DEPARTMENT OF MINES & ENERGY
SOUTH AUSTRALIA

Rept.Bk.No. 80/143

REFRACTION SEISMIC SURVEY AT A PROPOSED WATER FILTRATION PLANT: HAPPY VALLEY RESERVOIR

GEOLOGICAL SURVEY

by

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GEOPHYSICS SECTION

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E & W S

D.M. No. 667/79

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PLANS

DEPARTMENT OF MINES AND ENERGY
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Rept.Bk.No.80/143
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ABSTRACT

Shallow refraction seismic work was carried out in the vicinity of the proposed water filtration plant at Happy Valley Reservoir. This indicated that there would be little difficulty in excavating material to the level desired using a D8 or D9 bulldozer.

INTRODUCTION

At the request of the Engineering Geology Section a shallow refraction seismic survey was carried out at the site proposed for a water filtration plant at Happy Valley Reservoir. The aim of the survey was to assess the rippability of the material to be excavated.

The work consisted of five spreads located as shown on Figure 1. Each spread consisted of 24 geophones spaced 5 m apart (total distance 115 m) with explosives detonated in shallow holes at the centre, each end, half way between the centre and each end, and approximately 30 m beyond each end of each spread. Two 12 channel Nimbus ES1210 seismographs connected to operate simultaneously were used to record the first arrivals of energy to the geophones. These arrivals were timed with respect to the instant of detonation and the times plotted against the distance of the geophone from the shot. The time-distance curves were then analysed using the reciprocal method described by Hawkins (1961) to obtain horizontal velocities and depths to the various layers.

RESULTS AND CONCLUSIONS

Seismic velocity cross sections are shown on Figure 2 along with the depth to which the material is to be excavated.

Apart from the first layer (290 m/s-500 m/s), which is surface alluvium, normal seismic interpretation including the use of blind zone techniques shows up to three layers above a high velocity base layer.

The log of a borehole situated near the junction of spreads 3 and 4 shows that for the full depth of the hole (15 m) completely weathered to highly weathered siltstone with no visible structure is present.

The time-distance profiles should therefore be interpreted as if the velocity of the material below the surface alluvium increases gradually with depth, rather than as a series of separate refractors of different velocities. The increase in seismic velocity with depth is probably due to the degree of weathering which decreases with depth.

On the western end of both cross sections there is a 1500 m/s to 1700 m/s layer within 4 m of the surface. This is probably the the result of water saturation from the reservoir.

The high velocity layer (2000 m/s-3500 m/s) is probably caused by relatively fresh siltstone.

It is unlikely that there will be any rippability problems encountered in excavating to the planned levels with a D8 or D9 bulldozer. However, drilling at the points beneath the traverses where the high velocity medium is closest to the surface should be attempted to confirm this interpretation, e.g. at geophone 6 on spread 1.

B Taylor

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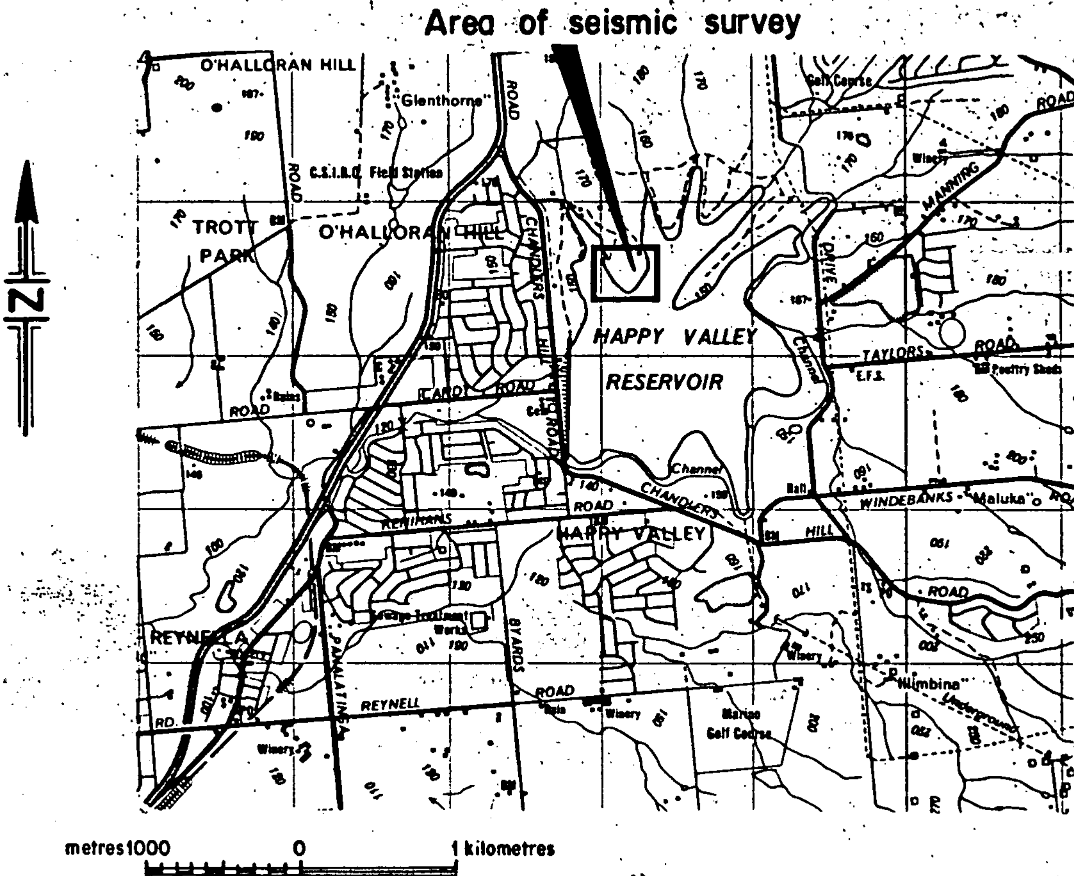
Supervising Technical Officer

