



Burn o'Vat

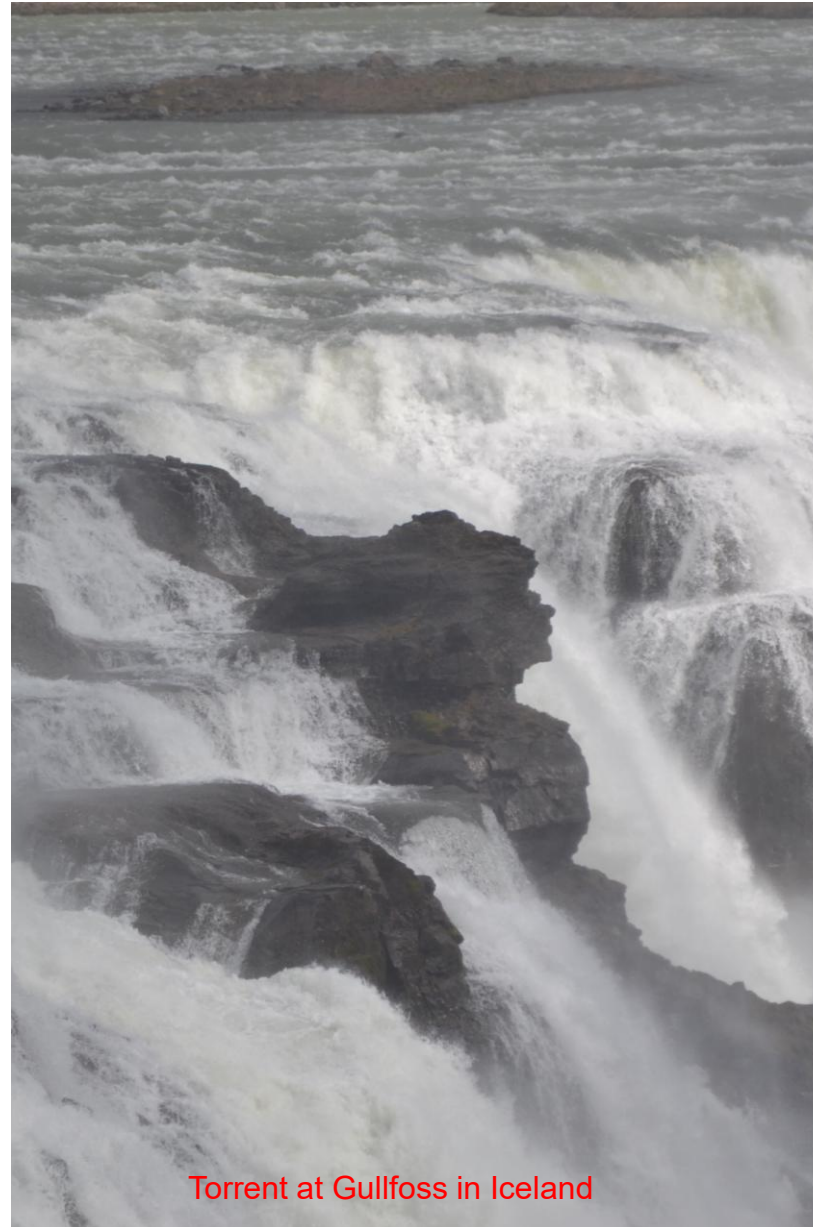
A 360° View inside a Granite Cauldron

We're in the **Vat** – a massive pothole scoured out of a granite pluton, located in the Muir of Dinnet National Nature Reserve some 7km northeast of Ballater. The little stream that feeds the west side of this feature today is a mere trickle compared to the raging torrent that carved this massive cauldron out of solid granite.

So, let's go back some 16,000 years to the last glacial age and imagine the ice, maybe over 1 km thick, covering all of the land that we see now.

As the ice melted, the outflow wash from the glacier exploited the horizontal and vertical cracks in the jointed rock creating a course west to east towards what is now Loch Kinord.

The channel increased in depth and width, accommodating an ever-increasing outflow of meltwater loaded with material to cut and shape the granite surfaces.



