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NOTES TO ACCOMPANY A GEOLOGICAL MAP AT 1:10 000 SCALE OF THE GOOGONG RESERVOIR, QUEANBEYAN RIVER, NEW SOUTH WALES

by

R.C.M. GOLDSMITH & W.R. EVANS

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NOTES TO ACCOMPANY A GEOLOGICAL MAP AT 1:10 000 SCALE

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CONTENTS

Figures 1, 8 and 9 have been omitted from the hardcopy of record 1980/21.

ABSTRACT

In 1977, an area now occupied by the Googong Reservoir, Queanbeyan River, New South Wales, was geologically mapped at a scale of 1:10 000. Clearing of vegetation in preparation for the filling of the reservoir improved access to the area and exposed additional outcrops. The object of the mapping was to delineate with stratigraphic sequence and complex structure of the Silurian sediments that lie between Ordovician turbidites to the east and the Silurian Colinton Volcanics to the west.

An unconformable contact between Silurian and Ordovician sediments was located farther west than indicated by earlier mapping. A complex relation between small granite bodies, limestone, calc-silicate hornfels, and altered basic intrusives is indicated by their irregular and unpredictable outcrop pattern.

The map does not attempt to clarify the geology of the entire area, as time in the field was limited; however, the area now flooded by the reservoir was mapped in detail. Follow-up work remains to be done on the calc-silicates and the altered basic rocks that crop out extensively around the London Bridge area, which is above the top water-level of the reservoir.

1. INTRODUCTION

The area mapped is located in the Queanbeyan River valley south of the city of Queanbeyan (Fig. 1). As part of the Googong Dam construction project, the area to be submerged by the reservoir was cleared of vegetation below the top water-level of 663 m R.L. Rock outcrops previously hidden by vegetation were exposed and the bulldozer blades unearthed near-surface rock, enabling a more complete picture of the geology to be obtained.

Previous geological work in the area was carried out by Burton (1963) and Simpson (1972) in connection with investigations for Googong Dam, which was recently constructed on the Queanbeyan River (Goldsmith, 1979). A structural analysis was made of an area to the north of the dam site by Stauffer & Rickard (1966), and the limestone in the London Bridge area has been the subject of a number of reports (Veevers 1951, 1953; and Cameron 1972).

The geological mapping was carried out in early 1977. The area which was to be flooded was given priority, and was mapped as time permitted between geological tasks associated with the construction of Googong Dam.

2. FIELDWORK

Access to the area was good, as numerous tracks used by the reservoir clearing contractors covered the area from Googong Dam to London Bridge. The mapping was generally restructed to those areas below the proposed top water-level of the reservoir, but mapping was more extensive around the dam and around the London Bridge limestone arch.

Base maps at 1:10 000 scale were used to plot the geology and localities visited. Rock samples were collected and descriptions of these are given in Apendix 2. Thin sections from 9 samples are described in Appendix 1.

Most of the area that was mapped in detail is now submerged by the reservoir waters and a number of problems remain unsolved; however, the geology has been recorded in sufficient detail to allow for some re-interpretation when the surrounding areas are mapped in more detail; hand specimens and thin sections from the inundated area are available for reference.

3. PHYSIOGRAPHY

The reservoir area is situated in rolling to hilly country south-east of Canberra, and is dominated by the broad valley of the Queanbeyan River. The river is entrenched in valley-floor meanders for 16 km, along which the bed of the river falls from RL 678 m to RL 610 m, a gradient of 4.25 m per km. A line of hills rises to nearly 900 m east of the river, and high ground to the west rises to about 750 m. The river channel is steep-sided with gorges up to 70 m deep in some places, and in a few sections it meanders through alluvial flats up to 100 m wide.

The geology has to some extent influenced the topography: acid igneous rocks form the hilly country west of the Queanbeyan River; folded sedimentary and volcanic rocks occupy the valleys, and quartzites and silicified shales form the high country to the east. The Queanbeyan Fault lies at the foot of a dissected escarpment 1 km east of Googong Dam and continues southwards beyond the confines of the reservoir into rugged country comprising the Ordovician sediments.

There does not appear to be any association of the granite bodies with any particular topographic forms; they crop out on hill-tops, on steep slopes, and in the valley floor.

4. STRATIGRAPHY AND STRUCTURE

A summary description of the stratigraphic units shown on the map (Plate 1) is given in Table 1.

The Cappanana beds and the Colinton Volcanics of Late Silurian age underlie much of the reservoir area. These formation have been folded about an axis striking generally 020° (true); shearing and faulting across the structures have complicated the geology. Ordovician sedimentary rocks, which unconformably underlie the Silurian formations, occupy the floor of the remainder of the reservoir area (Fig. 2). Siluro-Devonian granitoids have intruded both the Ordovician and Silurian rocks, and are foliated within shear zones that are aligned with the regional structure (Fig. 3).