REFERENCES

HAWKINS, K.V., 1961. The reciprocal method offrroutine shallow refraction investigations. Geophysics 26, 806-819

HAWKINS, L.V., and MAGGS, D., 1961. Nomograms for determining maximum errors and limiting conditions in seismic refraction survey with a blind-zone problem. Geophysical Prospecting. Vol. 9. 528-532.



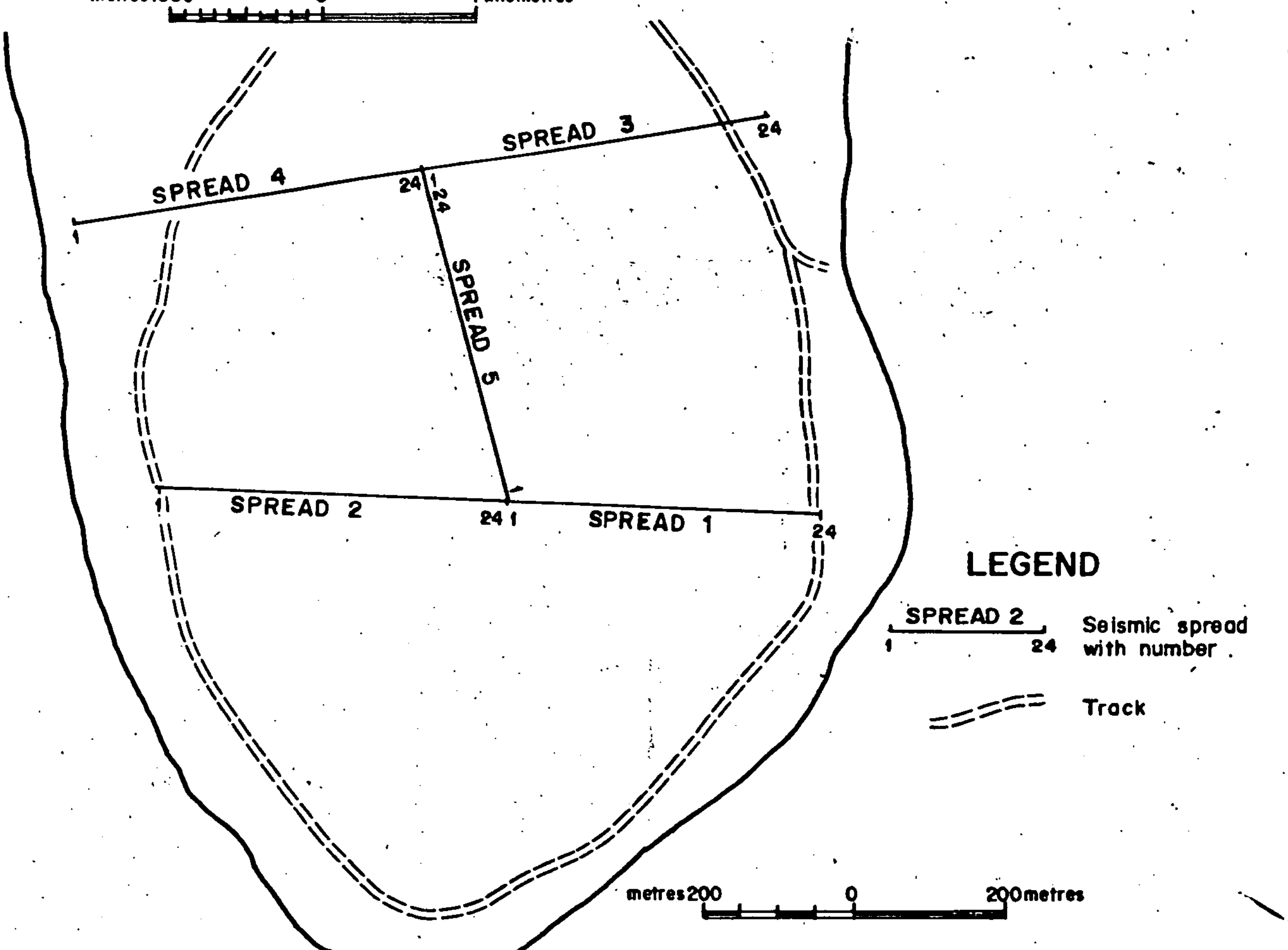


