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1960/7

GEOLOGICAL REPORT ON DAM SITE NO. 6, SIRINUMU

UPPER LALOKI RIVER,

Central District, Papua.

by

H. L. DAVIES.

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SUMMARY.

The proposed Sirinumu Dam is a part of extensions to the Laloki Hydro-electric Scheme planned by the Commonwealth Department of Works. Dam site No. 6 is the first site investigated.

The only rocks exposed in the area are the flat-lying volcanic agglomerate and tuff of the Astrolabe Agglomerate.

The dam site is on the upper Laloki River, near the lower end of the Sirinumu Gorge. There is good outcrop on both abutments and in the river bed, broken only by belts of no outcrop most of which reflect joints and minor shears.

Water pressure testing revealed only one major leakage zone; this coincides with minor shears under the river bed.

The investigation involved 617 feet of diamond drilling and two small costeans, and indicated that the site is suitable for either a thin-arch or gravity type dam.

INTRODUCTION.

The Commonwealth Department of Works intends to expand the Laloki Hydro-electric Scheme which serves Port Moresby. A major storage is required on the upper Laloki River to ensure a constant supply of water to the proposed No. 2 Power-house which will be sited at the foot of Rouna Falls. C.D.W. engineers selected the Sirinumu Gorge as the most suitable locality and chose eight likely dam-sites, numbered 1, 2, 3, 4, 5, 5a, 6, and 7, No. 1 being at the head of the gorge and No. 7 at the foot.

The gorge lies five miles south-east of Rouna Falls and is about twenty miles distant by road. Access is by the Karakatana Road to a point three miles beyond Eilogo Plantation, and thence by bush track. Sections of the bush track are impassable to conventional vehicles after rain.

In December, 1958, the dam-sites were inspected by Messrs. L.C. Noakes and D.E. Gardner of the Bureau of Mineral Resources, Canberra. They selected sites Nos. 6 and 7 as the most likely, on the grounds of profile and degree of solid outcrop. A plane-table survey of outcrop on Dam-site No. 6 was commenced by the writer in March and completed by D.S. Trail. A drilling programme was laid out with the assistance of Messrs. L.C. Noakes and J.E. Thompson (B.M.R.) and R.H. Gruber and J.R. Brett (C.D.W.) and drilling commenced on the 4th March, 1959. In all, eight holes were drilled and water pressure tested; drilling totalled 617 feet. Holes 6S1 to 6S4 were supervised by Mr. D.S. Trail, and 6S5 to 6S8 supervised by the writer. The programme was completed on the 25th June, 1959.

This report includes a brief account of the regional geology, an account of dam-site geology, and a synthesis of the geological logs of diamond-drill cores and of water pressure testing results. Attached plates show (i) locality, (ii) outcrop on the dam-site, and (iii) a section across the dam-site with diagrammatic representation of core logs and water pressure testing results.

REGIONAL GEOLOGY

The Astrolabe Agglomerate is a disorderly sequence of fragmental volcanic rocks more than a thousand feet in thickness. It is generally flat-lying and blankets an area 16 to 20 miles long on the north-westerly axis and 4 to 6 miles wide on a north-easterly axis. Gentle upward tilting on at least three of the present-day margins has produced a basin which is reflected in present-day topography. The undulating area in the centre of the basin is known as the Sogeri Plateau. The upper Laloki River drains the southwestern side of the basin and runs generally north and north-west.

The Agglomerate rests on intensely folded and faulted Tertiary or Mesozoic sediments of the Eriama Series in the west and south. In places these sediments are intruded by massive gabbro. In the east and north the Agglomerate may be underlain by metamorphosed sediments of the Mesozoic Kemp Welch Formation or the Palaeozoic Owen Stanley Metamorphics. None of these rock groups outcrop in the area considered in this report.

A more complete picture of the regional geology should be forth-coming from current fieldwork.

Description of the Agglomerate.

The agglomerate is composed of angular boulders of lava in a matrix of tuff, with minor beds of tuff. Rare boulders of lava have a long axis of about five feet but the normal size is from three to six inches with occasional boulders up to three feet. The tuff ranges in grain-size from tuffaceous mudstone to coarse tuff, grading into fine agglomerate.

Sorting of the boulders is rare though there is a tendency for each bed to contain boulders approximating to the one size. Graded bedding is common in the tuff beds and is in some places present in the tuff matrix of the agglomerate. Current bedding is developed around the large boulders which occur sporadically in the tuff beds.

The composition of the lava boulders ranges from augite basalt to hornblende andesite+ and as yet no pattern has been found in the distribution of these two types. Both are commonly porphyritic, with, in some cases, an alignment of the phenocrysts. Fine-grained rocks may show a streaky banding caused by alteration of bands of finely vesicular and non-vesicular rock. This banding and the alignment of phenocrysts are probably flow effects indicating that these boulders were once part of lava flows.

Vesicularity may be absent, minor or dominant; the scoria developed in the latter case weathers rapidly.

A near-basal conglomerate, several hundred feet in thickness, is exposed at the foot of Rouna Falls. This contains some schist boulders, the only components of non-volcanic origin in the formation. Calcite is seen in the outcrop of the conglomerate; elsewhere it is seen as a secondary vesicle filling in drill cores of agglomerate. Zeolites also occur as vesicle filling in the agglomerate.

