

Witches Cave and Shuttleworth Pot

A Cave Conservation Plan Final Draft March 2012



**NATURAL
ENGLAND**

Compiled by
Council of Northern Caving Clubs
with Natural England

CNCC

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Introduction

This conservation plan refers to the cave known as Witches Cave and Shuttleworth Pot on the Leck Fell area of South Cumbria.

It is located at NGR SD 66214 79777

The cave lies within the Leck Beck Head SSSI (Site of Special Scientific Interest)

The land is owned by the Kay-Shuttleworth Estates.

The dry passages of Witches II were first entered from the sump of Witches Cave by cave divers Jason Mallinson and Rick Stanton in the summer of 1997. They discovered a remarkable series of large dry passages which they eventually climbed up to within 17m of the fell surface. On a subsequent dive in 2010 they managed to place a radio transmitting beacon at the highest point which was located at the surface. After gaining a 'Consent' from Natural England, a surface dig at this point gained entry to the dry section of the cave and became known as Shuttleworth Pot.

The main passage in Witches Cave II appears to be a pre-Devensian phreatic trunk that flow markings indicate drained Leck Fell to the south to an unknown outlet in Ease Gill. Towards the northern end of the system a later invasion of the passages created a window into the underwater passages that carry current Leck Fell drainage to its resurgence at Leck Beck Head.

The cave contains a remarkable suite of scientifically important features including varved sediments, calcified mud formations and an array of pristine depositional calcite formations. These are described in full elsewhere in this publication. The calcite coated sediments of the cave floor show unusual colourings and developmental structures and remain the most vulnerable to damage by visiting cavers.

The excavation of the dry entrance and further exploration uncovered a wealth of archaeological material and faunal deposits which were catalogued and where necessary - removed from the site for preservation and further study.

For a comprehensive history of exploration and the digging of the Shuttleworth Pot entrance plus the archaeological record, see the CNCC publication "Shuttleworth Pot into Witches Cave II, which is available from the CNCC website.

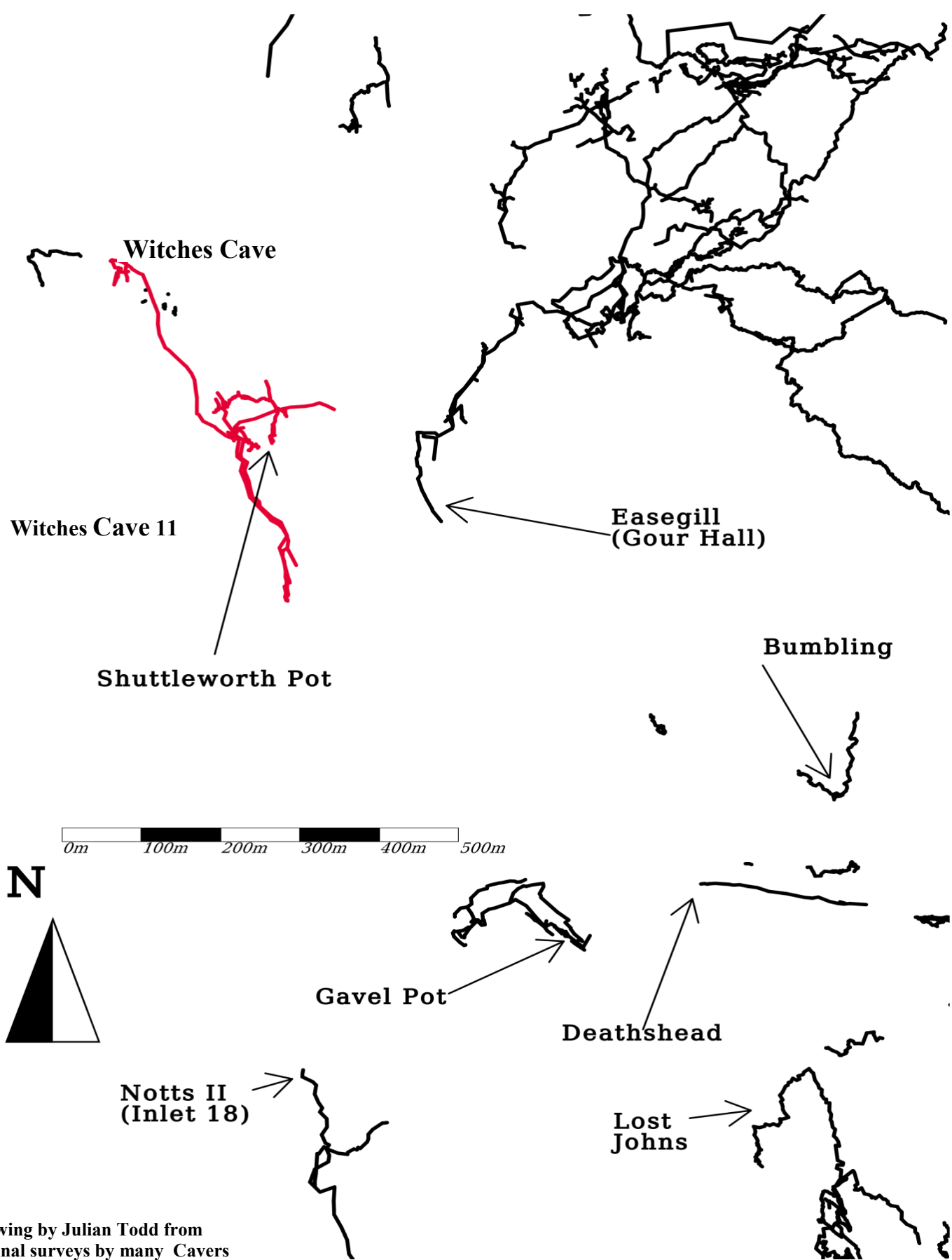
The vulnerable areas of the cave were taped off by the very first explorers to enter from Shuttleworth Pot. At this time the only evidence of human presence was a few divers footprints in the floor sediments which appeared at the time of the initial survey and exploration. All subsequent visits have been guided by conservation tape mounted on stainless steel pins throughout the vulnerable areas.

Objectives

The unique and beautiful features of this cave are of continuing interest for both their scientific and aesthetic qualities. It is important for future enjoyment and study that the site and its features are protected from damage.

The objective of this plan is to provide the maximum degree of conservation for the site, whilst still allowing permitted access through the CNCC permit scheme to responsible club groups affiliated to the BCA

