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PROGRESS REPORT ON ZEEHAN REGIONAL MAPPING TO 30TH SEPTEMBER, 1958.

by

D. McKenna

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PROGRESS REPORT ON ZEEHAN REGIONAL MAPPING TO 30TH SEPTEMBER, 1958.

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C O N T E N T S

Maps

Plan No. T.467 Progress Regional Geological Map - Zeehan Area. Scale 1 ml. = 1 in.

INTRODUCTION

This report summarises the results of geological mapping conducted from Zeehan by the writer during the past four months. Much of this time has been devoted to detailed appraisal of Swansea and Comet Mines. Regional mapping is still in progress and the conclusions given in this report should, at this stage, be considered as tentative only.

Broadly speaking the areal distribution of the Pre-Cambrian, Cambrian and later Paleozoic rocks as defined by previous investigators has beenproved essentially correct. An attempt has been made to map in detail the various subdivisions of the Cambrian in particular, in an endeavour to correlate rocks of separated areas.

THE ROCK SUCCESSION

(1) Pre-Cambrian

A sequence of Pre-Cambrian sediments defined as the Carbine group is represented to the N.E. and E. of Comet Mine. These rocks are typified by rapid and complexly folded alternations of white quartzites with black and grey slates and phyllites. All are commonly intruded by vein quartz. The rocks have undergone a high degree of metamorphism as typified by developments of sericite derived from pre-existing shales. Isoclinal folding is common. This rock type association, degree of metamorphism and deformation agrees in general with the characteristics of the Carbine group as studied to the North West of Zeehan township.

(2) Cambrian

Dundas - This area has been defined in detail by Elliston - Geology of the Dundas District - Tasmania, in the roughly triangular shaped wedge between the N.E. Dundas Tram and the Zeehan-Queenstown Road and extends eastwards to the vicinity of Williamsford.

The portion of this area which has to date been examined during the current mapping programme (see plan) consists of tuffs, graywacke agglomerates, breccias, slates and conglomerates. The whole sequence as postulated by Elliston is considered to be submarine sedimentary environment reflecting intermittent effusive volcanic activity. For this reason alone, it is difficult to demarcate rigid geological boundaries and hope to trace them over a regional extent. One horizon alone is distinctive: that of the Razorback conglomerate. This is a typical shore-line facies consisting of fragments of resistant cherty silica and to a lesser extent of pebbles of black and/or amber-coloured slate. The horizon averages 400'-500' thick and is generally poorly sorted with pebbles ranging from ¼ inch to 6 inches in diameter. Narrow lenses of grey and white sandstones, showing cross-bedded structures occur between the pebble bands and are very useful for determining attitude. A feature of the Razorback Conglomerate, seen to date, is the absence of any volcanic ejectamenta within the pebble and sandy bands.

The principle adopted in delimiting rock-type boundaries in the Dundas sequence is to consider the relative degree of prevailing vulcanism. That is, to consider the proportion of slate to graywacke agglomerate and tuffs. By applying this principle it is possible to delimit major units which are dominantly slatey or dominantly tuffaceous or agglomeratic.

Three main types of slate, based on a colour difference, are present. The most common and widespread is the locally well known pale brown to purple coloured variety. Another is a well laminated apple-green colour and contains occasional fine-grained green tuff bands. The third is a black, well laminated type to which Elliston has assigned the name "Hodge Slate" where it occurs stratigraphically below the Conglomerate at Mt. Razorback. This classification is relatively simple and in the field has been found quite valid.

Other rock types occur such as green tuffaceous quartzites and laminated black and blue coloured quartzites; these are assigned to different diagenetic agencies operating throughout the area.

<u>The Cambrian rocks to the North, North-West and West of Zeehan</u>.

The section between the Argent fault and the Owen Conglomerate mass to the South and centred approximately at the Swansea Mine could be correlated with the Dundas System. Unfortunately outcrops are sparse due in the low lying areas to extensive swamps, and in the hilly regions, to a regional superficial silicification.

The Swansea grit on megascopic examination is comparable with the Razorback conglomerate and where it is exposed near Swansea - has three small mines associated with it - viz. the Swansea, Tasmanian and T.L.E. This same grit horizon crops out in a fourth area in the Austral Valley which is situated South of the Argent fault and approximately 1½ miles E.N.E. of Swansea Mine.

Fine grained green tuffs (of the order of .02 inches grain size) occur to the South of Swansea exposed in McClean's Creek near the Northern limiting fault of the Mt. Zeehan Owen Conglomerate, and also in a swamp plain just North of the Comstock tram.

These tuffs are identical in hand specimen with the fine grained varieties at Dundas. Several exposures of a doubtful graywacke conglomerate and breccia occur on the Swansea Road between the Tasmanian and T.L.E. mines which are similar to the coarse pyroclastics mapped at Dundas.

The main discrepancy in rock type correlation between the two areas is in the nature of the slate associated with the tuffs. At Dundas and Northwards at least as far as Renison Bell the Cambrian slates are typically pale brown through pink to purple in colour, whereas at Swansea and the Zeehan area generally, they are almost without exception, black slates.

