COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

~~REPORT NO.~~
RECORDS 1952/39.

REPORT ON THE GEOLOGY OF THE SUTTON-NANIMA-GUNDAROO DISTRICT, N.S.W.

by

A.A. Day
Student Geologist.

CANBERRA

26th May, 1952.

REPORT ON THE GEOLOGY OF THE SUTTON NANIMA GUNDARCO DISTRICT, N.S.W.

by

A.A. DAY
Student Geologist

Records 1952/39

CONTENTS

Maps have not been supplied in the hardcopy of record 1952/39.

(N 83/1)

(N 83/2)

SUMMARY

Folded, rhythmically bedded, sandstones and shales of Ordovician age, form the frame-work of a basin containing the northerly extension of the Canberra Silurian sediments and volcanics previously mapped in the Canberra Area. Late Silurian hybrid biotite- and garnet- porphyries (dacites) occur as intrusions and flows over the western side of the basin.

The northern extension of the Lower Devonian Ainslie-Gooroo belt of dacitic volcanics lies unconformably on the folded and faulted Silurian.

Biotite grahite stocks (probably late Silurian in age) outcrop around Sutton. Small intrusions of intermediate composition are present farther north - these may be of Tabberabberan age.

I. INTRODUCTION

The results of the present investigation continue northward the information already gathered in the Australian Capital Territory by Dr. A.A. Öpik of the Bureau of Mineral Resources. The work was also carried out to fill in a gap in geological information, which existed in this area, to enable completion of the Lake George one-mile geological map.

Previously, surveys had been made by H.D. Garretty on the eastern side of the Lake George sheet (Garretty, 1936), by F.K. Rickwood on the western side along the Canberra-Yass Highway (Rickwood, 1945). Dr. Öpik and Mr. C.J. Sullivan have worked to the south/ Mrs K.M. Sherrard has recently completed a study of the Nanima district (Sherrard, 1951), but the results of this work were not available to the author at the time this report was prepared.

The author acknowledges the valuable help received through discussion with Dr. Öpik, Dr. G.A. Joplin and Mr. L.C. Noakes. Dr. Öpik also accompanied the author on a one-day field trip to investigate fossil localities.

Description Notes on the Area.

The area studied comprises about 140 square miles of gently undulating country with sporadic prominent hills. In the flatter parts, outcrops are few and in places difficult to interpret. Soil profiles in the Gundaroo district extend to a depth of six or seven feet; and the alluvium along the Yass River, in this area, is over fifteen feet.thick. Those areas where outcrops are covered by soil or alluvium are shown under the general category of "alluvium" on the geological map. On the other hand concealed geological boundaries could be placed with fair accuracy near Sutton, in spite of the Yass River alluvium, because local property-owners kindly supplied bore hole information from the numerous successful water wells put down in the areas.

II. STRATIGRAPHY

Ordovician System

Approximately one-half of the area studied consists of sediments of proven or very probable Ordovician age. The sediments consist of rhythmically interbedded sandstone and shale beds whose individual thicknesses rarely exceed ten feet, and mostly range between two and four feet. It is also normal to find the sandstone beds are slightly thicker than the interbedded shales, but in places this relationship is reversed.

Both sandstone and shale are normally buff-coloured micaceous (sericitic) types. In the belt west of Gundaroo the sandstone becomes a purer, quartzose type, the shale a darker mud-stone with induced cleavage. Slate pellets and flakes are common in the quartzose sandstones.

In a mudstone exposed in a cutting on the Murrumbateman-Gundaroo road (locality AD132, Plate 1), Dr. Öpik and the writer found graptolites which Dr. Öpik considers indicate a Gisbornian to lower Eastonian age (zones 9 to 11 of the English sequence) for this bed. The forms identified by Miss J. Gilbert-Tomlinson and Dr. Öpik are:-

Dicellograptus sp.
Amplexograptus aff. perexcavatus
Orthograptus calcaratus

Also conodonts, including

Loxodus sp.

Dr. Öpik also believes that the beds in this locality are the upper part of the "rhythmic series"(field name) of Canberra **).

As the general structure indicates that the beds farther eastwards belong to lower stratigraphic horizons than the fossiliferous bed, it is presumed that they are of Middle Ordovician or older age.