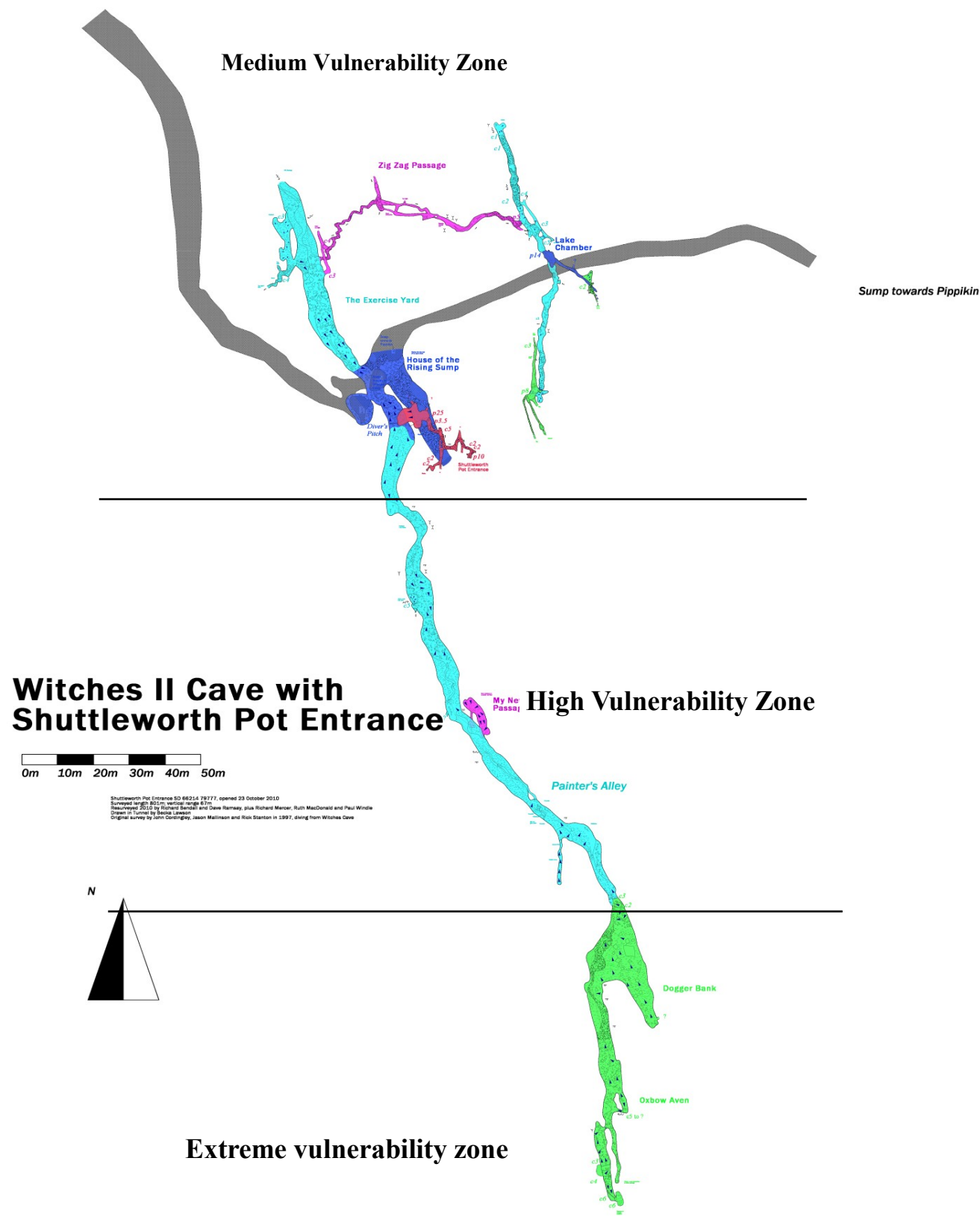
Survey showing the caves of Leck Fell



Drawing by Julian Todd from original surveys by many Cavers

Survey showing Conservation Zones

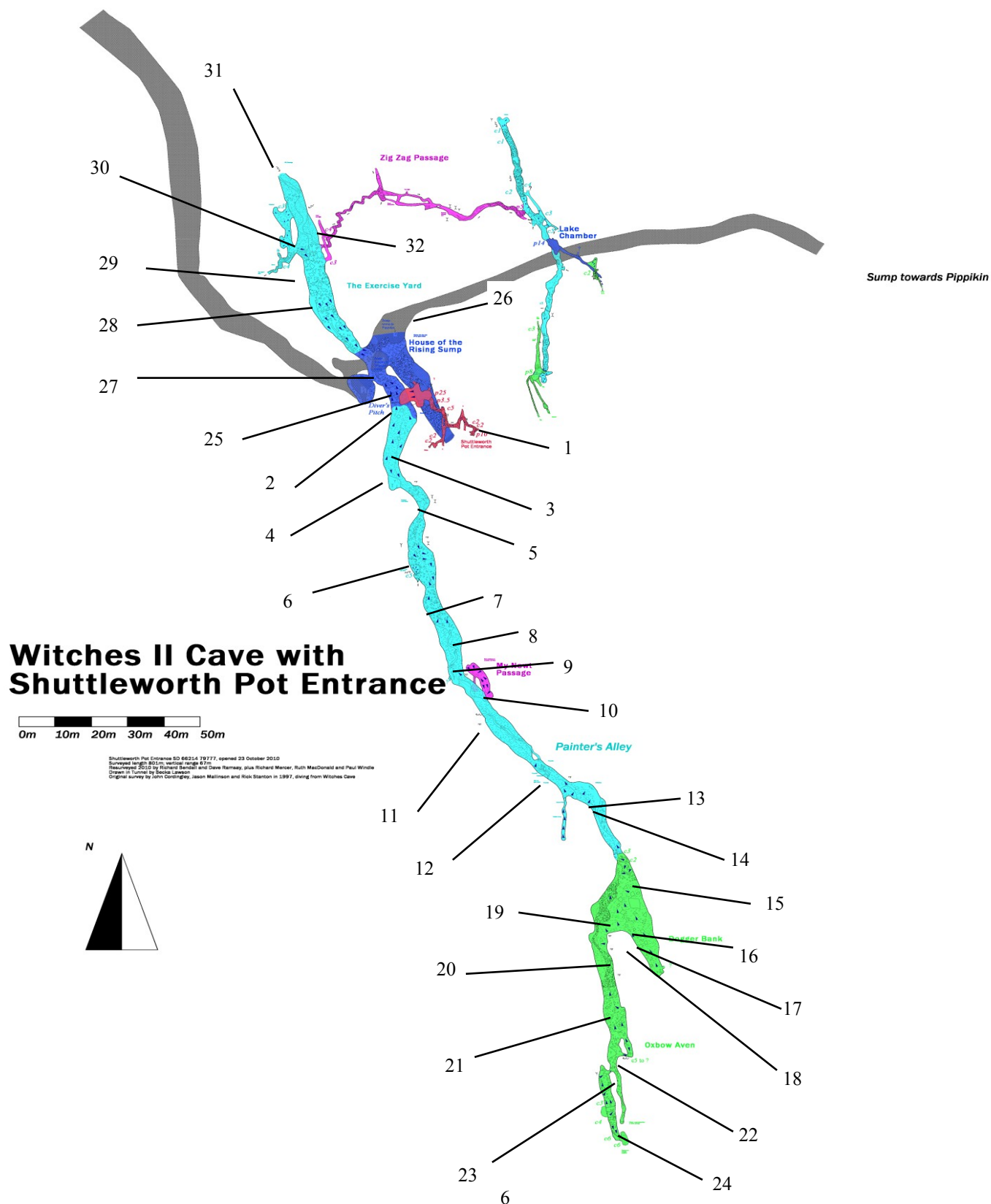
Sump to Witches Cave



An audit of the features of interest

By John Gardner, with photographs by Pete Monk, Dave Checkley, Glenn Jones, Ken Wood, Andrew Hinde, Dave Ramsay, Bob Evans, and Tony Brown.

Sump to Witches Cave



1. Shuttleworth Pot – a small 17 m deep shaft originally filled with limestone clasts up to boulder size, and clay. An assemblage of bones which included aurochs, wolf, and human unearthed from the lower half of the choked shaft indicate that the shaft has filled since the mid-Holocene. The shaft enters a small steeply descending passage to arrive at the top of Diver's Pitch.



2. Diver's Pitch is a 25 m pitch which enters a large chamber formed within the main Witches II passage oriented along a 4 m wide north-south fracture zone. The chamber has formed where at least four large avens enter from above, introducing drainage which washed away the considerable depth of sediment. An assemblage of bones found on the floor of this chamber included horse and pig – indicating that one or more of the shafts were active up to the Bronze Age. To the north, an almost vertical wall of rubble drops 10 m to the active stream way. A large phreatic tube can be seen in the roof extending from the passages to the north over the window into the streamway to the Exercise Yard (Location 29).



Diver's Pitch from south passage:



The main passage is now described going south away from the sump. Locations 25 and beyond describe the passages to the north. Left side of the passage refers to the east side, and right refers to the west.

3. From the Diver's Pitch the sand and clay sediments rise up a slope to the south to where the passage becomes low. Towards the top, a 2 m long stalactite feeds a large stalagmite boss and calcite flow resting on the sediment on the left. On the other side of the passage a calcite curtain hangs from the roof. Flow markings indicate a flow to the north.



4. 10 m into the crawl at the top of the slope there is a group of calcite curtains on the right. The middle one once formed a column 1m high, but the 2 m wide calcite base resting on sediment has slipped into a shallow gully, leaving the top and bottom offset by 20 cm. The shallow gully indicates that there has been some post-sediment flow in the passage towards the north.



5. The crawl continues low for another 15 m over sand and clay with some surface calcite deposition. There are small flow markings in the roof towards the north.



This warning sign was placed at the entrance to the south passage prior to the open season on Leck Fell. It is fixed to the sediment bank with 50 cm stainless steel conservation pins.

6. The crawl ends where an active aven has washed away the sediment. The water sinks into a small fissure leading to a boulder chamber. Ahead water once entering from the south washed out the main passage revealing an 8 m high canyon topped by a large phreatic half tube. A ledge of a false floor fragment on the right at the level of the bottom of the tube shows how the sediment used to continue at the same level as the crawl.



7. The canyon contains a misfit stream sinking towards the same fissures as the water from the active aven, and contains three prominent notch marks. A 4 metre wall of sands, clays, and cobbles can be seen on the left near to the top.



8. Detail of sands, clays, and gravels in the canyon. The light band of gravel was deposited on top of the eroded sands and mud during fluvial re-invasion



9. The passage ascends steeply for 4 m, temporarily losing the stream. There are several calcite straws up to 2 m long; an ornate curtain in the roof, and a finely banded curtain at floor level on the left. There is a 1 m straw column on the right. At the bottom of the slope there is a large section of fallen false floor standing on its edge, which has been recalcited.



Straws stalactites at Location 9:



Calcite curtain at Location 9:



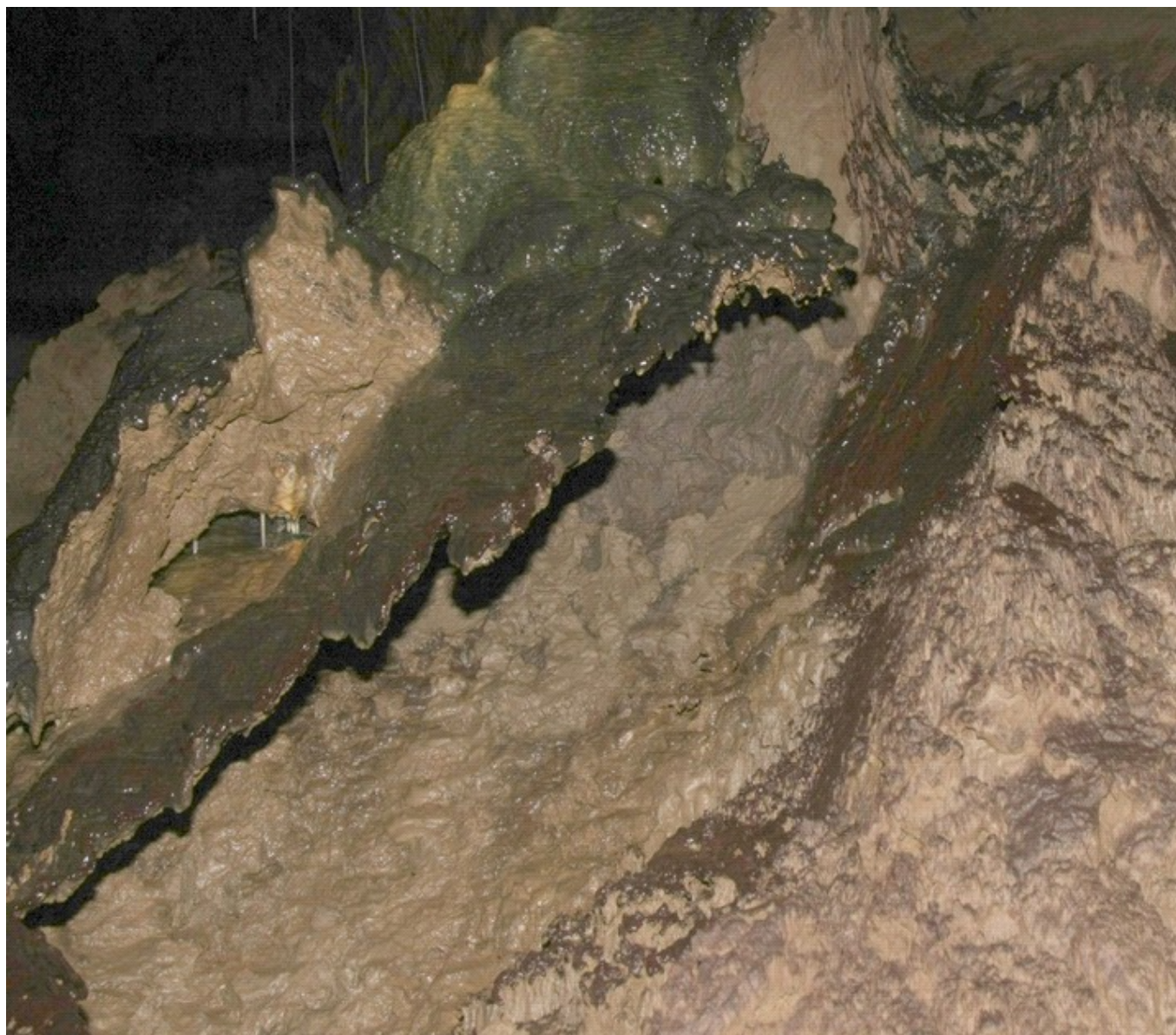
10. My Newt passage is on the left – a small passage which contains the intact skeletons of two newts, probably palmate. It also contains a fine cracked mud floor.



