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Geological Investigations, Belconnen Sheets G4C, G4D, G5A, G5B, G5C, & G5D, Australian Capital Territory, 1965-1967

compiled by

G.A.M. Henderson

GEOLOGICAL INVESTIGATIONS, BELCONNEN SHEETS G4C, G4D, G5A, G5B, G5C & G5D, AUSTRALIAN CAPITAL TERRITORY, 1965-1967

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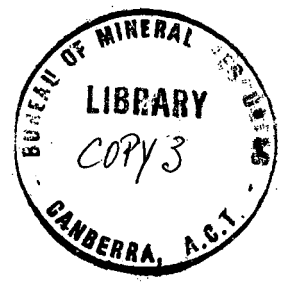

GEOLOGICAL INVESTIGATIONS, BELCONNEN SHEETS G4C, G4D, G5A, G5B, G5C & G5D, AUSTRALIAN CAPITAL TERRITORY, 1965-1967

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SUMMARY

The area of Belconnen west of the Glebe and Coppins Crossing Roads is almost entirely in rocks thought to be of volcanic origin. One unit, the "Weetangera Rhyodacite" may, however, be intrusive. The rocks are believed to be of Upper Silurian age, probably extending into the Lower Devonian at the top of the succession. The area is gently undulating except in the south where there are steeper slopes.

Excavating conditions are variable both from place to place and from one rock type to another. Most commonly soft, completely weathered material near the surface grades down to moderately or highly weathered material at about 6 feet. Rock of sufficient strength for foundations of large buildings is thought to occur at moderate depth; no unusual problems such as those which arise with cavernous limestone are anticipated. Possible quarry sites for road and concrete aggregate occur in the south of the area but would need further examination. Deposits of decomposed bedrock that resembles clayey sandy gravel occur in the south of the area. Extensive drainage problems are not anticipated.

INTRODUCTION

This report is based partly on geological mapping carried out during summer vacations by students W. Matthews, R. Fountain and D. Dyer in 1965-66, and J. Bein and B. Stevens in 1966-67, and partly on trench mapping by G.A.M. Henderson. The purpose of the mapping was to provide data which may be of use in planning the urban development of the area.

The area mapped covers approximately 7½ square miles and lies to the west of Glebe and Coppins Crossing Roads (Fig. 1). Geological observations were plotted in the field onto map sheets G4C, G4D, G5A, G5B, G5C, G5D of the A.C.T. Detail Series, scale 1 inch : 200 feet, supplied by the Lands and Surveys Branch, Department of the Interior, A.C.T. A geological map, at scale 4 inches : 1 mile was compiled in the office.

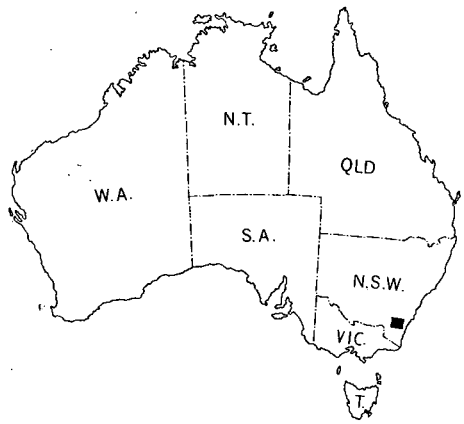
PHYSIOGRAPHY

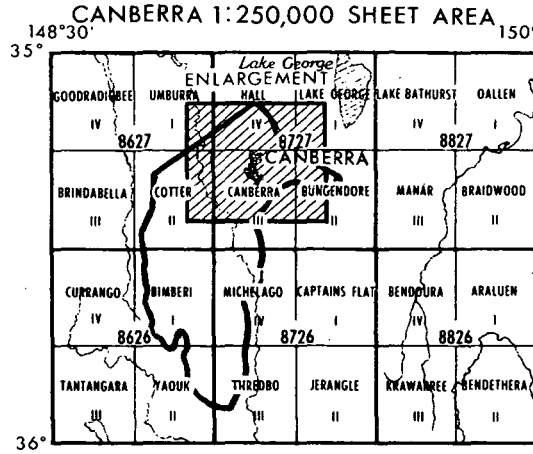
A prominent ridge crosses the southern part of the area from northwest to southeast, and forms a divide between creeks flowing north to Ginninderra Creek and those flowing south to the Molonglo River. Two lesser ridges trending northwest occur in the north of the area and appear to be structurally controlled.

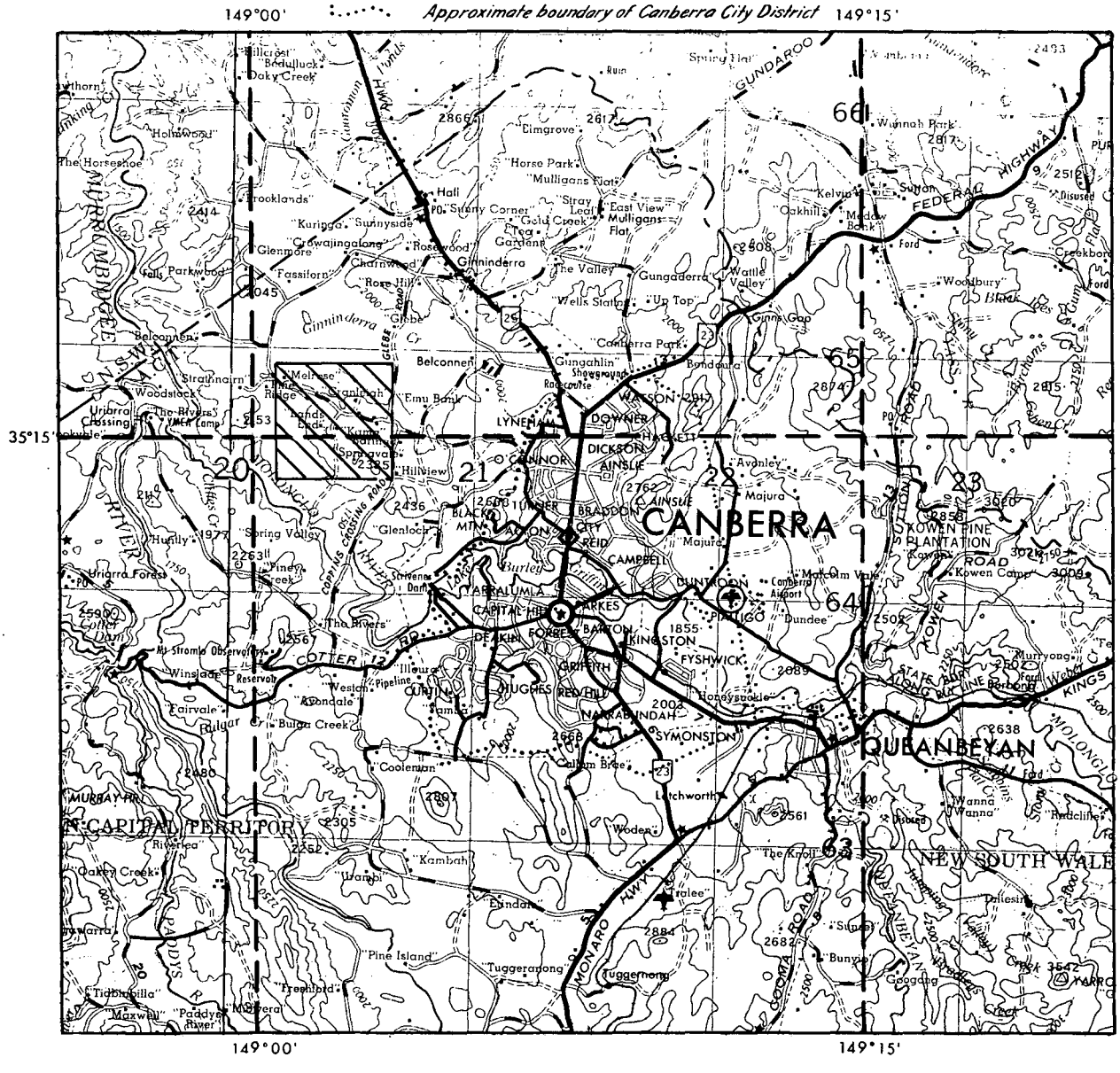
The area is mostly gently undulating except in the south where moderately steep slopes are associated with the high ridge. Outcrops are numerous on the high ridge but elsewhere are generally widely scattered, particularly in the northern part of the area.

