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INVESTIGATION FOR SOURCES OF ROAD AGGREGATE, CORIN DAM AND TIDBINBILLA ROADS AREA A.C.T., 1970

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SUMMARY

Nineteen sites in the Corin Dam and Tidbinbilla Roads area were investigated for road aggregate for surfacing Tidbinbilla, Paddys River and Corin Dam Roads, in the Australian Capital Territory (A.C.T.). The area is mostly underlain by granitic rocks of the Murrumbidgee Batholith, which crop out as prominent tors and boulders on hills and steep slopes. On lower slopes the granite is deeply weathered, and deposits of alluvium and colluvium are common. The granite intrudes Ordovician and Silurian sedimentary rocks.

Most of the sites, which were investigated by visual inspection and hand augering, appeared either too small or to contain unsuitable material. However, it is considered that deeper augering may have revealed suitable material at some of the sites. Site 9, which was the only suitable site found, was rejected by the Department of the Interior because of the proximity to an experimental pine plantation. It is recommended that further exploration be carried out to find material similar to that in Site 9.

Note - This report was edited after the resignation of Miss Rosenberg and some of the views expressed are those of the editor in consultation with other members of the Engineering Geology Sub-section.

INTRODUCTION

In June 1970 the Bureau received a request, from the Department of the Interior and the Department of Works, to locate sites where pits may be opened to provide aggregate suitable for the maintenance and reconstruction of rural roads in the A.C.T. This report deals with the search for aggregate in the Corin Dam Road and Tidbinbilla Road area (Fig. 1), for surfacing the Tidbinbilla, Paddys River, and Corin Dam roads. For the nature of the material required see Kellett and Van den Broek (1971).

The brief for the investigation stipulated that the pits should be within a 4 km (2.5 mile) radius of the road-works, and that they should be accessible from existing roads. It was also required that pits should be neither located on freehold land nor readily visible from roads or public areas.

Colour aerial photographs at a scale of 1:22,500, taken in 1968, were used for both preliminary and detailed investigation. The boundaries of freehold blocks were transferred to overlays of the photos to eliminate them from the investigations. During photo-interpretation areas of rock outcrop were also eliminated on the overlays, and some areas, that appeared suitable because of the slope of the ground and favourable drainage conditions, were marked for investigation; the prospective areas included some areas with accumulations of slope-wash and scree.

GEOLOGY

The general geology of the area is shown on the 1:250,000 Canberra Geological Sheet (second edition, 1964). The area investigated lies within the Murrumbidgee Batholith; the batholith is a composite granitic rock body, but the rock will be referred to in the report simply as granite. The granite, which is of Siluro-Devonian age, intrudes Ordovician and Silurian sedimentary rocks which consist of sandstone and shale, metamorphosed to quartzite and schist close to the contact with the granite.

The granite forms typical tors on the summits of the hills and crops out most commonly above an altitude of about 1000 m (3250 feet). Rounded floaters are common and may reach 5 m (16 feet) across; but few are larger than one to two metres. Outcrops of the granite displayed variations in grainsize and also in composition (indicated by the amount and type of mica).

Below about 1000 m the granite appears to be deeply weathered, and deposits of alluvium and colluvium are common. Rounded low hills occur east of Paddys River Road and north of Tidbinbilla Road. Colluvium and alluvium lie in the valleys between these hills, and can be seen in the banks of the creeks, which run northeast into Paddys River. The creeks are cutting down into alluvium, in which some interbedded colluvium can be seen as layers of fine and coarse material. The finer layers consist of silty clay with some sand-size particles; the coarser are gravel with some sand and silt-sized material.

The fragmental material probably accumulated in outwash fans and colluvial deposits in the early Pleistocene Epoch. In the warmer periods these deposits were modified by soil formation, with the development of clayey illuvial horizons, and by erosion. Cyclic climatic changes resulted in the deposition of successive layers of detritus; these in turn were modified locally by erosion and deposition of other sediments. Erosion gullies that have developed in historical times have exposed the layered deposits at some localities - for example at sites 10, 11, and 16 (Pl. 2).

The slopes are covered with vegetation - pasture on the lower slopes and eucalypt forest above - which protects them from erosion; soil creep is seen on some of the steeper slopes that have been cleared.

