DEPARTMENT OF NATIONAL RESOURCES

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1978/29

GEOLOGICAL INVESTIGATION OF TOPSOIL DEPOSITS ON BLOCK H.423, BOOTH DISTRICT, NAAS, ACT

by

J.R. KELLETT

Record No. 1978/29

GEOLOGICAL INVESTIGATION OF TOPSOIL DEPOSITS ON BLOCK H.423, BOOTH DISTRICT, NAAS, ACT

by

J.R. KELLETT

CONTENTS

SUMMARY

The Department of the Capital Territory requested the Bureau of Mineral Resources to assess the quantity of materials on Block H.423, Booth District, Naas, ACT, suitable for use as topsoil. Ten deposits were found to contain organic and inorganic sands and organic silt suitable for use as topsoil in sufficient quantities to constitute workable deposits. The total indicated reserves of topsoil were estimated at about 171,000 m^3.

INTRODUCTION

In January 1973, the Department of the Capital Territory requested the Bureau of Mineral Resources to locate suitable sources of topsoil* on the former block H.423, Booth District, ACT (see Plate 1 for locality map). The area investigated may eventually be inundated by the waters of the proposed Tennent Dam. The existing source of topsoil is at Tharwa, ACT, but these deposits are almost depleted and large quantities of suitable material will be required for the future development of southern Tuggeranong.

INVESTIGATION

Potential deposits were delineated on the aerial photographs and tested in the field by hand auger. Samples were classified into the following categories:

type A - organic sands,
type A' - organic silts,
type B - inorganic sands, and
types C,D - material unsuitable for topsoil.

Surface areas of proven deposits were calculated from airphotos at a scale of 1:17 000, and average thicknesses of material were estimated from auger data and exposures. Only those deposits with a volume greater than 1000 m^3 and with a depth of at least 1 m have been reported. The deposits are shown in Plates 1 to 5.

DESCRIPTIONS OF SOIL CATEGORIES

Type A

This soil occurs in depositional terraces of the Naas and Gudgenby Rivers (Plates 2 and 4) and also in a channel bar wedge of the

* 'Topsoil' in the geological sense means a cohesive aggregate of of dominantly fine to medium sand-size grains with a low clay content. For practical purposes the material should be workable, and hence friable, over a wide range of moisture contents and it should offer a high resistance to compaction and shrinkage. Ideally, topsoil should be of a high organic content, but this is not a necessary condition. Topsoil is used extensively in Canberra for spreading on lawns and gardens.

Gudgenby River (Plate 1). The deposits are fairly homogeneous. The soil is dark grey to black, highly organic, fine to medium sand with minor amounts of silt and clay. Its structure is essentially single-grained, but the fine fraction provides sufficient cohesion to give it a loamy texture. The high mica content of the soil reflects the mica content of the granitic rocks in the river catchment.

This material is regarded as good-quality topsoil.

Type A'

The origin and occurrence of this soil is similar to that of Type A. Its colour is greyish brown to black and it can be subdivided as follows:

(i) humic micaceous silt,
(ii) humic micaceous clayey silt,
(iii) humic micaceous clayey fine sand.

This soil is more abundant than type A, but the finer sediments are commonly associated with plastic organic clays or are interstratified with coarse sands and gravels that make many deposits unsuitable for topsoil. The only suitable deposit is No. 10, which is relatively homogeneous and occurs on a flood plain of the Naas River near the southern property boundary (Plate 5).

The soil's structure is generally massive; in a few places it is pedal with clay skins. The soil is tenacious in the dessicated state, but friable around the plastic limit.

This material is organically rich, but may tend to 'pug and set' owing to its excess of silt and clay fractions. It may be useful in a mixture with type A soils.

Type B

This soil is alluvial/colluvial in origin and is generally classified as a prairie soil. Its colour varies from grey to brown and sand-size particles are the dominant constituent. It has a low organic content but possesses the single-grained structure and loamy consistency of the type A soils. It is not as micaceous as soil types A and A'.