FIGURE 1

GEOLOGY OF BELCONNEN
LOCALITY MAP







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GEOLOGY

LITHOLOGY

General

Most outcrops in the area are of acid igneous rocks of rhyodacitic composition. A few outcrops of tuffaceous shale, siltstone and feldspathic sandstone occur in the north of the area. Some of the igneous rocks appear to be of tuffaceous origin; others, though possibly tuffaceous, may be lava flows, or may even be intrusive.

Grey-Green Rhyodacite (D1)

This rock crops out extensively in the south-eastern part of the area (see Plate 1). It is grey-green, and appears in hand specimen to be composed of quartz and feldspar grains set in a fine-grained groundmass. Descriptions of two thin sections (Nos. 69360110 and 69360113) are given in Appendix 2. The rock was at first thought to be part of a body of rock known as the "Mount Painter Porphyry" (Opik, 1958), because of the lithological similarity. However recent mapping to the south has revealed that the Winslade Fault, which occurs in the Cotter area, extends north-east and separates the rock body from the Mount Painter Porphyry. The thin sections indicate that the rock is probably a lava flow but there is slight evidence that it may be tuffaceous. Immediately to the east of the area two variations of the rock type have been distinguished (Wilson, 1966): one of intrusive and the other of tuffaceous origin. The distinction made by Wilson could not be extended west into the area mapped. Structural evidence for the age and origin of the rock is discussed under "Stratigraphy and Structure".

Purple Rhyodacite (Sv)

This rock crops out in the south-western part of the area. It is purple in colour and, like the rhyodacite described above, appears in hand specimen to be composed of crystals of quartz and feldspar set in a fine-grained groundmass. Descriptions of two thin sections (Nos. 69360111 and 69360120) are given in Appendix 2. The rock is possibly a lava flow or a densely welded tuff; evidence for a tuffaceous origin is slight.

Purple Tuff, Pale Green Tuff and Tuffaceous Shale (Svd)

A decomposed purple volcanic rock which is probably a tuff was exposed in trenches in Higgins together with a pale green fine-grained rock, probably also a tuff (See Sheet, G4C, Plate 2). In a creek to the north of Higgins some tuffaceous shale is interbedded with the purple tuff, and fragments of pale brown shale from filled trenches were observed in some places in Higgins. Purple tuff was also exposed in trenches in Latham together with a pale green lapilli tuff.

Rhyolite and Rhyolite Tuff (Svh)

A pale purple-pink rock which occurs in the north of the area has been described in one thin section (No. 69360109) as a rhyolite and in another (No. 69360119) as a rhyolite tuff. The chief distinction from the purple rhyodacite in hand specimen is the pale colour of the rock. In thin section it is seen to contain potash feldspar phenocrysts instead of the plagioclase which occurs in the less acid rocks described above.

Rhyolite Tuff (Svf)

This rock is similar to the rhyolite tuff described above, except that it contains both plagioclase and potash feldspar phenocrysts. It was exposed only in a trench near the northern boundary of the area; outcrops of the rock occur to the north of the area mapped.

Purple Rhyodacite (Svc)

This rock occurs in the north-eastern part of the area and is similar to the purple rhyodacite (Sv), except that it tends to contain a smaller proportion of phenocrysts. (See thin section no. 69360118). It also crops out to the north of Sheet G4C and probably occurs at depth in the north-western part of that sheet. It is mapped as a separate unit because it is exposed at some distance from the other purple rhyodacites; although there are some structural grounds for correlation they are inconclusive. A porphyritic grey-green rhyodacite which appears to form a lens within the purple rhyodacite to the north of the area mapped was exposed in the trunk sewer trench on the northern edge of Sheet G4D (Plate 3).

Siltstone and Feldspathic Sandstone (Suy)

In the extreme north-east corner of Sheet G4D (Plate 3) there are some outcrops of siltstone and feldspathic sandstone. Both rocks are weathered to a brown colour. The sandstone is medium to coarse grained and is probably of tuffaceous origin. The occurrence of a bed of fossiliferous limestone about 800 feet to the north suggests that the siltstone and feldspathic sandstone are of marine origin.

STRATIGRAPHY AND STRUCTURE

All rocks in the area are thought to be Upper Silurian or Lower Devonian in age because of a lithological similarity and structural relationship to rocks of known Upper Silurian and younger age in South Canberra, Woden and other parts of Belconnen. About 800 feet north of the siltstone and feldspathic sandstone, in the north-east of Sheet G4D, limestone was exposed in the Belconnen Trunk Sewer trench. Fossils from the limestone are similar to those in the Upper Silurian Yarralumla Formation (personal communication by Dr. D. Strusz).

Structural considerations also support a correlation with the Yarralumla Formation, and the limestone is shown by that name on the map.

The few dips and strikes which could be measured in the area and to the north, together with consideration of known and inferred faults, indicate that the succession is probably, from the top:-

Grey-green rhyodacite (Dl)
Rhyolite and rhyolite tuff (Svh)
Rhyolite tuff (Svf)
Purple tuff, pale green tuff and tuffaceous shale (Svd)
Purple rhyodacite (Svc and Sv)
Siltstone and feldspathic sandstone (Suy)

The only contact seen, and in no doubt, is that between units Svd and Svf, which was observed in the trunk sewer trench about 1000 feet north of the area. The rhyolite tuff (Svf) appears to be missing in the eastern part of Sheet G4C. The position of the grey-green rhyodacite (Dl) in the succession is in some doubt. The discordant relationship to the other rock types suggests that either it is intrusive or that it overlies the other rock types unconformably. The petrological evidence indicates that it is an extrusive volcanic rock; if this is correct a mild unconformity must be assumed. The rock does not show any of the structural features, such as chilled margins and veining of joints by residual liquids, that would be expected from the cooling and differentiation of a large intrusive body.

Because of the large thickness of volcanics above the inferred Yarralumla Formation it is thought that the succession probably extends beyond the Upper Silurian into the Lower Devonian.

Two stratigraphic names are suggested for the post Yarralumla Formation succession; they are "Stromlo Volcanics" for the rocks immediately above and conformable in the Yarralumla Formation (they also occur at Mt. Stromlo), and "Weetangera Rhyodacite" for the grey-green rhyodacite unconformably above the Stromlo Volcanics (see Appendix 3). The Stromlo Volcanics may extend into the Devonian and are shown as Upper Silurian to Lower Devonian on the maps. The Weetangera Rhyodacite is almost certainly Devonian, but is shown with a query because of the lack of palaeontological evidence.