FIELD INVESTIGATIONS

The field investigations started at sites 1, 2, 3, and 5 (Fig. 2), which were selected from the aerial photographs. Later, other sites were examined. Samples were taken by hand augering* and also from cuts beside the forestry tracks. Sites 7 and 9 were sampled to a depth of 2.4 m (8 feet) using a back-hoe. The sites were investigated in the approximate order in which they are numbered. All the sites are located on granite except sites 17 and 19, which are on sedimentary bedrock.

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*Hand augering severely restricted the ability to test and sample deposits. A mechanical (auger) with a barrel to recover undisturbed samples for laboratory testing is desirable for future operations. The mechanical (auger) permits more adequate testing of the deposits, not only because deeper material can be tested more rapidly, but also because the geologist can examine in more detail a thicker profile and determine the regional weathering patterns.

Grainsize was estimated visually, and plasticity by feel. This procedure enabled the recognition of areas which seemed likely to warrant further, more detailed investigation; other areas where the material was too fine or too plastic for road aggregate were rejected.

RESULTS

Brief descriptions of sites 1 to 12 and results of augering are given in Table 1. Notes on additional sites (13 to 19) are presented below.

Table 1. DETAILS OF SITES INVESTIGATED

SITE NO.		INTERVAL metres	INTERVAL feet	DESCRIPTION	COMMENT
1a	i	0-0.5	0-1.7	Site in dry creek bed; thin covering of grass, but below this, very wet with fine clay-silt material which was non cohesive.	Too wet to sample below 0.5 m.
1a	ii	0-0.225	0-0.75	Top soil	Two holes augered on east side of track. An aplite dyke runs across the track in a direction of 113°. It is about 0.75 m (2 ft 2 ins) thick. It was hoped that if this proved extensive, it would provide the larger fragments required by the specifications, and compensate for the rather fine nature of the weathered granite.
&	iii	0.225-0.5	0.75-1.7	Very weathered granite, with sand and fine gravel-sized particles and biotite mica.	
1a	iv	0-0.225	0-0.75	Top soil	Two holes augered on the west side of the track about 10 m (33 ft) up the hill. The dyke was not as extensive as hoped and the granite contains too much mica and is too weathered to be suitable.
&	v	0.225-0.75	0.75-2.2	Weathered granite, with sand and gravel-sized particles of quartz. Patches of clay, but also patches of non-plastic material.	
1b	i	0-0.225	0-0.75	Top soil	This hill slope to the west of the track was considered promising because of the slope of the land and lack of outcrop; but the augering disclosed a perched water table at a depth of 0.5 m (1.7 ft) below the surface. The clay allowed the water to penetrate to only a shallow depth, although the clay itself was very wet and incohesive in the lower part of the hole.
		0.225-1	0.75-3.2	Thick heavy orange-grey clay with sand-sized particles of quartz.	
	ii	0-0.225	0-0.75	Top soil	
		0.225-1.28	0.75-4	Thick heavy orange-grey clay with sand-sized particles of quartz.	

Table 1 (cont.)

SITE NO.	INTERVAL metres	INTERVAL feet	DESCRIPTION	COMMENT
2	0-0.225	0-0.75	Top soil	Two holes were augered on the slope of the hill. The material encountered contains too much clay and mica to be suitable for road material.
	0.225-0.75	0.75-2.2	Fine gravel, sand and clay-sized particles with biotite mica.	
3a	0-0.225	0-0.75	Top soil	This site is close to the road, although some 1600 cu m (2000 cu yds) could have been extracted without being too unsightly. The material is not suitable for the requirements because of the large amount of biotite and the extreme weathering.
	0.225-0.75	0.75-2.2	Deeply weathered rock containing sand-sized particles; very few gravel particles. Considerable biotite.	
3b	0-0.225	0-0.75	Top soil	Too much clay and too fine.
	0.225-0.7	0.75-2.0	Sand-sized particles for the most part, with clay and mica.	
4	0-0.225	0-0.75	Top soil	This is a westward facing slope on the east side of the track which appeared promising because of the coarse quartz, up to 0.15 m (5½ ins) across, lying on the surface. Augering proved that this was merely a surface phenomenon, due to the removal of the finer particles by rain water.
	0.225-0.295	0.75-1.3	Angular quartz fragments (0.075-0.125 m) with some sand-sized particles.	
	0.295-1.25	1.3-4.0	Sand-sized particles and deeply weathered rock	
5 i	0-0.15	0-0.5	Top soil	Thin soil cover only owing to the use of bulldozers in clearing natural eucalypt forest. Recently planted with radiata seedlings.
	0.15-0.7	0.5-2.0	Wet and sandy with some rock fragments.	

