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## 14 GEOLOGY OF PROPOSED REGIONAL WATER SCHEME, NORTH WEST COAST

by W. L. Matthews

### Abstract

This report deals with geological aspects of planned pipeline routes and reservoirs for the proposed North West Regional Water Scheme. Two alternative layouts are being considered—one to obtain water from the Forth River where water from the newly completed Devonport Scheme is pumped, and the other to draw water from the Leven River near its junction with Lobster Creek. Three reservoir sites have been selected for the latter scheme and one for the former.

### General Geology

The accompanying geological plan (Figure 27) is largely adopted from the Devonport Geological Map Sheet on a scale of 1 inch = 1 mile by Burns.

"Older" Precambrian quartzite, mica-schist, garnet-schist, amphibolite and conglomerate with a dominant strike from north to NE outcrop from the Forth River to the south of Ulverstone and along the Leven River, west of Ulverstone. Rocky Cape Group or "younger" Precambrian mudstone and sandstone are found along the Leven estuary.

Cambrian intermediate to acid volcanics, mudstone and chert, unconformably overlying Precambrian, occur between Ulverstone and Penguin. Cambrian serpentinite intrudes Precambrian rocks along Clayton Rivulet and the Forth River.

Tertiary gravel, sand, clay, and conglomerate, together with basalt overlies basement rocks.

Quaternary deposits of gravel and sand occur along the main streams and on a marine terrace extending from the Forth River to the west of West Ulverstone.

### Unstable Areas and Deviations

Each proposed pipe line passes through old landslide areas but few of the slips are active at present. The majority of them occur in Tertiary basalt but occasional slides have been noted in areas underlain by the older rocks. The following account describes briefly the geological features and some deviations are suggested around potentially unstable areas. The deviations marked on Figure 27 are based on geological considerations only and may adversely affect the hydraulics of the systems.

### FORTH SCHEME

#### *Forth River Area*

Precambrian garnet-schist, quartzite and amphibolite and a small intrusion of serpentinite form the basement rocks. Basalt cliffs rise sharply to the west of the serpentinite and outcrops extend to the north where the basalt appears to overlie directly Precambrian quartzite. South of the pipeline pre-basalt gravel, conglomerate and sand overlie the Precambrian.

From the outcrop pattern, the zone occupied by the unstable material is apparently a pre-Tertiary topographic low which controls the underground drainage causing seepages. This, together with the steep slopes left by river erosion, has produced an ideal situation for landslips to develop. The types of movement appear to be shear failures and earth-flows or a combination of both.

Two alternative deviations have been suggested. One avoids the slide area completely by going north along the river and the other passes through a stable area within the slide mass.

#### *Buttons Creek Area*

Small slips in talus overlying Precambrian quartzite occur east of Buttons Creek along the pipeline route. By moving the line slightly south, it would pass up a small valley in the most stable area.

West of the creek a series of small slumps, involving 2-3 cubic yards of material, have moved down a steep hill underlain by schist. These slides probably extend to bedrock and it is not likely that new movements of the same size would affect a pipeline.

#### *West Gawler*

On the side of a hill facing the Gawler River estuary the Forth line passes through the toe area of a series of ancient shear slides with associated internal drainage. Talus from the slides covers the contact between Precambrian and Cambrian rocks but basalt is in contact with quartzite to the east of the unstable zone and volcanics to the west. Hackly jointed basalt crops out strongly around the top of the ridge. By diverting the pipeline over the Gawler River Railway Bridge (where it is proposed to put the Leven line) and rejoining the planned Forth line near Masons Creek, the slip zone would be avoided, several sharp bends in the line would be eliminated and the length decreased by about 20 chains.

*South of Ulverstone*

Tertiary basalt overlies a brown to light bluish clay, the extent of which is difficult to determine because of encroachment of earth from slides. The Forth pipeline crosses the southern part of a zone of shear slides and in order to avoid it, a small deviation to the south is suggested.

*South Road*

It may be necessary to deviate the Forth line around a quarry in Tertiary gravels situated about 5 miles west of Ulverstone along South Road.

**LEVEN SCHEME***East of Ulverstone*

The scarp between the basalt plateau and the coastal plain shows Precambrian schist and quartzite intruded by serpentinite close to where the pipeline descends to the plain. A pre-basalt band of sand and clay can be found consistently overlying the basement rocks. Earth-flows down the scarp in country underlain by schist occur to the east. Near the line to the west is a zone of shear slides and earth-flows in Tertiary basalt and sediments. The alteration of the pipeline route places it so that it descends the most gentle slope in this portion of the scarp.

*South of Ulverstone*

Both proposed pipelines pass through an extensive unstable area. The main cause of movement is a Tertiary clay underlying basalt. The deviation marked on the map takes the line along the top of a ridge rather than around the side where it would cross several slides.

*West of Masons Creek*

The proposed pipeline descends a hill roughly along the contact between quartzite and basalt. A number of slides occur in the basalt to the north, but sited as it is, the pipeline appears safe from future slips.