TABLE 1. STRATIGRAPHIC TABLE FOR THE GOOGONG RESERVOIR AREA

Unit	Distribution	Rock types	Tectonic	Thickness	Depositional environment	Stratigraphic relations	Age
Alluvium	Along flanks of Queanbeyan River and in basins along tributary creeks	Sand, silt, gravel and boulders in and adjacent to river channel. Silty sand in basins	-	Up to 5 m	Fluvial	Unconformable on Silurian and Ordovician strata	Quaternary
High-level gravels	Residual patches on valley sides	Rounded gravel fragments	-	Less than 1 m	Fluvial	"	Tertiary
Collinton Volcanics	From Googong Dam south, west of the Queanbeyan R.	Dacite, rhyodacite (porphyritic), ash-flow tuff, welded tuff. Interbedded shale, sandstone, limestone.	Folded, generally steeply dipping dominant fracture cleavage of 000-010°.	More than 2 000 m	Extensive volcanism with intervening shallow-marine deposition.	Conformable on Cappanana beds. Intruded by Googong and related granites.	Late Silurian
Cappanana beds	Along Queanbeyan River valley from Googong Dam to south of London Bridge towards Cooma.	Mudstone, shale, siltstone, massive limestone, quartzite, minor beds of tuff. Hornfels near granite bodies.	Open-folded gentle plunges, dips 35-85°. Complex relations in some places Dominant cleavage at 000-010°. Faulted.	up to 800 m	Shallow-marine to terrestrial, minor volcanism.	Unconformable on Ordovician sediment. Conformable on possible Lower Silurian. Intruded by granite.	Late Silurian
Acton Shale Member	Queanbeyan River, mostly on the eastern side of the valley.	Black siliceous slatey shale.	Intensely folded as nappe fronts in places.	up to 200 m	Marine	Near top of Pittman Formation	Late Ordovician
Ordovician (Undifferentiated)	Eastern slopes of the Queanbeyan River valley and faulted blocks on the western side of the valley.	Quartzite, siltstone, slate, mudstone, as massive sequences, or turbidites. Ferruginous in places.	Folded, often intensely ? (overturned in palces); moderate to strong fracture cleavage, some slatey cleavage. Faulted.		Marine depth uncertain	Base not known; overlain unconformably by the Cappanana beds.	Middle to Late Ordovician

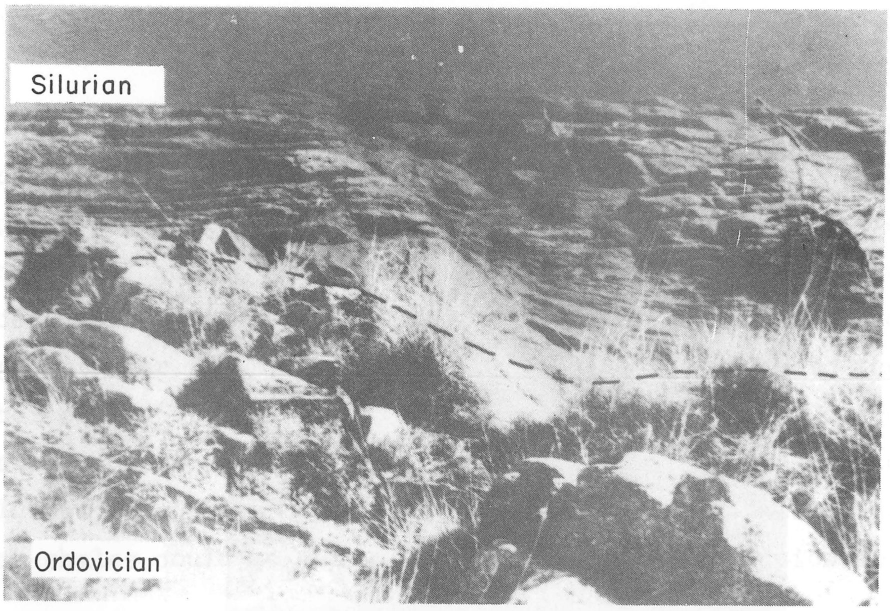

FIGURE 2 Unconformity between Ordovican quartzite and ?Lower Silurian mudstone. Beds in the mudstone drops over irregularities in the Ordovican surface. Location in Burra Creek 9km south of Googong Dam. (G.R.^{2}2305^{5}7958) GB/2243.

