

LAVA CAVES IN NORTH QUEENSLAND EINASLEIGH—MT SURPRISE AREA

by
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Introduction

During the winter of 1970, I was fortunate in having the opportunity of visiting a caving area which has fascinated me from my first reading of its descriptions in the A.S.F. Handbook (Matthews, P. Ed., 1968): "Undara North; a lava tunnel extending for 16 miles" and "Undara West; a lava tunnel extending for 24 miles". These two impressive sounding caves in the Einasleigh-Mount Surprise area of North Queensland however, are perhaps the least known on the Australian mainland.

Unfortunately, these tunnels are not complete in that they cannot be fully explored throughout their length due to numerous collapses but the largest intact section known at the moment is nearly half a mile in length. No doubt further exploration could produce perhaps the longest lava caves in the world.

The Einasleigh—Mount Surprise Area

The Undara lava tunnels are probably unique in that what might be called a "Grade 4" survey of them is marked on a 1:250,000 scale map, the Einasleigh sheet of the geological series (E/55-9 1962) — a rare scale for a cave survey! The tunnels were actually first located from this map by speleologists.

The Einasleigh—Mount Surprise area is geologically part of the largest volcanic "province" in Queensland — the McBride Shield. This huge basaltic plateau occupies about 2,000 square miles in an area 180 miles W.N.W. of Townsville. The plateau consists of Cainozoic olivine basalt, the most recent flow probably being extruded within the last 1,000 years (White, 1962). The general landform is perhaps only impressive for its monotony, with the flat wooded lava plains broken only by mini craters and protruding granite "tors" such as Barkers Knob.

Some 110 craters are associated within the "province", with the two lava tunnels running from a central point, Undara Crater, towards the northern and western boundaries of the area. The tunnels actually originate very near to the main Hann Highway, although this end has never been explored for "enterable" caves.

Formation of Lava Tunnels

The mode of formation of lava tunnels has already been well elucidated by C.D. Ollier (1963) in *Helictite* but a brief summary of the generally accepted theory should be useful as a guide.

Consider a lava flow moving down from its point of extrusion. The surface exposed to the air will naturally cool and solidify first with still molten layers underneath. If the solid surface is then breached further downstream, the lava can flow out leaving the tunnel cavity. This principle is easily envisaged at Einasleigh, with the thin lava roofs and slightly dipping caves following the surface contour.

The Lava Caves in the Barkers Knob Area

Although the lava tunnels are known to stretch over a total distance of over 30 miles, only a very small part of this (in the neighbourhood of Barkers Knob) has been explored and caves entered.

The main cave known, Barkers Cave, is located some 20 miles south-east of the township of Mount Surprise, and is well known to the locals, at least by hearsay. In an article in "Down Under" Henry Shannon (1969) suggests that Barkers Cave is *not* part of the main Undara West Tunnel. He bases this comment on the position of the tunnel relative to Barkers Knob as indicated on the geological map. However, from a study of other available maps it seems possible that a cartographic error occurs on the geological map and that Barkers Cave *is* part of the Undara Tunnel. It certainly follows the same direction as the line of collapses of the Undara Tunnel.

Barkers Cave is situated in a small collapse crater approximately one quarter of a mile from a small granite "tor" — Barkers Knob. This "tor" incidentally affords an impressive view of the non-spectacular landscape, but only the nearby caves can be seen from its summit.

The entrance slopes down over the boulder collapse onto the floor of a huge tunnel 40 feet high and 40 feet wide with a somewhat flattened oval shape (Plate 1). This cave entrance is undoubtedly the most impressive ever seen by the author. A vast passage can be seen extending into the darkness for hundreds of feet, with the walls stained with green, red, black and white bandings. A survey of the cave and adjacent surface features is presented (Figure 1) together with a number of selected cross-sections (Figure 2). The lava roof is only 2'6" thick at the entrance, so a collapse over a cave this size is not really surprising! From the entrance the cave continues slightly winding for approximately 2,400 feet to