11. 20 m from the top of the slope the sediments on the right have been covered with a green, brown, and orange calcite flow fed from a small hole lined with stalactites 3 m above. There are some unusual eroded clay formations below the calcite flow.



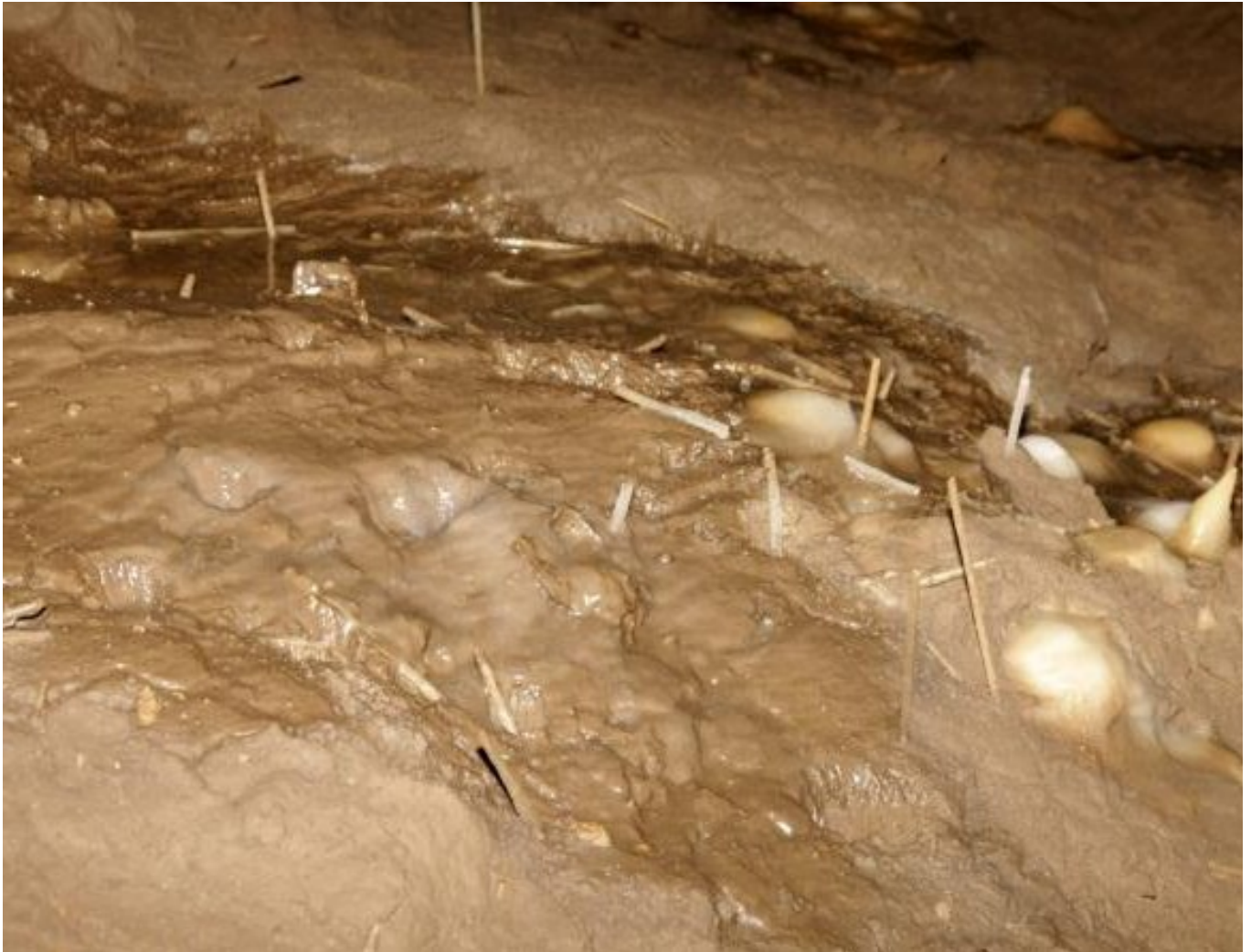
Green stained calcite over eroded sediment at Location 11:



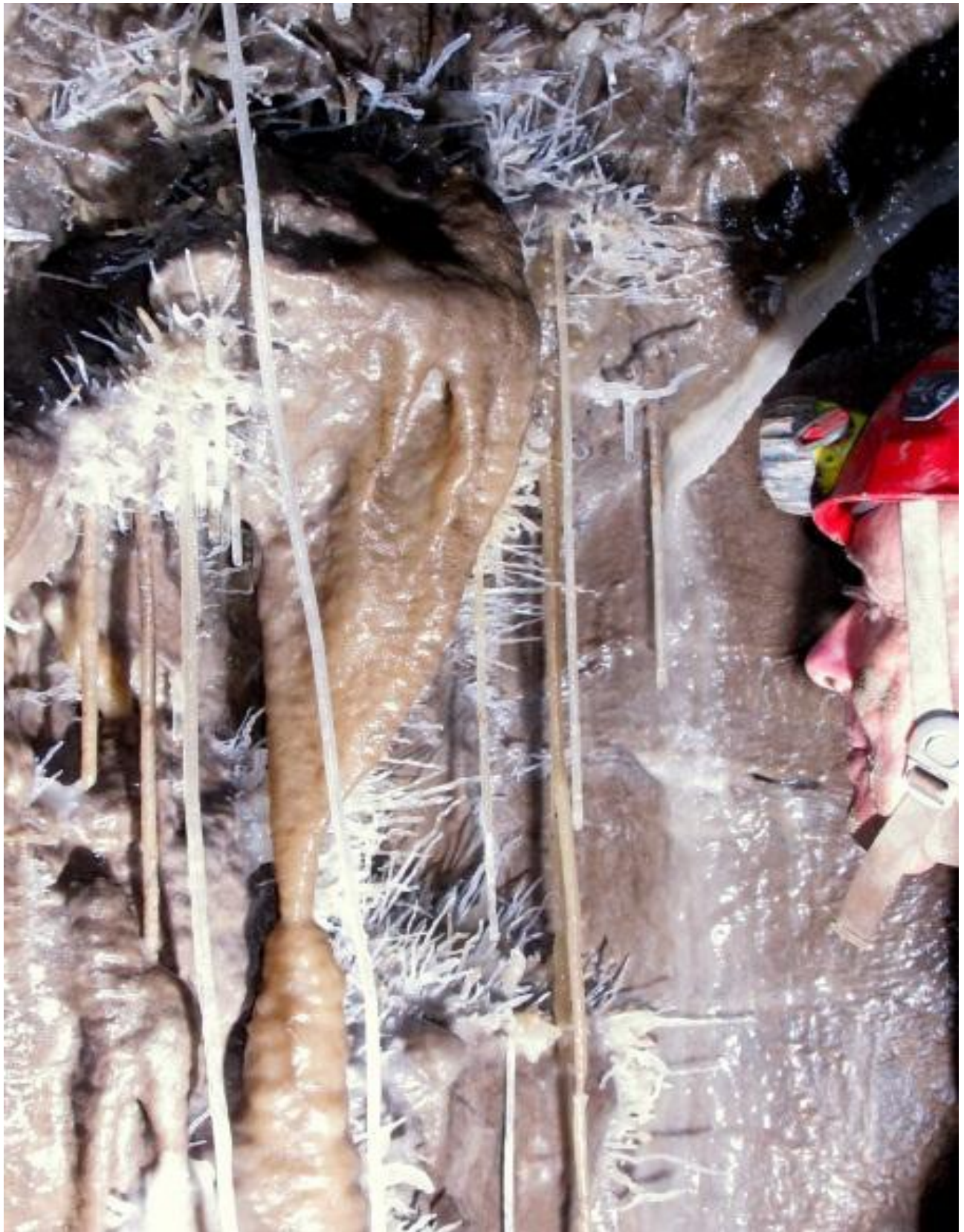
12. Clambering over a small sediment bank, the stream follows the left hand wall and passes some impressive volcano-like formations – calcite flows which appear to have had the mud inside removed by drips. These are red and brown in colour, and very vulnerable to careless feet.



- 13.** To the south the passage becomes tightly packed with 2 m long straw stalactites, and helictites up to 10 cm long. Other formations in this area include a prominent brown and grey floor topped by a 1m high pronged stalagmite boss on the right; the Painter's Palette – a calcite flow with cream, orange, green, brown, grey and red colouring on the left; a calcite flow with embedded fallen upright straws; and a superb bronze-coloured 1m high stalagmite standing on its own on the left.



