

Western Districts, VIC
On His Majesty's Service
Geological Notebook

No.7

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Notebook No.7

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If found please return to –

Edmund D Gill
National Museum,
Russell Street,
Melbourne, C.1,
1950

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Camperdown

Bones in Museum from Mr. P. Law Smith of "Chocolyn" on SE shore of Lake Colongulac. Infilling material of bones a grey "siltstone" loess?? & not a detrital tuff. On the other hand, the bones were quarried from a reddish "grit" which forms the old lake shore. They are therefore ~~probably~~ derived.

Tower Hill

Note rilling (guttering) down rim of caldera – a recent erosion effect since stripping vegetation.

Photo of Caldera

Page 2

Pertobe Cutting Cannon Hill

Photo of aeolianite & fossil soil 5' thick with fossil snails. Pertobe Rd ctg **Tower(Cannon?)** Hill E side.

Photo of Major soil horizon. Shows long period of soil formation cf. Thunder Pt. & Albert Park

Photo of Vertical solution channels in aeolianite.

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Dennington

Photo of Water gap in aeolianite ridge looking N to Dennington. Flood plain of Merri River.

Photo of Ditto. looking sea-wards. Mobile dunes in background.

A – Swampy area.

B – Flood Plain

C – Terrace

Photo of 10' Terrace.

Photo of Platform in aeolianite. Horizontal bed with marine shells. R/W (Last Interglacial) shallow water deposit grading into dune.

Page 4

Very Probably 1950

Photo of Tuff with pieces of aeolianite (not water-sorted) in side of 10' Terrace. Piled against? Not water/laid altho' only 3-4' above river level.

Washed sample showed pieces of marine shell, echinoid spines etc. (from R/W beach deposit).

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Very Probably 1950

Goose Lagoon

Photo of cliff on inland side of aeolianite ridge E side of Goose Lagoon. Looking S. from alluvial flats.

Basalt barrier cut by drain

Photo of Ditto. Looking E along cliff. M = midden. Cliff too steep to be a dune structure. See A. Sand against cliff at B. Arid period?

Table of Charcoal locations for C14 Tests

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1950

West of Levy's Point

Photo of Afterstorm Cumulus clouds Rough seas. Big sand blow in mobile dunes.

Photo of:

Aeolianite ridge

Kelly's Swamp

Vegetated dune

Mobile dune.

D = mobile dune running out over swamp.

Photo of Old sand blow now vegetated. Gap looking seaward Inland & vegetated tongue runs out into the swamp towards Dennington.

Photo of Sand hummocks c 25' high in front of main dune line. Formed last 100 yrs since deforestation. No middens seen on them.

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Photo of fossil grey soil with fossil snails.

2 soil layers merge into 1. Each soil layer & each subsoil c 1' thick.

Photo of Exhumed vegetation.

Photo of Marram grass pattern after storm.

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Photo of Rain rills

Photo of Sand ripples

Photo of Sand rills

Photo of Sand rills

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1950

Tower Hill Beach

Photo of during storm

1. Beach ridge boulders cast up
2. Dune ridge being eroded by waves. Looking S.

Photo of Ditto. looking N to Merri Cutting

Photo of Old beach ridge between sand ridges looking inland from break in seaward sand ridge.

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Photo of Inner beach ridge looking south.

Photo of Ditto. Looking North. Malcolm Gill

Midden Two *Hydriddella* shells (one indubitably in situ in carbonaceous layer) in midden at Tower Hill beach next Merri Ctg. Probably from river when Merri emerging there or from swamp or lake in swale. Possible white fisherman with shells for bait during **abo.** occup. of site, but this unlikely.

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Hamilton District

Grange Burn

4/11/50

1 Scour on N side of Grange Burn opposite double gate into large paddock E of McNaughton's & c ½ ml E upstream from tributary coming in from N. side

Map of Grange Burn Area showing scour location

Mil. Map. Hamilton Sheet 496, 346, Scour in 1946 floods.

Page 12

Sketch: Cross section of Grange Burn scour

1 Small fault where talus is. Beds horizontal on E of fault. Beds dip W on W of fault. Line of fault across country lower – prob. more rapid erosion of broken rock. Fault c 3' throw.

2 Whitish clay prob. diatomite because of colour, S.G., & adherence to tongue. Silts brought up by fault – reversed fault.

Page 13

As shown in sketch, shaft put down with windlass & below this an augur hole. Mr. Coates says traversed:

Sketch: Vertical profile (11 feet) of Shaft bottoming on hard rock (porphyry?)

[Australite in coll. Of Mr. G. Coates from Balmoral 40 mls N. of Hamilton]

Page 14

As follow the basalt downstream it descends below bed of stream. Columnar basalt. Concave horizontal joints in columns.

Property P D McNaughton

Bore 189 62':

Basalt c 30'

Limestone with shells c 25'

"Glassy stuff" 55'-62'

(Crystalline limestone?)

I was also informed that Mc N's bore went all the way in basalt. This unlikely since good water supply obtained above is about what expect from Creek sections. Also presence of shells.

Page 15

2 Porphyry Gorge

New name suggested by F.A. Cudmore for part of creek marginal to long porphyry outcrop on Grange Burn on Mr. O.C. Henty's property c ¾ ml upstream from house. Beds exposed by 1946 flood.

Cross section of part of Porphyry Gorge

Two formations distinct rock types.

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Sketch map of Porphyry Gorge showing location of section drawn on p29.

Page 17

Upstream from limit of marine outcrops shown in p.16 fossil soil with carbonized wood.

Diagram of outcrop – basalt over soil.