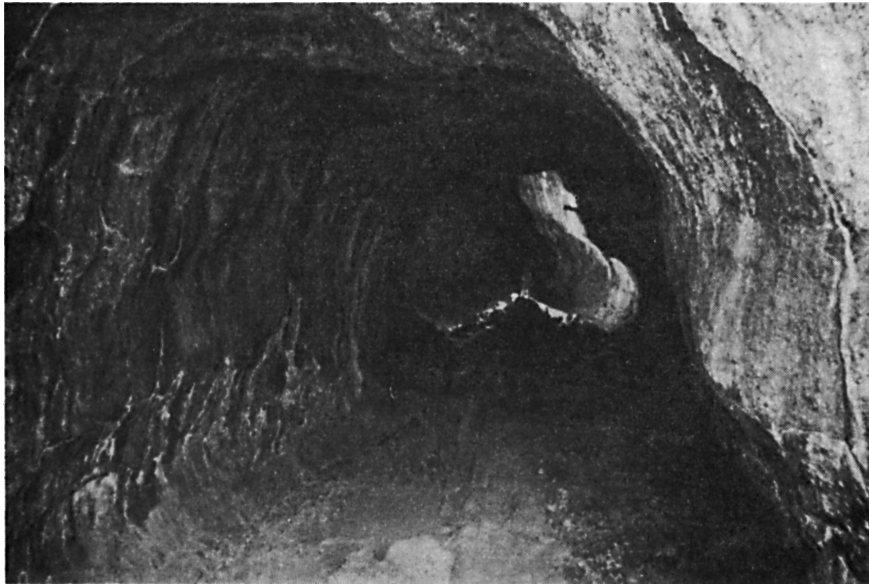


Plate 1. Barkers Cave. The Entrance

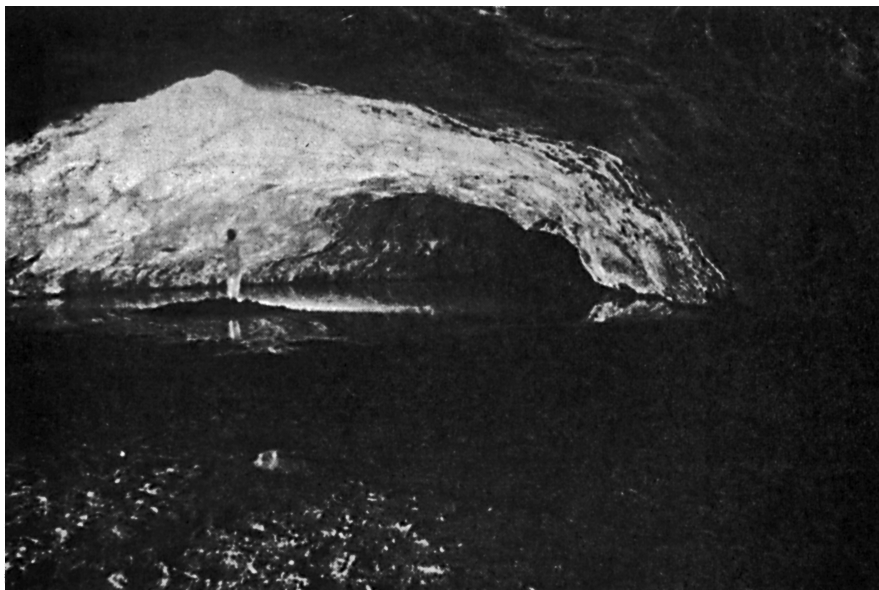


Plate 2. Barkers Cave. Terminal Lake

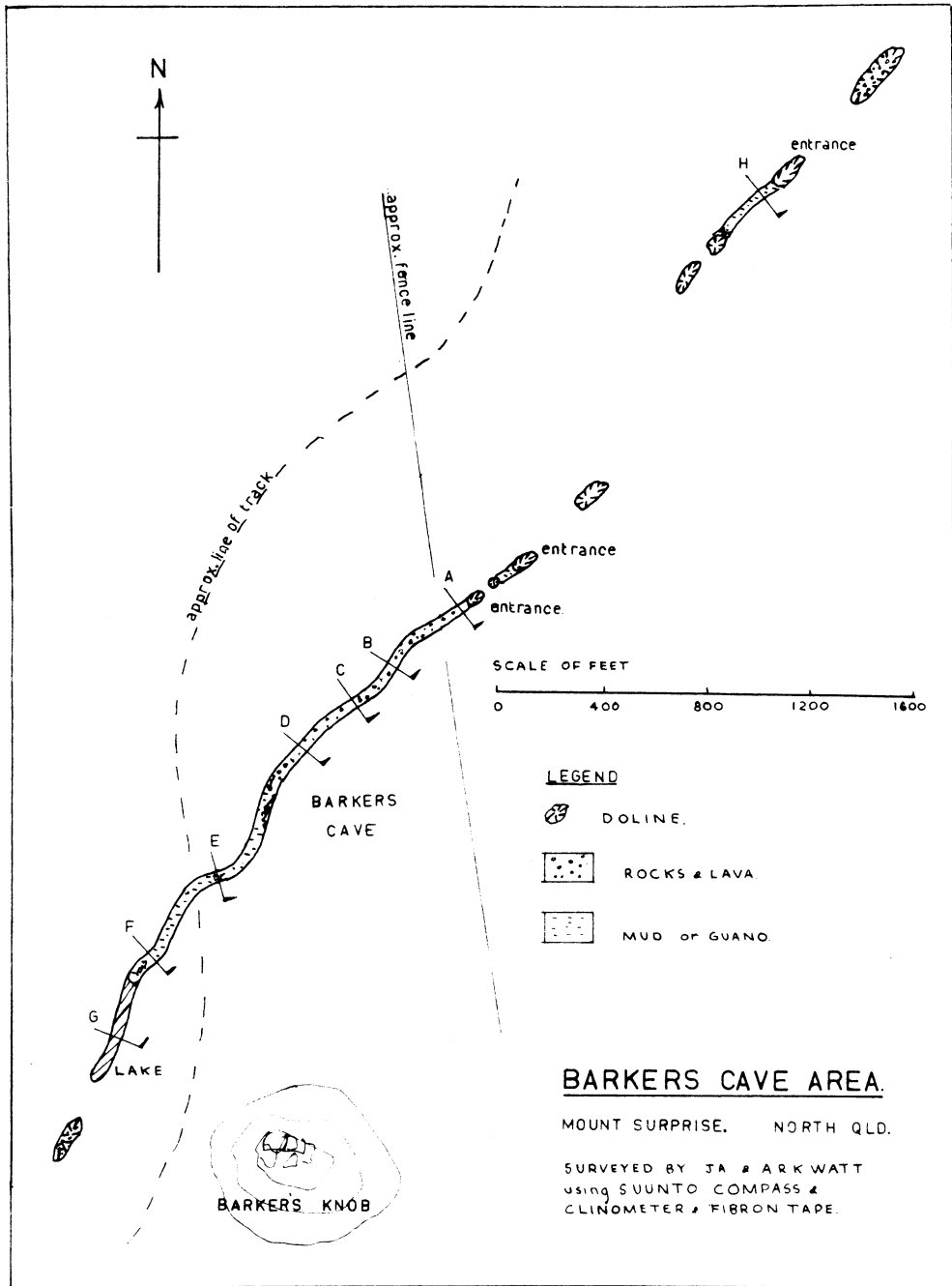


Figure 1 — A survey of Bakers Cave and adjacent surface features

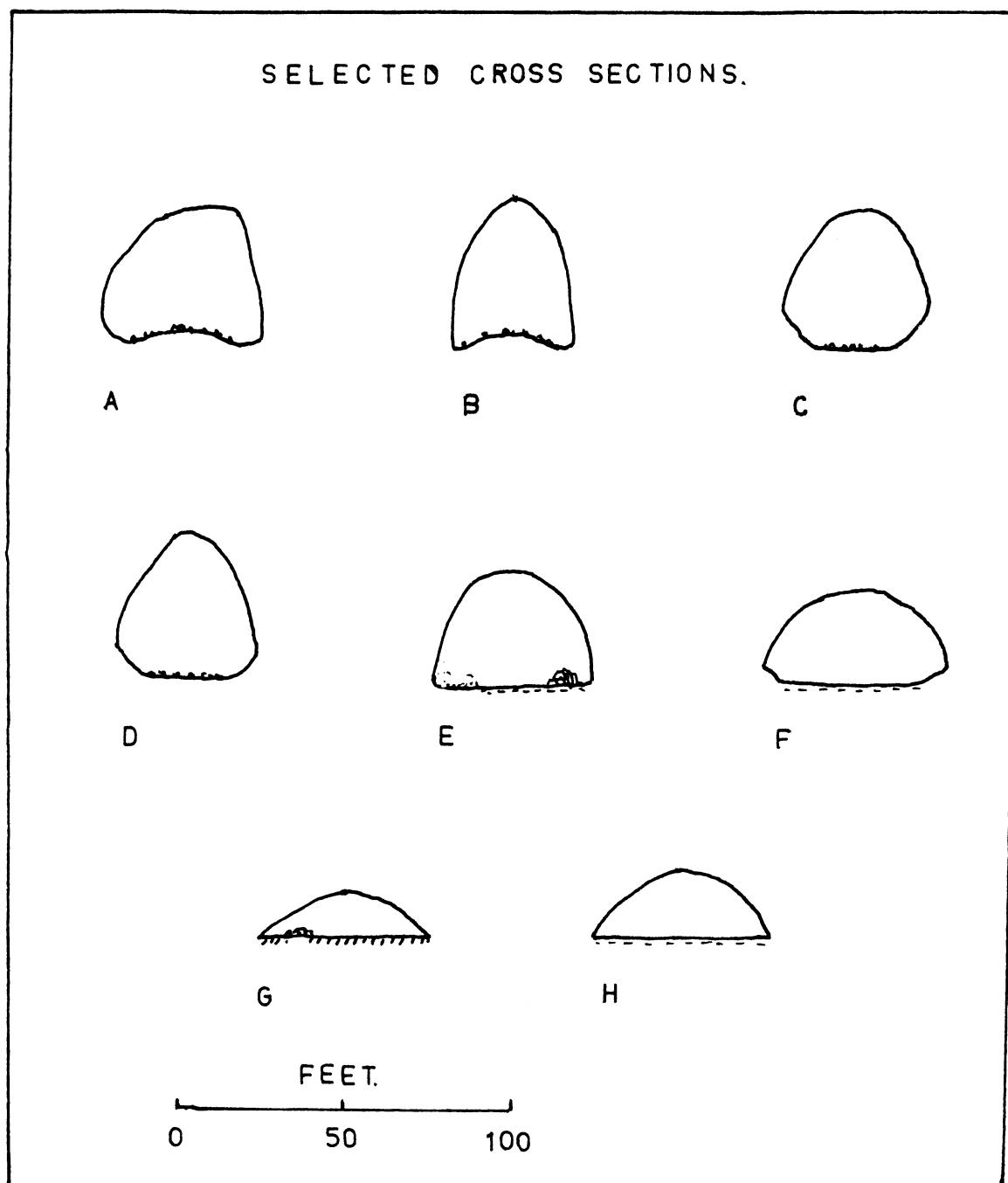


Figure 2 — Selected cross-sections of Barkers Cave. Positions are indicated in Figure 1.

an evil smelling lake seemingly consisting of bat urine (Plate 2). The lake extends for another 250 feet until the roof dips sharply down to meet the water. There are no side passages along the whole length. From the entrance to a point some 1,100 feet in the floor is composed of a solid lava surface. Here a small 5 foot drop occurs and henceforth the floor is mud covered suggesting that the cave fills up further in "the wet". A raised central lava bench (see survey sections) extends some way into the cave. Throughout its length the cave is virtually intact with only two minor collapses where the lava layering is revealed. Near the entrance the walls and floor are covered with a cave-coral like formation which gradually disappears along the cave. Barkers Cave must certainly be the finest example of the simple lava tunnel configuration yet known in Australia, very much dwarfing its Victorian counterparts.

