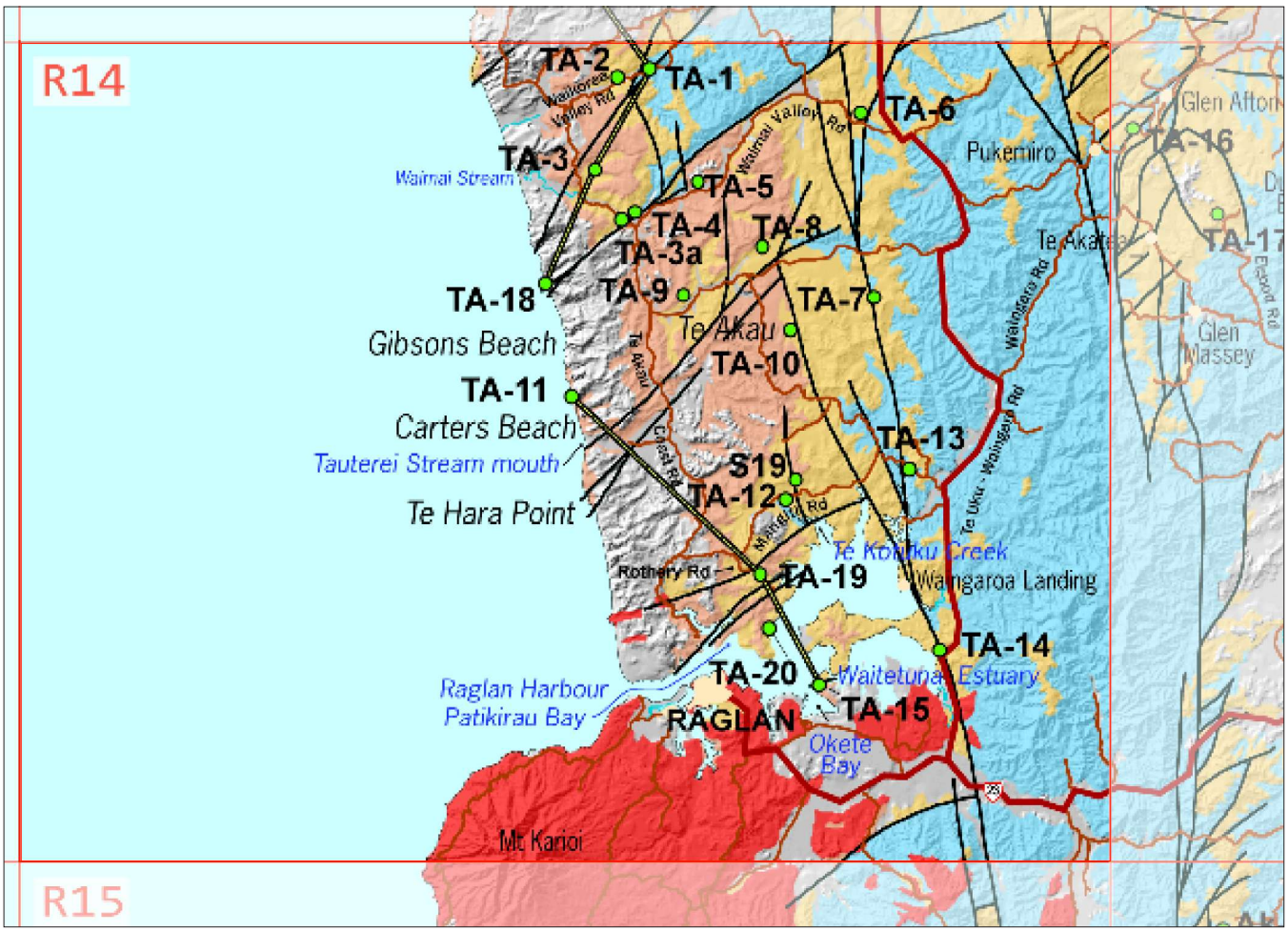
R14
R15
TA-1
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TA-3
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TA-15
TA-16
TA-17
TA-18
TA-19
TA-20
S19
Waitetuna Valley Rd
Wainui Stream
Pukemiro
Glen Afton
Te Akau
Te Akau
Gibsons Beach
Carters Beach
Tauterei Stream mouth
Te Hara Point
Te Akau Coast Rd
Waingaro Rd
Te Uku - Waingaro Rd
Te Kohiku Creek
Waingaroa Landing
Rothery Rd
Waitetuna Estuary
Raglan Harbour
Patikirau Bay
RAGLAN
Okete Bay
Mt Karioi
Glen Massey
Elwood Rd

Stratigraphic Column No: TA-1

Region: Te Akau

Location: Waikorea Valley Road

NZMS 260 Sheet: R14/727994

Grid Reference:

E: 2672787 - 2673113

N: 6399417 - 6398985

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Author: A. Tripathi

NZMS 260 R14

TA-1

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Stage	Strat Unit		Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Te Aketea	Carter	110			No exposures, calc. slst probably cont. for 30-40 m					
			100					Z_2			
			90			Massive,frittery					CALC SILTSTONE: Light grey to creamish, massive, highly frittered weathering surface exposed through the grassy mod. steep slope.
			? 80								
Ld	Aotea	Waimai - Patikirau?	70			Low angle x-bedding		L_2-L_3	3-4		CROSS BEDDED LIMESTONE: Light greyish to greenish grey, flaggy, 0.4-0.6 cm thick recessive seams, low angle planar x-bedding apparent in the middle part, glauconitic, medium to coarse sparry grainstone. FLAGGY SANDY LIMESTONE: Light greyish, horizontally bedded, mod. well dev. flags 3-8 cm thick sep. by recessive weath. siliciclastic rich seams, glauc. partic. in lower 10-15 cm, vert. sol. joints imparts a somewhat blocky app.
late Lwh	Whaingaroa	Waikorea	60			Sharp erosive contact		L_3	2		INTERBEDDED CALC SANDSTONE AND SILTY SANDSTONE: Dull brownish grey, med. horizontally bedded comparatively hard calc. sst beds with thin mod. hard silty sst beds, bding better defined in upper 1 m near the contact, bioturb.
						Horizontally bded, bedding better de-fined in upper part		S_1			SILTY SANDSTONE: Dull brownish grey, mod. cemented, massive to faint horizontal bedding visible in the middle part, calcareous content increasing up-section, common bioturbation features.
			50								
	Glen Massey	Ahirau	40			Bluffy, massive in appearance, bioturbated					CALC. SILTY SANDSTONE: Light brownish grey, hard, extensive bioturbation, common honeycombed weathering surface, weakly glauconitic in places, steep bluffy profile.
			30								
						Shell hash concen.					
early Lwh			20					S_2	1		
						Shell hash concen.	Fragmented bivalves casts and moulds, mainly pectins				CALC. SILTY SANDSTONE: Light greyish to brownish grey, mod. well cem., massive, very fine to fine calc. sst grading into silty sst, bioturbated, freq. burrows visible on the surface, com. scattered bivalves mainly of pectins, occ. cast and mould, rounded bulbous weathering profile.
			10			Large sol. cavities, honeycombed surface					
			0								Contact with basement is not exposed
	Basement										

mud: mud, silt; sand: med, coarse, med, coarse; gravel

TA-1

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Stratigraphic Column No: TA-2 **Grid Reference:**

Region: Te Akau **E:** 2671923

Location: Waikorea Valley Road **N:** 6398706

NZMS 260 Sheet: R14/719987 *Page* 1 *of* 3 **Author:** A. Tripathi

NZMS 260 R14

TA-2

1 of 3

Stage	Strat Unit		Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Te Aketea	Carter	100		Eroded top	Steep near vertical weathering profile					MASSIVE CALC. SILTSTONE: Light bluish grey to creamish, massive although faint horizontal bedding is discernible in places, foraminifera occ. visible.
			90			Massive, common criss-crossing joints		Z_2			
			80				Small bivalves, foraminifera				
			70			Common frittered weathering surface		Z_1	11		WEAKLY BEDDED CALC. SILTSTONE: Light greyish white to light bluish grey, faint horizontal bedding package 0.25 cm to 0.40 cm thick, highly frittery weathering surface.
Ld	Aotea	Patikirau?	60			No exposure, gentle to mod. sloping profile covered in grass					
			50					L_5			GLAUC. SANDY LIMESTONE: Light dull greyish, mod. flaggy 8-12cm to 2-3 cm flags, towards top showing wavy irregular pattern & fossiliferous mainly bivalve shell frags, the upper 10-15 cm of exposure consists of silty lst, glauc.
		Waimai	40			Low angle x-bedding		L_2-L_3			CROSS BEDDED GLAUC. LIMESTONE: Light greyish white, mod. to well flaggy low to med. angle cross-bedded, about 1m thick cross sets, prominent recessive siliciclastic seams, med. to coarse sparry grainstone, coarse bioclasts visible in places, glauc., thin bioturbated calc. sandy siltstone interbed occurring in the middle part.
late Lwh	Whaingaroa					Weathering break Horizontally bedded, mod.- well flaggy	Coarse fragmented echinoids and bivalves occ. discernible	L_3	6-10		
			30					L_2			GLAUC. SANDY LIMESTONE: Dull greenish grey, mod. flaggy 5-12 cm thick flags separated by calc. silty sst rich seams, seams in places consists of medium sst with rare rounded-subrounded granule and pebbles, conc. of glauc. pellets common within the seams and flags.
		Waikorea				Sharp contact, some burrows penetrate from overlying unit		L_3	5		
								S_1			MEDIUM BEDDED CALC. SILTY SST: Dull brownish to greenish grey, medium horizontally bedded consisting of comparatively resistant calc. silty sandstone with massive sandy siltstone interbeds, calc. content increasing towards top, glauc., bioturbated particularly in the sandy siltstone interbeds.
			20			Extensively bioturbated, mod. glauc.			4		
	Glen Massey	Ahirau				Rippley surface, bluffy weathering profile	Scattered bivalves	S_2	3		CALC. SILTY SANDSTONE: Light brownish grey, mod. well cemented, massive, very fine to fine sand grading into silty sandstone, extensively bioturbated, intensity of bioturbation glauc. content increasing in the uppermost 3-4 m of the exposure, scattered bivalves.
									1		CALC. SILTY SANDSTONE: Light brownish grey, fine silty sst, mass., honey-combed surface, com. bioturb. features, occ. tubular burrows visible on surface.
			10			Abrupt gradational contact					FLAGGY LIMESTONE: Greyish to brownish white, freq. mod. glauc, mod. flaggy 5--8 cm, wavy incipient siliciclastic dominant seams , becoming more sandy towards top, freq. with bivalve shell frags.
		Elgood				Lower1-1.5 m is knobbly to blocky becoming flaggy towards upper 2m.	Abundant bivalves mainly pectins, few oyster fragments, casts and moulds	L_2-L_4 L_2	2		SANDY LIMESTONE: Dirty white to brownish, fine sand, medium to coarse sparry bioclastic lst, irregular flaggy to blocky, glauc, freq. with pectins, oysters & other bivalves, thin calc. glauc. sst bed forming the lowermost exposure.
	Basement		0								Contact with basement is not exposed.

mud: mud
siltst: fine silt, med silt, coarse silt
sandst: fine sand, med sand, coarse sand
gravel: gravel

TA-2

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TA-2

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Stratigraphic Column No: *TA-3* **Grid Reference:**