Soil & subsoil look as though derived from a sandstone cf. beds under basalt in Porphyry Gorge.

In a number of places stumps of shrubs & small

Page 18

trees to 9" diam. in situ. Proves basalt flowed over terrestrial surface.

Diagram waterfall section on Grange Burn creek

Basalt & underlying beds sunk in. Creek followed line of weakness

Concretion

(Nodule) bed c 6" above water level c. 80' downstream from above.

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75 yds upstream from Gorge

Diagram of outcrop on stream side – basalt over shoreline marine beds

Diagram N Side of Grange Burn showing holes in porphyry infilled with conglomerate, grit and fossils.

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Grange Burn N. Bank

Upstream from waterfall

(On S. bank basalt & Talus)

Diagram of exposed porphyry and fossiliferous sediments.

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S. Bank Grange Burn immed. E

Upstream from Sect. p.20

Diagram of basalt over sediments, soil and carbonised roots

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1 Sub-basaltic surface a terrestrial one as soil & roots of trees in situ.

2 Poor development of soil

3 Sub-basaltic surface a plain because flat as far as can be followed up creek.

4. Why cut out westwards?

Old shoreline?

Marine beds underneath?

5 Marine beds on sandstone platform?

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Table Dumpy Traverse W end Porphyry Gorge (E of Henty's) to end of Tertiary marine outcrops (East & upstream)

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Table Continued from Page 23. Dumpy Traverse W end Porphyry Gorge (E of Henty's) to end of Tertiary marine outcrops (East & upstream)

Page 25

Diagram of creek cross section

Falls just downstream from section line, & outcrop as show on p.26 just upstream from section line.

No Balcombian above waterfall but both formations present.

Page 26

Diagram sediments exposed in creek bed

Blue clay of unknown depth but probably c 2' thick. Has Polinices pre-dominating. Small narrow Ostraea common.

Also Nassarius

Ledd

Mactra

Barnea

Pearl Oyster

Epitonium

No fossils seen in fine clayey sand.

Page 27

Flaggy Limestone Ostraea pre-dominates.

Probably a calcification of the grey clayey sand. Porphyry pebble 7" long & 2 3/4" diam. in this bed.

Such pebbles commoner in 2"-3" long. One 4" noted. Flaggy limestone formation continues upstream. Section c. 80' E of dumpy loc. (p.24)

Diagram creek section at dumpy location.

Blue clay not found here.

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Ostraea-Polinices bed eroded in places down to the green sandstone: ~~& conglomerate over both.~~ Some big sedimentational change for coarser marine bed to cover finer, (altho. conglom. not necessarily marine). Or two beds interleave. Ostraea & Polinices only in lower levels of conglomerate & then not common. Remanie? All pebbles of porphyry, except at base of conglomerate where some of greensand. Conglomerate definitely pre-basaltic. Green sandstone pebble noted which c. 6" long; well rounded & c. 6" above base of Ostraea - Polinices bed 88' E of dumpy loc. A number of others noted 3"-4" long.

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Table of Porphyry Gorge surveyed Section listing layers encountered

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Continuation of Table Porphyry Gorge Section

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Continuation of Table Porphyry Gorge Section

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Continuation of Table Porphyry Gorge Section

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Continuation of Table Porphyry Gorge Section

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Continuation of Table Porphyry Gorge Section

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Continuation of Table Porphyry Gorge Section

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Dumpy Levels of Beds

Table of Dumpy Levels of Beds

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Diagram longitudinal section of "Porphyry Gorge" Grange Burn showing fall in disconformity.

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1950

“Porphyry Gorge” Grange Burn

Photo of Looking W downstream towards Henty’s with annotations

Photo of same view from higher upstream (E) near waterfall with annotations

Photo of Grange Burn looking E with annotations

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Photo looking E with outcrop of Balcombian clay

Photo of showing location of p26 section and sketch p25. With annotations

Photo of cross-bedding in limestone E of waterfall (upstream)

Photo of Ditto. In loose block

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Photo of sediments in holes eroded in “porphyry” E of waterfall & near limit of marine sediments’ outcrops.

Photo of “Porphyry”= rhyolite, acid lava flow

Photo of conglomerate near above.

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November 1950

Grange Burn

W. of Hamilton

Photo of waterfall in faulted basalt See p.18 with annotations. See also p133.

Fossil Soil

Very sandy loam

Mottled light-coloured limey patches ¼” – 1/2” diameter

Sandy-clay loam to clay loam

Yellowish

Siliceous earthy limestone to calcareous sandstone 58.8% calc. matter

Podsol. Enrichment in B, in both clay & lime. Altho’ sub-tropical climate, soil not red, because conditions swampy in places.

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Two photos of columnar porphyry on N bank, Grange Burn, N of Henty homestead.

Photo of Natural arch in Batesfordian ~~Janjukian~~

limestone, W of Henty's house.

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Photo of Batesfordian limestone on porphyry W of Henty's House with annotation.

Photo of Ditto. but a little (W) downstream. Note dip off porphyry. Compaction and/or faulting.

Page 45

Schematic map of Grange Burn Creek at Porphyry Gorge. Showing section A – G locations

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Diagram Loc.B Section N. bank Grange G

Diagram Loc.D Section W. Bank

Note lowering of clay-limestone junction as go down creek.

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2 chns downstream from D junction c 6' above water level although no fall between D & 2 chs S. Due to warp.