At least five major faults occur in the area mapped. Two were seen in the Belconnen Trunk Sewer trench and three more are inferred from structural considerations, disturbed bedding and jasper veins. Inferred fold axes are not shown as their reliability is in some doubt owing to the paucity of dip measurements.

ENGINEERING GEOLOGY

EXCAVATIONS

Trenches for reticulation services in the area mapped have so far (November 1969) been dug in Higgins, Scullin, Page, Latham, Macquarie and Cook. The information gained on depths of soil and weathered rock from trench mapping in these areas, and also from the trunk sewer trench, helped to provide information on likely excavating conditions in that part of the Belconnen area underlain by volcanic rock. Observations of soil and alluvium thickness are shown in Plates 2-7. Broadly, the area mapped can be divided into two main zones: one underlain by the Weetangera Rhyodacite and one underlain by the other rock types.

The Weetangera Rhyodacite occurs in the south-eastern part of the area (see Plate 1). Generally about 6 inches to one foot of sandy loam overlies bedrock which ranges from very hard, fresh or slightly weathered, rock to soft, completely weathered, sandy clay with the rock texture preserved. Highly to completely weathered material, which could be excavated with a mechanical shovel, is the most common. In the trenches fresh rock is found as irregular bedies, generally near outcrops. The fresh or slightly weathered rock is very hard and strong, and heavy blasting is needed to excavate it. Blasting is assisted to some extent by joints which generally range in spacing from about 6 inches to 2 feet. Where weathered material occurs in the trenches it grades from completely weathered material near the surface down to highly or moderately weathered material near the bottom of the trench (see Appendix 1 for definition of degrees of weathering): the depth of the trenches generally averages about 6 feet. In some areas, generally where there are no outcrops, the top-soil is underlain by red-brown clay which extends to the bottom of the trench.

The other rock types, where exposed in the trenches, appear to weather more uniformly than the Weetangera Rhyodacite. Generally one or two feet of soil and completely weathered bedrock overlies highly weathered bedrock; this grades down to moderately weathered rock near the bottom of the trench at about 6 feet. In the north-eastern part of Sheet G4C the rhyolite (Svh) forms numerous fresh or only slightly weathered outcrops. The same rock, where encountered in the trunk sewer trench north of Sheet G4C, was fresh and very hard below one or two feet of overburden; it required extensive blasting. It is expected that hard fresh rock will be encountered in many of the trenches in this area.

The purple rhyodacite (Svc) on Sheet G4D appears on the surface as rounded boulders of fresh rock, generally less than two feet across. In the trunk sewer trench completely weathered material occurred to a depth of more than 6 feet and no boulders occurred as tors in the weathered rock. Slight to moderate weathering extended to a depth of more than 30 feet. Extensive areas of hard fresh rock near the surface in this rock type therefore appear to be unlikely.

In the north-east of Sheet G4D siltstone and feldspathic sandstone crop out in a gully. The sandstone and siltstone are moderately hard and strong and the siltstone required blasting where it was encountered as fresh rock in the trunk sewer trench. The minimum depth of soil in the creek bank is about three feet, but, as the soil is partly alluvial, shallower soil depths may be found on the slopes away from the creek.

Clayey and silty alluvium occurs along watercourses in the north of the area and ranges from four feet to more than six feet thick. Hard bedrock may be encountered at the bottom of deep trenches in the alluvium.

FOUNDATIONS

All bedrock in the area, where fresh, is amply strong to support all types of engineering structures, including these with very high foundation loadings. Where outcrops are numerous the depth to fresh rock probably varies considerably over short distances, but nowhere is it expected to be very great. In areas devoid of outcrops the depth to fresh rock is probably deeper. Observations along the trunk sewer trench suggest that rock of sufficient strength for foundations of most large buildings would be found at depths rarely exceeding 15 feet, in places hard fresh rock is only a few feet from the surface. Limestone may possibly occur in the extreme north-east of Sheet G4D. Where exposed over a width of about 100 feet in the trunk sewer trench a few hundred feet farther north, the limestone showed no evidence of being cavernous.

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Small buildings which do not impose heavy loadings may be safely founded on soil. Experience in South Canberra and Woden suggests that residual soil and clayey colluvium, derived from volcanic rocks that underlie most of the area under review, are not sufficiently expansive on hydration to cause serious problems. However any clayey B horizon soils would probably warrant some testing.

POSSIBLE QUARRY SITES

Sites possibly suitable for a quarry for road and concrete aggregate occur in the southern part of the area. However, as equally suitable sites are available outside the boundaries of the planned residential areas, those within the area were not examined. The specimens examined in thin section appeared to be free of deleterious minerals such as sulphides. The matrix of these rocks, however, consists partly of deritrified volcanic glass which should be tested for possible expansive reaction with cement.

OTHER MATERIALS

On Sheet G5A (Plate 4) a pit in completely weathered Weetangera Rhyodacite has been worked for many years as a source of gravel for paths and tennis courts. The material consists of coarsely granular completely weathered and disintegrated bedrock with clay binding. It is likely that other occurrences of this material are to be found in the area underlain by Weetangera Rhyodacite.

GROUNDWATER AND DRAINAGE

No drainage difficulties that would require extensive treatment are expected in the area. No permanent swamps and areas of black organic soil occur.

Along the watercourses which flow intermittently, and in areas of gentle slope, prolonged wet weather causes boggy conditions in some places, especially in the area underlain by the Weetangera Rhyodacite (see, for example Plate 7). On the slopes this is probably due, in many cases, to seepage from joints in the bedrock below. In summer the seepages dry up. The boggy areas should be alleviated adequately by the usual provision by the usual provision of stormwater drains; locally, deep drains filled with sand or gravel may be needed to prevent the groundwater level from rising to the surface. Seepages from slope wash at the foot of steep slopes may occur in wet years; they would be due to the escape of water from sandy layers alternating with clayey layers. The alluvial flats in the north of the area on sheet G4D show no signs of being swampy.

CONCLUSIONS

1. The area is gently undulating except in the south where there are moderately steep slopes. Outcrops are numerous on the steeper slopes but elsewhere are widely scattered.

2. Outcrops over most of the area consist of acid igneous rocks of volcanic origin; the Weetangera Rhyodacite appears to be an extrusive rock but may possibly be intrusive. Some interbedded shale and tuff occurs on Sheet G4C and some siltstone and feldspathic sandstone on Sheet G4D.

3. The age of all rocks in the area is probably Upper Silurian to Lower Devonian. The stratigraphic succession in the north of the area can be established with some certainty, but interpretation of the position of the Weetangera Rhyodacite depends on whether it is intrusive or extrusive in origin.

4. The depth to hard bedrock in the trenches is variable, especially in the Weetangera Rhyodacite. Most commonly soft, completely weathered, material grades down to moderately or highly weathered rock at about 6 feet. Hard rock occurs close to the surface in some places, generally where nearby outcrops are numerous.

5. No unusual foundation problems such as those that occur with cavernous limestone are anticipated. Rock of sufficient strength for foundations of large buildings should be found at depths rarely exceeding 15 feet. Clays in the area are not thought to be expansive enough to cause problems with foundations. However, all sites proposed for major buildings, or structures, should be thoroughly investigated.

6. Possible quarry sites for road and concrete aggregate occur in the south of the area.

7. Decomposed Weetangera Rhyodacite which has the composition and texture of clayey sandy gravel, and which could be used for path surfacing, occurs in the south of the area.