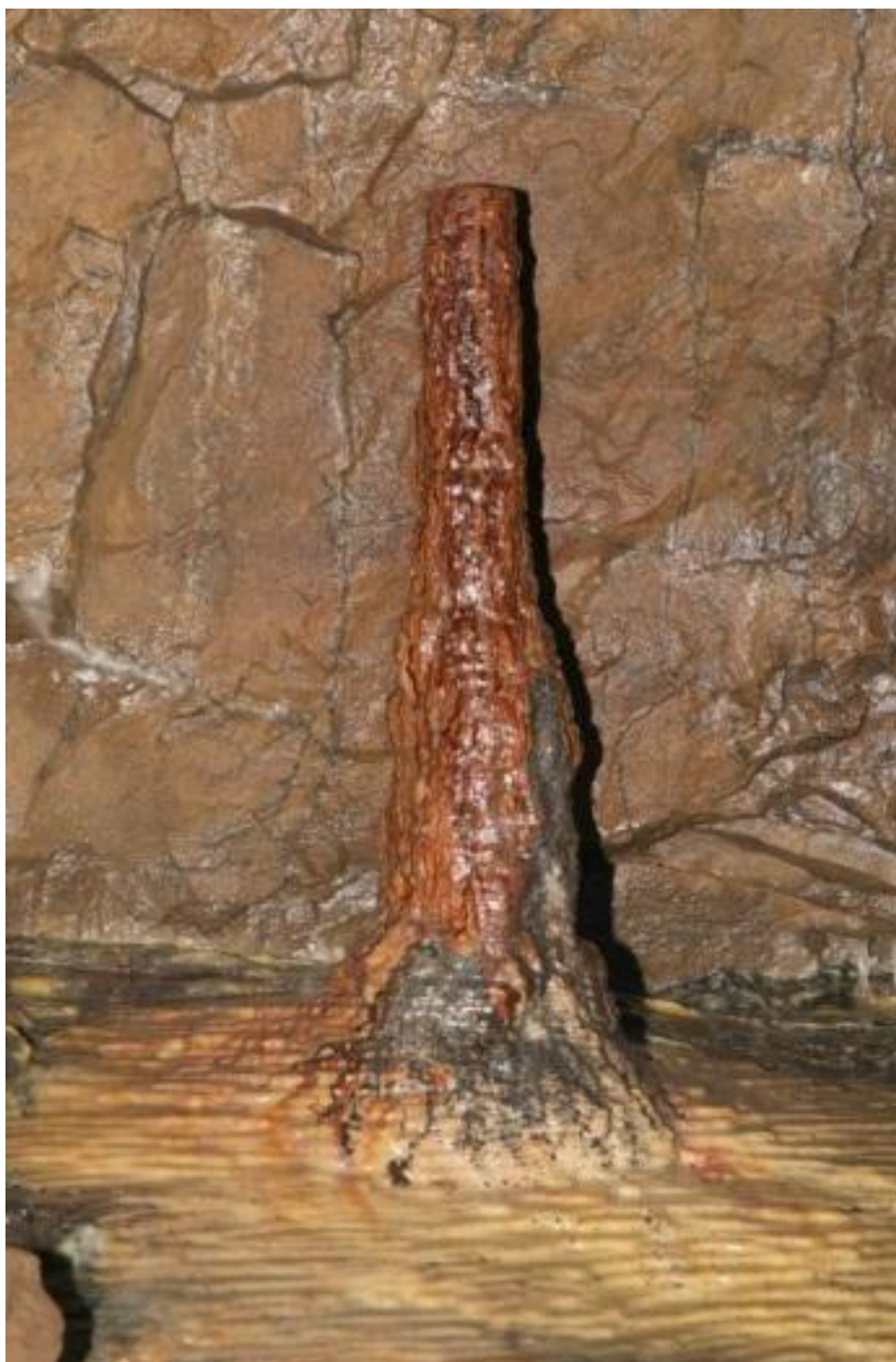
Helictites up to 10 cm long at Location 13:



Painter's Palette at Location 13:



Bronze coloured stalagmite at head of canyon at Location 13:



Stalagmites at head of canyon at Location 13:



- 14.** Also on the left in this section of passage is an area of calcite flow covering a sediment bank which contains some drip pits some 30 cm deep. The calcite flow spills into the pits implying that the pits pre-date the flow.



Drip holes with ball point pen for scale



15. Clambering up through some fallen boulders leads into Dogger Bank Chamber. Jointing in the roof indicates that the fracture zone has been rejoined. This continues up Dogger Bank. At 2 m past the climb up is a 10 cm high calcite mould of a sediment drip pit left standing proud on a boulder to the left



An interpretation of this remarkable feature is that it tells the story of the cave's history in miniature:

- A large phreatic passage develops
- Boulder falls in from roof
- Large sediment banks are deposited in the passage under phreatic or epiphreatic conditions, burying the boulder
- The water flow ceases, and the passage drains allowing drip holes to form in the sediment on top of the boulder, and calcify
- The passage is re-invaded, eroding the original sediment, leaving a cast of the drip hole exposed and depositing a fine gravel alongside it
- The water flow again ceases, leaving the passage as we see it today.

A view of Dogger Bank ascending towards the left side



- 16.** A climb up the Dogger Bank sediment to the left leads to a small depression containing the skeleton of a dog. This has seriously deteriorated since it was first discovered as a result of excessive handling. It is not known how the dog entered the system, but when the skeleton was first seen it was clear that it must have been alive when it entered the chamber.



Dog Bones at the top of Dogger Bank:



Dog Skeleton showing deterioration after five weeks of cave opening - caused by unnecessary handling by visitors.



17. To the left of the dog are some unusual calcited sediment formations fed by a 6 m high calcite flow on the wall, and on the right the un-trodden sediments exhibit polygonal cracking and contain drip holes. The sediment in this area is vulnerable to trampling, although it has been taped.



18. The passage terminates in a blank wall, with a possible way on being blocked by sediment. At roof level there is a 1m thick shale band. This shale bed is not seen elsewhere in the system, and is interpreted as a sequence boundary which was subjected to sub-aerial erosion. A gully formed in the paleokarst was then in-filled with sediment - probably volcanic ash.



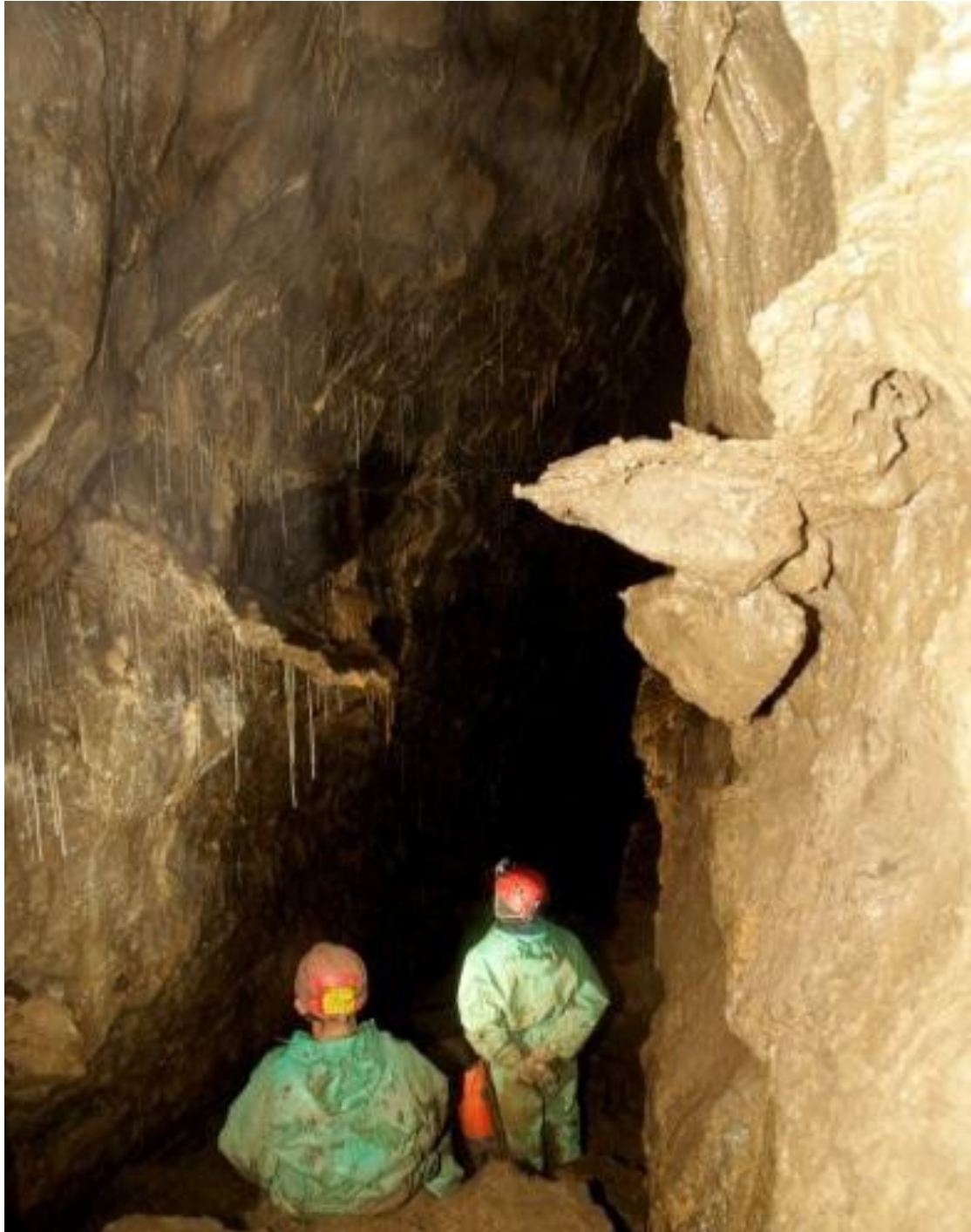
19. At the bottom of the Dogger Bank the stream enters from the passage straight ahead, where it has incised the Dogger Bank sediment to a depth of 4 metres exposing a fine section of varved sands and clays. The base of the sediment has many mud-drip formations.



20. A short climb up leads to an exceptionally well decorated area with over a hundred straws of up to 2 m long hanging from the roof, and the walls well decorated with helictites.



21. The continuing passage turns into an ascending canyon, with large flow markings flowing north on the walls, but no obvious roof-tube, and terminates at Oxbow Aven. This has been climbed to an area of large cantilevered blocks. Relics of a descending false floor high on the walls of the canyon indicate that after its initial formation the passage was filled with sediment and has since been re-invaded. Gravel deposits similar to those seen in Location 8 and alongside the calcite “cup”, rest on small ledges.



Gravel deposits resting on calcite resulting from fluvial re-invasion of the passage at Location 21:



Gravel deposits at Location 21:



22. Before the aven is reached, a well decorated oxbow takes off on the right. This has been taped off to minimise damage.



23. Beyond Oxbow Aven the passage drops down to the right where the oxbow rejoins it, to a complex of avens. These also have been climbed to large blocks. It would seem that all the avens are part of the same feature from which the passage originates.



The passages to the north of the Shuttleworth Pot entrance shafts are now described. Left side of the passage refers to the west side, and right refers to the east.

25. The way to the stream is down an almost vertical boulder slope with unsorted clasts, presumably associated with the avens above.



- 26.** The streamway is short, but consists of four sections. Upstream there are a few metres of low wide passage before the sump. This section terminates at a small waterfall, associated with the west side of the fracture zone. The water then enters a pool and passes under a flooded rock bridge. On the far side of this is another steep-sided pool, with the water again disappearing under a rock bridge. The water immediately reappears in another pool which is the top of the shaft from where the divers originally emerged.