Casts of twigs, branches, and logs are found within the agglomerate; some of these have a thin coating of carbon.

+ Field names pending laboratory identification.

DAM SITE GEOLOGY

Dam site No. 6 is set in a gorge cut through agglomerate and tuff. Soil cover is shallow or absent except in the fracture zones (see below) where soil, scree and soft weathered rock may be up to fifteen feet deep.

Lithology.

Typical volcanic agglomerate and tuff, as described under Regional Geology, are exposed on the dam-site, with the exception that hornblende andesite components are rare or absent. Drilling revealed clay filling in fractures, vesicles and cavities weathered from the matrix at depths exceeding fifty feet. Presumably the clay has resulted from weathering in situ of the agglomerate.

Stratigraphy.

Lateral variation in grain-size within any one bed makes it difficult to relate the stratigraphic succession at one point to that at another. Some tuff beds are lenticular suggesting old stream beds or ponds. However, horizons in which tuff predominates can be recognized. The most conspicuous of these is that exposed at between RL 1705' and RL 1715' on both abutments and in DDH 6S2, whilst others occur at RL 1670' and RL 1620' approximately (see Plate 3).

Structure.

The beds are horizontal except at one point beyond the left abutment where a local dip of 5 degrees was recorded.

The most striking feature of the surface geology is the system of vertical or near-vertical fractures mostly striking between 20 and 50 degrees. These are represented on the surface by belts of no outcrop commonly about six feet wide and bounded up-slope by vertical cliffs. Drilling indicates that these surface features reflect either (i) zones of tension joints or (ii) minor shear zones (identified by the presence of slickensides). Both are accompanied by weathering of the adjacent rock. Lack of obvious displacement of outcropping rock indicates that there has been little movement along the shear zones.

Thus the zones of no outcrop are attributed to fracturing and consequent weathering of rock resulting from tension jointing and minor shearing. However, some of the zones of broken rock observed in the core may merely indicate incompetent beds caused by poor cementation of the tuff matrix; the possibility of weaknesses in the horizontal plane should not be overlooked.

ENGINEERING GEOLOGY

General

The narrowness of section, the symmetry of profile, and the apparent stability of rock exposed on the dam site suggest that it is suitable for construction of either a thin arch or a gravity dam, and the investigation was planned with these two possibilities in mind. Agglomerate could be quarried locally for use as rock-fill or as concrete aggregate. It is possible that a dam will be constructed in two stages, first to a top water level at 1735' and later to a top water level at 1752'. In this case a rock fill dam might be favoured.

Sub-parallel zones of no outcrop in the river-bed and on the abutments reflect zones of tension joints or minor shears. Water

leakage in most of these fractures is negligible but in one zone reaches 14.9 g.p.m. at 10.5 p.s.i.

Both abutments are predominantly solid outcrop and would require little cleaning except in the vicinity of fractures "b" and "j" where there is up to 15 feet of overburden. A solid bench of rock forms 80% of the river bed but there is no outcrop above fracture "e": here overburden might be up to 15 feet thick.

Drilling and Water Pressure Testing.

The drill used was a Mindrill E 1000 with Triefus NMLC bits and stationary split-inner-tube core barrel. Core recovery was 100% except where material encountered was so soft as to be removed by the circulating water. The pumps were Mindrill 750-1200s and the packers were single and double balloon types. Testing was carried out at twenty foot intervals as the hole was deepened, using the single packer. Five-foot sections of particular interest were tested with the double packer. In each test a number of different water pressures was applied; these different results were used in correcting water pressures where leakages were significant.

The drilling and water pressure testing programme was designed to investigate the following points:-

(i) the quality of rock under the zones of no outcrop,

(ii) the rate of water leakage along the suspected fractures,

(iii) the relative permeability of the different rock types, particularly the tuff, and

(iv) the stability of what would be the thrust blocks should a thin arch dam be built.

Where possible the drill holes were directed normal to the fracture zones and at such an angle as to intersect them at between twenty and forty feet below surface. For convenience the fracture zones have been labelled "a" to "k", from east to west (see Plate 2). The result of drilling and water pressure testing these zones is set out in the following table.

DDH	Zone intersected	Depth below surface	Water pressure testing g.p.m.	Water pressure testing p.s.i.	Degree of weathering; fractures.
6S1	c	15'-20'	0.2	30+	Slight weathering; few tension joints.
6S2	b	20'	0.38	25+	Slight weathering; few tension joints.
	a	50'	0.93	45+	Weathered; zone of tension joints; sand and clay [illegible] filling.
6S3	d	10'	1.75	50	Weathered fractures parallel to core.
	e	15'-20'	12.7-13.1	25-30	Weathered; 4 zones of broken rock; some slickensides; clay filling.
	f	45'	0.01	75	Broken agglomerate with clay; some slickensides
	g	55'	0.48	75	Fracture with slickensides.

DDH	Zone intersected	Depth below surface	Water pressure testing g.p.m.	p.s.i.	Degree of Weathering; fractures.
6S4	e	20'	14.9	10.5	Weathered; 3 zones of broken rock; clay filling.
6S5	j	20'	0.53	30+	Weathered; tension joints and possible shears.
6S6	k	70'	0.48	60+	No indication.
6S7	i	20'	0.19	30+	Weathered; tension joints.
	h	20'	0.58	40+	Very weathered; 8" shear zone; grey pug filling.
6S8	j	20'	0.26	30+	Weathered; zone of tension joints.