8. Extensive drainage problems are not anticipated. No swamps occur in the area. Some local problems may arise in wet seasons, particularly if garden watering disturbs the natural groundwater regime.

REFERENCES

OPIK, A.A., 1958 - The geology of the Canberra City district. Bur. Miner. Resour. Aust. Bull. 32

WILSON, E.G., 1966 - Preliminary geological investigations of Belconnen areas 5, 6, 7, 8 and 9, Australian Capital Territory. Bur. Miner. Resour. Aust. Rec. 1966/67 (unpubl.).

APPENDIX 1

DEFINITIONS OF TERMS

Weathering

Fresh:	Rock shows no discolouration or loss of strength,
Slightly weathered:	Rock is slightly discoloured and noticeably weakened, but a 2-inch diameter drill core cannot usually be broken by hand across the rock fabric.
Moderately weathered:	Rock is discoloured and noticeably weakened, but a 2-inch diameter drill core cannot usually be broken by hand across the rock fabric.
Highly weathered:	Rock is usually discoloured and weakened to such an extent that 2-inch diameter cores can be broken readily by hand, across the rock fabric. Wet strength generally much lower than dry strength.
Completely weathered:	Rock is discoloured and entirely broken down to an aggregate of particles that has the mechanical property of a soil; the original fabric of the rock is mostly preserved. The properties of the soil depend upon the composition and structure of the parent rock.

Hardness

Hard to very hard:	Impossible to scratch with knife blade.
Moderately hard:	Shallow scratches can be made with a knife blade.
Soft:	Deep scratches can be made with a knife blade.

Strength

Strong to very strong:	Cannot be broken by repeated blows with hammer.
Moderately strong:	Rock breaks after 3 or 4 heavy blows with hammer.
Weak:	Rock breaks after one blow with hammer (includes brittle, fissile, friable, plastic and flaky rocks).

APPENDIX 2

The descriptions included in this appendix are from reports of petrographic examinations of hand specimens and thin sections, by Australian Mineral Development Laboratories, South Australia. Selected specimens, collected during the field and trench mapping, were submitted to A.M.D.L. by the Bureau.

Thin section 69360109 Co-ords E 5000
N 34500
Sheet G4C

Rock Name:
Rhyolite

Hand Specimen:

Pale coloured porphyritic rock similar to other specimens but with a pink groundmass.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Phenocrysts:	
Quartz	10-15
Sanidine	15-20
Altered plagioclase	Trace
Altered ferromagnesians	5-10
Groundmass (mainly potash feldspar)	50-60
Accessory zircon	Minute trace

Quartz phenocrysts vary in size up to 4 mm and are generally embayed and a few contain inclusions of altered ferromagnesian minerals and altered ?plagioclase. Feldspar phenocrysts show varying degrees of alteration.

Iron oxide is more abundant than in many specimens and partly or extensively replaces some ferromagnesian minerals and occurs in irregular patches in the groundmass. Much of it is very fine grained hematite.
The groundmass is composed mainly of intergrown microspherular aggregates of potash feldspar (stained with cobaltinitrite) with a little very fine grained hematite. There are a few minute globules of quartz in places.
A few small zircons are surrounded by red-brown haloes of staining on the groundmass. The rock is patchy and altered but shows no definite evidence to suggest a pyroclastic origin.
It is cut by small veinlets containing quartz and sericite and iron oxide stained chlorite or clay minerals.

History:

Volcanic igneous rock of acid composition.

Thin section 69360110 Co-ords E 6850
N 27600
Sheet G5A

Rock Name:

Porphyritic rhyodacite

Hand Specimen:

Fine grained, grey prophyritic rock with phenocrysts of quartz and white feldspar. Groundmass becomes reddish grey near the weathered surface.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Phenocrysts:	
Quartz	15-20
Plagioclase	30-35
Altered ferromagnesians	15-20
Apatite	Trace
Groundmass:	30-35

A porphyritic rhyodacite similar to previous specimens with the following special features.

Quartz phenocrysts are of very variable size and are mainly embayed and rounded euhedral crystals.

Plagioclase phenocrysts (oligoclase) are extensively altered.

Altered ferromagnesian minerals are of varying composition and shape. The texture of some suggest former biotite and small crystals replaced by green chlorite may have been pyroxene. Others may have been amphibole.

A few larger (3-4 mm) mineral grains with polygonal outline have been replaced by patches and veins of green chlorite surrounding patches of sericite and small aggregates of leucoxene. These grains contain numerous inclusions of apatite and a few small zircons. This association is persistent but its significance is not clear except that some may represent aggregates of an earlier mineral now completely altered.

Rare apatite crystals not included in phenocrysts are larger than in other specimens (up to 0.8 mm).

The groundmass is a cloudy mosaic of potash feldspar and plagioclase with very fine grained chlorite and minor quartz. The texture suggests devitrification. There are very few irregular and pointed fragments or patches composed of chloritic and sericitic minerals and the appearance of some of these is very similar to devitrified glass shards.

There is no apparent lineation or flow structure and apart from the few possible shards which could have been picked up by lava, no other evidence to indicate a pyroclastic origin.

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History:

Acid volcanic rock.

Thin Section 69360111 Co-ords E 2100
N 25600
Sheet G5A

Rock Name:

Rhyodacite

Hand Specimen:

Porphyritic rock containing phenocrysts of quartz and white feldspar in a dark, reddish groundmass.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Phenocrysts:	
Quartz	15-20
Altered plagioclase	25-30
Altered ferromagnesian	15-20
Accessory:	
Apatite	Trace
Zircon	Trace
Groundmass: (quartz and potash feldspar)	30-40

A porphyritic rock in which most of the phenocrysts of quartz, plagioclase and altered ferromagnesian minerals (?biotite) are similar to those in other specimens. Special features in this rock are as follows:

Very fine grained, opaque iron oxide (mainly hematite) is more abundant and much of it partly replaces and outlines altered ferromagnesian minerals. Some occurs as shreds and irregular patches in the groundmass.

The groundmass is composed mainly of potash feldspar and quartz. In some areas microspherules of feldspar form much of the groundmass with quartz in interstices, but in places, very small, globular grains of quartz and/or chlorite are surrounded by microspherular feldspar aggregates.

There are small patches of late or recrystallized quartz filling cavities or interstices in the rock.

Traces of carbonate are associated with seritite replacing some plagioclase.

History:

Acid volcanic rock. Late quartz is slightly more abundant in the groundmass.

Thin section 69360113 Co-ords E 8000
N 21200
Sheet G5D

Rock Name:

Rhyodacite

Hand Specimen:

A grey rock containing abundant phenocrysts of quartz and white feldspar and a few micaceous grains or fragments in a very fine grained groundmass.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Phenocrysts	
Quartz	10-15
Altered plagioclase	25-30
Altered ferromagnesian	10-15
Chloritic fragments and pseudomorphs.	2-3
Rock fragments	Trace
Groundmass (K-feldspar rich)	40-50

Quartz phenocrysts and chips show considerable variation in size (0.4 - 4 mm) and many of the larger ones are embayed and appear corroded.

Plagioclase phenocrysts have been extensively to completely altered to sericite etc. Little trace of twinning remains.

Some ferromagnesian phenocrysts were probably biotite and have been replaced by white mica, chlorite, carbonate, leucoxenic material and traces of epidote.

Others may have been amphibole and a few euhedral crystals and aggregates replaced by chlorite may have been pyroxene. Grains of apatite are included in some former ferromagnesian minerals.
There is no evidence of lineation or flow structure.
The groundmass is mainly a fine grained mosaic of feldspar with minor quartz and shows a typical devitrification texture. It is extensively stained by cobaltinitrite indicating abundant potash feldspar.

