FIELD REPORT

GLEN OSMOND AREA

C.C. BROOKS.

1959.

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GEOLOGICAL INVESTIGATION REPORT

Report to the Economic Geology Department, University of Adelaide, on the Glen Osmond - Brownhill Creek Area, Mount Lofty Ranges, South Australia.

C. C. Brooks,
September, 1959.

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SUMMARY:

The area was considered as unmapped. Previous workers' reports and maps were consulted only towards the close of the investigation. A stratigraphic succession was established; zones of conformity were delineated and critical areas were indicated by field mapping guided from first mapping several hundred feet of road batters. The writer considers that sufficient work has now been done in the area to enable detailed mapping to be carried out effectively to solve some of the regional stratigraphic problems. A fact map and a work sheet have been submitted with the report. Several conclusions have been drawn from the work and recommendations made.

INTRODUCTION:

The report has been compiled to accompany plans drawn by the writer after a brief field reconnaissance. A survey was suggested, both to take advantage of road batters exposed during current road works on Princes Highway (Route 1) and also to introduce some engineering geology into the current course of economic geology. It was anticipated that more precise mapping within this and adjacent areas might cast doubts on interpretations based on much early small scale reconnaissance mapping, and that the work might indicate approaches to the regional stratigraphic problem in this type area. Princes Highway, from the Big Gum Tree (at the junction of Cross Road, Glen Osmond Road and Portrush Road) to the Devil's Elbow, is included in the area which extends from Mount Osmond to Brownhill Creek.

Access by vehicle is along Princes Highway. A bitumen road in Brownhill Creek gully, and another from the Highway to Mount Osmond were also used.

Enlargements of aerial photographs taken during 1959 were used throughout the mapping. These were purchased from the South Australian Lands Department. Three techniques used were:

(1) a pin method - whereby each location is identified by puncturing the photograph, numbering the reverse side of the photograph, and recording the relevant data in a field note book;

(2) an overlay method - "Kodatrace" overlays were registered over the photograph and, especially where outcrop was plentiful but so poor that only lithology could be recorded, data written directly onto the overlay, alongside the outcrop trace;

(3) chinagraph pencils were applied directly to the surface of the photograph - this was used where contacts could be followed rapidly over relatively long distances.

In every instance the attitudes of bedding planes, faults, cleavage and joints were measured with a Brunton Compass, recorded and plotted on a Schmidt equal area lower hemisphere stereographic net. The mapping was then transferred onto an enlargement of a photogrammetric plot obtained from the Lands Department.

PLANS TO ACCOMPANY REPORT:

1. Geological Map - Area Between Glen Osmond & Brownhill Creek. - (Linen)

1. Rough work sheet - same as above (Cartridge Paper)

3. Photographs (B&W) 35 mm., 3¼" x 2¼" [with "Kodatrace" overlays.]
   1. Current Cross-bedding.
   2. Sedimentary Slump Structures
   3. Sandstone dyke.

GEOGRAPHY:

Several accordant summits in the area are at approximately 1200 feet above sea level. On these a shallow SW dip of less than one degree is apparent. Streams have eroded deep gullies to below 600 feet in several places, giving rise to ground slopes commonly 20° to 30°. In several places series of low cliffs have been formed. To the north-east of the area under consideration the summit levels rise to 2000 feet at Mount Lofty,-two to three miles to the east.

The drainage pattern, which appears at first glance to be dendritic, has two rather poorly developed preferred directions. Alteration by weathering seems to be very slight. No extensive zones of ferruginous or kaolin-rich rocks have been observed, although kunkar is evident in soils overlying and immediately downhill from dolomitic strata. This effect may in part be caused by weathering of calcareous shales.

Low, dense undergrowth impedes progress in the sheltered portions of gullies, while small eucalypts cover the highest ridges. Much of the area has been cleared for orchards, a camping reserve, a golf course, stud farms etc.

Accessibility is good, except in the deepest gullies.