*Opposite Singletons Point*

The pipeline follows approximately the same route as the Nietta railway around the end of a ridge. Basalt overlies "younger" Precambrian sedimentary rocks and the only signs of instability are two collapses in the railway line cutting.

**RESERVOIR SITES****FORTH SCHEME (No. 4)**

The site selected for a reservoir of 10 million gallons capacity is on a hill rising to 500 feet above sea level about a mile west of the proposed pumping station. The hill is steep to the south but slopes gently down toward the north. Tertiary grit and sand are overlain by at least 100 feet of basalt, the top of which has been lateritized at the reservoir site. Although there are no indications

of slips in the area, the large size of the reservoir warrants more detailed investigation at a later stage to determine the degree of weathering in the basalt and to locate any sedimentary intercalations that may be present.

#### LEVEN SCHEME

Each reservoir has a planned capacity of 5 million gallons.

##### *South of Turners Beach (No. 1)*

The hill on which it is proposed to site this reservoir is underlain dominantly by Tertiary rocks. At the site itself, grit is exposed whilst basalt talus occurs on the NE slope around the margin of the marine terrace. Excavations about 15 chains south of the site have exposed coarse rounded gravel, gravel and sand with a clay matrix and pure clay beds. West and SW of the reservoir site a weathered black garnet schist occurs striking N to NE. Any of these rocks could underlie the reservoir site at depth and if weathered basalt, clay or schist occur, the additional load of the reservoir may result in instability. Old slides have been mapped on the northern end of the hill and slide-like features were noted on the eastern slopes. Drilling is recommended at this site to determine the subsurface conditions more precisely.

##### *East of Leven River (No. 2)*

This site is situated on a ridge underlain by Cambrian chert. Foundations for the reservoir should be very stable although a certain amount of excavation of chert is expected. A flat area about 10 chains south, where little or no excavation is likely to be required, might serve as an alternative. It is, however, 50-75 feet above the planned site.

##### *Site SE of Penguin (No. 3)*

Cambrian chert underlies this reservoir site and, as with Site No. 2, there is little danger of instability.

#### EXCAVATION AND ACCESS CONDITIONS

The following table gives some indication of the type of country, accessibility, &c. of each scheme. Measurements refer to the original routes with the suggested deviations not taken into account. Measurements and percentages are only approximate.

	Leven Scheme	Forth Scheme
Length .....	11.1 miles	11.0 miles
<i>Poor access</i> —Mostly uncleared land. Parts may be negotiable without making special tracks. Includes "very poor access" .....	35.9%	21%
<i>Very poor access</i> —Special tracks probably needed to reach line .....	25.1%	12.5%
<i>Low lying, poorly drained areas</i> .....	22.9%	10%
<i>Outcrop</i> —Outcrop actually at surface plus where it could be expected in excavations 4'-5' deep .....	21.3%	17.1%
<i>Basalt</i> .....	23.5%	43.4%

Where they crop out, Cambrian chert, volcanics and serpentinite and Precambrian quartzite, amphibolite, sandstone and perhaps conglomerate are expected to cause the greatest difficulty in excavations. Some very isolated areas underlain by basalt might have unweathered rock close to the surface. Although it is probable that solid Precambrian schist and mudstone will be encountered (included in the above table) they are not expected to present great difficulty in excavations.

### CONCLUSIONS

(1) Although proposed pipelines from each scheme pass through potentially unstable areas, these zones can be avoided in each case by a deviation.

