NLSRT Memo No. 57

Possible Antenna Site by the Greenbrier River.

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NLSRT Memorandum No. 5 by S. von Hoerner mentions an alternate site for a large antenna near Green Bank. This site is in the valley of the Greenbrier River, just over the ridge approximately north-west of the 140-ft antenna. It is reached by a dirt road 2.2 miles long that leads off from the paved road running between the 140-ft and 300-ft antennas. This alternate site has better shielding by mountains than the general NRAO area at Green Bank, and would be expected to provide better protection from ground based interference and from wind. On May 4, we made a trip to the area for a brief visual inspection of the site as a possibility for a large telescope.

The site and part of the road into it can be seen from the maps in Figs. 1 and 2. The road up Slavin hollow was satisfactory for a four-wheel drive pickup for about half a mile, and then on the steeper part was badly enough washed out that in one place we were barely able to get through. We parked at the gate at the top of the ridge, which is at the edge of the NRAO property, 1.3 miles from the paved road. We walked the remaining 0.9 miles down the hill into the valley. The road here also had some badly washed out places, and is on Forest Service land. The road could clearly be put into satisfactory condition for small vehicles, although large trucks that would be required for parts of a big antenna would present a more difficult problem. First, there is a fairly sharp hairpin bend about 0.2 miles from the gate, and although the road is fairly wide at that point it would be difficult for a long vehicle. Second, the part of the road leading down beyond the ridge is rather narrow, and because it is cut into a hillside widening it would require a lot of work. About half a mile of this part of the road is on a north-facing slope, which should be remembered when considering the problem of winter maintenance.

The position that we judged to be best as a possible site for a large antenna is indicated in Fig. 1. The ground at this point is beginning to rise up from the valley bottom, and there is a fairly flat area about 50 yards in diameter which could be extended to 100 yards or more with some earth moving. We did not notice any rock coming through the surface in this area, so the depth of the bedrock would have to be determined by drilling. After the recent rains the wider area near the river looked rather marshy. Fig. 3 shows an estimate of the horizon elevation from the map in Fig. 2. At 10° intervals in azimuth, the elevations of high points within about a mile of the valley bottom are plotted in Fig. 3. A quick visual inspection confirmed the main festures in Fig. 3, although some of the low points appeared to be filled in by more distant hills. In general the horizon angle appeared to be roughly 10° in most places, with the lowest dip being to the east where the road in comes over the ridge. The valley is a most beautiful unspoiled area, and is indeed very well shielded.

Two main difficulties with the site are clear from a casual inspection. One is the problems with the road mentioned above, and the other is that the shielding is rather too good: the sky coverage is limited to angles above about 10°. For an antenna to be used only for total-power measurements the horizon would be ideal. However, one important role of a large antenna will

be to support VLBI observations, for which it is desirable to have as much sky coverage as possible to the east and west to maximize tracking times with antennas in Europe and on the west coast. A horizon angle of about 4°-5° would be a good compromise for a general purpose antenna, more like the horizon one sees from many parts of the existing observatory grounds at Green Bank. A possible problem with the observatory grounds is that there is little protection from the 14 miles of highway that runs from Dunmore to Bartow, and by most estimates there will be a major increase in the use of mobile communications units in the frequency bands up to 2 to 3 GHz over the next okne or two decades. An ideal site would appear to be one with moderate mountain shieading, in a valley with the same road in and out, rather than a highway passing through.

To get a quantitative estimate of the benefit of mountain shielding from interference, it may be useful to calculate propagation losses from a few points around Green bank to the Observatory grounds and to the alternate site described above. Points most likely to be sources of interference include towns and high points on highways.