The soil is distributed over the entire area, but the pediment deposits are too thin (less than 1 m) to permit economic extraction. The larger deposits are restricted to narrow strips adjacent to ephemeral stream channels. Only 3 areas (Plate 2) exceed the minimum of 1000 m^3 in volume.

This material may be useful in combination with types A or A'. Its structure and texture will provide good workability, but its moisture retention and plant nutrient supply are low.

Type C

Inorganic clayey fine sands and clayey silts are the dominant members of this soil type. It is found with soil types A and B in the area, and is described as follows:

(i) residual - the A_2 horizons of podzolic soils,
(ii) colluvial - indurated clayey fine sand and silt hillwash.

In all cases, the soils' structure is massive, although the colluvium is also porous. Type C material is not suitable for use as a topsoil, but minor amounts may be incorporated into soil types A, A', or B without adverse effect. Thus, extraction of suitable overlying material will not require close supervision.

Type D

This group consists of plastic inorganic and organic clays and/or coarse sandy (in some places carbonaceous) and gravelly clayey alluvium. The heavy clay subtype is generally found at depths greater than 1 m below Type C soils. The clayey gravels are generally below types A and A' at a depth of 2 m.

This material is unsuitable for use as a topsoil and must be avoided. Extraction of suitable overlying soil will require close supervision because even minor amounts of type D material will adversely affect the quality of the topsoil.

INDICATED RESERVES (Table 1)

Reserves have been calculated for the dominant soil type in

any one deposit; however, many auger holes penetrated type A soil and encountered underlying type A' or type B soils that would also be suitable for topsoil.

TABLE 1: Indicated reserves

Plate reference no.	Deposit no.	Volume (m^3)	Soil type
2	1	27 000	A
2	2	12 000	B
2	3	4 100	A
2	4	1 600	B
2	5	1 600	B
3	6	29 000	A
4	7	8 600	A
4	8	13 000	A
4	9	14 000	A
5	10	60 000	A'

Total indicated reserves

Type A	-	95 700 m^3
Type A'	-	60 000 m^3
Type B	-	15 200 m^3
TOTAL		170 900 m^3

The total indicated reserves in round figures are 171 000 m^3, but additional material suitable for topsoil could be won by careful management of the pits and observation of materials being excavated.

CONCLUSIONS

1. Organic and inorganic sands and organic silts of the depositional terraces of the Naas and Gudgenby Rivers are suitable for use as topsoil.

2. Indicated reserves of 171 000 m^3 of topsoil are present at 10 deposits on Block H.423, Booth District, Naas, ACT.

PLATE 1

LOCATION OF TOPSOIL DEPOSITS

SCALE 1:17000

N

PLATE 2

PLATE 3

PLATE 4

PLATE 5

H.423

Boboyan Road

"Naas"

Naas

Gundgenby River

Gudgenby River

Road

Limit of investigation

Road

Major river

Creek

Farm building

Topsoil deposit and deposit number ⑨

149°10'

HALL

BARTON HWY

FEDERAL HWY

A.C.T.

CANBERRA

Molonglo R

COTTER DAM

Cotter Rd

Murrumbidgee R

Tidbinbilla Rd

Paddys R

Tharwa Rd

THARWA

MONARO HWY

Gibraltar Ck

Orroral R

NAAS

Naas Rd

Naas R

Gudgenby Ck

Gudgenby R

Boboyan Rd

Area Investigated

Built up Area

Railway

Highway

Principal Road

Secondary Road

Vehicle Track

Territorial Boundary

N

N.T.

W.A.

S.A.

QLD

N.S.W.

A.C.T.