Torrent at Gullfoss in Iceland

When we approached the **Vat**, we were on a path located in a massive bowl, some 75m across, with bedrock either side and large boulders strewn everywhere. Were these erratics dumped by the retreating ice or debris from the collapsed **Vat**? Maybe both.

But 16,000 years ago, we would have been near the level of the top of the bowl and standing looking at a raging torrent of water cascading over a low waterfall at the east end of this area.

(It is a matter of debate whether the ice was above the **Vat** with water flowing underneath it or had the ice retreated a little west and the cauldron was an immediate glacial meltwater feature.)

Over time, the cascade cut back upstream and the ferocious action of the sediment-loaded water at the base of the fall, cut out the bowl and dumped the sediments that we see now. This bowl, named the *Cirque*, is analogous to the potholes formed at the base of waterfalls today.

The retreating fall increased in height as it cut westward – the curved edge of the granite pluton dips to the east.



During the continuous outflow of glacial water, the waterfall progressively cut back to what is now the entrance to the **Vat**. Today it is just a jumble of large blocks with a little stream flowing around them.

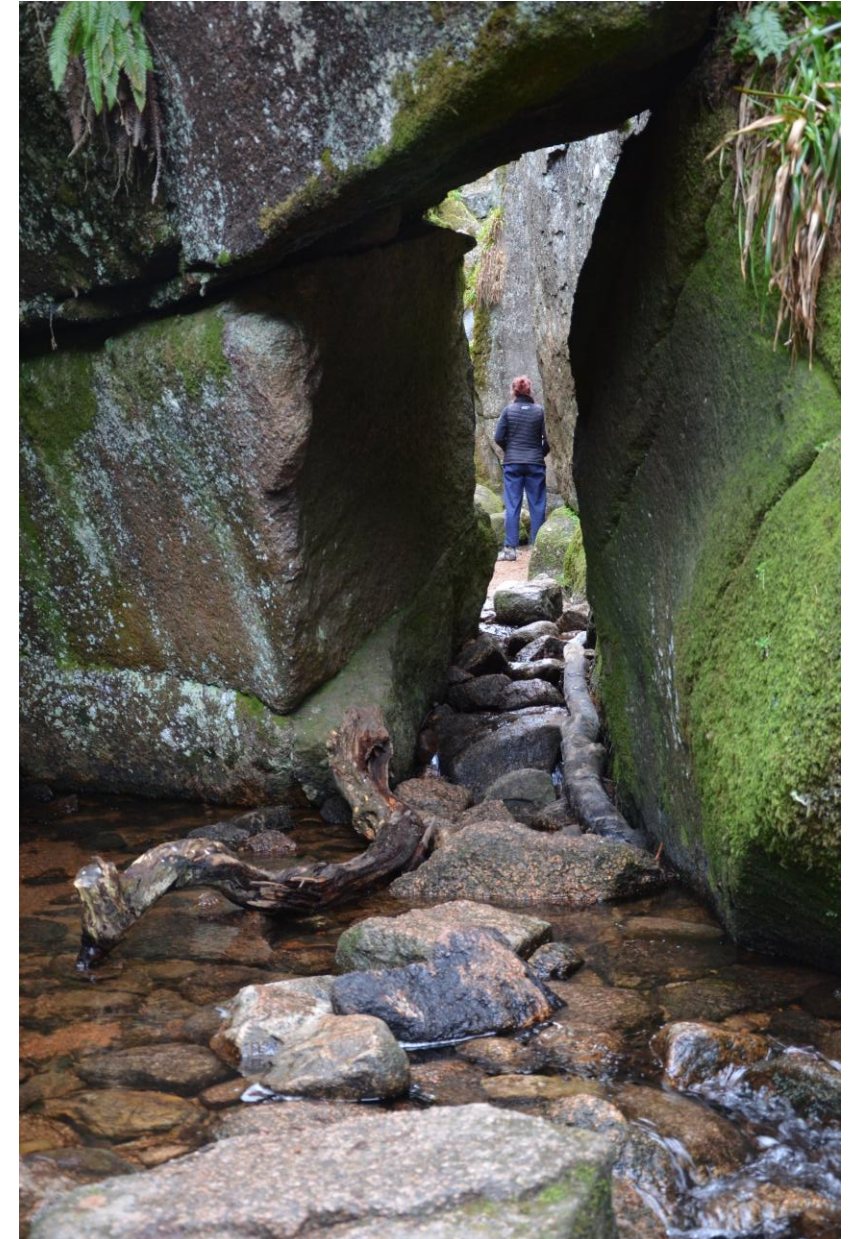
Duck through the tunnel formed by fallen blocks, using the stepping stones in the stream, to enter the **Vat** itself.