Region: Te Akau

Location: Waimai Valley, Waimai-Waikorea coast Road

E: 2670889 - 2671126

N: 6395081 - 6395283

NZMS 260 Sheet: R14/708950

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TA-3

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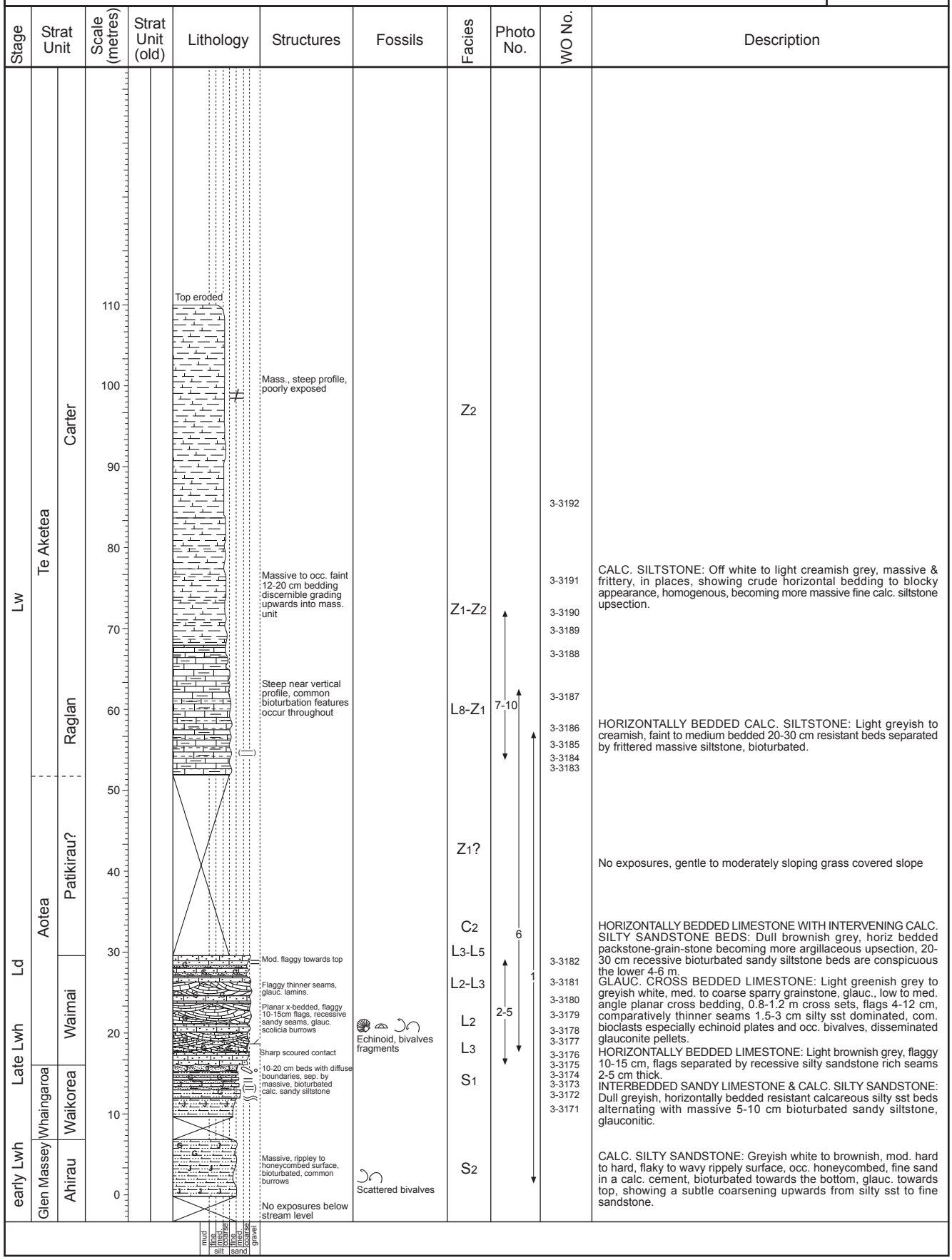

TA-3

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TA-3

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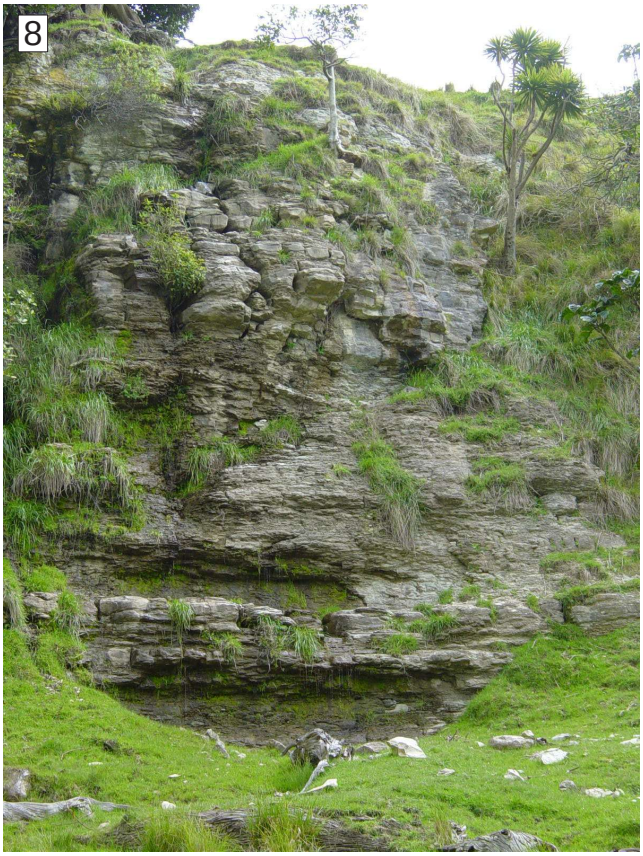

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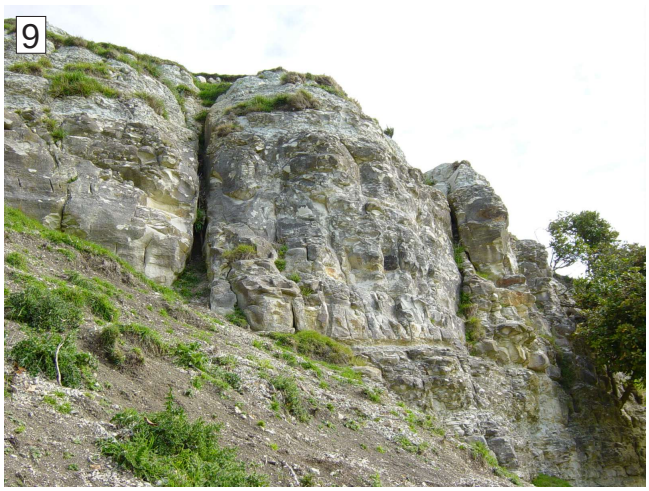

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Stratigraphic Column No: *TA-3a* **Grid Reference:**
Region: Te Akau **E:** 2672100
Location: Waimai-Waikorea Coast Road **N:** 6393450

NZMS 260 Sheet: R14/721934 *Page* 1 *of* 1 **Author:** A. Tripathi

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TA-3a

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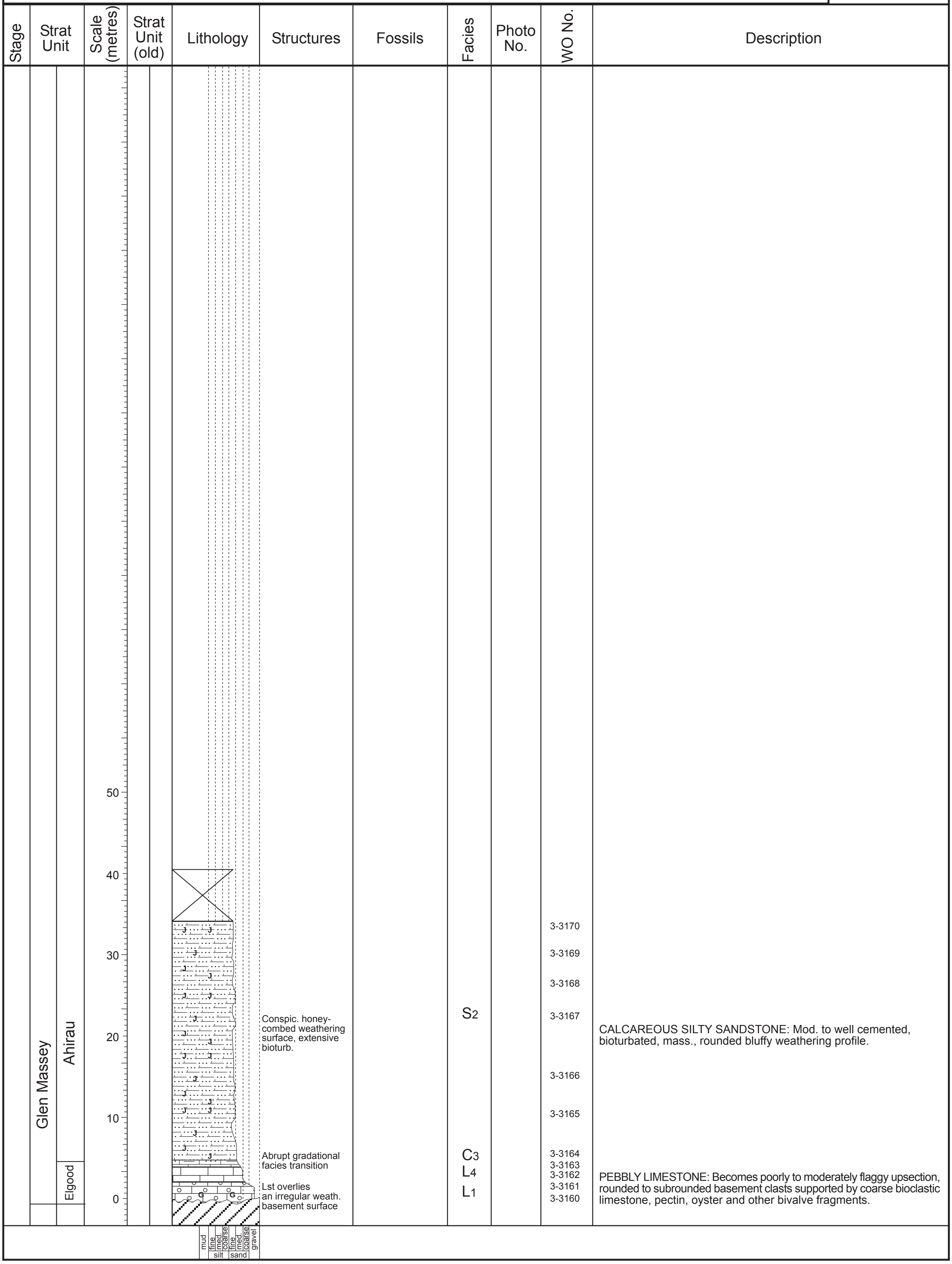