Table 1 (cont.)

SITE NO.	INTERVAL metres	INTERVAL feet	DESCRIPTION	COMMENTS
ii	0-0.225	0-0.75	Top soil	It was impossible to proceed with the augering at this depth because of a rock fragment which completely blocked the hole.
	0.225-0.35	0.75-1.0	Grey sandy gravel material with angular to sub-rounded quartz fragments, up to .03 m across.	
iii	0-0.225	0-0.75	Top soil	
	0.225-0.66	0.75-2.4	Grey sandy gravel material with quartz fragments up to 0.05 m (2 inches) across.	
	0.66-1.0	2.4-3.1	Yellow sandy gravel material with rock and quartz fragments.	
iv	0-0.225	0-0.75	Top soil	The promising surface indications were not fulfilled by the results of augering in this area (5), because of the presence of clay which occurred both as lumps in the sandy gravel and as layers. Later discussions with Department of Works indicated that this site would be too high up the slope to be worked economically in any case.
	0.225-0.4	0.75-1.1	Grey sandy clay containing free water.	
	0.4-0.66	1.1-2.4	Orange sandy clay	
	0.66-0.8	2.4-2.5	Clay lumps in orange sand	
	0.8-1.2	2.5-4.0	Orange-grey sandy clay	
6	0-0.225	0-0.75	Top soil	This is a southeast facing slope; wet with seeps at the surface and feedy type grass. The augering was done as it was hoped that the clay would prove to be only a thin surface layer, but this was not the case.
	0.225-0.66	0.75-2.4	Yellow-grey clay and sand which becomes more clayey and wetter with increasing depth, with fine sand-sized particles.	

Table 1 (cont.)

SITE NO.	INTERVAL metres	INTERVAL feet	DESCRIPTION	COMMENTS
7	0-0.225	0-0.75	Top soil	This southwest-facing slope is covered in white angular quartz fragments from 0.025-0.20 m across. The rock in this area is much finer grained and could be called a micro-granodiorite. This would account for the finer grain size of the quartz from this hole.
	.225-0.8	0.75-2.5	Yellow brown fine sandy material slightly clayey at top.	
	0.8-1.0	2.5-3.1	Paler but similar in grain-size and texture to the material above. A large piece of rock, or solid rock obstructed the augering at a depth of 1 m.	
8	0-0.8	0-2.5	Non-plastic sandy gravel	At this site the road is cut into the north-facing slope, leaving a bank about 0.8 to 1.0 m high. The auger hole was put down at the bottom of the scoured ditch. It is likely that the water running down the ditch had washed out the finer clay and silt-sized particles. This site lies above the experimental plot and the same restrictions would apply as at site 9 (vid. inf.)
9	Examination of cut alongside track		The material consists of deeply weathered granite. In contrast to all other areas investigated the dominant mica is muscovite. This is a potassium rich granite containing kaolin in a 'non-plastic' clay. This material has a very white appearance, in contrast with other deposits which are stained orange-brown by iron released from biotite by weathering.	This is an eastward facing slope and the track is cut in to the side of the hill to a depth of about 1.5 m (5 feet). The weathered material is bounded to the north-northeast by a shelf or ridge of outcropping rock. A sample from the cut was tested by Department of Works. The results of this test indicated a deeper investigation than could be obtained by the 5-foot (1.5 m) auger should be carried out. A back-hoe was used to dig test holes to a depth of 2.45 m (8 feet). The homogeneous nature of the material was proved.

Table 1 (cont.)