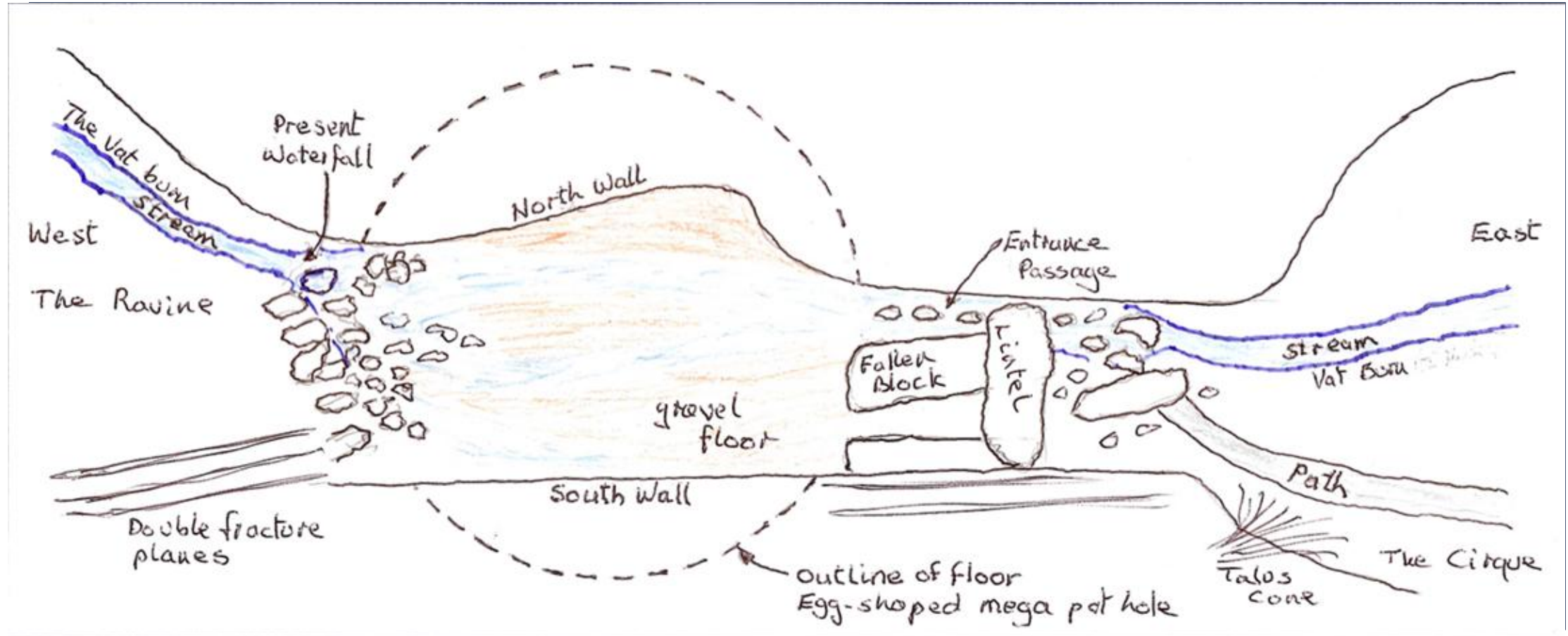
Around, 15,000 years ago, we would be looking at a cascade of water flowing over the rocks – at this time the walls had not collapsed.