GEOLOGY:

Road batters have been mapped; general lithologies and the stratigraphy determined. Marker horizons have been determined and mapping techniques selected. Critical areas have been delineated but not closely examined - i.e. the major problems can now be outlined and subjected to more detailed scrutiny.

The area was approached as new ground - previous works were consulted only at the conclusion of mapping.

This writer has mapped an apprently conformable sequence of siltstones, slaty siltstones, calcareous siltstones, quartzites and dolomites which show no obvious metamorphic gradient across the area. The sequence is inclied at 5 to 25° to the southwest, except in the Glen Osmond Quarry and and on the ridge on the southwestern side of Prince Highway, to the south west of Mount Osmond.

LITHOLOGY:

1. Quartzites: These include a poorly indurated highly felspathic, coarse-grained rock locally containing some pseudomorphs of limonite after pyrite. This unit has been mapped as the Thick Quartzite. Its distinguishing features may aid local correlations. Several well indurated medium to fine grained quartzites containing from 5% to 25% weathered felspar grains have been mapped. One distinctive white, fine grained sandy rock, exhibiting current bedding, has been classified as a quartzite. A few medium grain-size poorly indurated felspathic and ferruginous quartzites have been noted. The presence of the sandy rock at the base of the sequence indicates that overlying quartzites are all orthoquartzites.
2. Siltstones: Several fine grained grey, brown and buff-coloured clastic sediments have been mapped as siltstones. Referring to the Upper

Phyllites, Sprigg (op.cit.) has written: "When Howchin classified the group as phyllites he correctly observed that the alteration from slates to phyllites is frequently associated with fault movements". The writer agrees with Russell, (op.cit.), when he infers that this observation can be extended to include the sequence siltstone to slate to phyllites. This indicates that stress has induced a metamorphic gradient from the development of slaty cleavage through to mimetic recrystallisation. Sprigg (op.cit. p.321) refers to these as Upper Phyllites, which he considers to overlie the Thick Quartzite.

3. Dolomites: In the north-eastern portion of the area the Beaumont Dolomites were mapped as several thin strata 9 inches to 30 inches thick, outcropping in the road batters. A much greater thickness was seen in a quarry above the Devil's Elbow. This has been tentatively correlated with 40+ feet of blue dolomites, interbedded with calcareous slates, which are exposed in a road cut just over half a mile below the Devil's Elbow. Analyses by Barnes and Kleeman indicate that these dolomites contain from 20% to 30% SiO_2 as quartz grains. In some places quartz veins intersect and replace the dolomites.

   In the south and south-western portions of the area thin blue dolomites have been found underlain by buff dolomites and calcareous shales, which in turn are underlain by the white sandy rock mentioned above c.f. succession given below.

SEDIMENTARY FEATURES:

Throughout the siltstones current cross-bedding (Photo 1), graded bedding, sedimentary slump structures (Photo 2), load casts and/or groove casts were seen. In every instance these features indicated that the sediments have not been overturned.

In one locality a sandstone dyke was seen (Photo 3) - similar features have been observed in adjacent areas (Sprigg; op.cit).

Uses of Lithology in Future Mapping

The dolomite sequence noted independently by Sprigg in one area and the writer in another is:

Top 6. Calcareous Shales

5. Blue Dolomites

4. Calcareous Shales

3. Buff Dolomites

2. Calcareous shales - thin or absent

Base 1. Sandy white quartzite

This sequence has been used to establish that there is low amplitude folding in the lower Glen Osmond rocks and that there is stratigraphic continuity from the lower to the upper reaches of Brownhill Creek. This lithology leads the writer to suspect that thr sequence is part of the Beaumont Dolomite sequence in the type area, and may help to check the existence of a mjor fault between the phyllites and the Thick Quartzite.