History:

Volcanic igneous rock. The phenocrysts are mainly quartz, altered ferromagnesian minerals and the groundmass largely potash feldspar indicating a change in magma composition as crystallization progressed.

Thin Section 69360118 Co-ords E 11000
N 34000
Sheet G4D

Rock Name:

Porphyritic rhyodacite

Hand Specimen:

Very fine grained, dark reddish grey rock with abundant phenocrysts (1-3 mm) of white feldspar and quartz and a few volcanic rock fragments and some of fine grained, grey schist?

Thin Section:

An optical estimate of the constituents gives the following:

	%
Phenocrysts:	
Quartz	15-20
Plagioclase (oligoclase)	20-25
Altered ferromagnesian	10-15
Potash feldspar	Trace
Groundmass	50-60
Accessory:	
Apatite	Trace

Phenocrysts of quartz, feldspar and altered ferromagnesian minerals are of very variable size up to 5 mm and show no preferred orientation.
Quartz phenocrysts are mainly of stumpy crystals embayed or slightly rounded by corrosion.
Plagioclase occurs as single crystals or as aggregates of several grains and some show oscillatory zoning.
Ferromagnesian minerals have been replaced by white mica, iron oxide (hematite) leucoxene and traces of epidote.

History: Volcanic rock which shows evidence of some recrystallization after solidification and has been altered probably by hydrothermal solutions. It has less quartz than other specimens and shows more extensive alteration to epidote and carbonate.

Thin Section 69360119 Co-ords E 10,000 N 32,000 Sheet G4D

Rock Name:

Tuff - probably rhyolitic.

Hand Specimen:

A porphyritic rock containing phenocrysts of quartz, pink and white feldspars up to 5 mm and rare, small rock fragments in a fine grained, reddish groundmass.

Thin Section:

This is a fragmental rock of rather variable texture and composition.

Many fragments are of porphyritic volcanic rock in which feldspar phenocrysts are almost completely altered and the groundmass shows a typical devitrification texture.

There are scattered patches of altered and crumpled mica of doubtful origin.

The rock also contains irregular patches of medium to coarse grained quartz, some of which are probably fragments.

Quartz also occurs along a small vein.

All quartz has been extensively fractured or shattered at some time after consolidation of the rock.

The rock is cut by numerous fine veinlets containing pale brown iron oxide stained ?clay.

Staining with cobaltinitrite indicates abundant potash feldspar in the devitrified groundmass.

History:

Fragmental rock composed of material mainly of volcanic origin but with a few mica schist fragments. It has been fractured or crushed after solidification.

Thin section 69360120 Co-ords E 3,000
N 23,500
Sheet G5C

Rock Name:

Porphyritic rhyodacite

Hand Specimen:

Dark purple, fine grained porphyritic rock containing small phenocrysts of quartz and white feldspar and very few, porous dark rock fragments.

Thin Section:

An optical estimate of the constituents gives the following:

	%
Phenocrysts:	
Quartz	10-15
Altered plagioclase	25-30
Altered ferromagnesian	10-15
Volcanic rock fragment	1-2
Chloritic fragments and Pseudomorphs	1-2
Accessory:	
Zircon	Minute Trace
Apatite	Minute Trace
Groundmass:	45-50

Embayed and rounded phenocrysts of quartz, subhedral crystals of cloudy, sericitized plagioclase, elongate crystals or flakes of completely altered biotite or amphibole and a few small chloritic pseudomorphs after ?pyroxene are surrounded by a very fine grained groundmass which is extensively stained by cobaltinitrite indicating abundant potash feldspar.
There are a few vesiclues or amygdales lined or filled with minor carbonate, ?prehnite and chlorite or clay minerals.
Some small irregular cavities have been filled with chlorite.
Quartz crystals show hexagonal and stumpy prismatic form and many have been fractured. Fragments of some fractured grains have been displaced indicating tectonic deformation.
Former biotite or amphibole has been completely replaced by iron oxide (hematite) sericite and leucoxene or sphene. Subparallel orientation of some of these crystals suggests flow structure in places.

A rock fragment included in the section contains traces of a more basic plagioclase, patches of secondary carbonate, altered amphibole or pyroxene crystals and rare apatite all surrounded by green, chlorite with a little iron oxide staining.

This fragment has a more basic composition than the enclosing rock and may have been torn out, or picked up by the moving lava or magma.

Zircon and apatite grains occur as small (to 0.15 mm) fractured (zircon) or rounded and embayed (apatite) grains in the groundmass. Apatite is also included in the ferromagnesian mineral and most grains have a smoky core.

Some are partly altered around the boundary and have traces of iron oxide.

History:

Volcanic igneous rock. There is no textural evidence to suggest that this is of pyroclastic origin.

APPENDIX 3

NOTE ON STRATIGRAPHIC TERMS

The names "Weetangera Rhyodacite" and "Stromlo Volcanics", which are used in this report, have been reserved in the stratigraphic index but have not yet been formally defined and approved. For the purposes of this report the Stromlo Volcanics are defined as a sequence of acid volcanics more than 3000 feet thick which overlies the Yarralumla Formation, probably conformably. As far as is known the Stromlo Volcanics in the Belconnen area consist of the following units, from the top:-

Rhyolite	500 ft. + thick
Grey rhyodacite	0-300 ft "
Rhyolite tuff	0-300 ft "
Air-fall tuff and tuffaceous shale	600 ft + "
Purple rhyodacite	1200 ft + "

The age of the rocks is Upper Silurian, probably extending into the Lower Devonian at the top of the succession. The lower limit for the age is fixed by the Upper Silurian Yarralumla Formation. The upper limit is in some doubt, however, owing to the absence of fossils which can be dated accurately. Other rock units other than those listed above may occur in the sequence. The faulting, which occurs in the area, makes the stratigraphy difficult to interpret, and some parts of the sequence may not be exposed. Erosion could have removed rocks younger than the rhyolite which occurs at the apparent top of the sequence. The rocks identified as belonging to the Stromlo Volcanics in the Belconnen area occur along Ginninderra Creek west of the Deakin Fault (37,000 N, 00-13,000E - Stromlo co-ordinates).

The Weetangera Rhyodacite is a porphyritic lava flow, or possibly a densely welded porphyritic tuff, which overlies the Stromlo Volcanics unconformably (an intrusive origin for the rock has been considered but is thought unlikely on petrological grounds). If extrusive it is at least 300 and possibly as much as 1500 feet thick. The age of the rock is uncertain but it is most likely to be Lower Devonian. It is possibly the same age as the Ainslie Volcanics but a direct correlation is withheld because of lithological differences. Typical exposures of the rock occur on the hill south of the suburb of Weetangera (20,000 N, 12,000 E - Stromlo co-ordinates).