Diagram Loc.E. East Bank

Loc. F. South Bank

Polinices bed makes again. Fewer oysters. Plentiful Glycymeris, Dentalium. Also Nassarius, Crassatellites, etc. High cliff on S bank formerly studied. 1946 flood caused nodule bed (whale horizon)

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to be 2' under water because of ponding. At "Balcombian Island" in Porphyry Gorge whale vertebrae, pieces of bone, piece of skull dug out on S bank at or just below water level.

At F 6' clays above the water (E end), & above this 3' Polinices-Ostraea bed which 3' thick. P-O bed gradually sinks to water level in 5-6 chs. Above P-O bed 10'+ of flaggy limestone. P-O bed very rich indeed in fossils – a marl. Many shells whole but a good few broken. Some worn - A Thanatocoenose.

Mr. Henty says nodule bed a "few inches thick".

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Section Loc. F

Grange Burn

Diagram of vertical profile at Forsythe's Bank

NB. 1 Basalt directly on flaggy limestone.

2 Beds flexed. N dip at loc D & W dip at loc. F. At Loc.D appear horizontal. Flexures tie in with

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small faults to indicate limited earth movements in this area. However, little change over 1 ml. from A to G

10 chs upstream from Henty's House nodule bed just under water. Pieces of whale bone as at Porphyry Gorge. Generally worn by abrasion & some bored by molluscs & some encrusted with polyzoa etc.

Diagram: section upstream of Henty's house.

Similar a little further downstream near Henty's House where on N bank loc G.

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Diagram Loc. G SECTION

Nodule Bed with Diodon, whale bone, etc. Balcombian cf. at "Balc. Island" & Nodule Bed on Muddy Creek. Polinices found in top of Nodule Bed at loc. G

BORE 193

Yulecart (Information from Mr. Coates)

Basalt 100' finishing in "Red Basalt"

"MacIntyre's Well

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Diagram of Outcrops on Grange Burn from Henty's House to c 10chs E.

Dip of 5° towards fault.

On other side of Porphyry (W downstream) dip of 5° W - see photos p.40.

Joint planes in Porphyry c E 15° S

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Map of Grange Burn & Muddy Creek showing section point 'X'

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West Bank Muddy Cr at Point X

Diagram of creek profile.

Suggests

- 1 Two flows of basalt.
- 2 Lower flow decomp. Before second flow came.
- 3 Basalt is usually on top of hills in this area. The low level of this basalt either

(a) Palaeogeographic feature. If so where centre of eruption? Or

(b) Due to faulting.

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Diagram of creek bank at Clifton Bank

Above water level (roughly) the beds are brownish whereas the lower ones are blue. Difference due to oxidation apparently. This accounts for Chapman's beds A & B (Nat. Mus. Mem. 5, fig 14)

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Diagram of creek bank at Macdonald's

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Map of Glenelg River at Dartmoor showing fossil cliffs

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Schematic section of cliffs showing 3 fossiliferous layers

In oyster bed as many paired as not.

Same in Chione bed. 1 & 2 continue horizontally over a considerable distance but 3 not so well defined.

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Caldwell's Cliff

Vertical section of Caldwell's Cliff

Dwarf Fauna

Glycymeris c ¼ usual size

Chama lamellifera normal but no large ones.

Fusus, Ancilla, Liota normal

Voluta c ¼ usual size

Trivia small

Cucullaea & Cardita scabrosa small

Cudmore says majority smaller than usual.

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Fauna in clay formation has *Zemira praecursoria*, *Volutilites antiscalaris* & *Protochiton granulosus* which typically Balcombian.

Concretionary Layer

Singleton's bed (j)

Masses of somewhat intertwining tube or rather rope like masses, solid, roughly circular in cross-section & c 1" diameter, left standing out by differential wind erosion of cliff.

1. Many possess annulations cf. some stalactites.
2. All about the same diameter, they do not taper.
3. In places the cross-bedding continues on each side of the concretion, so must

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have been formed after stratification.

4. Orientated mainly to the plane of the beds.
5. Their regular diameter & orientation shows they are not "sand-pipes". They could be crustacean burrows.

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Cliff S.E. Caldwell's Cliff

On SE (left) bank of Glenelg River c 1 1/2 miles SE (downstream) from Caldwell's Cliff, & on next big bend. Top reached on foot & lower part by boat.

Diagram of cliff section downstream of Caldwell's Cliff

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Shallow caves occur about half way up limestone formation. Below disconformity lime-laden waters (emerging as springs betw. the 2 formations) have formed stalactites on side of cliff slightly over hanging benches. These up to 15" in diameter & up to 4' long. One 3' long collected. They tend to form masses due to approx. of stalactites (see collection). Some have annulations. Also plants covered with calcareous solutions & so preserved.

Diagram of stalactite

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Stalactites & lamellar calc. concretions in other parts of cliff now dry.

Site just downstream from Wild Dog Creek. Lairs of foxes in caves judging by spoors. Bones of rabbits about cf. on Caldwell's Cliff where fox lair & track.

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10/11/50

Diagram: map of Glenelg River showing locations A and X

Creek has flowing water very highly charged with lime as also is the river.

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Diagram Section at X on Glenelg River

Sand on top probably from weathering of bed underneath as also has earthy zone with concretions (sample taken)

c 3' above river level, lightly ferrug. band c 3" thick, slightly harder.

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At c 150 yds upstream from creek this band dips underwater at 5°. A little further upstream dip c 3° in what is probably the same bed. Small warps apparently but no great movement as beds can be followed up the river for so many miles.

At least 2 Ostraea horizons

- 1 Kalimnan As at Grange Burn & ~~Portland~~
- 2 Pleistocene As at Dartmoor & Caldwell's Cliff.
 - a. Maretimo
 - b. Werrikoo

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Section Loc. A (p.65)

Diagram: vertical cliff section

Limestone on top not dune rock as mapped but shallow water & littoral deposits.