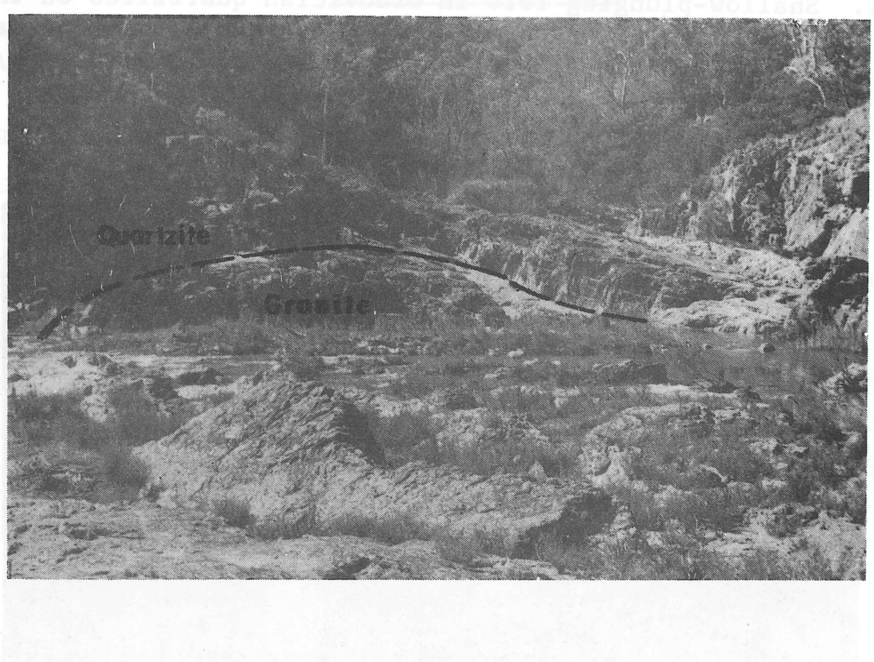

FIGURE 3 Outcrop in Queanbeyan River 9.5 km south of Googong Dam, showing tilting of the Ordovican quartzites by a small granite intrusion. (G.R.^{2}2342^{5}7975) M/2141.

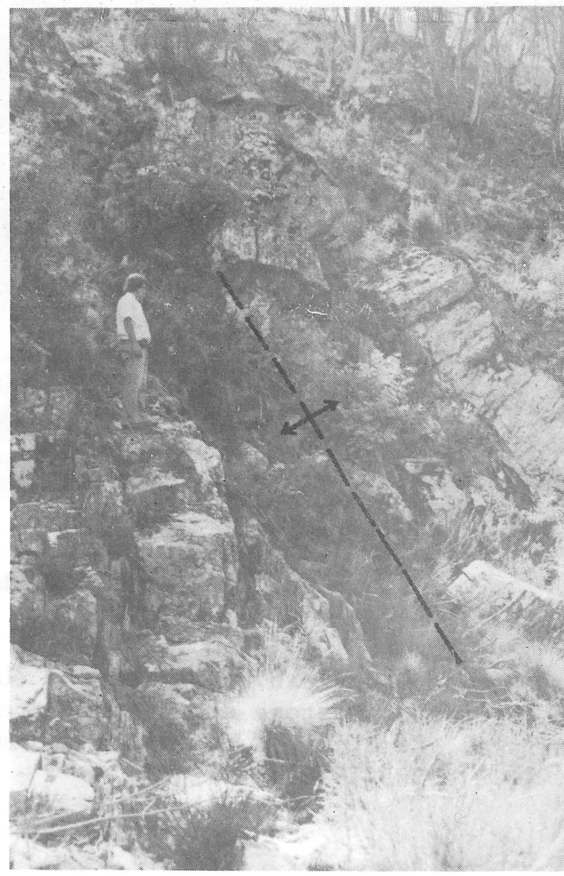

FIGURE 4. Shallow-plunging fold in Ordovician quartzites on the west bank of the Queanbeyan River 8km south of Googong Dam. The fold plunges 10 to the north (G.R.^{2}2325^{5}8000) M/2141.

FIGURE 5. Contorted laminated siltstone in an Ordovician turbidite sequence. Queanbeyan River 9 km south of Googong Dam. (G.R.^{2}2313^{5}7963) M/2141.

Ordovician sediments

The Ordovician sediments are more extensive than shown by Simpson (1972, 1974). Quartzite, sandstone, greywacke, shale, and slate comprise the rock units (Figs. 4 and 5), and a persistent feature is the abundance of quartz floaters derived from an extensive network of closely spaced quartz veins. Intensely fractured and recrystallised black shale crops out near the top of the sequence and is similar to the Acton Shale Member of the Pittman Formation in Canberra (G.A.M. Henderson, BMR personal communication), but no graptolites were found and correlation could not be confirmed. It follows that the quartzites adjacent to the black shales could be equated with the Pittman Formation in Canberra.

Thinly interbedded sandstone, siltstone, and shale with cross-bedding, graded bedding, and slump structures were observed along the Queanbeyan River upstream from its junction with Burra Creek. They are considered to be part of a turbidite sequence.