FIG. 1

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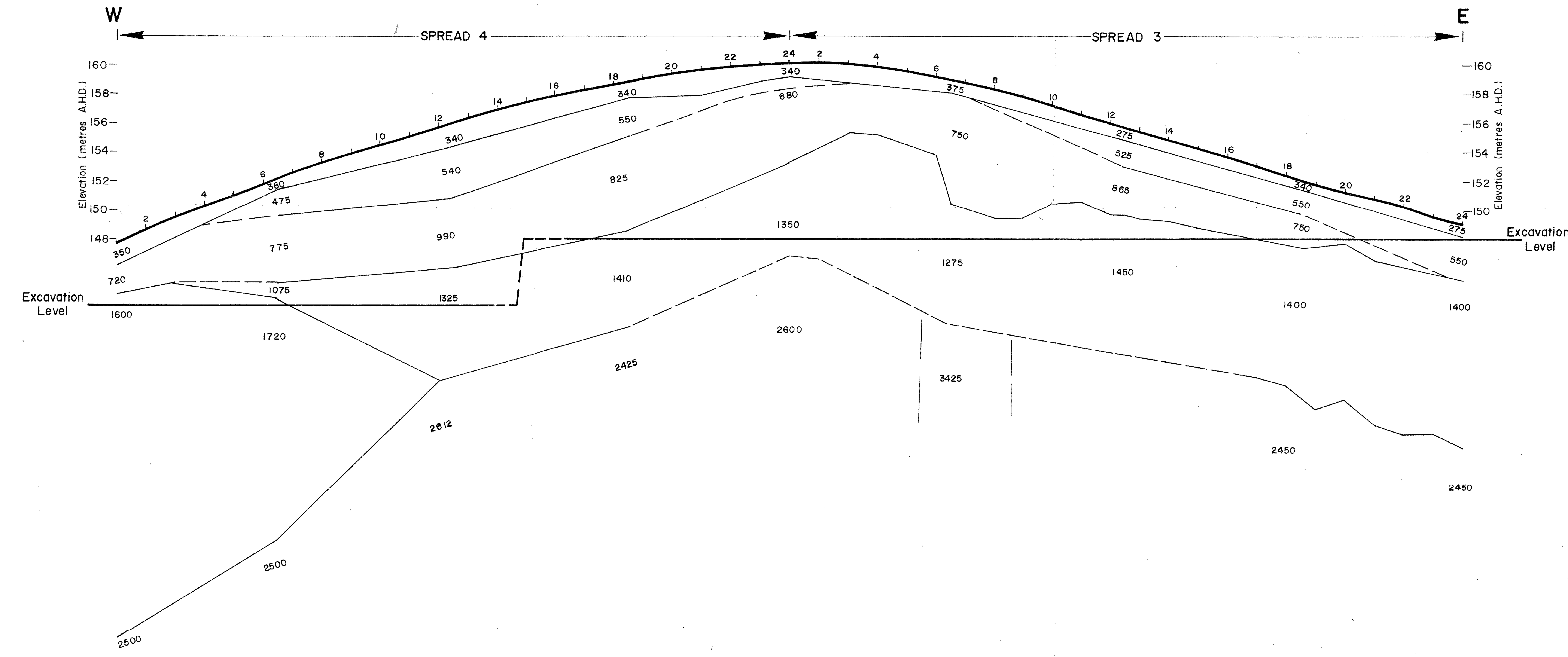
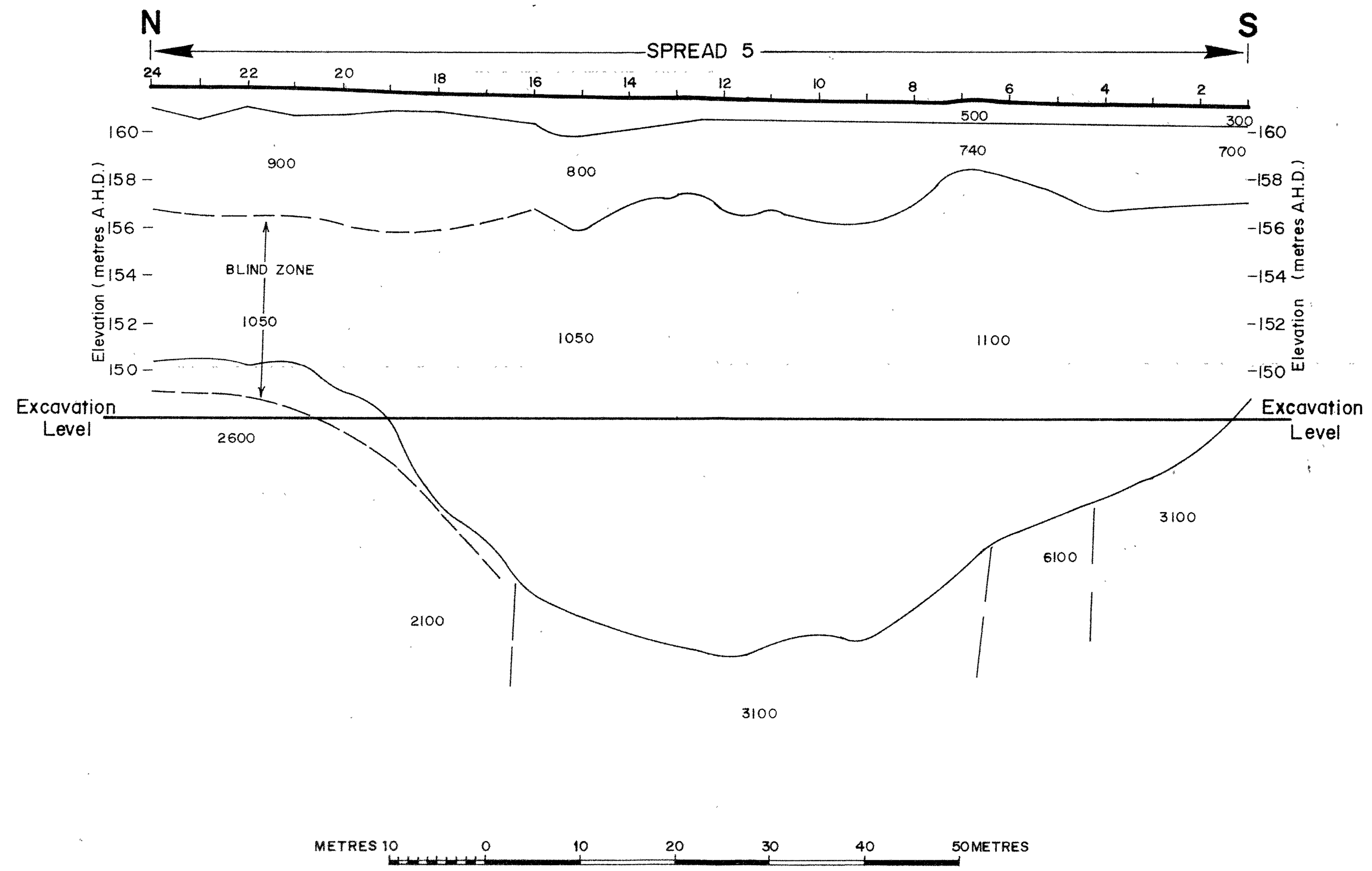
HAPPY VALLEY WATER FILTRATION SITE