SITE NO.	INTERVAL metres	INTERVAL feet	DESCRIPTION	COMMENTS
				Weathering has broken down the boundaries of the crystal so that though still appearing fairly solid the 'rock' can be broken down into its individual components by simple movement of the material in the hands. The quartz crystals are about 0.01-0.07 m (2/5-1 1/5 ins) across; the clay is kaolin maturing and the material virtually non-plastic. This was the only suitable non-plastic material found and was estimated to contain 8,000 cu yds (6,2000 cu metres) which was the required amount to meet the immediate need of Department of Works. However, this site is adjacent to, and up slope from, an experimental area which has been planted with test strains of Pinus radiata. The experimental plot would almost certainly be damaged by spoil from a pit at this site.
10	Examination of creek bank		The lower slopes of a steeply sloping bank that extends from the track to the creek contain deposits of gravelly material, which is fairly localized in the creek banks and represents an earlier period of deposition filling this steep sided valley. These deposits are now being eroded. The gravelly material is fairly plastic because of layers of clay, although some bands are fairly non-plastic.	It would be impossible to work the bands separately, and it would be difficult to remove on a commercial scale due to the difficulty of access for large machinery.

Table 1 (cont.)

SITE NO.	INTERVAL metres	INTERVAL feet	DESCRIPTION	COMMENTS
11	Examination of creek bank			A similar situation to that at site 10 exists here, with a local infilling of gravelly material in a steeply sloping valley. The material was suitable in places for use as a road-gravel but the deposit is too difficult of access and too small to be worth working.
12	0-0.225	0-0.75	Top soil	At this locality a knoll rises quite steeply above the road; an outcrop of solid rock forms its summit. An examination of the outcrop showed that the granite was fairly free from biotite in some places but rich in others. It was hoped that augering might disclose the weathering of a biotite poor zone, but this was not so.
	0.225-1.0	0.75-3.1	Weathered granite, rich in biotite; it is rather fine; sand-sized particles with clay.	

Site 13. Ten auger holes were put down to depths ranging from 0.7 m -1.5 m (2.2-5 feet). On the lower slopes of this bank, i.e. towards the west, up to 1.5 m (5 feet) of gravelly material was found, immediately below the top soil. However, water was encountered in the lower part of the hole. Other holes encountered only thin layers of non-plastic material with layers rich in clay and the material became very thick and clayey farther to the north at the eastward turn of the fence line.

Sites 14, 15, 16. These areas can be treated as one unit. They consist of gently undulating hills with incised creeks. It was hoped that these rounded hills would provide good sources of well-drained and therefore non-plastic material. The banks were examined and auger holes put down on the hills.

The augering showed that although the upper 0.3-0.7 m (1-2.2 feet) below the top soil is gravelly and well drained, thick clay exists below this to a depth of at least 1.3 m (4 feet). The examination of the creek banks confirms this.

Site 17. The track which leads northwards from "Miowera" crosses a creek in the bank of which are exposed deposits of material derived from the weathering and break up of the silicified shale and sandstone/quartzite of the roof pendants. The deposit is nonhomogeneous; it consists of layers of blocky sedimentary fragments and interposed fossil soils. The soils are fine and tend to be clayey. The deposit is unsuitable for use as road aggregate.

Site 18. Auger holes were drilled to depths of from 0.7-1.5 m (2.2-5 feet) along the side of a hill just below the junction of the roof pendant with the underlying granite. In nearly all cases about 0.3-0.5 m (1-1.5 feet) of 'washed' sandy gravel was found immediately below the top soil. The material appeared to be of suitable quality but the deposit is too thin to be worked economically and it rests on a layer of heavy clay.

Site 19. 1.5 m (5 feet) of washed sandy gravel is deposited in the valley, which lies directly below, i.e. south-west of the sediment/granite boundary. The creek, which flows only intermittently is incised into the deposits to a depth of about 0.5-1 m (1.5-3 feet). The deposits are too small, both in depth and area, and not accessible enough to be worked. It would supply small quantities of sandy gravel suitable for use on the property.

CONCLUSIONS

1. Sufficiently large deposits of material suitable for road aggregate were not proved in the area investigated, except at site 9.