Stratigraphic Column No: *TA-4* **Grid Reference:**

Region: Te Akau **E:** 2672573

Location: Waimai Valley Road **N:** 6393743

NZMS 260 Sheet: R14/729944 *Page* 1 *of* 2 **Author:** A. Tripathi

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TA-4

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Stage	Strat Unit			Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Te Akatea		Carter	160		Top eroded			Z_2			CALC SILTSTONE/MARL: Light greyish to dirty white, 30-40 cm faint bedding discernible in the lower 3-4 m, becomes massive with typical frittered weathered surface upsection
				150			40 m int. condensed, no exposures, grass covered mod. to steep slope					
			Raglan	120			Frittered weath. surface with conchoidal fracture development		L_8-Z_1			CALC. SILTSTONE: Light grey to off white, massive homogenous unit, mainly massive but faint bedding 20-30 cm apparent in places, bioturbation features visible in the lower part.
				110								
			Patikirau	100			10 m int. condensed, no exposures, mod. to steep weathering profile					No exposures, gap of approx. 30 m
Ld	Aotea			90					Z_1?			
				80			Interbedded facies transition		S_3			ALTERNATING SANDY SILTY LIMESTONE AND SANDY SILTSTONE: Dull brownish grey,alternation of resistant sandy-silty limestone beds and massive frittery calc. sandy siltstone, common bivalve frag, massive silty beds become thicker upsection.
			Waimai				Conspicuous bioturb. sandy siltstone	Concentration of bivalves, echinoid fragments	L_3	6		HORIZONTALLY BEDDED LIMESTONE: Light brownish grey, hard, med. to coarse sparry grainstone to packstone, common bioclasts, glauconitic, conspicuous recessed 0.2-0.4 m very bioturbated sandy siltstone interbeds.
				70			Recessive irregular siliciclast dom. seams		L_2			CROSS-BEDDED GLAUC. SANDY LIMESTONE: Light brownish grey, med. to coarse sparry, low angle planar x-bded, cross sets up to 1-1.2 m thick, beds 8-10 cm, siliciclastic dominated seams 0.4-1cm, gluaconitic becoming comparatively more glauc. in the upper part, com. horizontal burrows along the bedding plane.
Late Lwh	Whaingaroa						Sharp contact 20-30 cm resistant calc. sst beds alternating with massive bioturbated sandy siltstone		L_3-L_4	5		SANDY FLAGGY LIMESTONE: Dull greyish to greyish white, fine to med. sand in a crystalline/sparitic calc. cement, freq. mod. glauc., 8-12 cm flags, 1-2 cm sand dominated prominent seams, calcite veins common.
			Waikorea	60					S_1		2	ALTERNATING CALC. SILTY SANDSTONE AND SILTSTONE: Dull greyish to brownish grey, mod. cemented silty sandstone beds alternating with bioturbated frittery calc. siltstone, lower part poorly exposed and consists apparently of massive siltstone covered mainly by vegetation.
									Z_1 ?			Contact not exposed
				50			Bioturbated, mod. glauc.					
	Glen Massey								S_2-S_3			CALC SILTY SANDSTONE: Light greyish to brownish grey, mod. hard, wavy to rippley to flaky surface common, bluffy bulbuous weathering profile, towards top forming a step like profile, top 5-6 m is mod. to weakly glauc. mainly fine sand to freq. silty in a calc. cement, massive, homogenous unit. from a distance gives appearance of crude bedding.
				40			Crude horizontal bedding discernible	Scattered bivalves commonly pectins				
			Ahirau	30			Common irregular rippley surface, bioturbated, bluffy profile		S_2			
				20								GLAUC. SILTY SANDSTONE: Muddy brown to buff coloured, mod. hard, very fine to fine sandstone grading into silty sandstone, glauc.
early Lwh												GLAUC. CALC. SILTSTONE: Greenish grey to buff, well cemented, frittered weathering surface, extensive bioturbated, high concentration of glauc.
		Dunphail					Massive, extensively bioturbated, glauc.		S_5	4 3		
									L_4			FLAGGY LIMESTONE: Reddish brownish to greyish, med. to coarsely sparry grainstone, flags 3-6 cm separated by siliciclastic dominated seams 0.2-0.5 cm, flags thickening towards top, glauc., common bioclasts.
		Elgood					Mod. flaggy (5-10 cm), wavy siliciclastic rich seams, basal band of pebbly gritty limestone		L_2-L_4			PEBBLY CALC. SANDSTONE: Dirty brownish white, rounded to subrounded pebble band in a sandy calc matrix, common bivalve fragments, glauc.
				10			Sharp contact	Common bivalves, large fragments, casts and moulds	L_1	1		GLAUC. CALC. SANDSTONE: Dull greyish to greenish brown, fine to medium grained sandstone, mod. well cemented with crude horizontal bedding in the upper 1-1.5 m, mod. to weakly cemented in the lower part, scattered granule and bivalve fragments, glauc. concentration at the upper sharp contact.
	Mangakotuku	Waikeretu					Crude horizontal bding 4-8 cm, glauc, bioturb., contact with basement not exposed				3-3194 3-3193	
Ar	Basement			0								Contact with basement not exposed, 15 m high mound from the stream level,covered with grass, no exposures.

mud | fine | medium | coarse | silt | fine | medium | coarse | sand | gravel

TA-4

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Stratigraphic Column No: TA-5 **Grid Reference:**

Region: Te Akau

Location: Waimai Valley Road, a prominent ridge on the north side across the Waimai Stream

NZMS 260 Sheet: R14/744946

E: 2674421 - 2674905

N: 6394652 - 6394839

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TA-5

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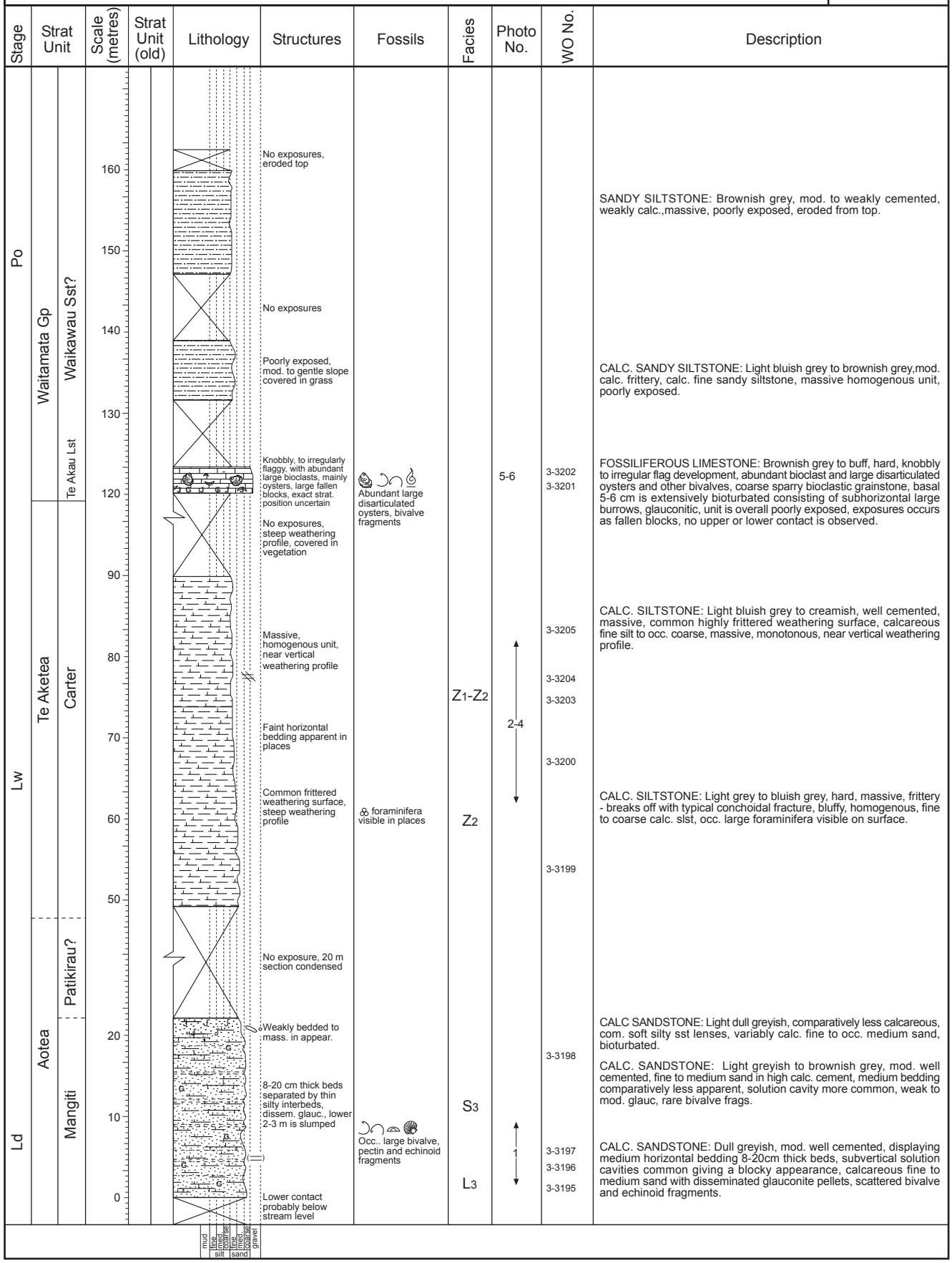

TA-5

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Stratigraphic Column No: *TA-6*
Region: Te Akau
Location: Waimai valley road

Grid Reference:
E: 2680867
N: 6397337

NZMS 260 Sheet: R14/808973

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NZMS 260 R14

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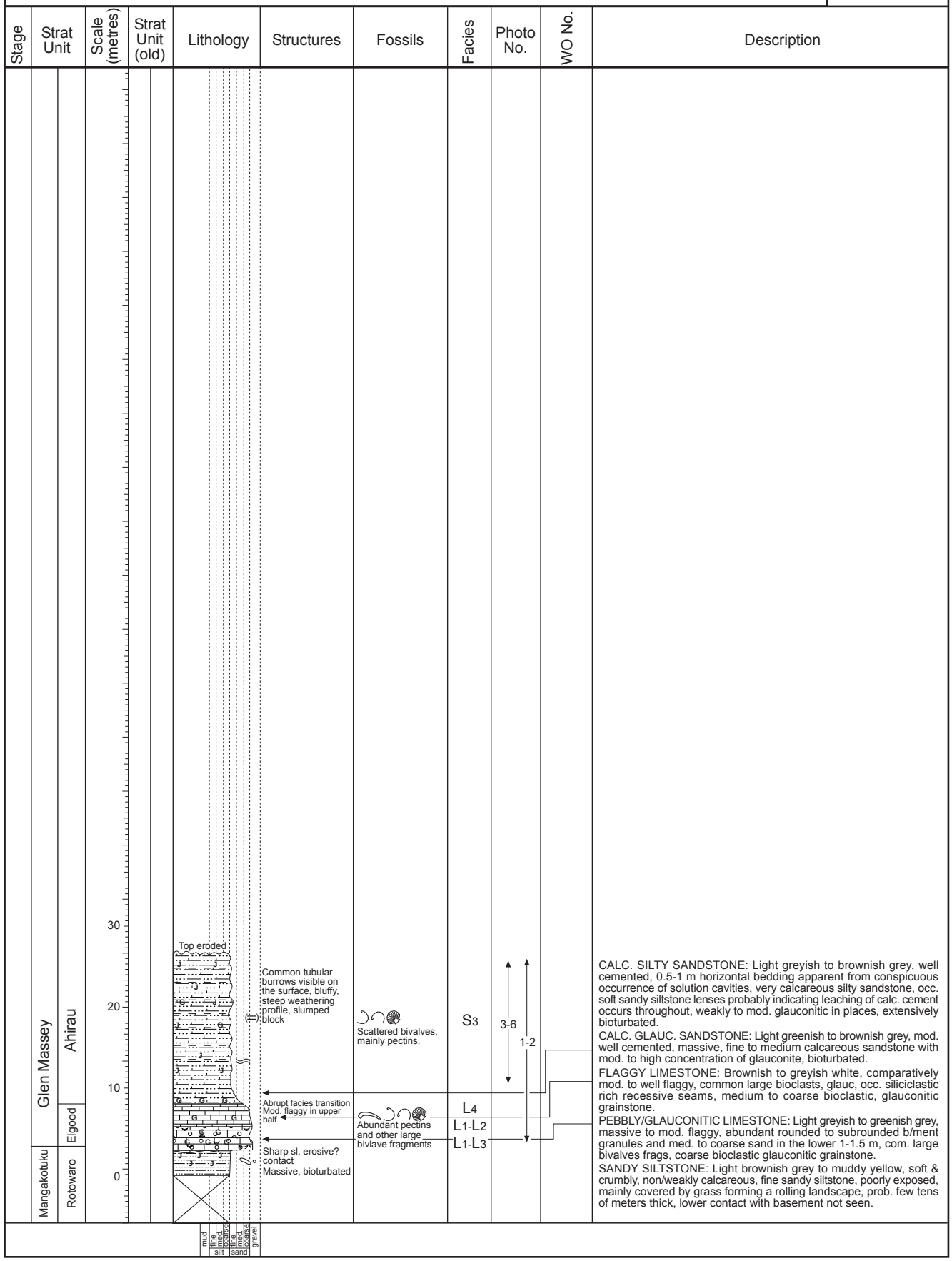