0 4 8 12 16 20 Kilometres

Commonwealth Of Australia
BUREAU OF MINERAL RESOURCES
Canberra ACT

Title
LOCATION OF TOPSOIL DEPOSITS

Project
NAAS TOPSOIL INVESTIGATION

Soils by **J.R.K. & G.W.B.**

Compiled & Checked **J.R.K.**

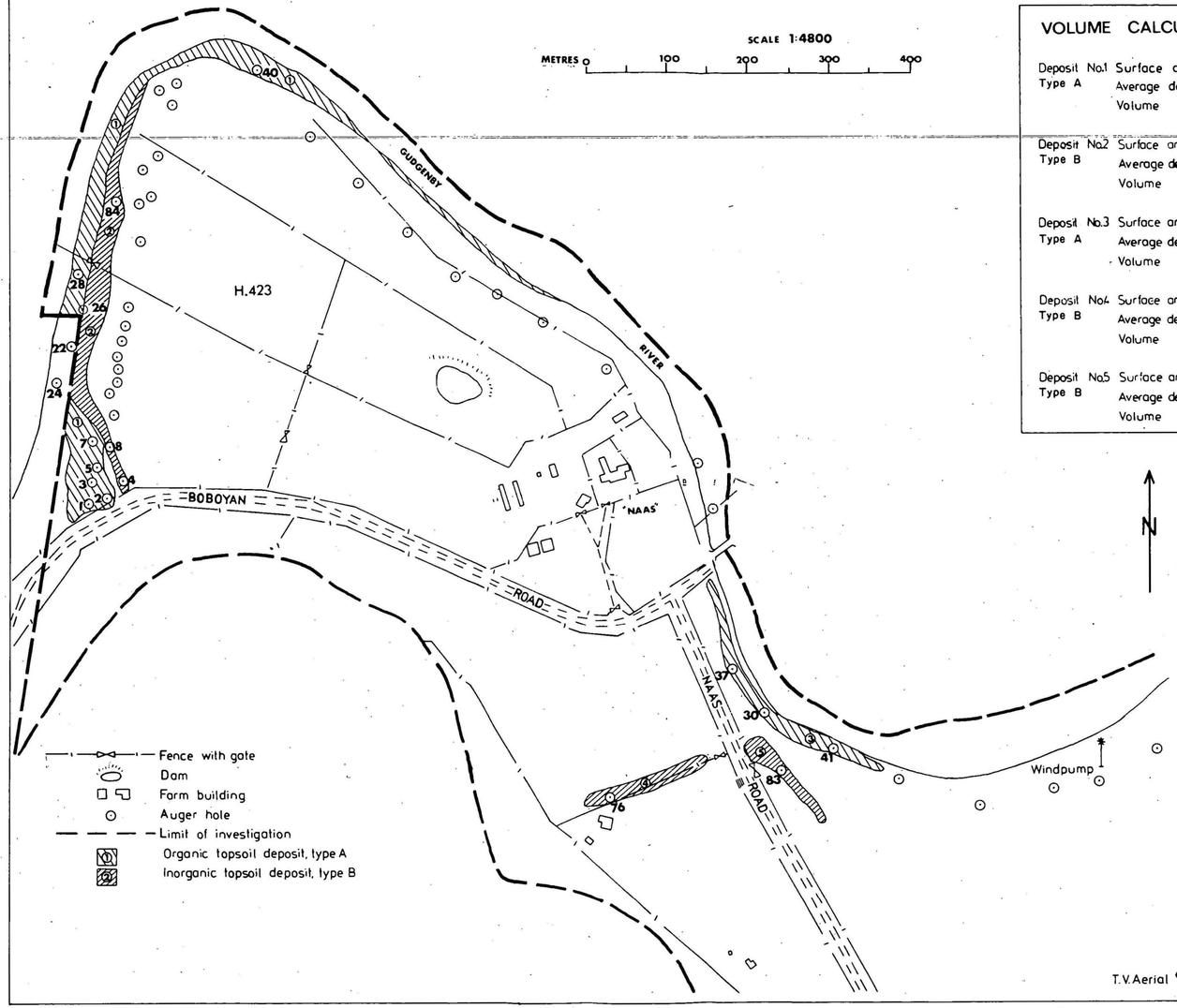
Supervising geologist

To accompany Record **1978/29**

Drawn by **C.M.**

Drawing No **155/A16/2017**

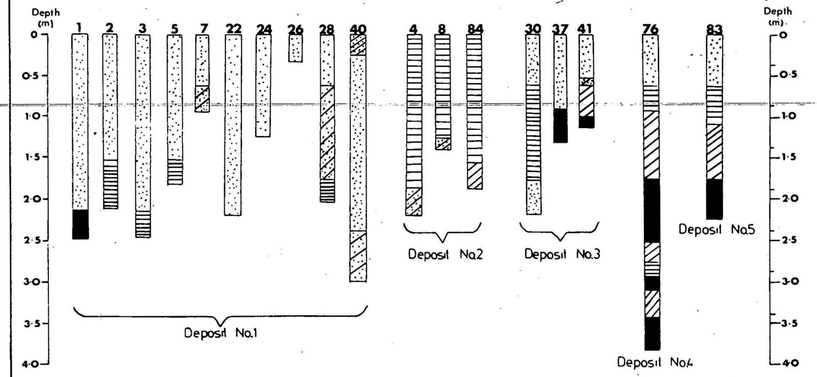
PLATE 2



VOLUME CALCULATIONS

Deposit No.1 Type A	Surface area	=17,690 m²
	Average depth	=1·5 m
	Volume	=27,000 m³
Deposit No.2 Type B	Surface area	=7,880 m²
	Average depth	=1·5 m
	Volume	=12,000 m³
Deposit No.3 Type A	Surface area	=5,150 m²
	Average depth	=0·8 m
	Volume	=4,100 m³
Deposit No.4 Type B	Surface area	=2,230 m²
	Average depth	=0·7 m
	Volume	=1,600 m³
Deposit No.5 Type B	Surface area	=1,635 m²
	Average depth	=1·0 m
	Volume	=1,600 m³

LOGS OF SELECTED AUGER HOLES



Code*

A	Very dark grey to black highly organic cohesive fine sands. Crumb structure and friable consistency. Usually micaceous.
A′	Dark greyish brown to black highly organic clayey fine sands and silts of low plasticity. Massive structure and friable when moist. Usually micaceous.
B	Grey to brown cohesive fine and medium sands of low organic content. Crumb structure and friable consistency.
C	Yellowish brown clayey fine sands and silts of low organic content. Massive structure and friable when moist.
D	Cohesionless coarse sands and gravels or clayey soils of high plasticity.

*For explanation see text

Commonwealth Of Australia
BUREAU OF MINERAL RESOURCES
Canberra A.C.T.