All the Ordovician sediments have been strongly compressed into small, close folds, the incompetent shale members developing false cleavage as a result. Some of the shales are now phyllites. The presence of vertical and thrust faults is also suspected, but their exact character could not be proved without much detailed work beyond the scope of this investigation. For similar reasons, no reliable estimate of the total thickness of Ordovician strata exposed can be made.

Silurian System

In the mapping of the Silurious rocks of the district, no attempt has been made to distinguish separate formations, with the exception of the Upper Silurian dacitic volcanics ("sheared porphyry").

The Silurian rocks are separated from the Ordovician to the east by a major fault called Sullivan's Line by Dr. Öpik, and to the north by a contact which is probably a fault trending north-north-west. (*)

Fieldwork shows that no connection between the Canberra and Yass Silurian sequence exists in this area, tending to confirm Dr. Öpik's opinion that the Canberra and Yass Silurian basins were almost completely separate entities. The only possible sedimentary connection now preserved is the narrow belt mapped by Rickwood(1945).

The sediments are mainly mudstones and shales, with a few lenses of occasional limestone and sandstone.

At locality AD138, occurs a fauna which Dr. Öpik correlates with the Grace Hill (upper Riverside Beds) fauna of top Llandovery to basal Wenlock age. At locality AD118, a few fossils were found and from these Dr. Öpik correlates the containing beds with the Majura-Mahon Group, of Wenlock age.

** In reality, it is the upper part of the Canberran "Rhythmic Series" identical in lithology, facies, history and fossils. The tectonic behaviour is also identical. (A.A.Ö)

* Silurian rocks along this contact are crushed in zones, with a network of quartz veins, small ironstone gossans (pyrite mineralization) etc. It suggests a fault trending NNW (AA.Ö)

The "sheared porphyry" belt of volcanics on the east occurs above the eastern Majura belt of sediments and is persistent stratigraphically. Consequently, it is a useful structural indicator. By this means the existence of an anticline with marginal synclines is well shown at the northern end of the belt. These structures plunge southwards; their eastern margin is the Sullivan's Line fault. An approximate estimate of the thickness of these volcanics is 1,000 feet.

Dip measurements on the Silurian beds farther to the north-west show a steady change from due east on the western margin (locality AD138) to southeast on Murrumbateman Creek. Dips on the eastern side are steep both to the east and west. The structure indicated is therefore a broad basin plunging southwards.

Cleavage in the sediments strikes persistently north-south, varying only within narrow limits. This confirms the postulated structure. The author regards this structure as the northern tip of the Canberra Silurian Basin.

On the western margin of the area studied, there occurs a group of igneous rocks which appear to be partly intrusive and partly extrusive. The rocks are apparently dacitic, of hybrid origin. The northern part of this belt is composed of biotite-bearing types, with plentiful xenoliths (specimen AD113). Farther south the rocks are garnetiferous, but without biotite, xenoliths still being plentiful. In the vicinity of locality AD137 their extrusive nature is shown, where they overly the beds equivalent to the Crace Hill beds on a fairly smooth surface dipping southwards. Many of the blocks show well developed flowage structures. Farther south, near the main road to Yass, the highly xenolithic varieties are suspected to be intrusive, perhaps into the earlier flows, or perhaps forming part of the original hypobyssal magma- reservoir.

These rocks are not structurally conformable with the Silurian sediments. Dr. Opik, from evidence obtained farther south,* considers that their intrusion and extrusion followed the Bowning folding, probably at the time of, or just before, the faulting movements which took place at the end of the Silurian Period. Similar Upper Silurian garnetiferous rocks are known in much of the long, sub-meridional belt extending from Canberra to Wellington.

Devonian System

Unconformably overlying the folded and faulted Silurian, a group of dacitic volcanics occurs. These form the Ainslie-Majura-Gooroo range, the northern end of which (Gooroo) lies in the area studied. North of Gooroo, these volcanics thin out, and their outcrop gives way to a claim of hills formed of the sheared Silurian volcanics.

Dr. Öpik suggests that these later volcanics might be a phase of the Lower Devonian Volcanics on a consolidated block, and contemporaneous, though different lithologically from the Black Range rhyolites in the basins to the west. Lithologically, the volcanics of the Ainslie, Majura and Gooroo areas are comparable with the Snowy River Porphyry, at the base of fossiliferous Devonian. They are extruded after the erosion of Silurian folds, and older than the marine Devonian in the Snowy River Area (A.A.O.)