Upstream of the fall, detritus started to swirl caused by eddy currents and the action began to hollow out a pothole. The ever-increasing flow of meltwater and entrained cutting agents caused it to widen and deepen.

The scouring action, from angular blocks in the pothole, continued relentlessly from these flood events, enlarging the hole to the dimensions that we see today.

At some stage the granite funnel to the pothole and roof collapsed with the debris transported downstream or ground down forming what is now the gravel bed of the chamber..





Here we see an overview of the **Vat** with the ravine to the west and the entrance blocks to the east. The north and south walls are near vertical and shear (where fractures have been utilised as planes of weakness) but lower down, a large curved egg-shaped hollow exists on both walls – a mega scour feature within a fracture controlled narrow defile. This suggests that the **Vat's** West to East linear shape is largely fracture controlled but within this, there is an elliptical scour.



Entrance – East end

A photomontage of the whole south side of the cauldron. The camera angle covers approx. 150°

The south wall is 18m high and is waterworn on all its surface from top to bottom.

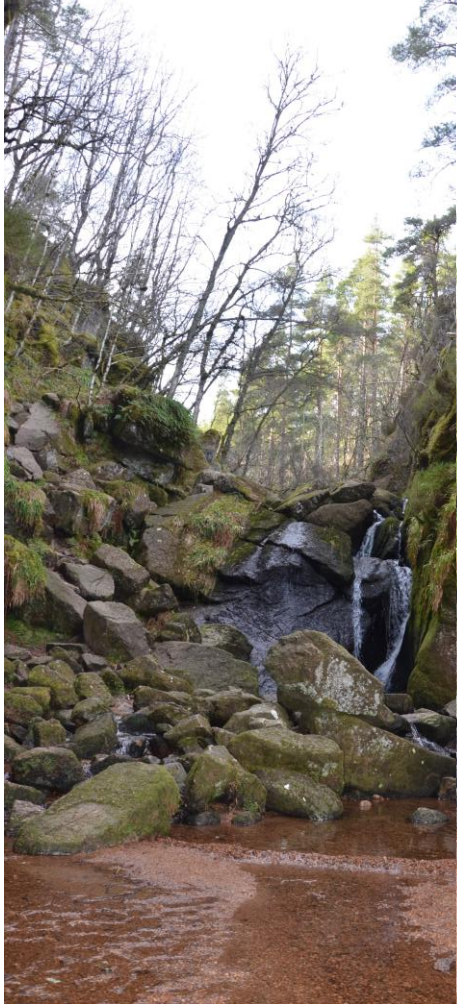
Note the near horizontal joints show a dip to the east. The north wall exhibits a similar dip, as if they could be cooling joints from the top and side of the pluton. The vertical fractures in the area of the **Vat** run W-E and have a close spacing, suggesting a zone of weakness between Cnoc Dhu and Culbean,

The South Wall



Stream inlet – West end





Stream inlet – West end



The North Wall



Entrance – East end

The chamber is not quite circular but approx. 17.5m +/-1m across.

The north wall is 13m high.