+ indicates pressure not corrected for column of water above packer, and loss of head due to friction etc. in pipes.

From this table it can be seen that all the zones of pre-outcrop except perhaps Zone k are represented by weathering and some kind of fracturing at depth. However, only Zone e which underlies the river, permits significant water leakage. L.C. Noakes points out (pers. comm.) that fractures in or near the riverbed should be the most open since they are subject to the greatest unloading. Perhaps the fractures away from the river are plugged by clay, in which case they might become more permeable when a storage is established (Krynine and Judd., 1957, p.564).

Major leakages having no apparent relation to surface geology were as follows:-

DDH	Section tested	Depth below surface	Water pressure testing g.p.m.	p.s.i.	Core Description.
6S1	21'10"-44'5"	10'	7.3	30	Parts weathered and broken.
6S3	118'-138'	60'	5.4	80	Fresh with few fractures.
6S6	39'3"-43'6"	40' inclined	1.71	40	Weathered friable tuff, fractured, at 39'9".

The first leakage is probably due to proximity to the surface and the third is probably due to the fracture mentioned. The cause of the second leakage is unexplained.

The permeability of the tuff bed at RL 1620' was tested in DDH 6S3. Leakage was at the rate of 0.34 g.p.m. at 80.7 p.s.i. corrected pressure, indicating that, in this case at least, the tuff was as impermeable as any of the agglomerate.

The drilling confirmed the impression gained from surface outcrop that the abutments are sufficiently stable to take the thrust of a thin arch dam.

Aggregate

No accumulations of sand or gravel suitable for use as concrete aggregate have been found in the Sogeri-Sirinumu area.

[illegible]ever, samples of the agglomerate, taken from the Rouna Falls [illegible] and tested by the Works Department, have proved suitable as [illegible]crete aggregate; as sand from crushed dolerite has been found [illegible]isfactory in concrete by the Hydro-Electric Commission in [illegible]smania, it seems very likely that the agglomerate will provide [illegible]nd suitable for concrete in New Guinea. Testing of the [illegible]omerate in the Sirinumu area by the Works Department is under [illegible] but no results are currently available.

[illegible]mary of Geological Logs of Diamond Drill Holes.

In the following logs it will be noted that much of the [illegible] has been described simply as "agglomerate". This label has [illegible] given to fresh or only slightly weathered volcanic agglomerate [illegible] no marked fractures. It includes agglomerate in which the [illegible]omponent boulders range in size from ½" to 30", and show varying [illegible]elopment of phenocrysts and vesicles. These properties are not [illegible] here as they may differ from point to point within the one [illegible] and are thus true for only that part of the rock intersected [illegible] the drill hole. More complete descriptions will be found in the [illegible]iginal core logs, copies of which are held at -

Geological Office, C/o Dept. of Lands, Mines and Surveys, Port Moresby,
Bureau of Mineral Resources, Canberra,
Commonwealth Dept. of Works, Port Moresby,
Commonwealth Dept. of Works, Melbourne.

[illegible] 6 S 1

Length 104'2"
Inclined 45 degrees
Bearing 290 degrees

0 - 19'10"	Not cored; clay, scree and soft weathered rock.
[illegible]0" - 20' 6"	Broken agglomerate, matrix weathered.
[illegible] 6" - 29' 5"	Agglomerate.
[illegible] 5" - 29'10"	Broken agglomerate, weathered, iron-stained.
[illegible]0" - 32' 2"	Agglomerate with soft weathered matrix.
[illegible] 2" - 39' 2"	Agglomerate.
[illegible] 2" - 43'10"	Agglomerate with soft weathered matrix.
[illegible]0" - 44' 2"	Tuff.
[illegible] 2" - 46' 3"	Agglomerate.
[illegible]3" - 50' 3"	Agglomerate with soft weathered matrix.
[illegible] 3" - 76' 7"	Agglomerate.
[illegible] 7" - 77' 6"	Tuff.
[illegible] - 85' 3"	Agglomerate.
[illegible] 3" - 87' 8"	Tuff.
[illegible] 8" - 89' 2"	Agglomerate.
[illegible] 2" - 94' 2"	Agglomerate with friable matrix.
[illegible] 2" - 94' 9"	Agglomerate.
[illegible] 9" - 97' 8"	Tuff and fine agglomerate, friable.

97' 8" - 104'2" Agglomerate.

Yellow clay fills some vesicles and fractures at points along the entire length of the hole.

DH 6 S 2

Length 96'11"
Inclined 15 degrees
Bearing 150 degrees

0 - 14' 1"	Not cored; soil, scree, and soft weathered rock.
14' 1" - 15' 6"	Agglomerate.
15' 6" - 15' 9"	Broken agglomerate, weathered.
15' 9" - 20' 6"	Agglomerate.
20' 6" - 20'10"	Broken agglomerate, weathered.
20'10" - 35' 4"	Agglomerate.
35' 4" - 37' 6"	Tuff.
37' 6" - 60' 0"	Agglomerate.
60' 0" - 61'11"	Weathered agglomerate with very weathered tuff matrix, also sand and clay.
61'11" - 68' 3"	Tuff, friable.
68' 3" - 72' 9"	Agglomerate.
72' 9" - 86'11"	Agglomerate cut by 24 weathered fractures.
86'11" - 96'11"	Agglomerate.