The Waterfall

The House of the Rising Sump:



The House of the Rising Sump:



The House of the Rising Sump in Low flow conditions



27. In the roof towards the south the fragment of floor from the main passage which connected the base of Diver's Pitch to the Exercise Yard can be seen to be associated with the fracture zone.



28. A steep ramp then rises towards the north to the Exercise Yard, following the line of the fracture zone. A small inlet trickles down this, actively depositing calcite.



- 29.** At the top of the ramp, is the Exercise Yard – an impressive section of 10 m wide, 15 m high passage, initially flooded with boulders. There is a distinct notch 30 cm high in the base of the left-hand wall which continues over the ramp for another 20 m.



30. Mud banks start to appear beyond Zig-Zag passage, which goes off to the right. Opposite Zig-Zag passage is an area of shallow gour pools and calcite floor, fed from a small inlet. Large 30 cm flow markings a little beyond the entrance to Zig-Zag passage indicate a flow to the north.



Large Flow markings to the north of the Zig- Zag Passage entrance



Flow markings near the entrance to Zig-Zag Passage:



31. The main passage finishes in a wall, with a low passage filled with soft sediment at floor level.



The mud choke at the end of the Exercise Yard:



32. Zig-Zag Passage is a descending 'joint-controlled' passage with flow-markings showing a flow outwards, indicating that this seems to have been a phreatic flood-rising from the lower sump passages. This rising may be associated with the notch in the base of the main passage wall, and explains the lack of sediment banks below the entrance to Zig-Zag Passage. The first 2 m of Zig-Zag Passage have many micro-joints with raised mineral veins.



Geological controls on passage morphology in the Witches Cave and Leck Beck Head sump.

By John Cordingley

The notes below describe some features which have influenced the development of the underwater passages between the dry part of Witches Cave II (now accessible without diving, via Shuttleworth Pot on Leck Fell) and the resurgences at Leck Beck Head and Witches Cave main entrance.

The sump consists of a single major underwater conduit of unusually large size, some 550 m in total length, carrying the Leck Fell drainage throughout most of its length. This divides into various distributaries near its downstream end which lead to one permanent resurgence at Leck Beck Head's main rising and several flood-only resurgences. Somewhere, probably near the downstream end, is a major (but as yet unidentified) inlet from Lancaster Hole.

The Leck Fell water (from Ireby, Notts, Gavel, Lost Johns and Pippikin Pots etc) emerges from upstream Sump 2 in Witches Cave (below the new Shuttleworth Pot entrance). Shortly downstream from here it disappears into a large flooded shaft. There is evidence of brecciation in this underwater shaft where the long axis of the many rock flakes is in a north north west / south south east direction (a typical orientation for small faults near the South Craven Fault). An almost vertical descent to -27 m lands in an underwater chamber where there is a somewhat confusing series of rifts in the walls. The way on downstream (initially to the north north west but then northwards) is guided by a single bedding plane throughout the whole of the deep part of the sump. The depth of the large passage gradually increases until -33.5 m is reached at one point some 340 m from the upstream end. It can therefore be inferred that there is a very gentle northerly dip in this area.

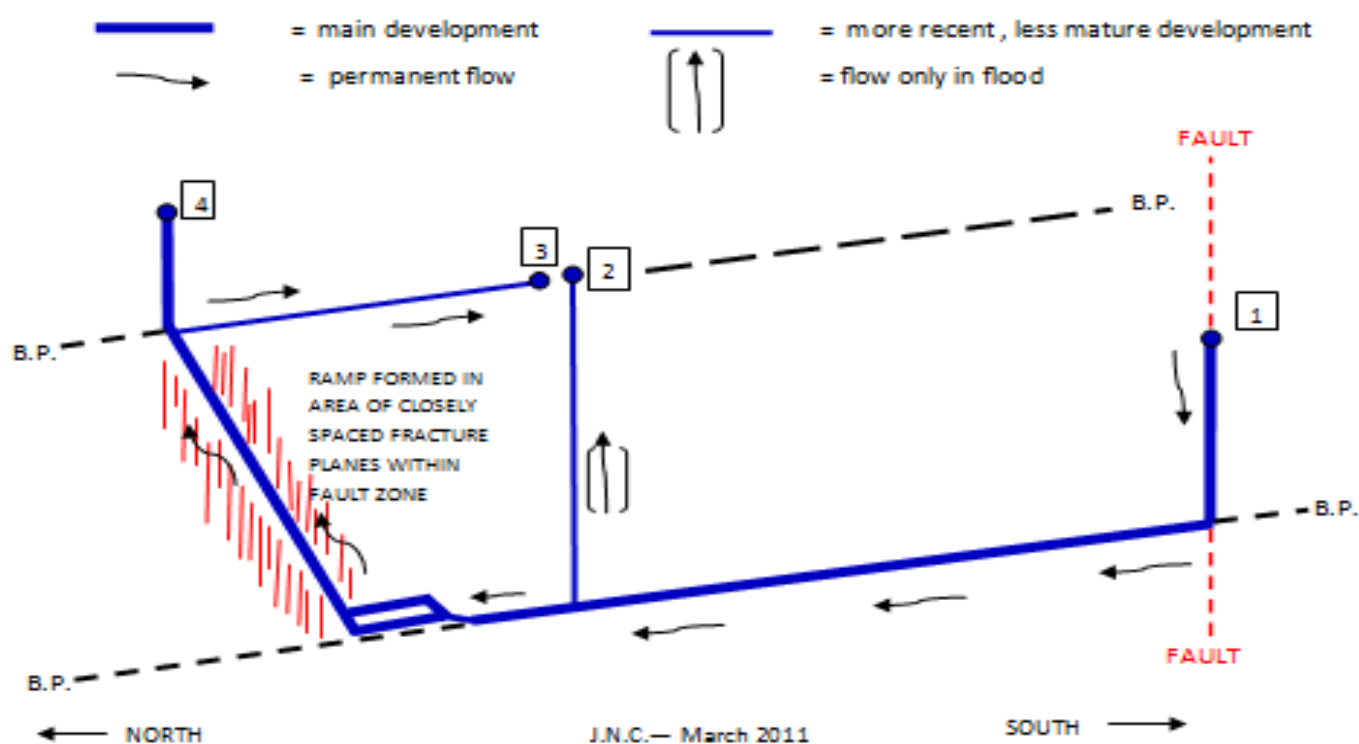
Shortly after this the passage draws closer to the Dent Fault, which thus exerts a greater influence on joint direction. Several strong north south joints or small faults are encountered, one of which conveys flood water upwards in the immature shaft rising up to the entrance of Witches Cave. This shaft is static apart from in high discharge when large volumes of water pass up it to resurge from Witches Cave entrance into Easegill Beck. The main guiding bedding plane in the deep tunnel appears to have been disturbed hereabouts so that the average depth is slightly reduced to around 31 m. The frequent small (north south) fracture planes in this area have also allowed the passage to develop bigger than further upstream which, in the frequently bad visibility, has provided a major constraint to diving exploration over the years.

20 m downstream of the flood outlet to Witches Cave entrance the main tunnel briefly divides to follow two bedding planes some 6 m vertically apart. These then reunite at the base of a spectacular ascending ramp (similar in form to the two ramps in Littondale's Sleets Gill Cave). On the floor is a vast accumulation of rounded pebbles and gravel which is pushed up in flood then remains precariously suspended. The slightest disturbance can cause dangerous collapse of many tons of this material. This area has only been passed on one occasion and the base of the ramp is normally completely choked. The geological controls allowing the cave to ascend steeply here are not fully understood but it seems likely that a large number of closely spaced minor fractures has disrupted the almost horizontal bedrock in this area. In the early stages of the development of the ramp the water probably made many small incremental upwards advances through stressed and slightly brecciated limestones; later enlargement smoothed out the profile resulting in the evenly rising tunnel seen today. At the top of this ramp (at 9 m depth) another bedding plane is encountered, which guides the rest of the passage out to daylight

at Leck Beck Head. This section of passage gradually becomes shallower in a southerly direction as it approaches the main resurgence, thus giving further evidence that the beds dip very gently to the north.

Downstream from the top of the ramp there is a dramatic reduction in size and the passage is significantly less mature than the ramp and the majestic deep tunnel further upstream. The main development is lost in a complex of submerged chokes in the roof which are presumed to lead upwards to a major relict resurgence, probably in the area of the large depression just up-valley from the two flood risings at Leck Beck Head. This ancient former outlet is now choked and obscured beneath the deep blanket of boulder clay covering the surface. The two Leck Beck Head flood risings are themselves relatively immature and are related to the present day active resurgence rather than the inferred ancient resurgence which accounts for the bulk of the development. These highly unstable chokes normally block the route for divers and have only been passed on two occasions (each as a result of major digging operations over many dives).

Somewhere in this large phreatic conduit there is a major inlet from the downstream sump of Lancaster Hole. It is thought that this may join the Leck Fell water in the shallow zone immediately downstream of the ramp. The walls have never been seen here (as access through the Leck Beck Head chokes was only briefly possible) and it may be that the Easegill water (last seen in the Lancaster sump) emerges from somewhere in the gloom on the north side in this area. Re-entering this part of the Leck Beck Head sump would involve a major effort to engineer a safe and permanent route through these highly dangerous chokes which caused so many problems when this part of the cave was explored.



Extended diagrammatic elevation along 550 m sump from Witches Cave dry extension to Leck Beck Head (not to scale)

Key: 1. Downstream sump pool in dry extension to Witches Cave 2. Witches Cave entrance 3. Leck Beck Head Rising 4. Ancient relict resurgence, now buried, above Leck Beck Head

NB This sketch is not accurate on the vertical scale— see poster on page 76 for updated survey of all relevant sump details.

Current condition of Witches Cave

Entrance series

The Shuttleworth Pot entrance is currently in a stable condition due to the foresight of the digging team in using reinforced concrete products and twin wall pipe as a long term solution to capping a broad rift entrance shaft.

A 1.5 m section of aluminium ladder is fixed below the entrance pitch. This will require periodic examination.

Some shoring with walling stone and bracing with scaffold tube has secured the lower part of the rift approaching the second pitch.

All the pitches are rigged with eco hangers to a CNCC approved standard. There are no fixed ropes.

Diver's Pitch Landing

The area around the Divers Pitch landing has a soft sediment floor with small stalagmites which are vulnerable to damage by cavers concentrating on kitting up. Care should be taken to avoid stacking gear in sensitive areas.

The traverse to the sump pitch is slightly unstable due to archaeological excavations in this area. Any bones found should be left in situ and reported to CNCC.