Silurian sediments

Silurian sediments overlie Ordovician rocks unconformably (Fig. 9). The unconformity is exposed in Burra Creek 100 m upstream from its junction with the Queanbeyan River (Fig. 2), where Silurian mudstone overlies greywacke of Ordovician age. The angle of unconformity is about 15-20° and scour-and-fill structues are visible at the contact.

The sequence immediately above the Ordovician rocks is thought to be of Early Silurian age (G.A.M. Henderson BMR personal communication); however, it is too thin to map separately at this scale, and cannot be readily separated from the overlying Upper Silurian beds.

No correlation with rocks of Silurian age in Canberra has been possible on the basis of fossils or other criteria. However, the Gladefield Volcanics in the ACT may be correlated with the Colinton Volcanics as each represents the first major phase of acid volcanism in its respective area.

Cappanana beds (London Bridge Formation)

Strusz (1975) described in detail the distribution of the Cappanana beds in the reservoir area. They consist of cleaved olive to brown mudstone, shale, and siltstone with lesser amounts of sandstone, limestone, and tuff. They extend from a contact against the Ordovician rocks along the Queanbeyan Fault northeast of Googong Dam to beyond the southern limits of the reservoir; the width of outcrop is up to 1100 m.

Within the reservoir area the Cappanana beds have been mapped on lithology; however, beds of the same lithology may not be the same age where they have been mapped across discontinous outcrop. Outcrop of the mudstone and siltstone is generally poor, and dips are steep. Some medium-scale fold axes have been delineated, but it is likely that small-scale folding is also common, and thickness estimates could be unreliable where folding has not been recognised (Fig. 6).

Limestone lenses are common and extensive in the northern part of the area. They are up to 180 m thick and 1700 m long along strike 020-025° (true), and in many places lens out from an outcrop width of 150 m over a very short distance; this is mainly attributed to folding (Fig.6). In the south, a lens of limestone, 90 m thick, dips steeply west and forms the London Bridge natural arch and caves system (Veevers 1953; Cameron 1972). The limestone is recrystallised and foliated, and fossils are poorly preserved.

Limestone has been mapped at four apparently distinct levels in the sequence. The lenticular nature of the limestone and the complexity of folding make it difficult to determine whether the limestones are parts of the one lithological unit, or whether there were four stages of limestone deposition. The structure may be further complicated by F1 recumbent folds and associated faults displacing the units some hundreds of metres, or further.

Colinton Volcanics

This unit contains volcanic rocks of dacitic and rhyodacitic composition in a thick sequence of flows, tuff, and welded tuff interbedded with marine shale, siltstone, sandstone, and some small limestone

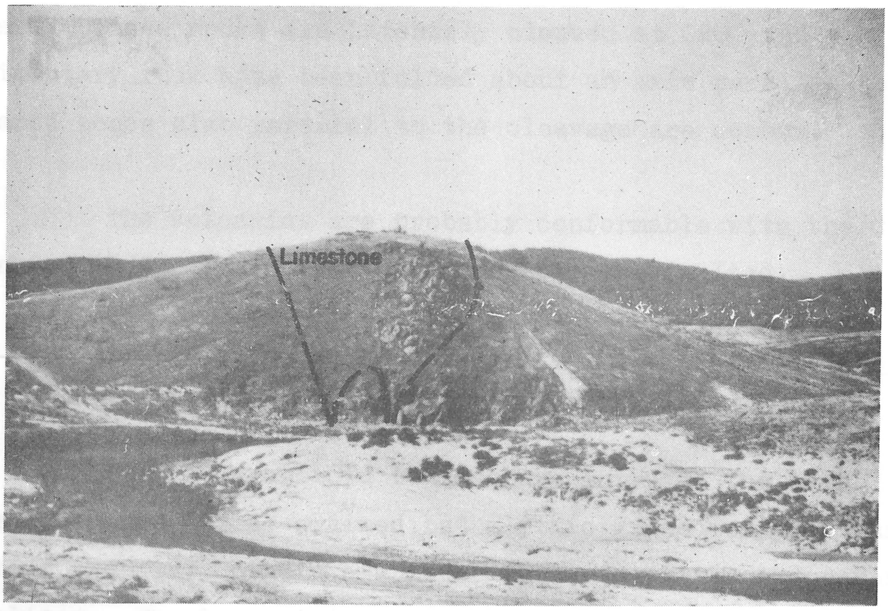

FIGURE 6 Limestone bluff, Queanbeyan River, 2 km south of Googong Dam. The limestone lens narrows from 150m wide to less than 1m at the river's edge. (G.R.^{2}2270^{5}8604) GB/1791.