STRUCTURE:

Most of the area consists of a conformable sequence of siltstones interbedded with quartzites, calcareous shales and dolomites. The regional strike varies from 110° to 160°. It is relatively constant, with no overall trend from one extreme in one part of the field to the other extreme in another. There are minor local variations suggesting low amplitude, long wavelength folding. This is confirmed by the relative levels of the dolomite sequence detailed above, but exposures are, in general, too far apart in critical areas to map the folding. Soil creep, too, poses a problem on many slopes which are comparatively steep and soil covered. To the south-east and east the area is overlain (?) by a thick quartzite. Mapping by the writer indicates, as will be mentioned below, that this overlies the siltstone sequence.

Quartzites to the south-west of Mount Osmond have been thought to be separated from the siltstones by faulting, and to represent a more contorted zone, but mapping by the writer has indicated that the area is more probably one of "plis en converture", or folding of a higher, more competent stratigraphic unit, unaccompanied by an equivalent disturbance of lower strata. Erosion has left what appear to be klipper of contorted quartzites lying on relatively unfolded, less competent slates. This could readily be verified by more mapping on the scale of one inch represents approximately 400 feet used by the writer. There remains a remote possibility that these quartzites are related to the Thick Quartzite. This would be much more difficult to check.

For ease of compilation several factual data have been reproduced by D. E. Ayres on his fact map.

Bedding plane and cleavage attitudes which have been plotted on a schmidt equal area stereogram do not assist any interpretation.

PREVIOUS WORK EVALUATED AND CORRELATED WITH THAT OF THE PRESENT:

Previous workers, (Howchin, Barnes and Kleeman and Sprigg principally) who have interpreted some broader scale reconnaissance mapping of the western escarpment of the Mount Lofty Ranges, present a stratigraphic sequence which includes the following relevant portion:

base of the Sturtian			Belair Group
			Glen Osmond arkosic quartzites
		1,500+	Slates and Phyllites
		450	Beaumont dolomites and interbedded slate and quartzite.
Lower Adelaidean	Torrensian	1,000	Phyllites & slates with minor quartzites
		1,000	"Thick" or Stonyfell Quartzite
		1,100	Phyllites (Lower)
		430	Upper Torrens blue grey dolomites
		680	Phyllites with minor quartzite bands
		150 ?	Lower Torrens (cream coloured) dolomites
Base of the Torrensian		2,000 +	Alternate slate and sandstone stratigraphic relations uncertain.

Mapping by the writer has led him to agree with the overall picture presented in Sprigg's report, but detailed studies in certain small areas have revealed additional information and a few discrepancies which require closer examination. In particular, the Beaumont Fault has not been found in the road batters of the Devil's Elbow and within the area cross hatched on the work sheet a quartzite has been traced into (but not across) the fault indicated by Sprigg. The breccia zone indicated by Sprigg has not been found, although an adit in the immediate vicinity has not been re-located. Although Barnes and Kleeman and Sprigg wished to correlate the dolomites above and below the Thick Quartzite, Sprigg states that mapping in other areas indicated that this would be untenable (c.f. Sprigg, p.323).

The conformable relation of the Upper Phyllite to the Thick Quartzite is suspected in this area (as indicated by Sprigg). From the ridge southwest of Mount Osmond and of Princes Highway to Mount Osmond Sprigg has marked a fault. Its position and extent are both open to question. As indicated above, the quartzites on the ridge are not conformable with the shallowly dipping strata nearby. Contortions, folds plunging at both ends and faults have been seen in the Glen Osmond Quarry which is along strike from this disturbed zone.

Thus several uncertainties have been revealed which could allow alterations to existing interpretations - both of stratigraphy and structure. Two extreme possibilities are that the area is almost exactly as shown on existing maps or that the thick Quartzite thins to the Glen Osmond quartzite (unlikely), this is unconformably above, not below the phyllites and there is no overthrusting or major block faulting in the area.

The relevant stratigraphic column would then be (?) Belair Group.

"Thick" or Stonyfell Quartzite

Lower Phyllites

Upper Torrens (blue grey) Dolomites

Phyllites (with minor Quartzite bands)

Lower Torrens (cream or buff) Dolomites

That is, the section bracketed on the existing section would be a duplication of lower horizons.