The Swansea grit marker horizon unfortunately disappears into a silicified area to the North and East of Swansea, and into a swamp to the South East.

The Cambrian area between the Argent fault and the Pre-Cambrian mass to the N.E. of Zeehan and embracing the Argent Flat has not yet been studied except for the so called Zeehan melaphyre lava. This rock type which has been variously described in previous literature is essentially a spilitic lava. It is for the most part highly vesicular and amygdaloidal and intraformational breccias are common. According to Twelvetrees and Ward the vesicles are filled with glassy matter, zeolites and often with quartz spherulites.

The spilitic lava appears in most cases to be interbedded or tightly infolded with the black and grey slates of the Zeehan system, but to the North of Zeehan appears to infill a present day Pre-Cambrian valley with the slates below, indicating a later age than the slates for the lava. There is also evidence that some of the spilitic type rock is intrusive. The problem is further complicated by the fact that the lavas today are represented at surface by mostly yellow clays and contact with the surrounding slates is rarely seen. The old mine workings in the complex are inaccessible.

The slates and quartzites associated with the spilite are an additional problem. These slates, on the basis of associated tuffs, have been supposed to be Cambrian in age. No tuffaceous material has been seen at surface in them during the current investigation. The slates and quartzites seem to grade imperceptibly into the Pre-Cambrian to the N.W. of Zeehan - the only apparent change being a decrease in the amount of intercalated quartzite as the Pre-Cambrian shield is approached. There is no evidence for an unconformable contact and very little for a fault line contact which has to date been the favoured interpretation.

The slates, shales and quartzites of the Pre-Cambrian and the "Zeehan Cambrian black slate" system are megascopically identical both as regards nature, colour and high degree of metamorphism and deformation. The only apparent difference is the great proportion of quartzite in the Pre-Cambrian as compared with the relative subordination of quartzite in the Zeehan slate assemblage.

In an area approximately four miles North of Zeehan, the black slates-quartzite assemblage of the Zeehan system is underlying red and amber shales and tuffs of undoubted Dundas type (see plan). The nature of the contact is obscured by swamp land, but a marked visual contrast exists between the well bedded, red coloured relatively gently folded Dundas group and the black and grey highly contorted and sheared Zeehan series. It is very doubtful whether these two groups of rocks belong to the same era. More traverses need to be run in the Zeehan area before it can be stated with certainty that the Zeehan Cambrian slates and shales are in fact of Pre-Cambrian age.

Cambrian Intrusives.

Several large masses of serpentinised gabbro invades both the Eastern (Dundas) and Western (Zeehan series) Cambrian groups. The intrusives are believed to be late Cambrian in age and have been influenced by later faulting. The Tenth Legion iron ore deposit occurs approximately ½ mile North of one of these intrusives.

(3) Ordovician System

(a) Owen Conglomerate

Mt. Zeehan Area.

Mapping on this occurrence is not completed. Data obtained to date and incorporating a traverse run by M. Solomon on the Eastern flank indicates that the overall structure is a S.E. plunging anticline with the axis striking 140°-150° and passing near the high point of Mt. Zeehan. The stratigraphic thickness is of the order of 5000 feet.

Torbicular sandstone and pink quartzite represent the upper facies to the East, and red sandstone occupies the same position on the Western side of the structure. The fold is truncated to the North and the South by East-West trending limiting faults and is in fault contact to the North with green Dundas tuffs.

A very strong fracture cleavage is seen to best advantage on the Western limb where the bedding is at an appreciable angle to cleavage.

(b) Gordon Limestone

The marine transgression in later Ordovician time resulting in the deposition of Gordon limestone has obscured the E. contact of the Owen with Cambrian rocks. In Zeehan and to immediate North is an occurrence of limestone occupying a low lying swampy valley. This limestone is in contact with Zeehan black slates on the Western side and Crotty quartzite (of Ordovician-Silurian age) on the Eastern side of the valley. Owen Conglomerate is entirely absent at surface.

It is doubtful whether the limestone extends right up the valley to the North and is continuous around the late Paleozoic syncline. It is probably a series of disconnected lenses around the structure. More mapping remains to be done to the North.

The following then are the facts relating to the Owen Conglomerate and Gordon limestone in the Zeehan area.

A deep trough existed at Mt. Zeehan in which was deposited at least 5000 feet of Owen sediments, which was later inundated by a marine transgression and limestone deposited. A gap occurs for approximately one mile along strike to the North of Mt. Zeehan over which neither limestone nor Owen occurs at surface. The limestone then recurs along a narrow valley to the north of Zeehan. If Owen conglomerate occurs below this limestone to the north: it must of necessity be a very thin deposit.

These combined facts could indicate a trough formed possibly by faulting of a "Hinge" type reaching its greatest displacement at Mt. Zeehan and decreasing to a narrow bay north of Zeehan township.

(4) Later Paleozoic Sediments

Very little detailed work has been done during the current investigation in the Zeehan syncline. Three check traverses have been run across the basin, but no rock type boundaries can, with confidence, be drawn at this stage. The folded structure shows up excellently under aerial photos and the broad interpretation of

structure by previous investigators appears to be correct. The subdivisions of Silurian and Devonian sediments are undifferentiated on the accompanying plan.