CALC. SILTY SANDSTONE: Light greyish to brownish grey, well cemented, 0.5-1 m horizontal bedding apparent from conspicuous occurrence of solution cavities, very calcareous silty sandstone, occ. soft sandy siltstone lenses probably indicating leaching of calc. cement occurs throughout, weakly to mod. glauconitic in places, extensively bioturbated.

CALC. GLAUC. SANDSTONE: Light greenish to brownish grey, mod. well cemented, massive, fine to medium calcareous sandstone with mod. to high concentration of glauconite, bioturbated.

FLAGGY LIMESTONE: Brownish to greyish white, comparatively mod. to well flaggy, common large bioclasts, glauc, occ. siliciclastic rich recessive seams, medium to coarse bioclastic, glauconitic grainstone.

PEBBLY/GLAUCONITIC LIMESTONE: Light greyish to greenish grey, massive to mod. flaggy, abundant rounded to subrounded b/ment granules and med. to coarse sand in the lower 1-1.5 m, com. large bivalves frags, coarse bioclastic glauconitic grainstone.

SANDY SILTSTONE: Light brownish grey to muddy yellow, soft & crumbly, non/weakly calcareous, fine sandy siltstone, poorly exposed, mainly covered by grass forming a rolling landscape, prob. few tens of meters thick, lower contact with basement not seen.

TA-6

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Stratigraphic Column No: *TA-7* ***Grid Reference:***

Region: Te Akau

Location: Te Akau Road, near Coleman basement quarry

E: 2680768 - 2681363

N: 6392003 - 6390595

NZMS 260 Sheet: R14/807920

Page 1 *of* 2 **Author:** A. Tripathi

NZMS 260 R14

TA-7

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Stage	Strat Unit	Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
eLwh	Whaingaroa / Kotuku	40		Top eroded	Massive, poorly exposed		Z_1			MASSIVE CALC. SILTSTONE: Light bluish grey with com. frittered weathered surface overlying abruptly on the bluffy calcareous silty sandstone unit.
	Glen Massey / Ahirau	30			Abrupt break in weath. profile					CALC. SILTY SANDSTONE: Light brownish grey, very well cemented, horizontal bedding discernible by solution cavities parallel to bedding occurring at approx. 0.4-0.6 m interval, highly calcareous fine silty sandstone, bioturbated, occ. weakly to mod. glauconitic.
		20			Solution cavities, steep near vertical weathering profile, bioturbated, com. tubular burrows visible	Rare pectins	S_3	1-6		
		10			Weathering surface varying from smooth to honeycombed, small solution cavities	Scattered bivalves				CALC. SILTY SANDSTONE: Light greyish to brownish grey, well cemented, scattered large bivalve fragments, occ. inclined tubular burrows 2-4 cm.
	Basement	0			No exposures, grassy steep slope littered with fallen blocks, contact with basement not exposed					

mud: fine, med, coarse; silt: fine, med, coarse; sand: fine, med, coarse; gravel

TA-7

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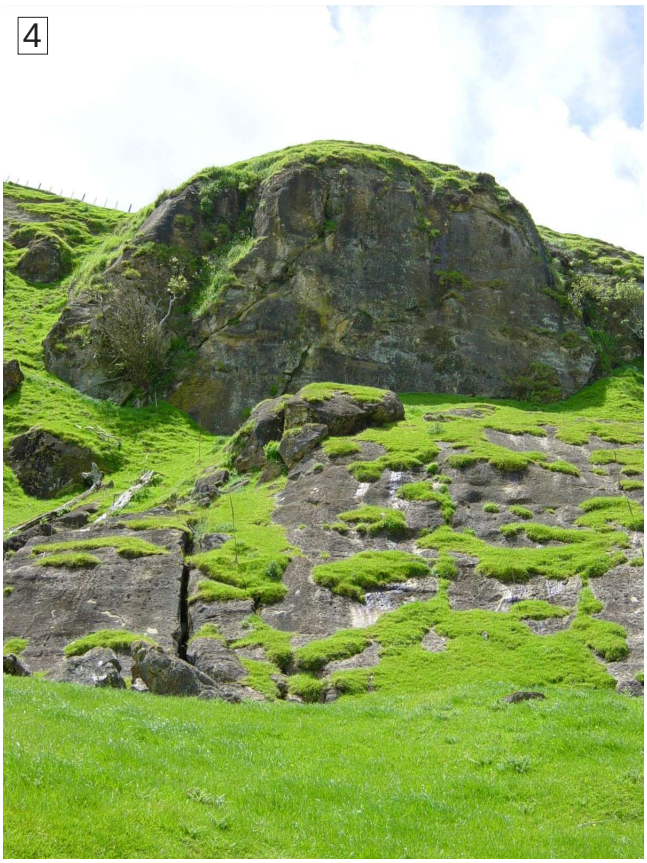

5

Stratigraphic Column No: TA-8 **Grid Reference:**

Region: Te Akau

Location: Te Akau Road near the intersection with Ruakiwi Road, ridge across the Mangati Stream

NZMS 260 Sheet: R14/772924

E: 2677285

N: 6392484

Page 1 *of* 2 **Author:** A. Tripathi

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TA-8

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Stage	Strat Unit		Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Te Aketea	Carter	130		Top eroded	Highly frittered weathering surface		Z_2			CALCAREOUS SILTSTONE: Light greyish to creamish white, massive to occ. showing faint bedding, homogenous unit, fine highly calcareous siltstone with typical frittered weathering surface.
			120								
			110								
			100								
		Raglan	90			Frittered surface, steep profile		L_8-Z_1	7-8		HORIZONTALLY BEDDED SILTY LIMESTONE: Light grey to buff, 6-30 cm horizontally bedded unit, fine packstone grading into wackestone especially in the upper 4-5 m before grades into overlying massive calcareous siltstone, common frittered surface, steep weathering profile.
Ld	Aotea		80			No exposure, gentle to mod. sloping weathering profile, 10 m sec. condensed					
		Patikirau	60			Poorly exposed		Z_1			CALC. SANDY SILTSTONE: Greyish to med. bluish grey, mass., mod. to poorly cemented, fine calcareous sandy siltstone, poorly exposed mainly covered with grass.
			50			Interbedded facies transition		Z_1-S_3	1,9		
		Mangiti	40				Large echinoid and bivalve frags. seen occ.	S_3	5-6		INTERBEDDED CALC. SANDSTONE AND SANDY SILTSTONE: Dirty brownish grey, resistant calcareous sandstone beds interbedded with sandy siltstone, bioturbated, sandy siltstone bed thickness increase upsection. GLAUC. CALC. SANDSTONE: Greyish to brownish grey, well cemented, faint to medium horizontally beds (8-15 cm) separated by thin silty interbeds, bedding become less distinct upsection, glauconitic.
l.Lwh	Whaingaroa		30			Sharp erosive contact, burrowed		S_1			CALC. SANDY SILTSTONE: Light dull grey to brownish grey, mod. cemented, fine calc. sandy siltstone, bioturbated, poorly exposed.
		Waikorea				Gentle slope					No exposures, grassy slope.
e.Lwh	Glen Massey					Comparatively more massive					MOD. GLAUC. CALC. SILTY SANDSTONE: Light dull greyish, mod. cemented, disseminated glauconite pellets, bioturbated, occ. tubular burrows seen on surface.
		Ahirau	10			Uneven honey-combed surface, extensive bioturb., burrows visible in places	Rare pectin & other bivalve shell frags.	S_3	2-4		CALC. SILTY SANDSTONE: Light greyish to greyish, mod. well cemented, calc. fine silty sst, medium horizontal bedding (6-10 cm) apparent particularly in the middle part, extensive bioturbation, weakly to mod. glauconitic. CALC. SANDY SILTSTONE: Light brownish grey, soft to mod. hard, highly weathered fine calc. sandy siltstone grading into silty sst, bioturbated, glauc.
	Basement		0			Basement exposed at stream level					BASEMENT: Conglomerate, no direct contact exposed.

mud: fine, medium, coarse — silt; sand: fine, medium, coarse; gravel

TA-8

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TA-8

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Stratigraphic Column No: *TA-9* **Grid Reference:**

Region: Te Akau **E:** 2674359

Location: Whaingaroa, Te Akau Village, Te Akau Road **N:** 6390673

NZMS 260 Sheet: R14/743906 *Page* 1 *of* 2 **Author:** A. Tripathi

NZMS 260 R14

TA-9

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Stage	Strat Unit	Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Te Akatea / Carter	120		Top eroded	Typical frittered surface & conchoidal fractures, steep bluffy weathering profile	Large foraminifera visible on surface	Z_2	4		MASSIVE CALC. SILTSTONE: Light bluish grey to grey, mass., well cemented, common frittered surface, abundant bioturbation features observed throughout, rounded bluffy weathering profile.
		110								
		100								
		90			30 m condensed sec., no exposure, mod. to steep weathering profile			5		
	Te Akatea / Raglan	60					L_8-Z_1			HORIZONTALLY BEDDED SILTY LIMESTONE: Greyish white to creamish white, well cemented, medium horizontal bedded (varying from 15-20 cm - 25-30 cm) silty lst with thin silty interbeds (2-2.5 cm), bioturbation apparent in the silty interbeds, vertical solution cavities at regular intervals give a blocky appearance, the horizontally bedded unit abruptly grades into more massive calcareous slst although 10-14 cm faint bedding is discernible in places.
		50					L_8			
	Aotea / Patikirau	40			20 m section condensed, no exposure, mod. to steep slope covered with vegetation					
		20					Z_1			
Ld							S_3-Z_1			INTERBEDDED CALC. SANDSTONE AND SANDY SILTSTONE: Medium blue grey, massive, bioturbated sandy siltstone with dull grey to brownish grey calc. silty sandstone resistant interbeds, unit becomes massive & consists mainly of massive bioturbated sandy siltstone upsection, poorly exposed.
	Aotea / Mangiti	10			Recessive interbeds, slightly thicker (12-18 cm) towards top, large sol. cavities	Occ. bivalve fragments in the calc. sst beds	S_3	1-3		HORIZONTALLY BEDDED CALCAREOUS SANDSTONE: Dull greyish to light brownish grey, mod. to well cemented, medium to well bedded (6-8 cm), beds separated by thin recessive silty sandstone interbeds, mod. concentration of glauc. in the calc. sst beds, silty interbeds are com. bioturbated with frittery surface, occ. scattered bivalve frags., highly calcareous very fine to fine sst.
l.Lwh	Whain-garoa / Walk-orea	0			Sharp, erosive contact, glauc. No exposure below the stream		S_1			CALC. SANDY SILTSTONE: Dull greyish brown, massive, bioturbated, glauc. poorly exposed.