The Glen Osmond stratigraphic unit has been shown on earlier maps as bounded by inferred faults from the north through east to south. It is cut by two other inferred faults, one of which displays a 90° bend which is not an expression of topography. This, for a type locality, (c.f. legend on S.A.D.M. Adelaide i mile sheet) seems rather unsatisfactory, especially as at least two phases of faulting have been recognised on this area.

No conclusive evidence has been found to support Sprigg's postulated major fault which crosses the hatchured area (c.f. work sheet). Those portions of this fault which have been indicated as observed seem to be concealed by topsoil and vegetation, while inferred sections seem to follow topography rather than geology. The fault is an interpreted feature to permit facts observed in other areas to be correlated. Doubt as to its existence was at least inferred by Sprigg in his report (op.cit).

Thus there are several problems in the area which may be solved by both more, closer mapping and by mapping over a larger area.

As indicated by Barnes and Kleeman and Sprigg, an interpretation cannot reasonably be placed on mapping in this small area. With this in mind, the writer has refrained from allocating a place beneath the Thick Quartzite to the Glen Osmond phyllites and siltstones. A current work sheet has been submitted in lieu of an interpretation, without which no sections can be drawn.

ECONOMIC GEOLOGY

From 1841 to 1867 several thin galena veins were worked in the Glen Osmond area. The writer has briefly examined the locations of five of these. During 1959 a road cut exposed 40+ feet of dolomite approximately ½ mile below the Devil's Elbow. An opportunity was taken to map this exposure and the coincidence of strike and elevation of this and those dolomites on which shafts were sunk during last century led the writer to suspect that these represented workings in one dolomite horizon. This has been supported by a verbal communication from a prospector working in the road gang, who claims to have hand cobbed galena from the cut. Bearing in mind the presence of galena in veins in the dolomite over a strike length of nearly 8,000 feet, and the proximity of a good labour pool, almost unlimited water supply, cheap power, ready access and proximity of a port, these occurrences may warrant further examination. Failing any (unlikely) economic exploitation, the area might well be investigated by students, with a view to duplicating the Queensland University mining scheme. It may be interesting to note that low grade deposits could not be recognised or treated when the mines were being worked.

Quartzite for aggregate and road base coarse material has been quarried from the Glen Osmond quartzite in several places, but work has ceased on all exc~~p~~pt the Glen Osmond Quarry on which are at least three pistol ranges - indicating that activities there are being curtailed. If, as mapping by D. E. Ayres and the writer suggests, the Thick Quartzite persists at depth, quartzite could be quarried from it in the area crosshatched - especially as work on the western flank of the range may be halted for aesthetic reasons. There is a bitumen road running to within ½ mile of the outcrops. The demand for quartzite is increasing.

Road batters have been mapped on a scale 1 inch represents 40 feet. These have not been inspected by engineering geologists as the Highways Department has not requested assistance.

CONCLUSIONS & RECOMMENDATIONS:

1. The Beaumont dolomites are possibly equivalent to the Upper Torrens dolomites. The conclusion is supported by both field mapping and chemical analyses, but is denied by interpretations over a much wider area covered by other geologists.

2. The Glen Osmond phyllites, slates and siltstones underlie the Thick Quartzite and are identical, stratigraphically with the Lower Phyllites.
3. Outcrop patterns, when viewed with topography, belie measured bedding plane attitudes in some instances.
4. It is possible that scree and other fallen and/or slumped blocks have been mapped as breccia zones and outcrop by previous workers.
5. Dolomites outcrop far more extensively in this area than indicated on earlier maps. They may be used to accurately delineate areas of sedimentary continuity and structural homogeneity.
6. Stress gradients are indicated in the area. They may be used to clarify the position, nature and extent of faults.
7. To map the road batters in detail seems unnecessary for soil conservation assessment. In many places these batters are 40+ feet high, and although the rock will not weathere badly the topsoil from slopes above will be brought to the road unless soil conservation measures are taken.
In one suspected fault zone the batter is composed of soil and clay. Unless this is grassed, gullying which has already commenced will initiate landslides onto Princes Highway.
8. The dolomites and nearby rocks could be tested for lead by geochemical methods.