Title: DEPOSITS Nos. 1–5

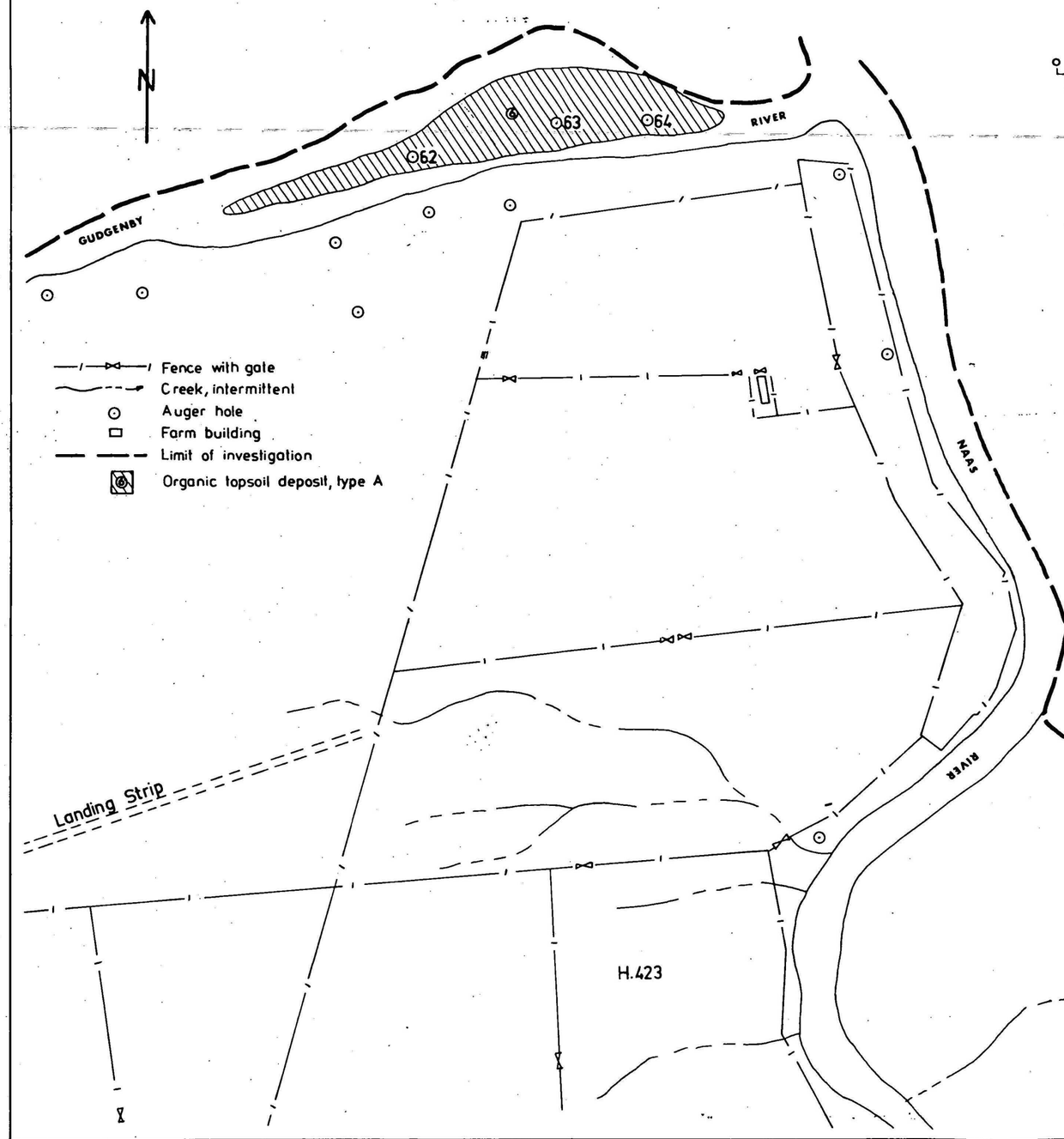
Project to: **NAAS TOPSOIL INVESTIGATION**

Soils by: **J.R.K. & G.W.B.** | Compiled & Checked: **J.R.K.**

Supervising geologist:

To accompany Record: **1978/29** | Drawn by: **C.R.M.** | Drawing No: **I55/A16/2018**

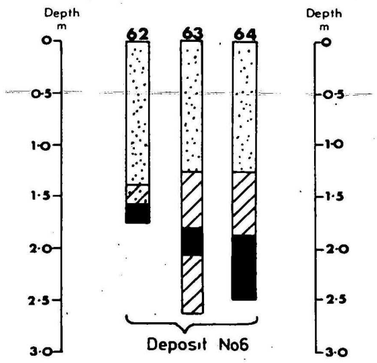
PLATE 3



SCALE 1:4800

0 100 200 300 400 METRES

LOGS OF SELECTED AUGER HOLES



*Code

A Very dark grey to black highly organic cohesive fine and medium sands. Crumb structure and friable consistency. Usually micaceous.

A' Very dark grey organic clayey fine sand. Massive structure but friable when moist. Micaceous.

C Brown and grey inorganic cemented clayey sands. Massive but porous.

D Cobbles and gravel or humic fat clay.