The South Passage

This area has suffered two breakages of fine calcite straws before open season in July 2011.

One of them was a fine 2m straw which had been taped. Unfortunately its exposed position within the only viable way on, always made this a high risk area.

The number of footprints on the pristine soft sediment floors has increased by at least two further incursions by individuals into restricted areas since the original taping was undertaken. Further taping has been undertaken after the first month of open season to try to deal with this problem.

The unique Volcano mud formations on the floor have had additional raised taping and remain in pristine condition.

Some formations such as flowstone in the narrower areas have become smeared with mud.

The dog skeleton has deteriorated dramatically due to unnecessary handling.

Only the stalagmites close to the taped route show any signs of mud accretion

My Newt Passage has been taped off completely to preserve the pristine cracked mud floor, as has the Oxbow Aven area near Dogger Bank.

The Dogger Bank area is fully taped and any further disturbance of the cracked mud floor is inexcusable.

The taped route through the south passage is already about 20cm deep in the softer areas. This will have to be monitored regularly so as to prevent muddy run off from invading any sensitive areas.

North Passage

Exploration continues in this area. This is an area of moderate sensitivity.

Current Conservation Practices

Access Control

Access is controlled by issue of a CNCC permit to any BCA affiliated group via the Leck Fell meets secretary. Applications are asked for 3 months in advance. Just three permits are available for the whole of Leck Fell per day, with no more than seven cavers allowed per permit. Only one permit is supplied for a cave per day. There is no access during April, May and June

The fell has only been filled to permit capacity on 2 weekends per year in recent times.

There is no lock on the Shuttleworth Pot entrance at this time.

Preferred Routes and Taping

The whole of the south passage is taped using stainless steel tape hanging rods to create a desired route through this fragile area of floor deposits. There is no need or excuse for crossing any of these tapes. A plastic sign has been placed at the start of the south passage explaining the function of the conservation tape



Use of Carbide

The use of carbide lamps is forbidden.



Digging Guidelines

All digs within this SSSI cave system are subject to the approval of Natural England and its consent procedure.

These will only be consented if they are:

- Likely to lead to SIGNIFICANT discoveries;
- Their working will not significantly damage known cave features including floor sediments;
- They will not result in the opening of a new entrance to Witches Cave.
- Explosives are not to be used.

Fixed Aids

It is intended that there are no fixed aids in this cave.

All anchors are eco anchors installed by CNCC qualified personnel. They are tested at prescribed intervals in accordance with CNCC technical committee guidelines.



Entrance Pitch

Surface Conservation Measures

The landscape around the entrance is an area of degenerated dwarf shrub species with an invasion of bracken. See SSSI citation in appendix . The original vegetation has been restored and shows every sign of being able to sustain the footfall it can expect from the low numbers of recreational cavers anticipated at this site.

The condition of the surface vegetation will form part of the annual monitoring report submitted to CNCC.

The distinct path approaching the site during the exploration and digging phase has recovered to become a faint track. Footpath erosion is not a problem at present.



Cave Flora and Fauna.

There have been no invertebrates recorded in the dry cave passages. A full biological survey is required.

The CDG log records evidence of *Gammarus pulex* in the Leck Beck Head.

There is a need to observe and record any bat species that might colonise the newly opened entrance.

Cave Archaeology

An interim report on the highly significant archaeological finds has been recorded in the 'Shuttleworth Pot to Witches Cave II' book— written by John Thorp and published by CNCC in spring 2011

A further report is in production which will record the archaeology in full.



Wolf - canine teeth



Aurochs - lower molar teeth

Monitoring

Monitoring the condition of the cave is carried out in two ways:

Fixed point Photography

- A full photographic record was undertaken in the second phase of original exploration in spring of 2011.
- The locations are numbered and shown on the survey.
- The survey should be repeated after 12 months to examine any deterioration in condition.
- A suitable interval to be established thereafter.

Written Reports

- A condition report will be supplied to CNCC committee on an annual basis by the Conservation Officer with assistance from the Meets Secretary and expert witnesses.

Future Conservation Measures

Subject to the results of the monitoring surveys, it may be that certain aspects of current practice need to be altered.

Access Control

There are several options for managing access to a cave. Those currently in use are:

- Open access– no restrictions of any kind;
- Permit System - no restriction based on numbers or experience;
- Permit system with number restrictions– permits issued to BCA affiliated clubs. (The system currently in use at Shuttleworth Pot entrance);
- Permit system with no novices or commercial caving;
- Permit system with accredited cave leader only;
- Locked entrance with Leader system;
- Closed system– access denied.

All of these options apart from the first one are increasingly difficult to administer effectively as the list progresses to ever more draconian levels.

Access Statement

If the cave shows any sign of significant deterioration (in condition of the scientific features of interest) the entrance will be gated, locked and a leader access system instituted. This would be organised through CNCC on behalf of the landowner.

Scientific Work

As this cave is in pristine condition it lends itself to further scientific research. Any archaeological work must not be carried out at the expense of other sediment features or research. Any proposed project would require NE consent and would be required to leave the site in the same or equivalent condition as prior to commencement of the works.

External features

– operations likely to damage
This can be examined in the appendix

Site clean ups

These should be unnecessary as no refuse will be tolerated anywhere in or around the cave.

Education

All visitor groups should receive a statement of the conservation value of the cave which explains their personal responsibilities. This to be issued to the permit applicant . It being his responsibility to ensure his group are made aware of its content.

Review

This plan will remain in force for five years (from 2011) and this period may be extended for further periods of 5 years or as otherwise agreed.

Cave Condition Assessment - July 2011.

Compiled by Andrew Hinde

Grading of features is on a scale from 1—5.

1 = Absent or destroyed

2 = Poor

3 = Satisfactory

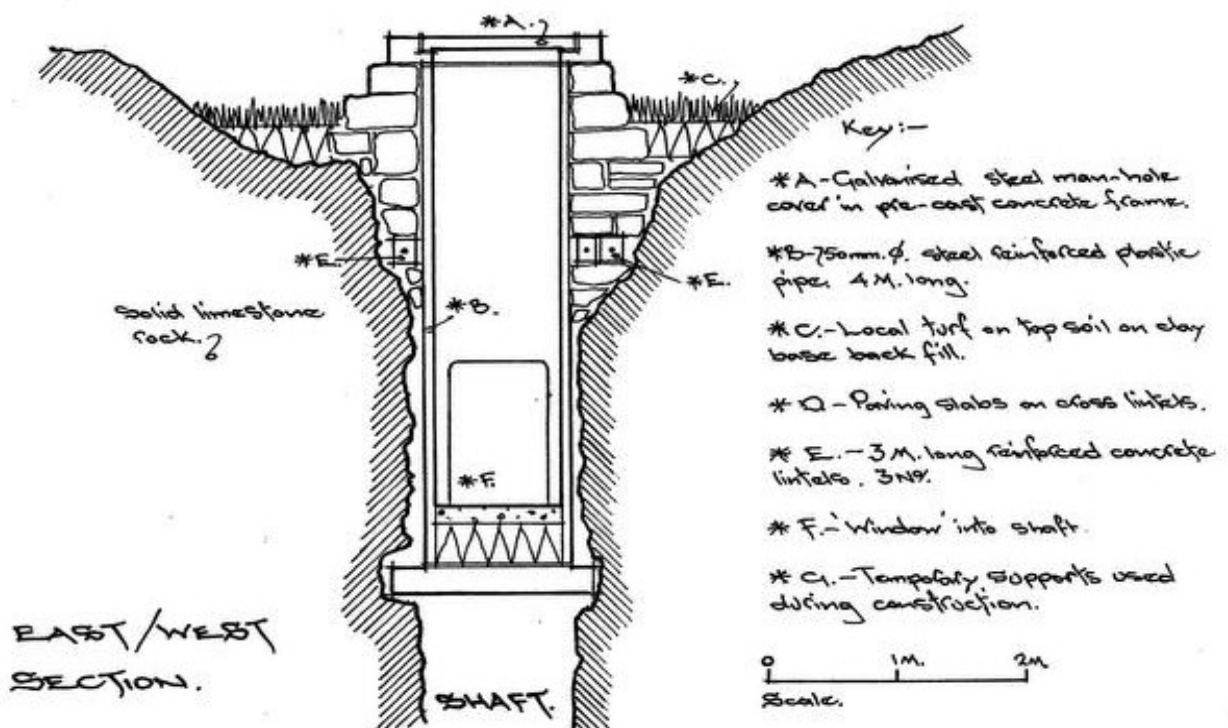
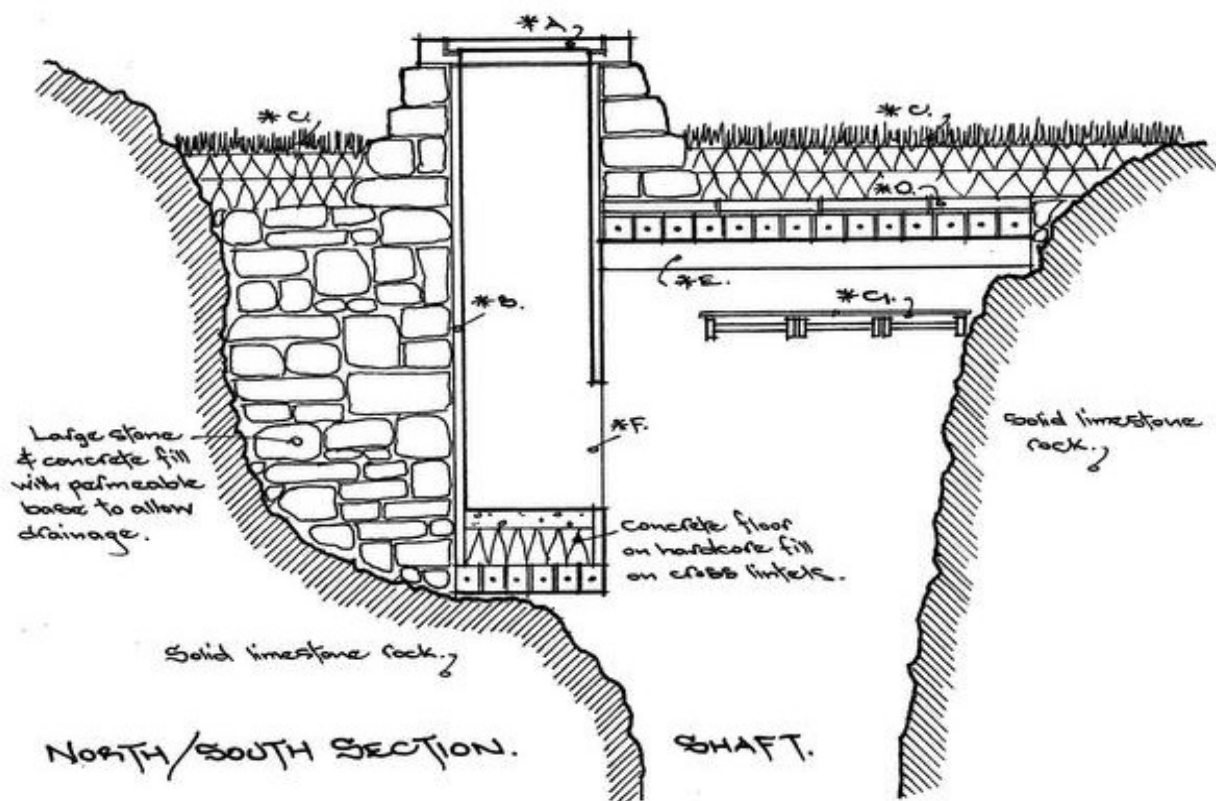
4 = Good