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Next bend E upstream cliff on E bank show 3° dip N. Cudmore coll. Balcombian fossils.

11/11/50

Limestone Cr.

Cross section showing Paired terraces

Beds described by early writers not in evidence. Probably covered by slips in 1946 flood. So also at Devil's Den.

On S bank c 200 yds from mouth "travertinised" terrace rock with fossil snail.

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Werrikooian shells non in situ in bed of Limestone creek & around mouth, but not numerous.

Diagram: Map of Limestone Creek /Glenelg River junction showing Oyster bed and terraces

Page 71

Section W bank Glenelg R. N side of Limestone Cr.

Diagram of cliff section

Limestone coarse & made up of broken shells in coarser horizons. Tough.

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due to secondary calcareous cement. Casts of lamelli-branchs (i.e. sandy facies) common.

At base of Werrikooian 2' bed rich in fossils preserved as casts & moulds.

Diagram of Werrikooian/Balcombian contact

Thickness of rocks removed at disconformity by erosion unknown.

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Barnea in smooth flat surface suggests shore platform or rather just below low tide which the habitat of pholads.

Upper part of clays in this section unfossiliferous but lower part yielded

Limopsis

Conus

Lima B

Natica polita

Protochiton granulosis

Murraria catinuliformis B or J

? M. suessi

Myochama

Dentalium mantelli B

Smooth Dentalium

Glycymeris cainozoicus B

Volutilites antiscalaris B

Dimya dissimilis B or J

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Cucullaea B or J

Balcombian cowrie

Large brachiopod

Most of the fossils found in the lower 20' but found up to 40'. Fossils not numerous. Layer of marl c 10' above water level. Brachiopods (**Mordvica?**) from this band.

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12/11/50

Devil's Den Cliffs

Diagram: map of Glenelg River showing locations A and B

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Section Balcombian Fossil Loc.

Diagram of cliff section on E bank at S end of Devils Den

Fauna *Limopsis maccoyi*

Dimya

Dentalium

Zemira

Lunulites

Nautilus

Voluta antiscalaris

Voluta sp.

Protochiton antiscalaris *tranulosus*

Forams

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Fossil bone found non in situ but highly mineralized & with tiny ~~Ostraea~~ *Dimya* attached.

Some parts of marl very rich in fossils. Bluish or bluish-grey colour. A few small concretions noted (2 samples taken). Where open to weather for a time, the marl oxidizes to a brownish colour.

Hard band 2 ½" thick almost unfossiliferous, but what are apparently worm borings are common (sample)

c 1 ch downstream dip c 3° N takes band up bank & another hard band in marl c 6" thick comes up.

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Loc.A (See p 75)

Balcombian fossils collected. Above is dune rock with strike roughly E-W & dips 17°, 22° & 27°. Cross-bedding marked in places. Gritty band 2' thick with casts of numerous fossils & dipping at 30°! This & may be some of above dips are due to collapse which common. Large sections of cliff have slid into arc in front of cliffs (prob. skidding on clay). The Werrikooian beds described by Dennant have been hidden. Large section of cliff cracked & when enough rain will collapse. 1946 flood wrought big changes.

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c 18" stratigraphically above grit bed *Ostraea* found & some other shells. Too big & heavy to be blown. Probably beaches, storm beaches, beach ridges & such littoral formations & not dunes. Rock

name needed for these littoral deposits wh. oscillate between just below LWM & just above HWM. I suggest

“Littorite”

No evidence of true dunes (as distinguished from beach or sand ridges). As much wave as wind action in making littorite. Shoreline facies product on sandy coast.

NOTE “Littorite” = author’s field term for shoreline deposits (shallow marine beach etc) as against dune rocks (aeolianite)

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In middle section of Devil’s Den cliffs, a number of grit bands in upper limestone formation. These horizontal. Most dips in associated limestone are under 5°. A few of dune dimensions observed but they persist for only c 5’ as a rule & are probably beach/dune ridge effects. *Ostraea*, *Placunanomia*, *Pecten* & many other shells in top 15’-20’ above a lighter coloured limestone. This lighter colour localized & may be only where a fresh break has occurred.

3 grit bands noted close together here & fossils collected from them – also sample of grit.

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Diagram cliff section showing position of grit bands.

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Loc. B (See p.75)

Diagram: profile of cliff at Location B

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In richly fossiliferous bed

Chione

Ostraea

Notovola

Placunanomia

~~Solen~~ *Zenatiopsis*

Modiola etc

No *Mytilus* noted.

This bed or rather its richly fossiliferous part extends for c ½ ch. only

13/11/50

As look round Devil's Den general stratification looks horizontal. All the cross-bedding local. Fossils incl heavy Ostraea all the way through but greatly varying in incidence.

Three solution pipes noted 2'-3' in diameter. One filled with terra rossa & sectioned vertically by cliff face,

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two sectioned horizontally. At N end fossils in cliffs coll. too. Oyster band c 1/3 way up vertical part of cliff. Grit bands all way round.

Singleton's Outcrop See Geol. Surv. Map.

Plentiful fossils complete & as casts & moulds.

Myaring Bridge

Diagram: map of Glenelg River at the bridge showing fossil locations.

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Slipped blocks have numerous oysters & also Notovola, so presumably are Pleistocene. Blocks show all angles from 0° - c 25 ° but mostly pretty flat. Foll. succession seen in 3 blocks:

Diagram: stratigraphic section showing oyster bed between sand (lower) and a fawn limestone.