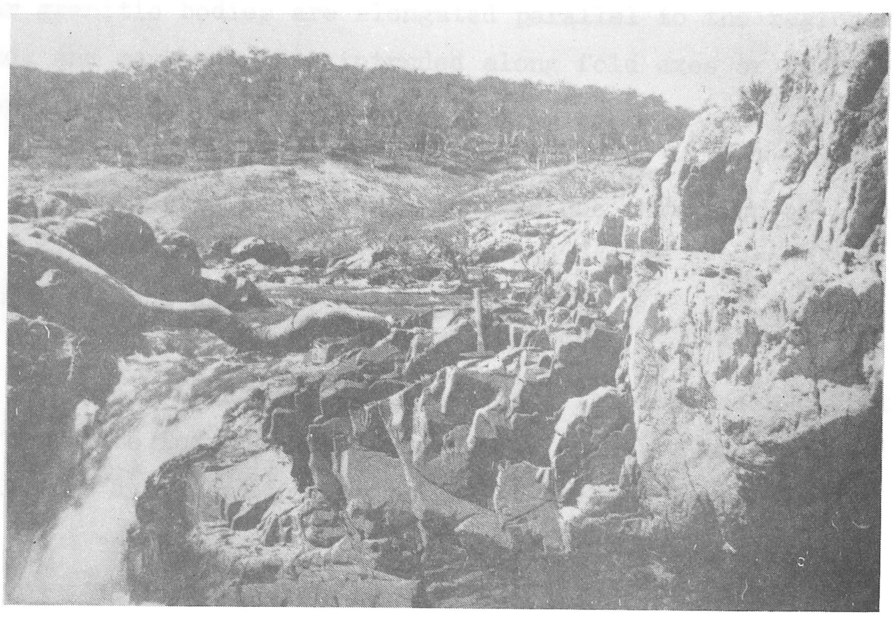

FIGURE 7 Dolerite dyke 1.5m wide within granite body 3.5 km south of Googong Dam. (G.R.^{2}2296^{5}8485) GB/1793.

lenses. These rocks are intensely cleaved at 020° and the lenses of sedimentary rock have been folded about an axis parallel to the cleavage; sheared zones also parallel to the cleavage are common.

The volcanics are probably conformable with the Cappanana beds (Strusz, 1975), but some of the contacts are faulted.

Intrusive rock

Over 60 granitoid bodies have intruded the area. Some of the intrusions are coarse-grained batholithic granodiorite, adamellite, or biotite granite; others are leucogranite, aplite, and porphyritic rhyolites. The largest intrusion in the area is the Googong Granite which forms a U-shaped body northwest of Googong Dam. It is an adamellite in composition (Simpson, 1974), but a band of albite-microcline-epidote rock forms a 400-m-wide median section. No definite association of granite intrusions has been postulated, but some are probably related to the emplacement of the Googong Granite; others that are 5 km or more south of the Googong Dam are probably associated with emplacement of the Urialla Granite, beyond the area mapped to the southeast. Smaller lenticular granitic bodies are elongated parallel to the regional structural trend, and may have been intruded along fold axes or faults during the major phase of deformation (see Fig. 9).

Dolerite dykes were found in one intrusion of leucogranite (Fig. 7). The dykes are 2-3 m wide and strike between 110° and 125°. They are not evident anywhere else in the area.

Near London Bridge homestead, igneous rocks of intermediate composition have intruded the limestone. Andesite and ?monzonite form a complex of dykes and an irregular intrusion (Plate 1).

Metamorphism

Contact metamorphism is irregular in distribution, and calcareous rock adjacent to the granitoids has been altered to form a green calc-silicate hornfels; some limestone lenses in contact with large granitoids show no alteration whatsoever. Dacite in contact with the Googong Granite is recrystallised and silicified, and has a marked increase in quartz phenocrysts.

Calc-silicate hornfels was mapped within the Cappanana beds, and occurs as irregular lenses and pods. Adjacent to the granitoid bodies, it is a banded green fine-grained rock and is associated with marble. Other bodies of hornfels are quite distinct and are some distance from the granitoids. In thin section they are basic in composition, being highly altered basalts and dolerites (similar to the dykes in the granite, Fig. 7).

Altered basic igneous rocks are common, as dykes in the granite (Fig. 7) and in association with calc-silicate hornfels. Thin section descriptions are given in Appendix 1.

Structure

Deformation has produced four phases of folds in Ordovician sediments to the north of Googong Dam (Stauffer & Rickard, 1966), and some of these phases were also observed in the reservoir area. The first phase consits of large isoclinal recumbent folds (F1). The second-generation folds (F2) are the most pronounced and consist of flattened flexural-slip folds with well-developed axial-plane slaty cleavage (Fig. 8). Third and fourth-generation folds are minor kink systems generally associated with movement adjacent to faults.

These folds may have developed during the Late Silurian Bowning orogeny, when recumbent folding initiated nappe fronts and gravity sliding from east to west. Remnants of the recumbent limbs were identified by Stauffer & Rickard (1966) as inliers of Acton Shale (Ordovician) within the Colinton Volcanics (Silurian) up to 5 km west of the main Ordovician outcrops, and in an area not covered by this report. The segment of Ordovician rocks that extends westwards between two strike-slip faults, 2.5 and 4 km south of the dam, may also be associated with F1 recumbent folding.