* for explanation see text

VOLUME CALCULATION

Deposit No.6

Surface area=23,780m²

Type A Average depth=1·2m

Indicated reserve=29,000m³

Commonwealth Of Australia
BUREAU OF MINERAL RESOURCES
Canberra ACT

Title: DEPOSIT No 6

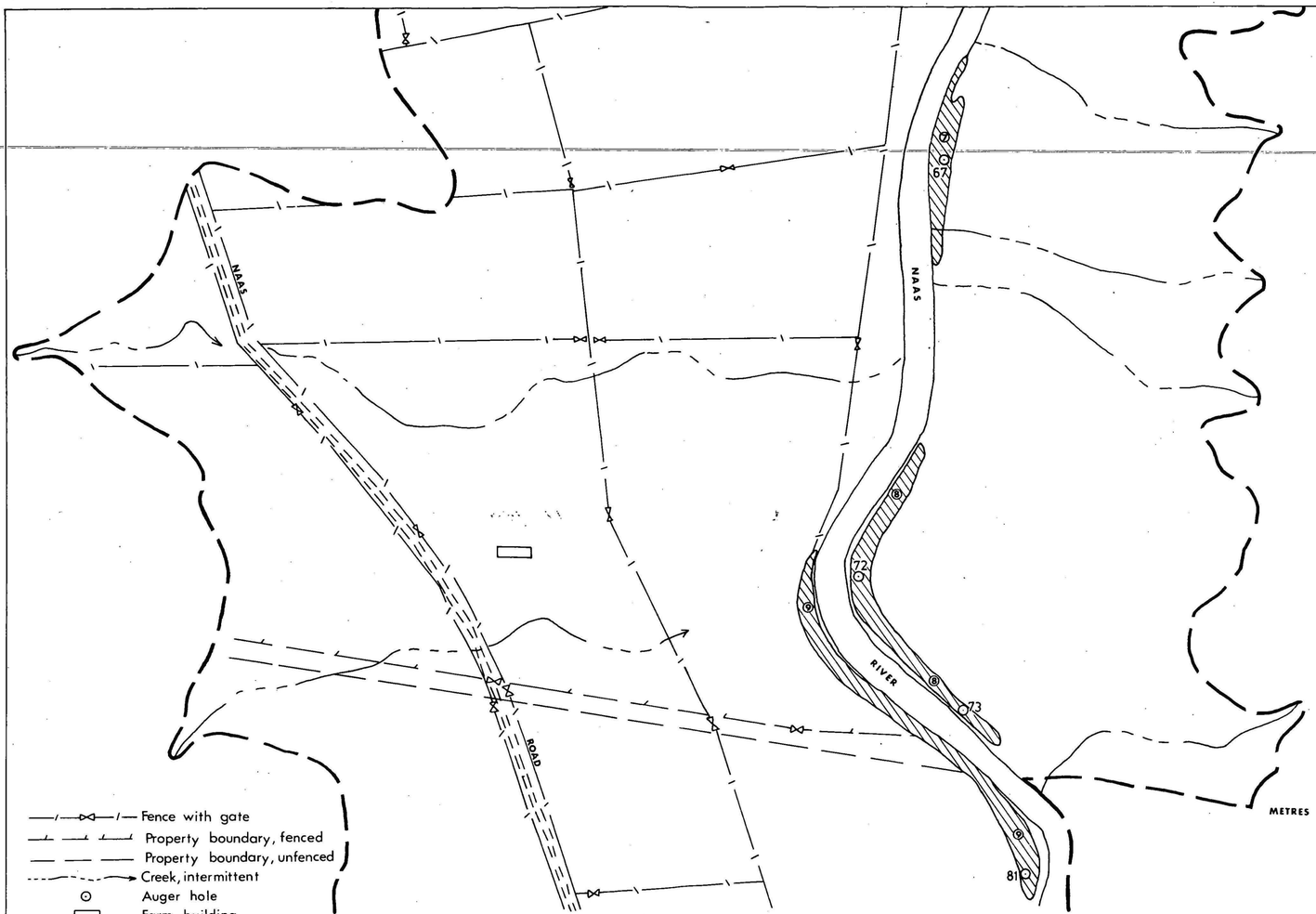
Project: **NAAS TOPSOIL INVESTIGATION**

Soils by: J.R.K. G.W.B. | Compiled & Checked: J.R.K.

