.

Non fossiliferous greywacke conglomerate with grainle to pebble-sized clasts. Lensoidal-shaped grains dominate with common oblate clasts.

Non cemented, very well sorted, slightly micaceous fine to medium sandstone sharply overlying underlying siltstone.

Blue-grey, non cemented, non fossiliferous massive to laminated siltstone with rare water escape structures.
Late Pliocene
Mangaheia Group/Petane Formation

WP 558
Te Ngaru Mudstone Member
Upper Nukumaruan

Rubbly, massive to weakly-bedded, moderately cemented biomouldic limestone. Medium-grained shellhash matrix with abundant biomoulds of *Tawera subsulcata*, some *Eumarcia*. Partially to completely recrystallised valves are common. *Ostrea* and intact valves become more common upsection. Greywacke pebbles up to 2 cm long are present and are more common than in underlying unit. This interval has a higher bioclast to matrix ratio than underlying beds.

Tangoio Limestone Member

Dirty, non cemented sparsely fossiliferous siltstone. Rapidly gradational lower contact with basal shellbed.

Dispersed, matrix supported shellbed. Dominated by *Ostrea* (often articulated) and *Zeacolpus vitattus* with some *Dosina* sp. and bryozoans. Abrupt lower contact with limestone.

Rubbly, massive to weakly-bedded, moderately cemented biomouldic limestone. Medium-grained shellhash matrix with abundant biomoulds of *Tawera subsulcata*, some *Eumarcia*. Partially to completely recrystallised valves are common. *Ostrea* and intact valves become more common upsection. Greywacke pebbles up to 2 cm long are present and are more common than in underlying unit. This interval has a higher bioclast to matrix ratio than underlying beds.

Moderately cemented, strongly trough, sigmoidal and tabular cross-stratified shellhash and biomouldic limestone. Matrix comprises medium to coarse sand shellhash. Fauna dominated by *Tawera subsulcata*, with *Paphies* sp. and are largely recrystallised. Cross-beds are low-angle and are of small to moderate scale. Flags are up to 3 cm thick, and average 1 cm thick. Abruptly overlain by more fossiliferous and massive limestone bed.
Non cemented slightly micaceous fine sandstone. Slightly to moderately fossiliferous throughout with the upper ~4 m being highly fossiliferous, with fauna dominated by disarticulated, shallow-water bivalves. Valves are arranged parallel to bedding. *Tawera subsulcata* is dominant, with *Ostrea, Calliostoma* sp., *Dosinia* sp., *gastropoda* spp., and *bivalva* spp. Lower parts of the sandstone contain thin (1 cm -5 cm-thick) pumiceous siltstone stringers.

Moderately cemented massive to laminated and imbricated unit. Clasts are of granule to coarse-pebble in size, averaging 25-30 mm across with oblate shapes dominating.
Very well sorted laminated non cemented sandstone with common very well sorted greywacke pebble lenses up to 20 cm thick. The clasts in these lenses are well rounded, spheroid to oblate in shape and are typically 10 mm across.

Moderately sorted medium grained greywacke conglomerate sharply overlying pebbly sandstone.

Non cemented fine to medium sandstone overlain by a series of siltstone, sandy siltstone and shellhash sandstone beds. The lower sandstone bed displays prominent convolute bedding, trough and herringbone cross-stratification and planar laminations. Mudstone stringers in this unit are disrupted. Burrows are present from siltstone beds down into underlying sandstone units.
Greenish-grey to white, chalky to hard, strongly laminated to cross-stratified to massive volcaniclastic ash bed. The unit is dominated by fine ash with medium ash beds present. This unit sharply overlies the underlying sandstone.

Firm, well-sorted massive to laminated sandstone with the occasional beds of greywacke granules. Non cemented siltstone overlain by moderately sorted, moderately cemented coarsening upwards greywacke conglomerate. Clasts are subangular, and granule to fine pebble in size. Upper parts of the bed are clast supported with a coarse-grained gritty matrix of greywacke sand. Non cemented, bioturbated medium sandstone overlain by a well sorted greywacke grit (granule-sized clasts) with scattered fine pebbles, and moderate-scale cross-stratification.

Non cemented, medium to coarse pebbly sandstone with abundant sub-angular greywacke granules and pebbles. The unit is strongly bi-directionally trough cross-bedded, greywacke clasts highlight the bedforms.

Non cemented, well sorted, medium to coarse pebble sandstone with small to moderate-scale trough cross-bedding. Greywacke pebbles typically occur on top of foresets. This unit coarsens up into overlying bed. Cross-bedded granule to fine-pebble greywacke conglomerate erosionally overlying lower bed. Contains mudstone rip-up clasts.

Non cemented, very well sorted non fossiliferous medium sandstone with common quartz and rock fragments.

Very well sorted moderately well cemented greywacke conglomerate. Clasts are 5-15mm across, well rounded, lensoidal to spheroid in shape and set in a medium to coarse sand matrix.