mud | silt: fine, medium, coarse | sand: fine, medium, coarse | gravel

TA-9

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Stratigraphic Column No: *TA-10* **Grid Reference:**

Region: Te Akau **E:** 2678286

Location: Ruakiwi Road **N:** 6389438

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1 of 2

Stage	Strat Unit	Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Te Akatea / Raglan / Carter	50, 40, 30, 20, 10		Top eroded; Beds separated by calc. slst interbeds, frittered surface; No exposure, mod. to steep grassy slope littered with fallen blocks			Z_2 / L_8 / L_8-Z_1	1		MASSIVE CALCAREOUS SILTSTONE: Massive blue grey calcareous slst, common frittered surface, bioturbation features common. HORIZONTALLY BEDDED SILTY LST WITH SILTY INTERBEDS: Light greyish to blue grey, medium horizontally bedded, beds average 8-14 cm but occ. up to 30 cm thick, thin silty interbeds with frittered surface, grades upward into massive siltstone unit. MASSIVE CALC. SILTSTONE WITH SILTY LIMESTONE INTERBEDS: Light greyish to cement grey, massive to faint horizontal bedded calcareous siltstone with 15-20 cm thick silty limestone interbeds, poorly exposed.

mud: mud, fine silt, medium silt, coarse silt; fine sand, medium sand, coarse sand; gravel

TA-10

1

Stratigraphic Column No: TA-11 **Grid Reference:**

Region: Te Akau **E:** 2672629 - 2670273

Location: Section continuous from the bluff overlooking Tauterei Stream flat at the end of Nielson Rd & extends towards Carters Beach **N:** 6385845 - 6386975

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TA-11

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Stage	Strat Unit	Strat Unit (old)	Scale (metres)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Waitemata Gp / Te Akau		180		Quaternary sands					
			170		Wavy seams	Abundant artic. & disart. bivalves, large shell frags.		12		FLAGGY BIOCLASTIC LIMESTONE: Dull greyish to whitish, irregular flaggy 15-20 cm thick flags, recessive seams 0.5- 1 cm with shell hash concentration, abundant articulated & disarticulated bivalves, and medium to large fragments, very coarse sparry bioclastic grainstone.
	Te Hara		160		Massive, smooth, sloping surface, bioturbated, weakly to mod. glauc.	Large disart. oysters		9 10-11 8	3-3295 3-3294 3-3293	MASSIVE SANDSTONE: Brownish grey to greyish, massive, soft and friable, very fine to fine sandstone grading into silty sandstone, weakly calc. to non calcareous, mod. glauconitic, very smooth weathering surface.
					Med. horizontally bded				3-3292 - 3289	HORIZONTALLY BEDDED GLAUC, SANDSTONE: Dull greyish to brownish grey, weakly to mod. cemented, distinct 20-30 cm slightly resistant mod. calc. silty sandstone beds alternating with massive, weakly cemented, bioturbated glauc. silty sandstone, common bivalve frags. and occ. disart. oysters.
	Te Aketea		150		Sharp, erosive contact				3-3288	
					Large vert. burrows	Rare large oysters	S_2	6-7	3-3287	CALC SANDY SILTSTONE: Light bluish grey to brownish grey, faint 14-25 cm bedding, bedding planes diffused/amalgamated beds, well cemented, calcareous sandy siltstone, common large 6-8 cm tubular burrows, rare large oysters.
			140						3-3286	
			130		30 m sec. condensed				3-3285	
		Carter	90		Comm. conchoidal fractures, multiple sets of criss-cross joints		Z_1-Z_2	5		FAINT HORIZONTALLY BEDDED CALC SILTSTONE: Light greyish, massive in appearance but faint bedding (30-40 cm) apparent in few places, vertical/diagonal joints, well cemented.
			80		Cliff-near vertical weathering profile	Large foraminifera	Z_1			MASSIVE CALC. SILTSTONE: Bluish grey to brownish grey, massive, well cemented, very frittered weathering surface, rare gastropod.
			70		Gradational, inter-bded transition up-section to mass. calc. slst	Rare gastropods		4	3-3284 3-3283	
		Raglan	60		Master bding surface visible in the lower 2-3 m	Rare whole echinoids, disart. bivalves and fragments	L_8	1-3	3-3282 3-3281 3-3280	HORIZONTALLY BEDDED SILTY LIMESTONE: Light brownish to buff, 4-12 cm fine silty limestone beds (4-12 cm) separated by recessive silty interbeds with extensive bioturbation, common *scolicia* burrows, scattered large bivalve and echinoid frags., rare whole echinoderms, conspicuous surface/master bedding in the lower 2-3 m, interbedded transition to overlying massive calc. siltstone.
					Sharp contact bioturbated, glauc.					
			50		Poorly exposed					MASSIVE SANDY SILSTONE: Greyish to medium blue grey, massive, common frittered weathering surface, weakly to mod. cemented, poorly exposed, mod. steep weathering profile.
							Z_1			
			30		Massive sandy slst with thin calc. silty sst beds, grad. facies transition					
							S_3-Z_1			ALTERNATING CALC. SILTY SANDSTONE & SANDY SILTSTONE: Light greyish white to greyish, 6-10 cm thick calc. silty sandstone alternating with 5-6 cm thick fine calc. sandy siltstone with frittered surface, in the upper part calc. sandy siltstone becomes thicker with only thin silty sandstone interbeds before grading upwards into massive sandy siltstone unit.
			20				S_3			
late Lwh	Aotea / Mangiti				Frittered surface, blocky appearance					HORIZONTALLY BEDDED FINE CALC. SANDSTONE: Brownish grey, well cemented, medium horizontally bedded (6-10 cm) fine calcareous sandstone with irregular silty interbeds usually 0.5 cm but up to 5 cm thick in places, vertical sol. cavities imparts blocky appearance, bioturbated especially in the silty interbeds
	Whain-garoa / Kotuku		10		Sharp contact, burrowed and mod. glauconitic		Z_1			CALC SILTSTONE: Greyish to brownish grey, mod. cemented, massive,bioturbated, mod. glauc., poorly exposed, most likely continuous in the subsurface below stream level.
			0		No exposure below stream level					

mud vfine fine med coarse vfine fine med coarse silt sand gravel

TA-11

TA-11

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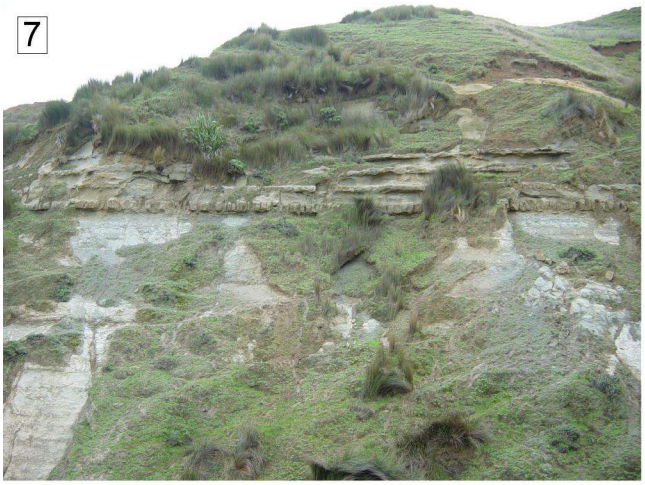

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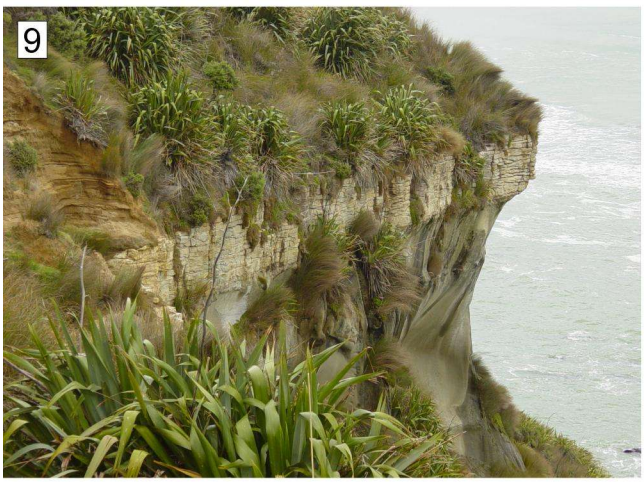

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Stratigraphic Column No: TA-12 **Grid Reference:**

Region: Port Waikato **E:** 2676986 - 2678100

Location: Te Kotuku Trig. Mangiti Road, section continues from bluff opposite Te Kotuku beach & extends to the NW **N:** 6384012 - 6383200