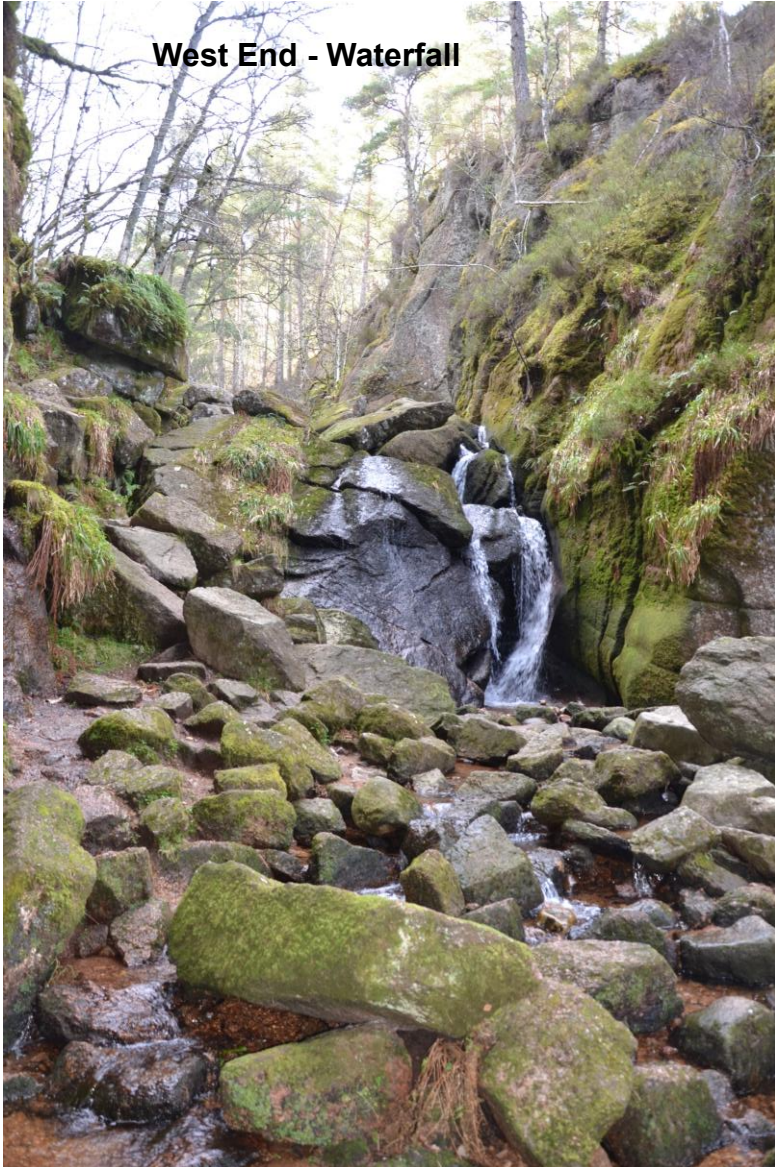
Ground penetrating radar established that the floor is just under 5m below the present gravel surface. It is not known whether it is concave or flat but the whirlpool's original scouring stones, (now highly spherical rounded clasts) may still be in place!

The overall time to create this unique impressive granite cauldron is unknown and difficult to measure.

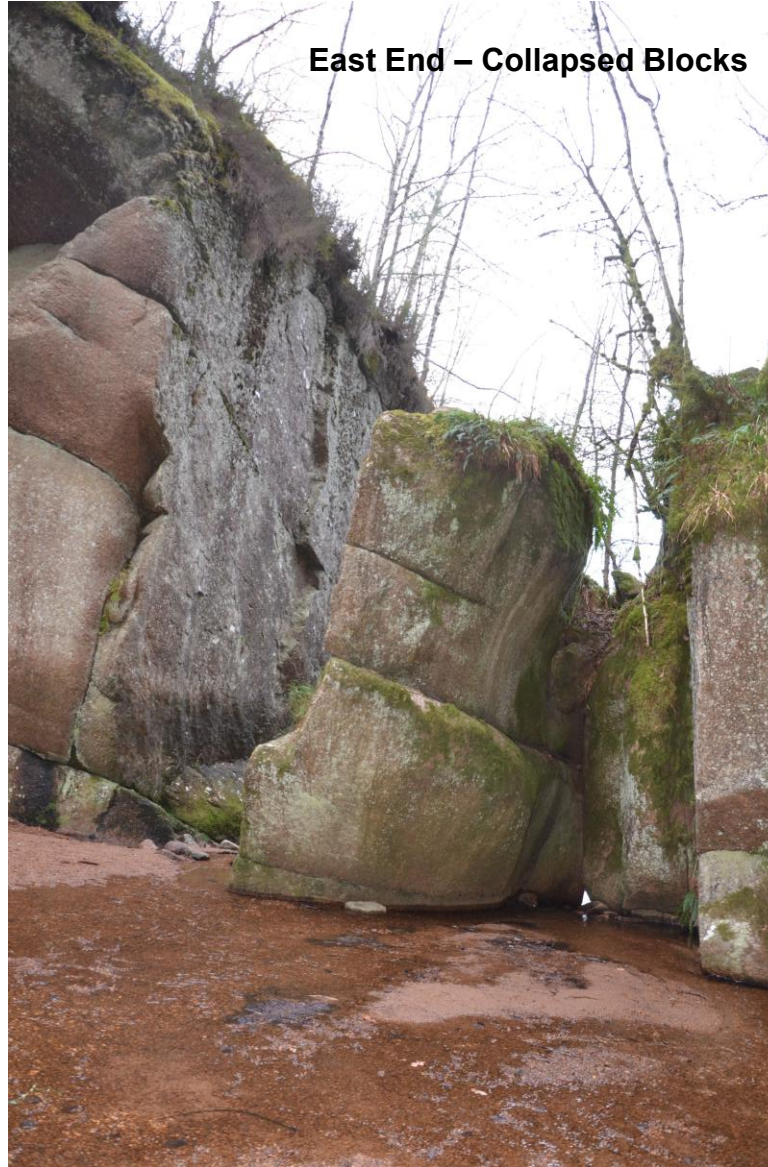
The large block at the entrance has fallen from the northern rock face - it is possible to see where it would have been attached (see postscript).