The Beltana Fault has been mapped in greater detail: a strike-slip displacement of the east block 2 to 6 km northwards is indicated.

One area near the London Bridge homestead which is of particular interest exhibits complex field relations between limestone, calc-silicate hornfels, andesite, and altered basic rocks, however, clarification of the structure in this area will require further study.

5. CONCLUSION

A narrow belt of Silurian sediments has been mapped in detail in the area now flooded by the Googong Reservoir, and some units have been delineated in more detail.

Ordovician sediments are more extensive than previously thought, and the unconformity with the overlying Silurian rocks was mapped at Burra Creek.

The distribution of the various lithological units of the Cappanana beds has been mapped, but the structure has not been satisfactorily resolved.

Numerous granitic intrusions disrupt the outcrop continuity of the sediments, and the area is structurally complex.

REFERENCES

BURTON, G.M, 1963. Googong Dam site - Queanbeyan River, N.S.W. Report on investigations May 1961 - August 1963. Bureau of Mineral Resources, Australia, Record 1963/68 (unpublished).

CAMBERON, J., 1972. Geology of the London Bridge limestone, Queanbeyan, N.S.W. Geol III Mapping Report, Australian National University (unpublished).

GOLDSMITH, R.C.M., 1979 - Geological report on the construction of Googong Dam, Queanbeyan River, New South Wales. Bureau of Mineral Resources, Australia, Record 1979/83 (unpublished).

SIMPSON, G.B., 1972. Geology of the Googong Reservoir, Queanbeyan River, N.S.W. Bureau of Mineral Resources, Australia, Record 1972/18 (unpublished).

SIMPSON, G.B. 1974. Googong Dam Site, Queanbeyan River, NSW - Geological Investigation 3 parts. Bureau of Mineral Resources, Australia, Record 1974/100 unpublished.

STAUFFER, M.R., & RICKARD, M.J., 1966. The establishment of recumbent folds in the lower Paleozoic near Queanbeyan, N.S.W. Journal of the Geological Society of Australia 13(2), 419-38.

STRUSZ D.L., 1975. Silurian stratigraphic units of the sourthern part of the Molong High. Bureau of Mineral Resources, Australia, Record 1975/147 (unpublished).

VEEVERS, J.J., 1951. The regional geology of an area northwest of Captains Flat, N.S.W. Hon. B.Sc. Honours Thesis, University of Sydney.

VEEVERS, J.J., 1953. The London Bridge Limestone. Bureau of Mineral Resources, Australia, Record 1953/55 (unpublished).

APPENDIX 1

PETROGRAPHIC DESCRIPTIONS

Locations of samples are shown in Plate 1.

Sample 77360001 (field specimen 1; G.R. 22298.58491)

This very fine-grained rock consists mostly of fibrous amphibole (probably tremolite-actinolite) and leucoxene in a closely interlocking fabric. Extremely fine-grained quartz occurs in the groundmass. Coarser epidote (up to 0.1 mm) in veins intersect the rock. This highly altered rock is probably of basaltic origin.

Sample 77360002 (field specimen 55, G.R. 22298.58491)

The rock is medium-grained and consists of an interlocking network of plagioclase laths and equidimensional pyroxene (augite). Titaniumrich magnetite and ilmenite make up 20% of the rock. Minor quartz and biotite make up the remainder of the rock. Alteration is seen in the presence of chlorite and amphiboles (replacing pyroxene).

Sample 77360003 (field specimen 13, G.R. 22390.58837)

The rock is composed of mostly actinolite and epidote. Leucoxene occurs in bands, and coarser epidote and ilmenite are found in clusters up to 2 mm. Minor quartz occurs within the fabric, and calcite and epidote veins intersect the rock - some of them are disharmonically folded. Altered basic rock.

Sample 77360004 (field specimen 23, G.R. 22313.58724)

This is an intermediate to basic altered rock, which may have had an intrusive origin. The original plagioclase-augite constituents have been altered by the introduction of water. Feldspars have been altered to sericite, and fibrous tremolite-actinolite surrounds remnant pyroxene cores. Epidote, chlorite, and leucoxene are also prominent. Minor quartz, calcite, and apatite.

Sample 77360005 (field specimen 24; G.R. 22275.58756)

This rock, of dacitic composition, is altered with clusters of epidote, sericite, and fibrous amphibole surrounded by phenocrysts of quartz, plagioclase, and K-feldspar up to 4 mm. Chlorite also occurs. The rock is probably intrusive in origin.

Sample 77360006 (field specimen 26; G.R. 22290.58731)

This rock consists almost entirely of quartz and epidote. The quartz occupies veins and pods up to 7 mm, and is surrounded by interlocking laths of epidote of 1-2 mm. The sample was found within a limestone unit and is probably a dyke from the nearby granite intrusions.