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Stage	Strat Unit		Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
	Te Aketea	Carter	160								
			150			Poorly exposed	Foraminifera	Z2		3-3236	CALC SILTSTONE: Light grey to creamish, massive, frittered weathering surface.
			140			Transition into mass. calc. slst not exposed, 10 m sec. condensed				3-3235	
		Raglan	120			HCS?	Common echinoid and large bioclasts	L8	9-11	3-3234 3-3233 3-3232 3-3231	CALC SILTSTONE: Light greyish, massive, faint indication of HCS visible in the lower half, abundant large bioclasts consisting mainly of echinoids and occ. whole specimen, the lowermost few centimeters is extensively bioturbated and glauconitic.
						Glauc., bioturbated		L8		3-3230 3-3229	CALC SILTSTONE ALTERNATING WITH SILTY LIMESTONE: Light grey to brownish grey, massive, frittered weathering surface, resistant silty lst beds 15-20 cm thick, mod. glauconitic.
	Aotea	Patikirau	110								
			90			10 m sec. condensed				3-3228	
						Mod. to steep weathering profile, poorly exposed		Z1	8		CALC. SANDY SILTSTONE: Medium greyish to bluish grey, massive, variably calcareous but usually soft and weakly cemented, slst grading into sandy slst, poorly exposed forming a mod. to steep sloping weathering profile.
			70							3-3227	
										3-3226	
			60							3-3225	
										3-3224	
		Mangiti	50			Massive, frittered		S3-Z1	7	3-3223 3-3222 3-3221	INTERBEDDED CALC. SILTY SANDSTONE & SANDY SILTSTONE: Light dull greyish to blue grey, 30 to 50 cm thick massive sandy slst alternating with resistant calc. silty sst beds becoming thinner upsection before grading into overlying massive sandy slst.
						Blocky appearance		S3	12	3-3220 3-3219 3-3218 3-3217	HORIZONTALLY BEDDED CALC. SILTY SANDSTONE: Light brownish grey to buff, mod. well cemented, 0.25-1.1m calc. silty sst beds with frittered silty interbeds, vertical solution cavities impart blocky appearance, silty interbeds apparently extensively bioturbd, large horizontal and inclined burrows visible in places, occ. mod. glauc.
			40			Sharp erosive contact, burrowed			5-6	3-3216 3-3215 3-3214	
	Whaingaroa	Kotuku				Well exposed in road cut, otherwise mainly covered by vegetation	Large forams visible in places		3-4	3-3213 3-3212 3-3211	MASSIVE CALC SILTSTONE: Bluish grey to brownish grey, massive, frittered weathering surface with common conchoidal fractures.
			30					Z1		3-3210	
						Abrupt transition, contact poorly exposed					GLAUC. CALC. SANDSTONE: Light greyish to brownish grey, weakly to mod. cemented, mod. glauconite concentration, extensively bioturbated, common large inclined tubular burrows.
	Glen Massey	Ahirau	20			Bluffy near vertical profile, abundant bioturb. features, mod. glauc. partic. in uppermost 2-3 m	Bivalve frags.			3-3209	
								S3		3-3208	CALC. SANDSTONE: Light greyish to brownish grey, mod. well cemented, massive but common faint horizontal bedding apparent from the sol. cavities occurring at regular interval which is inferred having relatively higher calc. content, bluffy weathering profile, com. honeycombed surface, calc. very fine to fine silty sst.
			10						1-2	3-3207	
		Dun-phail				Poorly exposed, covered by fallen blocks		S6		3-3206	CALC. SILTSTONE: Light creamish to buff, massive, well cemented, fine very calc. slst grading into silty sst, weakly to mod. glauc., bioturbated.
	Basement		0			Contact with b/ment not exposed					BASEMENT: Highly weathered slst/zst exposed at the stream level.

mud | silt: fine, medium, coarse | sand: fine, medium, coarse | gravel

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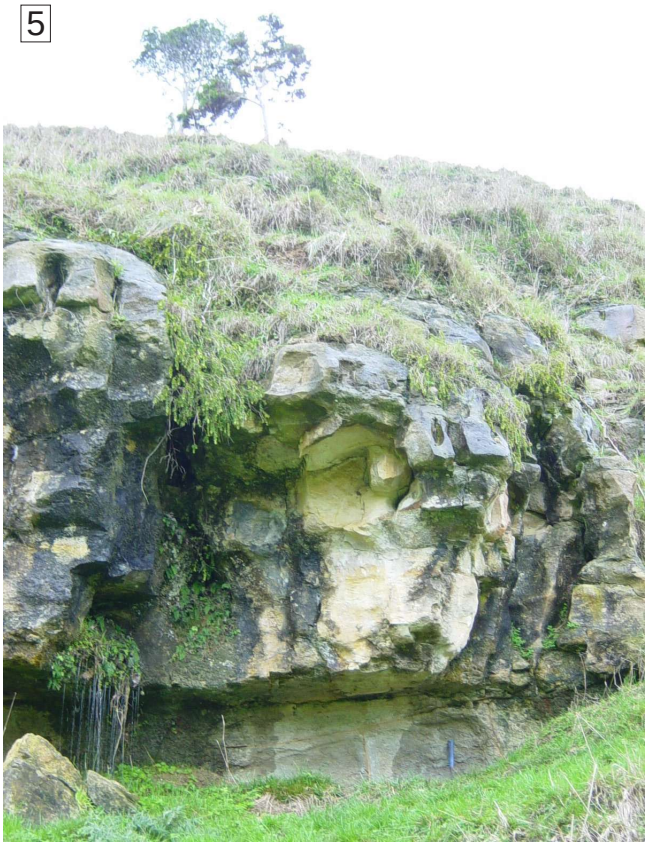

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TA-12

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Stratigraphic Column No: TA-13 **Grid Reference:**

Region: Te Akau **E:** 2683100 - 2682656

Location: Limestone Droppings near Mangiti Road Halliday Road intersection **N:** 6384050 - 6384331

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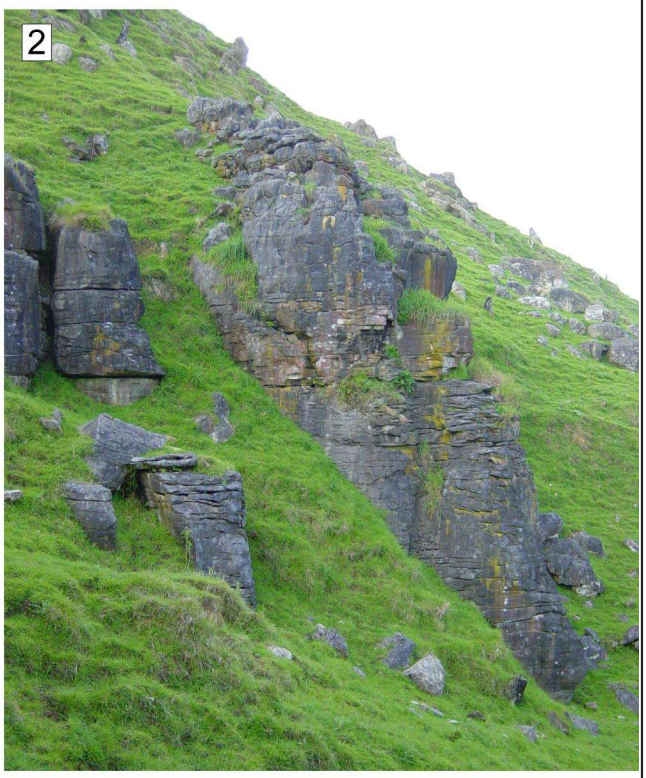
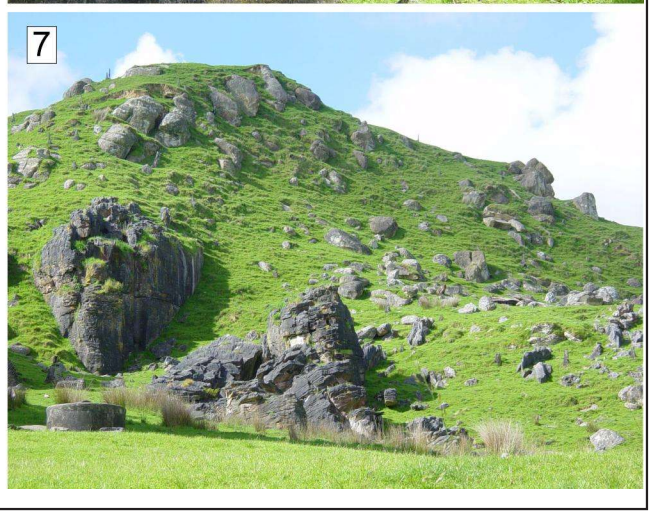
Stage	Strat Unit	Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
	Glen Massey / Ahirau	80		Top eroded						
		70			Exposed faces showing common frittered appear. bioturb. features, bluffy, steep profile				3-3251	
		60							3-3250	CALC. SILTY SANDSTONE: Light brownish grey, well cemented, massive to occ. faintly bedded, commonly frittery to occ. honeycombed surface weathering, calcareous fine silty sst, highly bioturbated, occ. scattered disarticulated pectin/bivalves.
							S3		3-3249	
		50			Faint bedding apparent from sol. cavities, honey-combed surface, steep bluffy weath. profile	Scattered bivalves, mainly pectins			3-3248	
		40							3-3247	
	Glen Massey / Dn				Poorly exposed		S6		3-3246	CALC. SILTSTONE: Greyish to dark greyish, mod. cemented, bioturbated fine calc. slst, massive, covered by fallen debris.
	Glen Massey / Elgood				Wavy irregular flags		L5	6 7	3-3245	KNOBBLY LIMESTONE: Light greyish to off-white, hard, irregularly flaggy to knobbly, discontinuous, irregular bifurcating dissolution seams, coarse sparry grainstone.
		30			Flaggy 6-10 cm flags separated by recessive seams, horizontally bedded			2	3-3244	
							L4		3-3243	CROSS BEDDED LIMESTONE: Light greyish to brownish, hard, mod. flaggy, low angle tabular cross-bedded 0.3-0.5 m cross set, medium to coarse sparry bioclastic lst, rare pebble grit.
							L3	5		
		20			Recessive silicicl. rich seams				3-3242	FLAGGY LIMESTONE: Light greyish to buff, mod. to well flagged, thin 6-8 cm flags, recessive seams occ. inverted, med. to coarse sparry bioclastic lst.
							L4	4		
							L1-L2	3	3-3241	PEBBLY LIMESTONE: Light brownish to buff, massive to poorly flaggy varying from 8 to 12 cm, recessive siliciclastic dominated seams 0.2-1.2 cm thick com. subrounded basement pebbles, glauconitic, coarse sparry bioclastic lst.
						Large bivalve, oyster fragments	S1			
	Mangakotuku / Rotowaro	10			Contact with basement not seen				3-3240	CALC. SANDSTONE: Dull greyish, well cemented, calc. gritty med. to coarse sandstone, common glauconitised rounded subrounded basement clasts, large bivalves fragments occ. oyster fragment.
									3-3239	
					Massive, soft, crumbly, shelly concretions in the upper 2-3 m, faint bding app. in upper 1 m, lower & upper contact not seen	Highly leached *eumarcia* shells and other brackish water bivalves		1	3-3238	CARBONACEOUS MUDSTONE: Dark greyish to yellowish to muddy brown, soft & sticky, highly frittered surface, limonite & sideritic highly oxidised Fe staining, highly leached *eumarcia* shells and concretions made up of shell material, faint bedding apparent in the upper 1 m of exposure.
	Basm.	0							3-3237	Conglomeratic basement, commonly occurring as boulders.