Mr. T. Sullivan "Shallum"

Strathdownie P.O.

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Diagram: map of Glenelg River bend near Mr Sullivan's house showing Gilmore's and Roscoe's cliffs.

This diagram very rough. See GSV map for orientation.

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Diagram of Gilmore's Cliff Section

Numerous free shells on this slope at top bed of sand & shells which showed no evidence of slumping. Similar matrix to that of Singleton's Outcrop.

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14-11-50

Map of Roscoe's Cliff showing terraces and position of Section A-B.

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Roscoe's Cliff

Diagram: Cross section A-B

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Appear to be two terraces of river as further downstream but other "terraces" near cliffs due to collapse features as at Devil's Den

Werrikooian shells

1 In great numbers

2 Sand or clayey sand matrix

3 Not higher than c 30' above river level.

4 Lower beds slumped or Werrikooian very thick here.

5 Some concretionary (calc.) masses as at Gilmore's Cliff & Singleton's Outcrop.

6 Bankivia abundant & this usu. conn. with stream mouth. Also Glycymeris, Leda, Chione, Mactra common. Ostraea present but not common as at Gilmore's Cliff.

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Mt. Gambier

Diagram: Cross section inside crater near the lake

Tuff more compact & not so stratified as at Tower Hill & so steeper slope. Lighter in colour. Different appearance from Tower Hill – Terang type. ~~Wangoom~~ Leura - Shadwell a cinder type like central cones of Tower Hill.

Basal basalt a common feature of Wangoom, Ecklin.

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15/11/50

Nelson

Mr. Collins with whom stayed.

Mr. Voss Private Museum

Mr. W. Evans Leptospermum sp.

Advised only one tide on day of c 1' but a slight banking up at time for other tide.

Emerged Shell Beds

Diagram: map of Nelson foreshore showing fossil locations

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Fossils at all places marked F. Those from Collins' property from septic tank excavation. Cross-bedding in quaternary beds in cutting to kiosk.

Diagram of Quarry Section

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Nelson Emerged Shell Beds

Table of survey data for shell beds

Base of shell bed in quarry 9.18' above mean tide level. Clearly 10' sea if eustatic unless tectonic movement or erosion cf. Two Mile Bay on Pt. Campbell coast, which last interglacial.

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Diagram: map of Nelson area showing middens along Long Swamp and beach (location A)

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Diagram of Loc. A Section

Semi-mobile shoreline dunes built on aeolianite platform as at Bream Creek, Dennington etc.

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Diagram of Section 2 chs E of Loc.A

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Fossil Soils

Table comparing Fossil Soils:

On Aeolianite	On Mobile Dunes
1 Red or reddish brown	Dark to light grey
2 Small flat snail shells <i>Paralaoma</i> etc.	Larger bluish turreted snail shells <i>Austrosuccinea australis</i>
3 Mature	Immature
4 Thicker	Thinner
5 On aeolianite only	On sand only

6 On planated surfaces

Low dips less than either windward or leeward slopes of dunes

7 Fossil

Fossil or exposed

Note

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Grey soils on dunes – usually 1 but sometimes two together as at Dennington. Dips low c 0° – 10°. Only go to within c 20' of top of dunes. Extra height apparently due to marram grass. Older soils may be red because deeper – longer weathering & more concentration of iron. More mature profile.

Midden on ocean coast at end of track S. fr. Nelson Donax plentiful.

Midden shells in grey soil *Purpura*, limpets, *Mytilus* & a few *Donax*

Mostly *Turbo* & *Mesodesma* Flints common in midden near track.

Further E an aeolianite prominence *Turbo* chiefly but also *Monodonta* small *Mytilus* & *Purpura*.

Page 100

Middens E. of Glenelg R. Mouth

[1] Middens Along shoreline on mobile dunes :

(a) In eminences where aeolianite outcrops eg at loc. A (p.95) & "The Rocks" 2 mls further E.

(b) On seaward dune slopes as large midden c 400 yds W of "The Rocks". Here on fossil grey soil – low dip.

Austrosuccinea australis, turreted snails (collected) Evidences of former vegetation

[2] Along S (seaward) edge of Long Swamp i.e. landward side of mobile foredune or of second dune ridge when one present.

[3] Along N edge of Long Swamp on old aeolianite cliffs especially little points.

[4] On landward side of summit of dune (50'?) on N side

Page 101

of Long Swamp. Track grubbed by bull-dozer. c ¼ m. E of track S of Nelson going to loc. A & E of fence line along E side of Sect. 15 Par. of Normanby. Contains *Turbo* & *Mytilus*, the latter being in great numbers (small ribbed type) Pieces of flint present.

Page 102

Diagram of Occurrence of Middens E. of Glenelg R.

Page 103

From middens along shoreline Mr. W. H. Vouse obtained:

1. Skeleton
2. Awl c 8" long
3. Muduk c 3" long
4. Shaped rib c 4" long
5. A number of diabase axes with ground edges
5" x 4" x 1 ½ " to 2" x 1 ½ "
6. Large axe c 2" thick

Diagram of Axe showing hafting

- 7 Sandstone axe 5 ¼" x 3 ¾" x 2 ¼" from near Little's Rocks c 8 mls E of Nelson
8. Sandstone axe blank & diabase axe blank.
9. Grind stone 4 1/2" x 3 ¾" x 1 1/2 "

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in igneous rock from c 4 mls E of mouth of Glenelg River. Another about same size fr. same place

10. Midden c 2ml E of Glenelg River. Wooden baby carrier?

Diagram of Wooden Baby Carrier?