Clay occurs in some vesicles and fractures from 32' to end of hole; there is some calcite in vesicles from 40' to end of hole.

DH 6 S 3

Length 157' 7"
Inclined 45 degrees
Bearing 300 degrees

0 - 9' 0"	Soil and weathered rock; not cored.
9' 0" - 22' 0"	Agglomerate.
22' 0" - 24'10"	Weathered fractures parallel to core.
24'10" - 27' 0"	Agglomerate.
27' 0" - 29' 0"	Tuff.
29' 0" - 41' 6"	Agglomerate.
41' 6" - 41'10"	Tuff.
41'10" - 43' 0"	Agglomerate.
43' 0"	Fracture with slickensides.
43' 0" - 48' 0"	Eleven clay-filled fractures in agglomerate.
48' 0" - 51' 6"	Agglomerate.
51' 6" - 52' 8"	Broken agglomerate and tuff with clay; slickensides

52' 8" - 54' 5"	Agglomerate
54' 5" - 55' 9"	Broken agglomerate, matrix weathered, friable.
55' 9" - 59' 9"	Agglomerate.
59' 9" - 60' 5"	Broken agglomerate with clay.
60' 5" - 61' 6"	Agglomerate.
61' 6" - 62' 3"	Broken agglomerate with clay.
62' 3" - 73' 0"	Agglomerate.
73' 0" - 77' 8"	Tuff with some fine agglomerate, part friable.
77' 8" - 82'10"	Agglomerate.
82'10" - 83' 0"	Fracture, badly weathered, at 15 degrees to core.
83' 0" - 96' 8"	Agglomerate.
96' 8" - 97' 4"	Broken agglomerate with clay; slickensides.
97'4" - 98' 0"	Agglomerate with weathered matrix.
98' 0" - 108'9"	Agglomerate.
108'9" - 113'0"	Tuff.
113'0" - 121'6"	Agglomerate
113'8"	Fracture with faint slickensides which strike at 90 degrees to core.
121'6" - 121'8"	Tuff.
121'8" - 131'4"	Agglomerate.
131'4" - 131'5"	Tuff.
131'5" - 132'0"	Agglomerate.
132'0" - 153'3"	Agglomerate with few fractures, not weathered.
153'3" - 153'7"	Tuff.
153'7" - 157'7"	Agglomerate.

Some clay filling from 33' onwards; no calcite.

<u>DDH 6 S 4</u>

Length	35'9"
Inclined	55 degrees
Bearing	286 degrees

0 - 5'9"	Soil, scree and soft weathered rock; not cored.
5' 9" - 10' 9"	Agglomerate.
10' 9" - 12' 2"	Agglomerate with most of tuff matrix replaced by clay.
12'2" - 15' 9"	Agglomerate.
15' 9" - 20' 9"	Agglomerate, weathered.
20' 9" - 27' 8"	Agglomerate.

27' 8" - 28' 6"	Broken agglomerate, weathered, with clay.
28' 6" - 30' 9"	Agglomerate.
30' 9" - 31' 9"	Broken weathered agglomerate with clay.
31' 9" - 32' 5"	Agglomerate.
32' 5" - 33' 4"	Broken weathered agglomerate with clay.
33'4" - 35' 9"	Agglomerate.

DDH 6 S 5

Length	55'1"
Inclined	45 degrees
Bearing	334 degrees

0 - 12' 0"	Soil, scree, and soft weathered rock; not cored.
12' 0" - 14' 0"	Broken weathered agglomerate.
14' 0" - 17' 4"	Agglomerate.
17' 4" - 19' 0"	Tuff.
19' 0" - 23' 6"	Agglomerate.
23' 6" - 23'11"	Tuff.
23'11" - 39' 2"	Agglomerate.
39' 2" - 39' 9"	Weathered agglomerate with fractures.
39' 9" - 48'11"	Agglomerate, fresh except around fracture at 48'1"; fracture strikes 065 degrees, dips 65 degrees S-E, soapy coating.
48'11" - 49' 7"	Tuff.
49' 7" - 55' 1"	Agglomerate.

A little clay in places throughout length of core; no calcite.

DDH 6 S 6

Length	78'10"
Inclined	20 degrees
Bearing	274 degrees

0 - 4' 3"	Slightly weathered agglomerate.
4' 3" - 16' 2"	Agglomerate.
16' 2" - 16' 7"	Tuff.
16' 7" - 19' 6"	Agglomerate.
19' 6" - 22' 3"	Tuff.
22' 3" - 35' 9"	Agglomerate.
35' 9" - 36' 2"	Tuff.
36' 2" - 39' 9"	Agglomerate.
39' 9" - 39'11"	Tuff, weathered, friable, fractured.
39'11" - 43' 8"	Agglomerate.
43' 8" - 43'11"	Broken agglomerate, fresh.
43'11" - 46' 3"	Agglomerate.
46' 3" - 46' 6"	Tuff.

46' 6" - 78'10" Agglomerate, fresh except around fracture at 62'5".

Clay in some vesicles between 29' and end of hole; calcite in vesicle at 38'.