A colony of approximately 2,000 bats inhabited the cave during our visit.

In view of the limited time available we were able to explore only for about two miles along the Main Tunnel on a S.W.—N.E. line from Barkers Knob, but other smaller caves, including one 300 feet long, were found. Other larger caves (up to 1,000 feet long) have been reported by Peter Dwyer (pers. comm.) of Queensland University to exist further towards One Hundred Mile Swamp. "Road Cave", a cave indicated by the manager of Whitewater to be near Iron Pot Creek approximately four miles away, could not be located.

Undoubtedly many more caves remain to be discovered in the Undara West Tunnel area and the Undara North Tunnel has probably never been visited by speleologists.

Access to the Area

Although tracks are shown on the Einasleigh maps, they are extremely rough and on the actual lava stony rises a high ground clearance vehicle is essential. It would only be possible to approach the area in the dry season due to the "black soil" patches and the numerous creek crossings.

The Undara West Tunnel is probably best approached from Whitewater Station on the main (bitumen) Mount Surprise to Mount Garnet road although it is actually on Rosella Plains property. The manager here is a very helpful character and willing to give further details. He, in fact, offered to send out his plane to look for us if we were not back at the station within a specified time. The track from here is ten miles to a vague 'T'-junction with the road towards Barkers Knob faintly visible back to the right. Barkers Knob is approximately 9 miles further along and is easily recognised standing up about 200 feet high towards the left. The cave is on the opposite side of the fence to the Knob. The main tunnel line runs along at varying distances south of the track from the 'T'-junction. If it is only intended to visit Barkers Cave rather than the tunnel area, the best approach would probably be from Mount Surprise. Most other tracks shown on the geological map are now non-existent.

It is hoped that this paper will stimulate some interest in this fascinating area with extremely good possibilities of finding "new caves". A detailed description of location has been given for this purpose. An area of some 130,000 acres including the Undara Tunnels has been proposed as a National Park (Bourke, 1970), however there seems little point in taking the land if no one visits it.

Acknowledgments

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DISCUSSION

- Q *Regarding the formation at the entrance, the cave at Bunyah Mountains has good calcite formation, but it is restricted to the entrance chamber where it is in contact with the outside air. Did you find any formation on the inside of the cave?*
- A It is just near the entrance of the cave. You get calcite formations in lava caves, there are some in Holy Jump as well. There are some very nice calcite flowers and flowstone in the lava caves there.