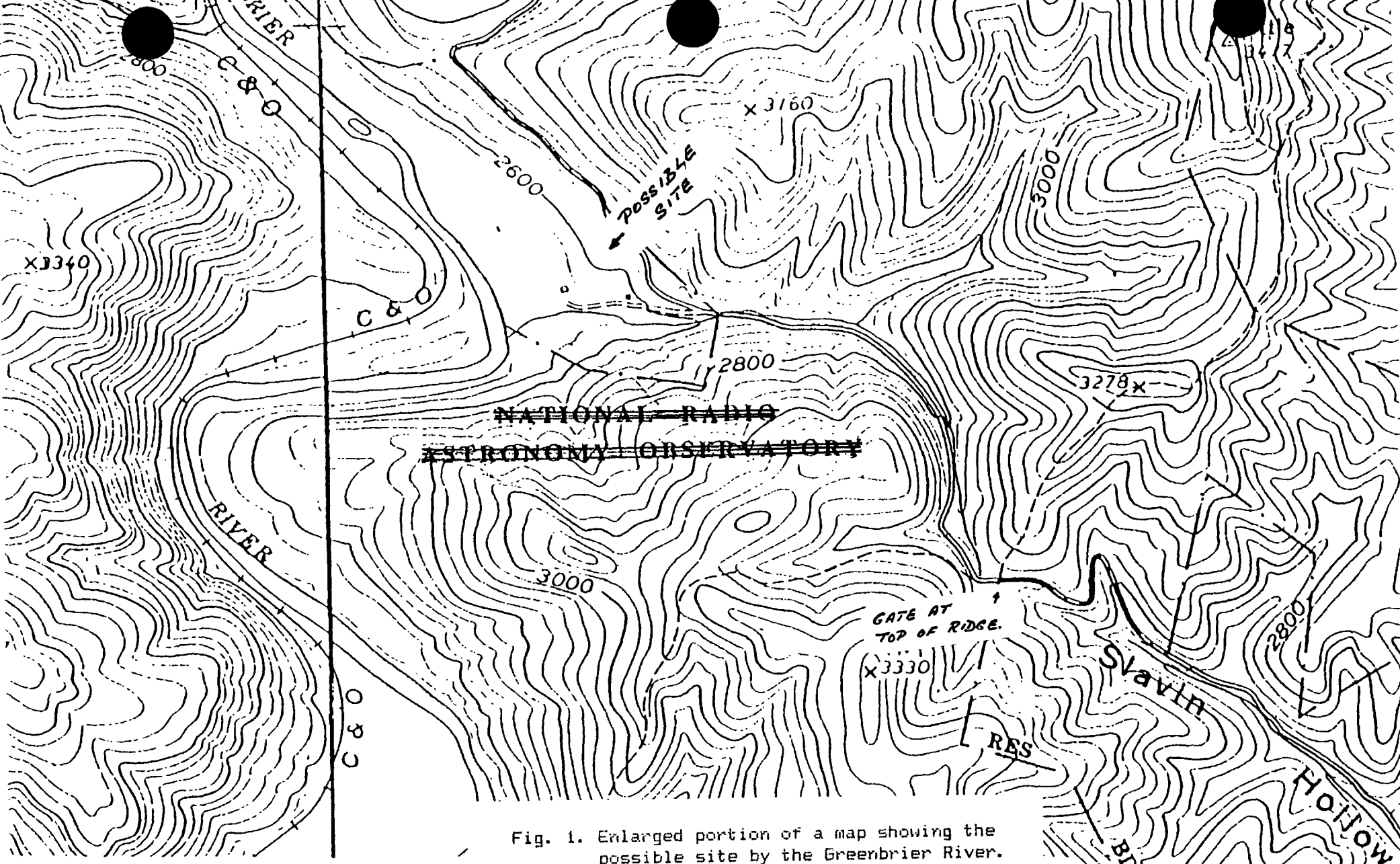

Fig. 1. Enlarged portion of a map showing the possible site by the Greenbrier River.