mud | silt | very fine sand | fine sand | medium sand | coarse sand | gravel

TA-13





Stratigraphic Column No: *TA-14* **Grid Reference:**

Region: Te Akau

Location: Waitetuna estuary, Waingaro-Ohautira Road

E: 2683300 - 2683750

N: 6377450 - 6377700

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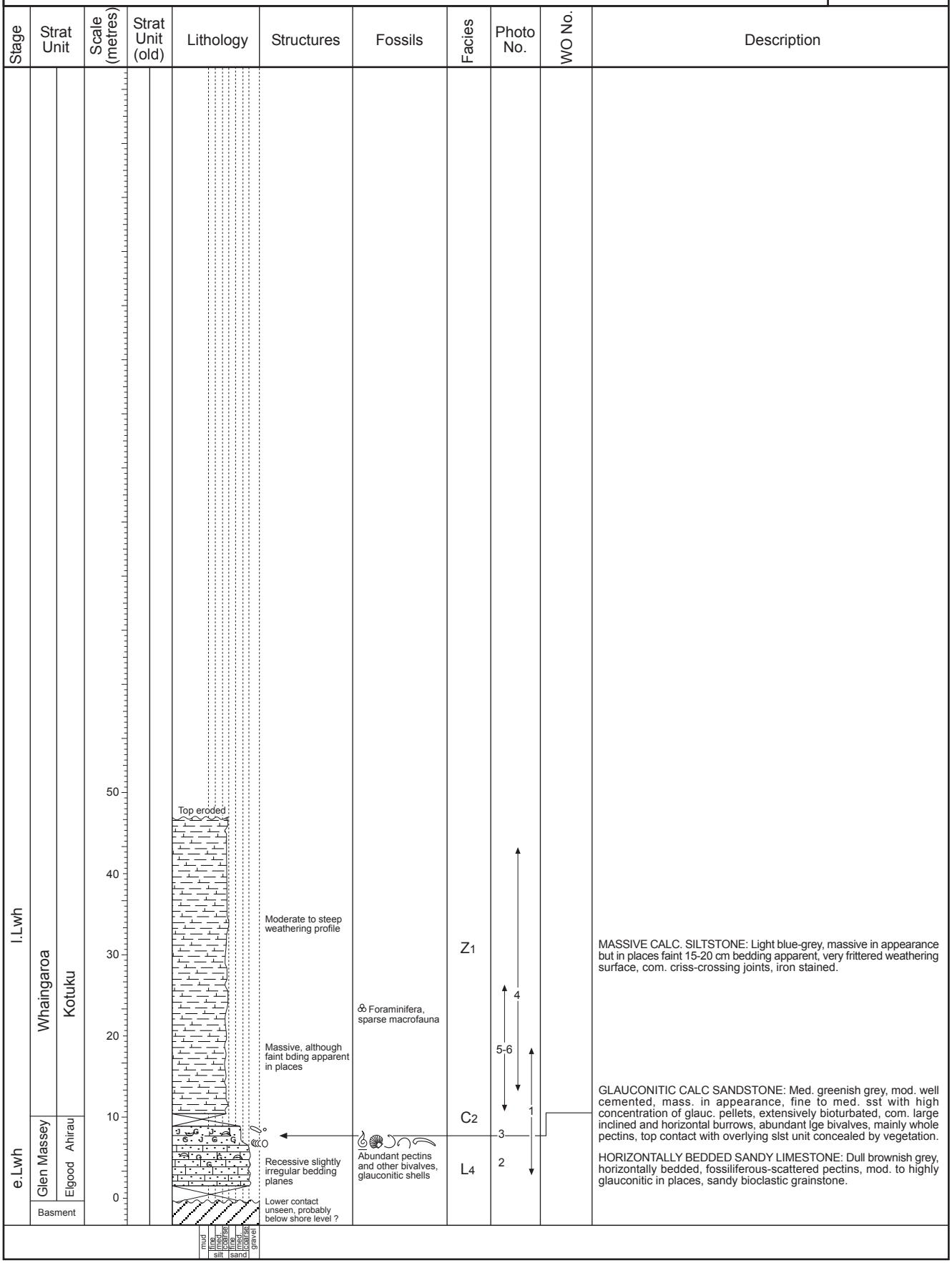

TA-14

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Stratigraphic Column No: TA-15 **Grid Reference:**

Region: Te Akau **E:** 2679343

Location: Okete Bay, Raglan Harbour **N:** 6376388

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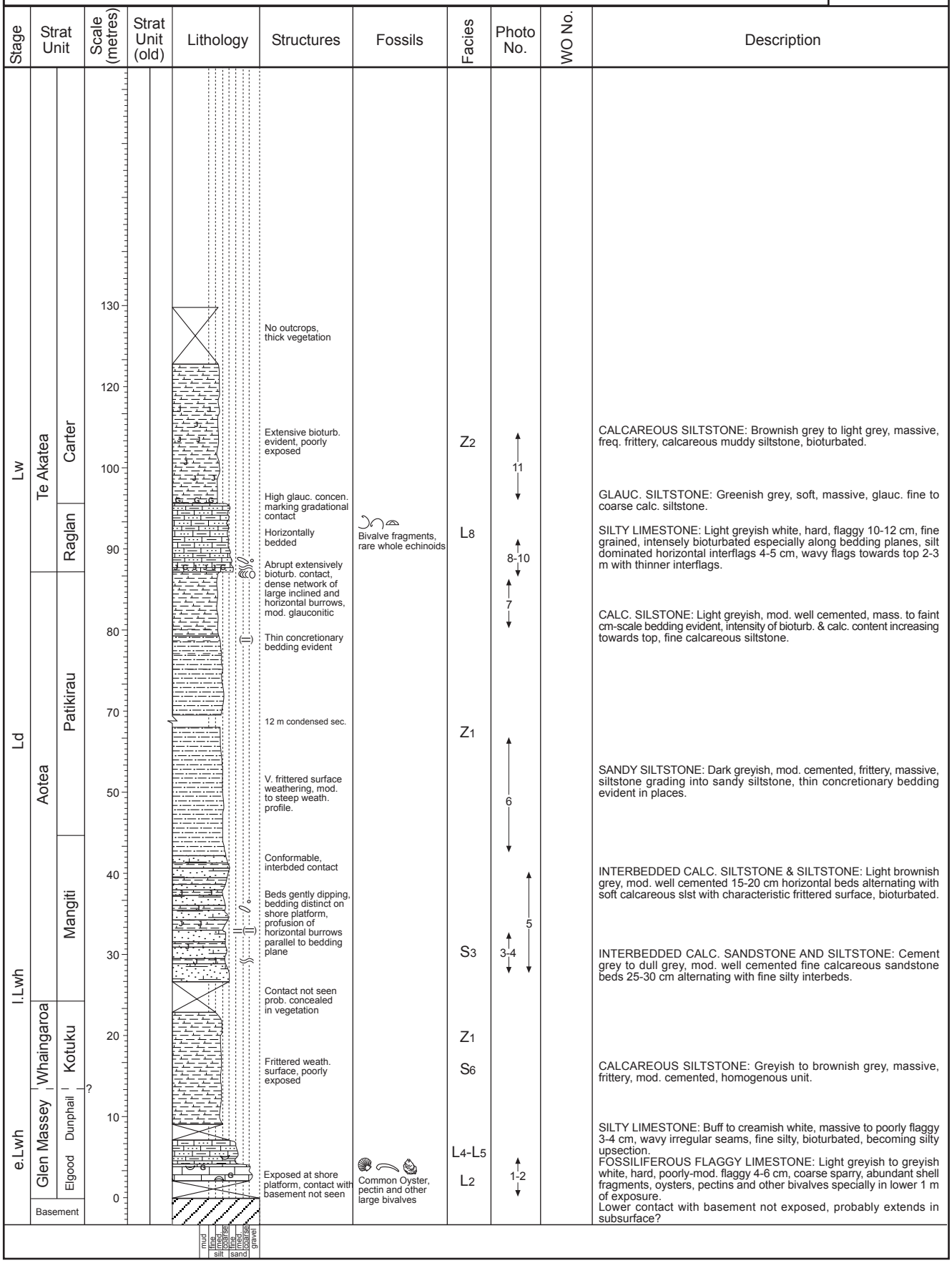

CALCAREOUS SILTSTONE: Brownish grey to light grey, massive, freq. frittery, calcareous muddy siltstone, bioturbated.

GLAUC. SILTSTONE: Greenish grey, soft, massive, glauc. fine to coarse calc. siltstone.

SILTY LIMESTONE: Light greyish white, hard, flaggy 10-12 cm, fine grained, intensely bioturbated especially along bedding planes, silt dominated horizontal interflags 4-5 cm, wavy flags towards top 2-3 m with thinner interflags.

CALC. SILSTONE: Light greyish, mod. well cemented, mass. to faint cm-scale bedding evident, intensity of bioturb. & calc. content increasing towards top, fine calcareous siltstone.

SANDY SILTSTONE: Dark greyish, mod. cemented, frittery, massive, siltstone grading into sandy siltstone, thin concretionary bedding evident in places.

INTERBEDDED CALC. SILTSTONE & SILTSTONE: Light brownish grey, mod. well cemented 15-20 cm horizontal beds alternating with soft calcareous slst with characteristic frittered surface, bioturbated.

INTERBEDDED CALC. SANDSTONE AND SILTSTONE: Cement grey to dull grey, mod. well cemented fine calcareous sandstone beds 25-30 cm alternating with fine silty interbeds.

CALCAREOUS SILTSTONE: Greyish to brownish grey, massive, frittery, mod. cemented, homogenous unit.

SILTY LIMESTONE: Buff to creamish white, massive to poorly flaggy 3-4 cm, wavy irregular seams, fine silty, bioturbated, becoming silty upsection.
FOSSILIFEROUS FLAGGY LIMESTONE: Light greyish to greyish white, hard, poorly-mod. flaggy 4-6 cm, coarse sparry, abundant shell fragments, oysters, pectins and other bivalves specially in lower 1 m of exposure.
Lower contact with basement not exposed, probably extends in subsurface?

TA-15

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TA-15

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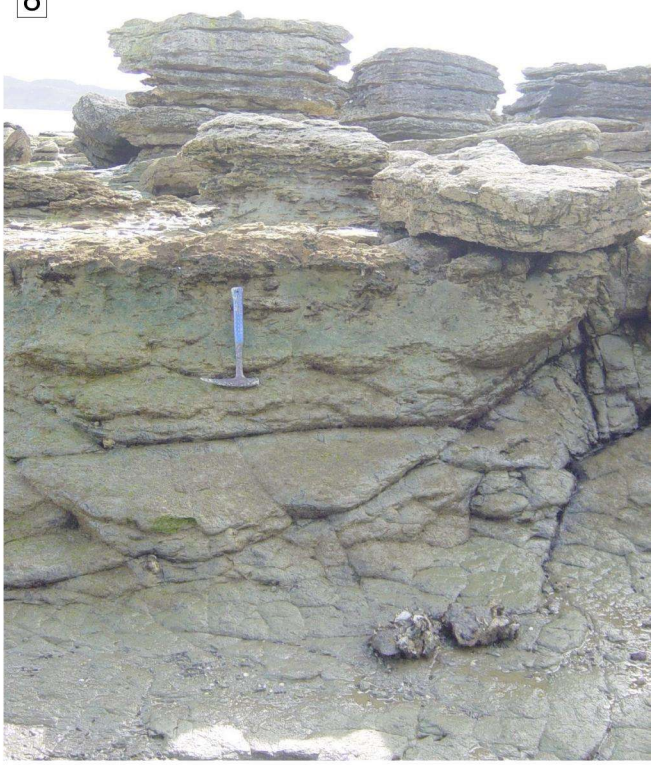

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Stratigraphic Column No: TA-18 **Grid Reference:**