5 = Pristine

Location Number	Feature of Interest	Condition Grade number	Comments
1	Entrance shaft	5	Secure and stable
2	Diver's Pitch -avens with flowstone	5	Clean and secure. Boulder slope to sump remains unstable.
3	2m long stal and with boss+ calcite curtain	5	Clean and pristine. Undisturbed floor sediments of sand and clays.
4	Curtain and broken stal	5	Natural existing damage to stal
5	Soft sand and clay floor sediments	4	Eroded only on taped route.
6	Relict false floor	5	Out of harm's way –hopefully
7	4m wall of sediments and cobbles	5	protected behind tape
8	1.5 m deep varved sediment exposed	5	
9	1 m long straw / column and fine curtains	5	
10	Newt skeletons and cracked mud floor in My Newt Passage	5	Area at great risk if people cross the tape into this area.
11	Coloured calcite flow on mud floor	5	
12	Volcano mud formations	5	heavily taped—very vulnerable.
13	Straws 2m long and helictites 20cm long Plus bronze coloured stalagmite 1m high	5	Taped route steers visitors away from features
14	Calcite drip pits	5	
15	Calcite drip pit on fallen boulder	5	Very close to path
16	Dog skeleton	2	Barely recognisable heap of dust and fragments. Too much handling.
17	Calcited mud formations and cracked mud floor	4	A few footprints have appeared on the floor formations. Further taping undertaken July 2011.
18	Shale band in roof	5	
19	4m high varved sediment bank	5	Vulnerable to erosion at base despite taping
20	Forest of 2m long straws	5	Floor formations adjacent to straws vulnerable to photographers and models footprints. Well taped.
21	False floors	5	well out of reach
22	Oxbow—well decorated	5	taped out of bounds
23	Multiple avens	5	

Location number	Feature of Interest	Condition Grade Number	Comments
24	Passage terminates in blank wall	5	
25	Unstable boulder slope	5	Bolt traverse should protect any archaeology among boulders
26	Rock bridge and sump pools	5	
27	Fracture zone	5	
28	Inlet forming calcite from fracture zone	5	
29	Notch in wall of “Exercise yard”	5	
30	Gour Pools beyond Zig Zag Passage entrance.	5	
31	Mud choke at terminal wall	5	
32	Zig - Zag passage. Raised mineral veins and flow markings in passage walls	5	

Appendices



Shuttleworth Pot Entrance Detail.

By Mick Markham

SSSI Designation for Leck Beck Head SSSI

County: Cumbria/Lancashire
Site Name: Leck Beck Head Catchment Area
District: South Lakeland/Lancaster
Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act, 1981.

Local Planning Authority: South Lakeland District Council
Lancaster City Council

National Grid Reference: SD 669797

Area:	Cumbria	236.9 (ha), 585.4 (ac)
	Lancashire	466.2 (ha), 1152.0 (ac)
	Total	703.1 (ha), 1737.4 (ac)

Ordnance Survey Sheet: 1:50 000 97, 98
1:10 000 SD 68 SE
SD 67 NE

Date Notified (Under 1949 Act): 1959 + 1960	Date of Last Revision: 1979 (Lancashire)
Date Notified (Under 1981 Act): 1986	Date of Last Revision: 1986

Other Information:

1. The boundary of the former Lancaster Hole–Easegill System SSSI has been modified by a partial deletion and by an extension (which includes the former Lost John’s Cave SSSI) to form this revised site.

Reasons for Notification:

Leck Beck Head Catchment Area is located some 5 km due east of Kirkby Lonsdale, encompassing part of Casterton, Leck and Ireby Fells above the Lune Valley and straddling the Cumbria–Lancashire boundary. The site extends from Aygill in the north for some 6 km southwards to the North Yorkshire county boundary on Ireby Fell and comprises an area which is not only of outstanding geological importance but which also includes areas of major biological interest. The geological interest of this site may be defined as follows:

This site comprises several long cave systems and their catchment areas and includes Easegill.

Caverns, the longest cave system in Britain (and 11th largest in the world). Surface water passes underground via 14 major sinkholes, and then travels through the cave system by way of a complex network of passages and fissures to converge at a single major spring (or resurgence) at Leck Beck Head. The caves exhibit a wide range of features of interest, including a number of passages which lie well above the present water table. These formed during successive stages (Devensian, Ipswichian and probably Hoxnian) of the Ice Ages and provide important evidence of landform development during that period. The scale and variety of the caves makes this a most important site for the study of surface and underground landform development over a long period of the recent past.

Most of the biological interest of the site is concentrated around various physical features associated with the underlying Carboniferous Limestone, such as pavements, cliffs, potholes and gorges. Easegill is one of the principal localities and represents a feature unique in South Cumbria and Lancashire. It comprises a series of steep limestone cliffs and associated scree which support a wide range of plants, including several rare and uncommon species such as rigid buckler-fern *Dryopteris villarii*, limestone

polypody *Gymnocarpium robertianum* and mossy saxifrage *Saxifraga hypnoides*. Downstream, the gill develops into a deep, wooded gorge which harbours a rich calcareous woodland flora including such species as wood forget-me-not, hairy rock-cress, wall lettuce, sanicle, whitlowgrass and eleven species of fern.

This diversity is augmented by an area of wet neutral grassland adjoining the gill which contain meadow grasses, meadow foxtail and hairy oat-grass and a variety of herbaceous species, including common spotted-orchid, ragged robin, hemlock water dropwort, bugle and water mint and which contrasts with the species-poor acidic grassland adjacent to it.

In contrast to Easegill, Aygill is on more acid rock and has a characteristic flora including, for example, wood rush *Luzula sylvatica*, hard fern *Blechnum spicant* and beech fern *Phegopteris connectilis*. In total, fifteen species of fern have been recorded from the gills, providing an indication of their high level of flora diversity.

Elsewhere, the various outcrops of limestone, in the form of pavement, low ridges, scree and scattered stone, support a wide range of characteristic limestone plants – including several colonies of rigid buckler-fern, limestone polypody and baneberry *Actaea spicata* – a rare plant of local distribution on limestone in northern England – while the steep, rocky sides of some of the numerous potholes provide ungrazed conditions in which rich, calcareous ‘woodland’ floras have developed. These plant communities provide an interesting and distinctive contrast to the acidic vegetation which is typical of the surrounding area.

Of additional botanical interest is a series of base-rich flushes, localised in a small area on the slopes beneath Gragareth along the approximate junction of Yoredale grit and carboniferous limestone. These features are essentially bryophyte-dominated springs which develop outwards into base-rich flushes supporting a typical high-level flush community with several notable species such as lesser clubmoss *Selaginella selaginoides* – the best surviving location in Lancashire, pale forget-me-not *Myosotis stolonifera* – a species which is nationally scarce, and scurvy-grass *Cochlearia pyrenaica* (of very localised distribution in Britain). These features represent the best examples of upland base-rich flush communities in Lancashire.

Notification of works on a SSSI presented to Natural England

NOTICE OF PROPOSAL TO CARRY OUT AN OPERATION SECTION 28(E) OF THE WILDLIFE AND COUNTRYSIDE ACT 1981 (AS AMENDED)

Name of SSSI: Leck Beck Head Catchment Area SSSI - Unit 4

Name and address of owner or occupier: Mr Shuttleworth c/o ##### ,Shuttleworth Estate Office, ##### I give notice under Section 28(E) of the Wildlife and Countryside Act 1981 of my proposal to carry out cause or permit to be carried out the operation specified below:

Details of proposed operations:

Excavation of shakehole at NGR 66138 79804 .

The excavation is intended to gain entry to Witches Cave system below by removal of infill boulder choke and formation of stabilised shaft with secure entrance and lid. Spoil from the dig to be retained within the shakehole which has been examined by NE staff and found to have little botanical interest. Soil to be stacked on a sheet for use in re landscaping the site at completion of dig. Excess spoil to be deposited in the shakehole identified by Natural England staff. Care to be taken to avoid run off contaminating the limestone crag to the west side of the dig site.

In the event of the dig failing "to go"- the shaft is to be back filled and landscaped with retained top soil.

Timing: 1st June 2010 until 1st June 2012

Land on which operations are to be carried out: (or attach map) NGr 66138 79804

Signed for owner/occupier:

Date: 1.06.2010

Geological Conservation Review Statement

SSSI Name LECK BECK HEAD CATCHMENT AREA

GCR Name LECK BECK HEAD CATCHMENT AREA

Area Team CUMBRIA

Count Lancashire

Within the site, 14 major sinkholes feed water through a major dendritic underground drainage system to a single karst resurgence at Leck Beck Head. Numerous long caves lie within the site including Ease Gill Caverns, the longest cave system in Britain (and 11th longest in the world). The caves show a long and complex evolution through the later Pleistocene with past resurgence levels indicating surface valley elevation in Late Devensian, Ipswichian and probably Hoxnian stages. The great variety of relatively easily accessible caves make this one of the most promising of all sites for geomorphic study and interpretation in the future.