GEOLOGY OF PART OF BELCONNEN AREA

PLATE 1

SCALE

0 1/4 1/2 3/4 1 Mile

12°

Magnetic North

True North

REFERENCE

QUATERNARY	Qa		Alluvium	
LOWER DEVONIAN?	Dl		Grey-green rhyodacite	"WEETANGERA RHYODACITE"
UPPER SILURIAN TO LOWER DEVONIAN	Svh		Rhyolite and rhyolite tuff	"STROMLO VOLCANICS"
	Svf		Rhyolite tuff	
	Svd		Purple and pale green tuff	
	Svc		Purple rhyodacite	
	Sv		Purple rhyodacite	
UPPER SILURIAN	Suy		Siltstone and feldspathic sandstone	YARRALUMLA FORMATION

—?— Fault, inferred

——— Geological boundary, position accurate

– – – Geological boundary, position approximate

34 Dip and strike of bedding

Outcrop, group of outcrops, or area of numerous outcrops; includes areas in Higgins, Scullin & Page where bedrock temporarily exposed by trenching

Road or proposed road

Creek

15 Neighbourhood area; boundaries indicated by roads shown

G4C 200 feet : 1 inch sheet number

Grid based on Stromlo datum

Contours show height above mean sea level

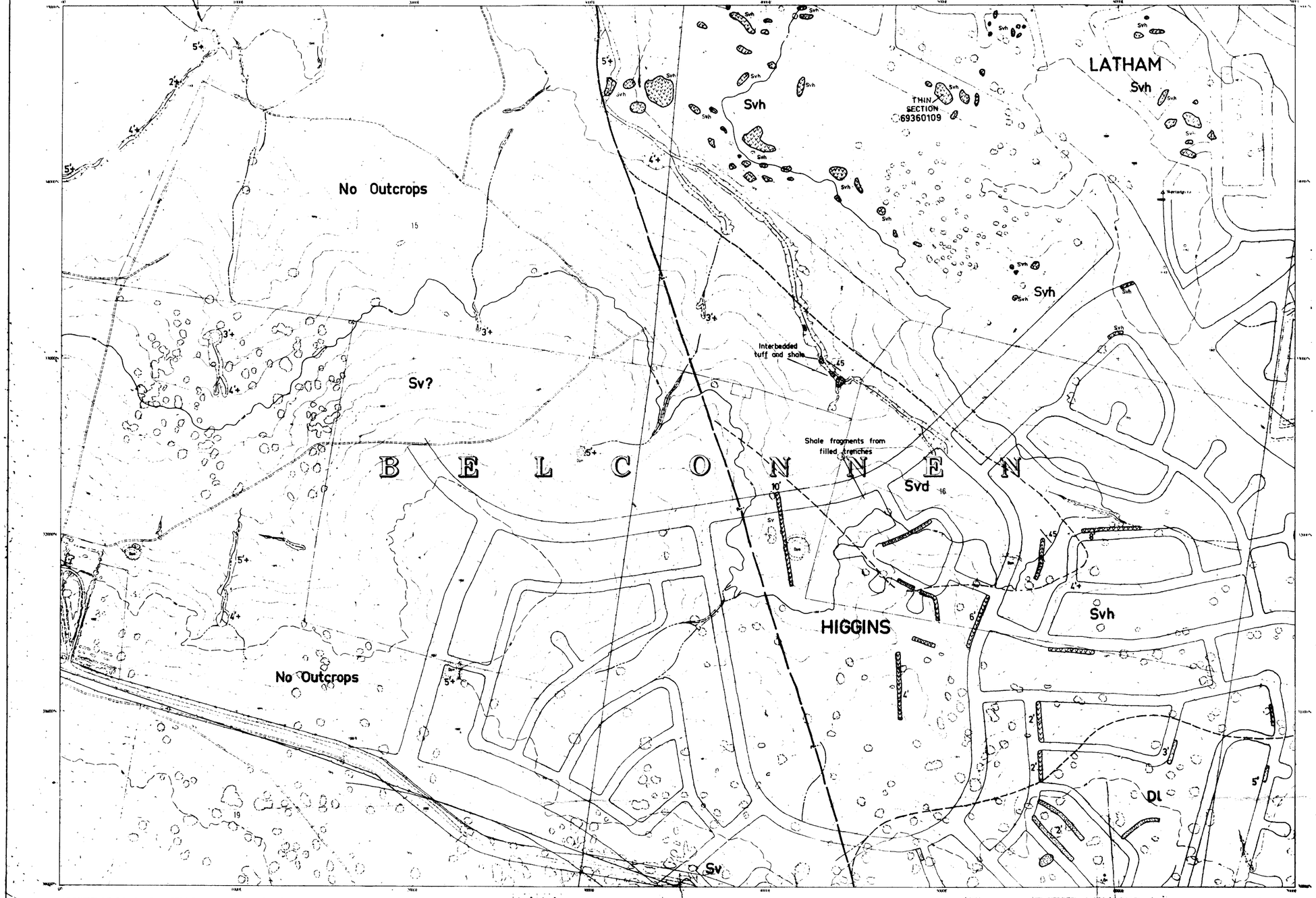
Record 1970/60

Bureau of Mineral Resources, Geology and Geophysics, January 1969 I55/A16/637

PLATE 2

GEOLOGY OF BELCONNEN
SHEET G4C

Geology by J. Bein, B. Stevens & G. Henderson



LOWER DEVONIAN? Dl — Grey-green rhyodacite – "Weetangera Rhyodacite"

UPPER SILURIAN TO LOWER DEVONIAN — "Stromlo Volcanics"

- Svh — Rhyolite
- Svd — Purple tuff / Pale green tuff
- Sv — Purple rhyodacite

- Geological boundary, position approximate
- Fault, inferred
- Dip and strike of bedding
- Outcrop
- Temporary exposure of bedrock in trench
- 5' — Depth to bedrock in gully or trench
- 5+ — Depth of gully or trench, no bedrock exposed

AUSTRALIAN CAPITAL TERRITORY
DETAIL SERIES

Detail plotted from aerial photography on Wild A8 Stereoplotter

Date of photography May 1969

Co-ordinates are in feet with origin at Stromlo Trig. Station

INDEX TO ADJOINING SHEETS

SCALE

Compiled and Drawn by the Survey Branch, Dept. of the Interior, Canberra, A.C.T.