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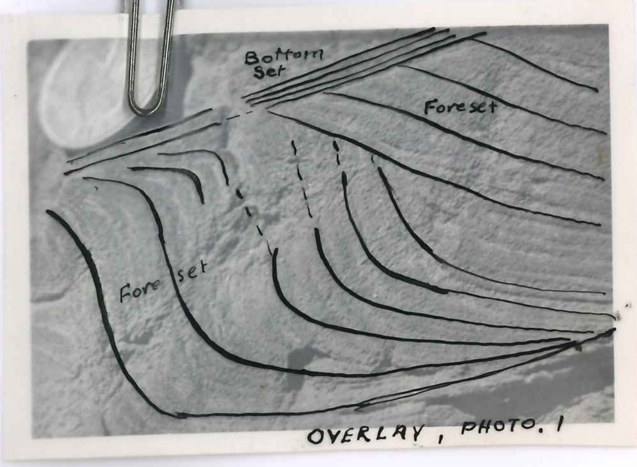
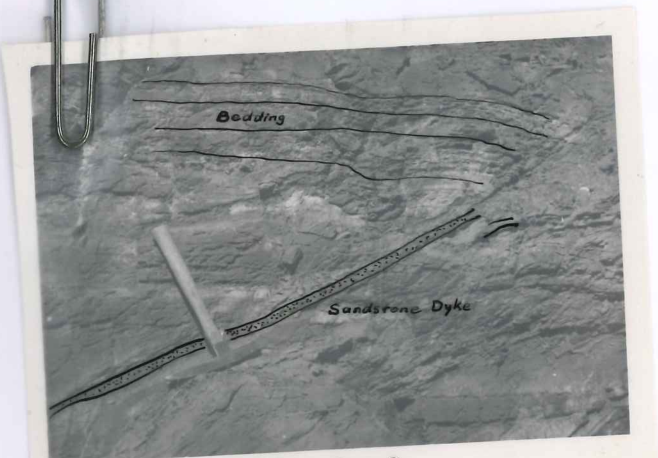
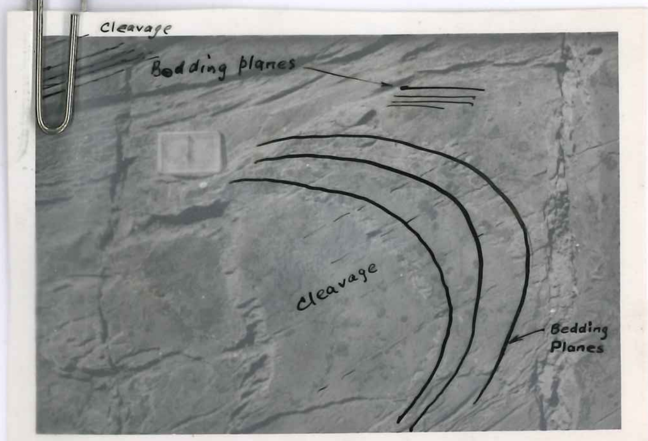


OVERLAY, PHOTO. 1



OVERLAY Photo. 3



OVERLAY, Photo. 2

Top

Photo. 1

Taken by J. Talbot. Aug. 1959

Current cross bedding : Mt Osmond.

c.f. Report, C.C. Brooks.

Bottom

Top

Photo. 3

Taken by J. Talbot. Aug. 1959

Sandstone dyke : Mt Osmond

c.f. Report, C.C. Brooks

Top

Photo. 2

Taken by J. Talbot. Aug. 1959

Sedimentary Slump Structures:

Mt Osmond.

c.f. Report, C.C. Brooks