Note the fractured surface on the north wall at the entrance, where the blocks have broken off, compared with the smooth water-worn surface of the chamber.

West End - Waterfall



East End – Collapsed Blocks



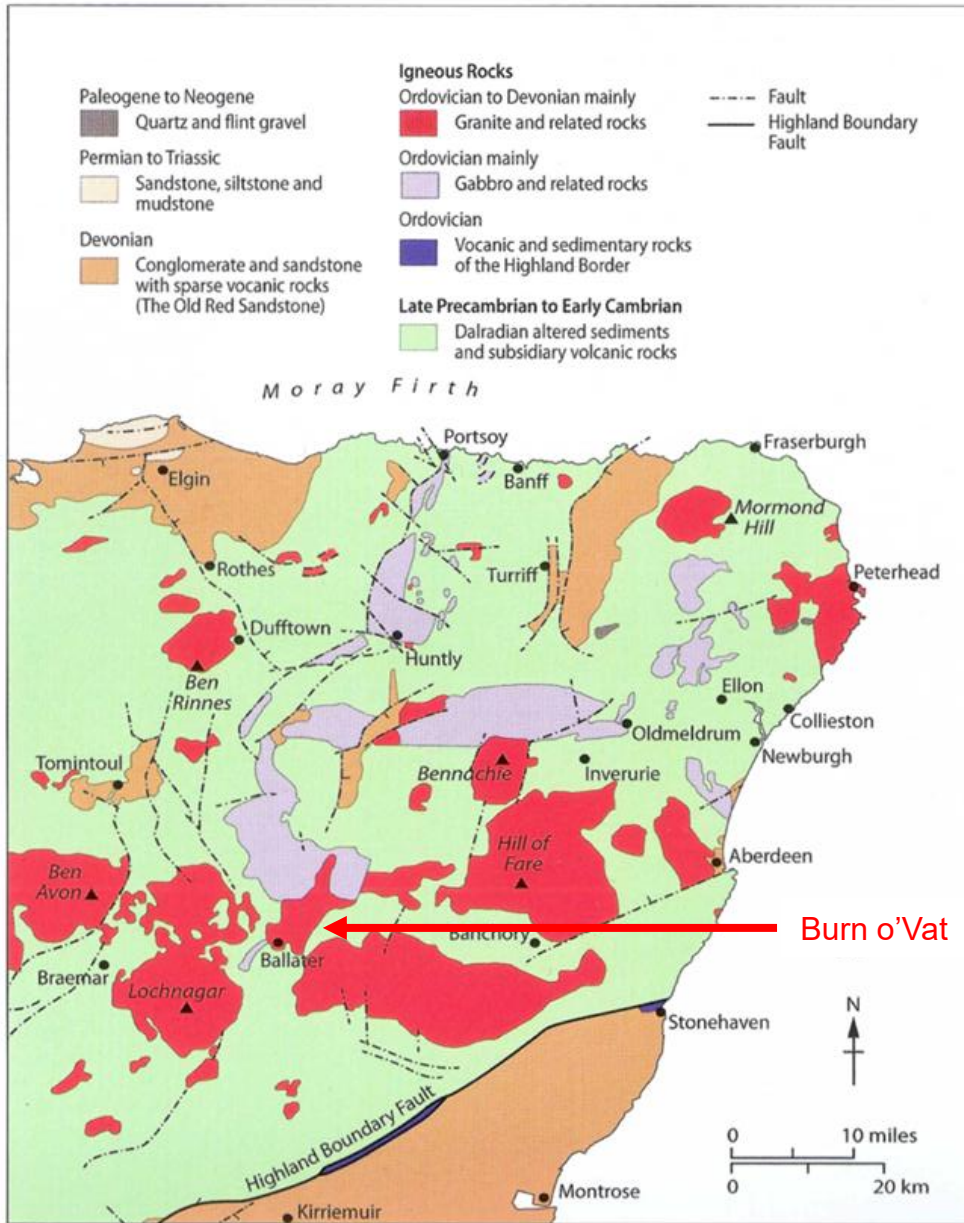
The jumble of rocks at the stream inlet is all that is left of the collapsed west wall of the cauldron. A small waterfall cascades over this debris