DDH 6 S 7

Length 119'4"
Inclined 52 degrees
Bearing 149 degrees

0 - 4' 6" Soil and soft weathered rock; not cored.

4' 6" - 12'10" Agglomerate.

12'10" - 13'11" Tuff and fine agglomerate.

13'11" - 20' 0" Agglomerate with thin tuff band at 14'9".

20' 0" - 20' 7" Tuff and fine agglomerate.

20' 7" - 21' 7" Agglomerate.

21' 7" - 22' 1" Tuff.

22'1" - 39' 1" Agglomerate, fresh except around fracture at 35'8".

39' 1" - 40' 9" Tuff and fine agglomerate.

40' 9" - 43' 6" Agglomerate.

43' 6" - 44' 4" Tuff.

44' 4" - 48' 5" Agglomerate.

48' 5" - 48'11" Coarse-grained tuff.

48'11" - 71'10" Agglomerate, fresh except around fractures at 59'3"-61'2".

71'10" - 72' 2" Tuff.

72' 2" - 87'11" Agglomerate.

87'11" - 88'11" Tuff and fine agglomerate.

88'11" - 90'3" Agglomerate.

90' 3" - 92' 3" Tuff and fine agglomerate.

92' 3" -104'10" Agglomerate.

104'10"-105' 6" Fractures strike 060 degrees, dip vertically, show slickensides; soft grey pug filling.

105'6" - 113'1" Agglomerate.

113'1" - 118'1" Tuff and fine agglomerate, one bed 15" thick.

118'1" - 119'4" Agglomerate.

Clay filling common from 21' onwards; a little calcite between 27' and 84'.

DDH 6 S 8

Length 69'4"
Inclined 44 degrees 40 mins.
Bearing 198 degrees.

0 - 6' 6" Not cored; soil, scree and soft weathered rock.

6' 6" - 9' 8"	Agglomerate.
9' 8" - 16' 8"	Agglomerate with weathered, clay-filled fractures which strike 060 degrees and dip vertically or at 60 degrees N-W.
16' 8" - 25' 9"	Agglomerate.
25' 9" - 26'10"	Tuff.
26'10" - 27'10"	Agglomerate.
27'10" - 28' 3"	Fine agglomerate, broken, weathered, with clay; one fracture strikes 060 degrees.
28' 3" - 29' 7"	Agglomerate.
29' 7" - 29' 8"	Fine agglomerate, broken, weathered.

Agglomerate of varying grain size to end of hole with clay filling in places throughout core; calcite in vesicle at 50'.

Summary of Results of Water Pressure Testing.

Only in the cases of major leakage have corrections been applied to the water pressure testing results. These corrections are as follows:-

(i) additional head due to column of water in pipes above packer or above standing water level, and

(ii) loss in head due to friction and turbulence in pipes at high rates of flow.

D.d.h. 6S1 Inclined 45 deg.

The only major leakage was in the section 21'10"-44'5", which includes broken weathered agglomerate at 29'5"-29'10", and agglomerate with weathered, friable, and possibly permeable matrix at 29'10"-32'2" and 39'2"-43'10".

21'10"-44' 5"	7.3 g/m at 30 p.s.i.	(corrected)
44' 5"-64' 3"	0.2 g/m at 30 p.s.i.	(uncorrected)
64' 3"-84' 7"	0.1 g/m at 35 p.s.i.	"
84' 7"-104'2"	0.14 g/m at 45 p.s.i.	"

D.d.h. 6S2 Inclined 15 degrees.

No major leakage.

17'11" - 37' 1"	0.38 g/m at 25 p.s.i.	(uncorrected)
37' 1" - 56'11"	0.62 g/m at 35 p.s.i.	"
56'11" - 76'11"	0.93 g/m at 45 p.s.i.	(corrected)
76'11" - 96'11"	0.48 g/m at 45 p.s.i.	(uncorrected)

D.d.h. 6S3 Inclined 45 degrees.

Major leakages occurred at 48'-53', 53'-63', and 118'-138'. The first may be related to a minor shear zone at 51'6"-52'8", and the second to broken and weathered rock at 54'5"-55'9", 59'9"-60'5" and 61'6"-62'3". There is no obvious explanation for the third major leakage; there are unweathered fractures in that section of core but these do not normally permit water movement.

The section 73'-78' is entirely tuff and a little fine agglomerate; testing at high pressures indicates that, at least in this case, the tuff is relatively impermeable.

Leakage rate of section 33'1"-48'1" is not known but is probably small.

11' 9" - 33' 1"	1.75 g/m at 50	p.s.i.		(corrected)
33' 1" - 53'	11.1 g/m at 12	p.s.i.	approx.	(uncorrected)
43' 1" - 53'	11.14 g/m at 12	p.s.i.	approx.	(uncorrected)
48' 1" - 53'	12.7 g/m at 25	p.s.i.		(corrected)
53' - 63'	13.1 g/m at 30	p.s.i.		"
63' - 73'	0.18 g/m at 50	p.s.i.		(uncorrected)
73' - 78'	0.34 g/m at 80.7	p.s.i.		(corrected)
78' - 98'	0.01 g/m at 75	p.s.i.		(uncorrected)
98' - 118'	0.48 g/m at 75	p.s.i.		"
118' - 138'	5.4 g/m at 80	p.s.i.		(corrected)

D.d.h. 6S4 Inclined 55 degrees

The leakage in the one section tested may be related to zones of broken rock at 27'8"-28'6", 30'9"-31'9", and 32'5"-33'4".