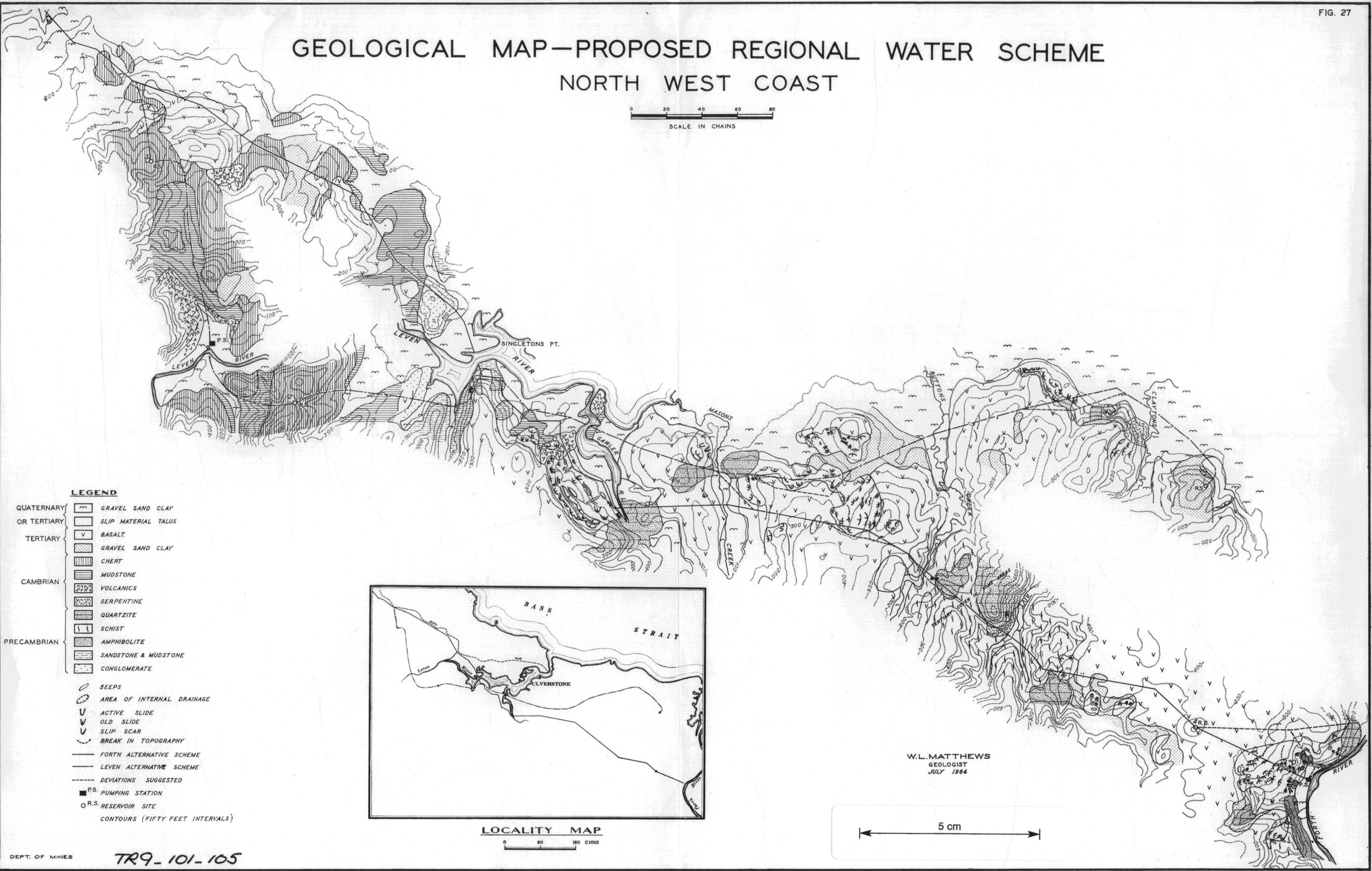
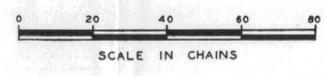
(2) Accessibility and general pipe laying conditions appear better for the Forth Scheme.

(3) Further investigation at one reservoir site on each scheme is recommended.

### REFERENCES

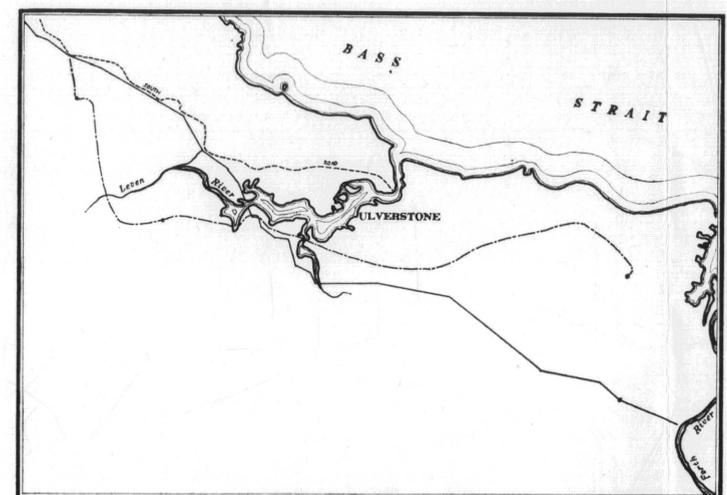
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# GEOLOGICAL MAP—PROPOSED REGIONAL WATER SCHEME NORTH WEST COAST



### LEGEND

- QUATERNARY OR TERTIARY
  - GRAVEL SAND CLAY
  - SLIP MATERIAL TALUS
- TERTIARY
  - BASALT
  - GRAVEL SAND CLAY
  - CHERT
- CAMBRIAN
  - MUDSTONE
  - VOLCANICS
  - SERPENTINE
  - QUARTZITE
- PRECAMBRIAN
  - SCHIST
  - AMPHIBOLITE
  - SANDSTONE & MUDSTONE
  - CONGLOMERATE
- SEEPS
- AREA OF INTERNAL DRAINAGE
- ACTIVE SLIDE
- OLD SLIDE
- SLIP SCAR
- BREAK IN TOPOGRAPHY
- FORTH ALTERNATIVE SCHEME
- LEVEN ALTERNATIVE SCHEME
- DEVIATIONS SUGGESTED
- PS. PUMPING STATION
- OR.S. RESERVOIR SITE
- CONTOURS (FIFTY FEET INTERVALS)



LOCALITY MAP  
0 80 160 CHNS

W.L. MATTHEWS  
GEOLOGIST  
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