Compare that with the massive blocks which fell from either of the side walls at the entrance east end. The other remains of the east wall have been washed into the bowl.

The gorge to the west of the **Vat** was scoured out by the glacial outflow and has little to do with the current stream. On the day of this visit, the stream was fairly normal with a low level of water covering most of the chamber floor. However, a few weeks earlier, when Deeside experienced constant rain for many days, it would have been impractical to enter the **Vat** because the water level would have been perhaps 15cm deep.

The solid walls, at the stream's east-end inlet, are approx. 7.5m apart but at the west outlet, the gap is a little narrower at 6m..

In the the west side (entrance) photo, the large slab, on far the right of the photo, has fallen from the south wall.



The **Vat** (Grid ref NO 425 997) lies less than 1 km from the east edge of the Ballater / Culbean Granite Pluton.

Interestingly, it is possible to see smaller scale potholes, nearby in Deeside at the Linn of Dee and the Devil's Punchbowl on River Quoich. The size of these features is only 30cm to 100cm wide which just illustrates the extreme flow of water which led to the creation of the **Vat**..

All photos and document by K. London using the 3 reference pieces of information listed below. Also, grateful thanks to S. Archer, who provided supplementary information about the local geology and helped with the **Vat** sketch.

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For further information on the **Vat**, please see:

- Scottish Geology Trust – 51 Best Places – *Burn o'Vat* written by P Craig.
- Deeside Field 1925 Volume – *The Vat* written by A Bremner M.A., D.Sc., FRSE
- Aberdeen Geological Society - *Dinnet Excursion Guide* written by S Archer.



Post script – A Reconstruction

At the entrance to / exit from the **Vat** on its east side, there are many collapsed blocks that have constricted the passageway. One, forms a large lintel creating a roof to the entrance tunnel. At first glance, they appear to have toppled from the north and south walls and are possible stoppers that were a critical part of the original formation of the chamber.

However, a more realistic interpretation is that these blocks fell sometime more recently because they have not broken up or undergone much erosion and therefore, are less likely to be failures during the age of glaciation.

In this picture, we have superimposed the large east side entrance block on to the north wall fracture surface. You can see that it fits quite neatly.

The West to East fracture planes are evidently the zones of weakness that failed and allowed the blocks to break off. If you look back at the two previous pictures of the side walls, there is an obvious fracture on the north wall and 2 or 3 fractures on the south wall, all of which trace back to the west end. These features lend proof that the weak linear planes were instrumental in the formation of the chamber at this particular location.