25' 9" - 35' 9"	14.9 g/m at 10.5	p.s.i.	(corrected)

D.d.h. 6S5 Inclined 45 degrees.

No major leakage.

19' - 40'	0.53 g/m at 30	p.s.i.	(uncorrected)
39' - 55'1"	0.09 g/m at 30	p.s.i.	"

D.d.h. 6S6 Inclined 20 degrees.

The only major leakage was in the section 39' - 43'6"; this is probably related to fractured and weathered friable tuff at 39'9" - 39'11".

19' - 39' 3"	0.12 g/m at 30	p.s.i.	(uncorrected)
39' - 58'11"	2.3 g/m at 40	p.s.i.	"
43' 6" - 58'11"	0.08 g/m at 40	p.s.i.	"
Calculated:-			
39' - 43' 6"	1.71 g/m at 40	p.s.i.	(corrected)
59' - 78'10"	0.48 g/m at 60	p.s.i.	(uncorrected)

D.d.h. 6S7 Inclined 52 degrees.

There were no major leakages, even in the section 99'-119'4", which includes a probable shear zone at 104'10"-105'6".

19' - 39' 6"	0.03 g/m at 30	p.s.i.	(uncorrected)
39' - 59' 3"	0.19 g/m at 30	p.s.i.	"
59' - 78'11"	0.34 g/m at 30	p.s.i.	"
79' - 99' 3"	0.11 g/m at 30	p.s.i.	"
99' - 119'4"	0.58 g/m at 40	p.s.i.	"

D.d.h. 6S8. Inclined 44 deg 40'

Broken weathered rock with clay was intersected at 27'10"-29'8" but there was little leakage.

19' - 39'8"	0.26 g/m at 30	p.s.i.	(uncorrected)
39' - 59'5"	0.02 g/m at 40	p.s.i.	"
59' - 68'4"	0.02 g/m at 60	p.s.i.	"

REFERENCES.

GARDNER, D.E., and NOAKES, L.C., 1959 : Geological Reconnaissance of the Laloki River Hydro-electric Projects - Port Moresby. Bur. Min. Resour. Aust. Rec. 1959/21 (unpubl.).

KRYNINE, D.P., and JUDD, W.R., 1957 : Principles of Engineering Geology and Geotechnics. McGraw-Hill, New York.

LOCALITY MAP — SIRINUMU AREA
TRACED FROM AERIAL PHOTOGRAPHS
UBERI RUNS 3A. AND 4.