Sample 77360007 (field specimen 36; G.R. 22259.58551)

The hand speciment of laminated siltstone consists of dark bands of magnetite, leucoxene, and clay minerals interbedded with fragmental quartz and sericite. The rock is fine-grained and relatively unaltered.

Sample 77360008 (field specimen 38; G.R.22314.58472)

The rock is an acid volcanic, probably rhyolite, and is slightly altered. Phenocrysts of -quartz 1-2 mm in size are surrounded by fibrous sericite and minor epidote. The plagioclase is finer-grained and is generally altered to sericite - although some crystals are clearly defined.

Sample 77360009 (field specimen 40; R.G. 22272.58559)

The rock is almost entirely detrital quartz, but secondary growths along the contacts indicate some recrystallisation. Fragments are 0.2-0.8 mm. Minor ilmenite and plagioclase also occur. The rock is a sandstone.

APPENDIX 2

HAND SPECIMENT NUMBERS AND NAMES

Sample localities of hand specimens are numbered in Plate 1. Grid references are shown below in parentheses.

1	Leucogranite)	irregular textures, some fine aplitic zones.
	)	(22298.58491)
1=	Granite)	
1A	Sandstone - medium to fine-grained; light tan. (22382.58758)	
2	Weathered aplite with numerous quartz veins; ironstained. (2237.58727).	
3	Aplite - white phenocrysts of quartz and feldspar. (22370.58777)	
4	Tuff - acid volcanic; phenocrysts of quartz and some altered plagioclase (green-brown colour). (22371.58762).	
5	Microgranite - grey-white, ferromagnesian minerals common. (22420.58702)	
7	Smokey quartz - Queanbeyan Fault zone. (22430.58740)	
8a	Tuff - green-grey, medium to fine groundmass; phenocrysts of quartz and feldspar, and lithic fragments. Thin bed. (22400.58828)	
b	Quartzite - dark grey, medium - grained sandstone silicified to quartzite. (22400.58828)	
c	Siltstone - partly silicified, medium grey. (22400.58828).	
d	Siltstone - unsilicified; bedding visible; medium grey-tan. (22400.58828)	
9	Rhyolite - coarse-grained, porphyritic. (22380.58845)	
10	Quartzite - grey, siliceous, hard. (22400.58858)	
11	Intrusive rhyolite - porphyritic with numerous quartz veins. (22358.58859)	
12	Altered basaltic rock - green, very fine-grained, dense. (22368.58880).	
14	Mudstone with tuff layer or porphyry vein?; medium tan-green, sheared. (22409.58847)	
15	Altered basaltic rock, extremely fine-grained. (22389.58812)	
17	Tuff - sheared and foliated; green brown, feldspar and lithic fragments, quartz not dominant. (22375.58798)	
18	Porphyritic rhyolite - intrusive. (22402.58808)	
19	Porphyritic rhyolite - phenocrysts of quartz and feldspar 0.5-1 cm. (22402.58807)	

APPENDIX 2 (contd)

20 Purple silstone - altered and ferruginised. (22410.58798)

21 Quartzite - slightly calcareous, brown-green. (22395.58795)

22 Calcareous siltstone - weathered and chemically decomposed. (22390.58787)

25 Calc-silicate hornfels - light grey, greenish zones. (22311.58769)

27 Silicified ashstone -dark grey. (22264.58750)

28 Dacitic tuff - dark grey. (22232.58565)

29 Altered basic rock (basaltic?). (22323.58645)

30 Quartzite - medium grey-blue. (22325.58635)

31 Black slate - thinly laminated. (22346.58629)

32 Chlorite schist - knotted dark green-grey (22332.58604)

33 Granite - a. med-grained grey adamellite.
b. leucogranite, some dark ferromagnesian minerals porphyritic (22333.58618)

35 Black slate. (22344.58599)

37 Granodiorite - coarse and even-grained (22329.58468)

39 Laminated siltstone - sandy layers, quartz-rich, laminations 3-4 mm thick. (22269.58542).

41 Quartzite - light tan, siliceous, argillaceous. (22278.58386)

43 Black silicified fine siltstone and sand-size fragments recrystallised with quartz porphyroblasts up to 1 mm. (22362.58395).