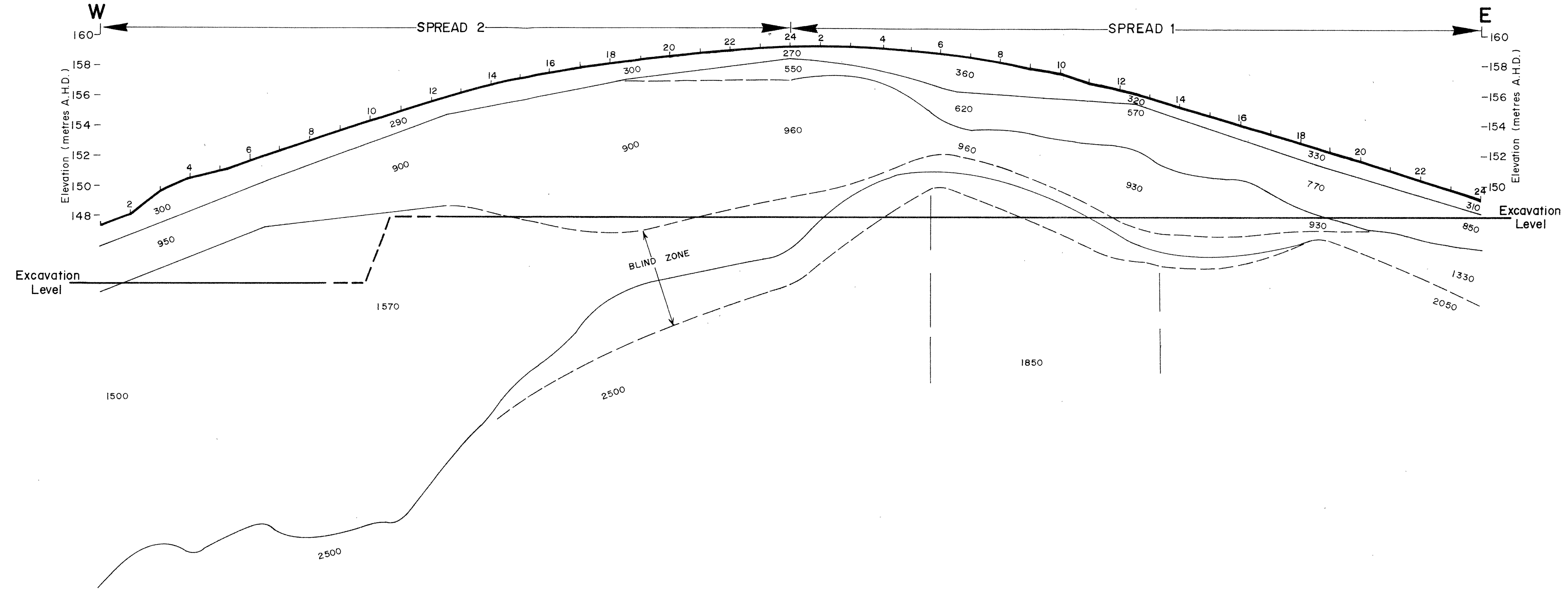
LOCATION OF SEISMIC SPREADS

COMPILED B.T.	C.D.O. 8-12-80 DATE
DRAWN S.R.	SCALE 50 000 / 10 000
DATE 4-9-80	PLAN NUMBER
CHECKED	S15046

2143







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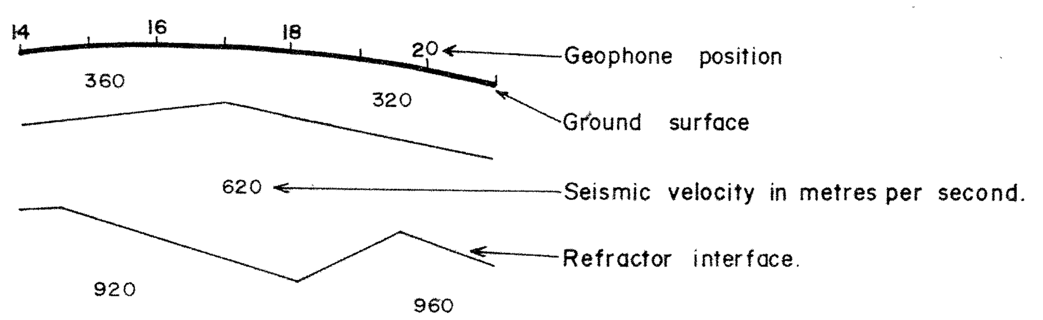

For location of sections see plan S15046

FIG. 2

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HAPPY VALLEY WATER FILTRATION SITE

SEISMIC CROSS-SECTIONS

SPREADS 1-5

COMPILED	B.T.
DRAWN	S.R
DATE	10/9/80
CHECKED	
C.D.O. DATE	8-12-80
SCALE	1:500
PLAN NUMBER	80-601