SCALE 1:24 000

0 1 MILE

1000 2000 3000 4000 5000 6000 7000 FEET

5 0 1 KILOMETER

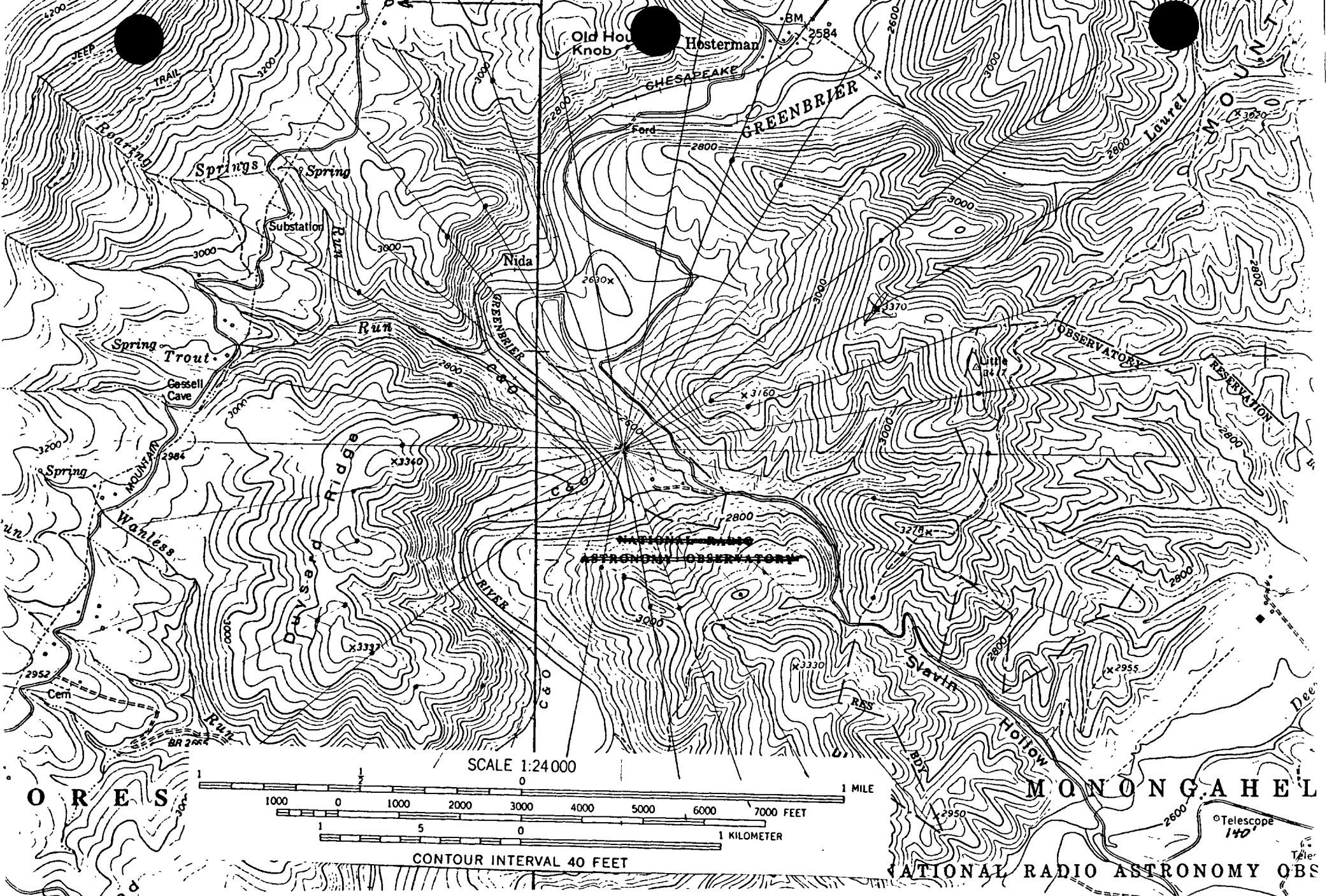

Fig. 2. Azimuths for which the horizon elevation was estimated in Fig. 3.

AZ	OBST ELEV(FT)	DIST(FT)	ANGLE	AZ	OBST ELEV(FT)	DIST(FT)	ANGLE
0°	460	6600	4.0°	180	460	2100	12.4
10	340	6800	2.9	190	340	2000	9.6
20	380	5000	4.3	200	260	2000	7.4
30	540	5000	6.2	210	380	4500	4.8
40	550	5500	5.7	220	580	5100	6.5
50	720	5500	7.5	230	780	5200	8.5
60	580	1700	19.8	240	700	5200	7.7
70	540	2100	14.4	250	780	4600	9.6
80	840	5800	8.2	260	740	4500	9.3
90	620	6000	5.9	270	740	3600	11.6
100	540	4200	7.3	280	660	2800	13.3
110	640	4800	7.6	290	420	3000	8.0
120	520	4800	6.2	300	340	5000	3.9
130	620	3200	11.0	310	500	4200	6.8
140	660	3000	12.4	320	580	4500	7.3
150	660	3300	11.3	330	540	4600	6.7
160	500	2700	10.5	340	500	6400	4.5
170	580	2600	12.6	350	700	6600	6.1

