1974/42. Preliminary account of the geology of the water storage area of the proposed Lake Gordon.

Regional Geological Survey Section

1. INTRODUCTION

In September 1972, the Hydro-Electric Commission of Tasmania requested the Department of Mines to study the geology of the water storage area of the proposed Lake Gordon in order to help them understand better any increase in seismic activity that may result from filling of the storage. This Department undertook the project requested by the Commission and stated that the mapping of the Lake Gordon area would be finished in three summers. Although geological teams of the Department of Mines have completed only two summers in the region the accompanying preliminary reports, which outline the information collected to date, have been prepared in the belief that they will be helpful to the Commission at this time. Reports giving final geological considerations of the Lake Gordon region will be available about August 1975.

During the periods from early January 1973, through to mid-April 1973 and from early November 1973, through to mid-May 1974, geologists A. V. Brown, Dr J. McClenaghan, Dr M. P. McClenaghan and N. J. Turner worked in the Lake Gordon region. Geologist P. R. Williams spent the 1973 summer only in the area. The geological studies were supervised by Dr E. Williams.

2. SUMMARY OF THE PRELIMINARY GEOLOGICAL REPORTS

PRECAMBRIAN METAMORPHIC ROCKS

Precambrian metamorphic sequences underlie the region west of the Denison Plain, and consist of penetratingly deformed schist, phyllite, massive quartzite and schistose quartzite. Narrow dykes of amphibolite cut the Precambrian rocks. The purity of the quartzite layers and the commonly preserved sedimentary textures.(e.g. grain size variation in ripples) and structures (e.g. ripple and current bedding) indicate that the metamorphic rocks were derived from a succession of interbedded silts and super-mature, shallow-water quartz sands.

Although the Precambrian rocks have been involved in at least three phases of folding the overall distribution of the various rock types is for most part determined by a simple regional fold pattern. A large antiform has been mapped trending NNW along the western side of Twelvetrees Range, and the Twelvetrees quartzite extends westward capping Four O'clock Ridge and probably joins northward with the quartzite of White Spur. Since the Precambrian quartzite forms well defined N-S trending ridges and pelitic rocks occupy the intervening valleys and lower ground, aerial photo interpretations of areas north of the Gordon River suggest that the Twelvetrees quartzite and the Atkins Range quartzite in the east are part of the same unit which forms a S-plunging synform. Further east the Atkins Range quartzite appears to merge in an antiformal structure with quartzite forming a western branch of Junction Range. The quartzite sequences of Junction Range form, in general, the western limb of a large N-plunging antiformal conical fold, the hinge of which has been traced immediately south of the Gordon River. It is tentatively concluded that the quartzite ridges from White Spur in the west to Junction Range in the east are of one main quartzite unit, folded into a series of S-plunging synforms and antiforms, which separate phyllite sequences of distinctly different lithological characters.

PRECAMBRIAN(?)–LOWER CAMBRIAN (?) SEQUENCES

Precambrian metamorphic rocks extend from the Gordon River dam to the western boundary of the Denison Plain, where there are very poor exposures of comparatively unmetamorphosed, unfossiliferous sequences, which include quartz sandstone, siltstone, chert and pebbly sandstone (mixtite) with fragments of Precambrian meta-quartzite. The deformation of the Denison Plain sequences is less than that of the Precambrian metamorphic rocks to the west, although the presence at a number of localities of crenulated slaty cleavage in the finer grained rocks and the nature of disturbance of bedding orientation are signs of two distinct phases of deformation. The constitution and comparatively simple deformation of the sedimentary rocks of the Denison Plain indicate that they are younger than the Precambrian metamorphic rocks, and they are classed as Precambrian(?)–Lower Cambrian (?) sequences.

Rock types similar to those of the Denison Plain underlie the eastern undulating hills, where, because of comparatively good outcrop, preliminary determinations of the relationships between the various units have been made. North of the Gordon River the lowest unit appears to consist of sequences of quartzite/siltstone, greywacke turbidite/conglomeratic turbidite, and massive chert. Two distinct cleavages are commonly present in the sandstone layers and deformation has, for most part, masked the sedimentary structures of the turbidite sequence producing a foliated pebbly sandstone. The deformation of the massive chert sequence is dominated by SE-plunging folds, with which are associated a penetrative cleavage. Fragments of the cleaved massive chert occur within a comparatively little-deformed sedimentary breccia mixtite , which is therefore believed to overlie the sequences of the lowest unit unconformably. A similar degree of deformation of the sedimentary breccia mixtite has been noted in a massive mature quartz sandstone which extends from north of the Gordon River south to Wings Lookout, where it is associated with a red mudstone sequence.