46 Greywacke sandstone - medium green-grey. (22278.58417)

47 Laminated siltstone - folded; quartz veins. (22243.58415)

48 Black shale and calc-silicates adjacent to granite - highly altered, recrystallised, and metasomatised. (22240.58612)

49 Mudstone - phyllite. (22280.58412)

50 Mudstone - phyllite. (22282.58412)

51 Altered lithic tuff - weathered brown-pink. (22268.58391)

53 Aplite - porphyritic, white. (22273.58374)

55 Basalt from dyke in granite - coarse and fine-grained varieties. (22303.58477)

APPENDIX 2 (contd)

56 Quartzite - hard and fine-grained, light grey. (22315.58385)

57 Porphyritic rhyolite. (22296.58630)

58 Calc-silicate hornfels. (22328.58645)

59 Banded calc-silicate hornfels. (22235. 58628)

60 Slatey shale - bedding laminations cross-cut intense cleavage. (22353.58161)

61 Skarn - crystalline, medium grey with even texture. (22274.58099)

62 Contorted mudstone - some laminations tightly folded; phyllite. (22364.58010)

63 Quartzite - dark-grey. (22307.58007)

64 Sandstone - medium-grained, light tan, quartz fragments.(22302.57966)

65 Quartzitic sandstone - medium grey. (22312.57966)

66 Calc-silicate hornfels - banded green grey. (22297.58047)

67 Basic rock? (22328.58021)

68 Quartzite - dark grey. (22324.58033)

69 Sheared tuff - phenocrysts of ironstained quartz. (22322.58045)

70 Micaceous arenite - calcareous, argillaceous; no quartz. (22332.58050)

71 Black siliceous mudstone - banded in places. (22341.58083)

72 Porphyritic adamellite - Googong Granite from dam-site.(22295.58850)

73 Dark grey dacite - from dam site. (22295.58850)

74 Porphyritic rhyolite - large phenocrysts of quartz. (22295.58850)

75 Ferruginous siltstone. (22302.58060)

76 Cleaved siltstone. (22257.58133)

77 Adamellite (22225.58093)

78 Jasper (22235.58098)

79 Altered basic rock. (22235.58095)

80 Amphibolite. (22235.58092)

81 Andesite. (22245.58054)

82 Andesite (22250.57965)

83 Andesite. (22222.57960)

APPENDIX 2 (contd)

84 Altered limestone. (22224.57950)

85 ?Monzonite. (22236.57984)

86 Andesite and fine-grained calcareous siltstone (22232.57965)

87 Calcareous siltstone - some tuffaceous fragments. (22248.57943)

88 Dark grey limestone. (22248.57935)

89 Altered intermediate rock - probably andesite, much epidote. (22282.57940)

90 Altered intermediate rock - probably andesite, much epidote. (22285.57921)

PLATE 1
GOOGONG RESERVOIR
GEOLOGICAL MAP
1:10 000 SCALE
CANBERRA
A.C.T.
N.S.W.
GOOGONG DAM
SPILLWAY
SADDLE DAM
QUEANBEYAN FAULT
BEVTAN FAULT
NO OUTCROP
Alluvium ; river flats ; terrace sand and gravel.
Gravel ; high level - remnant terraces.
COLINTON VOLCANICS
Dacite, rhyodacite, welded tuff, some minor ashstone and agglomerate. Sheared and foliated.
Metasediments ; shale, mudstone, siltstone, sandstone, limestone. Mostly outcrops of slaty shale.
CAPPANANA BEDS (= LONDON BRIDGE FM.)
SILURIAN
Brown-green mudstone, shale.
Siltstone, black and grey laminated.
Quartzite, sandstone, minor shale and siltstone
Limestone, impure, laminated in places, recrystallized in places.
Calc-silicate hornfels - green massive rock or banded grey rock. Some altered basic rocks.
Lithic tuff
Schist
Unconformity
ORDOVICIAN
Quartzite, slate and siltstone. Turbidite sequences, metagreywacke, numerous quartz veins.
Slate, mudstone, thinly banded, mid-brown colour.
ACTON SHALE MEMBER
Black slate, silicified, intensely cleaved.
Ferruginous sandstone
INTRUSIONS
Granite : dg = Googong Granite (adamellite).
Granitoids, small intrusions of leucogranite, aplite, granite, granodiorite. Some porphyritic bodies.
Quartz as dykes, veins or pods. massive. Some epidote.
Intermediate to basic intrusives; andesite amphibolite
Dyke, vein q = quartz, ap = aplite, d = dolerite
Geological boundary
Inferred geological boundary
Concealed geological boundary
Unconformity
Bedding, showing dip
Bedding, vertical
Anticline, showing plunge
Syncline, showing plunge
Plunge of minor anticline
Plunge of minor syncline
Plunge of drag fold
Fault, position accurate
Fault, position inferred
Cleavage, showing dip
Cleavage, vertical
Joint showing dip
Outcrop
Sample locality
x 77360003 Thin section locality
Road, track
Area Mapped
Fence
Creek
Building
Contour interval 5 metres
Geological cross-section line (see fig. 9)
1:10000
0 200 400 600 800 1000
metres
Geology by R.C.M. Goldsmith and W.R. Evans 1977
Engineering geology sub-section, Bureau of Mineral Resources, Australia
N
MN
Record 1980/21
355/A16/1998