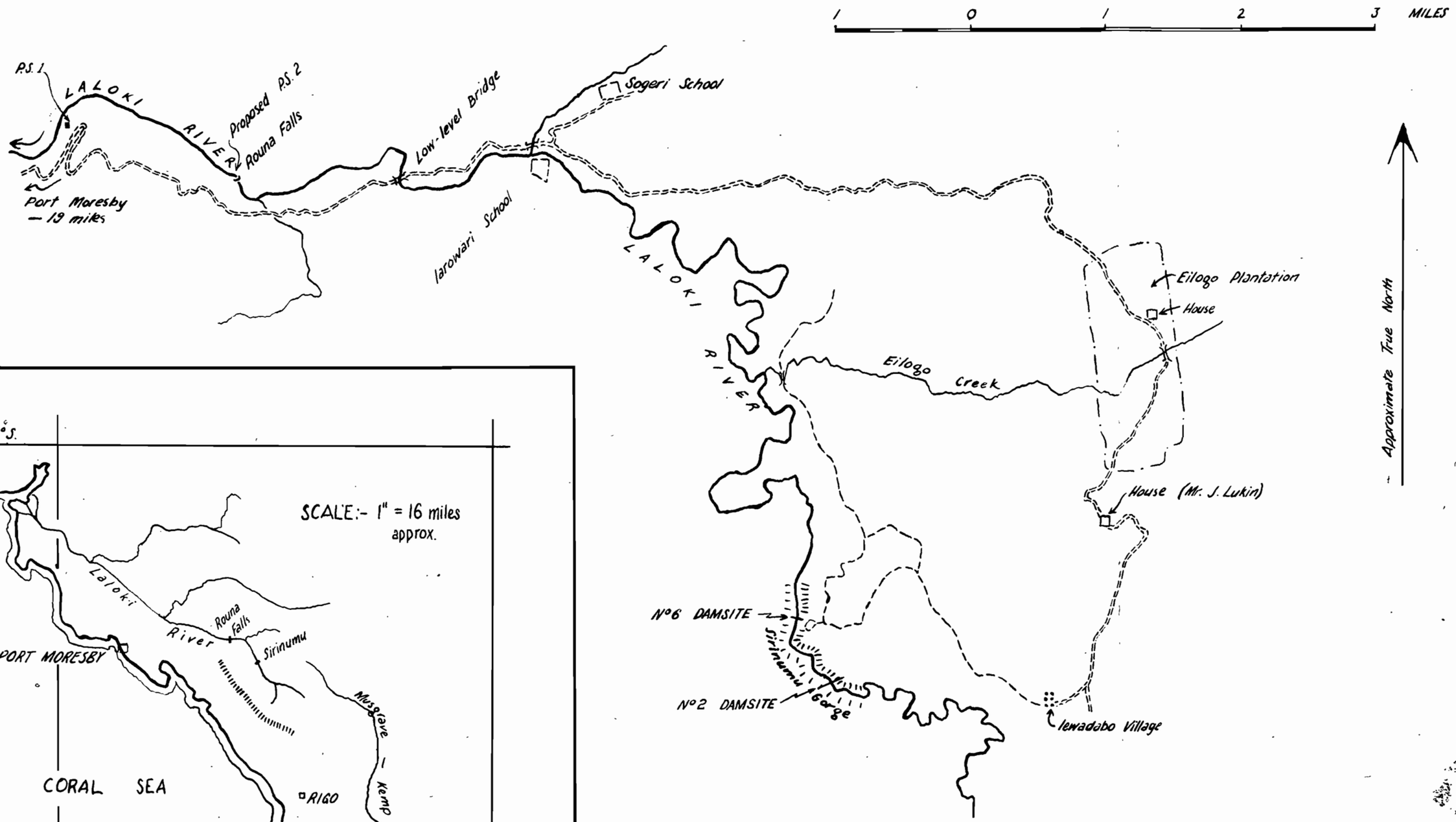


Plate 1

SIRINUMU Nº 6 DAM SITE

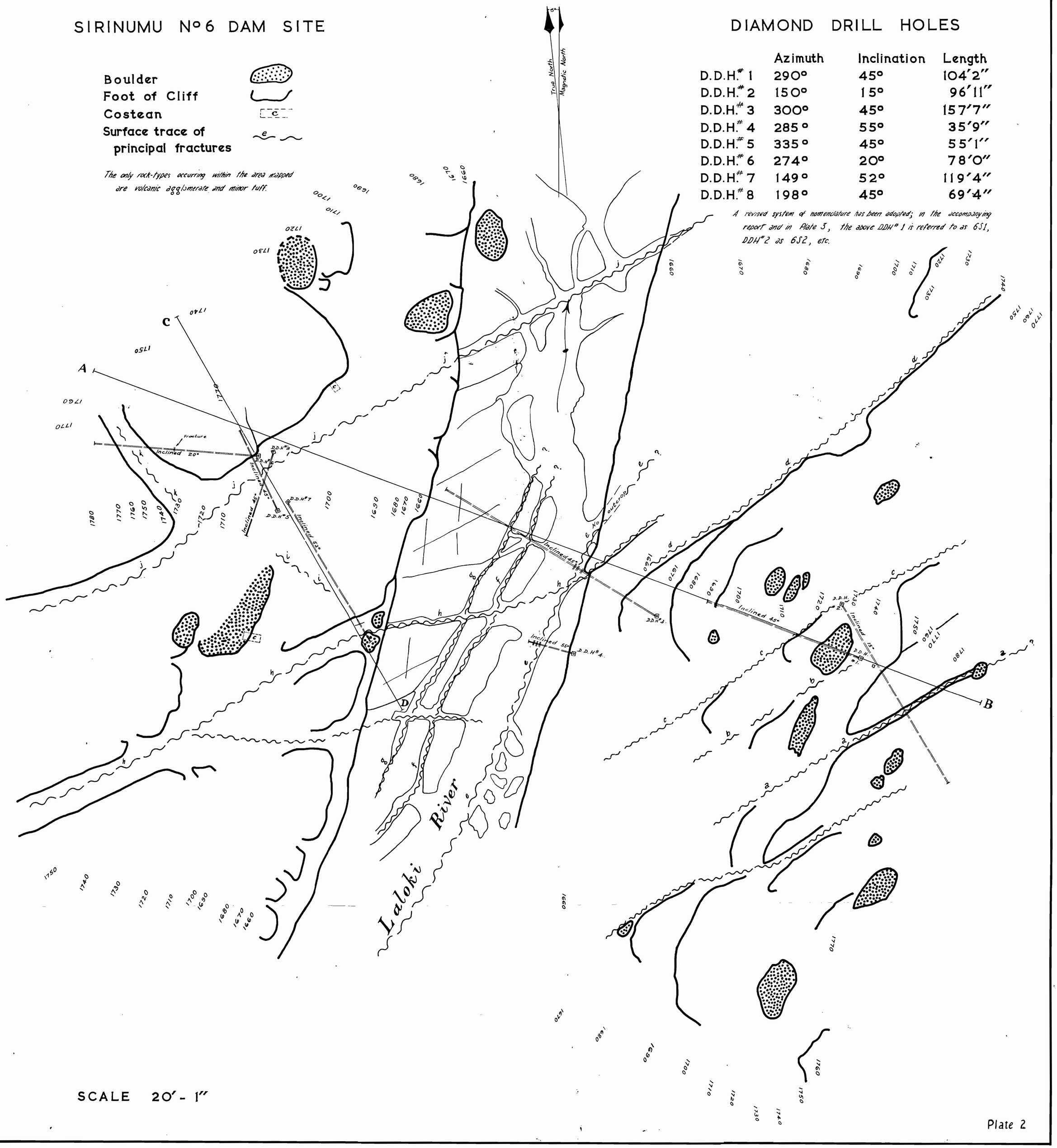
Boulder
Foot of Cliff
Costean
Surface trace of principal fractures

The only rock-types occurring within the area mapped are volcanic agglomerate and minor tuff.