Supervising geologist

To accompany Record: 1978/29 | Drawn by: C.M. | Drawing No: I 55/A16/2019

PLATE 4



Fence with gate
Property boundary, fenced
Property boundary, unfenced
Creek, intermittent
Auger hole
Farm building
Limit of investigation
Organic topsoil deposit, type A

VOLUME CALCULATIONS

Deposit No.7 Type A — Surface area = 4,310m²; Average depth = 2·0m; Indicated reserves = 8,600m³

Deposit No.8 Type A — Surface area = 7,283m²; Average depth = 1·8m; Indicated reserves = 1,300m³

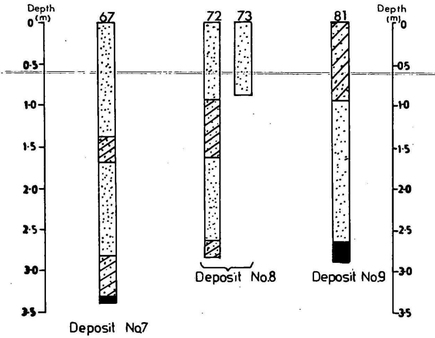
Deposit No.9 Type A — Surface area = 9,513m²; Average depth = 1·5m; Indicated reserves = 14,000m³

N

SCALE 1:4800

METRES 0 100 200 300 400

LOGS OF SELECTED AUGER HOLES



*Code

A — Very dark grey to black highly organic cohesive fine sands. Crumb structure and friable consistency. Usually micaceous.

A′ — Dark greyish brown to black highly organic clayey fine sands and silts of low plasticity. Massive structure but friable when moist. Usually micaceous.

D — Coarse sand and gravel aquifers.

* for explanation see text.

Commonwealth Of Australia
BUREAU OF MINERAL RESOURCES
Canberra A.C.T.

Title: DEPOSITS Nos 7-9

Project: NAAS TOPSOIL INVESTIGATION

Soils by: J.R.K. & G.W.B.

Compiled & Checked: J.R.K.