- C I think there is one point that could be brought out, which I noticed, that is that the lava crust which you see as part of the cave floor is very rapidly buried by sediments. Sediments increase gradually as you go into the cave and in effect that is what the series of sections are showing. Another thing we have found rather interesting is that many of these channels in the mud of the cave were in fact pits formed by water dropping from cracks in the roof. It made quite an interesting pattern, to a greater extent than I have seen in any of the limestone caves.
- C We don't really know where the cave is to the nearest 3 or 4 miles, whether the long cave, Barkers Cave, which is half a mile long, is part of those main tunnels. I rather think that the map is wrong, the main tunnel is misplaced and Barkers Cave is part of that tunnel.
- Q *This tunnel was located purely by means of aerial photographs?*
- A You can't follow it very clearly on the ground. You can only stand at one known entrance and look across and see the next one and walk across and follow the same line all the way through. We did for a mile and a half, something like that.
- Q *What is the actual rock when you are inside it? Is it relatively fresh basalt or is it altered in any way?*
- A I would say near the entrance it is covered in calcite, further in the basalt skin is exposed. As the molten lava drains out it leaves a skin round the edges.
- Q *What I found at Bunyah Mountains was that there was quite extensive secondary alteration of the basalt and it was probably about 50% zeolite type minerals and a residual clayey material. I just wondered if you had found anything like this?*
- A No, it is very fresh basalt.
- Q *You haven't been to the Mt Hamilton lava caves, have you?*
- A I've not been to Mt Hamilton but I have been to a few in Victoria.
- Q *They are very complex, in fact it is more a sort of maze. Cliff Ollier has done a survey of it, it was very complex. There must be some other way for forming lava caves apart from the laminar flow theory.*
- A Well there is as I said the steam theory. There is evidence for steam cavities in Hamilton Cave, I believe.
- C I wonder if there is a feature present that I have noticed in Byaduk Caves. If you look into the dolines there as well as the main cavity going through which generally connects up such as the Church Cave and so on, you always find a number of other tubes going off in different directions, some only going a few feet, some only about 6 feet across and you notice this tremendous criss-cross. You have got small tunnels going here, there and everywhere and at some later stage big ones just cut through this. We are puzzled by this criss-cross.
- A Well, for some reason the Victorian lava caves are much more complex than the ones in Queensland as you will see from the survey when it is published. It is just a simple straight tunnel, no side passages at all. This already seems to be covered by Ollier in his article in *Helictite*, but he seems pretty confident that the surface tension effect does bring the lava to a cylinder.
- C There is no incompatibility between a reticulate floor plan and this surface tension type effect. If you look at river channels which are pretty much the same thing there is great variation in the types that you can have — a reticulate type pattern similar to the braided stream which is like Mt Hamilton or a simple one more like a conventional single channel stream.
- Q *As you are going into the cave the sections across it were they towards the supposed source? The shape seems to be going the wrong way.*
- A Looking back towards the source the cave was gradually getting smaller.
- C Yes, the profile would seem to me to be more consistent with going away from the source.
- A No, this is what usually happens in lava caves.
- C The profile produced has got nothing to do with the directions of the source at all. It is just that the end of the cave has been cluttered up with sediment. A full section of the lava cave is exposed where you have lava crust floor.
- A The cave roof definitely does dip, I am pretty confident of that.
- Q *Are you saying that this sediment has been carried in the present entrance?*
- A Yes.
- Q *The present entrance is downflow?*
- A Yes, it is down.
- Q *Has there been post Tertiary tilting in the area?*
- A No.
- C According to the survey, there is a very large collapse not much past where the end of the cave is.
- Q *That is a probable source for the sedimentation?*
- A No, the entrance is the source of sedimentation.
- Q *Are these dolines collapse dolines or could they have been vents?*
- A They are collapse dolines.

- Q *I noticed you mentioned that there are considerable numbers of bats in these caves. I wonder if there is any evidence of the types of minerals that have been noted in a couple of Victorian caves resulting from inter-action of guano and basalt.*
- A It is a possibility finding the minerals. I don't know of any information but it may be possible to find them there. You've got the thick mud and guano.
- Q *On your map you showed a series of black marks to indicate I think you said the tunnel. What do they actually represent?*
- A That is part of the 4 inch geological map — that is how they show the tunnels.
- Q *Does the black represent the dolines?*
- A They have just put blobs where the dolines are. They don't show the size of the dolines.
- Q *Can you get any indication of the possible length of cave by the distance between the blobs?*
- A I would say no.
- Q *If I remember rightly you were saying that things go smaller as you went along the line so that you wouldn't have to get these very large tunnels. Did you say this?*
- A That is what could happen, yes.
- C *And that is towards the source.*
- A That is towards the exit.
- C *But you started well away from the source.*
- A Yes, this is just a thought, but the cave did seem to be getting smaller downflow but the tunnel actually doesn't continue past that point.
- C This business of getting smaller as you move downstream is explicable quite easily as far as I am concerned. As the flow gets further away from the source it cools more rapidly.
- C I have no argument with that but I thought he was referring to upstream getting smaller which would have been strange.
- C You have got to remember you are looking at a small section of the middle of a flow which goes miles in one direction and miles in the other.