Also told him this slung by piece of bark round mothers neck.

Page 105

16/11/50

Diagram: Cross section at Holloway's Beach

See G.S.V. map. Beach about ¾ mile wide.

Page 106

Holloway's beach a marine emerged platform because

- 1 A platform has been cut & only sea available to do this.
- 2 Potholes common.

3 Numerous littoral fossils.

4 Flint pebbles bored by marine organisms.

Page 107

Mt. Richmond

Covered with fine whitish siliceous sand & sclerophyll forest with patches of heath land.

Excavation for concrete army trig. column on summit brought up a lot of aeolianite.

What Coulson's evidence for volcanic nature of Mt? Tuff outcrops with included blocks of bedrock.
Spring between tuff & bedrock.

Diagram of Crater filled with sand

Page 108

Bridgewater Caves

Diagram: Cross section from beach to the caves

Large stalactites & stalagmites show dripstones once forming, & so wet caves.

1 Probably solution caves also suggested by different levels & W slope of floor of more northerly large cave.

2 Different relationships to water table now from when dripstones formed.

3 Since formed & became dry occupied by aborigines as in dust of floor found

Page 109

Flints, charcoal, shells of (mostly) edible kinds & sizes

Coulson explained cliff by fault, but the cliff curves round the lake to Cape Duquesne.

Zeolites common of Cape Nelson

Midden shells include, *Purpura*, limpets, *Mytilus* & *Mesodesma*. Bones incl. native cat.

Photo of Bridgewater Caves 1955.

Page 110

Cape Duquesne

Appear to be at least 3 flows.

Diagram: cliff section at Cape Duquesne

Middens also in vicinity of road at Cape Bridgewater. Both high up on cliffs & on flat below.

Diagram: Cross section from beach to cliffs near Cape Bridgewater.

Page 111

E. of Cape Bridgewater

Quarry MM Bridgewater 466,717.

Yellow earthy limestone with some concretionary zones. Appar. Miocene. No fossils noted but material taken for micro search.

Cape Nelson

On top of cliffs $\frac{1}{2}$ - $\frac{3}{4}$ ml. W of Cape.

Light greyish flint flakes. Rounded basaltic hammer stone. Pres. G.B. Hope

Page 112

17/11/50

Portland

Just past cemetery branch roads one to Cape Nelson & one direct to coast. Where latter reaches coast, camped, & this section noted.

Diagram; Vertical cliff section on beach.

Page 113

Soil horizons clayey. Beds nearly all-horizontal but warps of 1° – 5° over long distances in places. Apparently gentle subsidence of whole formation. Small fossil snails (coll.) in soil horizons. Latter thicken & thin 4'-6" Why? Formation terrestrial, lacustrine & aeolian. Freshwater beds.

N.B

1 Clayey character of formation – from basalt?

2 Considerable thickness.

3 Oscillation of conditions causing & inhibiting soil formation.

4 Lack of carbonaceous matter.

5 Materials largely ~~horizontal~~ oxidized.

6 Beds laid horizontally.

Page 114

and shows waterlaid. In places aeolian bedding but this generally planated (by sea?) to give rise to more horizontal bedding. 2 ½ chs greatest distance over which aeolian bedding noted (at foot of track at Cape Nelson end of Bay).

7 Soils immature, so soil forming time not great.

8 What ecology of snails present?

Page 115

Dutton way

Map: Dutton Way showing location of oyster bed

1. c 1 ml. N. of Portland, fossil bed rich in *Ostraea*, *Bankivia* – comparable with Werrikooian fauna of Roscoe's & Gilmore's = Maretimo. Compare & contrast with Grange Burn younger faunas.

Yellowish clayey sand & sandy clay, also reminiscent of matrix at Myaring Bridge, Singleton's Outcrop, Gilmore's, & Roscoes.

Page 116

2. Also 100 yds further N from last locality. Portland sheet 575, 759

Grey bed which oxidize yellowish.

Following beds noted :

Bankivia dominant

Chione subroborata dominant

Ostraea dominant

Clay bands in wh. fossils absent or almost so.

Above 4 beds not in strat. order.

Page 117

17/11/50

Narrawong

Portland MM 667,830

Map of Narrawong showing fossil shell locations

Aeolianite ridge apparently like that at Rosebrook etc with hard surface but soft inside, i.e. only slightly lithified.

Page 118

Cutting in road on Port Fairy side of bridge shows

Diagram; vertical soil profile over sand.

Similar section in another cutting shown on left of plan on p.117. c 6' sand with a dozen specimens of Donax noted.

Calcareous concretions formed during mid-Holocene arid period?

Page 119

17/11/50

c 1ml. S.E. of Goose Lagoon

Diagram: map of Lagoon showing cutting with midden. Midden divided by cutting shown above - on curve & E of "creek" outlet from E side of Goose Lagoon - ¼ m. fr. sea.

Eroded midden, on ridge a little over 25' above LWM.

Turbo = subnivalis

Purpura (Neothais)

Patella

Monodonta etc

Page 120

Warrnambool

Cannon Hill Auger Hole No.3

Soil - black alluvium, partly brownish in places (oxidized?) 4"

Black alluvium with numerous swap fossils 11"

Grey clayey & calcareous? Sand with swap fossils and occasional marine shells 6"

Ditto with marine fossils in great numbers, often 2 valves together. Shell band with Venerupis (muddy facies?) Macoma deltoidalis (~~Arca~~ ~~Barbatia~~) etc. Swamp fossils & some plant remains intermixed (Sample from 23") Batillaria dystralis Cominella and Monodonta, Bimbicium imbricatum, Spisula trigonella common Mytilus & Ostracea also present. Note originate from different facies 2"

Mud flat species Austrocochlea obtuse porcata Det. By Univ. Melb Mr A.N. Carter Zool. Dept.