G4C
FIRST EDITION

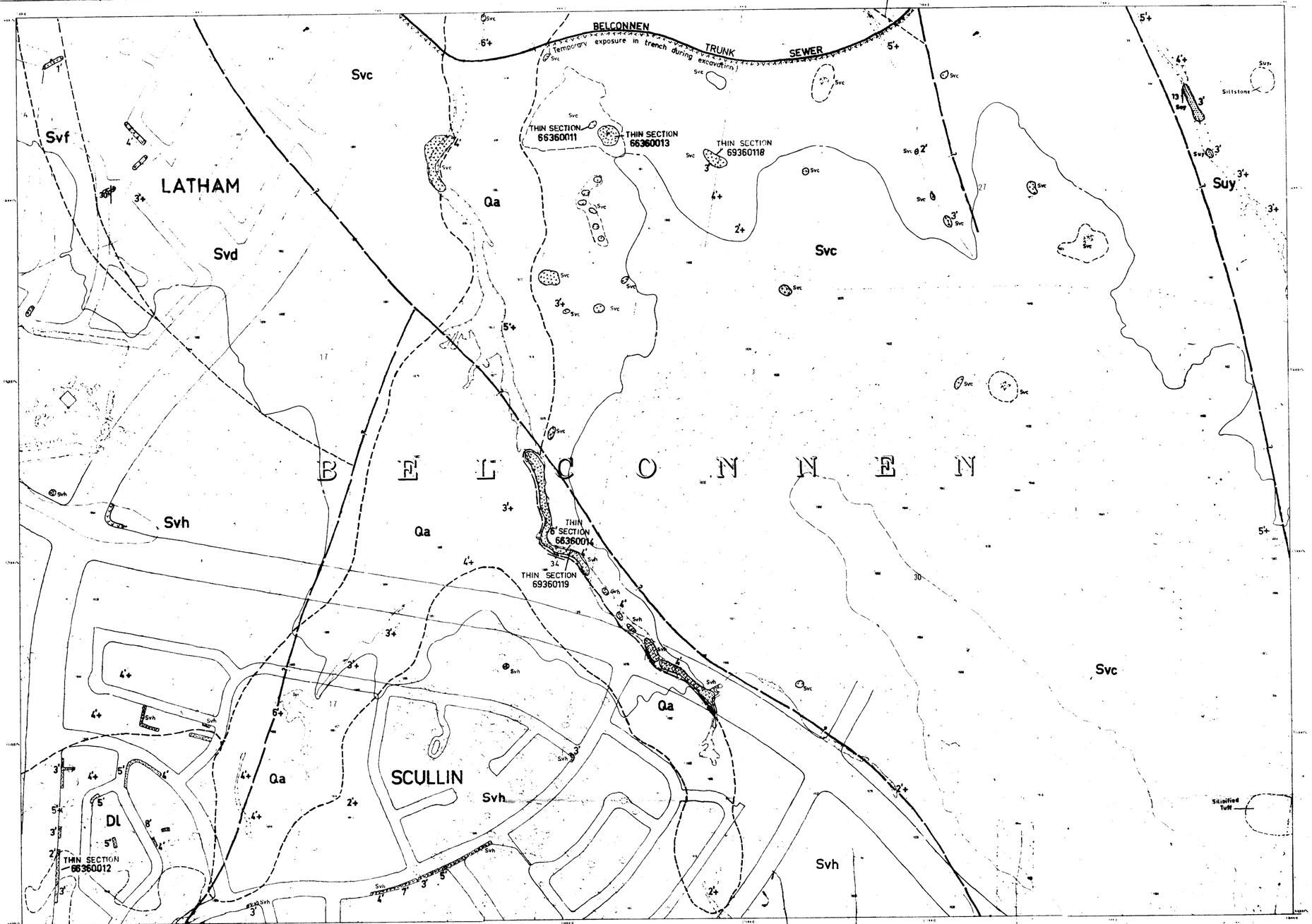
To accompany Record 1970/60

Bureau of Mineral Resources, Geology and Geophysics, December 1969 1965/A16/638

PLATE 3

GEOLOGY OF BELCONNEN SHEET G4D

Geology by W. Matthews, R. Fountain, D. Dyer & G. Henderson



QUATERNARY Qa — Alluvium

LOWER DEVONIAN? Dl — Grey-green rhyodacite – "Weetangera Rhyodacite"

UPPER SILURIAN TO LOWER DEVONIAN — "Stromlo Volcanics"

- Svh — Rhyolite and rhyolite tuff
- Svf — Rhyolite tuff
- Svd — Purple tuff, Pale green tuff
- Svc — Grey-green rhyodacite, Purple rhyodacite