CONTROL OF ORE DEPOSITS - ZEEHAN AND DUNDAS DISTRICTS

A detailed comparison between ore channels and regional structural features is not possible at this stage of the investigation. The following summarises the writer's present ideas on ore localisation, but may be subject to revision when the mapping programme is completed.

1. Lead mineralisation occurs in rocks of all ages from Pre-Cambrian to Silurian in the Zeehan and Dundas field.

2. Ore bodies in the quartzitic Pre-Cambrian to the N. & N.W. of Zeehan are without exception small and irregular. Ore bodies in the Pre-Cambrian inlier East of Dundas township are considerably stronger and more persistant in length (example Comet-South Comet lodes) and are believed to occupy old fault channels.

3. Lodes to the S. & S.W. of Zeehan nearly all trend 320°-330° and the lines of lode vary from 2½ miles (Spray line) down to a few tens of feet examples of the smaller type are innumerable. It is more than coincidental that this 320°-330° direction is also the strike of; the late Paleozoic fold axis; Zeehan Owen Conglomerate fold axis, and the strong fracture cleavage mapped in the Owen Conglomerate at Mt. Zeehan. This indicates that the lode channels in this area at least, were opened during the folding of the Paleozoic basin, which is believed to be Devonian in age. Several of the longer lines of lode have been drawn on the plan to illustrate the relation of lode trends to regional structural features.

Lodes to the North and West of Zeehan township which have been the biggest tonnage producers in the past are much shorter in length but more persistent in depth - none of these have been shown on the plan. The lodes occur along two dominant strike directions. One appears to be the 320°-330° shear direction, the second may be the complementary tensional direction. Some oblique cross lodes are also present.

In addition numerous small lodes occur along Waller's fault immediately N.W. of Zeehan. These appear to be tensional fractures resulting probably from movement along the fault.

The assessment of all known facts and study of lode patterns in detail will be attempted in the final report.

4. Influence of host rock on ore channelling.

The Pre-Cambrian quartzites are not of themselves amenable to lode channels formed by fracture cleavage processes. Large scale faulting as at Comet Mine seems necessary to open up suitable channels.

The Dundas slate-tuff association contains many and varied types of lodes, generally the slatey members have proved to be the most productive hosts.

The Ordovician limestone, situated at the Western base of Mt. Zeehan contains the Oceana Mine which is the only current producing lead mine in the Zeehan field.

The limestone belt to the North of Zeehan contains a few old mine openings in gossan near the contact with the Zeehan black slate series.

A line of narrow gossan has been traced for five chains along the N.W. margin of the Zeehan Owen Conglomerate. The gossan contains several shallow prospecting pits and trenches.

16th October. 1958.

D. McKenna,
Geologist.

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Pieman R.

RENISON BELL

AMG 368955mE 5370189mN

CORINNA

ROAD

170

Mortimer Fault

TRIAL HARBOUR ROAD

(MELAPHYRES)

Tenth Legion

Waller Fault

ZEEHAN TOWNSHIP

E.B. RAILWAY

COMSTOCK TRAM

AREA OF SURFACE SILICIFICATION

SPRAY LINE

AUSTRAL VALLEY

SILVER KING LINE

SWANSEA LINE

Argent Fault

McCleans

OCEANA LINE

Little Henty R.

N.E. DUNDAS TRAM

W. COMET LINE

COMET LINE

S. COMET LINE

Dundas Rivulet

AMG 373241mE 5360588mN MOUNT DUNDAS

ZEEHAN — QUEENSTOWN ROAD

T N

E.B. RAILWAY

Legend

PALAEOZOIC

PERMIAN

SILURIAN-DEVONIAN

- Tillite
- Granites
- Bell Shales
- Florence Quartzites
- Keel Quartzites } Undifferentiated
- Amber Quartzites
- Crotty Quartzites

ORDOVICIAN

- Gordon Limestone
- Owen Conglomerate — Lower and Middle Series
- Owen Quartzite, sandstone — Upper Series

CAMBRIAN

- Serpentine and Gabbro
- Amber coloured slates with subordinate tuff bands
- Purple greywacke agglomerate and tuff
- Razorback and Swansea Conglomerate and Grit
- Hodge Slate
- Zeehan spilitic type lavas (melaphyres) and volcanic breccia
- Zeehan black and grey shale and slate, subordinate quartzite

PRE-CAMBRIAN

- Carbine Group — quartzite, black and grey shale

Reference

- Lines of mineralisation as taken from old plans
- 30 Strike and dip of bedding
- 30 Fracture cleavage — strike and dip
- Anticlinal fold axis trend and plunge
- Synclinal fold axis trend and plunge
- Fault
- Railway line
- Road

AMG REFERENCE POINTS ADDED

5 cm

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PROGRESS REGIONAL GEOLOGICAL MAP

ZEEHAN AREA

TASMANIA

Date: September, 1958	Geologist: D. McKenna	Plan No. T467
Scale: 1 mile to 1 inch	Authority: P.R.P./7/100	