Page 121

Hard light grey band 1"

Tuffaceous?

Brownish-grey sand with fragment of marine shells 1' 11"

Red soil layer 3 "

Aeolianite ½"

Total 4' 2 ½"

Top of auger hole 3 =

$66.96' - 1.47' = 65.49'$

$70.13' - 65.49' = 4.64'$

Surface 4.64' above LWOST

Bottom 0.43"

Surface lowest part of hollow in Pertobe Lake side (S) of railway. Beach probably an offshore sand bar in retreating sea (cf. Johnson) & space behind filled with brackish & freshwater deposits.

Page 122

Survey Cnr. Pertobe Rd (Banyan St) & Merri St.

Table: Survey data To Auger Hole 3

Page 123

Level stood c 3' W of sign

Drawing of '50' Sign

post on railway & distant from there to W edge of bridge on Pertobe Rd over railway (where level brought down) is 325' as measured by dumpy.

Approx. in line with bores 1 & 2 & halfway between railway & S fenceline of railway property

Page 124

Goose Lagoon

Diagram: cross section on bank of the lagoon showing midden location

Page 125

1951

See Bk 9: 143-149

Bk 21: 146-147

Bk 55:27

Table Cave, Warrnambool

Photo of E. of Thunder Cave. Footprints in fallen rock (looking W.)

Called "Shelly Beach in 1900-1913+

Photo of steps by which access. Looking W.

Photo of fallen blocks

Page 126

Three Photos of possible footprints (unannotated)

Page 127

Three Photos of a set of footprints (without comments)

Page 128

Oblique Photo of a fossil trackway (no scale)

Page 129

Colongulac Bone

H.V.V.

Noone distinguishes

1 Percussion (a hit or blow)

2 Impulsive pressure (cf. "impulsive loading" of engineers).

3 Pressure (simple squeezing together).

In Colongulac Bone not (3) pressure of two jaws of an animal, but a sawing motion. Hence ridges & under-cutting.

If chewed by carnivore teeth (or cutting teeth of any kind) then the two incisors would be slightly offset but this not the case.

Diagram of Incisors showing offset

Page 130

The two cuts in a direct line. If not by cutting teeth then not incision but mere crushing.

Photo of "Chocolyn" NE of homestead

Cliffed loess dunes on E. side of Lake Colongulac. Bone bed under these & the Hampden tuff.

Page 131

Forsythe's

Diagram: Vertical section of Grange Burn Creek showing layers

Page 132

Immediately below the ruins of Forsythe's stone house, on left bank of Grange Burn, near Hamilton c ¼ mile upstream from Henty's house & fault bringing Batesfordian up. At sharp right-angle turn in creek.

Before 1946 flood nodule bed exposed, but gravel deposited round corner blocked waters & formed corner pool.

Page 133

November 1950

Grange Burn

Section at Waterfall (where creek leaves basalt)

Diagram: Vertical section of left bank of creek

Photo p.42

Fossil softwood & rhizomes of? Pteridium from under basalt

6" under basalt tooth of Cuscuta Thyligale-type.

Page 134

Fossil Roots run down to creek bed & below. When basalt extruded conditions –

1 Terrestrial as shown by plants, pollen, diatoms & roots in situ. In three places casts of small trunks in basalt.

Diagram: casts of trunks in basalt with carbonaceous layer and fossil roots below.

Map showing position of waterfall and casts on creek.

Page 135

2 Damp. Plant life. Vesicles in basalt exp. lowest 18" . Leached soil.

However, no alluvium etc to suggest wet conditions, with sedimentation

Two Photos of casts (one showing an impression of a branch)

Page 136

31/3/52

Grange Burn Old shoreline see pp.28, 40, 41

Diagram: Vertical section showing sedimentary layers.

Polinices bed becomes coarser upstream as above (cf. p.40) & so to conglomerate. Perhaps on eroded greensand (glauconitic), because this higher immed. Upstream as approach waterfall

c.75 yds downstream from waterfall & about same

Page 137

Same distance from conglomerate; on left bank.

Diagram: Vertical bank section with basalt covering

Page 138

History

1 Erosion leaving quartz porphyry outcrops.

2 Batesforian & Balcombian Beds laid by sea. Erosion – main nodule bed.

3 ? Cheltenhamian between nodule bed & disconformity above (small nodule bed) cf. Moorabool Valley, Melb. Area nodule bed.

4 Kalimnan shell bed laid down. ? Disconformity or diastem

5 Kalimnan flaggy limestone

6 Fault as seen at Henty's brought up Batesfordian. Younger beds eroded off.

7 Terrestrial Facies. Small trees, plants, small lakes with pollen & leaves. Diatoms, Kangaroos.

8 Basalt

9 Erosion

Page 139

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Page 140

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Page 141

Mt. LEURA

Quarry on W side, just W of Showgrounds & opposite end of Erney Street. Shows c 20 ' basalt. Three flows separated by reddish ash to very fine cinders in thin bands. Flows pahoehoe as shown by ropy lava structures on both tops & bottoms of flows!

Soil on top thin immature red loam, rather rocky.

Later basalt. Looks as if associated with scoria-cinders phase of Mt. Leura.