Region: Te Akau **E:** 2670100 - 2669318

Location: Gibson Beach **N:** 6389220 - 6391120

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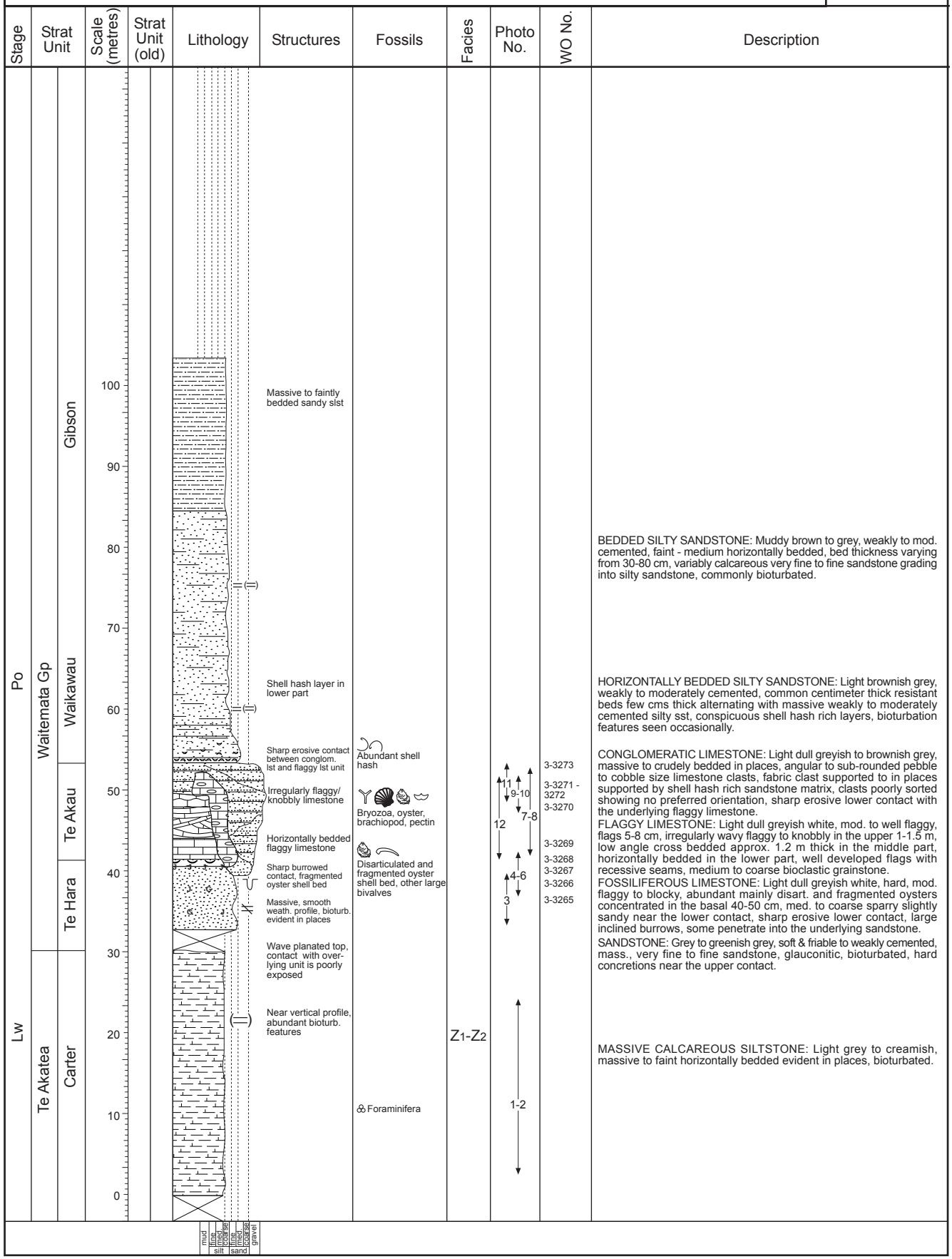

BEDDED SILTY SANDSTONE: Muddy brown to grey, weakly to mod. cemented, faint - medium horizontally bedded, bed thickness varying from 30-80 cm, variably calcareous very fine to fine sandstone grading into silty sandstone, commonly bioturbated.

HORIZONTALLY BEDDED SILTY SANDSTONE: Light brownish grey, weakly to moderately cemented, common centimeter thick resistant beds few cms thick alternating with massive weakly to moderately cemented silty sst, conspicuous shell hash rich layers, bioturbation features seen occasionally.

CONGLOMERATIC LIMESTONE: Light dull greyish to brownish grey, massive to crudely bedded in places, angular to sub-rounded pebble to cobble size limestone clasts, fabric clast supported to in places supported by shell hash rich sandstone matrix, clasts poorly sorted showing no preferred orientation, sharp erosive lower contact with the underlying flaggy limestone.

FLAGGY LIMESTONE: Light dull greyish white, mod. to well flaggy, flags 5-8 cm, irregularly wavy flaggy to knobbly in the upper 1-1.5 m, low angle cross bedded approx. 1.2 m thick in the middle part, horizontally bedded in the lower part, well developed flags with recessive seams, medium to coarse bioclastic grainstone.

FOSSILIFEROUS LIMESTONE: Light dull greyish white, hard, mod. flaggy to blocky, abundant mainly disart. and fragmented oysters concentrated in the basal 40-50 cm, med. to coarse sparry slightly sandy near the lower contact, sharp erosive lower contact, large inclined burrows, some penetrate into the underlying sandstone.

SANDSTONE: Grey to greenish grey, soft & friable to weakly cemented, mass., very fine to fine sandstone, glauconitic, bioturbated, hard concretions near the upper contact.

MASSIVE CALCAREOUS SILTSTONE: Light grey to creamish, massive to faint horizontally bedded evident in places, bioturbated.

TA-18

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TA-18

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Stratigraphic Column No: *TA-19* ***Grid Reference:***

Region: Te Akau ***E:*** 2677195

Location: Rothery Road, Raglan Harbour ***N:*** 6380485

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Stage	Strat Unit	Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Lw	Waitemata Gp / Te Akau	100		Top eroded		Scattered pectin casts and moulds		6		FLAGGY BIOCLASTIC LIMESTONE: Light greyish, flaggy, 6-8 cm well dev. flags, inter-flags varying from horiz. to irreg. and bifurcating, med. to coarse sparry grainstone with scattered coarse bioclasts & occ. pectin cast and mould.
	Te Hara				Poorly exposed	Disart. oyster and fragments concentrated at lower contact		5		OYSTER SHELL BED/FOSSILIFEROUS LIMESTONE: Light dull greyish, approx. 30 cm thick containing abundant disarticulated and fragmented oyster shells forming the lower sharp contact.
		90								MASSIVE SANDSTONE: Light brownish to rusty brown, soft, weakly-mod. cemented, massive in appearance lacking any primary depositional structures, conspicuous smooth weathering surface.
		?			No exposures, grass covered mod. to steep weathering profile, approx. 40m section condensed					
	Te Akatea / Carter	30					Z_2			MASSIVE CALCAREOUS SILTSTONE: Light greyish , mod. well cemented, fine calcareous siltstone, frittered weathering surface, poorly exposed.
	Raglan	20				Abundant echinoid plates and occ. whole shells	L_8	4	3-3279	SILTY LIMESTONE: Light greyish to dirty white, fine grained limestone, mass.to medium horizontal bedded, beds separated by resistant thin (1-2 cm) interbeds, scattered echinoid plates and occasional scolacia burrows.
									3-3278	
									3-3277	
					Vert. sol. cavities imparts blocky app.			3	3-3276	INTERBEDDED SILTY LIMESTONE & CALCAREOUS SILTSTONE: Dull greyish white to creamish, poorly to mod. flaggy, beds varying from 5-6 cm to 30 cm with vertical solution cavities, calcareous siltstone interbeds with frittered surface, abundant echinoid plates and occasional whole shells, calcareous content increasing upsection.
		10						2	3-3275	
Ld					No outcrops, mod. steep mound shaped profile		?L_8-Z_1			
	Aotea / Patikirau	?			Exposed at stream level		Z_1	1	3-3274	SANDY SILTSTONE: Brownish grey to medium grey, soft & sticky when wet to mod. cemented, massive in appearance, fine sandy siltstone, mod. calcareous, poorly exposed along the stream, likely to continue in subsurface.
		0								

mud | silt | fine | med. | coarse | sand | fine | med. | coarse | gravel

TA-19

Stratigraphic Column No: TA-20 **Grid Reference:**

Region: Te Akau **E:** 2676400 - 2677500

Location: Patikirau Bay, Raglan Harbour **N:** 6377800 - 6378500

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TA-20

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Stage	Strat Unit		Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
Ld	Aotea	Mangiti	0			Shore level		S3			CALCAREOUS SANDSTONE: Light brownish grey, mod. well cemented, med. horizontally bedded, reg. vertical solution cavities imparts a distinct blocky character, beds 12-18 cm separated by thin silty interbeds.
								S3-Z1	3		INTERBEDDED CALCAREOUS SANDSTONE & SANDY SILTSTONE: Light brownish grey, resistant calcareous sandstone beds int/bedded with sandy slst.
		Patikirau	10			Massive sandy siltstone, steep near vertical profile					
			20			Silty sandstone slightly resistant thin beds					
			30			Massive to faint horizontal bedding, very frittered weathering surface		Z1	2		SANDY SILTSTONE: Medium to dark greyish, mod. cemented, frittered weath. surface, steep profile, thin concretionary bedding evident in places.
			40								
			50			Abrupt contact marked by extens. burrowed and glauc. concentration		C1	5-6		
		Raglan	60		Top eroded		Echinoid	L8	4		SILTY LIMESTONE: Light brownish white, massive to medium horizontally bedded, 6-10 cm silty limestone beds separated by recessive bioturbated calc. silty interbeds, extensively bioturbated and glauconitic at the lower contact.
	Aotea										
	Te Akatea										

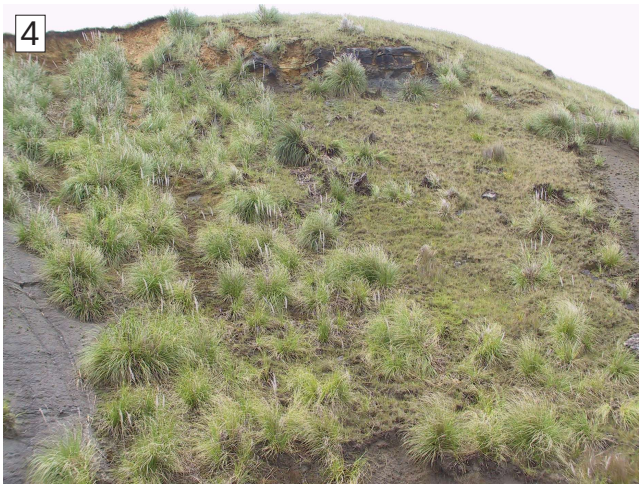
mud | silt (fine, med, coarse) | sand (fine, med, coarse) | gravel

TA-20

1


2


3


4


5


6


Stratigraphic Column No: S19 *Grid Reference:*

Region: Te Akau *E:* 2678478

Location: Section 'T' (Kear 1963); New Kotuku trig (Kotuku West; north side Raglan Harbour) *N:* 6383941

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NZMS 260 R14

S-19

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Stage	Strat Unit			Scale (metres)	Strat Unit (old)	Lithology	Structures	Fossils	Facies	Photo No.	WO No.	Description
LWh	Waitemata Group		Te Hara - Te Akau	100	Otorohanga Limestone		eroded top					
					Waitomo Sandstone							
	Te Akatea		Carter	90	Te Akatea Siltstone							
			-									
			Raglan	80								Massive calc. siltstone.
				70								
				60								
				50								Hard, planktic-rich slightly sandy argillaceous lst. with occ. echinoid plates. Sharp contact. Incip. flaggy; vertical sparite seams.
	Aotea		Patikirau	40	Aotea Sandstone							
			-	30								
		Mangiti										
	Whaingaroa		Kotuku	20	Whaingaroa Siltstone							Blue-grey calcareous mudstone. Frittery.
				10								
	GM Formation		Ahirau	0	GM Formation							Mesozoic basement rocks.

mud | silt | fine | med | coarse | sand | fine | med | coarse | gravel