DIAMOND DRILL HOLES

	Azimuth	Inclination	Length
D.D.H.# 1	290°	45°	104′2″
D.D.H.# 2	150°	15°	96′11″
D.D.H.# 3	300°	45°	157′7″
D.D.H.# 4	285°	55°	35′9″
D.D.H.# 5	335°	45°	55′1″
D.D.H.# 6	274°	20°	78′0″
D.D.H.# 7	149°	52°	119′4″
D.D.H.# 8	198°	45°	69′4″

A revised system of nomenclature has been adopted; in the accompanying report and in Plate 3, the above DDH# 1 is referred to as 6S1, DDH#2 as 6S2, etc.



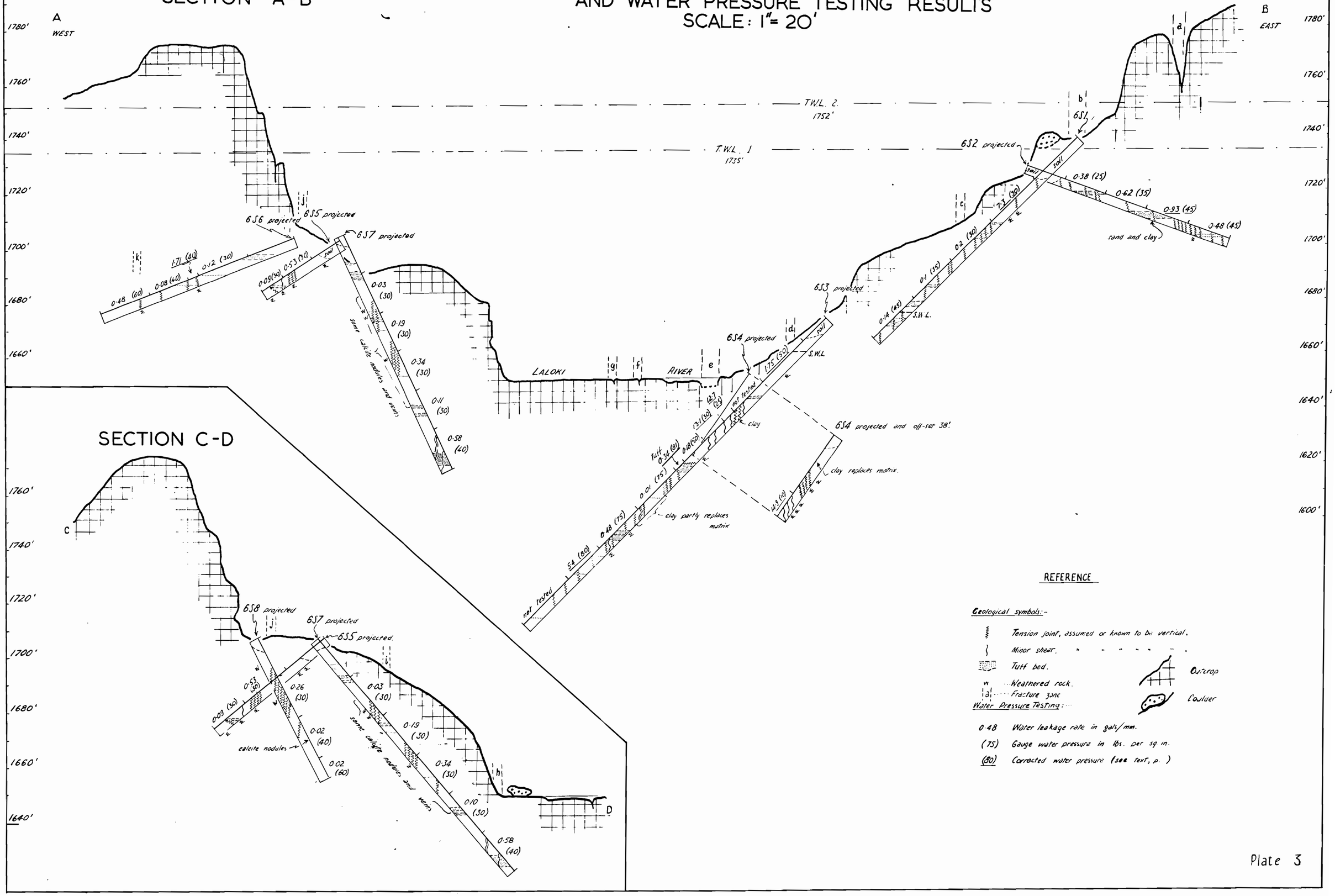
SCALE 20′ - 1″

Plate 2

SECTIONS — SIRINUMU DAMSITE No. 6

SHOWING GRAPHICAL LOGS OF DRILL HOLES AND WATER PRESSURE TESTING RESULTS

SCALE: 1" = 20'



REFERENCE

Geological symbols:-

- Tension joint, assumed or known to be vertical.
- Minor shear. " " " " " " "
- Tuff bed.
- w ... Weathered rock.
- a ... Fracture zone
- Outcrop
- Boulder

Water Pressure Testing:-

- 0·48 Water leakage rate in gals/min.
- (75) Gauge water pressure in lbs. per sq. in.
- (80) Corrected water pressure (see text, p.)

Plate 3