Page 142

Quarry on S side Princes Highway as enter Camperdown. Thick flow columnar basalt with big masses of olivine. Looks older than p.141 but has also thin immature red loam yet some buckshot ; grey cindery tuff of highway ctg rests on it. This tuff has red loam on it with plentiful buckshot, ~~but~~ not a podsol as on the other tuffs (see p.143)

Photo of columnar Basalt, Quarry S side Princes Highway Camperdown.

Photo of on Mt. Leura looking S.

Page 143

See p.155

Leura Caldera Rim

Diagram: vertical section at N W end of rim

Photo (unlabelled) view from Mt Leura(?)

Page 144

Alluvial flat W. of Mt. Leura

Diagram: Cross section of Alluvial flat W. of Mt. Leura

Photo (unlabelled) of flat (?)

Page 145

“Talindert”

Quarry on hill E of Mt. Leura. Cinders, dipping away from peak. Red loam on top. Fossils from bore on this property in National Museum.

Photo of On Mt. Leura looking Towards L. Colongulac

Page 146

Mt. Wiridgil

Quarry W side of mountain & N. of road. Scoria dipping W.

On road & E of homestead a cutting shows tuff & lapilli dipping 15 ° E, & striking c N-S. At E end of cutting 3 ° to horizontal. Fine cinders on top. A number of blocks of scoriaceous basalt included.

Photo (unlabelled) view from a mount (Wiridgil?)

Page 147

NE of Leura & SW of Wiridgil

Alluvium of old lake bed runs up banks. At excavation for large tank at fenceline Showed yellow concretions – prob. loess. [M M Corangamite 1916 2ml=1” 310,810 c.200 yds S of railway line & c. 100 yds S of dam]:

An excavation by spade to 21” in alluvium on bank of old lake. This not penetrated. First 6” somewhat podsolised, & below that some very fine (c 1/8” diam.) buckshot.

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2-4-52

'Carinya'

N.W. of Camperdown

Property on corner of "Darlinghurst Road" to Mortlake. N of Lake Gnotuk, W of L. Colongulac & S W of Lake Bookar

Owner : Mr P.L. Williams

Box 34

Camperdown

Auger hole on top of ridge c 3 chs S of house :

0"-27" Light-grey clayey very fine quartz sand

27"-33" Mid-grey sandy clay

33"-39" Mottled grey and yellow sandy clay

40"-49" Mottled ditto. With buckshot (sample taken from 40") Not penetrated.

Mr. Williams says a number of his postholes went into soft sand.

Page 149

Probably sand from area without basalt to west. May be windblown sand over basaltic ridge.

Fossil Lake on "Carinya" used to run into Lake Bookar.

Bookar dunes wide and complicated.

Diagram: Plan and TS of flat basalt axe from top of the ridge c. 4 chs S of house?

Numerous milky quartz flakes on slope on lake side of this ridge

Page 150

Lake Bullen Merri

Map showing Tertiary rock outcrops

Page 151

Mt. Porndon

South side. Bore near house. MM 2ml=1" 1916 708, 725. At N end of N-S road running from Stoneyford-Cobden highway c3 miles W. of Stoneyford. Bore went through 240' of volcanic rocks.

Basalt scoria, cinders, lapilli & tuff outcrop in the area.

Photo of Porndon Cave

More southerly & larger of 2 caves on NW side of Mt. Porndon shown on Mil. Map (2ml=1")

Lava tunnel.

Opening is a collapse of part of roof i.e. above part shown in this photo.

Page 152

22/1/52

Beach S. of Dennington

Photo of Beach

Photo of Beach Prof. G W Leeper on berm

At path where cross from beach to W'bool Council's Sanitary Depot. This accumulation of sand, Cliffed by low tide. Configuration of dune shows not eroded locally, therefore brought in by sea.

Page 153

Lake Purrumbete

Three Photos of Fault in tuff E side of Lake Purrumbete near Camperdown. V. Note Drag on beds.

Page 154

Three (unlabelled) Photos of cliff bank around lake

Page 155

Mt. Leura See p.143

Photo From top of Caldera rim looking N. to Mt. Leura

Photo Same showing tuff of caldera rim.

Photo of Fault line cliff of caldera rim S W corner. Note degree of erosion & contrast with Tower Hill.

Photo of Temporary lake in west corner of caldera floor.

Page 156

Photo of Quarry N side of Princes Highway

Photo of Nested caldera central complex

Photo of From Mt. Leura looking N W to Lake Colongulac

Photo of ditto

Page 157

Lake Colongulac

Two Photos of the Lake and shore

Photo of Creek entering at SE corner of lake just W of Rifle Range.

Page 158

Photo of Cluffed loess dunes on E side N of "Chocolyn" homestead. Giant Kangaroo site just this side of point on the old lake bed.

Photo of "Chocolyn" Creek, entrenched meanders

Photo of Ditto

Page 159

Photo of West shore

Photo (unlabelled) of lake and Mt Leura(?)

Photo of Headland on N shore looking s to Gnotuk & Leura

Page 160

Blank

Page 161

"Lake" Terang

Photo Now dry. This the wettest I have seen it.

Photo of S Bank. Tuff & lapilli then scoria further east (at SE cnr.)

Photo of Town of Terang seen across "lake"

Page 162

Red Hill. Alvie

Four (unlabelled) Photos of Red Hill area

Page 163

Lake Rosine

West of Cressy

Photo of Lunette

Photo (unlabelled) of a paddock

Photo of "The Basins"? S.E. cnr of L. Corangamite or L. Gnarpurt N.W. cnr. of L. Corangamite.

Page 164

Two Photos of Procoptodon jaw (with scale)

Photo of Carcharodon megalodon tooth (with scale)

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