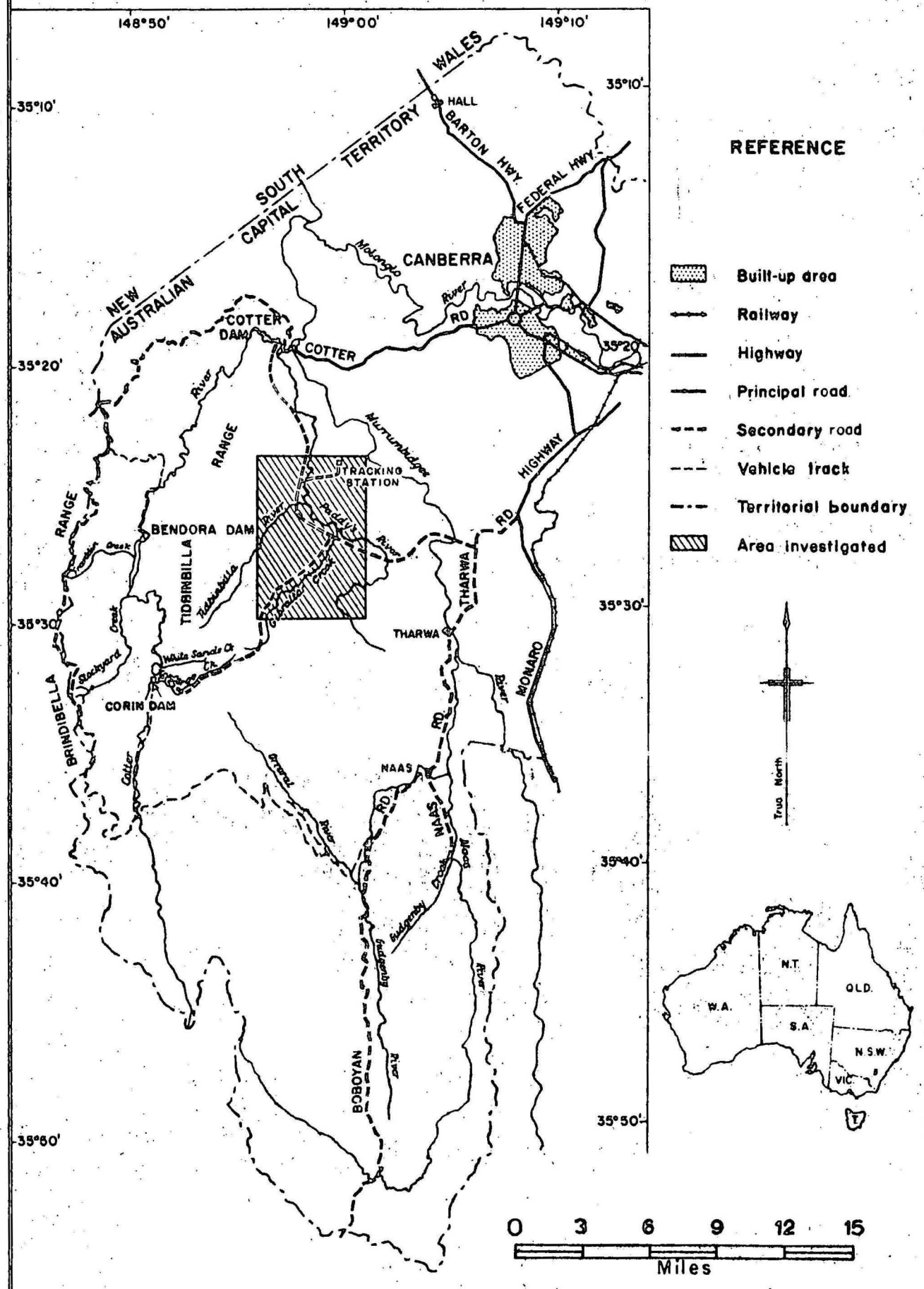
2. Site 9 contains suitable material but is not acceptable to the Department of the Interior because of the proximity of the experimental pine plantation. The nature of the original granite in this deposit and the type of weathering affecting it should, however, act as a guide for further exploration in this region.

REFERENCE

KELLETT, J.R., & Vanden BROEK, P.H., 1971 - Report on the proposed gravel pit, Block 12, Hall District, A.C.T. Bur. Miner. Resour. Aust. Rec. (in prep.).