Operations likely to damage SSSI interest

Site name: Leck Beck Head Catchment Area

OLD1001420

Ref. No. Type of Operation

- 1 Cultivation, including ploughing, rotovating, harrowing, and re-seeding.
- 2 Changes in the grazing regime (including type of stock or intensity or seasonal pattern of grazing and cessation of grazing).
- 3 The introduction of stock feeding and changes in stock feeding practice.
- 4 The introduction of mowing or other methods of cutting vegetation and changes in the mowing or cutting regime (including hay making to silage and cessation).
- 5 Application of manure, fertilisers and lime.
- 6 Application of pesticides, including herbicides (weedkillers).
- 7 Dumping, spreading or discharge of any materials.
- 8 Burning and changes in the pattern or frequency of burning.
- 9 The release into the site of any wild, feral or domestic animal*, plant or seed.
- 10 The killing or removal of any wild animal*, including pest control.
- 11 The destruction, displacement, removal or cutting of any plant or plant remains, including tree, shrub, herb, dead or decaying wood, moss, lichen, fungus, leafmould and turf.
- 12 The introduction of tree and/or woodland management+ and changes in tree and/or woodland management+.
- 13a Drainage (including moor-gripping and the use of mole, tile, tunnel or other artificial drains).
- 13b Modification of the structure of watercourses (eg rivers, streams, springs, ditches, dykes, drains), including their banks and beds, as by re-alignment, re-grading and dredging.
- 13c Management of aquatic and bank vegetation for drainage purposes.
- 14 The changing of water levels and tables and water utilisation (including irrigation, storage and abstraction from existing water bodies and through boreholes).
- 15 Infilling of ditches, dykes, drains, ponds, pools, marshes, caves, swallowholes or other natural depressions.
- 16a The introduction of freshwater fishery production and/or management and changes in freshwater fishery production and/or management, including sporting fishing and angling.
- 20 Extraction of minerals, including peat, sand and gravel, topsoil, subsoil, lime, limestone pavement and spoil.
- 21 Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
- 22 Storage of materials on the site.
- 23 Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
- 24 Modification of natural or man-made features, (including cave entrances, swallowholes or other natural depressions), clearance of boulders, large stones, loose rock or scree and battering, buttressing or grading rock-faces.
- 25 Removal of geological specimens, including cave formations (eg stalagmites and stalactites).
- 26 Use of vehicles likely to damage or disturb features of interest.
- 27 Recreational, educational or other activities likely to damage features of interest.
- 28 Introduction of game or waterfowl management and changes in game and waterfowl management and hunting practice.

* 'animal' includes any mammal, reptile, amphibian, bird, fish or invertebrate.

+ including afforestation, planting, clear and selective felling, thinning, coppicing, modification of the stand or underwood, changes in species composition, cessation of management.

Acknowledgements

I would like to thank the following for their voluntary contributions to this Conservation Plan :

- John Gardner for compiling the audit of features of scientific interest;
- the many photographers involved in the recording of these features who are listed elsewhere;
- John Cordingley for his article on geological controls;
- Dave Ramsay ,Becka Lawson and the surveying team for producing the excellent survey;
- John Thorp for the archaeological record.
- I would also like to thank Pete Monk for editing, and all the contributors to, the CNCC publication on which most of this report is based. (*Shuttleworth Pot into Witches II* – available from CNCC website)

Finally - thank you to all the explorers, surveyors and diggers for undertaking such an exemplary piece of cave exploration and conservation.

A future generation of cavers will judge us harshly, and rightly so, if we fail to provide the protection this beautiful cave deserves and it's statutory designation demands.

Any inaccuracies or errors remaining are mine alone.

Andrew Hinde CNCC Conservation Officer October 2011.

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Witches Cave with Shuttleworth Pot Entrance

Survey drawn in Tunnel by Becca Lawson and Julian Todd.
This version prepared 20 February 2012. Published by CNCC.
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Note that colours are for clarity and are not related to depth or geological features

Survey of sump I between dry cave in Witches and Witches II
by John Cordingley, 17 April 1997 and 9 July 1997.
Length: 420m, maximum surveyed depth: -32m.

Survey of sump II from Witches II towards Pippikin
by Jason Mallinson and Rick Stanton, 16 July 1997.
Length: 139m, maximum surveyed depth: -25m.

Survey of Witches II dry cave:
Main surveyors Richard Bendall and Dave Ramsay with help from
Becca Lawson, Ruth McDonald, Richard Mercer, Julian Todd and Paul Windle, 2010-2011.
Length: 1284m. Height of Shuttleworth Pot entrance above sump I: 69m.
Original survey by Jason Mallinson and Rick Stanton, diving from Witches Cave in 1997.

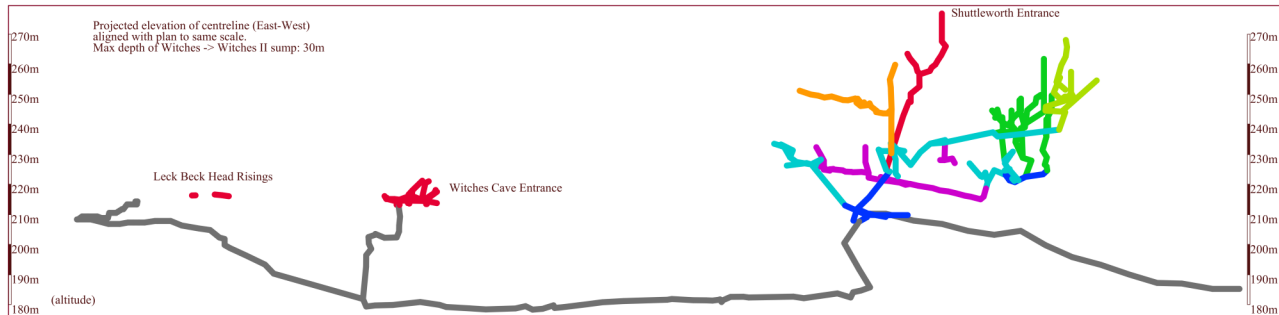
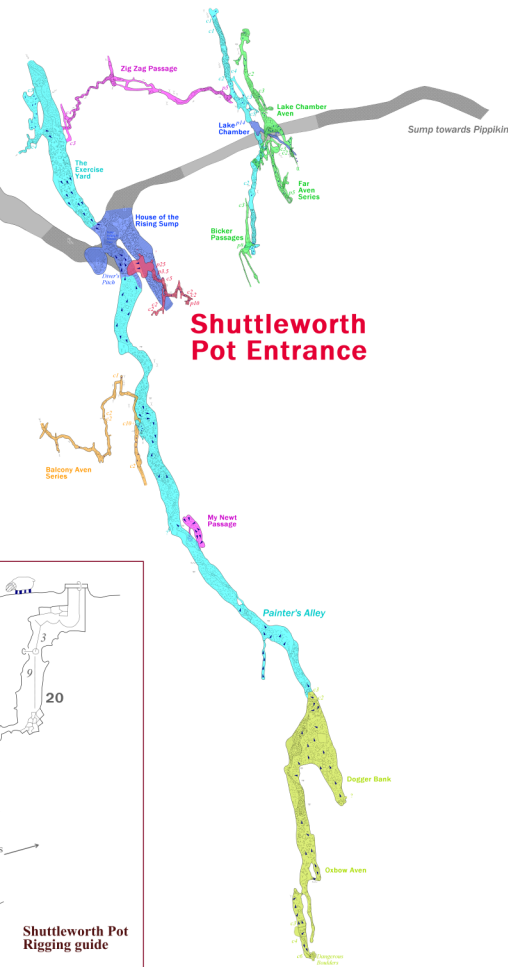
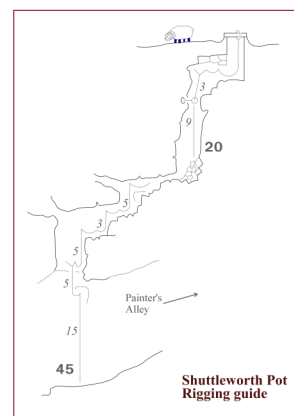
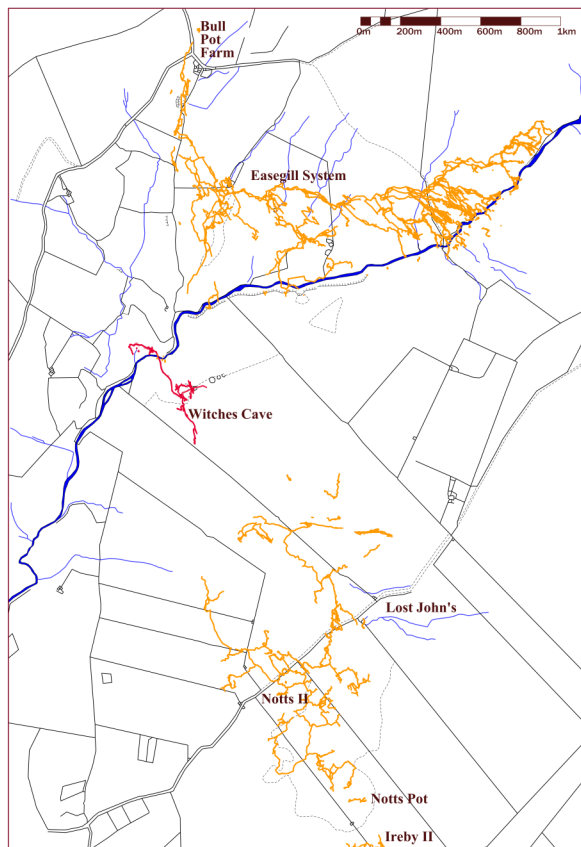
Survey of dry cave in Leck Beck Head area and of dry passage in Witches Cave
by Becca Lawson and Julian Todd, 2011.
Length of Witches Cave: 85m.

Survey of sump from Leck Beck Head Main Rising towards Witches Cave
by John Cordingley, 1993.
Length: 139m, maximum surveyed depth: -24m.

Entrance to Shuttleworth Pot (OS Grid reference SD 66214 79777 Altitude 277m)
opened on 23 Oct 2010 from a surface dig located using a radio beacon placed by
Jason Mallinson and Rick Stanton [Descent 218, p20-24].
Apply to CNCC for access permit.



- Flow of air
- Flow of water
- Steep slope, Exposed bedrock
- Stalagmite, Stalactite
- Curtain, Column
- Spires, Helictite
- Puddle, Sump
- Sand, Mud
- Boulders, Pebbles
- Flintstone, Dried mud



The Witches Cave with Shuttleworth Pot Entrance poster is available as a A1 size colour poster from Inglesport and Bernies Cafe and Caving Shop. It is also available via the CNCC website.

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