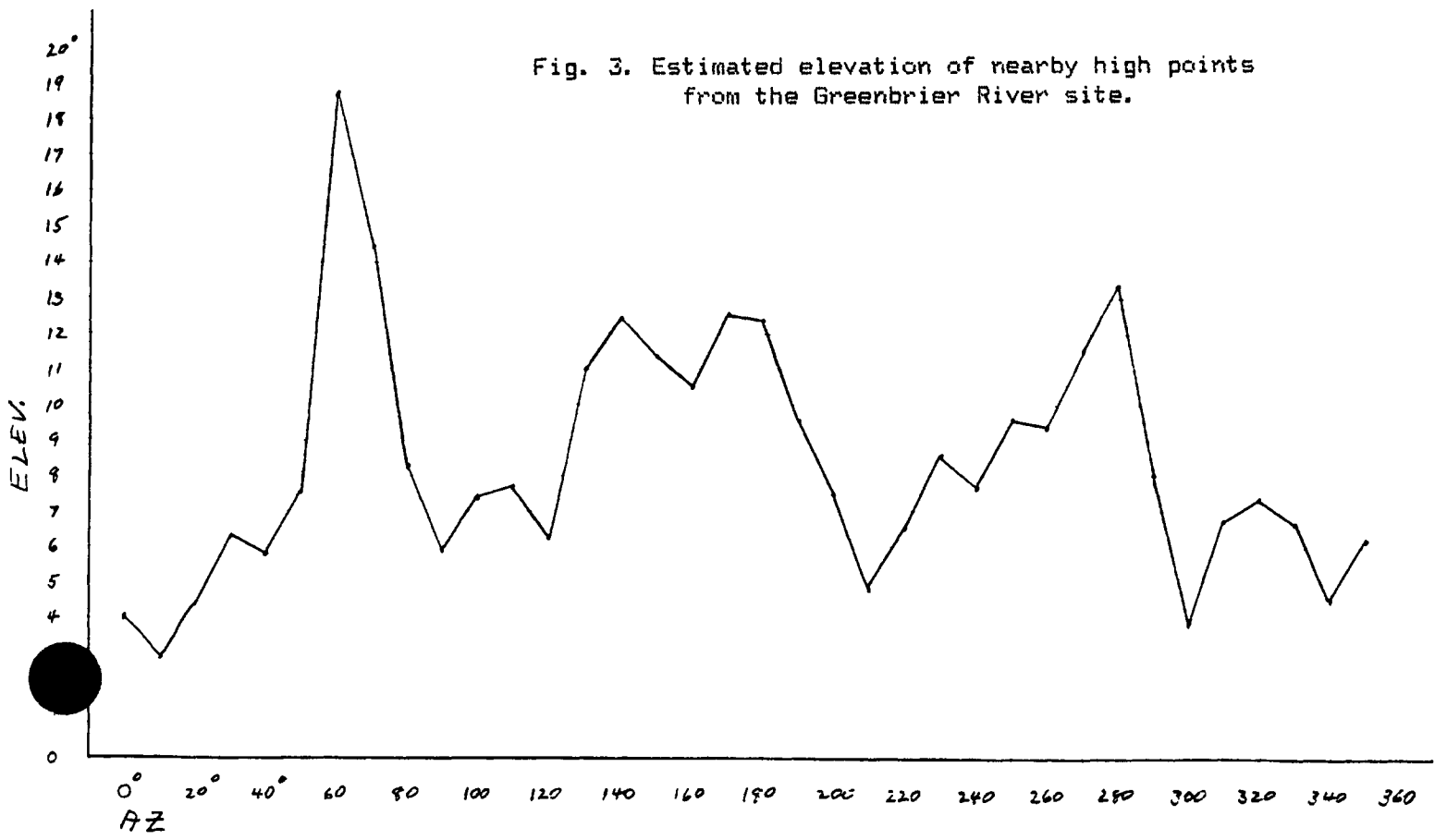

Fig. 3. Estimated elevation of nearby high points from the Greenbrier River site.