---

* The "Mt. Painter" suite of intrusive and extrusive("Sweet Hills") rocks in Canberra.

No sediments are present in this belt.

On and near Nobby Hill, there are isolated minor flows and dykes, the former being quite massive (with some splendidly preserved flowage-lines), resting on folded and cleaved Silurian beds, some of which are strongly silicified.

The rock is greenish and extremely fine-grained in hand-specimen. A thin section shows it to be microporphyritic in andesine. Sporadic laths of light green hornblende and flakes of green chlorite (?pennine) also occur, in a groundmass of minute epidote and chlorite aggregates. The epidote is largely derived from saussuritization of the plagioclase.

Thus this rock belongs to the hornblende andesite family - it is presumably related to the dacitic province of Gooroo-Ainslie, and is here correlated with that province .

Cainozoic Deposits

Small, thin cappings of ferrignous conglomerate with interbedded shale occur on the low hills of folded Ordovician strata near the junction of the Gundaroo and Murrumbateman roads (locality AD129). The contained fragments are almost entirely angular milky quartz pebbles. The beds are approximately forty or fifty feet above the Yass River level, and may or may not be part of an old alluvium of that river. No plant remains were found in the shale beds.

Along the Yass River the alluvium reaches a thickness of fifteen to twenty feet, and contains accumulations of metamorphic igneous and sedimentary rock-pebbles derived from the surrounding countryside.

There is no doubt that the first mentioned deposits are older than the second, but little else can be deduced until fossils evidence becomes available.

III. INTRUSIVES

The Greenwood-Sutton-Bywong Group of Intrusions (Stocks).

These are all in Ordovician country rocks, which have been contact metamorphosed with the production of andalusite - cordierite hornfelses and of quartzites. The three intrusions lie within one contact aureole. They are very uniform biotite granites, and, no doubt, belong to the same major batholith.

The A.C.T. portion of the Greenwood Granite was studied in fair detail. It was found to have associated marginal dykes (in the country rock) of porphyritic granite and granite-porphyry.

Marginal quartz veins and reefs are very common around all the masses. Aplite veins are plentiful, but no pegmatites have been found. Dr. Joplin suggests that, on the grounds of lithology, the abundance of aplites and absence of pegmatites, these intrusions belong to the late Silurian igneous activity (Murrumbidgee Batholity, etc.). At White Rock, Queanbeyan, a similar aplitic granite intrudes already folded Silurian rocks (Limestone, slate, tuffs, and sheared porphyries).

Small Intrusions

A granodioritic or dioritic intrusion outcrop south of Gundaroo. It contains the only sedimentary xenoliths observed in all the plutonic bodies of the area.

Another small mass, of probable quartz dioritic composition, occurs near the road bridge over Spring Flat Creek (locality AD124).

Boulders of hornblende syenite occur north east of Nobby Hill, associated with several thick granite reefs. These possibly belong to a large intrusion not yet exposed by erosion, which has been responsible for the silicification observed within a mile radius of Nobby Hill.

No indications of the exact ages of these last three intrusions are available. They are probably Tabberabberan or Kanimblan.

IV. REGIONAL STRUCTURAL FEATURES

Faulting

The major fault is Sullivan's Line, which, as described above, separates the Silurian sheared volcanics from the strongly folded Ordovician sediments. It is known to continue south beyond the area here studied, and Dr. Öpik has found the Ainslie-Gooroo volcanics transgressive over it. As a result, it can be regarded as the result of the faulting which succeeded folding in the Bowning Orogeny.

The character of the fault, whether thrust, reverse, or normal, is not known with certainty but the writer believes that its unusually straight outcrop indicates that it is close to vertical.

Sullivan's Line is displaced by a later cross-fault, running north east, at about the latitude of Sutton. This fault is overlain by the Ainslie-Gooroo volcanics without affecting them, so it also belongs to the Bowning fault-system.

Minor faults are present in the Silurian beds Murrumbateman Creek, and are thought to have been connected with the final movements which increased the marginal dip of the Silurian basin

Folding

The north-south anticlinal structure in the Silurian sheared volcanics has been described above. The existence of an overall basin-structure in the Silurian has also been discussed.