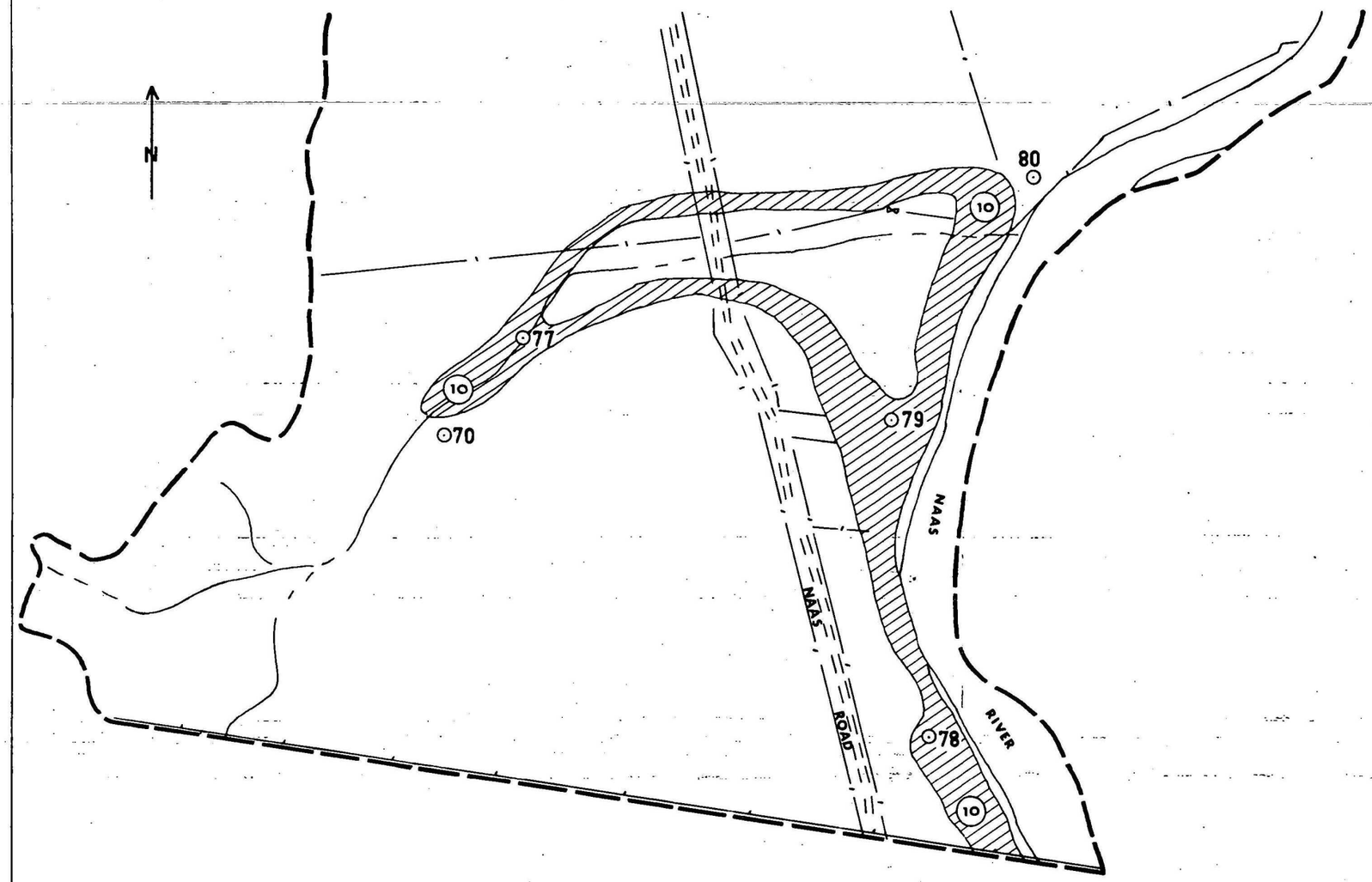
Supervising geologist: G.W. Laws

To accompany Record: 1978/29

Drawn by: C.M.

Drawing No: 155/A16/2020

PLATE 5



SCALE 1:4800

0 100 200 300 400 METRES

— / —⋈— / — Fence with gate

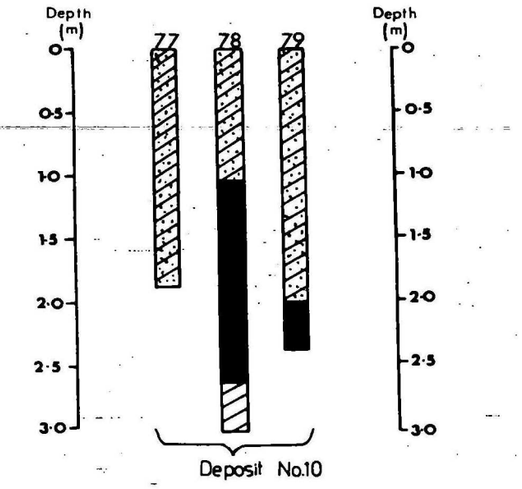
Creek

⊙ Auger hole

— — — — Limit of investigation

(10) Organic topsoil deposit, type A'

LOGS OF SELECTED AUGER HOLES



*Code

A' Very dark brown to black highly organic silts and clayey silts and clayey fine sands. Massive structure and friable when moist. Usually micaceous.

C Dark brown cemented clayey silt.

D Interstratified mottled heavy clays and sand aquifers.

*for explanation see text

VOLUME CALCULATION

Deposit No.10 Surface area = 39,840 m²
Type A' Average depth = 1·5m
Indicated reserves = 60,000 m³

Commonwealth Of Australia
BUREAU OF MINERAL RESOURCES
Canberra A.C.T.

Title: DEPOSIT No 10

Project: **NAAS TOPSOIL INVESTIGATION**

Soils by: **J.R.K. & G.W.B.** | Compiled & Checked: **J.R.K.**

Supervising geologist: A.T. Hawke

To accompany Record: 1978/29 | Drawn by: C.M. | Drawing No: I55/A16/2021