FIGURE 1

LOCALITY MAP



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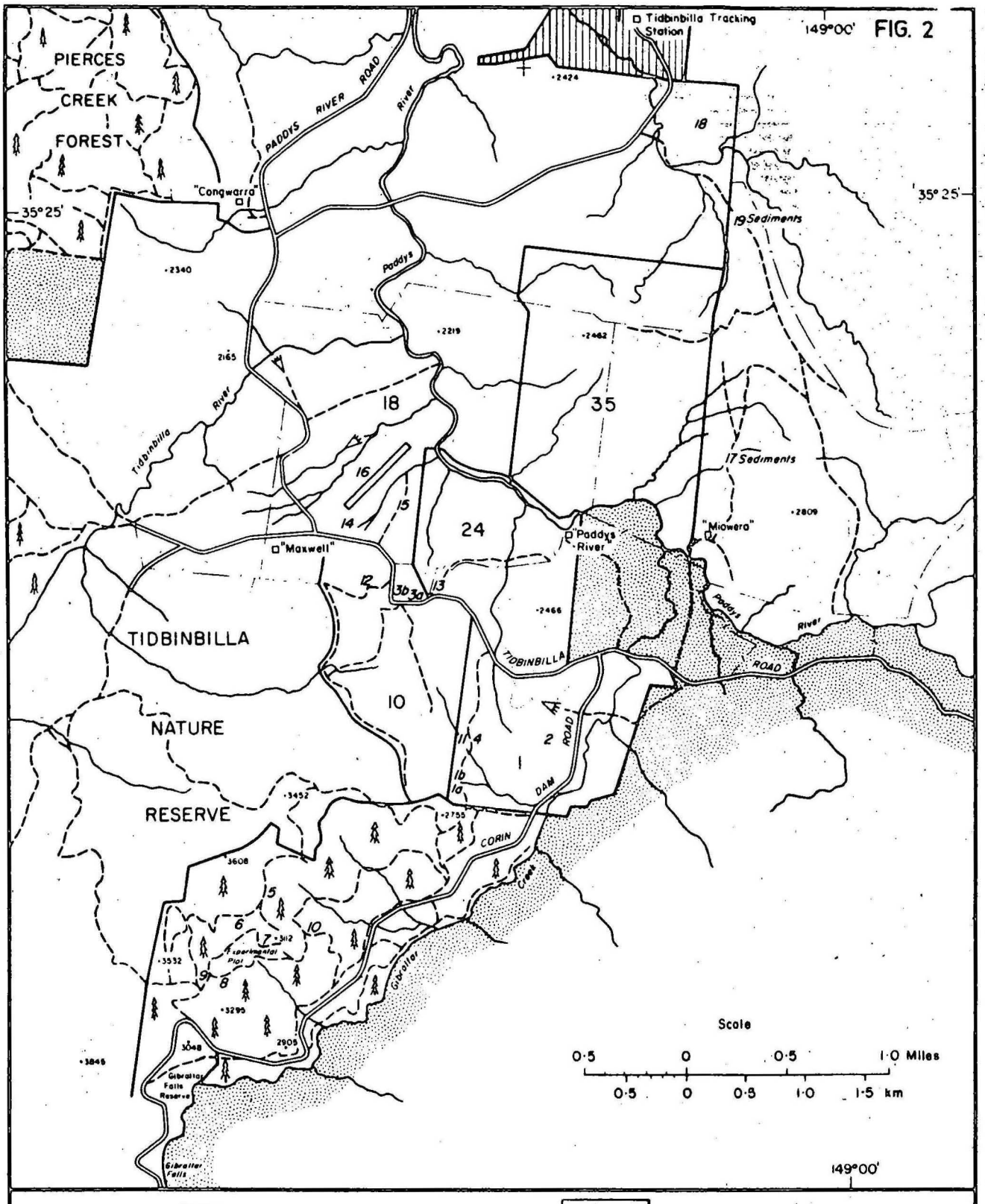

REFERENCE

- Road
- Track
- 2 — Reference to site in text
- 18 — Block numbers
- River or stream
- Property boundary
- Fence
- Dam
- ·3452 — Spot height in feet (position approx.)
- Commonwealth leasehold land
- Freehold land
- Commonwealth land, special
- Pine forest

Map compiled from uncontrolled air photographs taken on 10·4·68 and 15·10·68

LOCATION OF SITES INVESTIGATED FOR ROAD AGGREGATE FOR SURFACING PADDYS RIVER ROAD AND TIDBINBILLA ROAD

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