UPPER SILURIAN Suy — Feldspathic sandstone, Siltstone – Yarralumla Formation

Geological boundary, position approximate

Dip and strike of bedding

Fault, inferred

Outcrop — Scattered outcrops

Temporary exposure of bedrock in trench

5' Depth to bedrock in gully or trench

5+ Depth of gully or trench, no bedrock exposed

AUSTRALIAN CAPITAL TERRITORY
DETAIL SERIES

SCALE

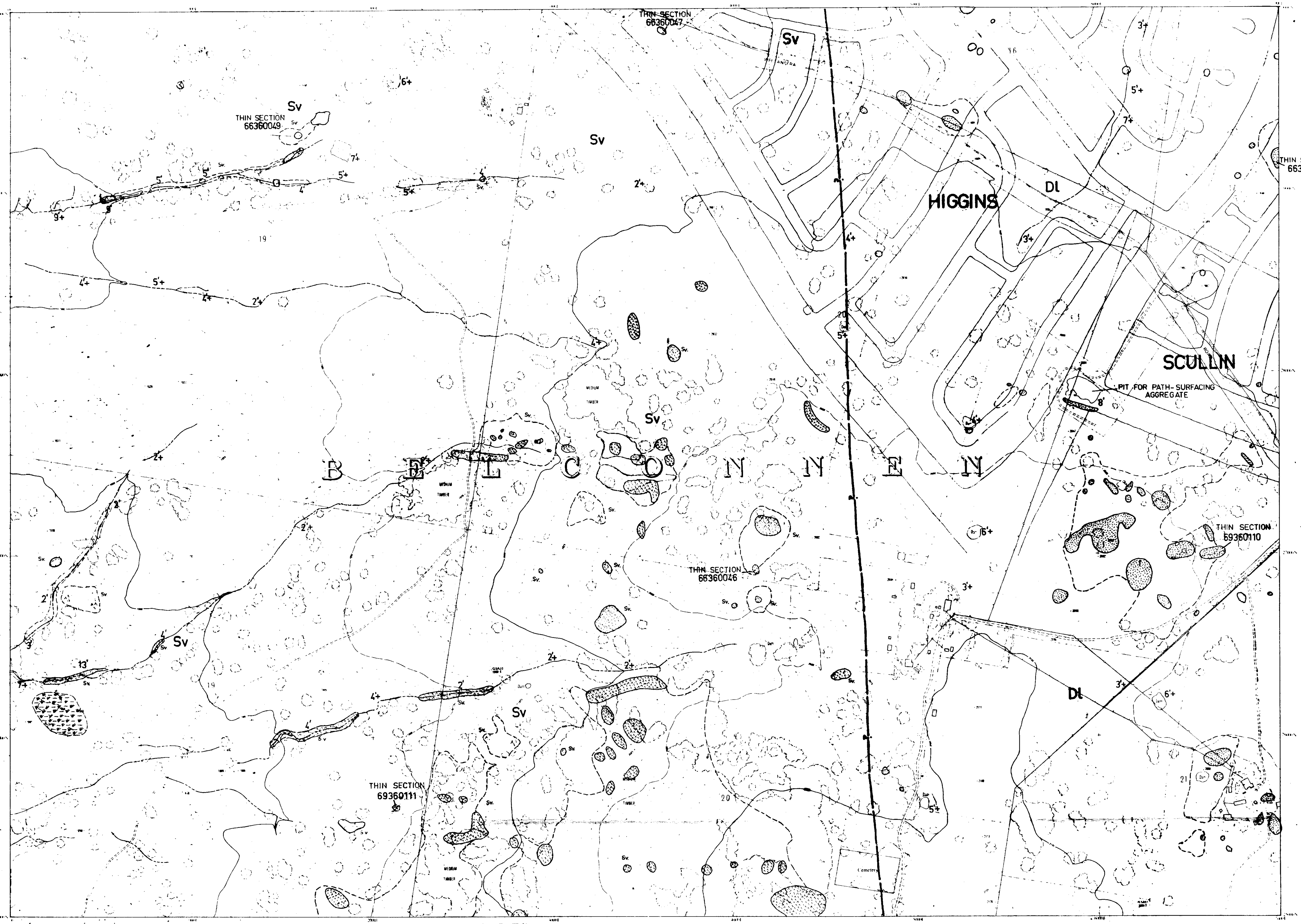
G4D

To accompany Record 1970/60

Bureau of Mineral Resources, Geology and Geophysics, December 1969 155/A16/639

GEOLOGY OF BELCONNEN
SHEET G5A

Geology by J. Bein, B. Stevens & G. Henderson



AUSTRALIAN CAPITAL TERRITORY
DETAIL SERIES

INDEX TO ADJOINING SHEETS

SCALE

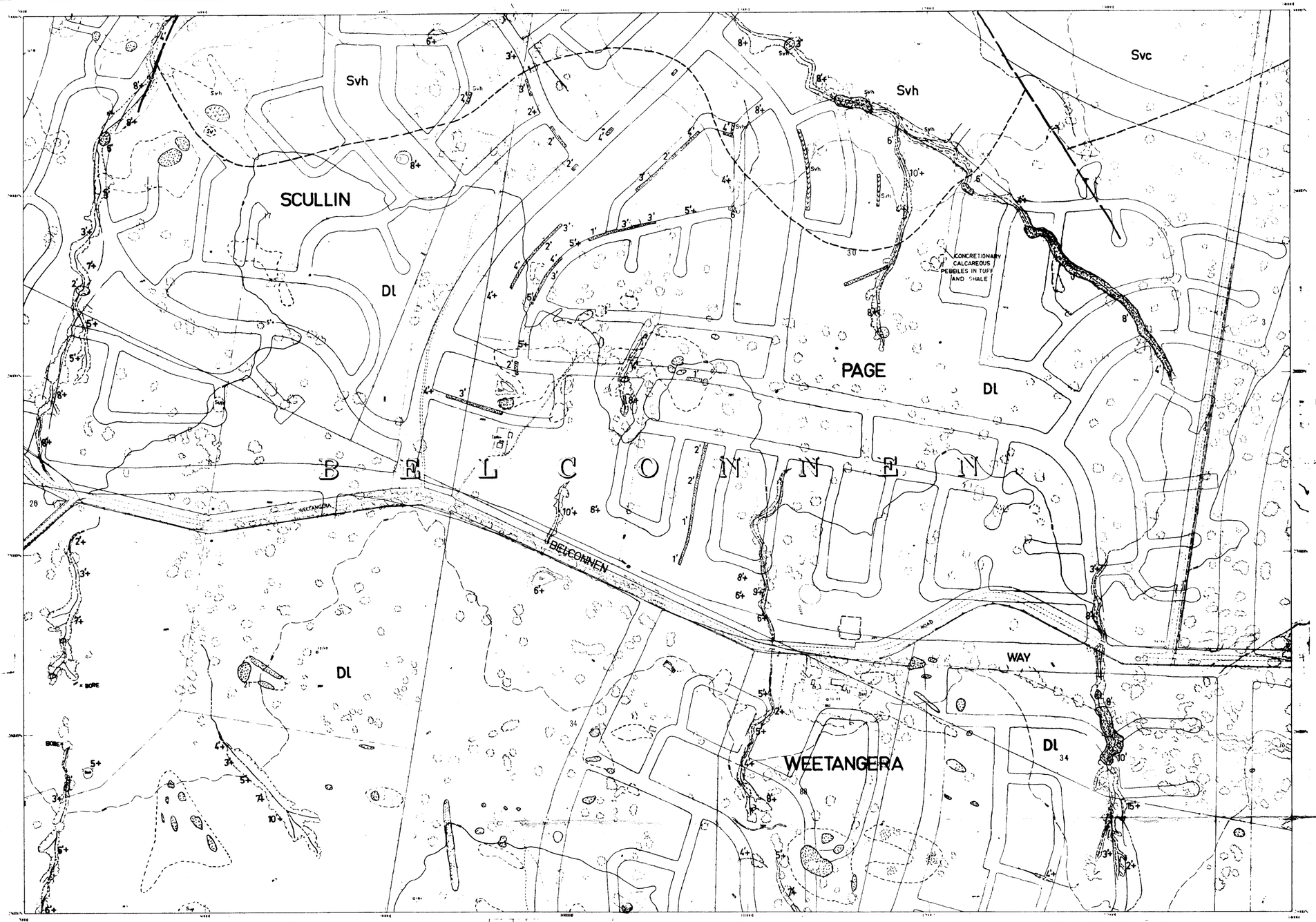
G5A

LOWER DEVONIAN? Dl		Grey-green rhyodacite - "Weetangera Rhyodacite"
UPPER SILURIAN TO LOWER DEVONIAN Svh		Rhyolite — "Stromlo Volcanics"
UPPER SILURIAN TO LOWER DEVONIAN Sv		Purple rhyodacite — "Stromlo Volcanics"
——?——		Fault, inferred
		Outcrop; Scattered outcrops
		Boggy area in wet season
5'		Depth to bedrock in gully
5'+		Depth of gully, no bedrock exposed

To accompany Record 1970/60

Bureau of Mineral Resources, Geology and Geophysics, December 1969 I55/A16/640

PLATE 5



GEOLOGY OF BELCONNEN SHEET G5B

Geology by W. Matthews, R. Fountain, D. Dyer & G. Henderson

LOWER DEVONIAN?	Dl	Grey-green rhyodacite - "Weetangera Rhyodacite"	
UPPER SILURIAN TO LOWER DEVONIAN	Svh	Rhyolite tuff	"Stromlo Volcanics"
	Svc	Purple rhyodacite	

Geological boundary, position approximate

Fault, inferred

Outcrop — Scattered outcrops

Temporary exposure of bedrock in trench

5' Depth to bedrock in gully or trench

5'+ Depth of gully or trench, no bedrock exposed

AUSTRALIAN CAPITAL TERRITORY
DETAIL SERIES

Detail plotted from aerial photographs on Wild A8 Stereoplotter

Date of photography June 1961

Co-ordinates are on Map with origin at Belcon Trig Station

INDEX TO ADJOINING SHEETS

SCALE

Compiled and Drawn by the Survey Branch, Dept. of the Interior, Canberra A.C.T.

G5B
FIRST EDITION

To accompany Record 1970/60

Bureau of Mineral Resources, Geology and Geophysics, December 1969 155/A16/641

GEOLOGY OF BELCONNEN SHEET G5C

Geology by W. Matthews, R. Fountain, D. Dyer & G. Henderson

LOWER DEVONIAN?	Dl	Grey-green rhyodacite – "Weetangera Rhyodacite"
UPPER SILURIAN -LOWER DEVONIAN	Sv	Purple rhyodacite – "Stromlo Volcanics"

Geological boundary, position approximate

Fault, inferred

Outcrop

Scattered outcrops

5' Depth to bedrock in gully

5'+ Depth of gully, no bedrock exposed

AUSTRALIAN CAPITAL TERRITORY
DETAIL SERIES

SCALE

REFER TO ADJOINING SHEETS

G5C

To accompany Record 1970/60

Bureau of Mineral Resources, Geology and Geophysics, December 1969 155/A16/642

PLATE 7

GEOLOGY OF BELCONEN SHEET G5D

Geology by J. Bein, B. Stevens & G. Henderson

LOWER DEVONIAN? DL — Grey-green rhyodacite – "Weetangera Rhyodacite"

Outcrop — Scattered outcrops

Boggy area in wet season

5' Depth to bedrock in gully

5'+ Depth of gully, no bedrock exposed

AUSTRALIAN CAPITAL TERRITORY CONTOUR SERIES

DATE OF MAP DEC 1960
APRIL 1964 Date of Photography, May 1961

SCALE

FEET 500 0 500 1000 1500 2000 2500 3000 FEET

Drawn by Lands & Survey Branch, Dept of the Interior, Canberra, A.C.T.

KEY TO ADJOINING SHEETS

G5D

To accompany Record 1970/60

Bureau of Mineral Resources, Geology and Geophysics, December 1969 155/A16/643