The east-west ridge of Ordovician sediments on the northern margin of the area is probable due to the presence of a large anticlinal crossfold superimposed on these rocks, probably in Silurian time.*

V. REFERENCES

Garretty, M.D., 1936 Geological notes on the country between the Yass and Shoalhaven Rivers. Roy.Soc.N.S.W.,Journ.and Proc. 70, 364-374.

Rickwood, F.K., 1945 Geology of an area between Yass and Canberra. B.S c. Honours Thesis, Sydney University (unpublished).

Sherrard, K.M., 1951 Nanima district Roy.Soc.N.S.W.,Journ.and Proc. (in press).

Öpik, A.A. Stratigraphy, Geological History, Tectonical Structure, And Physiography, of Canberra. (Unpublished).

---

* Perhaps a persistent "Benambran" structure later accentuated by faulting along its SSW-border. In the Silurian time it functioned as a divide between the Yass, and the Canberra basins (A.A.O.) (Compare also Page 36, ~~top~~. par 7.)

APPENDIX

Index to Specimen Localities.

See also the locality-map, Plate I. All specimen numbers are prefixed by the Initials 'AD'.

100. A.C.T. 4-inch feature map co-ordinates: N365, E992 (fence corner, Blk 149). Dyke

101. A.C.T. Map, N.360, E996.

102,103. A.C.T. Map, approximate co-ordinates N.390,E1 060

104. A.C.T. Map, approx. co-ordinates N.390, E1045.

105-8. Scattered blocks near track west of por 87 par. Goorooyaroo (co.Murray). Approx. Co-ords. on Ordinance Canberra 1-mile map 265460.

109. A.C.T. Map, co-ordinates N480, E960.

110. A.C.T. Map, co-ordinates N480, E965.

111. A.C.T. May, co-ordinates N480, E970.

112. Half-way between A.C.T. boundary posts L6 and M6

113. A.C.T. boundary peg P6.

114. 20 feet west of Greenwood Trigonometical Station.

115. 100 feet west of A.C.T. boundary peg L.

116. Co-ordinates, Lake George Ordinance 1-mile sheet, 284558. Road cutting, Federal Highway, ½ mile east of Yass River bridge.

117. Lake George sheet 177583, 100 feet north of the Gundaroo Road. Air-photo 14-53998.

118. Lake George sheet 177582, south side of Gundaroo Road, see Air-photo 14-53998.

119. A.C.T. border, Gundaroo Road.

120. Lake George sheet, 273585.

121. Lake George sheet, 190663. Eastern foot of Nobby Hill, Goodradibgee Shire.

122.. Nobby Trigonometrical Station. (186663).

123. Lake George sheet, 194669. ½ mile north-east of Nobby Hill.

124. Lake George sheet, 234708. Murrumbateman Road, bridge crossing Spring Flat Creek, ½ mile east of Lole Trig. Station.

125. Lake George Sheet,, 211538. ½ mile south-east of Gooroo Trig. Station.

126. Lake George sheet, 246581. One mile south-west of Sutton.

127. Lake George sheet, 247578. One mile north-west of Sutton.

128. Lake George sheet, 190562. One mile northwest of Gooroo Trig. Station.

129. Lake George sheet, 257689. Junction of Murrumbateman and Gundaroo Road.

130. Lake George Sheet, 190707. Prominent knoll north of creek (Air-photo 7-53424).

131. Lake George sheet, 133725.

132. Lake George sheet, 124738. Cutting in Murrumbateman-Gundaroo road.

133. Lake George sheet, 094685. 150 yards east of track.

134. Lake George sheet, 056621. Low hill, Nanima road.

135. Lake George sheet, 093668. Northern foot of Spring Hill, on the track.

136,137. Lake George sheet, 112657. Low hill north of homestead (Air-photo 11W - 54030).

138. Lake George sheet, 113657. Just west of junction of tracks (Air-photo 11W-54030).

139. Lake George sheet, 261719. Southern Gundaroo cemetery.

140. Junction of Gundaroo-Gunning and Gundaroo-Yass roads (Gunning 1-mile sheet).

141. Lake George sheet, 249721. Track leading west from southern Gundaroo cemetery.

142. Lake George sheet, 258714. Ridge west of Gundaroo-Sutton road.

143. Lake George sheet, 195659. ½ mile south-east of Nobby Hill.

144. Lake George sheet, 182660. 30 yards south of track south of Nobby Hill.