East of Wings Lookout, along the lower slopes of Clear Hill, occurs a sequence of mudstone, greywacke, minor limestone, pyritic mudstone and thinly bedded chert, and this sequence is associated with a belt of sheared black and green mudstone containing calcareous tectonic lenses.

LATE CAMBRIAN–EARLY ORDOVICIAN SEQUENCES (Junee Group)

Immediately south of the Gordon River on the western flanks of Clear Hill a sequence of interbedded siltstone and sandy limestone rests unconformably on Precambrian (?)–Lower Cambrian (?) beds. This calcareous unit is succeeded conformably by rock types typical of the Junee Group: a lower quartz sandstone/fine conglomerate member, followed by a siliceous conglomerate member, an upper quartz sandstone member, and an upper succession of interbedded mudstone and calcareous sandstone. South of Clear Hill the lower calcareous sequence is absent and the lower quartz sandstone/fine conglomerate member is the basal unit. Both the lower calcareous sequence and the lower quartz sandstone/fine conglomerate member have yielded Late Cambrian marine fossils, whereas the upper calcareous succession contains Early Ordovician marine fossils.

The distribution of the Late Cambrian–Early Ordovician sequences has been determined, in the main, by deformation during the Devonian Tabberabberan Orogeny resulting in N-trending folds of comparatively long wavelength.

CAINOZOIC DEPOSITS

In the Denison Plain areas of Tertiary (?) ferricrete, unconsolidated siliceous gravel and fine angular-grained siliceous gravel have been mapped. Bedded unconsolidated deposits and scree fans have been recorded on the western slopes of the mountains forming the eastern boundary of the Denison Plain. Sand and pebble beds have been noted exposed in the eroded banks of the Gordon River.

MAIN PERIODS OF FOLDING

At least three main periods of deformation by folding have been determined in the region mapped. The earliest period is of Precambrian age and involved at least two fold phases, which were accompanied, at least in part, by metamorphism of the rocks. The next period of folding is of a pre-Late Cambrian age and deformed the lowest units of the Precambrian(?)–Lower Cambrian (?) sequences. The last period is of the Devonian Tabberabberan Orogeny.

Some of the fold phases affecting the rocks of the region have not as yet been correlated with the main periods of folding determined. The effects of the Devonian and Cambrian (?) movements on the Precambrian metamorphic rocks, and the Devonian orogeny on the Precambrian (?)–Lower Cambrian (?) sequences, are to be investigated by further laboratory and field studies in the coming months.

FAULTS

In the region underlain by Precambrian rocks few faults have been detected. In the Gordon River at the eastern end of the Twelvetrees gorge an E-trending fault displaces a N-striking quartzite horizon about 200 m laterally. This fault is one of a number of E-trending and NE-trending photo lineaments, which form a pattern typical of conjugate strike-slip transcurrent faults.

In the Denison Plain only a couple of faults have been recognised, but investigations have been severely limited by the small number of rock outcrops. NW and NE-trending fault systems occur in the hills of the eastern boundary of the Denison Plain. North of Clear Hill the Gordon River appears to follow a probable ENE-trending sinistral transcurrent fault, which is associated with the emplacement of the Boyes River serpentinite. More detailed mapping is required to understand the nature of a number of faults disturbing the Late Cambrian–Early Ordovician rocks at Adams Falls.

Examination of Cainozoic deposits and the study of the geomorphology of the region mapped have given no indication of fault movements in the area during recent times.

3. FUTURE WORK

In the coming months petrological and petrofabric laboratory work is to be done on the material collected in the proposed Lake Gordon region in order to determine the rock types encountered more precisely, and the periods of folding to which the various fold phases noted belong.

During the next summer season geological mapping will be extended to north of the Gordon River into the Holley River area, the Pokana River area and the Denison Range. Detailed field studies are to be made of areas south of the Adams Falls on the western flank of Ragged Range.

[29 May 1974]